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Aims and Scope

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Comparison of Laryngeal Mask Airway Inserted in Prone Position versus Routine Endotracheal Intubation for Prone Surgeries

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Abstract

Background: Providing anaesthesia in prone position is a challenging task for an anaesthesiologist. Although the favourable technique of airway management has been endotracheal tube (ETT), alternative airway management with Laryngeal Mask Airway (LMA) has also been described. In the present study we compared use of LMA and ETT for surgeries in prone position. *Material and Method:* Study includes prospective analysis of 60 patients who underwent prone surgeries and were randomly divided into two groups of 30 each. Group I (LMA) - Patients underwent prone surgeries with classic LMA on spontaneous ventilation Group II (ETT) -Patients underwent prone surgeries with ETT under controlled ventilation. Time from induction of anaesthesia to start of surgery, time of recovery from anaesthesia after completion of surgery, number of complications and the haemodynamic parameters were recorded. *Results:* We observed significant reduction in induction to start of surgery time as well as recovery time in Group I (LMA) as compared to Group II (ETT) which results in decreased anaesthetic exposure duration in group I. There was better haemodynamic stability in Group I (LMA) as compared to Group II (ETT) along with marginal reduction (statistically non significant) in frequency of complications *Conclusion:* LMA minimizes the total time duration of anaesthesia during prone surgeries with better haemodynamic stability.

Keywords: Prone Position; LMA; ETT; Anaesthesia Duration; Recovery Time.

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Introduction

Prone positioning of patients during anaesthesia is required for various types of surgeries such as excision of pilonidal sinus, haemorrhidectomy, varicose veins avulsion, spine surgeries and tumors of the back. It is associated with various physiological changes such as decrease in stroke volume and relative increase in functional residual capacity [1,2]. It is also associated with a myriad of complications related to pressure injuries either by direct pressure on the affected organ or indirectly by impeding vascular supply to the organs [1]. Providing anaesthesia in prone position is a challenging task for an anaesthesiologist. Although the favorable technique of management of airway has been endotracheal tube (ETT), but a variety of problems may occur with the tracheal tube such as bloody secretions, inspissated sputum, kinking of the tube and accidental extubation [3]. Alternative airway management with the use of Laryngeal Mask Airway (LMA) has also been demonstrated successfully [4-9]. LMA can be inserted in the prone

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position also [5]. Patient himself/herself takes prone position when awake. This may decrease the incidence of adverse events such as soft tissue and nerve injury as well as reduce cardiovascular instability [5,10]. This also decreases the time between induction and commencement of surgery and also avoid the necessity of manpower to make the appropriate prone position. The airway can be more easily secured with LMA in prone position along with reduced risk of regurgitation [11].

The technique of surgery in prone position with spontaneously breathing has been done in the past. But there is paucity of studies demonstrating safety and efficacy of LMA with spontaneous ventilation in prone position. LMA on spontaneous ventilation is found to be very useful and it is an easy technique for managing the airway and also eliminates the need of drugs for intubation and their potential side effects and possible complications [12]. Keeping this in mind, in the present study we aim to compare use of LMA with spontaneous ventilation and endotracheal intubation with controlled ventilation for surgeries in prone position in terms of total time duration of anaesthesia, haemodynamic parameters, and number of complications.

Material and Method

The present prospective randomized controlled study was carried on 60 patients belonging to ASA Grade I and II, aged between 15-65 years, including either gender, scheduled for elective surgical and orthopedic procedures less than 120 min duration requiring prone position after approval from the institutional ethical committee and obtaining informed written consent from the patients. Our study is registered with clinical trials registry-India (CTRI/2018/04/013242). Patients were randomly divided into two groups of 30 each using computer generated random numbers.

Group I: Patients underwent prone surgeries with classic LMA on spontaneous ventilation

Group II: Patients underwent prone surgeries with endotracheal intubation under controlled ventilation.

Patients with ASA grade III and IV, predicted difficult airway, morbid obese, requiring surgeries in supine position, undergoing oral or nasal surgery and patients having history of preoperative sore throat were excluded from the study.

In group I, after cannulation of an appropriate vein, patients were asked to adopt the prone position on operation theatre (OT) table. The position consisted of one pillow under the chest and one pillow under the pelvis, allowing free anterior abdominal wall movement and the hands were placed above the patients' s head , which was rotated to the left or right on a soft head ring. When the patient was comfortable, standard monitors (ECG, Pulse oximeter and NIBP) were applied. Patients were given 100% oxygen for 3 minutes via a loosely applied face mask. One stretcher was kept inside O.T to be used for turning the patient in supine position in case of difficulty in securing the airway using LMA. Inj. Glycopyrrolate 0.004 mg/kg, inj ondansetron 0.08 mg/kg and inj butorphanol 2 mg I/V were given as premedication. Induction was done by using a mixture of 66% N_2O with 33% O_2 supplemented with inj. Propofol (1%) 2mg/ kg I/V. After loss of consciousness, the facemask was applied firmly, allowing manual ventilation, if needed. When sufficient depth of anaesthesia was achieved, LMA was inserted with the help of an assistant. The assistant lifted the head slightly above the ring and opened the mouth by holding the tip of the patients chin and the anaesthesiologist inserted the partially inflated LMA. As the LMA crossed the incisors, the patients chin was released.

Photograph 1: Showing LMA Insertion Technique in prone position

After confirming the correct placement, LMA fixed and connected to the circuit.

In group II, all patients were premedicated with injection glycopyrolate 0.004 mg/kg, ondansetron 0.08 mg/kg I/V and Inj. Butorphanol 2 mg I/V before preoxygeneration. All patients were induced with inj. Propofol 1% 2 mg/kg I/V. Endotracheal intubation was facilitated with 0.1mg/kg of vecuronium given 3 min. prior to laryngoscopy.

Laryngoscopy was performed using macintosh laryngoscope, intubation done with appropriate size endotracheal tube and connected to closed circuit. Inj. Vecuronium in maintenance dose of 0.015mg/kg was used as muscle relaxant during surgery.

Maintenance of anaesthesia was by O_2:N_2O: isoflurane. Haemodynamic parameters were recorded during basal period, preinduction, after induction, during intubation and throughout surgery.

At the end of surgery, in group I LMA was taken out in prone position and in group II, routine extubation was carried out after turning the patient to supine position using inj. neostigmine and inj glycopyrrolate I/V. Parameters recorded were time from induction of anaesthesia to start of surgery, time of recovery from anaesthesia after completion of surgery, success rate of each technique, number of complications and haemodynamic parameters.

All data was collected, sampled and analyzed using Chi Square and independent t test.

Result

Sixty patients were included in the study depending upon the inclusion and exclusion criterion. There was no significant difference observed in demographic parameters and the duration of surgeries was comparable in the study groups as shown in Table 1

In group I, prone surgeries were done with LMA inserted in prone position whereas in Group II, prone surgeries were done under endotracheal intubation. The technique success in both the groups was comparable although first attempt success rate was higher in LMA group as compared to ETT group as shown in Table 2.

In Group I, anaesthesia induction to start of surgery time was remarkably less as compared to Group II. In group I this time was 5.97±1.49 as compared to Group II where it was 16.35±2.94. Similarly recovery time after completion of surgery was significantly lesser in group I as compared to Group II. The mean recovery time in Group I was 4.97±1.20 as compared to 10.53±2.84 in Group II. P value for induction to start of surgery time as well as recovery time was statistically significant (p value (<0.05) as shown in Table 3

In terms of haemodynamic variables, in Group II (ET) there was significant rise in BP during induction as compared to Group I (LMA). During intraoperative period and emergence from

Table 1: Demograpic Variables

	Methods used		P-Value
	LMA(Group I)	ETT (Group II)	
Age in years (Mean ± SD)	42.24 ± 2.56	44.56 ± 3.42	0.440
Male (%)	43.3	50	
Female (%)	56.7	50	
Mean duration of surgeries (min)	75.17 ± 3.29	75.6 ± 4.47	0.811

p-value > 0.05 Not Significant

Table 2: Technique Success

	Methods used	
	LMA(Group I)	ETT(Group II)
1st attempt	25	22
2nd attempt	5	8
Failure of technique	Nil	Nil

P-value>.0 05, Not Significant

Table 3: Comparison of induction to surgery start time and recovery time

	LMA (Group I)	ETT (Group II)	P-Value
Induction to start of Surgery time	5.97 ± 1.49	16.35 ± 2.94	0.001
Completion of Surgery to recovery time	4.97 ± 1.24	10.54 ± 2.84	0.001

p-value < 0.05 Significant

anaesthesia, MBP remained on lower side in Group I (LMA) as compared to Group II (ET). p value < 0.05 statistically significant as shown in Table 4

There was no statistically significant difference observed between the heart rate, oxygen saturation and end tidal carbon dioxide in the two groups. p value>0.05 non significant as shown in Table 4.

In terms of complications, there was no statistically significant difference observed between the two groups. Blood on the device observed in three cases in Group I whereas in Group II, there were four cases observed where blood on device was present. Among other complications, in group II there occurred single episode each of hypercarbia, airway obstruction and sore throat whereas none of these complications were observed in group I. Laryngospasm and arterial desaturation was not observed in any of the patient in either group. Results of complications are illustrated in Table 5.

Discussion

Prone position is required for various surgeries like excision of pilonidal sinus, lipomas of the back, varicose vein avulsions and spine surgeries. Providing safe anaesthesia for surgeries in prone position is a challenging task. Conventional method of airway control is endotracheal intubation and then turning the patient to suitable prone position. But this requires a lot of manpower and unnecessary delay in surgeries and also unnecessary exposure of anesthetic agents. This technique has various other disadvantages like risk

Table 4: Haemodynamic Variables

	Basal	Induction	Intra-op				Emergence
Mean Blood Pressure (MBP)							
LMA	90.67 ± 8.74	83.08 ± 9.39	73.67 ± 4.82	76.00 ± 8.34	73.16 ± 6.44	74.36 ± 4.56	87.27 ± 5.66
ETT	92.64 ± 8.05	103.71 ± 10.33	99.91 ± 10.66	97.00 ± 7.96	93.87 ± 6.24	93.68 ± 5.41	103.20 ± 7.64
p- value <0.05 statistically significant							
Heart Rate (HR)							
LMA	90.4 ± 6.34	93.56 ± 8.2	94.7 ± 7.74	90.96 ± 4.76	87.10 ± 2.85	87.93 ± 2.74	93.33 ± 2.44
ETT	90.73 ± 7.09	93.96 ± 8.75	95.73 ± 8.28	96.96 ± 4.80	90.84 ± 5.60	90.93 ± 2.76	93.56 ± 2.35
p- value >0.05 statistically non-significant							
Oxygen saturation (SPO_2)							
LMA	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13
ETT	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13	99.56 ± .13
p- value >0.05 statistically non-significant							
End tidal carbon dioxide ($ETCO_2$)							
LMA	35.63 ± 1.97	35.56 ±1.38	35.83 ± 2.03	36.83 ± 2.57	37.06 ± 3.54	37.53 ± 3.88	38.90 ± 3.43
ETT	35.4 ± 1.8	35.56 ±1.38	35.96 ± 1.90	36.96 ± 2.73	37.13 ± 3.4	37.53 ± 3.89	39.4 ± 3.14
p- value >0.05 statistically non-significant							

Table 5: Complications

	LMA (GroupI)	ETT (GroupII)
Blood on Device at removal	3 (10%)	4 (13.33%)
Displacement of device	Nil	Nil
Laryngospsm	Nil	Nil
Arterial desaturation	Nil	Nil
Hypercarbia	Nil	1 (3.33%)
Airway Obstruction	Nil	1(3.33%)
Regurgitation	Nil	Nil
Gastric insufflation	Nil	Nil
Sore throat	Nil	1(3.33%)

of neurological trauma to patient's neck and peripheral nerves and also various pressure related complications [13]. Alternative method of airway control is Laryngeal Mask Airway (LMA). LMA is less invasive procedure as compared to endotracheal intubation. In the supine position, use of LMA for airway management in adults as well as children is well documented and practiced [14,15]. But there is paucity of literature regarding the safety and use of LMA with spontaneous ventilation in prone position. Some just deny the use of LMA in prone position [16]. There have been reports where LMA has been used as a rescue device for airway control following accidental extubation during prone position[4,17,18,19]

In our study we compared use of LMA with spontaneous ventilation and routine endotracheal intubation with controlled ventilation during prone surgeries in the terms of induction to commencement of surgery, cost effectiveness, feasibility, complications and haemodynamic characteristics. Demographic profile and mean duration of surgery was comparable in both the groups. Duration of surgeries was limited to 120 minutes.

Insertion success rate was higher in LMA group. Though there was no failure of technique in any group but first time success rate was 83.3% in LMA group as compared to 73.3% in ET group. Gravity pulls the tongue forward and creates larger pharyngeal space making LMA insertion and ventilation easy in prone position. There are also less chances of aspiration in prone position because gravity draws any regurgitated fluid away from the airway [20]. Our results were comparable to the study done by Ng et al, Weksler N et al, Lopez et al and Brimacombe J et al where LMA had been successfully placed in all the patients [4,5,16,21].

In our study we found that there was significant reduction between the times required from induction to start of surgery in the LMA group as the mean time required was 5.96 min in LMA group as compared to 16.33 min in ET group. These results were comparable to the study done by Weksler N et al where they found reduction in time from induction to incision in the group in which LMA was placed in prone position [5].

The time required for recovery after completion of surgery was less in the LMA group as we removed the LMA in prone position. In order to reduce the risk of laryngospasm during emergence from anaesthesia, we suggest that LMA should be deflated at the conclusion of surgery and should be slightly dragged away from the glottis opening, now it serves as an oral airway providing conduit for breathing and also reduces the risk of laryngospasm. This may be the reason that laryngospasm is not encountered in our study. Complications rate though comparable but were less in LMA group. There occurred no episode of hypercapnia and hypoxia in LMA group but there occurred one episode of hypercapnia in ET group as the ET got kinked. The incidence of complication reported was similar as compared to the study conducted by Mukul Jain et al. [20].

In terms of haemodynamic parameters there occurred less increase in blood pressure (BP) during induction in LMA group, it might be due to lack of pressor response during LMA insertion as compared to endotracheal intubation. During surgeries, BP remained on the lower side in the LMA group. It might be due to lack of tracheal stimulation and this helped in providing suitable operating conditions.

In our study group we found that LMA with spontaneous ventilation reduces total anesthesia time duration with better haemodynamic stability and marginally reduced complication rate as compared to endotracheal tube during prone surgeries.

Conclusion

LMA can be safely placed in prone position. It minimizes the time required from the induction to start of surgery and also the time of recovery following completion of surgery. Less manpower is required as patient self positioned himself and this leads to less chances of complications related to pressure injury and cardiovascular instability, but it should be performed only by a trained anesthetist and there should be suitable arrangements for turning the patient to supine position in case of LMA insertion failure. Further studies are needed to endorse the use of LMA in prone position.

References

1. Edgcombe H, Caeter K, Yarrow S. Anaesthesia in the prone position, Br J Anaesth, 2008;100:165-83.
2. PelosiP, CrocM, Calappi E, et al. The prone positioning during general anaesthesia minimally affects respiratory mechanics while improving functional residual capacity and increasing oxygen tension, Anesth Analg, 1995;80:955-60.
3. Lin J-A, Wong C-S, Cherng C-H. Unexpected blood clot – induced acute airway obstruction in a patient

with inactive pulmonary Tuberculosis during lumbar spine surgery in the prone position- a case report. Acta Anaesthesiol Taiwan 2005;43:93-7.

4. Brimacombe J, Keller C. An unusual case of airway rescue in the prone position with the proseal laryngeal mask airway. Can J Anaesth 2005;52:884.
5. Weksler N, klein M, Rozentsveig V, et al. Laryngeal mask in prone position: pure exhibitionism or a valid technique. Minerva Anestesiol 2007;73:33-7.
6. Ng A, Raitt DG, Smith G. Induction of anaesthesia and insertion of a laryngeal mask airway in the prone position for minor surgery. Anesth Analg 2002; 94:1194-8.
7. Milligan KA. Laryngeal mask in the prone position. Anaesthesia 1994;49:449.
8. McCaughey W, Bhanumurthy S. Laryngeal mask placement in the prone position. Anaesthesia 1993; 48:1104–5.
9. Kee WD. Laryngeal mask airway for radiotherapy in the prone position. Anaesthesia 1992;47:446-447.
10. Asai T, Shingu K. Airway management of a patient with tracheal stenosis for surgery in the prone position. Can J Anaesth 2004;51:733-6.
11. Schebesta AG, Wong TA. A method of spontaneously breathing anaesthesia in the prone position without endotracheal intubation. Anaesth intensive Care 1991;19:88-91.
12. Usher s. Use of the laryngeal mask airway in the prone position. Hospital Medicine 2004;65(4):252.
13. Miller RD. The immediate preinduction period in Anaesthesia 2nd ed, Churchill Livingstone 1986.pp. 403-408.
14. Brodrick PM, Webster NR, Nunn JF. The laryngeal mask airway. A study of 100 patients during spontaneous breathing. Anaesthesia 1989;44:238-41.
15. Johnston DF, Wrigley SR, Robb PJ, Jones HE. The laryngeal mask airway in pediatric anaesthesia. Anaesthesia1990;45:924-7.
16. Poltronieri J. The laryngeal mask. Ann Fr Anesth Reanim1990;9:362-366.
17. Valero R, Serrano S, Adalia R, Tercero J, Blasi A, Sánchez-Etayo G, Martínez G, Caral L, Ibáñez G. Anesthetic management of a patient in prone position with a drill bit penetrating the spinal canal at C1-C2, using a laryngeal mask. Anesth Analg 2004;98: 1447-50.
18. Raphael J, Rosenthal-Ganon T, Gozal Y. Emergency airway management with a laryngeal mask airway in a patient placed in the prone position. J Clin Anesth 2004;16:560-61.
19. Dingeman RS, Goumnerova LC, Goobie SM. The use of a laryngeal mask airway for emergent airway management in a prone child. Anesth Analg 2005;100: 670-671.
20. Jain M, Tripathi C B. Airway management in prone position during spine surgeries: Proseal LMA V/s Endotracheal Tube. Indian J. Prev.Soc. Med 2014;45 (1-2):48-52.
21. López AM, Valero R, Brimacombe J. Insertion and use of the LMA SupremeTM in the prone position. Anaesthesia 2010;65:154-7.

Original Research Article

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A Comparative Evaluation of Epidural Block using Bupivacaine and Lignocaine with Adrenaline Mixture for Lower Abdominal and Lower Limb Surgery

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Abstract

Epidural block is the procedure to block the nerve roots outside the dura. It is the method providing analgesia, reflex flaccidity to muscles, degree of hypotension and ischemia secondary to sympathetic blockade while allowing spontaneous respiration to continue relatively unimpaired. This study was done to observe the onset and duration of sensory and motor block and duration of postoperative analgesia. The study was conducted on 90 indoor patients of either sex belonging to ASA-I & ASA-II, aged 20-70 years scheduled for lower abdominal or lower limb surgery, were randomly allocated in 3 groups of 30 patients each. Group 1 received Epidural block with lignocaine and adrenaline 1.5%, Group 2- Epidural block with bupivacaine 0.375% and Group 3 received Epidural block with lignocaine and bupivacaine mixture in ratio of 1:1. Patients were premedicated with Atropine 0.6 mg, Midazolam 2mg and Pentazocine 30mg intravenously after the epidural block was achieved. They were monitored for pulse rate, respiratory rate, blood pressure, onset of sensory loss, motor paralysis and total duration of sensory and motor block. The onset of sensory (11.9±3.16mins) and motor block (13.2±2.1mins)was earliest in group I and duration of block (261±76mins) was longest in group II

Keywords: Epidural Block; Lignocaine with Adrenaline; Bupivacaine; Lower Abdomen; Lower Limb.

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Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain results in reflex muscle spasm, increased oxygen consumption, lactic acid production and sympathetic nervous system stimulation. Sympathetic stimulation results in tachycardia, hypertension, increased stroke volume and increased myocardial oxygen consumption. Effective pain control is essential for optimal care of surgical patients. Despite advances in knowledge of pathophysiology, pharmacology of analgesics and the development of more effective techniques for perioperative analgesia, many patients continue to experience distressing pain. Failure to relieve pain is moraly and ethically unacceptable approach to provide perioperative analgesia.

Regional anaesthetic techniques is one of the most important component of this multimodal approach. Regional anaesthesia was a term first used by Cushing Harvey in 1901 to describe pain

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relief by nerve blocks. Introduction of lignocaine in 1948 revolutionized the practice of regional anaesthesia. Regional anaesthetic techniques provide positive respiratory, cardiovascular and neuroendocrine effects. It also reduces the thromboembolic complications, blood loss and convalescence period. Additionally, it produces early ambulation and ideal for outpatient surgery. Regional anaesthetic techniques are useful in patients in whom maintenance of stable heamodynamics is critical. The sympathetic blockade and associated vasodilatation, afterload reduction that occur with central neuroaxial blockade are avoided. Regional techniques for anaesthesia and analgesia of lower limb have been historically regarded as more difficult than those of upper limb. Unlike the upper extremity, the nerve supply to lower extremity is widely separate, originates from both the lumber and sacral plexus. Due to the above mentioned factors, epidural and spinal anaesthesia were the most often used regional anaesthetic techniques for lower extremity surgeries. Although effective, they offer little selectivity for the operated side and regional techniques such as spinal anaesthesia is subjected to a number of side effects such as arterial hypotension, urinary retention and spinal headache. These side effects are undesirable, especially in ambulatory surgery. Previously it appeared that etidocaine will fulfill this requirement. But extremely high lipid solubility of etidocaine may result in a greater uptake of this agent by adipose tissue such as in the epidural space, which again comes fewer molecules to be available for neural blockade compared with bupivacaine. Some data suggest that etidocaine has profound motor blockade than sensory block. For these reasons etidocaine is not preferred in epidural analgesia.

Regional anaesthetic technique such as epidural anaesthesia can be adopted for lower abdominal and lower limb surgery without interfering with function of other organs and systems. Hence it is advantageous in the poor risk patients, emergency cases with uncontrolled systemic disease or when general anaesthesia might be unsuitable and hazardous. The technique itself is simple, effective, quite safe and economical for the lower limb surgery. Epidural block may be used for pain relief during and following surgical procedure, for reduction of bleeding by producing hypotension and to provide relaxation of the abdomen without the use of myoneural blocking drugs.

Aims and Objectives

The aim of the proposed work is to observe the onset and duration of sensory and motor block, changes in vitals, post-operative analgesia and related complications.

Material and Method

This study was conducted on 90 indoor patients of either sex, aged 20-70 yrs of ASA grade I and II proposed for lower abdominal and lower limb surgery and were randomly allocated in 3 groups.

Group I- Epidural block with lignocaine with adrenaline

Group II- Epidual block with bupivacaine

Group III- Epidural block with lignocaine with adrenaline and bupivacaine admixture

Thorough pre-anaesthetic assessment of every patient was done and were advised for routine and special investigations, if any. The nature of the procedure was explained and an informed consent was obtained. Sensitivity test for local anaesthetic agent was done. Patients were advised for 6-8 hrs fasting and tablet alprazolam 0.5 mg was given night before surgery.

In operation theatre, before any block is attempted, an open vein must be guaranteed (by indwelling cannula and drip etc). No block must be attempted without this supremely important precaution. The extradural space may be entered from the midline or laterally with the patient either on the sides or sitting. In midline approach, great care must be taken to insert the needle in sagital plane to minimize injury to extradural veins. Seletion of the needle depends on individual preference, the the *Tuohy* needle is preffered when a catheter is to be inserted. The greater the gauge of the needle, the easier it is to appreciate loss of resistence, but the greater the hole if an inadvertent dural puncture occurs. The tuohy needle is less likely to puncture the dura than a sharper pointed needle. Any easily palpable interspace belowL1/ L2 was chosen, a subcutaneous weal was raised by infiltrating local anaesthetic solution and epiduaral needle was inserted attached with resistance free syringe to appreciate the sudden loss of resistance while advancement of the needle.

Following Points Suggest that the Needle is in the Epidural Space

- Sudden loss of resistance to advancing needle as it leaves the dense ligamentum flavum. (advocated in the study of Dawkins CJM[1]-1969)

- Withdrawal of hanging drop of saline on hub of needle(**Gutierrez's sign**)
- Sudden ease of injection of a little amount of air or liquid from a freely running syringe attached to the needle. If the tip of needle is in ligamentum flavum, the plunger rebounds; if it is in the space, it can be easily pushed. (Sicard and Forestier 1921, Dogliotti 1931)
- Movement of bubble on Odom's indicator, which can be attached to hub of needle.
- By Macintosh's extradural space indicator
- Ultrasonic localization
- Oxford epidural space indicator

Once the epidural space was identified, **test dose** or initial injection of 1ml lignocaine was injected following aspiration test. If there is no evidence of intradural block(inability to move the feet), the main injection was given.

The patient was then turned supine with slight foot end raised, a pillow was placed under the shoulders to achieve the required level of block. Loss of temperature was tested by cold and warm saline in test-tubes. Loss of pain sensation was tested by pin-prick technique. Motor block was tested by deep tendon jerks and it was assessed by using Bromage scale and graded from I-IV

Grade I- free movement of thighs and feet Grade II- just able to move knees, with free movement of feet

Grade III- unable to move knees, with free movement of feet

Grade IV- unable to move legs and feet

Patients were medicated with atropine 0.6mg, midazolam 2mg and pentazocine 30mg. Pulse rate, respiratory rate and blood pressure were observed intraoperatively and in the immediate postoperative period. Follow-up was continued for 3-5 postoperative days to check for side effects and complications, if any.

Observations

Table 1 shows maximum patients were in the age group of 30-40 yrs. Minimum operations were in the age group of 60-70 yrs.

Table 1: Age distribution

Age in yrs	Group I	Group II	Group III
20-30	9	9	7
30-40	13	12	12
40-50	5	6	7
50-60	2	2	4
60-70	1	1	-

Table 2: Sex distribution

	Average weight	Dose (mg/kg)
Group I	48.1 kg	6.25mg/kg
Group II	47.7 kg	1.7mg/kg
Group III	46 kg	3.8mg/kg

Table 3: Average weight and average dose

Sex	Group I No. of cases	%	Group II No. of cases	%	Group III No. of cases	%
Male	10	33.33%	8	26.66%	12	40%
Female	20	66.66%	22	73.33%	18	60%
	30	100%	30	100%	30	100%

Table 4: Changes in pulse rate

	Group I	Group II	Group III
Basal	76.1±5.2	74.6±8.1	75.3±7.4
1 min	81.7±7.28*	74.6±8.1	
5 min	81.7±7.28*	82.1±6.53**	81.9±5.9**
10 min	81.7±7.28*	81.6±8.24**	81.9±5.9**
15 min	80.7±9.6***	81.0±7.6**	81.9±7.43**
20 min	80.7±9.6***	76.3±8.2**	75.8±7.4*
30 min	74.0±7.8*	76.3±8.2**	75.8±7.4*
45 min	66.84±4.1*	72.84±5.9*	72.9±4.9*
End of surgery	66.84±4.1*	72.84±5.9*	72.9±4.9*

***denotes very highly significant(P<0.001)
**denotes highly significant(P<0.01)
*denotes significant(P<0.05)

Table 5: Changes in mean arterial pressure

	Group I	Group II	Group III
Basal	98.89±12.27	98.9±13.4	103.24±13.4
1 min	103.83±11.02	99.7±14.15	100.04±9.05
5 min	95.96±9.15	99.3±14.12	92.5±11.23
10 min	92.69±8.56	95.3±14.60	90.17±11.84
15 min	91.83±8.59	95.03±12.71	95.4±11.65
20 min	92.22±9.04	94.04±10.56	91.04±9.25
30 min	91.97±9.09	93.7±11.27	87.31±14.83
45 min	88.77±7.33	89.4±11.01	93.15±14.83
End of surgery	91.11±9.09	90.9±8.79	91.77±14.13

Table 6:

	Group I	Group II	Group III
Onset of block (min)	11.9±3.16	21.8±3.54	14.3±2.27
Loss of pain sensation (min)	11.3±2.73	18.8±3.20	14.1±1.95
Loss of touch sensation (min)	12.6±2.84	21.7±2.70	14.9±2.70
Loss of cold temp sensation (min)	7.6±1.77	13.0±2.13	10.7±1.51
Loss of warm temp sensation (min)	9.6±1.94	15.6±2.09	12.5±2.16
Duration of block (hrs)	2.35±0.23	4.45±0.83	2.75±0.61

Ratio of male and female patients was 1:2 in this study (Table 2).

This Table 5 shows there was very high significant change in mean arterial pressure in group I after medication and at 45 mins, and at the end of surgery in group I and II.

This Table 6 shows onset which was observed earliest in group I and maximum duration of block in group II.

Discussion

With the increasing age, there is decreased efficiency of various organs in the body due to aging process and by various diseased processes. To avoid the morbidity and mortality rate due to these processes and to avoid hazards of general anaesthesia, regional anaesthesia is the best technique for the various types of operations. Anaesthesia and analgesia is important during intraoperative and postoperative period, as patients undergoing any type of surgical procedure wants painless surgery. Increasing use of local analgesia can be a great help in such circumstances. Various types of blocks for lower abdominal and lower limb surgery are in common use such as field block or regional block, lumber intradural and extradural block.

An ideal local anaesthetic agent should contain properties of quick onset, prolonged duration of analgesia, potent analgesic, should be free from local irritation and with less systemic toxicity. Inspite of availability of several local anaesthetic agents, none of them can be said as an ideal. Hence everlasting search for suitable local anaesthetic agent is continued.

It was observed in this study that dose of local anaesthetic does not depend upon age, sex and height of the patient. The average dose of lignocaine with adrenaline in group I was 6.25mg/kg, while in group II, average dose of bupivacaine was 1.8mg/kg and in group III, average dose of admixture of both drugs was 3.8mg/kg.

The onset of analgesia, defined as time from drug injection to the loss of pain, touch and temperature sensation which was 11.9±3.16 mins in group I, 21.8±3.54 mins in group II and 14.3±2.27 mins in group III. Seow LT et al. (1982) [2] observed analgesia within 12 mins with lignocaine, 16 mins with bupivacaine and 10 mins with mixture of these drugs. Seow LT(1982), DeflqueRJ and Stoelting VK [3] advocated the use of lignocaine with bupivacaine for shortening the latency of long acting local anaesthetic. Magee et al. (1983) [4] observed that the combination of lignocaine and bupivacaine shortened the time to onset of action, compared to bupivacaine alone This observation was well evident in this study as the onset of analgesia in all three groups is almost nearer to the study of Seow et al and Magee et al.

The onset of motor block is defined as the time from the injection of local anaesthetic to onset of motor blockade. The extent of blockade may be complete, partial or nil. Complete motor block was

when the muscles were completely paralysed, partial when the muscular movement persists but are sluggish and nil when there was no muscle paralysis. The mean injection to motor paralysis time in group I was 13.2±2.1 mins, 23.4±2.3 mins in group II and 15.9±2.21 mins in group III. Seow et al. observed time of onset of motor block for lignocaine was 8 mins, 14 mins for bupivacaine and 10 mins for mixture of both drugs. Poor muscle relaxation observed after epidural block with bupivacaine and good muscle relaxation obtained when lignocaine was combined with bupivacaine which have been reported by Braz et al. (1978) [5] and Covino(1986) [6]. There was significant changes in these groups may be due to use of less concentration of drugs in this study.

The quality and extent of sensory and motor block in this study are quite similar to the results of Seow et al[1] showing wide and long lasting acceptance of mixture of both drugs.

The average duration of analgesia in this study was 141±13.98 mins in group I, 261±76 mins in group II and 165±36.74 mins in group III.

In this study, more than one drug was used in combination to take advantage of the useful properties of each drug as it was observed in the studies of Brodsky JB and Brock-Utne JG [7](1978), Moore et al. [8] (1972) and Cunningham and Kaplan [9] (1974).

The requirement of volume of anaesthetic drug is found to be less in caesarean sections and in old age patients in compare to healthy adult patients which was found similar to the study of Bromage PR [10] (1969).

There was no significant change seen in mean pulse rate and respiratory rate in all the three groups. There was highly significant changes in systolic, diastolic and mean blood pressure just after performing epidural block in group I and group III, but no significant change in group II.

Conclusion

It is feasible to conclude by this study that mixture of lignocaine with adrenaline and bupivacaine (equal volume) is superior to bupivacaine alone in epidural block for lower abdominal and lower limb surgery as it has early onset, prolonged analgesia, least toxic and safe.

References

1. Dawkins CJM. The identification of the epidural space. A critical analysis of the various methods employed. Anaesthesia, 1963;18:66.
2. Seow LT, Lips FJ, Cousins MJ, Mather LE. Lidocaine and bupivacaine mixtures for epidural blockade. Anesthesiology. 1982 Mar;56(3):177-83.
3. Defalque RJ and Stoelting VK. Latency and duration of action of some local anaesthetic mixture. Anaesth Analg, 1966;45:106.
4. Magee DA, Sweet PT and Holeand AJC. Epidural anaesthesia with mixture of bupivacaine and lidocaine. Canad. Anaesth Soc J, 1983;30:174.
5. Braz JRC, Vianna PTG, Castiglia YMM, Vane LA, Carvalho LL and Nato BB. Effects of bupivacaine and of the association of bupivacaine-lignocaine in lumber epidural block. Revista Brasileira de Anaestesiologia, 1978;23:568-77.
6. Covino BG. Pharmacology of local anaesthetic agents. Br J Anaesth. 1986;58:701-716.
7. Brodsky JB and Brock-Utne JG. Mixing local anaesthetics. Br J Anaesth, 1978;50;12.69.
8. Moore DC, Bridenbaugh LD, Bridenbaugh PO, Thompson G and Tucker GT. Does compounding of local anaesthetic agents increase their toxicity in human. Anaesth Analg, 1972;51:579.
9. Cunningham NL and Kaplan JA. A rapid onset, long-acting regional anaesthetic technique. Anaesthesiology, 1974;41:509.
10. Bromage PR.Ageing and epidural dose requirements. British Journal of Anaesthesia, 1969 Dec 1;41(12): 1016–22.

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Comparison of Recovery Following Two Different Anaesthetic Techniques in Term Neonates Undergoing Emergency Colostomy: A Prospective Randomised Controlled Study

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Abstract

Introduction: The risk of apnea after surgery is significant in neonates regardless of anaesthetic agents used. A prospective randomized study done at our institute to explore the hypothesis "post-operative neonatal recovery is better with sevoflurane and caudal block with spontaneous ventilation compared to a technique with muscle relaxants." *Aim:* To study neonatal recovery after sevoflurane and caudal block with spontaneous ventilation in comparison with the addition of Muscle relaxants. *Materials and Methods:* Study done in 100 term neonates, undergoing emergency colostomy were studied for a period of 2 years. Group I patients induced and intubated with sevoflurane maintained spontaneous ventilation. Group II patients induction and intubation by sevoflurane and atracurium. Caudal block given in both groups with 1.25ml/kg volume of bupivacaine. Blinded observers recorded emergence timings and monitored postoperative apnea for 12 hours. *Results:* Statistically no significant difference in the vital parameters recorded intraoperatively and post-operatively between the 2 groups. Median value of $EtCO_2$ was different with p value < 0.05. Median time to first movement, eye opening, tracheal extubation and first cry was less in group I (150, 150, 180, 210 seconds) than in group II (300, 330, 360 and 420 seconds). Post-operative incidence of apnea is lesser in group I (3/50) than group 2 (11/50), Chi-square static is 6.3529. p value is 0.012 (<0.05). No rescue airway interventions were required in both groups. *Conclusion:* Post-operative apnoeic spells are less and neonates wake faster with sevoflurane and caudal block with spontaneous ventilation compared to muscle relaxant group with IPPV. Sevoflurane and caudal block with spontaneous ventilation is preferable to other techniques for newborn lower abdominal surgeries.

Keywords: Neonate; Sevoflurane; Caudal Blockade; Spontaneous Ventilation; Muscle Relaxants and Post-Operative Recovery.

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Introduction

The risk of life threatening apnea after surgery is significant in neonates regardless of the anesthetic techniques used by the pediatric anesthesiologists. Regional blocks especially Caudal block appears to be more safe in this age group, reduces the risk of Respiratory dysfunction. Inhalents also appears to be more safe especially Sevoflurane which is having rapid induction and recovery. Combination of both with endotracheal intubation protects airway, rapid recovery and reduces post-operative apnea spells. Increasing number of day care procedures are performed in children due to availability of short acting anaesthetic agents. Inhalational anaesthetics are one such easily titratable agents in availability. Sevoflurane, a polyfluorinated methyl isopropyl ether is a non pungent inhalational agent making

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easier to deliver anaesthesia to paediatric population [1]. Sevoflurane with a blood gas partition coefficient of 0.65 (@ 37^0C) is easily titratable achieving faster induction and recovery in children. The MAC of sevoflurane decreases with age ranging from 3.3% in neonates to 2.5% in infants and young adults [2]. Neonates and preterm infants are especially susceptible to ventilatory depressant effects of anaesthetics.

Sevoflurane attenuates bronchial smooth muscle constriction by histamine or acetylcholine release and is safe to use in children for mask induction as well as maintenance [3]. At clinical concentrations, it maintains cardiac output and preserves coronary blood flow in neonates and children [4]. The safety profile is also extended to children with uncommon conditions like acute intermittent porphyria, muscular dystrophies, myotonic dystrophy [9]. Sevoflurane based anaesthesia resulted in excitation/emergence phenomenon reported in some earlier studies [5]. However, this becomes infrequent with adequate pain control and avoiding associated risk factors [6]. Reliable pharmacodynamics and pharmacokinetic properties together with absence of major side effects have made sevoflurane a safe and reliable agent for clinical practice.

H(a):Alternate Hypothesis: There is variation in Neonatal recovery after Sevoflurane and Caudal block anaesthesia in comparison with others

H(o)Null Hypothesis: There is no variation in Neonatal recovery.

Our aim of study is neonatal recovery after sevoflurane and caudal block with spontaneous ventilation in comparison with the addition of Muscle relaxants

Materials and Methods

Post-operative Randomized pilot study that reflects both clinical practice at our institution and explore hypothesis that "Neonatal recovery after sevoflurane and caudal block with spontaneous ventilation is much better than other techniques."

After obtaining ethical committee approval and informed parental consent of 100 patients undergoing "emergency pelvic loop colostomy making"with in 48 hrs of birth, in the period of 30 months i.e. from January 2013 to jun 2015.

Inclusion Criteria

Term neonates weighing between 2.5 kgs to 3.5 kgs.

Exclusion Criteria

Preexisting cardiac, respiratory, neuromuscular, metabolic diseases and other any associated congenital abnormalities, very low birth weight and premature babies.

We studied total 100 patients 50 in each group.Using random number tables patients were allocated randomly to receive either sevo and caudal or sevo, atracurium and caudal.

Patients were allocated randomly to two groups. All patients received Inj. Atropine 0.1 mg IV and Inj. Fentanyl 1 mcg/kg IV and Caudal epidural block with 1.25ml/kg volume of bupivacaine.

GROUP 1 neonates induced and intubated with a 2 MAC value of Sevoflurane in 100% Oxygen (1 MAC =3.2% in neonates), maintained with spontaneous ventilation with end tidal sevoflurane concentration of 0.5-1.0 MAC in N_2O:O_2 mixture with paediatric circuit. GROUP 2 neonates induced with 1 to 1.5 MAC of Sevoflurane in 100% Oxygen, intubation facilitated by Inj. Atracurium 0.5 mg/kg, lungs were ventilated with an end tidal Sevoflurane concentration of 0.5 to 1.0 MAC in N_2O:O_2 mixture with paediatric circuit.

All neonates in both groups received Caudal epidural block in left lateral position, with a single injection of 1.25ml/kg volume of Bupivacaine (2 – 3 mg/kg) with 23 G hypodermic needle, to ensure that both groups were comparable to one another in terms of the duration and intensity of analgesia provided in the initial post-operative period. Induction to Incision and Incision to skin closure times (anaesthesia time) were recorded for both groups. After skin closure vitals recorded – Heart Rate, SpO_2, Blood Pressure, $EtCO_2$ and End tidal Sevoflurane. After completion of skin closure, Sevoflurane administration discontinued in both groups and residual neuromuscular block antagonized with Neostigmine 60 mcg/kg and Glycopyrollate 10 mcg/kg in Group 2.

Blinded observer (senior/junior residents) was admitted to the operating room once anaesthesia was discontinued and timed the undisturbed patient to the following end points – First gross movement, Eye opening, Tracheal extubation (decided by the anaesthesiologist on clinical grounds) and the first cry. Any adverse events in the recovery period such as Laryngospasm and cough recorded.

Blinded Observer was Admitted into Post Operative Room to Record

- Bradycardia (clinical significance if HR is less than 100),
- A haemoglobin O_2 Saturation (SpO_2) of less than 90% for more than 10 Sec
- Apnoea (defined as sustained respiratory pause of 15 sec or longer than 15 sec if accompanied by an SPO2 less than 90% or Bradycardia).

Patient characteristics were comparable. Median values p Value > 0.05.

Results

Hundred neonates were allotted equally to Group 1 and 2, both groups were comparable in age, Birth weight, Pre op Hb% and Anaesthetic time (induction to skin closure) P value >0.05, there was no statistically significant difference in between groups (Table 1).

Median values recorded for Heart Rate, Blood pressure and SpO_2 in Group 1 were comparable to values recorded in Group 2 at the time of skin closure, p value>0.05, not significant statistically. Comparison of $EtCO_2$ is significant p Value<0.05 (Table 2).

Median time to first gross movement in group-1 occurred in half time of the group-2, 150 seconds compared with 300 seconds . Standard deviation in group-1 is 23.23 where as in group-2 is 55.54, p Value is <0.05 (Graph 1).

Mean time to eye opening occurred in group-1 is under half of the time of the group-2 neonates, 150 seconds compared to 330 seconds. Standard deviation in group-1 is 25.71 where as in group-2 is 58.8, p Value<0.05 (Graph 2).

Median time to tracheal extubation occurred in group-1 in half of the time of the group-2 neonates, 180 seconds compared to 360 seconds. Standard deviation in group-1 is 25.29 where as in group-2 is 58.84, p Value<0.05 (Graph 3).

Median time to first cry in group-1 in half of the

Table 1: Neonatal Characteristics in present study,

Neonatal Characteristics	Group 1, n =50	Group 2, n = 50	P-Value
Neonate Weight in kgs	2.8	2.9	>0.05
Neonate Age in days	1	1	>0.05
Haemoglobin gm/dl	12.6	12.0	>0.05
Induction to Incision time in min.	7	7	>0.05
Incision to skin closure time in min	38	38.5	>0.05

All Characteristics are insignificant in comparison.

Table 2: Comparison of Median cardiorespiratory changes at the time of skin closure

Cardiorespiratory changes	Group 1, n = 50	Group 2, n = 50	P-Value
Herat rate	138 per min	140 per min	>0.05
Blood pressure	80/48 mmHg	78/49 mm Hg	>0.05
Spo2	96%	99%	>0.05
EtCO2 (Mean+SD)	39.97±40	45.14±45	<0.05

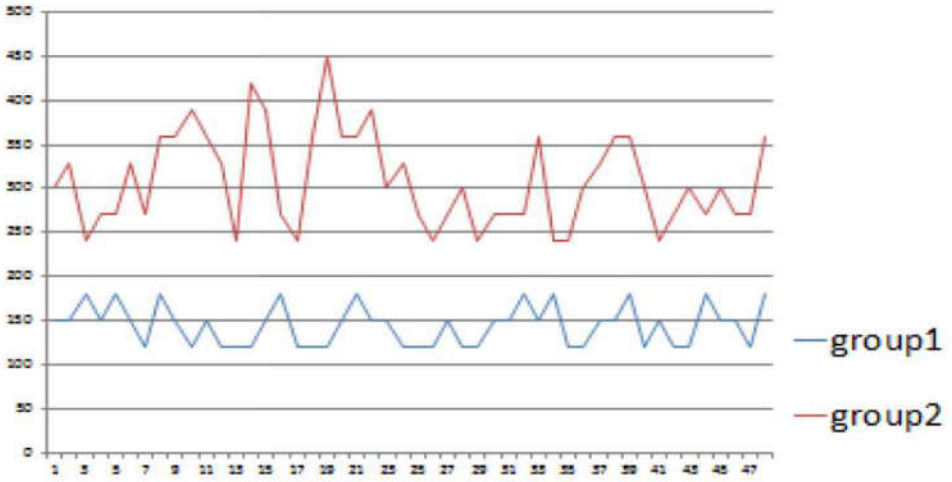

Fig. 1: Comparision of first gross movement in 2 groups

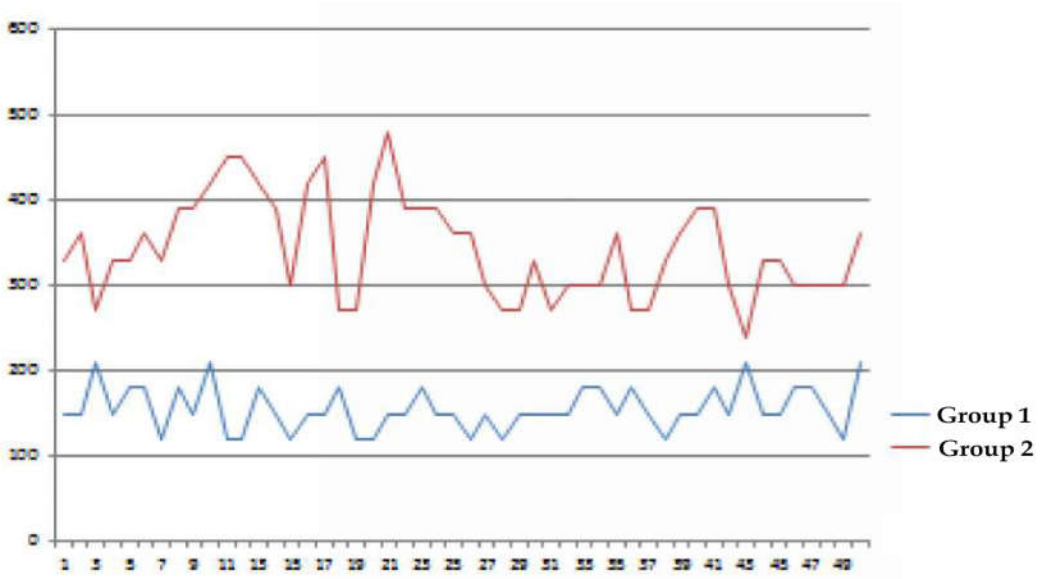

Fig. 2: Comparision of Eye opening in 2 groups

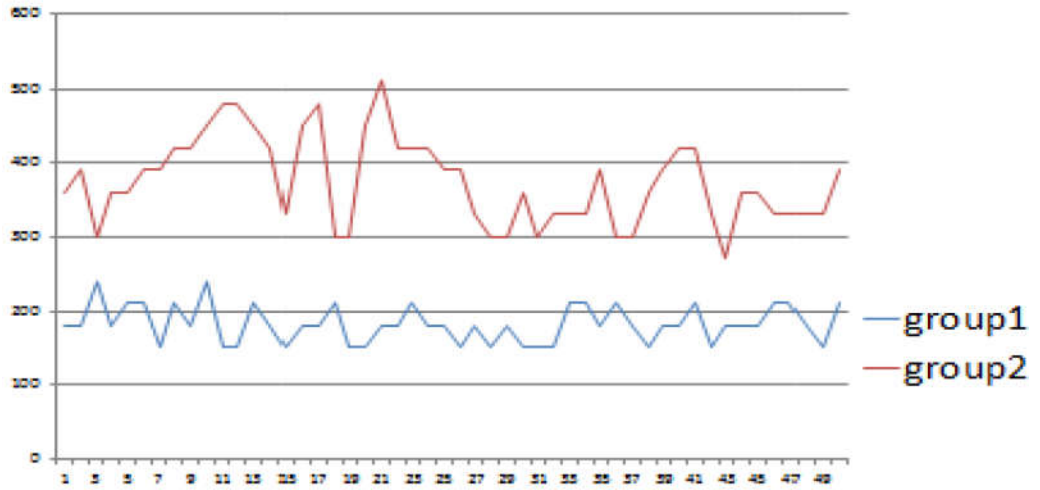

Fig. 3: Comparision of tracheal extubation in 2 groups

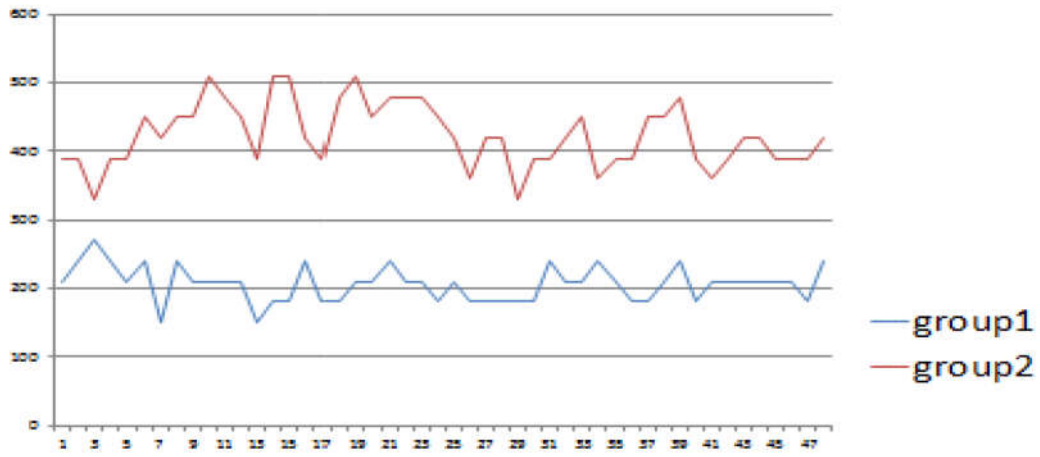

Fig. 4: Comparision of Frist cry in 2 groups

Table 3: Post operative findings in study

	YES	NO
Post-operative incidence of Apnoea		
Group 1	3	47
Group 2	12	38
SPo2 <90% for >10Sec & Bradycardia <100		
Group 1	3	47
Group 2	4	46

time of the group-2 , 210 seconds compared to 420 seconds. Standard deviation in group-1 is 28.2 where as in group-2 is 47.8 p Value<0.05 (Graph 4).

Comparison of post-operative incidence of Apnoea. There was clear statistical significance in between two groups, Post-operative incidence of apnoea is lesser in group I (3/50) than group 2 (11/50). The Chi-Square statistic is 6.3529. The p Value is 0.011719. The result is significant as p <0.05. These patients required O_2 therapy. The Chi-square statistic is 6.3529. The P value is 0.011719. This result is significant at p < 0.05. statistically significant (Table 3).

Comparison of SpO_2 <90% for >10sec and Bradycardia <100 per min. There was no statistical significance between two groups in the incidence of postoperative bradycardia and oxygen desaturation. p Value is 0.69, is more than 0.05, not significant. These patients are part of apnoeic spells patients, required O_2 therapy with bag mask ventilation. No rescue airway interventions were required in either of the groups. No patient required mechanical ventilation.

Discussion

We have designed a study that reflects clinical practice at the Niloufer hospital for women and children in Hyderabad. Anaesthesia with sevoflurane and caudal epidural block has been the preferred technique for those newborns, who are thought to be at risk for postoperative cardio respiratory complications, requiring lower abdominal surgery. This approach provides anaesthesia of sufficient quality and duration to permit the completion of colostomy making.The dosing regimen (Bupivacaine 2-3mg/kg) in caudal has been used without untoward sequale at our institution for the last 10 years. It is less than the 3.8mg/kg dose used by Gunter and collegue to establish single injection caudal epidural anaesthesia and compares favourably with mean total dose of bupivacaine 2.8mg/kg (range 2.5 -3.7 mg/kg) used by Peutrell and Hughes in their study of a combined spinal- epidural technique.

Proposed etiological factors for this include the hangover effect of residual anesthetic agents combined with an elevated plasma level of circulating endorphins. By attempting to ensure that both groups were comparable in terms of the duration and intensity of analgesia provided , we hoped to be able to detect in the initial postoperative period any excess cardiorespiratory complications attributable to residual anaesthesia alone.We designed our study to reflect as closely as possible the current practice at our institution. We used 2.0 MAC sevoflurane for induction and 0.75 – 1.0 MAC for maintenance of anaesthesia. So, Sevoflurane being low blood-gas solubility, rapid induction, and rapid emergence characteristics, coupled with its nonirritating airway properties and stable patient hemodynamic characteristics, is desirable for use in children. Although low soluble anesthetics allow for faster emergences, they have also been associated with higher incidences of emergence agitation [7-16]. Consequently, the advantage of a rapid emergence may be more than offset by the quality of the anesthetic emergence. In pediatric studies of desflurane and halothane emergence, excitement was noted to be more common in patients anesthetized with desflurane than in patients anesthetized with halothane [13,14,16]. In a study of pediatric ambulatory patients undergoing a variety of surgical procedures, Lerman et al. [7] noted that emergence excitement was 3 times more common in sevoflurane-anesthetized patients than in those patients receiving halothane. Aona et al. [9] also noted that the incidence of emergence excitement was greater with sevoflurane than with halothane. Not all studies have demonstrated an increase in emergence agitation with sevoflurane. Wellborn et al. [15] compared the emergence and recovery characteristics of desflurane, halothane, and sevoflurane in children undergoing outpatient adenoidectomy with BMT who had also received

intraoperative opioids. Although the addition of opioids attenuates emergence agitation, the incidence of emergence excitement was similar for both the halothane- (25%) and sevoflurane- (10%) anesthetized patients but was markedly greater in the desflurane-anesthetized children (55%).

In addition to the choice of anesthetics, other factors can influence the incidence of emergence agitation [12,17]. Pain, patient temperament, age, and developmental maturity are all factors that can affect emergence agitation. Pain, especially in preverbal children, can be difficult to quantify and may mimic the signs of emergence agitation from anesthesia.Lerman et al. [18], has noted that the intraoperative administration of opioids or the placement of regional blocks profoundly reduced the incidence of emergence agitation in patients anesthetized with both sevoflurane and halothane.

Except the neonates who had apnoeic spells, no other neonates required O_2 therapy, in addition to their preoperative requirement. None had airway irritation such as coughing or laryngospasm. Patients who had apnoeic spells with SpO_2 <90% and/or Bradycardia required active intervention with bag and mask ventilation. No patients required intubation and mechanical ventilation.In our study, none of the children suffered any excitation during sevoflurane induction that could possibly contribute to the emergence agitation. Naito et al. [19] compared emergence after sevoflurane and halothane anaesthesia in children, and described a greater incidence of restlessness and agitation in children anaesthetised with sevoflurane. The reason for this remains unclear. A central nervous system excitatory effect of sevoflurane has been proposed [3]. S.M. Sale, et al. [20] reported sevoflurane followed by maintenance with desflurane utilizes, to the most benefit, as it is less soluble volatile anaesthetic agents and results in the fastest recovery and may be of particular benefit in high-risk formerly premature infants.

Conclusion

In conclusion we suggest that Sevoflurane induction and intubation with spontaneous ventilation and caudal epidural block is the current best technique for new born surgeries under going lower abdominal surgeries, even preferable in very high risk newborns and premature babies.

References

1. Patel SS, Goa KL: Sevoflurane. A review of its pharmacodynamics and pharmacokinetic properties and its clinical use in general anaesthesia. Drugs. 1996;51:658–700.
2. Inomata S, Watanabe S, Taguchi M, et al. End-tidal sevoflurane concentration for tracheal intubation and minimum alveolar concentration in pediatric patients. Anesthesiology. 1994;80:93–6.
3. Eger EI 2nd: New inhaled anesthetics. Anesthesiology. 1994;80:906–22.
4. Young CJ, Apfelbaum JL: Inhalational anesthetics: desflurane and sevoflurane. J ClinAnesth. 1995;7: 564–77.
5. Lerman J, Davis PJ, Welborn LG, et al. Induction, recovery, and safety characteristics of sevoflurane in children undergoing ambulatory surgery. A comparison with halothane. Anesthesiology. 1996;84:1332–40.
6. Picard V, Dumont L, Pellegrini M. Quality of recovery in children: sevoflurane versus propofol. Acta Anaesthesiol Scand. 2000;44:307–10.
7. Lerman J, Davis PJ, Welborn LG, et al. Induction, recovery, and safety characteristics of sevoflurane in children undergoing ambulatory surgery: a comparison with halothane. Anesthesiology 1996;84: 1332-40.
8. Johannesson GP, Floren M, Lindahl SGE. Sevoflurane for ENT surgery in children: a comparison with halothane. ActaAnaesthesiolScand1995;39:546-50.
9. Aono J, Ueda W, Mamiya K, et al. Greater incidence of delirium during recovery from sevoflurane anesthesia in preschool boys. Anesthesiology 1997;87:1298-300.
10. Weldon BC, Abele A, Simeon R, et al. Postoperative agitation in children: sevoflurane vs halothane [abstract]. Anesthesiology 1997;87:A1057.
11. Westrin P, Beskow A. Sevoflurane causes more postoperative agitation in children than does halothane [abstract]. Anesthesiology 1997;87:A1061.
12. O'Kelly SW, Voepel-Lewis T, Tait AR. Postoperative behavior and emergence delirium in pediatric patients: a prospective study [abstract]. Anesthesiology 1997;87:A1060.
13. Davis PJ, Cohen IT, McGowan FX, Latta K. Recovery characteristics of desflurane versus halothane for maintenance of anesthesia in pediatric ambulatory patients. Anesthesiology 1994;80:298-302.
14. Davis PJ, McGowan FX, Landsman I, et al. Effect of antiemetic therapy on recovery and hospital discharge time. Anesthesiology 1995;83:956-60.
15. Welborn LG, Hannallah RS, Norden JM, et al. Comparison of emergence and recovery characteristics

of sevoflurane, desflurane, and halothane in pediatric ambulatory patients. AnesthAnalg 1996;83:917-20.

16. 1Welborn LG, Hannallah RS, McGill WA, et al. Induction and recovery characteristics of desflurane and halothane anaesthesia in paediatric outpatients. PaediatricAnaesthesia 1994;4:359-64.
17. Schechter NL, Bernstein BA, Beck A, et al. Individual differences in children's response to pain: role of temperament and parental characteristics. Pediatrics 1991;87:171.
18. Lerman J, Prokocimer P, Bohannon S. Is the incidence of excitement in children during emergence from anaesthesia similar with sevoflurane and halothane? 11th World Congress of Anaesthesiologists 1996;879: 461.
19. Naito Y, Tamai S, Shingu K, Fujimori R, Mori K. Comparison between sevoflurane and halothane for paediatricambulat- oryanaesthesia. Br J Anaesth 1991: 67:387–89.
20. S.M. Sale, J.A. Read, P.A. Stoddart and A.R.Wolt. Prospective comparison of sevoflurane and desflurane in formerly premature infants undergoing inguinal herniotomy BJA: 2006:96(6):774-8.

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Ropivacaine as a Sole Agent for Brachial Plexus Block Through Axillary Approach

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Abstract

Rapid onset of sensory block and prolonged postoperative analgesia with haemodynamic stability without neuro and cardiotoxicity are important goals in regional anaesthesia. Axillary block is the most distal block performed on the brachial plexus (except for single nerve blocks in the arm and forearm). Because of its distal location, the axillary block have negligible risks of the respiratory compromise secondary to pneumothorax or phrenic nerve blockade. In addition, the peripheral location permits adequate arterial tamponade to be apllied if an advertent puncture occurs. This study was conducted on 80 patients of ASA I & II and were randomly allocated in two groups receiving two different concentrations of ropivacaine through axillary approach. Onset and duration of sensory and motor block was observed, patients with partial or incomplete block were managed accordingly by supplementing sedatives and analgesics. The rate of complete sensory and motor block was higher in both groups at 10, 15 and 20 mins. Onset of sensory bock in group I and II was 18.48±1.52 mins and 18.88±1.45 mins. Onset of motor block in both groups was 19.48±3.84 mins and 20.56±3.78 mins. No significant stastistical differences were observed with different concentrations of ropivacaine, hence it can be concluded that higher concentration does not have additional benefits, both concentrations were found equally good and potent.

Keywords: Brachial Plexus Block; Ropivacaine; Axillary Approach; Forearm and Wrist Surgeries; Sedation.

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Introduction

Pain is the word for which till now no definition is complete. This word is sufficient to frighten the eyes, shiver the limbs and slur the voice. It is one of the biggest reason because of which patient refuses surgical intervention.

Local anaesthetics have a very old history. Friedrich Gaedcke (1828-1890) was the first to isolate the most potent alkaloid "cocaine" from the coca plant [1]. In 1884, Karl Koller instilled a 2% cocaine solution in his own eyes and tested its effectiveness as a local anaesthetic [2].

Brachial plexus block is the most effective and popular technique for upper limb surgeries. There are several techniques for blocking the nerves of brachial plexus. These techniques are classified and well known by the level at which the local anaesthetic is injected to block the nerves of brachial plexus. Axillary approach to achieve the brachial plexus block is the easiest technique. The axillary

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block is particularly useful in providing anaesthesia and postoperative analgesia for surgeries to the elbow, forearm, wrist and hand. The axillary approach is also the safest of all the four approaches to block the brachial plexus, as it does not risk paresis of phrenic nerve, nor does it have the potential to cause pneumothorax. Complications related to axillary approach are relatively lesser as compared with other approaches. It is not only the easiest way, but at the same time it is also the most consistent method for anaesthesia for below elbow surgeries. William Halsted (1852-1922) performed the first brachial plexus block [3,4]. Georg Hirschel(1875-1963) described a percutaneous approach to the brachial plexus from the axilla [5].

Ropivacaine is a long-acting regional anaesthetic which is structurally related to bupivacaine. It is a pure S (-) enantiomer, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block [6]. One of the most important properties of a long-acting local anaesthetic is to reversibily inhibit the nerve impulses, thus causing a prolonged sensory or motor blockade appropriate for anaesthesia in different types of surgeries [6]. It produces effects similar to other local anaesthetics through reversible inhibition of sodium ion influx in nerve fibres. It is less lipophilic than bupivacaine and less likely to penetrate large myelinated motor fibres, resulting in a relatively reduced intensity of motor blockade. Thus ropivacaine has a greater degree of motor-sensory differentiation, which could be useful when motor blockade is not desirable. The reduced lipophilicity is also associated with decreased potential for neuro and cardiotoxicity.

Aims and Objectives

This study was designed to observe the onset, duration and quality of sensory and motor block, postoperative analgesia and its effects on patients haemodynamics.

Material and Method

This single blind, prospective, randomized study was done on 80 patients of either sex belonging to ASA grade I and II, scheduled for forearm and hand surgeries and were allocated randomly in two groups.

Group I- Ropivacaine 0.75%

Group II- Ropivacane 0.5%

All the patients were thoroughly evaluated preoperatively and subjected to all routine & specific investigations (if required). Informed consent was achieved and procedure was explained to every patient. Patients were fasted for 6-8 hrs and no medication was given preoperatively. After shifting to the operation theatre, the monitors were attached and baseline heart rate, blood pressure respiratory rate and oxygen saturation were recorded. patent intravenous line was established with 18 gauze cannula, crystalloid solution infusion was started and uniform premedication with Inj. midazolam 0.03 mg/kg was given before performing the axillary brachial plexus block.

The patient was placed supine with the arm abducted at 90 degrees and flexion of the forearm with external rotation, so that the forearm lies parallel to the long axis of the body. Hyper-abduction was carefully avoided as it will obliterate the axillary artery pulse in 80% of individuals because the artery is compressed between the head of the humerus and the pectoralis minor muscle.

Axilla was prepared with all aseptic measures and drapped properly, axillary artery was located and fixed as high as possible in the axilla, a subcutaneous weal was raised with 2% lignocaine. 24 gauze hypodermic needle was slowly advanced between middle and index fingers until bright red blood is obtained during continuous advancement. Once blood return was obtained, the needle was advanced through the wall of the axillary artery until no additional blood could be aspirated (transarterial approach) [7]. Once it has been verified by the aspiration that the needle tip lies posterior to the arterial wall, the total anaesthetic solution was injected. The success of the block is related to the close proximity of the needle tip to the posterior wall of the artery (clinical sign to ensure this is aspiration of slight blood stained fluid during intermittent aspiration and injection). After injecting major volume of drug, some amount of local anaesthetic was injected subcutaneously over the axillary artery during withdrawl of the needle to block the branches of intercosto-brachial and median brachial cutaneous nerve.

Sustained pressure was applied for 5 mins over injection site to prevent the distal spread of local anaethetic and to prevent hematoma formation. The patient's arm was kept elevated for some time. A 10 cm wide tourniquet was applied to the upper arm and was inflated to 250 mm Hg prior to skin incision. All patients were monitored before starting until atleast one hour after finishing the procedure using automated blood pressure, oxygen

saturation and ECG lead II. Any episode of hypotension or bradycardia (about 20% decrease) in MAP or heart rate in relation to baseline value were noted.

Sensory block was assessed by pin-prick method on the dermatomal areas corresponding to median, radial and ulnar nerves. Sensory onset was considered when there was a dull sensation to pin-prick along the distribution of any nerve. Complete sensory block was considered when no pin-prick sensation was there.

Sensory Block Gradation

1. Grade 0- Sharp pin-prick felt
2. Grade I- Analgesia, dull sensation felt
3. Grade II- Analgesia, no pin-prick sensation felt

Onset of motor block was considered when there was grade-I motor blockade. Peak motor block was considered when there was grade-II motor blockade.

It was observed according to Modified Bromage Scale for upper extremity.

Grade 0- Normal motor function with full flexion and extention of forearm and hand

Grade I- Decreased motor strength with ability to move the fingers only

Grade II- Complete motor blockade.

Patients with incomplete or partial block were supplemented with Inj pentazocine 30 mg IV. Patients with failed block were not included in this study.

Sedation was scored using a five point scale proposed by Culebras et al. [8].

1. Awake and alert
2. Sedation but responding to verbal commands.
3. Sedated but responding to mild stimuli
4. Sedated but responding to moderate painful stimuli
5. Not arousable

Duration of analgesia was recorded as per numeric rating scale of 0-10. The numeric scale was recorded every hour till the score of 5. The rescue analgesia was given in the form of Inj Diclofenac sodium (1.5mg/kg) intramuscularly at the numeric scale 5 and the time was recorded.

Observation

Onset and duration of sensory and motor block, duration of postoperative analgesia, requirement of supplemental analgesia, sedation score and side effects were observed in this study.

Table 1 shows majority of patients were in the age gropu of 31-40 yrs. There was no significant difference between the mean age of patients in both groups ($p>0.05$).

Majority of patients were between 56-60 kg body weight. There was no statistically significant difference between the mean weight of both group patients ($p>0.05$) (Table 2).

There was no significant difference observed on the onset of sensory block in both groups ($p>0.05$) (Table 3).

Table 4 shows mean time of onset of motor block. It was found 19.48±3.84 mins in group I and 20.56±3.78 mins in group II which was statistically not significant ($p>0.05$).

Table 1: Distribution of patients according to age

Age in yrs	Group I	Group II
20-30	8	10
31-40	21	16
41-50	7	9
51-60	4	5
Mean ±S.D.	28.98±5.86	29.36±6.50

Table 2: Distribution of patients according to weight

Weight in kg	Group I	Group II
45-50	11	5
51-55	10	10
56-60	16	18
61-65	8	10
66-70	3	5
Mean ± S.D.	53.86±6.09	55.60±6.05

Table 3: Onset of sensory block (in mins)

	Group I	Group II
Nerve	Onset (mins)	Onset (mins)
Radial	20.9±2.78	21.8±3.12
Median	19.12±2.48	19.38±2.38
Ulnar	18.48±1.52	18.88±1.45

Table 4: Onset of motor block

Time in mins	Group I	Group II
10-15 mins	1	1
16-20 mins	13	20
21-25mins	18	13
26-30 mins	8	6
Mean ± S.D.	19.48 ± 3.84	20.56 ± 3.78

Table 5: Duration of analgesia (in hours)

	Group I	Group II	P Value
Sensory in hrs	9.72±2.73	8.77±1.75	>0.05
Motor in hrs	8.77±1.02	8.55±0.75	>0.05

Table 6: Mean sedation score at different time interval

Time (in hrs)	Group I	Group II
2 hrs	2.50±0.64	2.01±0.56
4 hrs	1.98±0.69	1.67±0.49
6 hrs	1.44±0.55	1.29±0.38
8 hrs	1.08±0.33	0.96±0.00
10 hrs	0.96±0.00	0.96±0.00
12 hrs	0.96±0.00	0.96±0.00

Table 7: Adverse effects

Adverse effects	Group I		Group II		P value
	No.	%	No.	%	
Drug reaction	-	-	-	-	-
Hypotension	6	15%	4	10%	>0.05
Bradycardia	2	5%	3	7.5%	>0.05
Nausea	3	7.5%	2	5%	>0.05
Vomiting	-	-	-	-	-

According to this table, it was observed that duration of sensory and motor blocks in both groups were almost similar which was statistically not significant (p.0.05) (Table 5).

12 hrs monitoring of all the patients in this study revealed there was no significant increase in the sedation (p>0.05) (Table 6). Table 7 shows the incidence of adverse effects in both groups. Hypotension and bradycardia was observed in both groups which was statistically not significant (p>0.05). Frequency of nausea was 7.5% and 5% respectively in group I and II. No patient developed neurological and respiratory symptoms.

Discussion

Brachial plexus block is a very old and popular technique for upper extremity surgeries. Even though there are many different approaches to administer the block, axillary approach is the preferred and safer method as it carries the less incidence of pneumothorax, the most feared complication associated with other techniques of brachial plexus block. Earlier bupivacaine was the most widely used drug for the blocks, but being relatively more cardiotoxic, accidental intravascular administration carried dreaded complications. Ropivacaine being less lipid soluble than bupivacaine, which makes it less cardio and neurotoxic.

Both the concentration and volume of local anaesthetic are likely to affect the onset and efficacy of nerve plexus blockade. (*Cockings E, Moore PL, Lewis RC*. Trans-arterial brachial plexus blockade using high doses of 1.5% mepivacaine. Reg Anaesth 1987; 12: 159-64.) Ropivacaine 0.75% was comparable with bupivacaine 0.5% when used for supraclavicular brachial plexus block [9]. In this study, volume of ropivacaine was used according to the recommended maximum dose by the manufacturer for brachial plexus blocks in adults [9]. It provides a high quality dense block, prolonged duration with minimum failure rate or incomplete block. Patients weighing <45 kg were excluded from this study to avoid the potential risks of administering excessive doses. The relative sparing of motor block, as seen with epidural ropivacaine, was not seen in this study as done by Brown DL, Carpenter RL, Thompson GE, in their study titled Comparison of 0.5% ropivacaine and 0.5% bupivacaine for epidural anaesthesia in patients undergoing lower extremity surgery. This may partially be explained by the higher doses used but may also reflect a differential effect on central and peripheral nerves.

In this study, it was observed that onset of sensory block in both groups was 18.48±1.52 mins and 18.88±1.45 mins and onset of motor block was 19.48±3.84 mins and 20.56±3.78 mins respectively and duration sensory block in both groups was 9.72±2.73 hours and 8.77±1.75 hours respectively and duration of motor block in group I was 8.77±1.02 hours and 8.55±0.75 hours in group II, which was found almost similar to other previous studies [10,11,12].

Conclusion

In this study, no statical significant difference was found in both groups. Hence it can be concluded that both 0.75% and 0.5% concentrations of ropivacaine are equivalently good to produce early sensory and motor block and prolonged postoperative analgesia with minimum risk of neuro and cardiotoxicity in nerve blocks.

References

1. Gaedcke F. Ueber das erythroxylin, dargestellt aus den Blattern des in Sudamerika cultivirten Strauches Erythroxylon Coca Lam. Archiv der Pharmazie 1855;132(2):141-50.
2. Koller K. Uber die verwendung des kokains zur anasthesierung am auge [On the use of cocaine for anaesthesia on the eye]. Wiener Medizinische Wochenschrift 1884;34:1276-1309.
3. Karch SB. Genies and furies. A brief history of cocaine from Inca monarchs to Cali cartels: 500 years of cocaine dealing (2nd ed.). Boca Raton Florida: Taylor and Francis group. 2006.pp.51-68. ISBN 978-0849397752.
4. Halsted WS. Practical comments on the use and abuse of cocaine; suggested by its invariably successful employment in more than a thousand minor surgical operations. New York Medical Journal 1885;42: 294-95.
5. Hirschel G. Die anasthesierung des plexus brachialis fuer die operationen an der oberen extremitat [Anaesthesia of the brachial plexus for operations on the upper extremity]. (in german). Munchener Medizinische Wochenschrift 1911;58:1555-6.
6. Borgeat A. All roads do not lead to Rome. Anaesthesiology 2006;105(1):1-2. Doi: 10.1097/ 00000542- 200607000-00002. PMID 16809983.
7. Winnie AP. Perivascular techniques of brachial plexus block. Plexus anaesthesia: perivascular technique of brachial plexus block. 1 (2nd ed.) Philadelphia: W. B. Saunders Company. 1990.pp.126-7.
8. Culebras X, Van Gessel E, Hoffmeyer P, Gamulin Z. Clonidine combined with a long acting local anaesthetic does not prolong postoperative analgesia after brachial plexus block but does induce hemodynamic changes. Anaesth Analg 2001;92: 199-204.
9. Indian J. Anaesth. 2011 Mar-Apr; 55(2):104-110.
10. Bertini et al. 0.75% and 0.5% ropivacaine for axillary brachial plexus block. A clinical comparison with 0.5% bupivacaine. Regional Anaesthesia and Pain Medicine. 1999;24(6):514-8.
11. Janzen PR et al. A comparison of 1% prilocaine with 0.5% ropivacaine for outpatient-based surgery under axillary brachial plexus block. Anesth Analg. 2001 Jul;93(1):187-91.
12. Satapathy AR, Coventry DM. Axillary Brachial Plexus Block. Anaesthesiology Research and Practice 201.pp.1-5.

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A Comparision between Femoral Nerve Block, Intravenous Fentanyl and Ketamine as Preemptive Analgesics in Lower Limb Fractures

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Abstract

Background: Spinal & combined spinal epidural anaesthesia are the preferred techniques for facilitation of surgical fixation of the fractures of the lower limb. Extreme pain does not allow ideal positioning for these procedures. Intravenous fentanyl and femoral nerve block are commonly used techniques to reduce the pain during positioning for central neuraxial blockade. *Aim:* To compare the analgesic effect provided by femoral nerve block, IV fentanyl and low dose IV ketamine given prior to positioning for central neuraxial block in patients undergoing surgery for lower limb fractures. *Material and methods:* This is a prospective, randomized, comparative study conducted at Nizam's Institute of Medical Sciences from June 2017 to August 2017**.** 60 patients with lower limb fractures were divided into 3 groups of 20 each - Group A (Femoral Nerve Block with 1% Lignocaine), Group B (IV Fentanyl - 1µg/kg) and Group C (low dose IV Ketamine – 0.1mg/kg). Baseline/pre-intervention VAS score was noted. Pain assessment was done using visual analog scale (0 = no pain, 10 = maximal pain). Depending on the group to which they were included, a particular intervention amongst the three was done for evaluating the analgesic efficacy for positioning for central neuraxial blockade.VAS pain scores were noted again 10 mts after the intervention. The difference in VAS pain score 10 mts after the intervention and baseline was derived at. Significant pain control was identified as the difference of at least 2 points on the VAS score before and after the procedure in an alert and conscious patient. Percentage of patients in each VAS strata (0= no pain, 1-3= mild pain, 4-6= moderate pain, 7-9= severe pain & 10= very severe pain) in comparision to total number of patients in each group (FNB, IV Fent, Low dose IV Ketamine) at different time points (before and 10 minutes after the specified intervention in each group) was also noted and the percentage change in the specific vas strata of a group at different points of time was also calculated. Total number of patients in each group with VAS ≤ 3, 10 minutes after the intervention was noted. *Results:* Baseline VAS scores in the 3 groups – Group A (FNB group): 7.55±1.47 vs Group B (IV Fentanyl group): 7.25±1.29 vs Group C (Low dose IV Ketamine group): 7.55±1.43, p = 0.737, statistically not significant . The baseline VAS scores were comparable amongst the 3 groups. The VAS score after 10 min in the 3 groups - Femoral nerve block group: 2.5±1.43 vs IV fentanyl group: 3.45±2.06 vs Low dose IV Ketamine group: 2.70±1.98, p= 0.238, statistically not significant. The difference of VAS scores before and after 10 min after the specific intervention amongst the 3 groups - Femoral nerve block group: 5.00±1.75 vs IV Fentanyl group: 3.7±1.66 vs IV Low dose IV Ketamine group: 4.65±1.35 with p = 0.035 which was significant (p ≤ 0.05 was considered significant). VAS score difference of before/after was significantly less in Group B, or higher outcome (pre-post difference of VAS score) was observed in Group A, followed by Group C. The number of patients whose VAS score after 10 min came down to ≤ 3, corresponding to mild pain in the VAS strata: 11(55%) in FNB group vs 10(50%) in IV Fentanyl group vs 15 (75%) in IV Low dose Ketamine group. The number of patients with VAS score ≤3, 10 minutes after the intervention were higher in Group C, followed by Group A and Group B. Though the pre/post VAS score difference and the separate mean VAS score at 10 mts was significantly low in the FNB group compared to the other groups, the total no of patients with a VAS score of ≤ 3, 10 minutes after the intervention were more in the IV low dose ketamine group. *Conclusion:* Femoral nerve block with 1% lignocaine appeared to provide better analgesia than IV fentanyl and IV low dose ketamine for positioning for central neuraxial block in patients with lower limb fractures. However, IV low dose ketamine appears to alter the pain scores to clinically comfortable levels for the patient in a quick and non-invasive way.

Keywords: Femoral Nerve Block; Low dose Ketamine; Fentanyl; Lower Limb Fractures; Central Neuraxial Blockade; Positional Pain.

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Introduction

Fracture is an orthopaedic problem following trauma in patients of all ages and central neuraxial block such as spinal anaesthesia is the preferred technique for providing anaesthesia for the surgical procedures for the lower limb fractures . Regional anaesthesia compared to general anaesthesia has many advantages in decreasing morbidity and mortality [1]. Correct positioning during central neuraxial block is the prerequisite for a successful procedure. The patients with lower limb fractures may experience severe pain, especially during the time taken in changing the position from lying flat to sitting up or to the lateral position, &/or throughout the time of performing the block until the effect of spinal anaesthesia is established. Limb immobility and extreme pain are the deterrents for an ideal positioning for this procedure.

Various modalities like intravenous (IV) Fentanyl , Femoral Nerve Block (FNB) or Low dose IV Ketamine have been advocated to reduce the pain pre-operatively and improve the positioning of these patients. This study contemplated to compare the analgesic effect provided by femoral nerve block, IV fentanyl and low dose IV ketamine prior to positioning for central neuraxial block in patients undergoing surgery for lower limb fractures.

Material and Methods

This was a prospective, randomized, comparative study conducted in the Department of Anesthesiology and Intensive care at Nizam's Institute of Medical Sciences (NIMS), Panjagutta, Hyderabad from June 2017 to August 2017. Institutional ethics committee approval and informed consent from the patient were taken for the study.

Sixty patients with lower limb fractures were included in the study-sample size based on previous studies [4,10]. Considering a mean VAS pain score difference of >2, pre/post intervention , assuming $p<0.05$ as of acceptable statistical significance, power of 80%, a confidence interval of 95% (α=0.05), standard deviation of approximately 0.35 and effect size between study groups as 10% (0.1), the calculation yielded a sample size of 20 subjects per arm amounting to 60 subjects for this study. Visual analogue scale was explained to the patients at the time of consent.

Inclusion Criteria

Patients of ASA class I ,II and III, of either gender, between the age group of 18 to 80 years, who sustained fracture of lower limb & scheduled for fracture surgery under central neuraxial block, but unable to sit due to pain .

Exclusion Criteria

Patients who tolerated pain well prior to surgery or refused to participate, patients who received strong analgesics (opioid) less than 6 hours prior to surgery, uncooperative patients or patients with dementia, contraindications to ketamine, fentanyl, femoral or central neuraxial block (coagulopathy, local infection, sepsis etc.)

No premedication was offered to the patients . It was made sure that the patients fasted for 6 hours prior to the elective surgery. Patients were distributed to 3 groups of 20 each through computer randomisation, wherein a particular intervention amongst the three was contemplated in each of the groups for evaluating the analgesic efficacy prior to positioning for central neuraxial blockade (SAB or CSE depending on the type and duration of surgery contemplated).

Group A (Femoral nerve block), Group B (IV Fentanyl) , Group C (Low dose IV Ketamine).

After being shifted into the operating room, IV line was secured , fluids started and monitors (NIBP, HR, SpO_2) attached and baseline parameters were recorded. Baseline /pre-intervention VAS score was noted. Pain assessment was done using visual analog scale (0 = no pain, 10 = maximal pain) .

Visual analogue scale scores: 0 = no pain,1 – 3 = mild pain, 4 – 6 = moderate pain, 7 – 9 = severe pain, 10 = very severe (worst imaginable pain).

Depending on the group to which they were included, a particular intervention amongst the three was done for evaluating the analgesic efficacy for positioning for central neuraxial blockade.

Group A (Femoral Nerve Block)

Femoral triangle was identified under strict aseptic precautions, entry point was infiltrated with 2%lignocaine 1 ml and then, a 21-23 gauge blunt needle was introduced 1cm lateral to the femoral artery and 1.5cm below the inguinal ligament. The pop up technique (blind technique) was used and upto 20ml of local anaesthetic 1% lignocaine (max dose ≤ 4mg/kg) given after a negative aspiration test. Block was instituted 10 min prior to positioning and VAS score noted after 10 min.

Group B (IV Fentanyl group)

Patients received IV Fentanyl 1µg/kg 10 min prior to positioning and VAS score noted after 10 min.

Group C (low dose IV Ketamine)

Patients received IV Low Dose Ketamine 0.1mg/kg 10min prior to positioning and VAS score noted after 10 min.

VAS pain scores were noted again 10 mts after the intervention. The difference in VAS pain score 10 mts after the intervention and baseline was derived at. Significant pain control was identified as the difference of at least 2 points on the VAS score before and after the procedure in an alert and conscious patient .

Percentage of patients in each VAS strata (0= no pain, 1-3 = mild pain, 4-6 = moderate pain, 7-9 = severe pain & 10 = very severe pain) in comparision to total number of patients in each group (FNB , IV Fent , Low dose IV Ketamine) at different time points (before and 10 minutes after the specified intervention in each group) was also noted and the percentage change in the specific vas strata of a group at different points of time was also calculated. Total number of patients in each group with VAS ≤3, 10 minutes after the intervention was noted

After it was made sure the patients were reasonably comfortable 10 mts after the intervention , positioning was done and a spinal block/CSE instituted either in the midline or paramedian approach in sitting position, at the L2/3 or L3/4 level .

Vital parameters: Heart rate (HR), Mean arterial pressure (MAP) by non-invasive blood pressure and Oxygen saturation (SpO_2) were monitored throughout the procedure.

Statistical Analysis

Statistical analysis was conducted using Software Package for Social Science (SPSS)18. For parametric data, mean and standard deviation were considered and P value was calculated by ANOVA. In Non-parametric setting for Qualitative data analysis, Chi-square/ Fisher Exact test was used to find the significance of study parameters on categorical scale between the groups. Fisher Exact test was used when cell samples were very small. Intergroup comparison was done with appropriate Post-hoc tukey test and p-values obtained. p value ≤ 0.05 was considered to be statistically significant.

Table 1: Demographic Data, ASA Status & Mode of Anaesthesia

Variable	Group A (FNB)	Group B (IV Fentanyl)	Group C (IV Low dose Ketamine)	p value
Age	42.75±9.57	42.90±10.8	39.65±11.2	P=0.551
Weight	57.75±11.5	57.50±12.5	52.90±9.28	p=0.311
Gender Male/Female	12/8	15/5	16/4	P=0.344
ASA I/II/III	15/5/0	15/5/0	17/3/0	P=0.789
Mode of anaesthesia CSE/SAB	5/15	7/13	6/14	P=0.788

Mean ±SD (standard deviation); p value ≤ 0.05 significant

Demographic details, ASA status & Mode of Anaesthesia were comparable across the 3 groups and not statistically significant.

Table 2: Diagnosis distribution in the three groups of patients studied

Diagnosis	Group A FNB	Group B IV Fentanyl	Group C Lowdose IV Ketamine	Total
#Femur shaft	1(5%)	11(55%)	12(60%)	24(40%)
IT#femur	12(60%)	0(0%)	0(0%)	12(20%)
#Proximal Tibia	1(5%)	3(15%)	3(15%)	7(11.7%)
IC#Femur	1(5%)	4(20%)	0(0%)	5(8.3%)
Compound#Femur	2(10%)	0(0%)	1(5%)	3(5%)
Acetabulum#	0(0%)	1(5%)	1(5%)	2(3.3%)
Crush injury #BBLEG	2(10%)	0(0%)	0(0%)	2(3.3%)
#BB leg	0(0%)	0(0%)	1(5%)	1(1.7%)
#Distal Femur	0(0%)	0(0%)	1(5%)	1(1.7%)
#Patella Femur	0(0%)	0(0%)	1(5%)	1(1.7%)
#SC Femur	0(0%)	1(5%)	0(0%)	1(1.7%)
BB#leg & # Femur shaft	1(5%)	0(0%)	0(0%)	1(1.7%)
Total	20(100%)	20(100%)	20(100%)	60(100%)

Most of the patients in the study were those with # Femur shaft - 24(40%)

Table 3: Duration of surgery distribution in three groups of patients studied

Duration of Surgery (in hrs)	Group A FNB	Group B IV Fentanyl	Group C Lowdose IV Ketamine	Total
1	0(0%)	0(0%)	0(0%)	0(0%)
2	0(0%)	2(10%)	0(0%)	2(3.3%)
3	15(75%)	13(65%)	13(65%)	41(68.3%)
4	5(25%)	5(25%)	7(35%)	17(28.3%)
Total	20(100%)	20(100%)	20(100%)	60(100%)

p=0.529, Not Significant, Fisher Exact Test
Duration of surgery was 3 hrs in most of the patients - 68.3%.

Table 4: Visual analogue scale score distribution in three groups of patients studied

Visual analogue scale score	Before	After 10 min	% change
Group A (n=20) FNB			
• 0	0(0%)	0(0%)	0.0%
• 1-3	0(0%)	11(55%)	55.0%
• 4-6	6(30%)	9(45%)	15.0%
• 7-10	14(70%)	0(0%)	-70.0%
Group B (n=20) IV Fentanyl			
• 0	0(0%)	0(0%)	0.0%
• 1-3	0(0%)	10(50%)	50.0%
• 4-6	7(35%)	9(45%)	10.0%
• 7-10	13(65%)	1(5%)	-60.0%
Group C (n=20) IV Low dose Ketamine			
• 0	0(0%)	0(0%)	0.0%
• 1-3	0(0%)	15(75%)	75.0%
• 4-6	6(30%)	4(20%)	-10.0%
• 7-10	14(70%)	1(5%)	-65.0%

Chi-Square/Fisher Exact Test

Results

The number of patients whose VAS score after 10 min came down to ≤ 3, corresponding to mild pain in the VAS strata: 11 (55%) in FNB group vs 10 (50%) in IV Fentanyl group vs 15 (75%) in IV Low dose Ketamine group . The number of patients with VAS score ≤ 3, 10 minutes after the intervention were higher in Group C, followed by

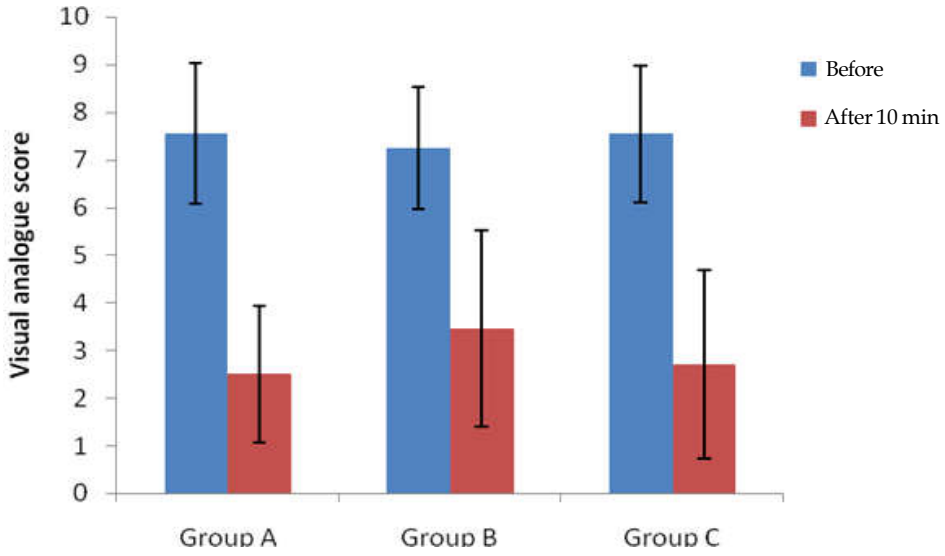

Fig. 1: Visual analogue scale score: comparative assessment of VAS scores in three groups studied

Group A and Group B.

ANOVA test was used for the comparative assessment of VAS scores at different time points and the difference in pre/post intervention VAS scores in the 3 groups .

Baseline VAS scores in the 3 groups – Group A (FNB group): 7.55±1.47 vs Group B (IV Fentanyl group): 7.25±1.29 vs Group C (Low dose IV Ketamine group): 7.55±1.43, p = 0.737, statistically not significant. The baseline VAS scores were comparable amongst the 3 groups .

The VAS score after 10 min in the 3 groups - Femoral nerve block group: 2.5±1.43 vs IV fentanyl group: 3.45±2.06 vs Low dose IV Ketamine group: 2.70±1.98, p= 0.238 , statistically not significant .

The difference of VAS scores before and after 10 min after the specific intervention amongst the 3 groups - Femoral nerve block group: 5.00±1.75 vs IV Fentanyl group: 3.7±1.66 vs IV Low dose IV Ketamine group: 4.65±1.35, with p = 0.035 which was significant ($p \leq 0.05$ was considered significant). VAS score difference of before/after was significantly less in Group B, or higher outcome (pre-post difference of VAS score) was observed in Group A followed by Group C.

Discussion

Fracture is a common problem in orthopaedics, among them, lower limb fractures account for almost one third of all fractures. The incidence of lower limb fractures are equally distributed among males and females till middle age after which the incidence is more in females. As the age advances the lower limb fracture incidence doubles. It was for the said reasons, we designed our study in patients with lower limb fractures. The most dreaded fear associated with any fracture is pain which has got wide psychological, clinical, and behavioural ramifications. Numerous researches and innovations have been carried out to give relief from this most unpleasant experience during intra-operative and postoperative period [2,3].

Fractures are excruciatingly painful because the periosteal tissue is richly supplied by nerve fibres from nerves and has lowest pain threshold among the deep somatic structures [1,4]. Thus, adequate pain management before surgical preparation for any positioning, transfer, and immobilization of patients is crucial for management. In general lower limb fractures are corrected with regional anaesthesia techniques rather than general anaesthesia. Spinal anaesthesia is universally accepted and preferred technique of anaesthesia for surgery of lower limb fractures. In a study on hip fractures by Rizwan HR et al., regional anaesthesia showed a significantly positive association with shorter operative time than general anaesthesia in hip fractures [5]. In another study by Yi-ju-shih et al., they found that regional was a safer option [6].

Spinal/epidural technique has many advantages over general anaesthesia like early mobility, less chances of deep vein thrombosis and mortality. A Cochrane review 2 stated that, RA was associated

with a decreased mortality at one month, even though this decrease was of borderline statistical significance [7]. Furthermore, time to ambulation may be quicker in patients receiving RA [7,8]. In addition, Urwin SC et al., reported that there were advantages for RA compared with GA in terms of 1-month mortality and deep vein thrombosis [8].

Most of these fractures have surgical interventions which are done under regional anaesthesia in our institution, i.e. under spinal/ epidural block. The major problem for spinal/ epidural block is the pain during positioning in these patients. These problems are further accentuated if we encounter obese patients for such surgical procedures. This pain hinders the patient to cooperate with the anaesthesiologist which can end up in multiple attempts or increase in failure chance of the central neuraxial blockade procedure. Many studies were conducted in this aspect, regarding various agents that reduce this pain. Sandby-Thomas M et al., reported that amongst the different medications used to aid positioning for central neuraxial block, the most frequently used agents were midazolam, ketamine, propofol, fentanyl, remifentanil, morphine, nitrous oxide, and sevoflurane [9]. Singh AP et al., suggested femoral nerve block with 0.2% ropivocaine as preemptive analgesic for fracture femur [4]. Amal A Mohammed et al., suggested the use of IV ketamine to reduce positional pain of femur fracture [10].

In this regard , our study aimed at comparing the reduction of positional pain in 3 groups i.e., among femoral nerve block with (1% lignocaine), IV fentanyl (1µg/kg) and IV low dose ketamine (0.1mg/kg), given 10 min before positioning in any of the lower limb fracture patients who were unable to sit due to extreme pain. We, chose femoral nerve block with 1% lignocaine in one of the groups as femoral nerve block has been successfully used in adults for fracture analgesia. Previously, nerve blocks were infrequently used to aid positioning in spinal-epidural block. However, there is sufficient data to show the usefulness of FNB to relieve pain from fracture of the femur and now, is being used for positioning during central neuraxial blockade as well [4,11]. As depicted in Table 2 , majority of the patients in the FNB group (>75%) are those with fracture femur for which femoral nerve block is very effective. Majority of patients in other 2 groups too were those with fracture femur (> 75% in IV Fentanyl group & Low dose IV Ketamine group) having a fair comparibility in the lesion causing the pain and these interventions measuring analgesic efficacy in similar type of lesions.

Demographic details (Age, weight & sex ratio), ASA status & Mode of Anaesthesia were comparable across the 3 groups and not statistically significant as depicted in Table 1, making the 3 groups comparable and avoiding any bias in this regard.

In a randomized controlled trial of femoral nerve blockade administered preclinically for pain relief in femoral trauma , Schiferer A et al., demonstrated that FNB provided analgesia which was adequate for patient transport [12]. A randomized control study by Fletcher AK et al., suggested three-in-one femoral nerve blockade as analgesia for fractured neck of femur in the emergency department [13] & a study on Femoral nerve block in extracapsular femoral neck fractures by Haddad FS et al., reported that Femoral nerve block reduced pain score and analgesic requirements [14]. A study by Parker MJ et al., on nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures stated the use of blocks for analgesia [15].

Femoral nerve block can be performed using peripheral nerve stimulator, ultrasound guided technique or by loss of resistance technique. Geier KO concluded that there were no significant differences regarding efficiency between loss of resistance and peripheral nerve stimulator methods [16]. His study reflected that the loss of resistance technique is an effective and feasible alternative to peripheral nerve stimulator technique. Time for peripheral nerve stimulator block was significantly longer ($p < 0.001$).We used Loss of resistance technique for blocking the femoral nerve using a single needle placement as described by Khoo ST and Brown TC [17]. We preferred 1% lignocaine in FNB, as the onset and peak effects of lignocaine are faster (5min) [11,18]. Gosavi CP et al., demonstrated the efficacy of FNB (using Khoo & Brown method) with lidocaine, in providing pain relief for patients with fracture of shaft or neck of femur, while positioning during conduct of regional anaesthesia [18]. Sia et al., compared IV fentanyl with FNB using lidocaine for analgesia before performing spinal block in sitting position for patients with fracture shaft of femur and demonstrated a better efficacy of FNB over IV fentanyl [11].

In prior studies on patients with femoral shaft fracture, by Singh AP et al. [4], and Sia S et al. [11], comparing preemptive analgesia of Femoral nerve block vs IV Fentanyl for patient positioning for spinal block they used IV Fentanyl at a dose of 0.5µg/kg & 3 µg/kg respectively. The time at which

the final VAS was noted (after FNB/IV Fentanyl) before positioning for spinal block in these studies was 15 minutes and 5 minutes respectively. We included IV fentanyl in group B, at a dose of 1μg/kg in our study, as compared to the different doses used in these prior studies, for faster and reliable onset of action and the minimal side effects as has been demonstrated in the previous studies where fentanyl at this dose was used as an adjuvant in Regional anaesthesia [19]. The time interval between the intervention (FNB/IV fentanyl/IV Low dose Ketamine) and noting the VAS scores before positioning for central neuraxial blockade was 10 minutes in our study. IV low dose ketamine (0.1mg/kg) was considered in group C for its analgesic properties [20,21]. In agreement with our study, Suzuki M et al., found that ketamine in subanesthetic doses possesses analgesic properties [20]. In the review article by Gorlin AW et al., they concluded that sub-anaesthetic dose of ketamine improves pain scores and reduces perioperative opioid consumption in a broad range of surgical procedures with a minimal risk of side effects [21].

Sub-anaesthetic ketamine has efficacy when given as an intraoperative bolus alone or as an intraoperative dose followed by a postoperative infusion of 24-72 h. The ideal dose of sub-anesthetic ketamine is 0.1-0.3 mg/kg as a bolus and 0.1-0.3 mg/kg/h as an infusion [21]. At sub-anaesthetic doses, ketamine has a minimal physiologic impact though it is associated with a low incidence of mild psychomimetic symptoms as well as nystagmus and double vision. Relative contraindications to its use do exist and due to ketamine's metabolism, caution should be exercised in patients with renal or hepatic dysfunction [21]. Psychosensory effects increase at doses above 0.3 mg/kg, so this can be considered a soft upper limit for bolus doses in awake patients [21].

In the study by Menigaux C et al., they used single intraoperative dose of ketamine 0.15mg/kg in patients scheduled for outpatient arthroscopic menescectomies under general anaesthesia and observed that at the said dose , it reduced the pain scores postoperatively at rest and during mobilisation [22]. In a case series by Lester L et al., they described the use of low dose ketamine (< 0.6 mg/kg) as a safe and effective analgesic for patients in Emergency department [23]. There are experimental studies indicating that, at low doses ketamine inhibits NMDA (N-methyl-D-aspartate) receptors ion channels of the postsynaptic membrane of neurons of spinal dorsal horn [21,24-27]. Low-dose ketamine inhibits nociception through its high affinity for the NMDA receptor. It may be that low-dose ketamine interacts more selectively with NMDA receptors, whereas, at full-anaesthetic doses, ketamine activates different types of opioid receptors with various affinities (μ, κ, and σ opioid receptors) [28-31].

The routine use of ketamine as an analgesic is avoided for the fear of it's side effects, however, several studies have shown that low dose ketamine was safe, a potent opioid adjuvant in pain relief quality and that it decreased postoperative opioid consumption [20,24-27]. As enumerated by Suzuki M et al., in their study, subanesthetic doses of ketamine and its enantiomers have been shown to produce a feeling of "high" and to be anxiolytic at low doses, but anxiogenic at higher doses [32].

In the study by Oda A et al., ketamine, 5 mg IV,was as effective as 50 μg fentanyl IV, in alleviating patient anxiety and in providing adequate sedation during the procedures necessary for epidural catheter placement, without inducing severe complications suggesting the use of ketamine [33]. Generally side effects of emergence and psychomimetic changes are a hindrance for its use but at such low dose of 0.1mg/kg in our study there were no such side effects observed . In support to this, the study by Badrinath S et al.,[34] concluded that subhypnotic dosage of ketamine, administered in combination with propofol for sedation, contributed significant analgesia without hemodynamic and respiratory depression or psychotomimetic side effects & larger doses of ketamine were associated with a clinically significant increase in psychotomimetic side effects.

Kumar VR et al.,[35] in their study of comparision of efficacy of three different subanaesthetic doses of IV ketamine (0.3mg/kg , 0.4mg/kg & 0.5mg/kg) for allaying the procedural discomfort during establishment of subarachnoid block demonstrated that the in the dose of 0.3 mg/kg , ketamine provided sufficient sedation for allaying procedural discomfort due to less sedation, less positional difficulty, early verbal response, no hallucinations, no recall of performance of procedure, and good patient satisfaction but patients in this dosage group had higher spinal needle prick response and scores as opposed to other 2 groups (0.4mg/kg & 0.5 mg/kg).

As priorly stated , in our study we used sub anaesthetic - analgesic IV ketamine dose of 0.1mg/kg (without any supplemental benzodiazepine or any other drug for premedication), which would be devoid of complications if any, less than that used in other studies in varied settings (Menigaux

C et al. [22]- 0.15mg/kg for analgesia after arthroscopic menescectomies, Lester L et al. [23] - 0.1 to 0.6mg/kg for analgesia in emergency department, Mohammed AA et al. [10] - 0.15 to 0.25mg/kg for analgesia before spinal anaesthesia for fractured femur).

Severity of pain was assessed by the visual analogue scale because it is an easy method for assessment of pain especially for the elderly [36].

All the patients in the 3 groups were haemodynamically stable after 10 min of the intervention depicting the safety of all the 3 interventions as such, to decrease positional pain.

In this prospective, randomised, comparative study, we found FNB with 1% lignocaine to be a better analgesic than IV Low dose Ketamine and IV Fentanyl in positional pain relief with VAS score difference (between baseline and 10mts after intervention) of 5.00±1.75 in FNB group vs 3.70±1.66 in IV Fentanyl group vs 4.65±1.35 in Low dose Ketamine group as is depicted in Figure 1. There are many studies comparing femoral nerve block with fentanyl, demonstrating the efficacy of FNB over I V fentanyl [4,11]. Similarly there are studies showing ketamine's role as an analgesic in relieving fracture pain [10].

However, in our study we compared all the 3 groups. Taking the VAS score before and after 10 min of administration into consideration, FNB appeared to provide superior pain relief, with VAS difference of (5.00±1.75) (p=0.035) compared with IV Low dose Ketamine (4.65±1.35) or IV Fentanyl (3.70±1.66) as represented in Figure 1. Another significant observation to note from the results depicted in Table 4 , is in the ketamine group regarding the VAS score after 10 min. The patients whose VAS scores have come down to ≤ 3 referred as mild pain are more in comparison with the FNB group (15 in ketamine vs 11 in FNB out of 20 in each group, accounting to 75% in ketamine and 55% in FNB group), suggesting that, the relief of pain is noteworthy, adding to the comfort of the patient clinically. Hence, IV Low dose Ketamine can be preferred in those patients who refuse to give consent for FNB or who have contraindications for FNB [10].

Conclusion

Reduction of positional pain can be addressed in several ways. In this study Femoral Nerve Block with 1% lignocaine appeared to provide better analgesia than IV Fentanyl and IV Low dose Ketamine. However, IV Low dose Ketamine appears to alter the pain scores to clinically comfortable levels for the patient in a quick and non-invasive way, & so can be preferred in cases where patients refuse to give consent or have contraindications for FNB.

References

1. Duc TA. Postoperative pain control. In: Conroy JM, Dorman BH, editors. Anesthesia for Orthopedic Surgery. New York: Raven Press; 1994.pp.355-65.
2. Bajwa SJ, Takrouri MS. Innovations, improvisations, challenges and constraints: The untold story of anesthesia in developing nations. Anesth Essays Res 2014;8(1):1-2.
3. Bajwa SJ, Kalra S, Takrouri MS. Quaternary prevention in anesthesiology: Enhancing the socio-clinical standards. Anesth Essays Res 2014;8(2):125-6.
4. Singh AP, Kohli V, Bajwa SJ. Intravenous analgesia with opioids versus femoral nerve block with 0.2% ropivacaine as preemptive analgesic for fracture femur: A randomized comparative study. Anesth Essays Res 2016;10(2):338-42.
5. Rizwan Haroon Rashid, Adil Aijaz Shah, Amarah Shakoor, and Shahryar Noordin. Hip Fracture Surgery: Does Type of Anesthesia Matter?BioMed Research International 2013, Article ID 252356, 5 pages.
6. Yi-Ju Shih, Cheng-Hung Hsieh, Ting-Wei Kang, Shih-Yen Peng, Kuo-Tung Fan, Lee-Min Wang. General versus spinal anesthesia: which is a risk factor for octogenarian hip fracture repair patients? International Journal of Gerontology 2010;4(1):37-42.
7. Parker MJ, Handoll HH, Griffiths R. Anaesthesia for hip fracture surgery in adults. Cochrane Database Syst Rev 2001;(4):CD000521.
8. Urwin SC, Parker MJ, Griffiths R. General versus regional anaesthesia for hip fracture surgery: A meta-analysis of randomized trials. Br J Anaesth 2000; 84(4):450-5.
9. Sandby-Thomas M, Sullivan G, Hall JE. A national survey into the peri-operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. Anaesthesia 2008;63(3):250-8.
10. Mohammed AA, Ali MM. Ketamine analgesia before spinal anesthesia for fractured femur: Sudan Med J 2015;51(1):17-22.
11. Sia S, Pelusio F, Barbagli R, Rivituso C. Analgesia before performing a spinal block in the sitting position in patients with femoral shaft fracture: A comparison between femoral nerve block and intravenous fentanyl. Anesth Analg 2004;99(4):1221-4.
12. Schiferer A, Gore C, Gorove L, Lang T, Steinlechner B, Zimpfer M, et al. A randomized controlled trial of

femoral nerve blockade administered preclinically for pain relief in femoral trauma. Anesth Analg 2007; 105(6):1852-4.

13. Fletcher AK, Rigby AS, Heyes FL. Three-in-one femoral nerve block as analgesia for fractured neck of femur in the emergency department: A randomized, controlled trial. Ann Emerg Med 2003;41(2):227-33.
14. Haddad FS, Williams RL. Femoral nerve block in extracapsular femoral neck fractures. J Bone Joint Surg 1995;77(6):922-3.
15. Parker MJ, Griffiths R, Appadu BN. Nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures. Cochrane Database Syst Rev 2002; (1):CD001159.
16. Geier KO. Peripheral nerve stimulator for femoral nerve block. Is it really necessary ? Rev Bras Anestesiol. 2003;53(3):338-45.
17. Khoo ST, Brown TC. Femoral nerve block—the anatomical basis for a single injection technique. Anaesth Intensive Care 1983;11(1):40-2.
18. Gosavi CP, Chaudhari LS, Poddar R. Use of femoral nerve block to help positioning during conduct of regional anesthesia :Bombay Hospital Journal 2001; 43(4):531-2.
19. 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 J Anaesth 2011;5(4): 365-70.
20. Suzuki M, Tsueda K, Lansing PS et al. Small-dose ketamine enhances morphine-induced analgesia after outpatient surgery. Anesth Analg 1999;89(1):98-103.
21. Gorlin AW, Rosenfeld DM, Ramakrishna H. Intravenous sub-anesthetic ketamine for perioperative analgesia. J Anaesthesiol Clin Pharmacol 2016;32(2):160-7.
22. Menigaux C, Guignard B, Fletcher D, Sessler DI, Dupont X, Chauvin M. Intraoperative Small-Dose Ketamine Enhances Analgesia After Outpatient Knee Arthroscopy. Anesth Analg 2001;93(3):606–12.
23. Lester L, Braude DA, Niles C, Crandall CS.Low-dose ketamine for analgesia in the ED: a retrospective case series. Am J Emerg Med 2010;28(7):820-7.
24. Hirota K, Lambert DG. Ketamine: its mechanism (s) of action and unusual clinical uses. Br J Anaesth 1996; 77(4):441-4.
25. Hughes AM, Rhodes J, Fisher G, Sellers M, Growcott JW. Assessment of the effect of dextromethorphan and ketamine on the acute nociceptive threshold and wind-up of the second pain response in healthy volunteers. Br J Clin Pharmacol 2002;53(6):604-12.
26. Campos AR, Santos FA, Rao VS. Ketamine-induced potentiation of morphine analgesia in rat tail-flick test: role of opioid-, alpha2-adrenoceptors and ATP-sensitive potassium channels. Biol Pharm Bull 2006; 29(1):86-9.
27. Bell RF, Dahl JB, Moore RA, Kalso E. Perioperative ketamine for acute postoperative pain. Cochrane Database Syst Rev 2006;(1):CD004603.
28. Stubhaug A, Breivik H, Eide PK, Kreunen M, Foss A. Mapping of punctuate hyperalgesia around a surgical incision demonstrates that ketamine is a powerful suppressor of central sensitization to pain following surgery. Acta Anaesthesiol Scand 1997;41(9):1124-32.
29. Oye I, Paulsen O, Maurset A. Effects of ketamine on sensory perception: Evidence for a role of N-methyl-D-aspartate receptors. J Pharmacol Exp Ther 1992; 260(3):1209-13.
30. Smith DJ, Bouchal RL, deSanctis CA, Monroe PJ, Amedro JB, Perrotti JM, et al. Properties of the interaction between ketamine and opiate binding sites in vivo and in vitro. Neuropharmacology 1987; 26(9):1253-60.
31. Sarton E, Teppema LJ, Olievier C, Nieuwenhuijs D, Matthes HW, Kieffer BL, et al. The involvement of the mu-opioid receptor in ketamine-induced respiratory depression and antinociception. Anesth Analg 2001; 93(6):1495-1500.
32. Suzuki M, Tsueda K, Lansing PS, Tolan MM, Fuhman TM, Sheppard RA, Hurst HE, Lippmann SB. Midazolam attenuates ketamine - induced abnormal perception and thought process but not mood changes. Can J Anaesth 2000;47(9):866-74.
33. Oda A, Lida H, Dohi S. Patient anxiety scores after low-dose ketamine or fentanyl for epidural catheter placement. Can J Anesth 2000;47(9):910-3.
34. Badrinath S, Avramov MN, Shdrick M, Witt TR, Ivankovich AD. The use of ketamine-propofol combination during monitored anesthesia care. Anesth Analg 2000;90(4):858-62.
35. Kumar VR, Athiraman UK, Jahagirdar SM, Sripriya R, Parthasarathy S, Ravishankar M. Comparison of efficacy of three subanesthetic doses of ketamine in allaying procedural discomfort during establishment of subarachnoid block: A randomized double-blind trial. Saudi J Anaesth 2015;9(1):55-9.
36. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a critical review. Psychol Med 1988;18(4):1007-19.

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Attenuation of Stress Response during Intubation for Laparoscopic Procedures: A Comparative Study between Intravenous Dexmedetomidine and Lidocaine

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Abstract

Introduction: During laryngoscopy and endotracheal intubation, one of the most dreaded complications is hemodynamic instability which is a well-archived certainty and this response in most susceptible patients induces myocardial ischemia or infarction, left ventricular failure and cerebral hemorrhage due to the strong sympathetic response during the procedure. *The aim of the study:* This study was aimed to compare the effect of dexmedetomidine and lidocaine on hemodynamic response to laryngoscopy and endotracheal intubation in patients undergoing elective laparoscopic procedures under general anaesthesia. *Materials and Methods:* A total of sixty patients were selected and randomized into two groups of thirty patients each: dexmedetomidine-intervention group and lidocaine-control group. Inj. Dexmedetomidine by means of infusion pump was given prior to anesthetic induction, at a rate of 1 μg/kg IV over a period of 10 min, to all intervention group patients. Three minutes after the completion of infusion, patients were induced with general anaesthesia. As a standard procedure, plain preservative-free 2% lidocaine was given at a rate of 1.5 mg/kg IV bolus to all patients in the control group 1.5 minutes prior to laryngoscopy. Baseline parameters such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial blood pressure (MAP), were recorded before administration of the drugs under study, at intubation, and at 1 min & 3 min after intubation. *Results:* The changes in mean heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure values were significantly lower in Dexmedetomidine group when compared to the lidocaine group. *Conclusions:* Dexmedetomidine when used as a pre-anesthetic medication significantly suppresses the sympathoadrenal response to laryngoscopy and endotracheal intubation without influencing intraoperative cardiovascular stability.

Keywords: Dexmedetomidine; Endotracheal Intubation; Hemodynamic Response; Laryngoscopy.

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Introduction

The word laparoscopy has its origin from the ancient Greek word *lapara* which literally means "flank or side". In this modern era, it has become the gold standard operating procedures for ovarian cystectomy, appendectomy, tubal ligation, and cholecystectomy [1]. Surgeons and patients prefer laparoscopic procedures over open procedures as they offer several advantages which include shorter hospitalization, can be carried out as a day care procedure, better cosmetics, faster recovery and reduced risk of postoperative adhesions. The method of laparoscopy basically includes creating a pneumoperitoneum utilizing carbon dioxide (CO_2) which is associated with different pathophysiological changes, especially involving

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the cardiovascular and respiratory systems. These changes manifest as an increase in heart rate, arterial pressure, systemic vascular resistance and abatement in both cardiac and urine output [2]. These changes are well tolerated by healthy adults but however can be detrimental in elderly and in patients with cardiorespiratory insufficiency. Subsequently, it is essential for the anesthesiologist to have an appropriate understanding of these changes for better preoperative assessment & preparation as well as perioperative management. One of the most dreaded complications during laryngoscopy and intubation is hemodynamic instability which is a well-archived certainty and these responses in most susceptible patients induce myocardial ischemia or infarction, left ventricular failure and cerebral hemorrhage [3,4]. Hence, in order to overcome these hemodynamic responses, various drugs like esmolol, lidocaine, nitroglycerine and clonidine, are being used to lessen the pressor response. All medications have a few contraindications and unfavorable events and need to be utilized with the precautionary measure. Dexmedetomidine, s-enantiomer of meditomidine, a highly selective alpha-2 adrenergic agonist, has many advantages like hypnotic, sedative, anxiolytic, sympatholytic, and opioid sparing, pain relieving properties without causing respiratory depression [5-8]. During the perioperative period, it can diminish both opioid analgesic and anaesthetic requirements [9,10]. Its sympatholytic property by diminishing norepinephrine release reduces mean arterial pressure (MAP) and heart rate (HR) and hence, improves hemodynamic stability during laparoscopy. [11, 12] These properties make dexmedetomidine a suitable medication to be utilized for reducing the pressor response to laryngoscopy & intubation and hence, it can serve as a useful anaesthetic adjunct. It has also been documented to decrease postoperative nausea and vomiting after laparoscopic surgery [13]. Hence, this study was undertaken to compare dexmedetomidine to lidocaine as regards to its efficacy on attenuation of intubation response.

Materials and Methodology

This study was conducted in the Department of Anaesthesiology, KarpagaVinayaga Institute of Medical Sciences, Madhurantagam, after obtaining approval by the Institutional Ethics Committee. A total of sixty patients, thirty in each group, aged between 20 and 45 years of either sex, scheduled for elective laparoscopic surgery, were considered for this study. Written informed consent was taken from all the patients.

Inclusion Criteria

1. Patients aged between 20 - 45 years
2. Patients scheduled for laparoscopic surgery belonging to American Society of Anesthesiologists Status I and II.

Exclusion Criteria

1. Patients who were not willing to give consent.
2. Patients with heart blocks, hypertensive patients on β blockers, morbid obesity, pregnant women & history of a psychiatric disorder were excluded from the study.
3. Patients with diabetes and renal disease were not included in the study.

Procedure

The preoperative and anesthetic procedures were explained to the patients. After obtaining informed consent, patients were kept nil per oral 8 hours prior to the surgery. All the patients received Tab Metoclopramide 10mg PO and Tab Pantoprazole 40 mg PO on the previous night and on the morning of the procedure. Inj Glycopyrrolate 0.2 mg IM was given as premedication an hour before the surgery. Intraoperative monitoring included pulse oximetry, noninvasive blood pressure (NIBP), ECG and capnography. Patients were assigned randomly into the dexmedetomidine-intervention group and lidocaine-control group. Inj. Dexmedetomidine, by means of an infusion pump, was given prior to anesthetic induction, at a rate of 1 µg/kg over a period of 10 min to all intervention group patients. As a standard procedure, plain, preservative-free, 2% lidocaine was given at a rate of 1.5 mg/kg IV bolus to all patients in the control group 1.5 minutes prior to laryngoscopy. All baseline parameters were recorded in the operation theatre. After preoxygenation with 100% oxygen for 3 minutes, Inj. Fentanyl 1.5 µg/kg IV was administered followed by Inj. Propofol, 2mg/kg IV, for induction of anaesthesia & Inj. Succinylcholine, 2 mg/kg IV. The patient was then subject to laryngoscopy and intubation with the appropriate endotracheal tube. For maintaining anaesthesia, nitrous oxide: oxygen in the ratio 2:1 was used while Inj. Vecuronium was used as muscle relaxant after intubation. Parameters like heart rate, systolic and

diastolic blood pressure were recorded pre-induction, during induction, during intubation, 1 min & 3 minutes after intubation. Inj. Neostigmine 0.05mg/kg and Inj. Glycopyrrolate 0.008mg/kg were used to reverse neuromuscular blockade at the end of the surgery. The patients were monitored post anesthesia after extubation for any side effects.

Statistical Analysis

Mann Whitney test was used. The statistical significance was taken as $p < 0.05$ Data were tabulated in MS-Excel and analyzed using SPSS software version 18.

Results

Patients were assigned randomly into the dexmedetomidine-intervention group and lidocaine-control group, thirty in each group.

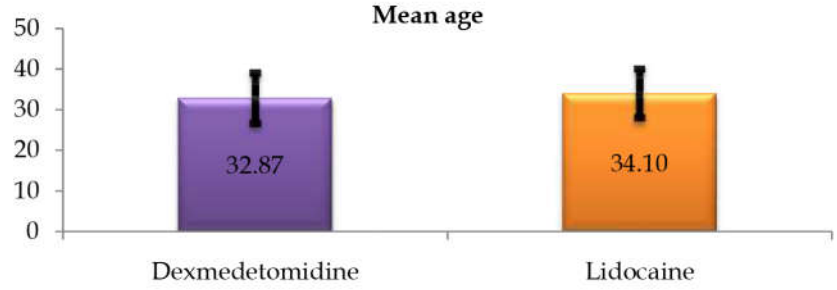

Fig. 1: Distribution of patients according to age

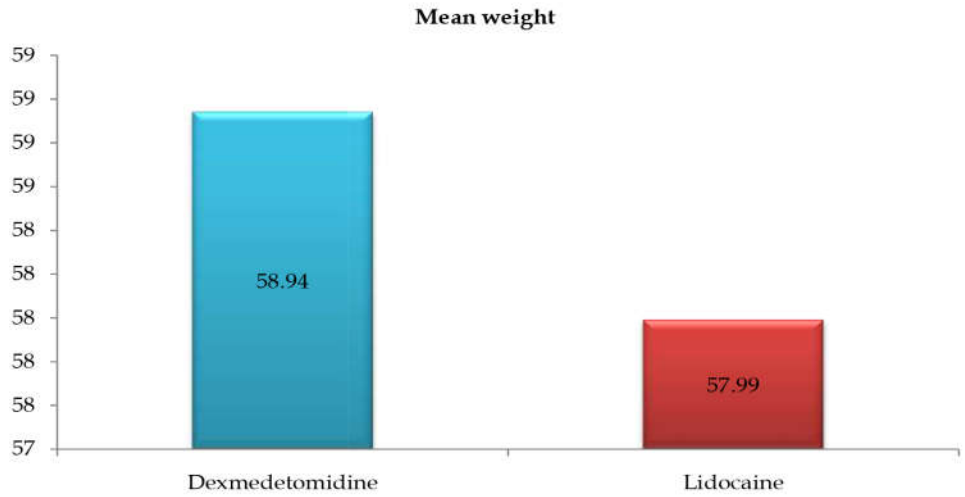

Fig. 2: Distribution of patients according to weight

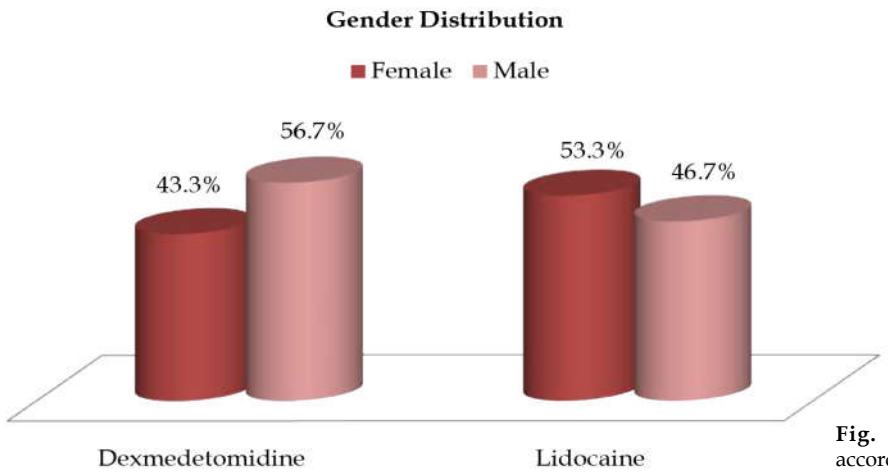

Fig. 3: Distribution of Patients according to Gender

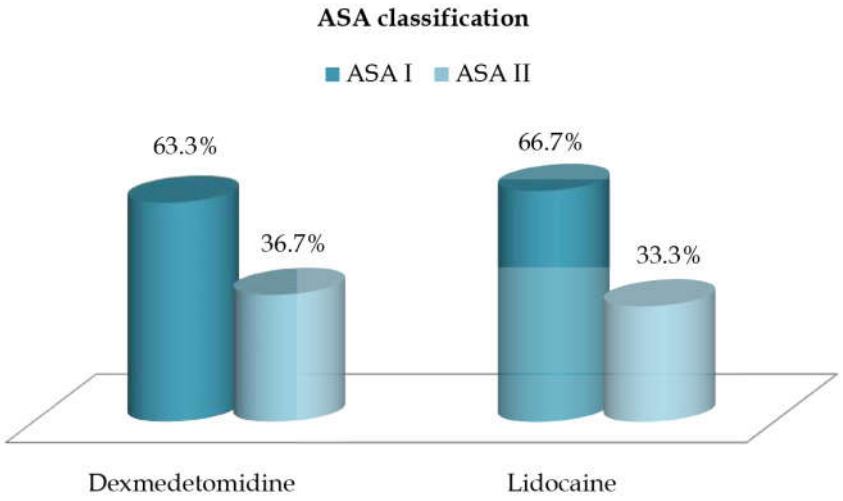

Fig. 4: Distribution of patients according to asa classification

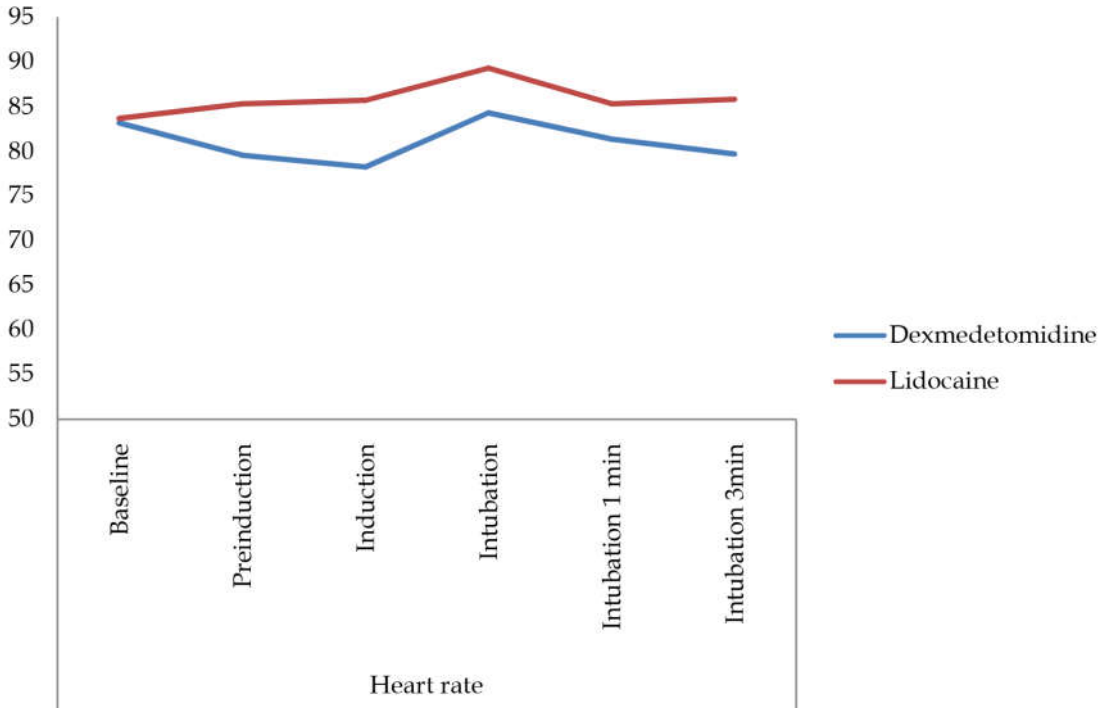

Fig. 5: Graph Showing Mean Heart Rate Variation

There was no difference in the baseline heart rate values. Statistically significant reduction in heart rate occurred in Dexmedetomidine group patients during pre-induction induction, intubation and 1min & 3min after intubation (p-value<0.05).

There was no variation in the baseline systolic blood pressure values. Statistically significant reduction in systolic blood pressure occurred in Dexmedetomidine group patients during pre-induction, induction, intubation and 1 min & 3 min after intubation (p-value<0.05).

There was no difference in the baseline diastolic blood pressure and preinduction diastolic BP values. Statistically significant reduction in diastolic blood pressure occurred in Dexmedetomidine group patients during induction, intubation and 1 min after intubation (p-value<0.05). However, no significant variation in diastolic BP at 3 min after intubation was observed.

There was no difference in the baseline Mean Arterial Pressure (MAP) values between the two groups.

Statistically significant reduction in mean arterial pressure occurred in Dexmedetomidine group

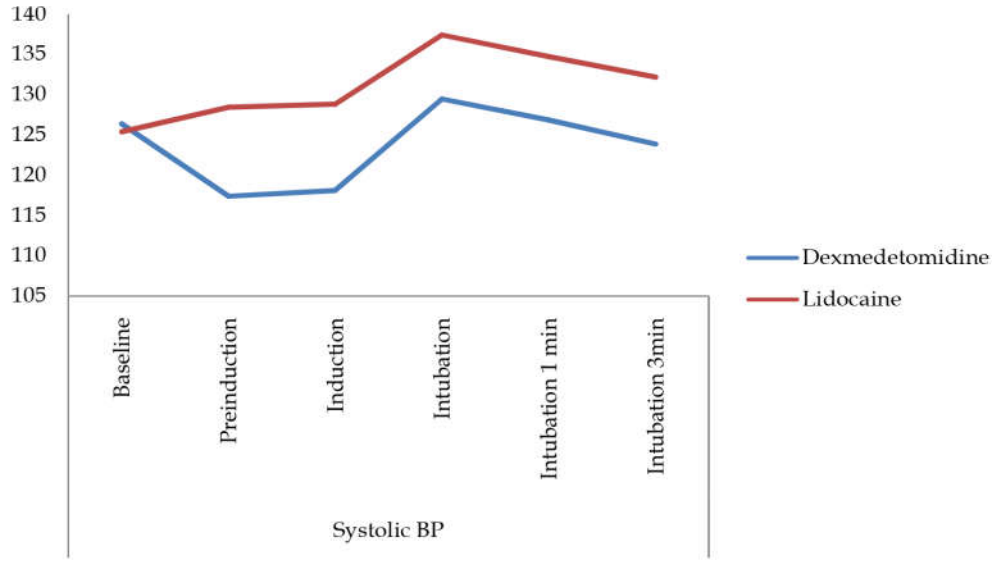

Fig. 6: Comparison of mean systolic blood pressure changes between groups at various intervals

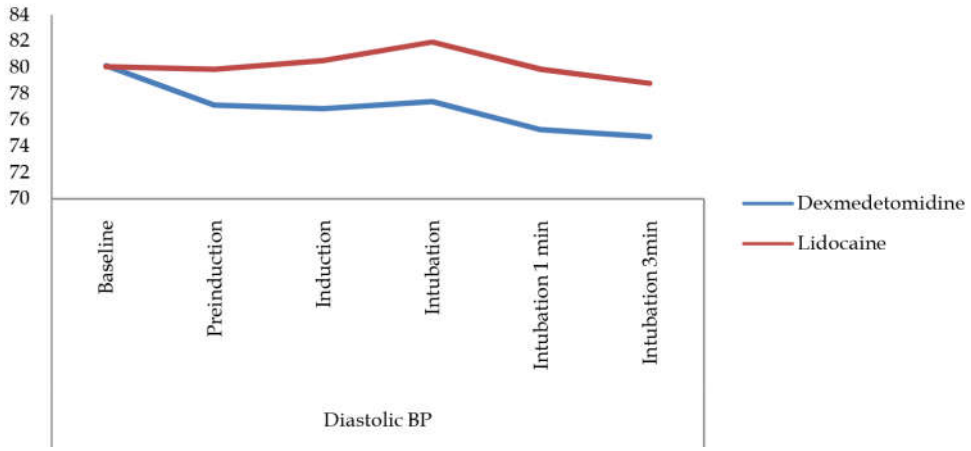

Fig. 7: Comparison of mean systolic blood pressure changes between groups at various intervals

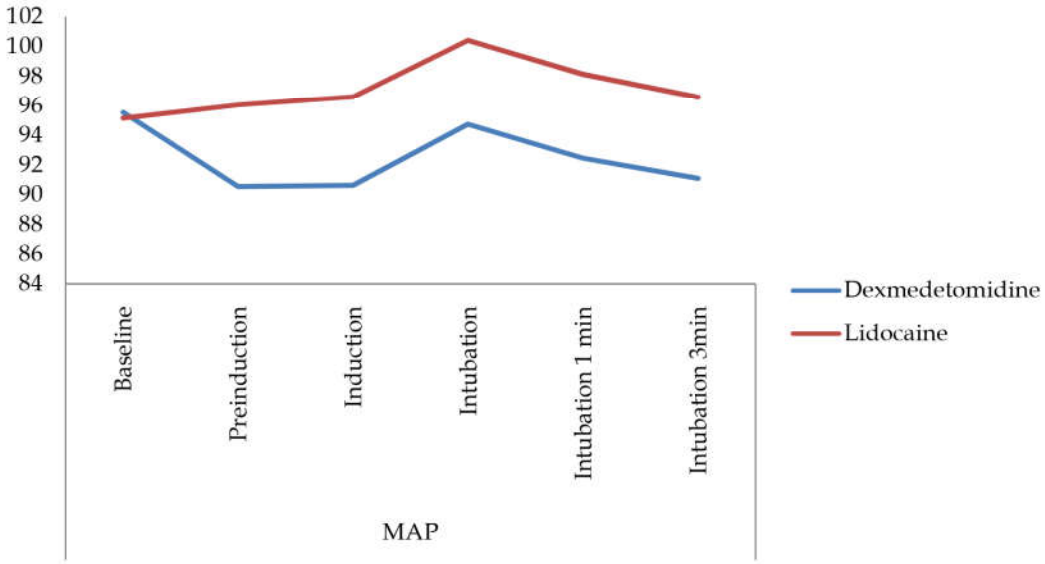

Fig. 8: Comparison of mean systolic blood pressure changes between groups at various intervals

patients during pre-induction, induction, intubation and at 1 min & 3 min after intubation (p-value<0.05).

Discussion

Laryngoscopy and endotracheal intubation are considered as the most crucial phenomenon in conducting general anesthesia [15]. They incite a transient and distinct sympathoadrenal response bringing about tachycardia and hypertension [16, 17]. Various strategies have been utilized to limit these reactions including inhalational anesthetic drugs, lignocaine, opioids, calcium channel blockers, and direct-acting vasodilators [18-20]. All these techniques have their own side effects, e.g. bradycardia, hypotension, sedation, and respiratory depression. In this manner, the search for a perfect agent is continuing. Beta blockers have been utilized for alleviating hemodynamic reaction to laryngoscopy and intubation. However, they limit the HR reaction better than blood pressure response. Calcium channel blockers may cause hypotension, inhibit autoregulation and dose-dependent cerebral vasodilatation. Alpha 2-adrenergic medications like clonidine or dexmedetomidine diminish these conceivably unsafe cardiovascular responses during induction of anesthesia. As of late, α-2 agonists, for example, clonidine and dexmedetomidine have been experimented for lessening the response to intubation without any adverse events. Dexmedetomidine is a direct acting, α-2 adrenergic agonist with sedative, anxiolytic, analgesic, and sympatholytic effects. It is superior to clonidine for decreasing the hemodynamic response to laryngoscopy and intubation as a result of higher selectivity to α-2 receptors than clonidine. Dexmedetomidine acts at the α-2 adrenergic receptors, thereby, diminishing the epinephrine and norepinephrine release. It also acts on the locus coeruleus and decreases central sympathetic outflow. Thus, Dexmedetomidine diminishes the hemodynamic response to intubation and minimizes the intraoperative opioid and anesthetic requirements. It also offers dose-dependent sedative property. Thus, the aforementioned aspects of the pharmacological profile of dexmedetomidine render it appropriate as an anaesthetic adjuvant. This randomized prospective study was conducted to find out the efficacy of dexmedetomidine, more recently introduced α2 - agonist, with additional advantageous properties, for example, sedation, anxiolysis, and sympatholysis, to reduce the hemodynamic response to laryngoscopy and endotracheal intubation. The study revealed that dexmedetomidine caused remarkable attenuation of heart rate and blood pressure response during laryngoscopy and intubation. A study done by Scheinin et al demonstrated that dexmedetomidine could not completely inhibit the pressor response to intubation but can significantly reduce it at a dosage of 0.6 μg/kg IV [20] . They also stated that the usage of thiopentone was lesser in the dexmedetomidine group compared to the control group. Lee et al stated that when used at 1a dose of 1 mcg/kg, dexmedetomidine suppressed the intubation response [21]. Bajwa et al. [22] used a similar dose of dexmedetomidine at 1 mcg/kg and found similar results. In a study done in neurosurgical patients, Srivastava et al. concluded similar results that dexmedetomidine was better [23]. Similar results were observed by Gupta and Vyas [24] and Selvaraj and Manoharan [25]. A study done by Lawrence et al revealed that 2 mcg/kg of dexmedetomidine when given as single dose before anesthesia induction decreased the hemodynamic response to intubation as well as to extubation. But they encountered bradycardia at the 1st and 5th min after administration. The reason might be due to a high bolus dose at administration [26]. Aantaa et al.[27] have already evaluated the various bolus dosages of dexmedetomidine for premedication. Attenuation in an increase in heart rate and blood pressure during intubation was also reported by Jaakola et al. [28]. Villela et al. [29] concluded that there was a decrease in anaesthetic needs in the dexmedetomidine group. A single dose of dexmedetomidine reduced opioid and anesthetic requirement when given as premedication by Yildiz M et al. [30]. The total dose of fentanyl and propofol were reduced for anesthesia maintainence when Tanuja et al. used dexmedetomidine was infused intravenously in the intraoperative period. They moreover concluded that there was better control in intra-operative & postoperative hemodynamic parameters and postoperative pain levels. Moreover, there was a better recovery inpatient profile when compared to placebo usage and they also reported a reduction in total dosage of morphine used [31]. In a study done to determine the efficacy of intravenous dexmedetomidine for attenuation of haemodynamic responses in patients having coronary artery disease, it reduced the sympathetic response in patients undergoing myocardial revascularization as stated by Sulaiman et al. [32].

The baseline heart rate value and blood pressure values were comparable in both groups in our study. Thus in our study pretreatment with

dexmedetomidine attenuated the cardiovascular response to tracheal intubation after anaesthesia induction but did not completely suppress the response when used at 1 mcg/kg over 10 minutes. To conclude, dexmedetomidine, as a pre-anesthetic medication, significantly weakens the sympathoadrenal response to laryngoscopy and endotracheal intubation without influencing intraoperative cardiovascular stability.

References

1. Goldberg JM. Indications and contraindications for laparoscopy. In: Falcone T, Goldberg JM. Basic, Advanced and Robotic Laparoscopic Surgery. Saunders; 2010: Chapter 2.
2. Junghans T, Neudecker J, Dörner F, Raue W, Haase O, Schwenk W. Effect of increasing cardiac preload, sympathetic antagonism, or vasodilation on visceral blood flow during pneumoperitoneum. Langenbecks Arch Surg. 2005 Nov;390(6):538-43.
3. Prys-Roberts C, Greene LT, Meloche R et al. Studies of anesthesia in relation to hypertension II: Haemodynamic consequences of induction and endotracheal intubation. Brit. J. Anaesth. 1971;43:531-547.
4. Masson AHB, Pulmonary edema during or after surgery. Anesth. Analog. Current Researches 1964;43:440-51.
5. Hall JE, Uhrich TD, Barney JA, Arain SR. Ebert TJ. Sedative, amnestic, and analgesic properties of small-doseDexmedetomidine infusions. Anaesthesia Analgesia 2000;90:699-705.
6. Talke P, Richardson CA, Scheinin M, Fisher DM. Postoperative pharmacokinetics and sympatholytic effects of dexmedetomidine. Anaesthesia Analgesia 1997;85:1136-42.
7. Paris A, Tonner PH. Dexmedetomidine in anesthesia. CurrOpinAnaesthesiol 2005;18:412-8.
8. Ebert TJ, Hall JE, Barney JA, Uhrich TD, Colinco MD. The effects of increasing plasma concentrations of dexmedetomidine in humans. Anesthesiology. 2000; 93:382-94.
9. Aantaa R, Jaakola ML, Kallio A, Kanto J. Reduction of the minimum alveolar concentration of isoflurane by dexmedetomidine. Anaesthesiology 1997;86: 1055-60.
10. Gurbet A, Basagan-Mogol E, Turker G, Ugun F, Kaya FN, Ozcan B. Intraoperative infusion of dexmedetomidine reduces perioperative analgesic requirements. Canada Journal Anaesthesia 2006;53:646-52.
11. Talke P, Chen R, Thomas B, Aggarwal A, Gottlieb A, Thorborg P, Heard S, Cheung A, Son SL, Kallio A. The hemodynamic and adrenergic effects of perioperative dexmedetomidine infusion after vascular surgery. Anaesthesia Analgesia 2000;90: 834-9.
12. Guler G, Akin Z, Tosun E, Eskitascoglu, Mizrak A, Boyaci A. Single-dose dexmedetomidine attenuates airway and circulatory reflexes during extubation. ActaAnaesthesiolScandinavica 2005;49:1088-91.
13. Massad IM, Mohsen WA, Basha AS, Al-Zaben KR, Al-Mustafa MM, Alghanem SM. A balanced anesthesia with dexmedetomidine decreases postoperative nausea and vomiting after laparoscopic surgery. Saudi Med J. 2009 Dec; 30(12):1537-41.
14. SreejithHariharan et al.Efficacy of intravenous dexmedetomidine versus lidocaine in attenuation of the stress response. International Journal of Biomedical Research 2016;7(3):099-107.
15. Forbes AM, Dally FG. Acute hypertension during induction of anesthesia and endotracheal intubation in normotensive man. Br J Anaesth. 1970;42:618–24.
16. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth. 1987;59: 295–9.
17. Miller DR, Martineau RJ. Esmolol for control of hemodynamic responses during anesthetic induction. Can J Anaesth. 1989;36:S164–5.
18. Ebert JP, Pearson JD, Gelman S, Harris C, Bradley EL. Circulatory responses to laryngoscopy: The comparative effects of placebo, fentanyl, and esmolol. Can J Anaesth. 1989;36:301–6.
19. Oxorn D, Knox JW, Hill J. Bolus doses of esmolol for the prevention of perioperative hypertension and tachycardia. Can J Anaesth. 1990;37:206–9.
20. Scheinin B, Lindgren L, Randell T, Scheinin H, Scheinin M. Dexmedetomidine attenuates sympathoadrenal responses to tracheal intubation and reduces the need for thiopentone and perioperative fentanyl. Br J Anaesth. 1992;68:126–31.
21. Lee JH, Kim H, Kim HT, Kim MH, Cho K, Lim SH, et al. Comparison of dexmedetomidine and remifentanil for attenuation of hemodynamic responses to laryngoscopy and tracheal intubation. Korean J Anesthesiol. 2012;63:124–9.
22. Bajwa SJ, Kaur J, Singh A, Parmar S, Singh G, Kulshrestha A, et al. Attenuation of pressor response and dose sparing of opioids and anesthetics with pre-operative dexmedetomidine. Indian J Anaesth. 2012; 56:123–8.
23. Srivastava VK, Agrawal S, Gautam SK, Ahmed M, Sharma S, Kumar R, et al. Comparative evaluation of esmolol and dexmedetomidine for attenuation of the sympathomimetic response to laryngoscopy and intubation in neurosurgical patients. J Anaesthesiol ClinPharmacol. 2015;31:186–90.
24. Gupta HB, Vyas S. A comparative study of the efficacy of intravenous dexmedetomidine and intravenous esmolol for attenuation of stress response during

laryngoscopy and endotracheal intubation. Int J Basic ClinPharmacol. 2016;5:1803–8.

25. Selvaraj V, Manoharan KR. Prospective randomized study to compare between intravenous dexmedetomidine and esmolol for attenuation of the hemodynamic response to endotracheal intubation. Anesth Essays Res. 2016;10:343–8.
26. Lawrence CJ, De Lange S. Effects of a single preoperative dexmedetomidine dose on isoflurane requirements and perioperative hemodynamic stability, Anaesthesia 1997;52:736-44.
27. Aantaa R, Jalonen J. Perioperative use of alpha2 adrenoceptor agonists and the cardiac patient. European Journal Anaesthesiol 2006;23:361-372.
28. Jaakola ML, Ali-Melkkila T, Kanto J, et al. Dexmedetomidine reduces intraocular pressure, intubation responses and anesthetic requirements in patients undergoing ophthalmic surgery. Br J Anaesth 1992;68:570-575.
29. Villela NR, Nascimento junior P. Dexmedetomidine in Anaesthesiology. Rev Bras Anestesiol 2003 Feb; 53(1):97-l 13.
30. Yildiz M, Taylan A, Turner S, Reisli R, Yosunkaya A, Oteleioglu. Effect of Dexmedetomidine on hemodynamic responses to laryngoscopy and Intubation: Perioperative hemodynamic and anesthetic requirements. Drugs RD. 2006;7:43-52.
31. Tanuja, Shobha Purohit, Amit Kulshreshtha, a study on the effects of dexmedetomidine on intraocular pressure and hemodynamic changes in response to laryngoscopy and tracheal intubation. Journal of Neuroanaesthesiology and critical care. 2014;1(3): 178-182.
32. Sulaiman S, Karthikeyan RB, Vakamudi M, Sundar AS, Ravullapalli H, Gandham R. the effects of Dexmedetomidine on attenuation of stress response to endotracheal intubation in patients undergoing elective off-pump coronary artery bypass grafting. Ann Card Anaesth 2012;15:39-43.

Original Research Article

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Comparison of Dexmedetomidine and Clonidine as Adjuvant to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block

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Abstract

Background and Aims: We compared analgesic effect of dexmedetomidine and clonidine as adjuvant to 30 ml solution of 0.25% bupivacaine in ultrasound guided supraclavicular brachial plexus block. *Materials and Methods:* Ninety patients scheduled for upper limb orthopedic surgeries were allocated to one of the three groups; control group B (n=30), clonidine group C (n=30), and the dexmedetomidine group D (n=30) in a randomized double blind fashion. In group B 1 ml Normal Saline; in group C 1 ml Clonidine (0.75μg/kg); and in Group D 1 ml Dexmedetomidine (0.75μg/kg); were added to 30 ml of 0.25% bupivacaine and administered during ultrasound guided supraclavicular brachial plexus block. Patients were evaluated for onset and duration of sensory and motor block along with duration of analgesia, sedation, side effects, if any. Hemodynamic parameters were also monitored. *Results:* The groups were comparable with respect to demographic parameters. Patients in group D had earlier onset as well as prolonged duration of sensory and motor block compared to group B and group C, which was statistically significant ($p < 0.001$). Mean Duration of analgesia was 301.5± 48.7 minutes in group B, 456.7±75.8 minutes in group C and 585.0±99.4 minutes in group D. On comparison duration of analgesia was significantly prolonged in group D ($p < 0.001$). *Conclusion:* Dexmedetomidine as adjuvant to local anaesthetic results in increased duration of sensory and motor block along with prolonged duration of analgesia as compared to clonidine.

Keywords: Adjuvant; Brachial Plexus Block; Bupivacaine; Clonidine; Dexmedetomidine; Ultrasound.

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Introduction

Peripheral neural blockade is an integral part of composite anaesthetic care. Brachial plexus block provides intraoperative anaesthesia as well as postoperative analgesia for upper limb orthopaedic surgeries. It offers many advantages over general anaesthesia, such as better postoperative pain relief, decreased incidence of PONV along with avoidance of complication of laryngoscopy and airway instrumentation; and systemic side effects of anaesthesia drugs and systemic analgesics. Ultrasound guidance for nerve localization during brachial plexus block is associated with improved success rate and safety [1]. The distinct advantages of brachial plexus block over general anaesthesia can be extremely useful in patients with significant co-morbidities.

A variety of perineural adjuvants have been used with the aim of extending the duration of analgesia during nerve blocks [2]. Alpha-2 adrenergic receptor agonists have been used as adjuvant for

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their sedative, analgesic, and perioperative sympatholytic effect. Clonidine, an α2-adrenergic agonist, has been previously used in various studies and shown to prolong the duration of anaesthesia and analgesia in nerve blocks. Dexmedetomidine is a highly selective α2-adrenergic agonist. It has been reported to improve the quality of intrathecal and epidural anaesthesia. However, data of its use in supraclavicular brachial plexus block is limited.

The aim of this clinical study was to compare clonidine and dexmedetomidine, as adjuvant to bupivacaine in supraclavicular brachial plexus block, in terms of onset and duration of sensory and motor block and duration of analgesia.

Materials and Methods

After ethical committee approval and informed written consent, a double-blind randomized prospective clinical study was carried out on 90 American Society of Anaesthesiologist (ASA) Grade I and II patients of either sex, aged 18–60 years, BMI 18-30 kg/m^2, undergoing surgery for fractures of lower end humerus and forearm bones under supraclavicular block. Patients with a history of pre-existing cardiac or pulmonary diseases, on adrenoreceptor agonist or antagonist therapy, with known hypersensitivity to local anaesthetic drugs or dexmedetomidine or clonidine, bleeding disorders, pregnant women and pre-existing peripheral neuropathy, were excluded from the study. After Pre anaesthetic evaluation the patients were randomly allocated, using sequentially numbered cards in sealed opaque envelopes to one of the following groups:

Group B (n=30): Bupivacaine 0.25% (30 ml) + 1 ml Normal Saline

Group C (n=30): Bupivacaine 0.25% (30 ml) + 1 ml Clonidine (0.75μg/kg)

Group D (n=30): Bupivacaine 0.25% (30 ml) + 1 ml Dexmedetomidine (0.75μg/kg)

The local anaesthetic solution was prepared by an anaesthetist not involved in the study. The dose of clonidine and dexmedetomidine i.e. 0.75μg/kg was diluted with normal saline to total volume of 1 ml. The anaesthetist performing the block was blinded to the treatment group. All observations were carried out by a single investigator who was also blinded to the treatment group.

On arrival in the operation room, standard monitors including NIBP cuff, pulse oximeter and ECG were attached and baseline heart rate, blood pressure and oxygen saturation were recorded. An intravenous line with 18 G cannula was secured in the unaffected limb and intravenous ringer lactate infusion was started.

Sonosite Fujifilm ultrasound system with HFL38/8-12 MHZ transducer was used for ultrasound guidance following all aseptic precaution. The block was performed with the patient in supine position with patient's head turned towards contralateral side. After aseptic preparation of the skin transducer was placed in transverse plane in the supraclavicular fossa and under ultrasound guidance the brachial plexus, subclavian artery, cervical pleura, and first rib were identified. 2 ml of 2% lignocaine was injected in the skin, lateral to the transducer. The bunch of grape appearance on ultrasound was noted and the 22 G, 5 cm needle was inserted in plane towards the brachial plexus, in a lateral to medial direction. After careful negative aspiration, 31 ml of solution containing study drug was administered.

Hemodynamic variables viz heart rate and mean arterial blood pressure along with oxygen saturation were recorded at time zero and 5^{th}, 15^{th}, 30^{th}, 60^{th}, 90^{th}, 120^{th}, 150^{th} minute and 3^{rd}, 6^{th}, 12^{th} and 24^{th} hour.

Sensory and motor block evaluation was done every minute after completion of drug administration until complete sensory and motor block. Sensory block was assessed by pinprick test with a blunt 26 G hypodermic needle in the distribution of ulnar, median, radial and musculocutaneous nerves using a 3-point scale as:

0 = Normal sensation,

1 = Loss of sensation of prick (analgesia),

2 = Loss of sensation of touch (anaesthesia).

The block was considered incomplete when any of the segments supplied by median, radial, ulnar and musculocutaneous nerve did not have analgesia even after 30 minutes of drug injection. When more than one nerve remained unaffected, it was considered a failed block. In this case, general anaesthesia was given intraoperatively. Onset time for sensory block was defined as the time interval between the end of total local anaesthetic administration and complete sensory block (score 2) on all nerve territories. Duration of sensory block defined as the time interval between the end of local anaesthetic administration and the complete resolution of anaesthesia (score 0).

Motor block was evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), and flexion at elbow

(musculocutaneous nerve) on a 3-point scale as:

0= Normal motor function,

1= Reduced motor strength (but able to move fingers),

2= Complete motor block.

Onset time motor block was defined as time interval between the end of total local anaesthetic administration and absence of voluntary movement on hand and forearm (score 2). Duration of motor block was defined as the time interval between end of local anaesthetic administration and the recovery of complete motor function of the hand and forearm (score 0).

Sedation score was assessed according to Ramsay Sedation Scale (RSS) from 1-6, with 1 corresponding to an anxious or agitated state and 6 to no response [3].

Patient pain was evaluated by Visual Analogue Scale (VAS), a scale of zero to ten, where 0 is no pain and 10 is very severe pain. In all the three groups time to injection was considered as time zero, VAS at time zero was baseline score and was recorded in all patients. Patient's pain was evaluated at the time zero and 5^{th}, 15^{th}, 30^{th} minute and 1^{st}, 2^{nd}, 6^{th}, 24^{th} hour by a co-investigator, who was blinded to the used method and asked for their pain scores and the same co-investigator recorded all pain scores. Nursing staff was directed to administer inj. diclofenac sodium 1.5 mg/kg intramuscular when VAS $\geq$ 4 (rescue analgesia). Time of first request for postoperative analgesic (duration of analgesia) was recorded. Total analgesic requirement in first 24 hours was also noted.

Patients were monitored for nausea, vomiting, skin rash, tachycardia (>20% above baseline value), bradycardia (<50 beats per minute), hypotension (>20% below baseline value), hypertension (>20% above baseline value), hypoxemia (SpO_2 <90%), sedation or any other side effect both intraoperatively and during 24 hour postoperative period.

Statistical Analysis

The data was recorded, summarized, tabulated and statistically analyzed using SPSS statistics program (Version 20). The statistical analysis of quantitative data (Mean± SD) between the groups was done by student 't' test. The statistical analysis of qualitative data (N%) between the groups was done by using fischer exact test. p-value <0.05 was considered to be statistically significant.

Results and Analysis

There was no statistically significant difference among the patients in the three groups with respect to age, weight, BMI, sex ratio, duration of surgery, and ASA physical status (Table 1).

The mean time for onset of sensory block was 17.7±2.2 minutes in group B, 12.0±1.2 minutes in group C, and 10.5±1.1 minutes in group D. The mean time for onset of motor block was 22.4±2.2 minutes in group B, 16.7±1.6 minutes in group C, and 14.8±1.4 minutes in group D (Table-2). The onset of sensory and motor block was earlier in group D which was found to be statistically significant when compared among group B and D (p=0.0001), and C and D (p=0.0001).

The duration of sensory block was maximum in group D (545.3±94.2min) followed by group C (419.3±74.0 min) and group B (275.7±40.6 min). The duration of motor block was also maximum in group D (508.3±95.8 min), followed by group C

Table 1: Patient profile and duration of surgery

Parameters	Group B N=30	Group C N=30	Group D N=30	P-value B vs C	B vs D	C vs D
Age	39.2 ± 12.3	36.1 ± 13.4	35.4 ± 11.9	0.35	0.23	0.83
Sex						
Male	21	20	20	1.00	1.00	1.00
Female	9	10	10			
BMI	22.3 ± 1.6	22.0 ± 1.4	21.8 ± 1.5	0.44	0.22	0.60
			ASA score			
1	28	28	28	1.00	1.00	1.00
2	2	2	2			
Duration of surgery (minutes)	119.0 ±25.5	114.0 ± 24.2	109.0 ± 21.6	0.44	0.10	0.40

(378.7±73.2 min) and group B (238.7±46.7). This was found to be statistically significant when compared among group B and C (p=0.0001), B and D (p=0.0001), and C and D (p=0.0001) (Table 2).

Mean Duration of analgesia was 301.5±48.7 minutes in group B, 456.7±75.8 minutes in group C and 585.0±99.4 minutes in group D (Table 2). It was statistically significant when compared among group B and C (p=0.0001), B and D (p=0.0001), and C and D (p=0.0001).

Mean consumption of diclofenac during 24 hours was maximum in group B, 306.7±25.4 mg. Patient in group D had significantly lower total 24 hour diclofenac consumption than group C, 190.0±54.8 mg vs 233.3±54.7 mg (p =0.003) (Table 2).

The baseline hemodynamic parameters were comparable in all the groups (Figure 1) and (Figure 2). Heart rate and Mean arterial pressure (MAP) were found to be lower in patients in group C and group D compared to group B. Patient receiving dexmedetomidine (group D) had lower heart rate and MAP than patients receiving clonidine (Group C) which was statistically significant between 30 minutes to 120 minutes (p<0.05).

Patients in group D were more sedated than group C when Ramsay Sedation score (RSS) was

Table 2: Block characteristics among the three groups

Parameters	Group B N=30	Group C N=30	Group D N=30	P value B vs C	B vs D	C vs D
Onset of Sensory Block (minutes)	17.7 ± 2.2	12.0 ± 1.2	10.5 ± 1.1	0.0001*	0.0001*	0.0001*
Onset of Motor Block (minutes)	22.4 ± 2.2	16.7 ± 1.6	14.8 ± 1.4	0.0001*	0.0001*	0.0001*
Duration of Sensory Block (minutes)	275.7 ± 46.7	419.3 ± 74.0	545.3 ± 94.2	0.0001*	0.0001*	0.0001*
Duration of Motor Block (minutes)	238.7 ± 40.6	378.7 ± 73.2	508.3 ± 95.8	0.0001*	0.0001*	0.0001*
Duration of analgesia (minutes)	301.5 ± 48.7	456.7 ± 75.8	585.0 ± 99.4	0.0001*	0.0001*	0.0001*
Total 24 Hr Analgesic consumption(mg)	306.7 ± 25.4	233.3 ± 54.7	190.0 ± 54.8	0.0001*	0.0001*	0.003*

*p value significant

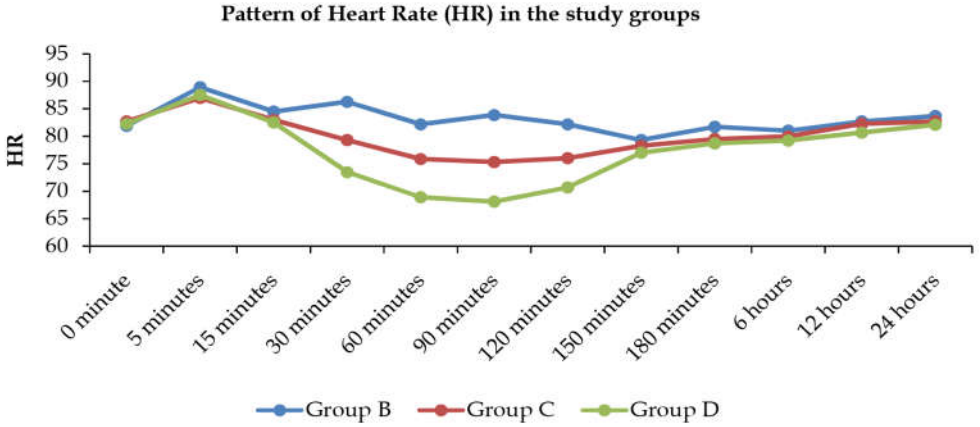

Fig. 1: Line diagram showing pattern of heart rate in the study groups

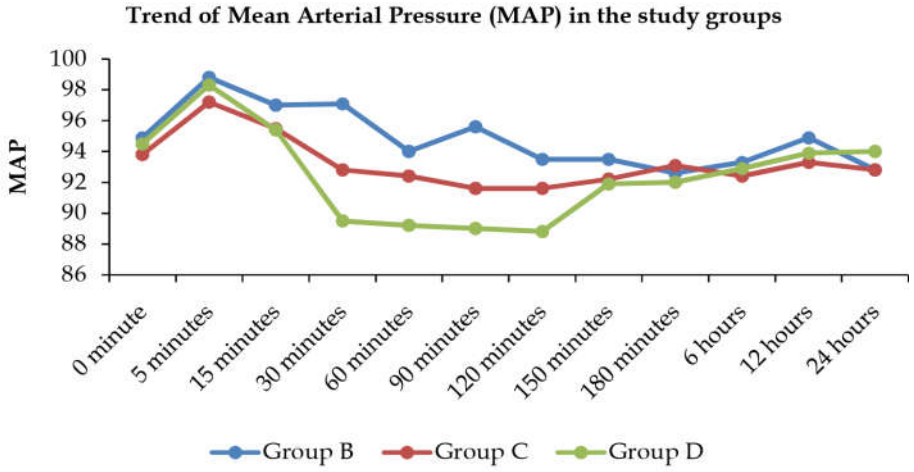

Fig. 2: Line diagram depicting trend of mean arterial pressure in the study groups

recorded at 30,60,120 and 180 minutes (Figure 3). In group C, all the patients had RSS ≤ 3 at 60 minutes while none of the patient achieved grade 4 sedation. In group D, 5 patients had grade 4 sedation, while remaining patients had RSS ≤ 3 at 60 minutes. At 360 minutes both group achieved their baseline score.

No episode of hypoxemia during 24 h period postoperatively was seen in any patient. None of the patients in group B and group C experienced any side effect. While two patients in group D experienced intraoperative bradycardia with hypotension. No episode of nausea, vomiting, or any other side-effect was observed.

Discussion

This prospective, randomized, double-blind study demonstrate that compared to clonidine (0.75 μg/kg), dexmedetomidine (0.75 μg/kg) as adjuvant to 30 ml of 0.25% bupivacaine results in faster onset and prolonged duration of both sensory and motor block in ultrasound-guided supraclavicular brachial plexus block. The duration of analgesia was also significantly prolonged in patients receiving dexmedetomidine compared to clonidine (p=0.0001). The prolonged duration of analgesia obtained in our study in dexmedetomidine group resulted in lower total 24 hour analgesic consumption compared to clonidine group and was clinically and statistically significant (p=0.003).

In animal studies, use of dexmedetomidine perineurally has been associated with decreased inflammation around peripheral nerve [4]. No neurological deficit was observed in any of our patients. No neurological deficit was reported in similar study by Swami et al. [5].

In our study, Bupivacaine dose was chosen as per recommendation in the text book and based on previous researches [6]. Clonidine as adjuvant was used at a dose of 0.75μg/kg. This dose was based on study by Singelyn et al. in which they found that 0.5 μg/kg clonidine, as adjuvant to local anaesthetic for axillary block, significantly prolonged analgesia and no additional advantage with doses higher than 1.5 μg/kg [7].

We used an equal dose of dexmedetomidine i.e. 0.75 μg/kg for comparison. Similar dose of dexmedetomidine has been used in study conducted by Ammar et al in which they tested the efficacy of adding 0.75 μg/kg of dexmedetomidine to 30 ml of 0.33% bupivacaine during ultrasound guided infraclavicular brachial plexus block [8].

Swami SS et al. in 2012 conducted a study in which they compared clonidine (1 μg/kg) and dexmedetomidine (1 μg/kg) as adjuvant to 35 ml of 0.25% bupivaciane in supralavicular brachial plexus block [5]. They concluded that dexmedetomidine when added to local anaesthetic in supraclavicular brachial plexus block significantly enhanced the duration of sensory and motor block and also the duration of analgesia compared with clonidine. The finding in their study corroborates our study. Swami SS et al. used nerve stimulation as the guidance method. Use of ultrasound guidance in our study enabled reduction in total volume of local anaesthetic as well as dose of adjuvants (0.75 μg/kg compared to 1 μg/kg).

Tripathi A et al. in 2016 compared (1 μg/kg) clonidine and (1 μg/kg) dexmedetomidine as adjuvant to 39 ml of 0.25% bupivacaine in supraclavicular brachial plexus block [9]. They observed no statistically significant difference in the onset of sensory and motor block in both the groups. However, similar to our study they found significantly increased duration of sensory and motor block, and analgesia in dexmedetomidine group.

Recently, El Boghdadly K et al. in 2017 conducted a systematic review and meta analysis to compare the efficacy of perineural Dexmedetomidine and Clonidine when added to local anaesthetic in supraclavicular brachial plexus block; in which they included 868 patients from 14 clinical studies [10]. This meta analysis was unavailable at the time we started our study. They observed that compared with clonidine, dexmedetomidine prolonged the duration of sensory and motor block, and analgesia. Dexmedetomidine also hastened the onset of sensory and motor block. Their finding further corroborates our study.

We observed that the use of alpha-2 agonists, dexmedetomidine and clonidine as adjuvant to bupivacaine in supraclavicular brachial plexus block, apart from hastening the onset of sensory and motor block also significantly prolonged the duration of sensory and motor block, as well as duration of analgesia compared to control group. The mechanism of the analgesic actions of α_2 agonists is probably multifactorial. The analgesic effect of α_2 agonists is mediated through stimulation of α_{2C} and α_{2A} receptor in dorsal horn, thus directly suppressing pain transmission by reducing the release of pronociceptive transmitters, substance P and glutamate, and

hyperpolarization of interneurons. During perineural administration the effect of dexmedetomidine and clonidine on nerves is likely elicited by prolonged hyperpolarization of unmyelinated C fibres (sensory) and to a lesser extent the A fibres (motor function). In animal models, the analgesic effect of perineural dexmedetomidine and clonidine have been shown to be caused by enhancement of the hyperpolarisation-activated cation current, which prevents the nerve from returning from a hyperpolarized state to resting membrane potential for subsequent firing [11,12].

In our study, patients receiving dexmedetomidine reported higher sedation score compared to clonidine. No patient experienced airway compromise or required airway assistance. Similar to our study Swami et al. in their study reported that the patients in dexmedetomidine and clonidine group were comfortable throughout the surgery with arousable sedative effects. α_2 agonists produce sedation by central action through activation of α_2 adrenoreceptor in locus coeruleus. The sedative effect can be explained on the basis that some amount of systemic absorption of drug could be present which can be due to lipophilic nature of clonidine and dexmedetomidine [13].

Patients receiving α_2 agonist reported lower heart rate and mean arterial pressure than control group which was statistically significant between 30 to 120 minutes. The reduction in heart rate was more profound in dexmedetomidine group. In Group D, two patients developed intraoperative bradycardia and required atropine administration, 0.6mg intravenously. Bradycardia was not reported in clonidine and control group. Some previous studies have reported the incidence of bradycardia and hypotension with α_2 adrenoreceptor agonists [14,15]. El Boghdadly K et al. in their meta analysis also reported that dexmedetomidine increases the risk of transient bradycardia. In peripheral nerve blockade the bradycardia observed can be a side effect due to systemic absorption of $\alpha_2$agonists.

The limitation of our study was small sample size. The strength of our study is that we used ultrasound guidance for supraclavicular brachial plexus block allowing us to use lesser concentration of local anaesthetic and α_2 agonists.

Furthermore, the effect of intravenous α_2 agonist and perineural administration needs to be compared and studied to delineate the action and mechanism by which α_2 agonists produce analgesia in peripheral nerve block. Further dose finding studies are required for recommendation on dose of dexmedetomidine when used perineurally as adjuvant, for maximum benefits and minimum side effects.

Conclusion

We conclude that the use of dexmedetomidine as adjuvant to local anaesthetic agent during ultrasound guided brachial plexus block provides longer duration of analgesia compared to clonidine. Dexmedetomidine holds considerable promise as an adjuvant in peripheral nerve block.

References

1. Lewis SR, Price A, Walker KJ, McGrattan K, Smith AF. Ultrasound guidance for upper and lower limb blocks. Cochrane Database Syst Rev 2015;11:CD00 6459.
2. Murphy DB, McCartney CJ, Chan VW. Novel analgesic adjuncts for brachial plexus block: A systematic review. Anesth Analg 2000;90(5):1122-8.
3. Ramsay MA, Savage TM, Simpson BR, Godwin R. Controlled sedation with alphaxolone-alphadolone. Br Med J 1974;2:656-9.
4. Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with Bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. Anesthesiology 2008;109:502-11.
5. Swami SS, Keniya VM, Ladi SD, Rao R. Comparison of dexmedetomidine and clonidine (α_2 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.
6. Duggan E, El Beheiry H, Perlas A, Lupu M, Nuica A, Chan VW, et al. Minimum effective volume of local anesthetic for ultrasound-guided supraclavicular brachial plexus block. Reg Anesth Pain Med 2009;34: 215–8.
7. Singelyn FJ, Gouveineur J, Robert A. A minimum dose of clonidine added to mepivacaine prolongs duration analgesia after brachial plexus block. Anesth Analg 1996;83:1046-50.
8. Ammar AS, Mahmoud KM. Ultrasound guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. Saudi J Anaesth 2012; 6:109-14.
9. Tripathi A, Sharma K, Somvanshi M, Samal RL. A comaparative study of clonidine and dexmedetomidine

as an adjunct to bupivacaine in supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol 2016;32:344-8.

10. El-Boghdadly K, Brull R, Sehmbi H, Abdallah FW. Perineural Dexmedetomidine Is More Effective Than Clonidine When Added to Local Anesthetic for Supraclavicular Brachial Plexus Block: A Systematic Review and Meta-analysis. Anesth Analg 2017; 124(6):2008-20.
11. Kroin JS, Buvanendran A, Beck DR, Topic JE, Watts DE, Tuman KJ. Clonidine prolongation of lidocaine analgesia after sciatic nerve block in rats is mediated via the hyperpolarization-activated cation current, not by alpha-adrenoreceptors. Anesthesiology 2004;101 (2):488–94.
12. Brummett CM, Hong EK, Janda AM, Amodeo FS, Lydic R. Perineural dexmedetomidine added to ropivacaine for sciatic nerve block in rats prolongs the duration of analgesia by blocking the hyperpolarization-activated cation current. Anesthesiology. 2011;115(4): 836–43.
13. Popping DM, Elia N, Marret E, Wenk M, Tramèr MR. Clonidine as an adjuvant to local anaesthetic for peripheral nerve and plexus blocks: A meta-analysis of randomized trials. Anesthesiology. 2009;111: 406–15.
14. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine added to levobupivacaine prolongs axillary brachial plexus block. Anesth Analg 2010;111:1548-51.
15. Bernard JM, Macaire P. Dose-range effects of clonidine added to lidocaine for brachial plexus block. Anesthesiology 1997;87:277-84.

Original Research Article

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Prospective Observational Study on the Incidence of Postoperative Sore Throat in Patients undergoing Endotracheal Intubation under General Anaesthesia

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Abstract

Background: There are various risk factors associated with Post Operative Sore Throat (POST). The objective of the study was to study the incidence of post operative sore throat in patients undergoing surgeries under general anaesthesia requiring endotracheal intubation. *Materials and Methods:* A total of 175 patients fulfilling the inclusion criteria were enrolled in the study. The incidence of post operative sore throat was observed at 1, 6 and 24 hours post extubation and its correlation with the mallampatti score, designation of the intubating anaesthesiologist and the duration of surgery. *Results:* In males the incidence was 50% and in females it was 47% with an overall incidence of 48%. In patients with mallampatti class 1 the incidence of POST was 41% and in class 2 it was 57.9%. Among the anaesthesists, 1st, 2nd and 3rd year PGs were 45.7 %, 50.7%, 48.6% and 44.4% respectively. The incidence of POST in patients in whom duration of surgery was between 1 to 2 hours was 39.4 %, 2 to 3 hours was 49.4 % and 3 to 4 hours was 68 %. *Conclusion:* The incidence of POST has no significant difference between female and male patients. Lower mallampatti score is associated with lower incidence. Designation of anesthesist has no impact on the incidence. Lower the duration of surgery, lower the incidence.

Keywords: Postoperative Sore Throat (POST); Endotracheal Intubation; Mallampatti Score.

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Introduction

General anaesthesia is one of the most common type of anaesthesia practiced all over the world. Airway management is the most important skill for a clinical anaesthesiologist as it is an integral part of general anaesthesia which facilitates ventilation and oxygenation as well as a mode for anaesthetic gas delivery [1]. Protective airway reflexes, airway patency, and breathing pattern are altered for patients under general anaesthesia due to the effects of intravenous, inhalational agents, opioids and muscle relaxants [2]. To maintain an open airway and regulate breathing, some form of airway device is to be placed after the patient is unconscious. To enable mechanical ventilation, the most common and a safe method to secure airway is by the placement of an endotracheal tube [3]. The endotracheal tube usage has many advantages like protection against aspiration and gastric insufflation. They are more effective for ventilation and oxygenation when compared to other airway devices and also facilitates suctioning and delivery of oxygen and mixture of anaesthetic gases [4]. Although there are advantages of endotracheal intubation it is also associated with many

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disadvantages such as, sore throat along with injury to the lips, tongue, gums, throat, breakage/damage to the teeth and also may be associated with hoarseness of voice from temporary or permanent damage to the vocal cords along with hemodynamic alterations during laryngoscopy [5].

Sore throat is defined as pain or scratchiness or irritation of the oropharynx usually due to mucosal injury and worsens during swallowing. Postoperative sore throat is a common complaint after tracheal intubation for general anaesthesia. It can lead to discomfort after surgery and may delay a patient's return to normal routine activities. It is the 8th most undesirable outcome in postoperative period. Its incidence varies from 0-50% in most research studies. But some studies report even a higher incidence with peak in 2-6 hrs of extubation and gradually decreases, and the most common cause being mucosal injury due to over inflation of the cuff of the endotracheal tube and any vocal cord injury [6].

There are many factors contributing to the development of post operative sore throat which includes, Mallampatti score of the patient, duration of the surgery as well as the designation of the intubating anaesthetist.

So, we designed this study which includes all the above mentioned factors to find the incidence of post operative sore throat in our population and the factors contributing to it.

Materials and Methods

A prospective, observational study was carried out at Sri Manakula Vinayagar Medical College and Hospital, Puducherry during the period of October 2014 to July 2016. This study was conducted as per Good clinical practice Guidelines (GCP) defined by WHO. Sample size (n=175) was calculated using 95% confidence interval, 80 % power and 7% alpha error with incidence of postoperative sore throat following endotracheal intubations of 28%.

Inclusion Criteria

All ASA I and II patients of both genders aged between 18 to 65 years were included in the study.

Exclusion Criteria

ASA III & IV patients, patients posted for surgeries of oral cavity and pharynx, unpredicted or long duration of surgeries that has taken more than 4 hours, anticipated difficult airways (Mallampatti 3 and 4), procedure that has taken more than three attempts at intubation and visual trauma during intubation were excluded from the study

Procedure

Pre anaesthetic checkup was done a day prior to the surgery and the patients were kept fasting for 6 to 8 hours. On the day before surgery, patients received T. Ranitidine 150 mg in the night and at 7AM. On the day of surgery along with T. Metoclopramide 10 mg. The Patients were shifted to waiting room and again re-assessed. An intravenous line was started using a 18G venflon. Anaesthesia was induced by Inj. Glycopyrolate 0.2 mg IV, Inj. Fentanyl 2mcg/kg IV, Inj. propofol 2 mg/kg IV, patients were intubated using the appropriate size endotracheal tube (8-8.5 mm size tube for male patients and 7-7.5 size tube for female patients) and macintosh blade (4 size for male patients and 3 size for female patients) following which intubation was facilitated by Inj.succinyl choline 2mg/kg and anaesthesia was maintained by 33% O_2 in N_2O along with an inhalational anaesthetic and muscle relaxant as per the choice of the intubating anaesthetist. At the end of surgery the oropharynx was cautiously suctioned using a soft suction catheter and the patients were extubated after standard reversal of muscle relaxation with neostigmine and glycopyrolate. Outcome assessment of incidence of sore throat was carried out at 1, 6 and 24 hours of post extubation in the postoperative ward and was assessed using a 4-point scale.

Score

Score 0: No sore throat at any time after the surgery

Score 1: The patient answered when asked about sore throat (minimal sore throat)

Score 2: The patient complained of sore throat on his/her own (moderate sore throat)

Score 3: The patient is in obvious distress (severe sore throat)

Results

Demography: Out of 175 patients in the overall population 117 patients are females and 58 patients

are males. Among the male patients, 29 (50%) had no POST whereas 26 (44.8%) and 3 (5.2%) had minimal and moderate POST respectively. 62 (53%) of the females patients experienced no POST the rest of which 45 (38.5%), 9 (7.7%) and 1 (0.9%) had POST scores of 1, 2 and 3 respectively at 1hr which was reduced in observations at 6 and 24 hrs. The overall incidence of POST was 48% and the incidence among male and female patients was not significantly different (Figure 1, 2).

Mallampatti score: 99 patients among the study population were patients with Mallampatti grade 1 amounting to 57 percentage and 76 patients among the study were patients with Mallampatti grade 2 amounting to 43 percentage. POST distribution among the mallampatti grade 1 was found to be 33%, 6% and 1% of score 1, 2 and 3 respectively. Out of the 76 grade 2 cases, score 1 was found to be 42.1% followed by score 2 (7.9%) with no incidence of severe (score 3) POST. 75% and 92% of patients relieved from POST at 24 hrs (Figure 3).

Designation of Intubating Anaesthetist: Among the total population, intubation was performed by, First Year PG (26.3%), Second Year PG (38.3%), Third Year PG (20%) and Consultant (15.4%) and the incidence of POST was found to be 45.7%, 50.7%, 48.6% and 44.4% respectively (Table 1).

Duration of surgery: Out of 175 study population, 71 patients had duration of surgery for 1-2 hours amounting for 41%. 79 patients had duration of surgery for 2-3 hours amounting for 45%.

Table 1: Incidence of POST In Relation To The Designation Of Intubating Anaesthesiologist

Anaesthetist (n=175)	Hours	POST (%)			
		Score 0	Score 1	Score 2	Score 3
First Year PG (n=46)	1 hr	54.3	32.6	10.9	2.2
	6 hrs	65.2	19.6	6.5	0
	24 hrs	78.3	19.5	2.2	0
Second Year PG (n=67)	1 hr	49.3	40.3	10.4	0
	6 hrs	70.1	25.4	4.5	0
	24 hrs	92.5	7.5	0	0
Third Year PG (n=35)	1 hr	51.4	48.6	0	0
	6 hrs	88.6	11.4	0	0
	24 hrs	97.1	2.9	0	0
Consultant (n=27)	1 hr	55.6	44.4	0	0
	6 hrs	85.2	14.8	0	0
	24 hrs	88.9	11.1	0	0

The rate of POST was not significantly related to the intubating anaesthesiologist

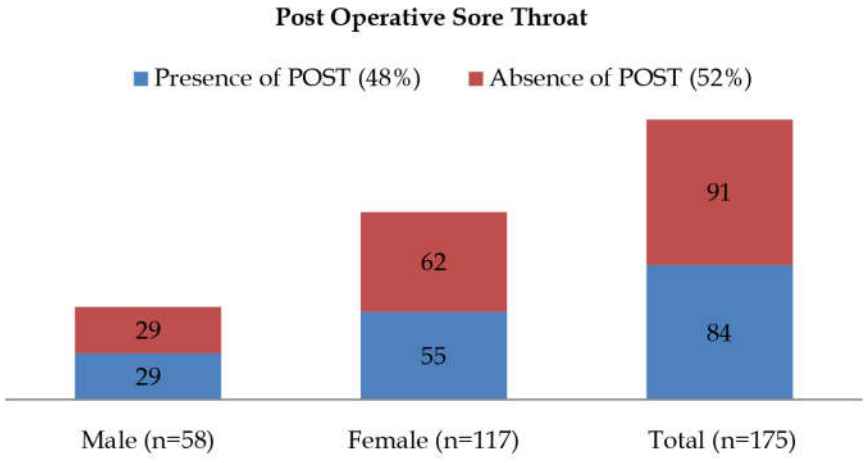


Fig. 1: Overall Incidence Of POST

Table 2: Incidence Of POST In Relation To The Duration Of Surgery

Duration of Surgery (n=175)	Hours	Post (%)			
		Score 0	Score 1	Score 2	Score 3
1 to 2hrs (n=71)	1 hr	60.6	28.2	9.8	1.4
	6 hrs	76.1	16.9	7	0
	24 hrs	90.1	9.9	0	0
2-3hrs (n=79)	1 hr	50.6	44.3	5.1	0
	6 hrs	73.4	20.3	6.3	0
	24 hrs	86.1	12.7	1.3	0
3 to 4 hrs (n=25)	1 hr	32	64	4	0
	6 hrs	76	24	0	0
	24 hrs	96	4	0	0

The rate of POST increased with an increased duration of surgery

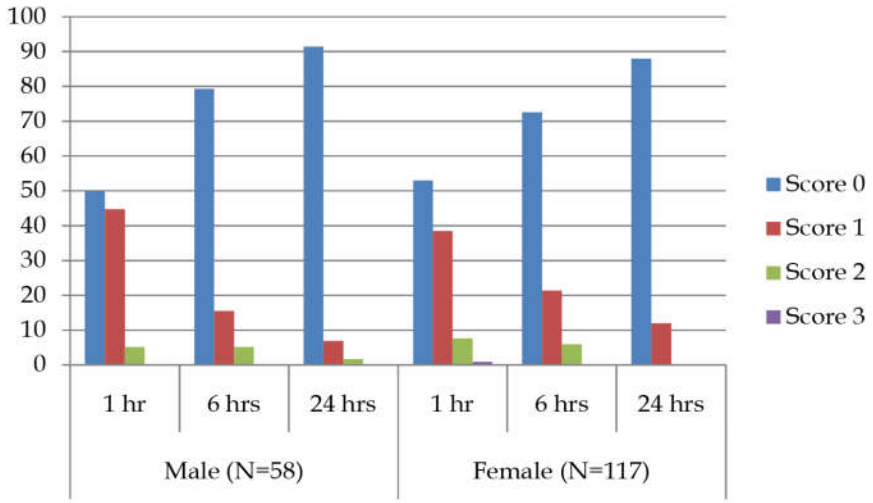
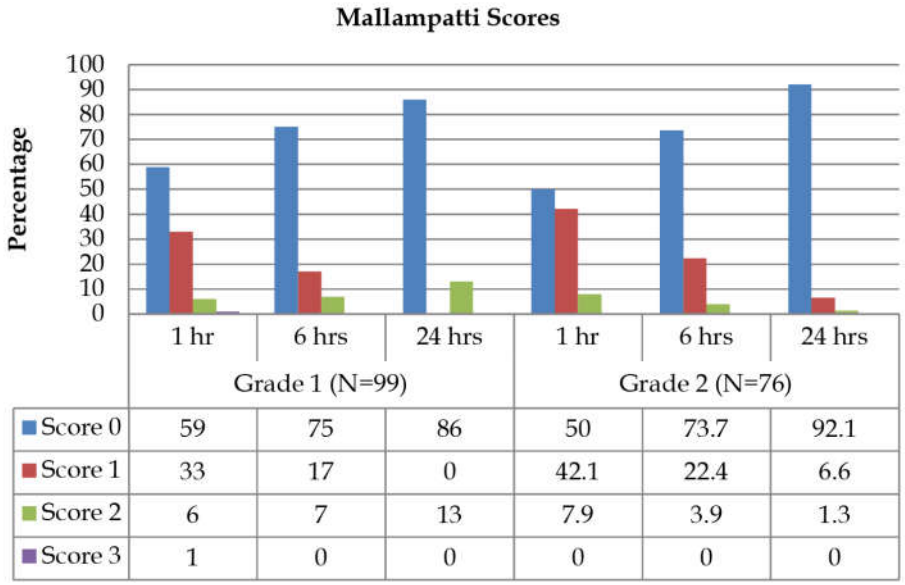


Fig. 2: Incidence of POST In Patients At 1, 6 And 24 Hours
The incidence of POST among the male and female patients were not significantly different



The overall incidence of POST in patients with Mallampatti score 1 was 41 % & Mallampatti score 2 was 57.9%
Fig. 3: Incidence of POST In Patients With Mallampatti Grade 1 & 2 At 1, 6 And 24 Hours

25patients had duration of surgery for 3-4 hour amounting for 14%. The overall incidence of POST in patients undergoing surgery for 1-2 hours was 39.4%, 2-3 hours was 49.4% and 3-4 hours was 68 % (Table 2).

Discussion

Causes of post operative sore throat are multifactorial [7]. So, we incorporated the important factors causing POST such as, mallampatti classification of the patient, duration of surgery and designation (experience) of the intubating anaesthesiologist.

There are many factors contributing to postoperative sore throat such as size of the ETT used along with the technique of insertion, use of any lubricant, the cuff pressure used for inflation, associated airway design, length of procedure and sometimes with the anaesthetic administered and the evaluation technique [8]. Tracheal intubation is commonly associated with an increase in number of polymorphonuclear cells in the tracheal tissue and plasma levels of interleukin 6, which suggests an inflammatory response to the presence of the endotracheal tube itself or to some aspects of the intubation process [9].

Routine tracheal intubation for elective surgical procedures can result in pathological Changes. High intracuff pressure is associated with nerve palsies due to neuropraxia, nerve compression and nerve damage which may also account for postoperative throat symptoms. Although these symptoms may be considered to be minor by some, they are important measures of quality of care. In most cases, the symptoms resolve spontaneously without intervention, but in a few cases, they may persist. When the symptoms do occur, patients perceive them as mild to severe and often discomforting. Careful insertion technique of the tracheal tube is of paramount importance in the prevention of postoperative sore throat [10].

PP Higgins et al. studied the incidence of post operative sore throat in 5264 patients undergoing surgeries requiring endotracheal intubation and observed that the overall incidence of POST was 45.4% [11]. Brio P et al. studied the incidence of POST in 809 patients undergoing elective surgeries requiring endotracheal intubation under general anaesthesia and observed that the overall incidence of POST was 40% [12]. Our results demonstrate that the overall incidence of POST was 48%.

Maria Jaensson et al studied gender differences in sore throat and hoarseness following endotracheal tube or laryngeal mask airway and observed that there was no significant difference in the incidence of post operative sore throat after using endotracheal tube in males and females [13]. A.M. Christensen et al. observed that the incidence of post operative sore throat was significantly higher in females when compared to females [14]. Our results demonstrate that the overall incidence of POST in male patients was 50% and overall incidence of POST in female patients was 47%.

S. Inoue et al. observed that that there was no difference between tracheal intubation by trainees and tracheal intubation by consultant anaesthetists in the incidences of post operative sore throat [15]. Biro P et al could find no influence on the occurrence or intensity of throat complaints by the professional assignment or the length of professional experience of the personnel involved [12]. Our study demonstrated that, the incidence of POST in patients intubated by first year post graduate students was 45.7%, the incidence of POST in patients intubated by second year post graduate students was 50.7%, the incidence of POST in patients intubated by third year post graduate students was 48.6% and the incidence of POST in patients intubated by consultants was 44.4%.

Maria Jaennson et al observed that there was no significant association between the Mallampati Score, duration of anaesthesia in the risk of developing POST [16].

In our study we observed that the incidence of POST in patients in whom duration of surgery was between 1 to 2 hours was 39.4%, the incidence of POST in patients in whom duration of surgery was between 2 to 3 hours was 49.4% and the incidence of POST in patients in whom duration of surgery was between 3 to 4 hours was 68%. So, in our study we observed that as duration of surgery increases the incidence of POST increases and this may be due to changes of cuff pressure with time. But in our study we did not measure cuff pressure intraoperatively.

In our study we observed that the incidence of POST in patients with mallampatti score 1 was 41% and incidence of POST in patients with mallampatii score 2 was 57.9%.

In our study we used conventional direct laryngoscope for inserting the endotracheal tube. Hence, we could not rule out laryngoscopy related trauma as a cause of POST. A fibre-optic

examination of the supraglottic area, pharynx and glottis area can be done after securing the ET tube to rule out laryngoscope related trauma which was not possible in our institution because of the limitations in the availability of equipment. Further studies are warranted using a fibre-optic bronchoscopy or other atraumatic methods of ET tube insertion which can ascertain to the cause of POST.

Conclusions

On an overall we observed that the rate of POST in the present study is in concordance with the previously reported studies. Sex of the patient has no influence on the incidence POST. Lower the mallampatti class lower the incidence of POST. Lesser the duration of surgery lesser the incidence of POST. Designation/Experience of intubating anaesthesist has no influence on the incidence of POST. Incidence and severity of POST reduces with time postoperatively.

References

1. Becker DE, Rosenberg MB, Phero JC. Essentials of airway management, oxygenation, and ventilation: part 1: basic equipment and devices. Anesth Prog. 2014;61(2):78–83.
2. Khan RM, Sharma PK, Kaul N. Airway management in trauma. Indian Journal of Anaesthesia. 2011 Sep 1;55(5):463.
3. Richter T, Ragaller M. Ventilation in chest trauma. Journal of Emergencies, Trauma, and Shock. 2011 Apr 1;4(2):251.
4. Venugopal A, Jacob RM, Koshy RC. A randomized control study comparing the pharyngolaryngeal morbidity of laryngeal mask airway versus endotracheal tube. Anesth Essays Res. 2016;10(2): 189–94.
5. Henlin T, Michalek P, Tyll T, Hinds JD, Dobias M. Oxygenation, Ventilation, and Airway Management in Out-of-Hospital Cardiac Arrest: A Review [Internet]. BioMed Research International. 2014 [cited 2018 Feb 19]. Available from: https://www.hindawi.com/journals/bmri/2014/376871/.
6. Jaensson M, Olowsson LL, Nilsson U. Endotracheal tube size and sore throat following surgery: a randomized-controlled study. Acta Anaesthesiol Scand. 2010 Feb;54(2):147–53.
7. McCarthy DT. Postoperative sore throat: a multifactorial problem. Br J Anaesth. 2012 Jun 1;108(6):1037–8.
8. Chari VR, Paul A. Comparative study to analyze the incidence of sore throat, cough, and hoarseness of voice after general anesthesia with the use of topical benzydamine hydrochloride and 2% lignocaine gel with placebo. Medical Journal of Dr DY Patil Vidyapeeth. 2016 Jan 1;9(1):61.
9. Puyo CA, Tricomi SM, Dahms TE. Early biochemical markers of inflammation in a swine model of endotracheal intubation. Anesthesiology. 2008 Jul;109(1):88–94.
10. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. Anaesthesia. 1999 May;54(5):444–53.
11. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth. 2002 Apr;88(4):582–4.
12. Biro P, Seifert B, Pasch T. Complaints of sore throat after tracheal intubation: a prospective evaluation. Eur J Anaesthesiol. 2005 Apr;22(4):307–11.
13. Jaensson M, Gupta A, Nilsson U. Gender differences in sore throat and hoarseness following endotracheal tube or laryngeal mask airway: a prospective study. BMC Anesthesiol. 2014;14:56.
14. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. Br J Anaesth. 1994 Dec;73(6): 786–7.
15. Inoue S, Abe R, Tanaka Y, Kawaguchi M. Tracheal intubation by trainees does not alter the incidence or duration of postoperative sore throat and hoarseness: a teaching hospital-based propensity score analysis. Br J Anaesth. 2015 Sep;115(3):463–9.
16. Jaensson M, Gupta A, Nilsson UG. Risk factors for development of postoperative sore throat and hoarseness after endotracheal intubation in women: a secondary analysis. AANA J. 2012 Aug;80(4 Suppl):S67-73.

Original Research Article

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Supraclavicular Versus Infraclavicular Approach of Subclavian Vein Cannulation in ICU Patients

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Abstract

Background: Subclavian vein is generally preferred in ICU for central venous access. Infraclavicular and supraclavicular approaches are the two techniques of subclavian venous catheterisation. Infraclavicular approach to subclavian vein has been widely used. The supraclavicular approach is less often used though this approach of subclavian vein catheterisation has some distinct advantages. So aim of our study was to compare the supraclavicular and infraclavicular approaches of subclavian vein cannulation in terms of success rate and safety profile. *Methods:* A total of 60 critically ill patients aged between 20-60 years of either sex admitted in ICU, where central venous catheterisation was indicated were enrolled in the study. Group I included 30 patients where right Subclavian vein cannulation was performed using Supraclavicular approach. Group II included 30 patients where right Subclavian vein cannulation was performed using Infraclavicular approach. The parameters recorded in the study included success rate of cannulation, number of attempts to cannulate the vein, time required to obtain the access and the various complications. *Statistically Analysis:* The results of the study were compiled, tabulated and compared statistically using unpaired *t*-test and Pearson's Chi-square test. *Results:* The first attempt success rate in Group I (supraclavicular group) is significantly higher than in Group II (Infraclavicular group). The time required to access is also less in Group I (supraclavicular) as compared to Group 11 (infraclavicular) and is statistically significant. *Conclusion:* We concluded that supraclavicular approach has high first attempt success rate and also the time required to access is less as compared to infraclavicular approach.

Keywords: ICU; Subclavian Vein; Supraclavicular Approach; Infraclavicular Approach.

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Introduction

Critical care and emergency medicine has progressed leaps and bounds in the last few decades offering favourable outcome even in terminally ill or moribund patients. Majority of patient presenting in critical care unit needs central venous access for various purposes including difficult peripheral catheterisation, volume resuscitation, central venous pressure monitoring, parentral nutrition, administration of ionotropes and hyperosmolar medications and as haemodialysis access [1]. Commonly the internal jugular, subclavian, or femoral veins are accessed for central venous cannulation.

Subclavian vein because of large diameter, relatively constant position and valveless course makes it most suitable for central venous access in ICU patients [1,2]. It also has reduced risk of catheter-related infection and thrombosis as compared to femoral or internal jugular vein

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cannulation, less interference with endotracheal intubation and and also decreased patient discomfort on long term intravenous treatment [3].

Subclavain vein can be either accessed by Infraclavicular (IC) approach or supraclavicular (SC) approach [2,4]. Infraclavicular approach to subclavian vein has been extensively used and has become well known and practised technique. In 1965, Yoffa described novel supraclavicular approach for subclavian vein access [2]. This technique although not enjoyed much popularity at that time due to some unknown reasons but it offers a definite superiority over infraclavicular approach. It has a well-demarcated landmark (the clavisternomastoid angle), a shorter and straighter path to the superior vena cava and reduced incidence of arterial puncture, pneumothorax and inadvertent catheter malposition [1,2,5-9]. Also in supraclavicular approach there is less interruption of CPCR than infraclavicular approach [10,11].

Hence we hypothesized that supraclavicular approach can be better alternative for subclavian vein cannulation as compared to infraclavicular approach. So, we have conducted this prospective randomized study to compare the ease and success rate of subclavian vein cannulation using SC versus IC approach as primary parameters, and to record the incidence of complications related to either approach as secondary parameters.

Material and Methods

Our study was registered with clinical trials registry-India (CTRI/2018/04/013195).After approval from the institutional ethical committee and obtaining informed written consent from patient or his/her attendant, the present prospective study was conducted on 60 adult critically ill patients of either sex admitted in ICU requiring central venous catheterisation. Routine investigations including complete haemogram, BT, CT and coagulation profile were done in all the patients. Our exclusion criterion were patients with infection at puncture site, abnormal blood coagulation profile, pneumothorax, trauma to clavicle and upper ribs, distorted anatomy of the neck or clavicle and cervical spine trauma.

Patients were randomly divided into two groups of 30 each using computer generated random numbers.

Group I (SC): Right SCV catheterisation was performed using SC approach.

Group II(IC): Right SCV catheterisation was performed using IC approach.

Patients were placed in trendelenburg position to reduce the risk of air embolism and to engorge the subclavian vein. Under all aseptic precautions, after cleaning with povidone iodine and draping, local infiltration was done with 2 ml of 2% lignocaine at the puncture site.

For infraclavicular approach, the needle was inserted nearly 1 cm inferior to the junction of medial 1/3 and middle 1/3 of the clavicle and directed towards the suprasternal notch.

In supraclavicular approach, the needle was inserted 1cm cephalad and 1cm lateral to the lateral border of clavicular head of sternocleidomastoid (SCM) muscle and directed towards the line bissecting the clavisternomastoid angle. For delineating the claviculosternomastoid angle patients head was raised actively by patient or passively with the help of assistant.

After aspirating and confirming free flow of venous blood, cannulation was performed using modified Seldingers technique. The procedure was performed by the anaesthetist well versed with both the approaches. After maximum of two attempts, the procedure was abandoned and alternate approach was considered. To confirm catheter position and to rule out any potential complications, chest X-rays were done in all the patients. The access time (time consumed for successful placement of catheter after the initial skin puncture), cannulation success rate of each approach, number of cannulation attempts and complications like pneumothorax, haemothorax, arterial puncture, haematoma, arrhythmias and cardiac arrest were recorded. All the data was collected, sampled and analyzed using unpaired *student t*-test and Pearson's Chi-square test.

Results

Sixty patients were included in the study depending upon the inclusion and exclusion criterion. There was no significant difference observed in demographic parameters ie age, weight and gender between the two groups as shown in Table 1.

The technique success in both the groups was comparable although first attempt success rate was higher in I group as compared to group II as shown in Table 2.

The mean access time taken for the cannulation

in group I (SC) catheterisation was 6.25±1.05 min and in Group II (IC) was 7.75±1.50 min. On intergroup comparison data was statistically significant as shown in Table 3.

In terms of complications, there was no statistically significant difference observed between the two groups. There occurred one haematoma incidence found in both the groups and a single episode of pnemothorax occurred in group II. Results are illustrated in Table 4.

Table 1: Demographic profile

Demographic variables	Group I(SC)	Group II(IC)	P-value
Age in years	42.27±8.34	46.74±6.45	>0.05
Weight in kg	57.65±11.46	62.42±8.73	>0.05
Gender(M/F)	18/12	16/14	>0.05

Table 2: Technique Success

	Methods used		
	SC (Group I)	IC (Group II)	P-Value
1st attempt	26	22	<0.05
2nd attempt	3	6	
Failure of technique	1	2	>0.05

Table 3: Access time

	(Group I)	(Group II)
Access (MIN)time	6.25±1.05	7.75±1.50

Table 4: Complications

	(Group I)	(Group II)
Pneumothorax	nil	1(3.33%)
Haemothorax	nil	nil
Arterial Puncture	nil	nil
Haematoma	1(3.33%)	1(3.33%)
Arrythmias	nil	nil

Discussion

Central venous catheterisation is the commonly performed procedure in the management of critically ill patients in the ICU. It is required for various purposes like monitoring of Central venous pressure, fluids resuscitation, ionotropic support, frequent blood sampling, haemodialysis access and transvenous cardiac pacing [1]. Commonly internal jugular, subclavian, or femoral veins are preferred for central venous access, but right sided subclavian vein is usually preferred due to various anatomical advantages, decreased chances of thrombosis and less patient discomfort [3]. In literature, two techniques of subclavian vein cannulation (supraclavicular and infraclavicular) are advocated we conducted this study to compare the ease of cannulation of SCV using SC versus IC approach, success rate of each technique and to record the incidence of complications.

In our study demographic variables namely age, weight and gender were comparable in both the groups. In terms of success rate, overall success rate was 96.65% (29/30) in Group I (SC) and was 93.3% (28/30) in Group II (IC) in our study. First attempt success in the SC group was 89.6% (26 out of 29) as compared to 78.57% (22 out of 28) in the IC group. On intergroup comparison though overall success rate was comparable in both the groups but the first time success rate was significantly higher in supraclavicular approach as compared to infraclavicular approach . Czarnik et al also observed high first attempt success rate i.e. 85.6% to be replaced with (85.6%) during supraclavicular method of subclavian vein cannulation in 370 mechanically ventilated patients [12]. Similarly, Dronen et al conducted study in 76 patients undergoing CPR and observed 90% success rate in group SC and 84% in group IC and also documented that there is less interuuption of CPR during SC approach [10]. Kores et al. also showed that SC method is better as it has high success rate and is relatively easy to secure [13]. They observed overall success of 97% in SC and 94% in the IC approach . Lu et al also conducted study on infants and observed high success rate in SC group [14].

Mean access time was 6.25±1.05 in group I and 7.75±1.50 in group II .On intergroup comparison data was found to be statistically significant. Our results are in accordance with the study done by M Iqbal et al, Thakur et al in which they documented that SC approach of SCV catheterisation was a better technique than IC approach [15,16].

Subclavian vein cannulation is a risky procedure as various complications i.e. pneumothorax, haemothorax, subclavian artery puncture, haematoma at the puncture site, venous thrombosis and pulmonary embolism can occur during cannulation [3, 17-19] .

In our study, there occurred single incidence of haematoma (3.33%) in group I (SC) and one episode of haematoma (3.33%) and pneumothorax (3.33%) in group II (IC) respectively. Overall complication rate was less in SC group as compared to IC group in our study. Results are in accordance with the

study done by Sterner et al. in which overall complication incidence in SC group was 2.04% and 5.09% in IC group [20]. In the study done by Kores et al. there occurred incidence of 2.8% subclavian artery puncture in both the groups and incidence of 1.4% pneumothorax observed in IC group and incidence of 1.4% each of haematoma and haemopneumothorax, observed in SC group [14].

Nevare et al during his study of 178 supraclavicular approach of subclavian vein cannulation also observed single incidence of pneumothorax and one malposition and the overall complication rate was just 0.56% [21]. In the study done by Czarnik et al. where SCV catheterisation was done using SC approach there occurred 3 subclavian artery punctures and 3 contralateral subclavian vein catheterisation and the overall complication rate was 1.7%. They observed no life-threatening complication during the study [12].

In our study we found that supraclavicular approach of subclavian vein cannulation is less time consuming and has high first time success rate as compared to infraclavicular approach

Conclusion

We concluded that first time success rate in supraclavicular approach is significantally higher and the time taken for supraclavicular cannulation is significantally less as compared to infraclavicular approach. Moreover this approach required less interruption of Cardiopulmonary resuscitation. So as in critically ill patient where quick access is required supraclavicular approach can be preferred as compared to infraclavicular approach.

References

1. Defalque R. Subclavian venipuncture: A review. Anesth Analg. 1968;47:677–8.
2. Yoffa D. Supraclavicular subclavian venepuncture and catheterisation.Lancet 1965;2:614-7.
3. McGee DC, Gould MK. Preventing complications of central venous catheterization.N Engl J Med. 2003; 348:1123–33.
4. Patrick SP, Tijunelis MA, Johnson S, Herbert ME.Supraclavicular subclavian vein catheterization: The forgotten central line. West J Emerg Med 2009;10: 110-4.
5. Brahos GJ, Cohen M. Supraclavicular central venous catheterization: 6. technique and experience in 250 cases. Wisconsin Med J. 1981;80:36-8.
6. Brahos GJ. Central venous catheterization via the supraclavicular approach. J Trauma. 1977;17:872–7.
7. Muhm M, Sunder-Plassmann G, Apsner R, Kritzinger M, Hiesmayr 7. M, Druml W. Supraclavicular approach to the subclavian/innominate vein for large-bore central venous catheters. Am J Kidney Dis. 1977;30:802-6.
8. Apsner R, Schulenburg A, Sunder-Plassmann G, Muhm M, Keil F, 8. Malzer R, Kalhs P, Druml W. Routine fluoroscopic guidance is not required for placement of Hickman catheters via the supraclavicular route. Bone Marrow Transplant. 1998; 21:1149-52.
9. Singh PK, Ali Z, Rath GP, Prabhakar H. Catheter malposition following supraclavicular approach for subclavian vein catheterisation – Case reports. Middle East J Anesthesiol. 2008;19: 1405–10.
10. Dronen S, Thompson B, Nowak R, Tomlanovich M. Subclavian vein catheterization during cardiopulmonary resuscitation: a prospective comparison of the supraclavicular and infraclavicular percutaneous approaches. JAMA. 1982;247: 3227–30.
11. Gorchynski J, Everett WW, Pentheroudakis E. A modified approach 10. to supraclavicular subclavian vein catheter placement: The pocket approach. Calif J Emerg Med. 2004; 5:50-4.
12. Czarnik T, Gawda R, Perkowski T, Weron R. Supraclavicular approach is an easy and safe method of subclavian vein catheterization even in mechanically ventilated patients: Analysis of 370 attempts. Anesthesiology. 2009;111:334–9.
13. Kores JS, Suresh G, Koshy T. Subclavian vein catheterization - A comparative study of supraclavicular versus infraclavicular approach. J Anaesthesiol Clin Pharmacol.1999;15:133–8.
14. Lu WH, Yao ML, Hsieh KS, Chiu PC, Chen YY, Lin CC, Huang TC, 13. Chen CC. Supraclavicular versus infraclavicular subclavian vein catheterizatin in infants. J Chin Med Assoc. 2006;69:153-6.
15. Anil Thakur, Kiranpreet Kaur, Aditya Lamba, Susheela Taxak, Jagdish Dureja, Suresh Singhal, and Mamta Bhardwaj. Comparative evaluation of subclavian vein catheterization using supraclavicular versus infraclavicular approach. Indian J Anaesth. 2014 Mar-Apr;58(2):160–164.
16. Safdar Hussain, Riaz Ahmed Khan, Muhammad Iqbal, Muhammad Shafiq. A comparative study of supraclavicular versus infraclavicular approach for central venous catheterization. Anaesthesia, Pain & Intensive Care; 2011 June;15(1):13.
17. Sznajder JI, Zveibil FR, Bitterman H, Weiner P, Bursztein S. Central veincatheterization. Failure and complication rates by three percutaneous approaches.Arch Int Med 1986;146:259–61.
18. Schummer W, Schummer C, Rose N, Niesen WD, Sakka SG. Mechanicalcomplications and malpositions of central venous cannulations by experiencedoperators.

A prospective study of 1794 cathetrizations in critically ill patients.Intensive Care Med 2007;33: 1055–9.

19. Lefrant JY, Muller L, De La Coussaye JE, Prudhomme M, Ripart J, Gouzes C, Peray P, Saissi G, Eledjam JJ: Risk factors of failure and immediate complication of subclavian vein catheterization in critically ill patients. Intensive Care Med 2002;28:1036–41.
20. Sterner S, Plummer DW, Clinton J, Ruiz E. A comparison of the supraclavicular approach and the infraclavicular approach for subclavian vein catheterization. Ann Emerg Med. 1986;15:421–4.
21. Nevarre DR, Domingo OH. Supraclavicular approach to subclavian catheterization: review of the literature and results of 178 attempts by the same operator. J Trauma. 1997;42:305-9.

Original Research Article

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Comparative Study of Epidural Ropivacaine HCL-Fentanyl Citrate and Ropivacaine HCL-Tramadol HCL for Postoperative Analgesia in Abdominal Surgeries

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Abstract

Introduction: Central neuraxial adjuvant drugs, alone or in combination, are used intrathecally or epidurally for the treatment of acute and chronic painful conditions. *Aims:* To compare the efficacy and duration of analgesia as well as to compare the hemodynamic parameters and the adverse effects of study drugs. *Method:* 100 adult patients of ASA grade I and II, of either sex, belonging to 18 -65 years of age, posted for elective abdominal surgeries were selected for the study. Patients were randomly divided into two groups of 50 each. Group RT received 13ml of Inj. Ropivacaine hydrochloride (0.2%) + 1ml of Inj. Tramadol hydrochloride (50mg) + 1ml of Normal Saline. Group RF received 13ml of Inj. Ropivacaine hydrochloride (0.2%) + 0.5ml of Inj. Fentanyl citrate (25µg) + 1.5ml of Normal Saline. Total volume = 15 ml, by epidural route at the time of skin closure. Postoperatively, VAS Score at rest and movement, Ramsay sedation score, hemodynamic changes and adverse effects were noted. *Result:* VAS at rest and movement were higher in Group RF at 6 hrs whereas in Group RT at 10 hrs. Ramsay sedation score were also comparable at 6 hrs and 10 hrs. Duration of analgesia was around 8 to 10 hours in Group RT whereas it was around 6 to 8 hours in Group RF. *Conclusion:* Epidural Tramadol hydrochloride along with Ropivacaine hydrochloride provides significant longer duration of analgesia, lower pain scores as compared to Epidural Fentanyl citrate with Ropivacaine hydrochloride.

Keywords: Epidural; Ropivacaine; Fentanyl; Tramadol; Analgesia.

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Introduction

Regional analgesia with the local anaesthetic drug via epidural catheter is established method of satisfactory postoperative pain management. Today, among local anaesthetic drugs, ropivacaine is preferred due to its favourable sensory block profile and lower cardiovascular toxicity compared to others [1]. Since it is less lipophilic than bupivacaine, its penetration is more selective for thin unmyelinated pain-transmitting nerve fibres compared to larger motor nerve fibres [2]. Ropivacaine, the S-enantiomer of the a mide local anesthetic, produces differential neural blockade, less motor blockade, cardiovascular and neurological toxicity [3]. Tramadol not only binds to opioid µ-receptors but also interacts with the central nervous system by inhibiting the withdrawal of noradrenaline and serotonin [4]. Fentanyl is a highly lipid soluble drug, and when placed in the epidural space, peak concentration is reached in about 20 minutes. The low incidence of side effects associated with epidural fentanyl has been explained by the lipid solubility of the agent, which is so great that only low concentration of drug reaches the brain stem [5].

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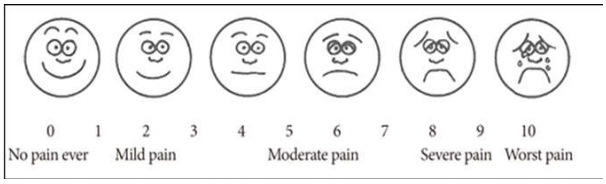
Material and Methodology

Hundred adult patients of ASA grade I and II, of either sex, belonging to 18 -65 years of age, posted for elective abdominal surgeries in general surgery and gynaecology were selected for the study. Patients were randomly divided into two groups (Group RT and Group RF) of 50 each. Group RT received 13ml of Inj. Ropivacaine hydrochloride (0.2%) + 1ml of Inj. Tramadol hydrochloride (50mg) + 1ml of Normal Saline (NS). Total volume = 15 ml and Group RF received 13ml of Inj. Ropivacaine hydrochloride (0.2%) + 0.5ml of Inj. Fentanyl citrate (25μg) + 1.5ml of Normal Saline (NS). Total volume = 15 ml, all received drugs by epidural route. Patients of ventricular dysfunction, coronary disease, valvular heart disease, renal and/or hepatic disorders, bronchial asthma and COPD, bleeding disorders, neurological and spine deficit, local skin infection, physically dependent on opioids, history of drug allergy were excluded from the study. The patients were explained about the epidural technique with catheter in situ, its advantages and disadvantages. They were also educated about the usage of

Visual Analogue Scale (VAS) for assessment of the intensity of postoperative pain and were instructed to mark on the scale at the point which he/she felt was representative of their level of discomfort. A written informed consent was taken from each patient.



To allay the anxiety and apprehension, all patients were given Tablet lorazepam (0.5 mg or 1 mg) at 10 pm in the night before the surgery. Epidural catheter was inserted for postoperative analgesia and all patients were operated under General Anaesthesia. The patient was placed in sitting or lateral position. Under all aseptic and antiseptic precautions, the epidural space was identified using 16G sterile disposable Tuohy needle with hanging drop technique at L1- L2 interspace and about 5 cms of the catheter was in the space. Then patient was induced under general anesthesia. No narcotics were administered during the intraoperative periodexcept Inj. Fentanyl citrate at the time of induction. We gave epidural drug study at the time of skin sutures. After the operation had finished, we reversed and extubated the patients. After completion of the surgery, patient was shifted to postoperative ward and monitoring of HR, Blood pressure, Oxygen saturation and Respiratory Rate, Ramsay Sedation Score and adverse effects was done at 1 hour, 2 hours, 4 hours and every 2 hourly for next 12 hours from the time the study drug was administered. The intensity of pain and pain relief was assessed using VAS at 1 hour, 2 hours, 4 hours and thereafter 2 hourly for 12 hours from the time the study drug was administered postoperatively. As and when the patient complains of further pain during the period of observation, intensity of pain was assessed again using VAS to know the effect of the study drug given earlier. If it was 4 or more, rescue analgesia was given in form of Inj. Paracetamol 15 mg/kg intravenously slowly as per the ward protocol and the time was noted. The Duration of analgesia was noted. The study would end at this stage (provided LFT is normal). The statistical software namely Instat 3 was used for the analysis of the data and to find the significance of each parameter between the two groups.

Result and Observation

Table 1 shows Demographic data is comparable in both the groups and there is no statistical difference between them (p value > 0.05).

Figure 1 shows the changes in heart rate in the postoperative period. Looking from the data in the graph we can see that mean heart rate does not change much in both the groups and is found to be statistically insignificant (p> 0.05).

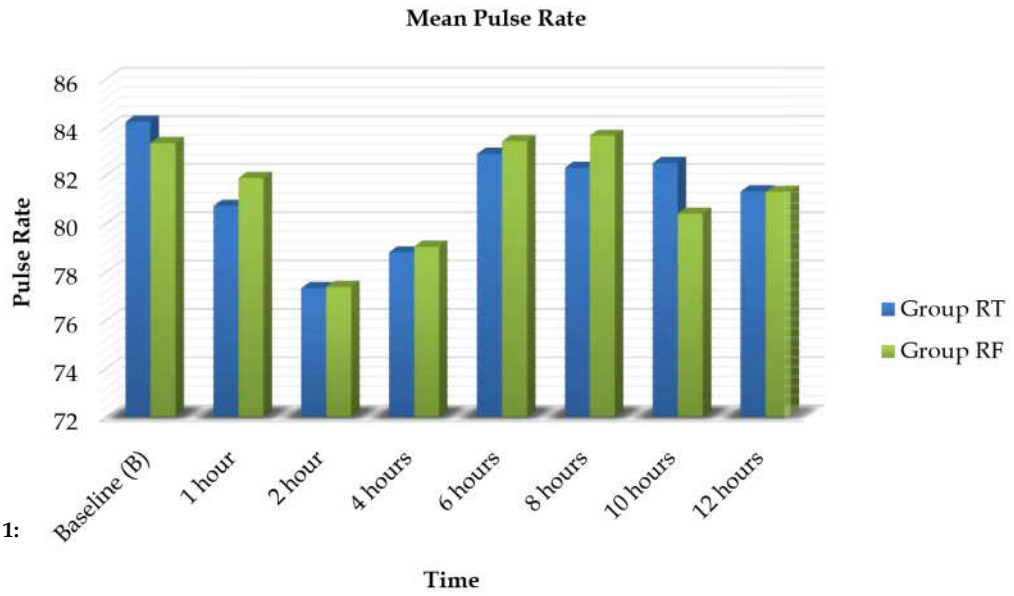
Figure 2 shows the changes in mean blood pressure (MBP) in the postoperative period. Looking from the data in the figure we can see that mean MBP does not change much in both the groups and is found to be statistically insignificant. (p> 0.05).

Looking from the data in the Figure 3 and 4 we can see that VAS scores in the two groups is comparable at Rest and Movement and the statistical difference is not significant (p>0.05) at 1, 2 and 4 hours. It is statistically extremely significant (ES) at 6 hours and 10 hours (p<0.05) as 28 patients of Group RF complain of pain and are having VAS scores ≥ 4 at 6 hours after which they are given rescue analgesia as Inj. Paracetamol 15 mg/kg i.v stat; no patients in Group RT have VAS scores ≥ 4 at 6 hours. Whereas 26 patients of Group RT complain of pain and are having VAS scores ≥ 4 at 10 hours. No patients of Group RF have VAS

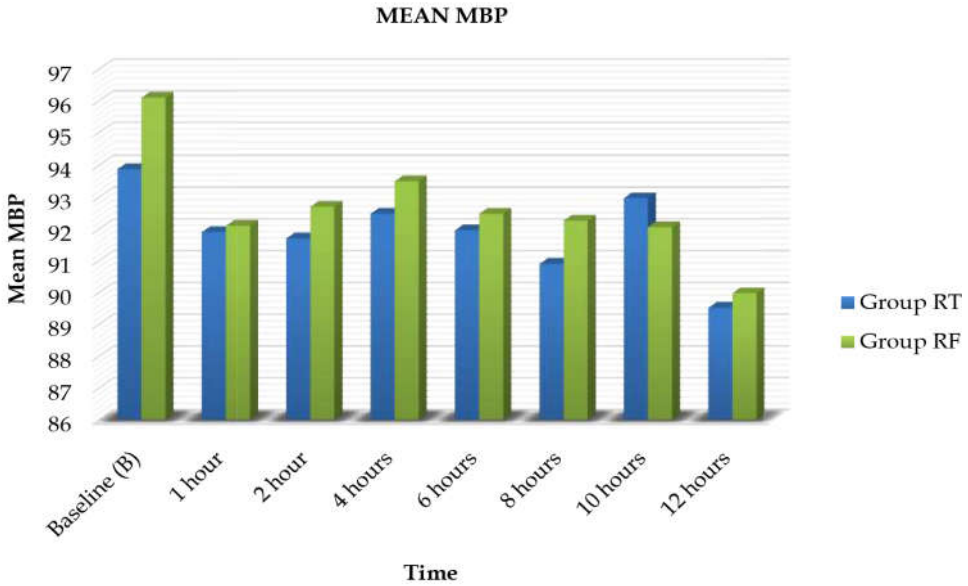
Table 1:

Parameters	Group RT: (n=50)	Group RF: (n=50)	P Value	Result
Age (Yrs)	44.2 ± 10.08	43.76± 10.37	0.8301	NS
Sex Ratio (M :F)	15:35	13:37		
Weight (Kg)	53.04± 7.71	52.02± 5.79	0.4562	NS

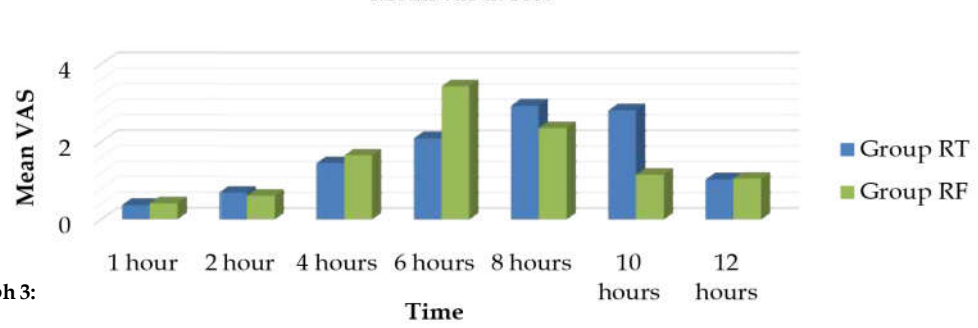
Graph 1:



Graph 2:



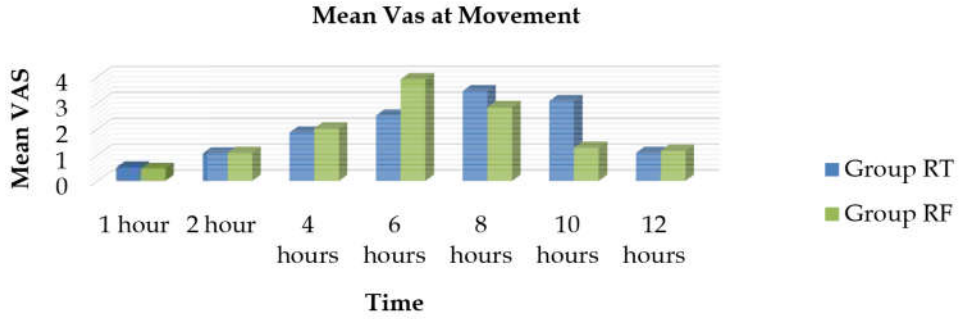
Graph 3:



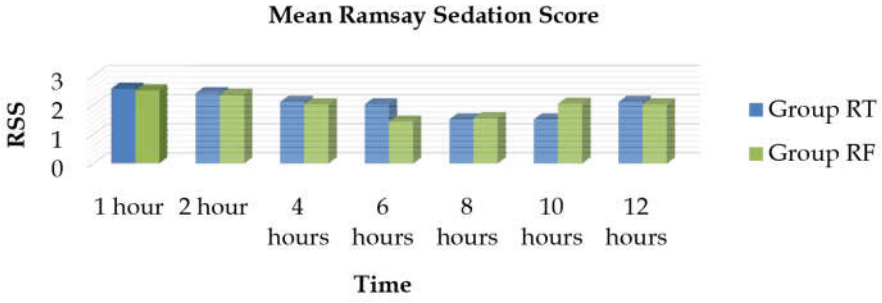
scores ≥ 4 at 10 hours after which they are given rescue analgesia.There is not quite significant (NQS) statistical difference at 8 hours as more patients (24 patients) of Group RT as compared to 22 patients of Group RF complain of pain and are having VAS score ≥ 4 at 8 hours.The statistical difference is again not significant ($p>0.05$) at 12 hours as patients are calmed after giving rescue analgesia.

Looking from the data in the Figure 5 we can see that sedation scores in the two groups is comparable and the statistical difference is not significant ($p>0.05$) at 1, 2 and 4 hours.It is statistically extremely significant at 6 hours and 10 hours ($p<0.05$) as 28 patients of Group RF complain of pain and are agitated with RSS 1 at 6 hours; no patients have RSS 1 in Group RT at 6 hours. Whereas 26 patients of Group RT complain of pain and are agitated with RSS 1 at 10 hours; no patients have RSS 1 in Group RF at 10 hours as their pain was relieved after giving rescue analgesia.There is no statistical difference at 8 hours as rest of the patients in both the groups complain of pain at 8 hours and are agitated with RSS 1 at 8 hours. The statistical difference is again not significant ($p>0.05$) at 12 hours as patients are calmed after giving rescue analgesia.

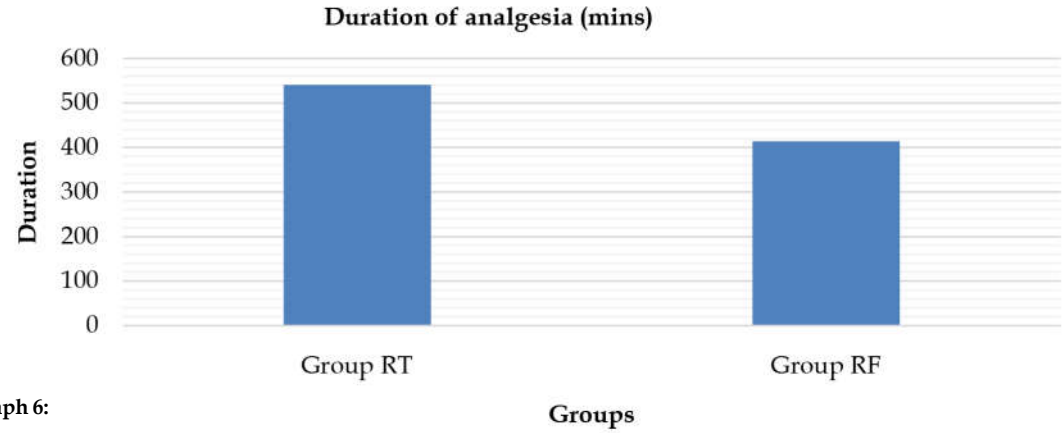
Figure 6 shows the duration of analgesia was around 8 to 10 hours in Group RT whereas it was around 6 to 8 hours in Group RF. The duration of analgesia was longer by around 23% in group RT (mean 540 minutes vs. 414 minutes; $p < 0.001$). Data are shown as the mean ± standard deviation. Rescue analgesia was given to 26 patients of Group RT at 8 hours and to 24 patients at 10 hours whereas it was given to 28 patients of Group RF at 6 hours and to 22 patients at 8 hours.



Graph 4:



Graph 5:



Graph 6:

Pruritis was seen in 7 patients (14%) of group RF and in none of the patients of group RT and was considered statistically significant with p value of 0.0187. Nausea was seen in 4 patients (8%) of group RT and 5 patients (10%) of group RF and Vomiting was seen in 3 patients (6%) of group RT and 4 patients (8%) of group RF which were statistically considered not significant (p >0.05). Hypotension, Bradycardia, Shivering was not seen in any of the patients of group RT and RF.

Discussion

Efficacy of Analgesia

In our study we found out mean hourly VAS scores in patients of GROUP RT was lower till 6 hours after which it started increasing in 26 patients at 8 hours and in 24 patients at 10 hours whereas in patients of GROUP RF, it was lower till 4 hours after which it started increasing in 28 patients at 6 hours and in 22 patients at 8 hours. Thus, the mean hourly pain scores in Group RF was significantly higher than Group RT.

Yunxia Fan et al [2]. observed in their study that the comparative VAS scores obtained in Group tramadol (0.125 % ropivacaine plus tramadol 5mg/ml) and Group fentanyl (0.125% ropivacaine plus fentanyl 3µg/ml) suggested that epidurally tramadol was as effective as fentanyl for labour epidural analgesia but without significant side effects as compared to fentanyl.

In our study, we selected epidural Ropivacaine and concentration was kept 0.2% due to its relative better sensory than motor block profile and lower risk of cardiovascular toxicity.

Scott et al. [6] in a dose finding study with 0.1%, 0.2% and 0.3% Ropivacaine in patients undergoing abdominal surgery demonstrated that 0.2% Ropivacaine 10ml/hr provided the best analgesia and motor block.

Bosenberg A et al. [7] in their study demonstrated that Ropivacaine 0.2% provided satisfactory postoperative pain relief while 0.1% was less effective and 0.3% was associated with higher incidence of motor block with minimal improvement in pain relief.

Duration of Analgesia

In our study, we found out that patients of GROUP RT has longer duration of analgesia than patients of GROUP RF. There is a statistical significance between GROUP RT and GROUP RF where GROUP RT has a duration of analgesia of 540.30±48.53 minutes and GROUP RF has duration of analgesia of 414.00±45.15minutes.

Singh AP, et al. [8] where they found mean duration of analgesia after first epidural bolus of ropivacaine (0.2%) with tramadol (1mg/kg) total volume 10 ml, was 394±46 minutes in patients undergoing adult upper abdominal surgeries.

Doctor TP, et al. [3] in their study found that caudal shot of 0.2% ropivacaine (1mg/kg) with fentanyl (1µg/kg) in children undergoing lower abdominal and urological procedures produced prolonged duration of action of 6.1 hours as compared to 0.25% bupivacaine with fentanyl (1µg/kg) that is 5.6 hours.

Inanoglu, K et al. [9] observed that the duration of analgesia in children undergoing major abdominal surgeries was significantly longer in Group RT receiving epidurally 0.7ml/kg of ropivacaine (0.2%) plus tramadol (2mg/kg) as compared to Group R receiving 0.7ml/kg of ropivacaine alone (0.2%) epidurally (867.9±106.28 minutes and 298.6±28 minutes in Group RT and Group R respectively).

Hemodynamic and Respiratory Changes

In our study, there is no statistical difference between patients receiving epidurally Ropivacaine 0.2% with Tramadol 50 mg (GROUP RT) and patients receiving epidurally Ropivacaine 0.2% with Fentanyl 25 µg (GROUP RF) with respect to Heart Rate, Mean arterial pressure, Respiratory Rate and Oxygen Saturation (p>0.05).

Singh AP et al. [8] where they studied the postoperative analgesic efficacy of epidural tramadol 1mg/kg and 2mg/kg as adjuvant to Ropivacaine (0.2%) in adult upper abdominal surgery would prolong the duration of analgesia without significant changes in HR, RR, MAP and SpO_2 from baseline.

Yunxia Fan et al. [2] in their study found no significant difference in maternal hemodynamic data such as HR, RR, MAP and SpO_2 and neonatal HR between the Group RT receiving epidurally 0.125% ropivacaine plus tramadol (5mg/ml) and Group RF receiving 0.125% ropivacaine plus fentanyl (3µg/ml) at any time points (p>0.005).

Sedation

In our study, there was no statistical difference in sedation scores between two groups at 1, 2, 4, 8

and 12 hours. However, we found extremely significant difference at 6 hours where Ramsay sedation score of patients of GROUP RT was 2.04±0.19 and of patients of GROUP RF was 1.44±0.50; as more patients were agitated in GROUP RF at 6 hours due to complain of pain whereas at 10 hours, Ramsay sedation score of GROUP RT was 1.52±0.61 and of GROUP RF was 2.06±0.23; as more patients were agitated of Group RT at 10 hours due to complain of pain and which was considered statistically extremely significant.

Singh AP et al. [8] observed in their study sedation in 6% patients of Group RT2 receiving epidurally tramadol 2mg/kg with 0.2% ropivacaine and nil in Group RT1 receiving tramadol 1mg/kg with 0.2% ropivacaine in patients undergoing upper abdominal surgeries.

Cohen S et al. [10] in their study observed in patients after caesarean sections that sedation was never described as stronger than mild in all the groups receiving epidurally different concentrations of ropivacaine with fentanyl 3µg/ml and epinephrine 0.5µg/ml.

Adverse Effects

In our study, Pruritis was seen in 7 patients (14%) of patients of GROUP RF and in none of the patients of Group RT.

Yunxia Fan et al. [2] who observed in their study about labour analgesia that pruritis and urinary retention was higher in Group receiving 0.125% ropivacaine plus fentanyl (3µg/ml) and nil in patients receiving epidurally 0.125% ropivacaine plus tramadol (5mg/ml). But in our study, we had catheterised the patients after induction of anaesthesia.

In our study, Nausea were observed in 4 patients (8%) in group RT and in 5 patients (10%) in group RF and Vomiting were observed in 3 patients (6%) in group RT and in 4 patients (8%) of the patients in group RF.

Singh AP et al. [8] observed nausea and vomiting in 10% patients of Group receiving epidurally 10ml of 0.2% ropivacaine with tramadol (1mg/kg) in patients undergoing upper abdominal surgeries.

Korat Reshma et al. [11] observed nausea in 4 patients; vomiting and pruritis in 2 patients receiving 15 ml of 0.75% ropivacaine plus 1µg/kg of fentanyl epidurally in patients undergoing lower limb orthopaedic surgeries.

In our study, no patients were found to have Bradycardia, Hypotension and Respiratory depression.

Conclusion

It can be concluded from the above study that Epidural Tramadol hydrochloride along with Ropivacaine hydrochloride provides significant longer duration of analgesia, lower pain scores and relatively lesser side effects as compared to Epidural Fentanyl citrate with Ropivacaine hydrochloride. Epidurally Tramadol hydrochloride and Fentanyl citrate as an adjuvant to Ropivacaine hydrochloride proved to have stable hemodynamic profile.

References

1. McClellan KJ, Faulds D. Ropivacaine: An update of its use in regional anaesthesia. Drugs 2000;60: 1065-93.
2. Yunxia Fan et al. Comparison of epidural tramadol - ropivacaine and fentanyl ropivacaine for labor analgesia: A prospective randomized study.Ups J Med Sci. 2011 Nov;116(4):252–257.
3. Doctor TP, Dalwadi DB, Abraham L, Shah N, Chadha IA, Shah BJ. Comparison of ropivacaine and bupivacaine with fentanyl for caudal epidural in pediatric surgery. Anesth Essays Res 2013;7:212-5.
4. Grond Stefan et al. Clinical Pharmacology of tramadol. Clin Pharmaco kinet 2004:43(13):879-923.
5. Isha Chora et al. Comparison of 0.1% Ropivacaine-fentanyl with 0.1% Bupivacaine-fentanyl epidurally for labour analgesia, Advances in Anesthesiology, 2014;2014:4 pages. Article ID 237034.
6. Scott DA et al. Pharmacokinetics and efficacy of long term epidural ropivacaine infusion for postoperative analgesia. Anesth Analg 1997;85:1322-30.
7. Bosenberg A, Thomas J et al: the efficacy of caudal ropivacaine 1,2 and 3 mg×l(-1) for postoperative analgesia in children. PediatrAnaesth. 2002;12:5-5.
8. Singh AP, Singh D et al. Postoperative analgesic efficacy of epidural tramadol as adjuvant to ropivacaine in adult upper abdominal surgeries. Anesth Essays Res 2015;9:369-73.
9. Inanoglu, K., Ozcengiz, D., Gunes, Y. et al. Epidural ropivacaine versus ropivacaine plus tramadol in postoperative analgesia in children undergoing major abdominal surgery: a comparison. J Anesth 2010;24:700–704.
10. Cohen S, Chhokra R, et al. Ropivacaine 0.025% mixed with fentanyl 3.0 µg/ml and epinephrine 0.5 ìg/ml is effective for epidural patient-controlled analgesia after caesarean section. J Anaesthesiol Clin Pharmacol 2015;31:471-77.
11. Korat Reshma et al. Comparative study of dexmedetomidine and fentanyl for epidural analgesia for lower limb orthopaedic surgeries. IJSR, 2017 May;6(5):343-47.

Original Research Article

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Comparison of 0.375% Bupivacaine in Tranversus Abdominal Plane Block Versus Epidural Block for Post-Operative Analgesia

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Abstract

Epidural analgesia by administration of bupivacaine has been considered as the Gold Standard for management of postoperative pain. On the other hand there is a paucity of literature on the efficacy of bupivacaine administered by Transversus Abdominis Plane (TAP) for postoperative pain relief in patients undergoing infra umbilical abdominal surgeries. The present study was carried out in a tertiary care medical college hospital in a rural setting to compare the efficacy of 0.375% Bupivacaine in the control of postoperative pain in patients undergoing infra umbilical abdominal surgeries when used in epidural space versus in the TAP. *Material and Methods*: Sixty patients between 20 to 60 years of age of either sex in ASA grade I or II undergoing infra umbilical abdominal surgeries were divided into two groups of 30 each depending upon the route of administration of 0.375% bupivacaine either though TAP (Group T) or through epidural space (Group E). The parameters studied were variations in haemo-dynamics, quality of analgesia by VAS score, duration of analgesia by request for rescue analgesics, adverse effects if any and finally patient satisfaction for the postoperative pain relief. *Results*: The Heart Rate (HR), Mean Arterial Pressure (MAP), Respiratory Rate (RR) and Oxygen Saturation (SpO_2) were comparable between both the groups throughout the postoperative period with no significant change in haemodynamics from the baseline. The quality of postop analgesia in Group T was significantly better than in Group E as observed by lower VAS Scores at rest at various time intervals in Group T as compared to Group E ($p<0.05$). Considerably higher scores for patient satisfaction for postoperative pain relief were observed in Group T as compared to Group E after 48 hours of administration of the study drug. ($p<0.05$). Considerably longer duration of postop analgesia was observed in Group T (420.03±30.42) as compared to Group E (240.27±30.1) which was statistically significant ($p<0.05$). *Conclusion:* 0.375% bupivacaine is effective for postoperative analgesia in both the groups however TAP block holds considerable promise for patients undergoing infra umbilical surgeries and is an efficient alternative to epidural analgesia on account of its efficacy, safety, affordability and simplicity.

Keywords: Postoperative Analgesia; Transversus Abdominis Plane Block; Epidural Analgesia; Infra Umbilical Surgical Procedures.

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Introduction

Anaesthesia enables the painless performance of procedures that would cause severe or intolerable pain to a non-anaesthetized patient. It could be either general anaesthesia (GA), regional anaesthesia (RA), local anaesthesia (LA) or sedation.

RA not only avoids the risks and side effects of GA but also has the primary benefit of elimination of both intraoperative and postoperative pain. Neuraxial or peripheral nerve blockade are used to achieve RA.

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The transversus abdominis plane (TAP) block is a relatively new RA technique that provides analgesia to the parietal peritoneum, as well as the skin and muscles of the anterior abdominal wall, for infra umbilical abdominal surgeries.

We conducted a study to compare the treatment outcome of 0.375% bupivacaine administered through TAP block vis-à-vis through epidural space for control of post-operative pain in patients undergoing infra-umbilical abdominal surgery at a tertiary care medical college hospital in rural setting.

The parameters compared were variations in haemo dynamics, quality of analgesia by VAS score, duration of analgesia by request for rescue analgesia, adverse effects if any and finally the patient satisfaction for the postop pain relief.

Objectives

To compare:

1. Quality of post-operative analgesia
- VAS scores at rest every hourly for the first 6 hours post-operatively, and every 2 hourly thereafter for the next 12 hours after surgery.
- Patient satisfaction in respect of relief of post-operative pain after 48 hours of administration of 0.375% bupivacaine.
- Time to first request for rescue analgesia.

2. Variation in haemodynamic parameters every 15 minutes for the first one hour post-operatively, and every two hours thereafter for the next 12 hours after surgery.
3. Adverse effects, if any.

Materials and Methods

Sixty patientswho gave informed written and verbal consent, between 20 to 60 years of age, of either gender, belonging to ASA class I or II, were included in the study.

Inclusion Criteria

Patients

- Aged between 20 to 60 years
- Of either gender
- Belonging to ASA class I or II
- Posted for infra-umbilical abdominal surgeries
- Willing to give informed written and verbal consent in local language to participate in the study

Exclusion Criteria

- Patients with known
  a. Cardio-respiratory disorders
  b. Hepatic and renal diseases
  c. Mental retardation or neurological disorders
  d. Coagulation disorders or receiving anti-coagulant medications
- Patients with
  a. Spinal deformities and psychiatric disorders
  b. Hypersensitivity to bupivacaine
  c. Localised infection/injury/swelling at the spine/site of TAP block
- Pregnant females and lactating mothers

Methodology

Sample size was calculated using OpenEpi version 3.01. Based on previous study parameters conducted by *Kandi et al.* comparing visual analogue scale pain scores post-operatively at various time intervals, for the power of study to be 80% and confidence interval 95%, the minimum sample size calculated was 28 (14 in each group). The Institutional Ethical Committee approval was obtained prior to conduct of the study

Procedure

As per routine protocol of the institution pre-anaesthetic evaluation was done and patients of both groups were fasted evening prior to surgery.

In the operating room, standard monitoring, including electrocardiogram, mean arterial blood pressure, respiratory rate and oxygen saturation was started using multi-para monitors. The anaesthesia machine, breathing circuits, emergency resuscitation trolley and airway equipment were kept ready.

Both patient groups received standard general anaesthesia using identical drugs and techniques.

Patients in Group T were administered 0.375% bupivacaine 2 mg/kg as a single dose bilaterally in transversus abdominis plane by a qualified anaesthesiologist using the, landmark technique described by McDonnell et al. with a 23 G needlebilaterally and 0.375% bupivacaine 2 mg/kg was injected on either side.

Patients in Group E were administered 0.375% bupivacaine 2 mg/kg as a single dose through a catheter in epidural space by a qualified anaesthesiologist using the loss of resistance technique.

Both patient groups were shifted to the post-anaesthesia care, and received the same basic standard of post-operative care.

Observations

Post-operatively, after administration of 0.375% bupivacaine, the following observations were made:

1. Quality of post-operative analgesia

• *Mean VAS scores*

The patients were asked to rate their average pain at rest by using visual analogue scale (VAS) scores, every hourly for the first 6 hours post-operatively, and every 2 hourly thereafter for the next 12 hours after surgery with 0 corresponding to no pain and 10 to the worst imaginable pain.

• *Patient satisfaction with their analgesia after 48 hours of administration of 0.375% bupivacaine.*

The patients were asked to rate their satisfaction with the analgesia after 48 hours of administration of 0.375% bupivacaine, which was assessed by a questionnaire.

Scoring scale used for the assessment of patient satisfaction:

Patient Satisfaction	Scoring Scale
Not satisfied	0
Mildly satisfied	1
Moderately satisfied	2
Fully satisfied	3

1. Time to first request for rescue analgesia (duration of post-operative analgesia) was noted. Rescue analgesia using injection diclofenac sodium 1.5 mg/kg intra-muscularly was given when the patient complained of pain at rest, of score ≥ 4 on the visual analogue scale or on patient demand, and was considered as the end point of the study. Duration of post-operative analgesia was defined as the time interval from administration of 0.375% bupivacaine, to the time of first rescue analgesia supplementation.
2. Patients were assessed for variations in heart rate, mean arterial pressure, respiratory rate and oxygen saturation, every 15 minutes for the first one hour post-operatively, and every 2 hourly thereafter for the next 12 hours after surgery. Hypotension is defined as reduction of systolic blood pressure, more than 30% from basal systolic blood pressure (SBP) or SBP less than 90 mmHg and was treated with increased rate of intravenous fluids and if needed, IV mephentermine 3 mg given in increments. Bradycardia (< 60 beats/min) was treated with injection IV atropine 0.6 mg.

Adverse effects such as hypotension, bradycardia, desaturation, respiratory depression, nausea, vomiting, shivering, muscle weakness, pruritus, urinary retention, transient neurological symptoms, post dural puncture headache & infection at local site were noted for up to 48 hours after administration of 0.375% bupivacaine and treated.

Statistical Analysis

The results of the study were entered in a sheet using Microsoft Excel 2016, and statistical analysis was done between the two groups using the software, IBM SPSS Statistics version 25. Parametric data were analysed using the unpaired Student's *t*- test, whereas categorical data were analysed using the Chi-square test. Repeated variables were analysed with repeated measure ANOVA test.

A p value <0.05 was considered statistically significant for this study.

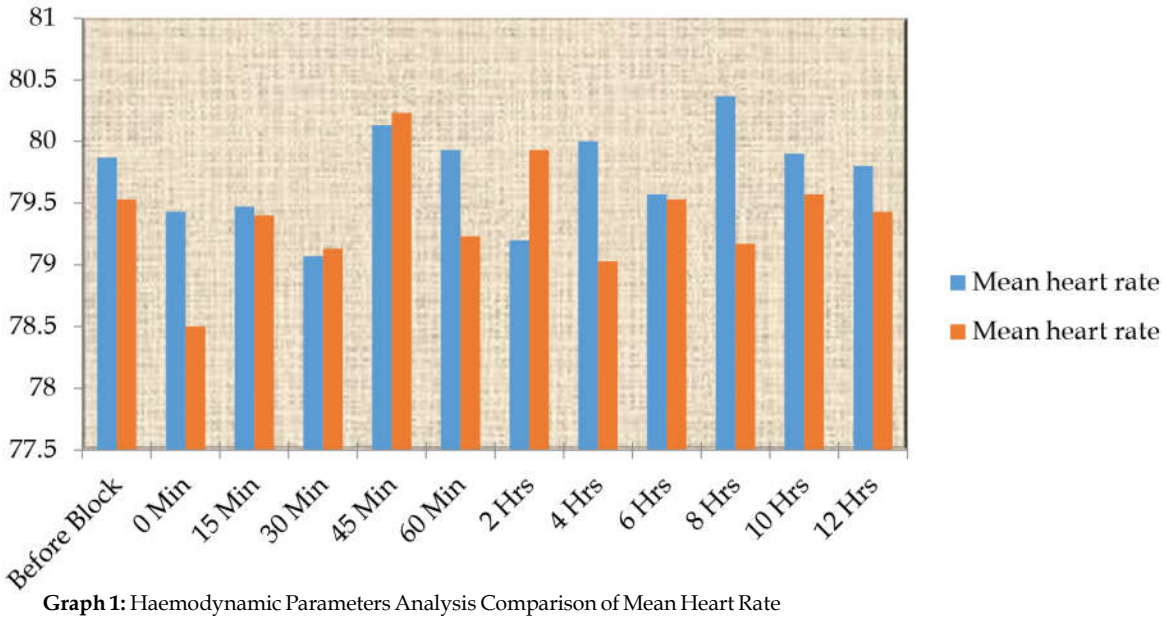
Observations and Results

Therapeutic failure in both the patient groups was defined as inadequate pain control from the surgical wound and drain site. Technical failure in Group T was defined as the inability to insert the 23G blunt regional block needle to administer the TAP block as a result of poor tissue planes, and in Group E as the inability to insert the epidural catheter. Therapeutic and technical failures were not observed in any of the patient groups, and were considered for statistical analysis.

Comparison of age, weight, height, ASA class showed no statistical significance.

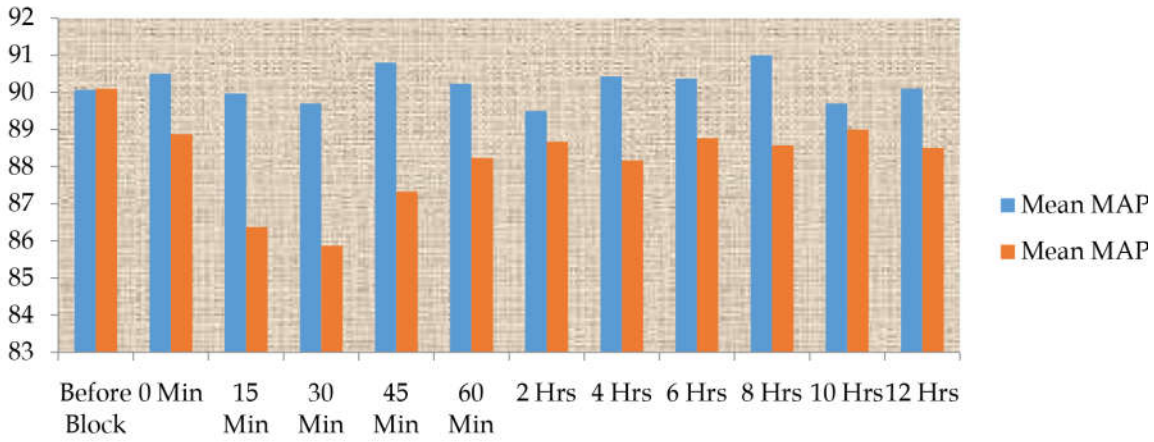
Comparison of Adverse Effect

Adverse effects such as hypotension, bradycardia, desaturation, respiratory depression, shivering,



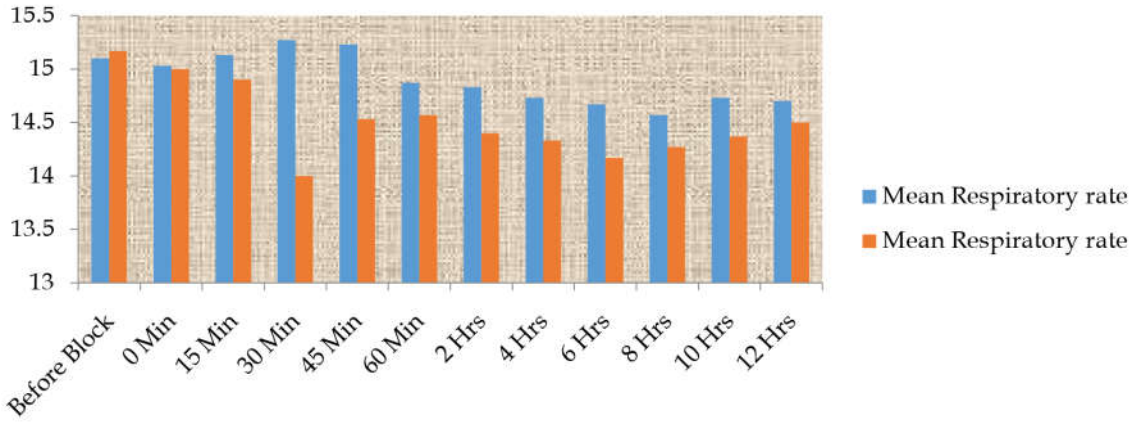
Graph 1: Haemodynamic Parameters Analysis Comparison of Mean Heart Rate

Mean h heart rate between the two groups was comparable with no significant statistical difference.



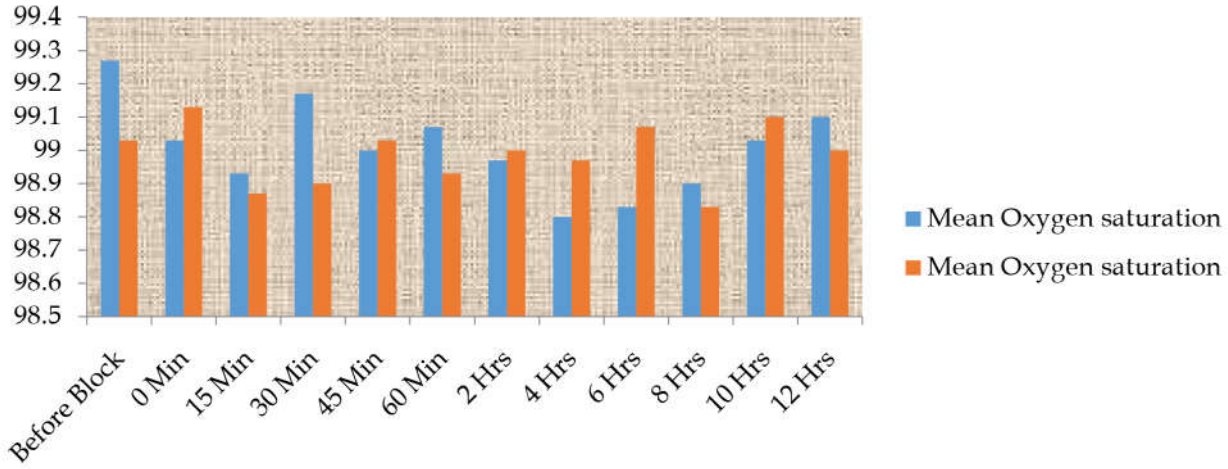
Graph 2: Comparison of Mean Map

Mean MAP between the two groups was comparable with no significant statistical difference.



Graph 3: Comparison of mean respiratory rate

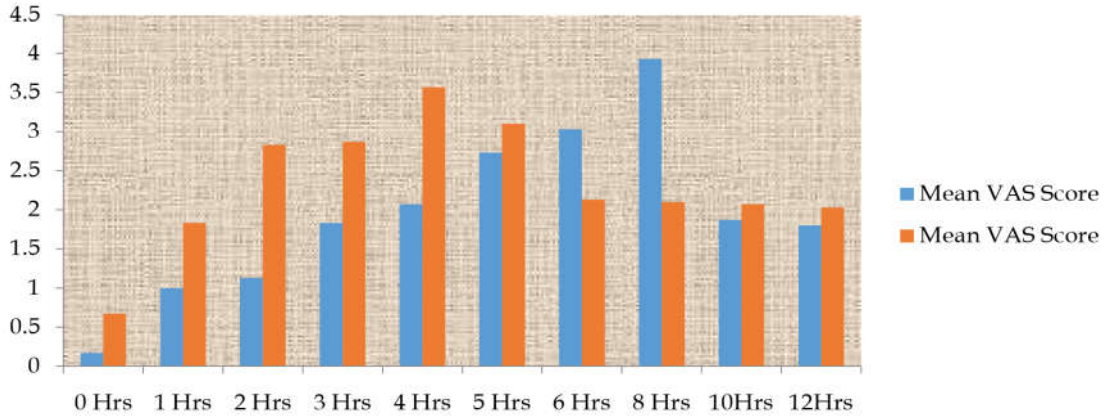
Mean respiratory rate between the two groups was comparable with no significant statistical difference



Graph 4: Comparison of mean oxygen saturation

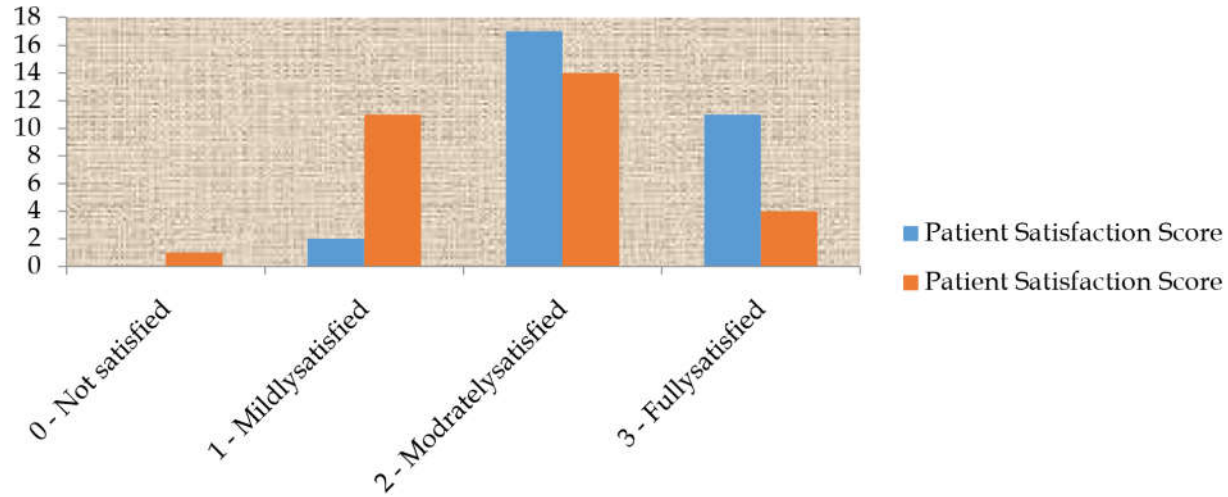
Mean oxygen saturation between the two groups was comparable with no significant statistical difference.

Quality of Post-Operative Analgesia



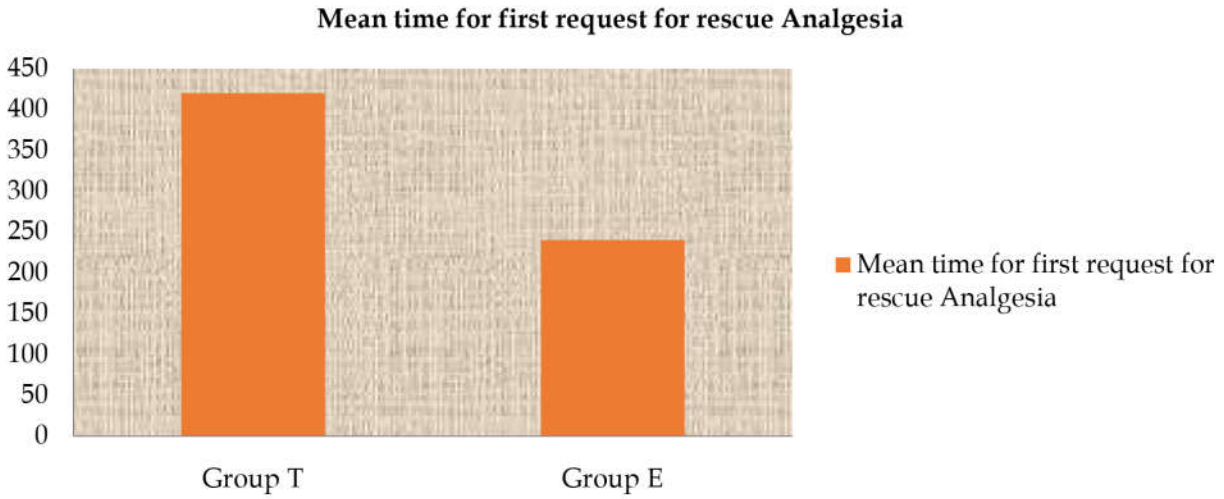
Graph 5: Comparison of mean vas score

Low mean VAS scores at various time intervals were observed in Group T, as compared to Group E



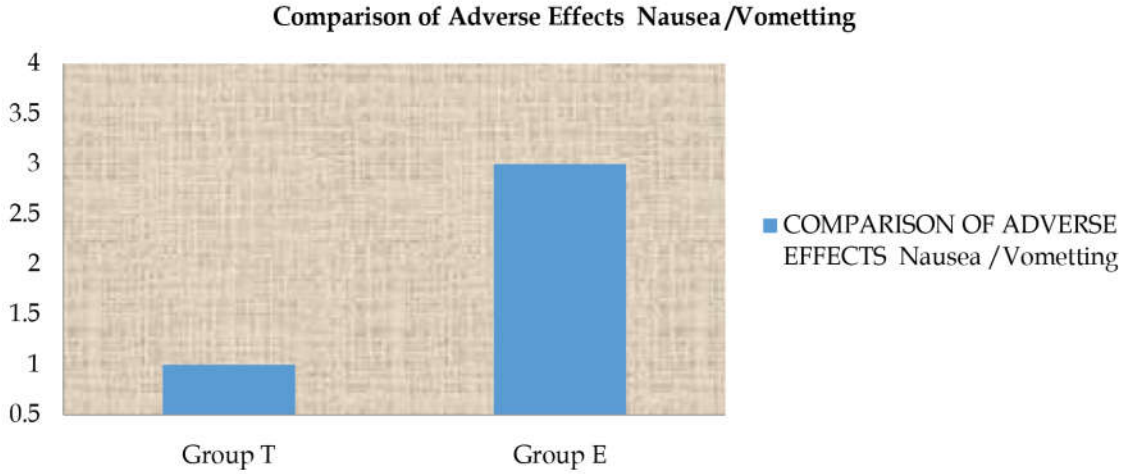
Graph 6: Comparison of patient satisfaction score

Considerably higher patient satisfaction score was observed in Group T, as compared to Group E.



Graph 7: Mean time to first request for rescue analgesia

Longer duration of post-operative analgesia was observed in Group T, as compared to Group E.



Graph 8:

muscle weakness, pruritus, urinary retention, transient neurological symptoms, post dural puncture headache and infection at local site were not observed in any of the patient groups for up to 48 hours after administration of the 0.375% bupivacaine.

Discussion

Pain is a complex subjective experience and its existence has been a constant stimulus to the discovery of both drugs and procedures for relief of pain.

The pain in the post-operative period demands relief not only on humanitarian ground, but also to reduce physical morbidity following the operation. In post-operative period when the effect of the anaesthetic disappears, the tissue injury persists and pain producing substances which are liberated during the operation greatly reduce the normally high threshold of the nociceptors, so that innocuous stimulation produces pain.

A wide range of options exist to combat pain, both pharmacologically and non-pharmacologically. However, despite the increasing complex armamentarium that we have at our disposal, the satisfactory alleviation of pain remains a difficult goal. Thus, the advances in anaesthetic techniques are rather a reflection of our constant efforts to obtain more effective and safer analgesia.

Effective pain control also facilitates rehabilitation and accelerates recovery from surgery.

Although single-shot neuraxial analgesic

techniques such as epidural blocks produce effective analgesia, they are associated with untoward effects such as motor and sensory blockade in the lower limbs. This results in delayed ambulation and recovery, along with decreased patient comfort and satisfaction. Also, the technique is labour intensive and has the risk of serious neuraxial morbidity, albeit rare . Furthermore, it is not always possible to provide neuraxial analgesia due to logistic issues and/or the presence of medical contraindications .

Given these issues, there is considerable potential for a regional technique such as TAP blockade to comprise an effective component of a multimodal regimen for post-operative analgesia following infra-umbilical surgeries.

The transversus abdominis plane block is a relatively new regional anaesthesia technique that can be used for post-operative pain control in abdominal, gynaecologic or urologic surgeries involving the T6 to L1 distribution.

When compared with epidural analgesia, TAP block analgesia does not cause haemodynamic imbalance, spares motor and sensory function of the lower limbs and can be used in patients requiring anticoagulation medication. Also, it provides effective analgesia with a better safety profile, by avoiding the addition of opioids which have significant adverse effects including sedation, nausea, vomiting, urinary retention, respiratory depression, delayed recovery of colonic mobility, and prolonged post-operative ileus .

Despite a low risk of complications and a high success rate using modern techniques, TAP blocks remain overwhelmingly underutilized. There is a paucity of literature on the efficacy of TAP block for control of post-operative pain in patients undergoing infra-umbilical abdominal surgery, in comparison to epidural block.

Selection of Study drug Concentration and Dosage

The efficacy of 0.375% bupivacaine in a dosage of 2 mg/kg has been successfully observed in a few studies like by O'Donnell et al. in 2006 in patients who underwent open retropubic prostatectomy , and by Niraj et al. in 2009 in patients admitted to the intensive care unit following major intra-abdominal surgery . They both observed lower mean VAS scores, reduced morphine consumption and no adverse effects post-operatively.

Hence, we chose 0.375% bupivacaine 2 mg/kg to provide both an effective, yet safe concentration and dosage for prolonged analgesia with a single-shot TAP block and epidural block.

Selection of TAP Block Technique

With the technique of ultrasound guided nerve blockade gaining popularity, USG guided TAP blocks have been performed to confirm the needle position in the TAP block. However, injection via Petit's triangle using anatomical landmark technique resulted in reliable deposition into the transversus abdominis plane.

There are now a variety of techniques for the TAP block and the analgesic merit of each is being elucidated in ongoing studies. Although it is possible to ultrasonically visualize the three muscle layers of the abdominal wall, there is variation in these muscle layers that can restrict the use of ultrasound over the lumbar triangle of Petit. As a result, the needle insertion point as described in the ultrasound studies, which is dependent on the adequate identification of the 3 muscle layers, can vary. This will alter the location of the injectate as will the angle of the needle insertion to skin, which contrasts to the landmark approach's description.

Moreover, it may not always be possible to use ultrasound guided techniques for administering TAP block where such facilities are not available, such as peripheral health centers. Hundred percent success rates with TAP block have been obtained using landmark technique for posterior approach of block. As real time USG guidance may increase the efficacy of TAP block, it will not change the primary findings of this study.

Demographic Data

The demographic data of the patients; including age, gender, weight, height and ASA Class, in both the study groups were comparable in both of our study groups.

Haemodynamic Parameters

As seen in tables and the graphs the heart rate, mean arterial pressure, respiratory rate and oxygen saturation were comparable between the two groups throughout the post-operative period with no significant change in hemodynamic parameters from the baseline. Haemodynamic parameters between the two groups were comparable on applying Student s unpaired t-test ($p > 0.05$) and on applying repeated measure ANOVA ($p>0.05$),

with no significant statistical difference in either case.

Parikh et al. in 2013 observed stable haemodynamic parameters using 0.375% bupivacaine while Fuladi et al. in 2014 demonstrated stable haemodynamic parameters using a lower concentration of 0.25% bupivacaine administered via TAP block for post-operative analgesia in patients undergoing lower abdominal surgery.

Considerably longer duration of post-operative analgesia was observed in Group T (420.03±30.42 minutes), as compared to Group E (240.27±30.01 minutes) which was statistically significant ($p<0.05$).

The number of patients having post-operative nausea and vomiting between the two groups was comparable with no significant statistical difference ($p>0.05$). No other adverse effects were observed in either of the patient groups.

With the above observations, it can be concluded that 0.375% bupivacaine administered either in the transversus abdominis plane, or through a catheter in the epidural space as a single dose provides satisfactory post-operative analgesia in both the groups.

However, the reduction in post-operative pain intensity with considerably lower VAS scores at rest, combined with longer duration of analgesia and sparing of the motor and sensory function of the lower limbs which allowed for early ambulation in patients in the TAP group facilitated a greater degree of post-operative care, and thereby resulted in high patient satisfaction levels.

Also, TAP block analgesia obviates the need for an epidural catheter whenever not available.

In conclusion, TAP block using 0.375% bupivacaine seems to hold considerable promise for patients undergoing infra-umbilical surgical procedures and is an effective alternative to epidural analgesia on account of its efficacy, safety, affordability and simplicity.

Conclusion

In this comparative observational study, comparison of 0.375% bupivacaine through transversus abdominis plane block versus epidural block for post-operative pain in patients undergoing infra-umbilical abdominal surgery was studied.

It was concluded that there is no significant change in hemodynamic parameters from the base line between the two groups throughout the post-operative period.

The quality of post-operative analgesia in patients who were administered TAP block was significantly better than in patients who were administered epidural analgesia.

VAS scores at rest in patients who were administered TAP block were significantly lower than in patients who were administered epidural analgesia.

Patient satisfaction score in patients who were administered TAP block were significantly higher than in patients who were administered epidural analgesia.

The duration of post-operative analgesia in patients who were administered TAP block was significantly longer than in patients who were administered epidural analgesia.

The incidence of patients having post-operative nausea and vomiting in patients receiving TAP block or epidural analgesia was not significant. No other adverse effects were observed in either of the patient groups.

In conclusion, 0.375% bupivacaine administered through transversus abdominis plane block is an effective alternative to epidural analgesia for control of post-operative pain in patients undergoing infra-umbilical surgical procedures.

Refrences

1. Stoelting RK, Hillier SC. Pharmacology and Physiology in Anaesthetic Practice. 4th Ed. London: Lippincott Williams and Wilkins; 1999:128-131.
2. Berde C. Strichartz G. Local Anesthetics. In: Miller RD, ed. Miller sAnesthesia. 8th Ed. Philadelphia: Elsevier; 2015:1028-1055.
3. Kandi. Efficacy of USgguded TAP block vs. epidural block for lower abdominal surgeries. ASJA 2015;8:4:653-657
4. Parikh BK, Waghmare VT, Shah VR, Mehta T, Butala BP, Parikh GP, Vora KS. The analgesic efficacy of ultrasound-guided transversus abdominis plane block for retroperitoneoscopic donor nephrectomy: A randomized controlled study. Saudi J Anaesth. 2013;7:43–7.
5. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. AnesthAnalg. 2008;107:2056–60.
6. Niraj G, Kelkar A, Hart E, Horst C, Malik D, Yeow C, Singh B, Chaudhri S. Comparison of analgesic efficacy

of four-quadrant transversus abdominis plane (TAP) block and continuous posterior TAP analgesia with epidural analgesia in patients undergoing laparoscopic colorectal surgery: an open-label, randomized, non-inferiority trial. Anaesthesia. 2014;69:348–55.

7. Mukhtar K, Singh S. Transversus abdominis plane block for laparoscopic surgery. Br J Anaesth. 2009; 102:143–4.
8. Fuladi N, Deshmukh S, Bhure A. Comparative Study of Bupivacaine 0.25% versus Ropivacaine 0.5% in Transversus Abdominis Plane Block for Postoperative Analgesia in Lower Abdominal Surgeries: A Randomised Controlled Trial. Journal of Evolution of Medical and Dental Sciences. 2014;3(17):4569-76.
9. Patel D, Patel B, Patel H, Shah D, Vachhrajani P. Transversus Abdominis Plane Block for Post-Operative Analgesia in Lower Abdominal Surgery: A Comparison of Bupivacaine and Ropivacaine. International Journal of Science and Research. 2016;5(12):446-50.

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Comparative Evaluation of the Effects of Combinations of Fentanyl-Propofol with Ketamine-Propofol in Short Gynaecological Day Care Procedures: A Randomised Double Blind Study

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Abstract

The advantages of ambulatory surgery is effective when patients get the benefits of day care anaesthesia.This is possible by using rapid acting intravenous anaesthetic agents. *Aim:* Comparative the effects of combinations of fentanyl -propofol with ketamine propofol in short gynaecological procedures. The null hypothesis was that there is no difference between the two groups. *Objective*: Primary outcome: To compare the induction dose and top up doses of propofol in the two groups, one pretreated with fentanyl and the other group pretreated with ketamine. Secondary outcome studied were the quality of immediate and intermediate recovery measured by time to eye opening, time to sit up and walk in the two groups. *Materials and Methods*:A randomised double blind study was conducted with Institutional review board and ethics committee approval. Forty ASA I and II physical status females with written informed consent for dilatation and curettage underwent the study. They were allocated to two groups by odd/even numbers by randomisation and blinded by by sealed cover method. Group I (F) received fentanyl citrate 1.5 microgram/kg intravenously and Group II (K) received ketamine 0.5mg/kg intravenously. Both groups of patients were induced two minutes later with tirated dose of propofol. In both groups anaesthesia was maintained with incremental doses of 25 mg propofol. The data was anlysed using unpaired t test. *Results*: The mean induction time and the total dose of propofol was more in the F group. The time taken for eye opening was shorter in group F. *Conclusion*: Anaesthesia with propofol-fentanyl was comparable with propofol-Ketamine for out patient anaesthesia. Recovery is rapid with fentanyl, with out emergence delirium and total absence of emetic sequelae.

Keywords: Outpatient Anaesthesia; Fentanyl; Propofol; Ketamine; Total Intravenous Anaesthesia; Early Recovery; Short Gynaecological Procedures.

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Introduction

The concept of day care anaesthesia has evolved because ambulatory surgery can offer a number of advantages for patients, health care providers and even hospitals including shorter operating room times and faster turnaround times.The ability to care for high volumes of patients reduces the waiting list of operations. Ambulatory surgery does not depend on the availability of a hospital bed, patients have greater flexibility to schedule the timing of surgeries. The reduced rate of infection for outpatient surgery is beneficial in immune compromised patients [1]. Ambulatory anaesthesia has become popular and currently many minor gynaecological procedures are performed on out patient basis [2]. Goal of outpatient anaesthesia is

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to provide good perioperative anaesthesia with minimal post operative side effects like nausea,vomiting, drowsiness etc. Speedy recovery is the end point in trials investigating day care anaesthesia.To fully evaluate patient recovery, all stages of recovery should be studied. Early recovery (emergence) is defined as time to eye opening and orientation.Intermediate recovery encompasses the return of cognitive and psychomotor function and the time to discharge ("home readiness or street fitness"). Currently intravenous induction agents like propofol and ketamine are used in combinations with fentanyl or alfentanyl and midazolam [3-5]. Faster immediate recovery with the new short acting intravenous anaesthetic propofol,yield significant savings in nursing hours [3,6-8]. Propofol also possess antiemetic action. Ketamine in low doses 10-20 mg is a useful alternative to opioid analgesic during induction of anaesthesia and maintenance [9-13]. Opioid analgesics are used during maintenance of general anaesthesia to prevent autonomic responses to painful stimuli. Opioids have been shown to decrease the incidence of pain on injection and involuntary motor activity associated with propofol. Small doses of fentanyl 1-2 µgm/kg provided excellent intra operative conditions and a more rapid emergence when it was used as part of a balanced anaesthesia technique [3,10,11,14,15].

In the present study an evaluation and comparison of induction, maintenance, quality of anaesthesia and the quality of immediate and intermediate recovery following administration of the above combinations in two groups of patients, each comprising twenty female patients scheduled for dilatation and curettage of the uterus (D & C) was conducted [16]. Speedy recovery is the primary end point in trials investigating day care anaesthesia.Ever since ambulatory surgery was introduced there is continued quest for an ideal anaesthetic agent which would have a rapid onset of action,quicker physical and faster psychomotor recovery (i.e. street fitness). To meet these requirements the currently used combination is propofol with fentanyl or alfentanil. As fentanyl could be procured in developing countries, combination of small doses of fentanyl for analgesia along with propofol is gaining attention similar to ketamine in subanaesthetic doses as analgesic alongwith propofol for total intravenous anaesthesia.

Aim

The aim of the study was to compare and evaluate the efficiency of combination of propofol-fentanyl with propofol-ketamine during induction and maintenance of general anaesthesia for minor gynaecological procedures.The quality of anaesthesia and quality of recovery from anaesthesia was also compared.

Objective

1. To assess the efficiency of the combinations of anaesthetics by measuring the cardiorespiratory changes during induction and maintenance of anaesthesia and recovery.
2. To measure the quality of anaesthesia by observing the depth of anaesthesia, adverse events if any and the recovery characteristics.

Materials and Methods

The present study was carried out in Sri Avittam Thirunal hospital allied to the Government Medical College,Thiruvanthapuram during 2001 April to August after approval from the Hospital Ethics Committee and Institutional Review Board.A convenient sample of forty females with written informed consent in the age group of 20-50 years with American Society of Anaesthesiologists Physical status grade I and II who were to undergo elective dilatation and curettage of the uterus (D & C) were included in this study.

Exclusion criteria: Patients with inability to communicate effectively, those who had received any narcotic or hypnotic medication within 24 hours before surgery, obese patients (body weight more than 80 Kg), patients with Haemoglobin less than 8 gms%, patients with hypersensitivity to the drugs used in the study and patients with more than 12 weeks gestation were excluded from the study. The patients were randomly allocated to two groups of twenty each to receive either a.Fentanyl 1.5 µgm/kg iv followed two minutes later by induction with propofol titrated to loss of consciousness-Group I (Group F)

b.Ketamine 0.5 mg/kg iv followed two minutes later by induction with propofol titrated to loss of consciousness-Group II (Group K). No premedication was given to the patients in both the groups. They were randomly allocated to receive one of the two anaesthetic combinations in a double blind manner.

Anaesthetic Technique

Blood pressure was monitored noninvasively.

ECG leads and pulse oximeter probes were attached to all patients prior to induction and the heart rate, blood pressure, respiratory rate and oxygen saturation were recorded.An intravenous line was started with an 18 guage cannula on the dorsum of the hand under local anaesthesia with 1% lignocaine. All patients were preoxygenated for three minutes with 100% oxygen through Mapleson A circuit. Patients were given intravenous fentanyl 1.5 µgm/kg in 30 seconds in Group I (F) and intravenous ketamine 0.5 mg/kg in 30 seconds in Group II (K). Anaesthesia was induced in both groups of patients with propofol by iv slow injection at a rate of 10 mg in 10 seconds titrating for loss of verbal contact and loss of eyelash reflex. An observer blinded to the nature of the drug being injected monitored patient responses (Figure 1).

Maintenance of Anaesthesia: As soon as the eyelash reflex disappeared the depth of anaesthesia was assessed by loss of jaw tone, patient was placed in lithotomy position and skin preparation for Dilatation and Curettage was begun. No muscle relaxant was used in this study. Airway was maintained by head tilt, chin lift and jaw thrust – manoeuvre with 100% oxygen inhalation through face mask and Magill's circuit.Anaesthesia was maintained by incremental top up doses of 25 mg propofol watching for abnormal movements related to surgical stimulation and hyperventilation (Figure 2).

Monitoring Parameters and Intervals

Depth of anaesthesia was monitored by presence of lacrimation, sweating, change of heart rate and blood pressure. Quality of anaesthesia assessed by looking for abnormal movements, laryngeal spasm, vocalisation, excess salivation, and episodes of desaturation. All monitored parameters were charted at the following intervals.

1. Preoperatively before induction
2. One minute after administration of induction agent
3. Thereafter every minute during maintenance of anaesthesia.
4. Full monitoring was continued until recovery period

Recovery: At the end of the procedure patients were transferred to the post anaesthesia recovery room. Patient's vital parameters were observed during post operative period.

Methods of Assessment of Recovery

Recovery time was taken from the last dose of propofol to the time of appearance of motor response or orientation. Motor response such as time to regain jaw tone, the return of eye lash reflex, and the ability to open the eyes on command were noted. Time to orientation based on the knowledge of the patient's name, current date and name of hospital were also judged. Thereafter the ability to sit up in bed, to stand up unsupported and the time of ambulation with out assistance, drink and voids were assessed every five minutes. Undesirable post operative side effects such as pain at the site of injection, nausea and vomiting were noted. At the time of discharge patients were interviewed for assessing quality of anaesthesia specifically asking about hallucination and pain during procedure.

Statistical Analysis

Data were collected with the help of a pre structural proforma and fed into the computer for construction of frequency tables. The statistical analysis was done with the help of SPSS (Statistical Package for social Scientist) for comparing the two groups mean and estimation of standard deviation of different assessment variables. The hypothesis formulated were tested statistically by unpaired t test.

Results

In this study that there was no difference in the mean age and weight of the participants in both groups and were identical with respect to demographic particulars has shown in Table 1. The anaesthetic induction time using propofol in the fentanyl group was more than in the ketamine group. The induction dose of propofol used was higher in the fentanyl Group than the ketamine pretreated group.The number of 25 mgs top up doses of propofol used for maintainance of anaesthesia were similar in both the groups whose duration of surgery was also similar. The incremental dose rate of propofol and the propofol utiliation rate and the duration of anaesthesia were similar in both the groups. Mean incremental dose rate of propofol was calculated by dividing total dose of incremental propofol in mgs by weight of patient in kgs. The propofol utilisation rate in mg/kg/minute was calculated by dividing the total dose of propofol in mg by the bodyweight in kgs and then multiplying by the duration of anaesthesia in minutes. The duration of recovery in minutes assessed by observing the time of eye opening on command, obeying of commands, ability to sit up,

Table 1: Demographic and clinical particulars measured

Mean & Standard Deviation of Particulars	Group I (F)	Group II (K)	't' value	p value
Age in years	42.95±8.9	44.3±4.8	0.6	>0.05
Body weight in Kgs	55.9±9.2	53.8±7.2	0.8	>0.05
Induction time in seconds	76.0±12.6	59.3±6.5	5.4	<0.05
Induction dose of propofol in mgs	114.5±40.3	85.3±21.4	2.9	<0.01
Number of top ups of propofol @ 25 mgs per top up	1.6±1.5	1.1±0.06	1.4	>0.05
Duration of surgery in minutes	6.7±4.5	4.9±2.2	1.6	>0.05
Incremental dose rate of propofol(mg/kg)	0.79±0.9	0.51±0.9	1.47	>0.05
Duration of anaesthesia in minutes	8.65±4.5	8.05±2.4	0.52	>0.05
Propofol utilisation rate mg/kg/mt	21.2±11	20.3±10.8	0.3	>0.05
Duration of recovery in minutes (assessed by eye opening)	2.4±1.5	3.8±0.7	3.9	<0.001
Duration of recovery in minutes (assessed by obeying commands)	3.4±1.6	6.1±1.1	6.4	<0.001
Dration of recovery time in minutes (assessed by ability to sit up)	33.2±2.3	37.71±3.5	4.89	<0.001
Dration of recovery time in minutes (assessed by ability to walk unaided)	56.5±3.4	59.5±2.6	3.19	<0.01
Dration of recovery time in minutes (assessed by ability to drink)	71±3.4	74.75±7.3	1.86	<0.05
Perioperative SpO_2	99.6±0.5	98.9±0.6	1.7	>0.05

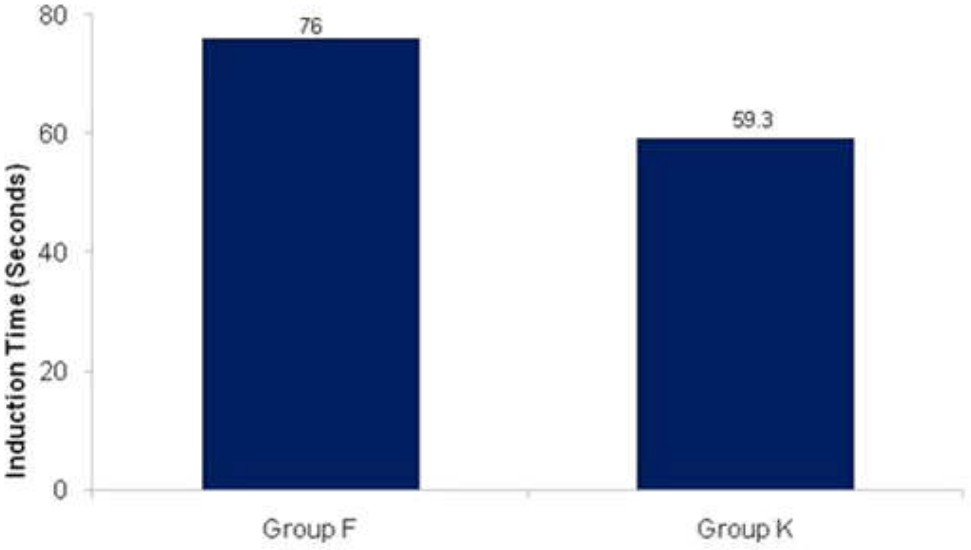

Fig. 1: Comparison of induction time ($p<0.05$)

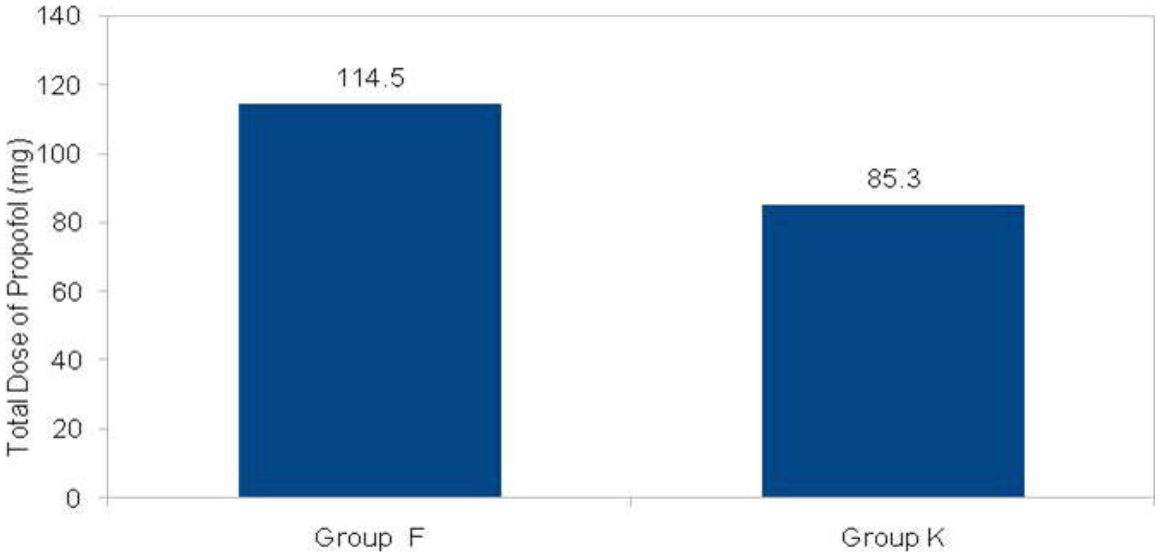

Fig. 2: Total dose of propofol used in mgs ($p<0.01$)

ability to walk unaided and ability to drink were significantly different between the two groups. Time for eye opening was calculated from the time of administration of last dose of propofol to eye opening upon commands after completion of the surgery. The mean recovery time to sit up and abiity to walk were more in the ketamine pretreatment group when compared with the fentanyl group.

There was a significant fall in the mean respiratory rate in Fentanyl group patients from the second minute of pretreatment onwards with maximum decrease of 29.8% at the seventh minute.The corresponding decrease in the mean respiratory rate in the ketamine group was only 3.1% (Fig. 3).

The change in mean heart rate noted every minute on pretreatment with fentanyl in group I and ketamine in group II followed after two minutes with induction with propofol showed a maximum increase of 5.2% and 6.2% respectively at the second minute.The maximum increase in mean heart rate of 7.9% was noted at the third minute in the ketamine group and the maximum decrease in mean heart rate of 12.4% was in the ninth minute in the fentanyl group (Fig. 4).

The mean blood pressure increased progressively in the first and second minute in both groups with

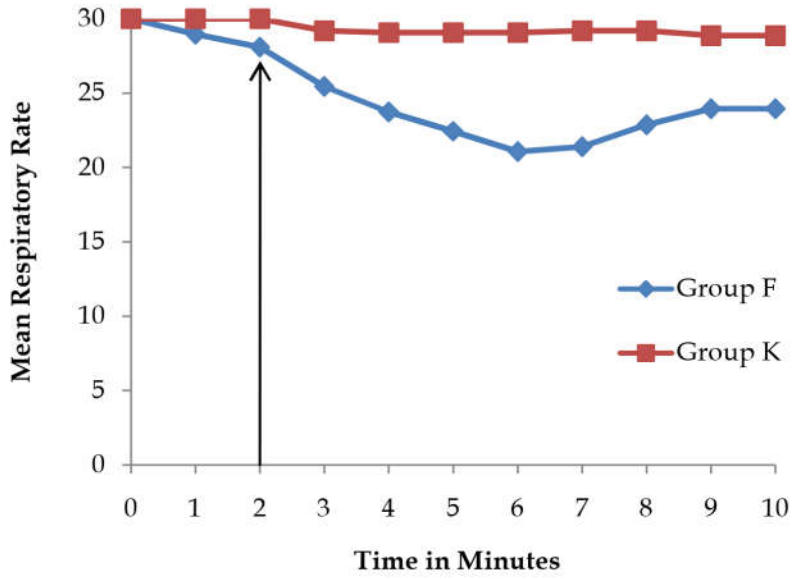

Fig. 3: Change in mean respiratory rate

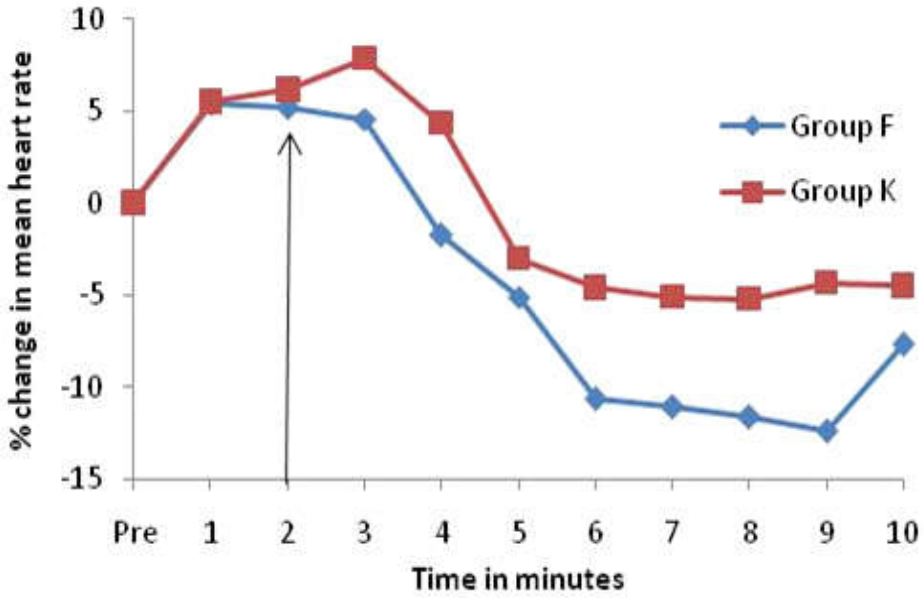

Fig. 4: Percentage change in mean heart rate

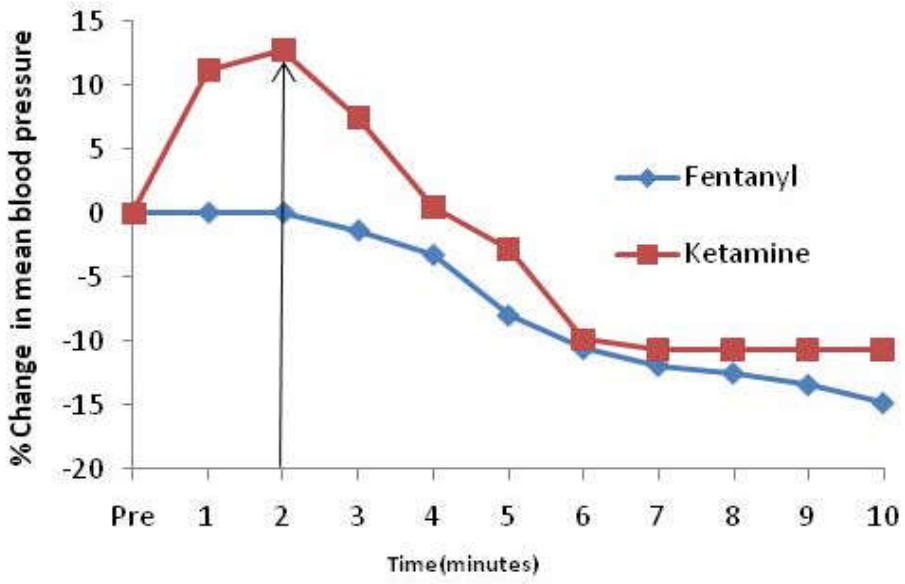

Fig. 5: Percentage change in mean systolic blood presure

higher increase noted in the ketamine group but with no significant difference between the two groups. On induction with propofol the fall in systolic blood pressure noted at fourth minute was less with the ketamine group than in the fentanyl pretreatment group. In Group I patients the blood pressure did not increase on pretreatment with fentanyl and were hamodynamically stable at near low normal levels whereas in group II patients the mean systolic pressure increased immediately on pretreatment with subanaesthetic doses of intravenous ketamine and on induction with propofol were maintained at ear high normal levels (Fig. 5).

Discussion

Day case surgery now widely practised has emphasized the need for an anaesthetic technique characterised by smooth, reliable and rapid onset of anaesthesia and quick recovery that allows discharge within a short time. By virtue of it's rapid induction and high plasma clearance, short elimination half life and absent emetic sequelae, many investigators have rcommended propofol as the specifically suitable agent for day care anaesthesia [17]. But it has little or no antinociception. Therefore propofol has to be combined with an analgesic. The purpose of this study was to compare the efficacy of combinations of propofol-fentanyl and propofol–ketamine during induction, maintenance and recovery phases during total intravenous general anaesthesia for minor gynaecological procedures.

The dose of propofol, fentanyl and ketamine used in this study was determined from available literature and these doses were equally adequate to provide anaesthesia and analgesia required for brief qynaecological procedures as long as ten minutes. Anaesthesia was maintained with top up doses of 25 mg of propofol depending on abnormal movements in response to surgical stimulation or hyperventilation. Time of induction, intraoperative haemodynamics and postoperative side effects were noted. Awakening and orientation to time and place were assessed by gross recovery parameters such as return of jaw tone, return of eyelash reflex, the ability to open eyes on command, ability to give correct name, current date and name of the hospital. Intermediate recovery which corresponds to the time the patients met the criteria for discharge home (Home readiness) was evaluated by noting the patients's ability to sit up and stand or walk.

The results of the present study has shown that all patients were identical with respect to age, weight, physical status, type of surgery and duration of anaesthesia.

The mean induction time in this study was 76±12.6 seconds in group I and 59.3±6.5 seconds in group II. The findings correlate with that reported in literature, Bowdle et al. [18]. In contrast to other studies by Johnston et al. the incidence of pain on

injection of propofol was low in this study [19]. Only two of the patients in group I complained of pain on receiving propofol or postoperatively.The lower incidence of pain in this study may be because of low incidence of pain with the injection of new formulation of propofol [20]. None of the patients in both the groups exhibited excitatory side effects. However, higher incidence of muscular movements have been reported by many other investigators [21].

Apnoea is a well known complication of propofol and the incidence was high in many patients in many previous studies in literature [22]. Apnoea was observed in three patients in group I and none in group II. There was a decrease in respiratory rate in group I from first minute to tenth minute where as the corresponding respiratory rate in group II was unchanged. This decrease in respiratory rate was statistically more significant from third minute onwards but was clinically not significant but for the three patients who had manageable apnoea.

There was a steady decrease in mean heart rate in group I, one minute after pre-treatment with fentanyl, and the mean heart rate continued to decrease from induction with propofol till the ninth mnute of anaesthesia, where as in group II there was an increase in mean heart rate in one minute after pretreatment with ketamine from preoperative values and started decreasing after third minute corresponding with induction with propofol and intraoperatively but the difference in heart rate between the two was not statistically significant.

The mean blood pressure in Group I remained unchanged till second minute after pretreatment with fentanyl and started decreasing till the ninth minute whereas in group II the mean blood pressure started increasing following first minute of pretreatment with ketamine and remained at the higher mean blood pressure level till the fourth minute and thereafter started decreasing from fifth minute.The onset of decrease in mean blood pressure in group II correspond with completion of induction with propofol [23]. The decrease in mean blood pressure in Group II persisted till the ninth minute. The percentage decrease in mean blood pressure from preoperative mean blood pressure was maximum by 8% at fifth minute and thereafter the mean blood pressure remained steady.The increase in mean blood pressure from preoperative mean blood pressure was maximum at 13% in Group II in the second minute and the maximum decrease in mean blood pressure was 2.8% at fifth minute. The changes in mean blood pressure were not statistically significant. Thus it was inferred that, propofol-fentanyl combination had a tendency to reduce mean systolic blood pressure from pretreatment with fentanyl and subsequently on induction with propofol to low normal levels. But with propofol-ketamine combination there was an immediate increase in mean systolic blood pressure from preoperative values upon pretreatment with ketamine and thereafter on induction with propofol the mean blood pressure was maintained at upper normal levels. The reduction in blood pressure in previous studies with propofol-fentanyl combination may be due to higher dose of rapidly injected propofol followed by fentanyl in fasting patients [24]. This may have clinical consequences in the hypovolaemic dehydrated patients and in patients with significant cardiovascular disease. However, the fall in mean blood pressure and mean heart rate in group I patients pre and intraoperatively and the initial increase in mean blood pressure and mean heart rate in group II patients preoperatively with pretreatment was well tolerated by the healthy patients in both the groups in this study. The relatively higher dose of propofol for induction with fentanyl may explain the decrease in blood pressure in Group I patients [24].

Quality of anaesthesia was assessed in this study by observing the incidence of abnormal movements, laryngeal spasm, vocalisation, excessive salivation and episodes of desaturation. None of the patients in both the groups exhibited salivation, laryngeal spasm or abnormal movements which affected the surgery. The arterial oxygen saturation levels in both the groups were practically the same.Immediate recovery (ie time of awakening and orientation to time and place) were assessed by recording the time after cessation of anaesthesia to the time when the patient opened eyes on command and gave her name, current date and name of hospital.

Early recovery was significantly different between the two groups statistically.Time to awakening was significantly shorter in Group I than in group II. Time to orientation was significantly shorter in group I than in group II with p value less than 0.01.

The intermediate recovery phase was assessed by observing patient's ability to sit up and stand and walk. The mean time to sit up by patients in Group I was less by four minutes when compared with Group was statistically significant ($p<0.001$). The difference in mean time noted between the two groups for walking and drinking were statistically significant. With respect to postoperative side

effects four patients in Group II had hallucinations and dreams which were clinically not significant. Postoperative nausea and vomiting were absent in both the groups due to inherent antiemetic activity of propofol.

Summary and Conclusions

The aim of the present study was to evaluate and compare the efficacy of propofol-ketamine and propofol-fentanyl for induction and maintenance of anaesthesia, along with quality of anaesthesia and recovery characteristics in minor gynaecological procedures. Forty healthy female patients, ASA grade I, scheduled for elective dilatation and curettage of the uterus participated in this study.

They were randomised into 2 groups to receive pretreatment with iv fentanyl 1.5 µgm /kg in group I (F) patients and IV ketamine 0.5mg/kg in group II (K) patients. Two minutes after pretreatment both groups of patients were induced with propofol titrated to loss of eyelash reflex, and loss of consciousness. Anaesthesia was maintained with incremental doses of 25 mg propofol watching for abnormal movements related to surgical stimulus and hyperventilation. Comparative evaluation was made regarding rapidity of recovery, haemodynamic and respiratory variables and side effects. At the time of discharge patients were interrogated regarding quality of anaesthesia, dreams, postoperative pain, nausea and vomiting and how they rated their experience during the recovery period.

Induction of anaesthesia was rapid and pleasant with both the combinations. There was no significant decrease in the respiratory rate in both the groups. Propofol-fentanyl combination caused reduction in both heart rate and blood pressure where as propofol-ketamine combination resulted in an initial increase in blood pressure and heart rate preoperatively on pretreatment with ketamine and later on induction with propofol haemodynamically stable anaesthesia was maintained. Early recovery was faster with propofol–fentanyl combination but with regard to orientation there was significant difference in the intermediate recovery phase in both the groups. Anaesthesia with fentanyl and propofol was comparable to the most commonly used combination of propofol and ketamine. It may be an appropriate choice when haemodynamic stability is of great importance or when post operative analgesia, post operative nausea and vomiting and rapid recovery to street fitness is required.

In conclusion, the results of this study suggest that propofol–fentanyl combination is a safe anaesthetic combination and is a better replacement for the commonly used propofol–ketamine combination for outpatient anaesthesia. It produces rapid and smooth anaesthesia with few untoward side effects. It produces no negative effects on the cardiorespiratory system. Recovery is rapid without emergence delirium and with total absence of emetic sequelae.

References

1. White PF, Smith I. Ambulatory anesthesia: past, present, and future. Int Anesthesiol Clin. 1994;32(3):1–16.
2. Ahuja H, Abraham V, Abraham J, Liddle D. Ideal anesthetic agents for day-care gynecological procedures: A clinical trial comparing thiopentone with ketamine as adjuncts to propofol. Adv Biomed Res 2015;4:81.
3. Sukhminder Jit Singh Bajwa, Sukhwinder Kaur Bajwa, and Jasbir Kaur. Comparison of two drug combinations in total intravenous anesthesia: Propofol-ketamine and propofol-fentanyl. Saudi J Anaesth. 2010 May-Aug;4(2):72–79.
4. S Scarrone, N Vivaldi, G D'Amico, G Spina. A propofol -ketamine combination in short-term anesthesia. Minerva anestesiologica 1990;56(9):809-11.
5. Hamed Aminiahidashti, Sajad Shafiee, Seyed Mohammad Hosseininejad, Abulfazl Firouzian. Comparison of the combination of propofol–fentanyl with combination of propofol–ketamine for procedural sedation and analgesia in patients with trauma American Journal of Emergency Medicine 2018 Feb;36(10).
6. Nabin Kumar Regmi, Santosh Khatri, Prashanta Kumar Datta. Comparison of Propofol-Ketamine Combination with Propofol-Butorphanol Combination for Total Intravenous Anaesthesia on Short Surgical Procedures. Journal of Nepalgunj Medical College. 2014 Dec;12(2):34-39.
7. Arikan M, Aslan B, Arikan O, But A, Horasanli E. Comparison of propofol-remifentanil and propofol-ketamine combination for dilatation and currettage: A randomized double blind prospective trial. Eur Rev Med Pharmacol Sci. 2015 Sep;19(18):3522-7.
8. Phillips W, Anderson A, Rosengreen M, Johnson J, Halpin J. Propofol Versus Propofol/Ketamine for Brief Painful Procedures in the Emergency Department: Clinical and Bispectral Index Scale Comparison. J Pain Palliat Care Pharmacother. 2010 Dec;24(4):349-55.
9. Slavik VC, Zed PJ. Combination Ketamine and Propofol for Procedural Sedation and Analgesia.

Pharmacotherapy. 2007 Nov;27(11):1588-98.

10. Guit JB, Koning HM, Coster ML, Niemeijer RP, Mackie DP. Ketamine as analgesic for total intravenous anaesthesia with propofol. Anaesthesia. 1991 Jan;46(1):24-7.
11. Baykal Tutal Z, Gulec H, Dereli N, Babayigit M, Kurtay A, Inceoz H, Horasanli E. Propofol-ketamine combination: a choice with less complications and better hemodynamic stability compared to propofol? On a prospective study in a group of colonoscopy patients. Ir J Med Sci. 2016 Aug;185(3):699-704.
12. Ramdev B, Sharma DK, Sharma SR, Sodhi GS. A Comparative Evaluation of Propofol-Ketamine and Propofol Fentanyl As T.I.V.A Techniques, 2015;14: 19-26.
13. Tandon M, Pandey VK, Dubey GK, Pandey CK, Wadhwa N. Addition of sub-anaesthetic dose of ketamine reduces gag reflex during propofol based sedation for upper gastrointestinal endoscopy: A prospective randomised double-blind study. Indian J Anaesth. 2014 Jul 1;58(4):436.
14. Lombard TP, Couper JL. Propofol or methohexitone for induction of anesthesia for minor gynaecological procedures. S Afr Med J. 1987 Dec 19;72(12):843-5.
15. H.H. Yuce, Ahmet Kucuk, Nuray Altay, Saban Yalcin. Propofol-ketamine combination has favorable impact on orientation times and pain scores compared to propofol in dilatation and curettage. A randomized trial. Acta Medica Mediterranea 2013 Jan;29(3): 539-544.
16. Sicignano A, Bellato V, Cancellieri F, Foroni C, Giubelli D, Latis G, et al. Propofol-ketamine vs propofol-fentanyl in short gynecologic surgery. Minerva Anestesiol. 1990 Mar;56(3):61–6.
17. Ogg TW. An Assessment of Postoperative Outpatient Cases. Br Med J. 1972 Dec 9;4(5840):573–6.
18. Bowdle TA, Ward RJ. Induction of anesthesia with small doses of sufentanil or fentanyl: dose versus EEG response, speed of onset, and thiopental requirement. Anesthesiology. 1989 Jan;70(1):26–30.
19. Johnston R, Noseworthy T, Anderson B, Konopad E, Grace M. Propofol versus thiopental for outpatient anesthesia. Anesthesiology. 1987 Sep;67(3):431–3.
20. Larsen B, Beerhalter U, Biedler A, Brandt A, Doege F, Brün K, et al. [Less pain on injection by a new formulation of propofol? A comparison with propofol LCT]. Anaesthesist. 2001 Nov;50(11):842–5.
21. Boysen K, Sanchez R, Krintel JJ, Hansen M, Haar PM, Dyrberg V. Induction and recovery characteristics of propofol, thiopental and etomidate. Acta Anaesthesiol Scand. 1989 Nov;33(8):689–92.
22. Raeder JC, Misvaer G. Comparison of propofol induction with thiopentone or methohexitone in short outpatient general anaesthesia. Acta Anaesthesiol Scand. 1988 Nov;32(8):607–13.
23. Ramdev B, Sharma DK, Sharma SR, Sodhi GS. A Comparative Evaluation of Propofol-Ketamine and Propofol- Fentanyl As T.I.V.A Techniques In Terms Of Haemodynamic Variables And Recovery Characteristics In Minor Surgeries. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)2015 Apr;14(4)Ver.III:19-26.
24. Gepts E, Jonckheer K, Maes V, Sonck W, Camu F. Disposition kinetics of propofol during alfentanil anaesthesia. Anaesthesia. 1988 Mar;43 Suppl:8–13.

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A Comparative Study of Dexmedetomidine HCL and Esmolol HCL for Attenuating Pressor Response to Laryngoscopy and Oral Endotracheal Intubation

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Abstract

Introduction: Laryngoscopy and intubation increases sympathetic activity resulting in tachycardia and hypertension which may cause myocardial ischemia, cardiac arrhythmias and cerebrovascular hemorrhage. We compared the efficacy of intravenous esmolol and dexmedetomidine to attenuate the pressor response to laryngoscopy and intubation. *Design:* Randomised controlled trial. *Method:* Seventy-five patients of ASA I and ASA II undergoing general anesthesia with oral intubation for elective surgery were allocated into three groups. *Group C:* Control group. *Group E:* intravenous esmolol 2mg/kg three minutes before laryngoscopy. *Group D:* Intravenous dexmedetomidine 1µg/kg in 100ml infusion over ten minutes before laryngoscopy. Heart rate, systolic, diastolic and mean arterial pressures were recorded before drug administration, after drug administration, after induction of standard anesthesia, immediately after intubation, every 2 minutes till 10 minutes. Incidence of bradycardia and hypotension were noted. *Statistical Analysis used:* IBM SPSS version. *Results:* Mean HR immediately after intubation for group C was (104.57±8.2) whereas it was (83±4.53, 92.6±4.70) for group D and group E with p value of (0.003,0.002) when compared to control group. While comparing group D and E, p value was 0.0001. MAP immediately after intubation for group C was (109±5.9) whereas it was (98±3.4, 100.2±5.2) for group D and E with p value (0.0001, 0.002) when compared to control group. While comparing group D and E, p value was 0.006. *Conclusion:* Dexmedetomidine and esmolol both attenuated the pressor response to laryngoscopy and intubation but it was better controlled with dexmedetomidine.

Keywords: Pressor Response; Laryngoscopy; Esmolol; Dexmedetomidine.

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Introduction

Laryngoscopy and tracheal intubation leads to increase in arterial blood pressure and heart rate, magnitude of which depends on various factors like depth of anaesthesia, use of any measures prior to airway manipulation, the anaesthetic agent used and the duration of laryngoscopy and intubation. The principle mechanism behind this is the sympathetic response resulting from increased catecholamine activity which is usually transitory, variable, unpredictable and hazardous to patients with hypertension, myocardial insufficiency or cerebrovascular diseases and predisposes to development of pulmonary edema, myocardial insufficiency and cerebrovascular accident [1,2].

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Intravenous anesthetic induction agents do not adequately or predictably suppress these responses. So reseachers have used different pharmacological measures like use of volatile anesthetics, topical and intravenous lidocaine, opioids, clonidine, nitroglycerine, calcium channel blockers and β-blockers prior to initiating laryngoscopy to blunt this response [3-9]. An ideal pharmacological agent would be one which minimizes these responses, prevent impairment of cerebral and coronary blood flow, avoid awareness and does not interfere recovery from anesthesia. Its administration and onset of action should not be time consuming also it should minimally affect the duration or modality of the ensuing anesthesia. Here we had chosen alpha 2 agonist and short acting beta blocker for blunting pressor response and compared their efficacy. α2 agonists are being used for attenuating the pressor response and amongst them dexmedetomidine appears to fulfill all the above criteria and is highly specific and selective α2 adrenoceptor agonist with α2: α1 binding selectivity ratio of 1620:1 compared to 220:1 for clonidine [10]. Its advantages include sedation, analgesia, anxiolysis and improved haemodynamic stability. It produces hyperpolarization of noradrenergic neurons and suppression of neuronal firing in the locus cerelous which leads to decreased systemic noradrenaline release resulting in attenuation of sympatho-adrenal responses and hemodynamic stability during laryngoscopy and tracheal intubation [10].

Esmolol decreases the force of contraction and heart rate by blocking action of catecholamines on beta-adrenergic- 1 receptors of the sympathetic nervous system, mainly found in the heart thus attenuates the tachycardia and hypertensive responses to laryngoscopy and endotracheal intubation [11].

Aims and Objective

In this study we compared the efficacy and safety of dexmedetomidine and esmolol in blunting pressor response to laryngoscopy and endotracheal intubation.

Materials and Methods

After approval from the Institutional Ethical Committee, 75 patients of ASA I and II, from age group of 18 - 60 years undergoing surgery under general anesthesia requiring oral intubation were selected and allocated into three groups (25 patients in each group). Written informed consent was obtained from each patient. Patients with ASA III and IV, anticipated difficult intubation, history of drug reaction with study drugs and patients on beta blockers or á agonists were excluded from the study.

After taking patient in the operation theatre, baseline vital parameters including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), oxygen saturation (SpO_2) and electrocardiogram (ECG) were recorded. Intravenous access was secured. All the patients were premediated with IV Inj. Ondansetron 0.08 mg/kg, Inj. Ranitidine 1 mg/kg and Inj. glycopyrrolate 0.004 mg/kg. Study drugs were given as following:

Group C: Control group – 100ml normal saline infusion over 10 minutes followed by 10 ml normal saline 3 minutes before laryngoscopy.

Group E: 100 ml normal saline infusion over 10 minutes followed by intravenous esmolol 2mg/kg diluted in 10 ml normal saline 3 minutes before laryngoscopy.

Group D: Intravenous dexmedetomidine 1ìg/kg in 100 ml normal saline infusion over 10 minutes followed by 10 ml normal saline 3 minutes before laryngoscopy

HR, SBP, DBP and MAP were recorded before drug administration, after drug administration, after induction of anesthesia, immediately after intubation and every 2 minutes till ten minutes and then at every 5 minutes interval. The patients were blinded to the treatment group and all data was collected by same anesthesiologist blinded to the group allocation. Induction of anesthesia was performed with Inj. thiopentone 5 mg/kg and Inj. Succinylcholine 2mg/kg intravenously. Then patients were ventilated manually with 100% oxygen.

Laryngoscopy and intubation was done by same experienced anesthesiologist with appropriate size-cuffed disposable portex endotracheal tracheal tube (No. 8 for males and 7 for females) within 15-20 seconds in all patients. Failure to intubate within this period was excluded from this study. Anesthesia was maintained with 50:50 Oxygen and Nitrogen dioxide mixture, 1% sevoflurane and Inj. Vecuronium 0.08 mg/kg/hour. Patients were ventilated with tidal volume of 6-8 ml/kg at frequency of 12 to 14/ minute. No surgical intervention was allowed till the study period of 10 min. Incidence of bradycardia and hypotension were noted. Decrease in MAP greater than 20% below the baseline value or SBP less than

90 mm of Hg was considered as hypotension and was treated by increasing the IV fluid infusion rate and then reducing sevoflurane concentration or incremental dose of Inj. Phenylephrine 0.1 mg bolus IV if necessary. Decrease in HR (<50 beats/min) was treated with atropine 0.6 mg IV.

Statistics: Groups were compared for demographic data (age, weight) and hemodynamic parameters by one-way analysis of variance. Paired t-test was used for comparison among the groups, while for comparison within the groups unpaired t-test was used. Statistical analysis was done by IBM SPSS version. Probability was considered to be significant if less than 0.05. Data are represented as mean± SD.

Observations

All the 75 patients completed the study. The demographic profile of the patients in terms of age, body weight, male:female ratio, ASA status, Mallampati Class were comparable and there were no significant differences among the three groups (p > 0.05) as shown in Table 1.

Results

Following laryngoscopy and tracheal intubation, HR and blood pressure increased immediately after intubation from the baseline in Group C which is statistically significant (p<0.001). But increase in Group E and D was not statistically significant.

Inter group variation

The rise in HR was 15% in Group C, 5 % in Group E and 2% in group D. This rise was significantly lower in Groups E and D compared to Group C at all-time intervals (p<0.01).

There was significant difference in rise of heart rate between Groups E and D (p - 0.01).

Blood pressure (SBP, DBP and MBP) increased immediately after intubation from the baseline in group C which was statistically significant (p<0.001).

The rise in MAP was 11% in Group C, 6 % in Group E and 2 % in Group D. A significant rise in MAP was observed up to 10 minutes post-intubation in Group C. In between Groups C and D, between Group C and E and between Groups E and D, the differences were significant at all-time intervals (p<0.01).

Intra Group Variation

There was significant rise in heart rate and blood pressure between baseline and immediately after intubation in Group C (p Value- 0.0003 for heart rate, 0.0004 for SBP, 0.002 for DBP and 0.001 for MAP), whereas in group E and D there was no significant rise between baseline and immediately after intubation (p – 0.2 for HR, 0.3 for SBP, 0.1 for DBP and 0.2 for MAP) in Group E and (p- 0.1 for HR, 0.2 for SBP, 0.4 for DBP and 0.3 for MAP) in Group D. Hypotension was seen in 1 case (4 %) in Group D and 2 cases (8%) in Group E. Bradycardia

Table 1: Patient's characteristics

	Group E	Group C	Group D	P Value (E/C)	P Value (D/C)	P Value (D/E)
Age	48.44±13.78	45.7±12.76	43.76±14.21	0.19	0.21	0.24
Sex (M:F)	15/10	16/9	15/10			
Weight	63.64±9.50	68±8.56	58.8±11.49	0.17	0.19	0.11

Abbreviations: M: Male, F: Female

Table 2: Changes in Heart Rate

HR (BPM)	Group D (Mean± SD)	Group E (Mean± SD)	Group C (Mean± SD)	P Value	P Value D/E	P Value D/C	P Value E/C
Baseline	88.6± 8	88.5± 5.31	88.5 ± 7.99	0.99(NS)	>0.05(NS)	>0.05(NS)	>0.05(NS)
Immediately after study drug injection	75.7± 7.05	82.8±5.45	88± 7.3	<0.0001	<0.001	<0.001	>0.05(NS)
After induction	70.9±5.2	78.2±5.20	87.3 ± 6.6	<0.0001	<0.001	<0.001	<0.001
After intubation immediately	83± 4.53	92.6 ±4.70	104.57 ± 8.2	<0.0001	0.0001	0.003	0.002
3RD Minute	85.5±5.58	99 ± 4.04	119.8 ± 8.06	<0.0001	<0.001	<0.001	<0.001
5TH Minute	80 ±5.4	92.7 ±3.10	113.52 ± 6.16	<0.0001	<0.001	<0.001	<0.001
7TH Minute	74.36± 4.5	88.12 ± 3.8	107.16 ± 6.16	<0.0001	<0.001	<0.001	<0.001
10TH Minute	73 ±3.7	86.3±4.04	98 ± 5.5	<0.0001	<0.001	<0.001	<0.001

Table 3: Changes in Systolic Blood pressure

SBP (mmHg)	Group D (Mean±SD)	Group E (Mean±SD)	Group C (Mean±SD)	P Value	P Value D/E	P Value D/C	P Value E/C
Baseline	130± 10	130.4±5.8	130.92±9.9	0.06	>0.05(NS)	>0.05(NS)	>0.05(NS)
Immediately after study drug injection	113.2± 8.2	121.3± 4.93	132± 9.05	<0.0001	<0.01	<0.001	>0.05(NS)
After induction	108.16±10.4	115.3±5.2	126.72± 7.8	<0.0001	<0.01	<0.001	>0.05(NS)
After intubation immediately	118 ± 3.42	135.1 ±4.08	150 ± 6.13	<0.0001	<0.001	<0.001	<0.001
3RD Minute	115± 6.31	137.36± 3.8	144 ± 5.45	<0.0001	<0.001	<0.001	<0.001
5TH Minute	111±7.6	132.3± 3.83	140.1 ± 5.43	<0.0001	<0.001	<0.001	<0.001
7TH Minute	106.5± 7.2	128.3±4.2	135.5± 5.7	<0.0001	<0.001	<0.001	<0.001
10TH Minute	104± 9.2	122.9± 3.71	130.7± 5.02	<0.0001	<0.001	<0.001	<0.001

Table 4: Changes in Diastolic Blood Pressure

DBP (mmHg)	Group D (Mean±SD)	Group E (Mean±SD)	Group C (Mean±SD)	P Value	P Value (D/E)	P Value (D/C)	P Value (E/C)
Baseline	79.64± 7.8	78.16± 7.9	79.6± 7.8	0.70(NS)	>0.05(NS)	>0.05(NS)	>0.05(NS)
Immediately after study drug injection	68.6± 5.9	74.12± 2.43	79.5±8.70	<0.0001	<0.01	<0.001	<0.05
After induction	65.5± 5.3	71.92± 3.25	76.36± 7.15	<0.0001	<0.001	<0.001	<0.05
After intubation immediately	75.24± 4.89	90.2± 4.02	102.96±5.08	<0.0001	<0.001	<0.001	<0.001
3RD minute	73± 5	91.9± 2.67	104.9±3.96	<0.0001	<0.001	<0.001	<0.001
5TH minute	69.04± 4.92	87 ± 3.3	96.56± 3.24	<0.0001	<0.001	<0.001	<0.001
7TH minute	67.24± 6.3	82.4± 3.02	92.6±2.81	<0.0001	<0.001	<0.001	<0.001
10TH minute	68.6± 6.23	79.6± 2.3	89.32± 3.73	<0.0001	<0.001	<0.001	<0.001

Table 5: Changes in Mean Arterial Blood Pressure

MBP (mmHg)	Group D (Mean±SD)	Group E (Mean±SD)	Group C (Mean±SD)	P Value	P Value (D/E)	P Value (D/C)	P Value (E/C)
Baseline	96.6± 7.31	95.48± 6.01	96.64± 7.31	0.75(NS)	>0.05(NS)	>0.05(NS)	>0.05(NS)
Immediately after study drug injection	83.64± 5.6	89.92± 2.58	96.96±7.31	<0.0001	<0.01	<0.001	<0.05
After induction	79.96±5.70	86.36 ± 2.99	91.2± 5.74	<0.0001	<0.001	<0.001	<0.05
After intubation immediately	98± 3.4	100.2±5.2	109±5.9	<0.0001	0.006	0.0001	0.002
3rd minute	83.2± 4.14	107.04±2.55	117.5± 3.72	<0.0001	<0.001	<0.001	<0.001
5th minute	80.2± 5.02	100.32±2.70	110.52±2.56	<0.0001	<0.001	<0.001	<0.001
7th minute	81.16± 5.89	95.28± 2.7	106.96±2.89	<0.0001	<0.001	<0.001	<0.001
10th minute	80.52± 6.65	91.68±2.51	104.6±3.08	<0.0001	<0.001	<0.001	<0.001

Abbreviations:
D – Dexmedetomidine
E – Esmolol
C – Control
SD – Standard Deviation

was seen in 2 cases (8%) and 3 cases (12%) in Group D and E respectively. All were treated appropriately.

Discussion

Laryngoscopy and endotracheal intubation are considered as most crucial procedures during induction of general anesthesia because they lead to a transient yet marked sympatho-adrenal response [1]. Healthy individuals may tolerate this response but patients with cardiovascular compromise, cerebrovascular disease and intracranial aneurysm may not tolerate these transient changes in hemodynamics which may result in ventricular failure, pulmonary edema, myocardial ischemia, arrhythmias and intracranial bleeds. This response usually lasts for 7- 10 minutes [2], this observation was concomitant with our finding of increase in hemodynamics till approximately 10 minutes in control group.

The hemodynamic response to this stimulus is due to the intense sympathetic discharge caused by stimulation of oro-laryngopharynx. Also placing the endotracheal tube through vocal cords and inflating the cuff in infra-glottic region contributes to sympatho-adrenal response.

Dexmedetomidine acts on α adrenoreceptors that are involved in regulating the autonomic nervous system and cardiovascular system. α2 receptors are located on blood vessels and central sympathetic presynaptic terminals. Stimulation of these receptors leads to reduction in central sympathetic outflow, augmentation of vagal activity and sedation which results in decrease in HR and cardiac output and in turn decreases blood pressure [12].

Dexmedetomidine has been used for attenuating pressor response by many authors at doses in range of 0.5 to 1 micrograms/kg [12-21]. But higher dose may be associated with hypotension and bradycardia. Rapid and bolus administration can cause tachycardia, bradycardia and hypertension followed by hypotension [15]. We used 1microgram/kg dexmedetomidine over 10 min infusion, yet encountered two cases of bradycardia.

A biphasic cardiovascular response of transient increase in blood pressure and reflex bradycardia is seen in healthy patients due to α2 receptor stimulation of vascular smooth vessels. This can be decreased by slow infusion. Apart from this effect, dexmedetomidine also seems to decrease adverse cardiac events like myocardial infarction by decreasing α receptor stimulation thus modulating coronary blood flow [13,15]. In our study we did not encounter any cardiac events except from bradycardia in 2 patients.

Siddareddigari Velayudha Reddy et al. [16] did similar study between dexmedetomidne 1 microgram/kg and esmolol 2 mg/kg for their efficacy in blunting pressor response and found that mean increase in HR was minimal in Group D than Group E and control group immediately after intubation and mean HR was not significantly increased in Group D at any time interval. While comparing the effect on MAP, Group D had lower MAP immediately after intubation till end of surgery whereas esmolol has less effect on control of MAP. They also showed decrease in requirements of anesthetic agents in both groups, more in dexmedetomidine group .

Esmolol has various properties like cardio-selectiveness, ultrashort acting, less drug interactions with commonly used anesthetics which makes it a valuable agent [11]. Many studies [3,4,5,9,15,16,18,22] have proved that esmolol has solely or predominantly negative chronotropic effect and less effect on blood pressure. In accordance to this our study also reflected that esmolol at 2 mg/kg was more effective in blunting the rise of HR than MAP.

Arti rathore et al. [22] used esmolol at different doses of 50 mg, 100mg, 150mg and demonstrated prevention of rise in heart rate in dose response manner. Decrease in MAP was significant only at higher dose with single incidence of treatable bradycardia. We used esmolol at 2 mg/kg which caused fewer side effects of bradycardia and hypotension.

Ajay Gupta et al. [5] compared esmolol 1.5 mg/kg with lignocaine 1.5 mg/kg and found that esmolol significantly attenuated HR for a maximum duration of 2 minutes after intubation. In contrast to this, our study suggested mild increase of 5% from baseline after intubation and later maintenance of heart rate at around baseline HR till 10 minutes.

Researchers have used invasive arterial blood pressure for monitoring exact fluctuations in the blood pressure. Usual non-invasive blood pressure monitoring requires an average of 40 seconds to measure blood pressure by oscillatory method, but the pressor response is a continuous process (maximum within 1 minute) which requires continuous monitoring [18]. We did not use invasive BP monitoring which may be the limitation of our study. This study was done on ASA I and II so effects in high risk patients could not be seen.

Conclusion

Evaluation of baseline and immediately after intubation value of hemodynamic parameters revealed a greater percentage variation in MAP in the esmolol and control groups as compared to the dexmedetomidine group. While considering variations in mean heart rate, attenuation was seen in both the study groups D and E. This suggests that both esmolol and dexmedetomidine blunts rise in heart rate but rise in blood pressure is better controlled with dexmedetomodine. Within the constraints of this study we demonstrated that administration of a single dose of dexmedetomidine before general anesthesia induction was an effective method for attenuating the hemodynamic response to endotracheal intubation.

Acknowledgement

Conflict of Interest No

Key Messages

Pressor response attenuation during laryngoscopy and oral intubation is very important aspect specially in compromised patients with cardiac and neurological diseases. Appropriate pharmacological agent is being sought for and dexmedetomidine seems to be promising.

References

1. Kayhan Z, Aldemir, Metler H. Which is responsible for hemodynamic response due to laryngoscopy and endotracheal intubation? Catecholamines, vasopressin or angiotensin? European Journel of Anesthesiology 2005;22;780-5.
2. Sukhminder Jit Singh Bajwa, Jasbir Kaur. Attenuation of pressor response and dose sparing of opioids and anaesthetics with preoperative dexmedetomidine. Indian J Anaesth. 2012 Mar-Apr;56(2):123–28.
3. Shailaja S, Srikantu J. Comparison of effect of esmolol vs. esmolol and fentanyl on hemodynamic response to laryngoscopy and tracheal intubation in controlled hypertensive patients: a randomized controlled double blind study. Anaesth Pain & Intensive Care 2013;17(3):267-73.
4. Ajay Gupta , Renu Wakhloo, Vishal Gupta , Anjali Mehta, BB Kapoor. Comparison of Esmolol and Lignocaine for Attenuation of cardiovascular stress response to laryngoscopy and endotracheal Intubation. J K Science, 2009 Apr-Jun;11(2):78-81.
5. Fernandez-Galinski S, Bermejo S, Mansilla R, Pol O, Puig MM. Comparative assessment of the effects of alfentanil, esmolol or clonidine when used as adjuvants during induction of general anaesthesia. Eur J Anaesthesiol. 2004;21:476–82.
6. Batra YK, Indu B, Puri GD. Attenuation of pulse rate and blood pressure response to laryngoscopy and tracheal intubation by clonidine. Int J Clin Pharmacol Ther Toxicol. 1988;26:360–3.
7. Pathak D, Slater RM, Ping SS, From RP. Effects of alfentanil and lidocaine on the hemodynamic responses to laryngoscopy and tracheal intubation. Indian J Clinical Anesthesiology. 1990;2:81–5.
8. Mikawa K, Obara H, Kusunoki M. Effect of nicardipine on the cardiovascular response to tracheal intubation. Br J Anaesth. 1990;64:240–2.
9. Singh SP, Quadir A, Malhotra P. Comparison of esmolol and labetalol, in low doses, for attenuation of sympathomimetic response to laryngoscopy and intubation. Saudi J Anaesth. 2010;4:163–8.
10. VL Scott-Warren, J Sebastian; Dexmedetomidine: its use in intensive care medicine and anaesthesia, BJA Education, 2016 July 1;16(7):242–246.
11. R.D. Reynolds, R.J. Gorczynski, C.Y. Quon. Pharmacology and pharmacokinetics of esmolol. J Clin Pharmacol. 1986 Mar;26 (Suppl A):A3–A14.
12. R. Saraf, M. Jha, Sunil Kumar, K Damani, S. Bokil. Dexmedetomidine, the ideal drug for attenuating the pressor response. Pediatric Anesthesia and Critical Care Journal 2013;1(1):78-86, doi:10.14587/paccj.2013.15.
13. Ralph Gertler, H. Cleighton Brown, Donald H. Mitchell & Erin N. Silvius. Dexmedetomidine: A Novel Sedative-Analgesic Agent, Baylor University Medical Center Proceedings, 2017;14:1,13-21.
14. Menda F, Köner O, Sayin M, Türe H, Imer P, Aykaç B. Dexmedetomidine as an adjuvant to anesthetic induction to attenuate hemodynamic response to endotracheal intubation in patients undergoing fast tract CABG. Ann Card Anaesth 2010;13:16-21.
15. 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.
16. Siddareddigari Velayudha Reddy, Donthu Balaji, and Shaik Nawaz Ahmed. Dexmedetomidine versus esmolol to attenuate the hemodynamic response to laryngoscopy and tracheal intubation: A randomized double-blind clinical study. Int J Appl Basic Med Res. 2014 Jul-Dec;4(2):95–100.
17. Yildiz M, Tavlan A, Tuncer S, Reisli R, Yosunkaya A, Otelcioglu S. Effect of dexmedetomidine on haemodynamic responses to laryngoscopy and intubation: perioperative haemodynamics and anaesthetic requirements. Drugs R D. 2006;7(1):43-52.
18. Srivishnu Vardhan Yallapragada, Krishna Santh Vidadala, Nagendra Nath Vemuri, and Mastan Saheb Shaik. Comparison of the efficacy of dexmedetomidine with that of esmolol in attenuating laryngoscopic and intubation response after rapid sequence induction. Anesth Essays Res. 2014 Sep-Dec; 8(3):383–87.
19. Sulaiman S, Karthekeyan RB, Vakamudi M, Sundar AS, Ravullapalli H, Gandham R. The effects of dexmedetomidine on attenuation of stress response to endotracheal intubation in patients undergoing elective off-pump coronary artery bypass grafting. Ann Card Anaesth 2012;15:39-43.
20. Dogru K, Arik T, Yildiz K, Bicer C, Madenoglu H, Boyaci A. The effectiveness of intramuscular dexmedetomidine on hemodynamic responses during tracheal intubation and anesthesia induction of hypertensive patients: A randomized, double-blind, placebo-controlled study. Curr Ther Res Clin Exp. 2007;68:292–302.
21. Scheinin B, Lindgren L, Randell T, Scheinin H, Scheinin M. Dexmedetomidine attenuates sympathoadrenal responses to tracheal intubation and reduces the need for thiopentone and peroperative fentanyl. Br J Anaesth. 1992;68:126–31.
22. Arti rathore, H. K. Gupta, G. L. Tanwar, H Rehman rathore. Attenuation of the pressure response to laryngoscopy and endotracheal intubation with different doses of esmolol. Indian J. Anaesth. 2002;46(6):449-52.

Original Research Article

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The Effectiveness of Ondansetron versus Tramadol as Pretreatment in Alleviating Propofol Injection Pain: A Comparative Study

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Abstract

Introduction: Propofol is widely used for induction of anesthesia, although the pain during its injection remains a concern for all anesthesiologists. A number of techniques have been adopted to minimize propofol-induced pain. Various 5-hydroxytryptamine-3 antagonists have shown to reduce propofol-induced pain. Hence, this placebo-controlled study was conducted to compare the efficacy of ondansetron, ramosetron, and lignocaine in terms of attenuation of propofol-induced pain during induction of anesthesia. *Aim of the Study:* To assess the effectiveness of ondansetron and tramadol as pre-treatment in alleviating propofol injection pain. *Materials and Methods:* 36 patients were randomly allocated into two groups. Group 1 who received up to 2 mL pretreatment with 50 mg tramadol with 1 ml NS while group 2 cases who received 2 mL pretreatment 4 mg ondansetron. The drug is injected into the largest vein on the dorsum of the hand by means of a 20 gauge cannula and the tourniquet being closed to the arm above the cannula and inflated upto 70 mmHg. The tourniquet is deflated after 20 seconds and propofol 2mg/kg injected over 10 seconds and assessment for pain was made. *Results*: Tramadol and ondansetron both reduced the incidence and severity of propofol injection pain but pain reduction with ondansetron was significant compared to tramadol (p=0.0402). Significantly 14 patients in the ondansetron group felt no pain when compared to only 8 patients in the tramadol group. *Conclusion:* In addition,ondansetron had the additional benefit as it controlled postoperative nausea and vomiting.

Keywords: Ondansetron; Tramadol; Propofol; Pain; Intravenous Injection.

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Introduction

Propofol is the medication of choice for induction of general anesthesia in a large number of patients consistently as a result of its rapid onset and short-term of action, easy titration, and favorable side effect profile [1]. Despite these positive qualities, around three out of five patients encounter severe or excruciating pain during the infusion of propofol, which is very distressing to patients. A few patients consider the perioperative period as the worst part of anesthesia induction. It is ranked seventh among thirty-three clinical problems when the frequency of occurrence and clinical significance were considered in clinical practice by American anaesthesiologist [2]. Moreover, 70% of patients encounter pain which is aching or burning and extremely sharp in nature [3]. Although various interventions are been used to alleviate the pain caused by intravenous infusion of propofol, the exact mechanism of how itinduces pain is still unclear [4]. Tramadola centrally acting weak μ receptor agonist promotes the release of serotonin

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there by inhibiting nor-adrenaline re-uptake [5]. Like lidocaine, pre-treatment with tramadol was found to be effective in alleviating pain on propofol infusion by Wong and Cheong [6]. Ondansetron which is a 5-HT receptor antagonist specific which blocks Na channel in rat brain neurons and it is also found to cause numbness, 15 times more than lidocaine when injected under the skin, has shown promising results as analternative to tramadol as described by Ye et al. [7-9]. Further recent studies have documented ondansetron as an established agent in preventing postoperative nausea and vomiting in procedures done for eye surgeries [10-13]. But till date very little published data are available illustrating the efficacy of ondansetron in alleviating pain caused by propofol infusion. Thus, we postulated thatpretreatment with intravenous ondansetron perhaps will reduces pain on propofol infusion. Hence, this study was designed to assess the effectiveness of ondansetron and tramadol as pretreatment for the alleviation of pain on propofol injection.

Materials and Methods

The prospective, comparative, double-blinded study. This study was conducted in the Department of Anaesthesiology, Karpaga Vinayaga Institute of Medical Science, after obtaining approval by the Institutional Ethics Committee. Totally thirty-six patients, eighteen in each group, aged between 18 and 60 years of either sex, scheduled for an elective surgery were considered for this study. Written informed consent was betaken from all the patients.

Inclusion Criteria

1. Patients aged between 18-60 years.
2. Patients scheduled for an elective surgery belonging to American Society of Anaesthesiologists Status I and II.

Exclusion Criteria

1. Patients with known hypersensitivity to propofol or tramadol, concomitant analgesic or sedative medication.
2. Presence of infection on the dorsum of the left hand; indications for rapid sequence intubation; the presence of cardiac conduction defects; epilepsy; and use of anti-arrhythmic medications, thin dorsal veins, and uncooperative patients.In our study, patients were randomly assigned to two groups of 18 patients each. There was no administration ofpre-medication. The largest vein on the dorsum of the left hand was chosen for placing the 20-gauge cannula along with other monitoring instruments like lead II electrocardiogram, pulse oximeter, and noninvasive blood pressure. As pretreatment, group 1 patients received 2ml tramadol 50mg in the saline while group 2 patients received 4mg ondansetron 2ml for a period of 10 seconds while the venous drainage was occluded by placing an air-filled tourniquet on the upper arm by an assistant. The solution was prepared by a blinded anesthetist, while the investigator was not aware of the content of the solution. 1% propofol (2mg/kg) was injected over a period of 10 seconds after the occlusion was released after 20 seconds. The drug was preservative free and was kept at room temperature. No sedative or analgesic was administered before propofol administration. The levels of pain on injection of propofol were assessed by another clinician who was unaware of patients allotment into groups. Patients verbal response, behavior signs which includes facial grimacing, arms withdrawal, or tears were recorded after answering to standard questions regarding any adverse effects after drug administration. A score of 0 to 3 was noted (0=nil, 1=mild, 2=moderate, 3=severe pain). We injected opioid and sedative after propofol for recording the patient's reliable response. Anesthetic induction and tracheal intubation were facilitated accordingly. The patients were extubated after administration of muscle relaxant antagonist and were followed up for the next 6 hours and assessed for any adverse reactions including pain, swelling or any allergic reactions at the propofol injection site by a blinded anesthesiologist.

Statistical Tool Used

Chi-square and t-testwereused.The statistical significance was taken as $p<0.05$ Data were tabulated in Exceland analyzed using SPSS software version 18.

Results

This study involved totally 36 patients who were designated into two groups (the ondansetron group and the tramadol group) of 18 each. The mean age of patients who participated in the study was

44.78±11.11 while for was ondansetron group was 45.22±9.42 (8 males and 10 females) and for tramadol group, it was 44.33 ± 12.84 (9 males and 9 females) respectively.

The incidence of overall pain was found to be 55.5% in tramadol group, while it was only 22.2% among ondansetron group which was found to be significant in this study with a p-value of 0.04 ($p<0.05$). But there was no significant association between pain and age of the patients (Table 1).

Totally 10 patients in the tramadol group experienced pain while the remaining 8 patients were pain-free after propofolinjection.while the number of patients who were pain-free in the ondansetron group was comparatively higher and only 4

Table 1: Comparison between pain and no pain among ondansetron and tramadol groups

Pain level	Tramadol	Ondansetron	Overall	Chi-square test	p-value
No pain	8	14	22	4.2078 (DF=1)	0.0402
Pain	10	4	14		p-value

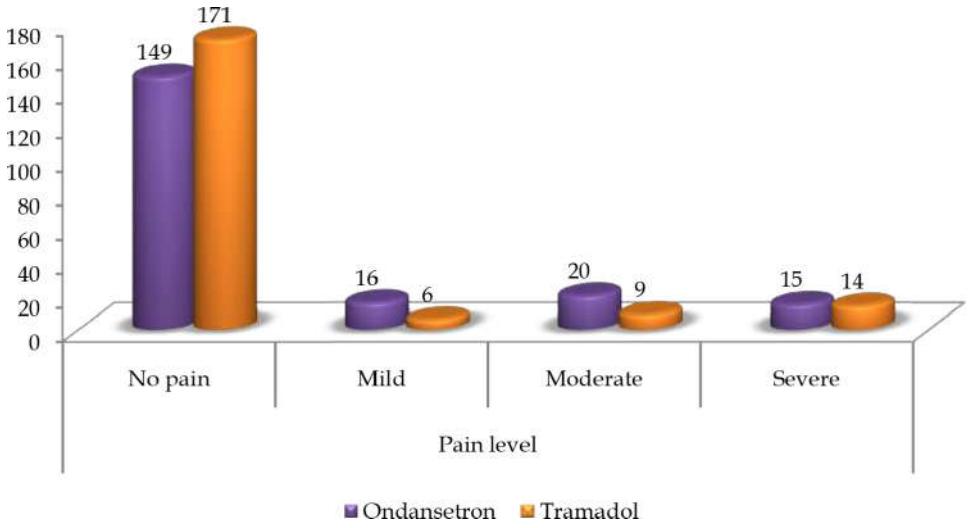

Fig. 1: Comparison of pain levels between ondansetron and tramadol groups

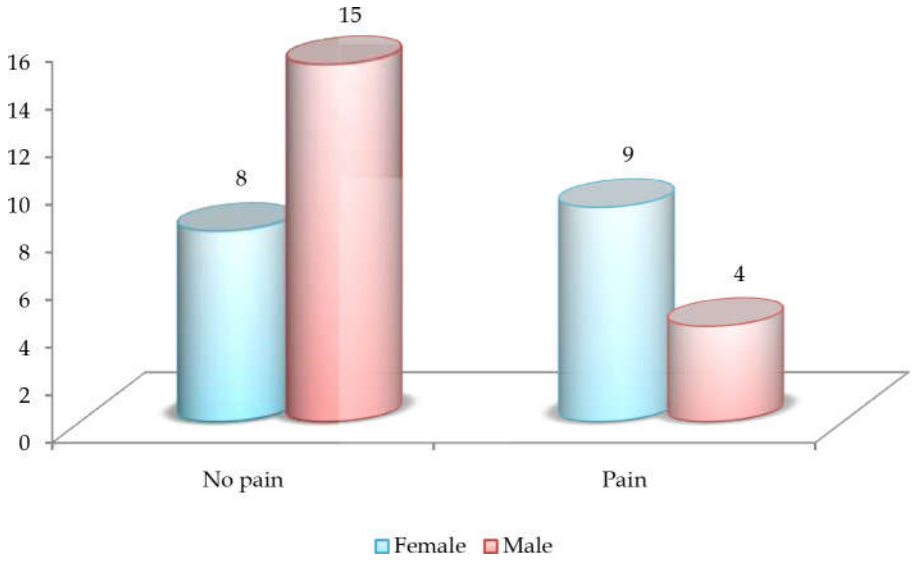

Fig. 2: Comparison between gender and pain among patients

patients experienced some sort of pain (Table 2).

Discussion

Propofol has always been a problem for clinicians for over a decade as it causes pain on injection. Studies reveal incidence around 28% to 90% in adults while in children, the incidence rate is around 85% [14,15]. Propofol which is commonly used for induction and maintenance of anesthesia causes distress to patients on infusion. While the uncertainty remains over the mechanism of causation of pain. Propofol irritates skin, mucous membrane and venous intima and has the tendency to stimulate nociceptors and free nerve endings [8]. Yull et al. described the cause of propofol infusion pain was due to release of local kininogens and they also stated that nonsteroidal anti-inflammatory drugs can certainly reduce the incidence of pain (eg – ketorolac) [16]. Propofol, when administered through small veins at the dorsum of the hand, causes pain which accounts for 45% -75% of patients [17,18]. Various methods to minimize this pain have been proposed, which includes utilizing bigger veins [19], preparations containing lidocaine, an opioid or midazolam before the injection of propofol [17, 18, 20-22], decreasing the concentration of propofol with 5% glucose or 10% intralipid [20], infusing cool saline with the propofol or discontinuing fluid during the injection [23], or administering 5-hydroxytryptamine-3 antagonist [24]. Bradykinin which is released by the activation of the kallikrein-kinin system is speculated as the root cause of pain as described by Scott et al.[17]. Bradykinin by increasing the contact between the nerve endings and aqueous phase propofol results in pain on propofol injection [25]. We have used venous retention with a tourniquet in our study as it is the procedure frequently utilized for pretreatment of propofol infusion pain [26-28]. Ondansetron is considered an antiemetic drug and a widely used 5-hydroxytryptamine-3 antagonist [29]. Ye et al. [7] havepreviously exhibited that ondansetron may be considered for novel type local anesthetics as it blocks sodium channel neurons in the rat brain. Like local anestheticsondansetron can block sodium channels; 5-hydroxytryptamine-3 receptors are additionally associated with nociceptive pathways and have demonstrated binding at opioid μ receptors showing agonist activity, subsequently bringing about a peripheral antinociceptive effect [7,30]. Ondansetron additionally attaches to opioid μ receptors with agonist action and might be useful in counteracting infusion pain caused by medications, for example, propofol [30] Ondansetron, when given at 2 ml, was found to be satisfactory in preventing injection site pain which was demonstrated by Ambush et al.[8]. In our investigation, we utilized the same dosage of ondansetron as Ambush et al. which diminishes the pain, however, did not completely prevent it. Tramadol is a centrally acting analgesics that delivers a pain relieving effect by preventing the norepinephrine take-up and release without activating the all of the opioid receptors [31]. Pang et al.[31,32] demonstrated that 25 mg of tramadol IM infusion provided an anesthetic effect and in addition demonstrated that 50 mg of tramadol IV prevented injected site pain after propofol infusion when compared with lidocaine but still did not eliminate the pain totally. In our study, 44% of patients did not experience the pain when treated with tramadol compared to 77% of patients treated with ondansetron. A study done by Zahedi et al demonstrated that the percentage of patients around 82.2% had pain or discomfort which significantly reduced to around 24.4% after ondansetron pretreatment [14].

Conculsion

Taking everything into account, ondansetron pretreatment provides a safe and simple procedure for lessening propofol infusion pain with the added benefit of preventing postoperative nausea and vomiting and thereby preventing the usage of undesired medicationswhich could be bothersome in specific conditions.

Source of support: Nil

Conflict of Interest: None

References

1. MarikPE.Propofol: therapeutic indications and side-effects. Curr Pharm Des 2004;10:3639-49.
2. Macario A, Weinger M, Truong P, Lee M. Which clinical anesthesia outcomes are both common and important to avoid? The perspective of a panel of expert anesthesiologists.AnesthAnalg 1999;88:1085–91.
3. Picard P, Tramèr MR. Prevention of pain on injection with propofol: A quantitative systematic review. AnesthAnalg. 2000;90:963–9.

4. Nathanson MH, Gajraj NM, Russell JA. Prevention of pain on injection of propofol: A comparison of lidocaine with alfentanil. AnesthAnalg. 1996;82:469–71.
5. Hennies HH, Friderichs E, Wilsmann K, Flohe L. Effect of the opioid analgesic tramadol on inactivation of norepinephrine and serotonin. BiochemPharmacol 1982;31(8):1654-5.
6. Wong WH, Cheong KF. Role of tramadol in reducing pain on propofol injection. Singapore Med J 2001;42(5):193-5.
7. Ye JH, Mui WC, Ren J, Hunt TE, Wu WH, Zbuzek VK. Ondansetron exhibits the properties of a local anesthetic. AnesthAnalg 1997;85(5):1116-21.
8. Ambesh SP, Dubey PK, Sinha PK. Ondansetronpre treatment to alleviate pain on propofol injection: a randomized, controlled, double-blinded study. AnesthAnalg 1999;89(1):197-9.
9. Reddy MS, Chen FG, Ng HP. Effect of ondansetronpre treatment on pain after rocuronium and propofol injection: a randomized, double-blind controlled comparison with lidocaine. Anesthesia 2001;56(9): 902-5.
10. EbrahimSoltani A, Mohammadinasab H, Goudarzi M, Arbabi S, Mohtaram R, Afkham K, Momenzadeh S, Darabi ME. Acupressure using ondansetron versus metoclopramide on the reduction of postoperative nausea and vomiting after strabismus surgery. Arch Iran Med 2010;13(4):288-93.
11. Peroutka SJ, Snyder SH. Antiemetics: neurotransmitter receptor binding predicts therapeutic actions. Lancet 1982;1(8273):658-9.
12. Boehler M, Mitterschiffthaler G, Schlager A. Korean hand acupressure reduces postoperative nausea and vomiting after gynecological laparoscopic surgery. AnesthAnalg 2002;94(4):872-5.
13. Bhardwaj N, Bala I, Kaur C, Chari P. Comparison of ondansetron with ondansetron plus dexamethasone for antiemetic prophylaxis in children undergoing strabismus surgery. J PediatrOphthalmol Strabismus 2004;41(2):100-4.14
14. Hamid Zahedi, Anahid Maleki, and Gholamreza Rostami. Ondansetron Pretreatment Reduces Pain on Injection of Propofol. Acta Medica Iranica, 2012;50(4): 239-43.
15. Tan CH, Onsiong MK. Pain on injection of propofol. Anesthesia 1998;53(5):468-76.
16. Yull DN, Berkshire KF, Dexter T. Pretreatment with ketorolac and venous occlusion to reduce pain on injection of propofol. Anesthesia 2000;55(3):284-7.
17. Scott RP, Saunders DA, Normal J. Propofol: clinical strategies for preventing the pain of injection. Anesthesia 1988;43:492–4.
18. Cameron E, Johnston G, Crofts S, Morton NS. The minimum effective dose of lignocaine to prevent injection pain due to propofol in children.Anesthesia 1992;47:604-6.
19. Seki S, Sekine R, Aketa K, et al. Induction of anesthesia with propofol injected through a central catheter. Masui 1999;48:62–6.
20. Johnson RA, Harper NJN, Chadwick S, Vohra A. Pain of injection of propofol: methods of alleviation. Anesthesia 1990;45:439-42.
21. Hillier SC. Monitored anesthesia care. In: Barash PG, Cullen BF, Stoelting RK, eds. Clinical Anesthesia. 3rd ed. Philadelphia, PA: Lippincott-Raven,1996:1159–71.
22. Memphis D, Turan A, Karamanlýog ¢lu B, et al. The prevention of pain of injection of propofol by tramadol or ondansetron.Eur J Anaesthesiol 2002;19:47–51.
23. Nakane M, Iwama H. A potential mechanism of propofol-induced pain on injection based on studies using nafamostat mesylate. Br J Anaesth 1999;83: 397–404.
24. Cox JA, Lysko PG, Henneberry RC. Excitatory amino acid neurotoxicity at the N-methyl-D-aspartate receptor in cultured neurons: the role of the voltage-dependent magnesium block. Brain Res 1989;499: 267–72.
25. Coderre TJ, Katz J, Vaccarino AL, Melcack R. Contribution of central neuroplasticity to pathological pain: a review of the clinical and experimental evidence. Pain 1993;52:259–85.
26. Pang WW, Huang S, Chung YT, et al. Comparison of intravenous retention of fentanyl and lidocaine on local analgesia in propofol injection pain. Acta Anaesthesiol Sin 1997;35:217–21.
27. Pang WW, Mok MS, Huang S, Hwang MH. The analgesic effect of fentanyl, morphine, meperidine, and lidocaine in the peripheral veins: a comparative study. AnesthAnalg 1998;86:382–6.
28. Borgeat A, Kwiatkowski D. Spontaneous movements associated with rocuronium: is a pain on injection the cause? Br J Anaesth 1997;79:382–3.
29. Deegan R. Ondansetron: pharmacology of a specific 5HT3receptor antagonist. Am J Med Sci 1992;304: 373–8.
30. Gregory RE, Ettinger DS. 5-HT3 receptor antagonists for the prevention of chemotherapy-induced nausea and vomiting: a comparison of their pharmacology and clinical efficacy. Drugs 1998;55:173–89.
31. Pang WW, Mok MS, Chang DP, Huang MH. Local anesthetic effect of tramadol, metoclopramide, and lidocaine following intradermal injection.RegAnesth Pain Med 1998;23:580–3.
32. Pang WW, Huang PY, Chang DP, Huang MH. The peripheral analgesic effect of tramadol in reducing propofol injection pain: a comparison with lidocaine. RegAnesth Pain Med 1999;24:246–9.

Original Research Article

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A Randomized Comparative Study of Spinal Anaesthesia versus General Anaesthesia for LSCS Patients with Severe Preeclampsia and Eclampsia

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Abstract

Background: It has been several controversies about technique of choice for cesarean section in severe preeclampsia and eclampsia patients for several years. Though earlier general anesthesia was routinely used for giving anesthesia in such patients, in last 10 years the picture has changed. Now, spinal anesthesia is an anesthetic choice for patient with preeclampsia unless it is contraindicated because of hypocoagulation. It was therefore decided to compare the hemodynamics of severely preeclamptic and eclamptic patients undergoing general or spinal of anesthesia. *Material:* We have studied 60 patients with severe preeclampsia and Eclampsia posted for emergency and elective caesarean section. All patients were divided randomly into two groups equally. All patients under the study underwent thorough pre-anaesthetic assessment including detailed case history, clinical examination and necessary investigations. All intraoperative and postoperative untoward complications will be recorded and treated. *Result:* There was statistically significant at all readings where group II were significantly more tachycardic compared to group I patients except preoperative readings for pulse rate, SBP, DBP, and MAP. *Conclusion:* We conclude that, severe preeclampsia and eclampsia patients undergoing spinal anesthesia, experience more hemodynamic instability (in the face of hypotension) than general group, but these changes are not severe, are transient, in the acceptable range and not influence the neonatal outcome. So, spinal anesthesia may be an appropriate anesthetic choice for woman with severe preeclampsia and stable eclampsia patients having cesarean delivery.

Keywords: Eclampsia; Pre-Eclampsia; Cesarean Section; Neonatal.

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Introduction

Severe features of preeclampsia include SBP >/ 160 mmHg or DBP>/110mmHg on two separate occasion atleast four hours apart while on bed rest, thrombocytopenia, impaired liver function with twice normal concentration of liver enzymes, right upper quadrant pain, progressive renal insufficiency with serum creatinine greater than 1.1 mg/dl or doubling of serum creatinine without other known renal disease (oliguria-<500ml in 24 hours), pulmonary edema and new onset cerebral or visual abnormalities. Eclampsia is preeclampsia complicated by seizure activity in the absence of any other pathologic brain condition [1,2].

It has been several controversies about technique of choice for cesarean section in severe preeclampsia and eclampsia patients for several years. According to the pathophysiology of severe preeclampsia and eclampsia, there has been an

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understandable caution as regards spinal anesthesia in these patients, because of the theoretical possibility of precipitous hypotension, decrease cardiac output and associated placental hypoperfusion [3].

On the other hand, the risk of general anesthesia, including failed intubation or esophageal intubation, pulmonary aspiration, drug related fetal depression, blood pressure changes during laryngoscopy and intubation and risk of cerebral hemorrhage may be more grater in preeclamptic woman than healthy patients [1,2,4,5].

Though earlier general anesthesia was routinely used for giving anesthesia in such patients, in last 10 years the picture has changed. Role of regional anesthesia is increasing day by day for LSCS in these patients. Now, spinal anesthesia is an anesthetic choice for patient with preeclampsia unless it is contraindicated because of hypocoagulation [2].

It was therefore decided to compare the hemodynamics of severely preeclamptic and eclamptic patients undergoing general or spinal of anesthesia and evaluate the neonatal outcome in each group. Presumably the use of spinal anesthesia in these patients is of considerable benefit, as it does not affect the neonatal outcome and prevent those patients from the particular hazards of general anesthesia.

Materials and Methods

We have studied 60 patients with severe preeclampsia and Eclampsia posted for emergency and elective caesarean section after ethical committee approval and obtaining informed consent. All patients were divided randomly into two groups equally.

Group I: Receive Spinal anaesthesia for caesarean section.

Group II: Receive General anaesthesia for caesarean section.

Selection of Cases

All patients under the study underwent thorough pre-anaesthetic assessment including detailed case history, clinical examination and necessary investigations. Investigations include hemogram, coagulation profile, urine routine. In the antepartum management, all the patients received magnesium sulphate as seizure prophylaxis and labetalol intravenously as vasodilator for additional blood pressure control against their standardized protocol. Previous use of other drugs (alpha – methyldopa, dexamethasone) was recorded.

Inclusion Criteria

a. Patients with severe pre eclampsia and eclampsia
b. ASA Grade III and IV

Exclusion Criteria

a. Patient refusal
b. Patient with bleeding disorder or on anticoagulant
c. Sensitivity to local Anaesthetic drugs
d. Patient with continuous convulsion
e. Infection at site of block
f. ASA Grade V

Data Collection Procedure

Patient was explained about procedure in their vernacular language, written and informed consent was taken. Basic vitals sign in the form of Heart rate, NIBP, Respiratory Rate, SpO_2, Urine output was recorded. Dose and time of inj. Magnesium sulphate ($MgSO_4$) as seizure prophylaxis was noted. Two wide bore IV line were secured.

Premedication

Group I: Inj. Ranitidine 1mg/kg i.v., Inj. Metaclopramide 0. 2 mg/kg i.v., Inj. Glycopyrrolate 0.004 mg/kg i.v.

Patients was preloaded with 10 ml/kg of Ringer lactate

Group II– Inj. Ranitidine 1 mg/kg i.v., Inj. Metaclopramide 0.2 mg/kg i.v., Inj. Glycopyrrolate 0.004 mg/kg i.v.

Anaesthesia Technique

Group I (spinal) All patients were preloaded with 10 ml/kg of Ringer Lactate and monitored with NIBP, ECG, Pulse Oxymetry. In Left lateral postion and under all aseptic precautions Lumber puncture was done in L3 – L4 interspace by 25G spinal needle, after continuous, clear and free flow of cerebrospinal fluid (CSF) inj. Bupivacaine 0.5% (Hyperbaric) 1.6cc – 2cc was injected in subarachnoid space according to height of patient. Patient was turned supine and 15° lift was given as wedge under

right buttocks to prevent supine hypotension. Peak sensory block level was assessed with pin prick. A waiting period of 20 minutes or time for maximal spinal action, whichever occurred earlier, was allowed to pass before general anesthesia induction. Any cases of failed spinal anesthesia were managed by giving general anesthesia and excluded from the study. Patients were received 4 L/min of oxygen from face mask throughout surgery.

Group II: All patients were preoxygenated with 100% Oxygen for 5 minutes. All patients were induced on inj. Propofol 2 mg/kg i.v. and muscle relaxation were achieved with inj. Suxamethonium chloride 1.5 mg/kg with rapid sequence induction and celic Maneuver. Under rapid, smooth direct laryngoscopic vision patient was intubated with proper size endotracheal tube, cuff will be inflated, endotracheal tube was connected to the close circuit, bilateral air entry will be checked and confirmed with $ETCO_2$, endotracheal tube will be fixed. Anaesthesia was maintained on Oxygen: Nitrous oxide 50:50, isoflurane 0.6%. Neuromuscular blockade was achieved with inj. Vecuronium 0.08 mg/kg i.v. Intraoperatively, Inj. Midazolam 1 mgi.v. and inj. Pentazocine 15 mgi.v was given after the delivery of baby.

At the end of surgical procedure and after appearance of spontaneous respiration reversal was given with inj. Neostigmine 0.05 mg/kg and inj. Glycopyrrolate 0.008 mg/kg. Endotracheal tube was removed after thorough oropharyngeal and ETT suction. Patients were received 6 – 8 L/min of oxygen from face mask postoperatively. Demographic data including age, gestational age was recorded. Vitals signs (BP.HR, SpO_2) were recorded before (baseline) and immediately after anesthesia, every 5 minutes thereafter throughout surgery using automated noninvasive devices. Peak sensory block level was assessed in group I (S). Mallampatti's class and grading of laryngoscopy were determined in group II(G). Any decrease or increase in blood pressure about 30% from baseline was treated with 2.5-5 mg ephedrine and repeated as needed or with inj. labetalol, respectively.

Immediately after induction and every 5 minutes intra-operatively, every 15 minutes for 2 hours postoperatively, all parameters were recorded. Apgar score will be recorded at 1 minute and at 5 minute, after delivery of baby. All intraoperative and postoperative untoward complications will be recorded and treated.

Statistical Analysis

Descriptive statistics such as mean, SD and percentage were used. Comparison between two groups was done by using unpaired t test for continuous variable and chi-square or z-test for categorical variable. A p-value less than 0.05 were considered as significant.

Result

There were no statistically differences between two groups regarding maternal age and the gestational age of the newborn compared using unpaired 't ' test. Most of the patients are young and term gestation (Table 1).

The Table 2 shows neonatal condition markers in two groups. There were no statistically significant differences between the two groups regarding APGAR score of the newborn at 1 minute and at the 5 minute compared using unpaired 't' test.

The Table 3 shows changes in the maternal mean pulse rate between the two groups at various periods. They were statistically significant at all readings where group II were significantly more tachycardic compared to group I patients except

Table 1: Basic characteristics

	Group – I(S)		Group – II(G)		P value	Inference
	Mean	SD	Mean	SD		
Maternal Age (Yrs)	23.46	3.99	22.53	3.904	0.3641	NS
Gestational age (wks)	35.83	0.63	35.63	0.54	0.1970	NS

Table 2: Neonatal condition markers

	Group – I		Group – II		P value	Inference
	Mean	SD	Mean	SD		
APGAR score at 1 min.	8.2	0.87	8.2	1.16	1.000	NS
APGAR score at 5 min.	9.96	0.17	9.93	0.24	0.5785	NS

Table 3: Shows Changes in Maternal Mean Pulse Rate/Min at Various Periods

PR	Group I Mean(SD)	Group II Mean(SD)	P value	Inference
A. Before induction				
Before Premedication	80.66 (12.37)	79.86 (9.26)	0.77	NS
After Premedication	87.033 (12.95)	87.06 (8.37)	0.9924	NS
B. After induction				
0 min	81.13 (12.03)	92.73 (9.97)	<0.0001	Significant
5 min	77.566 (11.99)	90.90 (8.87)	<0.0001	Significant
10 min	76.86 (11.11)	86.133 (7.27)	0.0003	Significant
15 min	76.366 (11.03)	84.30 (6.65)	0.0007	Significant
20 min	76.33 (11.02)	87.73 (6.239)	0.0014	Significant
25 min	76.36 (10.99)	82.766 (5.948)	0.0068	Significant
30 min	76.63 (10.57)	82.466 (5.4082)	0.0093	Significant
35 min	76.133 (10.38)	81.90 (4.7913)	0.0077	Significant
40 min	76.46 (10.33)	81.5 (4.455)	0.0172	Significant
45 min	74.275 (9.69)	80.433 (4.876)	0.0029	Significant
50 min	74 (10.1038)	80.576 (4.683)	0.0295	Significant
55 min	73.666 (9.58)	79.384 (5.107)	0.0055	Significant
60 min	74.42 (9.69)	79.4 (4.862)	0.0147	Significant
C. Postoperative				
0 min	74.70 (9.536)	81.533 (4.869)	0.0009	Significant
15 min	74.7 (9.536)	81.166 (4.817)	0.0016	Significant
30 min	73.86 (9.38)	80.633 (5.043)	0.0009	Significant
45 min	73.933 (9.193)	80.166 (4.899)	0.0018	Significant
60 min	74.2 (8.964)	79.733 (4.760)	0.0041	Significant
75 min	74.133 (9.061)	79.966 (4.708)	0.0027	Significant
90 min	74.2 (8.62)	79.80 (4.607)	0.0027	Significant
105 min	74.133 (8.605)	79.766 (4.609)	0.0025	Significant
120 min	74.2 (8.510)	79.30 (4.612)	0.0055	Significant

Table 4: Shows Changes in Maternal mean SBP in mmHg at Various Periods

SBP (mmHg)	Group I Mean(SD)	Group II Mean(SD)	P value	Inference
A. Before induction				
Before Premedication	153.43 (4.40)	154.33 (4.51)	0.0437	NS
After Premedication	153.43 (4.40)	154.33 (4.51)	0.5043	NS
B. After induction				
0 min	127.733 (11.084)	160.0667 (15.33)	<0.0001	Significant
5 min	124.30 (10.45)	157.53 (12.33)	<0.0001	Significant
10 min	124.0 (9.39)	139.133 (7.60)	<0.0001	Significant
15 min	122.8 (10.25)	134.46 (6.23)	<0.0001	Significant
20 min	121.66 (9.71)	133.2 (5.50)	<0.0001	Significant
25 min	121.8 (10.44)	132.333 (4.706)	<0.0001	Significant
30 min	122.4 (9.024)	131.26 (3.66)	<0.0001	Significant
35 min	121.40 (8.456)	130.53 (3.461)	<0.0001	Significant
40 min	122.66 (8.202)	130.533 (3.499)	<0.0001	Significant
45 min	122.48 (8.62)	130.533 (3.383)	<0.0001	Significant
50 min	121.39 (8.05)	130.384 (3.420)	<0.0001	Significant
55 min	123.33 (6.666)	131.692 (1.896)	<0.0001	Significant
60 min	124.57 (4.86)	131.8 (2.088)	<0.0001	Significant
C. Postoperative				
0 min	125.46 (7.28)	134.333 (3.9015)	<0.0001	Significant
15 min	125.46 (7.62)	137.80 (6.352)	<0.0001	Significant
30 min	125.06 (7.51)	138.933 (7.243)	<0.0001	Significant
45 min	125.33 (7.030)	142.3 (4.899)	<0.0001	Significant
60 min	125.60 (7.273)	136.8 (8.603)	<0.0001	Significant
75 min	125.2 (6.56)	136.48 (7.5132)	<0.0001	Significant
90 min	125.26 (6.64)	136.266(7.531)	<0.0001	Significant
105 min	124.93 (6.60)	135.333 (7.32)	<0.0001	Significant
120 min	125.2 (6.665)	134.7 (7.085)	<0.0001	Significant

preoperative readings.

The Table 4 shows changes in mean systolic blood pressure values at various periods between the two groups. They were statistically significant at all readings except preoperative reading.

The Table 5 shows changes in mean diastolic blood pressure at various periods in both groups. Differences in mean diastolic blood pressure values between the two groups were statistically significant and lower in group I compared to group II at all readings except preoperative reading.

The table 6 shows changes in mean MAP at various periods in both groups. Differences in mean arterial blood pressure values between the two

Table 5: Shows Changes in Maternal mean DBP in mmHg at Various Periods

DBP (mmHg)	Group I Mean (SD)	Group II Mean (SD)	P value	Inference
A. Before induction				
Before Premedication	92.06 (4.93)	94.43 (4.81)	0.0645	NS
After Premedication	92.06 (4.931)	94.43 (4.81)	0.0645	NS
B. After induction				
0 min	78.60 (5.46)	97.233 (7.994)	<0.0001	Significant
5 min	76.020 (5.92)	95.06 (5.67)	<0.0001	Significant
10 min	75.66 (5.51)	92.0 (4.28)	<0.0001	Significant
15 min	75.46 (5.11)	91.06 (3.85)	<0.0001	Significant
20 min	74.93 (5.28)	90.333 (3.90)	<0.0001	Significant
25 min	74.4 (5.75)	89.733 (3.375)	<0.0001	Significant
30 min	75.33 (4.011)	88.0 (3.055)	<0.0001	Significant
35 min	74.80 (4.052)	85.0 (2.7688)	<0.0001	Significant
40 min	75.6 (4.144)	84.4 (2.550)	<0.0001	Significant
45 min	76.06 (4.21)	83.333 (3.319)	<0.0001	Significant
50 min	74.69 (4.476)	83.0769 (3.2453)	<0.0001	Significant
55 min	77.11 (3.54)	82.307 (3.122)	<0.0001	Significant
60 min	78.28 (2.24)	80.8 (1.833)	<0.0001	Significant
C. Postoperative				
0 min	77.2 (4.57)	82.666 (2.844)	<0.0001	Significant
15 min	76.733 (5.151)	82.344 (2.815)	<0.0001	Significant
30 min	76.8 (4.085)	81.8 (4.641)	<0.0001	Significant
45 min	77.26 (3.776)	82.3 (12.21)	<0.0001	Significant
60 min	76.40 (4.363)	81.8 (5.594)	<0.0001	Significant
75 min	76.8 (3.745)	81.933 (4.304)	<0.0001	Significant
90 min	76.066 (4.14)	81.733 (4.464)	<0.0001	Significant
105 min	77.066 (3.60)	81.133(4.022)	<0.0001	Significant
120 min	76.46 (3.63)	81.133 (3.922)	<0.0001	Significant

Table 6: Shows Changes in Maternal mean MAP in mmHg at Various Periods

MAP (mmHg)	Group I Mean(SD)	Group II Mean(SD)	P value	Inference
A. Before induction				
Before Premedication	112.52 (4.56)	114.40 (4.48)	0.1126	NS
After Premedication	112.52 (4.56)	114.40 (4.48)	0.1126	NS
B. After induction				
0 min	95.0 (6.936)	118.17 (10.226)	<0.0001	Significant
5 min	92.23 (7.23)	115.88 (7.76)	<0.0001	Significant
10 min	91.77 (6.57)	107.71 (4.901)	<0.0001	Significant
15 min	91.24 (6.56)	105.53 (4.10)	<0.0001	Significant
20 min	90.51 (6.43)	104.622 (3.894)	<0.0001	Significant
25 min	90.20 (6.98)	103.93 (3.482)	<0.0001	Significant
30 min	91.02 (5.26)	102.422 (3.042)	<0.0001	Significant
35 min	90.333 (5.197)	100.177 (2.677)	<0.0001	Significant
40 min	91.28 (5.018)	99.777 (2.399)	<0.0001	Significant
45 min	91.54 (5.19)	99.066 (2.642)	<0.0001	Significant
50 min	90.260 (5.37)	98.846 (2.491)	<0.0001	Significant
55 min	92.51 (4.48)	98.769 (2.153)	<0.0001	Significant
60 min	93.71 (2.89)	97.80 (1.550)	<0.0001	Significant

C. Postoperative				
0 min	93.28 (5.30)	99.888 (2.547)	<0.0001	Significant
15 min	92.977 (5.151)	100.777 (3.333)	<0.0001	Significant
30 min	92.88 (5.028)	100.84(4.82)	<0.0001	Significant
45 min	93.28 (4.59)	102.65(9.233)	<0.0001	Significant
60 min	92.28 (5.136)	100.133 (6.108)	<0.0001	Significant
75 min	92.93 (4.35)	100.111 (5.006)	<0.0001	Significant
90 min	92.466 (4.670)	99.11 (5.079)	<0.0001	Significant
105 min	93.022 (4.013)	99.2 (4.597)	<0.0001	Significant
120 min	92.71 (4.219)	98.98 (4.5448)	<0.0001	Significant

Table 7: Comparison of Complications

Complications	Group I	Group II	P value	Interference
Difficult Intubation	Nil	3 (10%)	0.0758	NS
Intraoperative hypertension	0	2 (6.67%)	0.1498	NS
Intraoperative hypotension	1 (3.33)	0	0.3125	NS
Delayed Awaking	0	0	0	
Intraoperative pulmonary edema	0	0	0	
Postoperative Hypotension	0	0	0	
Postoperative Hypertension	0	1(3.33%)	0.3125	NS
Postoperative IPPV	0	0	0	
Convulsion	0	0	0	
Postoperative nausea vomiting	3	8	0.09492	NS
Postoperative pulmonary edema	0	0	0	

z-test for proportion

groups were statistically significant and lower in group I compared to group II at all readings except preoperative reading.

In postoperative period, 3 patients in group I and 9 patients in group II were reported to have problems. This difference is significant (p=0.04). From 3 patients of group I, 2 patients had transient nausea without vomiting and one had nausea with mild vomiting. None of them need for treatment. From 9 patients of group II, 1 patient had hypertension, which were consulted with physician for BP control. From another 8 patients, 5 had nausea without vomiting and they need not for treatment. Only 3 patients had persistent nausea and vomiting, treated with inj. Ondensetron (0.08 mg/kg). Other complications including hypotension, pulmonary edema, delayed awaking and cardiac arrhythmias were not seen.

Discussion

Fetal development is related to gestational age and to cronic utero-placental insufficiency, which result in intrauterine growth restriction. In addition any acute maternal deterioration may impact unfavorably on fetal outcome [2,3].

In this study equivalence is seen between the two study group in terms of demographic and clinical data, severity of maternal disease and gestational age. Such that mean baseline systolic and diastolic blood pressure of all mothers were high inspite of preoperative antihypertensive therapy. All of these, allow us to assess the influence of anesthesia independently.

One of the most important factor in the spinal anesthesia is sensory block level. The appropriate sensory level for cesarean section is T4 [2]. Adequate analgesia eliminates the using of supplemental systemic analgesia which could more interfere with maternal and fetal condition. On the other hand, high spinal level of block may influence the hemodynamic of mother with higher sympathetic block which could more lessen blood pressure of them.

In this study the sensory level of spinal group patients were adequate and there was not seen any decrement in maternal blood pressure in higher level (T4) in compared with lower level (T7). Also the quality of analgesia was satisfactory, so it did not necessitate for additional systemic analgesia or anesthesia.

Alteration in blood pressure were evaluated from two aspect. First systolic and diastolic changes were assessed in each group before (baseline) and after anesthesia. In the spinal group these changes were significant and all patients in this group became hypotensive following spinal anesthesia, but in the general group these changes were not significant

probably due to variable blood pressure changes, were seen in this group. Such that some of the patients became hypertensive following induction of anesthesia (due to laryngoscopy and intubation), some became hypotensive and the other did not experience blood pressure changes. Of course, most of these alterations were in the acceptable range (less than 30% from baseline) and only 1 patient in group I (S) and no patient in group II (G) had systolic blood pressure reduction higher than 30% of baseline and 2 patients from group II and no patient from group I had systolic BP increases by 30% from baseline . This was treated promptly with inj. ephedrine and inj. labetalol respectively.

Also, systolic and diastolic BP alterations were evaluated between two groups. Systolic pressure changes from baseline were 25.7±7.78 and 5.7333± 9.92 in group I and group II respectively, this between –group differences is significant. Changes in diastolic BP were 13.466±5.20 and 3.200±6.404 in group I and group II respectively. These changes were significant when comparing the two groups with each other. These changes reveal that systolic and diastolic BP changes in spinal group were more notable than general group although in the range of 30% from the baseline.

In the study of Ahmed et al. [4], the effects of spinal anesthesia was compared with general anesthesia in preeclamptic patients. Hypotension was seen in 47.1% of spinal group and 68.8% of general group became hypertensive.

Antoine et al. [6] showed that patients with severe preeclampsia experience less hypotension (6 times lesser) during spinal anesthesia with 0.5% Bupivacaine plus sufentanyl and morphine intrathecaly than healthy patients.

Clark AV et al. [7] study suggest that hypotension induced by spinal anesthesia in woman with severe but haemodynamically stabilized preeclampsia, is less than that of normotensive patients.

F. Moslemi et al. [8], examined both markers of neonatal conditions and hemodynamic in severely preeclamptic patients receiving spinal or general anesthesia. They concluded that although the incidence of hypotension was higher in spinal group as compared with general group, but it was in the acceptable range without any dangerous effects on the mother or her neonate.

Ranjusingh et al. [9] studied 12 stable eclampsia patients who received spinal anesthesia for cesarean section and found that one out of twelve patients had an episode of hypotension.

Ashok Deshpande et al. [10], prospective study concluded that incidence and severity of hypotension following spinal anesthesia was less in preeclampsia patients compared to healthy patients.

In our study, although the incidence of hypotension was higher in spinal group, but it was in the acceptable range without any dangerous effect on the mother or her neonate. It was appeared that many factors such as prehydration and other unknown preeclampsia related factors contribute to the lower incidence and severity of hypotension in severe preeclampsia and stable eclampsia patients.

After delivery, most common method used to detecting neonatal conditions is 1, 5 and occasionally 10 minutes Apgar score. Also, the more accurate and predictive measure, especially in high risk conditions such as fetal distress is neonatal umbilical Arterial acid base values [2].

Accepted criteria used to identify newborn infants at risk of fetal hypoxia are Apgar score less than 7 at one and five minutes, neonatal umbilical PH < 7.2 and umbilical Arterial base deficit greater than 10mm [3].

In the current study, 1 and 5 minutes Apgar score were evaluated; there was not seen significant difference between groups in 1 and 5 minutes Apgar scores. Three neonates in spinal group and six neonates in general groups had 1 minute Apgar score less than 7, but their 5 minute Apgar score became 9 or 10 after simple resuscitation (stimulation, free flow oxygen and positive pressure ventilation).

Shifman and Filippovich [11], contains data on retrospective observation study of 54 cases with subarachnoid anesthetic management for cesarean section in preeclampsia. The results showed that no complications were detected in mother and fetus of the experimental group and confirmed the safety of this method in the patients with preeclampsia.

Visalyaputra et al. [12], comparing the effect of spinal and epidural anesthesia for cesarean delivery in severely preeclamptic patients showed that although the incidence and severity of hypotension and ephedrine use were more in spinal group than in epidural group, but the duration was short (≤ 1 minute) in both groups and neonatal Apgar score and the umbilical arterial blood gas analysis were similar in either groups.

F.Moslemi et al. [8], compared neonatal condition and maternal hemodynamic in severlypreeclamptic patients receiving spinal or general anesthesia for cesarean section. They concluded that there was no significant group difference in 1 and 5 minutes Apgar score of neonates.

Mai Wedad Abdullah et al. [13], compared Apgar score at 1 and 5 minutes in patients receiving combine spinal epidural or general anesthesia for

cesarean section. They found that combine spinal epidural group Apgar score readings were higher than general anesthesia group.

In the present study, we evaluated the probable complications might be seen intra-operatively and in recovery period after anesthesia. According to Ahmed et al. [4], commonest complications during general anesthesia group were rise in BP in 68%,difficult intubation in 25% cases, pulmonary edema in 12.8%, delayed recovery and mortality 4.3%.

In our study we found the rise of BP in 60% of patients at the time of intubation and difficult intubation in 10% cases. In general group, postoperative hypertension and nausea and vomiting were higher than spinal group .No patient had convulsion and conversion of spinal anesthesia into general anesthesia. In the study of Salman Waris et al. [5], they found difficult intubation in 12%, pulmonary edema 13%, delayed recovery in 26%, rise in BP in 63% and mortality in 10% cases of general anesthesia group compared to spinal group patients. While in spinal anesthesia group there was no mortality.

In study of F. Moslemi et al. [8], found that general group patients had significantly higher postoperative hypertension, nausea and vomiting than spinal anesthesia group.

Ranjusingh et al. [9], studied spinal anesthesia in 12 stable eclamptic patients for cesarean section and saw no convulsion over 48 hours after delivery. He also concluded that spinal anesthesia avoided the known risks of general anesthesia and was not associated with any major complications.

Conclusion

We conclude that severe preeclampsia and Eclampsia patients undergoing spinal anesthesia, experience more hemodynamic instability (in the face of hypotension) than general group, but these changes are not severe, are transient, in the acceptable range and not influence the neonatal outcome. So, spinal anesthesia may be an appropriate anesthetic choice for woman with severe preeclampsia and stable eclampsia patients having cesarean delivery. Furthermore, because of its simplicity and rapidity we also believe that spinal anesthesia should be considered as an alternative to general anesthesia for emergency cesarean section in preeclamptic and eclamptic woman who have been adequately prepared with judicious amount of IV preload.

References

1. Roberta L. Hines, Katherine E. Marschall. Stoelting's anesthesia and co-existing diseases. 6th edition 2012. Chapter 26.pp.564-565.
2. Ronald D. Miller, 2015 eighth edition chapter 77.p.2348
3. Dyre RA et al. Prospective, randomized trial comparing general with spinal anesthesia for cesarean delivery in preeclamptic patients with a non reassuring fetal heart trace. Anaesthesiology 2003.
4. Ahmed SM, et al. Is spinal anaesthesia safer in preeclamptictoxaemia patients? J indian Med assoc 1999;97:165-8.
5. Salman Waris, Muhammad Yousuf, Rana Altaf, Muhammad Shahid et al. An experience of spinal versus general anaesthesia in severe preeclamptic patients undergoing lower segment caesarean section. Journal of surgery Pakistan. 2002;7(2):4 pages.
6. Aya, Antonie G. et al. Spinal anesthesia –induced Hypotension: A Risk comparison between patients with severe preeclampsia and healthy woman undergoing preterm cesarean delivery. Anaesthesia and analgesia 2005;101:869-75.
7. V.A. Clark, A.V.G. Stewart et al. Ephedrine requirements are reduced during spinal anaesthesia for caesarean section in preeclampsia. International journal of obstetric anesthesia 2005;14:9-13.
8. F. Moslemi and S. Rasooli et al. Comparison of spinal versus general anesthesia for cesarean delivery in patients with severe preeclampsia. J. Med sci,7(6);1044-1048-2007.
9. Ranju Singh, Nishant Kumar, Arunajain et al. Spinal anesthesia for lower segment cesarean section in patients with stable eclampsia. Journal of clinical anesthesia, plumx metrics 2011.
10. Ashok V. Deshpande, Sanjivani A. Deshpande et al. Spinal anesthesia in preeclamptic parturient. Journal of Evolution of Medical and Dental Science 2014;3(8):1915-19.
11. Shifman EM, Flippovich GV et al. safety of subarachnoid anesthesia during cesarean section in pregnant woman with preeclampsia. Anesteziologila I Reanimatologila 2003;(5):38-41.
12. Visalyaputra, Shusee et al. Spinal versus epidural anesthesia for cesarean delivery in severe preeclampsia: A prospective Randomized, Multicenter study. Anaesthesia and analgesia 2005;101:862-68.
13. Mai WedadAbdallah et al. A comparative study of general anesthesia versus combined spinal-epidural anesthesia on the fetus in cesarean section. Egyptian journal of anaesthesia 2014;30(2):155-160.

Original Research Article

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Effect of Dexmedetomidine on Induction and Hemodynamic Response to Laryngoscopy and Intubation with Propofol and Sevoflurane: A Randomized Clinical Trial

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Abstract

Background: Induction of anaesthesia, laryngoscopy and intubation are critical events and hemodynamic stability is an important factor during this period. This study aims to evaluate the effect of dexmedetomidine on induction with respect to hemodynamic response, induction time and smoothness of induction also to evaluate the combined effect of dexmedetomidine with propofol and sevoflurane on cardiovascular response to laryngoscopy and intubation. *Methods*: A total of 120 American Society of Anaesthesiologists physical status I and II patients undergoing elective surgical procedures under general anaesthesia were randomized into two groups. Both the groups received dexmedetomidine 1.0µg/kg diluted to 10ml, infused over 10min, 10min before induction. Group DP (Dexmedetomidine Propofol) received Inj propofol 1.5-2mg/kg titrated till the loss of verbal response (n= 60) andGroup DS (Dexmedetomidine Sevoflurane) were induced with sevoflurane 8% till loss of verbal response (n =60). Heart rate (HR) Mean arterial pressure (MAP) and rate pressure product (RPP) were recorded at baseline (T0), 2 min after administration of drug (T1), 1min after induction (T2) and at 1, 3, 5 and 10 min after intubation (T3, T4, T5 and T6 respectively). *Results*: There was a significant decrease in mean arterial pressure and heart rate from pre-induction values within both groups after induction. The reduction in MAP and RPP was significantly more in group DP at 1min to 5min after intubation than group DS ($p < 0.05$). *Conclusion*: Induction of anesthesia with Propofol and dexmedetomidine demonstrated a shorter induction time and greater decrease in mean arterial pressure at laryngoscopy and intubation.

Keywords: Induction; Propofol; Sevoflurane; Dexmedetomidine; Hemodynamics; Laryngoscopy.

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Introduction

Anesthetic induction is a critical event and hemodynamic stability is an important component of smooth anesthetic induction [1,2]. Stress response under anesthesia has long been universally recognized phenomenon which may be in the form of endocrine or autonomic disturbance. There is increase in heart rate, blood pressure and arrhythmias [3]. Increase in intraocular and intracranial pressure is also noted [4]. These changes are maximum at 1 min after intubation and last for 5-10 min.Various pharmacological [5,6] methods have been aimed to suppress this pressor response but the search for the ideal drug for attenuation of cardiovascular response during laryngoscopy and tracheal intubation continues as the stress may not be tolerated by patients with compromised cardiac status.

Propofol is one of the most widely used intravenous induction agent because of its rapid onset time, short action duration and lesser side

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effects. Sevoflurane has low blood gas solubility coefficient (0.69) and is a nonpungent inhaled anesthetic [7,8].

There are many studies on dexmedetomidine [9-11] for attenuation of stress response during laryngoscopy and intubation, majority of them using intravenous induction agents. None of the studies evaluate the effect of dexmedetomidine with different induction agents. This study aims to evaluate the effect of dexmedetomidine on induction with IVpropofol and inhalational agent sevoflurane with respect to hemodynamic response, time required and smoothness of induction and also to evaluate the combined effect of dexmedetomidine with propofol and sevoflurane on cardiovascular response to laryngoscopy and intubation.

Materials and Methods

After obtaining approval from the institutional ethics committee the study was registered in the Clinical Trial Registry of India as CTRI/2018/02/012009. A written informed consent was taken from each patient who met the inclusion criteria, before enrolment into the study. This was a prospective, randomized, single-blind study. A total of 120 ASA I and II patients of either gender between 18 to 65 years of age undergoing elective surgery under general anesthesia requiring endotracheal intubation were included. Patients with a history of allergy to volatile anesthetics or Propofol, anticipated difficult mask ventilation, communication problems, baseline mean arterial pressure (MAP) less than 70 mmHg and heart rate (HR) less than 60 beats per minute (bpm), Concomitant use of medications which may exaggerate the heart rate response of dexmedetomidine including digoxin or β–adrenergic antagonists, predicted difficulty in intubation, pregnancy, nursing women, morbid obesity and patients with coronary artery disease, ischemic heart disease, heart blocks were excluded from the study.

A computer-generated randomisation table was generated prior to commencement of the study and concealed in sealed opaque envelopes. Patients were randomly, in a single blinded fashion allocated into Group DP= Dexmedetomidine Propofol group, received Dexmedetomidine (1.0µg/kg) diluted to 10 ml with normal saline, .infused over 10min, 10 min prior induction and Inj propofol 1.5-2mg/kg titrated till the loss of verbal response (n= 60) and Group DS= Dexmedetomidine Sevoflurane group recieved Dexmedetomidine (1.0µg/kg) diluted to 10 ml with normal saline, infused over 10min, 10min before induction and induced with sevoflurane 8% till loss of verbal response (n =60).

On arrival in the operating room, routine standard monitors such as continuous ECG, NIBP and pulse oximeter were established and the patients' baseline heart rate, blood pressure and oxygen saturation (SpO_2) were recorded after 5 min of settling in the operative room. A 20G intravenous cannula was inserted for drug and continuous fluid administration.

All patients were premedicated with intravenous (IV) Glycopyrrolate (0.05mg/kg), IV midazolam 0.03mg/kg, IV Fentanyl (2µg/kg) for analgesia. 10mins prior induction both the groups received dexmedetomidine 1.0µg / kg diluted to 10 ml with normal saline infused over 10 mins. Based on randomisation, Group DP patients were induced with titrating dose of 1% Propofol injected manually at the rate of 1.5 ml every 5 seconds till loss of verbal response. Group DS patients were induced with (8%) Sevoflurane at tidal breathing, using circle system till loss of verbal response. The circuit was primed with 8% Sevoflurane in oxygen at six litres per minute for 30 seconds. Face mask was then applied to obtain adequate seal. The patients were asked to breathe normally. The time of start of injection of propofol or mask placement with sevoflurane 8% was considered as 'starting point of induction'. Loss of verbal response was defined as 'induction end point'. The time taken for anesthetic induction was recorded for both groups. For group DS patients, Sevoflurane was reduced to 4% and subsequently adjusted between 0.5 and 2% to maintain adequate depth of anesthesia clinically. For Group DP patients, 10 to 20 mg increments were administered if the anesthetic depth was clinically judged to be inadequate (indicated by patient movement, swallowing, tachycardia, or MAP >20% pre- induction)

After ensuring the ability to ventilate, patients were relaxed with IV vecuronium (0.1 mg/kg). Laryngoscopy was done with appropriate sized Mac-Intosh blade and intubation with appropriate sized cuffed endotracheal tube within 15 seconds at single attempt by the same anaesthesiologist. Ventilator settings were adjusted to maintain SpO_2>95% and $ETCO_2$ 30-35mmHg. Anaesthesia was maintained with oxygen, N_2O,isoflurane intermittent positive pressure ventilation and vecuronium. At the end of surgery residual neuromuscular blockade was reversed with

neostigmine 0.05 mg/kg and glycopyrrolate 0.02 mg/kg.

Induction time, intubating conditions, attempts for intubation, Hemodynamic response and complications i.e. coughing/gagging, laryngospasm/bronchospasm, patient's movement during endotracheal intubation were noted. The heart rate through ECG, systolic blood pressure, diastolic blood pressure, mean arterial pressure NIBP in mm/Hg, SpO_2 using pulse oximeter, and ECG were monitored continuously and HR, MAP and rate pressure product (RPP) calculated by formula (SBPX HR)/1000 were recorded at baseline (T0) and 2 min after administration of drug (T1),1min after induction (T2) and at 1 min (T3), 3 min (T4), 5 min (T5) and 10 min (T6) after intubation. Complications during the study period were recorded and managed accordingly. Hypotension was considered significant when MAP was less than 20% below pre-induction values and was managed by decreasing the delivery of anesthetic agents, administration of IV fluids and ephedrine 6 mg dose increments when needed. Bradycardia (HR <60 bpm), if associated with low MAP or HR <20% pre-induction values, was treated with atropine 0.6 mg. Tachycardia (HR >20% pre-induction values) was managed by increasing the anesthetic depth and treatment of any other possible cause such as inadequate oxygenation, ventilation or analgesia. Cases were excluded from study if Cormack Lehanne > 2, more than one attempt at laryngoscopy and intubation. Intubating conditions were graded using Cooper's score (annexure 1) in to excellent (Score 8-9), good (Score 6-7), poor (Score 3-5) or inadequate (Score 0-2), considering the criteria of jaw relaxation, condition of vocal cords and response to intubation. Excellent & good (Score>5) were considered as clinically acceptable intubating condition. Demographic data were analysed by student t test and chi square test. Paired sample T-test was used for comparison of MAP and HR within each group. Intergroup comparison was done by independent sample t test. Power analysis was carried out by statistical software package (SPSS version 16). A sample size of 60 patients per group was required to detect a 15% difference MAP, with a power of 90% and 5% significance level. All data were expressed as mean standard deviation (95%

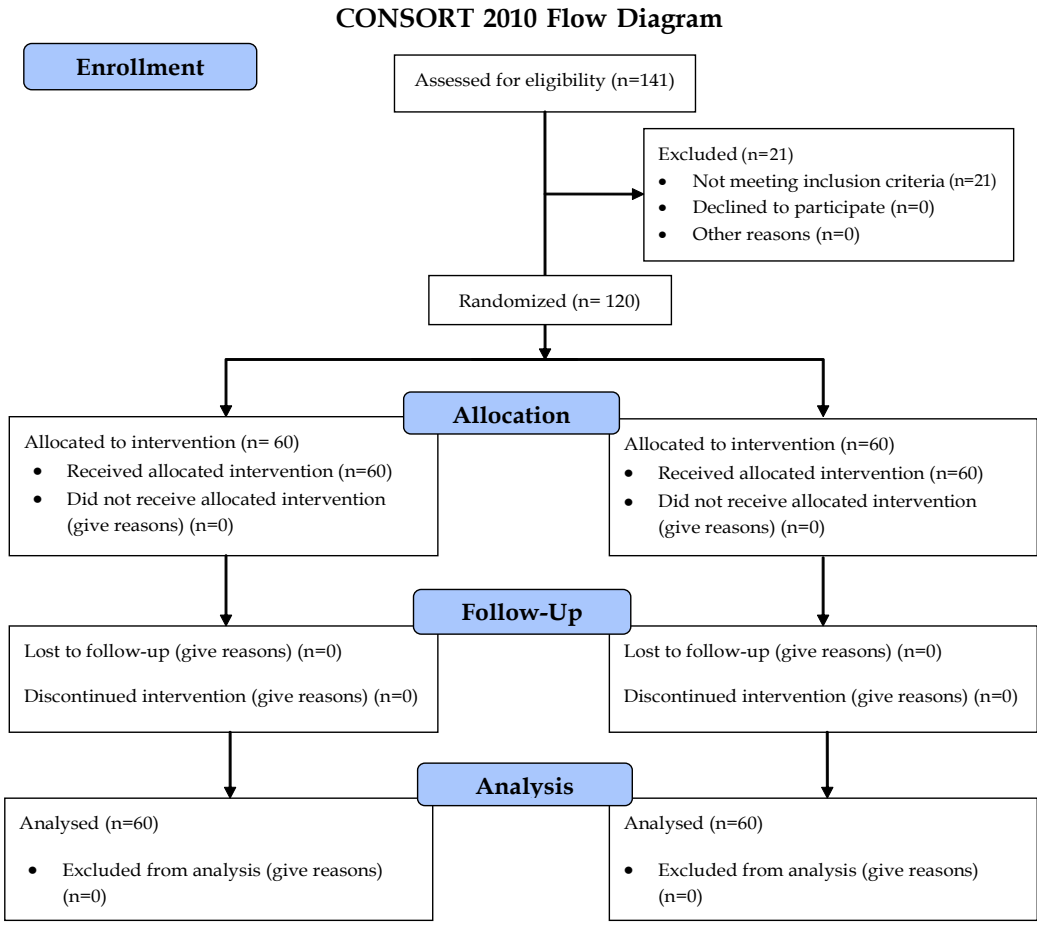

Fig. 1: CONSORT flow diagram of patients included in the study

confidence interval) and p<0.005 was considered significant.

Results

Figure 1 shows flow diagram for this study where 141 patients were assessed for eligibility and 120 patients were included and their results were analysed.The two groups were comparable in patient characteristics with respect to age, mean weight and gender (p>0.05) [Table 1].

The HR at Baseline and 2 min after dexmedetomidine infusion were comparable between the two groups. After induction there was a reduction in heart rates in both the groups but significantly more reduction in group DP, Following laryngoscopy and intubation the HR was comparable in both the groups (Figure 1)

The MAP and RPP were comparable between both the groups at baseline and T1.The fall in MAP and RPP was significantly more after induction in group DP(MAP 78.2±9.291vs 83.2±10.544) than group DS (p<0.05). The MAP and RPP was higher in group DS than group DP (MAP 85.9±10.054 vs91.4± 11.013 in

Table 1: Demographic characteristics amongst two groups

Parameters	Group DP	Group DS
Age [years] (mean ± SD)	35.06 ± 11.794	35.78 ± 10.719
Weight [kg] (mean ± SD)	55.20 ± 8.983	58.06 ± 9.527
Gender [Male / Female]	24/36	22/38

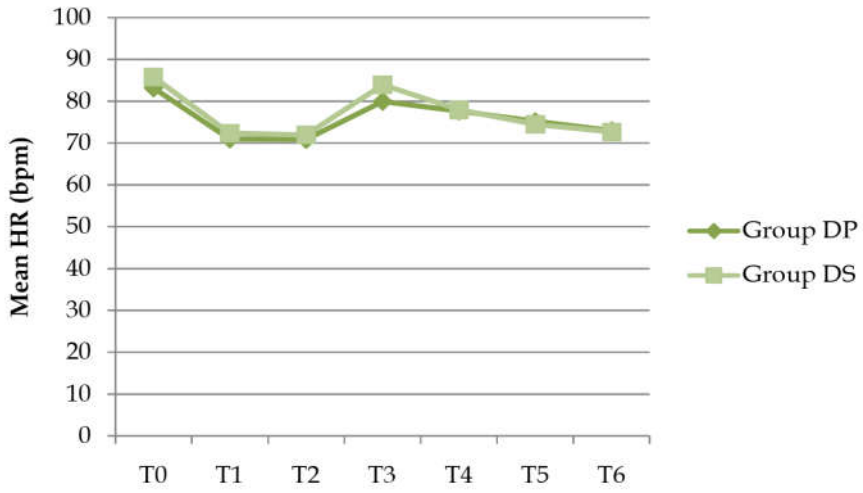

Fig. 1: Inter group comparison of mean heart rate

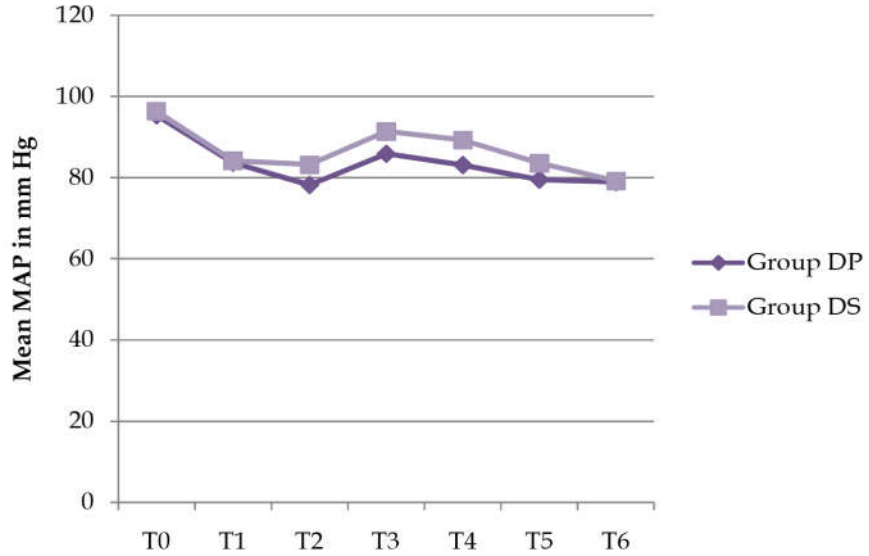

Fig. 2: Inter group comparison of mean MAP(mm Hg)

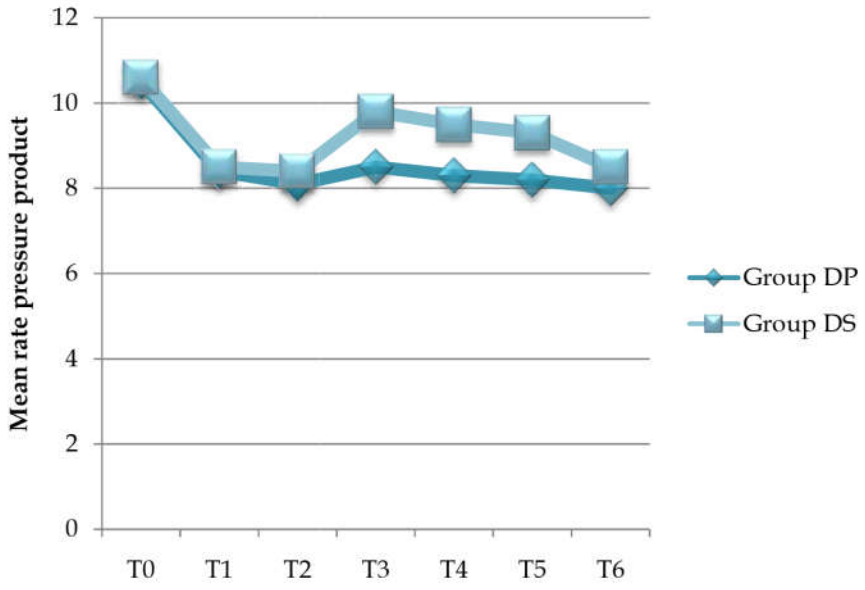

Fig. 3: Inter group comparison of mean rate presssure product

group DP and group DS respectively at T3) after intubation and were comparable at 10 mins (Figure 2 and 3).

The mean induction time was 52.36±13.24 sec in Group DS and 24.5±7.70 sec in Group DP. The mean popofol requirement was 62.64±12.8 mg. Both the groups had excellent intubating conditions cooper score (>8). Complications such as coughing, gagging, laryngospasm or bronchospasm were not observed in any patients. All patients had SpO_2>98% throughout the study period. Only one patient in group DP had bradycardia requiring IV atropine 0.6mg.

Discussion

Hemodynamic stability is an integral component of an ideal anesthetic induction. Patients with cardiovascular diseases and elderly patients are more liable to hemodynamic changes during anesthetic induction [1,2].

Inhalation induction is commonly performed in children. Inhalation induction is also preferred over intravenous induction in patients with anticipated difficult airway where spontaneous ventilation is preferred during induction. Sevoflurane is an inhalational anesthetic with comparable properties to IV Propofol for anesthetic induction, maintenance and recovery.

Non-invasive methods of blood pressure measurement by oscillatory method measures MAP better than systolic or diastolic blood pressure [14]. Rate pressure product is a term used in cardiology, as well as exercise physiology, to measure workload or oxygen demand of the heart and thus a good measure of energy consumption of heart. Hence, we compared MAP and RPP between the two groups in our study.

Dexmedetomidine has sedative, anxiolytic, analgesic and sympatholytic effects and may blunt the cardiovascular responses in the peri operative period without causing significant respiratory depression. Jaakola used 0.6 μg/kg dexmedetomidine and thiopentone induction and noted that after intubation the maximum heart rate was 18% less (p=0.036) in group D compared to placebo group and by 10 min after intubation maximum systolic and diastolic pressures were also significantly (p=0.013 and p=0.020) less in dexmedetomidine group [9].

Scheinin et al. used 0.6 μg/kg dexmedetomidine and showed that dexmedetomidine decreased, but did not completely suppress, the hemodynamic response to tracheal intubation in healthy individuals [10].

Our study showed similar results to Guptaa K et al. [11] where 1 μg/kg dexmedetomidine attenuated the adverse hemodynamic responses of laryngoscopy and intubation adequately, the fall in MAP was higher than study conducted by Gupta, which is probably due to use of fentanyl in our study. Thwaities S [12]

observed that induction of anesthesia with propofol was associated with decreased in MAP more than sevoflurane group. Volatile agents potentiate the effects of non-depolarizing muscle relaxants but in our study the intubating conditions were comparable in both groups (p=0.11) [13].

In this study dexmedetomidine 1 mcg/kg infusion before induction of anesthesia suppressed the hemodynamic response to tracheal intubation in normotensive patients. This suppression in cardiovascular responses was found to be greater with propofol than sevoflurane.

Conclusion

This study concludes that in patients premedicated with dexmedetomidine both the induction agents, sevoflurane and propofol provides good quality of intubating condition. Induction time and hemodynamic response was less in group DP than group DS. Both sevoflurane and propofol with dexmedetomidine showed lesser raise in cardiovascular response to laryngoscopy and intubation but Dexmedetomidine with propofol induction attenuated cardiovascular response better than dexmedetomidine with sevoflurane.

Annexure 1:

Cooper scoring system			
Score	**Jaw relaxation**	**Vocal cards**	**Response tointubation**
0	Impossible to open	Closed (adducted)	Severe coughing orbucking
1	Opens with difficulty	Closing	Mild coughing
2	Moderate opening	Moving	Slight diaphragmaticm ovement
3	Easy opening	Open (relaxed)	No movement

Conflict of Interest : None declared

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References

1. Kirkbride DA, Parker JL, Williams GD, Buggy DJ. Induction of anesthesia in the elderly ambulatory patient: a double- blinded comparison of Propofol and Sevoflurane. AnesthAnalg 2001;93:1185-87.
2. Samad K, Khan F, Azam I. Hemodynamic effects of anesthetic induction in patients treated with beta blockers and calcium channel blockers. M E J Anesth 2008;19:1111-28.
3. Reid, Brace. Irritation of respiratory tract and its reflex effect on heart surgeries. Gynaecology and Obstretrics 1940;70:157-62.
4. Fox EJ, Sklar GS, Hill CH, Villanoeva R, King BD. Complications related to the pressor response to endotracheal intubation Anaesthesiology. 1977;47:524-5.
5. Fuji Y, Tanaka H, Saitoh Y, Toyooka H. Effects of Calcium channel blockers on circulatory response to tracheal intubation in hypertensive patients Nicardipine vs Diltiazem. Canadian Journal of Anaesthesia 1995;42:785-8.
6. Ebert JP, Pearson JD, Gelman S, Harris C, Bradley EL. Circulatory response to laryngoscopy The comparative effects of Placebo, Fentanyl and Esmolol Canadian Journal of Anaesthesia.1989;36(3pt1): 301-6.
7. Strum DP and Eger EI 2nd. Partition coefficients for sevoflurane in human blood, saline, and olive oil. AnesthAnalg 1987;66:654-56.
8. Joo HS, Perks WJ, sevoflurane versus propofol for anesthetic induction: a metaanalysis. A & A 2000;91: 213-9.
9. Jaakola ML, Ali-Malkkila T, Kanto J, Kallio A, Scheinin H, Scheinin M. Dexmeditomidine reduces intraocular pressure, intubation response and anesthetic requirement in patients undergoing ophthalmic surgery Br Journal of Anesth 1992;68(6):570-5.
10. Scheinin B, Lindgren L, Randell T, Scheinin H, Scheinin M. Dexmedetomidine attenuates sympathoadrenal response to tracheal intubation and reduces the need for thiopentone and perioperative fentanyl, Br J Anaesth 1992;68(2):126-31.
11. Gupta K, Bansala M, Gupta PK, Singh M, Agarwal S, Tiwari V. Dexmedetomidine premedication with three different dosages to attenuate the adverse hemodynamic responses of direct laryngoscopy and intubation: a comparative evaluation. Ain-Shams J Anesthesiol; 2016;9(1):66–71.
12. Thwaites A J, Edmends S, Tomlinson A A, Kendall J B, Smith I. Double blind study on comparison of SevofluranevsPropofol and succinyl choline for tracheal intubation in children. British journal of anesthesia; 1999;83(3):410-14.
13. Khan KS, Hayes V, Buggy DJ. Pharmacology of anaesthetic agents II: inhalation anaesthetic agents. Continuing Education in Anaesthesia, Critical Care & Pain J 2014;14(3):106-111.
14. Lakhal K, Macq C, Ehrmann S, Boulain T, Capdevila X. Noninvasive monitoring of blood pressure in the critically ill: reliability according to the cuff site (arm, thigh, or ankle). Crit Care Med 2012;40:1207-13.

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Comparison of Efficacy of 0.25% Bupivacaine and 0.25% Bupivacaine-Clonidine Combination in Ultrasound Guided Transversus Abdominis Plane Block

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Abstract

Background and Aims: Pain is the most common symptom seen postoperatively and multiple approaches are used to overcome it. In this study, we compared bupivacaine and bupivacaine – clonidine combination in transversus abdominis plane (TAP) block for postoperative analgesia in patients undergoing inguinal hernioplasty under spinal anaesthesia. *Methods:* Sixty ASA I and II male patients in the age group of 18 to 60 years posted for inguinal hernioplasty were randomly divided into two groups (Group B and Group C). The procedure was done under spinal anaesthesia using 3 ml of 0.5% hyperbaric bupivacaine. After the surgery, ultrasound guided TAP block was given with 19.5 ml of 0.25% bupivacaine + 0.5 ml sterile water in Group B and 19.5 ml of 0.25% bupivacaine + 75 mcg of clonidine (0.5 ml) in Group C. Postoperatively, the patients' haemodynamic status, visual analogue scale (VAS) scores, dose of rescue analgesic used, duration of analgesia were recorded. Inj. Tramadol 100 mg was given intravenously as rescue analgesic when the VAS score was more than four. Data were analyzed using unpaired t test and Mann- Whitney test wherever indicated. *Results:* The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B ($p< 0.05$). The heart rates recorded at 16 and18 hours after TAP block were significantly lower in Group B compared to Group C. The mean arterial pressures (MAP) and VAS scores recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. The mean dose of tramadol administered was significantly lower in Group C (96.67±18.25 mg) compared to Group B (186.67±34.57 mg) (p value 0.0001). The mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001). *Conclusion:* Addition of clonidine to 0.25% bupivacaine for TAP block significantly prolongs the duration of analgesia and reduces postoperative analgesic requirements compared to patients receiving 0.25% bupivacaine alone.

Keywords: Bupivacaine; Clonidine; Inguinal Hernioplasty; Transversus Abdominis Plane (TAP) Block.

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Introduction

Inguinal hernia surgery is one of the most commonly performed surgical procedures. Pain after open hernia surgeries will be moderate to severe and is associated with prolonged hospital stay and delayed return to normal daily activities [1]. Various approaches have been used to manage this pain, ranging from oral medication to regional blocks [2]. Among the regional blocks, the Transversus Abdominis Plane (TAP) block has been found to be very effective in reducing acute postoperative pain and the use of opioids in patients undergoing hernia repair [3].

The aim of TAP block is to deposit the local anaesthetic in the plane between the internal

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oblique and transversus abdominis muscles targeting the lower intercostal, iliohypogastric and ilioinguinal nerves [4]. The advent of ultrasound guidance for visualizing needle tip and local anaesthetic spread in regional anaesthesia techniques has resulted in greater accuracy of the TAP block and fewer complications [5].

TAP blocks are usually given with local anaesthetics like bupivacaine or ropivacaine [6]. Many adjuvants like opioids, dexamethasone, ketamine, clonidine and dexmedetomidine have been used in peripheral nerve blocks to prolong the action of local anaesthetics. In this study, we compared the quality of postoperative analgesia in two groups by giving TAP block with bupivacaine and bupivacaine-clonidine combination.

Materials and Methods

After getting approval from the institutional ethical committee and informed consent, sixty adult male ASA I & II patients in the age group of 18- 60 years, admitted to Saveetha medical college and hospital, Kanchipuram district, who were posted for elective unilateral inguinal hernioplasty, were enrolled in this prospective, randomized, double blinded study. They were allocated into two groups as Group C and Group B of 30 each using computer generated random number. Group C received ultrasound guided TAP block with 19.5 ml of 0.25% bupivacaine + 75 mcg of clonidine in 0.5 ml. Group B received ultrasound guided TAP block with 19.5ml of 0.25% bupivacaine + 0.5ml of sterile water. Patients belonging to ASA III and above, patients who were posted for bilateral hernioplasty, patients who had contraindication for regional anaesthesia (coagulation disorder, local infection, raised intracranial pressure), patients who were allergic to local anaesthetics and patients undergoing emergency surgeries were excluded from the study.

The patients were visited in the evening before surgery and were familiarized with a 10 mm visual analogue scale for pain. They were premedicated with Tab. Alprazolam 0.5mg in the night and two hours before surgery. On the day of surgery, the patients were shifted to the operating room and were connected to electrocardiogram (ECG), non invasive blood pressure (NIBP) and Pulse oximetry (SpO_2) monitors. An 18 G intravenous access was established for infusion of fluids. A single dose sub-arachnoid block with three ml of 0.5% hyperbaric bupivacaine was administered using a 25G Quincke tip spinal needle. The surgery was performed with the above said monitoring.

After the end of surgery, the abdominal walls of patients were scanned using a linear array transducer probe (8-16 MHz), connected to a portable ultrasound unit (Sonoscape, model S8 expo), with the patients in supine position. The ultrasound probe was initially positioned perpendicular to the anterior abdominal wall to obtain optimal images of rectus abdominis muscle at the level of umbilicus. The probe was moved laterally to get a transverse view of the layers of the abdominal wall: external oblique, internal oblique, transversus abdominis muscles and peritoneal cavity, from superficial to deep. After skin disinfection, an 80 mm, 23 G short -bevel needle was advanced from an antero-medial to a lateral direction using the in -plane insertion technique with ultrasound real -time assessment.When the tip of the needle was correctly located in the space between internal oblique and transversus abdominis muscles, patients in Group C were injected with 19.5 ml of 0.25% bupivacaine with 75 mcg clonidine (0.5ml) and patients in Group B were injected with 19.5 ml of 0.25% bupivacaine with 0.5ml sterile water. The correct placement of the needle was confirmed by expansion of the local anaesthetic solution as a dark shadow (hypoechoeic) between aponeurosis of the internal oblique (which moved anteriorly) and the transversus abdominis muscles pushing the muscle deeper. The solutions were prepared by a collaborator who was not involved in the data collection. The procedure was done by an experienced anaesthetist who was blinded and a blind observer collected the data.

The patients were monitored for a period of 24 hours postoperatively. In the postoperative anaesthesia care unit, the heart rate, systolic, diastolic, mean arterial pressures and visual analogue scale (VAS) scores were recorded every two hours for 24 hours. When the VAS score was more than four, Inj. tramadol 100mg was administered intravenously as rescue analgesic. The time of first administration of rescue medication was noted. The duration of analgesia was recorded as the time from the administration of TAP block to the time of administration of rescue analgesic. Patients were also monitored for side effects of clonidine like hypotension, bradycardia and sedation.

Statistical Analysis

Based on the existing literature, for a power of 80% at 5% significant level, the sample size to be

studied was calculated to be 30 patients in each group. Statistical analysis was done using SPSS 20 software.The demographic data (age, weight and height), heart rate, mean arterial pressure (MAP), dose of rescue analgesia and duration of analgesia were analyzed using unpaired t- test. The VAS scores were analyzed using Mann Whitney test. p value< 0.05 was considered statistically significant.

Results

There were no statistically significant differences in the age, weight and height characteristics of patients in the two groups (Table 1). The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B. The heart rates recorded at 16 and18 hours after TAP block were significantly lower in Group B compared to Group C. There was no significant difference in the heart rates recorded at other time intervals between the two groups (Table 2). The mean arterial pressures (MAP) recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. There was no significant difference in the MAP recorded at other time intervals between the two groups (Table 3). The VAS scores recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. There was no significant

Table 1: Demographic data

	Group C	Group B	P value
Age (years)	46.47±9.477 *	48.97±10.788	0.343
Weight (Kg)	70.1 ± 10.23	67.4 ± 8.003	0.26
Height (cm)	160.87 ± 5.74	163.33 ± 4.33	0.075

*Mean ± Standard deviation
p < 0.05 statistically significant

Table 2: Heart rate after TAP block

Time	Group C (beats/minute)	Group B (beats/minute)	P value
2 hours	67.27 ± 4.533 *	69.87 ± 5.704	0.055
4 hours	71.83 ± 4.410	70.87 ± 4.805	0.057
6 hours	70.80 ± 4.745	73.20 ± 3.388	0.028
8 hours	69.53 ± 4.805	75.27 ± 4.085	0.000
10 hours	71.13 ± 4.158	75.67 ± 4.003	0.000
12 hours	72.20 ± 3.727	74.80 ± 4.597	0.019
14 hours	73.20 ± 2.952	76.67 ± 4.795	0.001
16 hours	84.67 ± 7.246	77.13 ± 4.805	0.000
18 hours	80.27 ± 8.497	76.60 ± 4.174	0.038
20 hours	77.13 ± 4.447	78.87 ± 4.158	0.124
22 hours	78.33 ± 3.642	79.20 ± 5.423	0.470
24 hours	80.33± 5.067	79.87 ± 4.424	0.705

*Mean ± Standard deviation
p < 0.05 statistically significant

Table 3: Mean Arterial Pressure (MAP) after TAP block

Time	Group C (mm Hg)	Group B (mm Hg)	P value
2 hours	74.53± 2.675 *	74.80± 4.080	0.546
4 hours	77.87 ±2.623	77.60± 3.654	0.747
6 hours	75.67± 2.578	91.27± 4.118	0.000
8 hours	71.47± 7.592	85.47± 5.752	0.000
10 hours	79.47 ± 3.481	78.73 ± 5.401	0.752
12 hours	78.20± 3.943	76.93± 5.765	0.654
14 hours	78.80± 4.021	77.87±5.981	0.742
16 hours	87.60 ±7.691	88.07± 4.218	0.772
18 hours	76.27± 3.513	77.60±4.530	0.208
20 hours	75.87±2.874	76.00±3.562	0.874
22 hours	76.20±2.747	77.40±5.922	0.318
24 hours	74.80±2.497	74.60±2.737	0.769

*Mean ± Standard deviation
P < 0.05 statistically significant

Table 4: VAS Score after TAP block

Time	Group C	Group B	P value
2 hours	2.20±0.610 *	2.67±0.959	0.059
4 hours	2.37±0.765	2.43±0.850	0.064
6 hours	2.53±0.776	6.90±1.296	0.000
8 hours	2.73±0.691	5.60±0.932	0.042
10 hours	3.03±0.765	2.67±0.884	0.095
12 hours	3.07±0.828	2.67±0.959	0.093
14 hours	3.40±0.621	3.70±0.750	0.060
16 hours	5.27±1.639	5.97±1.520	0.082
18 hours	5.00±2.101	5.23±1.194	0.074
20 hours	2.47±0.730	2.80±0.961	0.121
22 hours	2.57±1.073	2.80±0.997	0.407
24 hours	2.50±1.042	2.37±1.129	0.597

*Mean ± Standard deviation
$p < 0.05$ statistically significant

Table 5: Postoperative Analgesia

Parameter	Group C	Group B	P value
Dose of rescue analgesic (mg)	96.67 ± 18.25*	186.67 ± 34.57	0.0001
Duration of postoperative analgesia (minutes)	943.46 ± 70.751	413.20 ± 45.023	0.001

*Mean ± Standard deviation
$p < 0.05$ statistically significant

difference in the VAS scores recorded at other time intervals between the two groups (Table 4). The mean dose of rescue analgesia (tramadol) administered was significantly lower in Group C (96.67±18.25 mg) compared to Group B (186.67±34.57 mg) (p value 0.0001). The mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001) (Table 5). No patient experienced any side effects like sedation, hypotension or bradycardia in Group C.

Discussion

The TAP block gives an effective analgesic option for post hernia repair pain. The ultrasound guidance reduces the incidence of complications, improves the accuracy of the block and the use of adjuvant provides prolonged postoperative analgesia without any complication. In our study, the basis of the dose of clonidine was chosen from the systematic review by Mccartney et al. [7], where they analyzed and reported that clonidine at a dose lesser than 150 mcg reduced the systemic side effects and prolonged the postoperative analgesia.

In our study, the mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001). This observation was similar to the finding reported by Singh et al [8] who noted that the addition of 1 mcg/kg clonidine to 20 ml of 0.25% bupivacaine for TAP block significantly prolonged postoperative analgesia following caesarean section compared to patients receiving 0.25% bupivacaine alone for TAP block.

Mir et al. [9] compared the efficacy of TAP block with bupivacaine and bupivacaine- clonidine combination in patients undergoing lower abdominal surgeries and concluded that the addition of clonidine increases duration of postoperative analgesia and reduces postoperative analgesic consumption. This again was similar to the observation noted in our study.

A recent meta-analysis of randomized trials has shown that clonidine when added to local anaesthetics, significantly prolongs the duration of the motor block and postoperative analgesia when used for peripheral nerve and plexus blocks [10]. The reason for the prolongation of analgesic effect by clonidine is not clear as α2 adrenoceptors are not present on peripheral nerve axons [11]. The prolonged analgesia could be due to systemic absorption of clonidine from the TAP block site [12].

The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B. This could be attributed to the earlier onset of pain in Group B compared to Group C while the higher heart rates

at 16 and 18 hours in Group C could be due to the onset of pain in Group C while Group B patients had received rescue analgesics by then.

No patient had bradycardia or hypotension during the study duration in Group C. This was in correlation with the systematic review by Mccartney et al. [7] whose observations revealed that clonidine at this dose did not cause systemic effect when used as an additive.

Conclusion

Hence we conclude that the addition of 75 mcg of clonidine to 0.25% bupivacaine in TAP block for inguinal hernia repair prolongs the duration of analgesia and reduces the postoperative analgesic consumption compared to patients receiving 0.25% bupivacaine alone for TAP block without any adverse effect.

References

1. Callesen T, Bech K, Nielsen R, Andersen J, Hesselfeldt P, Roikjær O, et al. Pain after groin hernia repair. British Journal of Surgery. 1998 Oct 1;85(10):1412–4.
2. Joshi GP, Rawal N, Kehlet H, Bonnet F, Camu F, et al. Evidence-based management of postoperative pain in adults undergoing open inguinal hernia surgery. Br J Surg. 2012;99:168–85.
3. Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth. 2011;23:7–14.
4. Mukhtar K. Transversus Abdominis Plane Block. The Journal of NYSORA 2009;12:28-33.
5. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. Anaesth Intensive Care. 2007;35(4):616–7.
6. Abdallah FW, Halpern SH, Margarido CB. Transversus Abdominis Plane block for postoperative analgesia after caesarean delivery performed under spinal anaesthesia. A systematic review and meta-analysis. Br J Anaesth. 2012;109:679-87.
7. Mccartney C, Duggan E, Apatu E. Should We Add Clonidine to Local Anesthetic for Peripheral Nerve Blockade? A Qualitative Systematic Review of the Literature. Regional Anesthesia and Pain Medicine. 2007;32(4):330–8.
8. Singh R, Kumar N, Jain A, Joy S. Addition of clonidine to bupivacine in transversus abdominis plane block prolongs postoperative analgesia after cesarean section. J Anaesthesiol Clin Pharmacol 2016;32:501-4.
9. Mir TA, Mir AH, Gani TT, Yousuf A, Ahmad SI. Evaluation of efficacy of bupivacaine and bupivacaine plus clonidine in transversus abdominis plane (TAP) block for postoperative analgesia: a prospective, randomized, double blind, comparative study. Int J Res Med Sci 2017;5:4588-94.
10. Pöpping DM, Elia N, Marret E, Wenk M, Tramèr MR. Clonidine as an adjuvant to local anesthetics for peripheral nerve and plexus blocks: A meta-analysis of randomized trials. Anesthesiology 2009;111:406-15.
11. Eisenach JC, De Kock M, Klimscha W. Alpha (2)-adrenergic agonists for regional anesthesia. A clinical review of clonidine (1984-1995). Anesthesiology 1996; 85:655-74.
12. Griffiths JD, Le NV, Grant S, Bjorksten A, Hebbard P, Royse C. Symptomatic local anaesthetic toxicity and plasma ropivacaine concentrations after transversus abdominis plane block for caesarean section. Br J Anaesth 2013;110:996-1000.

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Synergestic Effect between Dexmedetomidine and 0.75% Ropivacaine in Epidural

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Abstract

Objective: The aim of this study is to evaluate and compare the clinical effects of added dexmedetomidine to epidural ropivacaine 0.75% for lower limb orthopedic procedures. *Methods:* 40 patients undergoing elective lower limb orthopedic procedures under epidural anesthesia were selected and divided into two groups of 20 each and assigned into Control Group (N=20): Epidural ropivacaine 0.75% 20ml (150mg)+1ml NS, Dexmedetomidine Group (N=20): Epidural ropivacaine 0.75% 20ml (150mg)+ Dexmedetomidine 1µg/kg+NS to complete 1ml. Variables studied include: Block onset time, maximum dermatomal level of anesthesia, duration of sensory and motor blockade, motor block intensityassessed by bromage motor scale, sensory block assessed by sensory scale, level of sedation assessed by ramsay sedation scale, hemodynamics, duration post operative analgesia-vas score *Results:* Duration of analgesia was prolonged in Dex group, level of significance ($p<0.05$), Motor block duration was prolonged in Dex group, level of significance ($p<0.05$), Intensity of motor block slightly increased in dex group, but without significance ($p<0.37$), need for Supplemental sedation was reduced need in Dex group, level of significance ($p<0.05$), Duration of post-op analgesia was significantly prolonged in Dex group when compared to control group, level of significance ($p<0.001$). *Conclusion:* There was a clear synergism between epidural dexmedetomidine and ropivacaine. Dexmedetomidine increases sensory and motor block duration during epidural anesthesia with ropivacaine, prolongs postoperative analgesia and does not cause hemodynamic instability.

Keywords: Synergestic Effect Between Dexmedetomidine and 0.75% Ropivacaine in Epidural.

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Introduction

The α_2-adrenergic agonists provide sedation, anxiolysis, hypnosis, analgesia, and sympatholysis. Dexmedetomidine shows a high ratio of specificity for the α_2 receptor (α_2/α_1 1600:1) compared with clonidine (α_2/α_1 200: 1), making it a complete α_2 agonist [27].

Alpha$_2$ agonists do have an analgesic effect when injected via the intrathecal or epidural route [4,5,6]. Intrathecally injected dexmedetomidine in sheep reduces blood pressure in 1 minute. When dexmedetomidine is injected into the epidural space, it rapidly diffuses into the CSF (in one study, 22% of the injected dose was identified in the CSF). The effects on blood pressure are slower in onset with an epidural injection than with an intrathecal administration. Epidural effects are seen in 5 to 20 minutes. The primary site of analgesic action is thought to be the spinal cord [5,6].

In humans, dexmedetomidine was first administered

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epidurally in 1997, combined with lidocaine 1.5 % in patients undergoing hysterectomy, prolonging postoperative analgesia [6].

Based on studies with clonidine [7,8], We evaluated the synergism of dexmedetomidine with ropivacaine during epidural administration, in improving the characteristics of anesthesia. The aim of this study was to evaluate the clinical effects of Dexmedetomidine added to ropivacaine on the characteristics of epidural anesthesia.

Methods

After approval of the study protocol by the Ethics committe and obtaining informed consent. It was a comparative, double blind, randomized, controlled study and distribution by means of a draw with a sealed envelope.

Inclusion Criteria

1. ASA I & II
2. Both Sexes
3. Age Between 18-70 yrs
4. Elective Orthopedic Procedure
5. Under Epidural Anesthesia
6. Withaout Comorbid Illness

Exclusion Criteria

1. Allergy to Local Anesthetics
2. NM Diseases
3. Alpha 2 Antagonist
4. Weight More than 120kg

Patients were admitted to the hospital, after a period of absolute fasting at least 8 hours, without administering premedication. venipuncture was performed with an 18G catheter for administration of Ringer's lactate, 8 $ml.kg^{-1}. h^{-1}$.

Monitoring consists of, Pulse oximetry (SpO_2), NIBP, ECG. persons not directly involved in the anesthetic prepared dexmedetomidine or sodium chloride 0.9%, 1 ml syringe.

Epidural puncture was performed with a 16G Tuohy needle, through the lumbar epidural space, with patients in sitting position, through loss of resistance technique. Patients were sedated on demand basis with pentazocine or midazolam.

All patients received an epidural 20ml of 0.75%Ropivacaine along with etiher:

Control group (n=20) +1ml normal saline

or

Dexmedetomidine Group (n = 20): 1µg.kg^{-1} + dexmedetomidine solution of sodium chloride 0.9 %, so that the volume was completed in 1ml syringe.

Immediately after the injection of the study drug, all patients were administered 20 ml of 0.75% (150 mg), the rate of 1 ml every three seconds.

After the surgery, patients were referred to the recovery room, where they remained for a period, until there was complete recovery of sensory and motor block. All were monitored with Pulse oximetry (SpO_2), NIBP, ECG. Patients who complained of pain were given rescue post-operative analgesia with 10ml of 0.2% Ropivacaine through epidural route.

Definition of Variables

Sensory Block Onset Time

Time interval between end of anesthetic injection and appearance of cutaneous analgesia in dermatomes T-12, T-10, T-8, T-6.

Duration of Motor Block

Administration of anesthetic and attainment of grade 0 in Bromage motor scale.

Duration of Analgesia

Administration of anesthetic and disappearance of cutaneous level at each dermatomal level.

Post-Op Analgesia Duration

Administration of anesthetic and time of analgesic usage in PACU.

Supplemental Sedation

If patient felt pain or uncomfortable, Sedated with pentazocine 0.3mg/kg and or midazolam 0.02mg I.V If there were hypotension (measured as systolic blood pressure less than 30% of its initial value or below 90 mmHg) during anesthesia , it was treated with administration of ephedrine, 6 to 12 mg and increased administration of intravenous fluids. Bradycardia (heart rate<45) were treated with atropine, 0.6 mg , and administration of oxygen via face mask (4 $l.min^{-1}$), if SpO_2 was < 94%.

Statistical Analysis

Variables were analysed with Student 't' test, Chi Square test. Variables like age, sex, weight, height

were compared using Levene's test for equality of variance.

Sample size obtained according to previous background study 'p' value less than 0.05 was taken as significant

Results

One patient in the control group excluded for failure of epidural and need for general anesthesia. There was no significant difference between groups in distributions of age, weight, height and sex, type of surgery or duration of surgery.

Regarding block onset time(time to attain analgesia at T12, T10, T8, T6), dex group has slightly shortented onset time with less significance when compared to control group (13.90mins vs 12.45mins) $p<0.08$.

Regarding the upper level of analgesia, examined after an hour after epidural, all patients did attain T6 level without any significance between groups

Table 1:

Variables		Control	DEX
Age		42.25	39.1
Sex	Female	3	4
	Male	17	16
Height (cm)		169.4	163.2
Weight (kg)		69.95	66.75
Level Of Epidural	L1-L2	2	2
	L2-L3	10	10
	L3-L4	8	8
Cathetar Length (cm)		6.5	6.85
Surgery	IM / IL Nailing	10	9
	Illizarao ring fixation	4	2
	DHS	2	5
	TKR	1	1
	THR	1	0
	DCS	0	1
	Encirclage / TBW L Patella	1	0
	Plate & Screw fixation	0	2
	Hemiarthroplasty	1	0
ASA	I	12	15
	II	8	5
Duration of Surgery (mins)		158.3	177

Table 2:

Independent Samples Test

		t-test for Equality of Means		
		DF	Sig. (2-tailed)	Mean Difference
Analgesia duration minutes	Equal variances assumed	38	.000	-67.900
	Equal variances not assumed	37.821	.000	-67.900

		Levene's Test for Equality of Variances		t-test for Equality of Means
		F	Sig.	t
Regression Time T6-T10 Minutes	Equal variances assumed	1.614	.212	-12.787
	Equal variances not assumed			-12.787
Regression Time T10-12 Minutes	Equal variances assumed	4.076	.051	-.394
	Equal variances not assumed			-.394

Regarding the duration of analgesia, the group receiving dexmedetomidine had significantly higher compared to the control group.in dex group it is 304.25mins compared to 236.35 in control group ($p<0.02$) and two segment regression time was prolonged in dex group.

Regarding motor block duration, dex group showed significant prolongation in duration (248mins) when compared to control group (204.65mins), level of significance $p<0.04$, slightly increased intensity of blockade assessed by bromage motor scale was observed with dex group, but without much significance $p<0.37$. The duration of postoperative analgesia was significantly different between groups ($p<0.001$), and the dexmedetomidine group had a duration of analgesia which is 60% more than control group. Values in minutes as an average were 496.95mins for dex group when compared to 309mins in control group

The occurrence of hypotension and the need for vasopressors in the intra- and post-operatively was similar between groups, with no significant difference $p>0.13$. Both groups showed excellent

Table 3:

Independent Samples Test

		t-test for Equality of Means		
		DF	Sig. (2-tailed)	Mean Difference
Post of Analgesis in Minutes.	Equal variances assumed	38	.000	-187.450
	Equal variances not assumed	32.091	.000	-187.450

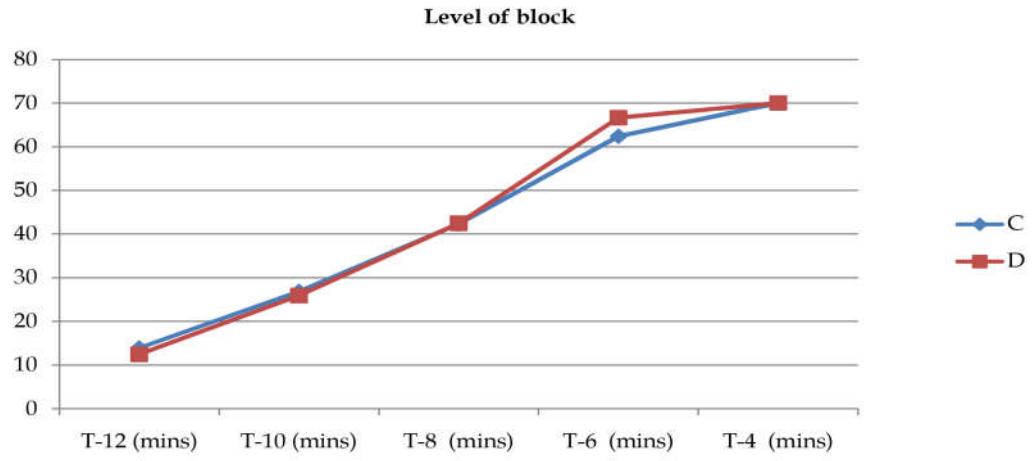

Fig. 1:

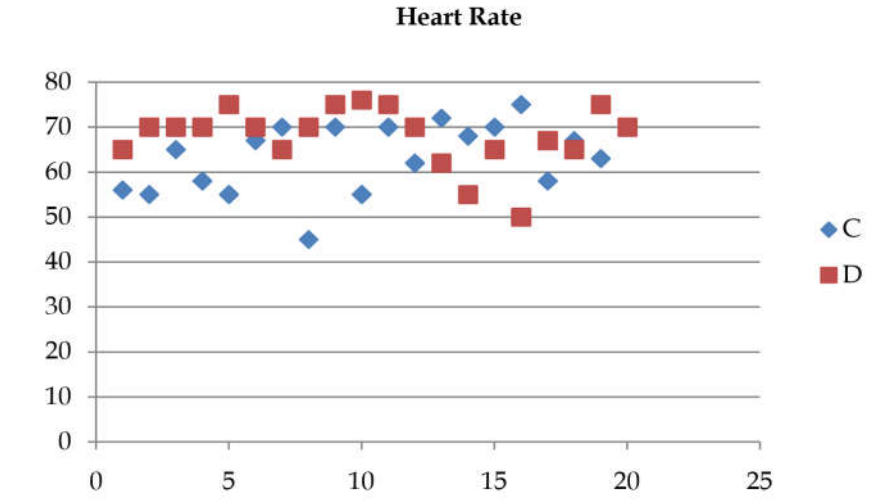

Fig. 2:

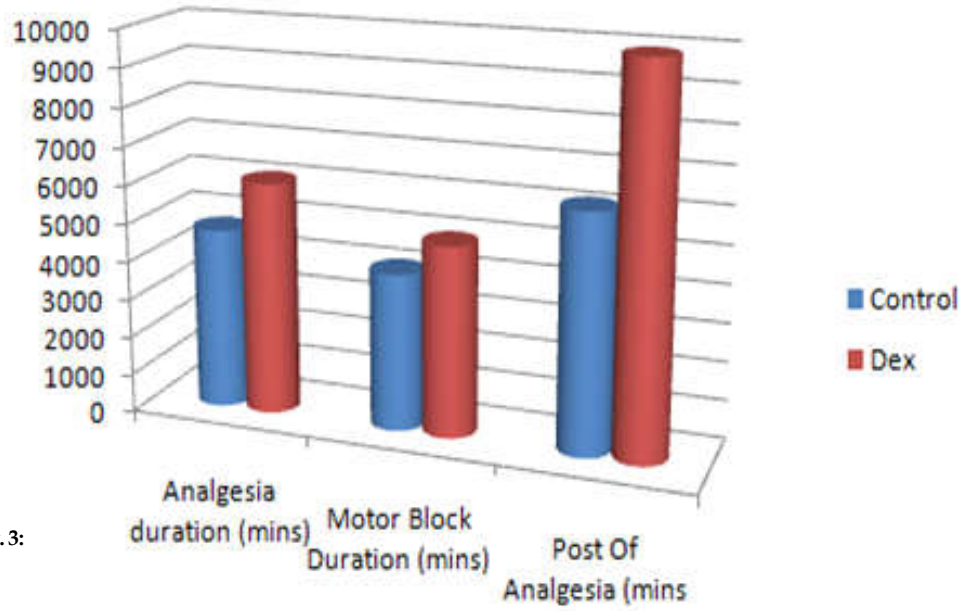

Fig. 3:

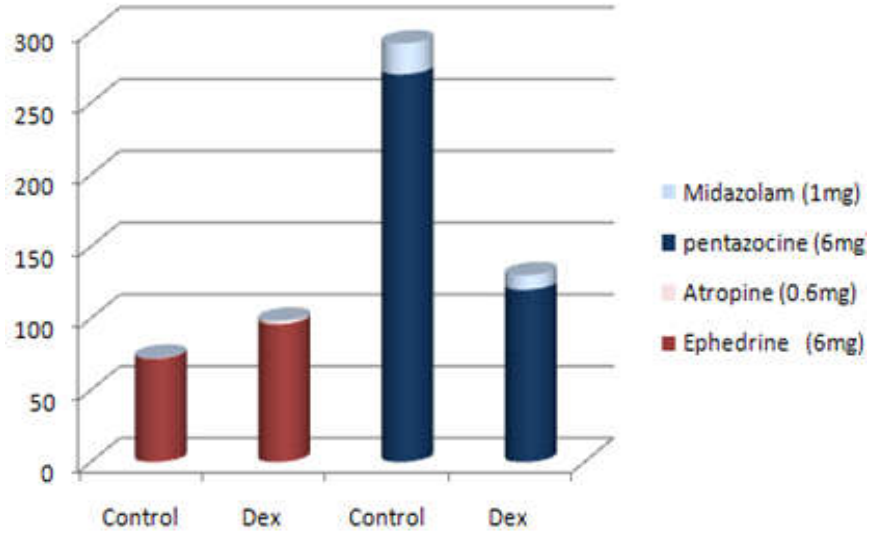

Fig. 4:

hemodynamic stability with less incidence of hypotension or bradycardia. The need for sedation was decreased in dex group when compared to control groups.

Discussion

In this study, the effect of added dexmedetomidine to epidural ropivacaine was evaluated. The results showed duration of analgesia,motor block block duration and postoperative analgesia were significantly increased and there is clear synergism between dexmedetomidine and ropivacaine when administered epidurally. Previous studies evaluated the effect of α_2 agonist added with various local anesthetics.This study conducted based on previous studies with epidural clonidine [8,10,11], which prolongs post operative analgesia [12,14,15]. Dexmedetomidine is a nonselective α_2 agonist. Three subtypes of α_2 adrenoreceptors have been described in humans: α_{2A}, α_{2B}, and α_{2C} [27,30]. The α_{2A} adrenoreceptors are primarily distributed in the periphery, whereas α_{2B} and α_{2C} are in the brain and spinal cord. Postsynaptic located α_2 adrenoreceptors in peripheral blood vessels produce vasoconstriction, whereas presynaptic α_2 adrenoreceptors inhibit the release of norepinephrine, potentially attenuating the vasoconstriction. The overall response to α_2

adrenoreceptors agonists is related to the stimulation of α_2 adrenoreceptors located in the CNS and spinal cord. These receptors are involved in the sympatholysis, sedation, and antinociception effects of α_2 adrenoreceptors. Ropivacaine is a long acting amide local anesthetics and 'S' isomer of the propyl analogue of mepivacaine and bupivacaine. It has similar properties to bupivacaine , but with better cadiotoxicity profile because it dissociates from Na+channels more rapidly and produces less accumulation of Na+channel block. Significantly better sensory-motor differentiation, due to lower lipid solubility than bupivacaine Has mild intrinsic vasoconstricting properties and so unsuitable for infiltration in tissues without collateral blood supply and is the reason for longer cutaneous anesthesia. Ropivacaine pKa is 8.07, Protein binding is 94%, Partition co-efficient is 11, CC:CNS ratio is 5:1, Potency 4. Dexmedetomidine is an agonist of α_2 adrenergic receptor – agonist where ratio among α_2:α_1 is 1600:1.Dex epidural effect is dose dependent and superior than I.V due to its high affinity for α_2 adrenergic receptors in spinal cord. After epidural administration of Dex , it is rapidly detected in CSF within five mins, however only 22% is absorbed into intra thecal space [19,31,33]. Its anti-nociceptive effect is dose dependent and is related to affinity of located α_2 adrenergic receptors in spinal cord and higher lipid solubility and penetration of meninges [5,20]. Prolonged analgesic action of local anesthetics in epidural space is due to reduced systemic absorbtion caused by local vasoconstriction mediated by α_{2C} adrenergic receptors in smooth muscle of epidural venous plexus [11,21,27].

The α_2 agonists produce their sedative-hypnotic effect by an action on α_2 receptors in the locus caeruleus and an analgesic action at α_2 receptors within the locus caeruleus and within the spinal cord [28,33,34]. During epidural administration cephalad spread of the drug into meninges may be responsible for sedation [16,22]. The α_2 agonists act through the endogenous sleep-promoting pathways to exert their sedative effect . Dexmedetomidine produces a decrease in activity of the projections of the locus caeruleus to the ventrolateral preoptic nucleus. This increases GABAergic and galanin release in the tuberomammillary nucleus, producing a decrease in histamine release in cortical and subcortical projections. Dexmedetomidine at concentrations producing significant sedation reduces minute ventilation, but retains the slope of the ventilatory response to increasing carbon dioxide. Dexmedetomidine also exhibited a hypercarbic arousal phenomenon, which has been described during normal sleep and is a safety feature. IV or inhaled dexmedetomidine has been implicated in blocking histamine-induced bronchoconstriction in dogs [22]. Another advantage is that their effects are easily reversible with alpha-2-adrenergic agonists such as atipamazole (with an affinity for the receptors of 60:1, compared to dexmedetomidine), which is the dependent dose, it rapidly reverses the sedation and cardiovascular effects at doses from 15 to 150 micg/kg [29]. The basic effects of α_2 agonists on the cardiovascular system are decreased heart rate; decreased systemic vascular resistance; and indirectly decreased myocardial contractility, cardiac output, and systemic blood pressure. Bradycardia and hypotension with administration of dexmedetomidine is dose dependent and occurs in epidural if level is higher [19,21,22,24]. Shivering incidence may be reduced with α_2 agonists due to central inhibition of thermoregulatory centre [23,25,26].

Conclusion

We conclude that dexmedetomidine at a dose of 1 $\mu g.kg^{-1}$ acts synergistically with ropivacaine 0.75% in epidural anesthesia. The drug increases the duration of analgesia, motor block duration, prolongs the duration of postoperative analgesia and decreases sedative usage and shivering episodes.

References

1. Aantaa R, Jaakola ML, Kallio A, Kanto J. Reduction of the minimum alveolar concentration of isoflurane by dexmedetomidine . Anesthesiology. 1997;86: 1055-60.
2. Jalonen J, Hynynen M, Kuitunen A, Heikkila H, J Perttila, Salmenpera M, et al. Dexmedetomidine an anesthetic adjunct in the coronary artery bypass grafting . Anesthesiology. 1997;86:331-45.
3. Unlugenc H, Gunduz M, Guler T, Yagmur O, Isik G. The effect of pre- administration of intravenous Anaesthetic dexmedetomidine on postoperative pain in Patients receiving patient -controlled morphine. Eur J Anaesthesiol. 2005;22:386-91.
4. Meert TF, De Kock M. Potentiation of the analgesic properties of fentanyl opioids with alpha$_2$-adrenoceptor agonists in rats . Anesthesiology. 1994;81:677-88.
5. Asano T, Dohi S, Ohta, Shimonaka H, Iida H. Antinociception by epidural and systemic alpha (2)-adrenoceptor agonists and Their binding affinity in rat spinal cord and brain. Analg. 2000;90:400-7.
6. Fukushima K, Nishime Y, Mori K, Kaneko I, Fukushima Y. Postoperative analgesic action and plasma concentration of epidural dexmedetomidine

administered. Anesthesiology. 1997;87(Suppl):744.

7. Klimscha W , Chiari A, Krafft P, Plattner O, Taslimi R, Mayer N, et al. Hemodynamic and analgesic effects of clonidine added repetitively to continuous epidural and spinal blocks. Analg. 1995;80:322-7.
8 . Alves TCA, Braz JRC. Effects of the combination of clonidine to ropivacaine for epidural anesthesia. Anesth Analg. 2002;52:410-9.
9. Bromage PR. A comparison of the hydrochloride and carbon dioxide salts of lidocaine and prilocaine in epidural analgesia. Acta Anaesthesiol Scand. 1965; 16:55-69.
10. Lima OS, Neto DSC , Araujo GS Jr , Benevides AM. Comparative study of epidural anesthesia with 1% ropivacaine combined with clonidine or dexmedetomidine. Anesth Analg. 2003;53(suppl):A013.
11. Nishikawa T, Dohi S. Clinical evaluation of clonidine added to lidocaine solution for epidural anesthesia. Anesthesiology. 1990;73:853-9.
12. Milligan KR, Convery PN, Weir P, Quinn P, Connolly D. The efficacy and safety of epidural infusions of levobupivacaine with and without clonidine for postoperative pain relief in Patients Undergoing total hip replacement. Analg. 2000;91:393-7.
13. Landau R, Schiffer E , Morales M, Savoldelli G, Kern C. The dose- sparing effect of clonidine added to ropivacaine for labor epidural analgesia. Analg. 2002; 95:728-34.
14. Curatolo M, Schnider TW, Petersen- Felix S , Weiss S, Signer C, Scaramozzino P, et al. A direct search procedure to optimize combinations of epidural bupivacaine, fentanyl, and clonidine for postoperative analgesia. Anesthesiology. 2000;92:325-37.
15. Paech MJ, Pavy TJ, Orlikowski CE , Lim W, Evans SF. Postoperative epidural infusion: a randomized , double-blind, dose -finding trial of clonidine in combination with bupivacaine and fentanyl. Analg. 1997;84:1323-8.
16. Walker SM, Howard RF, Keay KA, Fitzgerald M. Developmental age influences the effect of epidural dexmedetomidine on inflammatory hyperalgesia in rat pups . Anesthesiology. 2005;102:1226-34.
17. Muguruma T, Sakura S, Saito Y. Dexmedetomidine and bupivacaine Have synergistic antinociceptive interaction in rats. Anesthesiology. 2006;105(Suppl): A308.
18. Silva VM, Araújo JHL, Baldiotti LAS. epidural bupivacaine with Dexmedetomidine for hysterectomy. Anesth Analg . 2002;52(suppl):B014.
19. JC, Shafer SL, Bucklin BA , Jackson C, Kallio A. Pharmacokinetics and pharmacodynamics of intraspinal dexmedetomidine in sheep. Anesthesiology. 1994; 80:1349-59.
20. Ala- Kokko TI, Pienimaki P, Lampel And Hollmen AI, Pelkonen O, Vahakangas K. Transfer of clonidine and dexmedetomidine across the isolated perfused human placenta. Acta Anaesthesiol Scand. 1997;41: 313-9.
21. JC, De Kock M, Klimscha W. Alpha (2)- adrenergic agonists for regional anesthesia. A clinical review of clonidine (1984-1995). Anesthesiology. 1996;85: 655-74.
22. Sabbe MB, Penning JP, Ozaki GT, Yaksh TL. Spinal and systemic action of the alpha 2 receptor agonist dexmedetomidine in dogs. Antinociception and carbon dioxide response. Anesthesiology. 1994;80:1057-72.
23. Maroof M , Khan SA , Jain D , Khan RM, Maroof MS. Evaluation of effect of dexmedetomidine in Reducing shivering Following epidural anesthesia. Anesthesiology. 2004;101(suppl):A495.
24. Rauck RL, Eisenach JC, Jackson K, Young LD, Southern J. Epidural clonidine treatment for refractory reflex sympathetic dystrophy. Anesthesiology. 1993; 79:1163-9.
25. Talke P, Tayefeh F, Sessler DI, Jeffrey R, Noursalehi M , Richardson C. Dexmedetomidine does not alter the sweating threshold , But comparably and Linearly Decreases the vasoconstriction and shivering thresholds. Anesthesiology. 1997;87:835-41.
26. Douf AG, Lin CM, Suleman MI, Liem EB, Lenhardt R, Morioka N, et al. Dexmedetomidine and meperidine additively Reduce the shivering threshold in humans. Stroke. 2003;34:1218-23.
27. Virtanen R, Savola JM, Saano V, Nyman L: Characterization of the selectivity, specificity and potency of medetomidine as an alpha 2-adrenoceptor agonist. Eur J Pharmacol 1988;150:9-14.
28. Nelson LE, Lu J, Guo T, et al. The alpha2-adrenoceptor agonist dexmedetomidine converges on an endogenous sleep-promoting pathway to exert its sedative effects. Anesthesiology. 2003 Feb;98(2): 428-36.
29. Aho M, Erkola O, Kallio A, et al. Comparison of dexmedetomidine and midazolam sedation and antagonism of dexmedetomidine with atipamezole. J Clin Anesth 1993;5:194-203.
30. Reid K, Hayashi Y, Guo TZ, et al. Chronic administration of an alpha 2 adrenergic agonist desensitizes rats to the anesthetic effects of dexmedetomidine. Pharmacol Biochem Behav 1994;47:171-175.
31. Eisenach JC, De Kock M, Klimscha W. Alpha(2)-adrenergic agonists for regional anesthesia: A clinical review of clonidine (1984-1995). Anesthesiology 1996;85:655-674.
32. Karhuvaara S, Kallio A, Salonen M, et al. Rapid reversal of alpha 2-adrenoceptor agonist effects by atipamezole in human volunteers. Br J Clin Pharmacol 1991;31:160-165.
33. Guo TZ, Jiang JY, Buttermann AE, Maze M. Dexmedetomidine injection into the locus ceruleus produces antinociception. Anesthesiology 1996;84: 873-881.
34. Asano T, Dohi S, Ohta S, et al. Antinociception by epidural and systemic alpha(2)-adrenoceptor agonists and their binding affinity in rat spinal cord and brain. Anesth Analg 2000;90:400-407.

Original Research Article

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Comparison of Spinal and General Anaesthesia in Patients Undergoing Caesarean Section: A Prospective Study at a Tertiary Care Teaching Hospital

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Abstract

Background: Cesarean section (CS) is one of the most common surgical procedures today. About 20-25% of all birth is by CS. Surgery and anesthetic technique employed has been shown to effect postoperative outcomes, specifically effecting the length of hospital stay. Hence; present study was planned to assess and compare the efficacy of spinal anaesthesia and general anaesthesia in patients undergoing CS. *Materials & Methods:* The present study included evaluation and comparison of efficacy of spinal and general anaesthesia in patients undergoing caesarean section. A total of 30 subjects were included in the present study and were broadly divided into two study groups; group 1 and group 2 with 15 patients in each group. Group 1 included patients which underwent caesarean section under general anaesthesia and group 2 included patients which underwent caesarean section under spinal anaesthesia. All the patients underwent complete haematological and biochemical investigation before the starting of the surgical procedure. Complicate demographic details of all the patients were recorded. Presence of any postoperative complication were also evaluated and recorded. All the results were analyzed by SPSS software. *Results:* A total of 30 pregnant females were included in the present study and were broadly divided into two study groups with 15 females in each group. Mean age of the patients of group 1 and group 2 was 33.5 years and 34.1 years respectively. Mean gestation weeks of patients of group 1 and group 2 were 38.5 weeks and 38.4 weeks respectively.Number of hypotensive patients observed in group 1 and group 2 after procedure were found to be 2 and 8 respectively. Significant results were obtained while comparing the total intraoperative fluid requirement and number of ephedrine requiring patients in between both the study groups. *Conclusion:* In comparison to spinal anaesthesia, general anaesthesia is comparatively better for patients undergoing elective caesarean section.

Keywords: General Anaesthesia; Spinal Anaesthesia; Caesarean Section.

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Introduction

Caesarean section (CS) rates have increased dramatically in developed and developing countries alike in the past 30 years. In developed countries, regional anaesthesia, most often spinal anaesthesia (SA) rather than general anaesthesia (GA) has become the anesthetic technique of choice for women undergoing CS [1-3].

Caesarean section (CS) is one of the most common surgical procedures today. About 20-25% of all birth is by CS. Most of the CS are now performed under (SA) in modern obstetrics as it is technically easier, safe, with short recovery. It allows the patient to remain awake during the procedure, thus relieving anxiety and improving satisfaction and other benefit is the avoidance of infant sedation [4-6].

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Surgery and anesthetic technique employed has been shown to effect postoperative outcomes, specifically effecting the length of hospital stay. Rapid recovery after cesarean section should not only aim for an early return to normal daily life but also for the mother's bonding and nursing of the newborn [7-9].

Hence, we planned the present study to assess and compare the efficacy of spinal anaesthesia and general anaesthesia in patients undergoing CS.

Materials & Methods

We planned the present study in the Department of Anaesthesia, Rajshree Medical Research Institute & Hospital, Bareilly, Uttar Pradesh (India) and included evaluation and comparison of efficacy of spinal and general anaesthesia in patients undergoing caesarean section. Written consent was obtained after explaining in detail the entire research protocol.

A total of 30 subjects were included in the present study and were broadly divided into two study groups; group 1 and group 2 with 15 patients in each group. Group 1 included patients which underwent caesarean section under general anaesthesia and group 2 included patients which underwent caesarean section under spinal anaesthesia (Table 1 & Graph 1).

Exclusion Criteria

- Subjects with history of any form of systemic pathology,
- Subjects with positive history of any form of gynaecological surgery,
- Subjects with any known drug allergy

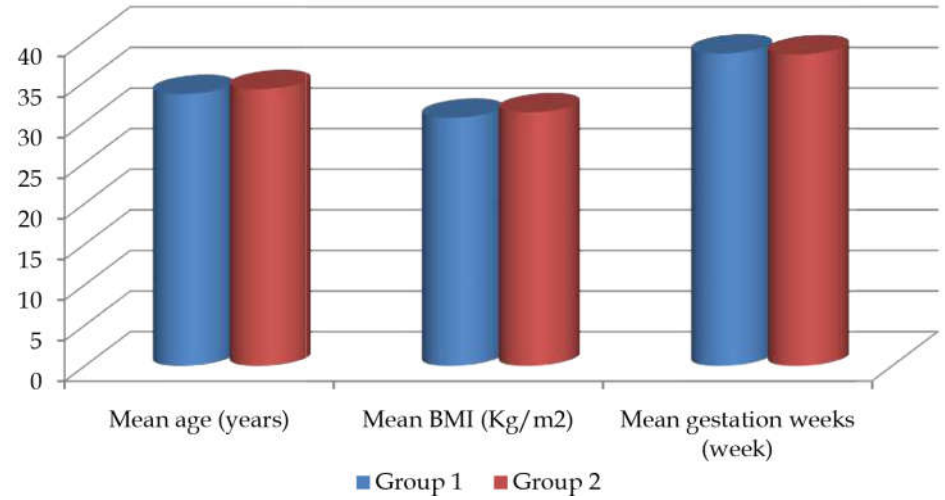
All the patients underwent complete haematological and biochemical investigation before the starting of the surgical procedure. Complicate demographic details of all the patients were recorded (Table 2). We also evaluated and recorded the presence of any postoperative complication. All the results were analyzed by SPSS software. Student t test was used for assessment of level of significance. p- value of

Table 1: Demographic details of the patients

Parameter	Group 1	Group 2	P- value
Mean age (years)	33.5	34.1	0.84
Mean BMI (Kg/m^2)	30.58	31.25	0.41
Mean gestation weeks (week)	38.5	38.4	0.25

Table 2: Complications occurring in the patients

Parameter	Group 1 (N=15)	Group 2 (N=15)	P- value
Hypotensive patients (N)	2	8	0.02*
Total intraoperative fluid requirement (ml)	1465	2102	0.03*
Ephedrine requiring patients (N)	1	7	0.04*



Graph 1: Demographic details of the patients

less than 0.05 was taken as significant.

Results

A total of 30 pregnant females were included in the present study and were broadly divided into two study groups with 15 females in each group. Mean age of the patients of group 1 and group 2 was 33.5 years and 34.1 years respectively. Mean gestation weeks of patients of group 1 and group 2 were 38.5 weeks and 38.4 weeks respectively. Number of hypotensive patients observed in group 1 and group 2 after procedure were found to be 2 and 8 respectively. Significant results were obtained while comparing the total intraoperative fluid requirement and number of ephedrine requiring patients in between both the study groups.

Discussion

In the present study, we observed that we observed significant results while comparing the number of hypotensive patients, the total intraoperative fluid requirement and number of ephedrine requiring patients in between both the study groups. Martin TC et al compared of maternal and neonatal outcomes comparing general anaesthesia (GA) and the early experience with spinal anaesthesia (SA) for CS in Antigua and Barbuda. Data obtained included maternal age, gravidity, parity, indication for operation, emergent versus routine operation and type of anaesthesia used. Outcome data comprised estimated blood loss, transfusion requirement, length of stay, postoperative wound infection for mothers. Data obtained for babies included birthweight, one and five minute Apgar scores, neonatal special care unit admission or perinatal death. The sample population included 103 CS patients who underwent GA and 45 who underwent SA. There was no difference in age (mean 29.3 vs 29.4 years), gravidity (mean 3.25 vs 3.27), parity (mean 1.74 vs 1.56) or emergency vs routine CS (44.4% vs 49.5%). Mothers who underwent GA had significantly greater estimated blood loss (mean 787 vs 632 mL, $p < 0.02$) and rate of transfusion (13.6% vs 2.2%, $p < 0.05$). There was a trend toward longer hospital stay (mean 6.86 vs 6.42 days, $p = 0.16$) but a lower rate of postoperative wound infection (8.7% vs 20%, $p < 0.10$) for mothers who underwent GA. There were no maternal deaths. Babies demonstrated no difference in birthweight (mean 3238 vs 3258 g) but those born to mothers who underwent GA had significantly lower one minute (mean 6.84 vs 8.17, $p < 0.0001$) and five minute (mean 8.13 vs 8.91, $p < 0.001$) Apgar scores, with a trend toward more frequent neonatal special care unit admission (26.2% vs 17.7%, $p < 0.20$) and perinatal death (3.9 vs 0%, $p < 0.30$). GA and SA appear equally safe, but SA was associated with significantly better outcome for both mothers and babies [10].

Afolabi BB et al determined the effect of the type of anaesthesia used for emergency Caesarean section on neonatal and maternal outcome. The patients were recruited into the study after being given either general or spinal anaesthesia. Neonatal outcome was assessed using Apgar scores and need for respiratory assistance at birth. Maternal outcome was assessed using the difference between pre- and post-operative packed cell volumes (PCV), need for blood transfusion and estimated blood loss. The groups were matched for pre-existing risk factors. Apgar scores at 1 and 5 minutes were found to be significantly lower for the general anaesthesia group (GA) than the spinal anaesthesia group (SA) and need for respiratory assistance was greater for the GA group. Difference between pre- and post-operative PCV and need for blood transfusion were also significantly greater in the GA group. This study confirmed that the current practice of spinal anaesthesia for Caesarean section in the Lagos University Teaching Hospital is a good one, but further studies need to be done to assess other outcome variables [11]. Fyneface-Ogan S et al determined outcomes following the use of infiltrative anaesthesia (gLA) compared with general anaesthesia (gGA) in eclamptic patients undergoing caesarean section. Eclamptic patients scheduled for emergency caesarean section were prospectively studied. They were randomised into two groups to receive either infiltration with local anaesthetic or general anaesthesia for caesarean section. The protocol used for this study included clinical and sociodemographic data, chest examination prior to administration of anaesthesia, maternal and perinatal outcome, duration of maternal hospital stay and intraoperative blood pressure measurement. There were a total of 76 eclamptic patients in the study. There were no significant differences between the infiltration and general anaesthesia groups with regard to clinical and bio-socio-demographic parameters. Fourteen (40.0%) newborns in the gLA had lowerApgar scores in the first minute than 27 (73.0%) in the gGA group. Five (14.3%) newborns were stillbirths in gLA while 2 (5.4%) were found in the gGA. Twenty-one (60.0%) in gLA had Apgar scores ≥ 8 compared

to 10 (27.0%) in the gGA. The duration of hospital stay was longer in the gGA (17.1±4.1 days) than the gLA (13.0±1.6 days) with a statistically significant difference ($p<0.0001$). There were five (12.5%) maternal deaths in the gGA and two (5.0%) in the gLA. Intraoperatively, the mean arterial pressure and mean systolic pressure at skin incision were consistently and significantly higher in the gGA group than in gLA group. Local infiltrative anaesthesia appears to have a better maternal and perinatal outcome than general anaesthesia for eclamptic patients undergoing caesarean section.[12]

Conclusion

From the above results, the authors concluded that in comparison to spinal anaesthesia, general anaesthesia is comparatively better for patients undergoing elective caesarean section. However; future studies are recommended.

References

1. Camous J, N'da A, Etienne-Julan M, Stéphan F. Anesthetic management of pregnant women with sickle cell disease-effect on postnatal sickling complications. Can J Anaesth. 2008;55:276–83.
2. Koshy M, Burd L. Management of pregnancy in sickle cell syndromes. Hematol Oncol Clin North Am. 1991;5:585–96.
3. Batool S, Malik AS. Comparison of spinal versus general anaesthesia for patients undergoing lower segment cesarean section. Pafmj 2010;60(3):439-43
4. Paech MJ, Scott KL, Clavisi O, Chua S, McDonnell N; ANZCA Trials Group. A prospective study of awareness and recall associated with general anaesthesia for caesarean section. Int J Obstet Anesth 2008;17(4):298-303.
5. Silva-Pinto AC, de Oliveira Domingues Ladeira S, Brunetta DM, De Santis GC, de Lucena Angulo I, Covas DT. Sickle cell disease and pregnancy: analysis of 34 patients followed at the Regional Blood Center of Ribeirão Preto, Brazil. Rev Bras Hematol Hemoter. 2014;36:329–333.
6. Lertakyamanee J, Chinachoti T, Muang Kasem J, Kolatat T, Tritrakarn T, Somboonnanonda A. Comparison of general & regional anaesthesia for cesarean section. Chot Mai Het Thong Phaet: 1999; 82:672-680.
7. Black AS, Newcombe GN, Plummer JL, McLeod DH, Martin DK. Spinal anaesthesia for ambulatory arthroscopic surgery of the knee: a comparison of low-dose prilocaine and fentanyl with bupivacaine and fentanyl. Br J Anaesth. 2011;106:183–188.
8. Brousse V, Makani J, Rees DC. Management of sickle cell disease in the community. BMJ. 2014;348:g1765.
9. Cooper GM, McClure JH. Maternal deaths from anaesthesia. An extract from Why Mothers Die 2000-2002, the Confidential Enquiries into Maternal Deaths in the United Kingdom: Chapter 9: Anaesthesia. Br J Anaesth 2005;94(4):417-23.
10. Martin TC1, Bell P, Ogunbiyi O. Comparison of general anaesthesia and spinal anaesthesia for caesarean section in Antigua and Barbuda. West Indian Med J. 2007 Sep;56(4):330-3.
11. Afolabi BB1, Kaka AA, Abudu OO. Spinal and general anaesthesia for emergency caesarean section: effects on neonatal Apgar score and maternal haematocrit. Niger Postgrad Med J. 2003 Mar;10(1):51-5.
12. Fyneface-Ogan S1, Uzoigwe SA. Caesarean section outcome in eclamptic patients: a comparison of infiltration and general anaesthesia. West Afr J Med. 2008 Oct;27(4):250-4.

Original Research Article

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A Comparative Study: Ultrasound Guided Transverse Abdominis Plane Block versus Caudal Block in Paediatric Patients for Lower Abdominal Surgeries

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Abstract

Background: Paediatric patients undergoing lower abdominal surgeries require adequate pain relief peri operatively, which is often neglected. Various methods of pain relief in paediatric patients are systemic opioids, NSAIDS and regional anaesthesia techniques like caudal block. Recently a newer technique i.e. ultrasound guided transversus abdominis plane (TAP) block is being taken into consideration. Therefore, we aimed to compare efficacy of USG guided TAP block Vs. Caudal block in paediatric patients undergoing lower abdominal surgeries for post-operative analgesia. *Methods:* Fifty patients were randomly allocated in two equal groups- group A received TAP block and group B received caudal block. Our study included children of age group one to ten years posted for lower abdominal surgeries. Both the blocks were performed after same general anaesthesia technique. We compared requirement of intra-operative additional analgesia, vital parameters, post op pain score and time of rescue analgesia. The entire data was statistically analyzed using SPSS software. The inter-group comparison is done using Chi-square test/ Fisher's exact probability test. *Result:* Intra-operative pulse rate did not differ significantly between two groups. The average requirement of intra-operative analgesia did not differ significantly in both the groups. The average post-operative Pain Score was significantly higher in group B compared to group A after 180 min (p=0.001). Significantly higher proportion of children from Group B required rescue analgesia compared to Group A (p=0.001). *Conclusion:* We conclude that USG guided TAP block is better alternative to caudal block for post operative analgesia in children undergoing lower abdominal surgeries.

Keywords: TAP Block; Caudal Block; Paediatric Patient.

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Introduction

The impact of a painful experience on the young nervous system is so significant that long-term effects can occur, including a lowered pain tolerance for months after a pain-producing event [1, 2]. On the other hand there are benefits of adequate analgesia, which include attenuation of the surgical stress response, decreased perioperative morbidity and improved outcome in certain types of surgeries. Also, effective pain control facilitates rehabilitation and accelerates recovery from surgery [3,4]. Paediatric patients undergo a variety of lower abdominal surgical procedures that need adequate pain relief peri-operatively, which is often neglected.

Finely et al observed that many types of the so called "minor"surgeries can cause significant pain in children [5]. Regional anaesthesia and analgesia techniques are commonly used to facilitate pain control during paediatric surgical practice, reduce

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parenteral opioids requirement and improve the quality of post-operative pain control and patient-parent satisfaction.

There are various methods of pain relief in paediatric patients such as systemic opioids, NSAIDS (non steroidal anti inflammatory drugs) and various regional anaesthesia techniques for e.g.: caudal epidural block for analgesia. However, caudal epidural block has its own disadvantages, like accidental injection of LA into intrathecal space, invasiveness, accidental rectal puncture, and difficult anatomic variations. It is contraindicated in conditions such as spina bifida, meningomyelocele, etc. So trends are shifting towards peripheral nerve blocks or infiltration blocks.

In recent times, because of availability of imaging techniques, use of peripheral nerve blockade is advocated wherever applicable. It has lower incidences of adverse effects compared to neuraxial blocks and the procedure is easy, safe and reliable due to imaging aids [6]. So, among the peripheral nerve blocks, TAP (tansverse abdominis plane) block is a newer technique, which can be used in lower abdominal and inguinal surgeries.

On searching literature, we found that there are limited conclusive studies of USG (ultrasonography) guided TAP blocks in paediatric patients. Therefore, we aimed to compare the efficacy of USG guided TAP block vs. caudal block in paediatric patients undergoing lower abdominal surgeries for postoperative analgesia. Our primary objective was to compare analgesic effect of caudal block with TAP block peri-operatively. Secondary objectives were to know the duration of analgesia in post operative period, time to first dose of rescue analgesia and incidence of rescue analgesia between the two groups.

Methods

Institutional ethical committee approval was taken. The study was conducted over a period of 14 months. The study was a prospective, randomized study and included fifty patients of ASA grade I and II within the age group of 1-11 years. We used simple random sampling (SRS) method for randomization and the list of cases was generated based on the on-line random number generators. Necessary parental consent was taken for all patients. All these patients were posted for elective lower abdominal surgeries such as pyeloplasty (explained in reply template), herniotomy, laparoscopic appendicectomy, etc. We excluded the patients with neurological diseases, with coagulopathies and patients having infection at the puncture site.

Patients were divided into two groups (twenty five in each group) and randomly received either caudal block or USG guided TAP block after induction of general anaesthesia.

Group A: TAP block was performed under ultrasound guidance with 0.25 ml/kg of 0.25% Bupivacaine (bilateral block was given).

Group B: Caudal block was performed with landmark technique with 1 ml/kg of 0.25% Bupivacaine with the child in lateral position [7, 8].

Standard protocol of GA was followed in both the groups. A complete preanaesthetic check up of patients was performed before their scheduled allotment into the two study groups. Appropriate biochemical, haematological and radiological investigations were done as per hospital protocol. Standard NPO guidelines were followed. All children were allowed to take clear fluids 2h prior to surgery.

Children were premedicated with Syrup Midazolam 0.5 mg/kg in the pre operative room. On shifting the patient to the operation theatre (OT), monitoring devices were attached including three lead electrocardiogram (ECG), pulse oximeter and non-invasive blood pressure monitor. An intravenous (I.V.) line was secured.

Pre medication with injection Glycopyrrolate 0.004 mg/kg I.V was given. Patients were preoxygenated with 100% O_2 for 3 minutes. Pre induction injection Fentanyl 1mcg/kg I.V. was given in both the groups, the same was used for intraoperative analgesia supplementation as per requirement. Induction was carried out with injection Thiopentone Sodium 5mg/kg I.V. Intubation was done under the effect of injection Succinylcholine 2mg/kg I.V and uncuffed/cuffed endotracheal tube of appropriate size was secured. Maintenance of anaesthesia was done on O_2+N_2O+Sevoflurane with intermittent doses of Inj. Vecuronium 0.08mg/kg I.V. Jackson Rees circuit was used for IPPV.

During surgery, all patients received an I.V. infusion of Ringer lactate as a maintenance dose as per Holliday Segar formula. On completion of surgery, in both the groups of patients, neuromuscular blockade was reversed with injection Neostigmine 0.05 mg/kg and injection Glycopyrrolate 0.01 mg/kg.

In case of caudal block, the child was placed in lateral position and caudal block was performed

using aseptic technique and a short bevelled 22 gauge needle. After negative aspiration of blood and CSF, 1ml/kg of 0.25% Bupivacaine was administered.

The TAP block procedure was done under ultrasound guidance using Sonosite ultrasound machine and linear multi-frequency 6-13 MHz transducer scanning probe. Under all aseptic precautions, with the patient in supine position, the probe was placed in a transverse plane to the lateral abdominal wall in the mid axillary line between the lower costal margin and iliac crest. The scan showed three muscles of the abdominal wall - external oblique, internal oblique and transverse abdominis. A 22 gauge hypodermic needle was inserted, in plane approach; the end point was, as shown in the Image 1, in between the internal oblique and transversus abdominis muscle in the fascial layer that separates the two muscle layers [9]. The local anaesthetic, 0.25 ml/kg (on each side) of 0.25% Bupivacaine was deposited after confirmation of the needle tip between the two fascial planes. After completion of surgical procedure and emergence from anaesthesia, the patients were shifted to PACU (post anaesthesia care unit). Quality of analgesia was assessed by using the Wong Baker's pain score till patient received first dose of rescue analgesia in both groups. Rescue analgesia was considered when the Pain score was more than three.

Sample size calculation was based on the results (effect sizes) from the previously published studies. A sample of size 23 cases in each study group, i.e. total 46 cases with Group A (TAP Block) to Group B (Caudal Block) ratio being 1:1 and satisfying the inclusion criteria would produce more than 80.0% statistical power (type II error =0.20) and 5% type I error probability (a=0.05) clinically significant difference in outcome measures based on post operative pain scores between the two study groups with a two-tailed alternative hypothesis by using power and sample size calculation software (PS). On an average one unit difference of Wong Baker's post-op pain scale was considered to be clinically significant.

The data on categorical variables is shown as n (% of cases) and the data on continuous variables is presented as Mean and Standard deviation (SD) across two intervention groups. The inter-group comparison of categorical variables was done using Chi-square test / Fisher's exact probability test.

The p-values less than 0.05 are 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 was statistically analyzed using Statistical Package for Social Sciences (SPSS ver. 16.0, Inc. Chicago, USA) for MS Windows.

Results

The demographic data: age, weight, sex, ASA grading and gender in both the groups were comparable (as shown in Table 1). The difference between average pain scores in post-operative period is shown in Graph 1.

The incidence of requirement of rescue analgesia was 36% in group A; however it was 96% in group B (p value-0.001) which was significantly higher.

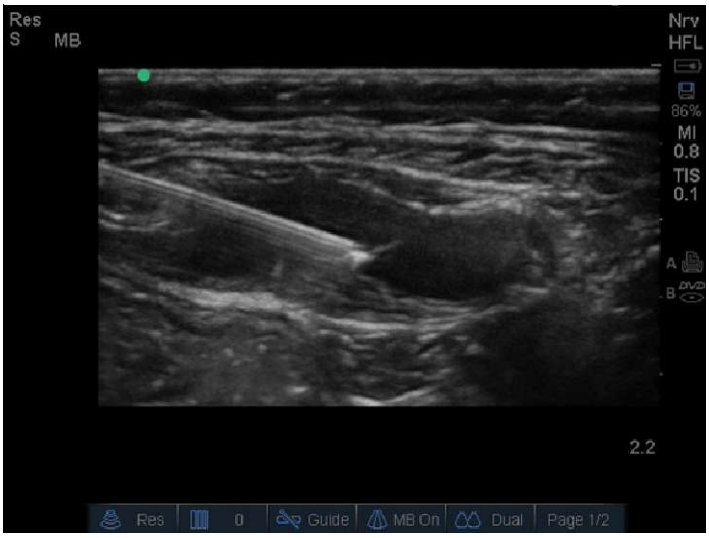
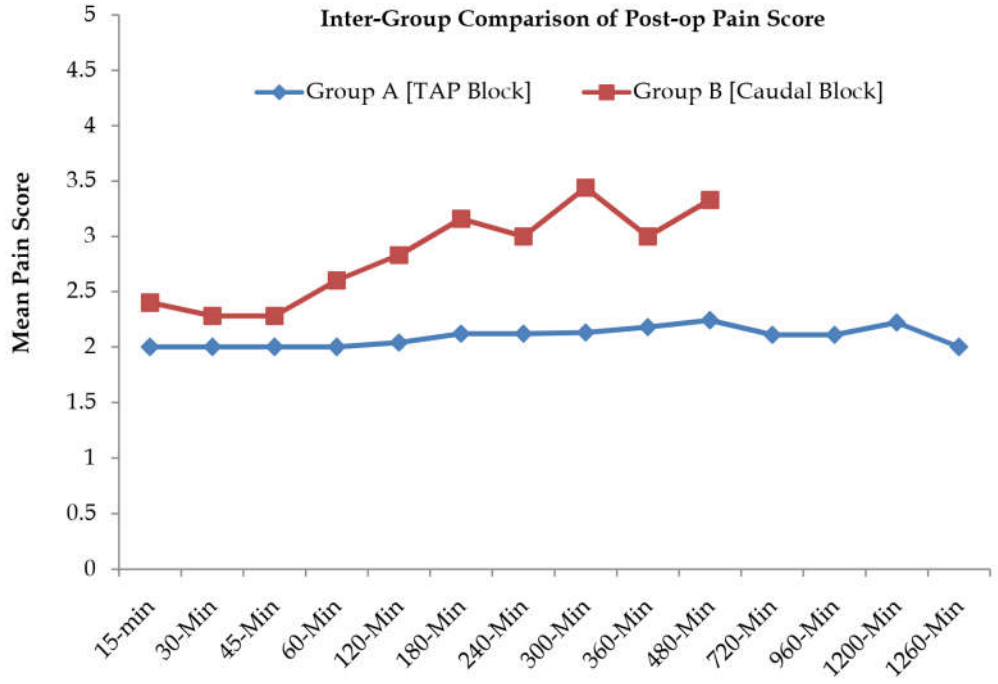


Image 1: Muscle layers of abdominal wall with needle entry and drug spread in TAP block

Table 1: Demographic Data

	Group A(n =25)	Group B (n=25)	P Value
Age (in years)	4.48 ± 4.15	3.11 ± 2.20	0.923
Weight (in kgs)	16.14 ± 9.09	13.61 ± 4.69	0.223
Gender (Male/ Female)	16/9	19/6	0.538



Graph 1: Inter-Group Comparison of Post-op Pain Score

The average time to first dose of rescue analgesia was 9.56±6.48 hrs in Group A compared to 3.75±1.87 hrs in Group B, which was significantly higher (p value-0.001). There was no change in intra operative hemodynamic parameters in both the groups.

Discussion

This prospective randomised study compared the analgesic effects of both ultrasound guided TAP block and landmark guided caudal block (which is used by most of the anaesthesiologists). Intra operative analgesic requirement in both the groups did not differ significantly. Even pain scores in early post operative period showed no significant difference till 180 min. The duration of analgesia was significantly longer in TAP block as compared to caudal block which showed early requirement of rescue analgesia.

Improved analgesia in TAP block compared to caudal block may be explained by ease of approach making the ultrasound view clearer and thereby confirming the site of injection. Ultrasound views were satisfactory in all patients in TAP block group and the spread of local anaesthetic was seen as spindle shape in all TAP blocks. This helped in direct visualisation of spread of LA in neurofascial plane.

TAP block per se only covers somatic sensation to the abdominal wall and the parietal peritoneum. However, if high volume of LA is used it facilitates spread of LA into paravertebral spaces as the transverse abdominis plane is in continuum with paravertebral spaces resulting in some visceral analgesia. Therefore, it helps in eliminating the need of additional opioids [10].

However caudal block provides predominantly sympathetic blockade, while visceral pain could not be eliminated [7]. This could be the reason of early requirement of analgesia in caudal group. The results from our study are very well correlated with the study done by Kanojia el al. They also found that the children who received USG guided TAP block had longer duration of analgesia compared to children who received caudal block [11]. Kanojia et al. used 0.3ml/kg of 0.2% Ropivaicaine as LA. Alsadek et al also did the same study but they used

USG in both the groups for TAP block and caudal block. They found that the patients who received TAP block required less post operative rescue analgesia with better impact on pain scores than caudal block. They also observed that patient and parent satisfaction was markedly good in case of TAP block [12]. Alsadek et al used drug dose of 0.5ml/kg of Bupivacaine on affected side. We found similar results with 0.25ml/kg of Bupvacaine given bilaterally. More interesting findings were observed by Farid et al. They did a comparison between USG guided TAP block vs. ilioinguinal/iliohypogastric nerve blocks in children undergoing lower abdominal surgeries and they found that TAP block has longer duration of analgesia [13]. Though both ilioinguinal and iliohypogastric nerves enter transverses abdominis plane by penetrating transverses abdominis muscle midway between iliac crest and costal margin, longer duration of analgesia was found with TAP block. It may be because of more anterior injection site which was implemented in their study. This anterior approach brought the TAP block in close proximity to both ilioinguinal and iliohypogastric nerves, having better results and long duration of analgesia. We used this anterior approach in our technique of blocks, which must have helped us with longer duration of analgesia and lower pain scores. In our study, though early post operative pain scores were similar in both the groups, sustained lower pain scores were seen in TAP block (6-8h) as compared to caudal block (3h). The only limitation of USG guided TAP block is expertise in USG imaging and longer learning curve.

Conclusion

To conclude, TAP block under ultrasound guidance was easy, safe, reliable and effective in children undergoing lower abdominal surgeries in comparison to caudal block. The patients who received TAP block required less post operative rescue analgesia with better impact on pain scores than caudal block.

References

1. Andrews K, Fitzgerald M. Cutaneous flexion reflex in human neonates: a quantitative study of threshold and stimulus response characteristics after single and repeated stimuli. DevMed Child Neurol 1999;41: 696–703.
2. Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. Lancet 1997;349: 599–603.
3. Kehlet H. Surgical stress: the role of pain and analgesia. Br JAnaesth 1989;63:189–95.
4. Capdevila X, Barthelet Y, Biboulet P, Ryckwaert Y, Rubenovitch J, d'Athis F. Effects of perioperative analgesic technique on the surgical outcome and duration of rehabilitation after major knee surgery. Anesthesiology 1999;91:8–15.
5. Finley GA, McGrath PJ, Forward SP, McNeill G, Fitzgerald P. Parents' management of children's pain following 'minor' surgery. Pain 1996;64:83-87.
6. Tobia JD. Preliminary experience with transversus abdominis plane block for postoperative pain relief in infants and children. Saudi J Anaesth 2009;3:2-6.
7. Bernard J. Dalens. Regional Anaesthesia in Children. In: Ronald D. Miller, editor. Miller's Anaesthesia, 6th ed. Philadelphia USA: Elsevier Churchill Livingstone; 2005.p.1733-34.
8. Dilip Pawar. Regional Anaesthesia In Paediatric Patients. Indian J. Anaesth. 2004; 48 (5):396.
9. Ahmed AA, Rayan AA. Ultrasound guided transversus abdominal plane block versus caudal block for postoperative analgesia in children undergoing unilateral open inguinal herniotomy: a comparative study. Ain-Shams Journal of Anaesthesiology 2014;2:285.
10. Bergmans E, Jacobs A, Desai R, Masters OW, Thies KC. Pain relief after transversus abdominis plane block for abdominal surgery in children: a service evaluation. Local and Regional Anesthesia 2015;8:4.
11. Kanojia N, Ahuja S. Comparison of TAP block and caudal block for post-operative analgesia in children undergoing lower abdominal surgery. International Journal of Science and Research 2015;4:4.
12. Al-sadek WM, Rizk SN, Selim MA. Ultrasound guided transversus abdominis plane block in paediatric patients undergoing laparoscopic surgery. Egyptian Journal ofAnaesthesia 2014;30:273-278.
13. Faried AM, Lahloub MF, Elzehery MM. Ultrasound guided Transverses Abdominal Plane Block versus Ilioinguinal/iliohypogastric Nerve Blocks for Postoperative Analgesia in Children Undergoing Lower Abdominal Surgery. Journal of Anesthesiology and critical care medicine 2014;1:6.

Original Research Article

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Clinical Evaluation of Adding Fentanyl versus Dexmedetomidine to Intrathecal Isobaric Levobupivacaine on Spinal Block Characteristics in Patients Scheduled for Lower Abdominal Surgeries

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Abstract

Background: Fentanyl, an opioid and dexmedetomidine, an alpha 2 agonist added to local anaesthetics in spinal anaesthesia potentiates local anaesthetics action, have analgesic properties and reduces the requirement of local anaesthetics. *Aim:* To evaluate the effect of adding fentanyl and dexmedetomidine to intrathecal isobaric levobupivacaine. *Materials and Methods:* 60 patients scheduled for lower abdominal surgeries at our institute belonging to ASAgrade I-II satisfying inclusion criteria were recruited for the study and randomised to receive levobupivacaine 15mg with dexmedetomidine 5µg in group LD or levobupivacaine 15mg with fentanyl 25 µg in group LF. Sensory and motor block characteristics, haemodynamic changes and side effects were recorded. *Results:* Onset of sensory block was shorter, time taken to attain maximum sensory block was shorter in group LD as compared to group LF with no stastistical significance. Maximum sensory block achieved was T4 in both the groups. Onset of motor blockade was faster and time taken to attain maximum bromage score 3 was faster in group LD as compared to group LF. Two segment regression duration, duration of analgesia, duration of sensory blockade and motor blockade were stastistically significantly prolonged in group LD as compared to groupLF. Patients maintained haemodynamic stability. Sedation scoring and side effects were insignificant. Data was analysed using Chi-square test and Independent t test. *Conclusion:* Dexmedetomidine as an adjuvant to isobaric levobupivacaine for spinal anaesthesia fastens sensory, motor onset and enhances the block duration without any significant side effects as compared to fentanyl.

Keywords: Isobaric Levobupivacaine; Dexmedetomidine; Fentanyl; Spinal Anaesthesia.

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Introduction

Spinal anaesthesia is a safe inexpensive common technique used to perform infraumbilical surgeries. It provides excellent surgical anaesthesia and prolongs post operative pain relief by the use of adjuvants with local anesthetics. It provides better operative pain relief and attenuates autonomic, somatic and endocrine responses [1].

Bupivacaine is available as a racemic mixture of its enantiomers, dextrobupivacaine and levobupivacaine. It has been found that dextro enantiomer is the cause for cardiotoxicity and the levobupivacaine the pure S (-) enantiomer does not have the cardiotoxicity. Levobupivacaine has similar pharmacodynamic properties of racemic bupivacaine but a documented reduced central nervous system and cardiovascular toxicity [2, 3,4]. It has emerged as a safer alternative for regional anaesthesia than its racemic parent in recent years [2,3].

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Different drugs like opioids and non- opioids are used as adjuvant drugs along with local anaesthetic agents [2]. Opioids and alpha2-receptor agonists are important as neuraxial adjuvants not only to improve the quality of perioperative analgesia but also to minimize the local Anesthetic dose, particularly in high-risk patients and in ambulatory procedures [5]. Opioids when given along with local anaesthetics prolongs sensory block without any prolongation in motor and sympathetic blockade.

Fentanyl is a potent mu opioid receptor agonist with improved analgesia overmorphine [6].The addition of fentanyl 10-15 microgram demonstrates a sparing effect on the requirement of levobupivacaine while maintaining excellent clinical efficacy with less hemodynamic variation [7,8,9]. Álpha-2 adrenoreceptor agonists have sedative, analgesic and haemodynamic stabilizing effect hence they have been used as additives to local anaesthetics. They are also found to decrease the sympathetic tone, attenuate stress response to surgery and anaesthesia and also prolong the duration of spinal block [10].

Dexmedetomidine being an alpha-2adrenergic agonists is pharmacologically related to clonidine, was approved by FDA in the year 1999 for its usage as analgesic and sedative [11]. Dexmedetomidine is a highly selective alpha 2 agonist. It has 10 times more affinity for alpha 2 receptors than clonidine. It potentiates local anaesthetic effect, prolongs postop analgesia and has a dose dependent sedative effect without respiratory depression [12].

Here we have designed a randomized clinical study to evaluate and compare the efficacy of addition of fentanyl or dexmedetomidine to levobupivacaine intrathecally in patients scheduled for lower abdominal surgeries.

Objectives

To compare the time taken for the onset, duration of sensory and motor block, two segment regression duration, total duration of analgesia, haemodynamic changes, sedation scoring, any side effects and complications following intrathecal administration of 15 mg of 0.5% isobaric levobupivacaine with either of 25 µg fentanyl or 5µg dexmedetomidine in patients undergoing lower abdominal surgeries.

Material and Methods

After obtaining the permission from institutional ethical committee, 60 patients scheduled for lower abdominal surgeries under spinal anaesthesia aged Between 20 to 60yrs with ASA physical status grade I –II were recruited for this prospective randomized, double blind controlled clinical study. Patient refusal for surgery, unco-operative patient, patients of age less than 20 years and more than 60 years, ASA grade III, IV and V, pregnant females, emergency surgeries, diabetes, hypertension, morbid obesity, local infection, hypovolemic shock, bleeding and clotting disorders, emergency surgeries, known allergy to any of the test drugs, pre-existing neurological deficits in the lower extremities, respiratory, neurological, psychological, hepatic and renal disease were excluded from the study. Informed written consent was obtained from all the patients. Patients were randomly allocated into 2 groups of 30 each using computer generated randomization table.

Group LD: 5µg dexmedetomidine was added to15 mg of 0.5% isobaric levobupivacaine intrathecally.

GroupLF: 25 µg fentanyl was added to15 mg of 0.5% isobaric levobupivacaine intrathecally.

Total volume of drug was 3.5 ml.

One day prior to surgery, preanaesthetic check-up was done for each patient, advised nil by mouth for solids at least 6hrs and clear fluids 2 hrs before surgery premedicants tablet ranitidine 150mg and tablet alprazolam 0.5mg were given at night.

On the day of surgery in the preoperative room, an intravenous line was secured with 18 gauge cannula and preloaded with 10 ml/kg ringer lactate solution half an hour before anaesthesia. After shifting the patient on to the ot table multiparameter monitor having pulse oximetry, ECG and NIBP was connected.

Under aseptic precautions spinal block was performed on patients at level of L3-L4 through a midline approach using 25G Quincke spinal needle in lateral position and study drug was injected with operative table kept flat. Immediately patients were turned to supine posture. The completion of the injection was taken as zero time of anaesthesia.

Parameters such as onset of sensory blockade (when patient does not feel pin pick at T10 level) and motor blockade, maximum level of sensory and motor blockade attained and the time taken for the same, two segments sensory regression time, total duration of analgesia(time at which patient demanded first dose of rescue analgesic,VAS >4) , total duration of sensory blockade(regression to S1dermatome)and motor blockade (recovery to

bromage 0), level of sedation, total duration of surgery and if any side effects like nausea vomiting, hypotension and bradycardia were noted.

Sensory blockade was tested in midclavicular line both the sides using pinprick method with a blunt tipped 27G needle. Quality of motor blockade was assessed by modified Bromage scale [13]. (Bromage 0 – patient is able to move the hip, knee and ankle, Bromage 1- patient is unable to move the hip but is able to move the knee and ankle, Bromage 2 – patient is unable to move the hip and knee but is able to move the ankle,Bromage 3- patient is unable to move the hip, knee and ankle). Level of sedation was assessed by Ramsay sedation scale [14].

Scale 1–patient is anxious, agitated or restless, Scale 2–patient is co-operative, oriented and tranquil alert, Scale 3- patient responds to commands, Scale 4 –patient is asleep but with brisk response to light glabellar tap or loud auditory stimulus, Scale 5- patient is asleep with sluggish response to light glabellar tap or loud auditory stimulus, Scale 6– patient is asleep, with no response.

Haemodynamic monitoring was done initially before block, after the block every 5 mins for first 15 mins and every 10 mins for next 60 mins and once in 15 mins till the end of surgery and every hour post operatively in PACU. Hypotension was defined as mean arterial pressure falling more than 20% mm Hg of preoperative value or SBP less than 100 mmHg and was treated by increasing the fluid infusion and with inj. mephenteramine 3-6 mg in bolus doses and bradycardia was defined as heart rate less than 60 beats/min and was treated with 0.6mg of inj. Atropine [12].

Post operative pain was assessed by Visual Analogue Scale (VAS), duration of analgesia was assessed by VAS scores, rescue analgesic Inj diclofenac 75mg intramuscularly was given if VAS was more than 4.

Statistical Analysis

Statistical Analysis was done using SPSS, Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version (IBM SPSS Statistics, Somers NY, USA) 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 identify the mean difference between two quantitative variables.

Result

In our study, demographic profile was comparable among both the groups as depicted in the Table 1.

Time taken for the onset of sensory block to achieve T10 level and time taken for maximum sensory blockade were shorter in group LD as compared to group LF with no statistical significance between the groups (p=0.125 and p=0.123 respectively).There was no difference between the groups with regard to maximum level of sensory blockade (p=0.960) as shown in table 1. Maximum sensory level attained in both the groups was T4 accounting up to 6.7% in each group . In groupLD and group LF majority of subjects had maximum level of sensory block at T6 level (53.3% and 50% respectively).

Ttime taken for the onset of motor block and time taken for maximum motor blockade were faster in group LD as compared to group LF but there was no statistical significant difference between the groups (p=0.42 and p=0.262 respectively). Maximum motor blockade attained in both the groups was bromage 3 (Table 2).

The time taken for sensory regression by two segments, total duration of analgesia, total duration of sensory blockade and total duration

Table 1: Demographic profile of patients in group LD and group LF

Parameters	Group LD	Group LF	P value
Mean age in years	42.7 ±10.4	39.4±12.6	0.274
Sex ratio in %			
Male	15(50%)	15(50%)	1
Female	15(50%)	15(50%)	1
Mean weight in kgs	80.2±8.2	79.6±8.4	0.426
Mean height in cms	175.7±3.6	170±6.2	0.086
Mean duration of surgery in minutes	94.7±37.3	68±40.5	0.01

Table 2: Sensory, Motor block and Analgesia

Parameters	Group LD	Group LF	P value
Onset of sensory block to T10 dermatome in mins	2.1±1.0	2.6±1.3	0.125
Time taken to achieve maximum Sensory Block in mins	7.3±2.4	8.5±3.3	0.123
Onset of motor block in mins	1.6±0.9	1.8±1.0	0.420
Time taken to achieve maximum motor block in mins	5.4±3.0	6.4±3.6	0.262
Time taken for sensory regression by two segments in mins	135.8± 22.0	98.5± 24.7	<0.001*
Total duration of analgesia in mins	411.43 ±18.81	212.00±21.94	<0.001*
Total duration of sensory blockade in mins(S1segment regression)	486.72 ±22.0	272.00±12.3	<0.001*
Total duration of motor blockade in mins	355.14±1 7.38	170.57±22.74	<0.001*

*P value significant

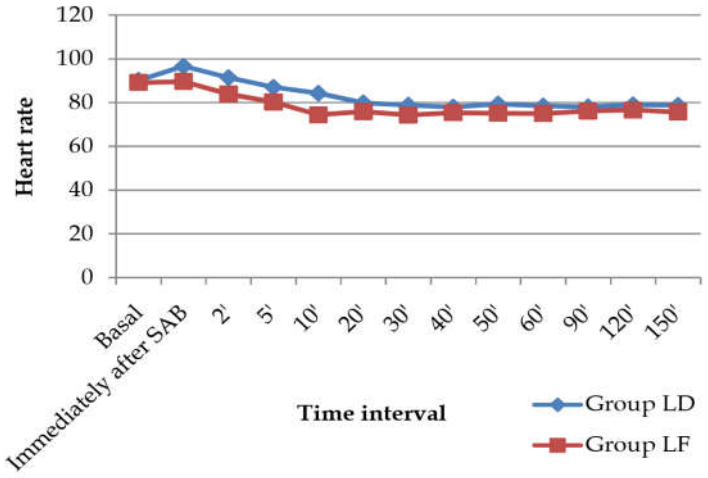

Fig. 1: Line diagram showing heart rate comparison between two groups at various intervals of Follow-up

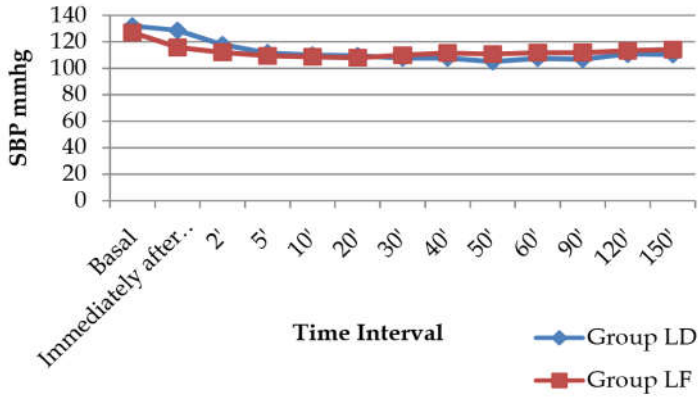

Fig. 2: Line diagram showing SBP comparison between two groups at various intervals of Followup

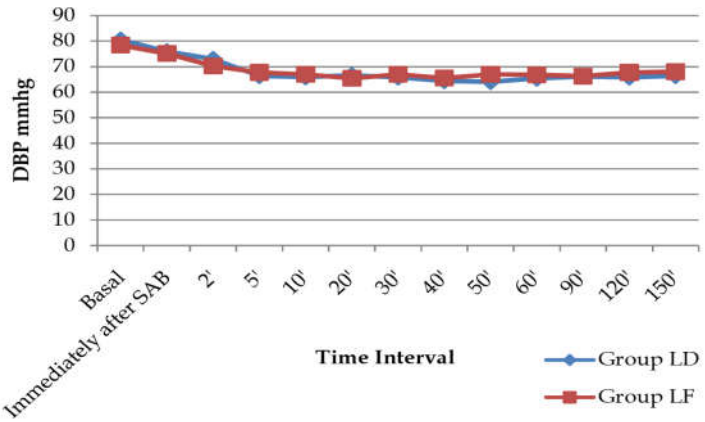

Fig. 3: Line diagram showing DBP comparison between two groups at various intervals of Followup

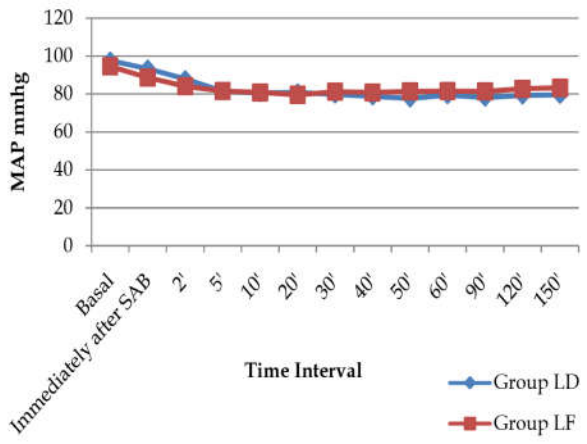

Fig. 4: Line diagram showing MAP comparison between two groups at various intervals of followup

of motor blockade were statistically significantly prolonged ($p< 0.001$) in group LD as compared to group LF (Table 2).

Patients hemodynamics were monitored at varying intervals starting from baseline till 24 hours , there was no significant change with regard to heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure as depicted in figures 1,2,3 and 4. Bradycardia was noted in about 5 patients (16.6%) in group LD and 2 patients (6.6%) in group LF within first 30 mins of spinal block intraoperatively , was treated with inj atropine 0.6mg intravenously. Hypotension was noted in 3 patients (10%) in group LD and 2 patients (6.6%) in group LF, patients were treated with oxygen, i.v fluids and inj.mephentramine as 6mg incremental doses. The sedation score was 2 in both the groups. Respiratory rate and SpO_2 were monitored and comparable. Patients were monitored for side effects and adverse effects.

Discussion

Spinal anaesthesia is most commonly performed technique for lower abdominal surgeries because of its early and effective onset of sensory and motor block and excellent prolonged post op analgesia [15]. Levobupivacaine, is being preferred in infraumbilical surgeries for its lower cardiovascular and CNS toxicity, lesser motor blockade and prolonged sensory blockade [16]. Levobupivacaine blocks the transmission of action potential in sensory, motor and sympathetic nerve fibers by inhibiting the passage of sodium through voltage sensitive ion channels in the neuronal membrane [16]. Alpha 2 adrenergic exert their action by binding to pre synaptic C fibers postsynaptic dorsal horn neurons and potentiate neuraxial local anaesthetics [10]. They produce analgesia by depressing the release of C fibers transmitters and hyperpolarisation of post synaptic dorsal horn neuron. Opioids related side effects are not seen when these agonists are given intrathecally along with local anaesthetics. They have antinociception for both somatic and visceral pain [17].

Fentanyl is a lipophilic μ receptor agonist opioid. It acts by combining with opioid receptors in the dorsal horn of spinal cord and it also has a supra spinal spread and action [18,19]. Fentanyl in dosage of 25μg for supplementation of spinal anaesthesia produces excellent quality of perioperative analgesia [17,20-22]. Kim et al., observed that fentanyl beyond 25 μg produce no benefit with regard to duration of analgesia [23]. Hence, we have chosen 25 μg as a supplementation for spinal anaesthesia.

Dexmedetomidine is highly selective alpha 2 adrenoceptor agonist and more specific ,hence used as a safe adjunct in diverse clinical application [24]. Dexmedetomidine in small doses (3,5,10 μg) as an additive to intrathecal bupivacaine has shown to produce a shorter onset of motor block and a prolonged sensory and motor block with preserved haemodynamics with lack of sedation and minimal side effects [17,25,26]. We have chosen 5μg in our study based on previous human studies [17,25,26]. In studies done by Sathikarnmanee T et al., and Mantouvalou M et al., authors used 15mg of levobupivacaine and concluded that 15mg is adequate to provide sensory and motor block for abdominal surgeries [27,28]. Hence we chose 15mg of levobupivacaine in our study.

In our study mean time of onset of spinal block was faster without any statistical significant difference and there was statistically significant prolongation of time taken for two segment regression, duration of analgesia, duration of sensory and motor block, with good post op analgesia and stable haemodynamics without any significant side effects in group LD as compared to group LF which is similar to the studies done by A.S. Basuni et al. [12], Al –Ghanem et al. [17] and Gupta. R.et al. [29].

A.S. Basuni, HAA Ezz et al. [12], found that dexmedetomidine 3μg with isobaric levobupivacaine 4mg improved the quality of anaesthesia and post op analgesia for knee arthroscopy as compared

with 10μg fentanyl added to levobupivacaine 4mg. Al –Ghanem et al. [17], in his study reported that under spinal block 10mg plain bupivacaine supplemented with 5μg dexmedetomidine produced prolonged motor and sensory block compared with 25 μg fentanyl in gynaecological procedures. In a comparative study by Gupta R et al. [29], dexmedetomidine 5μg was found to be a better alternative than 25 μg fentanyl as adjuvants to bupivacaine as it provided better quality of intra operative and post operative analgesia, haemodynamic stability and fewer side effects.

In a study done by Atrri J.P. et al. [30] author compared 10mg levobupivacaine and levobupivacaine with 25μg fentanyl given intrathecally for infraumbilical surgeries and found adding fentanyl fastens the onset and prolongs sensory and motor block with excellent post op analgesia, maintained haemodynamics and lesser side effects.

Author Vania K et al. [31], in her study added and compared dexmedetomidine 10 μg and clonidine 15μg as adjuvants to 15mg levobupivacaine intrathecally and found dexmedetomidine when compared to clonidine significantly prolongs motor and sensory block and increases duration of postop analgesia. Tiwari J.P. et al. [32], in patients undergoing gynaecological surgeries evaluated the efficacy and safety of addition of dexmedetomidine 5μg to 15mg levobupivacaine and reported that dexmedetomidine shortens the onset and provides intense sensory and motor block with maintained haemodynamics Aliye Esmaoglu and Sumeyra et al. [33], in their study added 3 μg dexmedetomidine to intrathecal 15mg levobupivacaine for transurethral endoscopic surgery and found dexmedetomidine prolongs the duration of sensory and motor block.

Haemodynamics remained stable during intaoperative and postoperative period. Bradycardia was seen in 5 (16.6%) patients in group LD and 2 patients in group LF(6.6%). Similar incidence of bradycardia with dexmedetomidine about 17.5 % was seen in a study conducted by Tiwari J.P et al. [32]. About 10% incidence of bradycardia with fentanyl was reported by Atrri et al. [30].

In our study hypotension was more in group LD than in group LF but there was no statistical significant difference between the group which is similar to study by Gupta et al. [29] slight reduction of MAP was observed in both the groups without any significance.

Kanazi et al. [25], reported insignificant effect of dexmedetomidine on mean blood pressure when added to intrathecal bupivacaine. Bradycardia and hypotension were managed successfully [25]. Sedation scores remained comparable among the groups, sedation scale was 2 among the patients. There was no incidence of respiratory depression, pruritis, delayed micturition and any other side effects and adverse effects observed in both the groups.

Conclusion

Dexmedetomidine 5μg is a good and safe adjuvant to spinal levobupivacaine as compared to 25μg fentanyl, it enhances sensory and motor block with better quality of post op analgesia, preserved haemodynamics and minimal side effects.

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Conflicting Interest: None

References

1. David LB. Spinal, Epidural and Caudal Anaesthesia. Miller's Anaesthesia. 7thEdition.Philidelphia: Churchill Livingstone Elsevier; 2010.
2. Burlacu CL, Buggy DJ. Update on local anesthetics: focus on levobupivacaine.Ther.Clin. Risk Manag. 2008;4(2):381–92.
3. Sanford M, Keating GM. Levobupivacaine: a review of its use in regionalanaesthesia and pain management. Drugs. 2010;70(6):761–91.
4. Bajwa SJS, Kaur J. Clinical profile of levobupivacaine in regional anesthesia:A systematic review. J. Anaesthesiol. Clin.Pharmacol. 2013;29(4):530–9.
5. Axelsson, Kjell; Gupta, Anil . Local anaesthetic adjuvants:neuraxial versusperipheral nerve block. Current Opinion in Anaesthesiology 2009;22(5): 649-654.
6. Kukanich B, Clark TO. The history and pharmacology of fentanyl: relevanceto a novel, long-acting transdermal fentanyl solution newly approved for use indogs. J. Vet. Pharmacol. Ther.2012;35.
7. Lee YY, Muchhal K, Chan CK, Cheung ASP. Levobupivacaine and fentanylfor spinal anaesthesia: a randomized trial. Eur. J. Anaesthesiol.2005; 22(12):899–903.

8. De Santiago J, Santos-Yglesias J, Giron J, Montes de Oca F, Jimenez A, Diaz P. Low-dose 3 mg levobupivacaine plus 10 microg fentanyl selective spinalanesthesia for gynecological outpatient laparoscopy. Anesth.Analg. 2009;109(5):1456–61.
9. Cuvas O, Basar H, Yeygel A, Turkyilmaz E, Sunay MM. Spinal anesthesia for transurethral resection operations: levobupivacaine with or without fentanyl. Middle East J. Anesthesiol. 2010;20(4):547–52.
10. Eisenach James C, De Kock Marc, Klimscha, Walter. Alpha sub 2- adrenergic agonist for regional anesthesia. A clinical review of clonidine. Anesthesiology: 1996;85(3):655-674.
11. Ralph Getler, Clieghton H Brown, Mitchel H, Silvius N. Dexmedetomidine: a novel sedative analgesic agent. Baylor University Medical Centre Proceedings. 2001;14(1).
12. Ahmed Sobhy Basuni and Hoda Alsaid Ahmed Ezz:Dexmedetomidine as supplement to low dose levobupivacaine spinal anesthesia for knee arthroscopy; Egyption Journal of Anesthesia; 2014,149-153.
13. Bromage PR. Epidural Anesthesia. Philadelphia, WB Saunders, 1978,144.
14. Ramsay MA, Savege TM, Simpson BR, Goodwin R. Controlled sedation with alphaxalone-alphadolone. Br Med J.1974,22;2(5920):656-9.
15. Casey WF. Spinal anaesthesia A practical guide. Update Anaesth 2000;12:1-7.
16. Foster RH, Markham A. Levobupivacaine: A review of its pharmacology and use as a local anaesthetic. Drugs 2000;59:551-79.
17. AlGhanem SM, Massad IM, Al Mustafa MA, Al Zaben KR, Qudaisat IY, Qatawneh AM, et al. Effect of addingdexmedetomidine versus fentanyl tointrathecal bupivacaine on spinal block characteristics in gynecological procedures: A double blind controlled study. Am J Applied Sci 2009;6:882-7.
18. Shende D, Cooper GM, Bowden MI. The influence of intathecal fentanyl on the characteristics of subarachnoid block for caesarean section. Anaesthesia 1998;79: 702-710.
19. Choi Dw, Ahn HJ, Kim MH. Bupivacaine-sparing effect of fentanyl in spinal anesthesia for cesarean delivey. Reg Anesth Pain Med 2000;25:240-245.
20. Vaghadia H, McLeod DH, Mitchell GW, Merrick PM, Chilvers CR, Small dose Hypobaric Lidocaine-fentanyl spinal anesthesia for short duration outpatient laparoscopy. II. Optimal fentanyl dose. Anesth Analg 1997;84:65-70.
21. Liu S, Chiu AA, Carpenter RL, Mulroy MF, Allen HW, Nea JM, Pollock JE. Fentanyl prolongs lidocaine anesthesia, without prolonging recovery. Anesth Analg 1995;80:730–4.
22. Singh H, Ynag J, Thornton K, Giesecke AH. Intrathecal fentanyl prolongs sensory bupivaciane spinal block. Can J Anesth 1995:42(11):987-991.
23. Kim SY, Cho JE, Hong JY, Koo BN, Kim JM, Kil HK. Comparison of intrathecal fentanyl and sufentanil in low dose dilute bupivacaine spinal anaesthesia for transurethral prostatectomy. Br J Anaesth 2009;103: 750-4.
24. Kalso E, Poyhia R, Rosenberg P. Spinal antinociception by dex-medetomidine, a highly selective alpha 2-adrenergic agonist. Pharmacol Toxicol 1991;68:140-3.
25. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alam-eddine MM, Al-Yaman R, et al. Effect of low-dose dexmedeto-midine or clonidine on the characteristics of bupivacaine spinal block. Acta AnaesthScand 2006;50:222-7.
26. Al-Mustafa MM, Abu-Halaweh SA, Aloweidi AS, Murshidi MM, Ammari BA, Awwad ZM, et al. Effect of dexmedetomidine add-ed to spinal bupivacaine for urological procedures. Saudi Med J 2009;30: 365-70.
27. Sathitkarnmanee T,Thongrong C, Tribuddharat S, Bn MT, Bn KP, Bn RK. A comparison of spinal isobariclevobupivacaine and racemic bupivacaine for lower abdominal and lowerextremity surgery.J Med Assoc Thai. 2011;94(6):716-720.
28. Mantouvalou M, Ralli S, Arnaoutoglou H, Tziris G,Papadopoulos G. Spinal anesthesia: comparison of plain ropivacaine, bupivacaine and levobupivacaine for lower abdominal surgery. ActaAnæsthesiologica Belgica 2008;59(2):65.
29. Gupta R, Verma R, Bogra J, Kohli M, Raman R, Kushwaha JK. A Comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to Bupivacaine.Journal of anaesthesiology, clinical pharmacology 2011;27(3):339.
30. Attri J, Kaur G, Kaur S, Kaur R, Mohan B, Kashyap K. Comparison of levobupivacaine and levobupivacaine with fentanyl in infraumbilical surgeries under spinal anaesthesia. Anesthesia: Essays and Researches. 2015;9(2):178.
31. Vania Kanvee, Gadhvi Rina,Singhal Shruti, Vania Mayur, Gandha Kapil. A Comparative Evaluation of Dexmedetomidine and Clonidine as an Adjunct with Intrathecal Inj. Levobupivacaine in Spinal Anaesthesia. J Res Med Den Sci. 2015;3(1):12-16.
32. Tiwari J.P, Tripathi D.K, Bhaskar P, Negi D.S, Vishal Mishra, Prashant Rai et al. A Comparative Evaluation of Intrathecal Levobupivacaine with Dexmedetomidine versus Levobupivacaine in Gynaecologicalsurgeries. IOSR Journal of Dental and Medical Sciences. 2016;15(7):23-29.
33. Aliye Esmaoðlu, Sumeyra Turk, Adnan Bayam, Aynur Akin, Fatih Ugur, Ayse Ulgey. The Effects of Dexmedetomidine Added to Spinal Levobupivacaine for Transurethral Endoscopic Surgery. Balkan Med J 2013;30:186-90.

Original Research Article

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Haemodynamic Effects of LMA Fastrach versus Macintosh Laryngoscope While Intubation in Patients Undergoing Cabg

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Abstract

Coronary artery bypass grafting (CABG) surgery is still the predominant operative procedure for myocardial revascularization. The pressor response to intubation is a detrimental factor in these patients, where stable hemodynamics is desired. Use of various intubation aids, is one of the methods by which this could be minimised. Hence, we decided to compare the haemodynamic changes to endotracheal intubation after conventional laryngoscopy versus the use of intubating laryngeal mask airway. We also aimed at comparing the ease of intubation and the complications of the above two intubation methods. *Methods:* Prospective, randomized, double blinded study in 60 patients between 30-75 yrs age group of either gender, scheduled for elective CABG surgery. patients were evaluated preoperatively and were randomly allocated into group I & group II consisting of 30 patients each using computer generated numbers. General anaesthesia administered and for patients in group I ILMA was used and in group II conventional laryngoscopy and endotracheal intubation was done. Haemodynamic parameters (blood pressure, heart rate, ST segment analysis) were recorded at different time intervals and the occurrence of adverse events such as oxygen desaturation and soft tissue trauma was also noted. *Results:* The time taken for intubation (represented as Mean SD) was found to be 108.5 (± 36.8) seconds in group I, 22.5 (±11.7) seconds in group II with a p value of 0.0001. There was no statistically significant changes in the haemodynamic parameters (heart rate, blood pressure, ST segment changes) between both the groups. However, statistically significant intragroup comparisons were found. The incidence of intraoperative complications was found to be 6.6% in group I and 3.3% in group II. Thus we concluded that, intubation through intubating laryngeal mask airway takes more time than conventional laryngoscopy and endotracheal intubation but offers no advantage when stress response to intubation is concerned in patients undergoing CABG.

Keywords: Coronary Artery Bypass Grafting; Intubating Laryngeal Mask Airway; Macintosh Laryngoscope Blade; Pressor Response; Wilcoxon Ranksum Test.

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Introduction

Modern day anaesthesia by virtue of its newer technology has indeed made the human body hemodynamically stable under anaesthesia. However, the pressor response to intubation is still a considerable worry to the anaesthesiologist. This response has been recognised since 1951 [1,2]. There are many methods of attenuating this response and the appropriate methods have to be chosen [3-11]. Coronary artery bypass grafting (CABG) surgery is still the predominant operative procedure for myocardial revascularisation [12]. Hemodynamic alterations such as hypotension after induction or hypertension at intubation are not infrequent.

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There are many methods of attenuating this response including drugs (lignocaine, beta blockers, high dose opioids etc.) and alternative methods of intubating the trachea [3-11]. Laryngoscopy and intubation is the primemeans to secure the airway. However, endotracheal intubation stimulates the sympathoadrenal system and this is associated with cardiovascular responses in the form of hypertension, tachycardia and dysarrythmias [1,13,14] and these responses are detrimental in these patients. These may culminate into left ventricular failure or myocardial ischemia in the presence of coronary or cerebral atheroma or hypertension which may become life threatening [14].

Intubating laryngeal mask airway (ILMA) is a supraglottic airway device which sits outside the trachea and provides a hands free means of achieving a gas tight airway [17]. The features of ILMA allow optimal alignment of the mask aperture with the glottic opening and provides a conduit for endotracheal tube passage [18]. The cardiovascular response of inserting ILMA was shown to be minimal in coronary artery surgery patients compared to endotracheal intubation [3]. However, there are studies which show that the cardiovascular response to intubation are similar in ILMA & endotracheal intubation [19,20]. Therefore we undertook this study, to compare the haemodynamic changes to endotracheal intubation after conventional laryngoscopy versus the use of intubating laryngeal mask airway . We also aimed at comparing the ease of intubation and the side effects between the above two intubation methods.

Materials & Methods

The study was a prospective, randomized, double-blinded clinical trial conducted after obtaining institutional ethical committee approval in 60 patients of either gender, between 30-75 years age group scheduled for elective CABG surgery. Randomization was done by computer generated random numbers. Patients with chronic obstructive pulmonary disease, uncontrolled hypertension , ASA physical status IV, VI, ejection fraction < 40%, patients with anticipated difficult airway and those with risk of aspiration of gastric contents were all excluded from the study. Patients requiring inotropic support at the time of induction were also excluded from the study.

All the patients considered for study were evaluated preoperatively and those who were taking anti hypertensive medications were continued until the morning of surgery except angiotensin converting enzyme inhibitors. intramuscular injection morphine 0.2 mg/ kg was given 30 minutes prior to surgery as premedication. Patients were randomly allocated into group I & group II consisting of 30 patients each using computer generated numbers. For patients belonging to group I - ILMA was used, the size of the device was chosen based on the weight of the patient. For patients in group II- macintosh laryngoscope was used for airway visualization and intubation done with oral endotracheal tube of internal diameter (ID) 8.5mm for male patients & 7.5mm for female patients. The study had a cross over design i.e. in the event of failure of one study method, defined by three unsuccessful attempts with the associated manouvre the alternative study method was performed. Alternative means for ensuring patient oxygenation i.e. oropharyngeal airway device was available. All the patients in the study were preoxygenated with 100% O_2. Anaesthesia was induced with intravenous administration of fentanyl (6 mcg/kg) , propofol (1 mg/kg) and non depolarizing muscle relaxant pancuronium (0.15 mg/kg) to secure the airway. In both the groups, correct positioning of the endotracheal tube was confirmed by end tidal carbon-dioxide & bilateral lung auscultation . Intraoperative monitoring consisted of invasive blood pressure, oxygen saturation, endtidal carbon dioxide, ST segment analysis for evidence of ischaemia, heart rate and rhythm analysis. The data was collected by an attending anaesthesiologist & an assistant using a data collection form on which the following were recorded:

- Success/ failure of the study method.
- Number of attempts.
- Duration of successful attempt (interval between the time of insertion of device to the detection of end tidal carbon-dioxide on capnography).
- Hemodynamic measurements.
- Adverse events such as oxygen desaturation (oxygen saturation < 90%), soft tissue trauma with bleeding, bronchospasm were recorded.

Intraoperatively haemodynamic parameters (SBP, DBP, MAP, HR, SpO_2 & ST segment -II & V_5) were recorded at different time intervals as follows:

T0 - before induction of anaesthesia (baseline)

T1 - 3 minutes after administering NDMR

T2 - at the completion of ILMA insertion (in

group I) or laryngoscopy (in group II)

T3 - 1 minute after the insertion of endotracheal tube

T4 - 5 minutes after the insertion of endotracheal tube

T5- 10 minutes after the insertion of endotracheal tube

T6 - 15 minutes after the insertion of endotracheal tube

Results

A Comparative study consisting of 60 patients , with 30 patients each in group I and group II. Both the groups were comparable in terms of age, gender, weight distribution, height distribution and BMI as seen in Table 1.

The time taken for intubation (represented as Mean ± SD) was compared in both the groups and it was found to be 108.5 (± 36.8) seconds in group I , 22.5 (± 11.7) seconds in group II with a p value of 0.0001 as seen in table 2 .

The mean heart rate varied from 70.9 (± 17) to 81.8 (± 18.9) in group I and 70.9(± 13.6) to 81.9 (± 18.8) in group II. As seen in graph 1, the heart changes in both the groups followed the same pattern and statistically they were not significant. However, while comparing within the groups the heart rate changes were significant at completion of intubation procedure (T 2) and 1 minute after the insertion of endotracheal tube (T3) in both the groups when compared to the baseline. Thus, intra group comparisons were found to be significant.

The systolic blood pressure varied from 133.1 (± 17.2) to 102.4 (± 17) , diastolic BP varied from 70.3 (± 9.8) to 59.3 (± 10) and mean arterial pressure varied from 93.9 (± 10) to 73.8 (± 11.1) in group I . Whereas in group II , the systolic blood pressure varied from140.2 (±22.4) to 108.1 (±17.9) , diastolic blood pressure varied from 72.1 (± 11) to 60.9 (± 9.4) and mean arterial pressure varied from 96.9 (±14.2) to 79.4 (± 13.2) . As seen in graph 2, 3 and 4 the blood pressure (SBP, DBP, MAP) changes in both the groups followed the same pattern. And when comparing in between the two groups it was found to be statistically insignificant. However while comparing within the groups, the changes were significant at all points except at 1 minute after insertion of endotracheal tube (T3) in both the groups when compared to the baseline. Thus, intra group comparisons were found to be significant.

As seen in graph 5, the graphs of both the groups followed the same pattern and statistically they were not significant which means that the SpO_2 changes between both the groups were similar.

Table 1: Patient characteristics

Parameter	Group I (n=30)	Group II (n=30)	p value
Sex	25:5 (M:F)	23:7 (M:F)	0.519
Age	57 (8.7)	55.9 (6.7)	0.5965
Weight	62.9 (11.1)	61.2 (9.4)	0.5261
Height	164.5 (8.8)	165.5 (7.8)	0.6539
BMI	23.1 (2.8)	22.3 (2.9)	0.2795

All data represented asMean± SD and *p value < 0.05 was considered as significant

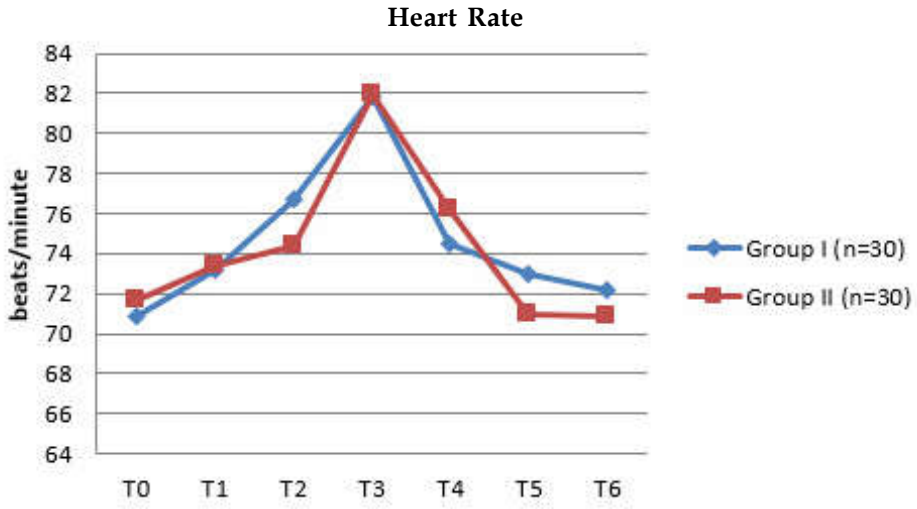
Table 2: Comparison of intubation time (in seconds)

Parameter	Group I (n=30)	Group II (n=30)	p value
Time for intubation	108.5 (36.8)	22.5 (11.7)	*<0.0001

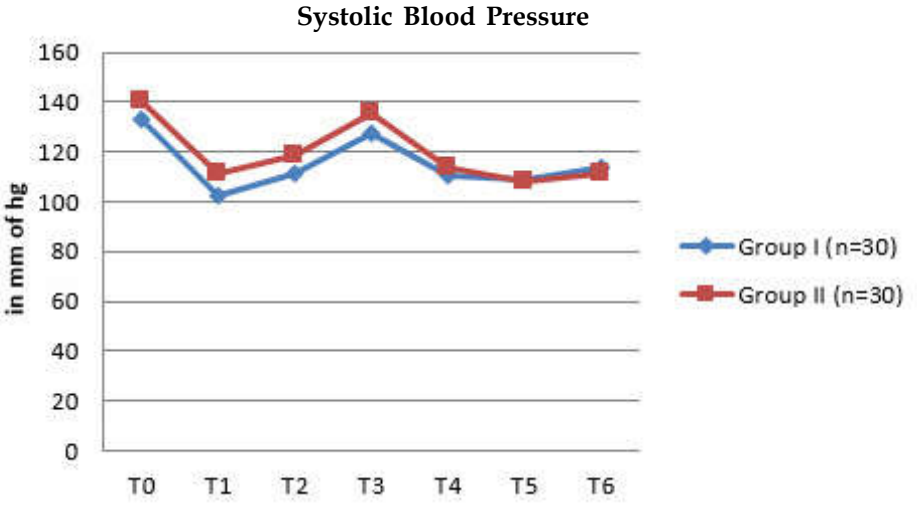
All data represented as Mean ± SD and *P value of <0.05 is considered significant

Table 3: Complications

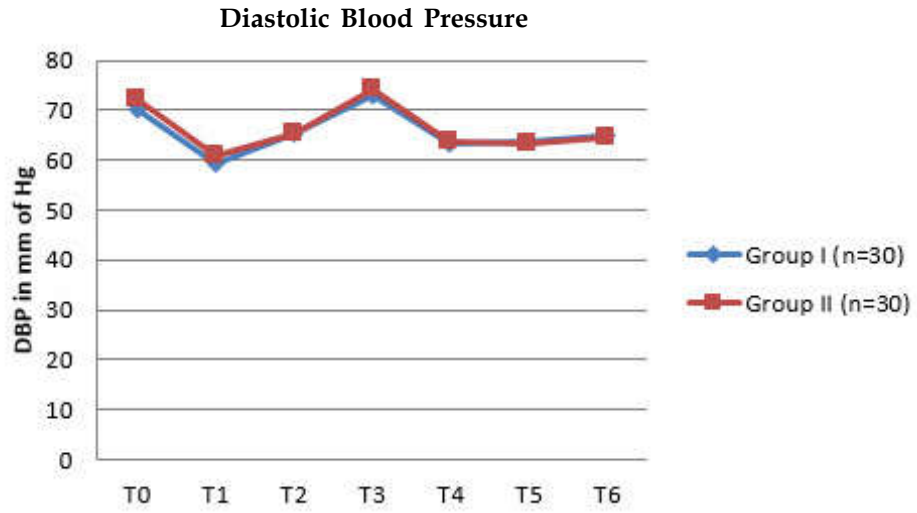
Parameter	Group I (n=30)	Group II (n=30)
Desaturation	0	0
Bronchospasm	0	1
Soft tissue trauma	1	0
Oropharyngeal bleed	1	0



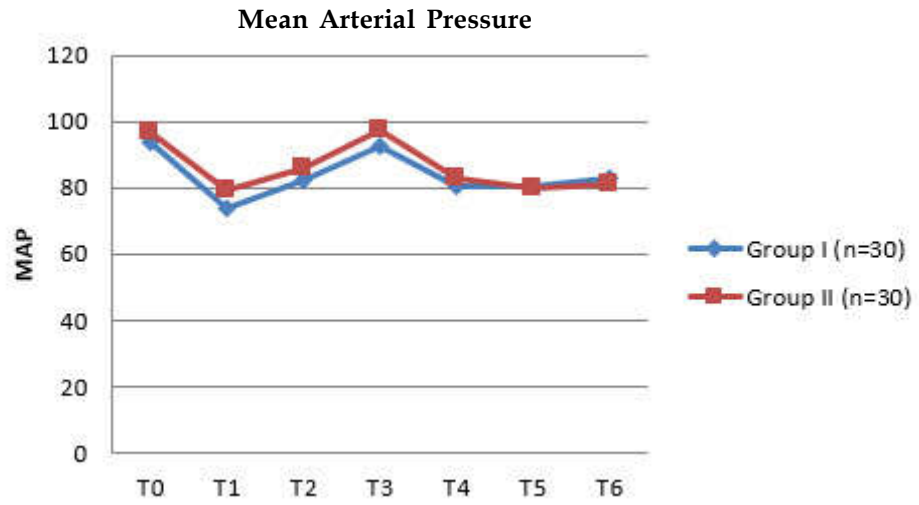
Graph 1:



Graph 2:



Graph 3 :



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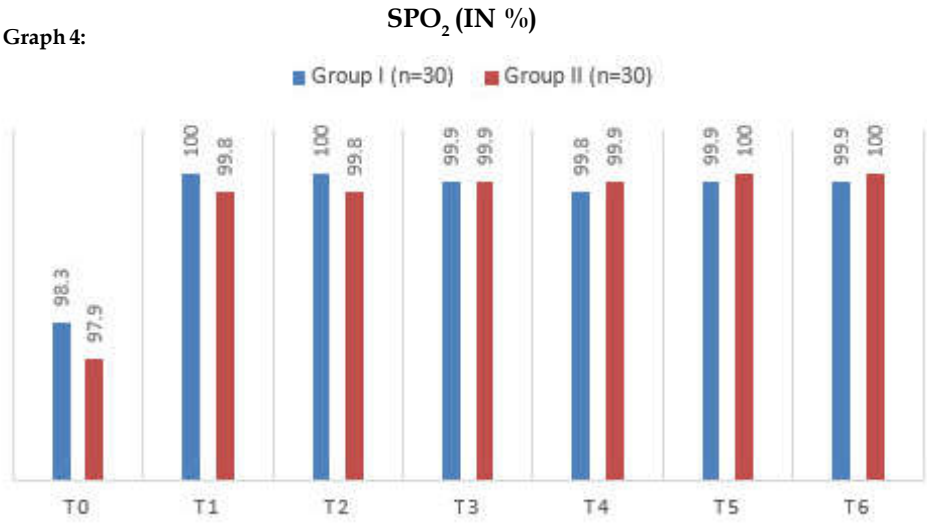
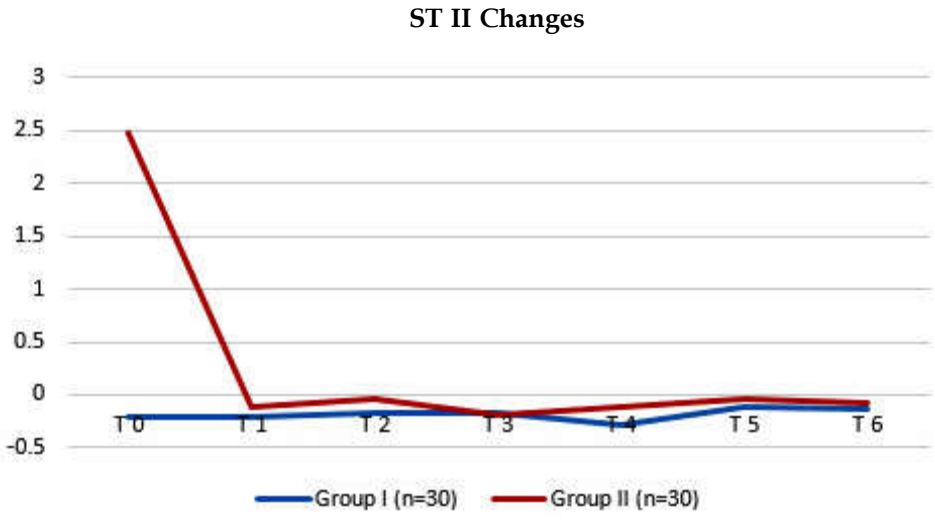
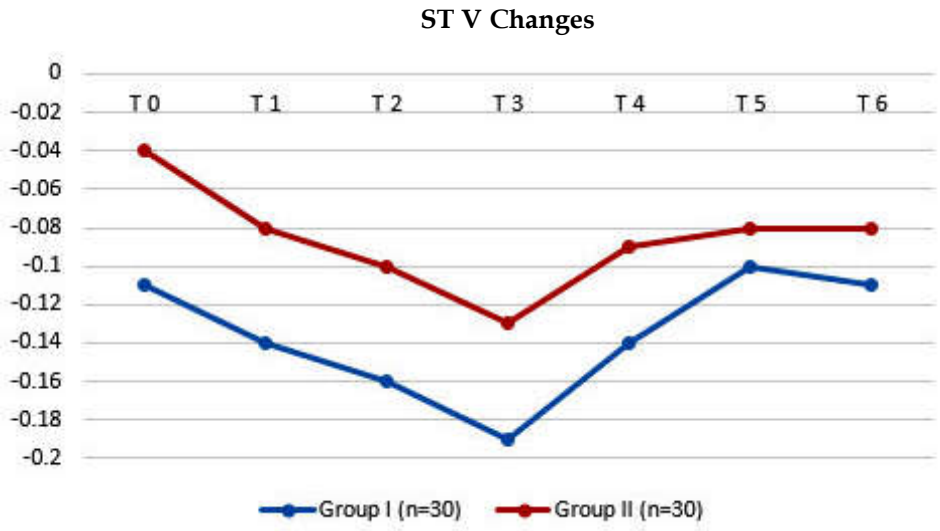


Graph 5:



Graph 6:



Graph 7:

However while comparing within the groups, the changes were again insignificant.

As seen in graph 6, ST II changes between both the groups were similar. However, while comparing within the groups, the changes were significant at 3 minutes after NDMR in group II and no significant changes noted in group I as compared to the baseline. Thus, intra group comparisons were significant for group II but not for group I.

As seen in graph 7, ST V changes between both the groups were similar. And, intra group comparison was also found to be insignificant.

The patients in both the groups were observed for the occurrence of any complications in the intraoperative period. As seen in table 3, there was no evidence of desaturation (SpO_2 < 90%) in both the groups. One patient (3.3%) in group II had bronchospasm and 2 patients (6.6%) in group I had soft tissue trauma.

Statistical Analysis

Descriptive statistical analysis has been carried out in our study. Results on continuous measurements are presented as Mean± SD (Min-Max) and results on categorical measurements are presented as Numbers (%). Significance is assessed at 5% level of significance. Nonparametric variables were analysed between the two groups using the chi square test. Continuous data was analysed using mann whitney U test/ t test as applicable. The time for intubation between groups was analysed using wilcoxon ranksum test. The remaining parameters were evaluated using t-test for inter group comparisons & repeated measure ANOVA for intra group comparisons. P value of less than or equal to 0.05 was considered clinically significant. The statistical software namely SPSS version 17.0 was used for the analysis of the data and microsoft word and excel have been used to generate graphs, tables etc.

Discussion

The pressor response to intubation is a detrimental factor in patients with ischemic heart disease undergoing CABG surgery, where stable hemodynamics is desired. Use of various intubation aids, is one of the methods by which this pressor response could be minimised. Hence , we decided to compare ILMA with endotracheal intubation after laryngoscopy using macintosh blade as limited literature was available between the two in CABG surgery.

In our study we observed that, there was significant difference between the intubation time between the two groups with ILMA taking more time (108.5±36.8s) than conventional laryngoscopy and intubation (22.5±11.7s) with p value of <0.0001. This was also in accordance with the findings of the previous studies [20,22].

Studies had conflicting results when it comes to inter group comparisons of hemodynamics between the two intubation aids. Some of the studies which had given contradictory results to ours finally

concluded by saying that though ILMA has a better hemodynamic profile, yet the results are of marginal clinical significance [21]. Kahl M and colleagues [3] calculated the pressure rate product obtained by multiplying MAP and heart rate, which was found to be statistically significant i.e. intubation through ILMA showed stable hemodynamics. In our study, the intra group haemodynamic response to intubation suggested by increase in blood pressure and heart rate was significant ($p < 0.0001$) in both the groups. However, there was no significant difference in haemodynamic parameters in between the groups. This result is thus in contradiction to that of Kahl M etal. This was possibly because of the fact that their sample size was more and also probably due to the different demographic profile of their study group. In addition, they have calculated blood catecholamine concentrations which we could not do as this was not possible in our set up. Also the fact that we used same dose of fentanyl in all our patients and that all our patients were beta blocked, makes these factors equally distributed in both the groups. Yet we went on to test our hypothesis as these agents have been mentioned to attenuate the pressor response and not abolish it.

However, the literature also has studies which support our findings pertaining to the hemodynamics [17-21]. To name a few, Choyce et al. [17] found that the pressor response was of a similar magnitude in both ILMA and macintosh laryngoscope groups and also the fact that though the delayed removal of ILMA was associated with a second pressor response but this was not of any clinical significance. Kihara S et al. [20] also found no significant difference between the two groups in normotensive patients. In their study, ILMA reduced the pressor response to intubation only in hypertensive patients. According to the authors, hypertensives have an exaggerated pressor response [23,24] probably due to increased sensitivity of peripheral vessels to catecholamines [25] and also due to increased level of catecholamines [26]. Whereas in our study, controlled hypertensive patients were considered which may have led to the similar hemodynamics in both groups .

Pertaining to our findings on complications, SpO_2 changes were significant within both the groups ($p= 0.001$ for ILMA group & $p= 0.04$ for macintosh group), ST segment changes were insignificant within both the groups except for ST II change in macintosh laryngoscopy group ($p= 0.031$). One patient in macintosh laryngoscopy group had bronchospasm and in the ILMA group, one patient had lip trauma and one had oropharyngeal bleed. Hence , the occurrence of complications in both the groups were comparable. Though ,the results of evaluation of haemodynamic response to two different intubation aids used in our study varied from other studies, the result of ease of intubation and complications of the techniques was found to be similar to other studies .

Thus, we concluded that

1. There was significant difference between the time for intubation between the two groups with intubation through ILMA taking more time (108.5±36.8s) than conventional laryngoscopy and endotracheal intubation (22.5±11.7s) with a p value of <0.0001 .
2. ILMA offers no advantage in comparison to the conventional macintosh laryngoscope when stress response to intubation is concerned in patients undergoing CABG.

References

1. Fox EJ, Sklar GS, Hill CH, Villanueva R, King BD. Complications related to the pressor response to endotracheal intubation. Anesthesiology 1977;47: 524-5.
2. King BD, Harris LC, Griefenstein FE, Elder JD, Dripps RD. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anaesthesia. Anesthesiology 1951;12:556-66.
3. Kahl M, Eberhart LHJ, Behnke H, Sanger S, Schwarz U, Vogt S et al. Stress response to tracheal intubation in patients undergoing coronary artery surgery: Direct laryngoscopy versus an intubating laryngeal mask airway. J Cardiothorac Vasc Anesth 2004;18: 275-80.
4. Braude N, Clements EAF, Hodges UM, Andrews BP. The pressor response and laryngeal mask insertion. A comparison with tracheal intubation. Anaesthesia 1989;44:551-4.
5. Kautto UM. Attenuation of the circulatory response to laryngoscopy and intubation by fentanyl. Acta Anesthesiol Scand 1982 Jun;26(3):217-21.
6. Kautto UM, Saarnivara L. Attenuation of the cardiovascular intubation response with N_2O, halothane or enflurane. Acta Anesthesiol Scand 1983 Aug;27(4):289-93.
7. Adachi YU, Satomoto M, Higuchi H, Watanabe K. Fentanyl attenuates the hemodynamic response to endotracheal intubation more than the response to laryngoscopy. Anesth Analg 2002;95:233-7.
8. Ghaus MS, Singh V, Kumar A, Wahal R, Bhatia VK,

Agarwal J. A study of cardiovascular response during laryngoscopy and intubation and their attenuation by ultra short acting beta blocker esmolol. Indian J Anaesth 2002;46(2):104-6.

9. Hatono Y, Imai R, Komatsu K, Mori K. Intravenous administration of isosorbide dinitrate attenuates the pressor response to laryngoscopy and tracheal intubation. Acta Anesthesiol Scand 1989 Apr;33(3): 214-8.
10. Maekawa N, Mikawa K, Hasegawa M, Kaetsu H, Goto R, Yaku H, Takao Y, Nishina K, Obara H. Partial attenuation of the cardiovascular responses to tracheal intubation with oral nisoldipine.J Clin Anesth. 1992 Jul-Aug;4(4):297-300.
11. Carabine UA, Allen RW, Moore J. Partial attenuation of the pressor response to endotracheal intubation. A comparison of the effects of intravenous clonidine and fentanyl. Eur J. Anaesthesiol 1992 Jul;9(4):325-9.
12. Kaplan JA, Reich DL, Lake CL, Konstadt SN. Kaplan's Cardiac Anaesthesia: Anesthesia for Myocardial Revascularization. 5th ed: Philadelphia: Elsevier: 2006: p.585-643.
13. Shribman AJ, Smith G and Achola KJ. Cardiovascular and cathecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth 1987;59:295-9.
14. Forbes AM, Dally FG. Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive man. Br J Anaesth 1970;42:618-24.
15. Dorsch JA, Dorsch SE. Dorsch & Dorsch. Supraglottic Airway Devices. 5th ed. Philadelphia: Lippincott Williams & Wilkins: 2008.p.461-501.
16. Gerstein NS, Braude DA, Hung O, Sanders JC, Murphy MF. The Fastrach Intubating Laryngeal Mask Airway: an overview and update. Can J Anesth 2010;57:588-601.
17. Choyce A, Avidan MS, Harvey A et al. The cardiovascular response to insertion of the intubating laryngeal mask airway. Anaesthesia 2002;57:330-3.
18. Guo-hua Z, Fu-shan X, Hai-yan S, Cheng-wen L, Hai-tao S, Ping L. Comparative study of hemodynamic responses to oro-tracheal intubation with intubating laryngeal mask airway. Chinese Medical Journal 2006;119(11):899-904.
19. Kihara S, Yaguchi Y, Watanabe S, Brimacombe J, Taguchi N, Yamasaki Y. Haemodynamic responses to the intubating laryngeal mask and timing of removal. Eur J Anaesthesiol. 2000 Dec;17(12):744-50.
20. Kihara S, Brimacombe J, Yaguchi Y, Watanabe S, Taguchi N, Komatsuzaki T. Hemodynamic responses among three tracheal intubation devices in normotensive and hypertensive patients. Anesth Analg 2003;96:890-95.
21. Kamata K, Komatsu R, Nagata O, Sessler DI, Ozaki M. Cardiovascular response to tracheal intubation with the Intubating laryngeal mask airway. Anesthesiology 2003;99:A570.
22. Bharti N, Naik AK. Ease of insertion and hemodynamic effects following tracheal intubation using Intubating laryngeal mask airway: a comparison with conventional macintosh laryngoscope. Indian J. Anaesth 2006;50(3):205-8.
23. Stone JG, Foex P, Sear JW, Johnson LL, Khambatta HJ, Triner L et al. Risk of myocardial ischemia during anaesthesia in treated and untreated hypertensive patients. Br J Anaesth 1986;61:675-9.
24. Fujii Y, Tanaka H, Tuyooka H. Circulatory responses to laryngeal mask airway insertion or tracheal intubation in normotensive and hypertensive patients. Can J Anaesth 1995;42:32-6.
25. Low JM, Harvey JT, Prys-Roberts C, Dagnino J. Studies of anaesthesia in relation to hypertension. VII: Adrenergic responses to laryngoscopy. Br J Anaesth 1986;58:471.
26. Goldman L, Caldera DL. Risks of general anaesthesia and elective operation in the hypertensive patient. Anesthesiology 1979;50:285-92.

Original Research Article

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Supraclavicular Brachial Plexus Block for Creation of AV Fistula: Nerve Localization by Paraesthesia versus Electrical Nerve Locator

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Abstract

Introduction: Regional nerve block anaesthesia offers many clinical advantages that contribute to improved patient outcome and lower healthcare costs.In patients with End Stage Renal Disease, a permanent vascular access through surgical construction of an arteriovenous fistula (AVF) is essential. However, many of these patients have severe comorbidities, which can lead to serious complications during general anesthesia. Brachial plexus block attenuates the side effects of general anesthesia in patients undergoing AVF construction. Our aim was to compare two methods of nerve localisation – elicitation of paresthesia versus nerve locator with regards to technical feasibility and ease of nerve localization, onset and the time to establish complete surgical anaesthesia and to determine the success rate,quality of block and failure rate between the two methods. *Materials and Methods:* A randomized controlled trial was conducted in to a near 1200 bed tertiary care hospital. The study population included patients who underwent AV fistula creation between a specified six months period. After obtaining written informed consent, patients fulfilling the study criteria were allocated randomly into two groups. Group (1) P – where nerve localization will be carried out by paresthesia technique. Group (2) PNL – where nerve localization will be done by peripheral nerve locator. The patients in both groups were monitored for the onset, duration, success or failure of block, sequelae and such other variables as required for fulfilling the objectives. *Results:* In paresthesia group the time to localise the nerve was observed to be significantly less ($p<0.05$) as compared to the nerve locator group.The time for onset of block, latency of block, complete surgical analgesia, duration of surgical analgesia and postoperative analgesia did not show any statistical significance ($p>0.05$) between the paresthesia and nerve locator groups. The paresthesia group had nine cases and nerve locator group had four cases who required supplementation to achieve complete surgical analgesia. The success rate of nerve block was 91.1% in nerve locator group compared to 80% in paresthesia group. *Conclusion:* Peripheral nerve locator appears to be more useful particularly when the block of deep seated plexus or nerves is desired. Although nerve locator may not help in improving the onset of block, latency of block or time to achieve complete surgical anaesthesia, the success ofperipheral nerve locator can be attributed to a lesser risk of tissue injuries like vascular punctures and direct nerve trauma.

Keywords: Brachial Plexus Block; Paresthesia; Peripheral Nerve Locator.

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Introduction

Regional nerve block anaesthesia offers many clinical advantages that contribute to improved patient outcome and lower healthcare costs. Regional anaesthesia is particularly desirable in elderly and high risk patients. It is increasingly used for day care anaesthesia [1]. In patients with End Stage Renal Disease, a permanent vascular access

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through surgical construction of an arteriovenous fistula (AVF) is essential. However, many of these patients have severe comorbidities, which can lead to serious complications during general anesthesia. Brachial plexus block attenuates the side effects of general anesthesia in patients undergoing AVF construction [2]. Regional blocks also improve the success of vascular access procedures by producing significant vasodilatation, greater fistula blood flow, sympathectomy-like effects, and decreased maturation time [3].

Our aim was to compare two methods of nerve localization – elicitation of paresthesia versus nerve locator with regards to technical feasibility and ease of nerve localization, onset and the time to establish complete surgical anaesthesia and to determine the success rate, quality of block and failure rate between the two methods.

Materials and Methods

A randomized controlled trial was conducted in a 1200 bed tertiary care hospital. The study population included patients who underwent AV fistula creation between a specified six months period.

The inclusion criteria were

ESRD patient for AVF procedure

ASA grade III

Weight between 45- 65 kg age >18 years

Communicable and cooperative

Exclusion Criteria

History of allergy to local anesthetic drugs, Pre-operative neurological deficit, Psychiatric disorder, Coagulation disorder, Uncontrolled seizure, Pregnant and lactating women.

Dependent variables considered are:

1. Time to localize nerve
2. Onset of block
3. Latency of block
4. Complete surgical anaesthesia.

Independent variables considered in this study are:

1. Medical diseases
2. Medication history
3. Duration of renal disease
4. Any drugs affecting nerve block

Study tools

1. A proforma including the independent and dependent variables and bio-socio-demographic variables
2. Anaesthetic medications and procedures:

   a. Regional anesthetic drug-

A 30 ml compound solution of Inj.Lignocaine 2% with epinephrine 1:200000 and Inj. Bupivicaine 0.5% as single injection technique was used [4].

b. Peripheral nerve locator- INNERVATOR 232 from Fisher & Paykel Healthcare Ltd, Auckland, New Zealand.

Procedure

After obtaining ethical approval and written informed consent, patients fulfilling the study criteria were allocated randomly into either of the two groups.

Group 1: P – where nerve localization will be carried out by paresthesia technique.

Group 2: PNL – where nerve localization will be done by peripheral nerve locator.

After standard safety precautions, proper positioning and skinwheal with local anaesthetic, a 22 G hypodermic needle was inserted at the midpoint of clavicle lateral to subclavian pulsation targeting the first rib and eliciting paresthesia of forearm or fingers as we proceeded [5]. In the PNL group, 22G stimuplex needle was used at the same location as the paresthesia method while observing muscle twitch and directing towards a position where twitch is observed with minimal current between 0.1 mA to 1 mA [6,7,8]. Once achieved, the drug mixture is delivered through the needle. The patients in both groups were monitored for the onset, duration, success or failure of block, sequelae and such other variables as required for fulfilling the objectives. After the completion of the procedure, patients were shifted to the post operative recovery room for observation.

Operational Definitions

Time to localize nerve –was taken as time in minutes from the insertion of the needle through the skin to onset of paresthesia or first motor response.

Latency of block was taken as the time from injection of local anaesthetic drug to loss of pinprick sensation in the anatomical distribution of the concerned nerve.

Complete surgical analgesia- The block was defined complete when surgical analgesia was observed at 30 min in all the sensory areas in the anatomical distribution of the nerve. The patient was declared ready for surgery when surgical analgesia was achieved.

Supplementation- After 30 minutes, in case of incomplete block, supplementation in the form of local skin infiltration and or analgesic (Inj.Fentanyl 1mcg/kg) was given and sensory assessment continued. These cases were noted as failure of blocks [8].

Duration of Surgical analgesia - adequate until completion of procedure.

Sequelae: Follow-up visits was taken at 24 and 48 hours after the surgery. Any neurological sequel was recorded during these visits as well as till the patient is discharged from the hospital.

Data Analysis: The obtained data was analyzed using SPSS 16.0 version. Mean, standard deviation and t test for continuous data and chi square tests for categorical data was used to compare the two groups.

Results

Ninety adult patients in the age group of 18-75 years were randomly allocated to either paresthesia technique (Group P, n=45) or peripheral nerve locator technique (Group PNL, n=45).The patients distributed in these two groups were comparable to their age distribution, gender distribution and weight distribution.

In paresthesia group the time to localise the nerve was observed to be significantly less ($p<0.05$) as compared to the nerve locator group. However in the paresthesia group three patients could not report paresthesia at all.

The time for onset of block, latency of block, complete surgical analgesia, duration of surgical analgesia and postoperative analgesia did not show any statistical significance ($p>0.05$) between the paresthesia and nerve locator groups. The paresthesia group had nine cases and nerve locator group had four cases who required supplementation to achieve complete surgical analgesia. The success rate of nerve block was 91.1% in nerve locator group compared to 80% in paresthesia group. In the present study no neurologic dysfunction was observed in either of the groups. (Table 1).

Comparing the two groups, the difference in time to localize nerve is statistically significant i.e less

Table 1: Baseline characteristics of the study population

Variables	Paresthesia	Peripheral nerve locator	Total
Age	No: (%)	No: (%)	No: (%)
15-30	3 (6.7)	1 (2.2)	4 (4.4)
31-45	12 (26.7)	9 (20.0)	21 (23.3)
46-60	17 (37.8)	19 (42.2)	36 (40.0)
61-75	12 (26.7)	16 (35.6)	28 (31.1)
Gender Male	29(64.4)	30(66.7)	59(65.6)
Female	16(35.6)	15(33.3)	31(34.4)
Weight			
45-50	20 (44.4)	24 (53.3)	44 (48.9)
51-55	7 (15.6)	1 (2.2)	8 (8.9)
56-60	8 (17.8)	10 (22.2)	18 (20.0)
61-65	10 (22.2)	10 (22.2)	20 (22.2)

Table 2: Mean time for nerveblock in the study groups

Variable	Paresthesia Mean (SD)	Peripheral nerve locator Mean (SD)	P value
Time to localise the nerve(min	1.85 (1.45)	2.53 (1.38)	p<0.05
Onset of block	2.33(1.65)	2.1(1.46)	p>0.05
Latency of block(min)	11.28(4.88)	10.44(4.53)	p>0.05

Table 3: Distribution of Success of nerve localisation in the study groups

		P	PNL	p value*
Successful localization	Present No: (%)	42(93.3)	45(100)	p>0.05
	Absent No: (%)	3(6.7)	0	
Complete surgical analgesia	Present No: (%)	36(80)	41(91.1)	p>0.05
	Absent No: (%)	9(20)	4(8.9)	

*Chi square test

Table 4: Frequency of Vascular puncture in the study groups

Method	Vascular puncture		
	No	Yes	Total
P	37	8	45
	82.2%	17.8%	100.0%
PNL	43	2	45
	95.6%	4.4%	100.0%
Total	80	10	90
	88.9%	11.1%	100.0%

$\chi^2 = 4.050$, df = 1, $p<0.05$

time is required to localize the nerve in P group as compared to PNL group. Eventhough PNL has faster onset of block, the difference between the two groups is not statistically significant. The table shows that there is no significant difference in latency of block between the two groups though the latency of block is lesser with PNL. (Table 2)

The table 3 shows that the nerve could be successfully located in all the patients (100%) in which nerve locator was used, but there is no significant difference in the proportion of patients with successful nerve localisation in two groups (Z =1.8).

The table 3 shows that the complete surgical analgesia was higher (91.1%) in the nerve locator group compared to the paresthesia group (80%) but there is no significant difference in the attainment of complete surgical analgesia between the two groups. χ^2=2.248, df=1, p>0.05.

Immediate complication i.e vascular puncture was significantly higher in the paresthesia group compared to the nerve locator group (Table 4).

Discussion

This prospective study was designed to evaluate patients undergoing supraclavicular brachial plexus block for creation of AV fistula either by paraesthesia or with PNL technique.

Study was conducted by random allocation of patients into either paraesthesia (Group P, n=45) or PNL (group PNL, n= 45) technique.

The two groups selected for this study were found to be comparable with respect to age, sex, and weight distribution.

In our study, in (group P) patients the nerve localization by paraesthesia was successful only in 80% of patients as compared to nerve locator 91.1%.

When paraesthesia is not elicited, there is an uncertainty regarding the proximity of the drug deposition with respect to the nerve. This may result in injecting additional dose or volume of local anaesthetic which theoretically puts the patient at a risk of local anaesthetic overdose. Use of PNL may reduce the possibility of such uncertainties.

In our study, time to localize a deep seated nerve in paraesthesia group was found to be significantly less compared to that with nerve locator. This can be explained on the fact that anaesthesiologists are more conversant with paraesthesia technique as compared to PNL. Secondly, while using PNL one goes stepwise frequently changing the current strength till the desired point of muscle contraction at a minimal current output. This naturally will need more time compared toparaesthesia. However, with experience this gap can be nullified.

There is no significant difference in the onset of block, latency of block and time to achieve complete surgical anaesthesia between the two groups. In a study of axillary nerve block done by Sia and Bartoli in 2000,they showed that when multiple injection technique is used the time to perform the block ,

onset time of primary block, time to achieve readiness to surgery and total anaesthetic time is significantly shorter in group PNL than group paraesthesia [9].

As shown by Horlocker in his study the success rate with the paraesthesia technique (90%) were significantly higher as compared to nerve stimulator technique (83%) [10]. Similarly, Shroeder and collegues reported that paraesthesia technique during axillary blockade resulted in significantly higher success rate [11]. Goldberg and collegues, found that for axillary blockade, transarterial, paraestheisa and nerve stimulator technique all resulted in similar success rate (70-80%)[12]. Correspeondingly McClain and collegues investigated brachial plexus blockade with interscalene approach and found that utilizing paraesthesia versus a nerve stimulator resulted in comparable success rates (70-80%) [13]. In our study success rate for PNL was found to be 91.1% compared to 80% for paraesthesia. Four cases in PNL and nine cases in paraesthesia group failed and required supplementation.

The results of our study show that use of PNL leads to higher success rate for performing local anaesthetic block as compared to paraesthesia. The results correlate with the study done by Sia and Bartoli comparing success rate of multiple injection axillary brachial plexus block performed by using two methods of nerve localization, paraesthesia elicitation or nerve stimulation [14].

In our study even though the failure rate was lower with PNL group, it was not statistically significant.

The incidence of vascular puncture was higher in paresthesia group (8 cases) as compared to PNL group (2 cases), which might lead to ischaemic damage to brachial plexus. Use of PNL might reduce these problems [12].

No neurological dysfunction was reported in this study. This might be due to the limited number of patients in this study. Although elicitation of paresthesia may represent direct needle trauma and theoretically increase the risk of neurologic injury, there are no prospective, randomized clinical studies that definitely support this hypothesis.

Conclusion

Regional anaesthetic techniques are gaining interest and use in present day clinical practice because of their inherent advantages over general anaesthesia.

The use of peripheral nerve locator in the process of nerve blocks is evaluated in the present study. It appears to be more useful to improve the result of the block particularly when the block of deep seated plexus or nerves is desired. Although nerve locator may not help in improving the onset of block, latency of block or time to achieve complete surgical anaesthesia, the success of peripheral nerve locator can be attributed to a lesser risk of tissue injuries like vascular punctures and direct nerve trauma.To overcome the problems of failed block or inadvertent local anaesthetic toxicity peripheral nerve locator is being considered and used in low resource setting.

Use of peripheral nerve locator for nerve blocks therefore appears to promise a better quality of surgical anaesthesia along with improved patient comfort and safety without possible side effects.Use of regional blocks may also improve the success of vascular access procedures by producing significant vasodilatation, greater fistula blood flow, sympathectomy-like effects, and decreased maturation time.It is proposed that the use of good quality nerve locator, meticulous nerve localisation technique and a large experience in this field is likely to give more promising results. This will help the anaesthesiologists, interested in regional anesthesia to achieve a reasonable high standard in giving quality regional blocks, along with an increased patient safety and acceptability.

References

1. Raj P P, De Andres, J. Grossi P, Banister R. Sala- Blanch X: Aids to localization of peripheral nerves. Textbook of Regional Anesthesia. Edited by Raj P.P. New York. Churchill Livingstone. 2002.pp.251-84.
2. Vascular Access to Hemodialysis. National Kidney and Urologic Diseases Information Clearinghouse, Home Health Information. December 1999. http://www.niddk.nih.gov.
3. Hingorani AP, Ascher E, Gupta P, Alam S, Marks N, Schutzer RWet al. Regional anesthesia: preferred technique for venodilatation in the creation of upper extremity arteriovenous fistulae. Vascular. 2006 Jan-Feb;14(1):23-6.
4. Ronald D, Miller. Local Anaesthetics. Millers Anaesthesia. Churchill Livingstone. 2010;928-30.
5. Ronald D. Miller. History of Anesthetic Practice. Miller's Anesthesia. Natasha Andjelkovic. Churchill Livingstone. 2005.pp.22-28.
6. Mulroy MF. Equipment. Regional Anesthesia. Edited by Mulroy MF. Philadelphia. Lippincott Williams and Wilkins. 2002.pp.51-63.

7. Kaiser H, Niesel HC, Hans V. Fundamentals and requirements of peripheral electric nerve stimulation. An improvement of safety standards in regional anaesthesia. Reg. Anesth 1990;13:143-47.
8. Guay J: The neurostimulator for brachial plexus blockade by the axillary approach: a meta analysis on its efficacy to increase the success rate: Ann Fr AnesthReanim: 2005 Mar;24(3):239-43.
9. Sia S, Bartoli M. Selective ulnar nerve localization is not essential for axillary brachial plexus block using a multiple nerve stimulation technique. Reg Anesth Pain Med, 2001;Jan-Feb; 26(1):12-6.
10. Horlocker TT, Kufner RP, Bishop AT, et al. The risk of persistent paresthesia is not increased with repeated axillary block. AnesthAnalg 1999;88:382-7.
11. Schroeder LE, Horlocker TT, Schroeder DR. The efficacy of axillary block for surgical procedures about the elbow. AnesthAnalg 1996;83:747-51.
12. Goldberg ME, Gregg C, Larijani GE, et al. A comparison of three methods of axillary approach to brachial plexus blockade for upper extremity surgery. Anesthesiology 1987;66:814-816.
13. McClaine DA, Funucane BT. Interscalene approach to the brachial plexus: Paraesthesae versus nerve stimulator. Reg. Anesth 1987;12:80.
14. . Sia S, Bartoli M, Lepri A, et al. Multiple injection axillary brachial plexus block: A comparison of two methods of nerve localisation - nerve stimulation versus paresthesia. AnesthAnalg 2000;91:647-651.

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[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.

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[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. p. 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.

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