Call for Editorial Board Members

As you are well aware that we are a medical and health sciences publishers; publishing peer-reviewed journals and books since 2004.

We are always looking for dedicated editorial board members for our journals. If you completed your master's degree and must have at least five years experience in teaching and having good publication records in journals and books.

If you are interested to be an editorial board member of the journal; please provide your complete resume and affiliation through e-mail (i.e. info@rfppl.co.in) or visit our website (i.e.www.rfppl.co.in) to register yourself online.

Call for Publication of Conference Papers/Abstracts

We publish pre-conference or post-conference papers and abstracts in our journals, and deliver hard copy and giving online access in a timely fashion to the authors.

For more information, please contact:

For more information, please contact:
A Lal
Publication-in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-22754205, 79695648
E-mail: info@rfppl.co.in

Free Announcements of your Conferences/Workshops/CMEs

This privilege to all Indian and other countries conferences organizing committee members to publish free announcements of your conferences/ workshops. If you are interested, please send your matter in word formats and images or pictures in JPG/JPEG/Tiff formats through e-mail attachments to sales@rfppl.co.in.

Terms & Conditions to publish free announcements:

1. Only conference organizers are eligible up to one full black and white page, but not applicable for the front, inside front, inside back and back cover, however, these pages are paid.
2. Only five pages in every issue are available for free announcements for different conferences.
3. This announcement will come in the next coming issue and no priority will be given.
4. All legal disputes subject to Delhi jurisdiction only.
5. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without prior notice.

For more information, please contact:
A Lal
Publication-in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-22754205, 79695648
E-mail: info@rfppl.co.in

Win Free Institutional Subscription!

Simply fill out this form and return scanned copy through e-mail or by post to us.

Name of the Institution_____
Name of the Principal/Chairman_____
Management (Trust/Society/Govt./Company)_____
Address 1_____
Address 2_____
Address 3_____
City_____
Country_____
PIN Code_____
Mobile_____
Email_____

We are regular subscriber of Red Flower Publication journals.

Year of first subscription_____

List of ordered journals (if you subscriberd more then 5 titles, please attach separate sheet)

Ordered through

Name of the Vendor	Subscription Year	Direct/subs Yr

Name of the journal for which you wish to be free winner

Terms & Conditions to win free institutional subscription

1. Only institutions can participate in this scheme
2. In group institutions only one institution would be winner
3. Only five institutions will be winner for each journal
4. An institution will be winner only for one journal
5. The free subscription will be valid for one year only (i.e. 1 Jan – 31 Dec)
6. This free subscription is not renewable, however, can be renewed with payment
7. Any institution can again participate after five years
8. All legal disputes subject to Delhi jurisdiction only
9. This scheme will be available to participate throughout year, but draw will be held in last week of August every year
10. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without prior notice.

I confirm and certify that the above information is true and correct to the best of my knowledge and belief.

Place: Signature with Seal
Date:

Revised Rates for 2021 (Institutional) Title of the Journal	Frequency	India(INR) Print Only	India(INR) Online Only	Outside India(USD) Print Only	Outside India(USD) Online Only
Community and Public Health Nursing	3	6000	5500	469	430
Indian Journal of Agriculture Business	2	6000	5500	469	430
Indian Journal of Anatomy	4	9000	8500	703	664
Indian Journal of Ancient Medicine and Yoga	4	8500	8000	664	625
Indian Journal of Anesthesia and Analgesia	6	8000	7500	625	586
Indian Journal of Biology	2	6000	5500	469	430
Indian Journal of Cancer Education and Research	2	9500	9000	742	703
Indian Journal of Communicable Diseases	2	9000	8500	703	664
Indian Journal of Dental Education	4	6000	5500	469	430
Indian Journal of Diabetes and Endocrinology	2	8500	8000	664	625
Indian Journal of Emergency Medicine	4	13000	12500	1016	977
Indian Journal of Forensic Medicine and Pathology	4	16500	16000	1289	1250
Indian Journal of Forensic Odontology	2	6000	5500	469	430
Indian Journal of Genetics and Molecular Research	2	7500	7000	586	547
Indian Journal of Law and Human Behavior	3	6500	6000	508	469
Indian Journal of Legal Medicine	2	9000	8500	703	664
Indian Journal of Library and Information Science	3	10000	9500	781	742
Indian Journal of Maternal-Fetal & Neonatal Medicine	2	10000	9500	781	742
Indian Journal of Medical and Health Sciences	2	7500	7000	586	547
Indian Journal of Obstetrics and Gynecology	4	10000	9500	781	742
Indian Journal of Pathology: Research and Practice	6	12500	12000	977	938
Indian Journal of Plant and Soil	2	7000	6500	547	508
Indian Journal of Preventive Medicine	2	7500	7000	586	547
Indian Journal of Research in Anthropology	2	13000	12500	1016	977
Indian Journal of Surgical Nursing	3	6000	5500	469	430
Indian Journal of Trauma and Emergency Pediatrics	4	10000	9500	781	742
Indian Journal of Waste Management	2	10000	9500	781	742
International Journal of Food, Nutrition & Dietetics	3	6000	5500	469	430
International Journal of Forensic Science	2	10500	10000	820	781
International Journal of Neurology and Neurosurgery	4	11000	10500	859	820
International Journal of Pediatric Nursing	3	6000	5500	469	430
International Journal of Political Science	2	6500	6000	508	469
International Journal of Practical Nursing	3	6000	5500	469	430
International Physiology	3	8000	7500	625	586
Journal of Animal Feed Science and Technology	2	8300	7800	648	609
Journal of Cardiovascular Medicine and Surgery	4	10500	10000	820	781
Journal of Emergency and Trauma Nursing	2	6000	5500	469	430
Journal of Forensic Chemistry and Toxicology	2	10000	9500	781	742
Journal of Global Medical Education and Research	2	6400	5900	500	461
Journal of Global Public Health	2	12500	12000	977	938
Journal of Microbiology and Related Research	2	9000	8500	703	664
Journal of Nurse Midwifery and Maternal Health	3	6000	5500	469	430
Journal of Orthopedic Education	3	6000	5500	469	430
Journal of Pharmaceutical and Medicinal Chemistry	2	17000	16500	1328	1289
Journal of Plastic Surgery and Transplantation	2	26900	26400	1954	575
Journal of Psychiatric Nursing	3	6000	5500	469	430
Journal of Social Welfare and Management	4	8000	7500	625	586
New Indian Journal of Surgery	6	8500	7500	664	625
Ophthalmology and Allied Sciences	3	6500	6000	508	469
Pediatric Education and Research	4	8000	7500	625	586
Physiotherapy and Occupational Therapy Journal	4	9500	9000	742	703
RFP Indian Journal of Medical Psychiatry	2	8500	8000	664	625
RFP Journal of Biochemistry and Biophysics	2	7500	7000	586	547
RFP Journal of Dermatology (Formerly Dermatology International)	2	6000	5500	469	430
RFP Journal of ENT and Allied Sciences (Formerly Otolaryngology International)	2	6000	5500	469	430
RFP Journal of Hospital Administration	2	7500	7000	586	547
Urology, Nephrology and Andrology International	2	8000	7500	625	586
Coming Soon					
RFP Gastroenterology International	2	–	–	–	–
Journal of Food Additives and Contaminants	2	–	–	–	–
Journal of Food Technology and Engineering	2	–	–	–	–
Journal of Radiology	2	–	–	–	–
Medical Drugs and Devices	3	–	–	–	–
RFP Indian Journal of Hospital Infection	2	–	–	–	–
RFP Journal of Gerontology and Geriatric Nursing	2	–	–	–	–

Terms of Supply:

1. Agency discount 12.5%. Issues will be sent directly to the end user, otherwise foreign rates will be charged.
2. All back volumes of all journals are available at current rates.
3. All journals are available free online with print order within the subscription period.
4. All legal disputes subject to Delhi jurisdiction.
5. Cancellations are not accepted orders once processed.
6. Demand draft/cheque should be issued in favour of "**Red Flower Publication Pvt. Ltd.**" payable at **Delhi.**
7. Full pre-payment is required. It can be done through online (http://rfppl.co.in/subscribe.php?mid=7).
8. No claims will be entertained if not reported within 6 months of the publishing date.
9. Orders and payments are to be sent to our office address as given below.
10. Postage & Handling is included in the subscription rates.
11. Subscription period is accepted on calendar year basis (i.e. Jan to Dec). However orders may be placed any time throughout the year.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Mobile: 8130750089, Phone: 91-11-79695648, 22754205, 22756995, E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Indian Journal of Anesthesia and Analgesia

Aims and Scope

The Indian Journal of Anesthesia and Analgesia (IJAA) is official peer-reviewed scientific journal addresses all aspects of anesthesia practice, including anesthetic administration, pharmacokinetics, preoperative and postoperative considerations, coexisting disease and other complicating factors, cost issues, and similar concerns anesthesiologists contend with daily. The Journal seeks a balance between outstanding basic scientific reports and definitive clinical and management investigations. The Journal welcomes manuscripts reflecting rigorous analysis, even if unusual in style and focus.

Readership: Anesthesiologists, Critical Care Physicians and Surgeons.

Office of Publication: Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I, Delhi – 110 091(India), Phone: 91-11-22754205, 79695648, Fax: 91-11-22754205
E-mail: info@rfppl.co.in, Website: www.rfppl.co.in

Journal Website

http://rfppl.co.in/about_journal.php?jid=24

Subscription Information

The Indian Journal of Anesthesia and Analgesia is published Six times a year.

Volume 7 (6 issues) will be published in 2020 pISSN: 2349-8471, eISSN: 2455-6238

For information on subscription rates please contact

Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India)
Phone: 91-11-79695648, 22754205, 22756995
sales@rfppl.co.in

The journal is distributed free of cost to members of editorial board. Institutional subscription rates (India) INR 8000 and (other countries) USD625.

All correspondence regarding individual and society subscriptions, subscription rates for 2019 and advertisements should be addressed to: info@rfppl.co.in.

Advertisement

E-mail: sales@rfppl.co.in.

INDIAN JOURNAL OF ANESTHESIA AND ANALGESIA

September – October 2020
Volume 7 Number 5

Contents

Original Research Articles

Case Report

Letter to Editor

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.28

Adenosine as Perioperative Analgesia as an Adjuvent: A Comparative Study

B Venkateswara Rao[1], G Srinivas Rao[2]

Author Affiliation: [1]Assistant Professor, [2]Associate Professor, Department of Anesthesia, Osmania Medical College, Hyderabad, Telangana 500095, India.

How to cite this article:
B Venkateswara Rao, G Srinivas Rao. Adenosine as Perioperative Anlgesia as an Adjuvent: A Comparative Study. Indian J Anesth Analg. 2020;7(5):1069–1074.

Abstract

Introduction: Painis a conscious experience that result from brain activity in response to a various stimulus and engages the sensory, emotional and cognitive process of the brain. Pain can be classified based on pain physiology, intensity, temporal characteristics, type of tissue affected, and syndrome.

Aims: A comparing adenosine as a perioperative analgesic as an adjuvant.

Materials and Methods: It is a randomised double-blind and controlled comparative study was conducted in fifty adult patients scheduled for various procedures under general anaesthesia. The patients in the age group of 25–50 years were taken for the study. Adenosine was compared with opioid (fentanyl) analgesia. The study involves n=25 study group n=25 control group.

Results: Control group received opioid analgesia injection fentanyl 2mcg\kg body weight started after intubation. The mean duration of surgery in both groups ranged between 75–90 mins.In comparision perioperative infusion of adenosine showed statistically significant stabilisation of hemodynamics intraoperatively and postoperatively over the control group. The VAS scoring suggested that adenosine group carried a good analgesic effect intraoperatively and postoperatively in comparison with control group.There are no significant side effects in adenosine group in comparison with control group.

Conclusion: The observation suggested that cumulative effect of adenosine infusion carried a good analgesic effect and hemodynamic stabilization in postoperative period. In post operative period patients who received adenosine not required any opiod or analgesic supplementation.

Keywords: Adenosine; Fentanyl; General anesthesia.

Introduction

An unpleasant sensory and emotional experience associated with actual or potential tissue damage or describes in terms of such damage. Pain is subjective, each individual learns the meaning of the word "pain" through experiences related to injury in early life. Biologists recognize that those stimuli or illness that cause pain are likely to damage the tissue. Accordingly pain is an experience we associate with actual or potential tissue damage. Pain is always unpleasant and therefore an emotional experience. Nociception is the process by which information about a various stimulus is conveyed to the brain. It is the total sum of neural activity that occupy prior to the cognitive process that enable humans to identify a sensation as pain. Nociception is necessary but not sufficient for the experience of pain. Perception is the process by which various event is recognized as pain by

Corresponding Author: G Srinivas Rao, Associate Professor, Department of Anesthesia, Osmania Medical College, Hyderabad, Telangana 500095, India.

E-mail: drsrinivasrao@gamil.com

a conscious person. Multiple area of the brain is involved. There is no location where perception occur, although major defining component of pain are attributed to processes that place in specific areas of the brain. For example the sensory-discriminative component is the result of activity in the somatosensory and insularcortex, which allows the person to identify the type, intensity and bodily location of various event. The affective-emotional response to the various stimulus is mediated by the limbic systems.

However, the occurrence of severe pain on emergence from anesthesia and typical opioid-related side effects have been reported in the postoperative period.[1,2] Adenosine, a naturally occurring nucleoside recipe with potent sympatholytic properties, has been reported to potentiate the sedative effect of midazolam and to reduce the requirement for isoflurane and postoperative opioid analgesics.[3] Authors suggested that a perioperative adenosine infusion of 70–130 g. kg^{-1} min^{-1} could replace opioid wardship during isoflurane and nitrous oxide (N2O) anesthesia. Despite its extremely short plasma suppuration half-life (less than 10 s), preliminary studies reported that adenosine possesses long-lasting sympatholytic and analgesic-like effects.[4] The primary objective of the study was to compare Adenosine as a perioperative analgesic as an adjuvant effects.

Materials and Methods

It is a randomised double-blind and controlled comparative study conducted in fifty adult patients scheduled for various procedures under general anaesthesia, in ASA Grade-1 physical status, after Hospital ethical committee approval and informed consent from all patients. The patients in the age group of 25–50 years were taken for the study. The study was taken out only in surgeries lasting for not more than 75 mins.

Patients underwent Gynecological Procedures like Total Abdominal Hysterectomy, Staging Laparatomy for various clinical conditions. All the patients were assessed clinically preoperatively and presence of any medical disorder and history of drug intake was ruled out. Patients with H/O chest pain/palpitations/syncope, H/O Respiratory problems, and Hepatic or Renal problems were excluded from the study. Patients with the base line heart rate <60 beats per minute, base line systolic blood pressure <100mm Hg, ECG abnormalities were excluded from the study. Patients in whom intubation was thought to be difficult were excluded from the study. All the patients underwent the following investigations, namely complete urine analysis, haemogram, blood chemistry, x-ray chest a pre-operative ECG and 2D ECHO and cardiology evaluation.Thepatients were randomly allocated to two Groups Group-1 and Group-2 (having 25 patients in each group).

Group-1: Control

Comprising of 25 patients. This group did not receive Adenosine.

Group-2: Study

Comprising of 25 patients, who received Adenosine 80mcg/kg/min infusion at a rate of 6–8 ml/min 10 min after induction.

The premedication, induction agent and muscle relaxant to facilitate were standardized for both the groups. Intravenous cannulation was done with 18G cannula after shifting the patient into the waiting area of the operation theatre, and connected to a drip of ringer lactate solution. Premedication with Glycopyrrolate 5mcg/kg body weight Ondansetron 0.1mg/kg body weight were given slowly intravenously, 15 minutes before induction. Patient was connected to non-invasive blood pressure monitors, pulse oximeter probe and electrocardiographic leads. All patients were pre -oxygenated with 100% oxygen for 3 minutes.

The patient was induced by Thiopentone sodium (5mg/kg body weight). Intubation was facilitated by using Suxamethonium 2 mg/kg body weight. The lungs were ventilated with 100% oxygen for 90 seconds. Intubation was achieved with an appropriate size oral cuffed, portex endotracheal tube by the aid of Macintosh laryngoscope blade. The time taken for intubation did not exceed 20 seconds. Anaesthesia was maintained with Vecuronium bromide 0.08mg/kg top-up doses;time bounded doses were given for every 20 min inhalation agent used was isoflurane in range of 0.5% to 1% and intermittent positive pressure ventilation with nitrous oxide and oxygen in the ratio of 66%: 33% using circle absorber system connected to the datexmeda aneasthesia work station. Surgery was not allowed to commence till the recordings were completed. Recordings were done at pre-induction, post intubation, then every 15 mins till end of surgery. Parameters monitored HR, SBP, DBP, MAP, Intraoperative fluid requirement were also given according to

protocol blood loss and urine output monitoring also done. At the end of the surgery, neuromuscular blockade was reversed with Neostigmine (0.05mg/kg) Glycopyrrolate (0.08mg/kg). All the patients were followed in the post-operative period of 6 hrs for hemodynamicsadaquet analgesia. There is no evidence of any side effects of the adenosine or fentanel were seen in post-operative period in the comparison of both groups.

The parameters recorded were Heart Rate, Systolic Blood Pressure, Diastolic Pressure, Mean Arterial Pressure and Visual Analog Scores (post operatively).

The recordings were noted at various intervals as detailed below, from the study conducted Pre-operatively i.e. at pre-anaesthestic evaluation, Pre-induction i.e. after premedication, After induction, At laryngoscopy and intubation, Every 15 minute after intubation till the end of surgery andPost operatively for 6 hrs. Parameters monitored were HR, SBP DBP MAP VAS.

Results

Fifty patients undergoing elective surgeries were selected for this study. Patients randomly divided into two groups of 25 patients each group.

Table 1: Demographic details in study.

Group	Age (in years)	Weight (in kgs)	P-Value
Study (n=25)	41.3	55.3	>0.05
Control (n=25	42.1	55.9	>0.05

Table 1 showing age weight distribution in both groups range for age was 25–50 yrs for both groups. Range for weight was 30–55 kg. There is no statistical significant difference in both groups.

Table 2 parameters are recorded at the preinduction time, intubation and 15 min after intubation has no statistically significant difference was observed between control and study group. (P> 0.05).

Parameters were recorded after 30 min, 45 min,60 min, 75 min and 90 min there is statistically significant difference was observed between control and study group. (P value < 0.05).

Table 3 parameters are recorded 1st hour, 2nd hour, 3rd hour, 4th hour, 5 th hour and 6th hour after extubation there is statistically significant difference was observed in all parameters between study group and control group (P value < 0.05).

Table 2: Parameter in preintubation and intubation at different time periods.

Parameters	Study (Mean)	Control (Mean)	P-Value
Preinduction time			
HR	85.04 ± 2.34	81.72	<0.05
SBP	122.8	165.6	<0.05
DBP	76	77.2	<0.05
MAP	91.36	90.9	<0.05
Intubation			
HR	113.6	110.04	<0.05
SBP	159.6	202.8	<0.05
DBP	101.12	91.2	<0.05
MAP	119.99	110.87	<0.05
15 mins after intubation			
HR	84.72	86.36	<0.05
SBP	116.76	128.4	<0.05
DBP	75.88	80.2	<0.05
MAP	90.016	96.77	<0.05
30 mins after intubation			
HR	78.44	85.92	<0.05
SBP	108.32	128.75	<0.05
DBP	72.24	77.4	<0.05
MAP	84.18	94.96	<0.05
45 mins after intubation			
HR	74.68	87.4	<0.05
SBP	107.32	131.72	<0.05
DBP	70.28	79.72	<0.05
MAP	82.58	97.21	<0.05
60 mins after intubation			
HR	76.12	96	<0.05
SBP	109.08	137.76	<0.05
DBP	72.24	84.72	<0.05
MAP	82.25	103.23	<0.05
75 mins after intubation			
HR	78.76	94.48	<0.05
SBP	109.4	135.2	<0.05
DBP	71.84	83.92	<0.05
MAP	84.19	100.89	<0.05
90 mins after intubation			
HR	78.44	85.92	<0.05
SBP	108.32	128.75	<0.05
DBP	72.24	77.4	<0.05
MAP	84.18	94.96	<0.05

P-Value- <0.05 is significant

Table 3: Post operative observation and after extubation at various time periods.

Parameter	Study	Control	P-value
1st hour after extubation			
HR	81.28	88.56	<0.05
SBP	111.52	128.8	<0.05
DBP	73.88	81.8	<0.05
MAP	86.07	96.7	<0.05
2nd hour after extubation			
HR	83.6	92.96	<0.05
SBP	117.8	132.72	<0.05
DBP	76.84	83.4	<0.05
MAP	91.08	99.62	<0.05
3rd hour after extubation			
HR	85.8	99.96	<0.05
SBP	123.16	137.92	<0.05
DBP	80.4	85.4	<0.05
MAP	95.5	102.5	<0.05
4th hour after extubation			
HR	92.4	105.8	<0.05
SBP	128.56	141.32	<0.05
DBP	83.6	88.76	<0.05
MAP	99.76	106.2	<0.05
5th hour after extubation			
HR	98.8	100.08	<0.05
SBP	135.72	138.2	<0.05
DBP	89.04	85.6	<0.05
MAP	106.12	102.4	<0.05
6th hour after extubation			
HR	107.8	93.36	<0.05
SBP	143.6	132.4	<0.05
DBP	91.68	82.84	<0.05
HR	107.8	93.36	<0.05

P-Value <0.05 is significant

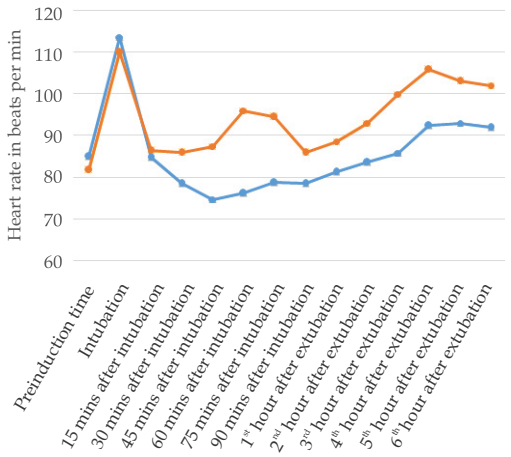


Fig. 1: Heart rate in various periods of study.

Heart rate is significant from 30 min after intubation till 6 th hour of extubation. (Fig. 1)

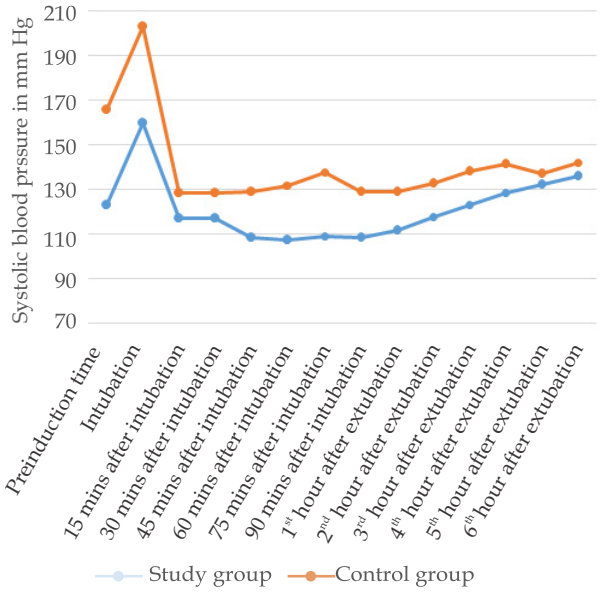


Fig. 2: Systolic blood pressure in various periods of study.

Systolic blood pressure is significant all over till 6 th hour of extubation. (Fig. 2).

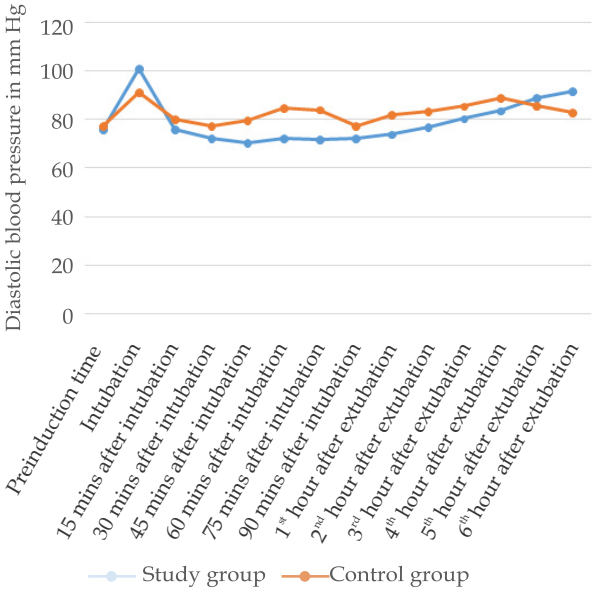


Fig. 3: Diastolic blood pressure in various periods of study.

Diastolic blood pressure is significant all over till 6th hour of extubation. (Fig. 3)

Table 4: VAS scores are recorded at 1–6 hrs in postoperative period.

Time periods	Study	Control
1st hr	0.35	5
2nd hr	0.56	6
3rd hr	2	6.6
4th hr	2.6	7.3
5th hr	3.2	6.8
6th hr	3.4	6

In Table 4 there is statistically significant difference was observed between study and control groups at initial four hrs.

Discussion

Acute pain is an expected out come after any kind of surgery. According one study approximately 80% of patients undergoing surgery experienced acute pain during postoperative period. Pain after surgery can impede recovery increase hospital stay increase health care costs affects patient's general activity and sleep despite increased focus on pain management and development of pain management guidelines, and the postoperative pain remains an important issue in the perioperative setting. Opioids remain the main stay for postoperative analgesia especially after major surgeries. However pain is a multifactorial phenomenon that may not be controlled adequately with opioid monotherapy and opioid use may be associated with dose related adverse effects such as respiratory depression, nausea vomiting, urinary retention, itching, and sedation.

To improve pain relief and reduce the incidence and severity of side effects a multi model approach to postoperative analgesia should be used.In our study we are investigated the effects of IV adenosine on anaesthetic requirements and post-operative recovery and analgesic effect in patients undergoing major surgical procedures under general anaesthesia.

Adenosine was compared with opioid (fentanyl) analgesia in a randomised double-blind and controlled comparative study. The study involves n=25 study group n=25 control group.The anaesthesia technique, drugs used in premedication, induction, intubation and maintenance and inhalational agent used were standardized for both groups. Study groupreceived adenosine 8mcg\kg\ min infusion started 10 mins after induction, after stabilization of heamodynamics. Control group received opioid analgesia injection fentanyl 2mcg/ kg body weight started after intubation. The mean duration of surgery in both groups ranged between 75–90 mins. Adenosine infusion was stopped immediately after completion surgery. In one study, patients received a perioperative infusion of adenosine adjusting the dose as needed to maintain acceptable hemodynamic stability. Infusion rates were also variable in the second study, ranging from 72 to 290 μg • kg^{-1} • min^{-1} for adenosine. In both studies, excellent hemodynamic stability was maintained intraoperatively by both drugs. In one study, the time to complete orientation was significantly faster with adenosine compared with remifentanil (mean ± sd: 6 ± 2 min vs 31 ± 12 min, $P < 0.05$). In this study, postoperative sedation and nausea were also significantly less in the adenosine group.[5,6,7]

In comparision perioperative infusion of adenosine showed statistically significant stabilization of hemodynamics intraoperatively and postoperatively over the control group. The VAS scoring suggested that adenosine group carried a good analgesic effect intraoperatively and postoperatively in comparison with control group. Fukunagaet al. (2003) also observed significantly reduced pain scores in their study with adenosine.[5]

There is no significant side effects in adenosine group in comparison with control group. The observation suggested that cumulative effect of adenosine infusion carried a good analytic effect and hemodynamic stabilization in postoperative period. In post-operative period patients who received adenosine not required any opiod or analgesic supplementation.

In this study involving females who underwent total abdominal hysterectomy 2 of 25 evaluable adenosine-treated pts. Reported one or more of the following: hematoma; fever;reoperation due to postoperative bleeding; due to surgical reasons.

1 of 25 adenosine treated pts. Experienced an adverse event: transient atrioventricular block II or transient decrease in systolic blood pressure due to accidental overdose. In who underwent surgery abdominal hysterectomy and received IV adenosine 2 pts. Experienced an adverse event ASHeadache (adenosine), faintness (adenosine), palpitation/ tightness (adenosine), and itching.

Pts who underwent hysterectomy 1 of 25 pts in the adenosine group experienced sever bronchospasm shortly after ignition of infusion.

In Gan Tang J et al study 8 were usually moderate and well tolerated by most patients

(81 per cent). Extreme bronchospasm was the most significant incident recorded in seven cases. There were no deaths, so there were just one cases of myocardial infarction so pulmonary edema each. Transient AV block existed in 8 percent of patients and was usually overcome in the adenosine infusion without any improvement.

There was no continuous series of AV block. Adenocard's safety profile is very similar to the one described for Adenoscan.

Owing to the extremely short adenosine half-life of whole blood (< 10 s) (12,13), concerns about the treatment of cardiovascular side effects are minimised. However, it is important to note that in nonsurgical use the safety of adenosine may not reflect its protection during the perioperative phase.

Like nonchirurgical application, there can be a variety of drug-to-drug reactions between adenosine and inhaled anesthetics and opioids that can aggravate adenosine's hemodynamic effects.

Furthermore, with enhanced bronchotracheal stimulation during the perioperative phase, the bronchoconstriction risk could be greater than in a non-surgical population.

Conclusion

Adenosine is Good Analgesia without Sedation, Excellent Controllability, Stimulates Breathing, Mild Hemodynamic Effects, No Postoperative Hyperalgesia, Treats Pulmonary Hypertensionand May be used in Opiate Addicts.

Adenosine appears to demonstrate opiod-sparing, anesthetic-sparing, and analgesic properties Dose finding clinical studies are warranted to establish the optimal dose for achieving a balance between efficacy and side effects profile for adenosine use in the perioperative setting.

References

1. Sawynok J, Liu XJ. Adenosine in the spinal cord and periphery: release and regulation of pain. Prog Neurobiol. 2003;69(5):313–340.
2. Cronstein BN. Adenosine, an endogenous anti-inflammatory agent. J ApplPhysiol (1985). 1994;76(1):5–13.
3. Bours, M J, Swennen, EL, Di Virgilio, F, Cronstein, BN & Dagnelie, PC Adenosine 5′-triphosphate and adenosine as endogenous signaling molecules in immunity and inflammation. 2006: Pharmacol. Ther. 112, 358–404 .
4. Burnstock G. Physiology and pathophysiology of purinergic neurotransmission Physiol Rev. 2007;87(2):659–797.
5. Fukunaga AF, Alexander GE, Stark CW. Characterization of the analgesic actions of adenosine: comparison of adenosine and remifentanil infusions in patients undergoing major surgical procedures. Pain 2003;101:129–38.
6. Rane K, Sollevi A, Segerdahl M. Intrathecal adenosine administration in abdominal hysterectomy lacks analgesic effect. Acta AnaesthesiolSc and 2000;44:868–72.
7. Zarate E, Sa Rego MM, White PF, Duffy L, Shearer VE, Griffin JD, Whitten CW. Comparison of adenosine and remifentanil infusions as adjuvants to desflurane anesthesia. Anesthesiology 1999;90:956–63.
8. Gan, Tong J, MB, FRCA, FFARCSI; Habib, Ashraf S, MB, FRCA Adenosine as a Non-Opioid Analgesic in the Perioperative Setting, Anesthesia & Analgesia: August 2007 - Volume 105 - Issue 2 - p 487–494 doi:
9. Package insert for Adenocard®. Available at: www.fujisawa.com/medinfo/pi/pi_page_ac.htm. Accessed Dec. 7, 2006.
10. Package insert for Adenoscan®. Available at: www.fujisawa.com/medinfo/pi/pi_main_as.htm. Accessed Dec. 7, 2006.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.29

Comparative Effect of Etomidate and Thiopentone on the Heart Rate and Respiratory Rate for Induction of General Anaesthesia

Sushil Kumar[1], Uday Pratap[2], Ruchi Gupta[3], Mahesh Verma[4]

Author Affiliation: [1]Assistant Professor, Department of Anesthesia, Government Medical College, Banda, Tindwara, Uttar Pradesh 210001, India [2,3]Assistant Professor, Department of Anesthesia, Geetanjali Medical College Udaipur, Rajasthan- 313001, india. [4]Assistant Professor, Department of Anaesthesia, Maharani Laxmi Bai Medical College Jhansi, Uttar Pradesh 284001, India.

How to cite this article:
Sushil Kumar, Uday Pratap, Ruchi Gupta, et al. Comparative Effect of Etomidate and Thiopentone on the Heart Rate and Respiratory Rate for Induction of General Anaesthesia. Indian J Anesth Analg. 2020;7(5):1075–1079.

Abstract

Introduction: Etomidate is recommended for induction in patients with poor left ventricular (LV) function. Thiopentone has been the routine induction agent of anaesthesia since 1930's because of its rapid and predictable action. Hence the present study allows evaluation of Etomidate in comparison with Thiopentone sodium as an induction agent.

Materials and Methods: Total of 120 patients between the age ranges of 20 to 70 years were included in the study. All the patients were scheduled to undergo the elective surgery under general anaesthesia. They were divided into two groups: *Group A:* comprised of 60 patients induced with injection etomidate 0.3 mg/kg IV for general anaesthesia. *Group B:* comprised of 60 patients induced with injection Thiopentone 5 mg/kg IV for general anaesthesia.

Results: The mean induction time for etomidate for group A was found to be 23±5 seconds and the mean induction time for Thiopentone for group B was found to be 33±6 seconds. There is significant increase in heart rate after intubation in thiopentone group as compared to etomidate group. During induction there was decrease in respiratory rate in both groups and when the comparison was done the more decrease was found in group B that is in patients with thiopentone group.

Conclusion: By the present study it can be concluded the induction time was lesser in Etomidate and the incidence of aponea was more in Thiopentone. Etomidate is an effective and rapid acting induction anesthetic agent with good cardiovascular stability and respiratory stability. Its side effects can be reduced to minimum by proper premedication and suitable IV Anaesthetic techniques.

Keywords: Anaesthesia; Complications; Etomidate; Thiopentone.

Introduction

The considerations for induction of anaesthesia in patients undergoing cardiac surgery include hemodynamic stability, attenuation of the stress responses and maintenance of balance between myocardial oxygen demand and supply.[1] The Induction of general anaesthesia allowed Surgeons to operate with careful deliberation on patients made totally unaware and pain free. With this arose the problem of inducing quick and reversible unconsciousness with minimal side effects. This was initially tried with inhalation agents and later intravenous agents.[2]

Hemodynamic stability is very much important during induction of general anaesthesia in surgical patients. Thus, anaesthetic agent with minimum

Corresponding Author: Uday Pratap, Assistant Professor, Department of Anaesthesia, Geetanjali Medical College Udaipur, Rajasthan 313001, India.

E-mail: researchguide86@gmail.com

effect on heart rate (HR) and blood pressure (BP) would be the agent of choice for general anesthesia.[3] Use of inhalational anaesthetics can cause progressive cardiopulmonary depression. Thus, use of non-inhalational anaesthetic agents can decrease the requirement of inhalational anaesthetics which lead to less cardiovascular depression.[4,5]

Etomidate, first introduced in the seventies, was withdrawn, because of anaphylactic reactions to Cremaphore EL. There were also concerns about reductions in the serum cortisol levels, which lasts for up to 24 h. However, it has a very stable cardiovascular profile and has been reintroduced in India. Etomidate is recommended for induction in patients with poor left ventricular (LV) function.[6,7]

Thiopentone has been the routine induction agent of anaesthesia since 1930's because of its rapid and predictable action. The main drawbacks are cardiovascular and respiratory depression, increased incidence of Laryngospasm, bronchospasm, allergic reactions.[8] Thiopentone has survived the test of time as an intravenous anaesthesia drug. The different agents like Etomidate have been tried with varied success.[8,9] Hence the present study allows evaluation of Etomidate in comparison with Thiopentone sodium as an induction agent. This study aims an attempt to compare heart rate and respiratory rate.

Materials and Methods

The present clinical study was done in the medical college and associated hospital. Total of 120 patients between the age ranges of 20 to 70 years were included in the study. All the patients were scheduled to undergo the elective surgery under general anaesthesia. The institute ethical committee was informed about the study and the clearance certificate was obtained from them. All the included patients were evaluated thoroughly on the previous day of surgery.

Thorough history and complete physical examination was under taken. All the patients who were included in the study were explained about the study and the written informed consent was obtained from them. The patients who were of lesser age of 20 years and more than 70 years were excluded in the study. All those patients who were unable to give the inform consent, patients belonging to ASA grade III and IV patients, those who require emergency surgeries, patient with history of hypersensitivity to thiopentone and etomidate, all those on steroid medication were excluded in the study.

The included 120 patients belonged to ASA I or II grade and were divided into two groups:

Group A: comprised of 60 patients induced with injection etomidate 0.3 mg/kg IV for general anaesthesia.

Group B: comprised of 60 patients induced with injection Thiopentone 5 mg/kg IV for general anaesthesia.

All the patients were positioned in the operating room and IV line was started into a suitable vein. The infusion line was started and continued throughout the procedure. Pulse oximeter and ECG was used to check the following parameters like pulse rate, oxygen saturation and pulse saturation. Prior to the induction of anaesthsia, all patients were pre-medicated with Injection fentanyl 2 microgram per kg and Inj. Glycopyrrolate 0.2 mg I.V 10 minutes before induction Patients were pre-oxygenated with 100% O2 for 3 minutes.

All the patients were asked to take deep breaths. The induction time was calculated from the start of injection of either of the drug to the time of loss of eyelash reflex. Patient intubated after relaxing with injection succinylcholine 2 mg/kg, with appropriate size endotracheal tube. Anaesthesia was maintained with 33% Oxygen + 66% nitrous oxide + non depolarizing muscular relaxants (vecuronium 0.05 mg/kg). At the end of surgery when the patient had respiratory efforts, patients were reversed with injection Neostigmine 0.05 mg/kg + injection glycopyrollate 0.01 mg/kg and extubated. Patient was shifted to the recovery room later.

Before the induction of anaesthesia, during the pre induction period the blood pressure and the respiratory rate were recorded. These values formed the base line values for the future comparison. Induction period starts from the injection of induction agent upto the period of loss of eye lash reflex. During the induction period the parameters like heart rate, blood pressure and respiratory rate were measured at regular interval. Pain on injection was assessed by visual analogue scale was graded as 0 – no pain, 1 – slight pain, 2 – moderate pain, 3 – severe pain. Immediately after intubation the blood pressure, heart rate and respiratory rate were recorded at regular intervals. The occurrences of the adverse effects were noted as vomiting and nausea. Results are presented as the mean (SD) unless and otherwise stated. Between the groups, statistical significance of the readings obtained during the

study is compared using t-test and p value was calculated to know its significance. P value < 0.05 was considered significant.

Results

In the present study total of 120 patients belonging to the ASA Grade I and II scheduled to undergo the elective surgeries under general anaesthesia were included in the study. All the patients were equally divided into the two groups; Group A consist of 60 patients were induced with injection etomidate and Group B consist of 60 patients were induced with injection Thiopentone.

The average mean weights were 58.9±9.7 kg in group A and 62±6.5 kg in group B. The mean weight in the group A who were induced with etomidate was slightly lesser than other group and the difference was not found to be significant. The age wise distribution of the patients was in range of 20 to 70 years. The minimum age was found to be 20 years and maximum age was found to be 70 years. The average mean age in group A was found to be 35 years and that in group B was 33 years. The distribution of males and females in different groups are as follows: there werem28 males and 32 females in group A and there were 34 males and 26 female in group B.

The patients included in the study were scheduled to undergo submucosal resection, septoplasty, tonsillectomy or general surgical procedures. Majority of the surgeries scheduled for patients in both the groups were ENT surgeries.

The mean induction time for etomidate for group A was found to be 23±5 seconds and the mean induction time for Thiopentone for group B was found to be 33±6 seconds. The time of induction for etomidate in group A was found to be significantly shorter compared to thiopentone in group B. The induction time was calculated from the start of induction of the anaesthetic drug to the loss of reflex of eye lashes. The difference was found to be statistically significant with p < 0.005.

During induction, the heart rate increased in group A and group B values form the base value. There is significant increase in heart rate after intubation in thiopentone group as compared to etomidate group. Post intubation there was decrease in heart rate in group A and there was increase in heart rate in group B. The difference was found to be statistically significant. (Table 1).

During induction there was decrease in respiratory rate in both groups and when the comparison was done the more decrease was found in group B that is in patients with thiopentone group. The respiratory rate was fixed at one rate after the intubation in both the groups. (Table 2).

Aponea occurred more frequently in group B compared to the group A. Pain on injection was present in 20 patients in the group A but there was none in group B. The post operative complication like nausea and vomiting were low especially in the group B .In the group B nausea and vomiting was present in 6 patients and 10 patients in group A. Incidence of side effect like myoclonus occurred in group A 16 patients but there was none in group B. (Table 3).

Table 1: Comparison of heart rate in two groups.

Time of assessment	Group A	Group B	T value	P value
Pre induction	73±10	73±16	0.60	0.33
Induction	75±16	78±14	1.49	0.10
Post induction	74±19	82±19	3.20	0.003

Table 2: Comparison of respiratory rate in two groups.

Time of assessment	Group A	Group B	T value	P value
Pre induction	12±2	11±1	0.60	1.71
Induction	10.2±3.1	12±2.1	0.9	1.20
Post induction	12	12	-	-

Table 3: Adverse effects in two study groups.

Adverse effects	Group A	Group B
Apnea	6	52
Myoclonus	16	0
Pain on injection	20	0
Nausea- vomiting	10	6

Discussion

The deleterious effects of anaesthetic agents in patients suffering from coronary artery disease are well-known. Induction of general anaesthesia may be a critical period during CABG and valve replacement surgery, especially in presence of LV dysfunction.[10] There is a paucity of literature regarding the choice of suitable agent to avoid deleterious effects in such patients. Anaesthetic induction techniques for cardiovascular surgery are based on considering hemodynamic stability and effects on myocardial oxygen supply and demand.[11]

Thiopentone is reliable, safe and inexpensive hence its considered as gold standard for the induction in the clinical practice. There are some contraindications for its uses like hereditary intermittent porphyria and sensitivity to barbiturate. In the cardio respiratory diseases

person the thiopentone is not the drug of choice as it causes the cardio respiratory depressive effects.[12] Etomidate has properties which suggest that it is a useful alternative to thiopentone. Etomidate is a short acting non barbiturate IV anesthetic agent with cardiovascular stability and with minimal respiratory depression.[13]

The similar study which was done by Shah et al showed that induction of etomidate achieved fast and smooth anaesthesia. The average time of induction of anaesthesia was found to be 20 seconds.[14] Hence the results are in consistent with the result with our study. In the study with Batra et al[15] showed that means induction with thiopentone and etomidate anaesthesia onset were found to be identical. The faster induction time of Etomidate can be explained by the rapid distribution and short elimination half life. Etomidate has a large volume of distribution (160 lt) and high plasma clearance of 1600ml/min resulting in a relatively short elimination half life of about 70 minute, and rapid distribution from blood in to CNS with substantial tissue uptake.

There is increase in heart rate in Thiopentone group compared to the Etomidate group. During the 1st min tachycardia was seen in Thiopentone group. The heart rate showed marginal increase when compared to the pre induction value in Etomidate group which is not statistically significant. Studies by Harris, et al., found Thiopentone increases the heart rate and returns to the preinduction level just prior to the intubation. The respiratory rate showed a decrease in the Thiopentone group.[16] The Etomidate group showed increase in respiratory rate after the induction. Our study correlates with the study conducted by S V Korgaonkar,et al.,17 reported that there was increase in Respiratory rate 80% and did not change in 19.1% at 5 and 7 min after induction in Etomidate group.

Conclusion

By the present study it can be concluded the induction time was lesser in Etomidate and the incidence of aponea was more in Thiopentone. Etomidate is an effective and rapid acting induction anesthetic agent with good cardiovascular stability and respiratory stability. Its side effects can be reduced to minimum by proper premedication and suitable IV Anaesthetic techniques.

Conflict of Interest: None

Source of Support: Nil

References

1. Kaushal RP, Vatal A, Pathak R: Effect of etomidate and propofol induction on hemodynamic and endocrine response in patients undergoing coronary artery bypass grafting/mitral valve and aortic valve replacement surgery on cardiopulmonary bypass. Annals of cardiac anaesthesia 2015, 18:172.
2. Lugli AK, Yost CS, Kindler CH: Anaesthetic mechanisms: update on the challenge of unravelling the mystery of anaesthesia. European journal of anaesthesiology 2009, 26:807.
3. Ebert TJ, Muzi M, Berens R, Goff D, Kampine JP: Sympathetic responses to induction of anesthesia in humans with propofol or etomidate. Anesthesiology: The Journal of the American Society of Anesthesiologists 1992, 76:725-33.
4. Kushwaha R, Choudhary S: A comparative study between propofol and thiopentone for hemodynamic parameters during induction of general anesthesia in surgical patients. Journal of Medical and Allied Sciences 2017, 7:9.
5. Kikuchi C, Dosenovic S, Bienengraeber M: Anaesthetics as cardioprotectants: translatability and mechanism. British journal of pharmacology 2015, 172:2051-61.
6. Jamuna S: Comparison of Propofol and Etomidate Induction on Hemodynamic Response to Endotracleal in Tubation. ESIC Medical College and Postgraduate Institute of Medical Science and …, 2019.
7. Dayananda V: Total Intraveous Anasthesia with Propofol For Intra-Abdominal Surgeries. 2006.
8. Shilpashri A, Hanji SA, Gayathri G, Palakshappa K: Etomidate is Rapid Acting and has Good Cardiovascular and Respiratory Stability than Thiopentone Sodium. Indian Journal of Public Health Research and Development 2015, 6:172-7.
9. BASTOS-RAMOS WP, GONÇALVES NM, BACILA M: Anesthesia and analgesia in Antarctic fish: an experimental approach. Archives of Veterinary Science 1998, 3.
10. McGlothlin D, Ivascu N, Heerdt PM: Anesthesia and pulmonary hypertension. Progress in cardiovascular diseases 2012, 55:199-217.
11. Hoeper MM, Granton J: Intensive care unit management of patients with severe pulmonary hypertension and right heart failure. American journal of respiratory and critical care medicine 2011, 184:1114-24.
12. Aouad MT: The psychological disturbances of the child undergoing surgery-from admission till beyond discharge. Middle East J Anesth 2011, 21:145-7.
13. Giese JL, Stanley TH: Etomidate: a new intravenous anesthetic induction agent. Pharmacotherapy:

The Journal of Human Pharmacology and Drug Therapy 1983, 3:251-8.

14. Harris EA, Lubarsky DA, Candiotti KA: Monitored anesthesia care (MAC) sedation: clinical utility of fospropofol. Therapeutics and clinical risk management 2009, 5:949.
15. Sahajanandan R: Comparative evaluation of the effects of Etomidate versus midazolam on hemodynamic stability during induction in patients with impaired left ventricular function undergoing cardiac surgery. Christian Medical College, Vellore, 2017.
16. Riznyk L, Fijalkowska M, Przesmycki K: Effects of thiopental and propofol on heart rate variability during fentanyl-based induction of general anesthesia. Pharmacol Rep 2005, 57:128-34.
17. KORGAONKAR S, Shetti R: Clinical evaluation of Etomidate as an intravenous induction agent. Ind J Anaesth,(41) 1993.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.30

To Compare the Effectiveness of Non-Opioid Analgesics over Opioids in the Intraoperative Pain Management

Ashish Nair[1], Sarita S Swami[2]

Author Affiliation: [1]Resident, [2]Professor, Department of Anesthesia, Bharati Vidyapeeth Deemed University Medical College, Pune, Maharashtra 411043, India.

How to cite this article:
Ashish Nair, Sarita S Swami. To Compare the Effectiveness of Non-Opioid Analgesics over Opioids in the Intraoperative Pain Management. Indian J Anesth Analg. 2020;7(5):1081–1088.

Abstract

The primary aim is to compare the effectiveness of non-opioid analgesics over opioids in the intraoperative pain management.

The secondary objective to compare the intraoperative hemodynamic variables, requirement of additional analgesia intraoperativelyand to assess the side effects in both groups.

The study was approved by the University's institutional ethics committee(Reg No. ECR 518/Inst/MH/2014/RR-17) and written informed consent was obtained from all subjects participating in the trial. The study was registered prior to patient enrollment at BHARATI VIDYAPEETH MEDICAL COLLEGE institutional ethics committee (REF: BVDUMC/IEC/51, Principal investigator: Dr. Ashish Nair, Date of registration:10th October 2017).

This prospective comparative study enrolled a sample of 60 patients undergoing ENT surgeries, with 30 in each group.Non-Opioid group receivedpreoperative Intravenous (IV) dexmedetomidine 1mcg/kg started as infusion 15 mins prior to induction followed by a Maintenance dose of 0.5mcg/kgand the Opioid group received IV fentanyl 1mcg/kg as bolus prior to induction and were supplemented with 0.5mcg/kg as and when required. Intraoperative haemodynamic variables and analgesic requirement were monitored and were observed postoperatively till the patient received rescue analgesia as IV paracetamol 1gm.

Results: The haemodynamic variables at different time interval after intubation was statistically more significant in the Non-Opioid group as compared to Opioid group. Additional analgesia requirement was higher in the Opioid group (26.67%) as compared to Non-Opioid group (10%). Patients in the Non-Opioid group were better sedated and more comfortable post-operatively.

Conclusion: Opioid free anaesthesia is a better alternative in maintaining intraoperative haemodynamic parameters and pain management as compared to the Opioid drugs.

Keywords: Opioid free anesthesia; Dexmedetomidine hydrochloride; Additional analgesia.

Introduction

Acute pain is an expected outcome in any surgical procedure and Opioids remain the mainstay for pain management.[1] Opioids are associated with many dose-related side effects such as nausea, vomiting, urinary retention, pruritis and sedation. The concept of *Opioid-Free Anaesthesia (OFA)* is based on the idea that haemodynamic stability and pain management can be attained without the use of opioids. The availability of novel, less cardiovascular suppressant anaesthetic drugs forms the foundation of the Opioid Free Anaesthesia "movement".[2] A recent study by Frauenknecht J,

Corresponding Author: Sarita S Swami, Professor, Department of Anaesthesia, Bharati Vidyapeeth Deemed University Medical College, Pune, Maharashtra 411043, India.

E-mail: drswamisarita@yahoo.in

Kirkham KR, et al (2019) concluded that a single modality of Non-Opioid drugs when used were associated with a 20% reduction in post-operative nausea and vomiting and thus the patients had a better recovery period.[3] Alpha-2 agonists like Dexmedetomidine in the intra-operatively decreases the sympathetic tone with attenuation of the neuroendocrine and hemodynamic responses to anaesthesia and surgery, thus reducing the anaesthetic and opioid requirements and causes adequate sedation and analgesia.[4]

Thus, Alpha-2 agonists may offer new possibilities in the treatment of pain and may help to reduce intraoperative opioid requirements. Therefore, we decided to compare the effectiveness of dexmedetomidine over opioids in the intraoperative management of pain.

Methodology

This prospectiverandomized study was carried out on 60 patients of ASA Grade I/II between 18 to 50 years of age posted for all elective ENT surgery after getting approval from ethical committee and written inform consent. Patients on beta-blocker, comorbidities and chronic opioid treatment were excluded from the study.Patients was divided into 2 groups by simple randomization, Non-Opioid group and Opioid group (30 patients each). Study was conducted between October 2017 to September 2019.

Non-Opioid group receivedIV Dexmedetomidine 1mcg/kg started as infusion 15 mins prior to induction followed by a Maintenance dose of 0.5mcg/kg.

Opioid group receivedIV fentanyl 1mcg/kg as bolus prior to induction and were supplemented with 0.5mcg/kg as and when required.

Standard Anaesthesia Protocol was followed for all the patients. After attaching monitors and securing IV-line, IV Ondansetron 4mg and IV midazolam 1mg was given with ongoing IV crystalloids. In the Non-Opioid group, patients were given preoperative Intravenous (IV) Dexmedetomidine 1mcg/kg started as infusion 15 mins prior to induction inside the operation theatre as Loading dose while in the Opioid groupPatients received IV Fentanyl 1mcg/kg as bolus prior to induction.

All Patients were pre-oxygenated with 100% oxygen for 3 mins and were induced with Propofol 2mg/kg IV and were intubated under the effect of Succinylcholine 2mg/kg IV or Rocuronium 0.5mg/kg.The hemodynamic parameters like pulse rate, SBP, DBP and MAP were assessed as baseline record followed by at induction, after intubation and then at every 15 minutes till the end of surgery.

In the Non-Opioid group, the loading dose of Dexmedetomidine was followed by maintenance dose of 0.5mcg/kg via an infusion pump while in the Opioid group the patients were supplemented with 0.5mcg/kg as and when required. The patients were maintained on vecuronium and sevoflurane with adequate ventilatory settings.

In both the groups we assessed the percentage of inhalational agent required intraoperatively. In the Non-opioid group, patients were given additional analgesia as IV paracetamol 1gm as per requirement while in the Opioid group the patients were supplemented with Fentanyl 0.5 mcg/kg as additional analgesia.Dexmedetomidine infusions were stopped 30–45 mins prior to the reversal. Patient were reversed with neostigmine 0.05mg/kg + glycopyrrolate 0.01mg/kg IV.Patient were extubated after fulfilling all extubation criteria. Both groups were monitored intraoperatively and postoperatively till the patient received first dose of rescue analgesia for the occurrence of dose related side effects like nausea, vomiting, urinary retention, pruritis and sedation.

Statistical analysis was performed using SPSS ver. 20. Results were expressed as mean ± standard deviation, number and percentage (%). Data were analyzed normally distributed data were assessed using independent sample t test (for comparison of parameters among groups). Comparison was carried out using Chi-square ($\chi 2$) fisher exact test with a P value reported at 95% confidence level. P Value < 0.05 considered as statistically significant.

Results

There was no significant difference with respect to age, sex and weight (Table 1).

Table 1: Demographic characteristics of patients, operative data in studied groups.

Variable	Mean ± SD		P *	Statistical Significance
	Group B (n=26)	Group BD (n=26)		
Age(years)	36.83 ± 16.02	31.13 ± 8.20	0.0.088	NS
Sex				
Males	12(40)	10(33.3)	0.789	NS
Females	18(60)	20(66.7)		
Weight	60.80(13.89)	61.70(11.50)	0.786	NS

SD: Standard deviation, P* < 0.05 considered as statistically significant.

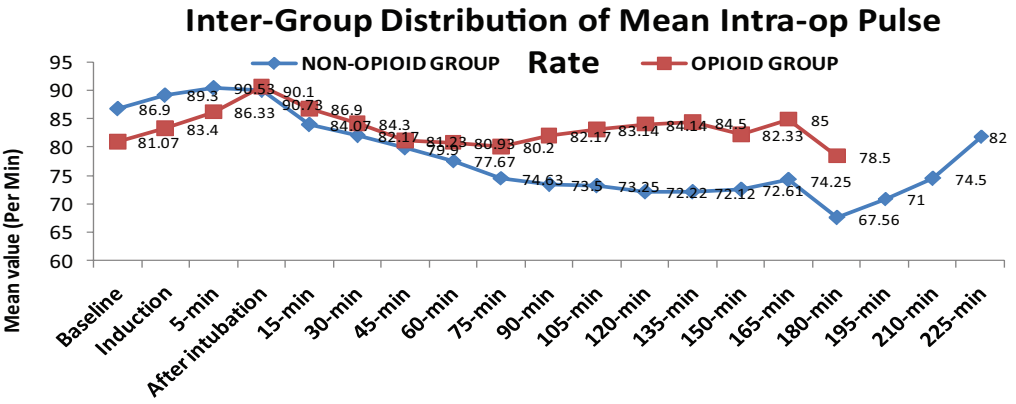
P*Value > 0.05 by independent sample t test.

So, there was no significant difference with respect to age, sex and weight.

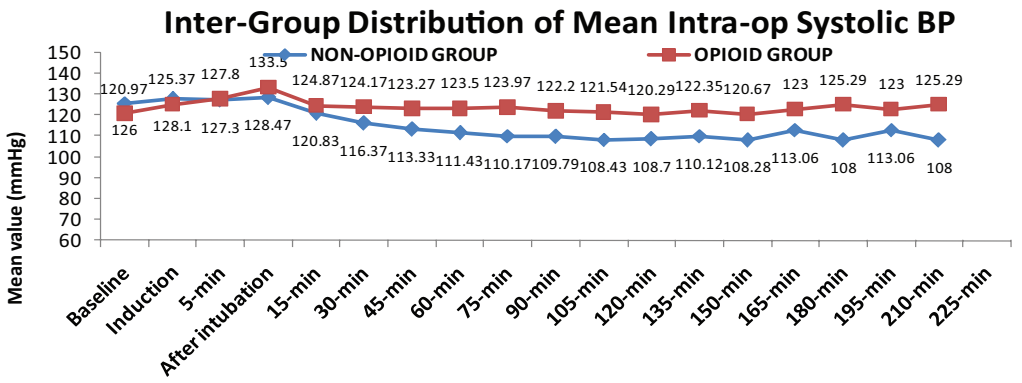
Inter-group comparison of mean intra-op pulse rateat different time intervals were statistically significantly lower at all times in the Non-Opioid group (Graph 1).

Furthermore, Mean Systolic Blood Pressure (Graph 2), Diastolic blood pressure (Graph 3) and

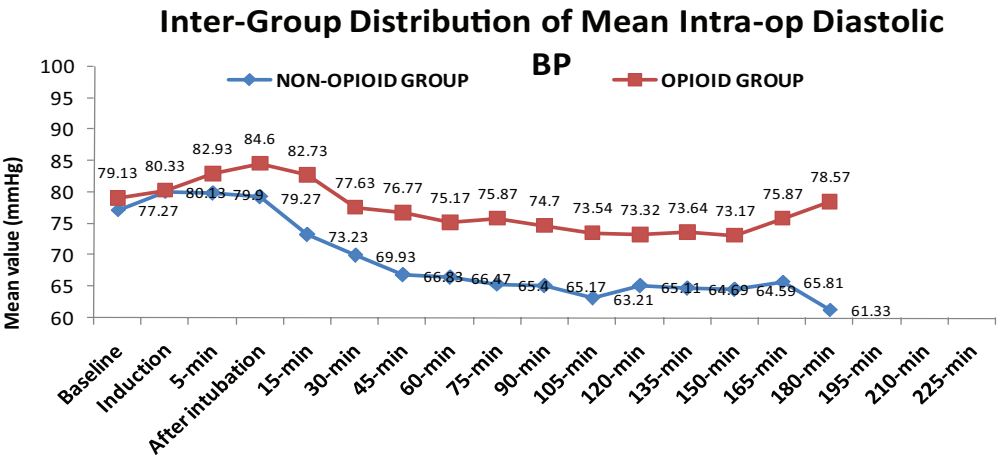
Graph 1: Inter-group comparison of mean intra-op pulse.



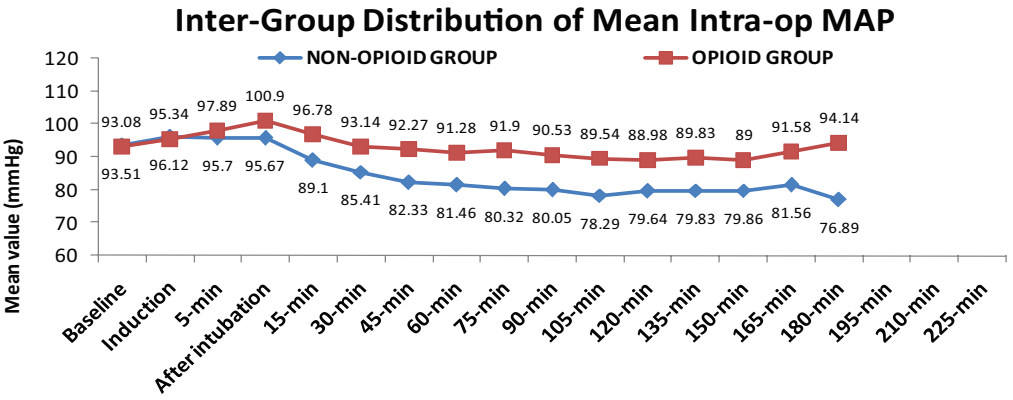
Graph 2: Inter-group comparison of mean intra-op SBP.



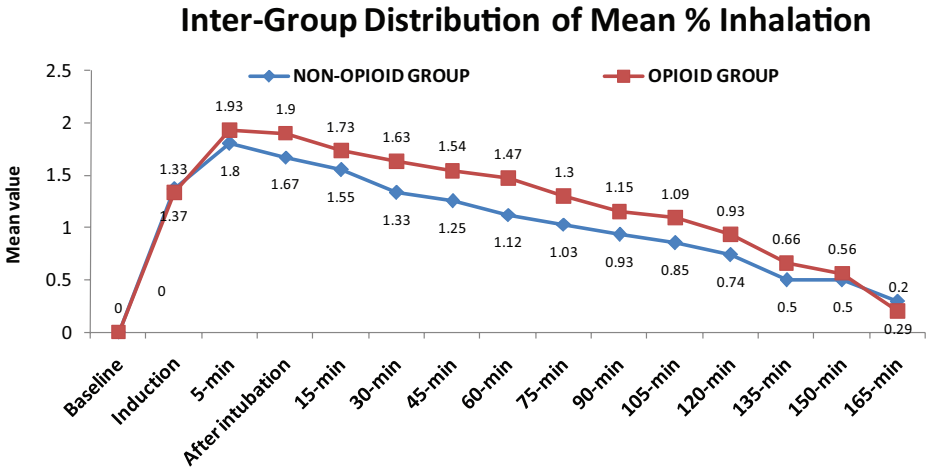
Graph 3: Inter-group comparison of mean intra-op DBP.



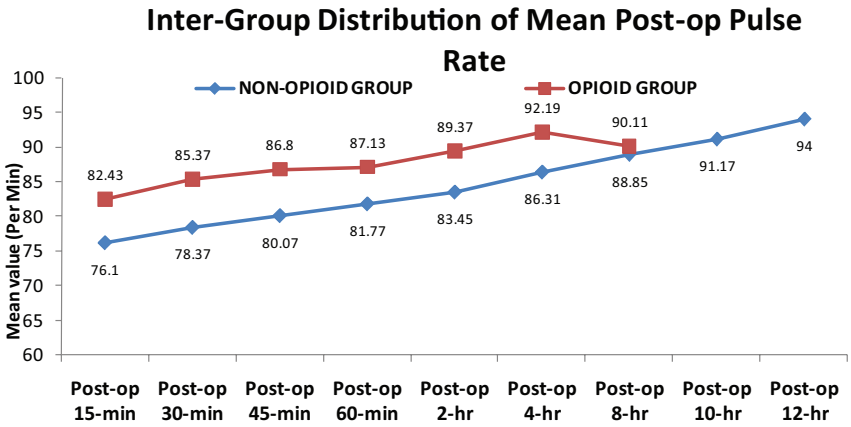
Graph 4: Inter-group comparison of mean intra-op MAP.



Graph 5: Inter-group comparison of mean % inhalation.



Graph 6: Inter-group comparison of mean post-op pulse rate.



Mean Arterial Pressure (Graph 4) among the cases studied is significantly higher in Opioid group compared to Non-Opioid group (P-value <0.05 for all).

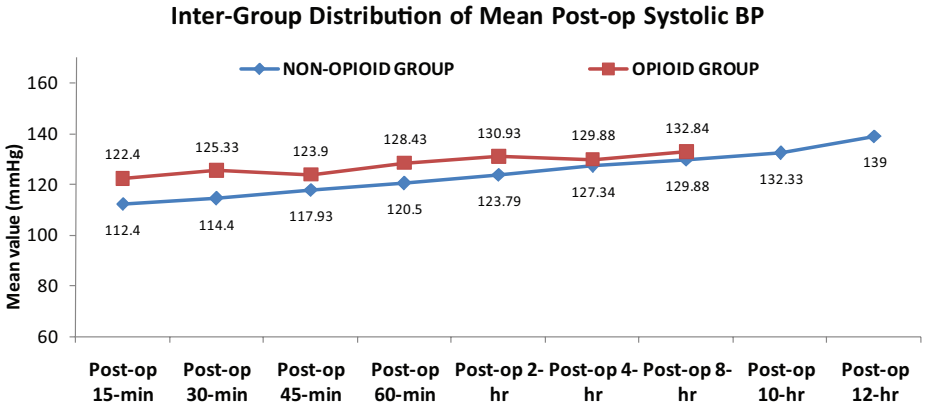
Distribution of mean % inhalational requirement among the cases studied is significantly higher in Opioid Group compared to Non-Opioid Group (P-value <0.05 for all). (Graph 5).

Table 2: Inter-group comparison of intraoperative analgesic requirement.

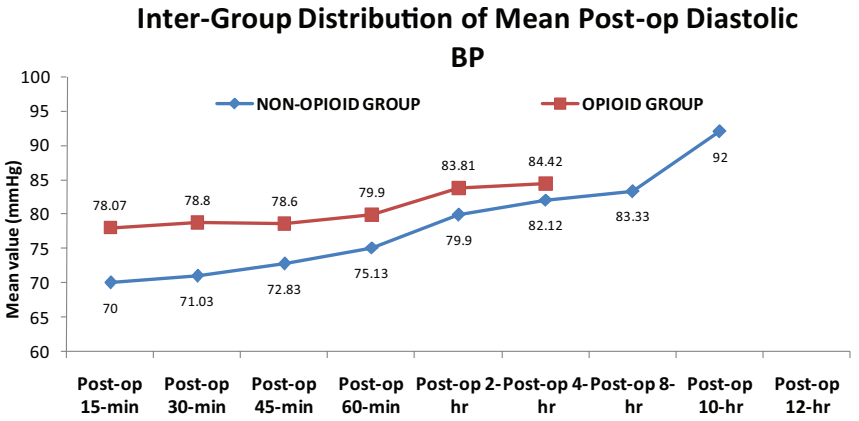
	Non-Opioid Group	Opioid Group
Rescue Analgesia	3(10%)	8(26.67%)
No Rescue Analgesia	27(90%)	22(73.33%)
Total Patients	30(100%)	30(100%)

The intraoperative requirement of additional analgesia was less (10%) in the Non-Opioid group as compared to the Opioid group (26.67%). (Table 2)

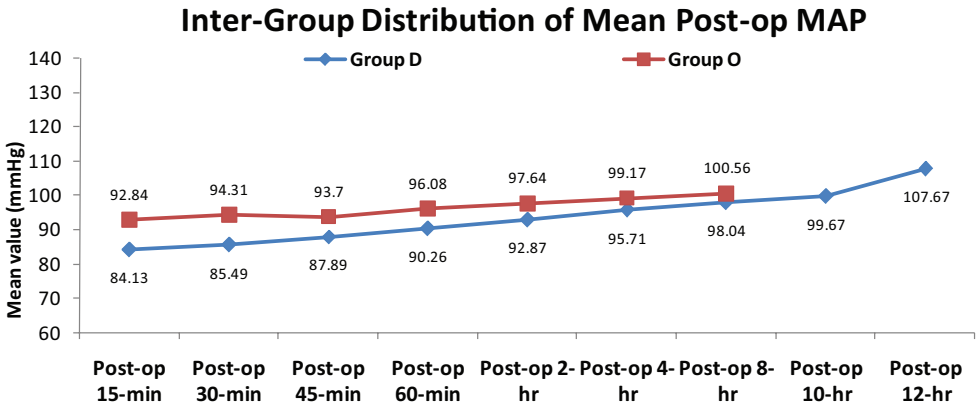
Graph 7: Inter-group comparison of mean post-op SBP.



Graph 8: Inter-group comparison of mean post-op DBP.



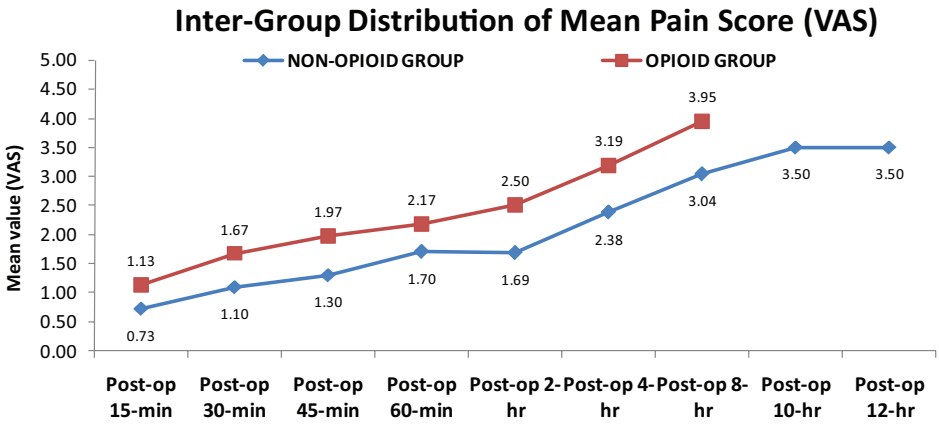
Graph 9: Inter-group comparison of mean post-op MAP.



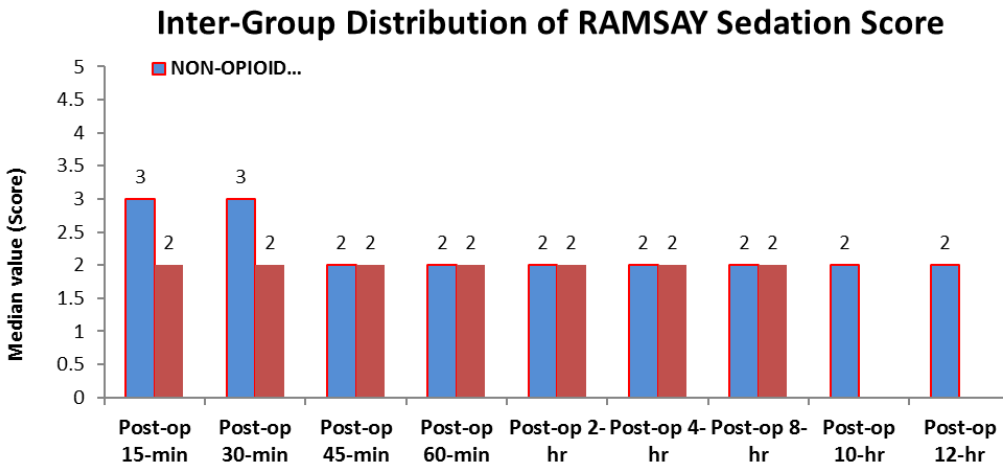
Distribution of mean Pulse rate(Graph 6), SBP (Graph 7), DBP (Graph 8) and MAP (Graph 9) in the post-operative period among the cases studied are significantly higher in Opioid Group compared to Non-Opioid Group.The mean post-operative haemodynamic variables in the Non-Opioid group After 30 min post-operatively till 4 hours post-operatively were lower and statistically significant with p value <0.05 for all.

Distribution of mean pain score (VAS) among the cases studied is significantly higher in Opioid Group compared to Non-Opioid Group (P-value <0.001 for all) (Graph 10). The analgesic effect of Dexmedetomidine lasted longer till 8-10 hours before their VAS score became more than 3 and they were given rescue analgesia. Demographic data was analyzed which was comparable with respect to sedation scores of patients in both the groups as

Graph 10: Inter-group comparison of mean pain score (VAS).



Graph 11: Inter-group comparison of RAMSAY SEDATION SCORE.



shown in Graph 11. The Ramsay Sedation scores in both the groups were statistically not significant (p value >0.05) in the post-operative period.

Discussion

Peri-operative opioid administration has long been one of the three pillars of 'balanced anaesthesia'. Pain management is an important aspect for haemodynamic stability and the patient's outcome in the postoperative period. Opioids have always been considered effective in pain management as they suppress or block ascending nociceptive stimuli thus reducing the requirement of higher doses of anaesthetic drugs. Use of Opioids has always been associated with dose-related adverse effects such as nausea, vomiting, urinary retention, itching, and sedation. Lyons P. J et al (2015) published a review article where he evaluated the concept of opioid-induced hyperalgesia after acutefentanyl exposure.[1] The concept of Opioid-free Anaesthesia (OFA) has been discussed by many authors recently and this is based on the idea that haemodynamic stability can be attained by avoiding Opioid use. OFA with a Non-Opioid drug like dexmedetomidine significantly attenuates postoperative pain and reduces Opioid requirements without causing respiratory depression.

Our Primary Objective was to compare the haemodynamic variables in both the groups. There are several studies comparing the efficacy of Opioid Free Anaesthesia (OFA) over Opioids in anaesthesia and pain management. There are various schools of thought on the risk versus benefits of Opioid Free Anaesthesia. In a Meta-Analysis by Gupta K et al (2013)[5] and Shareef SM et al (2016)[6], it was observed that when Dexmedetomidine was used before induction, it attenuated the haemodynamic response to pneumoperitoneum during laparoscopic surgeries as compared to Fentanyl.

In the intra-operative period, mean pulse rate (Graph 1) was better controlled in the Non-Opioid group as compared to the Opioid group from 90 minutes onwards which was statistically significant (p value = 0.001) till 180 mins.In our study we observed that in the Non-Opioid group patients

had better control over intraoperative SBP (GRAPH 2), DBP (Graph 3) and MAP (Graph 4) which was observed from 30 minutes onwards till 180 minutes, which was statistically significant with a p value= 0.001. These parameters were comparable to the study conducted by Patel CR et al (2012), who found lesser increase in SBP (6% vs 23%), DBP (7% Vs 20%) after using Dexmedetomidine 1 mcg/kg as compared to fentanyl 2 mcg/kg when given as loading dose prior to induction.[7]

Intraoperatively, we observed that the percentage of Sevoflurane required in the Non-Opioid group was less (0.6–1%) intraoperatively from 30mins onwards and is statistically significant (p value <0.05) as compared to the Opioid Group (1.5–2%) (GRAPH 5). This finding was comparable to a study conducted by Na Young Kim, So Yeon Kim et al where Intraoperative Dexmedetomidine 1 mcg/kg bolus, followed by 0.1 mcg/kg/h infusion in paediatric patients. They observed significant reduction in anaesthetic requirements and also less incidence of delayed recovery.[8]

Our Second Objective, where we observed the Intraoperative requirement of additionalanalgesiain both the group The NON-OPIOID group showed only 2 cases (10%) where additional analgesia was required and Injection Paracetamol 1gm IV was given as per protocol. In the OPIOID group, we observed that 8 cases (26.67%) required additional doses of Injection Fentanyl (0.5mcg/kg) (Table 2). These findings were comparable to a study conducted by Tang C, Xia Z et al (2017) where they described the analgesic efficacy of Dexmedetomidine as an adjuvant for perioperative acute pain treatment.[9]

In the Post-operative period,all the patients were observed post-operatively every 15 minutes for 2 hours and there after every 2 hourly up to 8 hours post-operatively. The Mean distribution of the haemodynamic parameters among the cases studied in both the groups and we observed that these parameters were better controlled in the Non-Opioid Group and the values were statistically significant (p value = 0.001) (Graph 6–9) These findings are comparable to Monaz Abdulrahman Ali et al (2013) who observed that Dexmedetomidine had better haemodynamic control and also decreased the postoperative pain without affecting the length of stay in post anaesthesia care unit.[10]

We found that duration of postoperative analgesia was higher in the Non-Opioid group as compared to Opioid group with a p value = 0.001 and was statistically significant (Graph 10) Our findings were consistent with that of Feld JM et al (2006) who reported that Dexmedetomidine provided both stable perioperative hemodynamic and postoperative analgesia, thus reducing the use of supplementary analgesic as compared to Fentanyl.[11] The analgesic effect of Dexmedetomidine lasted longer till 8–10 hours before their VAS score became more than 3 and they were given rescue analgesia.

Our Third Objective was to monitor the dose related complications like Post-operative sedation in both the groups. Graph 11 shows the inter-group comparison of Ramsay sedation scores of patients in both the groups. In our study, we found that patients who received Dexmedetomidine were better sedated with a Ramsay sedation score of 3 in the initial 15–30 minutes and were more comfortable post operatively than those patients who received Fentanyl. Our findings are in agreement with Patel CR et al (2012) who concluded that Dexmedetomidine (1 mcg/kg) shows significant sedation with a Ramsay sedation score of 3 at two hours postoperatively as compared to Fentanyl (2 mcg/kg).[7] Other dose related complications such as nausea and vomiting, pruritis, urine retention and delayed emergence were not observed in any patients of both the groups in our study. This is probably because the procedures were short and we did not require higher doses of Fentanyl were not required intraoperatively.

Our study concludes that Non-Opioid drugs like dexmedetomidine are a better alternative than Opioid drugs intraoperative haemodynamic stability and pain management.

However, the limitation of our study is the type of surgery we have chosen i.e. ENT surgeries and for the duration of the study, limited sample size was used.

Conclusion

We can conclude from our study we can conclude that Non-Opioid drugs like Dexmedetomidine are abetter anaestheticalternative to Opioid drugs in terms of intraoperative haemodynamic stability and pain management.

References

1. Lyons PJ, Rivosecchi RM, Nery JP, Kane-Gill SL. Fentanyl-induced hyperalgesia in acute pain management. Journal of pain & palliative care pharmacotherapy. 2015 Apr 3;29(2):153–60.

2. Funk RD, Hilliard P, Ramachandran SK. Perioperative opioid usage: avoiding adverse effects. Plastic and reconstructive surgery. 2014 Oct 1;134(4S–2):32S–9S.

3. Frauenknecht J, Kirkham KR, Jacot-Guillarmod A, Albrecht E. Analgesic impact of intra-operative opioids vs. opioid-free anaesthesia: a systematic review and meta-analysis. Anaesthesia. 2019 May;74(5):651–62.

4. Jung HS, Joo JD, Jeon YS, Lee JA, Kim DW, In JH, et al. Comparison of an intraoperative infusion of dexmedetomidine or remifentanil on perioperative haemodynamics, hypnosis and sedation, and postoperative pain control. J Int Med Res 2011; 39:1890 9.

5. Gupta K, Maggo A, Gupta PK. Blood glucose estimation as an indirect assessment of modulation of neuroendocrine response by Dexmedetomidine versus Fentanyl premedication during laparoscopic cholecystectomy: A clinical study. Anaesth Essays Res. 2013; 7:34–38.

6. Shareef SM, Venu GB. A comparative study of the haemodynamic changes with Dexmedetomidine Vs Fentanyl during laparoscopic cholecystectomies under general anaesthesia. J of Dental and Medical Sciences. 2016; 15:01–09.

7. Patel CR, Engineer SR, Shah BJ. Effect of intravenous infusion of Dexmedetomidine on perioperative haemodynamic changes and postoperative recovery: a study with entrophy analysis. Indian J. Anaesth. 2012; 56:542–46.

8. Na Young Kim, So Yeon Kim,HyeJin Yoon. Effect of Dexmedetomidine on Sevoflurane Requirements and Emergence Agitation in Children Undergoing Ambulatory Surgery. 2014;55(1):209–215.

9. Tang C, Xia Z. Dexmedetomidine in perioperative acute pain management: a non-opioid adjuvant analgesic. Journal of pain research. 2017; 10:1899.

10. Ali MA, Abdellatif AA. Prevention of sevoflurane related emergence agitation in children undergoing adenotonsillectomy: a comparison of dexmedetomidine and propofol. Saudi journal of anaesthesia. 2013 Jul;7(3):296.

11. Feld JM, Hoffman WE, Stechert MM, et al. Fentanyl or dexmedetomidine combined with desflurane for bariatric surgery. J Clin Anesth 2006; 18:24–8.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.31

Effect of Spectral Entropy on the Requirement of Propofol During Induction of Anesthesia

G Srinivas Rao[1], B Venkateswara Rao[2]

Author Affiliation: [1]Associate Professor, [2]Assistant Professor, Department of Anesthesia, Osmania Medical College, Hyderabad, Telangana 500095, India.

How to cite this article:
G Srinivas Rao, B Venkateswara Rao. Effect of Spectral Entropy on the Requirement of Propofol During Induction of Anaesthesia. Indian J Anesth Analg. 2020;7(5):1089–1093.

Abstract

Introduction: Entropy of electroencephalogram (EEG) quantifies the degree of chaos, complexity or irregularity of the EEG signal. The EEG activity would show more regularity in anaesthetized, than in awake patients. In recent years, Propofol is used commonly as an intravenous induction agent during General Anaesthesia as the recovery is smooth and clear.

Aims: To Study the effect of spectral entropy on the requirement of Propofol during induction of Anaesthesia.

Materials and Methods: 40 patients belonging to ASA grade 1 and ASA grade 2 undergoing spine surgeries under general anaesthesia were taken in the age group of 20 years to 60 years and randomly allocated to 2 groups after taking approval from institutional ethics committee.

Results: The demographic profile (age, age wise distribution, gender wise distribution, weight, weight wise distribution, height, height wise distribution) was comparable in both the groups. Haemodynamic parameters (heart rate, systolic, diastolic blood pressure and entropy parameters) were comparable in both the groups. The amount of propofol per kg dose decreased from 2mg/kg to 1.4mg/kg when induction was done using the entropy sensor. This decrease in the dose was statistically significant with $p<0.05$. This decrease in the total dosage was 25.3% and 27.8% with respect to the total dose and per kg dose of propofol respectively. The end result showed that inclusion of entropy monitor during general anaesthesia for induction with propofol decreased the requirement of propofol for induction when compared with propofol requirement without entropy monitoring. This decrease in propofol requirement was statistically significant. However the hemodynamic stability was not significantly different in both the groups.

Conclusion: Propofol, an intravenous induction drugwhile monitoring the depth of anaesthesia with spectral entropy, the requirement of propofol during induction of anaesthesia is significantly reduced in comparision when induction of anaesthesia was done without spectral entropy monitoring.

Keywords: Entropy of electroencephalogram; Propofol; General Anesthesia.

Introduction

Entropy of electroencephalogram (EEG) quantifies the degree of chaos, complexity or irregularity of the EEG signal. The EEG activity would show more regularity in anaesthetized, than in awake patients. Spectral Entropy is a new EEG derived parameter that may be used to model the pharmacokinetic-pharmacodynamic effects of General Anaesthestics. Datex-Ohmeda (Datex-Ohmeda division, Instrumentarium Corp., Helsinki, Finland) has developed a commercially available depth of anaesthesia monitor, the Entropy Module that is based on the time frequency balanced Spectral Entropy of the EEG.

Corresponding Author: B Venkateswara Rao, Assistant Professor, Department of Anesthesia, Osmania Medical College, Hyderabad, Telangana 500095, India.

E-mail: drvenkateswararao@gmail.com

The two output parameters called the State Entropy (SE) & Response Entropy (RE) represent the Entropy scales. The output values can range between 0–91 for State Entropy and 0–100 for Response Entropy. State Entropy is computed over a frequency range from 0.8–32 Hz & Response Entropy is computed over a frequency range from 0.8–47 Hz. For fully awake responsive subjects, a value of 100 for Response Entropy and 91 for State Entropy is observed respectively and a difference between these parameters is usually < 10. For a clinically meaningful anaesthesia and low probability of consciousness following an administration of a General Anaesthetic (GA) in a patient, a Response Entropy value of 40–60 is considered as appropriate with Response Entropy - State Entropy difference of less than 10.[1,2]

In recent years, Propofol is used commonly as an intravenous induction agent during General Anaesthesia as the recovery is smooth and clear. High doses of Propofol can cause some side effects like hypotension, respiratory depression, vasodilatation etc., which may affect the patients who undergo surgeries under GA. Therefore, it is essential to optimize the dose of Propofol during induction. In view of the above and as Spectral Entropy monitoring is a fast and simple method of analysis of the EEG, it is proposed to study how this new device helps in decreasing the requirement of Propofolduring induction of General Anaesthesia.

Materials and Methods

40 patients belonging to ASA grade 1 and ASA grade 2 undergoing spine surgeries under general anaesthesia were taken in the age group of 20 years to 60 years and randomly allocated to 2 groups after taking approval from institutional ethics committee.

Group E (Entropy): Propofol is given in 30mg increments every 30seconds until RE values dropped to 50 and the RE-SE difference was less than 10 and confirmed clinically with loss of response to verbal commands.

Group C (Control): Propofol is given at a dose of 2mg/kg in 30 mg increments every 30 seconds and then confirmed clinically with loss of response to verbal commands.

In the operation theatre, an intravenous line to be secured after giving local anaesthesia and basic monitoring (i.e. ECG, heart rate, non-invasive blood pressure, and pulse oximetry) to be initiated. The skin of forehead is cleansed thoroughly with ether before application of entropy sensors. Entropy to be monitored with Datex-Ohmeda S/5 entropy module. In a noise free environment, baseline values of RE, SE, heart rate and blood pressure will be recorded every minute for five minutes and mean to be calculated. No patient was given premedication. All patients were allowed to breathe 100% oxygen for 3 min before induction of anaesthesia.

For the entropy group, propofol was given for induction in successive 30 mg doses every 30 sec until RE values dropped to 50 and the RE−SE difference was less than 10; this was confirmed clinically with loss of response to verbal commands. The control group was given the recommended dose of propofol at induction (2 mg/ kg) in the same manner, i.e. successive, spaced bolus of 30 mg every 30 sec to a total of 2 mg/ kg and then confirmed clinically to ensure adequate hypnosis. If the patient is still responding verbally, additional increments of 30 mg each were given. Haemodynamic variables (HR and blood pressure (BP)), RE and SE were collected at three different points, baseline value before induction of anaesthesia, after induction of anaesthesia and before intubation and 1 min after intubation.After collection of the data at the second point, fentanyl was given for all patients in a dose of 2 mcg/kg together with vecuronium 1mg/kg followed by endotracheal intubation. During intubation, if there was any increase in the reading of entropy, an additional dose of propofol 30 mg bolus was given until no increase in readings was observed, and then intubation was performed. Total dose of propofol was recorded and the dose of propofol / kg was also calculated. Anaesthesia was maintained using isoflurane and O2 air mixture. At the end of the surgical procedure, residual neuromuscular block was reversed with 0.05 mg/kg neostigmine and 10mcg/ kg glycopyrrolate.

Methodology

Sample taken at random from a population when each member of the population has an equal chance of being chosen. The purpose is to produce groups that are as nearly similar as possible prior to the experimental procedure. (SPSS 15.0 Evaluation version). Data was expressed as either mean or standard deviation or numbers and percentages. Continuous covariates were compared using analysis of variance (ANOVA). In the present study, we used student's unpaired t-test for statistical analysis. It was used because two sets of population

were compared which were independent and identically distributed with the P value reported at the 95% confidence interval. P<0.05 was considered statistically significant.

Result

Table 1: Demographic details in present study.

Details	Entropy	Control	S.E.D.	CD 95%	P-Value
N	20.000	20.000			0.058
Age					0.058
Mean	46.100	45.150	2.651	5.366	
Std. Dev.	8.341	8.425			
Shapiro Wilk	0.946	0.957			
Gender					
Male to female ratio	11/9	12/8	0.162	0.328	0.05
Shapiro Wilk	0.637	0.641			
ASA grade I and II					
ASA grade-I	15	14	0.129	0.261	0.125
ASA grade-II	5	6			
Shapiro Wilk	0.544	0.433			
Weight					
Mean	73.100	68.800	4.706	9.528	0.147
Std. Dev.	16.626	12.907			
Shapiro Wilk	0.948	0.978			

There is no significance between 2 groups in the demographic parameters.

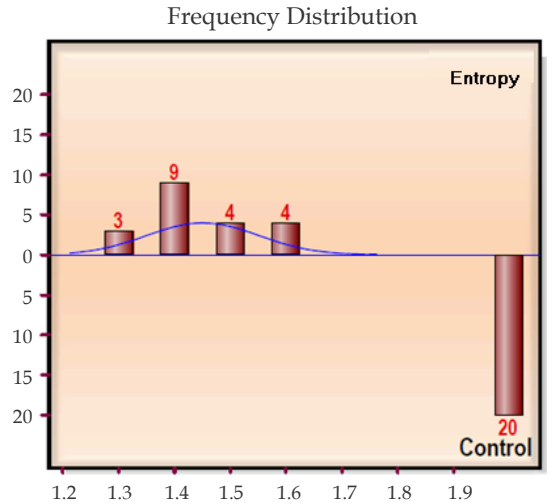


Fig. 1: Study population distribution of propofol administered per kg.

The results of the present study showed that the requirement of propofol was greatly decreased in the Entropy group.

This total dose of propofol and the dose per kg was significantly reduced by 25.3% and 27.8%, respectively, in the entropy group.

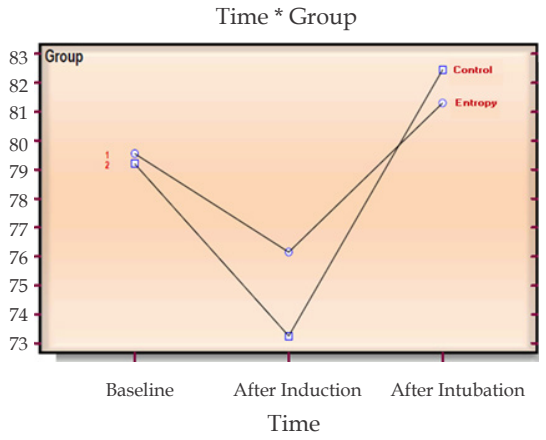


Fig. 2: Study population distribution of heart rate at different intervals.

It shows heart rate were decreased in both groups after anaesthesia induction, which was not significant when both groups were compared.

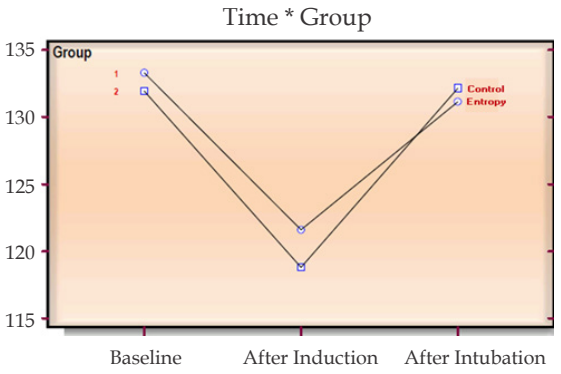


Fig. 3: Study population distribution for systolic BP at different intervals.

It shows systolic blood pressures were decreased in both groups after anaesthesia induction, which was not significant when both groups were compared.

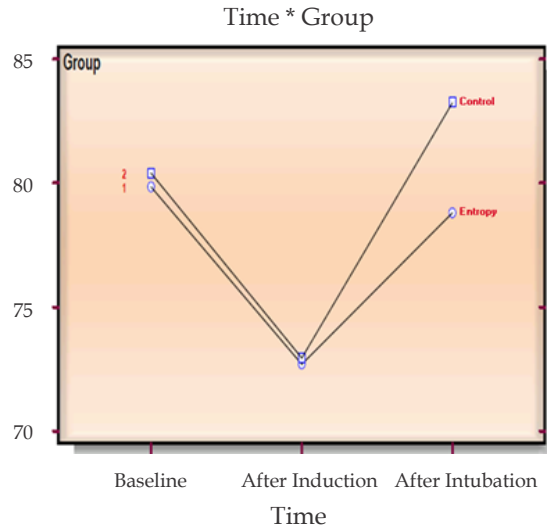


Fig. 4: Study population distribution of diastolic BP at different intervals.

It shows diastolic blood pressures were decreased in both groups after anaesthesia induction, which was not significant when both groups were compared.

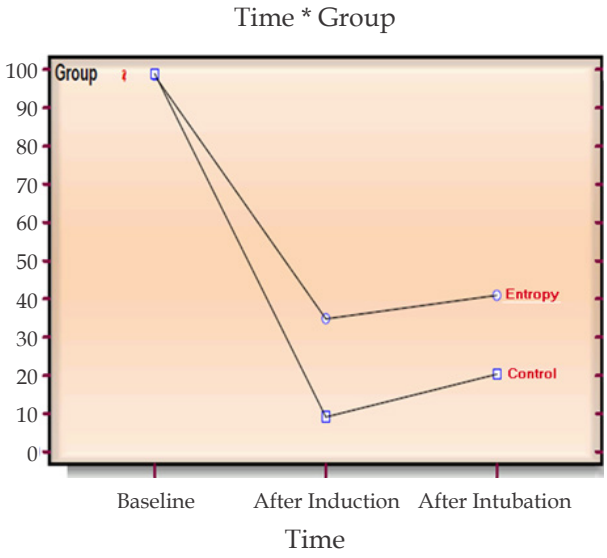


Fig. 5: Study population distribution of Response Entropy at different intervals.

There was a significant drop of entropy values in the control group as compared with the entropy group which received a greater induction dose. Adequate cardiovascular stability was observed in both groups of the patients with Entropy group showing no greater significance than the control group. Thus monitoring with Entropy decreased the consumption of Propofol in a significant proportion.

Discussion

The goal for devices measuring depth of anaesthesia is to ascertain an adequate, but not excessive, depth of anaesthesia regardless of drug or drug combination used. Such devices should allow optimal delivery of drug or drugs to each patient, to guarantee an adequate depth of anaesthesia, loss of awareness and no recall. Day surgery with propofol is an important clinical setting for monitoring the anaesthetic depth, where minimising drug use may aid rapid turnover. The present study was basically undertaken to see that by using Entropy whether we can reduce the dose of prsopofol at the time of induction. For the study, 40 patients were taken and were randomly allotted to either of the group i.e., Group E or Group C. (Table 1 and Fig. 1) The results of the present study demonstrated that the induction dose of propofol was decreased in the Entropy group in comparision with the Control group as was demonstrated in the study by W.Riadet al.[3] and Bruhn et al.[4]

The present study demonstrated heart rate were decreased in both groups after anaesthesia induction, which was not significant when both groups were as that systolic and diastolic blood pressures are decreased in both groups after anaesthesia induction with propofol (Fig. 2,3,4) which is in accordance with the study done by Hug and colleagues[5] and Michelson and colleagues.[6] Little information is available regarding the usefulness of EEG entropy in the prevention of adverse hemodynamic effects during induction of anaesthesia.Vakkuri and colleagues[7] demonstrated precise haemodynamic control at induction of anaesthesia in middle-aged patients guided by EEG entropy. Our study showed that total dose of propofol and the dose/kg were significantly reduced by 25.3% and 27.8%, respectively, in the entropy group. There was a significant drop of entropy values in the control group as compared with the entropy group which received a greater induction dose.

Sensitivity and specificity of the entropy were demonstrated in previous reports which shows that entropy is as efficient as BIS in predicting changes in the hypnotic component of anaesthesia8, and the changes in SE and RE values followed a similar pattern to the BIS values during propofol induction in adults.[9] In a comparision of different neurophysiological techniques, Muncaster and colleagues found entropy processing of the EEG to be more sensitive than BIS and auditory evoked potential.[10] Anderson and Jakobsson[11] demonstrated good correlation between propofol sedation and entropy indices in young and elderly patients.

In our study, the stress response associated with intubation led to an increase in RE and SE reading. (Fig. 5) The increase in the entropy reading was associated with increase in HR, systolic blood pressure and diastolic blood pressure in both groups. In agreement with the present work Wheeler and colleagues[12] demonstrated that RE, RE-SE difference, HR and BP were significantly increased during painful stimulation. It has been reported that excitability of subcortical structures evoked by noxious stimuli will increase the difference between RE and SE. Takamastu and colleagues[13] also reported that frontal EMG may be of value in assessing adequacy of anaesthesia and also reflects nociception, but it did not correlate with the intensity of the stimulation. This increase could be attributed to increase in nociceptive

information in the central nervous system, which activates sympathetic pathways and increases the circulating levels of catecholamines result in tachycardia and hypertension.[14] The absence of difference between the two groups, although the total dose of propofol was significantly higher in the control group, pointed to the good correlation between entropy reading and propofolplasma concentration.[15] In conclusion, the use of EEG entropy during induction of anaesthesia reduces propofol requirements.

Conclusion

Propofol, an intravenous induction drug is a common induction agent in the current anaesthesia practice. Spectral entropy, an EEG based monitor, is used to monitor adequate depth under general anaesthesia. It is also used to titrate the dosages of the drugs to achieve adequate depth thereby preventing overdosage and its associated side effects. The present study showed that while monitoring the depth of anaesthesia with spectral entropy, the requirement of propofol during induction of anaesthesia is significantly reduced in comparision when induction of anaesthesia was done without spectral entropy monitoring. Further studies with a large number of patients are required to substantiate the above result.

References

1. Yli-Hankala A, Vakkuri A, Annila P, Korttila K:EEG bispectral index monitoring in sevoflurane or propofolanaesthesia: Analysis of direct costs and immediate recovery. ActaAnaesthesiolScand 1999;43:545–9.
2. Struys M, Versichelen L, Mortier E, et al. Comparison of spontaneous frontal EMG, EEG power spectrum and bispectral index to monitor propofol drug effect and emergence. Acta AnaesthesiolSc and 1998; 42: 628–36.
3. W. Riad et al Monitoring with EEG entropy decreases propofol requirement and maintains cardiovascular stability during induction of anaesthesia in elderly patients. European Journal of Anaesthesiology 24: 684–688.
4. Bruhn J, Bouillon TW, Radulescu L, Hoeft A, Bertaccini E, Shafer SL. Correlation of approximate entropy, bispectral index, and spectral edge frequency 95 (SEF95) with clinical signs of `anesthetic depth' during co-administration of propofol and remifentanil. Anesthesiology 2003; 3: 621–7.
5. Hug CC, McLeskey CH, Nahtwold ML et al. Hemodynamic effects of propofol: data from over 25,000 patients. AnesthAnalg 1993; 77(Suppl 4): S21–S29.
6. Michelsen I, Helbo H, Hans S et al. Prophylactic ephedrine attenuates the hemodynamic response to propofol in elderly female patients. AnesthAnalg 1998; 86: 477–481.
7. Vakkuri A, Yli-Hankala A, Sandin R et al. Spectral entropy monitoring is associated with reduced propofol use and faster emergence in propofol-nitrous oxide-alfentanil anesthesia. Anesthesiology 2005; 103: 274–279.
8. Bonhomme V, Hans P. Monitoring depth of anaesthesia: is it worth the effort? Eur J Anaesthesiol 2004; 21: 423–428.
9. White PF, Tang J, Romero GF et at. A comparison of state and response entropy versus bispectral index values during the perioperative period. AnesthAnalg2006; 102:160–167.
10. Muncaster AR, Sleigh JW, Williams M. Changes in consciousness, conceptual memory and quantitative electro encephalographical measures during recovery from sevoflurane and remifentanil based anesthesia. AnesthAnalg 2003: 96:720–5.
11. Anderson RE, Jakobsson JG. Entropy of EEG during anaesthetic induction: a comparative study with propofol or nitrous oxide as sole agent. Br J Anaesth 2004; 92:167–170.
12. Wheeler P, Hoffman WE, Baughman VL, Koenig H. Response entropy increases during painful stimulation. J Neurosurg Anesthesiol 2005; 17: 86–90.
13. Takamatsu I, Ozaki M, Kazamal T. Entropy indices vs the bispectral index for estimating nociception during sevoflurane anesthesia. BrJAnaesth 2006; 96: 620–626.
14. Smith C, McEwan E, Jhaveri R et al. The interaction of fentanyl on the CP50 of propoful for loss of consciousness and skin incision. Anesthesiology 1994; 81: 820–828.
15. Bruhn J, Bouillon TW, Shafer SL. Onset of propofol induced burst suppression may be correctly detected as deepening of anaesthesia by approximate entropy but not by bispectral index. BrJAnaesth2001; 87: 505–507.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.32

General Anaesthesia Versus Paravertebral Anaesthesia with General Anesthesia in Mastectomy: Comparative Surgical Outcome

Uday Pratap[1], Sushil Kumar[2], Mahesh Verma[3], Ruchi Gupta[4]

Author Affiliation: [1,4]Assistant Professor, Department of Anesthesia, Geetanjali Medical College, Udaipur, Rajasthan 313001, India, [2]Assistant Professor, Department of Anesthesia, Government Medical College, Banda, Tindwara, Uttar Pradesh 210001, India, [3]Assistant Professor, Department of Anesthesia, Maharani Laxmi Bai Medical College, Jhansi 284001,Uttar Pradesh, India.

How to cite this article:

Sushil Kumar, Uday Pratap, Ruchi Gupta, et al. Comparative Effect of Etomidate and Thiopentone on the Heart Rate and Respiratory Rate for Induction of General Anesthesia. Indian J Anesth Analg. 2020;7(5):1095–1099.

Abstract

Introduction: Paravertebral nerve blocks provide excellent pain relief and inhibit the neuroendocrine stress response to surgical trauma, which suggests that a very high quality afferent block can be affected. Aim was to assess the efficacy of paravertebral block use in conjunction with general anaesthesia for better postoperative pain management in comparison to general anaesthesia alone.

Materials and Methods: As per the criteria total of 120 patients were included in the study. Group A received general anaesthesia only and group B patients received paravertebral block long with general anaesthesia. All patients underwent preoperative assessment prior to surgery. The patients were instructed on the use of the Visual Analogue Scale (VAS 0–10) and Numerical Rating Scale (NRS 0–4).

Results: When VAS score of both the groups are compared the score in group B was found to be lower than in group A. When NRS score of both the groups are compared the score in group B was found to be lower than in comparison to group A.

Conclusion: Paravertebral block reduces incidence of postoperative nausea and vomiting in comparison to general anaesthesia alone. Paravertebral block leads to significantly reduced consumption of opioids in the postoperative period in comparison to general anaesthesia alone.

Keywords: Anesthesia; Breast Cancer; Paravertebral; Mastectomy.

Introduction

The major concern with the general anaesthesia is the peri operative stress. To reduce the requirement of analgesia and anaesthetic agent combination of regional anaesthesia with general anaesthesia is used.[1] The advantage is better achievement of hemodynamic stability and suppression of immunologic, metabolic and endocrine response. Due to advancement of the diagnostic field it has lead us to increase frequency in detection of breast cancer cases. Majority of the patients after the confirmed diagnosis undergo lumpectomy or mastectomy.[2]

The most important medical problem with the women gender is the breast cancer. Approximately about one from ten women do suffer from breast cancer in life time.[3] When there is proper control of pain during and after the surgery of breast cancer will not only enhance the post operative recovery of the patient but also lead to prevention of post operative pain. There are varieties of regional anaesthesia that may play an important role in pain management during breast surgery however

Corresponding Author: Sushil Kumar, Assistant Professor, Department of Anesthesia, Government Medical College, Banda, Tindwara, Uttar Pradesh 210001, India

E-mail: researchguide86@gmail.com

the gold standard technique is the thoracic paravertebral block.[4,5]

Among the various analgesic techniques aimed to reduce post breast surgery, thoracic paravertebral block (PVB) combined with general anaesthesia (GA) stands out for the good results and favourable risk.[6] Benefits include reduced prolonged postoperativ relief, decreased opioid consumption nausea/vomiting and increased potential for ambulatory discharge. The paravertebral space contains dorsal and ventral rami and the sympathetic chain.[7] Hence, infiltration of this space results in unilateral sensory, motor and sympathetic blockade. Paravertebral block has been used to relieve acute chest wall pain from rib fractures, herpes zoster, pleurisy, to manage acute and chronic post thoracotomy pain and as an anaesthetic technique for surgery of the chest and shoulder.[8]

After one year of surgery there are chronic symptoms like pain in the operated area and ipsilerated arm. After breast conserving surgery there is more common occurrence of chronic pain as compared to radical surgery. The intensity of acute postoperative pain, the type of operation, involvement of regional lymph nodes and radiotherapy have been considered the most important treatment related factors predisposing to chronic pain in patients with breast cancer.[9]

Good immediate postoperative analgesia is achieved by providing preincisional PVB in patients undergoing breast surgery for cancer. Good acute pain relief is associated with a lower risk of development of chronic pain in the operative area.[10] Paravertebral nerve blocks provide excellent pain relief and inhibit the neuroendocrine stress response to surgical trauma, which suggests that a very high quality afferent block can be affected. This study was conducted to assess the efficacy of paravertebral block use in conjunction with general anaesthesia for better postoperative pain management in comparison to general anaesthesia alone.

Materials and Methods

The present study was done at a hospital care. The ethical committee was informed about the study and the ethical clearance certificate was obtained. All the patients who were diagnosed with breast cancer and were scheduled to undergo modified radical mastectomy under general anaesthesia were included in the study. The patients were between the ages of 20 to 70 years.

Patients having any other medical condition, allergy to local anaesthesia, presence of infection at injection site, patients belonging to category IV and V physical status were excluded from the study. As per the criteria total of 120 patients were included in the study. All the patients were informed about the study and the written informed consent was obtained from all patients. The included patients were divided in two groups as below: Group A received general anaesthesia only and group B patients received paravertebral block long with general anaesthesia. All patients underwent preoperative assessment prior to surgery. The patients were instructed on the use of the Visual Analogue Scale (VAS 0–10) and Numerical Rating Scale (NRS 0–4).

At the day of surgery, 45 min prior to the surgery premedication was given to all the patients. In group A the patients were administered with general anesthesia only and in group B patients the paravertebral block along with anesthesia was administered by attending ansthesiologist. After confirming sensory anaesthesia following PVB ,GA was induced. Patient was induced with propofol 2 mg/kg IV. Succinylcholine 1.5 mg/kg IV was given to facilitate tracheal intubation. After intubation patient was maintained with isoflurane 0.6 – 1% with 66 % nitrous oxide in oxygen. Neuromuscular blockade was achieved using vecuronium 0.1 mg/kg IV. Mastectomy was performed through transverse or oblique incision. Ondansetron 0.15µg/kg IV was given 30 minutes before extubation. The residual neuromuscular blockade was antagonised with IV neostigmine 50 µg/kg & glycopyrolate 8 µg/kg. After surgery, patients were observed in the postoperative room for thirty minutes and then shifted to their respective wards.

Following the surgery, the level of post operative pain was assessed using VAS scale starting from 0 – no pain to 10 – worst pain. The post operative assessment of vomiting and nausea was assessed with Numerical Rating Scale that range from 0 – no nausea to 4 – severe vomiting. The observations recorded in each group were compared using statistical analysis.

Results

The present study was done in the medical hospital care. A total of 120 patients were included in the study. The included patients were planned for breast cancer surgery with modified radical mastectomy. The total of 120 patients who were included in the study was divided into two groups.

Group A included patients were administered with general anaesthesia only whereas patients in group B were administered with GA with prevertebral anaesthesia. All the patients included in the study belonged to ASA I to III distribution, maximum of the patients belonged to ASA II group.

The patients who were included in the study were of age range of 20 to 70 years. When both the groups were compared for significance for age distribution the difference was not found to be significant. Next the weights of all the patients were compared in both the groups, the difference was not found to be significant.

The VAS score was compared for the patients included in both the groups. The VAS score was recorded in the post operative period at 1st hour, 2nd hour, 3rd hour and 6th hour. Patients whose score was four or more were administered with rescue analgesia with Inj. Fentanyl. When VAS score of both the groups are compared the score in group B was found to be lower than in group A. (Table 1)

Table 1: Comparison of VAS score in both groups.

VAS SCORE at time interval	Group A		Group B		P value
	Mean	SD	Mean	SD	
1st hour	3.5	1.54	0.54	0.89	<0.001
2nd hour	3.31	1.53	0.75	0.91	<0.001
3rd hour	1.87	1.30	0.46	0.71	<0.001
6th hour	0.43	0.84	0	0	<0.001

The NRS score was compared for the patients included in both the groups. The NRS score was recorded in the post operative period at 1st hour, 2nd hour, 3rd hour and 6th hour. When NRS score of both the groups are compared the score in group B was found to be lower than in comparison to group A. (Tabel 2)

Table 2: Comparison of NRS score in both groups.

NRS SCORE at time interval	Group A		Group B		P value
	Mean	SD	Mean	SD	
1st hour	1.54	1.05	0.05	0.15	<0.001
2nd hour	1.32	1.00	0.00	0.00	<0.001
3rd hour	1.08	1.10	0.00	0.00	<0.001
6th hour	0.45	0.16	0.00	0.00	<0.001

Patients complaining of postoperative nausea and vomiting were provided antiemesis with Inj. Ondansetron. NRS was used as the guiding parameter. Patients reporting an NRS score of two or more were provided antiemesis. Both the groups were compared for amount of antiemetic consumption .Group A was found to have significantly greater consumption of antiemetics than Group A.

Patients were monitored in the intraoperative and post operative period. Few complications were observed for following post operative complications in group A such as failure of block, hypotension, pulmonary haemorrhage, hematoma, local anaesthetic toxicity and ipsilateral arm sensory change. However no post operative complications were noted in group B where paravertebral block was assisted with general anaesthesia. Hence the technique can be considered safe.

Discussion

Surgical stress leads to reproducible physiological metabolic and hormonal responses, characterized by an altered carbohydrate metabolism, a net loss of protein and an increased lipolysis. Anesthesia for this group of patients can be challenging due to comorbidities, frailty, advancing age, and anxiety.[11] Whilst these are not absolute indications for TPVB with sedation rather than GA, many are relative contraindications to GA and were therefore contributory factors in the decision making process following full discussions with the patients before hand. Providing satisfactory operating conditions without GA whilst maintaining patient confidence, comfort, and dignity is potentially a problem, but our cohort demonstrates that it is possible with ongoing refinement of the anesthetic technique.[12]

Different types of treatment are available for patients with breast cancer. Standard surgical procedures include- lumpectomy, segmental mastectomy, total mastectomy, modified radical mastectomy and radical mastectomy.[13] General anaesthesia (GA) is currently the standard technique used for surgical treatment of breast cancer. However, the side-effects and complications of general anaesthesia preclude ambulatory surgery for most patients undergoing breast surgery.[13]

Regional anaesthesia using paravertebral block (PVB) is an ideal alternative to general anaesthesia for breast cancer surgery. The mechanism of action of paravertebral analgesia is by direct penetration of local anaesthetic into the intercostals nerve, including its dorsal ramus, the rami communicantes and the sympathetic chain. Benefits of paravertebral block include a reduction in postoperative nausea and vomiting, prolonged postoperative pain relief and potential for early discharge.[14,15]

To analyze the pain at rest at operated site and pain due to motion the patients were asked to analyze as per visual analogue scale to evaluate the condition.

Patients were asked to analyse the pain related to breast, arm or axilla. VAS score was recorded at interval at 1st hour, 2nd hour, 3rd hour, 4th hour and 6th hour postoperatively. The follow up shows that patient receiving prevertebral block along with general anesthesia experienced low VAS score as compared to the patients who received general anaesthesia alone. The result is in accordance with the result obtained by the other authors. In the study done by Kairaluoma et al.[16] involving sixty patients, out of the thirty patients receiving PVB prior to GA, only three patients had pain on the first postoperative day in comparison to the control group which had twelve patients with postoperative pain (p=0.007). Terheggen and colleague, in their study of thirty patients deduced that VAS scores for pain at 15,30,60,90 and 120 minutes in the postoperative period were significantly lower in the fifteen patients who received PVB. It was clearly observed that the Group A had significantly higher NRS scores in comparison to Group B. In a similar study conducted by Coveney et al, patients receiving PVB had comparatively lesser incidence of PONV. In another study involving 25 patients conducted by Greengrass et al, out of the seventeen patients receiving PVB, 13 patients had no nausea or vomiting in the entire postoperative period.

Patients complaining of postoperative nausea and vomiting (PONV) were provided medication with ondansetron (0.1mg/kg body weight) given intravenously. NRS was used as the guiding parameter. Patients reporting an NRS score of two or more were provided antiemetics. Both the groups were compared for amount of antiemetic consumption. Group A was found to have significantly greater consumption of antiemetics than Group B. In a similar study conducted by Pekka et al, patients receiving PVB with GA required lesser number of antiemetic doses (15) in comparison to patients receiving GA only.

Conclusion

Paravertebral block when used in conjunction with general anaesthesia provides superior analgesia in the postoperative period in comparison to general anaesthesia alone. Paravertebral block reduces incidence of postoperative nausea and vomiting in comparison to general anaesthesia alone. Paravertebral block leads to significantly reduced consumption of opioids in the postoperative period in comparison to general anaesthesia alone.

Conflict of Interest: None

Source of Support: Nil.

References

1. Moraca RJ, Sheldon DG, Thirlby RC: The role of epidural anesthesia and analgesia in surgical practice. Annals of surgery 2003, 238:663.
2. Orel SG, Schnall MD: MR imaging of the breast for the detection, diagnosis, and staging of breast cancer. Radiology 2001, 220:13–30.
3. Baucom DH, Porter LS, Kirby JS, Gremore TM, Keefe FJ: Psychosocial issues confronting young women with breast cancer. Breast disease 2006, 23:103–13.
4. Moustafa MA, Alabd AS, Ahmed AM, Deghidy EA: Erector spinae versus paravertebral plane blocks in modified radical mastectomy: randomised comparative study of the technique success rate among novice anaesthesiologists. Indian Journal of Anaesthesia 2020, 64:49.
5. Albrecht E, Chin K: Advances in regional anaesthesia and acute pain management: a narrative review. Anaesthesia 2020, 75:e101–e10.
6. Faria SS, Gomez RS: Clinical application of thoracic paravertebral anesthetic block in breast surgeries. Revista Brasileira de Anestesiologia 2015, 65:147–54.
7. Greengrass R, Buckenmaier III CC: Paravertebral anaesthesia/analgesia for ambulatory surgery. Best Practice and Research Clinical Anaesthesiology 2002, 16:271–83.
8. Coveney E, Weltz CR, Greengrass R, Iglehart JD, Leight GS, Steele SM, Lyerly HK: Use of paravertebral block anesthesia in the surgical management of breast cancer: experience in 156 cases. Annals of surgery 1998, 227:496.
9. Tasmuth T, Kataja M, Blomqvist C, Smitten Kv, Kalso E: Treatment-related factors predisposing to chronic pain in patients with breast cancer a multivariate approach. Acta Oncologica 1997, 36:625–30.
10. Naccache N, Jabbour H, Nasser-ayoub E, Abou Zeid H, Naja Z: SPECIAL ISSUES IN BREAST CANCER REGIONAL ANALGESIA AND BREAST CANCER SURGERY. Lebanese Medical Journal 2009, 57.
11. Pisters PW, Pearlstone DB, Toroslan M: Protein and amino acid metabolism in cancer cachexia: investigative techniques and therapeutic interventions. Critical reviews in clinical laboratory sciences 1993, 30:223–72.
12. Simpson J, Ariyarathenam A, Dunn J, Ford P: Breast surgery using thoracic paravertebral blockade and sedation alone. Anesthesiology research and practice 2014, 2014.
13. Rawal N: Postoperative pain treatment for ambulatory surgery. Best Practice and Research Clinical Anaesthesiology 2007, 21:129–48.
14. D'Ercole F, Arora H, Kumar PA: Paravertebral block

for thoracic surgery. Journal of Cardiothoracic and Vascular Anesthesia 2018, 32:915–27.

15. Abdallah FW, Morgan PJ, Cil T, McNaught A, Escallon JM, Semple JL, Wu W, Chan VW: Ultrasound-guided multilevel paravertebral blocks and total intravenous anesthesia improve the quality of recovery after ambulatory breast tumor resection. Anesthesiology: The Journal of the American Society of Anesthesiologists 2014, 120:703–13.
16. Kairaluoma P, Bachmann M, Korpinen A, Rosenberg P, Pere P: Single-injection paravertebral block before general anaesthesia enhances analgesia after breast cancer surgery with associated lymph node biopsy: A–436. European Journal of Anaesthesiology (EJA) 2004, 21:105–6.

Instructions to Authors

Submission to the journal must comply with the Guidelines for Authors.
Non-compliant submission will be returned to the author for correction.

To access the online submission system and for the most up-to-date version of the Guide for Authors please visit:

http://www.rfppl.co.in

Technical problems or general questions on publishing with **Indian Journal of Anesthesia and Analgesia** are supported by Red Flower Publication Pvt. Ltd.'s Author Support team (http://rfppl.co.in/article_submission_system.php?mid=5#)

Alternatively, please contact the Journal's Editorial Office for further assistance.

Editorial Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India)
Mobile: 9821671871, Phone: 91-11-22754205, 79695648, 22756995
E-mail: author@rfppl.co.in

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.33

Thoracic Epidural Anaesthesia for Upper Abdominal Surgery

Chandrashekar E

Author Affiliation: Assistant Professor, Department of Anaesthesia, ESI Post Graduate Institute of Medical Sciences and Research, Rajajinagar, Bengalore, Karnataka 560010, India.

How to cite this article:
Chandrashekar E. Thoracic Epidural Anesthesia for Upper Abdominal Surgery. Indian J Anesth Analg. 2020;7(5):1101–1105.

Abstract

Background: Thoracic epidural anaesthesia (TEA) has many benefits over general anaesthesia in major abdominal surgeries including avoidance of endo tracheal intubation.

Aims: To evaluate the feasibility of TEA for various upper abdominal surgeries using 0.5% bupivacaine.

Patients and Methods: This was a clinical study of 50 selected patients undergoing elective upper abdominal surgery under TEA conducted at hospitals attached to JJM Medical college Davangere for a period of 3 years. All thoracic epidural anaesthesia was performed under aseptic conditions at T 8/9 interspinous space using a size 18G Tuohy needle and catheter inserted at appropriate level. A test dose of 3 ml 2% lignocaine with adrenaline was used in all patients ,after which a single dose of 10 ml 0.5% bupivacaine was injected steadly at a rate 0.5 ml per sec.

The operative conditions was assessed on basis of sedation and analgesia requirement, as well as response to mesentric traction. Surgeons opinion with regard to muscle relaxation was taken. The pulse rate, blood pressure and oxygen saturation were monitored throughout the procedure and recorded. Information obtained included age, gender, ASA status, diagnosis and type of surgery performed. Data analysis was performed under guidance of statician.

Results: 50 patients under went major abdominal surgeries. The mean age was 35.3 +_ 9.4 yrs (20-50), with male to female ratio of 1:1. Onset of analgesia was of 17.4 +_2.1 min (15-22), 88% of patients had Grade 1 analgesia, 68% of patients had good muscle relaxation, hemodynamic changes was significant with 6 patients having bradycardia and was treated with Ing atropine.

Conclusion: Thoracic epidural anaesthesia for upper abdominal surgeries provide good analgesia and muscle relaxation with minimal amount of drug used . Hemodynamic changes are significant. Post operative complications were minimal and was managed satisfactorily.

Keywords: Thoracic epidural; Abdominal surgeries.

Introduction

Major abdominal surgeries induces profound physiological changes in the perioperative period characterized by increase in sympathoadrenal and other neuroendocrine activity and also increased cytokine production. As epidural anaesthesia can attenuate this stress response to surgery, improve the quality of postoperative analgesia in comparison with systemic opioids and hasten recovery of gut function, it has been suggested that conducting surgery under epidural anaesthesia may reduce perioperative morbidity and mortality compared with general anaesthesia.[1]

Dawkins and Steal reported that ideal conditions for upper abdominal surgery can be obtained by instilling the local anaesthetic agents into epidural

Corresponding Author: Chandrashekar E, Assistant Professor, Department of Anesthesia, ESI Post Graduate Institute of Medical Sciences and Research, Rajajinagar, Bengalore, Karnataka 560010, India.

E-mail: drchandru_79@yahoo.co.in

space at midpoint of nerve supply to the site of operation.[2]

Although lumbar spinal and epidural blockade are often preferred by the anaesthetist, primarily because of technically less difficult needle placement and decreased possibility of dural puncture and neural injury, thoracic epidural anaesthesia provides selective blockade of surgical site, with diminished requirement of local anaesthetic and opioid requirement. In addition thoracic epidural anaesthesia provides pain relief and sympatholysis of such magnitude that allow patient to cough, breath deeply, drink and mobilize which can contribute to enhanced post operative outcomes such as improved respiratory function, reduction in ileus and protein sparing.[3]

This clinical study is therefore undertaken to evaluate the usefulness of employing thoracic epidural anaesthesia for various upper abdominal surgeries using 0.5% bupivacaine.

Patients and Methods

This clinical study was conducted in Department of Anaesthesiology in association with Department of Surgery at Chigateri Hospital and Bapuji Hospital attached to JJM Medical college Davangere for a period of 3 years. Clearance was obtained from hospital ethical committee and informed consent was obtained from all the patients. 50 patients coming for elective abdominal surgery were selected based on following inclusion criteria. ASA 1 and 2, Age group 20–50 yrs of either sex. Patients belonging to ASA 3 and 4, emergency surgeries, hemodynamically unstable patients and patients with coagulation defects were excluded.

All the cases were conducted in major O.T. Anaesthesia workstation, drugs, monitors, emergency resuscitation equipments were checked and kept ready before each case. Thoracic epidural anaesthesia was performed under aseptic conditions at T 8–9 level interspinous space using 18 G Tuohy needle and catheter was inserted as appropriate to surgical procedure. A test dose of 3 ml of lignocaine with adrenaline was used in all patients after which a loading dose of 10 ml 0.5 % bupivacaine was injected steadly at a rate of 0.5 ml per sec for all patients.

Pulse, blood pressure, ECG, respiratory rate and oxygen saturation was recorded before the start of the procedure and every 5 min, 10 min, 15 min, 30 min, 45 min and thereafter at an interval of 15 min till the patient was shifted out of recovery. If bradycardia occurred at anytime (<50 beats per min) then 0.6mg of injection atropine was given.If hypotension occurred then it was treated appropriately with intravenous fluids and vasopressors (mephenteramine 5mg increments). Following parameters were monitored.

1. Time of onset of analgesia in min.
2. Quality of analgesia.
3. Assesment of motor blockade.
4. Duration of analgesia.
5. Intra operative complications.
6. Post operative complications.

Quality of analgesia and motor blockade were measured using grades as depicted in the Table 1. Thoracic epidural was considered inadequate or failed if patient was uncomfortable during surgical manipulation warranting deep sedation and/or conversion to general anaesthesia. Data analysis was done under the guidance of statistician.

Table 1: Grading for quality of analgesia and motor blockade

Quality of analgesia:	
Grade 1:	Analgesia was complete and sedatives were Administered only to relieve apprehension.
Grade 2:	Analgesia was inadequate or patchy and supplementation Was needed with narcotics or ketamine or N2O /halothane.
Grade 3:	Analgesia was very poor and the technique was changed Over to general anaesthesia.
Assesment of motor blockade RAM Test	
100% power	Able to rise from supine to sitting position with hands Behind head.
80% power	can sit only with arms extended.
60% power	can lift only head and scapulae off bed.
40% power	can lift only shoulders off bed.
20% power	An increase in abdominal muscle tension can be felt During effort. no other response.

Results

Thoracic epidural anaesthesia was performed on 50 patients coming for major abdominal surgeries. The mean age was 35.3 +_9.4 yrs. There was equal distribution of males and females (1:1) Table 2. Majority of the surgeries performed were cholecystectomy (44%), GJ vagatomy (28%), epigastric hernia (16%), followed by hemicolectomy, hydatid cyst and pseudopancreatic cyst performed on 1 patient each (4%). Table 3.

The mean onset of sensory analgesia in our study was 17.4+_2.1 min with range 15–22 min. Most of the patient had sensory blockade from

Table 2: Demographic data and ASA

Category		Value
Age		
	Mean (years)	35.3
	Range	20 – 50
Gender		
	Male n(%)	25 (50)
	Female n(%)	25 (50)
Height (cm)		
	Male	170.6
	Female	159.3
ASA status n(%)		
	ASA 1	40(80%)
	ASA 2	10(20%)

Table 3: Types of surgical procedure

Surgical procedure	Frequency	Percentage
Cholecystectomy	22	44
Epigastric hernia	8	16
GJ vagotomy	14	28
Hemicolectomy	2	4
Hydatid cyst liver	2	4
Pseudopancreatic cyst	2	4

Table 4: Intraoperative profile of the patients

Category	Value
Onset of analgesia	17.4 +_2.1 min
Quaility of analgesia	
Grade 1	44(88%)
Grade 2	4(8%)
Grade 3	2(4%)
Degree of motor blockade	
Grade 1	35(70%)
Grade 2	13(26%)
Grade3	2(4%)
Intra operative complications	
Hypotension	10(20%)
Bradycardia	6(12%)
Shivering	5(10%)
Nausea and Vomiting	8(16%)
Post operative complications	
Backache	2(4%)
Nausea and Vomiting	4(8%)
PDPH	Nil
Neurological sequelae	Nil

T4–L1 segments. 88% of the patient had grade 1 analgesia, 8% grade 2 and 2 patients had grade 3 analgesia which were considered as failure and converted to general anaesthesia. Degree of motor blockade was assessed using RAM test and also surgeons opinion. In our study 68% of the patient had good muscle relaxation. Mean duration of analgesia was 127.2 +_9.5 min. Intra operative and post operative complications are represented in table 4. 10 patinents had hypotension which was managed with inj ephedrine 5mg intermitant bolus and 6 patients had bradycardia requiring one dose of atropine.

Discussion

Thoracic epidural anaesthesia though introduced 50 yrs ago is less preferred compared to lumbar epidural because of perceived technical difficulty, probability of dural puncture and neural injury and incidence of intra operative and post operative complications. So the present study of thoracic epidural anaesthesia for elective upper abdominal surgeries was under taken to evaluate the effectiveness of TEA with regard to onset of analgesia, level of blockade, quality and duration of sensory analgesia, degree of motor blockade, hemodynamic changes and intra operative and post operative complications. Similar studies have been conducted for both elective and emergency upper abdominal surgeries.[4,5]

Dawkins and Steal[2] have reported that ideal conditions for upper abdominal surgery can be obtained by injecting the local anaesthetic at the mid part of nerve supply to the abdominal wall. This corelates with the T8–9 interspace selected in our study. Here the spines are less angulated compared to mid thoracic level and mid line approach can be used with less technical difficulty.[6] Small volume of local anaesthetics are needed if center of block is close to operation site. Dose requirement for lumbar and mid thoracic differ by a ratio of 3:2, so a thoracic block will require 30% less drug than a lumbar block. Sakura and colleagues[7] have used 10 cc of 2% lignocaine to achieve a block upto T3 for upper abdominal surgery. In our study we have used 10 cc of 0.5% bupivacaine to obtain required analgesia.

Time of onset was noted as the interval between the drug injection to development of upper level of sensory block. In our study onset of analgesia had a range of 15–22 min with mean duration of 17.4+_2.1 min. Bromage[8] in his study found that average time required for complete spread of analgesia using 0.5% bupivacaine was 19 min. Morrison et al[9] during a study found mean onset time for bupivacaine was 18+_10 min . Thus onset of analgesia was comparable with similar studies done by other authors.

In our study 88% of patients had grade 1 analgesia where sedation was given only to relieve apprehension, 8% of patients had grade 2 analgesia where supplementation was given and 4% had

grade 3 analgesia and was converted to general anaesthesia. In a study conducted by Giebler RM[10] there was 0.7% incidence of failed block. Thus occurance of failed block are less and most of the patients have good analgesia during thoracic epidural anaesthesia.The degree of motor blockade was assessed by RAM test and by taking surgeons opinion during surjery. In our study 68% of the patients had good relaxation with RAM score of 20% power, other 32% of patients had poor muscle relaxation. Our study using RAM test correlates with surgeons opinion taken during the procedure where 70% of the patients had grade 1 relaxation and remaining 30% had grade 2 and 3 relaxation.

In our study a constant volume (10 cc) of 0.5% bupivacaine was injected at T8–9 interspace for all patients . The upper level of blockade had a range from T1–T6 with 62% of patients having block at T3–4 level. T he lower level of blockade had a range from T12–L2 with 80 % of cases having the block at T12 and L1 segments. Few cases where expected levels were not reached can be explained by factors influencing the level of blockade.[11] A total duration of 127.2+_9.8 min of analgesia was achieved in our study.

Though it is commonly held assumption that thoracic epidural catheterization is technically more difficult than lumbar,in our study the incidence of technical complication was less and comparable to the results done by Giebler RM.[10] Thus our data shows dural perforation (4%), bleeding (nil), difficulty in threading catheter (8%) occurs less frequently with thoracic epidural anaesthesia. Other intraoperative complications were hypotension (20%) and bradycardia (12%) which responded appropriately with inj ephedrine and inj atropine. This can be explained by higher level of block (upto T1) which occurred in these patients. Mac lean and colleagues[12] also found 15 – 20% fall in MAP during high thoracic block.In the presence of inhibition of cardiac sympathetic fibres, enhanced vagal tone like traction on bowel and decrease in central venous return can cause sudden onset of bradycardia and cardiac arrest. 10% of the patient had shivering as a result of due to sympathetectomy induced vasodilatation. In another study shivering like tremors was shown to occur in 30% of the patients with epidural anaesthesia.[13] These patients were treated with inj Tramadol. 16% of the patients had intraoperative nausea and vomiting and were managed with inj ondansetrone.

Post operative complications were minimal. In our study though 2 cases had dural puncture there was no incidence of PDPH. In a similar study done by Scherer R[14] despite 6 documented dural puncture in the thoracic region there was no incidence of PDPH. This can be explained by decrease in CSF pressure in thoracic region compared to lumbar region.There was no incidence of epidural hematoma , infection or neurological complication in our study. Giebler RM[10] in there study of 4185 patients undergoing thoracic epidural anaesthesia, 3.6% had neurological complication involving peripheral nerve palsy due to positioning, radicular pain during catheterization, however severe and permanent neurological complication was only 0.07%. De Leon Casosola and associates[15] have calculated a overall risk of 0.07% for thoracic epidural anaesthesia. Thus our study confirms the generally low overall incidence of neurological complications with thoracic epidural anaesthesia.

Conclusion

Relaxation with minimal amount of drug used. Hemodynamic changes are significant. Perioperative complications were minimal and was managed satisfactorily. None of the patients had respiratory or cardiac arrest. There were no incidence of post operative neurological complication. Thus we conclude that thoracic epidural anaesthesia is an excellent alternative technique for upper abdominal surgeries.

References

1. Buggy DJ, Smith G,Epidural anaesthesia and analgesia : Better outcome after major surgery? BMJ 1999;319:530–31.
2. Dawkins CJM, Steel GC. Thoracic epidural block for upper abdominal surgery.Anaesthesia 1971;26:41–9.
3. Waurick R ,Van Aken H. Update in thoracic epidural anaesthesia. Best Pract Res Clin Anaesthesiol 2005;19(2):201–13.
4. Wang C M,Ko W R,Chao CC,Lin CH,Chen MH,Lin HJ et al. Thoracic epidural anaesthesia for major abdominal surgery : a retrospective study. Acta – Anaesthesiol – Sin 1994;32(1):31–6.
5. Kostadinova R, Belitova M. Continuous thoracic epidural anaesthesia in abdominal surgery. Khirurgiia (sofiia)1988;51(3):31–5.
6. Claeys MA, Verborgh C, Delvaux G. Thoracic epidural bupivacaine-Fentanyl anaesthesia for percutaneous cholecystolithotomy in high risk patients. Reg – Anaesth 1992;17(2):87–90.
7. Sakura S, Saito Y, Kosaka Y. Effect of extra dural anaesthesia on the ventilatory response to hypoxemia. Anaesthesia 1993;48:205–9.

8. Bromage RP. Epidural anaesthesia. Philadelphia : W.B. Saunders company;1978.
9. Morrison LMM ,Emanuelsson BM, McClure JH.Efficacy and kinetics of extra dural ropivacaine: comparison with bupivacaine. Br J Anaesth 1994;72:164–7.
10. Giebler RM, Scherer RU, Peters J. Incidence of neurologic complications related to thoracic epidural catheterization. Anaesthesiology 1997;86:53–63.
11. Cousins MJ, Veering BT. Epidural neural blockade. In: Cousins MJ, Birdenbaugh PO, editors. Neural blockade in clinical anaesthesia and management of pain. 3rd Ed ,Philadelphia; Lipincott-Raven, 1998:243–323.
12. Mc Lean APH, Molligan GW, Otton P, Mc Lean LD. Hemodynamic alterations associated with epidural anaesthesia.Surgery 1967;20:117–9.
13. Glosten B, Sessler DI, Hynson J, Mc Guire J. Pre anaesthetic skin surface warming reduces redistribution hypothermia caused by epidural block. Anaesth. Analg 1993;77:488–91.
14. Scherer R, Schmutzler M, Giebler R, Erhard J, Stocker L, Kox WJ .Complications related to thoracic epidural analgesia. A prospective study in 1071 surgical patients. Acta Anaesthesiol Scand 1993;37:370–4.
15. de Leon –Casasola OA, Parker B, Lema MJ, Harrison P, Massey J. Post operative epidural bupivacaine-morphine therapy. Experience with 4227 surgical cancer patients. Anaesthesiology 1994;81:368–75.

Subscription Information

India
Institutional (1 year) (Print+Online): INR7500

Rest of the World
Institutional (1 year) (Print+Online): $607

Payment instructions Online payment
link:
http://rfppl.co.in/payment.php?mid=15

Cheque/DD:
Please send the US dollar check from outside India and INR check from India made payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch

Wire transfer/NEFT/RTGS:
Complete Bank Account No. 604320110000467
Beneficiary Name: Red Flower Publication Pvt. Ltd.
Bank & Branch Name: Bank of India, Mayur Vihar
MICR Code: 110013045
Branch Code: 6043
IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)
Swift Code: BKIDINBBDOS

Send all Orders to: Subscription and Marketing Manager, Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091(India)
Mobile: 8130750089, Phone: 91-11-79695648, 22754205, 22756995
E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.34

A Randomized Controlled Study of The Efficacy of Addition of Clonidine to Bupivacaine as Compared with Bupivacaine Alone used in Supracalvicular Brachial Plexus Block for Upper Limb Surgeries

Leno Ninan Jacob[1], Balaji Ramamurthy[2]

Author Affiliation: [1]Assistant Professor, Department of Anesthesiology, Believers Church Medical College Hospital, Thiruvalla 689103, Kerala, India [2]Associate Professor Department of Anesthesiology, SRM Medical College Hospital and Research Centre Kattangulathur, Tamil Nadu 603203, India.

How to cite this article:
Leno Ninan Jacob, Balaji Ramamurthy. A Randomized Controlled Study of The Efficacy of Addition of Clonidine to Bupivacaine as Compared with Bupivacaine Alone used in Supracalvicular Brachial Plexus Block for Upper Limb Surgeries. Indian J Anesth Analg. 2020;7(5):1107–1112.

Abstract

Introduction: Regional nerve blocks of the upper extremity avoid the polypharmacy and stress of laryngoscopy and tracheal intubation associated with general anaesthesia. Drug administration at the supraclavicular level offers comprehensive anaesthesia for the complete limb. Post-operative analgesia may be provided by either adding additives to the local anaesthetics or placing a catheter in place. Clonidine (alpha 2 adrenergic receptor agonist) is a classic additive to local anaesthetic in various regional procedures.

Aim: To compare efficacy of clonidine added as an adjuvant to bupivacaine with plain bupivacaine alone in supraclavicular brachial plexus block.

Methodology: Fifty ASA I and II patients coming for upper limb surgeries were assigned randomly into two equal groups.

Group S: received 35 ml of 0.25% Bupivacaine and 0.5 ml of normal saline 0.9%.

Group C: received 35 ml of 0.25% Bupivacaine and Clonidine 75mcg (0.5 ml).

Onset and duration of sensory and motor blockade and complications, if any were documented.

Results: Demographic variables were comparable. There was a statistically significant faster onset and prolonged duration of block in clonidine group when compared to plain bupivacaine ($p<0.05$). Clonidine also produced sedation which however did not require any clinical intervention.

Conclusion: We conclude that clonidine causes earlier onset, prolongs the duration of sensory and motor block with sedation and without any significant clinical side effects when added to bupivacaine in brachial plexus block.

Keywords: Bupivacaine; Clonidine; Brachial plexus block.

Introduction

Supraclavicular Brachial plexus block is the standard regional anaesthesia technique of the upper limb. This is due to the excellent surgical anaesthesia and effective postoperative pain relief it offers. A variety of additives have been fount not only improve the efficacy of the blockade but also reduces the total local anaesthetic dosage.[1,2,3,4] Clonidine has been studied as an additive over a wide dose range.[5] Hence we undertook this study to analyse the efficacy of clonidine as an additive to local anaesthetic in supraclavicular brachial plexus block.

Corresponding Author: Balaji Ramamurthy, Associate Professor, Department of Anaesthesiology, SRM Medical College Hospital and Research Center, Kattangulathur, Tamil Nadu 603203, Chennai, Tamil Nadu, India.

E-mail: aarbee79@gmail.com

Aim

To compare efficacy of clonidine added as an adjuvant to bupivacaine with plain bupivacaine alone in supraclavicular brachial plexus block.

Primary outcome:

- Duration of analgesia

Secondary outcome:

- Onset of sensory blockade
- Onset and duration of motor blockade
- Hemodynamic parameters
- Sedation score

Methodology

After obtaining Institutional Ethical committee clearance and written informed consent, fifty patients in the age group of 18 to 60 years were included in the study. Orthopedic procedures of the upper limb were planned to be done under supraclavicular brachial plexus block. Any hypersensitivity to the drugs under study and contraindication to blocks were excluded. The participants were randomized based on computer generated random numbers into two groups.

Group S (25 each) – 35 ml of 0.25% Bupivacaine with 0.5 ml of normal saline.

Group C (25 each) – 35ml of 0.25 % Bupivacaine with 75mcg of clonidine (0.5 ml).

A pilot study was conducted in 10 patients with 5 in each group. The mean difference in the duration of analgesia was found as 105 minutes with a confidence interval of 95% and 80% power of the study. A sample size of 23 in each group was considered adequate. An anaesthesiologist not involved in the study opened the sealed envelope and prepared the drug solution as per the randomization while the anaesthesiologist performing the procedure was blinded to the allotted group. Patients were shifted to the operation theatre, standard monitors attached and baseline parameters noted. Intravenous access with an 18 G IV cannula on the non-surgical limb was secured. The patient was placed in supine position with the head turned away from the side to be blocked. The surgical arm is adducted and the supraclavicular area is prepared aseptically. A 22 gauge needle was introduced in the parasagittal plane at the superior border of the clavicle at the lateral edge of the sternocleidomastoid muscle insertion. The response to nerve stimulator was noted. Twitch of pectoralis, deltoid, biceps (upper trunk), triceps (upper and middle trunk) and hand (lower trunk) muscles with current intensity of 0.4 mA was done. Distal responses (hand or wrist flexion or extension) were accepted as confirmed placement within the fascia. Anaesthetic solution was injected while the needle was fixed in position. Onset of sensory block was defined as the time elapsed between injection of drug and complete loss of pinprick sensation of the hand, while onset of motor blockade was defined as the time elapsed from injection of drug to complete motor block. Duration of sensory block (the time elapsed between injection of drug and appearance of pain requiring analgesia) and duration of motor block (the time elapsed between injection of drug and complete return of muscle power) would also be recorded.

Ramsay sedation Score

1. Anxious and agitated or restless or both.
2. Cooperative, oriented and tranquil.
3. Responding to commands only.
4. Brisk response to light glabellar tap.
5. Sluggish response to light glabellar tap.
6. No response to light glabellar tap.

The hemodynamic parameters and sedation scores were assessed at 5, 10, 20, 30, 60 min and later on at 120,240,360, 480, 540 and 600 minutes.

Results

Demographic variables were comparable as shown in Table 1. Group C had faster sensory (6.60±2.386 minutes) and motor onset (9.80±2.693 minutes) than Group S ($p < 0.05$ Fig 1). The mean duration of sensory blockade was 505.20 ± 50.010 minutes in Group C and 333.96 ± 63.16 in Group S. The difference was highly significant (Table 2). The mean duration of motor block was 294.80 ± 49.508 minutes in group S while Group C showed 414.60 ± 52.335 minutes and this too was statistically significant (Table 2). There was a significant difference in the mean duration of analgesia with group S showing 356.00 ± 52.994 minutes in comparison to group C which showed 527.20 ± 51.358 minutes (Fig 2). Mean heart rate was significantly lower in group C than in Group S during observation period of 15 min to 360 mins (Fig 3). There was no significant fall in systolic or diastolic blood pressure during the observation period in the groups (Fig 4 and 5).

Sedation score

The sedation score in Group S was 1 in all the patients throughout the period of observation. In group S, majority of the participants scored 2 in the sedation scale from 15th minute after injection till two hours. This change reverted back to score 1 at 360 minutes of observation. No patient crossed sedation score of 2 and above during the study period. Statistical analysis of sedation score showed that the difference was significant ($p < 0.05$) (Table 3).

Table 1: Demographic Data.

	Group I (n=25)	Group II (n=25)
Sex(M/F)	18(72%) /7(28%)	14(56%) /11(44%)
Age (in Years)	36.96 ± 11.995	40.76 ± 8.781
Weight (in kg)	65.40 ± 5.986	57.56 ± 5.432

Table 2: Comparison of DOB in Sensory and Motor.

	Group	N	Mean	SD	t Test	P Value
DOB Sensory	Group I	25	333.96	63.169	10.627	0.000
	Group II	25	505.20	50.010		***
DOB Motor	Group I	25	294.80	49.508	10.189	0.000
	Group II	25	441.60	52.335		***

Table 3: Comparison of Sedation Score.

Sedation Score	Score	Group I	Group II	Chi Square Test	P Value
0	1	25(100)	25(100)	NA	NA
	2	–	–		
5	1	25(100)	25(100)	NA	NA
	2	–	–		
10	1	25(100)	24(96)	1.02	0.312
	2	0(0)	1(4)		NS
15	1	25(100)	7(28)	28.125	0.000
	2	0(0)	18(72)		***
30	1	25(100)	2(8)	42.593	0.000
	2	0(0)	23(92)		***
60	1	25(100)	6(24)	30.645	0.000
	2	0(0)	19(76)		***
120	1	25(100)	6(24)	30.645	0.000
	2	0(0)	19(76)		***
240	1	25(100)	15(60)	12.500	0.000
	2	0(0)	10(40)		***
360	1	25(100)	22(880	3.191	0.074
	2	0(0)	3(12)		NS
480	1	25(100)	25(100)	NA	NA
	2	0(0)	0(0)		
540	1	25(100)	25(100)	NA	NA
	2	0(0)	0(0)		
600	1	25(100)	25(100)	NA	NA
	2	0(0)	0(0)		

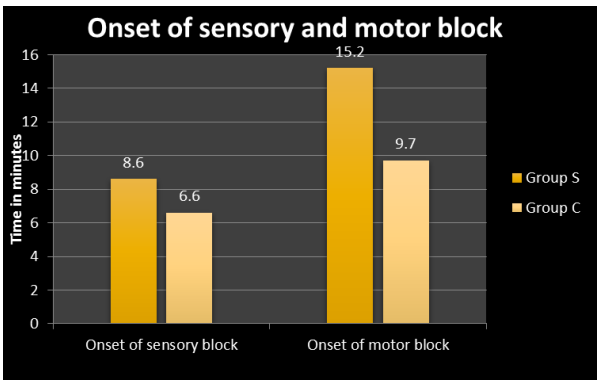


Fig 1: Comparison of Onset of sensory and motor block.

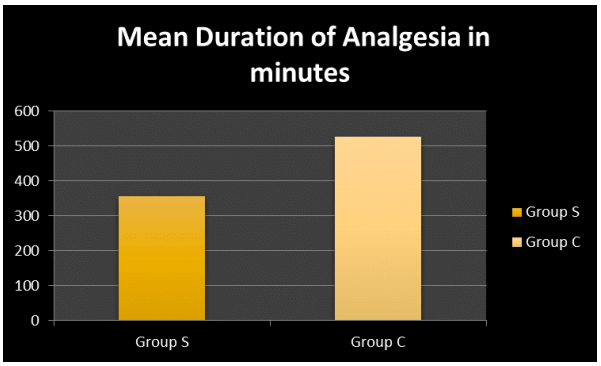


Fig 2: Comparison of Duration of analgesia.

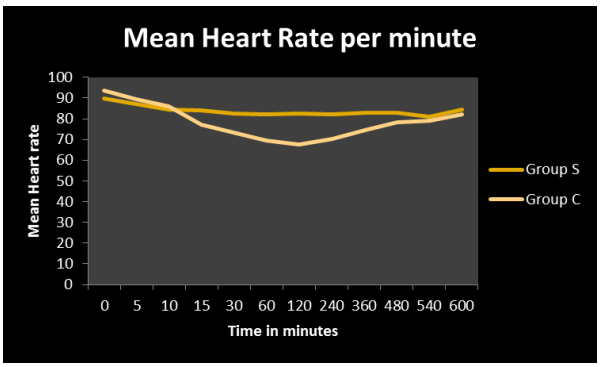


Fig 3: Comparison of Mean Heart rate per minute.

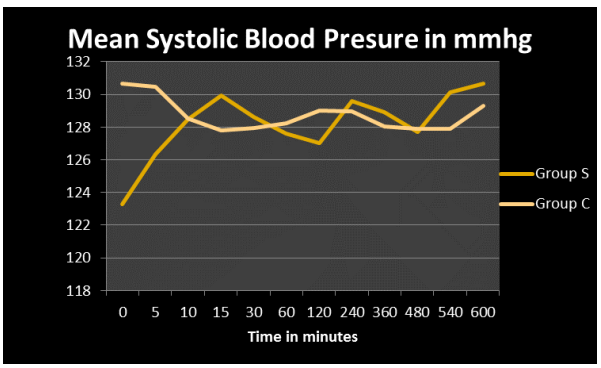


Fig 4: Comparison of Mean Systolic blood pressure in mmhg per minute.

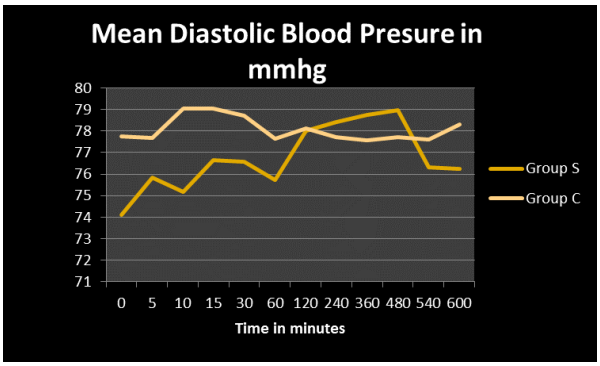


Fig. 5: Comparison of Mean Diastolic blood pressure in mmhg per minute.

Discussion

Bupivacaine is the most frequently used local anaesthetic due to its relatively longer duration of action which ranges from 3 to 8 hours.[6] The prominent shortcoming of Bupivacaine is its long onset time in regional blocks. On mixing short and long acting local anaesthetics, researchers found that even though the onset time was shortened, the duration of the blockade was reduced as the total effective concentration of bupivacaine was less.

Various studies have investigated several adjuncts including opioids, midazolam, neostigmine, hyaluronidase and bicarbonate,[1,2,3,4] but the results have been inconclusive with either ineffective outcomes or higher incidence of adverse effects and their limitations.

Limited studies are available on the effects of clonidine on the analgesic property of local anaesthetic agents in peripheral nerve blocks.[7-15] Previous studies have proved that clonidine hydrochloride which is an imidazole derivative, known to produce antinociception, enhances the effect of local anaesthetics when administered intrathecally and epidurally. It is proved that a very low dose of clonidine increased the C-fibre blockade from lignocaine induced blockade as shown in an isolated de-sheathed rabbit vagus nerve.[16]

This study was carried out in Fifty ASA I and II patients in SRM Medical College undergoing elective upper limb surgery. We had equal number of study population in both the groups. Both the groups received equal amounts of the local anaesthetic solution with the group S receiving 0.5 ml of normal saline and group C receiving 75 mcg of clonidine. A nerve stimulator was used to improve the precision and success rate of the blockade. Variables related to sensory and motor blockade, hemodynamic parameters and sedation scores were compared.

In our study, the clonidine group had a faster onset of both sensory and motor blockade compared to the other group. Clonidine and local anaesthetic agents have a synergistic action. Clonidine enhances both sensory and motor blockade of neuraxial and peripheral nerves by the local anaesthetic solution. This is thought to be due to blockage of conduction of A-delta and C fibers, increased potassium conductance observed in isolated neurons in vitro and intensification of conduction block achieved by local anaesthetics.

Our study showed a significantly longer mean duration of sensory and motor blockade was achieved by the clonidine group as compared to the control group (Table 3). This concurs with the results of the study done by Cucchiaro G[11] and colleagues in children where they demonstrated prolongation of the duration of sensory block with the use of clonidine.

Iskandar H et al[8] and Iohom G et al[10] too showed that the sensory blockade in the clonidine group were longer when compared to the control groups. The equivalent results between our study and by previous investigators could be due to the similar methodology applied and the near similar drug regimens used. In contrast, Duma A et al[17] and Culebras X et al[18] showed that there was no added advantage in terms of duration of blockade between the clonidine and placebo group. They concluded that addition of Clonidine produced a variable, inconsistent and unpredictable effect.

In our study we observed a significant prolongation in the mean duration of analgesia in the clonidine group than in the control group. McCartney and colleagues found that clonidine used as an adjunct to bupivacaine prolonged the postoperative analgesic effects compared to bupivacaine alone when administered for various peripheral nerve blocks.[12]

Popping DM et al[14] too showed that the difference in duration of postoperative analgesia for the clonidine group was significantly higher than the control group. This prolongation in the duration of blockade was attributed the interaction between clonidine and the axonal ion channel and its receptors. The mechanism of action is inhibition of the action potential of A and C fibers in the peripheral nerves by clonidine.

Our study showed that there was significant prolongation of mean duration of motor blockade in the clonidine group compared to the control

group. Popping DM[14] in his study showed that there was significant prolongation of the average duration of motor blockade by 141 minutes when clonidine was used as an adjuvant.

This was further concurred by Cucchiaro G[11] and colleagues. In contrast to this Duma[17] and colleagues showed that clonidine did not prolong the duration of block. The reasons for this inconclusive result have been discussed.

In our study we found out that there was a reduced pulse rate of patients in group C. Significant changes in heart rate occurred after 15 min and was maintained till 360 minutes. Even though some patients had minimal decrease in systolic, diastolic as well as the mean arterial pressure all of them maintained their hemodynamic parameters within the normal range. There was no significant hemodynamic change that had to be interfered with other drugs. It has been observed in few studies that intravenous and neuraxial administration of clonidine resulted in significant hemodynamic variations including bradycardia and hypotension.[18]

Intraoperative sedation scores were higher in clonidine group when compared with the control group which was statistically significant. However, none of the patients had any episodes of desaturation.

Conclusion

Addition of 75mcg of clonidine to bupivacaine causes a faster onset of sensory and motor block and prolongs the duration of analgesia without producing any clinically significant adverse effects in supraclavicular brachial plexus blocks.

Acknowledgement: none.

References

1. Keeler JF, Simpson KH, Ellis FR, Kay SP. Effect of addition of hyaluronidase to bupivacaine during axillary brachial plexus block. Br J Anaesth 1992; 68:68–71.
2. Bazin JE, Massoni C, Bruelle P, Fenies V, Groslier D, Schoeffler P. The addition of local anaesthetics in brachial plexus block: The comparative effects of morphine, buprenorphine and sufentanil. Anaesthesia 1997;52:858.
3. Bone HG, van Aken H, Brooke M, Burkle H. Enhancement of axillary brachial plexus block anaesthesia by coadministration of neostigmine. Reg Anesth Pain Med 1999;24:405–10.
4. Jarbo K, Batra YK, Panda NB. Brachial plexus block with midazolam and bupivacaine improves analgesia. Can J Anesth 2005; 52: 822 – 826.
5. Bernard JM, Macaire P: Dose-range effects of Clonidine added to Lignocaine for brachial plexus block. Anaesthesiology 1997; 87:277–84.
6. Butterworth JF, Strichartz GR. Molecular mechanisms of local anesthetics. A review. Anesthesiology 1990; 72: 711–25.
7. El Saied AH, Steyn MP, Ansermino JH. Clonidine prolongs the effect of Ropivacaine for axillary brachial plexus blockade. Can J Anaesth 2000; 47: 962–7.
8. Iskandar H, Benard A, Ruel-Raymond J, Cochard G, Manaud B: The analgesic effect of interscalene block using Clonidine as an analgesic for shoulder arthroscopy. Anesth Analg 2003; 96:260–62.
9. Hutschala D, Mascher H, Schmetterer L, Klimscha W, Fleck T, Eichler H.G, Tschernko EM. Clonidine added to bupivacaine enhances and prolongs analgesia after brachial plexus block via a local mechanism in healthy volunteers. European Journal of Anaesthesiology 2004; 21(3):198–204.
10. Iohom G, Machmachiv A, Deśire´ PD, Khatouf M, Boileau S , François DF. The Effects of Clonidine Added to Mepivacaine for Paronychia Surgery Under Axillary Brachial Plexus Block. Anesth Analg 2005;100:1179–83.
11. Cucchiaro G, Ganesh A. The Effects of Clonidine on Postoperative Analgesia After Peripheral Nerve Blockade in Children. International Anaesthesia Research Society March 2007; 104(3):240–45.
12. McCartney CJ, Duggan E, Apatu E. Should we add clonidine to local anesthetic for peripheral nerve blockade? A qualitative systematic review of the literature. Reg Anesth Pain Med 2007; Jul-Aug, 32(4):330–8.
13. YaDeau JT, LaSala VR, Leonardo P, Kahn RL, Kethy MJ, Levine DS, Clonidine and Analgesic Duration After Popliteal Fossa Nerve Blockade: Randomized, Double-Blind, Placebo-Controlled Study. Anesth Analg, June 2008; 106(6):120–130.
14. Popping DM, Elia N, Marret E, Wenk M, Trame MR. A Meta-analysis of Randomized Trials. Clonidine as an Adjuvant to Local Anesthetics for Peripheral Nerve and Plexus Blocks. Anesthesiology Aug 2009; 111(2):321–26.
15. Chakraborty S, Chakraborty J, Mandal MC, Hazra A, Das S. Effect of Clonidine as adjuvant in Bupivacaine induced supraclavicular brachial plexus block - lled trial. Indian Journal of Pharmacology. Apr 2010; 42(2): 74 –77.
16. Gaumann DM, Brunet PC, Jirounek P. Clonidine enhances the effects of Lidocaine on C-Fiber action potential. Anesth Analg 1992; 74 (5): 719–725.

17. Duma A, Urbanek B, Sitzwohl C, Kreiger A, Zimpfer M, Kapral S: Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block: A randomized, controlled study. Br J Anaesth 2005; 94:112–116.

18. Culebras X, Van Gessel E. Clonidine combined with a long acting local anesthetic does not prolong postoperative analgesia after brachial block but does induce hemodynamic changes. Anesth Analg 2001; 92: 201–04.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.35

Evaluation of Efficacy of Fentanyl as an Adjuvant to 1% 2-Chloroprocaine for Subarachnoid Block in Ambulatory Surgery: A Prospective Study

Neena Jain[1], Preeti Lamba[2], Rahul Bankapur[3], Pooja R Mathur[4], Vikas Kumar[5]

Author Affiliation: [1]Senior Professor, [4]Associate Professor, Department of Anesthesia, Jawaharlal Nehru Medical College, Ajmer 305001, Rajasthan, [2]Post Graduate, Department of Cardiac Anesthesia, Jawaharlal Nehru Medical College, Belgaum, Karnataka 590010, [3]Senior Resident, Department of Anesthesia, SDM College of Medical Sciences and Hospital, Sattur, Dharwad, Karnataka 580009, [5]Senior Resident, Department of Medicine, Jag Pravesh Chandra Hospital, New Delhi 110053, India.

How to cite this article:
Neena Jain, Preeti Lamba, Rahul Bankapur, et al. Evaluation of Efficacy of Fentanyl as an Adjuvant to 1% 2-Chloroprocaine for Subarachnoid Block in Ambulatory Surgery: A Prospective Study. Indian J Anesth Analg. 2020;7(5):1113–1120.

Abstract

Background and Aims: Subarachnoid block using short-acting drugs like chloroprocaine may be preferred in ambulatory surgeries. Various adjuncts are being added to local anesthetics to enhance the quality of analgesia. Fentanyl given by intrathecal route with local anesthetics has antinociceptive and synergistic effect.

Our study aimed to elucidate the effects of adding fentanyl to 1% 2-chloroprocaine on duration of sensory block and analgesia for subarachnoid block.

Methods: A prospective, randomized, double-blind study was conducted on a hundred patients of ASA physical status I/II, age group 18–80 years scheduled for elective infra-umbilical surgeries. Patients were allocated into two groups of 50 each to receive either 5 ml (50 mg) of chloroprocaine with 0.5 ml of normal saline (Group A) or 5 ml (50 mg) of chloroprocaine with 0.5 ml of fentanyl 25 µg (Group B). Block characteristics, duration of analgesia and complications were assessed.

Results: Sensory and motor block were achieved faster in chloroprocaine-fentanyl group. Duration of sensory and motor block, analgesia and return of voiding function, were significantly prolonged in Group B. No difference was noted in maximum motor block and ambulation time. Eight patients in Group B developed pruritus. Chi-Square and Student's unpaired t-test were used to analyse results, using Epi info version 7.2.1.0 statistical software.

Conclusion: Isobaric chloroprocaine and fentanyl mixture enhanced the duration of sensory block, analgesia and motor block without increasing ambulation time but with delay in return of voiding reflex.

Keywords: Fentanyl; Subarachnoid; Chloroprocaine.

Introduction

Subarachnoid block is routinely practised technique for surgeries on the lower part of the body. Although recovery from general anesthesia using short-acting intravenous or inhalational agents may be fast, in many day-care patients, regional anesthetic techniques might be preferable for their postoperative analgesic effects.[1] For ambulatory surgical procedures, the anesthetic drug should provide an enhanced recovery for fast patient discharge with minimal side effects. Lidocaine is associated with transient neurologic symptoms and cauda equina syndrome.[2] Chloroprocaine is being studied for day-care surgeries because of its rapid onset and short duration of action.[3]

Chloroprocaine belongs to ester group of local anesthetics, first introduced in 1952 and used

Corresponding Author: Preeti Lamba, Senior Resident, Department of Cardiac Anesthesia, JLN Medical College and KLE's Prabhakar Kore Hospital, Belgaum, Karnataka 590010.

E-mail: preetilamba91@gmail.com

successfully for spinal anesthesia. In early 1980s neurotoxicity was observed with the accidental subarachnoid injection of large volumes of chloroprocaine during attempted epidural anesthesia, since then the drug was no longer used for subarachnoid block.[4] Antioxidant sodium bisulphite at low pH was accepted to be the culprit in these cases. Recently, a new preparation of isobaric 1% 2-chloroprocaine is introduced. This preparation is devoid of antioxidants and preservative. Chloroprocaine is approved as a local anesthetic by the Federal Drug Administration (FDA), but it is not approved for spinal anesthesia and so used, 'off-label'. After 2004, no case of transient neurological syndrome, and neurotoxicity was reported with the use of preservative-free chloroprocaine.[4]

Fentanyl inhibits afferent synaptic transmission via 'C' and 'A' types of pain fibres in substantia gelatinosa of dorsal horn of spinal cord.[5,6]

Based on the hypothesis that intrathecal opioids with local anesthetics improve the duration of sensory block and analgesia without significantly prolonging motor recovery, we conducted this study with the primary aim of describing the effects of adding fentanyl to isobaric chloroprocaine on the duration of sensory block and analgesia for subarachnoid block in the surgical population. Our primary outcome variable was the effect on duration of sensory block and analgesia with addition of fentanyl.

Materials and Methods

This was a hospital-based prospective, comparative, randomized study. Study was done after getting approval from the Ethical Committee. Based on a previous study, a total of 50 subjects were taken in each group, this sample size was adequate to investigate a difference of 9 min. in the mean time of complete regression of sensory block with a pooled standard deviation of 9. The sample size was calculated at alpha error 0.05 and study power of 90%.[7]

All participants were explained about the procedure and a valid informed, written consent was obtained. Study groups comprised of hundred patients of either sex or age between 18 to 80 years posted for various elective infra-umbilical surgeries. Readiness for discharge on the day of surgery was considered as the criteria for ambulatory surgeries. Participants were divided into two groups with 50 patients in each using a computer-generated table of random numbers. Group A (n=50) received preservative-free 1% isobaric 2-chloroprocaine 50 mg (5ml, Neon pharmaceuticals) with 0.5 ml normal saline (total volume–5.5 ml). Group B (n =50) received preservative-free 1% isobaric 2-chloroprocaine 50 mg (5ml) with injection fentanyl 25 μg (0.5 ml, Fendrop®-Sun pharma) (total volume–5.5ml).

Patients with ASA physical status III, IV, V, and VI, allergy to local anesthetic agents, peripheral sensorineural deficit, and infection at the site of lumbar puncture and on anticoagulants were excluded from the study. A pre-anesthetic evaluation which included relevant patient history, examination and routine investigations was done. Patients were shifted onto the operating table and intravenous line secured using 18 G cannula.

Under aseptic precautions, the subarachnoid block was given using 25 G Quincke Babcock needle in sitting position at L3–L4 or L4–L5 intervertebral level by a blinded anesthetist. Study drugs were pre-filled by a qualified anesthetist who was not associated with patient management and data collection. Both the patient and investigator were kept blinded to the contents of injection. Patients were kept in a supine position after spinal anesthesia.

Intraoperative and postoperative evaluation of outcome variables was done by anesthesiologist who was unaware of study allocation groups and contents of drug syringes. Following study parameters were evaluated: Primary outcome variable included duration of sensory block and analgesia. Onset and degree of sensorimotor block, 2-segment regression time, duration of motor block, time of ambulation, micturition time, and complications like local anesthetic toxicity, bradycardia (<50 bpm), hypotension (decrease in SBP >30% baseline or <100mm Hg), pruritus, respiratory depression, sedation, were recorded as secondary outcome variables.

Sensory block was assessed using a 23 G hypodermic needle in dermatome areas of T4 to S2 bilaterally in the midclavicular line. Sensory block onset time was the period between drug injections to the time of loss sensation to pinprick at T10 dermatome level assessed every 30 sec. for initial 3 min and then every 2 min for the next 10 min. if needed. The highest dermatome level of sensory block was described as the level achieved after 15 min. of anesthesia. Degree of sensory block was graded as, 0 = normal sensation. 1 = sensation loss to pinprick (analgesia). 2 = sensation loss to touch (anesthesia) and degree of sensory block achieved at 15 min. was noted. Sensory block regression time was assessed, starting from highest dermatome level, every 5 min. after 20 min. for the first hour

and then at 10 min. intervals until regression to S1. When sensory block regressed by two dermatomes from its highest level, this time was taken as 2-segment regression time. Regression time to S1 was considered the same as the duration of sensory block. Duration of analgesia was the time interval between onset of sensory block to the point of time when patients asked for rescue analgesia or VAS (visual analogue scale) was >3.

The onset of motor block was taken as the time interval between drug injections to the time when it reached grade 4 of the modified Bromage scale. Time taken to regain the ability to flex toes was regarded as duration of motor block. Postoperative time of return of voiding function, ambulation time and adverse effects were noted. Discharge criteria for home was defined as regression of sensory block to S1 dermatome, ability to walk without assistance (ambulation time, excluding orthopaedic procedures), return of voiding function and stable vital signs. At the time of discharge patients were prescribed oral analgesics and instructed to report any complications like headache, backache or dysaesthesia in buttocks, thigh and lower limb up to 1 week of surgery. We followed the patients, telephonically after one week for transient neurological symptoms, and back pain.

Statistical analysis was done using Epi info version 7.2.1.0 statistical software. Chi-Square test was used to analyse categorical/nominal variables (summarized as frequency, percentage). Continuous variables in the form of mean and standard deviation were analysed using Student's unpaired t-test and Mann–Whitney U-test. Data were expressed as mean ± SD unless specified and P-value < 0.05, was considered statistically significant.

Results

One hundred and twenty patients were assessed for eligibility. Out of these 20 patients didn't fulfil the study criteria and were excluded. A total of 100 patients were studied and there was no loss to follow-ups (Fig. 1). Demographic parameters like

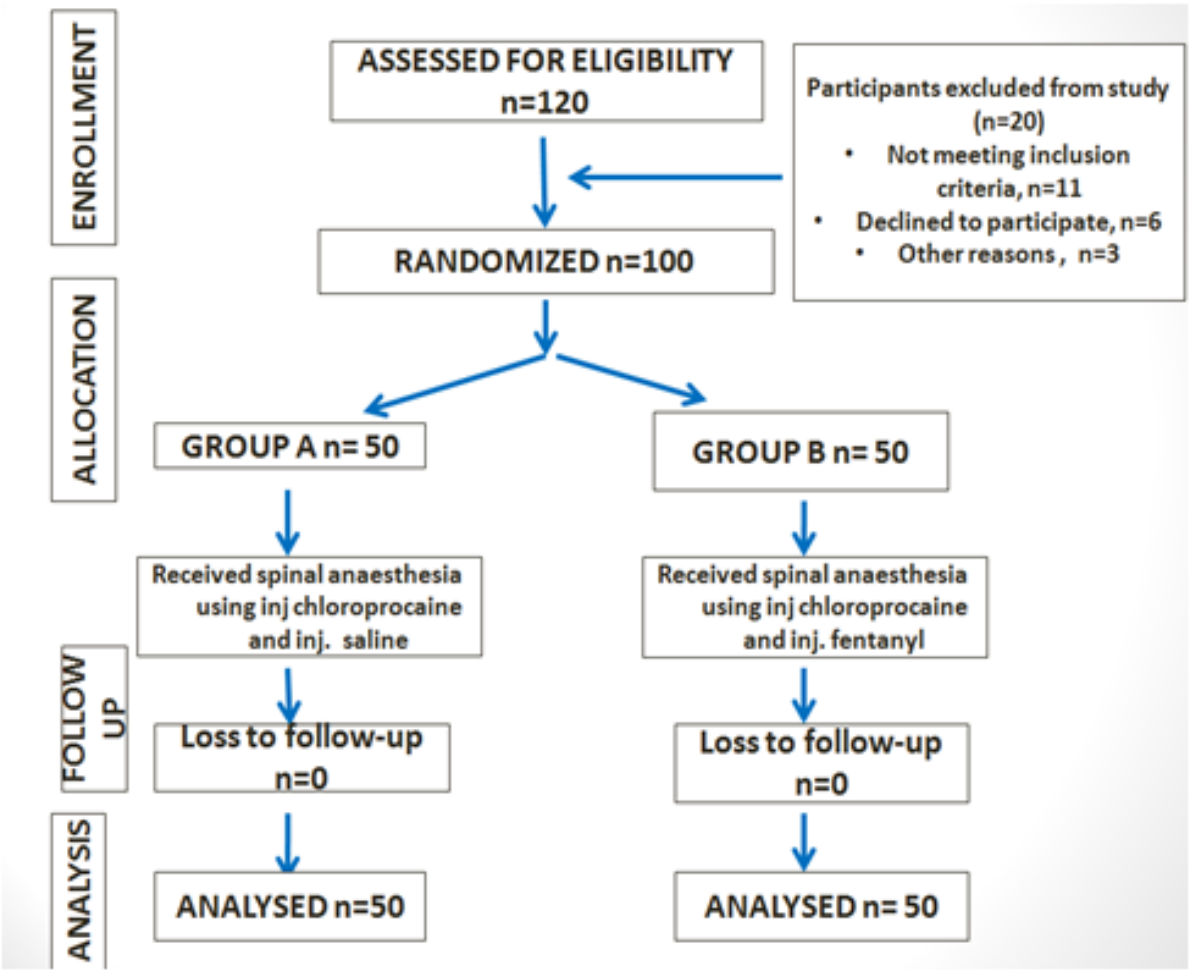


Fig. 1: Consort diagram.

Table 1: Demographic profile, mean duration and type of surgeries.

Demographic parameters	Group A (n=50)	Group B (n=50)	P-value
Age (yrs)	41.48 ± 13.19	41.36 ± 15.85	0.9670
Sex (M / F) (n)	35/15	32/18	0.671
Weight (kgs)	58.16 ± 3.31	57.56 ± 2.20	0.288
ASA physical status (I / II) (n)	22 / 28	19 / 31	0.684
Mean duration of surgeries (min.)	55.46 ± 9.8	52.37 ± 16.88	0.255
Type of surgeries - Mesh hernioplasty (inguinal)/ (fissurectomy, fistulectomy and others)/ Gynaecology/ Lower limb/ Urology (percentage of total)	28%/26%/4%/38%/4%	18%/18%/4%/44%/12%	0.319

Data represented as mean ± SD., n - number of patients, SD - Standard deviation, ASA- American Society of Anesthesiologists, and M: Males. F: Females, yr- years, kgs-kilograms.

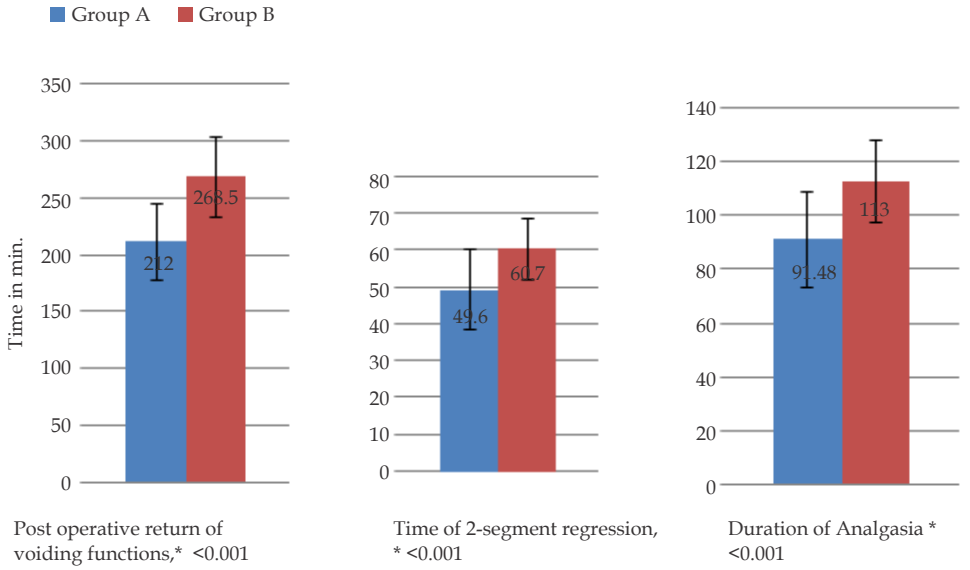


Fig. 2: Sensory block Characteristics.

Table 2: Sensory block characteristics.

Study parameters	Group A (n=50)	Group B (n=50)	P- value
Onset of sensory block (min.)	2.12 ± 0.78	1.79 ± 0.72	0.010*
Percentage of patients who achieved T6/T8 as highest dermatome level of sensory block	12%/28%	48%/14%	<0.001*
Percentage of patients to achieve second degree of sensory block	40%	64%	0.028*
Mean time of regression to S1 (min.) or duration of sensory block	93.7 ± 22.23	116.7 ± 14.78	0.001.*

Data represented as mean ± SD. n - number of patients, % - percentage of total. SD - Standard deviation, min. - minutes, T6/T8- thoracic dermatome level, S1- sacral first dermatome level, '*' denotes significant P-value.

age, sex, weight, ASA physical status, mean surgery time and type of surgeries (P = 0.319) were similar in both study groups (Table 1). Intraoperatively, none of the patients needed supplementary analgesics, general anesthesia or airway management.

Sensory block was achieved faster in Group B (1.79 ± 0.72 min.) compared to Group A (2.12 ± 0.78 min., P = 0.010) (Table 2). Regression time for 2-segments was substantially lengthened in Group B (60.7 ± 8.35 min., In Group A – 49.66 ± 10.95 min., P < 0.001). Time to demand rescue analgesia in Group B was 113 ± 15.81 min., prolonged compared to Group A (91.48 ± 17.97 min. P < 0.001). Difference in duration of sensory block/regression time to S1 was significant. (116.7 ± 14.78 min.in Group B versus 93.7 ± 22.23 min. in Group A, P = 0.001) (Table 2, Fig. 2).

Return of voiding function was delayed in Group B (268.5 ± 35.39 min.) compared to Group A (212.2 ± 33.64 min. P < 0.001) (Fig. 2). 64% of patients achieved a 2nd degree of sensory block in Group B compared to only 40% in Group A (P = 0.028).

Table 3: Motor block characteristics.

Study parameters		Group A (n=50)	Group B (n=50)	P- value
Onset of motor block(min.)		3.07 ± 0.77	2.43 ± 0.61	<0.001*
Maximum motor block (modified Bromage)	Grade	Number of patients		0.126
	1	2	0	
	2	9	3	
	3	15	22	
	4	24	25	
Duration of motor block(min)		81.17 ± 26.75	97.58 ± 16.23	<0.001*
# Time of ambulation				
		177.6 ± 38.11 (n = 32)	180.4 ± 51.17 (n = 31)	0.808

Patients undergoing orthopaedic surgeries were excluded, Data represented as mean ± SD, n - Number of patients. '*' denotes significant P-value.

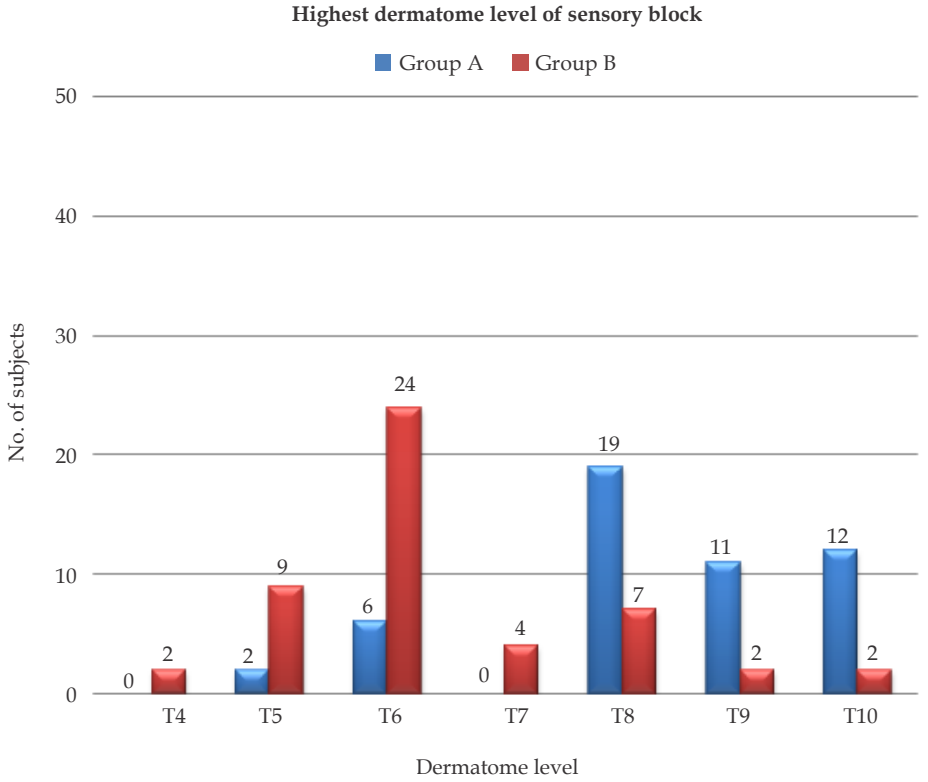


Fig. 3: Dermatome level achieved by the subjects.

(Table 2). Patients who couldn't achieve 2nd degree of sensory block, had no complaints of pain in either group, surgery was tolerated without discomfort, anxious patients were only motivated and explained about the short duration of surgery.

In Group B peak dermatome levels of 'T6 / T8 / T10' were achieved in '48% / 14% / 4%' of patients while in group A this value was '12% / 38 % / 24%' respectively. This difference was statistically significant (P < 0.001) (Table 2, Fig. 3).

Motor block onset time in Group A was 3.07 ± 0.77 min. while in Group B it was 2.43 ± 0.61 min. (P < 0.001). Maximum motor block (modified Bromage) was comparable in both Groups. Motor block duration in Group B– 97.58 ± 16.23 min. was significantly longer than Group A– 81.17 ± 26.75 min. (P < 0.001). No difference was noted in mean ambulation time among the Groups (P = 0.808). Patients undergoing orthopaedic surgeries (n=18 in Group A, n=19 in Group B) were excluded, for the analysis of ambulation time (Table 3).

Mean arterial pressure, arterial oxygen saturation and pulse rate were comparable and stable among both study groups intraoperatively and postoperatively. Eight patients (16%) in Group B developed pruritus compared to nil in Group A. Pruritus was self-limiting and patients were reassured (P = 0.010). All patients except those undergoing orthopaedic procedures, where

ambulation is not relevant, (total number = 37 in both the groups) were able to fulfil discharge criteria to home on the day of surgery. None of the patients had complaints of back pain, transient neurological symptoms on telephonic follow-ups after one week of anesthesia. There were no other postoperative complications in either group.

Discussion

Recent trend is growing towards ambulatory surgeries where the goal is early recovery and fast ambulation. A combination of isobaric drug with an opioid can fulfil this goal.[8] The primary finding of our study was that combining 25 μg of fentanyl to 50 mg chloroprocaine for subarachnoid block prolonged sensory as well as motor block. These findings are divergent from the presumed hypothesis. Difference in sensory block characteristics which included its duration, onset, peak dermatome level achieved, degree, 2-segment regression time, duration of analgesia and post-operative return of voiding function, was statistically significant. For motor block also, onset was earlier and duration was significantly lengthened. But, maximum motor block (modified Bromage) and ambulation time were found similar in both study groups. None of the patients developed neurological or other side effects except for pruritus which was noted in 16 % of patients receiving chloroprocaine and fentanyl.

So far, chloroprocaine and chloroprocaine-fentanyl combination were compared only in one study conducted on 8 healthy volunteers using chloroprocaine in a dose of 40 mg and fentanyl 20 μg.[4,7] We selected higher dose of chloroprocaine (50 mg) and fentanyl (25 μg).

Onset time of sensory and motor block was substantially earlier in chloroprocaine-fentanyl group. Onsets of action of local anesthetics depend on their pKa values. Higher pKa means slower the onset of action. Chloroprocaine is an exception to this because it has the fastest onset despite high pKa (9.1).[3] This suggests that other factors like the ability to diffuse through connective tissues, baricity and change in baricity due to the addition of adjuncts may alter drug's onset of action.

The mean duration of analgesia was prolonged by 22 min. in fentanyl receiving patients which was statistically significant but this small duration may not of much practical importance. In chloroprocaine-fentanyl group, 64% of patients achieved a 2nd degree of sensory block compared to only 40% of patients of chloroprocaine-saline group. Both these findings can be attributed to the synergistic action of fentanyl with local anesthetics.[5] Opioid-local anesthetic combination reduces transmission through both, 'A δ' (fast pain) and 'C' (slow pain) fibres.

Onset time of sensory and motor block, duration of analgesia, degree of sensory block and maximum motor block achieved, were not investigated in previous study with chloroprocaine and fentanyl.[4] Prolongation in an average time of the 2-dermatome regression of sensory block was divergent from the previous study, which may be attributed to the selection of a higher dose of chloroprocaine (50 mg) and fentanyl (25 μg) in our study.[7]

Peak dermatome level, duration of sensory and motor block, time of postoperative return of voiding function were significantly higher in chloroprocaine-fentanyl group and were consistent with findings of previous similar study.[7] The mean time of the return of voiding function was prolonged by 56 min. in fentanyl group which may translate to a slight delay (56 min.) in discharge. In our study it was not enough to surpass requirement of ambulatory surgery. Ambulation time was reported similar in both groups (after exclusion of patients undergoing orthopaedic procedures).

Duration of action of local anesthetics is directly related to lipid solubility and protein binding. Relative lipid solubility of unchanged chloroprocaine is 2.3 that is very low as compared to more commonly used drug bupivacaine and that is why chloroprocaine is short-acting.[3] It is already described in former studies that chloroprocaine has the shortest recovery profile compared with bupivacaine, lidocaine, prilocaine and mepivacaine.[9,10] Discharge criteria vary for different surgical procedure. In day-care surgeries discharge criteria include the return of voiding function, ability to ambulate and haemodynamic stability. In review analysis of chloroprocaine, it is obvious that the use of varying doses of chloroprocaine can result in wide variation in voiding times ranging from 95 to 271 min.[4] Return of voiding function depends on many factors such as preoperative hydration status, age of patient (enlarged prostate in males), type of surgery (perianal procedures, inguinal herniorrhaphy, urological procedures - can increase voiding time) and this finding can't be solely credited to use of fentanyl.

Transient neurological symptoms and respiratory depression were not seen in any of the patients of either group. It was consistent with findings of previous study combining chloroprocaine with

fentanyl, where authors didn't report any case of neurological complications even in lithotomy position with the use of spinal chloroprocaine while higher incidence was noted in lignocaine-fentanyl combination.[11]

Sixteen per cent of participants in group B developed pruritus ($P < 0.010$), itching was minimized with reassurance and judicious use of anti-pruritic therapy. Pruritus was also seen in other studies combining fentanyl with local anesthetics for spinal anesthesia and is one of the common side effects.[12] As with other complications of neuraxial opioids like respiratory depression, pruritus is likely dose-dependent and may need further studies.

Superiority of chloroprocaine spinal anesthesia over total intravenous anesthesia is shown in a previous study.[13] Recently, a multicentre observational study was conducted on 615 patients receiving chloroprocaine spinal anesthesia where authors observed chloroprocaine as a short-duration anesthetic and a strong contender for ambulatory surgeries.[14]

We suggest that isobaric, 50 mg 1% 2-chloroprocaine is safe and reliable for spinal anesthesia in infra-umbilical surgeries of predicted duration less than < 50 min. Fentanyl added with spinal chloroprocaine enhances the duration of postoperative analgesia and provides satisfactory operating conditions for surgeries lasting around 90 min. Isobaric chloroprocaine and fentanyl combination may be a good choice for subarachanoid block in day-care surgical procedures.

Our study is not without limitation. Addition of fentanyl was associated with prolongation of the time of the return of voiding reflex. Although prolongation in the duration of sensory block by 22 min. is statistically significant, it may not of much practical benefit. We selected a wide surgical population where an assessment of analgesia, the return of voiding reflex and ambulation time may have been confounded by type of surgeries, in turn leading to imprecision. In future, the efficacy of chloroprocaine in different dose combination with adjuvant should be investigated in a group of patients undergoing 'particular' types of surgeries.

Conclusion

Addition of 25 μg fentanyl to 50 mg isobaric 1% 2-chloroprocaine for spinal anesthesia resulted in prolonged sensory block, duration of analgesia and motor block without prolongation of ambulation time but with delay in return of voiding reflex.

Conflicts of interest: Nil.

Acknowledgement: Nil.

References

1. Kulkarni S, Harsoor S S, Chandrasekar M, Bhaskar S B, Bapat J, Ramdas EK, Valecha UK, Pradhan AS, Swami AC. Consensus statement on anesthesia for day care surgeries. Indian J Anaesth 2017; 61:110–24.
2. Alley EA, Mulroy MF. Neuraxial anesthesia for outpatients. Anesthesiology Clin 2014; 32:357–69.
3. John F. Butterworth, David C. Mackey, John D. Wasnick, G Edward Morgan, Maged S Mikhail. Local Anesthetics. In: Morgan and Mikhail's Clinical Anesthesiology, 5th Ed. New Delhi: McGraw Hill; 2014.p. 267–9.
4. Ghisi D, Bonarelli S. Ambulatory surgery with chloroprocaine spinal Anesthesia: a review. Ambulatory Anesthesia 2015; 2:111–20.
5. Nayagam HA, Singh N R, Singh H S. A prospective randomised double blind study of intrathecal fentanyl and dexmedetomidine added to low dose bupivacaine for spinal anesthesia for lower abdominal surgeries. Indian J Anaesth 2014; 58: 430–5.
6. John F. Butterworth, David C. Mackey, John D. Wasnick, G Edward Morgan, Maged S Mikhail. Local Anesthetics. In: Morgan and Mikhail's Clinical Anesthesiology, 5th Ed. New Delhi: McGraw Hill; 2014.p.189–90.
7. Vath JS, Kopacz DJ. Spinal chloroprocaine: the effect of added fentanyl. Anesth Analg 2004; 98:89–94.
8. Upadya M, Neeta S, Manissery JJ, Kuriakose N, Singh RR. A randomized controlled study comparing intrathecal hyperbaric bupivacaine-fentanyl mixture and isobaric bupivacaine- fentanyl mixture in common urological procedures. Indian J Anaesth 2016; 16:44–9.
9. Gebhardt V, Kiefer K, Bussen D, Weiss C, Schmittner MD. Retrospective analysis of mepivacaine, prilocaine and chloroprocaine for low-dose spinal anesthesia in outpatient perianal procedures. Int J Colorectal Dis. 2018; 33:1469–77.
10. Teunkens A, Vermeulen K, Van Gerven E, Fieuws S, Velde M, Rex S. Comparison of 2-Chloroprocaine, Bupivacaine, and Lidocaine for Spinal Anesthesia in Patients Undergoing Knee Arthroscopy in an Outpatient Setting: A Double-Blind Randomized Controlled Trial. Regional Anesthesia and Pain Medicine 2016; 41:576–583.
11. Vaghadia H, Neilson G, Lennox PH. Selective spinal anesthesia for outpatient transurethral prostatectomy (TURP): randomized controlled comparison of chloroprocaine with lidocaine. Acta Anesthesiol Scand 2012; 56:217–23.

12. Kumar K, Singh SI. Neuraxial opioid induced pruritus: An update. J Anesthesiol Clin Pharmacol 2013; 29:303–7.
13. Gebhardt V, Zawierucha V, Schöffski O, Schwarz A, Weiss C, Schmittner MD. Spinal anaesthesia with chloroprocaine 1% versus total intravenous anaesthesia for outpatient knee arthroscopy. Euro J Anaesthesiol 2018; 3:774–81.
14. Capdevila X, Aveline C, Delaunay L, Bouaziz H, Zetlaoui P, Choquet O et al. Impact of Chloroprocaine on the Eligibility for Hospital Discharge in Patients Requiring Ambulatory Surgery Under Spinal Anesthesia: An Observational Multicenter Prospective Study. Adv Ther 2020; 37:541–51.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.36

A Comparative Study of Intravenous Paracetamol Versus Intramuscular Diclofenac For postoperative Pain Relief in Tonsillectomy Patients

Priyadarshini M Bentur[1], Vivek MP[2]

Author Affiliation: [1]Professor, [2]Senior Resident, Department of Anesthesiology, Jagadguru Jayadeva Murugarajendra Medical College, Davangere, Karnataka 577002, India.

How to cite this article:
Priyadarshini M Bentur, Vivek MP. A Comparative Study of Intravenous Paracetamol Versus Intramuscular Diclofenac For postoperative Pain Relief in Tonsillectomy Patients. Indian J Anesth Analg. 2020;7(5):1121–1124.

Abstract

Introduction: Post tonsillectomy pain relief is commonly inadequate as the pharynx is continuously active, swallowing saliva. I. m. Diclofenac provides good pain relief but pricks are usually unwelcome by children and it may cause dangerous side effects like inhibition of platelet aggregation (post op hemorrhage) and kidney problems. I.v Paracetamol is a good and safe alternative and the study was conducted to compare the 2 drugs.

Aims: To evaluate onset of analgesia, duration and efficacy of analgesia, and adverse effects if any between the 2 drugs.

Settings and design: 100 cases aged between 10 and 40 years posted selectively for tonsillectomy under general anaesthesia were randomly selected and divided into 2 groups. Groups P received Paracetamol 1g I.v for those more than 50 kg and 15 mg/kg for those between 30 and 50 kg over 10 min after delivery of second tonsil and this time was taken as time 0. Group D received inj. Diclofenac I.m 75 mg at the same time.

Subsequently data regarding pain relief at 30 min,1h, 2h, 4h and 6h using Visual Analog Scale was collected. Duration of analgesia, number of patients asking for rescue analgesia were recorded.

Statistical Analysis: This was done using Student test and Chi square tests as and where needed.

Results: Comparison of pain scores 30 min and 1 h after drug administration showed superior pain relief with Paracetamol and at 4 and 6h better pain relief with Inj. Diclofenac. Duration of analgesia was significantly longer with inj Diclofenac.

Conclusion: We concluded that both I.v Paracetamol and I.m Diclofenac have equal efficacy. The onset was early in Inj. Paracetamol and longer with inj. Diclofenac.

Keywords: Inj. Paracetamol I V; Inj. diclofenac I.M; Tonsillectomy; Post operative analgesia.

Introduction

Pain-Historical review[2]:

Man has been afflicted with this evil pain since beginning for as records of every race are examined one finds testimonials to the omnipresence of pain.

The International Association for Study of Pain has defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Despite advances in the knowledge and sophisticated technology relief of post tonsillectomy pain still remains a problem.

Paracetamol I V in comparison to oral route has

Corresponding Author: Priyadarshini M Bentur, Professor, Department of Anesthesiology, Jagadguru Jayadeva Murugarajendra Medical College, Davangere, Karnataka 577002, India.

E-mail: priyadarshiniveereshangadi@gmail.com

superior pharmacokinetics and efficacy. Hyllested M et al[6] compared the analgesic and adverse effects of paracetamol with those of NSAIDs in post-operative pain and concluded that paracetamol is a viable alternative to NSAIDs in high-risk patients. Cakan T et al[7] studied analgesic efficacy, opioid sparing effect of paracetamol in combination with i.v. morphine after spine surgery and concluded that it did not have significant opioid sparing effect. Alhashemi JA et al[8] compared the effect of i.v. acetaminophen with i.m. meperidine in 80 children undergoing tonsillectomy and concluded that i.v. acetaminophen gave comparable effects. I.m diclofenac has well established its role as an effective post-operative analgesic but can cause unwanted platelet and kidney dysfunction. Platelet dysfunction can cause troublesome bleeding in ENT surgeries.

Methods

Institutional ethical committee approval was taken and the study was conducted on 100 patients aged between 10 and 40 years belonging to ASA 1 and 2 categories who were selectively posted for tonsillectomy alone under general anesthesia.

Excluded were those who belonged to ASA g 3 and 4, those undergoing adenoids resection, those with history of drug allergy, bronchial asthma, gastrointestinal dysfunction, liver disease, renal disease and bleeding diathesis.

All patients were divided randomly into 2 groups, P and D. All patients received Inj Atropine is 0.01 mg/ kg. I.v and Inj. Fentanyl 2 microgram/ kg I.v as premeditation. After preoxygenation, anesthesiawas induced with Inj. Thiopental sodium 5 mg/kg, intubated with Inj. Scoline. 2 mg/kg with appropriate sized cuffed endotracheal tube and maintained with halothane in 70% nitrous oxideand oxygen mixture. Intraoperative relaxation was provided with Inj. Vecuronium .05 mg/kg I.v. Residual neuromuscular blockage was reversed with Inj. Glyco. 01 mg/kg and Inj. Neostigmine .05 mg/kg I.v. ECG, Spo 2, EtCO2, NIBP and heart rate were monitored continuously.

After delivery of second tonsil, gp P patients received 1g I.vInj Paracetamol for those weighing more than 50 kg and at a dose of 15mg/kg for those weighing between 30 and 50 kg infused over a period of 10 min. This time was taken as time 0. Gp D patients received Inj. Diclofenac 75mg I.m (2 mg/ kg) at the same time.

Pain was assessed at 30 min, 1h, 2h, 4h and 6 h intervals using Visual Analog Scale as 0 – poor, 1- fair, 2 – good, 3- excellent. Duration of analgesia was taken from time 0 to resurfacing of pain. Need for rescue analgesic, Inj. Tramadol 2 mg/kg I.v was recorded. Hr and BP were also recorded.

Statistical analysis

Quantitative data was analyzed by Student T test. Qualitative data was analyzed using Chi square/ Man Whitney U test. Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver. 2.11.1 were used for the analysis and Microsoft Word and Excel were used to generate Graphs and Tables.

Results

VAS scores were significantly lower for Inj. Paracetamol at 30 min and 1 h intervals. VAS Scores were significantly lower at 4h and 6h intervals for Inj. Diclofenac. Duration of analgesia was longer with the latter and onset was earlier with the former. There was no statistical difference between rescue analgesia requirements at 6 h in both groups. No significant side effects were seen in either group. The results are tabulated below.

Table 1: Comparison of age of participants.

Group	Mean(Sd)	P value
P	25.8	.550
D	26.8	

Statistically insignificant.

Table 2: Comparison of gender distribution.

Gender	Group P	Group D	P value
Male	28	27	.841
Female	22	23	
Total	50	50	

Statistically insignificant.

Table 3: Comparison of pulse rate between both groups at various intervals.

Time	P gp, Mean (sd)	D gp, Mean(sd)	P Value
Baseline	87.9 (9.07)	88.64(8.33)	.672
At 30 min	84.24 (7.57)	84.94(7.12)	.635
At 1 h	83.28 (7.13)	82.84(6.66)	.751
At 2 h	83.34 (7.03)	83.22(6.41)	.929
At 4 h	82.88 (6.65)	83.16(6.03)	.826
At 6 h	84.02 ()	84.16(6.36)	.915

Table 4: Comparison of systolic blood pressure between both groups at various intervals.

Time	P gp, Mean(sd)	D gp, Mean(sd)	P value
Baseline	121.76(3.32)	121.84(6.52)	.939
At 30 min	121.24(3.33)	120.24(5.06)	.246
At 1 h	121.16(3.88)	120.0(6.43)	.277
At 2 h	121.2(3.55)	120.52(4.93)	.430
At 4 h	120.96(3.36)	120.56(3.96)	.587
At 6 h	12.52(3.07)	121.4(4.3)	.873

Both tables 3 and 4 show statistically insignificant values.

Table 5: Comparison of diastolic blood pressure between both groups at various intervals.

Time	P gp, Mean (sd)	D gp, Mean (sd)	P value
Baseline	80.48(2.70)	77.88(4.523)	.001
At 30 mins	80.04(2.84)	77.76(4.62)	.004
At 1 h	80.08(2.59)	78.16(5.37)	.025
At 2 h	80.16(2.49)	78.76(4.12)	.042
At 4 h	80.44(2.07)	78.80(4.08)	.013
At 6 h	80.72(2.35)	79.48(3.07)	.026

Statistically insignificant.

Table 6: Comparison of onset of analgesia among both groups.

Group	Mean (sd)	p value
P	10.64(2.07)	<.001
D	38.40(4.10)	

Statistically significant.

Table 7: Comparison of initial pain scores immediately after extubation.

Group	Mean(IQR)	P value
P	6(6–7)	.295
D	6(6–7)	

Statistically insignificant

Table 8: Comparison of pain scores at 30 min.

Group	Mean(IQR)	P value
P	3(3–4)	<.001
D	5(5–6)	

Statistically significant

Table 9: Comparison of pain scores at 1h.

Group	Mean(IQR)	P value
P	2(2–3)	<.001
D	4(4–4)	

Statistically significant

Table 10: Comparison of pain scores at 2 h.

Group	Mean(IQR)	P value
P	2(1–3)	<.001
D	2(2–3)	

Statistically significant

Table 11: Comparison of pain scores at 4h.

Group	Mean(IQR)	P value
P	3(3–4)	<.001
D	1(1–2)	

Statistically significant

Table 12: Comparison of pain scores at 6h.

Group	Mean(IQR)	P value
P	4(4–4)	<.001
D	1(1–2)	

Statistically significant

Table 13: Comparison of total pain scores.

Group	D	P	t value	p value	Singnificance
Total pain relief score Mean +/– sd	2.82+/–.39	2.8+/– .40	.252	.801	NS

Statistically significant

Table 14: Comparison of duration of analgesia.

Group	Mean +/– sd	P value
P	5.87(.62)	<.001
D	7.71(.5)	

Statistically significant.

Table 15: Need for rescue analgesia.

Reascue analgesia	P	D	P value
Yes	6	9	
No	44	41	1.0
Total	50	50	

Statistically insignificant.

Table 16: Comparison of incidence of adverse effects between the two groups.

Complications	P	D	P value
Yes	4	9	.234
No	46	41	
Total	50	50	

Complications
P: headache:1, n/v: 1, pruritus: 2. D: n/v:3, epigastric discomfort: 6.

Discussion

Pain is a sensory experience that is subjective and individualized. It frequently exceeds its protective nature and makes the post operative period a suffering. Despite the availability of a wide variety of agents, management of postoperative analgesia remains a challenge. In our study, the effects of I.v Paracetamol were compared with I.m Diclofenac as the latter is the most common standard analgesic used in our institution.

In the study, patients between ages 10 and 40

years (Table 1) were randomly selected with out any criteria for gender distribution (Table 2). All were healthy ASA 1 and 2 patients and underwent tonsillectomy under the same general anesthesia technique. They were divided randomly into groups P and D and received the study drugs in the above prescribed format.

In the study, average pulse rate (Table 3) and mean SBP (Table 4) and DBP (Table 5) in both groups at 30 min, 1 h, 2 h, 4 h, and 6 h did not vary significantly. Haynes D . et al[5] studied the efficacy of the same 2 drugs in post operative orthopedic pain and observed statistically insignificant changes in the vitals.

Onset of analgesia was 10.64+/–2.07 min with Inj Paracetamol and 38.4+/–4.10 with Inj Diclofenac (Table 6) which was statistically significant. Moller P L et al[9] in their study showed that onset for Paracetamol was 5 min and for Diclofenac was 26+/–8 min in Nuuttnen LS, et al[10] study.

There was no difference in the pain scores immediately after extubation (Table 7). Pain scores at intervals 30 min and I h after drug administration were significantly lower in the P group (Tables 8 and 9). Pain score at 2h were similar in both groups (Table 10). Pain scores at 4h and 6h intervals was lower in the D group which was statistically significant (Tables 11 and 12). In our study, total pain relief score in gp P was 2.8 +/– 0.4 and in gp D it was 2.82+/–0.39 (Table 13) which was not statistically significant which was similar to what was observed in Hynes D et al[5] study.

Duration of analgesia in gp P was 5.87+/–0.62 h and that in gp D was 7.71+/–0.5 h (Table 14). This showed that Diclofenac I.m had a longer period of analgesia which was similar to the Cengiz Kara et al[3] study that showed significantly increased pain scores in Paracetamol gp at 6 h interval. ADIS drug profile by Sean T Duggan and Lesley J Scott[11] has shown that the duration of action of paracetamol is between 4 to 6 hours which is comparable with our study.

Rescue analgesia was required in both groups in 6 patients each which was not statistically significant. (Table 15).

In our study, (Table 16) P gp showed headache and nausea in 1 patient and pruritus in 2 patients. In gp D there was observed epigastric pain in 6 patients, and 3 had nausea and vomiting.

None of the complaints were serious enough and were treated symptomatically. Similar side effects were seen in the Hiller A. et al[4] study, Hynes D et al[5] study and the Cengiz Kara et al[3] study.

Conclusion

It was concluded that intravenous paracetamol produces rapid, excellent brief period of analgesia. Intramuscular Diclofenac provided equally efficient pain relief with an extended duration.

References

1. Atet A, Fawaz AA. Intravenous Paracetamol is highly effective in pain treatment after tonsillectomy in adults. Eur Arch Otorhinolaryngol 2008; Mar, 256(31):351–5.
2. John J Bonica. History of pain concepts and therapies. In :The management of pain, 2 and ed. Philadelphia: Lea and Febiger; 1990.p.2–197.
3. Cengiz Kara, BerkanResorlu, IzzetCicekbilek, Ali Unsal. Analgesic efficacy and safety of NSAIDs after trans urethral resection of prostate. Int. Brazil J Urol. Jan/Feb 2010;36(1).
4. Hiller A. Silvanto M. Sawolainen S, Tarkilla P. Proparacetamol and Diclofenac alone and in continuation for analgesia after elective tonsillectomy. Acta Anaesthesiol Scans- Oct 2004; 48(9) :1185–9.
5. D Hynes, M McCaroll, O Hiesse- provost. Analgesic efficacy of parenteral Paracetamol (proparacetamol) and Diclofenac in post operative orthopedicpain. Acta Anaesthesiologica Scandinavica. 2005; Mar, 50(3): 374– 381.
6. M Hyllested, S. Jones, JL Pederson et al. Comparative effect of Paracetamol, NSAIDs or their combination in post operative pain management; a qualitative review. Br J Anaesth 2002; 88:199–214.
7. Cakan T, Inan N. Culhaoglus. Intravenous Paracetamol improves the quality of post operative analgesia but does not decrease narcotic requirements. J Neurosurg Anaesthesiol. 2008 Jul; 20(3) :169–73.
8. Alhashemi JA, Daghistami M F. Effects of intraoperative I.v acetaminophen VS meperidine I.m on post tonsillectomy pain in children. Br. J Anaesth, 2006 Jan; 96(6): 750–5.
9. PL Moller, S. Sindet Pederson, et al. Onset of acetaminophen analgesia: Comparison of oral and intravenous routes after third molar surgery. Br J Anaesth 2005 Mar;94(5): 642–8.
10. Nuuttnen LS, Wuolijoki E, et al. Diclofenac and oxycodone in treatment of post operative pain- a double blind trial. Acta AnaesthesiolSc and 1986 Nov; 30(9): 620–624.
11. Sean. T. Duggan and Lesley J. Scott. Intravenous Paracetamol. In: ADIS Drug profile; 2009, 69(1), Pg – 101–113.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.37

Effectiveness of USG Guided Axillary Ring Block in Reducing Tourniquet Pain in Patients Undergoing Upper Extremity Surgery With Supraclavicular Brachial Plexus Block

Rayees Najib[1], Umer Iqbal Peer[2], Ruksana Najeeb[3]

Author Affiliation: [1]Lecturer, [2]Post Graduate Student, [3]HOD, Department of Anaesthesia and Critical Care Medicine, Government Medical College, Srinagar, Jammu and Kashmir 190010, India.

How to cite this article:

Rayees Najib, Umer Iqbal Peer, Ruksana Najeeb. Effectiveness of Usg Guided Axillary Ring Block in Reducing Tourniquet Pain in Patients Undergoing Upper Extremity Surgery With Supraclavicular Brachial Plexus Block. Indian J Anesth Analg. 2020;7(5): 1125–1130.

Abstract

Background: Brachial plexus block has evolved as an important tool in the anaesthesiologists armamentarium as a safe alternative to general anaesthesia for upper limb surgery, providing complete muscle relaxation, stable intraoperative haemodynamic and smooth transition to postoperative pain relief[1] reducing the need for opioid analgesics. But it has been observed that the brachial plexus block alone doesn't prevent the tourniquet pain entirely because of varied mechanisms. The primary aim of this study was to determine whether a subcutaneous ring of local anaesthetic (0.5% ropivacaine) on the inner aspect of the upper arm just distal to axillary crease will significantly decrease tourniquet pain.

Approach of hypothesis: In this study 100 patients with comparable demographics in Group A (ASA I and II) underwent USG guided subcutaneous axillary ring injection with 15 ml of local anaesthetic 0.5% ropivacaine for supraclavicular block and 5 ml of 0.5% ropivacainefor axillary ring block. Group B (ASA I and II) also included 100 patients who received only USG guided supraclavicular block using 15 ml of 0.5% ropivacaine prior to inflation of an upper arm tourniquet.

Result: It was observed that Group A who receivedboth supraclavicular block and axillary ring block tolerated the upper arm tourniquet for a longer period than those who received only supraclavicular block (mean of 36.9 min vs. 6.9 min) ($p = 0.014$) respectively.

Conclusion: We demonstrated that axillary ring block will decrease tourniquet pain which leads to discomfort is a common obstacle in anaesthetic managementand increase tourniquet tolerance period even with excellent regional anaesthesia of the upper extremity.

Keywords: Axillary ring block; Brachial plexus block; Tourniquet pain; Visual analogue scale.

Introduction

Supraclavicular brachial plexus block is a common regional anaesthesia technique and is used to provide anaesthesia to the hand, forearm and arm sparing the shoulder[6] for a wide range of orthopaedic and reconstructive surgeries. Besides anaesthesia SBPB provides postoperative analgesia and improves regional blood flow owing to sympathetic blockade without producing systemic side effects.[7] SBPB carries the risk of pneumothorax and also the development of transient horner's syndrome, however the ultrasound guidance has facilitated its performance with minimal adverse effects.

Axillary Ring Block: Tourniquet used for limb surgery leads to discomfort is a common obstacle in anaesthetic management. Prior studies have shown

Corresponding Author: Rayees Najib, Lecturer, Department of Anesthesia and Critical Care Medicine, Government Medical College, Srinagar, Jammu and Kashmir 190010, India.

E-mail: rayeesnajib@yahoo.com

that awake volunteers experience a vague, dull pain after tourniquet inflation that is tolerated for an average of 30 minutes extended to 45 minutes with sedation.[8,9] Prolonged tourniquet inflation (>30–60 min) leads to gradual increase in heart rate and blood pressure, the incidence of which is related to the type of anaesthesia.[8] The leading hypothesis for the mechanism of tourniquet pain is the loss of inhibition of unmyelinated, slow conducting C fibers. These fibers are usually inhibited by fast, myelinated A-delta fibers which are blocked after approximately 30 minutes of tourniquet inflation and mechanical compression.[8]

After brachial plexus anaesthesia the anatomy and innervation of the upper arm has led to an additional subcutaneous infiltration of local anaesthetic on the medial aspect of the upper arm.[10] This is called the "Axillary Ring Block" and it targets the intercostal brachial nerve and the medial cutaneous nerve of the arm. The intercostal brachial nerve is the lateral cutaneous branch of the ventral primary ramus of T2. It provides innervation to the skin of axilla and the medial aspect of the proximal arm. The intercostal brachial nerve communicates with the medial cutaneous nerve of the arm, which is a branch of the medial cord of the brachial plexus. Both of these nerves are routinely missed with supraclavicular and infra-clavicular brachial plexus anaesthesia. It is hypothesized that the axillary ring block will decrease tourniquet pain and increase tourniquet tolerance period even with excellent regional anaesthesia of the upper extremity.

Tourniquet pain from an upper arm tourniquet can limit the ability to use regional anaesthesia as the primary anaesthetic for surgical procedures on the upper extremity. The aim of this study is to determine whether a subcutaneous ring of local anaesthetic on the inner aspect of the upper arm just distal to axillary crease will significantly decrease tourniquet pain. If it does, peripheral nerve blocks distal to the tourniquet (i.e., nerve blocks at the elbow) could be used as the primary anaesthetic for the surgery of the hand and forearm. These distal peripheral nerve blocks have fewer complications than brachial plexus blocks performed at higher levels and postoperatively patient has better control of his or her arm when distal nerve blocks are used.

Materials and Methods

The main aim of this study was to determine the effectiveness of axillary ring block in decreasing tourniquet pain in patients undergoing upper extremity surgeries.

This study was conducted at Bone and Joint Hospital, which is one of the associated hospitals of Government Medical Collage, Srinagar. After obtaining approval from Institutional Ethical Committee and informed consent of the patients for participation in the study, sixty (60) patients scheduled to undergo upper extremity surgeries of elbow and forearm were enrolled in this study.

Inclusion Criteria:

1. Age from 18 to 60 years

2. American Society of Anaesthesiologists (ASA) grade I – II undergoing elective surgeries of elbow and forearm.

Exclusion Criteria:

1. Age less than 18 years and more than 60 years.
2. Patient refusal.
3. Morbid obesity (Body Mass Index > 35kg/ m2).
4. Local infection at the site of block.
5. Coagulopathy.
6. Local anaesthetic allergy and significant neurological, cardiac, renal, hepatic and respiratory disease.
7. Local site anatomical abnormality
8. Inability to understand the information provided.
9. American society of Anaesthesiologists (ASA) grade III & IV.

Patients scheduled for the study were kept fasting for 6 hours. On arrival to the operation theatre, all patients were kept in supine position. 18–20 G intravenous cannula was placed in the contralateral arm to be operated in all patients. Supplemental oxygen at 4L/min was given to all the patients during surgery. Standard ASA monitoring was done throughout the procedure. Both supraclavicular and axillary ring blocks were performed under USG guidance by an experienced anaesthesiologist. Patientswere randomly divided into two groups (A and B) using a computer generated double blinded coupon system. Group A received 15 ml of local anaesthetic 0.5% ropivacaine for supraclavicular block (using a 1.5 inch, 25 gauge needle to inject the drug) and 5 ml of 0.5% ropivacaine for the axillary ring blockto raise a subcutaneous wheal. Group B received only supraclavicular block using 15 ml of 0.5% ropivacaine prior to inflation of an upper arm tourniquet. The extremity prior to the application of tourniquet was wrapped with soft gauze to prevent

discomfort and skin bruising and was elevated to allow passive exsanguination and a 5 inch (12.7 cm). Esmarchbandage was applied from the distal part of the extremity to the tourniquet. The exsanguination of the extremity is combined with a tourniquet to create almost a bloodless surgical field. Tourniquet pressure was kept around 100 mm Hg more than the systolic blood pressure in both the groups. Sensory and motor block assessment was done at 5 minutes intervals up to 30 minutes after injection. First assessment was performed after 5 minutes of completion of injection. The sensory score was assessed using alcohol soaked gauze by testing the individual nerves: Radial nerve (posterior part of wrist and of the three first fingers), Median nerve (anterior part of wrist and of the first three fingers), ulnar nerve (medial part of wrist and of the hand), musculocutaneous nerve (lateral part of forearm), axillary nerve (shoulder), medial brachial nerve (medial part of arm) and medial antebrachial nerve (medial part of forearm): responses were compared with the opposite corresponding areas and graded as follows:

0 – no difference from an unblocked extremity

1 – Less cold than unblocked Extremity

2 – No sensation of cold.

Regarding motor nerves, the radial (elbow extension), median (third finger flexion), ulnar (fifth finger flexion), musculocutaneous (elbow flexion) and axillary nerves (arm abduction), the quality of motor block was observed on a four point scale:

0– Flexion and extension in both the hand and arm against resistance 1– Flexion and extension in both the hand and arm against gravity but not against resistance 2– Flexion and extension movements in the hand but not in the arm 3 – No movement in the entire upper limb.

The onset of sensory block was defined as the time elapsed between injection of drug and complete loss of sensation (score 2), whereas onset of motor blockade was outlined as the time elapsed from injection of drug to complete motor block (score 3). The quality of the block was evaluated in the intraoperative time as:

(a) Satisfactory block: surgery without patient discomfort or the need for supplementation;

(b) Unsatisfactory block: a sensory region involved in the surgery is not completely anesthetized and the block is supplemented by strong Opioid analgesic.

(c) Complete failure: if the patient still experiences pain despite supplementation, needs general anaesthesia.

The duration of sensory and motor block was assessed. The duration of sensory block was defined as the time interval between the onset of sensory block to first requirement of postoperative analgesia. The duration of motor block was defined as the time between the end of the local anaesthetic injection and the total recovery of motor functions. Patients who did not tolerate the tourniquet pain despite giving adequate sedation and rescue analgesics were given general anaesthesia and excluded from the study. Patients werealso observed postoperatively for 24 hrs. Post-operative pain at the incision site was assessed by visual analogue scale (VAS) and a score of more than 3 when recorded was taken as end point for duration of block and the patientswere given supplementary rescue analgesics accordingly. Patient's satisfaction with the anaesthetic technique was assessed postoperatively using a 2-point scale (0 = unsatisfied; 1 = satisfied). The patients were asked to mark it as satisfied only if they will be happy to accept the same block in future.

Results

In this study 100 patients with comparable demographics (Table 1 and 2) in Group A (ASA I and II) underwent USG guided subcutaneous axillary ring injection with 15ml of local anaesthetic 0.5% ropivacaine for supraclavicular block and 5 ml of 0.5% ropivacaine for axillary ring block. Group B (ASA I and II) also included 100 patients who received only USG guided supraclavicular block using 15 ml of 0.5% ropivacaine prior to inflation of an upper arm tourniquet. It was observed that Group A who receivedboth supraclavicular block and axillary ring block tolerated the upper arm tourniquet for a longer period than those who received only supraclavicular block (mean of 36.9 min vs. 6.9 min) ($p = 0.014$) respectively (Table 3).

The axillary ring injection also decreased pain at the tourniquet site by 1.0 pain scale unit ($p = 0.025$) and pain below tourniquet by 1.1 units ($p = 0.001$). So, Group A could tolerate tourniquet inflation for a longer duration (mean of 76.5 vs 62.9 mins) respectively (Table 4). Pain score at the end of tourniquet deflation in two groups was also lower in Group A as compared to its counterpart (mean of 2.7 vs 7.4 mins) respectively (Table 5). Post-operative pain at the incision site was assessed by visual analogue scale (VAS) and a score of more than 3 when recorded was taken as end point for duration of block although clinically not significant but lower in Group A (mean of 8.7 vs 7.5 hrs) respectively (Table 6).

Haemodynamic variables measured in terms of both HR and Systolic Blood pressure in both the groups remained clinically insignificant (Table 7 and 8).

Demographics

Table 1: Age distribution of study patients.

Age (Years)	Group A	Group B
< 30	30.0	33.3
30–44	46.7	43.3
45–59	13.3	20.0
≥ 60	10.0	3.3
Total	100	100

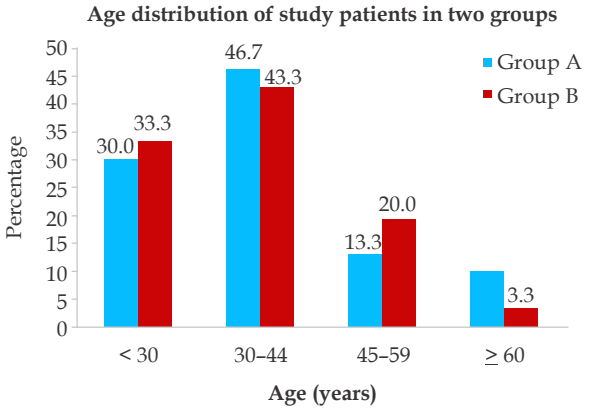


Table 2: Gender distribution of study patients.

	Male	Female
Group A	47	53
Group B	57	43

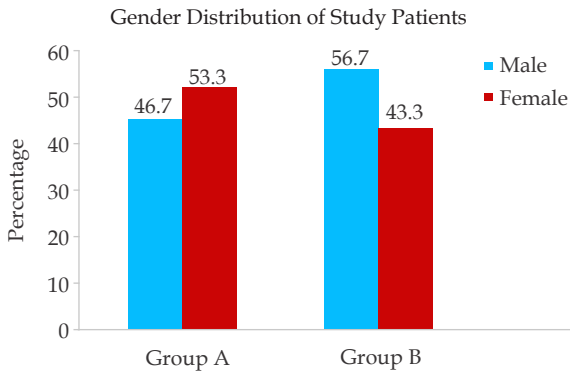


Table 3: Time of onset of pain after tourniquet inflation (Minutes) in two groups.

Group	Mean
Group A	36.9
Group B	6.1

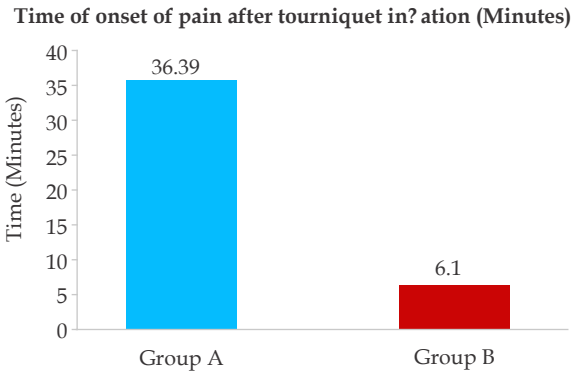


Table 4: Time in minutes that tourniquet remained inflated in two groups.

Group	Mean
Group A	76.5
Group B	62.9

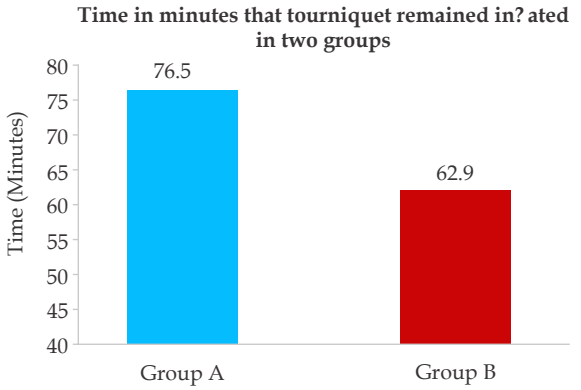


Table 5: Pain score at the end of tourniquet deflation in two groups.

Group	Mean
Group A	2.7
Group B	7.4

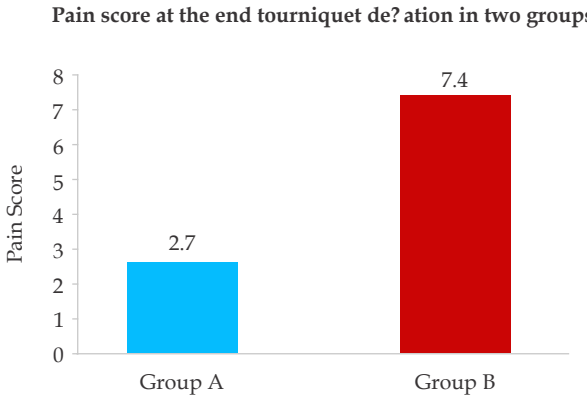


Table 6: Onset of pain after surgery was completed (Hours) in two groups.

Duration of surgery (Minutes)	Mean
Group A	8.7
Group B	7.5

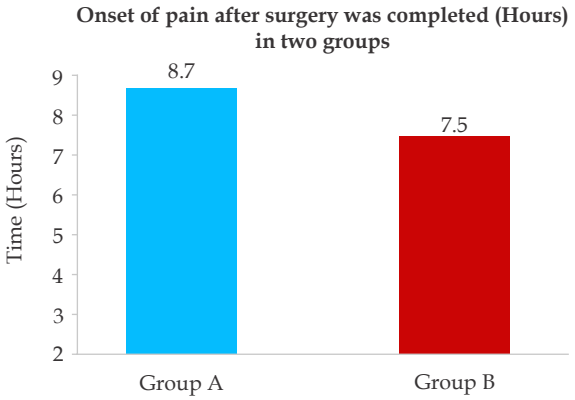


Table 7: Comparison based on interoperative HR (beats/min) in two groups.

Time (Minutes)	Group A	Group B
0 Min	75.90	75.97
5 Min	78.23	77.30
15 Min	80.00	78.67
20 Min	81.23	80.57
25 Min	80.90	79.77
30 Min	81.70	79.87
40 Min	82.83	81.30
50 Min	81.63	80.27
60 Min	79.60	78.67

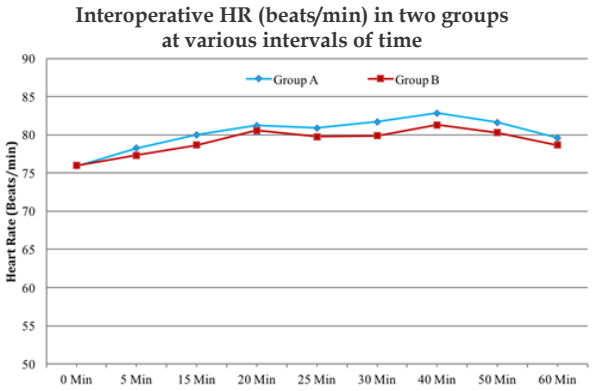
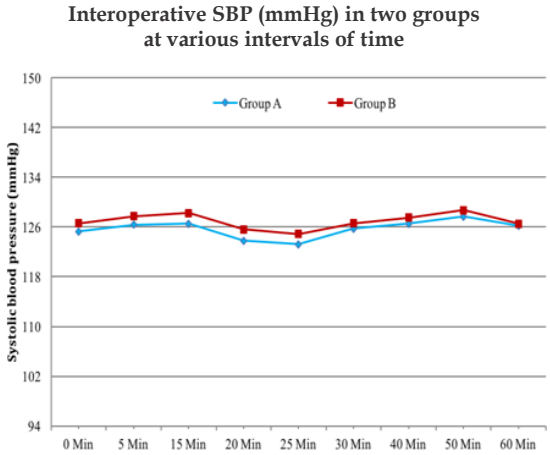


Table 8: Comparison based on interoperative SBP (mmHg) in two groups.

Time (Minutes)	Group A	Group B
0 Min	125.27	126.60
5 Min	126.37	127.73
15 Min	126.53	128.23
20 Min	123.80	125.60
25 Min	123.20	124.90
30 Min	125.73	126.60
40 Min	126.50	127.50
50 Min	127.67	128.70
60 Min	126.17	126.53



Statistical Methods: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean ± SD and categorical variableswere summarized as frequencies and percentages. Graphically the data was presented by barand line diagrams. Student's independent t-test was employed for comparing continuousvariables. Chi-square test or Fisher's exact test, whichever appropriate, was applied forcomparing categorical variables. A P-value of less than 0.05 was considered statistically significant. All P-values were two tailed. Sample size for this study was determined using the PROC POWER procedure for paired means as implemented in SAS 9.3.

Discussion/Conclusion

Brachial plexus blocks popularity is increasing day by day because of advancements in regional anaesthesia techniques in terms of local anaesthesia drugs, newer adjuvant drugs and use of ultrasound guidance for safe and successful conduct of block, it helps in reduced hospital stay, less financial burden and also leads to avoidance of undesirable side effects of general anaesthesia.

Since the introduction of first Brachial plexus block using Cocaine by Halstead (1884), the technique of brachial plexus block has evolved from classical blind technique to use of nerve stimulators and USG for supraclavicular brachial plexus block.[2] There is without doubt a renewed interest among anaesthesiologists in the inter-scalene/supraclavicular/infra-clavicular/axillary brachial plexus block with increasing use of ultrasound. The brachial plexus block was initially done by identifying anatomical landmarks and

eliciting paresthesias. The introduction of USG technique during the last decade improved the success rate, enhances the ease of performance[3] and when used in combination with a nerve stimulator it provides as of today the highest degree of safety and success.[4,5]

The Ultrasound guided technique helps in visualizing the needle tip and solution injected reduces the risk of side effects, accidental intravenous injections and possibly also trauma to the tissues around. The USG technique has also reduced the volume of drug to be given in order to gain an effective block.

This was a prospective randomized, blinded, controlled clinical trial to study the Effectiveness of an "axillary ring block" in reducing tourniquet pain in patients undergoing upper limb surgery.

Axillary ring block targets the intercostal brachial nerve and the medial cutaneous nerve of the arm. The intercostal brachial nerve is the lateral cutaneous branch of the ventral primary ramus of T2. It is therefore concluded that the axillary ring block will decrease tourniquet pain and increase tourniquet toleranceperiod as compared to supraclavicular block alone even with excellent regional anaesthesia of the upper extremity.

In this study, Group A received both Supraclavicular block and axillary ring block, with loss of sensation to the entire arm. But since Group B received only the supraclavicular block leaving the medial side of arm with intact sensory sensations so it was difficult to determine the exact contribution of the medial upper arm to the overall pain scores from the tourniquet site. The decreased pain score at one point on a 10- point scale may or may not be clinically significant.

Sensory and motor changes of the hand were found to be quite consistent between study participants. The various times required for the tourniquet to produce decreased sensation and grip strength were similar despite axillary ring block in Group A. All the patients in both the groups demonstrated complete resolution of tourniquet related sensory and motor changes within 15 minutes of tourniquet deflation. Patients who received axillary ring block were more likely to have sensory changes (touch and prick) immediately before the tourniquet deflation (Fisher exact test, p=0.042 and 0.041 respectively) but not changes in muscle strength. There were no cases of prolonged sensory changes over the medial upper arm after the axillary ring injection in Group A.

References

1. Koj J, Nidhi BP, Yatindra KB. Brachial plexus block with midazolam and bupivacaine improves analgesia. Can J Anesth. 2005;52:822–6.
2. Halstead C. In: A Practice of Anesthesia. 7thed. London, UK: Lioyd-Luke; 2003. Great moments in the history of anesthesiology; p. 5.
3. Lewis SR, Price A, Walker KJ, et al.: Ultrasound guidance for upper and lower limb blocks. Cochrane Database Syst Rev. 2015;9: CD006459. 10.1002/1465158. CD006459. pub3 (PubMed) (Cross Ret).
4. Guay J: (The neuro stimulator for brachial plexus blockade by the axillary approach: a meta- analysis on its efficacy to increase the success rate). Ann Fr AnesthReanim. 2005;24(3):239–43. 10.1016/j.annfar. 2005.01.002 (PubMed) (Cross Ret).
5. Gelf and HJ, Ouanes JP, Lesley MR, et al.: Analgesic efficacy of ultrasound-guided regional anesthesia: a meta-analysis. J ClinAnesth. 2011;23(2):90–6. 10.1016/j.jclinane.2010. OK12.005. (PubMed) (Cross Ret).
6. Stephen MK, Holly E, Karen CN, Marcy ST, David SW. Peripheral nerve block techniques for Ambulatory Surgery. Anesth Analg. 2005; 101: 1663–76.
7. Khanduri KC. Regional anesthetic techniques for orthopedic surgeries. Med J Armed Forces India 2008; 64:109.
8. PCA Kam, R. Kavanaugh, FFY Yoong. The arterial tourniquet: pathophysiological consequences and anesthetic implications. Anesth. 2001;56:534–545.
9. Douglas T. Hutchinson, Michael A. McClinton. Upper extremity tourniquet tolerance. J Hand Surg.1993;18:206–210.
10. Y Kubota, T Koizumi, A Udagawa, T Kuroki. Prevention of tourniquet pain by subcutaneous injection into the posterior half of the axilla. J PlastReconstrAesthet surg. 2008;61:595–597
11. Schoenherr JW, Bortsov A, Rowan C, Calhoun A, Fletcher A, Gracely RH, Coombs R. Effectiveness of an "axillary ring block" in reducing tourniquet pain in volunteers. Online J Science matters. May 24th 2016. (Accessed 24thMay 2016). DOI: 10.19185/ matters.201605000003.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.38

Ultrasound Guided Caudal Epidural: A Comparative Study of Ropivacaine Clonidine versus Ropivacaine Dex Medetomidine for Perioperative Analgesia in Spine Surgery

Saraswathi Nagappa[1], Sandhya Kalappa[2], Raghavendra Biligiri Sridhara[3]

Author Affiliation: [1,3]Assistant Professor, [2]Professor, Department of Anesthesia, Bangalore Medical College and Research Institute and Superspeciality Hospital, Bangalore, Karnataka 560002, India.

How to cite this article:
Saraswathi Nagappa, Sandhya Kalappa, Raghavendra Biligiri Sridhara. Ultrasound Guided Caudal Epidural: A Comparative Study of Ropivacaine Clonidine versus Ropivacaine Dex Medetomidine for Perioperative Analgesia in Spine Surgery. Indian J Anesth Analg. 2020;7(5):1131–1137.

Abstract

Background: Caudal epidural is a proven technique for providing analgesia for lower spinal surgeries. Prolonged pain relief with no motor blockade is desired for early mobilization. Now, with ultrasound, we can visualize the caudal space and can see both the needle position and the injection. This has made the technique much more reliable.

Aim: To compare the analgesic and sedative effects Clonidine and dexemedetomidine a selective α2-agonist drugs when used caudal epidurally as an adjuvant to ropivacaine and also to evaluate the feasibility of ultrasound guided caudal block in patients undergoing lumbar spine surgery.

Settings and Design: A Comparative, Prospective randomized, controlled two group's clinical study of 60 adults undergoing lumbosacral surgeries.

Materials and Methods: 60 patients were allocated into any one of two groups of 30 patients each, by means of computer-generated randomization: *Group RD:* Patients receiving caudal block with injected Ropivacaine 0.2% 20 ml+1µg/kg of injdexmedetomidine. *Group RC:* Patients receiving Ropivacaine 0.2% 20 ml + 2µg/kg clonidine.

Statistical Methods: Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small.

Results: The duration of postoperative analgesia was more in RD GROUP compared Patients in RC GROUP, which is statistically significant P=0.005**.

Significant lower mean VAS score at 480min [P < 0.001] and 720 min [P 0.010] in RD group compared to RC group with minimal sedation score and hemodynamic disturbances.

Conclusion: Dexmedetomidine is a better neuraxial adjuvant to ropivacaine when compared to clonidine for providing prolonged post-operative analgesia with lower pain score and stable cardiorespiratory parameters.

Keywords: Analgesia; Caudal Epidural; Ultrasound.

Introduction

Administration of analgesic medication, before the actual onset of painful stimulus, is more effective than that after the onset of painful stimulus. This is the principle of preemptive analgesia.[1,2] Caudal epidural blockade is particularly popular in pediatric practice, even in the adult population, the caudal

Corresponding Author: Saraswathi Nagappa, Assistant Professor, Department of Anesthesia, Bangalore Medical College and Research Institute and Superspeciality Hospital, Bangalore, Karnataka 560002, India.

E-mail: dr.saraswathi.pmssy@gmail.com

approach to the epidural space is generally easily accomplished and can be used to provide effective analgesia.[3] Caudal epidural is a proven technique for providing analgesia for spinal surgeries. Prolonged pain relief with no motor blockade is desired for early mobilization. Postoperative pain following lumbosacral spine surgeries can be alleviated by caudal analgesia using local anesthetics, duration of analgesia can further be prolonged by adding adjuvants to local anesthetics.[3,4] Single shot caudal block provides analgesia for 2-4 hours, but this can be further prolonged by adding adjuvants like opioids, ketamine, alpha 2 agonists, adrenaline, etc. Clonidine and dexemedetomidine a selective α2-agonist with safe pharmacokinetic profile is a good neuraxial adjuvant.[5]

Alpha 2 adrenergic agonists have both analgesic and sedative properties when used as an adjuvant in regional anesthesia.[6,7] The anesthetic and the analgesic requirement get reduced to a huge extent by the use of α 2 adrenergic agonists because of their analgesic properties and augmenttion of local anesthetic effects as they cause hyperpolarization of nerve issues by altering transmembrane potential and ion conductance at locus coeruleus in the brainstem.[8,9] The stable hemodynamics and the decreased oxygen demand due to enhanced sympathoadrenal stability make them very useful pharmacologic agents.[10] Now, with ultrasound, we can visualize the caudal space and can see both the needle position and the injection. This has made the technique much more reliable. Aims and objectives of this study are to compare the analgesic and sedative effects of both these drugs when used caudal epidurally as an adjuvant to ropivacaine, and also to evaluate the feasibility of ultrasound guided caudal block.

Methodology

The study design was a prospective, double-blinded, and randomized controlled trial. Sixty patients physical status American Society of Anesthesiologists (ASA) Classes I and II between the age of 18 and 65 years who underwent lumbosacral surgeries were included in the study. Written informed consent was taken. They were allocated into any one of two groups of 30 patients each, by means of computer-generated randomization:

- Group RD: Patients receiving caudal block with injected ropivacaine 0.2% 20 ml+1μg/kg of injdexmedetomidine.
- Group RC: Patients receiving ropivacaine 0.2% 20 ml + 2μg/kg clonidine.

Patients with cardiac conductive disorders, hepatic insufficiency, renal impairment, psychiatric disorders, those with contraindications for a caudal block (skin infection at the injection site, bleeding diathesis, neurological disorders, and sacral anomalies) and a history of allergy to any of the study medications were excluded from the study. Patients who had undergone previous back surgeries were also excluded from the study. In the preoperative visit, the numerical visual rating scale for pain was explained to all patients, which ranges from 0 = no pain to 10 = worst imaginable pain.[11] The demographic data (age, weight, and ASA status, type of operation, and duration of surgery) and hemodynamic parameters such as heart rate (HR) and mean blood pressure (MBP) were recorded before the block which was considered as the baseline and at regular intervals intraoperative and postoperatively using standard monitoring such as pulse oximeter, HR, noninvasive blood pressure, electrocardiogram, and oxygen saturation. After securing appropriate gauge IV cannula, anesthesia was induced with injection fentanyl 2 μg/kg, injection propofol 2 mg/kg, and endotracheal intubation facilitated by injection vecuronium 0.1 mg/kg and then turned prone for the surgery. Under strict aseptic precautions, sacral hiatus was identified by ultrasound. Twenty gauge IV cannula needle was used to locate caudal space under ultrasound guidance. After negative aspiration for blood and cerebrospinal fluid, the study drugs were introduced into the caudal space according to allocation. The anesthetist blinded to the contents of the syringe injected into the epidural space. Patients in the RD Group were given 1ug/kg dexmedetomidine with 20 ml of 0.2% ropivacaine and patients in Group RC were given 2μg/kg of injection clonidine with 0.2% injection ropivacaine. Moreover, surgeon was asked to wait for 15 min to put incision. IV paracetamol 1 g was given to all patients intraoperatively and the same was continued eight hourly for the first 24 h. Intraoperatively, HR and MBP were recorded. A fall of systolic blood pressure to <20% baseline was considered as hypotension. Bradycardia was considered when HR dropped to <60/min or <20% of baseline pulse and was treated with IV atropine sulfate 0.6 mg. Response for incision managed either by opioids i.e. fentanyl 1ug/kg or by increase in isoflurane. All patients were observed in the post anesthesia care unit for the next 6 h. All patients were catheterized before starting of surgery as a routine protocol of neurosurgeons and were kept for 12 h. At the end of the operation, patients were placed back in the supine position and the trachea

was extubated after reversal of the muscle relaxant by administration of mixed neostigmine 40 µg/kg with glycopyrrolate 10 µg/kg intravenously. Total opioid requirement recorded at the end of surgery .Visual analog scale (VAS)[11] was used for the assessment of postoperative pain relief at immediate postoperatively, 30 min, 1, 2, 4, 8, 12, and 24 h by a trained nurse. At VAS score of ≥4, rescue analgesia was given in the form of injection tramadol 50 mg IV. Duration of analgesia is defined as the time taken from the time of caudal anesthesia to the first request of rescue analgesia. Sedation score was assessed on a four point categorical scale as 0 = awake, alert; 1 = drowsy, not sleeping; 2 = asleep, arousable by verbal contact; 3 = asleep, not arousable by verbal contact. Side-effects such as nausea, vomiting, respiratory depression, motor blockade (Bromage scale >1), deep sedation (Ramsay sedation scale [RSS] >3), shivering and hypotension, duration of surgery, and parameters were recorded.

Statistical Methods: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, Assumptions: 1.Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent.

Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Leven`s test for homogeneity of variance has been performed to assess the homogeneity of variance.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small.

Statistical software: The Statistical software namely SPSS 22.0, and R environment ver. 3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, Fs etc.

Results

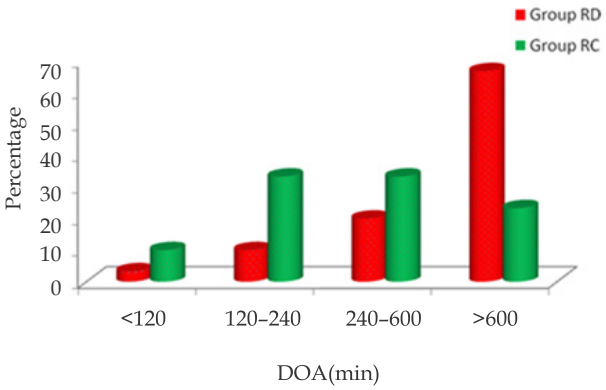
The demographic profile of our patients was comparable with respect to mean age, body weight, body mass index, ASA grade and duration of surgery two groups were comparable in age, weight, sex distribution (Table 1,2,3) and baseline HR and MAP. The duration of surgery and duration of anesthesia were also comparable in the two groups. The caudal block was successful in all the patients included in the study. None of the patients in either group required intraoperative extra opioid [fentanyl] analgesia. All patients remained vitally stable throughout the procedure and intraoperative hemodynamic parameters were comparable in the two groups.

The duration of postoperative analgesia was more than 600 min (10 hr) in twenty (20) patients in RD group compared to seven (7) Patients in RC GROUP, which is statistically significant P=0.005** [Fig. 1].

Table 1: Age distribution of patients studied.

Age in years	Group RD	Group RC	Total
21-30	6(20%)	8(26.7%)	14(23.3%)
31-40	11(36.7%)	3(10%)	14(23.3%)
41-50	6(20%)	11(36.7%)	17(28.3%)
51-60	7(23.3%)	2(6.7%)	9(15%)
>60	0(0%)	6(20%)	6(10%)
Total	30(100%)	30(100%)	60(100%)
Mean ± SD	40.87±10.03	43.80±14.24	42.33±12.30

Samples are age matched with P=0.360, student t test



P=0.005**, Significant, Fisher Exact Test

Fig. 1: Duration of Analgesia [DOA] (min) distribution in two groups of patients studied.

Table 2: Gender distribution of patients studied.

Gender	Group RD	Group RC	Total
Female	12(40%)	15(50%)	27(45%)
Male	18(60%)	15(50%)	33(55%)
Total	30(100%)	30(100%)	60(100%)

Samples are gender matched with P=0.436, Chi-Square test.

Table 3: Weight (kg) distribution in two groups of patients studied.

Weight (kg)	Group RD	Group RC	Total
<50	4(13.3%)	0	4(6.7%)
50-60	17(56.7%)	26(86.7%)	43(71.7%)
61-70	9(30.0%)	4(13-.3%)	13(21.7%)
Total	30(100.0%)	30(100.0%)	60(100.0%)
Mean ± SD	56.80±9.92	59.40±3.15	5810±7.60

Samples are weight matched P=0.189, student t test.

Rescue analgesic requirement was in required eight patients in group RD compared with eighteen patients in group RC, which is statistically significant P=0.009**. (Table 4).

Table 4: Rescue Analgesia distribution in two groups of patients studied.

Rescue A	Group RD	Group RC	Total
No	22(73.3%)	12(40%)	34(56.7%)
Yes	8(26.7%)	18(60%)	26(43.3%)
Total	30(100%)	30(100%)	60(100%)

P=0.009**, Significant, Chi-Square Test.

There was a significant difference between the groups in the VAS score (Fig. 2) measured 4th hourly in the postoperative period. Group RC patients achieved significantly higher VAS score compared with Group RD patients, where 15 out of 30 patient achieved a VAS score of more than 4 at 480min compared with 4 patients in Group RD, which is statistically significant P < 0.001 and 21 patients in RC group compared with 9 patients in RD group at 720 min, which is statistically significant P 0.010. (Table 5).

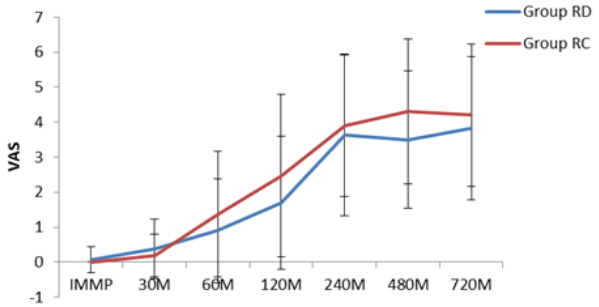


Fig. 2: VAS- A comparison in two groups of patients studied.

Both the groups showed gradual decreasing trends in mean heart rate from the pre-operative baseline intraoperatively, which may be attributable to caudal dexemedetomidine/clonidine (Fig. 3). No increase in heart rate during incision in both groups. Changes in mean arterial pressure (MAP) in both the groups are comparable and statistically insignificant (P > 0.05) (Fig. 4). Both the groups showed gradual decreasing trends in MAP from the pre-operative baseline value, which may be attributable to caudal dexemedetomidine/clonidine. No increase in MAP during incision in both the group. No statistical significant in HR and MAP postoperatively in both Group RD and Group RC (Fig. 5,6). Both groups showed comparable modified Bromage scale scores at all the set time points, none of the patients in the two groups had residual motor block. Difference of mean sedation score between both the groups was not statistically significant. 7 patients had sedation score of 1 in RC group compared to 6 patients in RD group whereas 7 patients in RC had sedation score of 2, compared to 9 patients in RD group. Overall, none of the patient in either groups had profound deep sedation (sedation score>3).The incidence of other side effects like nausea, vomiting, headache, shivering and dizziness were comparable in both the groups and statistically non-significant. We did not observe the respiratory depression in any patient from either group.

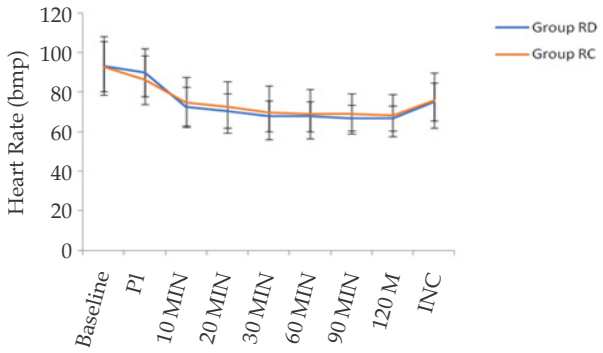


Fig. 3: Heart Rate (bpm) - a comparison in two groups of patients studied.

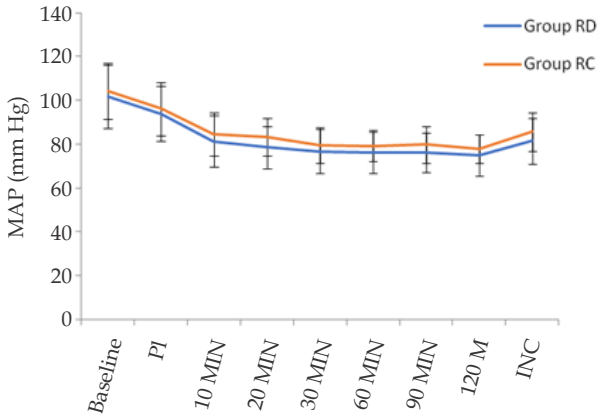


Fig. 4: MAP (mm Hg)-a comparison in two groups of patients studied.**Table 5:** VAS- A comparison in two groups of patients studied.

Table 5: VAS- A comparison in two groups of patients studied.

VAS	Group RD	Group RC	Total	P value
IMMP	0.07±0.37	0.00±0.00	0.03±0.26	0.321
30M	0.37±0.85	0.20±0.61	0.28±0.74	0.387
60M	0.90±1.49	1.37±1.79	1.13±1.65	0.278
120M	1.70±1.90	2.47±2.32	2.08±2.13	0.166

240M	3.63±2.31	3.90±2.02	3.73±2.25	0.178
480M	3.50±1.96	4.30±2.07	3.90±2.04	0.130
720M	3.83±2.04	4.20±2.04	4.02±2.03	0.489
1440M	2.83±1.51	3.14±1.25	2.98±1.38	0.402

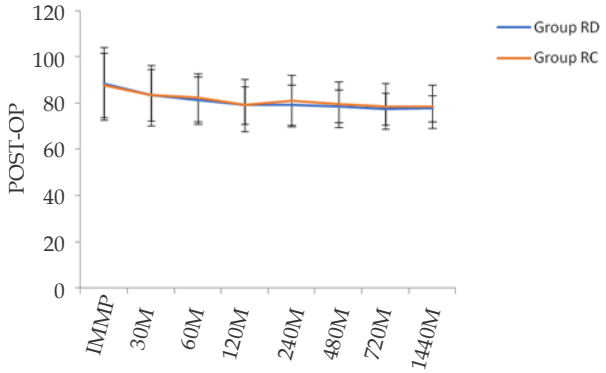


Fig. 5: PostoperativeHeart Rate (bpm) - a comparison in two groups of patients studied.

Table 6: QOP [Quality of Picture]-distribution in two groups of patients studied.

QOP	Group RD	Group RC	Total
Good	23(76.7%)	25(83.3%)	48(80%)
Interme	7(23.3%)	5(16.7%)	12(20%)
Total	30(100%)	30(100%)	60(100%)

P=0.519, Not Significant, Chi-Square Test.

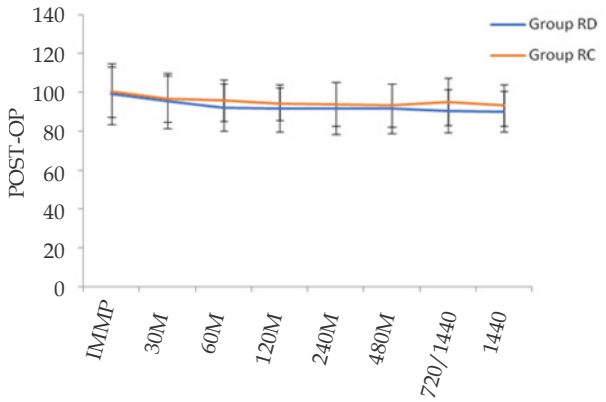
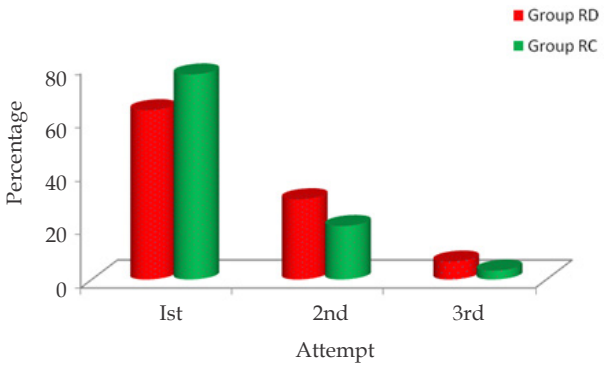
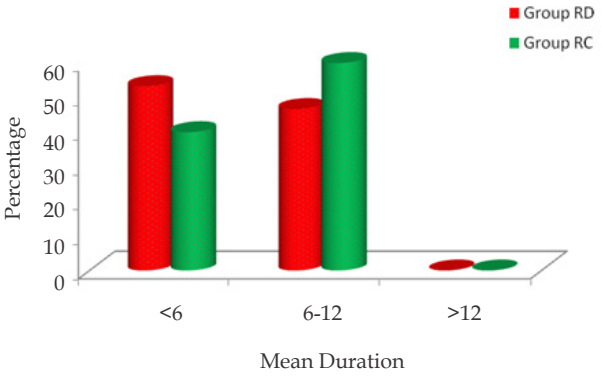


Fig. 6: Postoperative MAP (mm Hg - a comparison in two groups of patients studied.



P=0.526, Not Significant, Fisher Exact Test

Fig. 7: Attempt-distribution in two groups of patients studied.



P=0.365, Not Significant, Fisher Exact Test

Fig. 8: Mean Duration-distribution in two groups of patients studied.

Feasebility of Usage of Ultrasound

The US-guided blocks were performed by residents in 78.33% of case and in 21.67% by senior practitioners. The quality of the picture was judged "good" by the practitioner in 80% of cases, "intermediate" in 18.49%, and was never considered "bad" pictures (Table 6). Localization of the tip of the needle was possible for all blocks: directly in 73.3% of punctures or indirectly, by the movement of adjacent anatomic structures, in 26.7% of cases. The spread of local anesthetic was visualized in all cases. For blocks among 60 patients, in 42 patients (70%) a single attempt was successful. A second attempt was required in 15 patients [25%] and more than 2 attempts needed in 3 patients [5%] (maximum 3 attempts) (Fig. 7]. The mean duration of the technique from ultrasonographic identification of anatomical structures to withdrawal of the needle was <6 min in 46.7% and 6 to 12 min in 53.3%) (Fig. 8). Only one side effect was noted (blood during aspiration test), no injection was performed. The needle was relocated and injection of the local anesthetic was completed.

Discussion

Caudal epidural block is a simple and effective means of relieving pain after lumbosacral spine surgeries. Relieving pain might enhance restoration of function by allowing the Patient to breathe, cough and to be easily ambulant.[12] The pharmacologic properties of α-2 agonists have been employed clinically to achieve the desired effects in regional anesthesia.[13,14,15] Caudal Epidural administration of these drugs is associated with sedation, analgesia, anxiolytic, hypnosis and sympatholytic. . Further,

addition of these two adjuvants promotes faster onset compared to established time of onset of sensory analgesia with ropivacaine alone.[16,17]

Clonidine has been used successfully used over the last decade for the said purpose and the introduction of dexmedetomidine has further widened the scope of α-2 agonists in regional anesthesia.[18] The faster onset of action of local anesthesia, rapid establishment of both sensory and motor blockade, prolonged duration of analgesia into the post-operative period, dose-sparing action of local anesthesia and stable cardiovascular parameters makes these agents a very effective adjuvant in regional anesthesia.[19-21] Scope of ultrasound for caudal epidural in prone position, is easy to use, is radiation free and can provide real-time images in guiding the caudal epidural needle into caudal space. Ultrasound may therefore be used as an adjuvant tool in caudal needle placement.[22]

The results of the study has shown that the addition of either 1. µg/ kg dexmedetomidine or 2 µg/kg clonidine as adjuvant to epidural ropivacaine not only prolongs the duration of analgesiaalso provide good hemodynamic stability. Duration of block was prolonged in RD group than in RC group. Saravana Babu MS et al.,[23] compared epidural ropivacaine and dexmedetomedine 1µg/ kg with ropivacine and clonidine 2µg/kg in 60 patients for spine surgeries given postoperatively and found dexmedetomedine as neuraxial adjuvant is better for prolonging duration of analgesia and for cardio respiratory stability. Fawzi MH et al., also used same dose with good results.[24] These properties of dexmedetomidine are mostly due to their increased affinity to α2 receptors (8 times more than clonidine). This affinity is when the drug is used in IV route. The affinity for epidural route is not known.[25,26,27]

The 11 point linear Visual Analogue Scale (VAS) being a reliable validated score for assessing acute postoperative pain was used in our study. The mean VAS score at postoperative 4 hour, 8 hour and 12 hour were statistically lower in RD group compared to RC group. The time to first rescue analgesic was prolonged in the RD group compared to the RC group and it was statistically significant. Even Bajwa, et al[28] noticed that rescue analgesia was comparatively shorter (310.76 ± 23.75 min) in the patients who were administered clonidine ($P < 0.05$), compared with dexmedetomedine.

In our study heart rate and blood pressures were in a clinically acceptable range. Hemodynamic parameters, the cardio-respiratory parameters remained stable throughout the study period, which reaffirms the established effects of α2 agonists in providing a hemodynamically stable post-operative analgesia.[29] The use of alpha-2 agonists for regional neural blockade in combination with local anaesthetic results in increased duration of sensory blockade.[30,20]

Eighty six percent of the patients remained awake but calm in Clonidine group compared to Eighty five percent in dexmedetomidine group who were equally cooperative and calm. Overall none of the patient in either groups had profound deep sedation (sedation score>3) or motor blockade and respiratory depression.[30] This can be attributed to lower concentrations of ropivacaine and the α2 agonists properties of sedation with no respiratory depression.

The results of this prospective descriptive study show that the performance of real-time US-guided caudal nerve block is feasible and easy under general anesthesia. As noted by our anesthesiologist team, the technique is easy to learn because the puncture site using the US-guided approach was sensibly unchanged in comparison with landmark technique.

Conclusion

Dexmedetomidine is a better neuraxial adjuvant to ropivacaine when compared to clonidine for providing low pain score and prolonged post-operative analgesia and stable cardiorespiratory parameters.

Reference

1. Kundra P1, Gurnani A, Bhattacharya A. Preemptive epidural morphine for postoperative pain relief after lumbar laminectomy.AnesthAnalg. 1997 Jul; 85(1):135-8.
2. Sekar C, Rajasekaran S, Kannan R, Reddy S, Shetty TA, Pithwa YK. Pre-emptive analgesia for postoperative pain relief in lumbosacral spine surgeries. Spine J. 2004; 4(3):26.
3. Schloss B, Jayanthi VR, Bhalla T, Tobias JD. Caudal epidural blockade in adolescents. Saudi J Anaesth. 2016; 7:57-60.
4. Bajwa SJ, Kaur J, Bajwa SK, Bakshi G, Singh K, Panda A. Caudal ropivacaine-clonidine: A better post-operative analgesic approach. Indian J Anaesth 2010; 54(3): 226-30.
5. Sukhwinder Kaur Bajwa, 1 et al. Dexmedetomidine and clonidine in epiduralanaesthesia: A comparative evaluation. Indian J Anaesth 2011; 55:116-21.

6. Mauro VA, Brandão ST. Clonidine and dexmedetomidine through epidural route for post-operative analgesia and sedation in a colecistectomy. Rev Bras Anestesiol 2004; 4:1-10.
7. Fukushima K, Nishimi Y, Mori K. The effect of epidural administered dexmedetomidine on central and peripheral nervous system in man. AnesthAnalg 1997; 84:S292.
8. Correa-Sales C. A hypnotic response to dexmedetomidine, an alpha-2 agonist, is mediated in the locus coeruleus in rats. Anesthesiology 1992; 76:948-52.
9. Taittonen MT, Kirvelä OA, Aantaa R, Kanto JH. Effect of clonidine and dexmedetomidine premedication on perioperative oxygen consumption and haemodynamic state.Br J Anaesth 1997; 78:400-6.
10. Buerkle H. Peripheral anti-nociceptive action of alpha2- adrenoceptor agonists. Baillière's Clin Anaesth 2000; 14:411-8.
11. Jensen MP, Turner JA, Romano JM. What is the maximum number of levels in pain intensity measurement? Pain 1994; 58:387–392.
12. Sandhya Kalappa, Raghavendra Biligiri Sridhara, Saraswathi Kumaraswamy. Dexmedetomidine as an Adjuvant to Pre-Emptive Caudal Epidural Ropivacaine for Lumbosacral Spine Surgeries Journal of Clinical and Diagnostic Research. 2016 ;10(1): 22-24.
13. Kamibayashi T, Maze M. Clinical uses of alpha-2 adrenergic agonists. Anaesthesiology 2000; 93: 1345-9.
14. Hall JE, Uhrich TD, Ebert TJ. Sedative, analgesic and cognitive effects of clonidine infusions in humans. Br J Anaesth 2001; 86:5-11.
15. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnesic, and analgesic properties of small-dose dexmedetomidine infusions. Anesth Analg 2000; 90:699-705.
16. Ogun CO, Kirgiz EN, Duman A, Kara I, Okesli S. The comparison of intrathecal isobaric ropivacaine and isobaric ropivacaineclonidine for caesarean delivery. Internet J Anesthesiol 2007; 15:1.
17. El Saied AH, Steyn MP, Ansermino JM. Clonidine prolongs the effect of ropivacaine for axillary brachial plexus blockade. Can J Anaesth 2000; 47:962-7.
18. Gertler R, Brown HC, Mitchell DH, Silvius EN. Dexmedetomidine: A novel sedative-analgesic agent. Proc (BaylUniv Med Cent) 2001; 14:13-21.
19. Coskuner I, Tekin M, Kati I. Effects of dexmedetomidine on the duration of anaesthesia and wakefulness in bupivacaine epidural block. Eur J Anaesthesiol 2007; 24:535-40.
20. El-Hennawy AM, Abd-Elwahab AM, Abd-Elmaksoud AM, and El-Ozairy HS, Boulis SR. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children. Br J Anaesth 2009; 103:268-74.
21. Aantaa R, Kanto J, Scheinin M, Kallio A, Scheinin H. Dexmedetomidine, an alpha 2-adrenoceptor agonist, reduces anesthetic requirements for patients undergoing minor gynaecologic surgery. Anesthesiology 1990; 73:230-5.
22. Chen CP, Tang SF, Hsu TC, et al. Ultrasound guidance in caudal epidural needle placement. Anesthesiology. 2004; 101(1):181-184.
23. Saravana Babu MS, Verma AK, Agarwal A, Tyagi CM, Upadhyay M, Tripathi S. A comparative study in the postoperative spine surgeries: Epidural ropivacaine with dexmedetomidine and ropivacaine with clonidine for Postoperative analgesia. Indian J Anaesth. 2013; 57:371-76.
24. Fawzi HM, Almarakbi WA. Effects of pre-emptive caudal dexmedetomedine-bupivacaine mixture in adult patients undergoing single level lumbar laminectomy: A prospective randomized study. Ain Shams Journal of Anaesthesiology. 2012; 5: 223-28.
25. Aryan HE, Box KW, Ibrahim D, Desiraju U, Ames CP. Safety and efficacy of dexmedetomidine in neurosurgical patients. Brain Inj 2006; 20:791-8.
26. Swami SS, Keniya VM, Ladi SD, Rao R. Comparison of dexmedetomidine and clonidine (α2 agonist drugs) as an adjuvant to local anaesthesia in supraclavicular brachial plexus block: A randomised double-blind prospective study. Indian J Anaesth 2012; 56:243-9.
27. Schnaider TB, Vieira AM, Brandão AC, Lobo MV. Intraoperative analgesic effect of epidural ketamine, clonidine or dexmedetomidine for upper abdominal surgery. Rev Bras Anestesiol 2005; 55:525-31.
28. Bajwa SJ, Bajwa SK, Kaur J, Singh G, Arora V, Gupta S, et al. Dexmedetomidine and clonidine in epidural anaesthesia: A comparative evaluation. Indian J Anaesth 2011; 55:116-21.
29. Pichot C, Longrois D, Ghignone M, Quintin L. Dexmedetomidine and clonidine: A review of their pharmacodynamy to define their role for sedation in intensive care patients. Ann Fr Anest Reanim 2012; 31:876-96.
30. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman R, et al. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anaesthesiol Scand 2006; 50:222-7.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.39

Functional Outcome of Open Inguinal Hernia Repair: Nerve Block Versus Spinal

Sasidharan Nair M[1], S Mohideen Abdul Kadar[2], M Paul Wilson[3], VM Shibinath[4], Chandy Mathew[5]

Author Affiliation: [1,2]Associate Professor, [3]Professor and Head, [5]Junior Resident, Department of Anesthesia, Dr Somervell Memorial CSI Medical College Hospital, Karakonam, Trivandrum, Kerala, 695504, India. [4]Senior Resident, Department of Anesthesia, Meitra Hospital, Edakkad, Kerala 673005, India.

How to cite this article:
Sasidharan Nair M, S Mohideen Abdul Kadar, M Paul Wilson et al. Functional Outcome of Open Inguinal Hernia Repair: Nerve Block Versus Spinal. Indian J Anesth Analg. 2020;7(5):1139–1147.

Abstract

Background and Objectives: Inguinal hernia repair done under peripheral nerve block provides many advantages compared to spinal or general anaesthesia. The aim of this study is to compare the functional outcome of Ultrasound guided ilioinguinal and iliohypogastric nerve block with spinal anaesthesia using 0.5% bupivacaine in terms of duration of post-operative analgesia, hemodynamic stability, time for ambulation, hospital stay and side effects.

Methods: Forty adult patients aged 30 – 70 years with BMI 18 – 29.9 kg/m2 belonging to ASA physical status I & II undergoing elective open inguinal hernia repair were divided randomly into two groups of 20 to receive either Ultrasound guided ilioinguinal and iliohypogastric nerve block (Group U) using 0.5% bupivacaine 0.3 ml/kg or spinal anaesthesia (Group S) using 0.5% hyperbaric bupivacaine 3 ml (15 mg). Intra operative HR, SBP, DBP, MAP, SpO2 were recorded. Post-operatively patients were monitored for VAS score, ambulation time, time for first rescue analgesia, duration of hospital stay and side effects. Recorded data was compared between two groups using SPSS software. Qualitative data and quantitative data were compared using Chi-square test and independent't' test respectively. A p value of less than 0.05 was taken as significant.

Results and Discussion: The time for onset of sensory block was longer in Group U than for Group S. Mean VAS scores were less and duration of analgesia was longer in Group U than Group S. There was significant fall in SBP, DBP and MAP in Group S during the intraoperative period compared to Group U. The ambulation time and duration of hospital stay in Group S were much longer than Group U.

Conclusion: Ultrasound guided Ilioinguinal & Iliohypogastric nerve block can be a safe alternative to spinal anaesthesia for elective unilateral inguinal hernia repair.

Keywords: Iliohypogastric; Ilioinguinal; Spinal anesthesia; Ultrasound.

Introduction

Inguinal hernia repair is one of the most commonly performed surgeries. The repair of groin hernias with local anaesthesia has gained popularity. Still, there is no consensus regarding the optimum anaesthesia technique for this surgery.[1] Ideal anaesthetic technique is identified as acceptable for the patient, suitable for surgery, simple and safe with low risk of morbidity and low cost.[2] General anaesthesia, central neuraxial blockade and regional anaesthesia with sedation are the commonly employed techniques.[3] General anaesthesia carries risks of possible airway complications, post-operative deterioration of cognitive function, sore

Corresponding Author: Mohideen Abdul Kadar S, Associate Professor, Department of Anesthesia, Dr Somervell Memorial CSI Medical College Hospital, Karakonam, Trivandrum, Kerala, 695504, India.

E-mail: abdulkadar2k@yahoo.co.in

throat, nausea, vomiting and prolonged period of immobilisation with associated risk of deep vein thrombosis and longer hospital stay.[4] Spinal anaesthesia, although effective, is not without risk in patients with decompensated heart disease, recent head injury, convulsions and coagulopathies. Also, spinal and epidural anaesthesia have been associated with haemodynamic instability, vomiting, urinary retention, post dural puncture headache and backache and lesser patient acceptance.[5]

Since inguinal hernia is rarely associated with serious complications, it is an ideal surgical procedure for ambulatory settings. Ilioinguinal and iliohypogastric nerve block (IHNB) is the most frequently performed regional block for these surgical procedures. It has been reported that inguinal nerve block can have 10 to 30% failure rate when a blind technique is used[6] and ultrasound guidance can provide up to 100% success rate.[7,8,9]

Inadequate treatment of post-operative pain continues to be an important clinical problem. Persistent postsurgical pain that lasts beyond the typical healing period of 1 to 2 months has become increasingly recognised as a significant issue after surgery. Early ambulation in the post-operative period leads to decreased incidence of deep vein thrombosis, muscle atrophy, shorter length of stay and lower cost of care. Hence we decided to find out if there is any difference in the functional outcome of ultrasound guided ilioinguinal and iliohypogasgtric nerve block versus spinal anaesthesia for adult open inguinal hernia surgeries.

Despite being a simple operation with a very infrequent overall morbidity only few centres practice peripheral nerve block for hernia repair surgeries. So, we did this study to popularise USG guided IHNB as a successful alternative for spinal anaesthesia and general anaesthesia. Our study focused on emphasising its advantages like early ambulation, lesser hemodynamic variations and prolonged post-operative analgesia. Diseases like chronic obstructive emphysema, heart disease and renal failure can easily be handled with IHNB without increasing the risk to the patient there by leading to a better surgical outcome.

Methodology

Study Design: Longitudinal observational study.

Study Setting: Patients undergoing unilateral elective open inguinal hernia repair surgery in the age group 30 to 70 were assessed and included in the study after obtaining written informed consent. Patients with recurrent hernia, obesity and multiple co-morbidities (ASA 3 and above) were not included in the study.

Sample size calculation: From previous literature it was found that the standard deviation of the time for ambulation in hours after ultrasound guided IHNB and spinal anesthesia was 2.45 and 2.12 respectively.[9] The mean difference between the two groups was found to be 2.5 hours. Considering 5% level of significance with 90% power the estimated sample size for our study was 18 patients in each group. Thus the total sample size would be 35.

Sample size was calculated using the formula

$(Z\alpha/2+Z1-\beta)^2\ [2(\sigma1^2 + \sigma2^2)/2]\div(\mu1 - \mu2)^2$

$Z_{\alpha/2}$ = represent the desired level of statistical significance (1.96)

$Z_{1-\beta}$ = represent the desired level of power [typically 1.282 for 90% power].

σ1 = standard deviation of ultrasound guided IHNB.

σ2 = standard deviation of spinal anaestheia Group

μ1 = mean of post-operative ambulation in hours in ultrasound guided IHNB. μ2=mean of post-operative ambulation in hours in spinal anaestheia Group.

Materials and Methods

The study was conducted on 40 patients undergoing elective open inguinal hernia repair surgeries after getting approval from the Institutional Research Committee (IRC) and Institutional Ethical Committee (IEC). Study was conducted after getting informed consent from all patients satisfying the inclusion criteria. Half of the Patients were allocated to USG guided IHNB (Group U) and other half subarachnoid block (Group S) by the table of random numbers. Pre-operatively all patients were instructed regarding how to read the Visual Analogue Scale (VAS) that will be used for assessing pain in the post-operative period. Premedication was given with oral Ranitidine 150 mg previous day night and in the morning and oral Metoclopromide 10mg in the morning and glycopyrrolate 0.2 mg 6 hours before surgery and inj. Midazolam 0.03 mg/kg at the beginning of procedure intravenously. Nerve block in Group U was performed with 0.5% bupivacaine, 0.3 ml/kg or a maximum dose of 150 mg. The time of onset of sensory block was assessed in the related nerve

innervation area with the ''pinprick test'' (analgesia test with needle). When patients complained of pain during pulling of cords, cord structures were infiltrated with 0.25% 5 to 7 ml bupivacaine by operating surgeon.

In Group S, the patients were positioned in lateral decubitus position and dural puncture was performed at L_3–L_4 interspace through midline approach with 25 G Quincke needle. 15 mg (3 ml) of 0.5% Hyperbaric Bupivacaine was injected intrathecally. Patients were immediately positioned supine for the surgery. Any block failure or failed spinal cases were converted to general anaesthesia. Such cases were excluded from the study. Motor block was assessed by Modified Bromage scale every 2 minutes for first 10 minutes. Duration of motor block was considered as time for return to Modified Bromage scale.[1]

Modified Bromage scale 0– no paralysis.

Modified Bromage scale 1– unable to raise extended leg.

Modified Bromage scale 2– unable to flex knee.

Modified Bromage scale 3– unable to flex ankle.

Baseline mean arterial pressure (MAP), pulse rate, respiratory rate and oxygen saturation were recorded before surgery. Standard ASA monitoring was done with continuous ECG, intermittent non-invasive blood pressure and continuous oxygen saturation till the end of surgery. Vitals signs were maintained stable throughout intraoperative period.

Outcome variables

Post operative analgesia

The visual analogue scale (VAS) scores at rest and on movement/cough were recorded hourly in the post operative period for first 8 hours. Time for first dose of rescue analgesia was noted. The duration of analgesia was taken as the time at which patient complained of pain or the VAS was ≥3 on assessment at serial intervals. Patient at VAS score 3 got intramuscular injection of pentazocin 30 mg as rescue analgesia.

Haemodynamic parameters

The patients were considered haemodynamically stable if the mean arterial pressure and pulse rate remained within 20 % of baseline values. Hypotension after spinal anaesthesia was treated with a bolus administration of 250 ml RL over ten minutes and incremental doses of Inj. Ephedrine if necessary.

Time for ambulation

Duration of ambulation was the time interval from the end of surgery till the patient could start walking without support. The suitable criteria for ambulation after spinal anaesthesia include normal perianal (S4-S5) pinprick sensation, ability to plantar flex the foot and proprioception of the big toe. This suggests a complete regression of sensory block. There should also be no residual motor blockade. The residual sympathetic block can lead to dizziness on standing which should also be regressed.[11]

In our study, time for ambulation was recorded after surgery (in minutes) when all of the following parameters were present.

The patient was fully conscious and oriented to time, place and person.

There was complete regain of motor power (grade 5 power in lower limbs).

There was complete regain of all modalities of sensation, including proprioception of the great toe.

No dizziness on standing and walking.

Post-operatively the patients were monitored in the post operative ICU for occurrence of any complications like haematoma, bleeding, urinary retention, nausea and vomiting. Time of hospital stay was also noted from the discharge notes.

Data analysis

Statistical analysis of the data was done using Statistical Package for the Social Sciences (SPSS) software version 25 (Armonk, NY, IBM Corp). Qualitative data like sex, ASA physical status and adverse effects were compared using Chi- square test. Quantitative data like age, height, weight, BMI, visual analogue scale, time for first analgesic dose were compared using independent 't' test. A p value of less than 0.05 was taken as statistically significant. The data was expressed in number, percentage, mean and standard deviation.

Results

The two Groups were comparable with respect to their age, weight, sex, and ASA physical status. There is no statistically significant difference among two Groups in demographic profile. (Table 1-4)

Table 1: Sex Distribution.

Gender	Group U (n=20)		Group S (n=20)		Total		Chi-sq	p value
	N	%	N	%	N	%		
Females	1	5	2	10	4	7.5		
Males	19	95	18	90	36	92.5	0.3604	0.548
Total	20	100	20	100	40	100		

Table 2: Age distribution.

Category	Age in Years		t	p
	Mean	SD		
Group U (n=20)	53.60	11.071	0.740	0.464
Group S (n=20)	51.10	10.295		

Table 3: Comparison of height weight and BMI.

	Group U (n=20)	Group S (n=20)	t	p
Height	165.95±6.100	166.90±5.647	0.511	0.612
Weight	60.50±5.482	68.45±5.326	1.141	0.261
BMI	24.190±2.2176	24.810±2.5429	0.822	0.416

Table 4: ASA Grade.

ASA Grade	Group U (n=20)		Group S (n=20)		Total		Chi-sq	p value
	N	%	N	%	N	%		
1	8	40	11	55	19	47.5		
2	12	60	9	45	21	52.5	0.902	0.342
Total	20	100	20	100	40	100		

Table 5: Onset of Sensory Block.

	Mean (min)	SD	P value
Group U (n=20)	12.05	0.887	0.00
Group S (n=20)	5.75	0.967	

There was significant difference among two Groups in the time for onset of sensory block (p<0.05).

Table 6: Duration of Surgery.

	Mean (min)	SD	P value
Group U(n=20)	55.75	8.926	0.111
Group S (n=20)	59.75	6.382	

The data suggest that duration of surgery was comparable in both Groups. (p>0.05).

Table 7: Duration of hospital stay.

Category	Mean (hours)	SD	t	P
Group U (n=20)	56.95	2.164	24.3111	0.00*
Group S (n=20)	85.55	4.796		

The mean duration of hospital stay was significantly higher in Group S (p<0.001).
VAS score was recorded hourly for first 8 hours in the post-operative period

Table 8: Visual Analogue Scale (VAS) Score.

VAS	Group U (n=20)	Group S (n=20)	P value
2nd hour	0.00±0.00	0.05±0.224	0.324
3rd hour	0.00 ±0.00	0.65±0.587	0.00
4th hour	0.05±0.224	1.80±0.696	0.00
5th hour	0.55±0.510	2.65±1.812	0.00
6th hour	1.60±0.503	0.90± 0.553	0.00
7th hour	2.70±0.657	1.10±0.308	0.00
8th hour	1.85±1.040	1.60±0.681	0.374

Mean VAS score from 3rd to 7th hours were statistically significant (p < 0.001) between Group U and Group S. Highest VAS recorded in Group S was at 4th hour 1.80±0.696 (17 patients) and in Group U was at 7th hour 2.70±0.657 (12 patients) in the post-operative period indicating post operative analgesia was significantly better in Group U (p<0.001).

Table 9: Duration of analgesia.

Category	Mean (Min)	SD	P-value
Group U (n=20)	406.75	29.704	0.000
Group S (n=20)	254.00	30.677	

Duration of post operative analgesia is significantly longer in Group U.

Table 10: Pre-operative Hemodynamic Parameters.

Baseline	Group U (n=20)		Group S(n=20)		t	P
	Mean	SD	Mean	SD		
HR	73.50	6.134	68.90	2.713	0.554	0.583
SBP (mmHg)	127.40	8.055	128.1	8.979	0.260	0.797
DBP (mmHg)	77.45	5.104	72.20	4.980	1.446	0.156
MAP (mmHg)	94.10	4.930	90.85	5.441	0.815	0.420

Group U and Group S were comparable in terms of baseline hemodynamic parameters like heart rate, systolic BP, diastolic BP and Mean Arterial Pressure. (Table 10).

Intraoperative Hemodynamic Parameters

The heart rate was recorded at 5 minutes interval till the end of surgery. Heart rate in the two groups were comparable (p>0.05).

Table 11: Comparison of Heart rate between groups..

Heart Rate	Group U (n=20)		Group S (n=20)		t	p
	Mean	SD	Mean	SD		
0 min	73.50	6.134	74.65	6.961	0.554	0.583
5 min	74.05	6.134	69.6	7.486	2.035	0.05
10 min	74	7.108	74.55	5.596	0.275	0.785
15 min	73.2	7.179	74.45	5.596	0.614	0.543
20 min	71.2	6.346	72.60	4.650	0.796	0.431
25 min	70.85	5.613	73.10	4.229	1.432	0.160
30 min	70.6	5.915	73.00	3.825	1.524	0.136
35 min	70.65	6.675	72.45	4.359	1.010	0.319
40 min	69.6	6.5	71.90	3.291	1.412	0.166
45 min	71.65	5.860	70.90	2.900	0.513	0.611
50 min	70.25	2.9	72.25	4.077	1.160	0.253
55 min	70.50	6.637	71.10	3.878	0.349	0.729
60 min	70.45	6.194	70.95	2.819	0.329	0.744
65 min	70.05	5.844	69.95	2.282	0.071	0.944
70 min	69.2	6.338	68.90	2.713	0.195	0.847

Systolic, diastolic and mean blood pressures were recorded at 5 minutes interval till the end of surgery. There was statistically significant drop in all blood pressures in Group S compared to Group U ($p<0.05$).

Table 12: Comparison of SBP and DBP between groups.

Time	Group (n=20)	SBP (mmHg)				DBP (mmHg)			
		Mean	SD	t	p	Mean	SD	t	P
0 min	U	127.40	8.055	2.60	0.797	77.45	5.104	1.446	0.156
	S	128.10	8.979			75.00	5.601		
5 min	U	126.50	8.205	2.552	0.015	76.90	4.599	5.411	0.00
	S	118.80	10.710			67.20	6.566		
10 min	U	126.25	8.522	2.399	0.450	76.35	4.511	5.085	0.00
	S	119.80	8.483			68.50	5.226		
15 min	U	125.65	8.561	2.229	0.032	75.65	4.749	4.739	0.00
	S	119.70	8.317			68.40	4.925		
20 min	U	125.95	8.709	2.547	0.015	74.75	4.983	4.107	0.00
	S	119.20	8.037			68.40	4.795		
25 min	U	125.90	8.849	2.544	0.015	74.05	4.796	3.619	0.001
	S	119.20	7.770			68.60	4.728		
30 min	U	125.20	9.041	2.437	0.020	74.15	4.891	3.501	0.001
	S	118.80	7.495			68.70	4.953		
35 min	U	124.40	8.695	2.487	0.017	73.70	4.964	2.558	0.015
	S	118	7.539			69.80	4.675		
40 min	U	124.20	8.965	2.498	0.017	73.60	5.394	2.264	0.029
	S	117.80	7.135			70	4.634		
45 min	U	123.65	9.218	2.344	0.024	73.55	5.472	2.389	0.022
	S	117.60	6.946			69.70	4.692		
50 min	U	123.45	9.478	2.461	0.019	73.05	5.808	1.871	0.069
	S	116.80	7.495			69.90	4.789		
55 min	U	123.10	9.170	2.238	0.031	72.80	5.126	1.292	0.204
	S	117.20	7.410			70.80	4.652		
60 min	U	122.95	9.512	2.099	0.042	72.60	4.978	0.538	0.247
	S	117.40	7.022			70.80	4.697		
65 min	U	122.55	10.071	1.681	0.101	72.20	5.105	0.763	0.450
	S	118	6.712			71	4.834		
70 min	U	122.45	10.190	1.669	0.103	72.15	5.060	0.663	0.512
	S	117.90	6.696			71.10	4.962		

Table 13: Comparison of MAP between groups.

MAP	Group U (n=20)		Group S (n=20)		t	p
	Mean	SD	Mean	SD		
0 min	94.10	4.930	92.6715	6.09487	0.815	0.420
5 min	93.5	4.815	84.5	7.266	4.541	0.000
10 min	92.90	4.800	85.65	5.393	4.491	0.000
15 min	92.30	5.038	85.65	4.923	4.222	0.00
20 min	91.80	5.074	85.45	4.904	4.024	0.00
25 min	91.35	5.081	85.45	4.839	3.760	0.001
30 min	91.00	5.301	85.40	4.967	3.447	0.001
35 min	90.45	5.286	85.90	4.756	2.862	0.007
40 min	90.65	5.163	85.95	4.740	2.999	0.005
45 min	90.25	5.457	85.70	4.646	2.839	0.007
50 min	89.85	5.603	85.40	4.871	2.680	0.011
55 min	89.60	5.394	86.30	4.624	2.077	0.045
60 min	89.25	5.210	86.25	4.678	1.916	0.063
65 min	89.00	5.516	86.80	4.618	1.368	0.179
70 min	88.95	5.472	86.90	4.756	1.264	0.214

Table 14: Comparison of time for Ambulation between groups

Ambulation Time	Group U(n=20)		Group S(n=20)		Chi-sq	P
	N	%	N	%		
4th hour	15	75	1	5	24	0.000
5th hour	5	25	2	10	36.19	0.000
6th hour	0	0	3	15	29.565	0.000
7th hour	0	0	14	70	21.538	0.000
Total	20	100	20	100		

None of the patients were able to ambulate in the initial three hours in both the groups (Table 14). By 8th hour all patients in both groups ambulated. In Group U 15 patients (75%) were able to ambulate by 4th hour after surgery ($p<0.05$). In Group S 14 patients (70%) were able to ambulate only by 7th hour ($p<0.05$). The data suggests that post-operative ambulation is significantly earlier in Group U compared to Group S.

Table 15: Comparison of Mean time for ambulation between groups.

	mean±std (min)	p value
Group U (n=20)	210±29.29	0.000
Group S (n=20)	412.25±47.94	

Mean ambulation time in Group S was 412.25±47.94 and in Group U was 210±29.29 (Table 15). Patients in Group U ambulated early compared to Group S.

Table 16: Side effects between groups.

	Post-operative urinary retention		Post-operative nausea and vomiting		Chi-sq	p
	N	%	N	%		
Group U(n=20)	0	0	0	0	4.444	0.035
Group S(n=20)	4	20	3	15	3.243	0.072

In Group U none of the patients had side effects like urinary retention or nausea and vomiting. In Group S, 4 patients (20%) complained of urinary retention ($p= 0.036$) and 3 patients (15%) complained of nausea and vomiting ($p=0.075$). No other side effects like arrhythmias, seizure and vertigo were reported in both Groups (Table 16).

Discussion

Ilioinguinal and Iliohypogastric nerve block is a well known peripheral nerve blockade used for intra operative and post operative analgesia in inguinal herniorrhaphy, orchipexy, hydrocoele repair, cord cyst[12] excision for both adult and pediatric population.

To obtain post -operative analgesia in surgeries using Pfannenstiel incision like caesarean section[13] and abdominal hysterectomy.[14]

To diagnose chronic nerve entrapment pain after hernia repair surgeries.

For inguinal surgeries in patients with compromised cardio-respiratory functions.

It is proven that peripheral nerve blockade with long acting local anaesthetic agents not only provide extended analgesia but also early ambulation and better hemodynamic stability. Spinal anaesthesia (SAB) provides excellent intra -operative conditions but with associated change in normal physiology. Hypotension, urinary retention and post dural puncture head ache (PDPH) are well known complications after SAB. Lack of effective postoperative pain control will not only result in adverse physiological effects but also can end in chronic pain.[15] Callesen et al[16] found out moderate or severe pain scores in 60% of cases in the first day of herniorrhaphy and in 33% of cases in the 6th day of surgery. Conventional fascial click method for IHNB is associated with high block failure rate, erratic needle placement and other side effects. Ultrasound guidance had revolutionised the practice of regional anaesthesia. Thus, we decided to compare efficacy of ultrasound guided IHNB with SAB using 0.5% bupivacaine.

In our study 20 patients received USG guided IHNB (Group U) and 20 (Group S) received SAB. There were no failures reported in both Groups. Both groups were comparable in terms of age distribution, sex, ASA grading, height, weight and BMI.

Onset of sensory block

In our study, the mean time for onset of sensory block was 12.05±0.887 min in Group U and 5.75±0.967 min in Group S. There was significant difference among two Groups in the time for onset of sensory block ($p<0.05$). Our results were comparable with previous studies (Table 5).

Gurkan et al[9] in their study in 50 patients divided into 2 groups showed mean sensory block rise time as 25.2±5.1 min (IHNB) vs 6.9±3.4 min (SAB). In our study faster onset of sensory block in Group U can be attributed to the use of USG which allows accurate placement of drug. Dorreya M. Fekrya et al[17] showed onset of sensory block is faster in SAB (9.19±2.54 min in USG-IHNB versus 3.10±0.70 min in SAB).

In contrast to our study Swati Chhatrapati et al.[18] in their study in 60 patients, showed onset of block in 6.567±0.4037 min in IHNB Group and 6.224± 1.0487 min in SAB Group. The faster onset in IHNB Group may be due to drug characteristics. They used 50% of their drug volume as lignocaine with epinephrine. Lignocaine has a faster onset compared to bupivacaine but with lesser duration of analgesia. Another factor is higher drug volume they used which was 40–60ml. Higher volume of drug is associated with local anesthetic toxicity and TFNP (Transient Femoral Nerve Palsy).

Duration of surgery

Our study has shown that mean duration of surgery in both groups were comparable (55.75±8.926 min in Group U and 59.75±6.382 min in Group S) (Table 6). Duration of surgery mainly depends upon the surgeon's expertise. In our study three patients in group U complained of pain when traction was applied to the cord structures. This was managed by infiltrating 0.25% bupivacaine 5–7 ml to cord structures by surgeon. Study by Shiv Kumar Singh et al[19] and Reynolds L et al[20] showed blocking genitofemoral nerve along with IHNB increases the quality of block especially when novice surgeons are doing the repair.

Duration of hospital stay

In our study the mean duration of hospital stay in Group U was 56.95 ± 2.164 hours whereas in Group S was 85.55 ± 4.796 hours. Our study has shown that patients who received (Table 7) USG -IHNB can be discharged early compared to patients who received SAB for hernia repair. Our results were comparable with previous studies.

In a study by Yilmazral et al8 the time to home readiness was 14.1±0.1hours in IHNB group and 42.8±5.3 hours in SA group. Early home readiness in Group U is attributed to the technique of peripheral nerve blockade.

Post-operative analgesia

Present study has shown that mean VAS Score was high in the post operative period in patients who received SAB for inguinal hernia repair. Due to extended analgesia of USG guided IHNB (Table 8) the mean VAS Score was less in the post operative period. Dorreya M. Fekrya et al[17] showed the VAS in group SAB was significantly higher at the fourth hour (P=0.002) and at the 16th hour (P=0.002) postoperatively when compared with VAS in group IHNB. Pradeep Goyal et al[21] states that the mean pain was statistically significantly less in IHNB group as compared to SAB ($p<0.05$).

In our study mean duration of analgesia in Group U was 406.75 ± 29.704 minutes and in Group S it was 254 ± 30.677 minutes (Table 9). Uma Shrivastava et al[22] found postoperative analgesia after IHNB to be 10.18±1.12 hrs and in SAB group it was 4.34± 2.16 hrs. Same observation was made by Natasha Shafique et al.[23] They found that time for rescue analgesia was 4.5 hours in IHNB and 3.9 hours for SAB group. The results may vary according to the VAS score at which first dose of rescue analgesia was given. In present study rescue analgesia was given at VAS score 3. Literature suggests that total analgesic consumption was also higher in SAB group. Pradeep Goyal et al[21] found mean analgesic dose received was statistically significantly less in IHNB group patients as compared to SAB Group patients ($p<0.05$).

Hemodynamic stability

Our study has shown that hemodynamic parameters were close to baseline values in USG guided IHNB Group. SAB resulted in significant drop in SBP, DBP, MAP during the intra operative period (Table 11-13). Our results were consistent with previous studies. Drop in mean arterial pressure was measured in percentage. One patient who received SAB developed 21.3% drop in MAP and was managed by fluid bolus and graded dose of vasopressors. There was no post operative hypotension reported in patients who received SAB or USG guided IHNB.

Dongare et al[24] in their study showed 25 (30) patients in SAB group and 28(30) patients in IHNB group had MAP within 10 % of baseline. 5 in SAB group and 1 patient in IHNB group had decreases in MAP from 10–20%. Swati Chhatrapati et al[19] in their study showed statistically significant reduction in systolic and mean blood pressure in first 40 minutes with higher intraoperative fluid requirement in SAB Group patients. Neuraxial anaesthesia produces sympathetic (vasomotor) and somatic (sensory and motor) nervous system blockade along with unopposed parasympathetic activity and compensatory reflexes. The decrease in stroke volume and cardiac output is due to peripheral (T1–L2) and cardiac (T1–T4) sympathetic fibre blockade. Adrenal medullary secretion also gets blocked. Inguinal hernia repair need a

sensory level up to T6 because of involvement of peritoneum. This in turn produces hypotension. Hypotension in patients with compensated cardio-respiratory diseases will be detrimental and difficult to manage. Peripheral nerve blockade is free of all the above said physiological changes.

Time for ambulation

Our study has shown that USG guided IHNB allows patients to ambulate and return to normal activities much earlier than patients who received SAB. During the first 3 hours of post operative period no patients were able to ambulate. In patients who received SAB for hernia repair it may be due to residual motor block. Anxiety and surgical stress may be the reason in patients who received USG guided IHNB. By 8th hour all patients in both Groups were ambulated (Table 14). Mean ambulation time in Group S was 412.25±47.94 and in Group U was 210±29.29 (Table 15). USG guided IHNB was found to provide analgesia at rest as well as on ambulation.

Our study was comparable with the study by Dongare et al.[24] They have shown that the mean duration of postoperative ambulation was 298.6 ±27.9 minutes in SAB group and 120.1±15.8 minutes in IHNB group. Similar results were obtained in a study by Gurkan et al.[11] Mean time to first mobilization was 307.1±146.9 min in IHNB group and 456.9±131.7 min SAB group. Early mobilsation helps in accommodating more patients and surgeries without compromising care leading to reduced cost of hospital stay.

Side effects

In our study, few patients who received spinal anesthesia had side effects like urinary retention, nausea and vomiting. Urinary retention was managed by bladder catheterisation (Table 16).

Nausea and vomiting was managed by intravenous ondansetron 0.1 mg/kg. There was no incidence of PDPH, hematoma formation, bowel injuries etc. Our results were comparable with study conducted by Dajun song et al[7] who found urinary retention in 20% patients receiving spinal anesthesia and none in general anesthesia or IHNB group . Dongare et al[24] reported Nausea and vomiting in 3.3% patients in IHNB and 3.4% in SAB group and urinary retention 10% in SAB and zero in IHNB group. Natasha Shafique et al[23] showed 20% of SAB group patients had PONV and 8% in IHNB group. Urinary retention was 9.7% in SAB group and zero in IHNB group.

Our study had multiple limitations. Though subjects were allocated to Group U and S randomly, blinding was not done for both observation and analysis. So there was an element of bias. Monitoring the plasma level of bupivacaine will help to reduce local anaesthetic toxicity if it occurs and will also help to calculate the minimum effective volume of drugs for IHNB block, which is not clearly mentioned anywhere. Overall patient satisfaction scale assessment was not done even though it is the ultimate aim of all postoperative analgesic techniques. Further studies are required to show the analgesic efficacy of USG guided IHNB in various other abdominal surgeries using different local anaesthetics and continuous catheter techniques.

Conclusion

Ultra-sound guided ilioinguinal and iliohypogastric nerve block is a safer alternative to spinal anesthesia or general anesthesia for adult open unilateral inguinal hernia repair.

Acknowledgement: We thank all the faculty and staff of our department.

Conflict of interest: None to declare.

References

1. Amado WJ. Anesthesia for hernia surgery. Surg Clin North Am. 1993 Jun;73(3):427–38.
2. Joshi GP. Multimodal Analgesia Techniques and Postoperative Rehabilitation. Anesthesiol Clin North Am. 2005;23:185–202.
3. Kulacoglu H. Current Options in Inguinal Hernia Repair in Adult Patients. Hippokratia 2011; 15(3):223–231.
4. Kehlet H, White PF. Optimizing Anaesthesia for Inguinal Herniorrhaphy: General,Regional, or Local Anaesthesia? Anesth Analg 2001; 93(6): 1367–1369.
5. Vincent J, Collins. Spinal Anesthesia- Principles and Spinal analgesics- Physiological Effects. In: Principles of Anesthesiology: general and regional Anesthesia. 3rd ed. Philadelphia :Lea and Febiger;1993.p1445– 1516.
6. Hyderally H. Complications of Spinal Anaesthesia. The Mount Sinai Journal of Medicine.2002; 69 (1–2):55–56.
7. Dajun Song, Nancy B. Greilich, Paul F. White,Mehernoor F. Watcha, W. Kendall Tongier.

Recovery Profiles and Costs of Anaesthesia for Outpatient Unilateral Inguinal Herniorrhaphy. AnesthAnalg. 2000; 91: 876–81.

8. Aysun Yilmazlar, MD, Halil Bilgel, MD, Canan Donmez, MD, Ayla Guney, MD, Tuncay Yilmazlar, MD, Oğuz Tokat. Comparison of Ilioinguinal-iliohypogastric Nerve Block Versus Spinal Anesthesia for Inguinal Herniorrhaphy. South Med J. 2006 Jan;99(1):48–51.
9. Işik Gürkan, Gülten Utebey, Onur Özlü. Comparison of Ilioinguinal-Iliohypogastric Nerve Block Versus Spinal Anesthesia Techniques for Single Sided Inguinal Herniorrhaphy. Agri. 2013;25(3):108–1.
10. A Gupta, N Aggarwal, D Sharma. Ultrasound Guided Ilioinguinal Block. The Internet Journal of Anesthesiology. 2010;29(1):1–5.
11. Marshall SI, Chung F. Discharge Criteria and Complications After Ambulatory Surgery. Anesth Analg. 1999;88(3):508.
12. Christophe Dadure, Chrystelle Sola, Bernard Dalens, Xavier Capdevila. Regional Anesthesia in Children. In: Ronald D Miller (ed). Miller's Anesthesia. 8th Edition. Elsevier.2015. p 2744–45.
13. Bell EA, Jones BP, Olufolabi AJ, Dexter F, Phillips-Bute B, Greengras RA et al. Iliohypogastric-ilioinguinal Peripheral Nerve Block for post-Cesarean Delivery Analgesia Decreases Morphine Use but Not Opioid-Related Side Effects. Can J Anaesth 2002;49(7):694–700.
14. Kelly MC, Beers HT, Huss BK, Gilliland HM. Biateral Ilioinguinal Nerve Blocks for Analgesia After Total Abdominal Hysterectomy. Anaesthesia 1996;51(4):406.
15. Poobalan AS, Bruce J, Smith WC, King PM, Krukowski ZH, Chambers WA. A review of chronic pain after inguinal herniorrhaphy. Clin J Pain 2003; 19(1): 48–54.
16. Callesen T, Bech K, Nielsen R, Andersen J, Hesselfeldt P, Roikjaer O, H Kehlet H. Pain after groin hernia repair. Br J Surg.1998;85(10):1412–4.
17. Dorreya M.Fekrya, Nagwa A. Megahedb, Mohammed H. EL-Lakanyb, Maha Mahmoud Soliman Yakoutb. Ultrasound-guided ilioinguinal, iliohypogastric, and genitofemoral nerve block versus spinal subarachnoid blockade for inguinal hernia repair. Research and Opinion in Anesthesia and Intensive Care 2017;4(1):29–34.
18. Swati Chhatrapati,Anjana Sahu, Smita Patil. Comparative Evaluation of Ilioinguinal/ Iliohypogastric Nerve Block with Spinal Anaesthesia for Unilateral Open Inguinal Hernia Repair. International Journal of Contemporary Medical Research.2016;3(4):1177–81.
19. Shiv Kumar Singh, Hate B. Vadera. Ultrasound guided hernia blocks. Anaesthesia, Pain and Intensive Care 2015;19(3):366–371.
20. Reynolds L, Kedlaya D. Ilioinguinal-iliohypogastric and genitofemoral nerve blocks. In: Waldman SD (ed). Interventional Pain Management. 2nd ed. Philadelphia, PA: WB Saunders Co; 2001:508–511.
21. Pradeep Goyal, Shiv Kumar Sharma , Kamaljeet Singh Jaswal, Sandeep Goyal , Mushtaq Ahmed, Gauravrai Sharma et al. Comparison of inguinal hernia repair under local anesthesia versus spinal anesthesia. Journal of Dental and Medical Sciences.2014;13(1):54–59.
22. Srivastava U, Kumar A, Saxena S, Neeraj, Sehgal DR. Comparison of local, spinal and general anesthesia for inguinal hernia repair. Journal of anaesthesiology Clinical Pharmacology. 2007;23(2):151–154.
23. Natasha Shafique, Haroon Ur Rashid, Muhammad Ijaz raja, Mohammad Saeed. Comparison of Efficacy of Spinal Anaesthesia and Subfascial Local Anaesthetic Inguinal Field Block for Open Inguinal Hernia Repair-A single Institutional Experience. J Ayub Med Coll Abbottabad. 2015;27(1):197–200.
24. Dongare DH, Dongare HC. Comparison of ilio-inguinal ilio-hypogastricnerve block versus spinal anaesthesia for hernia repair as day caresurgery. Perspect Med Res 2014; 2(3):7–12.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.40

Comparative Study to Evaluate Intravenous Dexmedetomidine as Bolus Versus Infusion with Spinal Anaesthesia for Infra-Umbilical Surgeries

Shah Parth M[1], Juhi Mattoo[2], Thakur Dinesh[3]

Author Affiliation: [1]Assistant Professor, [2]Associate Professor, [3]Professor and Head, Department of Anesthesia, Dr M K Shah Medical College and Research Center, Ahmedabad, Gujarat 382424, India..

How to cite this article:
Shah Parth M, Juhi Mattoo, Thakur Dinesh. Comparative Study to Evaluate Intravenous Dexmedetomidine as Bolus Versus Infusion with Spinal Anaesthesia for Infra-Umbilical Surgeries. Indian J Anesth Analg. 2020;7(5):1149–1154.

Abstract

Context: Dexmetedomidine, an alpha 2 agonist as adjuvant to spinal anesthesia for prolongation of sensory, motor block, postoperative analgesia.

Aims: We studied effectiveness of intravenous dexmedetomidine in prolonging duration of subarachnoid block when administered as bolus and bolus plus infusion dose.

Methods and Material: 100 ASA 1 and 2 patients scheduled to undergo elective surgeries under SAB were randomly allocated into two groups. After SAB,Group B received 1 µg/kg of dexmedetomidine bolus over 10 min and group Ireceived 0.5 mcg/kg over 10 mins followed by 0.5 mcg/kg over next 60 mins.Time of onset, duration of sensor and motor blockage, hemodynamic stability and sedation score were observed in both group patients.

Statistical analysis used: Results were evaluated by applying paired t test and P value using SPSS statistical software.

Results: Time to onset of sensory blockade (T10) in group B was 4.3 ±1.02 mins and group I - 5.2±1.6 mins. Time of onset of motor blockade in group B and I was 4.6 ± 1.01 and 5.5 ± 1.4 mins respectively. Two segment regression time was prolonged in group I – 124 ± 11.51 mins as compared to group B 110± 12.2 mins. Time to achieve complete sensory recovery in group B was 211 ± 10.2 min and group I was 240 ± 9.24 min. Time to achieve complete motor recovery in group B and I was 196 ± 9.6 and 219 ± 6.2 min respectively.

Conclusions: Both dosage regimens of dexmedetomidine can be used for prolongation of spinal anaesthesia with bupivacine. Time of onset of block is faster in bolus group however bolus plus infusion dosage provides more prolonged sensory and motor regression of block.

Keywords: Intravenous dexmedetomidine; Subarachnoid block; Bolus; Bolus plus infusion.

Keymessages: Intravenous Dexmedetomidine can be Used as an Adjuvant for Prolongation of Spinal Anaesthesia in Bolus as Well as Bolus and Infusion Doses.

Introduction

Subarachnoid block is regional anaesthetic technique used frequently to produce intense sensory and motor blockade for infraumbilical and lower limb surgeries. Several drugs such as opioids and alpha-2 agonists can be used as adjuvants to prolong sensory and motor blockade1 so as to provide sedation and postoperative analgesia to patients.

Dexmedetomidine is a highly selective alpha-2 agonist with relatively high α2/α1 activity (1620:1)

Corresponding Author: Juhi Mattoo, Associate Professor, Department of Anesthesia, Dr M K Shah Medical College and Research Center, Ahmedabad, Gujarat 382424, India.

E-mail: jmattoo@yahoo.co.in

as compared to clonidine (220:1).[2] It possesses advantages of sedative, analgesic properties with lack of respiratory depression makes it a preferable and suitable adjunct in various clinical anaesthesia.[3,4]

It was introduced for short-timeintensive care unit sedation in 1999. Since, thenit is rapidly emerging drug now-a-days as anadjuvant to regional and general anesthesia, MAC, premedication for prolonged postoperative sedation andanalgesia.[5]

Apart from conventional technique of adding adjuvants intrathecally, we carried out study with new approach gaining importance of usingintravenous dexmedetomidine to prolong duration and intensity of SAB and to provide sedation during the perioperative period. Thereby desirable goals of postoperative analgesia and intraoperative sedation are achieved.

The primary aim of this study was to assess the quality of subarachnoid block on different iv dosage of dexmedetomidine as bolus and infusion in elective surgeries.

Materials and Methods

After approval from the Institutional Ethics Committee and obtaining written and informed consent from the patients wecarried out this randomized prospective comparative double blind study.

100 adult patients of either sex, aged between 18 and 65 years belonging to American Society of Anaesthesiologists Physical Status (ASA-PS) 1 or 2 scheduled to undergo electiveinfraumbilical or lower limb surgery under spinal anesthesia were enrolled. Patients who refused to give consent, belongingto ASA 3–4, emergency surgeries, patients with co-agulopathis,bleeding diathesis, allergic to local anaesthetic agents or otherdrugs were excluded from the study. A detailed preoperative evaluation was performed prior to surgery, and were kept Nil by mouth overnight.

On the day of surgery, 18G IV line was secured in thenondominant hand and iv fluid was administered- ringer lactatesolution at 100 mL/h.

Patient was shifted to the opertation theatre. Multiparamonitoring system was established that included 5-electrode electrocardiogram monitoring Lead II and V 5, noninvasive blood pressure, and pulse oximetry and baseline vitals recorded.– pulse, BP, SP02, RR .Drug preparation and administration was done intravenously by one of the two anesthesiologists not involved in data collection. Another anesthesiologist who was kept blinded about the study drug administered performed subarachnoid block and recorded the sensory and motor effects of spinal anesthesia.

Patients were randomly allocated into one of the two groups (50 patients in each group) using a computer-generated random number table.

Under all aseptic and antiseptic precautions: Intrathecal bupivacaine (2.5 mL of 0.5% bupivacaine heavy) was administered in both groups at L 3 –L 4 or L 4 –L 5 interspace using a23 standard wire gauge Quincke-Babcock spinal needle after confirming free flow of clear cerebrospinal fluid . The time ofintrathecal drug injection was noted as time "0" and the patientturned supine. Immediately after spinal anaesthesia with intrathecal hyperbaric bupivacaine patients were given dexmedetomidine intravenous as per group allocation.

Group B: received bolus 20 mL of 0.9% NaCl containing 1 µg/kg of dexmedetomidine (rounded to nearest 10 micrograms) intravenously over 10 min followed by 20 mL of 0.9% NaCl overnext 60 min.

Group I: received intravenous dexmedetomidine in atotal dose of 1 µg/kg (rounded to nearest 10 micrograms). Initially half of this dose (0.5 µg/kg) diluted in 20 mL of 0.9%NaCl was administered over the first 10 min, followed by theremaining half dose (0.5 µg/kg) diluted in 20 mL of 0.9% NaClover the next 60 min.

Onset of sensory blockade at T 10 was noted. In addition, 2-segment regression time (defined as recovery of sensory blockby two segments from the highest sensory level achieved inthat patient) and sensory recovery (defined as recovery at S2 – S4 dermatomes) were also noted.

Motorblock was assessed by modified bromage scale:

0 No paralysis, able to flex hips/knees/ ankles.

1 Able to move knees, unable to raise extendedlegs

2 Able to flex knees, unable to flex knees

3 Unable to move any part of the lower limb.

Motor blockade wasperiodically assessed till a modified Bromage score of 3 (inability to flex hip, knee, and ankle) was obtained. This timewas denoted as onset of motor blockade. Attainment of amodified Bromage score of 0 (ability to flex hip, knee, and ankle) was noted to herald recovery from motor blockade.

Sedation score was noted on a 6-point Ramsay sedation score Ramsay Sedation Scale (RSS):

1. Patient fully awake and oriented.
2. Patient cooperative, drowsy and tranquil.
3. Patient asleep but responds to oralcommands.
4. Asleep, but responds to light glabellar tap.
5. Asleep, sluggish response to light glabellartap.
6. Asleep, no response.

Hemodynamic parameters - blood pressure, heart rate, respiratory rate, and oxygensaturation were monitored throughout the surgery.anynotable Adverse effects such as nausea, vomiting, andpruritus were noted.

Results

There was no significant statistical difference inall patients in Group B and Group I with respect todemographic profile that included patients age, sex,height, weight, ASA physical status and durationof surgery, (Table 1).

Table 1: Demographic Data.

Parameter	Group B (N= 50)	Group I (N= 50)	P Value
Age (Years)	38.2±14.5	45.1±10.4	0.0931 (Not Significant)
Weight (Kg)	68.2±11.1	65.1±12.4	0.1909 (Not Significant)
Height (Cm)	168±10.2	169.4±8.8	0.4642 (Not Significant)
Sex M:f	46:4	44:6	
Asa 1 :2	32:18	28:22	

The time to onset of sensory blockade (at t10)in group B was 4.3 ±1.02 mins and group I - 5.2±1.6 mins with p value 0.0011 . the time of onset of motor blockade (BROMAGE 3) in group B and I was 4.6 ± 1.01 mins and 5.5 ± 1.4 mins respectively with P value 0.0004 (Table 2).

Table 2: Spinal Anaesthesia Parameters.

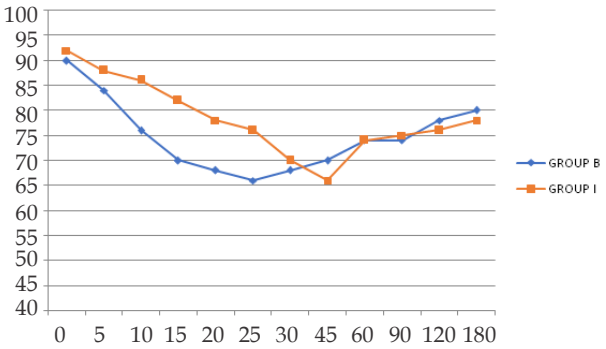
Parameter	Group B (N= 50)	Group I (N= 50)	P Value
Time To Onset Of Sensory Blockade (At T10) Min	4.3 ± 1.02	5.2 ± 1.6	0.0011 (Significant)
Time To Onset Of Motor Blockade (Bromage 3) Min	4.6 ± 1.01	5.5 ± 1.4	0.0004 (Significant)
2 Segment Regression (Min)	110 ± 12.2	124 ± 11.51	0.0001 (Significant)
Complete Sensory Recovery	211 ± 10.2	240 ± 9.24	0.0001 (Significant)
Complete Motor Recovery	196 ± 9.6	219 ± 6.2	0.0001 (Significant)
Time To Reach Ramsay Sedation Score Of 3	6.3 ± 2.3	6.6 ± 2.6	0.5425 (Significant)

The two segment regression time was prolonged in group I – 124 ± 11.51 mins as compared to group B 110 ± 12.2 mins and the difference is significant p value 0.0001 (Table 2).

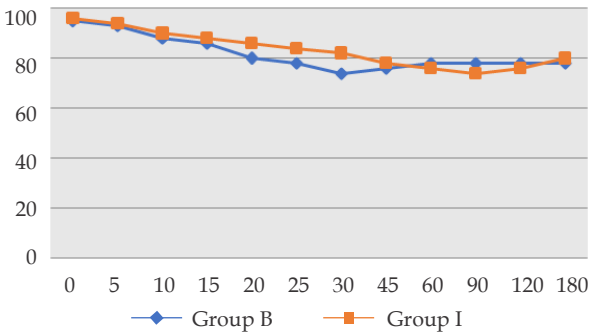
Time to achieve complete sensory recovery in group B was 211 ± 10.2 min and group I was 240 ± 9.24 min with p value 0.0001 (highly significant). Time to achieve complete motor recovery in group B and group I was 196 ± 9.6 min and 219 ± 6.2 min respectively and its p value was 0.0001 (highly significant) (Table 2).

Time to reach Ramsay Sedation of score 3 in group B and I was nearly same Group B : 6.3 ± 2.3 mins and group I was 6.6 ± 2.6 mins. (Table 2).

Heart rate and Blood Pressure were continuously monitored and graph plotted (GRAPH 1 and 2) and the decrease in heart rate was more evident for intital transitory period in group B as compared to group I.



Graph 1: Heart Rate.



Graph 2: Mean Arterial Pressure (Map).

Discussion

We conducted a study to observe the effect of intravenous dexmedetomidine given as a bolus and bolus plus infusion immediately after spinalanaesthesia with intrathecal hyperbaric bupivacaine.

The demographic data that included age, height, weight, ASA physical status (duration of surgery) were comparable among the two groups and there was no significant difference between them (Table 1).

The time of onset of sensory blockage in group B was 4.3 ± 1.02 mins faster than group I – 5.2 ± 1.6 mins with p value 0.0011. the time of onset of motor blockade in group B and I was 4.6 ± 1.01 mins and 5.5 ± 1.4 mins respectively with P value 0.0004 ,both these p values reflect a significant difference between them. (Table 2).

The above faster onset of action in group B might be due to the fact that bolus dose administration has more effect in fastening the time to reach the T10 level.

Thomas et all in his study entitled "Comparison of different regimens of intravenous dexmedetomidine on duration of subarachnoid block" compared patients receiving dexmedetomidine and divided them among 3 groups. He concluded quick time of onset to achieve sensory level of T10 in patients recvng bolus doses of dexmedetomidine. These observations were similar to our study.[6]

However Upadhyaya R. Kavya in their research entitled: "effect of intravenous dexmedetomidine administered as bolus or as bolus plus infusion on subarachnoid anaesthesia with hyperbaric bupivacaine" observed that the time of onset of sensory blockade was almost similar in both bolus and infusion groups of dexmedetomidine.[7]

SS Harsoors's study "effect of supplementation of low dose iv dexmedetomidine on characteristics of hyperbaric bupivacaine " also support our result as in their study that dexmedetomidine when given as bolus plus infusion hastened the onset of sensory blockade.[4]

The alpha receptors activation induced inhibition of nociceptive impulse transmission may be leading to faster onset of sensory blockade as compared to motor blockade.

The two segment regression time was prolonged in group I – 124 ± 11.51 mins as compared to group B 110 ± 12.2 and the difference is significant p value 0.0001. This may be due to the longer duration of action of group I where the drug was administered as an infusion followed by bolus dosage.

Our findings were similar to TriptiVatsalya's study" comparison of intravenous bolus and infusion of dexmedetomidine on characteristics of subarachnoid block" where patients receiving intravenous dexmedetomidine as infusion showed prolonged 2 segment regression time as compared to bolus dosage. Thomas et all concluded the same in his study.[8]

In our study time to achieve complete sensory recovery in group B was 211 ± 10.2 min and group I was 240 ± 9.24 mins with p value 0.0001 (highly significant). Time to achieve complete motor recovery in group B and group I was 196 ± 9.6 and 219 ± 6.2 respectively and its p value was 0.0001 (highly significant). Hence in our study bolus plus infusion dosage (group I) of intravenous dexmedetomidine prolongs the sensory and motor blockade of spinal anaesthesia as compared to bolus administration only.

SS Harsoor has results similar to our study thus strengthen our results and observations.[4]

Other researchers also carried out comparative study and observed the effect of dexmedetomidine infusion on spinal anaesthesia with ropivacaine and concluded that dexmedetomidine bolus of 1 microgram/kg followed by 0.4 mcg/kg/hr prolonged sensory and motor regression.[9]

Study entitled "Intravenous dexmedetomidine prolongs bupivacaine spinal analgesia " by Mustafa et all included comparison of loading plus infusion dosage of dexmedetomidine with normal saline (placebo) resulted in prolongation of spinal anaesthesia with sensory and motor regression.[10]

Dexmedetomidine provides good sedation with wide safety margins and doesnot cause much respiratory depressiom. Moreover sedation produced by it is different from other sedatives as patients receiving dexmedetomidine remain co-operative and are easily arousable. This is termed as "co-operative arousable sedation" and is easily distinguished from sedation caused by drugs-propofol and midazolam that act by inhibiting GABA.[11]

Here we assessed sedation with Ramsay Sedation Score (RSS) and observed that patients of both groups took nearly similar times to reach RSS score of 3 with no statistical significant difference.

However the duration for which RSS was maintained 3 was greater in group bolus plus infusion (group I) than group bolus. (group B) that

was maintained throughout in group I and for 60 mins in group B.

In our study the decrease in Heart Rate was more evident for initial transitory period in group B than group I. However only 1 patient required atropine in group B. There was hypotension and fall in Mean Arterial Pressure (MAP) in both groups intraoperatively but clinically was not that significant.

The above bradycardia and hypotension can be explained by the fact that dexmedetomidine doesnot have any direct effect on heart. It causes dose dependent increase in coronary Vascular Resistence and o2 extraction in coronary circulation but supply/demand ratio remains unaltered.[12]

Dexmedetomidine causes biphasic cardioversion response after administration. Pharmcaokinetics describe that bolus dose of 1 mcg/kg leads to transient rise in BP and reflex decrease in HR. This initial response occurs due to direct B-adenoreceptor stimulation of vascular smooth muscle. However this response is attenuated when it is administered as slow infusion over 10 mins. Hence we in our study administered dose over 10 mins which resulted in stabilization of Heart rate and BP 10–15% below the baseline parameters.

Jyotsna Kubre et all in their study of 0.5 mcg/kg dexmedetomidine loading over 10 mins concluded no difference in MAP in both groups and only 2 patients required atropine and ephidrene to treat bradycardia and hypotension.[13]

Mustafa et al, Tekin et al and Whizar Lugo et all reported no significant difference in Mean Arterial Pressure in dexmedetomidine group in their studied.[10,14,15]

Conclusion

Administration of intravenous dexmedetomidine as an adjunct to spinal anaesthesia in a dose of 1 mcg/kg aver 10 mins and 0.5 mcg/kg over 10 mins followed by 0.5 mcg/kg over next 60 mins both prolong the sensory and motor blockade produced by 12.5 mg of intrathecal hyperbaric bupivacaine.

However time of onset of bolus dosage of 1 mcg/kg was faster than bolus plus infusion divided dosage of 0.5 mcg/kg. however the bolus plus infusion dosage had prolonged sensory and motor regression of blockade as compared to bolus dosage regimen solely.

Both dosage regimens had hemodynamic stability in parameters within tolerant and treatable limits with arousable sedation and Ramsay Sedation Score of ≥ 3 was maintained.

Hence we conclude that Intravenous Dexmedetomidine in above mentioned 2 dosage regimens can be used as a adjuvant for prolongation of spinal anaesthesia without any notable adverse events.

Acknowledgement:

Conflict of Interest: nil

References

1. Pitkanen M. Spinal (subarachnoid) blockade. In: Cousins MJ, Bridenbaugh PO, Carr DB, Horlocker TT, editors. Neural Blockade in Clinical Anesthesia and Pain Medicine. 4th ed. Philadelphia: Lippincott Williams and Wilkins; 2009. p. 213–38.
2. Kamibayashi T, Maze M. Clinical uses of alpha2 -adrenergic agonists. Anesthesiology2000;93:1345–9.
3. Reves JG, Glass P. Intravenous anesthetics. In: Miller RD, Eriksson LI, Fleisher LA, Wiener–Kronish GP, Young WL, editors. Miller's Anesthesia. 7th ed. Philadelphia: Elsevier Churchill Livingstone; 2010. p. 756.
4. Harsoor S, Rani DD, Yalamuru B, Sudheesh K, Nethra S. Effect of supplementation of low dose intravenous dexmedetomidine on characteristics of spinal anaesthesia with hyperbaric bupivacaine. Indian J Anaesth2013;57:265–9. [PUBMED]
5. Eren G, Cukurova Z, Demir G, et al. Comparison of dexmedetomidine and three different doses of midazolam in preoperative sedation. J Anesthesiol Clin Pharmacol 2011;27:367–72.
6. Thomas A, Satyaprakash M, Elakkumanan LB, Bidkar PU, Mishra SK. Comparison of different regimens of intravenous dexmedetomidine on duration of subarachnoid block. J Anaesthesiol Clin Pharmacol. 2016;32:497–500. [PMC free article] [PubMed] [Google Scholar.
7. Upadhya R Kavya, Shenoy Laxmi, Venkateswaran Ramkumar, Effect of intravenous dexmedetomidine administered as bolus or as bolus-plus-infusion on subarachnoid anesthesia with hyperbaric bupivacaine, journal of anaesthesiology clinical pharmacology.

   ORIGINAL ARTICLE Year : 2018 | Volume : 34 | Issue : 1 | Page : 46–50.
8. Tripti Vatsalya, Chandrakant Waikar, and Madhurima Singh Comparison of Intravenous Bolus and Infusion of Dexmedetomidine on Characteristics of Subarachnoid Block Anesth Essays Res. 2018 Jan-Mar; 12(1): 190–193. doi: 10.4103/aer.AER_111_17 PMCID: PMC5872862 PMID: 29628580.

9. Elcicek K, Tekin M, Kati I. The effects of intravenous dexmedetomidine on spinal hyperbaric ropivacaine anesthesia. J Anesth2010;24:544–8.
10. Al-Mustafa MM, Badran IZ, Abu-Ali HM, Al-Barazangi BA, Massad IM, Al-Ghanem SM. Intravenous dexmedetomidine prolongs bupivacaine spinal analgesia. Middle East J Anesthesiol2009;20:225–31. [PUBMED]
11. Venn RM, Hell J, Grounds RM. Respiratory effects of dexmedetomidine in the surgical patient requiring intensive care. Crit Care. 2000;4:302–8. [PMC free article].
12. Patel CR, Engineer SR, Shah BJ, Madhu S. Effect of intravenous infusion of dexmedetomidine on perioperative haemodynamic changes and postoperative recovery: A study with entropy analysis. Indian J Anaesth. 2012;56:542–6.
13. Jyotsna Kubre, Ashish Sethi et al. single dose intravenous dexmedetomidine prolongs spinal anaesthesia with hyperbaric bupivacaine. Anaesthesia essays and researches . year 2016/ volume 10/pg 273–277.
14. Whizar-Lugo V, Gómez-Ramírez IA, Cisneros-Corral R, Gallegos NM. Intravenous dexmedetomidine vs. Intravenous clonidine to prolong bupivacaine spinal anesthesia. A double blind study Anest Mé× 2007;19:143–6. [Google Scholar].
15. Tekin M, Kati I, Tomak Y, Kisli E. Effect of dexmedetomidine IV on the duration of spinal anesthesia with prilocaine: A double-blind, prospective study in adult surgical patients. CurrTher Res. 2007;68:313–24.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.41

A Comparative Study of Oral Clonidine and Intravenousesmolol for Attenuation of Pressor Response During Laryngoscopy and Endotracheal Intubation

Sheetal Jaykar[1], Bhavini Shah[2], Neha Garg[3], Tanya Gulia[4]

Author Affiliation: [1]Associate Professor, [2]Professor, [3-4]3rd year Junior Resident, Department of Anaesthesiology, Dr.DY Patil Medical College, Hospital and Research Centre, Pimpri-Chinchwad, Maharashtra 411018, India.

How to cite this article:
Sheetal Jaykar, Bhavini Shah, Neha Garg, et al. A Comparative Study of Oral Clonidine and Intravenousesmolol for Attenuation of Pressor Response During Laryngoscopy and Endotracheal Intubation. Indian J Anesth Analg. 2020;7(5):1155–1159.

Abstract

Background: Endotracheal intubation and laryngoscopy are often associated with increased sympathetic response due to stimulation of laryngeal and tracheal sensory receptors. This can be harmful especially in patients who have cardiac issues, hypertension, etc. and can be associated with increased morbidity and mortality. Attenuation of pressor response can prevent sympathetic stimulation.

Aim: To evaluate and compare oral Clonidine and intravenous Esmolol for attenuation of pressor response during laryngoscopy and endotracheal intubation.

Materials and methods: 60 patients were divided into two groups after satisfying the inclusion and exclusion criteria. Group-A received clonidine orally at a dose of 150 mcg, around 75–90 minutes before elective surgery. Group-B received intravenous esmolol at a dose of 1.5mg/kg, 2 minutes prior to laryngoscopy. HR, SBP, DBP, MAP were recorded at time of shifting to operation theatre (T0), subsequent to administration of premedications (T1), prior to laryngoscopy (T2), subsequent to intubation (T3), at 1 minute (T4), 3 minutes (T5), 5 minutes (T6) and 10 minutes (T7) subsequent to intubation. Side effects if any were recorded.

Results: There was significant suppression of HR, SBP, DBP and MAP at T3, T4, T5, T6 and T7 in Group B that received Intravenous esmolol. There were no serious adverse events in either of the group.

Conclusion: Esmolol can be an effective pharmacological agent that can be used for attenuation of pressor response during laryngoscopy and endotracheal intubation. We suggest conducting similar study in patients with significant co-morbidities for a more comprehensive analysis.

Keywords: Pressor response; Esmolol; Clonidine; Endotracheal intubation.

Introduction

For maintaining a patent airway, laryngoscopy and endotracheal intubation are crucial procedures which an anaesthesiologist performs in day to day practice. Rield and brace in 1940,[1] were first to describe haemodynamic response to laryngoscopy and tracheal intubation. The pressor response to direct laryngoscopy (DL) and endotracheal intubation precipitating a significant increase in heart rate and systemic blood pressure is an established phenomenon and thus, a cause of concern for anesthesiologists all over.[2] King et al.[3] in 1951 described sympathetic hemodynamic response to laryngoscopy and endotracheal intubation. Direct laryngoscopy exerts a pressure over the tongue base that stimulates proprioceptors, resulting in a significant increase in sympathetic amines and hemodynamic parameters. Passage of the tube through the trachea further exaggerates this response by somato-visceral reflex followed

Corresponding Author: Bhavini Shah, Professor, Department of Anesthesia, Dr. DY Patil Medical College, Hospital And Research Centre, Pimpri-Chinchwad, Maharashtra 411018, India.

E-mail: drbhavinishah71@gmail.com

by rapid regression of SBP and heart rate whereas plasma catecholamine concentrations regress more slowly.[3]

Clonidine is a partial agonist with high affinity and high intrinsic activity at alpha-2 receptors. It activates the alpha-2 receptor of the brain and spinal cord to decrease the sympathetic outflow, causing sedation, analgesia, hypotension and bradycardia without significant respiratory depression.[4] It is well absorbed after oral administration with peak plasma concentration in 75 to 90 minutes. Preoperative use decreases the intraoperative stress response by reducing the nociceptive transmission and decrease norepinephrine concentration in serum, provided haemodynamic stability.[5–6]

Esmolol is a Beta1-adrenoceptor blocker. It has a very short diffusion (2 minutes) and elimination half-life (9 minutes). Peak effects with bolus injections of esmolol are seen in 1–2 minutes.[7] Various workers have utilized esmolol to attenuate sympathetic vasopressor response associated with intubation.[8–9]

Considering both clonidine and esmolol have a suppressive action on activation of the sympathetic system, we evaluated their safety and efficacy in this study. We evaluated the attenuation of pressor actions by measuring and comparing heart rate, blood pressure and mean arterial pressure between two groups receiving either of the drugs at time of endotracheal intubation.

Materials and Methods

Institutional ethics committee clearance was obtained prior to start of the study. This prospective, randomized study was conducted for duration of 3 months in a tertiary care hospital. 60 patients willing to give informed consent (explained in native language) who satisfied inclusion and exclusion criteria were recruited in to the study.

Inclusion criteria:

- ASA grade I or II
- Patients above 18 years and below 65 years of age
- Patients of either gender
- Mallampati class I and II
- Patients willing to give informed consent for the study
- Patients with normal hemodynamic parameters prior to surgery
- Patients undergoing elective surgeries under general anesthesia.

Exclusion criteria:

- Patients with a difficult airway or difficult intubation
- Patients with significant cardiac, respiratory, renal, endocrine, nervous system disorders
- Patients with allergy to either of the study drugs.
- Patients with malignancies.

Patients were randomized in to 2 groups of 30 subjects each.

Group A: Clonidine group (n=30) will receive oral Clonidine 150 mcg 75–90 minutes before surgery.

Group B: Esmolol group (n=30) received intravenous esmolol 1.5 mg/kg 2 minutes before laryngoscopy and ETT intubation.

All patients were kept nil per oral (NPO) for a period of at least 6 hours prior to surgery to avoid the risk of aspiration. After shifting the patient on the operating table, all the monitors such as NIBP, pulse oximeter, ECG, etc will be connected to the patient. Baseline vital parameters such as systolic blood pressure (SBP), diastolic blood pressure (SBP), mean arterial blood pressure (MBP), SpO2, respiratory rate and ECG were recorded (T0). The study drugs were administered prior to intubation. The vital parameters were recorded once again after premedication (T1). Patients were pre-oxygenated for 3 minutes. This was followed by Inj. Propofol (2 mg/kg) given slowly till the eyelash reflex is lost followed by Succinylcholine (2 mg/kg). Vital parameters were recorded as (T2). Patients were intubated with cuffed Endotracheal tube. Air entry equal on both sides of the lungs was checked, cuff was inflated and tube fixed. Loading dose of Vecuronium 0.1 mg/kg i.v. was given. Anaesthesia was maintained with 65% Nitrous Oxide and 35% Oxygen mixture along with Isoflurane 0.8%–1% in Bains breathing circuit and controlled ventilation with intermittent doses of Vecuronium (0.08 mg/kg) as and when required by the patient. Post intubation vitals at 0, 1, 3, 5, 10 minutes (T3 to T7) were be recorded.

Results

Table 1: Evaluation of age.

Age	Group-A	Group-B
Mean	46.17	44.5
Std dev	7.03	4.8
Range	32 to 57 years	36 to 56 years
P value	0.288 (P>0.05) (Student's t-test)	
Inference	Non-significant difference in age between two groups	

Table 2: Gender.

Gender	Group-A	Group-B
Male	15	15
Female	15	15
P value (Chi-sq)	1	1
Inference	Equal number of male and female participation in both the groups	

Table 3: Evaluation of heart rate.

Heart rate	Group-A mean	SD	Group-B mean	SD	P value	Inference
T0	82.70	5.64	81.07	4.08	0.204	NS
T1	81.90	5.90	83.27	2.88	0.26	NS
T2	82.40	5.05	80.13	4.69	0.076	NS
T3	93.90	5.10	79.33	3.40	<0.001	S
T4	92.30	5.27	82.87	4.35	<0.001	S
T5	92.77	3.40	84.70	3.91	<0.001	S
T6	89.43	5.04	84.43	3.64	<0.001	S
T7	86.50	4.86	80.33	4.57	<0.001	S

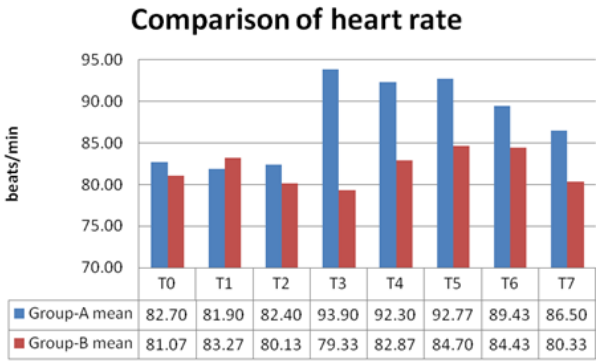


Table 4: Evaluation of SBP.

SBP	Group-A mean	SD	Group-B mean	SD	P value	Inference
T0	122.73	7.62	120.37	7.65	0.234	NS
T1	119.73	6.29	121.10	8.26	0.474	NS
T2	125.17	6.64	119.03	4.84	<0.001	S
T3	125.13	8.24	118.47	5.42	<0.001	S
T4	128.07	5.96	117.07	4.69	<0.001	S
T5	130.90	5.60	119.83	7.87	<0.001	S
T6	127.50	3.05	118.10	5.47	<0.001	S
T7	123.10	2.35	117.67	6.32	<0.001	S

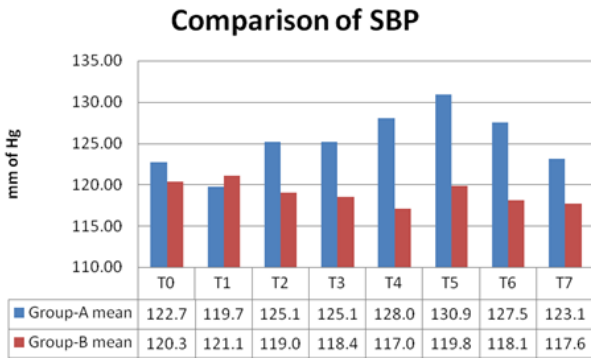


Table 5: Evaluation of DBP.

DBP	Group-A mean	SD	Group-B mean	SD	P value	Inference
T0	80.27	3.68	79.10	5.97	0.366	NS
T1	80.13	3.40	78.17	6.74	0.16	NS
T2	79.83	3.90	74.57	5.15	<0.001	S
T3	84.70	3.31	78.17	4.10	<0.001	S
T4	84.27	5.33	79.63	3.74	<0.001	S
T5	82.20	4.64	76.93	4.43	<0.001	S
T6	81.17	5.40	76.17	5.14	<0.001	S
T7	82.10	4.99	75.43	4.75	<0.001	S

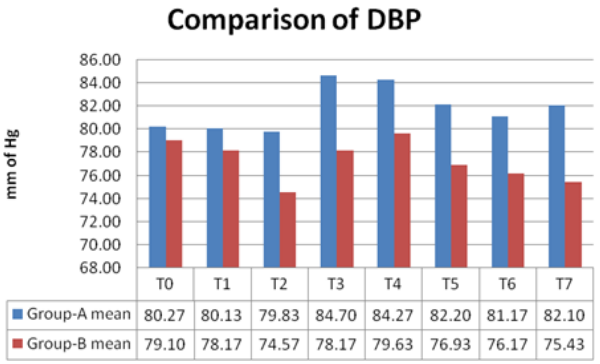
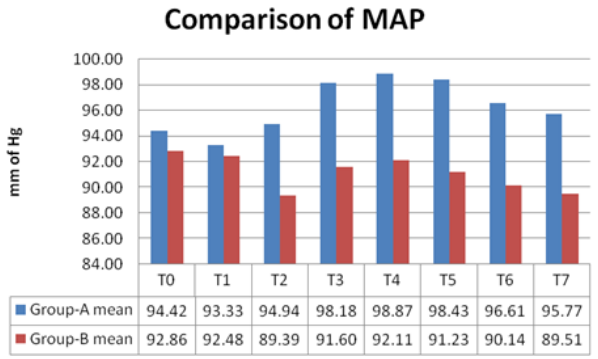


Table 6: Evaluation of Mean arterial pressure.

MAP	Group-A mean	SD	Group-B mean	SD	P value	Inference
T0	94.42	3.52	92.86	6.42	0.247	NS
T1	93.33	3.27	92.48	6.59	0.527	NS
T2	94.94	4.12	89.39	3.76	<0.001	S
T3	98.18	3.63	91.60	4.07	<0.001	S
T4	98.87	3.79	92.11	3.20	<0.001	S
T5	98.43	3.85	91.23	3.45	<0.001	S
T6	96.61	4.17	90.14	4.27	<0.001	S
T7	95.77	3.54	89.51	3.75	<0.001	S



Discussion

The patients were compared by age, gender and ASA groups. The mean age in group A was 46.17 years whereas it was 44.5 years in Group B (Table 1). The P value was non significant at 0.288 and hence Non-significant difference in age between

two groups was found. Equal number of patients had ASA grade 1 and 2 in both the groups at 17 and 13 respectively. Both the groups had equal number of gender participation at 15 males and 15 females in each group (Table 2). The baseline and T1 values of all vital parameters (heart rate, blood pressure, mean arterial pressure) was non significantly different when compared between the two groups. In group A that received oral clonidine the heart rate was significantly higher at time intervals T3 to T7 when compared to Group B that received intravenous esmolol (Table 3). The systolic blood pressure, diastolic blood pressure and the mean arterial blood pressure were similarly higher (significant $P<0.05$) at time intervals T2 to T7 in Group A that received oral clonidine when compared to Group B. These findings are suggestive of elevated vasopressor response in Group A when compared to Group B (Table 4-6). In our study Intravenous Esmolol in the dosage of 1.5 mcg/kg prior to laryngoscopy provided an adequate attenuation of pressor response to laryngoscopy and subsequent endotracheal intubation. No serious adverse events were noted in the study however, one patient in Group B had bradycardia (HR:58 bpm) that resolved without any intervention.

Various workers have utilized either of the drugs to suppress stress response in form of increase in heart rate and blood pressure at time of endotracheal intubation. Yadav S et al.[10] evaluated efficacy of single intravenous dose of esmolol hydrochloride in attenuation of hemodynamic response of laryngoscopy and endotracheal intubation. They noted that in dose of 1 mg/kg and 1.5 mg/kg drug effectively controlled post intubation rise in pulse rate whereas dose required to control MAP is higher (1.5 mg/kg) and without any serious side effects. We used a dose of 1.5 mg/kg in our study. Swargiri K et al.[11] noted attenuation of vasopressor response of at a higher dose of 3 mg/kg 3 minutes prior to laryngoscopy in form of intravenous bolus. On contrary, Gupta HB et al.[12] compared intravenous dexmedetomidine with esmolol (1 mg/kg dose) in suppressing vasopressor response at time of intubation and noted dexmedetomidine to be superior to esmolol. Rathore P et al.[13] compared oral pregabalin and clonidine for control of hemodynamic response to laryngoscopy and intubation. Authors noted that clonidine provided adequate control of hemodynamic response and it was superior to pregabalin. Singh S[14] noted that both oral and intravenous clonidine can be useful in attenuation of pressor response in patients undergoing elective surgeries with ASA grade I and II in general anesthesia requiring endotracheal intubation. The effect was more pronounced with intravenous clonidine without any adverse events.

Limitations

- Patients with ASA grade III and other co-morbidities were not included.
- Sample size was small and cannot be extrapolated.
- The study was not blinded with a chance of bias.
- The cost-effectiveness of the study drugs was not conducted.
- Effect beyond 10 minutes post intubation was not noted.

Conclusion

Esmolol can be an effective pharmacological agent that can be used for attenuation of pressor response during laryngoscopy and endotracheal intubation. Also no significant or serious side effects were identified in the study. We suggest conducting similar study with higher patient participation and also in patients with significant co-morbidities for a more comprehensive analysis. We also suggest comparing intravenous esmolol at various doses and in comparison with other drugs used for this purpose such as dexmedetomidine, labetolol, etc.

References

1. Reild LC, Brace de. Irritation of respiratory tract and its reflex effect upon heart. Surg gynarc and obst. 1940:70:157–62.
2. Hassan HG, el-Sharkawy TY, Renck H, Mansour G, Fouda A. Hemodynamic and catecholamine responses to laryngoscopy with vs. without endotracheal intubation. Acta Anesthesiol Scand. 1991;35:442–7.
3. King BD, Harris LC, Jr, Greifenstein FE, Elder JD, Jr, Dripps RD. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. Anesthesiology. 1951;12:556–66.
4. Sanderson PM, Eltringham R. The role of clonidine in anaesthesia. Hosp Med 1998;59:221–3.
5. Joris JL, Chiche JD, Lamy M. Clonidine reducaed haemodynamic changes induced by pneumoperitoneum during laparoscopic cholecystectomy. Br J Anaesth 1995;74:A124.

6. Nishikawa T, Taguchi M, Kimura T, Taguchi N, Sato Y, Dai M. Effects of clonidine premedication upon haemodynamic changes associated with laryngoscopy and tracheal intubation. Masui 1991;40:1083–8.
7. Sintelos AL, Hulse J, Pritchett EL. Pharmacokinetics and pharmacodynamics of esmolol administered as intravenous bolus. Clin Pharmacol Ther 1987;41:112–7.
8. Sharma S, Suthar OP, Tak ML, Thanvi A, Paliwal N, Karnawat R. Comparison of esmolol and dexmedetomidine for suppression of hemodynamic response to laryngoscopy and endotracheal intubation in adult patients undergoing elective general surgery: A prospective, randomized controlled double-blinded study. Anesthesia, essays and researches. 2018 Jan;12(1):262.
9. Reddy MM, Nagaraja AS. Attenuation of haemodynamic responses to laryngoscopy and intubation--a comparative study between IV esmolol and IV dexmedetomidine. Journal of Evolution of Medical and Dental Sciences. 2016 Oct 24;5(85):6313–8.
10. Yadav S, Verma RS. Attenuation of haemodynamic responses of laryngoscopy and endotracheal intubation: An evaluation of efficacy of single intravenous dose of esmolol hydrochloride. Indian Journal of Clinical Anaesthesia. 2019 Jan;6(1):40–6.
11. Swargiri K, Kumar P. Effects of three dose regimens of esmolol on haemodynamic responses to endotracheal intubation. International Journal of Surgery and Surgical Sciences (IJSSS). 2019 Jul 15;7(2):33–8.
12. Gupta HB, Vyas S. A comparative study of efficacy of intravenous dexmedetomidine and intravenous esmolol for attenuation of stress response during laryngoscopy and endotracheal intubation. International Journal of Basic & Clinical Pharmacology. 2016 Sep;5(5):1803.
13. Rathore P, Saini V, Ahmed F, Chatterjee R, Rathore M. A comparative study of oral clonidine versus oral pregabalin on hemodynamic responses to laryngoscopy and endotracheal intubation under general anaestesia. International Journal of Medical and Biomedical Studies. 2019 May 1;3(4).
14. Singh S. A Comparative Clinical Study of Oral Clonidine Versus Intravenous Clonidine on Haemodynamic Changes due to Laryngoscopy and Endotracheal Intubation. Pharmaceutical Science and Technology. 2020 Jan 9;3(2):34.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.42

Peripheral Nerve Stimulator for Obturator Nerve Block during Transurethral Resection of Bladder Tumor Following Spinal Anesthesia: Initial Experience

Shilpa G K Bhat[1], Suranjith Sorake[2], Divyashree[3], Nischith D Souza[4], Harish Hegde[5], Sampathila Padmanabha[6], Jeevan Kumar[7]

Author Affiliation: [1]Senior Resident, [2]Assistant Professor, [5]Professor and HOD, [6]Professor, Department of Anesthesia, [3]Post Graduate, [4]Associate Professor, [7]Post Graduate, Department of Urology, Yenepoya Medical College and Hospital, Deralakatte, Mangalore, Karnataka 575017, India.

How to cite this article:
Shilpa G K Bhat, Suranjith Sorake, Divyashree, et al. Peripheral Nerve Stimulator for Obturator Nerve Block during Transurethral Resection of Bladder Tumor Following Spinal Anesthesia: Initial Experience. Indian J Anesth Analg. 2020;7(5):1161–1165.

Abstract

Context: Bladder injury and perforation is a major problem encountered during transurethral resection of bladder tumor (TURBT) under spinal anesthesia which can be overcome using obturator nerve block.

Aims: To evaluate obturator nerve block (ONB) using peripheral nerve stimulator during TURBT.

Subjects and Methods: Twenty adult male patients underwent TURBT under spinal anesthesia. ONB was performed with peripheral nerve stimulator. Data was assessed in terms of primary endpoints - the occurrence of obturator jerk, injury or perforation of bladder, and surgeon satisfaction in terms of ability to resect the tumor, number of surgical interruptions and number of blood transfusions required.

Results: In our study, there was reduction in obturator jerk but not complete abolition, during resection of bladder tumor. Bleeding was observed, however no bladder perforation occurred.

Conclusions: We conclude that ONB, when administered along with spinal anesthesia for TURBT, is feasible, simple and safe method of anesthesia to overcome adductor contraction. ONB with peripheral nerve stimulator is more precise and extremely efficient, although not absolute during TURBT.

Keywords: Obturator Nerve Block (ONB); Transurethral Resection of Bladder Tumor (TURBT); Peripheral Nerve Stimulator (PNS).

Introduction

Bladder cancer is the ninth most common malignancy worldwide. The predominant histological type (90%) consists of urothelial carcinoma[1] Bladder tumors require transurethral resection (TURBT) as an initial step for diagnosis and sometimes therapeutic as in Non muscle invasive bladder tumor (NMIBC). Although TURBT is commonly performed under spinal anesthesia which offers many advantages such as technical ease of performing the procedure and avoiding the risks of general anesthesia; the major shortcoming with TURBT under spinal anesthesia is sparing of the obturator nerve with a potential complication of bladder injury or perforation secondary to obturator reflex i.e adductor muscle contraction from obturator nerve stimulation.[2]

The obturator nerve is mainly formed by the 3rd and 4th lumbar nerves with a minor contribution

Corresponding Author: Shilpa G K Bhat, Senior Resident, Department of Anesthesia, Yenepoya Medical College and Hospital, Deralakatte, Mangalore, Karnataka 575017, India.

E-mail: shilpabhat04@gmail.com

from L2. The nerve descends down on the psoas muscle and lies deep in the obturator canal. Exiting from here it divides into anterior and posterior branches. The anterior branch gives rise to an articular branch to hip and innervates adductor muscles, whereas the posterior branch innervates deep adductor muscles and the knee joint. The obturator nerve pass along with their corresponding vessels in pelvic cavity and exit through obturator canal to the thigh where it can be easily blocked.[3]

Various techniques of obturator nerve blocks (ONB) have been described such as using peripheral nerve stimulator, transvesical route and various ultrasound-guided ONB techniques (depending on the approach i.e distal or proximal.) We describe our initial experience of obturator block with peripheral nerve stimulation with key objective being - the ability to resect bladder tumor without occurrence of adductor jerk and hence avoiding bladder injuries or complications.

Material and Methods

Twenty patients with age range 59–73 years belonging to American Society of Anesthesiologists class III–IV underwent obturator block with peripheral nerve stimulation for transurethral resection of bladder tumor under spinal anesthesia. Exclusion criteria included patients with local site infection, coagulation disorders or surgery at lumbar spine and pubic region and patients with previous hypersensitivity to the local anesthetic agent. Preoperative assessment included ultrasonography and a CT of the KUB region to decide the side on which obturator nerve was to be blocked. Tumor number, location, size , shape, duration of surgery, blood loss, and postoperative complications, were all noted .The patients received 10 ml 2% preservative free lignocaine along with adrenaline for ONB.

Anesthetic Technique

Intravenous access was secured; patients were monitored routinely for pulse rate, noninvasive blood pressure, and oxygen saturation. Under strict aseptic precautions, in sitting position, all patients received subarachnoid block at lumbar space 3–4 or 4–5 with 2.5 ml of 0.5% heavy bupivacaine. After completion of spinal anesthesia, these patients were positioned supine with limb abducted to 30 degrees for obturator nerve block. After aseptic preparation of pubic area and upper thigh, an 10 cm long block needle attached to nerve locator set at 2.0 mA current intensity initially was inserted perpendicularly 1.5 cm lateral and inferior to pubic tubercle to hit pubic ramus and needle redirected caudally and medially to enter obturator foramen where obturator canal houses the nerve.(Fig 1) Needle tip is advanced until the tip is placed over the obturator foramen. When muscle contractions were visible on the medial aspect of the thigh at 0.5 mA current level, the local anesthetic was injected to block the obturator nerve. A waiting period of 20 min was allowed before initiating TURBT for the block to be in maximal effect. Monopolar cautery with the loop was used to resect the tumor, with setting adjusted between 70–80W for cutting and 50–60 W for coagulation.

During the operative procedure, surgeons observation was noted for primary endpoint of the study i.e resectability of the tumor whether hampered or unhampered due to adductor reflex. Adductor reflex was described as jerky adduction, and external rotation of the thigh at hip joint associated with interruptions of tumor resection. Bladder injury mandating the need of blood transfusions and bladder perforation were the secondary endpoints.

All patients who had unresectability of the tumor due to adductor jerk were managed under general anesthesia with adequate muscle relaxation.

Results

All twenty patients who underwent this technique of ONB were males aged between 59–73 years. Mean age of the patient undergoing the procedure was 65.4 years (SD 3.92). Duration of the surgery ranged between 37–57 minutes (Average 44.25 minutes). Obturator jerk was seen in 15% of the patients undergoing this procedure. (Fig 2) Complete resectability was hampered in 30% of the patients and 50% of these had associated abductor jerk. (Fig 3) Injury in the form of bladder wall tear was seen in 20% of the patients and necessitating blood transfusion in 10%. (Fig 4) However, bladder perforation was not noted in our study. As per the surgeon observation it was noted that there was overall a better ability to resect the tumor with reduced adductor reflex by the usage of ONB. Overall 85% surgeon satisfaction regarding absence of abductor jerk for successful surgery was observed in our study.

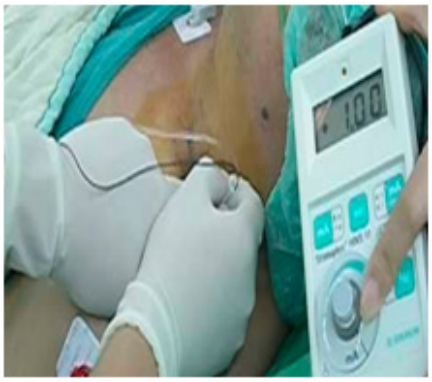


Fig. 1: Image showing usage of peripheral nerve stimulator to locate the obturator nerve.

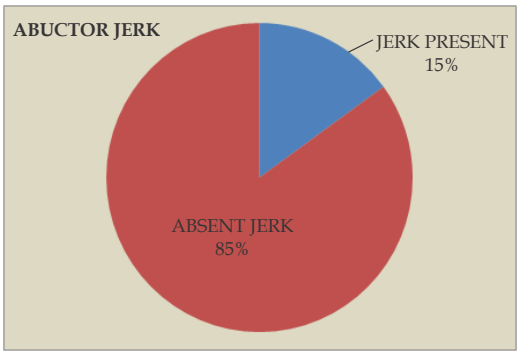


Fig. 2: Image showing percentage of patients having obturator jerk.

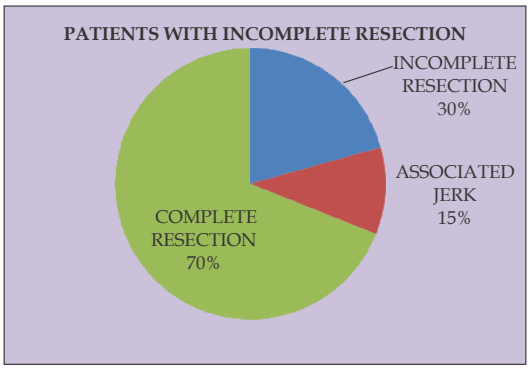


Fig. 3: Image showing percentage of patients with incomplete resection.

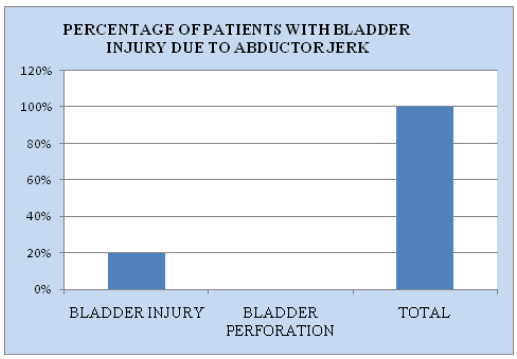


Fig. 4: Image showing percentage of patients having bladder injury and perforation.

Discussion

TURBT is widely used surgical technique for both diagnosis and treatment of bladder cancer. Usually when performed under spinal, obturator nerve sparing can produce adductor jerk causing difficulty in completing TURBT. Obturator nerve which courses along the lateral wall of the bladder in the pelvis can be easily stimulated by the electrical current passing through the Monopolar loop used for resection evoking an intense involuntary response in the form of jerk from adductor muscles i.e adductor longus, brevis, magnus, gracilis and external rotation by obturator externus of hip. This jerk can cause serious injury such as bladder injury, vessel wall laceration with profuse bleeding necessitating the need for blood transfusion, bladder wall perforation, and sometimes even incomplete resection due to frequent distractions and interruptions to the operating surgeon.[2,9]

Several methods were attempted to abolish this reflex including reducing the diathermy power and using bipolar instead of Monopolar cautery but none have been completely successful. Abolition of nerve stimulation with the use of current of low power such as 50 W for cutting and 40 W for coagulation, was reported by Gupta et al.[4] but these settings are too low for satisfactory and complete resection. Usage of ONB facilitated use of higher power sources compared to that used in Gupta et al facilitating complete resection. A study by Venkatramani et al. compared monopolar with bipolar cauterization concluded that bipolar TURBT was similar and not superior to unipolar TURBT with respect to bladder perforation, obturator jerk, and hemostasis.[5] Various other strategies, such as modification in the surgical procedure such as resecting the tumor on thinner slices, laser resection, usage of general anesthesia with muscle relaxants, partial filling of the bladder during resection, reversing polarity of electric current, and change in site of inactive electrode have been adapted to avoid complications during surgery but with wide variability in the results.[6] Smoking is an important risk factor for bladder tumor, and many of these patients have associated COPD due to long term smoking. General anesthesia is not always a suitable option as many of these patients are elderly and may have co-morbidities forbidding the use of the same especially due to associated pulmonary complication of general anesthesia.

Various methods have been described in literature to block obturator nerve. Peripheral nerve stimulation, USG guided and transvesical

block to name a few. Kennedy et al described nerve stimulation technique with a success rate between 83.8% and 85.7% with classic approach[7] A comparative study by Moningi S et al between the Classical technique described by Labat and the inguinal approach by Choquet Parks showed the latter approach more effective and lesser vascular complications than classic approach.[8] Augspurger and Donohue stated that 83.8% success can be achieved with abolishing obturator jerk through blind anatomic approach which is significantly lower compared to peripheral nerve stimulation technique described above.[10] Gasparich et al.[11] used the nerve stimulation approach with 0.5 mA, and 3–4 ml of 1% lignocaine with a success rate of 100%, while Kobayashi et al.[12] and Kuo et. al also used nerve stimulation with 0.5 mA and injected 7–40 ml of 0.25% bupivacaine with a success rate of 89.4%.[13]

Khorrami et al.[14] compared 30 patients each of transvesical blockade of obturator nerve with 10 ml 1% lignocaine injected through cystoscope along with spinal anesthesia with spinal anesthesia only. They observed a significant jerk in the spinal only group (16.5%) compared to the ONB through transvesical group (3%). Malik et al. compared ONB through peripheral nerve stimulation and transvesical route and reported transfusion in 25% of patients (11/42) after TURBT with peripheral nerve stimulation group.[15] Collado et al.[2] have reported 3.4% incidence of blood transfusion. Lower preoperative hemoglobin levels may be responsible for more transfusions. The above results are in comparison with our study. Rates of visibility of common obturator nerve, and anterior branch of obturator nerve with ultrasound were determined in 12/16, 13/16 respectively as per Akkaya Taylan et al. 93% of the patients reported satisfaction from the block by USG method.[16] This improved efficacy using newer techniques is probably attributed to the better visualization of the nerve and accurate localization before injecting the anesthetic drug.[17]

In our study, although bladder wall injury was noted in the form of bladder wall tear and 2 of the 4 necessitating transfusion, no bladder perforation was observed in any patients.

Conclusion

ONB using a peripheral nerve stimulator is a safe, effective and essential method to abolish adductor jerk in patients with bladder tumors undergoing TURBT under spinal anesthesia. It is simple and feasible with short learning curve which can achieve successful blocks with lesser patient complications and improved surgeon satisfaction. However, it is not absolute in the abolition of the adductor jerk. Hence in future, it is necessary for comparative studies with newer techniques of anesthetic drug delivery such as USG guided obturator nerve block etc. for better accuracy in achieving the block.

References

1. 1. Ferlay, J. et al. GLOBOCAN 2012v1.0, Cancer Incidence and Mortality Worldwide. IARC Cancer Base No. 11. Lyon, France: International Agency for Research on Cancer http://globocan.iarc.fr (Date of access: 06/07/2017) (2013).
2. Collado A, Chéchile GE, Salvador J, Vicente J. Early complications of endoscopic treatment for superficial bladder tumors. J Urol 2000;164:1529-32.
3. Berberoglu M, Uz A, Ozmen MM, Bozkurt MC, Erkuran C, Taner S, et al. Corona mortis: An anatomic study in seven cadavers and an endoscopic study in 28 patients. Surg Endosc 2001;15:72-5.
4. Gupta NP, Saini AK, Dogra PN, Seth A, Kumar R. Bipolar energy for transurethral resection of bladder tumours at low-power settings: Initial experience. BJU Int 2011;108:553-6.
5. Venkatramani V, Panda A, Manojkumar R, Kekre NS. Monopolar versus bipolar transurethral resection of bladder tumors: A single center, parallel arm, randomized, controlled trial. J Urol 2014;191:1703-7.
6. Kramer MW, Bach T, Wolters M, Imkamp F, Gross AJ, Kuczyk MA, et al. Current evidence for transurethral laser therapy of non-muscle invasive bladder cancer. World J Urol 2011;29:433-42.
7. Parks CR, Kennedy WF Jr. Obturator nerve block: A simplified approach. Anesthesiology 1967;28:775-8.
8. Moningi S, Durga P, Ramachandran G, Murthy PV, Chilumala RR. Comparison of inguinal versus classic approach for obturator nerve block in patients undergoing transurethral resection of bladder tumors under spinal anesthesia. J Anaesthesiol Clin Pharmacol 2014;30:41-5.
9. Dick A, Barnes R, Hadley H, Bergman RT, Ninan CA. Complications of transurethral resection of bladder tumors: Prevention, recognition and treatment. J Urol 1980;124:810-1.
10. Augspurger RR, Donohue RE. Prevention of obturator nerve stimulation during transurethral surgery. J Urol 1980;123:170-2.
11. Gasparich JP, Mason JT, Berger RE. Use of nerve stimulator for simple and accurate obturator nerve block before transurethral resection. J Urol1984;132:291-3.
12. Kobayashi M, Takeyoshi S, Takiyama R, Seki E, Tsuno S, Hidaka S, et al. A report of 107 cases of obturator nerve block. Jpn J Anesth 1991;40:1138-43.

13. Kuo JY. Prevention of obturator jerk during transurethral resection of bladder tumor. JTUA 2008;19:27-31.
14. Khorrami MH, Javid A, Saryazdi H, Javid M. Transvesical blockade of the obturator nerve to prevent adductor contraction in transurethral bladder surgery. J Endourol 2010;24:1651-4.
15. Malik MA, Nawaz S, Khalid M, Ahmad A, Ahmad M, Shahzad S, et al. Obturator nerve block (ONB) in transurethral resection of bladder tumor (TURBT). JUMDC 2013;4:16-21.
16. Akkaya T, Ozturk E, Comert A, Ates Y, Gumus H, Ozturk H, et al. Ultrasound-guided obturator nerve block: A sonoanatomic study of a new methodologic approach. Anesth Analg 2009;108:1037-41.
17. Thallaj A, Rabah D. Efficacy of ultrasound-guided obturator nerve block in transurethral surgery. Saudi J Anaesth 2011;5:42-4.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.43

To Study the Comparison of Ondansetron and Granisetron with Dexamethasone as Adjuvant for Prevention of Post Operative Nausea and Vomiting in Middle Ear Surgery

Shipra[1], Chandrika Bhut[2], Komal Shah[3]

Author Affiliation: [1]3rd Year Resident, [2]Assistant Professor, [3]Associate Professor, Department of Anesthesia, Government Medical College Bhavnagar, Gujrat 364001, India.

How to cite this article:
Shipra, Chandrika Bhut, Komal Shah, et al. To Study the Comparison of Ondansetron and Granisetron with Dexamethasone as Adjuvant for Prevention of Post Operative Nausea and Vomiting in Middle Ear. Indian J Anesth Analg. 2020;7(5):1167–1177.

Abstract

Aims: To determine the efficacy and safety of prophylactic ondansetron and granisetron with adjuvant dexamethasone in the prevention of PONV in patients of middle ear surgery.

- To assess the requirement of doses of rescue antiemetic in the postoperative period.
- To note the side effect of both the drugs if any

Settings and Design: Prospective, randomized, single blind study.

Methods and Material: After institutional review board approval and informed written consent from patients, total 100 patients were randomly assign in two groups of each 50. Group O received intravenously inj. dexamethasone 8mg two minute before induction and inj. ondansetron 4 mg diluted in 5cc NS, half hour before extubation. Group G received intravenously inj. dexamethasone 8 mg two minute before induction and inj. granisetron 1mg diluted in 5cc NS, half hour before extubation. Premedication was given to all patients. General anesthesia was given to all the patients. At the end of surgery, trachea was extubated when patient had spontaneous breathing and follow verbal command. After extubation, all the patients were shifted to post-anesthesia recovery room [PACU] and observed for post operative nausea and vomiting for 24 hours at interval of 0–2 hours, 2–6 hours, 6–12 hours,12–18 hours and 18–24 hours. Episodes of post operative nausea and vomiting were identified by spontaneous complaints by the patients.

Statistical analysis used: Data were analysed by using unpaired t -test, Chi-square test.

Results: Both the groups were comparable with regard to demographic data and hemodynamic parameters. The incidence of mean PONV score at different time interval was high in group O compare to group G but, the p value was more than 0.05 which was statistically not significant. The requirement of rescue antiemetic was more in group O (16%) compare to group G (6%) but, the p value was more than 0.05 which was statistically not significant. Complete response in 24 hours was more in group G (82%) compare to group O (72%) but, the p value was more than 0.05 which was statistically not significant. The incidence of PONV in 24 hours was high in group O (28%) compare to group G (18%) but, the p value was more than 0.05 which was statistically not significant. Incidence of side effects were comparable in both the groups (p value >0.05). So, in our study both the groups were comparable in prevention of PONV in middle ear surgery under general anesthesia.

Conclusion: Both ondansetron and Granisetron with dexamethasone as adjuvant were equally effective and safe for prevention of post operative nausea and vomiting [PONV] in middle ear surgery. Requirement of rescue antiemetic was comparable in both the groups. Minimal side effects were observed in both the groups. So, combination of dexamethasone 8 mg with either Granisetron 1 mg or ondansetron 4 mg was equally effective and safe in prevention of post operative nausea and vomiting in middle ear surgery under general anesthesia.

Keywords: Ondansetron; Granisetron; Dexamethasone; PONV score.

Corresponding Author: Chandrika Bhut, Assistant Professor, Department of Anesthesia, Government Medical College Bhavnagar, Bhavnagar, Gujrat 364001, India.

E-mail: chandrika62@gmail.com

Introduction

Post operative nausea, retching and vomiting are the known postoperative complications and it occur after regional, general and local anesthesia. A chance of PONV was higher especially with middle ear surgery, laparoscopic surgery, gynecological surgery and emergency laprotomy etc. Among all, the incidence of PONV is as high as 62– 80% when no prophylactic antiemetic is given.[15]

Post operative nausea and vomiting [PONV] can cause patient discomfort, alter the attitude of the patient, electrolyte disturbance, and may lead to delay in resumption of normal activities after elective surgery, increase pain at operative site, bleeding, dehydration and aspiration pneumonia in over sedated patient, delayed wound healing. The deleterious effect of PONV are not only limited to the patient health but can also produce a negative impact on hospital resource and the patient due to delay in recovery and prolonged hospitalization.[27]

Vestibular apparatus generates impulses when body is rotated or equilibrium is disturbed or when ototoxic drugs act. These impulses reach the vomiting centre mainly relayed from the cerebellum and utilize muscarinic as well as H1 receptor and 5 HT receptor.[28] The vestibular system can stimulate PONV as a result of surgery involving the middle ear. Sudden movement of the patient's head after awakening leads to middle ear vestibular disturbance, and increased incidence of PONV which is the main cause for PONV in middle ear surgery.[29]

Though several traditional antiemetic agent viz. metoclopromide, procloperazone, droperidol, antihistaminic, phenothiazine derivatives, anticholinergic and dopamine receptor antagonist are available in anaesthesthetic armamentarium, they were used in past but today they are not in much use for the prophylaxis and therapy because of their relative ineffectiveness and higher incidence of serious side effect like sedation, dysphoria, extra pyramidal symptoms, dry mouth, restlessness and tachycardia.[27]

Newer antiemetic agent like ondansetron and granisetron, a selective competitive antagonist of 5-hydroxytryptamine-3 [5HT] receptor, are used to treat PONV but still sometime not satisfied with this drug alone so, dexamethasone, a glucocorticoid; can be used as adjunct to antiemetics. Dexamethasone used as a component of combined prophylaxis for control of PONV in patients undergoing middle ear surgery because of potentiating effects of antiemetic agent, partial analgesic effect and anti-inflammatory action at surgical site.[3]

The FDA and SAMBA guidelines recommended 1 mg as the dose of granisetron for prevention of PONV.[2] Elhakim M et al concluded that dexamethasone 8mg represented the minimal effective dose for combination with ondansetron 4mg for prophylaxis of PONV.[3] So, with this background, the present study was undertaken to compare the antiemetic effects of optimal dose of ondansetron and granisetron with adjuvant dexamethasone to prevent PONV in patient of middle ear surgery.

Material and Methods

After getting approval from Institutional Review Board (IRB(HEC) 815/2018) and informed written consent from patients, this prospective, randomized, double blind study was carried out in the Department of Anaesthesiology, Govt. Medical College and Sir. T. Hospital, Bhavnagar, Gujarat. Trial was registered under Clinical Trial Registry India (CTRI registration No.CTRI/2019/05/025854.

Total 100 patients of either gender posted for middle ear surgery under general anaesthesia were enrolled in this study according to following criteria:

Inclusion Criteria:

- informed written consent
- Age : 18–50 years
- Gender: Male/female
- ASA : I and II
- Surgery: middle ear surgery

Exclusion Criteria

- Patient refusal
- History of drug allergy.
- Patient suffering from any major medical illness like uncontrolled diabetes mellitus, hypertension.
- Patient suffering from psychotic disorder and patient on antiepileptic drugs.

100 Patient were divided into two equal group of 50 patient in each. the patient were allocated to respective group by computer generated random number sequence.

Group O:

Patient in this group was received iv inj.

dexamethasone 8mg two minute before induction and inj. ondansetron 4 mg diluted in 5cc NS, half hour before extubation.

Group G:

Patient in this group was received iv inj. dexamethasone 8 mg two minute before induction and inj granisetron 1mg diluted in 5cc NS, half hour before extubation.

After through pre anesthetic check up, following patients were included and excluded from the study.

Procedure

Written informed consent was taken in local language. After shifting the patient to the pre anaesthetic care room, 20G intravenous canula was inserted in non dominant hand; ECG, non invasive blood pressure and SpO_2 was recorded by using multipara monitor. Inj.Dns was started and patient is shifted to operation room.

Premedication was given which include Inj. Dexamethasone 8mg, Inj.Glycopyrolate .004mg/kg, Inj.Midazolam 0.02mg/kg intravenously.

Multipara monitor was attached and ECG, pulse oximeter, non invasive blood pressure and end-tidal CO_2 were recorded in given time interval. General anesthesia will be induced by using intravenous Inj. Fentanyl 1 µg/kg, Inj. Propofol 1.5–2 mg/kg and Inj. Succinyl choline 2mg/kg.

Tracheal intubation was done using appropriate size cuffed portex endotracheal tube. Anaesthesia was maintained using oxygen, nitrous oxide, intermittent positive pressure ventilation, intermittent dose of Inj.Vecuronium and inhalational sevoflurane.

Mechanical ventilation was maintained with an 8 ml/kg tidal volume and frequency was adjusted to maintain $ETCO_2$ around 40 mmHg.

Half an hour before extubation inj granisetron 1mg diluted in 5 cc or inj ondansetron 4 mg diluted in 5cc was given to the patient in group ''O'' and group ''G'' respectively.

AT the end of the surgery, sevoflurane was turned off in both the groups, and mechanical ventilation was converted to manual ventilation with 100% oxygen at 8 liter/ min.

The patient was not to be disturbed, except by continual verbal requests to open their eyes. All other stimuli were prevented.

After thorough oropharyngeal suction, anesthesia was reversed using Inj. Glycopyrolate 0.008 mg/kg and Inj. Neostigmine 0.05 mg/kg after confirming return of neuromuscular function.

Trachea was extubated when patient had spontaneous breathing and follow verbal command. After extubation, all the patients were shifted to post anaesthesia [PACU] recovery room and observed for post operative nausea and vomiting and other complications.

The incidence of postoperative nausea and vomiting were recorded within 24 hr after surgery at interval of 0–2 hours, 2–6 hours, 6–12 hours, 12–18 hours and 18–24 hours. Episodes of post operative nausea and vomiting were identified by spontaneous complaints by the patients.

Score Table:

Score table to assess post operative nausea and vomiting[3,38]

0	No Sympotoms
1	Nausea Only
2	Nausea With Retching
3	Vomiting

Complete response was defined as the absence of nausea, retching or vomiting and no need for rescue antiemetics (inj Metoclopromide) during 24 hours observation period.

Rescue antiemetic was given in the form of inj Metoclopromide 10 mg iv slowly for vomiting or persistent nausea.

Side effects

Patient were observed for side effect like this:

- Headache
- dizziness
- drowsiness
- gastritis

Statistical analysis

The data entry was done in Microsoft Excel 2010 and the data analysis was done in Graph Pad InStat. Mean and percentages were calculated and p-value was established to find a statistical difference between the variables. The significance level was set at $p<0.05$. t test and Mann-whitney test were also applied for the analysis and qualitative data was analysed using chi-square test.

Observation and Results

Both the groups were comparable with regard to demographic data and hemodynamic parameters. The incidence of mean PONV score at different time interval was high in group O compare to group G but, the p value was more than 0.05 which was statistically not significant. The requirement of rescue antiemetic was more in group O (16%) compare to group G (6%) but, the p value was more than 0.05 which was statistically not significant. Complete response in 24 hours was more in group G (82%) compare to group O (72%) but, the p value was more than 0.05 which was statistically not significant. The incidence of PONV in 24 hours was high in group O (28%) compare to group G (18%) but, the p value was more than 0.05 which was statistically not significant. Incidence of side effects were comparable in both the groups (p value >0.05). So, in our study both the groups were comparable in prevention of PONV in middle ear surgery under general anesthesia.

Table 1: Patient characteristic's.

Patients Characteristic's	Group-O Mean±Sd	Group-G Mean±Sd	P Value
Age(Years)	33.22± 11.02	34.54± 11.11	0.288
Gender(M/F)	32/18	30/20	>0.05
Weight(Kg)	55.8± 8.33	58.48± 7.18	0.096
Height	160.30± 4.26	160.28 ± 3.58	0.426

Patients characteristic's in terms of age, gender, weight and height were comparable among both the groups.(p>0.05).

Graph 1 : Patient characteristics.

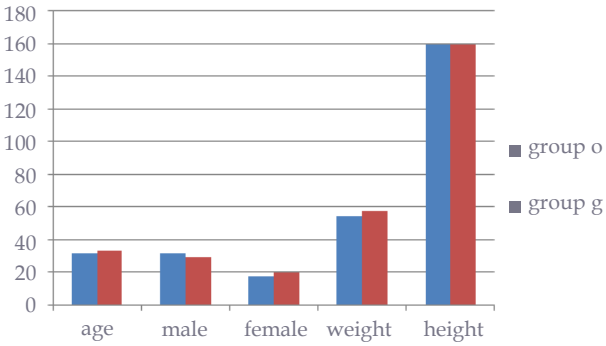
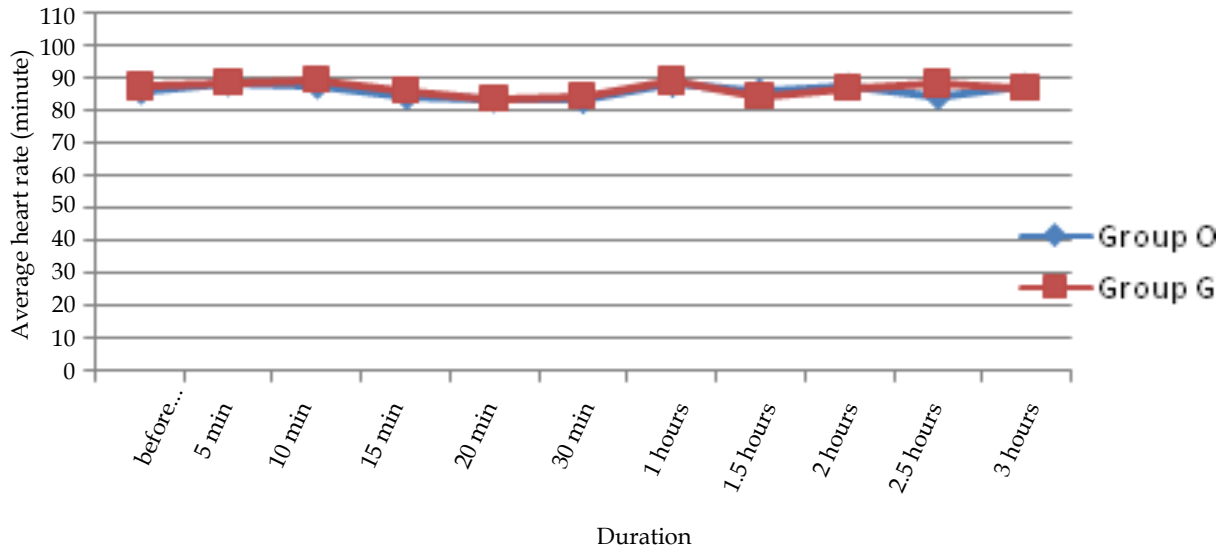


Table 2: Change in heart rate.

Time	Group O (N=50) Mean±Sd	Group G(N=50) Mean±Sd	P Value
Before Induction	86 ± 9.23	87.54 ± 50	0.724
After Induction			
5 Min	88.5± 10.02	88.64 ± 8.1	0.1409
10Min	88.1 ± 11.34	89.30 ± 9.05	0.1168
15 Min	84.82 ± 10.82	86.18± 9.63	0.4167
20 Min	83.76. ± 10.37	83.72 ± 8.56	0.1828
30 Min	83.46 ± 8.84	84.58± 8.41	0..7297
1Hours	88.28 ± 10.29	89.02± 8.92	0.3214
1.5Hours	86.46 ± 10.23	84.74 ± 9.01	0.3766
2 Hours	88.0± 10.19	87.38 ± 9.71	0.7392
2.5 Hours	84.70 ± 9.06	88.38 ± 9.10	0.9732
3 Hours	88.10 ± 8.43	86.9 ± 10.11	0.2067

Graph 2: Changes In Heart Rate.

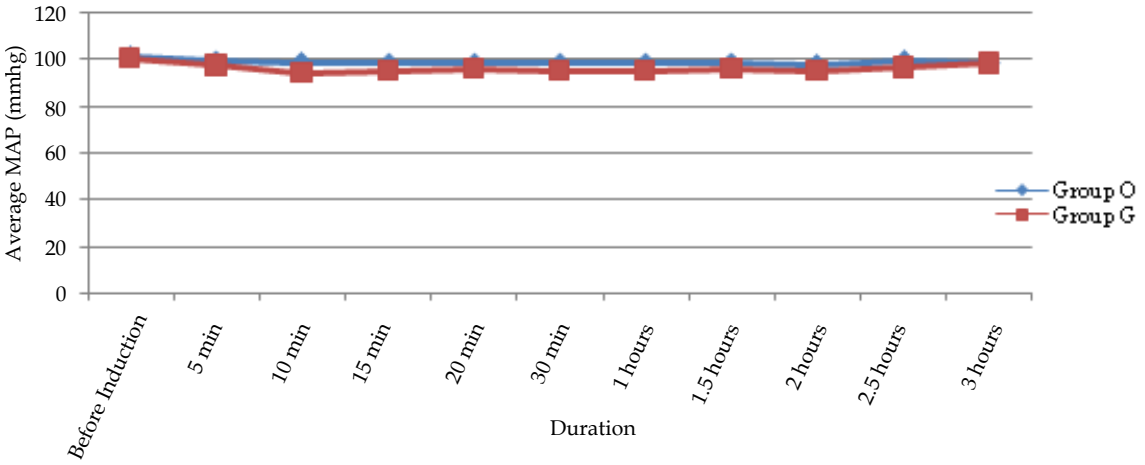


No significant difference was observed in the heart rate of two groups at different time interval (P value >0.05).

Table: 3: Comparison of Mean arterial pressure between two groups.

Time	Group O (N=50) Mean±Sd	Group G (N=50) Mean±Sd	P Value
Before Induction	100.78 ± 6.26	100.32± 7.02	0.505
After Induction			
5 Min	99.33 ± 5.09	97.33 ± 6.13	0.339
10Min	98.20 ± 5.20	94.46 ± 5.8	0.079
15 Min	98.8 ± 5.51	94.93 ± 6.68	0.101
20 Min	98.6 ± 5.07	95.74 ± 5.12	0.164
30 Min	98.73 ± 4.94	94.93 ± 7.6	0.116
1 Hour	98.86 ± 5.60	95.13 ± 7.08	0.120
1.5Hour	98.8 ± 5.11	95.73 ± 8.14	0.227
2 Hour	97.3 ± 4.7	95.2± 7.3	0.350
2.5 Hours	99 ± 5.24	96.2 ± 6.46	0.202
3 Hours	98.6 ± 5.18	96.06 ± 6.9	0.253

Graph 3: Changes In Mean Arterial Pressure.

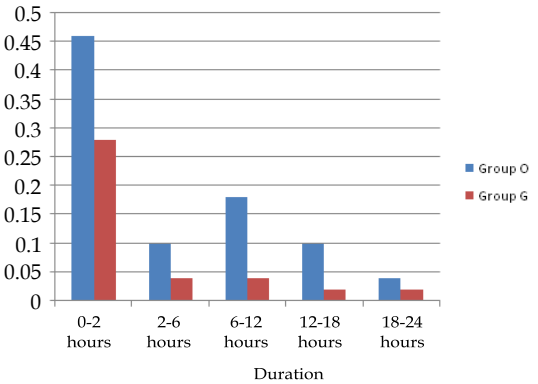


No significant difference was observed in the mean arterial pressure of two groups at different time interval (P value >0.05)

Table 4: Comparison of PONV SCORE between 2 groups.

Time after extubation	Group- O Mean±SD	Group-G Mean±SD	P value
0–2 hours	0.46 ± .90	0.28 ± 0.72	0.373
2–6 hours	0.10 ± 0.36	0.04 ± 0.19	0.713
6–12 hours	0.18 ± .56	0.04 ± 0.197	0.711
12–18 hours	0.10 ± 0.36	0 .02± 0.141	0.581
18–24 hours	0.04± 0.19	0.02± 0.141	0.857

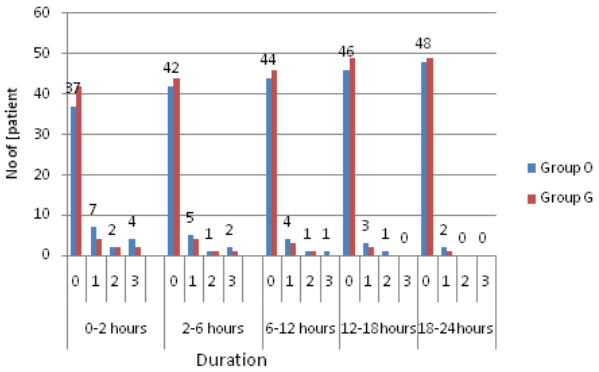
Graph 4: Comparison of PONV SCORE.



The Table 4 showed that mean PONV SCORE from 0 min to 24 hrs in study group.
PONV score was not significant in these two groups in 24 hours (p value >0.05).

Table 5: Ponv Score Wise Distribution.

Time	PONV score	Group O (N=50) No. of patient	Group G (N=50) No. of patient
0–2 hours	0	37	42
	1	7	4
	2	2	2
	3	4	2
2–6 hours	0	42	44
	1	5	4
	2	1	1
	3	2	1
6–12 hours	0	44	46
	1	4	3
	2	1	1
	3	1	0
12–18 hours	0	46	49
	1	3	2
	2	1	0
	3	0	0
18–24 hours	0	48	49
	1	2	1
	2	0	0
	3	0	0



Graph 5: PONV Score Wise Distribution.

Table 5: showed that

Complete response for 0–2 hours was 74% (37 patients) in group O and 84% (42 patients) in group G so, p value was more than 0.05 which was statistically not significant . (P value 0.3261, C.I. 0.5023–1.14).

Complete response for 2–6 hours was 84% (42 patients) in group O and 88% (44 patients) in group G so, p value was more than 0.05 which was statistically not significant. (P value 0.7732, C.I. 0.5170–1.413).

Complete response for 6–12 hours was 88 % (44 patients) in group O and 92% (46 patients) in group G so, p value was more than 0.05 which was statistically not significant. (P value 0.738, C.I. 0.4708–1.14).

Complete response for 12–18 hours was 92% (46 patients) in group O and 98% (49 patients) in group G so, p value was more than 0.05 which was statistically not significant. (P value 0.358, C.I. 0.3726–0.983).

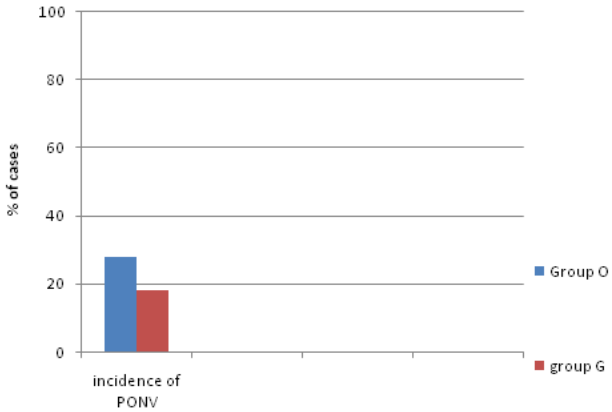
Complete response for 18–24 hours was 96% (48 patients) in group O and 98% (49 patients) in group G so, p value was more than 0.05 which was statistically not significant. (P value 0.557, C.I. 0.3252–1.694).

Complete response for 24 hours was 72% (36 patients) in group O and 82% (41 patients) in group G but, p value was more than 0.05 which was statistically not significant. (P value 0.3419, C.I. 0.5121–1.152).

Table 6: Incidence of PONV.

Incidence of PONV	Group O	Group G	P value
	28%	18%	0.341

Graph 6: Incidence of vomiting.

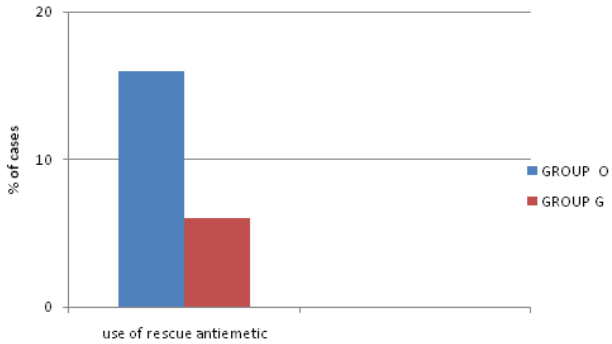


In 24 hours, overall incidence of PONV in group O was 28% (14 patients) and in group G was 18% (9 patients) but, p value was more than 0.05 which was statistically not significant.(p value–0.341, C.I..868–1.95).

Table 7: Use of rescue antiemetic.

Group O	Group G	P Value
8/50 (16%)	3/50 (6%)	0.2011 (C.I.=1.009–2.35)

Graph 7: Use of rescue antiemetic.



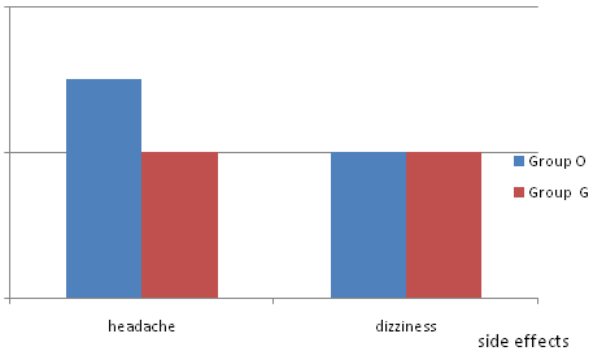
Rescue antiemetic (inj. Metoclopromide 10 mg iv slowly) was used 6% patients in group G while 16% patients in group O. Thus, incidence was higher in group O compare to group G but, the p value was more than 0.05 which was statistically not significant. (p value 0.2011, C.I–1.009–2.35).

Table 8: Comparison of Side effects.

In the present study side effects of drug like headache and dizziness were observed.

Side effects	GROUP O	GROUP G	P value
headache	6%	4%	0.738
dizziness	4%	4%	1.00

Graph 8: Comparison of Side effects.



Incidence of headache was 4% in group G and 6% in group O, but p value was more than 0.05 which was statistically not significant. (P value 0.738 with C.I. 0.709 to 2.124).

Incidence of dizziness was 4% in both the group but, p value was more than 0.05 which was statistically not significant. (P value 1.00 with C.I. 0.547 to 1.828).

Discussion

Post operative nausea and vomiting are one of the most common complications after anesthesia and surgery with a relative high incidence (60–80%) after middle ear surgery.[7] These high incidence justify the use of prophylactic antiemetic for prevention of PONV after middle ear surgery.

PONV can contribute to the development of medical problems and patients with PONV consume more resources and require additional health care professional time compared with patients in whom these complications are avoided.[1]

Several traditional antiemetic agents like antihistamines (hydroxyzine), Butyrophenones (droperidol), and dopamine receptor antagonist (metoclopromide) were used in past, but these drugs have undesirable side effects such as sedation, hypotension, dry mouth, dysphoria, restlessness and extra pyramidal symptoms.[15]

Newly introduced, the 5HT3 receptor antagonists are highly specific and selective for nausea and vomiting. Member of this group exert their effects by binding to the serotonin 5HT3 receptor in the chemoreceptor trigger zone and at vagal afferents in the gastrointestinal tracts.[11]

A potential new entry into the antiemetic pharmacopia in the year 1991 is ondansetron; of the class of selective 5 hydroxytryptamine subtype 3 (5HT3) receptor antagonists which lack effects on cholinergic adrenergic, dopaminergic or histaminergic receptors.[1]

The antiemetic property of ondansetron may be mediated peripherally, centrally or both. Ondansetron has little effect on lower esophageal sphincter pressure, esophageal or gastric motility, or small bowel transit time. By 5HT3 selectivity, the undesirable side effects of using antagonists of dopaminergic, cholinergic or histaminergic receptors as antiemetic agents, such as dysphoria, sedation and extrapyramidal symptoms, are avoided.[14]

The use of ondansetron has now become extended to the management of PONV routinely. Extensive trails using oral and intravenous ondansetron in various types of patients posted for various surgeries have confirmed the efficacy of the drug with a less side effect profile.[14]

Granisetron is recently introduced, 5-hydroxy tryptamine receptor antagonist, with stronger 5HT3 binding. It is more potent and longer acting antiemetic agent compared to ondansetron against emesis associated with chemotherapy and have been found to be very effective for preventing PONV. Granisetron has fewer incidences of side effects.[14] Granisetron is highly selective in its ability to bind the 5HT3 receptor 1000:1 to other receptor such as (5HT1A, 5HT1B, 5HT1C, 5HT1, 5HT2) or alpha 1 and alpha 2 adrenergic, dopamine D2, histamine H1, benzodiazepines, beta adrenergic and opoid receptors while the selectivity for ondansetron is only 250–400:1.[8]

Dexamethasone was first reported to be an effective agent in patient undergoing cancer[14] Granisetron is highly selective in its ability to bind the 5HT3 receptor 1000:1 to other receptor such as (5HT1A, 5HT1B, 5HT1C, 5HT1, 5HT2) or alpha 1 and alpha 2 adrenergic, dopamine D2, histamine H1, benzodiazepines, beta adrenergic, and opoid receptors, while the selectivity for ondansetron is only 250–400:1. chemotherapy in 1981.[12] Since, then randomized, placebo controlled studies have shown that the role of dexamethasone for the prevention of post operative nausea and vomiting compared to placebo shows that dexamethasone treatment, reduces early and late PONV.[13]

Combination therapy using antiemetics acting at different neuroreceptor sites is more effective than using individual component alone. This is particularly true when dexamethasone is combined with a serotonin receptor antagonist such as granisetron or ondansetron. The mechanism of antiemetic action of corticosteroid is unknown, but may be related to inhibition of prostaglandin synthesis, decrease in 5HT3 level in the cns and by an anti-inflammatory action at operative site.[9]

With regard to timing, the 5-HT3 receptor antagonists are most effective when administered

at the end of surgery where as dexamethasone seems to be most effective when given before the induction of anesthesia.[10]

The combination of dexamethasone and ondansetron was better than ondansetron alone.[8] Also, dexamethasone and granisetron was better than granisetron alone.[11]

With this background, present study was carried out in the dept. of Anaesthesiology, Government medical college & Sir T General Hospital, Bhavnagar to study the comparison of Ondansetron and Granisetron with Dexamethasone as adjuvant for prevention of post operative nausea and vomiting [PONV] in middle ear surgery.

The result of our study shows that demographic data (age, weight, sex, and height) and hemodynamic parameter (mean pulse rate, mean blood pressure) were comparable in both the groups. ($p > 0.05$).

The FDA and SAMBA guidelines recommended 1mg as the dose of granisetron for prevention of PONV.[2] Elhakim M et al concluded that dexamethasone 8 mg represented the minimal effective dose for combination with ondansetron 4 mg for prophylaxis of PONV.[3] Hence, our dose selection is justified.

During first 2 hours, after extubation, 37 patients (74%) did not developed PONV in group O while in group G, 42 patients (84 %) did not developed PONV. So, complete response for 0–2 hours was 74% in group O and 84% in group G but, p value was more than 0.05 which was statistically not significant. Mean PONV score in group O was (0.46 ± .90) and in group G was (0.28 ± 0.72), PONV score was high in group O, but p value was more than 0.05 which was statistically not significant. So, results of both the group were comparable in our study. (Table 4, 5).

Gan et al.[4] reported a similar study to ours using different dosages for abdominal hysterectomy. They also found that both combinations were equally effective in preventing PONV in the first two hours postoperatively. Thus, our result was in consonance with this study.

During 2–6 hours, after extubation, 42 patients (84%) did not developed PONV in group O while in group G, 44 patients (88%) did not developed PONV. So, complete response for 2–6 hours was 84% in group O and 88% in group G but, p value was more than 0.05 which was statistically not significant. Mean PONV score in group O was (0.10 ± 0.36) and in group G was (0.04 ± 0.19), PONV score was high in group O but, p value was more than 0.05 which was statistically not significant. (Table 4, 5)

During 6–12 hours, after extubation, 44 patients (88%) did not developed PONV in group O while in group G, 46 patients (92%) did not developed PONV. So, complete response for 6–12 hours was 88 % in group O and 92% in group G but, p value was more than 0.05 which was statistically not significant. Mean PONV score in group O was (0.18 ± .56) and in group G was (0.04 ± 0.197), PONV score was high in group O but, p value was more than 0.05 which was statistically not significant. (Table 4, 5)

Nethra H. et.[2] was also suggested that there is no statistical difference in between both groups in 12 hrs post operatively. Thus, our result was in consonance with this study.

During 12–18 hours, after extubation, 46 patients (92%) did not developed PONV in group O while in group G, 49 patients (98%) did not developed PONV. So, complete response for 12–18 hours was 92% in group O and 98% in group G but, p value was more than 0.05 which was statistically not significant. Mean PONV score in group O was (0.10 ± 0.36) and in group G was (0.02± 0.141), PONV score was high in group O but, p value was more than 0.05 which was statistically not significant. (Table 4 ,5).

During 18–24 hours, after extubation, 48 patients (96%) did not developed PONV in group O while in group G, 49 patients (98%) did not developed PONV. So, complete response for 18–24 hours was 96% in group O and 98 % in group G but, p value was more than 0.05 which was statistically not significant. Mean PONV score in group O was (0.04± 0.19) and in group G was (0.02± 0.141), PONV score was high in group O but, p value was more than 0.05 which was statistically not significant. (Table 4, 5).

Complete response was found 82% patients (41 patients) in group G and 72% patients (36 patients) in group O during 24 hours, but the p value was more than 0.05. So, it was statistically not significant. Thus, our result showed that both the groups were equally effective in prevention of PONV in middle ear surgery.

In our study during 24 hours, in group G 18% patients (9 patients) developed PONV, while 28% patients (14 patients) developed PONV in group O. So, the incidence of PONV was lesser in group G compared to group O but, the p value was more than 0.05 which was statistically not significant. (Graph 9).

Rescue antiemetic (inj. Metoclopromide 10 mg iv slowly) was used 6% patients in group G while

16% patients in group O, thus incidence was higher in group O compare to group G but, the p value was more than 0.05 which was statistically not significant. (Graph 10).

Our study showed that 6% patients complained of headache in group O and 4% in group G. So, p value was more than 0.05 which was statistically not significant. 4% patients, developed dizziness in both the groups, which was comparable in both the groups. So, side effects in both the groups were comparable. (Graph 11).

Dabbous A et al[2] also found that the combination of dexamethasone 8mg with either granisetron 1 mg or ondansetron 4 mg following induction of anesthesia in patients undergoing laparoscopic surgery showed no statistically significant difference in antiemetic efficacy with minimal side effects.[5] Thus, our result was in consonance with this study.

Similar results was also found by Nethra H. et[2] that granisetron 1 mg and ondansetron 4 mg in combination with dexamethasone 8 mg are equally effective and safe in decreasing the incidence of post operative nausea and vomiting in laparoscopic cholecystectomies under general anaesthesia. Thus, our result was in consonance with this study.

Similar study by Rakesh bendre et al.[1] showed that there was no statistically significant difference between the two combinations concerning rescue antiemetic required or side effects. It also showed that there is no statistical difference in two groups in late post operative period in terms of PONV and in early post operative period in terms of retching and vomiting. Thus, our result was in consonance with this study.

Gan et al[4] was also found similar result with both the groups during 0–2 hrs. Thus, our result was in consonance with this study.

Our study shows that administration of either combination granisetron with dexamethasone or ondansetron with dexamethasone were equally effective in prevention of PONV with minimal side effects in middle ear surgery under general anesthesia.

In our study, we observed that the incidence of PONV and requirement of rescue antiemetic drugs were higher in group O compare to group G. It was because of high receptor specificity and potency of Granisetron[26] but, the p value was more than 0.05. So, we concluded that both the groups were equally effective and safe in prevention of PONV with minimal side effects in middle ear surgery under general anesthesia.

Conclusion

We conclude the study of comparison of "Ondansetron and Granisetron with Dexamethasone as adjuvant for prevention of post operative nausea and vomiting [PONV] in middle ear surgery" as follows:

I. Both ondansetron and Granisetron with dexamethasone as adjuvant were equally effective and safe for prevention of post operative nausea and vomiting [PONV] in middle ear surgery.

II. Requirement of rescue antiemetic was comparable in both the groups.

III. Minimal side effects were observed in both the groups.

Thus, combination of dexamethasone 8 mg with either Granisetron 1 mg or ondansetron 4 mg is equally effective and safe in prevention of post operative nausea and vomiting in middle ear surgery under general anesthesia.

References

1. Bendre R, Karthik S, Potli S, Madhusudhana R. A comparative study of ondansetron with dexamethasone and granisetron with dexamethasone for prevention of postoperative nausea and vomiting following abdominal surgeries under general anaesthesia. WJPPS. 2015;4(3):605–20.
2. Nethra H. Nanjundaswamy, Raghavendra Biligiri Sridhara:A comparative study of ondansetron and granisetron in combination with dexamethasone-in prophylaxis for postoperative nausea and vomiting (PONV) in laproscopic cholecystectomies. International Journal of Research in Medical Sciences Nanjundaswamy NH et al. Int J Res Med Sci. 2018 Feb;6(2):503–508.
3. Kushwaha B, Chakraborty A, Agarwal J, Malick A, Bhushan S, Bhattacharya P. Comparative study of granisetron and ondansetron alone and their combination with dexamethasone, for prevention of PONV in middle ear surgery. Inter J Anesthesiol. 2007;13(2):10.
4. GanTaong J, Coop Andrew, Beverly K Philip. A randomized, double-blind study of Granisetron plus Dexamethasone versus Ondansetron plus Dexamethasone to prevent of postoperative nausea and vomiting in patient undergoing abdominal hysterectomy. AnesthAnalg 2005; 101:1323–9.
5. Dabbous Alia S, Jabbour-Khoury Samar I, Nasr Viviane G, et al, Dexamethasone with either Granisetron or Ondansetron for postoperative nausea and vomiting in laparoscopic surgery. M.e.j. anesth 2010; 20 (4): 565–570.

6. Elhakim M, Nafie M, Mahmoud K, Atef A: Dexamethasone 8 mg in combination with ondansetron 4 mg appears to be the optimal dose for the prevention of nausea and vomiting after laparoscopic cholecystectomy. Can J Anaesth 2002, 49:922–6.
7. Honkavaara P, Saarinavaara L, Klemola U-K. Prevention of nausea and vomiting with transdermal hyscine in adults after middle ear surgery during general anaesthesia. Br J. Anaesth. 1994; 73: 763–66.
8. Mihailidis M, Macheridou A, Kalantzi N, Violari M, Michaloliakou C: Comparison of the effectiveness of preventive ondansetron monotherapy and ondansetron-dexamethasone combination in surgical patients at high risk for postoperative nausea and vomiting (PONV). Eur J Anaesthesiol 2010, 27(47):11–12.
9. Y Lee, Hsien, Yong Lai, Pei-Chin Lin, Shen-Jer Huang, Youh-Sheng Lin, Dexamethasone prevents post operative nausea and vomiting more effectively in women with motion sickness. Can. J. Anesth. 2003: 50(3): 232–237.
10. Gan TJ, Meyer T, Apfel CC, et al. Consensus guidelines for managing postoperative nausea and vomiting. Anesth Analg 2003;97:62–71.
11. Biswas BN, Rudra A: Comparison of granisetron and granisetron plus dexamethasone for the prevention of postoperative nausea and vomiting after laparoscopic cholecystectomy. ActaAnaesthesiol Scan 2003; 47:79–83.
12. Lopez –Oaondo, et al, Advances in antiemetic pharmacology – ESRA refresher course, 2000; 1– 11.
13. Henzi I, Walder B, TramerM: Dexamethasone for the prevention of postoperative nausea and vomiting: A quantitative systemic review. AnesthAnalg 2000, 90:186–94.
14. D. Russel and G.N.C. Kenny, 5HT3 antagonist in post operative nausea and vomiting. Br. J. Anaesth 1992; 69(S): 63–68.
15. Fujji Y, Toyooka H, Tanaka H. Granisetron reduces the incidence of nausea andvomiting following middle ear surgery. Br J Anaesth. 1997;79:539–540. doi: 10.1093/bja/79.4.539.
16. Gilm AG, Rall TW, Nics AS, Taylor Peds. Goodman and Gilman's The pharmacological basis of Therapeutics New York: Pergamon Press; 1991.
17. Michael J. Murray, David A. Grossblatt, —Antiemetics, part vi, Gastrointestinal system and metabolism, Stoeltings Pharmacology and Physiology in Anaesthetic Practice, 5th edition, page 692–699.
18. Andrews PLR. Physiology of nausea and vomiting. Br J Anaesthesia 1992; 69 (Suppl.1): 25–195.
19. Ghassem E. Lari Jani. Treatment of PONV with Ondansetron: A randomized double comparison with placebo. Anaesth. Analog 1991; 73: 264–9.
20. Lessin JB. Does antimetic prophylaxis with ondansetron prolong recovery time? Anaesth. Analog 1991; 72: s162.
21. Scuderi P. Treatment of post operative nausea and vomiting after outpatient surgery with the 5 HTS antagonist ondansetron Anesthesiology 1993; 78: 15–20.
22. Claybon L. A single dose intravenous ondansetron for the 24 hours of PONV. Anaesthesia 1994; 49 (SUPPL): 24–9.
23. Pearman M.H. single dose intravenous ondanestron in the prevention of postoperative nausea and vomiting. Anesthesia 1994, Vol 49 (supplement) P.11–15.
24. Yoshitaka F, Hiroyoshi T, Hiderori T. Optimal antiemetic dose of granisctron for preventing post operative nausea and vomiting. Can J Anaesth 1994; 41: 94–7.
25. Yoshitaka F. Hiroyoshi T, Hideneri T. Granisetron reduces vomiting after strabismus surgery and tonsillectomy in children. Can J Anaesth 1996; 43 (1): 35–8.
26. Savant K, Khandeparker RV, Berwal V, Khandeparker PV, Jain H. Comparison of ondansetron and granisetron for antiemetic prophylaxis in maxillofacial surgery patients receiving general anesthesia: a prospective, randomised, and double blind study. Journal of the Korean Association of Oral and Maxillofacial Surgeons. 2016 Apr 1;42(2):84–9.
27. Gupta S, Choudhary R. A comparative clinical study of prevention of post-operative nausea and vomiting using granisetron and ondansetron in laparoscopic surgeries. The Internet Journal of Anesthesiology. 2009;26(1).
28. Essentials of medical pharmacology 6 th edition pg.no 639.
29. Rahman MB, Beattie J. J.. Post-operative Nausea and Vomiting. The Pharmaceutical Journal. 2019 Jul 19.
30. Naguib M, EI Bakry AK, Khoshim MHB et al, Prophylactic antimetic therapy with Ondansetron, Tropisetron, Granisetron and metoclopramide in patients undergoing laparoscopic cholecystectomy. Can J Anaesth 1996:43: 226–31.
31. Andrews PLR, Davis CJ, Bighanis DH, Honvthoin J. Mashell L. Theabdominal visceral innervation and the emetic reflex, pathway and plasticity. Can J Physiol Pharmacol 1990: 68: 325–45.
32. Rajeeva V, Bharadwaj N, Balia YK, Dhaliwal LK. —Comparison of ondansetron with ondansetron and dexamethasone in prevention of PONV in diagnostic laparoscopy. Can J Anaesth. 1999;46: 40–4.
33. Fujii Y., Tanaka H., Toyooka H., Prophylatic antiemetic therapy with Granisetron, droperidol and metoclopramide in female patients undergoing middle ear surgery Anaesthesia 1997, 53, P 1165–68.

34. Subramaniam B1, Madan R, Sadhasivam S, Sennaraj B, Tamilselvan P,Rajeshwari S, Jagan D, Shende D.Dexamethasone is a cost-effective alternative to ondansetron in preventing PONV after paediatricstrabismus repair.Br J Anaesth. 2001 Jan;86(1):84–9.

35. R. Thomas N. Jones, Prospective randomized, double-blind comparative study of Dexamethasone, Ondansetron, and Ondansetron plus Dexamethasone as prophylactic antiemetic therapy in patients undergoing day-case gynaecological surgery BJA: British Journal of Anaesthesia,Volume 87, Issue 4, 1 October 2001, Pages 588–592.

36. Bhattcharya D, Banerjee A. Comparison of Ondansetron and Granisetron for prevention of nausea and vomiting following day care gynecological Taproscopy. Indian journal Anesthesia 2003,47(4):279–282.

37. Kanwalpreet S, Mohindra B.K et al. A Comparative study of Granisetron, Dexamethasone, and Granisetron plus Dexamethasone as Propylactic antiemetic therapy in female patients undergoing breast surgery. J Anesth Clin Pharmacology 2007; 23(4): 373–378.

38. Gupta V, Wakhloo R, Lahori VU, Mahajan MK, Gupta SD. Prophylactic antiemetic therapy with ondansetron, granisetron and metoclopramide in patients undergoing laparoscopic cholecystectomy under general anaesthesia. Internet journal of anesthesiology. 2007;14(1):1–5.

39. Palazzo MGA, Strunnin L. Anaesthsia and emesis. 1 Etiology Can Anaesth Soc J.

40. Andrews PLR, Hawtnom J. The Neurophysiology of vomiting. Clinical Gastroenterology 1998: 2; 141–68.

41. Beattie WS, Lindbald T. Buckley DN, Forrest JB. The incidence of postoperative nau sea and vomiting in women undergoing laparoscopy 4: 31: 178–87.

42. Gervoreto F, Morvison JFB. Progress in Brain Research. Vol 67, London; Elsevier Slience Publishers: 1996.

43. Dollery C, Therapeutic Drugs Vol 1, 2nd edition, Churchill Livingstone, 1999, 021– 024.

44. Zofran package insert.

45. Monograph - Ondanesetron systemic. Drug information for the health careprofessional Vol I, 25th edition, U.S.A., Thomson Micromedex, 2005; 2206, 2208.

46. Monograph - Antiemetics. AHFS Drug Information, Gerald K, McEvoy, Snow EL, Kester L, Miller J. Welsh Jr. et al, USA., Authority of the Board of the American Society of Health-System Pharmacists, 2005;2806,2808.

47. Grandem package insert.

48. Kytril package insert.

49. Granisetron: An update on its clinical use in the management of nausea and vomiting. The oncologist 2004; 9:673–86.

50. Mikawa K. Takao Y. Nishina K. Mackawa N. Obara N. The antiemtic efficacy of prophylactic granisetron in gynecological surgery. Anaesth Analg 1995; 80: 970–74.

51. King MJ, Mllazokiewiez R, Carlif. Influence of neostigmine on postoperative vomiting Br J Anaesth 1988: 61: 403.

52. Keats A. Preoperative use of antiemetics. Anesthesiology 1960: 21:213.

53. Hindle AT. Recent development in the physiology and pharmacology of 5 hydroxytryptamine Br J Anesth 1994: 73; 395–407.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.44

A Comparison of Effect of Dexmedetomidine and Esmolol For Attenuation of Haemodynamic Stress Response During Direct Laryngoscopy and Tracheal Intubation

Shivananda PT[1], Shashank M[2]

Author Affiliation: [1]Associate Professor, Department of Anaesthesiology, Shimoga institute of medical sciences, Shivamogga, Karnataka, 577201, [2]Assistant Professor, Department of anesthesiology, Basaveshwara Medical College and hospital, Chitradurga, Karnataka, 577501.

How to cite this article:
Shivananda PT, Shashank M. A Comparison of Effect of Dexmedetomidine and Esmolol For Attenuation of Haemodynamic Stress Response During Direct Laryngoscopy and Tracheal Intubation. Indian J Anesth Analg. 2020;7(5):1179–1185.

Abstract

Objective: To study and compare the effectiveness of intravenous dexmedetomidine and esmolol in attenuating sympathomimetic response to direct laryngoscopy and endotracheal intubation.

Methods: 100 patients aged between 18 years to 50 years of either sex belonging to ASA class I and II with Mallampatti grading I and II posted for various elective surgeries under general anaesthesia were divided into two groups. Group D received dexmedetomidine 1 µg/kg and group E received esmolol 2 mg/kg. Heart rate, blood pressure and ECG were recorded at baseline, after premedication, after induction, after intubation, 1,2,3,5 and 10min after intubation.

Results: Heart rate and blood pressure at various intervals were noted and compared between the two groups. The attenuation of heart rate was more in dexmedetomidine group than the patients who received esmolol.

Conclusion: Dexmedetomidine is safe and more effective than Esmolol in attenuating the haemodynamic response to direct laryngoscopy and endotracheal intubation in patients undergoing surgical procedures under general anaesthesia.

Keywords: Dexmedetomidine; Esmolol; Intubation; laryngoscopy.

Introduction

Direct Laryngoscopy and endotracheal intubation are associated with certain cardiovascular changes such as hypertension, tachycardia and wide variety of cardiac arrhythmias. These hemodynamic changes occur due to epipharyngeal and laryngopharyngeal stimulation which causes reflex increase in sympatho-adrenal activity and sympathetic discharge.[1,2] Increase in blood pressure and heart rate are usually transient, variable and unpredictable. These effects are usually of no consequences in healthy individuals but it may be hazardous in patients with hypertension, myocardial insufficiency, pre-eclampsia, eclampsia, cerebral hemorrhage etc. To attenuate this stress response, various drugs and methods have been used[3] such as premedicating patient with antihypertensive drugs - vasodilator (eg. hydralazine), beta blocker (eg. Esmolol, labetalol), calcium channel blocker (eg. nifedipine), α-2 agonist (clonidine, dexmedetomidine), nitroglycerine (intravenous, intranasal spray or sublingual), ACE inhibitor (eg. captopril,enalapril), Opioids (fentanyl, alfentanyl, sufentanyl), Lignocaine (intravenous, spray or gargles), deepen plane of

Corresponding Author: Shashank M, Assistant Professor, Department of Anesthesiology, Basaveshwara Medical College and hospital, Chitradurga, Karnataka, 577501.

E-mail: shashankm.07@gmail.com

anaesthesia by intravenous induction agent or increasing concentration of volatile anaesthetic during mask ventilation, decreasing laryngoscopy time to less than 15 seconds.

Dexmedetomidine is a highly selective α-2 adrenergic agonist that has sympatholytic, sedative, anxiolytic and analgesic effect.[4] Studies have shown that dexmedetomidine decreases the induction doses of intravenous anaesthetic agent and also decreases the intra operative opioid and volatile anaesthetic requirements for maintenance of anaesthesia.[5,6]

Esmolol is a cardioselective β adrenergic blocker that has an effect with rapid onset and short duration. While it inhibits β1 receptors of myocardium, it also inhibits β2 receptors of smooth muscles of bronchial and vascular walls at higher doses.[7,8]

This study was designed to study and compare the effectiveness of intravenous dexmedetomidine and esmolol in attenuating sympathomimetic response to direct laryngoscopy and endotracheal intubation in patients undergoing surgical procedures under general anaesthesia.

Aims and Objectives

1. To study and compare the effectiveness of I.V. Dexmedetomidine and I.V. Esmolol in attenuating the haemodynamic response to direct laryngoscopy and endotracheal intubation in patients undergoing surgical procedures under general anaesthesia.
2. To study any side-effects of the drugs in intraoperative and postoperative period.

Materials and Methods

After obtaining institutional ethical committee approval, this prospective clinical study was conducted in the Department of Anaesthesiology, at McGann Hospital, Shimoga Institute of Medical Sciences, Shimoga. Written informed consent was obtained from 100 patients aged between 18 years to 50 years of either sex belonging to ASA class I and II with Mallampatti grading I and II posted for various elective surgeries under general anaesthesia at our institute. Exclusion criteria were patient refusal, patient less than 18 and more than 50 years, ASA grade III/IV/V, allergy to any of the anaesthetic drug used in the study, patients with hypertension, cardiac, renal, hepatic and respiratory diseases, patients on medications like hypnotics, narcotics or antihypertensive drugs, patients with difficult airway and obese patients, history of alcohol or drug abuse, pregnant or nursing mother. Study population were randomly divided by computer generated numbers into 2 groups with 50 patients in each group.

Preoperative assessement (PAC)

All the patients underwent a detailed pre anaesthetic check-up on the day before surgery and all the routine and specific investigations like Hemoglobin, Total leucocyte count, Differential leucocyte count, Liver function test, Renal function test, ECG, X-Ray chest (PA view), Fasting/ Random Blood Sugar, Platelet count were done. Whenever necessary special tests were carried out. The patients were electively kept nil by mouth for 6 hours before surgery and prior to operation patients were explained about the procedure and informed consent was taken from patients' relatives.

After the patient was shifted to the operation theatre, standard monitors like ECG, NIBP, and pulse oximetry were applied and baseline parameters [Spo_2, Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure(MAP) were recorded. Intravenous line with 18 gauge cannula was secured and intravenous fluid was started. Patients were pre-medicated with: Inj. Ondansetron 0.15 mg/kg i.v and Inj. Midazolam 1mg i.v. 1hour prior to surgery.

Group D: received Inj. Dexmedetomidine 1 μg/ kg diluted in 20 ml NS injected slowly over 10 min before induction.

Group E: received Inj. Esmolol 2mg/kg before induction.

All patients were preoxygenated with 100% oxygen at 8 lit/min for 3 minutes using Bain's circuit. Patients were induced after giving the study drug with Inj. Propofol 1% 2 mg/kg i.v. followed by Inj. Suxamethonium 2 mg/kg i.v to facilitate endotracheal intubation. Intubation was done with an appropriate Portex cuffed endotracheal tube after direct laryngoscopy using Macintosh blade. After confirming equal bilateral air entry, endotracheal tube was fixed and positive pressure ventilation was started. Maintenance with 50% 0_2+ 50% N_2O + sevoflurane + Inj. Vecuronium Bromide (0.08 mg/kg loading and 0.01 mg/kg maintenance)

Monitoring

- Heart rate(HR)
- Systolic blood pressure(SBP)
- Diastolic blood pressure(DBP)
- Mean arterial blood pressure(MAP)
- Pulse oximetry(Spo2)

All parameters were recorded at following stages:

- Baseline
- After pre-medication
- After induction.
- After intubation.
- At 1,2,3,5 and 10 mins after intubation.

All patients were reversed after onset of spontaneous respiration using Inj. Glycopyrrolate 8µg/kg i.v. and Inj. Neostigmine 0.05 mg/kg i.v. After satisfied criteria for extubation, thorough oral and endotracheal suction was done and patients were extubated. Any prevalence of laryngospasm, bronchospasm or desaturation were recorded and managed according to standard protocols. Any intraoperative complication were recorded and managed accordingly.

Patients were shifted to recovery room and any immediate postoperative complication e.g. nausea, vomiting, shivering, respiratory depression, sedation, restlessness, hypotension, bradycardia etc were recorded and managed accordingly.

Statistical Analysis

All patients data were recorded in proforma of study. Data was expressed as mean values ± standard deviation (SD). Quantitative data was analysed using t-test and qualitative by chi square test. Statistical calculations were carried out using Microsoft Office Excel 2010 and Graph Pad Prism 6.05 (quickcalc) Software (Graph pad software inc. La Jalla CA USA). Changes in hemodynamic variables from baseline and a comparison of means were analysed by paired t-test for each time interval. A P-value <0.05 was considered statistically significant. P value >0.05 was considered non-significant.

Observations and Results

100 patients aged between 18 years to 50 years of either sex belonging to ASA class I and II posted for various elective surgeries under general anaesthesia at our institute were randomly selected and divided by computer generated numbers into 2 groups with 50 patients in each group.

Group	Drug	Dose
D	Dexmedetomidine	1µg/kg in 20 ml NS Over 10 minutes i.v.
E	Esmolol	2mg/kg i.v.

Table 1: Demographic Data.

Group	D	E
Age (Years) Mean ± Sd	38.8±11.78	34.03±12.39
Sex	Male- 28	Male- 26
	Female- 22	Female- 24
Weight (Kgs)		
Mean ± Sd	65.96±9.03	62.26±6.15

No statistically significant difference was found between the groups (p>0.05).

Table 2: Comparison of changes in Mean HEART RATE between the two groups.

Heart rate	D		E		P Value
	Mean	± SD	Mean	± SD	DE
Baseline	84.56	11.2	86.53	13.35	0.5382
After premed	80.26	11.46	81.96	9.81	0.5395
After induction	81.46	10.96	83.96	11.81	0.3989
After intubation	87.36	8.91	94.06	12.35	0.0192
1 min after intubation	88.23	8.42	95.5	14.5	0.0209
2 min after intubation	85.73	9.42	93.6	12.98	0.0094
3 min after intubation	82.23	8.99	89.66	13.08	0.013
5 min after intubation	81.56	8.51	87.96	13.57	0.0327
10 min after intubation	78.06	8.17	82.3	12.22	0.1196

Graph 1: Changes in mean heart rate.

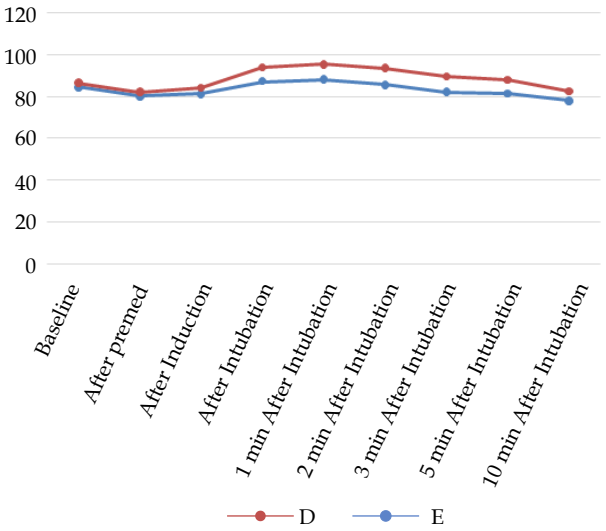


Table 3: Comparison of changes in Mean Sbp (Systolic Blood Pressure) ± S.D. between the two groups.

Systolic blood pressure	D		E		P Value
	Mean	± SD	Mean	± SD	DE
Baseline	125.73	9.77	126.7	10.18	0.7079
After premed	125.1	9.32	124.86	7.89	0.9146
After induction	124.9	11.44	122.46	7.8	0.3384
After intubation	128.93	11.52	135.46	10.98	0.0284
1 min after intubation	129.76	12.29	135.86	10.07	0.0398
2 min after intubation	125.9	12.28	133.4	8.68	0.0083
3 min after intubation	122.26	12.33	130.66	8.35	0.0031
5 min after intubation	118.36	11.42	124.2	8.31	0.0273
10 min after intubation	117	8.97	120.7	8.67	0.1097

Graph 2: Changes in mean SBP.

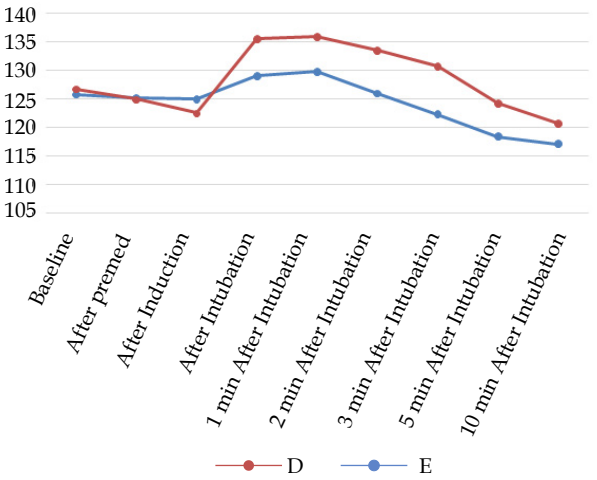


Table 4: Comparison of Changes in Mean DBP (Diastolic Blood Pressure) ± S.D. between the two groups.

Diastolic blood pressure	D		E		P Value
	Mean	± SD	Mean	± SD	DE
Baseline	78.9	8.01	80	7.99	0.5964
After premed	79.06	6.78	78.93	6.93	0.9417
After induction	78.23	9.1	77.63	5.97	0.7638
After intubation	84	8.11	88.83	6.1	0.0116
1 min after intubation	82.16	9.23	87.03	5.44	0.0157
2 min after intubation	79.73	8.57	85.2	3.88	0.0023
3 min after intubation	74.56	11.64	82.1	5.1	0.0012
5 min after intubation	72.2	9.75	78.16	5.65	0.0053
10 min after intubation	71.8	9.89	76.3	6.25	0.0395

Graph 3: Changes in mean DBP.

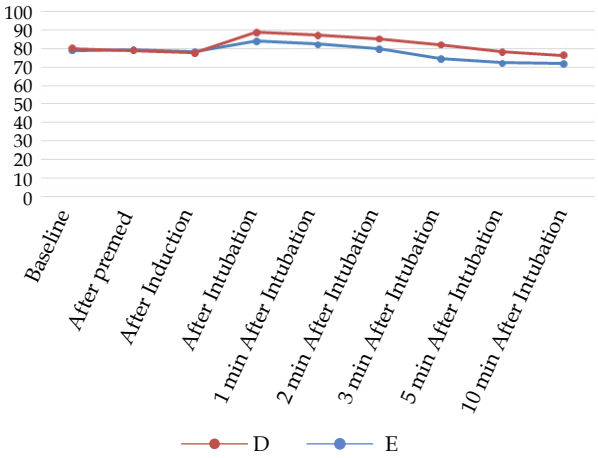


Table 5: Comparison of changes in Mean of MAP (Mean Arterial Pressure) ± S.D. between the two groups.

Mean arterial blood pressure	D		E		P Value
	Mean	± SD	Mean	± SD	DE
Baseline	94.5	7.93	95.26	8.13	0.7153
After premed	94.33	7.27	94.03	6.55	0.8672
After induction	93.76	9.41	92.5	5.61	0.5312
After intubation	98.96	8.14	104.46	6.53	0.0055
1 min after intubation	98.03	9.15	103.4	5.62	0.0082
2 min after intubation	95.1	9.22	101.3	4.44	0.0016
3 min after intubation	90.43	11.5	98.3	4.89	0.0011
5 min after intubation	87.63	9.56	93.5	5.69	0.0054
10 min after intubation	86.9	8.86	91	5.98	0.04

Graph 4: Changes in mean MAP.

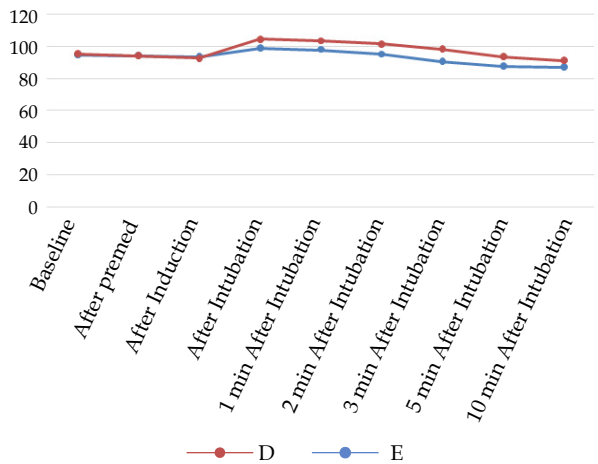


Table 6:

Side Effects and Compications	D	E
Intraoperative		
Bradycardia	--	--
Hypotension	--	--
Arrhythmia	--	--
Bronchospasm	--	--
POSTOPERATIVE		
Bradycardia/tachycardia	--	--
Hypotension/Hypertension	--	--
Arrhythmia	--	--
Respiratory depression	--	--
Bronchospasm	--	--
Vomiting	--	--

Discussion

Cardiovascular response to laryngoscopy and endotracheal intubation has always become a challenge for anaesthesiologists. Cardiovascular response may occur in form of hypertension, tachycardia and different types of arrhythmias. These effects may prove disastrous in patients of hypertension, myocardial insufficiency, pre-eclampsia, eclampsia, cerebral hemorrhage etc.[9,10] High incidences of myocardial ischemia- infarction, cardiac arrhythmia, acute LVF and cerebrovascular accidents following intubation in patients with hypertension were reported in study by C. Prys-Roberts et al (1971).[11] As discussed earlier, various drugs and techniques have been tried to attenuate this hemodynamic response to laryngoscopy and tracheal intubation. In our study we compared the effects of Dexmedetomidine and Esmolol in attenuating the hemodynamic response to laryngoscopy and tracheal intubation. For this study 100 patients aged between 18 years to 60 years of either sex belonging to ASA class I and II posted for various elective surgeries under general anaesthesia were selected randomly after applying inclusion and exclusion criteria. These patients were divided into 2 groups of 50 patients each.

Group D: Dexmedetomidine 1µg/kg in 20 ml NS over 10 minutes i.v.

Group E: Esmolol 2mg/kg i.v.

Both groups were comparable in age, sex and body weight as shown in Table 1, 2 and 3 and there was no statistically significant difference between these three groups.

Hemodynamic Parameters

(A) Heart Rate (Hr): As shown in Table 4, baseline values of mean Heart rate were comparable between two groups with no statistically significant difference (P>0.05). Changes in heart rate after giving study drug and after induction were also not statistically significant between any of the group. (P>0.05). Heart rate increased after intubation and increase was more in group E (94.06±12.35) and in group D (87.36±8.91). Maximum rise in heart rate was seen after 1 minute of intubation (Group D – 88.23±8.42, Group E – 95.5±14.50). Heart rate started to return to baseline values after 2 minute in group D and after 5 minutes in group E. Between group D and group E changes in heart rate was statistically significant after intubation and till 5 minutes after intubation. Thus our study suggests that Dexmedetomidine provides more significant attenuation of heart rate than Esmolol after laryngoscopy and tracheal intubation. Srivastava V. et al,[12] concluded that Dexmedetomidine provide better control of heart rate after laryngoscopy and intubation than Esmolol. Thus result of our study correlates with studies conducted by Srivastava V. et al.[12] Kharwar et al.[9] observed that there was a more decrease in pulse rate from baseline in the dexmedetomidine group as compared with the esmolol group from baseline after induction. At 1 min after intubation, they observed an increase in heart rate from baseline in the esmolol group and decrease from baseline in the dexmedetomidine group. While in our study heart rate increased from baseline after intubation in both dexmedetomidine and esmolol receiving patients.

(B) Systolic Blood Pressure(Sbp): As shown in table 5, baseline values of mean SBP were comparable between two groups with no statistically significant difference (P>0.05). Changes in SBP after giving study drug and after induction were also not statistically significant between any of the group(P>0.05). SBP increased in all groups after intubation and increase was more in group E (135.46±10.98mmHg) and less in group D (128.93±11.52mmHg). In both groups maximum rise in SBP was seen after 1 minute of intubation (Group D-129.76±12.29mmHg, Group E-135.86±10.07mmHg). SBP started to return to baseline values after 2 minute in group D and after 3 minutes in group C. Between group D and group E changes in SBP was statistically significant after intubation and till 5 minutes after intubation. (P<0.05). Thus this data indicates that Dexmedetomidine controls rise in SBP after laryngoscopy and tracheal intubation more effectively than Esmolol.

Reddy S. et al[13] showed that mean SBP levels were significantly controlled by Dexmedetomidine

as compared to Esmolol after intubation. Thus results of our study is comparable with studies conducted by Reddy S. et al.

(C) Diastolic Blood Pressure (DBP): As shown in Table 6, baseline values of mean DBP were comparable between two groups with no statistically significant difference (P>0.05). Changes in DBP after giving study drug and after induction were also not statistically significant between any of the group (P>0.05). DBP increased in all groups after intubation and increase was more in group E (88.83±6.10mmHg) and lesser in group D (84±8.11mmHg). Maximum rise in DBP was seen after intubation in all the groups. DBP started to return to baseline values after 2 minutes in group D and after 3 minutes in group E. Between group D and group E changes in DBP was statistically significant after intubation and till 10 minutes after intubation.(P<0.05). Thus our study shows that Dexmedetomidine attenuates rise in DBP after laryngoscopy and tracheal intubation more effectively than esmolol. Srivastava V. et al,[12] showed that the use of both esmolol and dexmedetomidine were effective in decreasing the hypertensive response to laryngoscopy and intubation though the use of dexmedetomidine was more effective for same. Jain V. et al[14] observed that the preinduction mean DBP values were statistically significantly different between the two groups of Dexmedetomidine and Fentanyl. (P < 0.05). Postinduction mean DBP showed a comparable increase, which was statistically not significant. Post laryngoscopic comparison of the mean DBP values showed a statistically significant variation in mean DBP values at 1,2,5,10, and 15 min, demonstrating better suppression of the pressor response to intubation in patients receiving Dexmedetomidine. In our study we observed that DBP were not significant pre-induction but was significant after intubation and after 1,2,3,5,10 minutes after intubation.

(D) Mean Arterial Pressure (Map): Baseline values of mean MAP were comparable between two groups with no statistically significant difference (P>0.05). Changes in MAP after giving study drug and after induction were also not statistically significant between any of the group (P>0.05). MAP increased in all groups after intubation and increase was more in group E (109.1±7.99 mmHg) and lesser in group D (98.96±8.14 mmHg). Maximum rise in MAP was seen after intubation in all the groups. MAP started to return to baseline values after 2 minutes in group D, after 5 minutes in group E. Between group D and group E changes in MAP was statistically significant after intubation and till 10 minutes after intubation. (P<0.05) Hence this study demonstrates that Dexmedetomidine is better than Esmolol in attenuating rise in MAP after laryngoscopy and tracheal intubation. Jain V.et al[14] did a comparison between the two groups of Dexmedetomidine and esmolol which showed that there was no statistically significant difference between the mean baseline MAP values of the two groups. The post laryngoscopic mean MAP values showed a statistically significant difference between the two groups, with intravenous dexmedetomidine group at 1,2,5,10, and 15 min demonstrating better suppression of the pressor response to intubation. Thus results of our study are comparable with studies conducted by Gupta S,Tank P[15] and Jain V.et al.[14] Gogus N. et al,[16] showed that esmolol was more effective than dexmedetomidine in prevention of the increases in systolic, diastolic and mean arterial pressures following endotracheal intubation. On the other hand, dexmedetomidine was more effective than esmolol in preventing the increase in heart rate which differs from our study which shows that Dexmedetomidine is better than Esmolol in controlling both heart rate and SBP,DBP and MAP.

Mean Oxygen saturation remained above 98% in all the groups. Changes in oxygen saturation was not statistically significant (P>0.05) between any of the groups at any point of time interval.

Side Effects and Complication

In our study, No intraoperative bradycardia, hypotension, arrhythmias, bronchospasm or postoperative vomiting, respiratory depression, bronchospasm, bradycardia/tachycardia, hypotension/hypertension, arrhythmias or any other side effects or complication were observed in any of the groups.

Summary and Conclusion

This study was designed to study and compare the effectiveness of intravenous dexmedetomidine and esmolol in attenuating sympathomimetic response to direct laryngoscopy and endotracheal intubation in patients undergoing surgical procedures under general anaesthesia. It is concluded that there was an increase in the heart rate , systolic blood pressure, diastolic blood pressure and mean blood pressure during laryngoscopy and post endotracheal intubation in both the groups but Dexmedetomidine

produces more significant attenuation of rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure as compared to Esmolol. No serious side effects or complications were found in any of the study groups.

Dexmedetomidine is safe and more effective than Esmolol in attenuating the haemodynamic response to direct laryngoscopy and endotracheal intubation in patients undergoing surgical procedures under general anaesthesia.

References

1. Shribman AJ, Smith G and Achola KJ: Cardiovascular and catecholamine response to laryngoscopy with and without tracheal intubation. Br. J Anaesth 1987; 59: 295-9.
2. King BD, Harris LC, Greifenstein FE, Elder JD and Dripps RD: Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. Anesthesiology 1951; 12:556-66.
3. Bruder N, Ortega D and Granthil C: Consequences and preventive methods of hemodynamic changes during laryngoscopy and intratracheal intubation. Ann Fr Anaesth Reanim 1992;11:57-71.
4. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. Anaesth Analg 2000;90:699-705.
5. Keniya VM, Ladi S, Naphade R. Dexmedetomidine attenuates sympathoadrenal response to tracheal intubation and reduces perioperative anaesthetic requirement. Indian J Anaesth 2011;55:352-7.
6. Kunisawa T1, Nagata O, Nagashima M, Mitamura S, Ueno M, Suzuki A, et al: Dexmedetomidine suppresses the decrease in blood pressure during anaesthetic induction and blunts the cardiovascular response to tracheal intubation. J Clin Anaesth. 2009; 21(3):194-9.
7. Menkhaus PG, Reves JG, Kissin I. Cardiovascular effects of Esmolol in anaesthetized humans. Anaesth Analg 1985;64:327.
8. Parnass SM1, Rothenberg DM, Kerchberger JP, Ivankovich AD. A single bolus dose of esmolol in the prevention of intubation-induced tachycardia and hypertension in an ambulatory surgery unit. J Clin Anesth. 1990 Jul-Aug;2(4):232.
9. Kharwar RK, Kumar R, Tiwary PK, Suwalka U, Prakash S. A comparison of intravenous dexmedetomidine v/s inj. fentanyl for attenuation of hemodynamic responses during laryngoscopy and intubation after propofol induction. NJIRM 2014 ; 5:71–75.
10. Forbes A.M. and Dally F.G.:Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive patient. British Journal of Aanesathesia,1970;42:618-624.
11. C Pyrs. Roberts et al:Studies of anaesthesia in relation to hypertension-hemodynamic consequences of induction and endotracheal intubation.British Journal of Anaesthesia,1971;43:531-545.
12. Srivastava VK, Agrawal S, Gautam SKS, Ahmed M, Sharma S, Kumar R. Comparative evaluation of esmolol and dexmedetomidine for attenuation of sympathomimetic response to laryngoscopy and intubation in neurosurgical patients. Journal of Anaesthesiology, Clinical Pharmacology. 2015;31(2):186-190.
13. Reddy SV, Balaji D, Ahmed SN. Dexmedetomidine versus esmolol to attenuate the hemodynamic response to laryngoscopy and tracheal intubation: A randomized double-blind clinical study. International Journal of Applied and Basic Medical Research. 2014;4(2):95-100.
14. Jain V, Chandak A, Ghosh A, Golhar M. Comparison of dexmedetomidine and fentanyl for attenuation of the hemodynamic response to laryngoscopy and tracheal intubation. Ain-Shams J Anaesthesiol 2015;8:236-43.
15. Gupta S, Tank P. A comparative study of efficacy of esmolol and fentanyl for pressure attenuation during laryngoscopy and endotracheal intubation. Saudi J Anaesth 2011;5:2-8.
16. Gogus N, Akan B, Serger N, and Baydar M. The comparison of the effects of dexmedetomidine, fentanyl and esmolol on prevention of hemodynamic response to intubation. Revista Brasileira de Anestesiologia.@014 64(5), 314-319.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.45

Effectiveness of 5% Lidocaine Patch in Post Mastectomy Cancer Pain – A Randomized Controlled Trial

Sushree Das[1], Nupur Moda[2], Madhusmita Patro[3]

Author Affiliation: [1-3]Assistant Professor, Department of Anesthesiology and Pain Medicine, Institute of Medical Sciences and SUM Hospital, Bhubaneswar, Odisha 751003, India.

How to cite this article:
Sushree Das, Nupur Moda, Madhusmita Patro. Effectiveness of 5% Lidocaine Patch in Post Mastectomy Cancer Pain – A Randomized Controlled Trial. Indian J Anesth Analg. 2020;7(5):1187–1191.

Abstract

Background: The control of cancer pain still is a significant problem in patients undergoing major oncological surgical procedures. The use of high dose opioids has resulted in multiple side effects. The present study was carried out to analyze the effectiveness of a 5% lidocaine patch in patients with cancer pain undergoing mastectomy.

Methods: This was a prospective randomized control trial. Sixty patients were included in the study. Group A patients have 5% lidocaine patch applied, and in Group B, a placebo patch was used. Demographic profile, the severity of pain score, and opioid requirement, at the beginning and conclusion of the treatment, patients' impression, drug-related side effects all were noted.

Results: 60 patients took part in the study, with fourteen days mean follow up. The Mean Verbal Numerical Scale (VNS) score was 3.5 in Group A and 6.76 in Group B at Day 1(P=0.00), and VNS Score was 4.06 in Group A and 7.3 in Group B at Day 5(P=0.00). At days 10 and 14, both the groups had no statistically significant difference in pain score. The opioid requirement in group A was significantly less, the average being 636.67 mg and in Group B being 2123.34 mg.

Conclusions: 5 % lidocaine patch was found to be useful for short period management of neuropathic pain along with allodynia derived from a painful scar. But its long term usefulness is yet to be validated.

Keywords: Cancer Pain; Lidocaine; Nociceptors; Mastectomy; Neuralgia; Allodynia; Pain Assessment; Opioid.

Introduction

Cancer patients commonly experience pain ranging from 30% in the early stages to 90% at advanced stages.[1] Treatment of such pain remains a challenge. Cancer pain results from multiple interactions between the central and peripheral nervous system, cancer cells, and the immune system.[2,3] Local immune cells, along with cancer cells, secrete a range of substances that stimulate the pain receptors/nociceptors. Neuropathic pain is an area that is often ignored in patients undergoing cancer treatment as well as post-treatment when the patient is on follow up.

In a multicentre international survey, neuropathic mechanisms were seen in 40% of the patients with cancer pain.[4] On using the Edmonton Staging System in palliative care services, 17% incidence of neuropathic pain was seen in cancer patients.[5] This type of pain is described by the character of burning pain, hyperalgesia, and paroxysmal pain.

Post-mastectomy pain syndrome (PMPS) is a condition with a chronic pain that is neuropathic in nature and occurs following surgery.

Corresponding Author: Nupur Moda, Assistant Professor, Department of Anesthesiology and Pain Medicine, Institute of Medical Sciences and SUM Hospital, Bhubaneswar, Odisha 751003, India.

E-mail: drnups@yahoo.com

The neuropathic pain brings in many complex challenges for the treating physician, and also, in addition to the family and caregivers, the patients undergo anxiety, distress, and frustration. The treatment options at present include opioids, tramadol, and other drugs, blocks, stimulators, and intrathecal catheters.[6] Opioids have been widely used in cancer pain, and despite constipation and respiratory problems, it also has issues like addiction. Tricyclic antidepressants and anticonvulsants have been used for neuropathic pain as first-line drugs.[7,8] Since the early 1990s, opioids have been successfully used for neuropathic pain and has established itself as an option for moderate-to-severe cancer pain.[9,10]

Management of neuropathic pain remains a challenge for cancer patients who have been exposed to multiple drugs.[11] To date, there are very few studies carried out to focus on other newer options to deal with post-mastectomy neuropathic pain, in spite of it being an area of concern.

5% lidocaine plaster (LP5) is recommended for localized neuropathic pain, but evidence in postsurgery neuropathic pain is missing. Thus, in the present study, we compared the efficacy of lidocaine 5% patches with a placebo patch in post-mastectomy patients.

Material and Methods

The study was conducted in the tertiary care center in Pain and Palliative care OPD and Ward by the Department of Anesthesia. The Good Clinical Practice standards and the ethical principles, according to the Helsinki Declaration, were followed. Our study followed the CONSORT recommendations. After approval from the Institutional Ethical Committee, 68 patients of breast cancer post-mastectomy were included in the study. Informed written consent was taken from all patients included in the study. A sample size of 46 patients was required for this placebo-controlled parallel-design study. With a 20% drop out rate, a total of 56 cases were sufficient to close the study; however, 68 subjects were enrolled.

Patients were randomized into two groups using a computer-generated random number sequence. One being test group, Group A, which received 5% lidocaine patch and the other control Group B which received a placebo patch. Informed written consent was taken from all the participants.

Inclusion criteria included females ranging from the age of 18 to 65 yrs with mastectomy and visited the outpatient department with complaints of pain. The patient had undergone mastectomy for early and advanced stages of breast cancer by a surgeon who had comparable surgical skills. To be included in the study, the patient should have been on one analgesic, such as paracetamol at therapeutic dose before the addition of the patch, and the pain score had to be > 4/10 on the Verbal Numerical Score (VNS). The patients with advanced breast cancer and ASA grade 3 and 4 were excluded from the study. 5% lidocaine patch was used in Group A, and a placebo patch in Group B. Maximum of 3 patches was allowed to be used by the patients at the scar site for 12 hours each day. The painful scar was found to be the main cause of pain in these patients. The patients were followed up in day one that is the next day after patch application, on day 5, day ten and day 14.

The primary objective was to study the short term efficacy of a 5% lidocaine patch for cancer pain. Patients' perception of the treatment and adverse effects of 5% lidocaine patch evaluation was the secondary objective. Demographic data, variable relating to the severity of the pain using Numerical Verbal Score (VNS), the concomitant opioid requirement in both groups, i.e., breakthrough pain, patients' subjective perception, and treatment-related side effects were all recorded. The patient perception was assessed with a simple question and answer like "Have you noticed any improvement in the pain since the treatment with the patch?" with the response categories of "none," "mild," or "significant." VNS was used to assess the severity of pain by giving score "0" for no pain at all and score "10" for worst imaginable pain. Opioid dose modification was allowed, but a dose of co-analgesics had to be the same.

Statistical Analysis was done using Stata 11.1 software and t-test and chi-square test. Mean and Standard deviation was calculated for quantitative variables, and the percentage was used for categorical variables.

Results

There were 68 patients willing to participate in the study. Out of these, four were excluded in the initial phase as two patients did not meet inclusion criteria, while two did not give consent. The rest (n = 64) were randomized and allocated to the two different intervention groups (Groups A and B), with proper allocation concealment in place (n = 32 each). The interventions were applied to the cases and followed up. In group A, two patients were lost to follow up, so n=30. However, in group

B, one patient was excluded from the study due to the need for hospitalization, and one was lost to follow n=30. Thus, a total of 60 patients were analyzed (n = 30 in each group). Details have been summarized in the CONSORT flow diagram (Fig. 1). The average age of the patients in both groups was similar and statistically, not significant. Even the ASA grade was similar and non-significant. This ensures that randomization had been done correctly, and there is no selection bias. The Mean Verbal Numerical Scale (VNS) score was 3.5 in Group A and 6.76 in Group B at Day 1(P=0.00), and VNS Score was 4.06 in Group A and 7.3 in Group B at Day 5(P=0.00). At days 10 and 14, the pain scores were almost comparable average being 7.3 and 8.06, respectively, in Group A and 7.6 and 8.1, respectively, in Group B (Table 1). The opioid requirement in group A was significantly less, average daily tramadol requirement being 636.67 mg Group B being 2123.34 mg. 63.66 % of patients were satisfied with the therapy in Group A (Table 2). Patients did not report any local site adverse effect or any systemic misadventure.

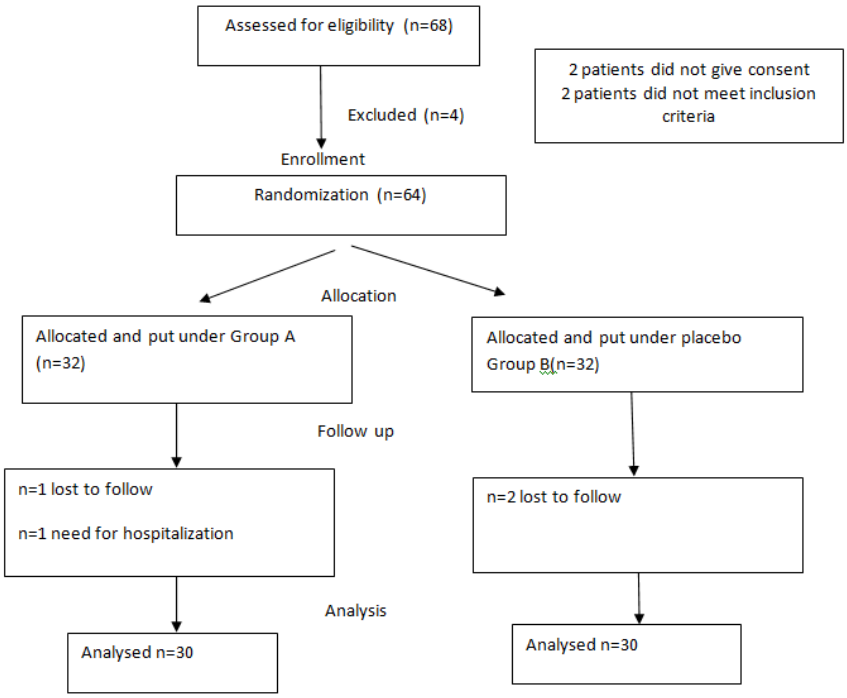


Fig. 1: Consort Flow Chart.

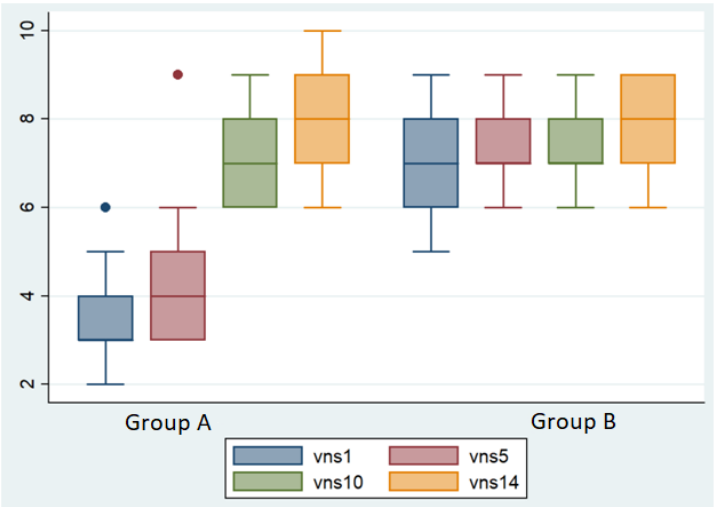


Fig. 2: Graph Box showing VNS in both Groups.

Table 1: Mean VNS in both Groups.

	Group A	Group B	P Value
VNS at day 1	3.5	6.76	0.0000
VNS at day 5	4.06	7.3	0.0000
VNS at day 10	7.3	7.6	0.1240
VNS at day 14	8.06	8.1	0.4473

Table 2: Mean Opioid Requirement and Patient Satisfaction.

	Group A	Group B	P Value
Tramadol requirement	636.67 mg	2123.34 mg	0.0000
Patient satisfaction	63.66 %	38.5 %	0.0000

Discussion

To date, there are not many randomized trials showing the efficacy of 5% lidocaine patch for these painful scars. 5% lidocaine patch showed short term effectiveness in this study for neuropathic cancer pain, derived from the painful scar. In patients with allodynia, the mechanism of symptomatic relief with lidocaine patch has not been understood. Lidocaine acts by blocking the abnormally functioning sodium channels in nociceptors of the skin, thus decreasing the ectopic discharges.

The result of our study is similar to the nonrandomized study by Cristina Garzón-Rodríguez et al.[12] Only three patients required an interventional anesthetic technique during the follow-up period in their study. The authors stressed the role of the selection of patients having neuropathic pain, which should be well localized, superficial, and have allodynia or hyperalgesia occurring from both painful scars. We studied patients who had neuropathic pain secondary to post-mastectomy. Ours was a randomized placebo-controlled trial, which clearly showed improvement in pain score by application of a 5 % lidocaine patch.

Julia Ann Fleming et al.[13] also conducted a retrospective study for the role of lidocaine patch in neuropathic pain. No analgesic effect or benefit was seen in 45% of the patients. The potent benefit was seen in 35% of patients with persistent postsurgical pain.

The VNS was used to assess the severity of pain, but no scale was used for the Analysis of emotional stress, quality of sleep, and interference with daily activity. This is one limitation of the study.

Optimum duration of treatment with patch also lacks consensus. Fleming et al. proposed the use of the patch for at least ten days before labeling it as nonbeneficial.[13] Cheville et al. used the patch for four weeks but did not find its usefulness in the reduction of pain intensity.[14]

The safety of the patch was taken into account for the study. Levels in the blood are minimal when three patches are used for 12 hours a day. Only 1/10th of the concentration required in cardiac arrhythmias for lidocaine is reached.[15] As reported in various studies,[11-14] the withdrawal of patients from our study could not be attributed to any adverse events due to the use of the drug.

Conclusion

To conclude, we can say that a 5% lidocaine patch is helpful for short term pain, but for a longer duration, its role is still to be validated. Further trials are required for its role in long term management of neuropathic pain in cancer patients.

Reference

1. Khosravi Shahi P, Del Castillo Rueda A, Perez Manga G.Management of cancer pain. An Med Interna , 2007, vol. 24; 553–556.
2. Schmidt BL, Hamamoto DT, Simone DA, Wilcox GL. Mechanism of cancer pain. Mol Interv. 2010;10(3):164–178.
3. Ellis A, Bennett DL. Neuroinflammation and the generation of neuropathic pain. Br J Anaesth. 2013;111(1):26–37.
4. Caraceni A, Portenoy RK. An international survey of cancer pain characteristics and syndromes. Pain. 1999;82:263–74.
5. Fainsinger RL, Nekolaichuk CL, Lawlor PG, Neumann CM, Hanson J, Vigano A. A multicenter study of the revised Edmonton Staging System for classifying cancer pain in advanced cancer patients. J Pain Symptom Manage. 2005;29:224–37.
6. Stac BR.Management of peripheral neuropathic pain. Am J Phys Med Rehabil ,200, vol. 84 ; S4–S16.
7. Backonja MM, Serra J. Pharmacologic management part 1: better-studied neuropathic pain diseases. Pain Med 2004; 5(Suppl 1): S28–S47.
8. Backonja MM, Serra J. Pharmacologic management part 2: lesser-studied neuropathic pain diseases, Pain Med, 2004, vol. 5 Suppl 1;S48–S59.
9. Mercadante S, Gebbia V, David F, et al. Tools for identifying cancer pain of predominantly neuropathic origin and opioid responsiveness in cancer patients. J Pain , 2009, vol. 10 ;594–600.
10. Arner S, Meyerson BA. Lack of analgesic effect of opioids on neuropathic and idiopathic forms of pain. Pain 1988; 33:11–23
11. Dworkin RH, Backonja M, Rowbotham MC, et al. Advances in neuropathic pain: Diagnosis, mechanisms, and treatment recommendations. Arch Neurol 2003;60:1524–34

12. Cristina Garzón-Rodríguez & Miquel Casals Merchan &Agnes Calsina-Berna & Eugenia López-Rómboli & Josep Porta-Sales. Lidocaine 5 % patches as an effective short-term co-analgesic in cancer pain. Preliminary results, Support Care Cancer, 10.1007/s00520–013–1948–7.
13. Fleming JA, O'Connor BD (2009). Use of lidocaine patches for neuropathic pain in a comprehensive cancer centre. Pain ResManage; 381–388
14. Cheville A, Sloan J, Northfelt D, Jillella A, Wong G, Bearden J et al .2009 Use of a lidocaine patch in the management of postsurgical neuropathic pain in patients with cancer: a phase III double-blind crossover study (N01CB). Support Care Canc 17:451–460.
15. Gammaitoni AR, Davis MW (2002). Pharmacokinetics and tolerability of lidocaine patch 5 % with extended doping. Ann Pharmacother 36:236–240.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.46

Comparison of the Characteristics and Hemodynamic Effects of Infraclavicular Subclavian Central Venous Catheterisation Done under Spontaneous Respiration versus Mechanical Ventilation

Mohammed Afsal P[1], Vijay Kumar Nagpal[2], Mohan Deep Kaur[3]

Author Affiliation: [1]Resident, [2]Professor, [3]Professor and HOD, Department of Anesthesiology, Atal Bihari Vajpayee Institute of Medical Sciences, Dr Ram Manohar Lohia Hospital, New Delhi, Delhi 110001, India.

How to cite this article:

Mohammed Afsal P, Vijay Kumar Nagpal, Mohan Deep Kaur. Comparison of the Characteristics and Hemodynamic Effects of Infraclavicular Subclavian Central Venous Catheterisation Done under Spontaneous Respiration versus Mechanical Ventilation. Indian J Anesth Analg. 2020;7(5):1193–1202.

Abstract

Context: The study was designed to compare the characteristics and hemodynamic effects subclavian central venous catheterisation done under spontaneous respiration versus mechanical ventilation.

Aims: To compare the characteristics and hemodynamic effects of infraclavicular subclavian central venous catheterisation done under spontaneous respiration versus mechanical ventilation.

Settings and Design: prospective cross-sectional study.

Methods and Material: A prospective randomised cross-sectional study was undertaken in 100 patients requiring subclavian venous catheterisation. They were randomised by computer generated random number table to receive the venous cannulation either during spontaneous or mechanical ventilation. The characteristics i.e success or failure, successful cannulation in first attempt, number of attempts, time taken ; and hemodynamic effects i.e heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were measured in patients with spontaneous respiration and with mechanical ventilation. Hemodynamic variables were measured every 2 minutes till successful catheterisation and till 10 minutes after successful catheterisation.

Statistical analysis used: Statistical Package for Social Sciences (SPSS) version 21.0.

Results: The demographic variables were comparable in both the groups. Failure to cannulate occurred in total of 8 patients and were comparable among the groups. Successful catheterisation in first attempt was possible in 66% patients breathing spontaneously versus 72% in mechanically ventilated patients (p=0.517). Time to successful catheterisation were also comparable between groups (145.42 ± 56.54 secvs 133.38 ± 36.78 sec, p = 0.582). Heart rate variability >20% of baseline occurred in 22% vs 4% in spontaneously breathing and mechanically ventilated patients (p = 0.015). The systolic, diastolic and MAP were comparable between the groups.

Conclusions: The characteristics of infraclavicular subclavian central venous catheterisation are similar regardless of mechanical ventilation and spontaneous respiration. The infraclavicular subclavian venous catheterisation done under spontaneous respiration may result in significant heart rate variability.

Keywords: Central venous catheterisation; Ventilation; Hemodynamics.

Keymessages: The characteristics of infraclavicular subclavian central venous catheterisation are similar regardless of mechanical ventilation and spontaneous respiration. The infraclavicular subclavian venous catheterisation done under spontaneous respiration may result in significant heart rate variability.

Corresponding Author: Mohammed Afsal P, Resident, Department of Anesthesiology, Atal Bihari Vajpayee Institute of Medical Sciences, Dr Ram Manohar Lohia Hospital, New Delhi, Delhi 110001, India.

E-mail: asfl333@gmail.com

Introduction

Central venous catheterization is an integral part of invasive monitoring and management. It's used by anaesthesiologists, intensivists and physicians. Central venous catheters allow measurement of central venous pressure, delivery of fluids, medication and nutritional support.[1–3] Central venous catheterisation decreased the need for open cut down procedures and associated morbidity. Studies reported prevalence of central venous catheterisation range from 32% to 80%.[4,5]

The subclavian vein is commonly used for central venous catheterization both for short- and long-term use. Advantages of using the subclavian vein for central venous access over other routes include consistent surface anatomic landmarks and vein location, its large diameter (1–2 cm), absence of valves, ability to remain patent in a relatively constant position and the ease of insertion in trauma patients with suspected cervical spine injury.[6–9] In addition, the Subclavian vein carries the lowest rate of catheter related infections and thrombosis and is associated with lesser patient discomfort, especially on long-term basis.[10–11]

Multiple percutaneous pricks tend to increase the failure and complication rate, Studies suggest that if a central vein is not accessed rapidly within the first two venepuncture's, failures and complications are likely to increase.[12,13]

There is a belief that during lung deflation the lung apex to move downward and increases the distance from the subclavian vein to pleura and lesser chance of mechanical complications. Recent studies shows that success and complication rates were similar regardless of mechanical ventilation and the distance from the subclavian vein to the pleura did not change after full expiration.[14–16]

Subjects and Methods

After the approval of hospital ethics committee and written informed consent, 100 adult patients were enrolled into a prospective, cross-sectional study. Adult patients (18–65 years) requiring central venous catheterisation of either sex with BMI 18.5 to 29.9 kg/m^2 were included. Patients with infection over skin puncture site, history of clavicle or shoulder fracture, anatomical abnormality of clavicle or chest wall, diaphragmatic dysfunction history of COPD, pneumothorax, pleural effusion and significant lung parenchymal pathology (Tuberculosis, pneumonia etc.), prior catheterization or attempted catheterization on same side, prior major surgery (Mastectomy, neck dissection, axillary dissection or thoracotomy, radiotherapy or burns of the area, deranged coagulation profile, history of bleeding disorders were excluded from the study. Randomisation was achieved by computer generated random number table. Subjects were randomized to one of the two groups of 50 patients each, Group S (Patients on spontaneous respiration) and Group M (Mechanically ventilated patients). In pre anaesthetic evaluation, the following data were recorded before insertion of central venous catheter, demographic characteristics (name, age, gender, height and weight), detailed clinical history,complete general physical and systemic examination, pre-operative ECG, pre-operative chest X-ray (PA View), complete hemogram (Hemoglobin, Total leucocyte count, differential leucocyte count, hematocrit, red blood cell count, platelet count), coagulation profile (bleeding time, clotting time, PT/INR, aPTT) and examination of site of insertion. The procedure, its benefits, complications and major risks involved were explained to the patient. Thereafter, written informed consent of the patient or relative was taken. Patient was then brought to operation theatre and standard monitors were attached. Baseline readings were recorded, an 18 gauge intravenous line was established. Anaesthesia machine was checked before proceeding further.

In spontaneous respiration group patient was laid supine, a small roll was placed between shoulder blades to expose the infraclavicular area, comfortable head ring was placed beneath patient head, patient was placed in 20 degree trendelenburg position, patient's head turned to left side, patient's eyes were covered with soft eye padding and appropriate size venturi mask was applied. Patient was sedated using fentanyl (1 microgram/kg) intravenously and midazolam (0.015 mg/kg) intravenously. Checked materials in the catheterisation trolley, sterilized the field with povidone iodine and spirit, prepared the equipments, flushed all ports, attached the three way stop cocks to the ports and landmarks for insertion was identified (1 cm inferior to the midpoint of clavicle). After sterile preparation, infiltration of local anaesthesia (5–8 ml 2% preservative free lignocaine) given at the site of needle insertion. Subclavian central venous catheterisation done by modified seldinger technique.

In mechanical ventilation group, patient was given fentanyl (1 microgram/kg) intravenously and midazolam (0.015mg/kg) intravenously. General anaesthesia was induced with propofol 2 mg/kg,

0.1 mg/kg vecuronium and maintained with 1–2% end tidal sevoflurane concentration in 50% oxygen and 50% nitrous oxide. Tracheal intubation was done 3 minutes after giving vecuronium. Patient was mechanically ventilated during the procedure by using volume control mode with a tidal volume of 8 mL/kg, respiratory rate of 12/min, inspiration: expiration ratio of 1:2 without PEEP. In the mechanical ventilation group, catheterization was performed without interruption of mechanical ventilation.

Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used. Quantitative variables were compared using Independent t test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups. Qualitative variables were correlated using Chi-Square test/Fisher's exact test.

A p value of < 0.05 was considered statistically significant.

Results

100 patients divided into group s and group m were studied over a period of 1 year. There was no significant difference in age, age distribution, sex and bmi between the groups with the above characteristics normally distributed in our sample (Table 1).

Table 1: Comparison of two groups based on age.

Age	Group S	Group M	p-value	Significance
Sample size	50	50	0.405	No
Mean ± SD	45.16 ± 11.67	43.02 ± 12.49		
Median	45	45		
Min-Max	22–65	23–65		
Inter quartile Range	35 – 55	32 – 50		

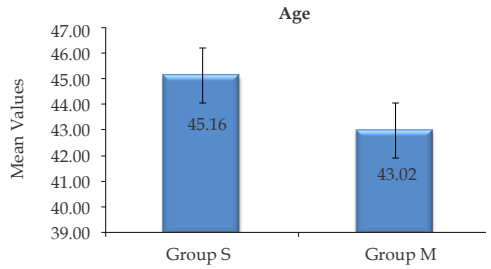


Fig. 1: Comparison of two groups based on age.

Both groups were comparable with respect to age (p value - 0.405) showing no statistical difference between two groups (Table 1/Fig. 1).

Table 2: Comparison of two groups based on age distribution.

Age distribution	Group		Total	p-value	Significance
	Group S	Group M			
21–30	16%	20%	18.00%	0.714	No
31–40	20%	28%	24.00%		
41–50	28%	28%	28.00%		
51–60	26%	18%	22.00%		
>60	10%	6%	8.00%		
Total	100.00%	100.00%	100.00%		

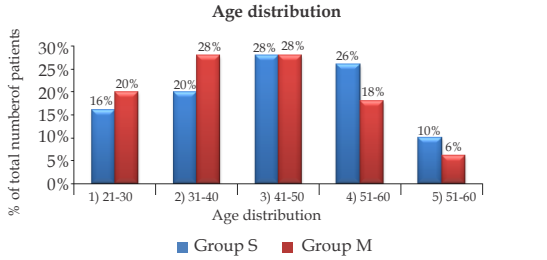


Fig. 2: Comparison of two groups based on age distribution.

Both groups were comparable with respect to distribution of age (p - value 0.714) showing no statistical difference between two groups.(Table 2/Fig. 2).

Table 3: Comparison of two groups based on sex.

Sex	Group S	Group M	Total	p-value	Significance
Male	52.00%	56.00%	54.00%	0.688	No
Female	48.00%	44.00%	46.00%		
Total	100.00%	100.00%	100.00%		

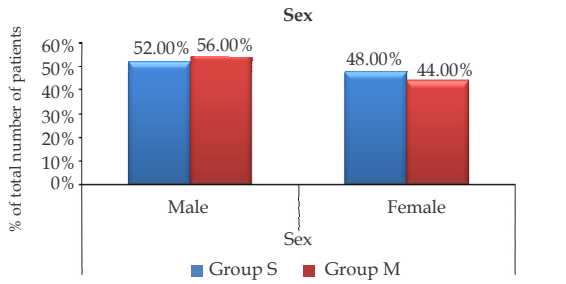


Fig. 3: Comparison of two groups based on sex.

Both groups were comparable with respect to gender (p value – 0.688) showing no statistical difference between two groups. (Table 3/Fig. 3).

Table 4: Comparison of two groups based on Body Mass Index.

BMI	Group S	Group M	p-value	Significance
Sample size	50	50		
Mean ± SD	23.03 ± 2.19	22.72 ± 1.8		
Median	23.12	22.71		
Min-Max	19.22–27.41	19.05–27.12		
Inter quartile Range	21.320 – 24.450	21.560 – 23.610		

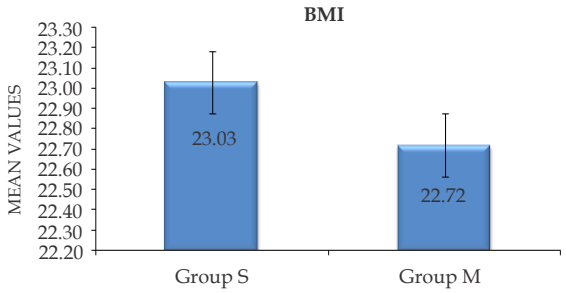


Fig. 4: Comparison of two groups based on Body Mass Index.

Both groups were comparable with respect to BMI (p value - 0.436) showing no statistical difference between two groups. (Table 4/Fig. 4).

Table 5: Comparison of two groups based on success/failure of the procedure.

Success/Failure	Group		Total	p-value	Significance
	Group S	Group M			
Successful catheterisation	45 (90.00%)	47 (94.00%)	92 (92.00%)		
Failed catheterisation	5 (10.00%)	3 (6.00%)	8 (8.00%)	0.715	No
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

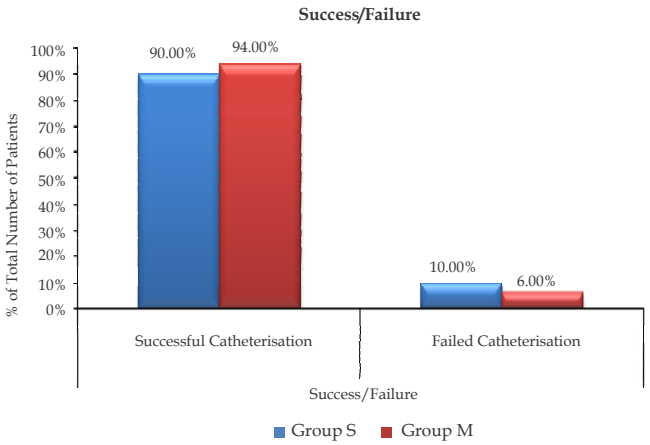


Fig. 5: Comparison of two groups based on success/failure of the procedure.

The success and failure rates were comparable in both the groups (p value – 0.715) with no statistical difference between the groups. (Table 5 / Fig. 5).

Table 6: Comparison of two groups based on success in first attempt.

Success in 1st attempt		Group		Total	p- value	Significance
		Group S	Group M			
	Yes	33 (66.00%)	36 (72.00%)	69 (69.00%)		
	No	17 (34.00%)	14 (28.00%)	31 (31.00%)	0.517	No
Total		50 (100.00%)	50 (100.00%)	100 (100.00%)		

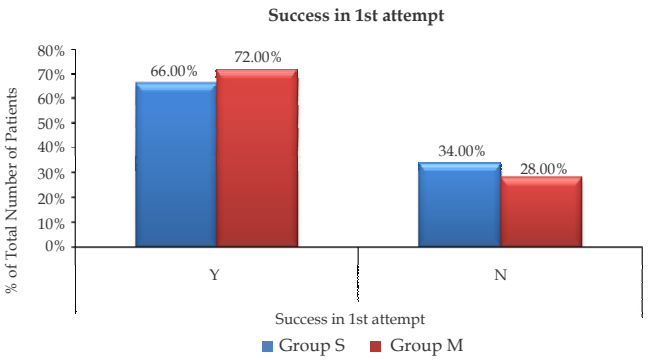


Fig. 6: Comparison of two groups based on success in first attempt.
Success rate for the procedure in first attempt was comparable between the groups (p-value -0.517) with no statistical difference. (Table 6 / Fig. 6).

Table 7: Number of attempts made for successful catheterisation.

No. of attempts	Group S	Group M	p-value	Significance
Sample size	45	47		
Mean ± SD	1.31 ± 0.56	1.23 ± 0.48		
Median	1	1	**0.521**	**No**
Min-Max	1–3	1–3		
Inter quartile Range	1 – 2	1 – 2		

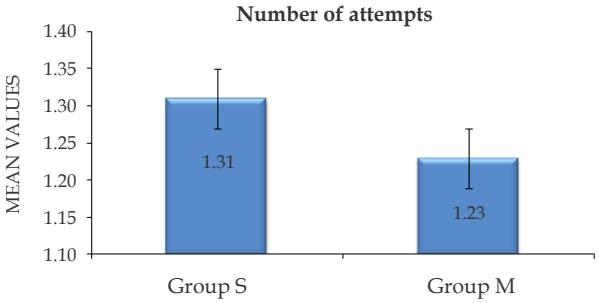


Fig. 7: Number of attempts made for successful catheterization.

Number of attempts required for the successful cannulation in both groups were comparable(p-value – 0.521) with no statistical difference (Table 7 / Fig. 7).

Table 8: Comparison of two groups based number of attempts.

No. of attempts	Group		Total	p-value	Significance
	Group S	Group M			
1	33 (66.00%)	37 (74.00%)	70 (70.00%)		
2	10 (20.00%)	9 (18.00%)	19 (19.00%)		
3	2 (4.00%)	1 (2.00%)	3 (3.00%)	**0.774**	**No**
Failure	5 (10.00%)	3 (6.00%)	8 (8.00%)		
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

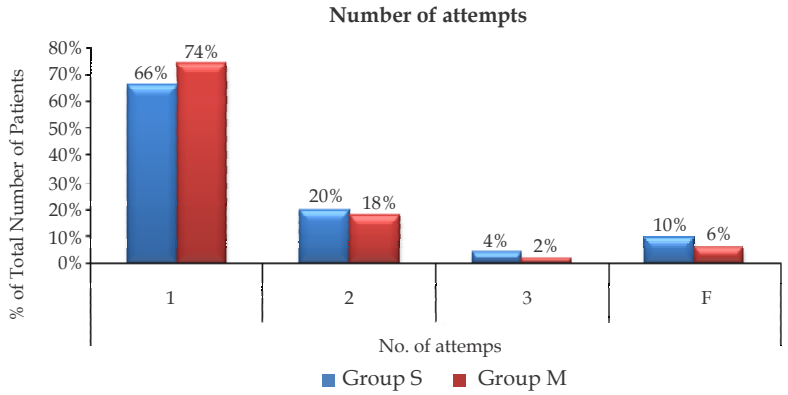


Fig. 8: Comparison of two groups based number of attempts.

Number of attempts required for the successful catheterisation in both groups were comparable (p-value = 0.774) with no statistical difference. (Table 8 / Fig. 8).

Table 9: Time taken for successful catheterisation between two groups.

Time taken (Sec)	Group S	Group M	p-value	Significance
Sample size	45	47		
Mean ± SD	145.42 ± 56.54	133.38 ± 36.78		
Median	128	120	**0.582**	**No**
Min-Max	78–324	85–238		
Inter quartile Range	103.500 – 177.250	108.250 – 145		

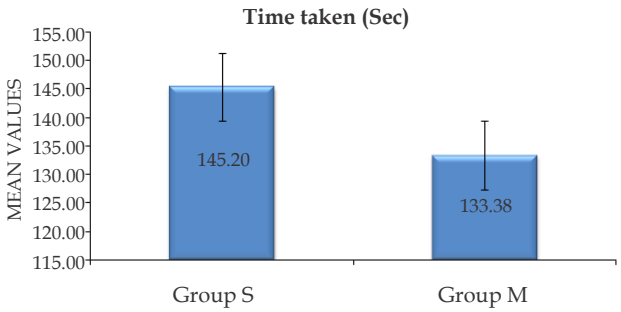


Fig. 9: Time taken for successful catheterisation between two groups.

Time taken for the procedure between the groups was comparable (p value – 0.582) showing no statistical difference (Table 9 / Fig. 9).

Table 10: Comparison of the groups based on heart rate.

Heart Rate	Group		Total	p-value	Significance
	Group S	Group M			
Variation less than 20% baseline value	39 (78.00%)	48 (96.00%)	87 (87.00%)	0.015	Yes
Variation greater than 20% baseline value	11 (22.00%)	2 (4.00%)	13 (13.00%)		
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

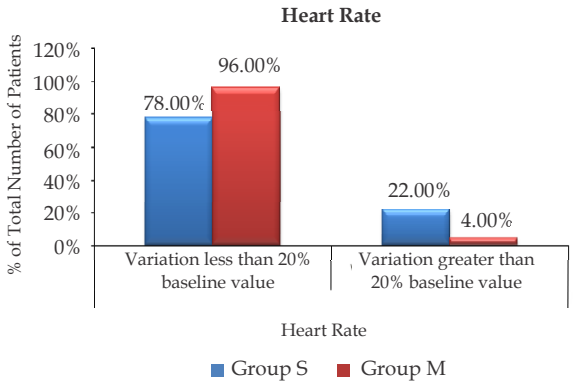


Fig. 10: Comparison of the groups based on heart rate.

Heart rate variation was found to be higher in group S than group M which is statistically significant (p-value - 0.015) (Table 10/Fig. 10).

Table 11: Comparison of groups based on systolic blood pressure.

Systolic BP	Group		Total	p-value	Significance
	Group S	Group M			
Variation less than 20% baseline value	42 (84.00%)	47 (94.00%)	89 (89.00%)	0.200	No
Variation greater than 20% baseline value	8 (16.00%)	3 (6.00%)	11 (11.00%)		
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

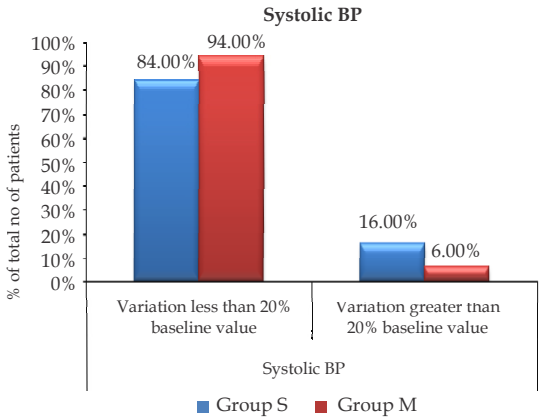


Fig. 11: Comparison of groups based on systolic blood pressure.

Systolic blood pressure values were higher in group S than group M, but difference was not statistically significant. (p – 0.200) (Table 11 / Fig. 11).

Table 12: Comparison of groups based on diastolic blood pressure.

Diastolic BP	Group		Total	p- value	Significance
	Group S	Group M			
Variation less than 20% baseline value	45 (90.00%)	48 (96.00%)	93 (93.00%)		
Variation greater than 20% baseline value	5 (10.00%)	2 (4.00%)	7 (7.00%)	**0.436**	**No**
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

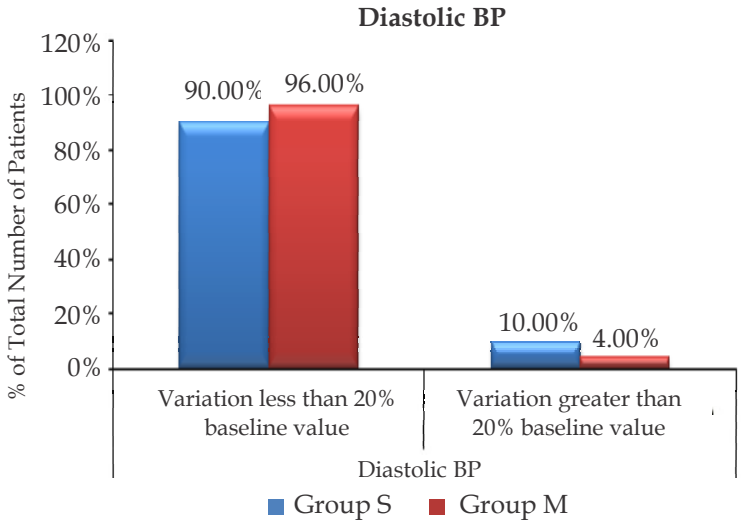


Fig. 12: Comparison of groups based on diastolic blood pressure.

Diastolic blood pressure values were found higher in group S than group M, but difference was not statistically significant. (pvalue – 0.436) (Table 12 / Fig. 12).

Table 13: Comparison of groups based on Mean Arterial Pressure.

MAP	Group		Total	p- value	Significance
	Group S	Group M			
Variation less than 20% baseline value	44 (88.00%)	48 (96.00%)	92 (92.00%)		
Variation greater than 20% baseline value	6 (12.00%)	2 (4.00%)	8 (8.00%)	**0.269**	**No**
Total	50 (100.00%)	50 (100.00%)	100 (100.00%)		

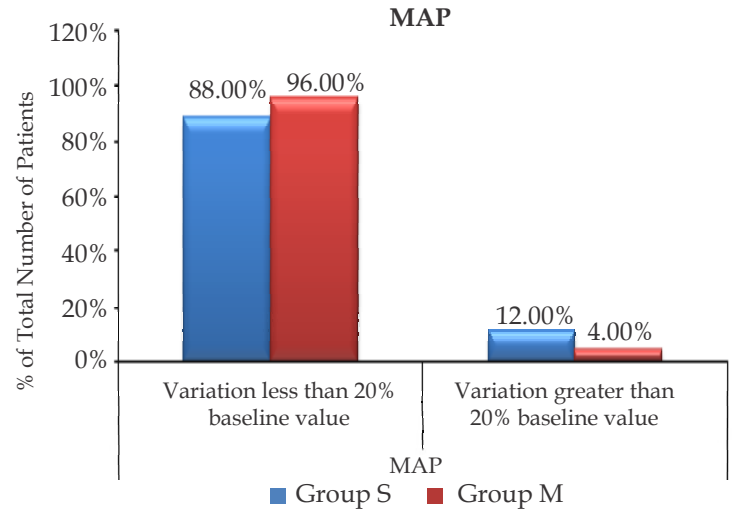


Fig. 13: Comparison of groups based on Mean Arterial Pressure.

Mean arterial pressure values were found higher in group S than group M, but difference was not statistically significant. (p value – 0.269) (Table 12/Fig. 12).

There was no significant difference in characteristics between both the groups (Table 2). Success of the infraclavicular subclavian central venous catheterisation showed that group M had a better success rate in comparison to group S, but the difference was not statistically significant. 45 out of 50 patients had successful catheterisation in group S while 47 out of 50 patients had successful catheterisation (p value 0.517). 33 patients had successful catherisation in first attempt in group S and 36 patients in group M (p value 0.715). Ten patients of group S and nine patients of group M required second attempt. In group S seven patients required three attempts, out of them five were failure and in group M four patients required third attempt, out of them three were failure. Mean number of attempts for successful cannulation in group S were 1.31 ± 0.56 and 1.23 ± 0.48 in group M (p value). Average time required to secure a successful cannulation in Group S was 145.42 ± 56.54 seconds, which was relatively higher in group M, 133.38 ± 36.78. But there was no statistically significant difference between the groups (p value 0.582).

The hemodynamic parameters showed higher variation in group S compared to group M. Heart rate showed a significantly higher variability (greater than 20% from baseline value) in group S as compared to group M. Eleven patients (22%) had heart rate greater than 20% from the baseline in group S while only two patients (4%) were having variation in group M. It was statistically significant with p value of 0.015.

The variability in systolic blood pressure, diastolic blood pressure and mean arterial pressure were found higher but it was statistically insignificant.

Discussion

We conducted a prospective cross sectional study, with 50 participants in each group, patients on spontaneous respiration (Group S) and mechanically ventilated patients (Group M). The groups were statistically matched for age, sex and BMI.

Analysis of the success and failure of the infraclavicular subclavian central venous catheterisation showed that Group M had a better success rate (f = 47, 94%) in comparison to Group S (f = 45, 90%). Among the eight failed procedures, five were from Group S. There was no statistically significant difference between two groups. Similar results were obtained in a prospective randomized study conducted by Kim et al 14 in 334 patients undergoing neurosurgical procedures under general anaesthesia with a success rate of 97.6%. In a prospective randomized study, Fragou M et al 17 observed a relatively lower success rate of 87.5% in mechanically ventilated patients by landmark method.

When the success of the procedure in the first attempt was analyzed, in all patients in the individual groups, it was comparatively better in Group M (72%) than the Group S (66%), but this was statistically not significant (p value – 0.517). Kim et al 14 observed 73.3% success rate in first attem-pt in mechanically ventilated patients and their observation was similar to our study.

Similarly second and third attempts required for successful catheterization were also more in group S in comparison to Group M. Ten patients of spontaneous respiration group and nine patients of mechanical ventilation group required second attempt. In spontaneous respiration group seven patients required three attempts, out of them five were failure and in mechanical ventilation group four patients required third attempt, out of them three were failure.

Number of attempts required to secure a patent cannulation in both groups were also statistically similar (p = 0.521). Mean number of attempts for successful cannulation in spontaneous respiration patients were 1.31 ± 0.56 and 1.23 ± 0.48 in mechanically ventilated patients. Kim et al 14 in their study demonstrated similar mean number of attempts for cannulation in mechanically ventilated patients with mean attempts of 1.4 ± 0.9. Fragou M et al 17 in their study demonstrated that mean number of attempts in locating the vein by land mark technique was significantly higher i.e, 1.9 ± 0.7.

Average time required to secure a successful cannulation in Group S was 145.42 (± 56.54) seconds, which was relatively higher than the group M (mean = 133.38, S.D. ± 36.78. But there was no statistically significant difference between the groups (p=0.582). Fragou M et al 17 reported an average insertion time of 44.8+ 54.9 seconds for subclavian venous catheterisation in landmark technique. The relatively lower insertion time reported in Fragou M et al 17 study is because they consider access time as the time between penetration of skin and aspiration of venous blood into the syringe. In our study access times were considered as the time between first skin puncture and successful placement of catheter.

When heart rate among both the groups were analysed, they showed a significantly higher variability (greater than 20% from baseline value) in spontaneous respiration group as compared to mechanical ventilation group. Eleven patients (22%) had heart rate greater than 20% from the baseline in spontaneous respiration group (group S) while only two patients (4%) were having variation in mechanical ventilation group (group M). It was statistically significant with a p value of 0.015. Higher heart rate variation was found in patients with more number of attempts.

Variation in systolic blood pressure was found higher in spontaneous respiration group (group S) as compared to the mechanical ventilation group (group M). Eight patients (16%) had higher systolic blood pressure than 20% of baseline value in spontaneous respiration group and three patients had higher systolic blood pressure values in mechanical ventilation group. But the systolic blood pressure variation was not statistically significant (p value 0.200). Variation in systolic blood pressure also increased with number of attempts.

Variation in diastolic blood pressure was found higher in spontaneous respiration group (group S) as compared to the mechanical ventilation group (group M). But the variation found to be less compared to systolic blood pressure variation. Five patients (10%) had higher diastolic blood pressure than 20% of baseline value in spontaneous respiration group and two patients (4%) had higher diastolic blood pressure values in mechanical ventilation group. But the diastolic blood pressure variation was not statistically significant (p value 0.436).

In mean arterial pressure variation also observed a similar pattern as in other hemodynamic parameters. Six patients (12%) had higher mean arterial pressure than 20% of baseline value in spontaneous respiration group and two patients (4%) had higher systolic blood pressure values in mechanical ventilation group. But the mean arterial pressure variation was also statistically not significant (p value 0.269).

Despite the paucity of reported infraclavicular subclavian central venous catheterisation under spontaneous respiration, our study reveals that it is a comparable method with success rates matching the catheterisation done in anaesthetised patients. However our sample size was only 50 patients in each group, larger sample size is desirable for validation of these findings.

Conclusion

The characteristics of infraclavicular subclavian central venous catheterisation are similar regardless of mechanical ventilation and spontaneous respiration.The infraclavicular subclavian venous catheterisation done under spontaneous respiration may result in significant heart rate variability.

References

1. Hurst JW. Central venous access. In: Marino PL, ed. Marino's The ICU Book, 4th ed. Philadelphia: Wolters Kluwer Health; 2014; 15–36.
2. Taylor RW, Palagiri AV. Central venous catheterization. Crit Care Med. 2007;35:1390–1396.
3. Frykholm P, Pikwer A, Hammarskjold F. Clinical guidelines on central venous catheterisation. Acta Anaesthesiol Scand. 2014;58(5):508–24.
4. National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 to June 2002. Am J Infect Control. 2002;30(8):458–475.
5. Vincent JL, Bihari DJ, Suter PM. The prevalence of nosocomial infection in intensive care units in Europe. Results of the European prevalence of infection in intensive care (EPIC) study. J Am Med Assoc. 1995;274(8):639–644.
6. Celinski SA, Seneff MG. Central venous catheterization. In: Irwin RS, Rippe JM, Libson A, Herad SO. Procedures, Techniques and minimally Invasive Monitoring in Intensive care Medicine, 4th Ed. Philadelphia: Lippincott Williams and Wilkins; 2007: 19–37.
7. Timsit JF. What is the best site for central venous catheter insertion in critically ill patients? Critical Care. 2003;7:397.
8. Thakur A, Kaur K, Lamba A. Comparative evaluation of subclavian vein catheterisation using supraclavicular versus infraclavicular approach. Indian J Anaesth 2014;58(2): 160–164.
9. Troianos CA, Hartman GS, Glas KE, et al. Guidelines for performing ultrasound guided vascular cannulation: recommendations of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists. J Am Soc Echocardiogr. 2011;24:1291–318.
10. Goetz AM, Wagener MM, Miller JM, Muder RR. Risk of infection due to central venous catheters: effect of site of placement and catheter type. Infect Control Hosp Epidemiol 1998;19:842–5.
11. Defalque RJ. Subclavian venipuncture: a review. Anesth Analg. 1968;47(6):677–82.
12. Calvache JA, Rodríguez MV, Trochez A, Klimek M, Stolker RJ, Lesaffre E. Incidence of Mechanical Complications of Central Venous Catheterization

Using Landmark Technique: Do Not Try More Than 3 Times. J Intensive Care Med. 2016;31(6):397–402.

13. McGee WT. Central venous catheterization: better and worse. J Intensive Care Med. 2006;21(1):51–3.
14. Kim E, Kim HJ, Hong DM, Park HP, Bahk JH. Influence of mechanical ventilation on the incidence of pneumothorax during infraclavicular subclavian vein catheterization: a prospective randomized noninferiority trial. Anesth Analg. 2016;123(3): 636–40.
15. Lim KJ, Lee JM, Byon HJ, Kim HS, Kim CS, Lee SK, Kim JT. The effect of full expiration on the position and size of the subclavian vein in spontaneously breathing adults. Anesth Analg. 2013;117(1):109–13.
16. Lim KJ, Kim JT, Kim HS, Byon HJ, Lee SK, Lee JM. The effect of lung deflation on the position and size of the subclavian veinin mechanically ventilated infants and children. Anesth Analg. 2011;112:1448–1451.
17. Fragou M, Gravvanis A, Dimitriou V, Papalois A, Kouraklis G, Karabinis A, et al. Real-time ultrasound-guided subclavian vein cannulation versus the landmark method in critical care patients: a prospective randomized study. Crit Care Med. 2011;39(7):1607-12.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.47

Comparative Study of Epidural Fentanyl versus Epidural Dexmedetomidine as Adjuvants to Ropivacaine for Post Operative Analgesia

Ramesh R[1], Vidhyalakshmi K[2]

Author Affiliation: [1]Associate Professor, [2]Post Graduate Student, Department of Anesthesiology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka 560002, India.

How to cite this article:
Ramesh R, Vidhyalakshmi K. Comparative Study of Epidural Fentanyl versus Epidural Dexmedetomidine as Adjuvants to Ropivacaine for Post Operative Analgesia. Indian J Anesth Analg. 2020;7(5):1203–1208.

Abstract

Background: Epidural anaesthesia is a central neuraxial block technique which has the ability to prolong or extend the block via an indwelling catheter. Ropivacaine is a long-acting amino amide local anaesthetic. The onset of sensory and motor blockade may be delayed with ropivacaine. Fentanyl is a commonly used adjuvant for neuraxial block and dexmedetomidine has been used increasingly as adjuvant due to the added benefits and lower side effects. The present study is being undertaken to evaluate quality of epidural anaesthesia using fentanyl and dexmedetomidine as adjuvants to ropivacaine in infra umbilical surgeries for post operative analgesia.

Aims: The major aim of the study was to compare the quality of epidural anaesthesia for post-operative analgesia using fentanyl and dexmedetomidine as adjuvants to ropivacaine in infra umbilical surgeries.

Materials and Methods: 60 patients of both genders aged 18–60 years, ASA I/II physical status undergoing elective infra-umbilical surgeries were randomized into 2 groups. Group RD(n=30) patients received 17ml of 0.75% Ropivacaine + 1µg/kg Dexmedetomidine and group RF (n=30) patients received 17ml of 0.75% Ropivacaine + 1µg/kg Fentanyl. Epidural block characteristics observed included time to onset of analgesia at T10, maximum sensory analgesic level, time to complete motor blockade, time to first rescue analgesic and local anesthetic consumption. Data was compiled and analysed using ANOVA, Chi-square test and Fisher's exact test. Value of $P<0.05$ is considered significant.

Results: Demographic data was comparable between the 2 groups. Heart rate and mean arterial pressure values were lower in RD group compared to RF group. Time to onset of analgesia was 9.56 + 1.32 min in group RF and 7.28 + 1.27 min in group RD (p value < 0.001). Maximum sensory level achieved was T5 in group RF whereas in group RD it was T4 (p value < 0.001). Time taken to achieve maximum sensory level [12.82 + 2.74 min vs 17.54 + 2.88 min] (p value<0.001) and time for complete motor blockade [17.24 + 2.56 min vs 22.71 + 2.50 min] (p value<0.001) in minutes were earlier in group RD compared to group RF. Duration of analgesia was 367.80 + 12.59 min in group RD and 237.94 +14.08 min in group RF. There was significant difference in mean total dose consumption of local anaesthetic used over 24 hours post-operatively.

Conclusion: Dexmedetomidine is a better epidural adjuvant for post-operative analgesia compared to fentanyl as it provides prolonged post-operative analgesia and lower consumption of local anaesthetic.

Keywords: Ropivacaine; Dexmedetomidine; Fentanyl; Epidural anesthesia; Analgesia; Adjuvants; Infra-umbilical.

Corresponding Author: Vidhyalakshmi K, Post Graduate Student, Department of Anesthesiology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka 560002, India.

E-mail: kvidhya1992@gmail.com

Introduction

Pain in the postoperative period is one among the factors that delay recovery from anesthesia and surgery.[1] Inadequate pain relief can lead to delayed mobilization and increased morbidity and mortality. Epidural anesthesia is a central neuraxial block technique which has the ability to prolong or extend the block via an indwelling catheter in the post-operative period.[2]

Use of epidural analgesic technique for infra-umbilical surgery will provide effective pain relief with minimal side effects and high levels of patient satisfaction.[3] Among the local anesthetics used, Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres, resulting in a relatively reduced motor blockade with decreased potential for central nervous system toxicity and cardiotoxicity.[4] Hence in our study ropivacaine was selected as the study drug.

Opioids such as fentanyl provide a dose sparing effect of local anesthetic and superior analgesia but has possibility of an increased incidence of pruritis, urinary retention, nausea, vomiting and respiratory depression. Alpha (α)-2-Adrenergic receptor agonists like dexmedetomidine have sedative, analgesic, perioperative sympatholytic, anesthetic-sparing, and hemodynamic-stabilizing propertiesbut lacks respiratory depression, making it a useful and safe adjunct to epidural ropivacaine.[5]

Keeping this in mind, thisstudy was done to evaluate the efficacy and safety of dexmedetomidine and fentanyl as an adjuvant to epidural ropivacaine in patients undergoing infra-umbilical surgery.

Aims and Objectives

1. To evaluate the effect of 1 µg/kg fentanyl versus 1 µg/kg Dexmedetomidine as adjuvant to 0.75% ropivacaine in terms of
   - Time to 2 segmental dermatomal regression
   - Regression to S1
   - First request for post-operative analgesia
   - Total dose consumption of local anaesthetic used over 24 hours
2. To study sedation and analgesia during and after surgery.

Materials and Methods

After obtaining written informed consent and approval from institutional ethical committee a prospective randomised double-blind comparative study was conducted on 60 patients aged 18 – 60 years of either sex, with height > 140cm and weight > 45kgs, belonging to American Society of Anesthesiologists grade I and grade II, undergoing elective infra-umbilical surgeries. Patients with contraindications for neuraxial blockade or allergy to the study drug or on alpha-2 antagonist treatment, patients posted for lower segment caesarean section, patients of American Society of Anesthesiologists grade 3 and above and aged< 18 and > 60 years, and patients who were morbidly obese and under nourished were excluded from our study.

After routine pre anaesthetic evaluation, patients were randomly allocated in to one of the two groups using numbers generated from www.random.org. The study drug was prepared by anesthesiologist not involved in the study.

- *Study group RD*-received 17ml of 0.75% Ropivacaine + 1µg/kg Dexmedetomidine.
- *Study group RF*-received 17ml of 0.75% Ropivacaine + 1µg/kg Fentanyl.

Result values were recorded using a pre-set Proforma.

Procedure: A routine pre-anaesthetic examination was conducted on the evening before the scheduled day of surgery, assessing:

1. History and general condition of the patient
2. Airway assessment by Mallampatti grading
3. A detailed examination of the systems like Cardiovascular system, Respiratory system and Central nervous system.
4. Examination of the Spine.

Basic lab investigations like Complete Blood Count, Fasting Blood Sugar or Random Blood Sugar, blood urea, serum creatinine, chest X-ray and Electrocardiograph were carried out. The entire procedure was explained to the patient.

All patients were kept fasting for 8 hours on the previous day of surgery. Patients were pre medicated with tab Alprazolam 0.5 mg and tab Ranitidine 150 mg on the night before the day of surgery.

In preoperative room, intravenous line was secured with 18 G IV cannula and were preloaded

with 10ml/kg of Ringer Lactate. Injection Ranitidine 50 mg was given intravenously half an hour preoperatively.

On the arrival to the operating room, Non-invasive blood pressure, pulse oximeter and three lead Electrocardiogram were connected. The baseline systolic, diastolic blood pressure (SBP, DBP), heart rate(HR) and oxygen saturation (SpO_2) were recorded. The patient was be placed in left lateral position and the back was prepared with betadine. With all aseptic measures the skin over L1–L2 interspace was anesthetized with 2 ml of 2% Lignocaine. A 18G Touhy needle was passed through this space and advanced slowly until it enters epidural space which was confirmed by loss of resistance to air technique. Then a 20 G epidural catheter was passed through the needle into epidural space and secured with minimum of 3–4 cm of catheter within the space.

The study drug was loaded in a 20 ml syringe by a senior anesthesiologist who was not involved in the study. After giving test dose with 2% Lignoadrenaline 3 ml, syringe was handed over to the anesthesiologist performing the epidural block, who was also the observer of the study. The patients were not aware of the drug being administered to them. Thus, both the observer and the patient were blinded.

17 ml of the solution containing 0.75% Ropivacaine plus study drug was injected through the epidural catheter intermittently over 3 min. The time at which injection was completed was considered as zero time of the study and all measurements were recorded from this point. All patients were given supplementary oxygen through a venturi mask at 6L/min.

The following parameters were monitored:

- Onset of sensory block assessed by bilateral pin prick method.
- Degree and level of motor blockade - using Modified Bromage scale.
- Level of sedation using Ramsay sedation scale before, during and after surgery.
- Hemodynamic changes – heart rate, blood pressure and respiratory rate.
- Time to two segmental dermatomal regression.
- Regression to S1.
- First request for post-operative analgesia.
- Total dose consumption of local anaesthetic used over 24 hours.
- Intra operative and post-operative complications if any was looked for, recorded and treated accordingly.

In case of failure of epidural block and conversion to general anesthesia, those cases were excluded from the study. After the surgery, patients were shifted to the post anesthesia care and recovery unit where they remained until complete recovery of sensory and motor blockade was achieved.

Rescue analgesia: The onset of pain was managed by top up doses of 8 ml of 0.2% ropivacaine after operation.

Definitions of various parameters studied:

Degree and level of motor blockade: assessed by modified bromage scale.

Modified Bromage Scale (6)

0 – Able to perform a full straight leg raise over the bed for 5 sec.

1 – Unable to perform a leg raise but can flex the leg on knee.

2 – Unable to flex knee but can flex ankle.

3 – Unable to flex ankle.

4 – Unable to move toes.

Onset of sensory blockade: was defined as time taken from the completion of the injection of the study drug till the patient did not feel pin prick sensation at T10 dermatome.

Onset of motor blockade: was defined as the time taken from the completion of the injection of the study drug till the patient achieved motor blockade of Bromage score 1.

Time to 2 segmental dermatomal regression: was defined as the time taken from the completion of the injection of study drug to the sensory level to regress to 2 dermatomes lower from the highest dermatome achieved.

Regression of sensory block to S1: defined as the time taken from the completion of injection of study drug till regression of sensory level to S1 dermatome.

Regression of motor block: defined as time taken from the completion of injection of study drug till the patient attains modified Bromage 1.

Level of sedation: assessed by Ramsay Sedation Score.

Ramsay Sedation Score

1. Anxious and agitated.
2. Cooperative, oriented and tranquil.
3. Responds only to verbal commands.
4. Asleep with brisk response to light stimulation.
5. Asleep with sluggish response to light stimulation.
6. Asleep without response to stimulation.

First request for post-operative analgesia: was defined as the time for first complaint of pain from the time of completion of injection of study drug.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identifythe mean difference between two quantitative variables. p value (Probability that the result is true) of <0.05 was considered as statistically significantafter assuming all the rules of statistical tests.

Results

It is a prospective randomized double blind study with 60 patients randomly divided into two groups of 30 patients each, using www.random.org.

Group RD-received 17ml of 0.75% Ropivacaine + 1µg/kg Dexmedetomidine.

Group RF- received 17ml of 0.75% Ropivacaine + 1µg/kg Fentanyl.

In RF group mean age of participants was 40.03 ± 13.05 years and in RD group mean age was 41.20 ± 12.00 years. In Group RF, majority of subjects were in the age group ≤ 30 Years (30%) and in Group RD, majority of subjects were in the age group >50 years.In Group RF, 53.33% were females and 46.67% were males and in Group RD, 56.67% were females and 43.33% were males.In the study there was no significant difference in mean weight and height between two groups. There was no significant difference in demographic data between the groups in the study.

Mean Time to onset of analgesia at T10 in Group RF was 9.56 ± 1.32 min and in Group RD was 7.28 ± 1.27. Group RD achieved analgesia at T10 earlier than group RF.In group RF the maximum sensory level achieved was T5 dermatome level, whereas in group RD T4 dermatome was the maximum sensory level achieved.Mean Time to complete motor blockade in Group RF was 22.71 ± 2.50 min and in Group RD was 17.24 ± 2.56 min. Complete motor block was achieved earlier in RD group.

In the study there was statistically significant difference in sedation scores between two groups at all intervals of follow up except at baseline, 1min and 2 min. RD group had better sedation compared to RF group in our study. Group RF had achieved maximum sedation score of 2, and group RD had achieved maximum sedation score of 4. (Fig 1)

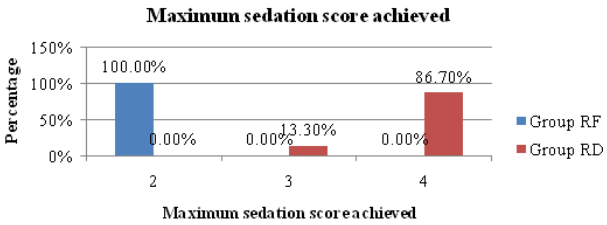


Fig. 1: Bar diagram showing comparison of maximum sedation score achieved between two groups.

In the study there was statistically significant difference in mean heart rate between two groups at all the intervals of follow up intra-operatively except at baseline. Mean HR was significantly high in Group RF compared to Group RD. But this difference was not clinically significant and heart rate values remained within the normal physiological limits at all intervals. 3 patients in the dexmedetomidine group developed bradycardia and they were treated with Inj.Atropine 0.6mg. As tachycardia is not favorable during surgeries, RD group provides better hemodynamics. Post-operatively the difference in heart rate was not statistically significant.In the study there was statistically significant difference in mean MAP(mean arterial pressures) between two groups at all the intervals of follow up except at baseline, 1 min, 5 min, 1 hr 40 min and 1 hr 50 min. Mean mean arterial pressures was significantly high in Group RF compared to Group RD. But this was not clinically significant as MAP values were well within the normal limits at all intervals of follow up.3 patients in group RF and 6 patients in group RD developed hypotension which was managed with intravenous fluids and Inj.Ephedrine. As hypertension is not favorable in any surgeries, RD group provides better hemodynamics. Post-operatively there was no difference in mean arterial pressures between the groups.

Table 1: Comparison of parameters between two groups.

	Group				P Value
	Group RF		Group RD		
	Mean	SD	Mean	SD	
Time to 2 segmental dermatomal regression in minutes	111.00	5.05	142.12	5.57	< 0.001*
Regression to S1 in minutes	203.27	13.78	330.53	16.14	< 0.001*
Mean time for regression to Bromage 1 in minutes	177.63	11.60	262.08	10.45	< 0.001*
First request for post-operative analgesiain minutes	237.94	14.08	367.80	12.59	< 0.001*
Total dose consumption of local anesthetic used over 24 hrs (mg)	113.60	12.14	78.40	11.39	< 0.001*

Mean time to first request for post-operative analgesia in Group RF was 237.94 ± 14.08 min and in Group RD was 367.80 ± 12.59 min. Group RF required rescue analgesia earlier than group RD. (Table 1)

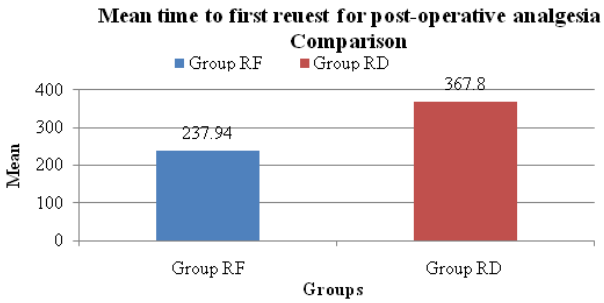


Fig. 2: Bar diagram showingcomparison of mean time to first request for post-operative analgesia between two groups.

Mean Total dose consumption of local anesthetic used over 24 in Group RF was 113.60 ± 12.14 mg and in Group RD was 78.40 ± 11.39. There was significant difference in mean Total dose consumption of local anesthetic used over 24 hrs between two groups. (Fig 2)

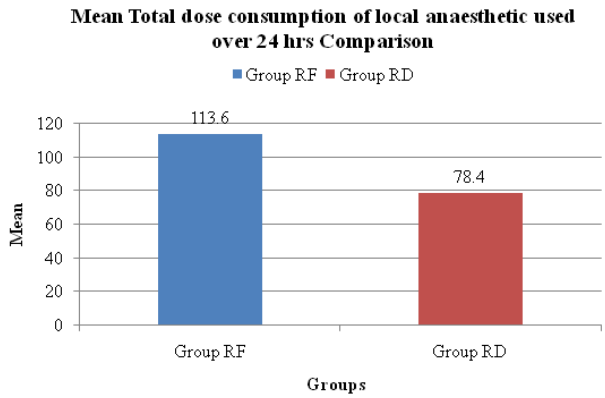


Fig 3: Bar Diagram Showing comparison of Mean Total dose consumption of local anaesthetic used over 24 hrs (mg) between two groups.

In the study, clinically significant extent of hypotension was observed in RD group compared to RF group. Nausea and vomiting were more common in the Ropivacaine + Fentanyl group in the study. Pruritis was seen to a statistically significant extent in RF group compared to group RD. Dry mouth was more common in RD group. (Fig 3) Other side effects were comparable between the two groups and were statistically and clinically insignificant. No respiratory depression was seen in any of the patients in the study groups. (Fig 4)

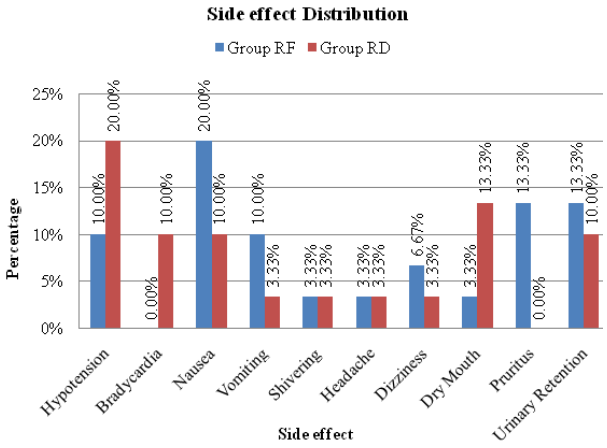


Fig. 4: Bar diagram showing Side effect distribution between two groups.

Discussion

Postoperative pain is a major obstacle for early postoperative ambulation. It increases the risk of venous thromboembolism and respiratory complications and prolongs hospital stay.[7] Epidural analgesia offers superior pain relief and early mobilization especially when local anesthetic dose is combined with an adjuvant as compared to local anesthetic used alone.[6] In the present study, we used fixed dose and concentration of ropivacaine i.e. 17 ml of 0.75% ropivacaine in both the groups as the volume of the study drug because the influence of height and weight on the spread of epidural block is little, and usually not clinically significant unless considering the extremes of the spectrum.[8]

In our study the results show that addition of epidural Ropivacaine with Dexmedetomidine significantly prolongs the duration of sensory and motor block with improved quality of

postoperative analgesia and lesser requirement of local anesthetic for post-operative analgesia as compared to Ropivacaine combined with fentanyl. These observationsare in agreement with the similarstudies.[1,3,6,8,9,10]

Dexmedetomidine acts by binding to the presynaptic C-fibers and post synaptic dorsal horn neurons. They produce analgesia by depressing the release of C-fiber transmitters and by hyperpolarisation of post synaptic dorsal horn neurons.[9] Fentanyl acts primarily as an agonist at μ-opioid receptors to enhance the analgesia. The dorsal roots (primary afferent tissues) contain opioid-binding sites and fentanyl either acts directly on the spinal nerve or by penetrating the duramater to act at the spinal roots.[10]

Time to 2 segmental dermatomal regression,Regression to S1, Mean time for regression to Bromage 1 was earlier in group RF compared to group RD. Bajwa SJ et al also found similar results in their study.

First request for post-operative analgesia is earlier in RF group and, Total dose consumption of local anesthetic used over 24 hrs was higher in RF group.

Dexmedetomidine is a better adjuvant to epidural ropivacaine when compared to fentanyl, with early onset and prolonged duration of sensory and motor blockade with better hemodynamic stability and intraoperative sedation and also analgesic sparing effect in the postoperative period.

The decrease in HR caused by α-2 agonist can again be explained on the basis of their central action whereby they decrease sympathetic outflow and nor-epinephrine release. Dexmedetomidine does not decrease gut motility, hence it prevents intraoperative and postoperative nausea and vomiting.[8]

Limitation

- Serum levels of local anesthetic was not measured
- Motor block was not assessed after the top up dose.

Conclusion

Dexmedetomidine gave longer post-operative analgesia with sedation than fentanyl and also resulted in lower consumption of post-operative local anesthetic.

References

1. Kiran S, Jinjil K, Tandon U, Kar S. Evaluation of dexmedetomidine and fentanyl as additives to ropivacaine for epidural anesthesia and postoperative analgesia. Journal of anaesthesiology, clinical pharmacology. 2018 Jan;34(1):41.
2. Zhang WP, Li C. EC50 of epidural ropivacaine combined with dexmedetomidine for labor analgesia. The Clinical journal of pain. 2018 Oct 1;34(10):950–3.
3. Park SJ, Shin S, Kim SH, Kim HW, Kim SH, Do HY, Choi YS. Comparison of dexmedetomidine and fentanyl as an adjuvant to ropivacaine for postoperative epidural analgesia in pediatricorthopedic surgery. Yonsei Medical Journal. 2017 May 1;58(3):650–7.
4. Sarkar A, Bafila NS, Singh RB, Rasheed MA, Choubey S, Arora V. Comparison of epidural bupivacaine and dexmedetomidine with bupivacaine and fentanyl for postoperative pain relief in lower limb orthopedic surgery. Anesthesia, essays and researches. 2018 Apr;12(2):572.
5. Praveena BL, Bharathi B, Sahana VR. Intraperitoneal ropivacaine with dexmedetomidine or fentanyl for postoperative analgesia following laparoscopic cholecystectomy: A comparative randomized trial. Anesthesia, essays and researches. 2019 Jan;13(1):169.
6. Kazim M, Kothari V, Priyadarshi S, Mistry T, Prajapati R, Mathur R. A comparative study to assess the effect of dexmedetomidine and fentanyl as an adjuvant to ropivacaine for epidural anesthesia in percutaneous nephrolithotomy. Anaesthesia, Pain & Intensive Care. 2019 Jan 20:59–64.
7. Bajwa SJ, Arora V, Kaur J, Singh A, Parmar SS. Comparative evaluation of dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries. Saudi journal of anaesthesia. 2011 Oct;5(4):365.
8. Kaur S, Attri JP, Kaur G, Singh TP. Comparative evaluation of ropivacaine versus dexmedetomidine and ropivacaine in epidural anesthesia in lower limb orthopedic surgeries. Saudi journal of anaesthesia. 2014 Oct;8(4):463.
9. Paul A, Nathroy A, Paul T. A comparative study of dexmedetomidine and fentanyl as an adjuvant to epidural bupivacaine in lower limb surgeries. Journal of Medical Sciences. 2017 Nov 1;37(6):221.
10. Grewal A. Dexmedetomidine: new avenues. Journal of anaesthesiology, clinical pharmacology. 2011 Jul;27(3):297.

Original Research Article

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.48

Analgesic Efficacy of Addition of Clonidine to Bupivacaine in Transversus Abdominis Plane Block for Postoperative Analgesia in Laparoscopic Appendicectomy

Samhita Kalimireddy[1], Jyotsna Bhosale[2], Sarita Swami[3]

Author Affiliation: [1]Junior Resident, [2]Associate Professor, Department of Anesthesiology, Symbiosis Medical College For Women, Lavale, Pune, Maharashtra 412115, [3]Professor, Department of Anesthesiology, Bharati Hospital and Medical College, Bharatividyapeeth Campus, Dhankawadi, Pune, Maharashtra 411043, India.

How to cite this article:
Samhita Kalimireddy, Jyotsna Bhosale, Sarita Swami. Analgesic Efficacy of Addition of Clonidine to Bupivacaine in Transversus Abdominis Plane Block for Postoperative Analgesia in Laparoscopic Appendicectomy. Indian J Anesth Analg. 2020;7(5):1209–1215.

Abstract

Background and Objectives: Transversus abdominis plane block is widely practised peripheral nerve block and has been shown to provide postoperative pain relief following various abdominal surgeries. Proper pain management is essential for optimizing clinical outcomes and early ambulation post operatively. Alpha-2 agonists are mixed with local anesthetic agents to extend the duration of spinal, extradural and peripheral nerve blocks. We compared addition of clonidine as an adjuvant to bupivacaine in transversus abdominis plane block with respect to duration of analgesia and total analgesic requirement in 24 hours.

Methods: Sixty ASA I and II patients scheduled for elective or emergency laparoscopic appendicectomy were divided into two equal groups in a randomized double-blinded fashion. Group B received bilateral USG guided TAP block with 15ml of 0.25% bupivacaine (total of 30ml). Group C received bilateral USG guided TAP block with 15ml of 0.25% bupivacaine + clonidine 1mcg/kg (total of 30ml + clonidine 2mcg/kg). Duration of analgesia and total analgesic requirement in 24 hours were studied. Hemodynamic parameters like pulse rate, systolic and diastolic BP and possible side effects were observed.

Results: Duration of analgesia in Group B and Group C was 11.18 ± 2.51 hrs and 19.73 ± 2.33 hrs respectively. Total analgesic requirement in 24-hours in Group B and Group C was 2.63 ± 0.67 and 1.20 ± 0.48 respectively.

Conclusion: Clonidine as an adjunct to bupivacaine in bilateral USG guided TAP block provides prolonged and sustained pain relief with reduced analgesic requirement and lesser side effects as compared to bupivacaine alone.

Keywords: TAP Block; Clonidine; Bupivacaine; VAS; Postoperative Analgesia.

Introduction

Laparoscopic appendicectomy is one of the most common surgical procedures and patients undergoing surgery suffer significant postoperative pain and require effective analgesia.[1] Proper pain management is essential for optimizing clinical outcomes and early ambulation post operatively. Post operative pain in acute appendicitis is mainly caused by surgical wound and viscero-peritoneal pain due to peritoneal insufflation.[2]

Transversus abdominis plane (TAP) block is one of the newer regional anesthetic technique that blocks the anterior abdominal wall neural afferents(T7-T11) and significantly reduces the pain associated with it.[3]

Local anesthetic agents are deposited in neuro-fascial plane between internal oblique

Corresponding Author: Jyotsna Bhosale, Associate Professor, Department of Anesthesiology, Symbiosis Medical College For Women, Lavale, Pune, Maharashtra 412115, India.

E-mail: drjyotsnabhosale20@gmail.com

and transversus abdominis muscle via needle inserted through the lumbar triangle of Petit under ultrasound guidance.[1,4]

The block was first described by Rafi in 2001.[5] The USG guided TAP block was described by Hebbard and colleagues[6] in 2007. The conventional TAP block is performed at so-called "Triangle of Petit" is bounded anteriorly by external oblique muscle (EOM), posteriorly by latissimus dorsi muscle and inferiorly by iliac crest, by advancing the needle for "double pop" or "pop" sensation of puncturing fascia to inject the local anaesthetic.[7,8]

Different adjuvants have been studied to improve the efficacy and to increase the duration of local anesthetic action in various nerve block techniques. Although opioids have been found to have effect on peripheral receptors, studies related to their effect as an additive to local anesthetic for TAP block are lacking.

Clonidine is an alpha agonist and an anti-hypertensive agent with properties of analgesia and sedation when given intravenous was used in this study as an adjuvant for prolonging the duration of TAP block, as it is cost effective and easily available.

Fatal complication like bowel puncture and hepatic injury have been reported while performing TAP Block.[9] These complications are now reduced by performing ultrasound guided TAP block, since precise location of needle and diffusion of local anesthetics can be directly observed by this technique.

The present study was planned to investigate whether addition of 1mcg/kg of Clonidine to 0.25% Bupivacaine in in bilateral USG guided TAP blockincreases the duration of postoperative analgesia in Laparoscopic appendicectomy as compared to 0.25% bupivacaine alone.

Material and Methods

This study was conducted in multi-speciality tertiary care teaching hospital associated with medical college. After approval by college ethical committee, study was conducted from April 2018 till August 2019.

Study design

This study was a prospective randomized double blind study.

Study population

A total of 60 patients of ASA I and ASA physical status undergoing elective or emergency laparoscopic appendicectomy were taken in the study. They were divided in two equal groups with 30 patients in each group by random chit method.

Group B (n=30) received bilateral USG guided TAP block with 15ml of 0.25% bupivacaine (total of 30 ml).

Group C (n=30) received bilateral USG guided TAP block with 15ml of 0.25% bupivacaine + clonidine 1 mcg/kg (total of 30 ml + clonidine 2 mcg/kg).

Inclusion Criteria

Patients belonging to ASA grade I and grade between the age groups 18-60 years weighing > 50 kg scheduled for elective/emergency laparoscopic appendicectomy.

Exclusion Criteria

- Patient not willing.
- Patients with history of chronic pain condition with analgesic usage on regular basis.
- Patients with known allergy to drugs used in the study .
- Patients who are mentally handicapped.
- Patients with localized infection at site of block.

Methodology of Study

All patients were evaluated preoperatively as per the proforma and were familiarized with Visual analogue scale (VAS) score.Written informed consent was obtained after explaining the procedure and NPO guidelines were followed in both the groups. Intravenous line was setup in ward. The patient and the investigator were kept unaware of the group allocated and standard protocol of GA was followed in both the groups as follows:

Preoperative

Inj. Glycopyrrolate 0.2 mg IV in preoperative room as premedication. Patient was then taken in Operation theatre. Multiparameter monitor (NIBP, SPO_2, ECG and HR) was attached. Premedication was done with Inj. Midazolam 1 mg IV and Inj. Fentanyl 1mcg/kg IV in both the groups. Pre oxygenation with 100% O_2 was done for 3 minutes. Induction was done with Inj. Thiopentone Sodium

5 mg/kg IV slowly. Intubation was done under effect of Inj. Succinylcholine 2 mg/kg IV under direct laryngoscopy with cuffed endotracheal tube of appropriate size.Intravenous fluid was started according to Holiday and Segar formula. (<10kg=100kcal/kg/day,10–20kg=1000kcal+50 calorie for each kg over 10kg, >20kg=1500kcal+20 calorie for each kg over 20kg.)

Maintenance

Was done on O_2 + air + Sevoflurane with intermittent Inj. Vecuronium 0.08mg/kg IV and intermittent positive pressure ventilation with closed circuit.After completion of the surgical procedure, bilateral USG guided TAP block was given as mentioned with 23 G spinal needle, before reversal of Neuromuscular blockade.At the end of procedure, reversal was done with Inj. Neostigmine 0.04mg/kg I.V. + Inj. Glycopyrrolate 0.01mg/kg IV.Extubation was done after fulfilment of extubation criteria.

Postoperative

The patients was assessed at interval of 30 min for first hour, 1 hourly till 6th hour then 6 hourly till 24hours.Pain severity was measured using VAS score(1-none,2-mild,3-moderate, 4-severe) patients was given analgesia on VAS score >4 . Inj. Dynapar 75mg IV in 100ml Normal saline was used as rescue analgesia.Sedation was evaluated using a four-point ordinal scale. Other associated side effects such as dryness of mouth, hypotension(SBP<20%of baseline),and bradycardia(HR<60/min) were observed.

Ordinal scale for sedation[3]

Grade	Ordinal scale
1	wide awake and alert
2	awake but drowsy responding to verbal stimulus
3	arousable, responding to physical stimulus
4	not arousable, not responding to physical stimulus

A note of the total analgesic need for the first 24hours was recorded after the USG guided TAP block. The TAP block was considered to be fail if rescue analgesia was needed within 2 hrs of block.

Statistical analysis[10,11,12]

The inter-group comparison of categorical variables is performed using Chi-square test / Fisher's exact probability test. The statistical significance of inter-group difference of mean of continuous variables is tested using independent sample 't' test or unpaired 't' test. The underlying normality assumption is tested before subjecting the study variables to 't' test. The entire data is entered and cleaned in MS Excel before it's statistical analysis. All the results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly.

The p-values less than 0.05 were considered to be statistically significant. All the hypotheses were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference). The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS ver. 16.0, IBM Corporation; NY, USA) for MS Windows.

Results

Sixty patients posted for elective/emergency laparoscopic appendicectomy were assessed for suitability to enroll in the study. Two patients were excluded from the study as analgesic was given in immediate postoperative period. Patients fulfilling the inclusion criteria were randomly assigned to one of the two groups. Standard protocol were followed in all groups.

Table 1: Patient characteristics.

Variable	Group B Mean± SD	Group C Mean± SD	P value
Age (years)	28.53 ± 7.62	28.53 ± 9.58	0.999NS
Weight (kg)	62.40 ± 9.12	65.00 ± 7.17	0.224NS
Gender (M/F)	17/13	16/14	0.795NS
ASA grade(I/□)	24/6	25/5	0.999NS
Duration of surgery (hours)	2.875 ± 0.278	2.868 ± 0.253	0.459NS

(P-value<0.05 is considered to be statistically significant. NS-Statistically non-significant.)

Both groups were comparable in terms of age, gender, weight, ASA grading and duration of surgery. (Table 1) (P> 0.001)

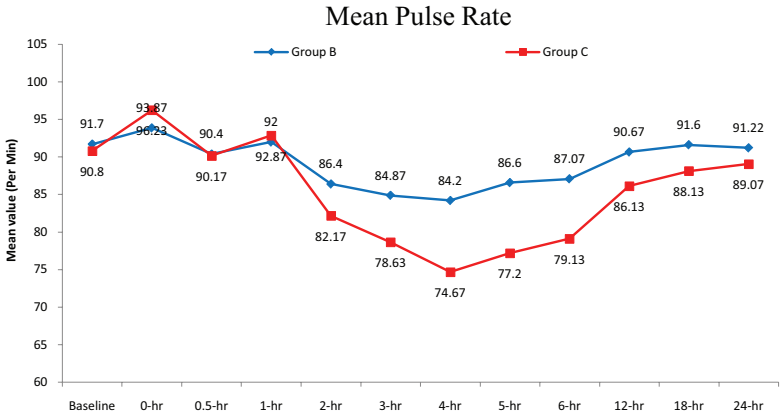
Table 2: Baseline parameters.

Variable	Group B Mean± SD	Group C Mean± SD	P value
VAS	3.0	3.0	0.470^{NS}
Pulse (per min)	91.70	90.80	0.062^{NS}
Systolic BP (mmHg)	123.33	122.47	0.450^{NS}
Diastolic BP (mmHg)	79.07	76.33	0.054^{NS}
Respiratory rate (per min)	16.07	16.13	0.656^{NS}
Spo2(%)	98.70	98.53	0.470^{NS}

(P-value<0.05 is considered to be statistically significant. NS-Statistically non-significant.)

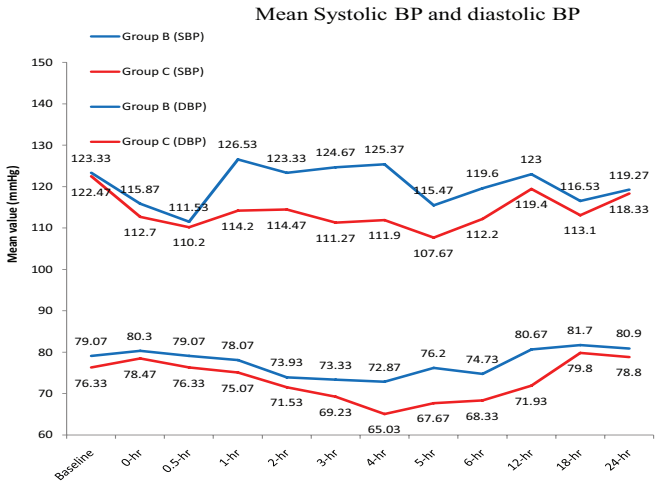
The baseline parameters like pulse rate, systolic blood pressure, diastolic blood pressure, respiratory rate, SPO2 and mean VAS were also comparable in both the groups (Table 2).

Graph 1: Mean pulse rate.



Distribution of mean pulse rate at 2-hr, 3-hr, 4-hr, 5-hr and 6-hr postoperatively among the cases studied was significantly higher in Group B compared to Group C (P-value<0.05 for all).(Graph 1).

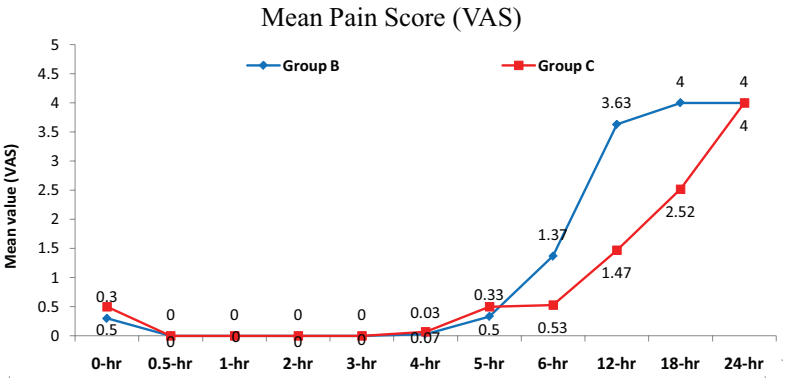
Graph 2: Mean systolic BP and diastolic BP.



Distribution of mean systolic BP at 1-hr, 2-hr, 3-hr, 4-hr, 5-hr, 6-hrand 12-hr postoperativelyamong the cases studied was significantly higher in Group B compared to Group C (P-value<0.05 for all).

Distribution of mean diastolic BP at 3-hr, 4-hr, 5-hr, 6-hr and 12-hr postoperatively among the cases studied was significantly higher in Group B compared to Group C (P-value<0.05 for all). (Graph 2).

Graph 3: Mean pain score.



The baseline VAS was comparable in both groups. VAS score in both groups did not differ upto 5-hr. In 6-hr there was comparable difference in VAS between both groups after which group B required rescue analgesia . Group C had better VAS upto 12-hr and 18-hr, after which rescue analgesia was given. At 24-hr VAS did not differ between both the groups (Graph 3).

Table 3: Duration of analgesia.

No. of hrs of analgesia (Hrs)	Group B (n=30)		Group C (n=30)		P-value
	Mean	SD	Mean	SD	
No. of hrs of analgesia (Hrs)	11.18	2.51	19.73	2.33	0.001***

Values are mean and SD, P-value by independent sample t test. P-value<0.05 is considered to be statistically significant. ***P-value<0.001.

The mean ± SD of No. of hrs of analgesia among the cases studied in Group B and Group C was 11.18 ± 2.51 hrs and 19.73 ± 2.33 hrs respectively. (P-value<0.001) (Table 3).

Table 4: Total analgesic doses.

Total analgesic doses in 24-hrs	Group B (n=30)		Group C (n=30)		P-value
	Mean	SD	Mean	SD	
Total analgesic doses in 24-hrs	2.63	0.67	1.20	0.48	0.001***

Values are mean and SD, P-value by independent sample t test. P-value<0.05 is considered to be statistically significant. ***P-value<0.001.

The mean ± SD of Total analgesic doses in 24-hrs among the cases studied in Group B and Group C was 2.63 ± 0.67 and 1.20 ± 0.48 respectively. (P-value<0.001) (Table 4).

Discussion

The advances in surgical techniques and the development of newer anesthetics techniques have enabled the current rapid growth of outpatient surgical procedures. With recent development of technology and endoscopic surgical intervention, the patient satisfaction and outcomes have been better.

Acute appendicitis is one of the most common causes of acute abdomen. Appendicectomy remains the "gold standard" in management of acute appendicitis. Minimally invasive laparoscopic intervention is preferred. Pain due to surgery is lesser compared to open surgical method.

Pain interferes with recovery and rehabilitation. Adequate pain relief is an important aspect of post operative care. This is important not only for psychological well being of patient, but also decreases the stress response to surgery and favors a better outcome. It facilitates rehabilitation and accelerates recovery from surgery.

Different post-operative pain relief modalities like enteral, parenteral analgesics, regional blocks i.e central neuraxial block and peripheral nerve blocks are available, having their own advantages and disadvantages.

Transversus Abdominis Plane block has been used as a multimodal strategy to optimize post operative pain outcomes. Many additives are added like opioids, dexamethasone, dexmeditomedine, clonidine etc. to prolong the duration of peripheral nerve blocks.

Many previous investigations have reported the analgesic benefit of TAP block in patients undergoing lower abdominal surgeries including laparoscopic appendicectomy, but very few used clonidine as an additive to local anesthetic.

This study was formulated with an aim to compare the efficacy of clonidine as an additive to 0.25% bupivacaine in transversus abdominis plane block for postoperative pain relief.

The demographic profile of patients in our study was comparable in relation to age, gender, ASA grade, mean body weight and mean duration of surgery (Table 1).

The intergroup comparison of mean pulse rate, SBP, DBP were comparable between two groups. Distribution of mean pulse rate was significantly lower in Group C varying between 70-90 beats/min, but none showed bradycardia of < 60beats/min requiring intervention (Graph 1). Similarly mean systolic blood pressure and mean diastolic blood pressure showed significant difference from 1-hr to 12-hr and 3-hr to 12-hr respectively, which was lower in group C (Graph 2). Mean pulse rate, SBP and DBP did not show significance at 18-hr and 24-hr as group B was receiving Diclofenac injection. Similar observations were made by B Manju Sruthi et al[13] in 2019, they concluded that there is dose dependent variation in vitals. Higher doses of clonidine showed dose dependent adverse effects like hypotension and bradycardia.

The baseline VAS was comparable in both groups. VAS score in both groups did not differ upto 5-hr. In 6-hr there was comparable difference in VAS between both groups after which group B required rescue analgesia . Group C had better VAS upto 12-hr and 18-hr, after which rescue analgesia was given. At 24-hr VAS did not differ between both the groups. (Graph 3).

The mean duration of analgesia in group B was 11.18 ± 2.51 hrs while in group C it was 19.73 ± 2.33 hrs (Table 3). Similar observations were made by Ranjusinghet al[3] in 2016, they observed that addition of clonidine in bilateral TAP block for post operative analgesia in caesarean section significantly increased duration of analgesia. They observed that duration of analgesia was longer in clonidine group (17.8±3.7 hours) compared to bupivacaine alone group (7.3±1.2 hours). Similar observations were made by Deshpande JP et al[14] in 2017 ,Mehmet Aziretet al15 in 2018 and Kayla Krajicket al[16] in 2019, they observed that TAP block provided lower VAS and better analgesia.

The total analgesic consumption was comparable in both the groups (Table 4). The total requirement of Diclofenac in group B was 2.63 ± 0.67 mg (197.25 mg) and group C was 1.20± 0.48 mg (90 mg). There was almost 50% reduction in analgesic consumption in group C. Similar observation were seen by Ranjusinghet al[3] in 2016 , they observed that the mean consumption of diclofenac in group with bupivacaine alone was 150 mg and group with clonidine was 65.5mg in 24 hours. Also Zanghiet al[17] in 2015 observed that TAP Block with bupivacaine and clonidine after laparoscopic cholecystectomy resultedin effective pain control and decreased post operative analgesic requirements.

There were nocomparable adverse effects. In group B ,three candidates had nausea/vomiting and in group C four showed similar effects. It can be attributed to patient and surgery related factors like peritoneal handling and fasting period.

Other known side effects of clonidine like bradycardia, hypotension and dry mouth requiring intervention was not observed. Similarly, Zanghiet al[17] in 2015 observed no clonidine related side effects like hypotension, bradycardia and sedation when clonidine was given as adjunct in TAP block for postoperative analgesia after laparoscopic cholecystectomy.

Studies conducted by Rakesh Dhupia et al[18] in 2017 and B Manju Sruthi et al[13] in 2019 observed dose dependent increase in side effects when two different doses of clonidine were compared in TAP block. They compared addition of 150 mcg and 300 mcg and 75 mcg and 150 mcg respectively. The lower dose of clonidine i.e 1 mcg/kg produced effective analgesia without adverse effects .

Contrary to our study, Bollaget al[19] in 2012 observed wound hyperalgesia and long term pain descriptions after cesarean delivery in women receiving an USG guided bilateral TAP block with 0.375% bupivacaine with 75mcg clonidine on each side. They concluded that performing a TAP block with or without clonidine does not appear to offer any benefits in chronic pain description after 12 months. But it provided significant reduction in hyperalgesia index in 48 hrs and reduction in analgesic consumption in clonidine group.

Thus in our study it was observed that the TAP block with bupivacaine and clonidine as an additive provided better postoperative analgesia and lesser total requirement of analgesic in 24 hours when compared with bupivacaine alone with no incidence of significant side effects in either groups.

We recommend that additional studies using ultrasonography and different drug combinations and doses of local anesthetics for TAP block can be done.

Conclusion

Clonidine as an adjunct to bupivacaine in bilateral USG guided TAP block provides prolonged and sustained pain relief with reduced analgesic requirement and lesser side effects as compared to bupivacaine alone.

Limitations

1. The first limitation of our study was small sample size.
2. Second limitation was that we used intermittent Dynapar as rescue analgesic, the use of Patient controlled analgesia (PCA) Pump in the postoperative period would have given better idea in assessing analgesic requirement more precisely.
3. The results of our study may vary as compared to other studies due to variable ethnic population as pain tolerance may vary.

References

1. Ghimire A, Bhattarai B, Prasad JN, Subedi A, Thapa P, Limbu PM, Adhikari S. Postoperative Analgesic Effect of Morphine Added to Bupivacaine for Transversus Abdominis Plane (TAP) Block in Appendectomy. Kathmandu Univ Med J. 2017;58(2):137-41.
2. D.J. Sandelman, M. Bennett, A.V. Dilley, A. Perczuk, S. Lim and K.J. Kelly. Ultrasound guided transverse abdominis plane blocks for laparoscopic appendicectomy in children: a prospective

randomised trial. British Journal of Anaesthesia (2011) 106 (6): 882-6.

3. Singh R, Kumar N, Jain A, Joy S. Addition of clonidine to bupivacaine in transversus abdominis plane block prolongs postoperative analgesia after cesarean section. Journal of anaesthesiology, clinical pharmacology. 2016 Oct;32(4):501.
4. Gopinath N, Searle A, Mathews M, Mishra V, baban M and Wong M. Analgesic efficacy of ultrasound-guided transversusabdominis plane block in patients undergoing open appendicectomy Br J Anaesth. 2009; 103: 468-70.
5. AN Rafi, Abdominal Field Block: a New Approach Via The Lumbar Triangle; Anaesthesia; 2001;56:1024-6.
6. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. Anaesthesia and intensive care. 2007 Aug 1;35(4):616-8.
7. Ra YS, Kim CH, Lee GY, Han JI. The analgesic effect of the ultrasound-guided transverse abdominis plane block after laparoscopic cholecystectomy. Korean journal of anesthesiology. 2010 Apr;58(4):362.
8. Peng K, Ji FH, Liu HY, Wu SR. Ultrasound-guided transversus abdominis plane block for analgesia in laparoscopic cholecystectomy: a systematic review and meta-analysis. Medical Principles and Practice. 2016;25(3):237-46.
9. Farooq M, Carey M.A case of liver trauma with a blunt regional anesthesia needle while performing transversusabdominis plane block.RegAnesth Pain Med 2008;33:274-5.
10. Bernard Rosner. Fundamentals of Biostatistics, 2000, 5th Edition, Duxbury, page 80-240.
11. Robert H Riffenburg. Statistics in Medicine 2005, 2nd Edition, Academic press. 85-125.
12. Sunder Rao P, Richard J, An Introduction to Biostatistics, A manual for students in health sciences, New Delhi: Prentice hall of India. 2006; 4th Edition, 86-160.
13. Sruthi BM, Reddy GS, Jyothsna G. Transversus abdominis plane block: Comparison of efficacy of varying doses of clonidine combined with levobupivacaine–A double-blind randomizedtrial. Anesthesia, essays and researches. 2019 Jan;13(1):179.
14. Deshpande JP, Ghodki PS, Sardesai SP. The analgesic efficacy of dexamethasone added to ropivacaine in transversus abdominis plane block for transabdominal hysterectomy under subarachnoid block. Anesthesia, essays and researches. 2017 Apr;11(2):499.
15. Aziret M, Palabıyık O, Karaman K, Muhtaroğlu A, Baş E, Öter V, Ercan M, Çelebi F, Bostancı E. Effectiveness of transversus abdominis plane block for laparoscopic appendectomy in non-perforated acute appendicitis. Laparoscopic Endoscopic Surgical Science (LESS).;25(4):133-9.
16. Krajick KA, Sullivan MH. Postoperative Opioids After Laparoscopic Hysterectomy With Transversus Abdominis Plane Block [2D]. Obstetrics & Gynecology. 2019 May 1;133:42S.
17. Zanghì GN, Rinzivillo NM, Milazzo M, Lodato M, Panascia E, Sorbello M, Corso RM, Basile F. Postoperative analgesic efficacy of transversus abdominis plane block with clonidine after laparoscopic cholecystectomy. Chirurgia. 2015;36(1):9-14.
18. Dhupia R, Jain S, Sahani IS, Modi V, Romday R, Kothari A. Effect of adding various doses of clonidine as an adjunct in Transversus abdominis plane block in unilateral inguinal hernioplasty. International Surgery Journal. 2017 Nov 25;4(12):4039-42.
19. Bollag L, Richebe P, Siaulys M, et alEffect of Transversus Abdominis Plane Block With and Without Clonidine on Post–Cesarean Delivery Wound Hyperalgesia and Pain, Regional Anesthesia & Pain Medicine 2012;37:508-514.

Case Report

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.49

Coccygodynia after Caudal Epidural Steroid Injection: A Case Report

Rachna Varma[1], Gauri Varma[2], Sudheer Dara[3] Minal Chandra[4]

Author Affiliation: [1,3,4]Consultant, [2]Intern, Department of Anesthesia, Epione Centre of Pain Relief and Beyond, Varma Union Hospital, Indore, Madhya Pradesh 452002, India.

How to cite this article:
Rachna Varma Gauri Varma, Sudheer Dara et al. Coccygodynia after Caudal Epidural Steroid Injection: A Case Report. Indian J Anesth Analg. 2020;7(5):1217–1219.

Abstract

Caudal epidural is a commonly used approach for epidural for different intervention. It is used commonly to treat painful coccyx pain.We report an unusual complication of coccygeal pain after caudal epidural steroid injection given for treatment of L5-S1 Prolapsed disc causing right S1 root pain.

Keywords: Caudal, Coccyx, Epidural space, Steroids, Prolapsed disc, Root pain.

Introduction

The first documented epidural medication injection, which was performed using the caudal approach was performed in 1901, when cocaine was injected to treat lumbago and sciatica (presumably pain referred from lumbar nerve roots).[1&2] According to reports, epidurals from the 1920s–1940s involved using high volumes of normal saline and local anaesthetics.[3] Injection of corticosteroids into the epidural space for the management of lumbar radicular pain was first recorded in 1952.

Case report

A 34 years male presented with complains of low back pain with radiation to right lower limb up to knee jointand tingling for one year.[4] It was a continuous burning pain which increased on bending forwards and Sitting. His visual analogue scale was 6/10. On examination his straight leg raising test right side was positive at 40° right. Faberstest was positive on the right side. On palpation tenderness was present onaxial midline lumbar spine and right Posterior Superior iliac spine.[5] There was no motor, sensory deficit or bladder bowel deficit. He was advised MRI lumbar spine which showed a moderately large posterocentral to right paracentral disc protrusion indenting the right S1 nerve root. He was counselled for surgical and non surgical interventions. He was taken for a L5, S1 right transforaminal nerve block and caudal epidural steroid injection5. He was taken to the operation theatre with intravenous catheter 18 G and monitors in place a single shot of intravenous antibiotic administered patient was put in prone position. Aseptic painting and draping was done. A right L5 and S1 transforaminal nerve block and caudal epidural injection of 0.25% bupivicaine and steroid was done under local anaesthetic infiltration and fluoroscopy guidance6. Immediately after the procedure patient reported a decrease in pain. He was observed in recovery room for two hours and was discharged with analgesics and anti neuropathics. He came for follow up after 7 days with complains of pain at site of injection. On examination there was mild tenderness on coccygeal area but no other signs of inflammation. He was advised anti inflammatory analgesics for seven days. The patient came back after seven days with severe pain at site of injection

Corresponding Author: Rachna Varma, Consultant, Department of Anesthesia, Epione Centre of Pain Relief and Beyond, Varma Union Hospital, Indore, Madhya Pradesh 452002, India.

E-mail: drrvarma@ymail.com

unable to sit but no fever or neurological signs or symptoms. His original back pain and radicular pain were negligible. On General examination patient was in severe agony but no signs of systemic illness and was afebrile. His pulse rate and blood pressure were normal. On local examination there was severe tenderness in coccygeal area. His VAS was 9/10. He was admitted and a complete blood count, C reactive protein and ESR donewas negative for any infection. A MRI with contrast of lumbosacralcoccygealregion was done which showededematous inflammatory changes in proximalcoccygeal segments. Local anaesthetic and triamcinolone 40 mg was infiltratedat the site of tenderness and fluoroscopy guidance. He reported decrease in pain scores immediately and was observed for 24 hours He was put on analgesics, anti inflammatory, advisesitz bath and prophylactic antibiotics for a week. Patient was discharged after 24 hours 7. Patient was comfortable and followed up after 7 days where he reported decreased pain with VAS of 2/10. He was then followed up after a month where he was pain free.

Discussion

Epidural steroid injection is used commonly to diagnose as well as treat various conditions. Epidural space is a potential pain generator in many conditions mainly disc disease causing inflammation of nerve roots.[8] This has lead to the use of epidural steroid injection and decrease in pain over a prolonged period of time and a positive therapeutic response in patients with radiculopathy and sciatica.[9] Chronic inflammation of nerve roots results in wallerian degeneration and fibrosis of neural tissues. The analgesic effects of corticosteroids are most likely because of inhibition of inflammation and PLA2, reduction of capillary permeability and also because it inhibits neural transmissions in nociceptors C fibres.

Caudal epidural steroid injection is commonly done to alleviate pain in acute pain like post-operative pain relief or chronic benign pain like spondylosis, radiculopathy and regional pain, coccygodynia, cancer pain. Caudal epidural approach is also used epidural injection, spinal-cord stimulation, epiduroscopy.[10] This is also used for drug Administration in patients on anticoagulation drugs or with coagulopathy. There are various advantages over lumbar epidural injection as it is technically less demanding and chances of Dural puncture is minimal.[11] There are various known but infrequently occurring complications like neurological, infection, bleeding, urinary retention, ocular complications or drug related complications. Coccygodynia or coccygeal pain is a pain in vicinity of tail bone. Most often it's caused by trauma to coccyx other causes include infection, congenital anomaly, tumours etc. it's Treatment includes conservative methods using physiotherapy, support with cushion (foam doughnut), pharmacological using analgesics and anti inflammatory drugs and interventions which includes massage, local infiltration of local anaesthetic and steroid, caudal epidural, ganglionimpar block and RF ablation (Nathan ST et al 2010). In resistant cases surgical interventions are done.[12]

Conclusion

Caudal epidural is a technically an easy procedure but should always be done with strict asepsis. Chances of any complications are very less but should be watched for and appropriate measures should be taken to recognise and corrective measures taken.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest

References

1. Riew KD, Park JB, Cho YS, et al. Nerve root blocks in the treatment of lumbar radicular pain. A minimum five-year follow-up. J Bone Joint Surg Am. 2006 Aug. 88(8):1722–5. [Medline].
2. 7. Barre L, Lutz GE, Southern D, et al. Fluoroscopically guided caudal epidural steroid injections for lumbar spinal stenosis: a retrospective evaluation of long term efficacy. Pain Physician. 2004 Apr. 7(2):187–93. [Medline].
3. Rados I, Sakic K, Fingler M, Kapural L. Efficacy of interlaminar vs transforaminal epidural steroid injection for the treatment of chronic unilateral radicular pain: prospective, randomized study. Pain Med. 2011 Sep. 12(9):1316–21. [Medline].
4. Radcliff K, Hilibrand A, Lurie JD, Tosteson TD, Delasotta L, Rihn J. The impact of epidural steroid injections on the outcomes of patients treated for lumbar disc herniation: a subgroup analysis of the SPORT trial. J Bone Joint Surg Am. 2012 Aug 1. 94(15):1353–8. [Medline].
5. Buttermann GR. Treatment of lumbar disc herniation: epidural steroid injection compared with discectomy. A prospective, randomized study. J Bone Joint Surg Am. 2004 Apr. 86-A(4):670–9. [Medline].

6. Zhu J, Falco FJ, Formoso F, Onyewu O, Irwin FL. Alternative approach for lumbar transforaminal epidural steroid injections. Pain Physician. 2011 Jul-Aug. 14(4):331–41. [Medline].

7. McCahon RA, Ravenscroft A, Hodgkinson V, Evley R, Hardman J. A pilot study of the dose-response of caudal methylprednisolone with levobupivacaine in chronic lower back pain. Anaesthesia. 2011 Jul. 66(7):595–603. [Medline].

8. Manchikanti L, Singh V, Cash KA, Pampati V, Damron KS, Boswell MV. A randomized, controlled, double-blind trial of fluoroscopic caudal epidural injections in the treatment of lumbar disc herniation and radiculitis. Spine (Phila Pa 1976). 2011 Nov 1. 36(23):1897–905.

9. Abdi S, Datta S, Trescot AM, et al. Epidural steroids in the management of chronic spinal pain: a systematic review. Pain Physician. 2007 Jan. 10(1):185–212.

10. Foye PM. Coccydynia: Tailbone Pain. Phys Med RehabilClin N Am. 2017 Aug. 28 (3):539–549.

11. Nathan ST, Fisher BE, Roberts CS. Coccydynia: a review of pathoanatomy, aetiology, treatment and outcome. J Bone Joint Surg Br. 2010 Dec. 92 (12):1622–7.

12. Postacchini F, Massobrio M. Idiopathic coccygodynia. Analysis of fifty-one operative cases and a radiographic study of the normal coccyx. J Bone Joint Surg Am. 1983 Oct. 65 (8):1116–24.

Case Report

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.50

Extra Pleural Pneumonectomy: Perioperative Anaesthetic Management in Spindle Cell Sarcoma Patient – A Case Report

Veena[1], Chandrashekar Manjunatha[2], Rashmi Hegde[3], Guruchannabasavaiah B[4]

Author Affiliation: [1,3,4]Consultant, Department of Anesthesiology, Nanjappa Multispeciality Hospital, Shivamogga, Karnataka 577201, [2]Assistant Professor, Department of Anaesthesiology, ESIC Medical College Bangalore, Karnataka 560010, India.

How to cite this article:
Veena, Chandrashekar Manjunatha, Rashmi Hegde, et al. Extra Pleural Pneumonectomy: Perioperative Anaesthetic Management in Spindle Cell Sarcoma Patient – A Case Report. Indian J Anesth Analg. 2020;7(5):1221–1223.

Abstract

Extrapleural pneumonectomy is a radical and aggressive surgery for malignant pleural tumors. Anaesthesia management in these patients is highly a challenging task for anesthesiologists due to increased risk of perioperative morbidity and mortality. We present a case report of 45 year old female with spindle cell sarcoma for extrapleural pneumonectomy it represents our institution experience in anaesthesia care. An understand of the unique physiological consequences of this procedure,preoperative assessment of cardiopulmonary function,thoracic epidural, physiotherapy, high vigilance, team work, collaboration with surgeon helps to improve perioperative outcome of patients.

Keywords: Extra pleural pneumonectomy; Spindle cell sarcoma; Forcedexpiratory volume in 1 second; Forced vital capacity.

Introduction

Extrapleural pneumonectomy (EPP) is a surgical treatment for malingnant pleural tumors which is an invasive complex surgery first described by Irving Arthur Sarot in 1949[1] for the treatment of tuberculosis empyema and later Butchart et al.,employed in malignant pleural mesothelioma treatment.[2] EPP involves enbloc resection of lung, ipsilateral diaphragm,parietal pleura and pericardium.

Anaesthesia management of these patients will be highly challenging due to risk of significant blood loss, hemodynamic instability,difficult fluid therapy and risk of dysrhythmias, cardiac herniation and pericardial tamponade.[3]

Case report

A 45 year old female patient, with history of cough and breathlessness since two months presented to our institute. She has been diagnosed as spindle cell sarcoma and posted for left thoracotomy and pneumonectomy.

Preanaesthetic checkup done: She has no other medical comorbid illness and not on any medications. *Her vitals:* heart rate 70 bpm, blood pressure 100/60 and oxygen saturation 93% on room air. Routine laboratory investigations and cardiac evaluation were within normal limits. Pulmonary function tests revealed mild restrictive pattern with FEV1/FVC 91%,FEV1 postoperative predicted 45%, lung perfusion scan left 6.9% and right 93.1%.Computed tomography (CT) thorax showed pleural based tumor with multiple pleural nodules and collapsed left lung with effusion. CT guided pleural nodule biopsy which showed spindle cell sarcoma.After discussing with intra hospital tumor board planned for upfront surgery.

On day of surgery standard monitors,five lead electro cardiography,pulse oximetry,non- invasive blood pressure was connected.Underaseptic

Corresponding Author: Chandrashekar Manjunatha, Assistant Professor, Department of Anaesthesiology ESIC Medical College Bangalore, Karnataka 560010, India.

E-mail: manjunathc61@gmail.com

precautions (ASP) thoracic epidural at T6–T7 using 18 G touhy needle and 20 G catheter threaded and fixed at 9 cm before induction. Right subclavian venous and right radial artery cannulation were done to monitor central venous pressure and invasive pressure monitoring respectively.

Preoxygenationwas done for 5 min. Glycopyrrolate 0.2 milligram (mg), midazolam one mg, fentanyl two microgram/kg were given intravenously.Induction done with propofol2 mg/kg,vecuronium 0.1 mg/kg.Intubated with 32 Fr left double lumen tube (DLT), tube secured after confirming with fiberoptic bronchoscopy. Patient placed in right lateral for left thoracotomy. Anaesthesia maintained with oxygen - air mixture,isoflurane and vecuronium. One lung anaesthesia was initiated with tidal volume 6 ml/kg, 15 breaths per minute and Fio 2 –50%.Adequate ventilation was monitored with end-tidal carbon di oxide,arterial blood gas analysis.

The surgery includes EPP, hemidiaphragm resection and repair with mesh and closure of bronchial stump with latissimus dorsi flap to prevent bronchopleural fistula.Pericardial resection was not done in our patient.

During surgery appropriate padding done at all pressure points. Fluid warmer, forced air warmer, pneumatic compression stockings were used. Temperature with peripheral probe, arterial blood gas analysis and urine output were monitored. Noradrenalin infusion started to maintain mean arterial pressure more than 70mmhg.Total blood loss was 1200 ml replaced with1500 ml crystalloids, two units of packed red cell,one unit of fresh frozen plasma and four platelets. DLT was withdrawn little during bronchial stump stapling. After completion of surgery muscle relaxation was reversed by neostigmine 2.5 mg with glycopyrrolate 0.4 mg,extubated on table in order to prevent stump leak,patient shifted to ICU.Total urine output was 500 ml for 8 hours. Intraopratively patient started on continuous epidural infusion with a mixture of bupivacaine 0.125% with 2 microgram/ml fentanyl at 8 ml/hour, continued in post-operative period. Nor - adrenaline was tapered after second day of surgery.Patient developed ileus on second postoperative day due to hypokalemia correction given with potassium chloride. Patient discharged on tenth postoperative day.

Discussion

EPP involves enbloc resection of lung,ipsilateral diaphragm, parietal pleura and pericardium.[1] Anaesthetic management is crucial in reducing the postoperative complications by understanding the physiological changes associated with EPP which includes prolonged duration of surgery,fluid-electrolyte and acid base imbalance,temperature variations and arrhythmias.[3,4,6] Induction agent propofol, fentanyl, vecuronium and isoflurane was used to reduce myocardial depression[3,5] and thoracic epidural used to reduce pain and early extubation of patient to reduce bronchial stump leak and ventilator associated complications.

Thoracic epidural with local anaesthetics known to inhibit hypoxic pulmonary vasoconstriction and also reduces mean arterial pressure, even though we had placed to reduce postoperative respiratory complications, early mobilization of patients and reduction in opioid usage and its complications.[6]

Lung isolation can be done either with DLT or bronchial blockers. In our patient we used double lumen tube.The most important goal during one lung ventilation is to ensure adequate oxygenation, prevent hypoxemia as well as acute lung injury,therefore we used protective lung ventilation with low tidal volume 6ml/kg, fio2 –50%, 15 breaths per minute to maintain peak airway pressure between 25–30 cmH2o.[5,6,7,8]

Hypotension occurred due to anaesthetic agents, thoracic epidural, insensible loss, blood loss during surgery which was managed by fluid therapy and blood components. Perioperative fluid management is an important cornerstone of hemodynamic stability and a challenge for each anaesthesiologist. Liberal fluid administration leads to lung edema,acute lung injury, respiratory failure and increases postoperative mortality. This was managed with goal directed fluid therapy and nor adrenaline infusion to maintain hemodynamic stability and tissue perfusion as well as to maintain urine output of 0.5 ml/kg/min.[3,6]

Maintaining normothermia during procedure is very much essential to prevent hypothermia induced complications like impaired platelet and clotting factor enzyme function,impaired immune function, increased heart rate, oxygen demand which can lead to myocardial infarction. We used forced air blanket to maintain temperature above 35.5 degree Celsius.[6,9]

Pulmonary complications are the major etiology for morbidity and mortality. Independent risk factors for pulmonary complications are ASA 3, smoking, age more than 70, COPD, BMI>30mg/kg. Prolonged exposure to general anaesthetics can cause reduced production of surfactant,increased

alveolar-capillary permeability,impaired alveolar macrophage function and slow mucociliary clearance leading to an alteration in gas exchange. Positioning and mechanical ventilation cause postoperative atelectasis which results in V/Q mismatch and hypoxemia.[7]

Conclusion

Patients undergoing EPP are at risk of perioperative complications, detailed preoperative assessment and risk stratification of patients is essential to reduce morbidity and mortality.

References

1. Irving Arthur Sarot. Extrapleural pneumonectomy and pleurectomy in pulmonary tuberculosis. Thorax, 1949;4:173–223.
2. Butchart EG, Ashcroft T, Barnsley WC, Holden MP. Pleuopneumonectomy in the management of difuse malignant mesothiloma of the pleura.Experince with 29 patients.Thorax 1976;31:15–24.
3. Ju Mei Ng, Philip M, Hartigan. curropin Anesthesiology. 2008;21:21–27.
4. Miller T E. Extra pleural pneumonectomy. In: Barbeito A, Shaw A D, Grichnik K, editors. Thoracic anesthesia. United states: The McGraw-Hill Companies;2012.
5. Ramegowda J K, Salam M A, Nayak V, Zaveri. Anesthetic management of extrapleural pneumonectomy and hyperthermicintrathoracic chemotherapy procedure. Indian J Anesth 2015;59: 807–10.
6. Shah S B, Chowdhary I, Darling L M, Goyal P, Kansas A.Clinical pearls in anaesthesia for Pleurectomy/ Decortication for Malignant mesothelioma. The Open Anesthesiology Journal 2017;11:29–34.
7. Lederman D, Easwar J, Feldman J, Shapiro V. Anesthetic consideration for lung resection: Preoperative assessment,intraoperative challenges and postoperative analgesia. Ann Transl Med 2019;7;356.
8. Blank R S, Douglas A. Colquhous, Durieux M E, Benjamin D, Kozower, et al. Management of one lung ventilation: Impact of Tidal volume on complications after thoracic surgery. Anesthesiology 2016;124:1286–95.
9. Bindu B, Binders A, Rath G.J Anesthesiologistclin pharmacol 2017;33:306–16.

Case Report

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5, September – October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.51

Missing Epidural Catheter Fragment: Case Report and Review of Literature

Haramritpal Kaur[1], Jatin Gupta[2], Jaipreet Singh Sidhu[3], Anshul Dahuja[4], Amandeep Singh[5]

Author Affiliation: [1]Associate Professor, [2]Junior Resident, [3]Senior resident, Department of Anaesthesia, [4]Assistant Professor, Department of Orthopaedics, [5]Associate Professor, Department of Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab 151203, India.

How to cite this article:

Haramritpal Kaur, Jatin Gupta, Jaipreet Singh Sidhu, et al. Missing Epidural Catheter Fragment: Case Report and Review of Literature. Indian J Anesth Analg. 2020;7(5):1225–1227.

Abstract

Epidural blocks are very important part of anaesthesia practice for providing anaesthesia/analgesia in various surgical and painful conditions. Breakage of an epidural catheter is a rare complication which disturbs patient, anaesthesiologist as well as operating surgeon. We describe the occurrence of such an event where epidural catheter fragment was found to be missing at the time of removal. We would also highlight the common reasons mentioned in literature that can precipitate such events and recommendations to prevent them.

Keywords: Analgesia; Anaesthesia; Epidural catheter; Breakage; Management.

Introduction

Epidural anaesthesia/analgesia is a widely used technique involving neural blockade of thoracic, lumbar and/or sacral segments. Depending upon indication local anaesthetics can be administered into the epidural space using single injection technique or continuously/intermittently via a catheter. Although epidural catheters are normally used without much complications, still some complications like catheter breakage can occur and add on to the worry of the anaesthesiologist, surgeon as well as of the patient. We here by present a case report of such an event and would also highlight the common reasons mentioned in literature that can precipitate such events and recommendations to prevent them.

Case report

An 80-year-old female, weighing 90 kg had fall at home and suffered left inter-trochanteric femur fracture. It was not associated with any other injury. She was known case of hypertension for 5 years for which she was on tab telmisartan 40mg OD and tab amlodipine 5 mg OD. She had history of breathlessness (NYHA 3) and palpitations forlast 4 months. She had cough with expectoration since 5 days for which she was on injection deriphyllin intravenous (i/v), injection hydrocort 100mg i/v, and Injaugmentin 625 mg. She was hard of hearing. On examination, her blood pressure was 170/100 mmHg, pulse rate 88/min and regular, breadth holding time 18 sec. On auscultation, her chest had left basal crepts/rhonchi with decreased air entry on right side.

Her blood investigations were within normal limit. Her ECG showed right bundle branch Block and her chest x-ray showed cardiomegaly with hyperinflated lung fields with infiltration in left lower zones. Her 2-D echocardiography revealed sclerotic aortic valve, mild aortic regurgitation, mild mitral regurgitation, age related grade 1 left ventricular diastolic dysfunction, no regional wall motion abnormality and ejection fraction of 45%. Informed written high risk consent was taken from patient in view of old age, obesity, cardiac status and

Corresponding Author: Haramritpal Kaur, Associate Professor, Department of Anesthesia, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab 151203, India.

E-mail: amritk_dr @yahoo.co.in

chest infection. Considering the patient's condition and purposed surgery i.e. left proximal femur nailing, combined spinal epidural anaesthesia was planned.

In the operating room, ASA standard monitoring was applied. Her preoperative vitals were BP - 182/75 mmHg, HR - 82/min regular, Spo2 - 89%- 91% RR - 18/min. IV line was started and emergency drugs were kept ready. Under all aseptic precautions, 18 gauze, 80 mm Tuohy needle (PORTEX Epidural Minipack System 1) was used to access the epidural space in L3–L4 intervertebral space with loss of resistance technique in the sitting position. The epidural space was encountered at 6 cm from skin through a paramedian approach, and 20-gauze radio-opaque close-ended multihole epidural catheter was advanced and fixed at 11cm after administering test dose. Spinal anaesthesia was given using 25G Quincke's needle with 0.5% heavy bupivacaine 2ml and 25µg Fentanyl at L2–L3 interspace. An aseptic dressing was done and adequate motor block and sensory level upto T8 was achieved. Intraoperatively, her vitals were maintained within 20% of baseline throughout the procedure. Epidural top up was given using 0.5% ropivacaine 6ml after 2 hrs. The surgery lasted for 3 hrs. Total fluid given was one litre crystalloids and one unit of PRBC was transfused. The estimated blood loss was 450ml. On completion of surgery, the patient was shifted to Post Anaesthesia Care Unit (PACU). Patient's vitals remained stable and hence she was shifted to ward later.

Next day, resistance was encountered while trying to administer top up. We were unable to give top up, so removal of epidural catheter was planned. On removal of dressing, the epidural catheter was found to be lying outside the skin. On inspection of the catheter, tip of the catheter along with some part (8 cm) was found to be missing (Fig 2). The distal part of the catheter was found to be stretched along it's length (Fig 3). The surgical team and the patient were informed of the event. On examination there was no feature of any local infection, sepsis, or any neurological deficit.

Digital X-ray of thoracolumbar spine both in anteroposterior and lateral position was done. It was not possible to detect the missing fragment. Computed tomography (CT) scan of dorsolumbar spine with sagittal and coronal reconstruction could not detect missing catheter fragment.

The patient was counselled about the possible complications related to the retained epidural catheter fragment. She was kept on a regular follow up with an advice to report in case of any abnormal signs and symptoms. The patient remained stable in postoperative period and discharged in satisfactory condition. Our patient has not reported any adverse symptoms so far till the writing of this article approximately 12 months.

Discussion

Epidural analgesia is an important part of many enhanced recovery after surgery (ERAS) protocols for patients undergoing major intra-abdominal, intra-thoracic and lower limb procedures. Epidural anaesthesia is relatively slower in onset and may be helpful when caring for haemodynamically fragile patients. Literature review shows only few case reports of breakage of epidural catheter, most of which occur during catheter removal and some during insertion but missing at the time of removal makes this case a unique. Breakage of the epidural catheter is usually a benign issue except for a few instances.

All patients with retained epidural catheter fragment should undergo proper imaging studies to know it's exact location.[1] It is also necessary for documentation purposes. Radio opaque epidural catheters are easier to locate radiologically than non-radio opaque ones, but paradoxically, they have a lower tensile strength than standard clear catheters. Radio-opaque fragment may also be impossible to locate radiologically because of the radio dense surrounding structures.[1] CT scanning is more sensitive than plain radiography and MRI in detecting the high attenuation catheter fragment within the epidural space.[1] In our case X Ray and CT did not help to locate the fragment since they are helpful only when there is a reactive mass around the catheter fragment and it usually takes approximately 3 weeks to form the same.

Retained epidural catheter pieces are generally considered to be inert and should not produce a foreign body reaction. However literature research has shown certain complications pertaining to retained catheter like formation of a reactive epidural mass around the catheter fragment resulting in lumbar spinal stenosis,[2] low back ache due to foramina stenosis[3] and delayed onset of subdural hematoma.[4] However, there are 3 situations where a policy of non-interference or reassurance does not apply:-

1. Where infection or symptoms supervene, a careful history and physical examination should help determine the spinal level involved.

2. If the catheter fragment gets migrated intrathecally and allowing persistent CSF leakage.
3. If the proximal end of the segment is located at or just beneath the skin such that it can be retrieved simple through a superficial incision made under local anaesthesia.

In most cases, the current practice is to leave them alone unless symptomatic because surgical removal can produce more harm than good. Surgery is reserved for symptomatic cases only.

Usual Causes of Broken Epidural Catheter

At the time of insertion	At the time of removal
1. When excessive length of the catheter has been inserted.[5] Therefore, no more than 4–5 cm of catheter should be advanced into the epidural space.	1. When excessive force is applied to remove an entrapped catheter. Minimal force should be applied to remove a catheter.
2. When excessive force is used to advance the catheter against resistance or when catheter is withdrawn without moving the Tuohy needle or when Tuohy needle is advanced over the catheter. Therefore, on encountering resistance, the catheter should never be withdrawn through the needle. Both should be removed as a single unit.	2. If resistance is encountered, a number of simple manoeuvres may help to enable removal of catheter without stretching or tearing which includes:- a) Maximal flexion of back in lateral decubitus position.[8] b) Returning the patient to the position used at time of insertion. c) Allowing tissues to soften for 15–30 minutes before reattempting.[8]
3. When the catheter gets damaged due to getting pinched between the tip of needle and a bony surface.	
4. In two level CSE, the catheter may get sheared off by spinal needle.[6]	
5. Weak catheter due to manufacturing defect.[7] The needle should be checked for barbs on bevel and the catheter for manufacturing defects before insertion. Catheters of high tensile strength should be obtained from a reputable, reliable manufacturer.	

In our case, we couldn't ascertain any of the mentioned causes for breakage. Most probably it broke due to excessive stretching of the catheter either at the time of shifting/nursing care or positioning of the patient in the ward. So in addition to recommendations mentioned above, epidural catheter should be taken care of while moving/ shifting the patients especially in obese patients.

Conclusion

Missing epidural catheter fragment puts the anaesthesiologist in a dilemma. To avoid such an event, it is imperative to stick to the usual guidelines for epidural insertion and removal as well as during shifting/positioning of the patient. The event of a missing epidural catheter fragment tip must be addressed and communicated both to the surgeon and the patient.

Conflicts of interest: nil.

References

1. Pant D, Jain P, Kanthed P, et al. Epidural catheter breakage: A dilemma. Indian J Anaesth. 2007;51:434–7.
2. Stats PS, Stinson MS, Lee R. Lumbar stenosis complicating retained epidural catheter tip. Anesthesiology. 1995;83:1115–18.
3. You JW, Cho YH. Foramina stenosis complicating retained broken epidural needle tip - A case report. Korean J Anesthesiology. 2010;59:69-72.
4. Ishikawa Y, Magma S, Ito Z, et al. Delayed onset of subdural hematoma following epidural catheter breakage. Global spine J. 2016;6(1):e1–6.
5. Reena, Vikram A. Fracture of epidural catheter: A case report and review of literature. Saudi J Anaesth.2017;11:108–10.
6. Sakuma N, Hori M, Suzuki H, et al. A sheared off and sequestered epidural catheter: A case report. 2004;53:198-200.
7. Sardana DK, Panaych K, Samra T. Broken Epidural Catheter: An Anesthesiologist's Dilemma. J Case Reports.2017;7:116–8.
8. Demiraran Y, Yucel I, Erdogmus B. Subcutaneous effusion resulting from an epidural catheter fragment. Br J Anaesth 2006;96:508-9.

Indian Journal of Anesthesia and Analgesia
Volume 7, Number 5, September–October 2020

Awake Tracheal Intubation During COVID Pandemic

Harshal D Wagh[1], Aparna Date[2]

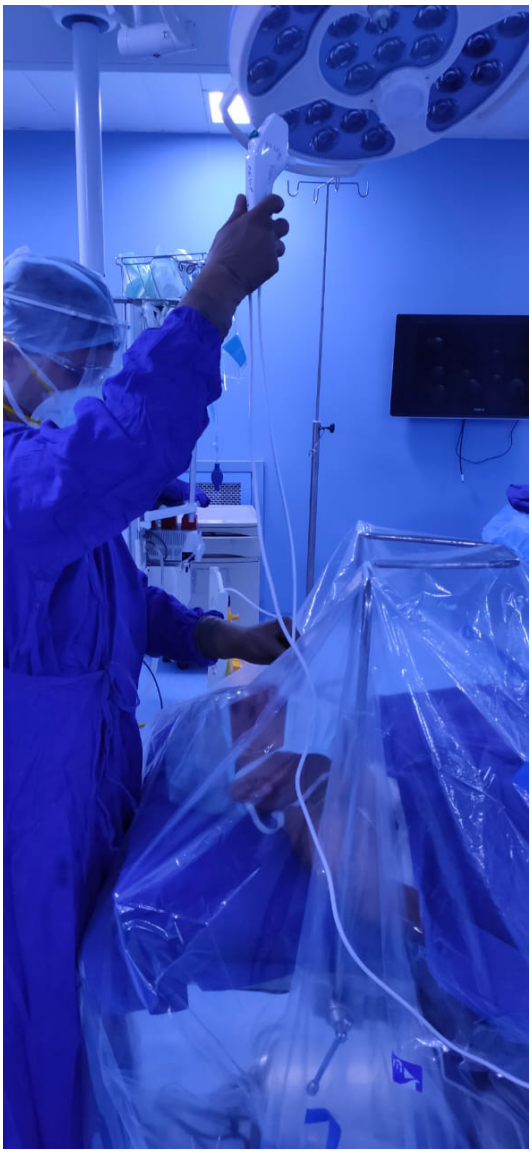
Author's Affiliation: [1,2]Consultant, Department of Anesthesia, Kokilaben Ambani Hospital, Mumbai, Maharashtra 400053, India.

How to cite this article:
Harshal D Wagh, Aparna Date. Awake Tracheal Intubation During COVID Pandemic. Indian Journal of Anesthesia and Analgesia. 2020;7(5):1229–1230.

Airway management in the operating room (OR) during the COVID-19 pandemic poses unique challenges. Airway interventions can cause a high amount of aerosolisation, putting all the team members at a high risk of acquiring COVID-19 infection during the procedure.[1,2]

During airway management, in addition to ensuring patient safety, additional measures to prevent aerosol generation and reduce viral spread are required to ensure safety of the airway manager and the other OR personnel.[2] Use of modified techniques, unfamiliar equipment like a customised intubation and extubation box (COVID box) or other barrier devices, make airway management more challenging. In addition, the fear of contamination and infection may lead to cognitive overload which may affect the performance of the airway manager.Vigilant precautionary measures are warranted during airway management in the OR to prevent the spread of infection among OR personnel. There is no robust evidence for a definite technique or strategy for airway management in OR during the COVID-19 pandemic. All India Difficult Airway Association (AIDAA) consensus guidelines for airway management in the operating room during the COVID-19 pandemic have been recently published that recommend avoiding awake tracheal intubation (ATI) as much as possible.[3] Managing an anticipated difficult airway is a challenging task for the anaesthesiologist, as ATI is a highly aerosol generating procedure.[4] Prolonged duration of ATI increases exposure time to the aerosols.[3]

Our institute caters to a large volume of cancer cases which include head and neck cancer and reconstructive surgeries. During the period of 23rd march 2020 to 7th June 2020 we performed 50 head and neck cancer resection surgeries with reconstruction. 26 patients from this group needed awake tracheal intubation because of their anticipated difficult airway.



Corresponding Author: Harshal D Wagh, Consultant, Department of Anesthesia, Kokilaben Ambani Hospital, Mumbai, Maharashtra 400053, India.

E-mail: drhdw@yahoo.com

On the basis of our experience we propose the following if an awake tracheal intubation is inevitable.

Meticulous planning, optimal preparation, pre procedural briefing and proper coordination among team members, reduces procedural time. Good counselling and optimal level of sedation increases the success rate and also decreases the procedural time.[3] Use of dexmedetomidine infusion for sedation, keeping the patient calm and maintaining a patent airway can be considered.

Anaesthetising the airway using local anaesthetic techniques is challenging. There is a potential risk of aerosol generation with all the techniques. Therefore, these should be performed only after weighing the benefits and the risks andwith the use of personal protective equipment (PPE).Spraying the oral cavity and posterior pharyngeal wall with 10 percent lignocaine spray, viscous lignocaine gargles, nasal lignocaine jelly or lignocaine soaked patty in the nose can be considered.

Airway blocks are to be considered only by an experienced operator and weighing the risk and benefits.Intratracheal local infiltration maybe considered through a sterile plastic drape covering the patient.

Nebulisation is best avoided as it can be associated with aerosol generation.

Use of a disposable flexible bronchoscope maybe considered if feasible. During intubation only the minimum required personnel should be present inside the OR. The team should be wearing the PPE as recommended by the parent institute protocols.

The aerosol box in its present design maybe difficult to use for a Flexible fibreoptic bronchoscope (FFB) intubation, so we used a transparent plastic drape that was suspended over a support as shown in the pic 1 and pic 2. This arrangement allowed comfortable manipulation of the FFB and containment of the aerosol generated under the plastic drape. A suction placed under the drapes to reduce the concentration of aerosols generated maybe considered.

Therefore if an awake tracheal intubation in a Covid suspect or positive patient is inevitable proper planning, preparation and execution of the procedure is required to ensure patient and operator safety. Modification of techniques to reduce aerosol generation and spread must be considered. The goal should be to minimize intubation time, reduce aerosol generation and prevent aerosol transmission.

References

1. Cook TM, El-Boghdadly K, McGuire B, McNarry AF, Patel A, Higgs A. Consensus guidelines for managing the airway in patients with COVID-19. Anaesthesia2020;75:785-99.
2. Cook TM. Personal protective equipment during the COVID-19 pandemic – Anarrative review. Anaesthesia2020;https://doi. org/10.1111/anae. 15071. [Epub ahead of print]. [Last cited on 2020 Apr 30].
3. Patwa A, Shah A, Garg R, Divatia JV, Kundra P, Doctor JR, Shetty SR, Ahmed SM, Das S, Myatra SN. All India difficult airway association (AIDAA) consensus guidelines for airway management in the operating room during the COVID-19 pandemic. Indian J Anaesth 2020;64, Suppl S2:107-15.
4. Jiang J, Ma DX, Li B, Wu AS, Xue FS. Videolaryngoscopy versus fiberoptic bronchoscope for awake intubation – A systematic review and meta-analysis of randomized controlled trials. Ther Clin Risk Manag2018;14:1995-63.

Erratum

"A Retrospective Study of Serial Inspection of ACLS Ambulances in a Tertiary Care Facility"

Wasnik Seema B[1], Kaur Mohandeep[2], Dhir Vinod Bala[3], Mittal Rajishth[4], Singh Tarundeep[5], Sikri Himanshu[6], Nisha[7]

Author's Affiliation: [1]Senior Anesthesiologist, [2,3]Professor, [4]PG 2nd Year Student, [5]Junior Resident [6]Medical Officer, [7]Senior Resident, Department of Anesthesia, Dr. Ram Manohar Lohia Hospital, New Delhi, Delhi 110001, India.

Corresponding Author: Kaur Mohandeep, Professor, Department of Anesthesia, Dr. Ram Manohar Lohia Hospital, New Delhi, Delhi 110001, India.

E-mail: mdkaur@gmail.com

Received 26.10.2018 **| Accepted** 14.11.2018

Published in

Indian Journal of Anesthesia and Analgesia
Volume 7 Number 5 / September - October 2020
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7520.47

The original published version of this Article contained errors in Author **Singh Tarundeep** Designation **Junior Resident** as author mentioned, Now readed as **Clinical Observer.**

Now we can cite this article as:

Wasnik Seema B, Kaur Mohandeep, Dhir Vinod Bala et al. A Retrospective Study of Serial Inspection of ACLS Ambulances in a Tertiary Care Facility. Indian J Anesth Analg. 2019;6(1):341-347.

Mistake is regretted

Editor-in -chief

Guidelines for Authors

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journal" developed by international committee of medical Journal Editors

Types of Manuscripts and Limits

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.

Review articles: Up to 2500 words excluding references and abstract and up to 10 references.

Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts

Articles can also be submitted online from http://rfppl.co.in/customer_index.php.

I) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor program. All information which can reveal your identity should be here. use text/rtf/doc/PDF files. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 Kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 Kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the figures/images should be included at the end of the article file.

If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks from submission. Hard copies of the images (3 sets), for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript. Editorial office: Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091, India, Phone: 91-11-22754205, 45796900, 22756995. E-mail: author@rfppl.co.in. Submission page: http://rfppl.co.in/article_submission_system.php?mid=5.

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, References, Tables, Figures, Figure legends, and Acknowledgment. Do not make subheadings in these sections.

Title Page

The title page should carry

1) Type of manuscript (e.g. Original article, Review article, Case Report)
2) The title of the article should be concise and informative;
3) Running title or short title not more than 50 characters;
4) The name by which each contributor is known (Last name, First name and initials of middle name), with his or her highest academic degree(s) and institutional affiliation;
5) The name of the department(s) and institution(s) to which the work should be attributed;
6) The name, address, phone numbers, facsimile numbers and e-mail address of the contributor responsible for correspondence about the manuscript; should be mentoined.
7) The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references and abstract);
8) Source(s) of support in the form of grants, equipment, drugs, or all of these;
9) Acknowledgement, if any; and
l0) If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of the study and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http:// www. consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma. net/e/policy/l7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_ requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540–7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003; 61: 347–55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone-iodine antisepsis. State of the art. Dermatology 1997; 195 Suppl 2: 3–9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792–801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. pp 7–27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979–2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7–18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title, no issue or date after volume, etc.).

Tables

Tables should be self-explanatory and should not duplicate textual material.

Tables with more than 10 columns and 25 rows are not acceptable.

Table numbers should be in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.

Explain in footnotes all non-standard abbreviations that are used in each table.

For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations (Figures)

Graphics files are welcome if supplied as Tiff, EPS, or Power Point files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.

When possible, please place symbol legends below the figure instead of the side.

Original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay.

Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point-to-point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

Journal provides no free printed, reprints, however a author copy is sent to the main author and additional copies are available on payment (ask to the journal office).

Copyrights

The whole of the literary matter in the journal is copyright and cannot be reproduced without the written permission.

Declaration

A declaration should be submitted stating that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by any one whose name(s) is/are not listed here, and that the order of authorship as placed in the manuscript is final and accepted by the co-authors. Declarations should be signed by all the authors in the order in which they are mentioned in the original manuscript. Matters appearing in the Journal are covered by copyright but no objection will be made to their reproduction provided permission is obtained from the Editor prior to publication and due acknowledgment of the source is made.

Approval of Ethics Committee

We need the Ethics committee approval letter from an Institutional ethical committee (IEC) or an institutional review board (IRB) to publish your Research article or author should submit a statement that the study does not require ethics approval along with evidence. The evidence could either be consent from patients is available and there are no ethics issues in the paper or a letter from an IRB stating that the study in question does not require ethics approval.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/presentations mentioned, Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions.
- Identity not revealed in paper except title page (e.g. name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Title page contains all the desired information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Abstract provided: Structured abstract provided for an original article.
- Keywords provided (three or more)
- Introduction of 75-100 words
- Headings in title case (not ALL CAPITALS). References cited in square brackets
- References according to the journal's instructions

Language and grammar

- Uniformly American English
- Abbreviations spelt out in full for the first time. Numerals from 1 to l0 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and figures

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Figures necessary and of good quality (color)
- Table and figure numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Figure legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed figures/tables provided
- Manuscript provided on a CDROM (with double spacing)

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is the cover letter included with the manuscript? Does the letter:

1. Include the author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article. Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript)