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Aims and Scope

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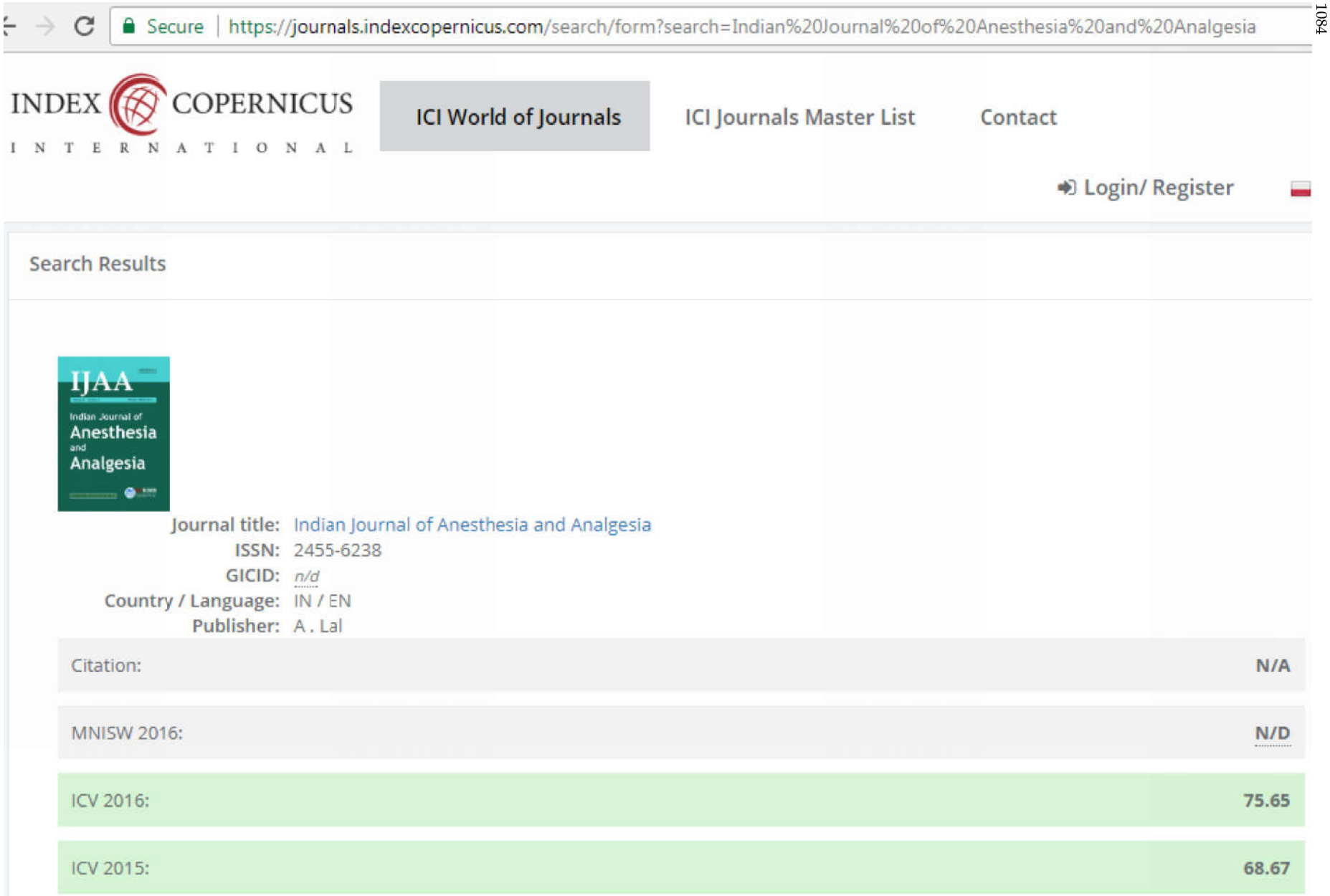
Original Research Articles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A Study of Efficacy of Trans Dermal Nitroglycerine Patch in Enhancing Analgesia of Intrathecal Neostigmine Following Hyterectomies Under Bupivacaine Spinal Anaesthesia

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Abstract

Aim of the study: To evaluate and compare the efficacy, safety and adverse effects of combining intrathecal neostigmine with transdermal nitroglycerine patch for pain relief in patients undergoing hysterectomies under bupivacaine spinal anaesthesia. *Materials and Methods:* The study was conducted on 78 patients aged 30 to 60years of ASA grade I and II, planned for hysterectomies. Patients were allocated into 3 groups, each group containing 26 patients.

Group C: Patients received 15mg [3ml] of intrathecal bupivacaine.

Group N: Patients received 15mg [3ml] of intrathecal Bupivacaine and 25µg [1ml] of neostigmine.

Group P: Patients in addition to 15 mg [3ml] of intrathecal Bupivacaine and 25µg [1ml] of neostigmine, received transdermal NTG patch [5mg / 24hours] at chest wall in non- anaesthetized area 15 minutes after intrathecal administration of drug solution. Sensory level during anaesthesia, Postop VAS score and incidence of side effects were noted in all patients. *Observation and Results:* Duration of analgesia was longest in Group P (316.3 minutes) compared to other two groups. (Group N 211.3 minutes and Group C 150.4 minutes) which was statistically significant. Incidence of nausea and vomiting were higher in Group N and P compared to Group C. *Conclusion:* Addition of transdermal nitroglycerine patch [5mg/24hrs] and intrathecal 25µg neostigmine to 3ml of 0.5% bupivacaine spinal anaesthesia provided prolonged duration of analgesia but with increased incidence of nausea and vomiting.

Keywords: Nitroglycerine; Bupivacaine; Neostigmine; Spinal Anaesthesia.

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Introduction

Post-operative pain is a universal phenomenon experienced by millions of patients throughout the world, yet paradoxically after all the efforts taken to make intraoperative period pain and stress free, the patients is left to fend for himself in the postoperative period.

Neuraxial blockade is one of the answers to control post-operative pain. Neostigmine is the universally used neuromuscular block reversal agent whose post-operative pain relief property was first described by Naquib and Yaksh et al in1994. It inhibits the breakdown of acetylcholine which has been shown to cause analgesia by stimulating the synthesis of nitric oxide [NO] in the spinal cord. It blocks the activity of both true and

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pseudo cholineterase and thereby enhancing accumulation and binding of acetylcholine at various cholinergic sites.

But a higher dose of neostigmine produce many untoward side effect such a nausea, vomiting etc and lower does of neostigmine doesn't show much analgesic property. So as to reduce dose of neostigmine and potentiate its analgesic property other adjuvants like clonidine, opioids,transdermal nitroglyceine pathc etc, have been adden alone with it.

The transdermal nitroglycerine acts as a source for nitric oxide (NO). NO acts as a second messenger in the CNS and plays an important role in the mediation of pain. Intracellular cGMP levels are increased by NO by activation of enzyme guanyl cyclase. This Nitric oxide–cyclic GMP cascade in endothelial cells mediates acetylcholine induced vasodilatation as well as acetylcholine induced antinociception.

Aim of The Study

To evaluate and compare the efficacy , safety and adverse effects of combining intrathecal neostigmine with transdermal nitroglycerine patch for pain relief in patients undergoing hysterectomies under bupivacaine spinal anaesthesia.

Materials And Methods

After obtaining approval from Ethical committee, the study was conducted in *Raja Mirasdar Hospital, Thanjavur*.[Thanjavur Medical College] over a period of 5 months. Informed consent was obtained, the study was conducted on 78 patients aged 30 to 60years of ASA grade I and II, planned for hysterectomies. Patients were allocated into 3 groups, each group containing 26 patients.

Group C: Patients received 15mg [3ml] of intrathecal Bupivacaine.

Group N: Patients received 15mg [3ml] of intrathecal Bupivacaine and 25µg [1ml] of neotigmine.

Group P: Patients , in addition to 15 mg [3ml] of intrathecal bupivacaine and 25µg [1ml] of neostigmine, received transdermal NTG patch [5mg / 24hours] at chest wall in non-anaesthetized area 15 minutes after intrathecal administration of drug solution.

Visual analogue scale [VAS] was used as pain score, 0= no pain and 10= worst pain. After preloading the patient with Ringer lactate 10ml/ kg, spinal anaesthesia was performed at L3-L4 level, with 25 gauge Quincke needle and 4 ml of drug volume was injected intrathecally.

Sensory level was assessed by pin prick . BP was recorded every 5 minute during the surgery. Inj. ephedrine 6mg iv was given when systolic BP decreases below 15% of base line. Pulse rate and SpO_2 were observed continuously. Fall in heart rate below 60 per minute was treated with Injection atropine 0.2mg IV. Intraoperative vomiting was treated with Injection metoclopramide 10 mg IV. Postoperatively VAS score was used to assess pain in subjects for every 30 minutes. Patients were given rescue analgesia at VAS score of 4.

Other adverse effects like vomiting, nausea, sedation, bradycardia, hypotension, sweating, headache and palpitation were also monitored.

Inj. pentazocine 30mg was administered intramuscularly as rescue analgesic. Duration of analgesia was calculated from the time of intrathecal drug administration till VAS score reaches 4.

Data thus obtained were analyzed using Microsoft excel software.

Statistical Tools

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using Epidemiological Information Package (EPI 2010) developed by Centre for Disease control, Atlanta.

Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. Kruskul Wallis chi-quare test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A 'p'value less than 0.05 is taken to denote significant relationship.

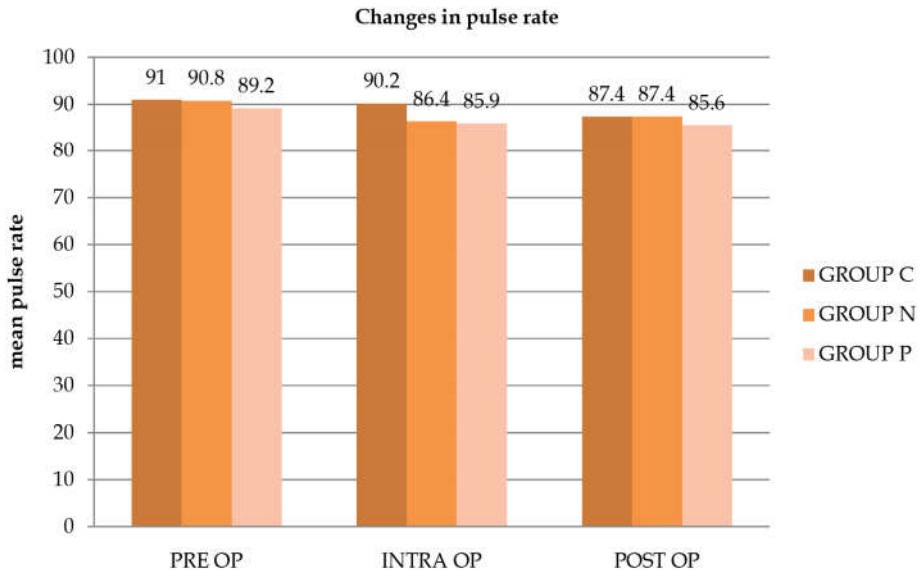
Results

Characteristics of Cases

The three groups were comparable with respect to the demographic variables such as age, weight & duration of surgery. There was no statistically significant difference between distribution of age, weight & duration of surgery among the three groups.

Table 1: Changes in Pulse rate

Pulse rate	Pulse rate						'p' value between Groups			
	Group C		Group N		Group P		C,N&P	C&N	C&P	N&P
	Mean	SD	Mean	SD	Mean	SD				
Pre operative	91	10.4	90.8	11.6	89.2	12.8	0.7195 Not significant	0.5701 Not significant	0.481 Not significant	0.6604 Not significant
Intra operative	90.2	11.1	86.4	10.7	85.9	12.7	0.1723 Not significant	0.0714 Not significant	0.156 Not significant	0.927 Not significant
Post operative	87.4	10.5	87.4	11.4	85.6	12.6	0.7125 Not significant	0.5704 Not significant	0.5159 Not significant	0.5518 Not significant
Decrease	3.5	2.4	3.3	5	3.6	7.3	0.7623 Not significant	0.4809 Not significant	0.5704 Not significant	0.9416 Not significant



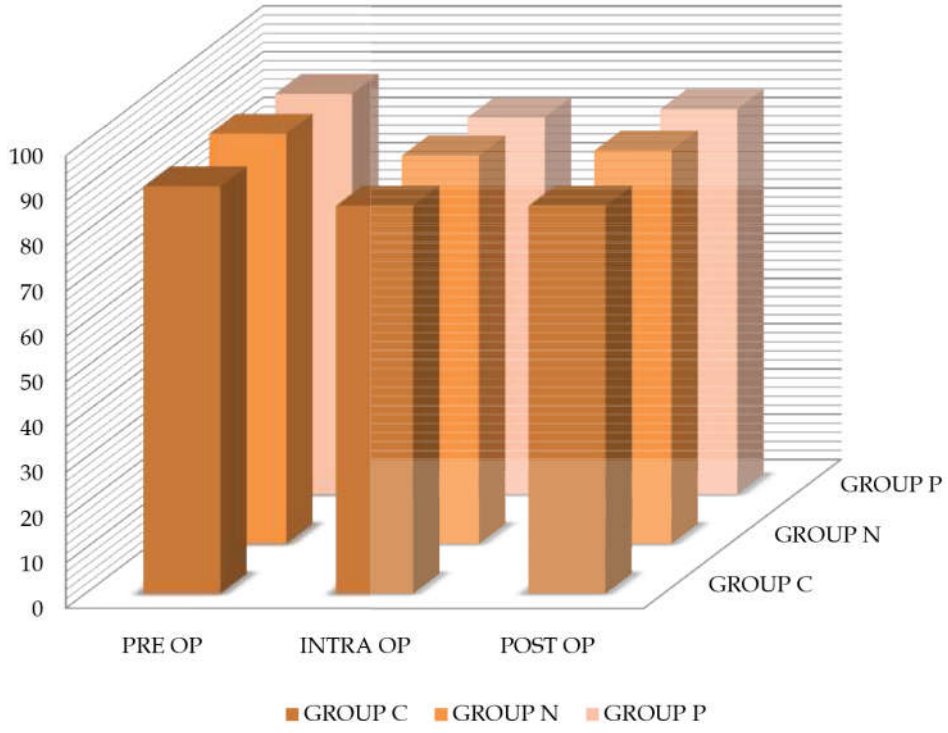
Graph 1: Changes in Pulse rate

There was no statistically significant difference in the heart rate among the three groups (Table 1 & Graph 1).

There was no statistically significant difference in the mean arterial pressure among the three groups (Table 2 & Graph 1).

Table 2: Changes in Mean arterial Pressure among the three groups

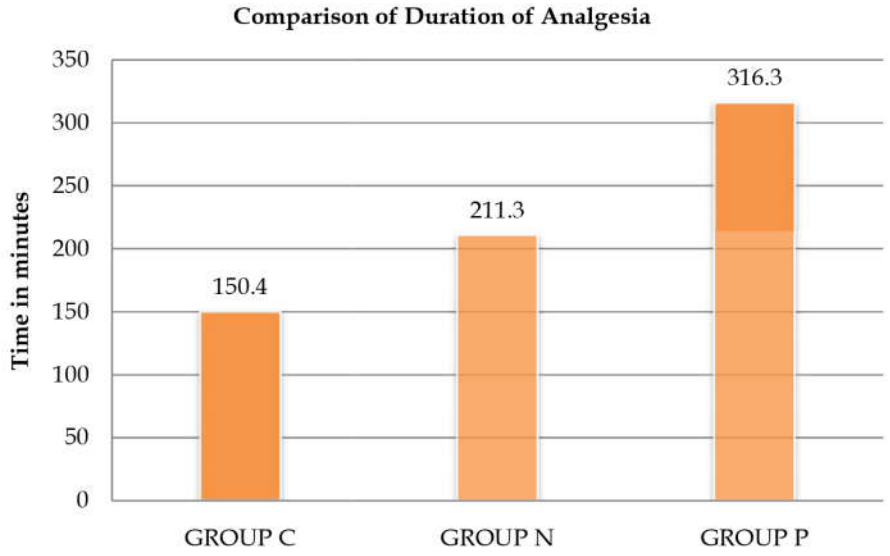
MAP	MAP of						'p' value between Groups			
	Group C		Group N		Group P		C,N&P	C&N	C&P	N&P
	Mean	SD	Mean	SD	Mean	SD				
Pre operative	90	5.2	90.7	5.2	88.5	6.8	0.4273 Not significant	0.3696 Not significant	0.558 Not significant	0.234 Not significant
Intra operative	85.7	5.5	85.8	5.4	83.3	6.7	0.2021 Not significant	0.8836 Not significant	0.148 Not significant	0.1033 Not significant
Post operative	85.7	5.6	86.9	4.6	85.1	6.6	0.7111 Not significant	0.4474 Not significant	0.9416 Not significant	0.5099 Not significant
Decrease	3.9	1.7	3.7	4.2	3.4	2.2	0.118 Not significant	0.9271 Not significant	0.1102 Not significant	0.4207 Not significant



Graph 2: Changes in MAP

Table 3: Comparison of duration of analgesia

Group	Duration of analgesia in minutes		
	Range	Mean	SD
Group C	120-180	150.4	15.7
Group N	180-250	211.3	22.8
Group P	200-400	316.3	48
'p' value between Groups C,N&P		0.0001 - Significant	
C&N		0.0001 - Significant	
C&P		0.0001 - Significant	
N&P		0.0001 - Significant	



Graph 3: Duration of analgesia

Duration of analgesia was longest in Group P in comparison to other two groups and this difference was statistically significant (p-0.0001) (Table 3).

Duration of analgesia was longer in Group N in comparison to Group C and this difference was also statistically significant (p-0.0001) (Graph 3).

Incidence of nausea and vomiting was higher in Group N and Group P when compared with Group C and this difference is statistically significant. There was no statistically significant difference in the incidence of nausea and vomiting among Group-P and Group-N (Table 4, 5 & Graph 4).

Discussion

Various drugs have been tried in the subarachnoid space along with local anaesthetics with the aim of improving the duration of post-operative analgesia. The cholinesterase inhibitor neostigmine is one among such adjuvants.

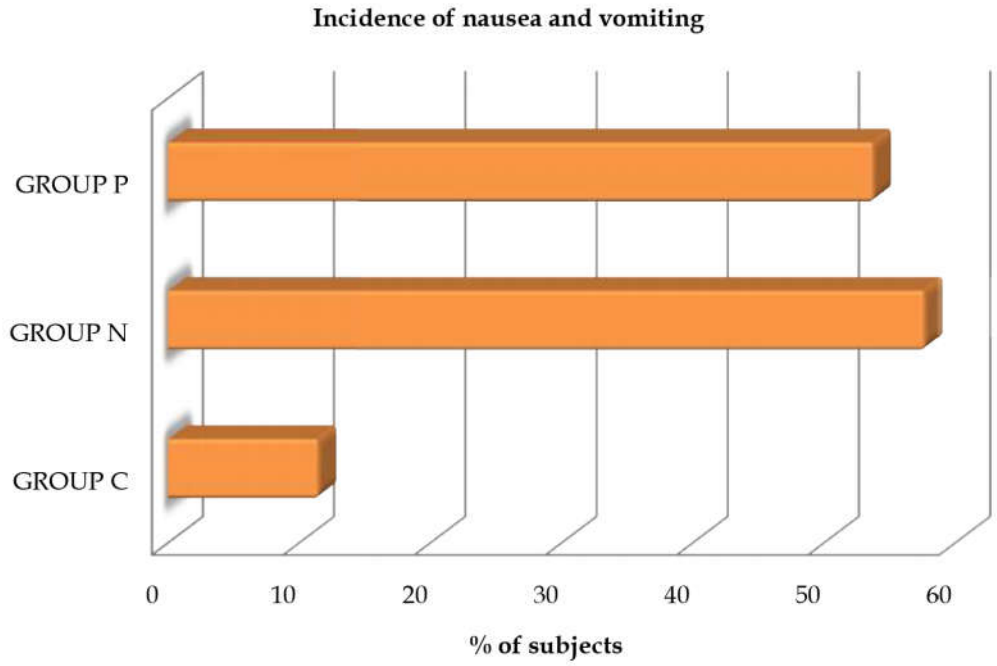
Even though neostigmine produces an increase in duration of analgesia, it was also associated with many unwanted side effects particularly nausea and vomiting, especially in higher doses. So to reduce the incidence of adverse effects and to

Table 4: Adverse effects

	Group - P	Group - N	Group - C
Nausea	8	8	2
Vomiting	6	7	1
Hypotension	3	2	3
Bradycardia	2	2	1

Table 5: Comparison of Adverse effects

Group	Nausea and Vomiting			
	Yes	%	No	%
Group C	3	11.5	23	88.5
Group N	15	57.7	11	42.3
Group P	14	53.8	12	46.2
'p' value between Groups				
C & N		0.0238 - Significant		
C & P		0.046 - Significant		
N & P		0.7822 - Not significant		



Graph 4: Incidence of nausea and vomiting

prolong the post operative analgesia other adjuvants have been used along with neostigmine.

The aim of this study was to systematically review the current evidence of analgesic enhancement of intrathecal neostigmine by the addition of transdermal nitroglycerine patch on bupivacaine spinal anaesthesia.

Analgesic effect of intrathecally administered neostigmine is by release of acetylcholine in the spinal cord. Increased acetylcholine due to surgical stimuli and acetylcholine preserved from anticholinesterase activity of intrathecal neostigmine, binds to nicotinic and muscarinic nerve terminals in the spinal cord. Studies have proved that cholinergic agonist produce inhibitory effects on spinal dorsal horn neurons, including spinothalamic tract. This suggest that a spinal cholinergic system plays an important role in the modulation of pain pathways.

Since NO was shown to be a CNS neurotransmitter, there has been reports of relationship between nitric oxide and pain processing in the CNS. It is accepted that nitric oxide may occupy an important position in the mediation of pain. Acetyl choline induces analgesia by activation of the arginine- nitric oxide –cGMP pathway. Enzyme Guanylate Cyclase activity in the CNS is markedly stimulated by nitric oxide generated from L-arginine or provided through transdermal NTG, an exogenous source as in the present study. Nitric oxide formation occurs during degradation of organic nitrate from transdermal NTG.

This study was designed to find out whether the analgesic effect of intrathecal neostigmine will be enhanced by transdermal NTG, which act as an exogenous source of nitric oxide. In this study the duration of analgesia was analyzed as period from intrathecal drug administration till VAS score reaches 4. On statistical analysis, patient belonging to Group C complained of pain earlier than other groups, duration of analgesia being 2.5 hours. There was statistically significant delay in the onset of pain in Group N and Group P. Our study showed a mean duration of 3.5 hours in patients belonging to Group N and 5.2 hours in patients belonging to Group P.

Lauretti, Gabriela R. et al., in 2000 conducted a study to determine whether association of transdermal nitroglycerine would enhance analgesia from low dose of intrathecal neostigmine in patients undergoing gynaecologic surgery during spinal anaesthesia. They concluded that neither intrathecal 5µg neotigmine alone nor transdermal nitroglycerine alone (5mg/day) delayed the time to administration of first rescue analgesics, but the combination of both provided an average of 550min of effective postoperative analgesia after vaginoplasty. There was no significant difference in the incidence of adverse effect. They suggested that transdermal nitroglycerine and the central cholinergic agent neostigmine may enhance each other's antinociceptive effects which correlate with findings of our study. The increased incidence of adverse effects in our study may be due to usage of higher dose of neostigmine.

Gurvinder Kaur, Narheet Osahan, Lalita AFzal in 2007 conducted a study to examine the effect of transdermal NTG patch (5mg/24hour) in intrathecally administered neostigmine (5µg) along with 15mg Bupivacaine and incidence of untoward effect. They found that average duration of analgesia in intrathecal neostigmine group [Group I] was 6.5 hours and in neostigmine and transdermal nitroglycerine patch Group [Group II] wa 9.10 hours. Duration of analgesia was significantly higher in patients in Group II as compared t Group I. The incidence of nausea was higher in Group I than in Group II. The enhancement of analgesia of intrathecal neostigmine by transdermal NTG in this study correlates with our study. The increased incidence of nausea and vomiting in my study may be due to usage of higher dose of neostigmine.

Fareed ahmed et. Al 2010 conducted a study to determine the effect of trandermal nitroglycerine patch on intrathecal neostigmine. Patients were allocated into four group with Group I received 15 mg bupiuvacaine intrathecally, Group II received 15 mg of Bupivacaine with 5µg neostigmine intrathecally, patients in group III received 15 mg of Bupivacaine with 1 ml of normal saline intrathecally and transdermal NTG patch [5mg/24hours]. Patients in Group IV received 15mg bupivacaine with 5µg of neostigmine intrathecally and transdermal NTG patch [5mg/24 hours]. The mean duration of analgesia was 202.2 min, 407.6 min,207.8 min and 581.6min in Group [I], Group [II], Group [III], Group [IV] respectively.

In my study intrathecal Bupivacaine–transdermal nitroglycerine patch group was omitted since the above studies substantiated that transdermal nitroglycerine patch do not show analgesic potential of its own. The enhancement of analgesia by intrathecal neostigmine and potentiation of analgesic effect of intrathecal neostigmine by transdermal NTG patch correlates with the findings of our study. No change in perioperative hemodynamic parameters which was observed in this

study also correlates with our study. The increased incidence of nausea and vomiting in my study may be due to usage of higher dose of neostigmine.

Conclusion

On the basis of this study the following conclusions were drawn :

1. Spinal anaesthesia with 3ml 0.5% Bupivacaine provided 2.5 ± 0.26 hours of analgesia.
2. Addition of intrathecal 25µg neostigmine to bupivacaine spinal anaesthesia significantly prolonged the duration of analgesia [3.52±0.38 hrs]
3. Addition of transdermal nitroglycerine patch [5mg/24hrs] and intrathecal 25 µg neostigmine to bupivacaine spinal anaesthesia provided the longest duration of analgesia [5.27±0.8 hrs]
4. Addition of intrathecal neostigmine and transdermal nitroglycerine patch to bupivacaine spinal anaesthesia did not produce any significant change in hemodynamic parameters.
5. Addition of intrathecal 25 µg neotigmine to bupivacaine spinal anaesthesia significantly increased the incidence of nausea and vomiting.

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Indian Journal of Medical & Health Sciences	Semiannual	7000	6500	547	508
Indian Journal of Obstetrics and Gynecology	Bi-monthly	9500	9000	742	703
Indian Journal of Pathology: Research and Practice	Monthly	12000	11500	938	898
Indian Journal of Plant and Soil	Semiannual	65500	65000	5117	5078
Indian Journal of Preventive Medicine	Semiannual	7000	6500	547	508
Indian Journal of Research in Anthropology	Semiannual	12500	12000	977	938
Indian Journal of Surgical Nursing	Triannual	5500	5000	430	391
Indian Journal of Trauma & Emergency Pediatrics	Quarterly	9500	9000	742	703
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Original Research Article

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Magnesium Sulphate as an Adjuvant to Ropivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block: A Comparative Prospective Randomized Controlled Study

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Abstract

Background: Ropivacaine has been chosen for supraclavicular brachial plexus blockfor its safety profile. Magnesium Sulphate is used as an adjuvant to local anaesthetics as it is known to potentiate sensory and motor blockade. *Aims:* Our aim was to assess and compare the effectiveness of adding Magnesium Sulphate to Ropivacaine for supraclavicular brachial plexus block.The variables compared included onset, duration of sensory and motor blockade and duration of analgesia. Any adverse effects were also documented. *Methods:* A prospective randomized double blinded controlled study was conducted involving 50 adult patients between the ages of 20 and 50 years belonging to American Society of Anaesthesiologists (ASA) grade 1 and 2 who underwent upper limb orthopaedic surgeries. Patients were randomly assigned into two groups of 25 each. Group R was administered 0.75% Ropivacaine while Group RM received 0.75% of Ropivacaine along with 250 mg Magnesium Sulphate. Sensory and motor blockade characteristics along with analgesic efficiency was determined. *Statistical analysis:* The collected data was entered and tabulated in Microsoft excel and were subjected to analysis using SPSS version 16.0. Student t test was used for analysis of the demographic and hemodynamic data. Unpaired t test was used for statistical evaluation of the data which comprised of onset, duration of both sensory and motor blockade as well as duration of analgesia. The results were statistically significant if p value obtained was <0.05. P value < 0.001 was considered as highly significant statistically. *Results:* Patients in group RM had rapid onset of sensory and motor blockade (7.8±1.24min v/s 9.6±1.76min and 10.36±1.22min v/s 12.24±2.26min). There was also prolongation of sensory and motor blockade along with reduced analgesic requirements in the post operative period. *Conclusion:* Adding Magnesium Sulphate to 0.75% Ropivacaine provided faster onset and longer duration of sensory and motor blockade along with superior post operative analgesia without any adverse effects.

Keywords: Ropivacaine; Magnesium Sulphate; Supraclavicular Brachial Plexus Block; Upper Limb Orthopaedic Surgeries.

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Introduction

Brachial plexus block is used for the surgeries of the upper limb. It provides a dense and most reliable anaesthesia and analgesia.The unwanted effects of general anaesthesia can be prevented with the use of this technique [1].

There are a lot of benefits with the advent of ultrasoundfor regional anaesthesia when compared to use of other techniques. With the use of ultrasound probe, the block can be performed very quickly and the onset time is also very fast [2].

Ropivacaine is a long-acting localanaesthetic agent. It was first synthesized as a pure enantiomer.

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It mediates its effects via the blockade of sodium channels.Because it is less lipophilic, the cardiovascular and the central nervous system are minimal [3].

Lot of adjuvants have been combined with local anaesthetics for supraclavicular brachial plexus block to provide satisfactory anaesthetic outcomes. Magnesium Sulphate is one among them. It has been postulated that Magnesium mediates anti hypertensive and analgesic effects. It also blocks the conduction of nerve impulses when used in higher doses [4,5].

Methods

A prospective randomized double blinded comparative study was planned after discussing and taking approval from the ethical committee at our medical college and hospital. This study involved 50 patients belonging to ASA physical status Grade 1 and 2. Patients who were posted for surgeries involving the forearm, elbow and wrist were selected. Their age group was between 20 -50 years. Ultrasound guided supraclavicular brachial plexus block was performed. Pre anesthetic work up was done for all the 50 patients. All relevant investigations and workup were done keeping in view about the patient's co morbid conditions.Patients were told about the interpretation of Visual Analogue Scale (VAS) score during pre anaesthetic evaluation. Consent was obtained for the procedure after explaining to the patients in their own language.

Patients were assigned randomly into 2 groups who were categorized as group R and group RM. The sample size was calculated by using Epi Info 6 software. Based on a previous study with an á error of 0.05 and the power of study being 80% and keeping the mean time of first rescue analgesic requirement as one of the main primary variables at the p value of <0.05, we selected 25 patients in each group for our study [6]. This was done with the help of computer generated code where group R had patients who were given 25ml of Ropivacaine (0.75%) with 1 ml of normal saline. The other group (group RM) were given Ropivacaine (0.75%) 25 ml in combination with 250 mg of Magnesium Sulphate (25% w/v, Harson laboratories) 1ml prepared as an admixture.

Patients with coagulation abnormalities, infection at the site of injection, history of known psychiatric ailments, peripheral vascular insufficiency, any documentations or history regarding allergy to local anaesthetics previously were not involved in the study. Other patients who were excluded were as follows: patients with severely compromised cardio respiratory reserve, taking warfarin or any other anti-coagulants and on long term pain relieving medications (like Non-steroidal anti-inflammatory drugs). Pregnant women and post-partum lactating patients were also excluded. Patients who refused to take part in the study were also not considered.

The drugs used for the procedure were prepared and kept ready by a resident not involved in the study process. Since we planned for a double blinded study, the patients on whom the procedure was done and the anaesthesiologist who was involved in the procedure did not have any idea about the drug allocation.

Patients scheduled for surgery were kept nil per orally for a duration of 6 hours before surgery. Tablet Pantoprazole 40 mg was administered orally the previous night half an hour before food. To allay anxiety and apprehension a small dose of Alprazolam 0.25 mg was administered to the patient the previous night at 10 pm.Ringer lactate infusion was started after securing 20 gauge cannula in the limb opposite the surgical site. All baseline parameters including heart rate, blood pressure (noninvasive) and oxygen saturation were noted and recorded.

In supine position and with a small elevation under the shoulder using a wedge or a small pillow, the patients were prepared for the supraclavicular brachial plexus block. Under aseptic precautions, local anaesthetic solution (2% lignocaine)was injected over the area where the block was planned. An ultrasound probe was used to perform the block. Required anatomical landmarks including subclavian artery, first rib, pleura and brachial plexus nerve cluster were delineated. We used the in plane technique using ultrasound probe wherein a 23 Gauge (23G) spinal needle was directed in the long axis of the ultrasound beam. After attaching a ten centimeter extension to the spinal needle the prepared drug mixture which included either plain Ropivacaine or Ropivacaine with Magnesium Sulphate was injected covering all the boundaries near the vicinity of the nerve clusters trying to cover all the nerve trunks. We made sure that before injection no blood vessel was entered. Assessment of the sensory and motor blockade including their onset and duration were done every 5 minutes initiallyand there on upto the entire surgery. The above parameters were noted even after completion of surgery and until the recovery of the block. The sensory block was determined by a pin prick test which indicated a 3 point scale. This was as follows; numeral0 denoted

normal sensation 1 indicated loss of sensation of pin prick 2 denoted loss of sensation of touch.

Modified Bromage scale was used to evaluate the motor blockade which includes grade 0 to grade 2. Their description is as follows:

Grade 0 is normal motor function with full extension and flexion of the elbow, wrist and fingers,

Grade 1 is inability to move the fingers only

Grade 2 is the inability to move the fingers with complete motor blockade.

The time interval between the end of local anaesthetic injection and complete sensory blockade was taken as onset time for sensory blockade (score 2). The time which has elapsed between the complete sensory blockade and complete anaesthetic resolution was considered as duration of sensory block (score 0). The time interval between local anaesthetic injection and complete motor blockade was termed as onset time for motor blockade (Grade 2). Duration of motor blockade was also considered and it was taken from the time interval involving complete motor blockade to complete recovery of motor function of hand and forearm. Between the period of complete sensory blockade and first analgesic request, the time interval recorded was taken as the duration of analgesia.

Adverse effects if any were noted. If the blood pressure declined to 20% lesser than the baseline values, it was considered as hypotension for which fluid infusion was increased. If hypotension did not respond to fluid boluses injection Mephenteramine, 5mg was used. Bradycardia was defined in our study as heart rate less than 50 beats per min. Injection Atropine 0.6 mg was kept ready if Bradycardia persisted. Mean blood pressure and heart rate values were noted down and tabulated at the intervals of every 5 minutes till 30 minutes and then on till the end of surgery.

Other side effects like nausea and vomiting were treated with injection Ondansetron 8 mg intravenously. In the post-operative period, visual analogue scale (VAS score)was used to access the intensity of pain in the first 24 hours. In this scale 0 depicts no pain and a score of 10 represents worst possible pain. Rescue analgesic was given to the patients in both the groupsif VAS score was more than 3. We used injection Diclofenac 75mg as a rescue analgesic if the patients complained of pain. The amount of analgesic requirement was calculated in group R as well as in group RM postoperatively. The collected data was entered and tabulated in Microsoft excel and were subjected to analysis using SPSS version 16.0. Student t test was used for analysis of the demographic and hemodynamic data. Unpaired t test was used for statistical evaluation of the data which comprised of onset, duration of both sensory and motor blockade as well as duration of analgesia. The results were statistically significant if p value obtained was <0.05. P value < 0.001 was considered as highly significant statistically.

Results

Fifty patients were enrolled for the study as per the study protocol mentioned above. Both the groups R and RM were comparable with respect to age, weight, sex distribution, height (Table 1) and ASA grading (Table 2). Even the duration of surgery were comparable among both the groups (p=0.1314). As per the observations in Table 3, the onset time for sensory and motor blockade were significantly shorter in RM

Table 1: Comparison of demographic variables

	Group R	Group RM	P Value
Age in YRS	35.6±6.1	36.1± 7.2	0.4226
Weight (KG)	60.6 ± 4.7	61.9 ± 3.7	0.2483
Height (CM)	163.90 ± 5.92	162.2 ± 3.2	0.2127
Sex (Male/Female)	13(52%)/12(48%)	13(52%)/12(48%)	1.0
Mean Duration of Surgery (in minutes)	67 ± 4.16	68 ± 3.04	0.1314

Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate, p value-not significant (student t test)

Table 2: ASA grading in both the groups

	Group R	Group RM	P value
Grade 1	9(36%)	10(40%)	
Grade 2	16(64%)	15(60%)	0.862
Total	25(100%)	25(100%)	

Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate, p=0.862, not significant

group (7.8±1.24 minutes and 10.36±1.22 minutes respectively) when compared to R group (9.6±1.76 minutes and 12.24±2.26 minutes respectively) with p value <0.05. By adding Magnesium Sulphateto Ropivacaine in our study, we noted the occurrence of early onset of sensory and motor blockade when compared to use of Ropivacaine alone. The duration of sensory blockade was longer in RM group (526.32±10.34minutes) when compared to R group (403.78±14.62minutes) with p value of 0.0037 (statistically significant). The duration of motor blockade was also enhanced to a greater degree in RM group (428.76± 12.76minutes) when compared to R group(296.16± 16.41)(p value <0.001)(Table 4). The duration of analgesia lasted longer in RM group (634.96±18.35) when compared to group R (496.62± 13.68 minutes) (p value <0.001)(Table 4).

Haemodynamic stability was maintained in patients of both the groups. Adverse effects like nausea, vomiting, sedation and respiratory depression

Table 3: Comparison of onset time of both sensory and motor blockade among both the groups

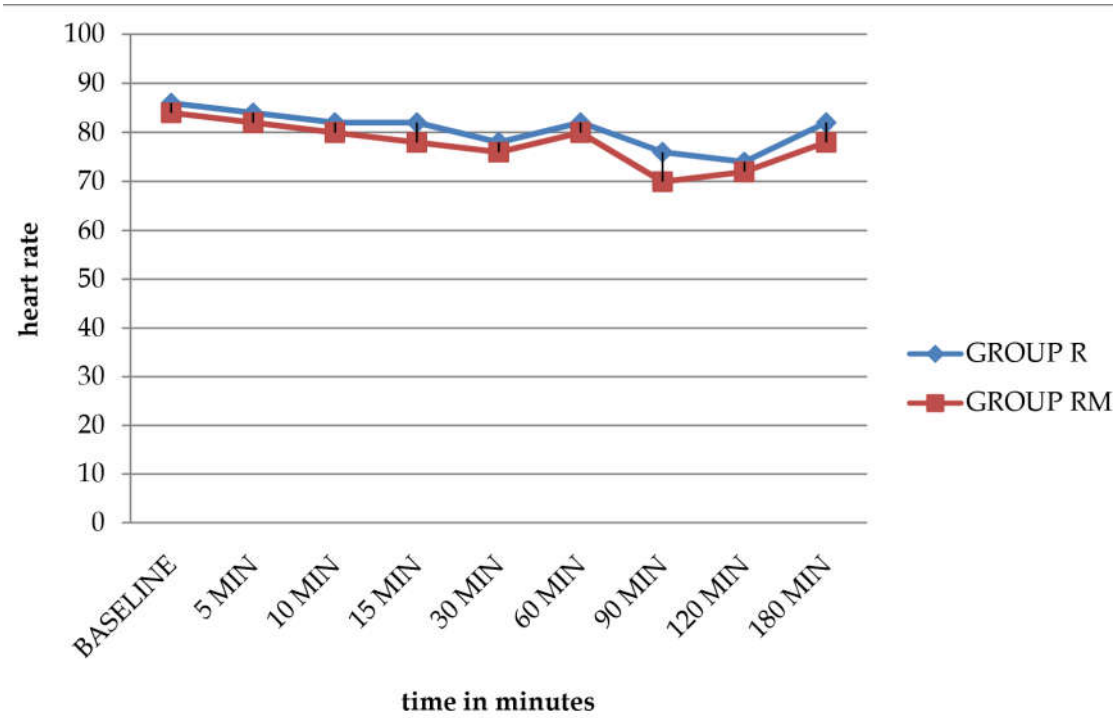
	Group R	Group RM	P value
Onset Time of Sensory Blockade (in Minutes)	9.6 ± 1.76	7.8 ± 1.24	0.0031
Onset Time of Motor Blockade (in Minutes)	12.24 ± 2.26	10.36 ± 1.22	0.0037

p value< 0.05, statistically significant and <0.001- statistically highly significant (unpaired t test). Group R=Ropivacaine, Group RM: Ropivacaine+Magnesium Sulphate

Table 4: Comparison of duration of both sensory and motor blockade among both the groups

	Group R	Group RM	P Value
Duration of Sensory Blockade (in minutes)	403.78 ± 14.62	526.32 ± 10.34	0.0037
Duration of Motor Blockade (in Minutes)	296.16 ± 16.41	428.76 ± 12.76	<0.001

p value< 0.05, statistically significant and <0.001- statistically highly significant (unpaired t test). Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate



Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate

Graph 1: Comparison of mean pulse rate in both the groups (graphical representation)

in either of the groups were not statistically significant.No any other adverse effects were noticed. VAS scores were less in patients of group RM and hence total analgesic requirement was less in group RM (67.62±11.61 minutes) when compared to group R (102.68±12.72 minutes) (p<0.001) (table 5).

Discussion

When general anaesthesia is used for the patients undergoing surgeries of the upper limb patients do not experience good analgesia in the perioperative period when compared to brachial plexus block. The stress response mediated by laryngoscopy and intubation causes significant hemodynamic disturbances. Other adverse effects following general anaesthesia include nausea, vomiting and respiratory depression in the post-operative period. To avoid all these adverse effects brachial plexus block is commonly administered. Brachial plexus block provides excellent analgesia in the perioperative period as the upper limb is innervated solely by the brachial plexus.

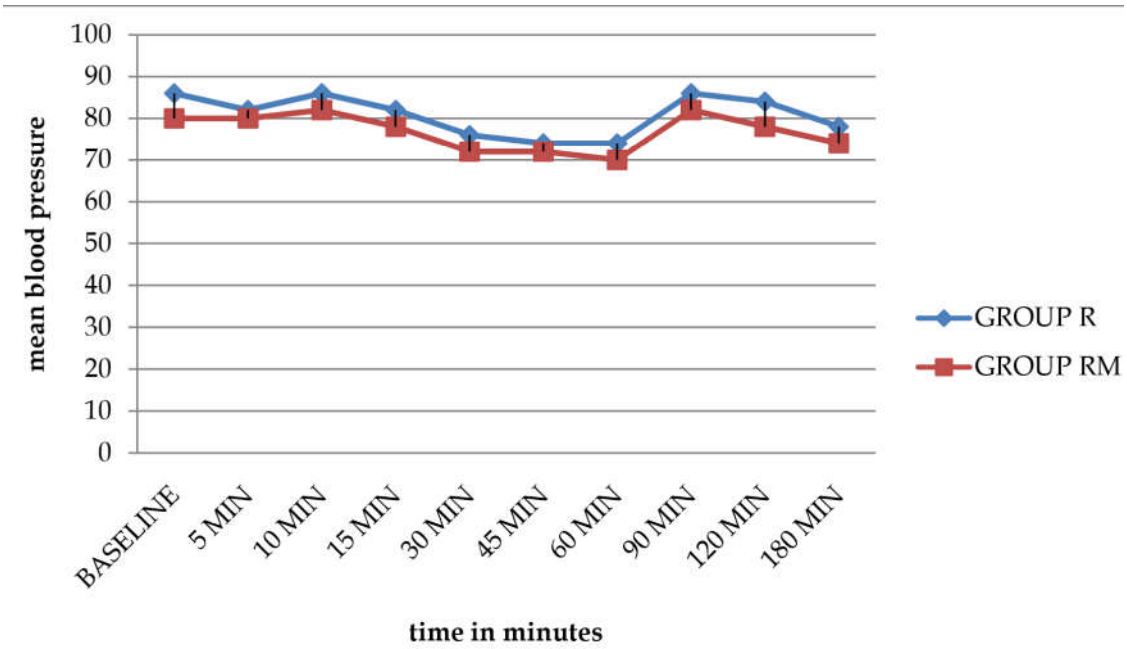
Ropivacaine is one of the recently synthesized long acting local anaesthetic which belongs to the amide group. It mediates its effects via the blockade of sodium channels. When compared to Bupivacaine it is less lipophilic and hence it is associated with minimal cardio vascular and central nervous system effects [7].

Magnesium is one of the important ion which mediates lot of physiological processes within the body system. It plays an important role in the prevention ofrelease of acetyl choline at the neuro muscular junction which is mediated by the entry of calcium thus bringing about blockade of nerve impulses. Its effects are mediated by inhibition of NMDA (N- methyl, D- aspartate) receptors. Beneficial effects of Magnesium have been found out during general anaesthesia and epidural anaesthesia. It's a known fact that Magnesium mediates anti-hypertensive effects and when used during anaesthesia it reduces the requirements of the drugs used in combination with it [8].

Table 5: Comparison of analgesic profile among both the groups

	Group R	Group RM	P value
Duration of Analgesia (in minutes)	496.62 ± 13.68	634.96 ± 18.35	<0.001
Rescue analgesia- diclofenac (mg)	102.68± 12.72	67.62± 11.61	<0.001

Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate p<0.001 highly significant



Group R=Ropivacaine, Group RM=Ropivacaine+Magnesium Sulphate

Graph 2: Comparison of mean arterial pressure in both the groups (graphical representation)

Brachial plexus block ensures better anaesthetic conditions when used in conjunction with ultrasound. The nerve clusters are better identified and hence the block quality is superior.The occurrence of accidental intra-arterial injection can be avoided. As the pleura is visible the chances of pneumothorax are very negligible [9].

In our study, we used 250 mg of Magnesium Sulphate as an additive to Ropivacaine and we found out that Magnesium Sulphate prolonged the duration of sensory and motor blockade. The duration of analgesia was also prolonged. The rescue analgesic medication used in the post operative period was of lesser doses in the group which received Magnesium Sulphate as adjuvant (group RM)(based on VAS score). These observations in our study correlates to a similar study which was conducted by Verma et al.[10]. They used two doses of Magnesium Sulphate(125 mg and 250 mg) which were used as adjuvants to Bupivacaine and have concluded that Magnesium Sulphate in a dose dependent fashion provided faster onset of sensory and motor blockade (5.17±2.2 min v/s 8.9±2.3 min). The duration of sensory and motor blockade was also prolonged along with very good analgesia (665.13±97.87min v/s 475.10±53.29 min). Therefore according to their study, higher doses of Magnesium Sulphate (250 mg) was very effective when compared to lower dose (125 mg). Like in our study, they also did not report any adverse effects. Even the post operative analgesic requirement was very low in the group to which Magnesium Sulphate was used as an adjuvant. They also used VAS score to evaluate the requirement of rescue analgesic.

Our study also correlates with the study conducted by Goyal et al.[11] wherein they have reported that the requirement of rescue analgesic was very less in the post operative period as they independently used Magnesium to the axillary approach of brachial plexus block. This is also in support with our observations as the total dose of rescue analgesic was less in RM group when compared to group R.

We noted certain differences in our study from a study conducted by Mukherjee et al. [12]. In their study protocol, they have come to a conclusion that addition of 150 mg of Magnesium Sulphate to 0.5% Ropivacaine prolonged the duration of sensory and motor blockade. Here the onset time of sensory and motor blockade(as per the bromage scale) was delayed, whereas in our study we have derived that Magnesium Sulphate when added to Ropivacaine resulted in an immediate onset of both sensory and motor blockade. This might be because we used increased dose of Magnesium Sulphate (250mg).

In one of the other studies conducted by Gupta et al. [13], Magnesium Sulphate was used as an adjuvant to Ropivacaine (0.5%). They opined that addition of 150 mg of Magnesium Sulphate to Ropivacaine speeds the onset of sensory blockade but delays the onset of motor blockade. However the duration of motor blockade lasted for a longer time. But we noted that addition of Magnesium Sulphate to Ropivacaine hastened the onset of both motor and sensory blockade. This could also be attributed to the use of 250 mg of Magnesium Sulphate.

Studies involving the use of Magnesium Sulphate as an additive to 0.5% bupivacaine were conducted by Rao et al.[14] and Lee et al.[15] wherein they have also proved that Magnesium Sulphate is a superior adjunct to 0.5% bupivacaine when added to supraclavicular brachial plexus block in terms of onset, duration and analgesic potentiation. Though the observations made by Rao et al had a weak statistical significance, clinically the addition of Magnesium Sulphate had a good impact in increasing the duration of motor and sensory blockade.

Studies using Magnesium Sulphate in intravenous regional anaesthesia has also been reported by Bansal et al. [16] and Narang et al. [17]. As per their observations the onset of sensory and motor blockade was very quick in their study group which used Magnesium Sulphate as an adjuvant.

There are reports of Magnesium being used as an adjuvant to other local anaesthetics like prilocaine by Gunduz et al. [18]. They have concluded that, Magnesium Sulphate when added to prilocaine in supraclavicular brachial plexus block prolonged the duration of sensory and motor blockade. Our study is also supported by a study conducted by El Shamaa et al. [19] wherein the post operative rescue analgesia required was significantly less in their group of patients who received Magnesium Sulphate for femoral nerve block.

Dogru K et al. [20] in their study concluded that addition of Magnesium Sulphate to bupivacaine for arteriovenous fistula surgeries prolonged the duration of both sensory and motor blockade. Similar observations were noted by Haghighi M et al. [21] wherein Magnesium Sulphate (20%) was used as an adjuvant to Lignocaine in axillary brachial plexus block.They also noted that the duration of sensory and motor blockade was prolonged in the group which received magnesium sulphate.

Choi IG et al. [22] in their study used 200 mg of Magnesium Sulphate as adjuvant to 0.2% Ropivacaine in axillary brachial plexus block. But they did not note significant potentiation of

analgesic effects of Ropivacaine along with Magnesium Sulphate. This could be because of using either only 20 ml of 0.2% Ropivacaine or 200 mg of Magnesium Sulphate which might not have been sufficient to enhance analgesic potency.

Our study has provided superior block characteristics along with prolonged post operative analgesia with the addition of Magnesium Sulphate as an adjuvant to 0.75% Ropivacaine when compared to Ropivacaine alone in supraclavicular brachial plexus block. Thus it can be emphasized that Magnesium Sulphate can be a good adjuvant to Ropivacaine in supraclavicular brachial plexus block. There are few limitations in our study as further studies have to be carried out to conclude the optimal and safe dose of Magnesium Sulphate to be used in clinical practice as adjuvants to local anaesthetic medications. Large sample size may have to be used to obtain clinically and statistically valid observations to prove our findings.

Conclusion

Our conclusion from the present study is that addition of 250 mg of Magnesium Sulphateto 0.75% of Ropivacaine speeds up the onset of both sensory and motor blockade when added to Ropivacaine in ultrasound guided supraclavicular brachial plexus block for upper limb orthopaedic surgeries. It also lengthens the duration of sensory and motor blockade. The quality of block was enhanced as the duration of analgesia was significantly prolonged and thus it is one of the potential adjuvant for local anaesthetics in peripheral nerve blocks.

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Effects of Oral Clonidine Premedication on Spinal Subarachnoid Blockade with Hyperbaric Bupivacaine

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Abstract

Background: The prolongation of local anesthetic induced sensory and motor block after co-administration with intrathecal clonidine [1,2] is well documented, but with oral clonidine the effect remains controversial [1.3]. *Aim:* To assess the effects of oral clonidine premedication in bupivacaine spinal anaesthesia (SA). *Materials and Methods:* 40 patients of ASA I & II undergoing spinal anesthesia were randomly divided into two groups of 20 each. *Group* C: Oral clonidine 150µg premedication 90mins before SA with15 mg of 0.5% Bupivacaine heavy. *Group P:* SA with15 mg 0.5% bupivacaine heavy. *Result:* The time of onset of sensory blockade in group C was 2.95±0.68 min and in group P 6.75±0.71 min [p<0.0001], duration was 370.55±39.10 min in Group C and 253.50±43.95 min in Group P [p<0.0001]. The duration of motor block was 296.45±33.15 min in Group C and 196.3±32.7 min in Group P [p<0.0001]. No significant difference was found on demographic data, hemodynamic parameters and frequency of complications. *Conclusion:* Pre medication with 150 µg oral clonidine in bupivacaine spinal block, can be instituted to prolong the duration of both sensory and motor blockade in routine practice without the fear of added complications.

Keywords: Oral Clonidine; Bupivacaine; Spinal Anaesthesia; Sensory Blockade; Motor Blockade.

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Introduction

Several agents alone or in combination have been used to prolong the duration of spinal anesthesia for lengthened surgeries. Vasoconstrictors like epinephrine [4], opioid [5], dextran-40, carbonated local anesthetics, proteins, potassium etc. are some of the well-known agents. Clonidine, a non-opioid alpha2 adrenergic agonist [6] has been successfully used in the past and recent years and is administered sublingually [7], intramuscularly [8], intravenously [9] and by various other routes [10,11,12] as a premedication due to its sedation and anxiolytic properties and also as an agent for controlling shivering [13]. Regional anesthesia too was benefited by using clonidine, either by spinal [14] or epidural. Clonidine stimulates alpha 2 adrenergic inhibitory neurons in medullary vasomotor centre which decreases sympathetic outflow and is manifested as decreasesd systemic blood pressure, heart rate and cardiac output. Clonidine has also been used as an adjuvant in postoperative pain relief, alternative to opioid.

In view of wealth of literature supporting the potent analgesic properties of clonidine in central neuraxial blockade, we aimed to study the effect of oral clonidine premedication during bupivacaine spinal anesthesia.

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Aims and Objectives

Our primary aim is to study the effects of oral clonidine premedication with hyperbaric Bupivacaine on spinal anaesthesia. The objectives of this study are in reference to

- Onset and duration of sensory and motor blockade
- Haemodynamic status,
- Adverse effects

Materials and Methods

After obtaining approval from institutional ethics committee, our study, a randomized controlled prospective one, had been conducted during the period of August 2016 to July 2017 in a rural hospital medical college. Study design was an interventional one withcomputer generated randomly allocated patientsof sample size 40. Patients weredivided into two groups - clonidine (Group C) and control (Group P) of 20 patients each. All Patients were assessed on the previous day of the surgery. Patients satisfying the inclusion criteria were included in the study.

Inclusion Criteria

- Lower abdominal and lower limb surgeries under spinal anesthesia
- ASA grade I and II patients
- Age 20 to 60 yrs
- Weight 40-65kg
- Height 150-160cm

Exclusion Criteria

- Unwilling patient.
- Emergency Surgeries
- History of

  *known allergies to study drugs,

  *cardiovascular disorders,

  *on medications known to affect cardiovascular functions,

  *disorders known to affect autonomic function, *diabetes
- Pregnant patients
- ASA Grade III or higher.

Pre-anaesthetic evaluation:

Of detailed history, physical examination, systemic examination, routine investigations. After proper pre-anaesthetic counselling in the patient's own language a written and informed consent had been obtained.

Anaesthetic Protocol Followed

1. Premedications

Group C-1 tablet of clonidine 150µg in the morning of surgery orally, with a sip of water to the patients, 90 minutes before anesthesia.Group P-control group, no premedication of tablet of clonidine 150µg No oral gastric tube was used during surgery.

2. Preoperative Preparation

On arrival at the operation theatre, baseline heart rate, systolic, diastolic blood pressures ,Spo_2 (by pulse oximetry) were measured using an automated noninvasive monitor, an 18 gauge intravenous cannula was inserted under local anaesthesia ointment and lactated ringers solution of 15ml/kg was infused for co-loading. Scoring was done for sedation using a 5 point Ramsay scale. Score 1: Anxious, agitated, and restless. Score 2: Awake, cooperative, oriented, tranquil. Score 3: Semi asleep responds only to verbal commands. Score 4: Asleep with brisk response to glabellar tap or loud auditory stimulus. Score 5: Asleep with sluggish response to glabellar tap or loud auditory stimulus. Score 6: Non responsive.

Hemodynamic parameters were monitored before, during and after the procedure. Time for onset of sensory and motor blockade, duration of maximum motor blockade, duration of per-operative analgesia and the incidence of complications were recorded and compared between the two groups.

3. Positioning and Technique of the Block

The patients were placed in the lateral decubitus for the anaesthetic procedure. Under strict aseptic precautions a lumbar puncture was performed through a midline approach using a 25 gauge quincke spinal needle at the L3-L4 inter vertebral space. Once a free flow of cerebrospinal fluid was obtained, 15 mg of 0.5% Bupivacaine heavy was injected.

4. Assessment of the level of the block

After the spinal injection ,the patient was retained in supine position till the Bromage scale 3 motor block was obtained. Dermatome levels of sensory anaesthesia were evaluated by pin prick. The levels

of pin prick analgesia were studied every 2 min until analgesia to pin prick recovered to the L1 segment.

a. Time of onset of sensory blockade was noted which is considered as the time interval between the completion of injection of local anaesthetic solution to the appearance of analgesia at L1 to pin prick.
b. Duration of sensory block was noted which is defined as the time interval between the onset of sensory block and the regression of block to L2 The time when patient asks for analgesia were monitored and noted.
c. Time for onset of motor blockade was noted which is the time interval between the completion of the injection of local anaesthetic solution to the establishment of inability to move the lower limbs both at the knee and ankle (Bromage scale grade 3).
d. Duration of motor blockade was noted which was the time interval between the establishment of inability to move the lower limbs both at the knee and ankle to the patient's ability to flex the feet.

Bromage Scale Grade: Scale 0 – Free movements of legs and feet, with ability to raise the extended leg.

Scales 1 – Inability to raise extended leg and knee flexion is decreased, but flexion of feet and ankles is present.

Scale 2 – Inability to raise leg or flex knees, flexion of ankle and feet Present.

Scale 3 – Inability to raise leg, flex knee or ankle, or move toes.

5. Intra-operative Monitoring

Intra operatively, the blood pressure and heart rate were monitored at 2 minutes interval for the first 10 minutes, later every 20 minutes for 1 hr and every 30 minutes for 2 hrs. Hypotension (defined as less than 20% of baseline blood pressure) was treated with intravenous fluid initially (250 ml boluses repeated twice) and intravenous mephentermine 6 mg, if required. Bradycardia (defined as heart rate of less than 50) was treated with intravenous 0.6 mg atropine sulfate.

6. Post-operative Monitoring

Assessed for side-effects like hypotension, bradycardia, pruritis, nausea, vomiting, shivering, respiratory depression.

7. Results

- *Statistical Method*

The parameters were expressed as mean± standard deviation and analyzed using chi square test or student 't' test as appropriate, with the p value reported at the 95% confidence interval. The results obtained in the study were analyzed using Microsoft Excel and SPSS for analyzing the collected data. Power of study was kept 80% (β=0.8).

'p' value >0.05 statistically not significant (NS)

'p' value of <0.05 as statistically significant (S)

'p' value of <0.01 as statistically highly significant (HS)

'p' value of <0.0001 as statistically very highly significant (VHS)

Result

The study groups C (Clonidine) and P (Control) of 20 patients each were comparable with respect to demographic profile. Non significant (NS) difference in the two groups with respect to age, weight and height (Table 1).

Intergroup comparison of groups C (Clonidine) and P (Control) showed a statistically very highly significant (VHS) [p <0.0001] difference in the onset of sensory block, duration of sensory block [p <0.0001],

Table 1: Patients' demographic data

	Group	N	M±SD	p value
Age (yrs)	Clonidine (C)	20	30.6±8.20	p 0.25 (NS)
	Control (P)	20	33.7±8.8	
Weight (kg)	Clonidine (C)	20	51.95± 8.38	p 0.55 (NS)
	Control (P)	20	53.45±7.5	
Height (cm)	Clonidine (C)	20	155.4±3.48	p 0.85 (NS)
	Control (P)	20	155.6±3.5	

N= Number of patient

onset of motor block [p<0.0001], duration of motor blockade [p <0.0001]. Duration of surgery was non significant (NS) (Table 2).

Haemodynamic parameters

Systolic Blood Pressure

The mean systolic blood pressure before premedication (base line) was 119.7±8.92 mmHg in clonidine group and 121.9±6.4 mmHg in control group [p=0.45]. After 3 hours (pre-spinal) it was 104.5±8.75 mmHg in clonidine group and 108.50± 4.03 mmHg in control group [p=0.10]. Both were statistically insignificant.

Diastolic Blood Pressure

The mean diastolic blood pressure (base line) before premedication was 78.6±6.1 mmHg in clonidine group and 76.9±7.66 mmHg in control group [p=0.45]and after 3 hours of premedication (pre-spinal) it was 64.2 ± 6.95 mmHg in clonidine group and 65.9±5.90 mmHg in control group [p=0.40] (Graph 1,2). Both were statistically insignificant.

The mean pulse rate before pre-medication (base line) in the clonidine group (C) was 87±10.3 bpm and in control group(p), it was 85.7±9.69 bpm [p=0.06]. After 3h (pre-spinal),the pulse beat per minute became 70.48±11.67 in the clonidine group was and 69.1± 13.95 with the control group (p=0.73). No statistically significant difference was seen between the two groups .

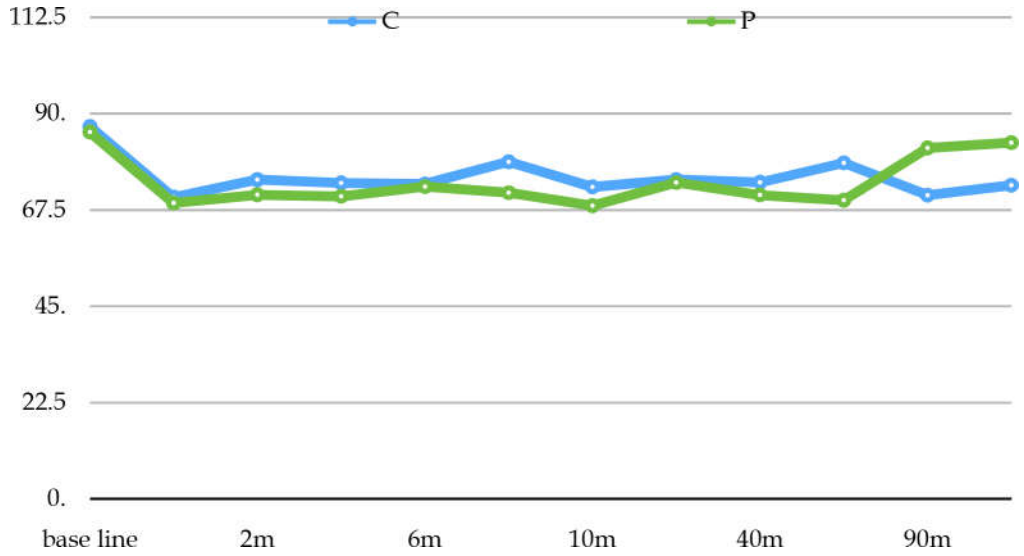
Per-operative complication

Although few incidences of hypotension, bradycardia, nausea, vomiting pruritus, shivering were noted with both the groups, the difference was not statistically significant.

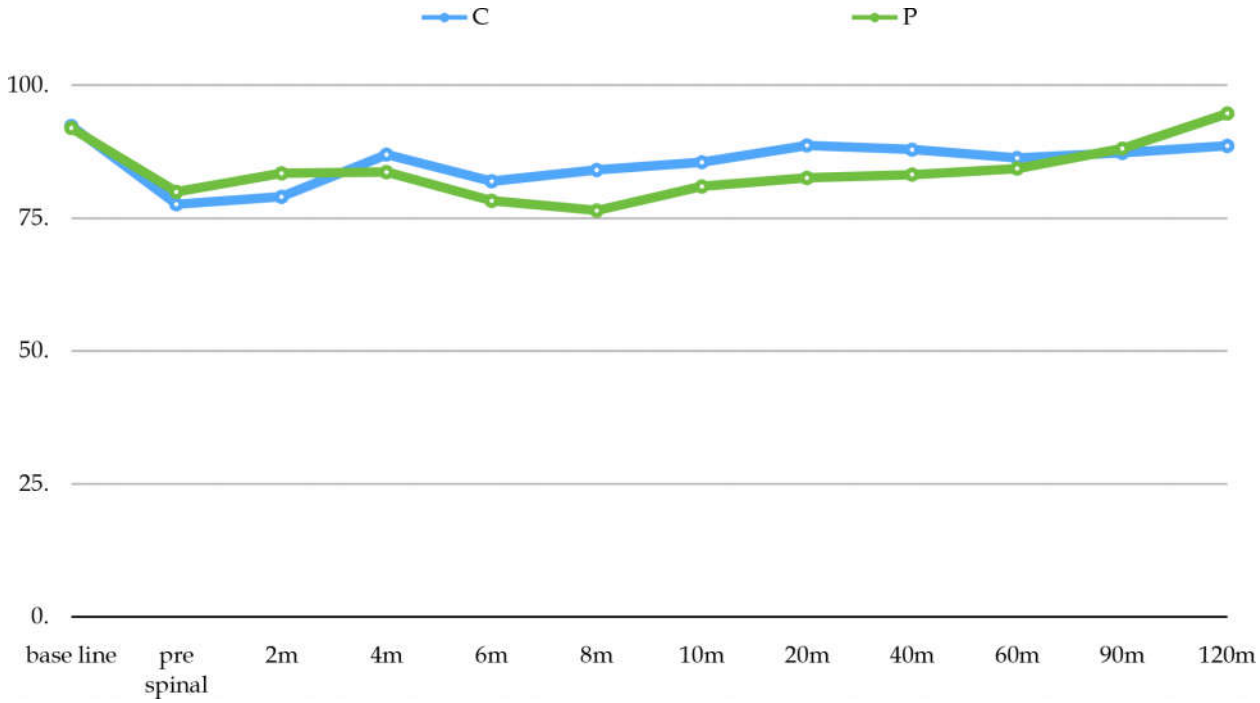
Table 2: Study parameters (Intraoperative)

Parameters	Group C M±SD	N 20	Group P M±SD	N 20	p value
Onset of Sensory block (min)	2.95 ± 0.68		6.75 ± 0.71		<0.0001 (VHS)
Duration of Sensory block (min)	370.55 ±39.10		253.50 ±43.95		< 0.0001(VHS)
Onset of Motor blockade at time (Bromage score 3) (min)	6.15 ± 0.93		11.55 ± 1.5		< 0.0001 (VHS)
Duration of Motor block(min)	296.45 ±33.15		196.3 ± 32.7		<0.0001 (VHS)
Duration of Surgery (min)	61.95 ± 3.72		60.04 ± 4.07		0.12 (NS)

N= Number of patient



Graph 1: Mean arterial pressure (MAP) at different time intervals: C (**Clonidine**) P (**Control**)



Graph 2 : Mean Pulse rate at different time intervals: C (Clonidine) P (Control)

Discussion

Administration of Clonidine through oral route is generally considered most suitable because it is convenient, effective, painless, non-invasive, relatively safe in recommended doses,therefore has the best patient compliance [15]. Clonidineresults in almost complete absorption after 1-2 hours and peak plasma concentration is observed between 1 and 3 hr [16] of oral ingestion.

Because clonidine is highly lipid soluble, it easily crosses the blood brain barrier, therefore may interact with á adrenergic receptors [17], which are strategically located on the dorsal horn neurons of the spinal cord where they can inhibit the release of nociceptive neurotransmitters such as calcitonin gene related peptide or substance 'P'. This may be the most probable reason for non opioid mechanism of the analgesic action of α2 agonists which relates to the role of descending medullospinal noradrenergic pathway modulating spinal nociceptive processing.

The exact mechanism of clonidine for prolongation of sensory block with spinal anaesthesia is unclear.It may due to (1) spread of drug into the spinal cord via systemic circulation causing direct spinal activation which represents an analgesic action at spinal and supraspinal sites or (2) constriction of spinal vasculature which delays vascular absorption of local anaesthetics. Another mechanism of analgesia is by the synergistic interaction between α, α2 adrenergic agonists and opiates in the spinal cord. Clonidine inhibits neurotransmission in both 'C and 'Aδ' nerve fibres [18] which mediate surgical pain and pinprick. It also potentiates the inhibitory effects of local anaesthetics on 'C' fiber activity [19]. Therefore oral clonidine may exert its effects within the central nervous system, at peripheral nerve roots or by potentiating the effects of local anaesthetics [1,20]. The time of onset of sensory block between the two groups of our study was found to be statistically very highly insignificant ($p<0.0001$). The duration of analgesiain our study was 370.55±39.10 min in clonidine group and 253.50±43.95 min in control group which was statistically very highly significant ($p < 0.0001$). This is due to the potent analgesic property of clonidine that acts at spinal and supraspinal sites. Dobrydnjov et al. [21]did a similar study on 45 patients posted for osteosynthesis of femur fracture and found that oral clonidine premedication significantly prolonged the time required for the first dose of analgesic. Bonnet et. al. [1] failed to demonstrate significant prologation of bupivacaine induced sensory and motor blockade following clonidine 150µg or 0.3 mg orally and claimed that subarachnoid clonidine but not oral clonidine prolonged the duration of sensory block at spinal

and supraspinal sites within the central nervous system. Our study but did not go in accordance with them.

The mechanism by which oral clonidine affect motor blockade is not known - may be both by direct inhibition of Aα motor fibres and augmentation of intrathecal local anaesthetic. In our study, we found a significant difference ($p < 0.0001$) in the time of onset of complete motor block between the two groups - group C: 2.95±0.68 and group P: 6.75 ±0.71. The duration of motor block was prolonged in clonidine group (296.45±33.15) than the control group (196.23±32.7), $p < 0.0001$. Thus, we confirm the prolongation of sensory and motor blockade by oral clonidine during spinal Bupivacaine anaesthesia. Since clonidine is an antihypertensive due to its central effect or its direct action on peripheral α2 adrenoreceptors ,we anticipated a fall of prespinal blood pressures after oral ingestion of clodine [22,23]. Dodd JM et al. [24] presented that patients were able to generate a sympathetic response to surgery and hypotension despite the presence of the α2 agonist agent. In our study, both the groups showed decrease in MAP from baslinein systolic and diastolic blood pressures with or without premedication but the comparison was non-sigcant. It was thus clear from our study that fall in blood pressure was insignificant with a premedication of single oral dose of 150µg of clonidine.

The heart rate in clonidine treated groups in the present study, did not differ from the control group either in baseline or in pre spinal values and the comparison was insignificant,indicating our pre-medication did not have any effect on heart rate [25], though following spinal anaesthesia, there was a fall in heart rates in both the groups due to sympatholysis and the potentiation of parasympathetic nervous activity [26].

The complications noticed in our study were hypotension, bradycardia, nausea and vomiting but no significant statistical differences was there.

Conclusion

In view of the limitations of adding narcotics to spinal bupivacaine for prolonging the duration of analgesia, we conclude that pre medication with 150 µg oral clonidine can be instituted into bupivacaine spinal analgesia to prolong the duration of both sensory and motor blockage in routine practice without the fear of added complications. It is safe, do not prevent increase in serum catecholamine in response to modulation of efferent sympathetic nerve traffic [25].

Limitation of our study is that to conclude the evidence, more observations have to be done on a larger population because the type of surgery might have influence on recorded lowest blood pressures, heart rate values and also on requirement of rescue analgesics.Changes in volume of distribution, gastric emptying, metabolism etc. may cause varying actions with different plasma levels of clonidine, in patients.

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Original Research Article

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Comparison between Combined Sciatic-Fascia Iliaca Compartment Block and Unilateral Spinal Anesthesia for Unilateral Lower Limb Surgery: A Retrospective Study

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Abstract

Introduction: We aimed this study to evaluate the efficacy, quality and safety of combined sciatic and Fascia Iliaca Compartment Block with Unilateral Spinal Anaesthesia for selected lower limb surgeries. *Materials & Methods:* Data collected retrospectively from prescheduled 60 patients of ASA grade I & II, were equally distributed in two groups - Spinal group and the Block group. The time taken for the application of the block, number of attempts, qualilty of anaesthesia, hemodynamic parameters, duration of block & post op first analgesic need were compared. *Results:* The patients of Block group had a greater hemodynamic stability, longer duration of sensory & motor blockade with a longer time for the need of rescue analgesic although the block application time was shorter in spinal group and quality of blockade was significantly better requiring no additional sedation or analgesia intraoperatively. Complication rates were comparable in both groups though tourniquet pain was common in block group & hypotension in spinal group. Bilateral blockade was seen only in spinal group. *Conclusion:* Combined sciatic-fascia iliaca compartment block is a suitable alternative to spinal anaesthesia when hemodynamic stability and analgesia is considered, especially in high risk patients.

Keywords: Unilateral Spinal; Combined Sciatic and Fascia Iliaca Compartment Block; Lower Limb Surgeries.

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Introduction

Outpatient procedures and discharge poses a significant challenge for the anaesthesiologist to provide patients with suitable modes of anaesthesia helping early post op recovery, good analgesia with fewer complications [1]. For unilateral lower limb surgeries, unilateral spinal anesthesia is generally most commonly practiced and well established procedure for its completeness of blockade. The sciatic nerve alongwith Fascia Iliaca Cmpartment Block (FICB) can provide almost complete anaesthesia for unilateral lower limb, though the success rate of blockade is lower even in experienced hand [2, 3]. The study was thus aimed at comparing the quality, efficacy, success rate and feasibility of combined sciatic block and FICB with that of unilateral spinal blockade for unilateral anesthesia of lower limb in below knee and some selected above knee surgeries.

Aims & Objectives

This study was conducted aiming to compare

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1. Post-blockade hemodynamic parameters during unilateral spinal anaesthesia and combined sciaticofemoral block.
2. Onset and duration of blockade.
3. Duration of analgesia and need for first analgesic.
4. Success rate of both blocks.

Methods

After acquiring approval of Institutional Ethical Committee, this study was conducted at ESIPGIMSR Andheri (E). The size of the study population was estimated to detect the mean time to perform the blockades by, at least, one minute less by using unilateral spinal anesthesia instead of combined sciatic- fascia iliaca block based on a common standard deviation of no more than 1.2 minutes, with a power of 90%, and significance level of α= 0.05, resulting in 26 patients in each group. Data collected from prescheduled 60 patients of ASA grade I & II, equally distributed retrospectively and randomly (by coin method) in two groups - Spinal group and the Block group. Patient with age ranging from 30 to 70 yrs, body weight 50 to 80 kg, height 150-180 cm of both genders scheduled for below knee surgeries or selective above knee surgeries (e.g. split skin grafting) were included in the study. Patients with cardiovascular or respiratory disorders, neuropsychiatric derangement, coagulopathy, surgeries around hip joint and patients with history of local anaesthetic sensitivity were excluded.

Standard monitoring according to the American Society of Anaesthesiologiy guidelines were applied for each patient, venous cannulation done with 20 gauze intravenous catheter, patients were transfused with intravenous fluids as per requirement throughout the surgery.

In the Spinal group, with the patient in left or right lateral decubitus, subarachnoid puncture was performed in the L_3-L_4 intervertebral space with a 25G Quincke's needle. After free flow of cerebrospinal fluid (CSF), the bevel of the needle was directed towards the dependent side and 7.5-10 mg (1.5-2 mL) of hyperbaric 0.5% was injected over 30 second. The number of attempts to access the subarachnoid space was evaluated. Patients were maintained in this position for 10 minutes and then positioned according to the need of the surgery.

In the block group, first sciatic block was performed via modified Winnie's approach [4]. PSIS, Greater Trochanter and sacral hiatus was identified. Greater Trochanter was joined with PSIS and sacral hiatus through a line respectively. The intersection point of the line joining GT and sacral hiatus with that of the perpendicular drawn from the midpoint of the line joining GT and PSIS was marked as entry point. A 10 cm insulated short beveled PNS needle (B. Braun) was introduced at this point keeping it perpendicular to the skin in all direction and local anaesthetic agent was injected after attaining end motor response at a current of 0.5 mA. Inversion and plantar flexion was considered as end motor response.

Then, in supine position, a point at the junction of lateral third and medial two third of the line joining the ASIS and Pubic Tubercle was taken as the entry point and with same PNS needle, two pops were elicited after entering skin above inguinal ligament. Patellar twitch was elicited before injecting the local anaesthetic agents at a current of 0.5 mA. This point anatomically correspond to suprainguinal approach for FICB.

Inj Lignocaine at a dose of 5 mg/kg and Inj Bupivacaine at 2 mg/kg were taken and the total volume was diluted upto 50 ml. 20 ml of this solution was injected for sciatic block and rest for the FICB.

The time to perform the block was evaluated in both groups. The technical implementation time (T1) was defined as the time needed for application of block after antiseptic skin preparation. The surgery delivery time (T2) was defined as the time needed for starting the surgery after injection of the local anaesthetic agent was done.

Comparison of the sensory and motor blockades in the limb to be operated was done with that of the contralateral limb. The sensory blockade was evaluated by the loss of cold and pinprick sensations bilaterally, in the spinal group, and on the dermatomal distributions of the femoral, lateral femoral cutaneous, obturator, common peroneal, and tibial nerves, in the block group. The motor blockade was evaluated by the modified Bromage scale (0 = absence of blockade; 1 = thigh blocked; 2 = hip and knee blocked; 3 = hip, knee, and ankle blocked). Maximum duration of motor and sensory blockade was noted.

Vital parameters (Heart rate, Systolic Blood Pressure, Diastolic Blood Pressure, SpO_2) were noted at regular intervals. Hypotension (a reduction in SBP > 25% when compared to the baseline) was treated with titrated boluses of mephenteramine and crystalloid, while bradycardia (HR < 45 bpm) was treated with atropine (0.01 mg/kg IV).

When the patients felt pain (visual analog scale (0-10 cm) score >3) in any step of the operation, they were first sedated with titrated doses of midazolam and if required, with 1µg/kg fentanyl. Quality of anesthesia was labelled as excellent when no additional drugs was administered, good when Benzodiazepine was used, adequate when opioid was used, and inadequate when general anesthesia was needed.

Intraoperative complications such as hypotension, bradycardia, tourniquet pain etc and post op complications such as residual neurological deficit, hypoesthesia, paraesthesia, PDPH was noted. Post operatively, parenteral analgesia with NSAIDS, Paracetamol and Tramadol (SOS) was administered. Time taken for first analgesic need was also noted.

Data were entered in Microsoft Excel and analysed using Stata Version 13.1. We calculated the means and standard deviations for the linear variables (such as age, technical implementation time, surgery delivery time, total time, mean duration of sensory and motor block, pulse rate, Systolic and diastolic Blood Pressure) and proportions for the categorical variables (such as sex, ASA Status, number of block attempts, grades of motor block, complications, quality of block). The means between two groups were compared using the unpaired t-test. The proportions were compared using the chi square test or the Fisher's exact test (for low expected cell counts). A p value of less than 0.05 was considered to be statistically significant.

Results

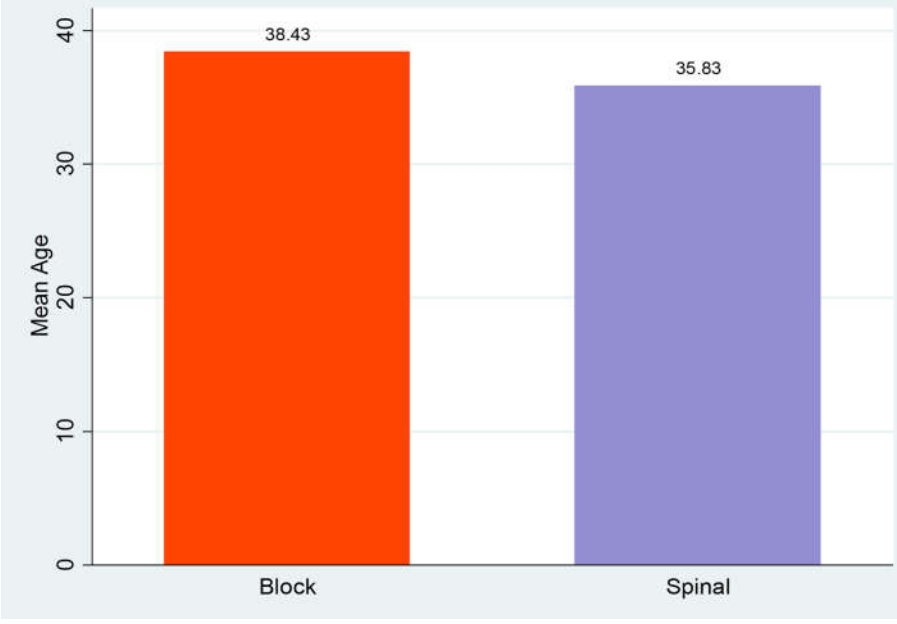
The demographic profiles (age, sex, ASA status) were comparable in both the groups (Table 1, Graph 1, 2 & 3).

In the Block group, the end motor response could be obtained in the first attempt in 24 patients (80%), in the second attempt in 5 patients (16.67%) and in the third attempt in 1 patient (3.33%). In the spinal group, access to the subarachnoid space could be achieved in the first attempt in 22 patients (73.33%), in the second attempt in 6 patients (20%) and in 2 patients (6.67%) in three attempts (Table 2). This was statistically not significant as the p value was 0.81.

In the block group, sciatic block required multiple attempts in 2 cases and in the other 4 cases, the FICB warranted multiple attempts. Most number of attempts were required to achieve quadriceps twitch during the FICB.

The technical implementation time needed in the block group was 11.90± 2.33 mins, and 5.93±1.13 mins in the Spinal group (Table 3, Graph 4). The surgery delivery time (Table 4, Graph 4) was also higher in the Block group (17.56±2.07 mins) than the spinal group (11.07±0.56 mins)

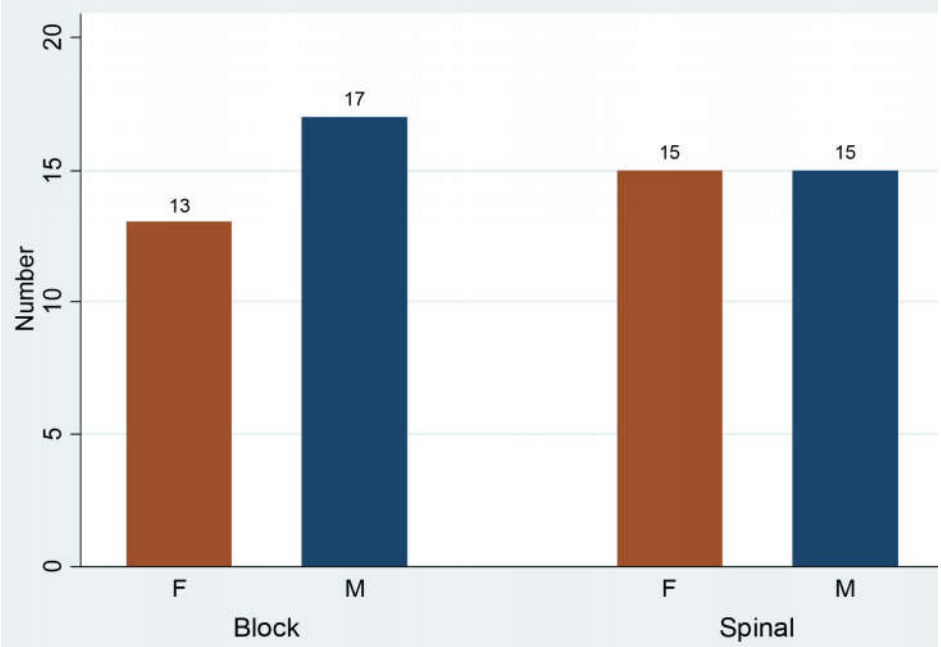
Total time measured (Table 5, Graph 4) in the block group was higher (29.46±3.0 min) than that of the spinal group (15.0±1.53 min). This was statistically significant as the p value was <0.0001.



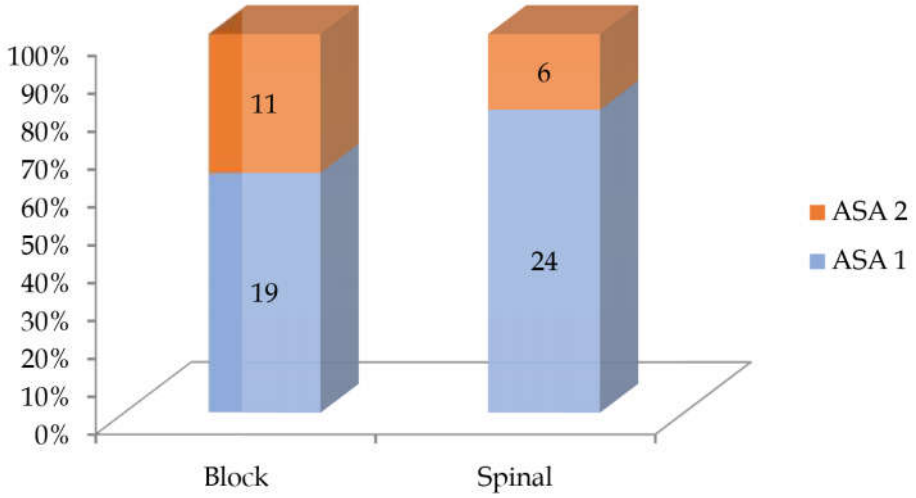
Graph 1: Distribution of study groups as per age

Table 1: Comparison of Demographic variables in the study groups

Variables	Block group	Spinal group	P value
Age	38.43 (12.02)	35.83 (10.85)	0.38
Sex (M/F)	17/13	15/15	0.61
ASA Status (I/II)	19/11	24/6	0.15



Graph 2: Distribution of Study groups according to number of males and females



Graph 3: ASA status in the study groups

Table 2: Comparison of Number of attempts in the study groups

Group	No of attempts 1	2	3	Total
Block	24	5	1	30
%	80.00	16.67	3.33	100
Spinal	22	6	2	30
%	73.33	20.00	6.67	100
Total	46	11	3	60
%	76.67	18.33	5	100

Table 3: Comparison of the technical implementation time in the study groups

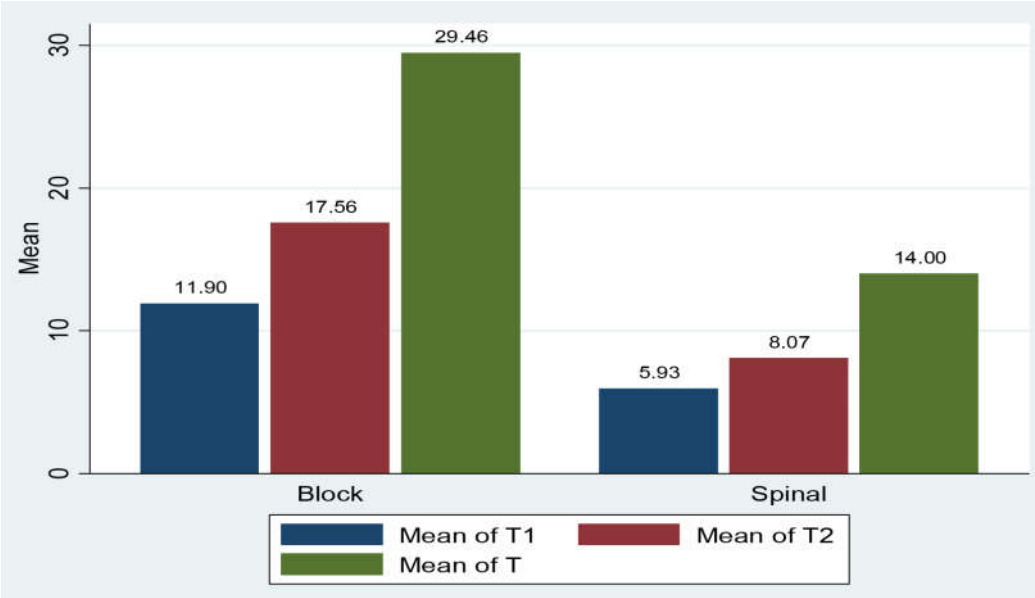
Group	Observed	Mean	Std. Dev.	[95% Conf. Interval]		P value
Block	30	11.90	2.33	11.03	12.76	<0.0001
Spinal	30	5.93	1.13	5.51	6.35	

Table 4: Comparison of the surgery delivery time in the study groups

Group	Observed	Mean	Std. Dev.	[95% Conf. Interval]		P value
Block	30	17.56	2.07	16.79	18.34	<0.0001
Spinal	30	11.07	0.56	7.86	8.28	

Table 5: Comparison of the total time needed in the study groups

Group	Observed	Mean	Std. Dev.	[95% Conf. Interval]		P value
Block	30	29.46	3.00	28.34	30.58	<0.0001
Spinal	30	14.00	1.53	13.43	14.57	



Graph 4: Comparison of the time needed for blockade
(Where T1= technical implementation time, T2= Surgery delivery time, T= Total time)

In the block group, 22 (73.33%) patients had a Grade 3, 5 (16.67%) had grade 2 and 3 (10%) patients had Grade 1 motor block as per Bromage Scale. In the Spinal group, 28 (93.33%) patients had Grade 3 motor block and none had grade 1 block (Table 6). This was not statistically significant (p value is 0.09>0.05).

Among the 30 cases, sciatic block was successful in 28 (93.33%) cases and FICB was sucessful in 26 (86.67%) cases.

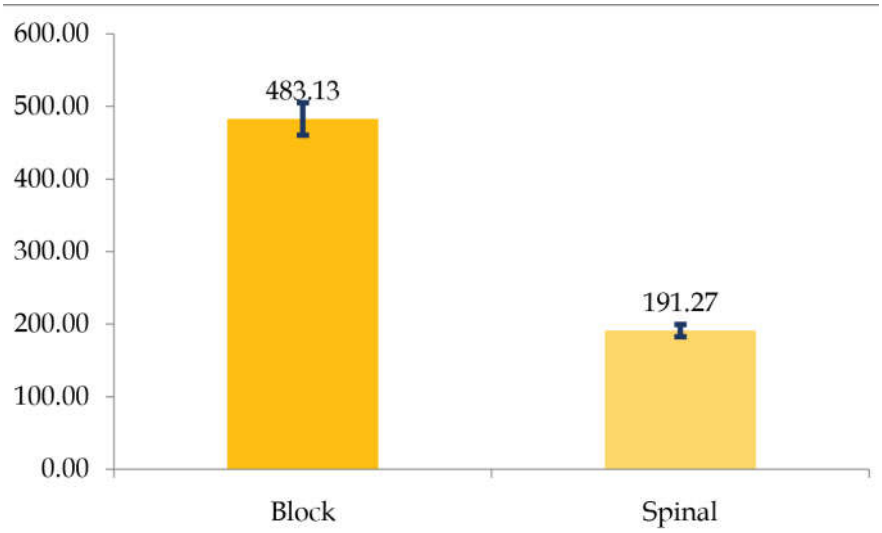
The mean duration of sensory block in Block group was significantly higher (483.13±60.11 min) as compared to the Spinal group (191.27±22.45 min). The mean duration of the motor block was also significantly higher in the Block group (p value was <0.0001 in both cases). In the Spinal group, 6 patients had a bilateral block whereas there was no such event in the Block group (Table 7, 8 & Graph 5, 6).

In the block group, 19 out of 30 cases required use of tourniquet which was comparable to the spinal group (20 of 30 cases) as the p value was >0.05.

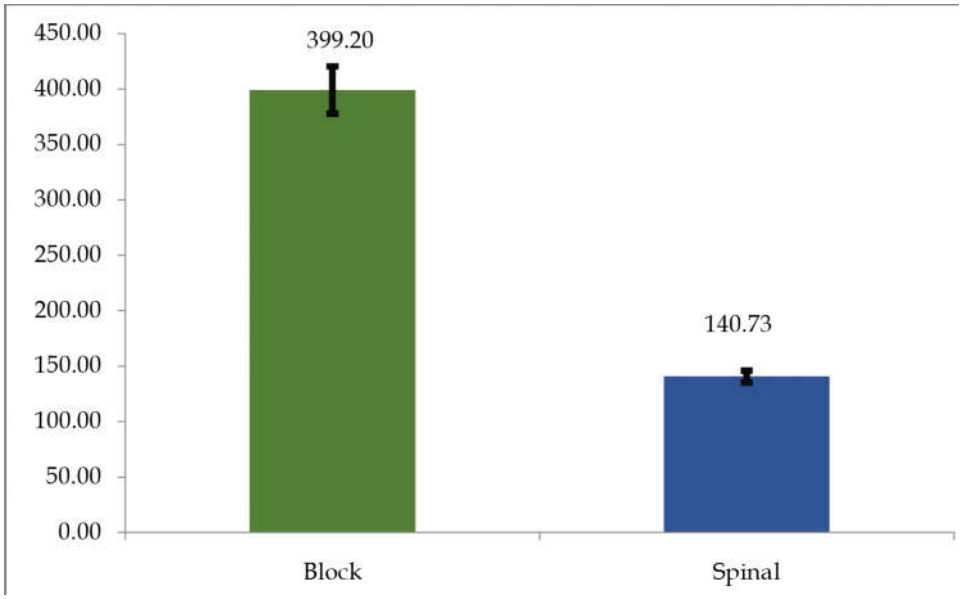
The fall in mean pulse rate in the spinal group was significant immediately post induction to the 20 mins post induction as in all instances the P value were<0.05. The mean pulse rate in the block group had a relatively stable course (Table 9, Graph 7). The same was applicable for Systolic Blood pressure. The SBP decreased significantly and

Table 6: Comparison of the Grades of Motor Block in the study groups

Group	Grade of Motor Block 1	2	3	Total
Block	3	5	22	30
%	10.00	16.67	73.33	100
Spinal	0	2	28	30
%	0.00	6.67	93.33	100
Total	3	7	50	60
	5.00	11.67	83.33	100



Graph 5: Comparison of mean duration of sensory block in the study groups



Graph 6: Comparison of mean duration of Motor block in the study groups

Table 7: Comparison of the mean duration of Sensory Block in the study groups

Group	Observed	Mean	Std. Dev.	[95% Conf. Interval]	
Block	30	483.13	60.11	460.69	505.58
Spinal	30	191.27	22.45	182.88	199.65

Table 8: Comparison of the mean duration of Motor Block in the study groups

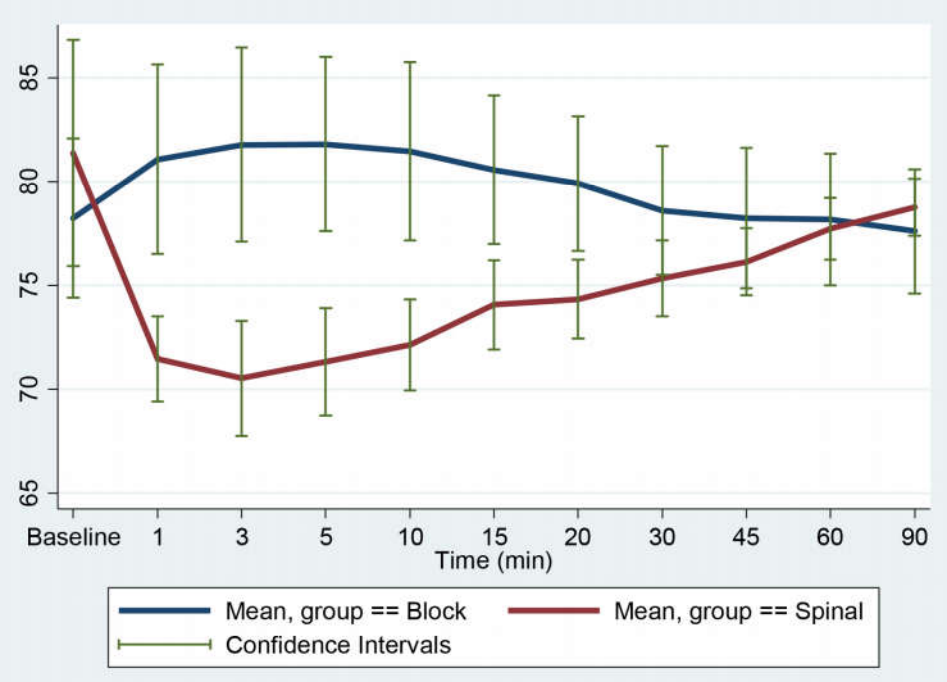
Group	Observed	Mean	Std. Dev.	[95% Conf. Interval]	
Block	30	399.20	57.29	377.81	420.59
Spinal	30	140.73	14.53	135.31	146.16

Table 9: Comparison of the Mean Pulse rate in the study groups

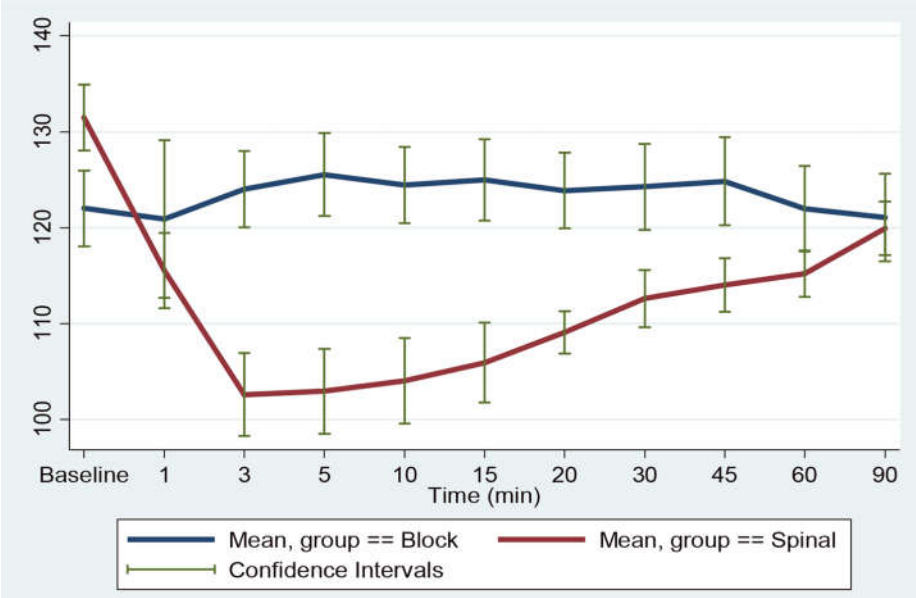
Pulse rate	Block Group		Spinal Group		p value
	Mean	Std. Dev.	Mean	Std. Dev.	
Baseline	78.23	10.28	81.37	14.59	0.3403
1 min	81.07	12.22	71.47	5.48	0.0002
3 min	81.77	12.53	70.53	7.41	0.0001
5 min	81.80	11.27	71.33	6.92	0.0001
10 min	81.47	11.52	72.13	5.87	0.0002
15 min	80.57	9.61	74.07	5.74	0.0024
20 min	79.90	8.67	74.33	5.10	0.0036
30 min	78.60	8.31	75.33	4.91	0.0688
45 min	78.23	9.07	76.13	4.35	0.2574
60 min	78.17	8.51	77.73	3.98	0.8014
90 min	77.60	8.00	78.77	3.67	0.4707

Table 10: Comparison of the Mean Systolic Blood Pressure in the study groups

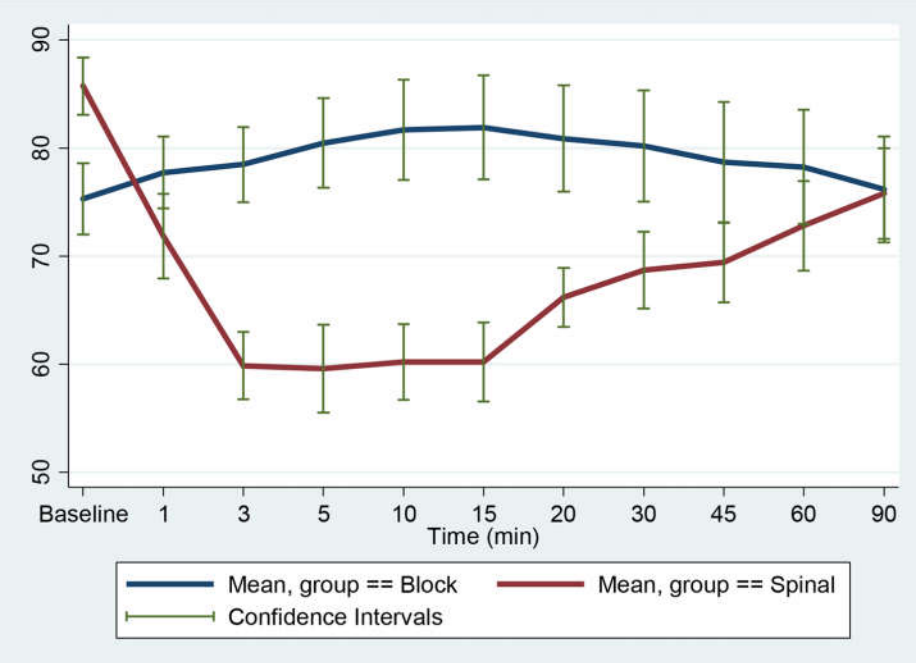
Systolic Blood Pressure	Block Group		Spinal Group		p value
	Mean	Std. Dev.	Mean	Std. Dev.	
Baseline	122.00	10.55	131.47	9.23	0.0005
1 min	120.90	21.98	115.53	10.50	0.2325
3 min	124.03	10.68	102.60	11.62	<0.0001
5 min	125.53	11.58	102.93	11.91	<0.0001
10 min	124.47	10.66	104.03	11.99	<0.0001
15 min	124.97	11.36	105.93	11.11	<0.0001
20 min	123.87	10.62	109.07	5.89	<0.0001
30 min	124.27	12.03	112.60	8.05	<0.0001
45 min	124.83	12.31	114.00	7.50	0.0001
60 min	121.97	11.99	115.20	6.47	0.0086
90 min	121.07	12.27	119.93	7.51	0.6677



Graph 7: Comparison of the trend of pulse rate in the study groups



Graph 8: Comparison of the trend of Systolic Blood Pressure in the study groups



Graph 9: Comparison of the trend of Diastolic Blood Pressure in the study groups

Table 11: Comparison of the Mean Diastolic Blood Pressure in the study groups

Diastolic Blood Pressure	Block Group		Spinal Group		p value
	Mean	Std. Dev.	Mean	Std. Dev.	
Baseline	75.30	8.85	85.73	7.10	<0.0001
1 min	77.73	8.91	71.83	10.49	0.0223
3 min	78.47	9.37	59.87	8.33	<0.0001
5 min	80.47	11.07	59.60	10.94	<0.0001
10 min	81.67	12.44	60.20	9.40	<0.0001
15 min	81.90	12.91	60.20	9.82	<0.0001
20 min	80.87	13.20	66.20	7.30	<0.0001
30 min	80.17	13.81	68.70	9.57	0.0004
45 min	78.70	14.93	69.40	9.84	0.0061
60 min	78.23	14.15	72.80	11.11	0.1035
90 min	76.17	13.15	75.80	11.26	0.9080

remained lower in the spinal group during 3min post induction to 60 min post induction in comparison to the block group (Table 10, Graph 8). The diastolic BP had a similar course as of Systolic Blood Pressure (Table 11, Graph 9).

The overall complication rates were comparable in the study groups (p value 0.75>0.05). There were 7 cases (23.33%) out of 30 cases in the block group who experienced tourniquet pain. 6 patients (20%) had significant hypotension in the spinal group (Table 12, 13). There were 2 cases with urinary retention in the late post operative period in the spinal group and none in the block group. No events of any paresthesia or persistent sensory motor deficit in any of the patients of either group noted. There were no events of local anaesthesia systemic toxicity in the Block group. No patient in the spinal group complained of post dural puncture headache (Table 14).

When the quality of blockade was compared, the unilateral spinal provided excellent blockade in 100% cases, whereas in the block group, 5 patients

Table 12: Comparison of the overall complications in the study groups

Group	Complication		Total
	None	Any	
Block	23	7	30
%	76.67	23.33	100
Spinal	24	6	30
%	80.00	20.00	100
Total	47	13	60
%	78.33	21.67	100

Table 13: Comparison of the complications encountered in the study groups

Group	Complication			Total
	None	Hypotension	Tourniquet pain	
Block	23	0	7	30
%	76.67	0.00	23.33	100
Spinal	24	6	0	30
%	80.00	20.00	0.00	100
Total	47	6	7	60
%	78.33	10.00	11.67	100

Table 14: Comparison of the late post op complications in the study groups

Group	Late post op complications		Total
	None	Urinary	
Block	30	0	30
%	100.00	0.00	100
Spinal	28	2	30
%	93.33	6.66	100
Total	58	2	60
%	96.67	1.67	100

Table 15: Comparison of quality of blockade in the study groups

Group	Quality of block			Total
	Adequate	Good	Excellent	
Block	2	5	23	30
%	6.67	16.67	76.67	100
Spinal	0	0	30	30
%	0.00	0.00	100.00	100
Total	2	5	53	60
%	3.33	8.33	88.33	100

(16.67%) had a good block (required midazolam) and 2 patients (6.67%) had adequate blockade (required fentanyl). This was statistically significant (p value 0.01<0.05). No patient in the block group required general anaesthesia (Table 15).

Discussion

Neuraxial anaesthesia in the form of spinal anaesthesia is one of the commonest procedures practiced for lower limb surgeries. The main objective of providing unilateral spinal anaesthesia is unilateral motor block, lesser incidence of hypotension and greater patient satisfaction due to movement of the contralateral limb. Peripheral nerve block is an excellent alternative for rendering the entire lower limb anaesthetized. The objective of our study was to compare the feasibility, success rate of combined sciatic and FICB block with that of the unilateral spinal anaesthesia. The study was also meant to show the comparison between hemodynamic variables, time of onset and duration of sensorimotor block and complication of the procedures.

Clearly, the demographic profile did not pose any bias in our study as they were comparable in both the groups. The time required for performing the sciatic and FICB block was significantly higher (29.46±3.00 min) as compared to the Spinal group (14.0±1.53 min) even after attempting to cut short the technical implementation time in the block group by painting the two puncture sites in the same setting and draping both of them using a single sterile plastic drape maintaining strict asepsis. The duration was more due to blocking of two nerves by precise elicitation of end motor response and the change of position while performing two separate blocks. This increased mean duration was in accordance with the studies conducted by Sari et al. [5]. The time of onset of sensory motor blockade was 17.56±2.07 mins in the block group which was higher than the studies conducted by Palkhiwala et al (14.41±3.11 min), Sari et al. [5] (12.9±2.53 min) and less than that of A. Singh et al. [6] (21.3±9.94 min). This was probably due to use of different drug mixture, addition of adjuvants (Adrenaline) in their studies and patients' individual variation.

Like any other regional anaesthesia technique, knowledge of the anatomy is fundamental for the sciatic block and FICB. The number of attempts to find the desired responses was not significantly different between the study groups as careful landmark identification and markings were done in the study. Identifying the quadriceps contraction during FICB warranted more attempts as the approach was suprainguinal and the needle was needed to direct little medially unlike the standard femoral block technique. No cases showed true 3-in-1 block as the obturator nerve was spared in all cases. The sciatic block was successful in 93.33% cases and the FICB was successful in 86.67% cases. A. Singh et al. [6] also reported the high reliability and relatively low failure rate (4%) in their study. Raj kumar et al. [7] also reported 99.44% success rate in their study. Our study results are comparable with both of them. 12 to 20 mg of bupivacaine in spinal anesthesia show higher block level even with the patient remaining in the sitting position for one hour [8], while small doses (5-8 mg) with the patient made to remain in the lateral position for 10 to 15 minutes [9], resulted in restricted blockade. In this study, maintaining the patient in lateral decubitus for 10 minutes, selective unilateral blockade was observed in 80% of the patients. As expected, combined sciatic block & FICB resulted in selective unilateral blockade.

Only 2 patients in the Spinal group had a motor block of grade 2 (as per Bromage Scale) while there were a higher number of inadequate block in the block group. This was somewhat similar to the study by Imbeloni et al. [10] (30 in spinal and 19 in block group had Bromage 3).

When the quality of blockade was compared, the unilateral spinal provided excellent blockade in 100% cases which was statistically significant (p value 0.01<0.05) in comparison to the block group. In a study by Montes et al. [11], adequate anesthesia could not be provided by femoral sciatic block in one of 25 patients. In another study by Fanelli et al. [12], this rate has been reported as 4%. Anesthesia can be insufficient in FICB due to the low distribution of local anesthetic agent to the obturator and lateral femoral cutaneous nerves and due to this reason in this study, tourniquet inflation caused sufficient pain and discomfort in patients requiring additional sedative and analgesic drugs. This was comparable to the study done by Sari et al. [5].

The total duration of sensory blockade (483.13± 60.11 min) and motor blockade (399.20±57.29 min) was significantly higher in the block group than that of the Spinal Group (191.27±22.45 & 140.73±14.53 min respectively). That suggests, the VAS score was better for a longer duration in the block group and thus the first analgesic need was significantly delayed. This was similar to the studies by Casati et al. [13], Sari et al. [5]. Since the side effects and complications related with the

anesthesia method affect the hospitalization duration of patients, the important factors affecting the hospital stay related to this study are duration of complete return of motor and bladder functions. Same side extremity motor block duration is the main limiting factor affecting the hospitalization duration in the present study, as the total duration of the motor blockage was statistically significant ($p<0.001$) and the discharge was delayed in block group as many patients were uncomfortable while carrying weight of the entire body on a single limb even with support.

The hemodynamic parameters like pulse rate, systolic blood pressure and diastolic blood pressure were significantly lower in the spinal group post induction than that of the block group and again become comparable after 45-60 mins post blockade which can be explained by the greater sympathetic blockade experienced in the spinal group than that of the block group, although it was clinically insignificant as the patients were of ASA grade I & II. Fanelli et al. [14] found that a decrease in MAP and cardiac index occurs in the spinal group, while no hemodynamic changes occurred in the block group. This was also similar to Sari et al. [5].

The complications associated with this block are local anesthetic toxicity, neuraxial block due to proximal spread, neurological complications like needle trauma, intraneuronal injection and neuronal ischemia. In our study, none of the patients had any significant complications. Hypotension occurred in the spinal group, more in the cases where there was bilateral blockade. Tourniquet pain was seen in the block group intraoperatively when the block was inadequate. Only two patients had post operative urinary retention in the spinal group. Our study results are comparable with that of the study by Zaric et al. [15]. Fowler et al. [16] reported that Peripheral Nerve Block may provide effective unilateral analgesia with lower incidence of opioid related and autonomic side effects and fewer serious neurological complication compared to epidural analgesia.

Conclusion

The sparing of obturator nerve and otherwise inadequate block causing tourniquet pain, longer hospital stay due to prolonged motor blockade in outpatient procedures might be a limitation of the combined sciatic block and FICB. But this block still remains a suitable alternative to unilateral spinal anaesthesia for its better hemodynamic profile and longer duration of analgesia with comparable complication rate rendering it an attractive choice in high risk cases, particularly in patents with cardiovascular comorobidities, where the adverse consequences of even slightest attenuation of hemodynamic parameters are not well tolerated.

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Original Research Article

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Efficacy of Nitroglycerine and Dexamethasone with Lignocaine in Bier's Block for Upper Limb Surgery

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Abstract

This study was done to evaluate the efficacy of nitroglycerine and dexamethasone as adjuncts to lignocaine in the terms of onset, duration, quality and efficacy of IVRA (Bier's block). This study was done on randomly selected 90 adult patients of either sex belonging to ASA grade I & II, aged 20 to 60 years undergoing for upper limb surgery duration lasting not more than 90 mins in three groups. Group 1- Plain lignocaine 2% diluted with saline (40ml), Group 2- lignocaine 2% and nitroglycerine, (40ml) Group 3- lignocaine 2% and dexamethasone (40ml). Patients were premedicated with 0.05mg/kg midazolam 5 minutes prior to surgical procedure. Basal vitals were monitored in all the patients. Two venous cannulae were placed, with all aseptic measures, one in dorsum of the operating hand and the other in the opposite hand for intravenous fluid infusion. Operative hand was exsanguinated with an esmarch bandage to squeeze the circulating blood, a double cuffed pneumatic tourniquet was placed around the upper arm and proximal cuff was inflated to 250mm Hg. Regional anaesthesia was injected slowly. Sensory block was assessed by pin prick cutaneous test. Onset of motor block was noted by asking the subject to flex and extent his/her wrist and fingers. As the sensory and motor block was achieved, distal cuff was inflated and the proximal cuff was released and surgery was started. Tourniquet pain was assessed using Visual Analogue Scale. The mean duration of surgery in group 1 was was 44.0±10.5 minutes, in Group2 was 41.2±9.7 minutes and Group3 was 43.3±9 minutes. The addition of 200µgm nitroglycerine improved the speed of onset, quality of anaesthesia, prolonged the sensory and motor block recovery time, increase the duration of post-operative analgesia. The addition of 8mg dexamethasone improved the quality of anaesthesia but did not cause significant difference in time. According to this study, it can be assumed that the addition of nitroglycerine and dexamethasone to lignocaine in Intravenous Regional Analgesia definitely improved the quality of anaesthesia.

Keywords: Intravenous Regional Analesia; Double Cuff Pneumatic Tourniquet; Esmarch Bandage; Lignocaine; Nitroglycerine; Dexamethasone.

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Introduction

The advent of anaesthesia in 1846 enabled the field of surgery to show tremendous progress and outcome. Anaesthesia word has a vast meaning which is not only limited to general anaesthesia. To overcome the consequences of general anaesthesia, advances were made in the fields of regional anaesthesia. In 1902, the term "Regional Anaesthesia" was coined by Harvey Cushing. August Gustav Bier (1908) invented intravenous

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regional anaesthesia for forearm and hand. This technique which now bears his name, consisted of occluding the circulation in a segment of arm with the use of two bandages and then injecting a dilute concentration of a local anaesthetic agent in this isolated segment. Prompt analgesia and fast recovery can be achieved in this technique. Feature of prompt analgesia have made this technique suitable for short duration surgeries. This technique never gained much popularity as it was cumbersome, requiring meticulous exsanguation of the part, providing limited operative period, discomfort and risk of toxicity.

The earliest agent injected into the isolated vascular compartment was procaine. This technique again become popular in 1960, when Holmes used lidocaine in place of procaine and introduced several modifications including either a second cuff, or a subcutaneous band of local anaesthetic to control tourniquet pain.

Lidocaine is the least toxic local anaesthetic agent used in IVRA. To achieve early onset and to prolong the operative period, lists of drugs were used as adjuvants, including narcotics, clonidine, nitroglycerine, dexmedetomidine and magnesium in combination with local anaesthetic agents. Nitroglycerine has been used along with many anaesthetic drugs to enhance the onset of analgesia.

Nitroglycerine is metabolized to nitric oxide in the cell. Nitric oxide causes an increase in the intracellular concentration of cyclic guanosine monophosphate, which produces pain modulation in the central and peripheral nervous system.

Dexamethasone is a potent anti-inflammatory drug. Dexamethasone combined with bupivacaine prolongs the duration of analgesia in nerve blocks.

Aims of Study

The present clinical study was done to evaluate the efficacy of nitroglycerine and dexamethasone in combination with lignocaine in IVRA for upper limb surgeries in terms of onset, duration and post-operative analgesia.

Material and Method

This study was done on 90 patients of ASA grade I and II of age 20–60 years of either sex admitted for forearm or hand surgery which were likely to get completed within 60-90 min and were randomly allocated in 3 groups, consisting of 30 patients each.

Group 1: Plain Lignocaine 2% diluted with normal saline to make a volume of 40 ml

Group 2: Lignocaine and nitroglycerine (200µgm)

Group 3: lignocaine and dexamethasone (8mg)

Observations

Patients Characteristics	Group 1	Group 2	Group 3	P
Age (years)	35.4±11.3	43.0±11.0	40.6±12.1	0.088
Weight(kgs)	58.6±8.1	58.5±9.3	60.3±8.5	0.705
Duration of surgery(mins)	43.3±9.0	44.0±10.5	41.2±9.7	0.175
Onset of sensory block(mins)	7.0±1.7	3.5±0.8	5.0±1.7	0.000
Onset of motor block(mins)	7.5±1.8	4.1±0.5	5.2±2.1	0.000
VAS score at 5 min before tourniquet deflation	1.6±1.2	1.1±0.8	1.3±0.9	0.052
VAS score at 10 min before tourniquet deflation	1.5±1.1	1.6±0.8	1.2±1.1	0.106
VAS score at 20 min before tourniquet deflation	2.0±0.9	0.9±1.1	1.5±1.4	0.002
VAS score at 40 min before tourniquet deflation	3.0±0.7	1.9±1.1	2.3±1.1	0.001
VAS score at 60 min before tourniquet deflation	2.2±0.9	2.2±1.1	1.5±1.3	0.000
VAS score at 2 hrs after tourniquet deflation	3.3±0.7	2.5±1.2	2.8±0.9	0.0046
VAS score at 4 hrs after tourniquet deflation	3.6±1.6	2.9±1.0	2.9±1.1	0.033
VAS score at 6 hrs after tourniquet deflation	3.2±0.8	3.1±1.0	2.6±0.9	0.007
VAS score at 12 hrs after tourniquet deflation	1.3±1.2	0.9±0.8	1.0±1.1	0.491
VAS score at 24 hrs after tourniquet deflation	1.0±0.8	1.1±0.9	1.0±0.9	0.782
Sensory block recovery time(mins)	3.3±1.1	6.8±1.8	12.2±4.4	0.000
Motor block recovery time(mins)	3.9±1.4	7.6±1.9	13.0±3.8	0.000
Time of injection of first dose of analgesic(mins)	48.2±31.3	195.7±112.9	55.0±36.5	0.000
Total no. of doses of alagesic required	2.0±0.6	1.3±0.5	1.4±0.6	0.000

Discussion

Bier's block or intravenous regional anaesthesia is simple to administer, reliable and cost effective. It is ideal for short operative procedures of extremeties performed on an ambulatory basis. There are various proposed sites of action of IVRA. Raj et al. reported that the action of local anaesthetic is on major nerve trunks, possibly reaching to the nerve trunk via small veinules within the nerve core, whereas Rosenberg provided strong evidence concerning a peripheral site. It is now accepted that both the nerve endings and trunks are affected.

Different anaesthetic agents including procaine, lidocaine, prilocaine, bupivacaine and mepivacaine have been used for intravenous regional anaesthesia since the initial description of this technique by Bier in 1908. Lidocaine is the most commonly used local anaesthetic agent for this technique. Brown et al described that lidocaine is one of the least toxic local anaesthetic used in intravenous regional anaesthesia. Lidocaine 3mg/kg administered as 0.5% solution ensures adequate analgesia and relaxation when used for upper limb surgery.

IVRA has been limited by tourniquet pain and the inability to provide post-operative analgesia as compared with peripheral nerve blocks. It is the high success rate (96-100%) of block in contrast to other methods for obtaining upper limb analgesia where success rate is 75-80%, which makes it popular today.

Numerous attempts to reduce the severity of tourniquet discomfort improve the quality of block and prolong analgesia have been made by adding a wide range of agents to the local anaesthetic for Bier's block.

It was observed in this study, that sensory and motor block onset times were statistically shorter in nitroglycerine group as compared to control group. Intergroup comparison shows that the onset of sensory and motor block was earliest in nitroglycerine group.

This study is comparable with finding of Turan et al. (2005) who observed that the mean time of recovery from sensory and motor block is prolonged in nitroglycerine group.

Demand of first analgesic dose in the post-operative period was longest in nitroglycerine group and shortest in dexamethasone group. Our finding is comparable with Sen et al. (2006) [13] and with Bigat et al. (2006) [5] respectively.

Using nitroglycerine (200μgm) as an adjuvant to lignocaine for IVRA in this study shows the improvement in speed of onset and the quality of anaesthesia. It helps to provide prolonged sensory and motor block and delays the demand of first analgesic dose with minimum adverse effects.

Conclusion

According to the intergroup comparison it was concluded that the onset of sensory and motor block was earliest and the duration of post-operative analgesia was also prolonged in NTG group.

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Original Research Article

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Comparative Study of Conventional Versus Nasal-18 Method for Fiberoptic Nasal Intubation

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Abstract

Background: Fiberoptic nasal intubation (FONI) is an effective technique for establishing airway access in patients with both anticipated and unanticipated difficult airways. Utilization of fiberscope without the use of any facilitating techniques has proven to be a difficult task. In this study we compare conventional versus Nasal- 18 method for fiberoptic nasal intubation.

Aims and Objectives: To compare time for successful FONI in both the groups. To see procedure related adverse effects.

Method: A randomized controlled trial was carried out at our hospital. Fifty patients aged 20-60 years with American Society of Anesthesiologist (ASA) class I and II undergoing elective surgery under general anesthesia were allocated to two groups of fiber optic nasal intubation using either the Nasal -18 technique or the conventional method. In the Nasal-18 group, a nasal tube was gently inserted into the nasopharynx till mark 18, then a fiberscope was glided over it and advanced through the nasal cavity till the glottis could be visualized. Finally the nasal tube was rolled over the fiberscope. Time from the start of insertion of fiberscope into nares till visualization of vocal cord (T_1) and from visualization of vocal cord to complete intubation (T_2) was recorded. *Result:* T_1 values in nasal 18 and conventional group were 33.16±7.96 and 56.76±17.08 seconds respectively [$p < 0.05$]. T_2 duration were 35.16±9.83 and 31.20±6.89 seconds in nasal 18 and conventional group respectively [$p = 0.10$]. *Conclusion:* Nasasl- 18 method significantly reduces the time to visualize the glottis compare to conventional technique for FONI. This method should be added as a preferred technique to facilitate FONI.

Keywords: Fibre Optic Intubation; Fibre Optic Nasal Intubation; Conventional Method.

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Introduction

Fiberoptic nasal intubation (FONI) is an effective technique for establishing airway access in patients with both anticipated and unanticipated difficult airways. First described in the late 1960s, this approach can facilitate airway management in a variety of clinical scenarios given proper patient preparation and technique [1].

The conventional fiber-optic nasal intubation method could be divided into three steps which include the visualization of the glottis with fiberscope, passing the fiberscope through the glottis into trachea till carina and railroading the endotracheal tube over the fiberscope into the trachea. Few major problems are encountered with conventional method, i.e. visualization of the glottis, the entry point at the level of vocal cords, and insertion of the fiberscope into the trachea [2,3].

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To expedite the successful visualization of the glottis, different methods such as jaw thrust, lingual traction, fiber-optic assisting airway devices and laryngoscopy assisted fiber-optic intubation have been employed [4,5]. None of them has been found to be individually effective to improve the glottis visualization while the combination offers a better outcome on most occasions.

If choosing to pass the tube first, the anaesthetist is faced with the challenge of inserting the tube to an appropriate distance that allows for appropriate visualization of the laryngeal opening after the fibrescope is passed through the pre-placed tube. A reasonable approach is to insert the tube to approximately 18 cm. If breath sounds can be heard through the tube, it is likely placed above the laryngeal inlet, and ready for insertion of the bronchoscope.

The goal of the Nasal-18 or the tube-first approach is to achieve Greater speed of intubation with potentially more successful intubation Rates [6,7]. This study was designed to ascertain whether the Nasal-18 is superior to the Conventional fiber-optic nasal intubation, as judged by visualization of vocal cord (T_1) and from visualization of vocal cord to complete intubation (T_2).

Method

This randomised study was conducted in medical college and research institute after obtaining approval from the institutional research and ethics committee. Patients with age between 20 to 60 years belonging to the ASA grade I and II scheduled for an elective surgery under general anaesthesia were included in the study. Patients with anticipated difficult airway, pregnancy, contraindication for nasal intubation, maxillofacial trauma and known allergy to anaesthetic drugs were excluded from the study.

The patients were randomly allocated into two groups of fiber optic nasal intubation using either the Nasal-18 or the conventional method based on a table of randomization.

In the conventional group, the fiberscope was inserted into the nasal cavity via the nostril and advanced through it till the vocal cords were visualized. Then, the nasal tube, which had been mounted on the scope before hand, was glided over the scope and advanced through the vocal cords into the trachea. Whereas in the Nasal-18 group, the tube-first approach, the nasal tube was inserted into the nasal cavity and advanced through it till the mark 18 reached at the level of alae of the nose. Here the tube tip stands just above the larynx and breath sounds are audible through the Tracheal tube. With additional anesthesia directed at the larynx (topical Lignocaine), run the long scope through the tube, visualize the larynx, and pass between the cords towards the carina. The final depth of insertion of the nasal tube should be 26–28 cm at the nare, establishing its correct placement in the trachea as confirmed by bilateral audible breath sounds.

The routine pre-anaesthetic evaluation was performed on the day before surgery. After obtaining written and informed consent, all the patients were premedicated with aspiration prophylaxis and anxiolytics as per departmental protocol. In the pre-anaesthetic room, an intravenous infusion was initiated, and glycopyrolate (0.2 mg) was administered.

Standard monitors including pulse oximetry, capnography, electrocardiography, and non-invasive blood pressure measurement were performed prior to the administration of intravenous medications.

After instillation of phenylephrine drops (3 drops in each nostril), lidocaine spray (10%) and xylocaine 4% Nebulisation were used to anaesthetize airway passage. In addition to this like bilateral superior laryngeal nerve block and transtracheal block were perfomed. All the patients received Inj. fentanyl 2 μg/kg, Inj. Midazolam 0.02 mg/kg intravenously.

Nasal intubation with a flexometalic armoured tube no.7 or 7.5 were used. Two experienced anesthesiologists in fiber-optic nasal intubation were involved in fiberoptic intubation of patients, and each anesthesiologist performed both techniques. The karlz storze fibre optic scope was used during this procedure. After dipping the fiberscope into the lubricating jelly, we inserted it into the nasal cavity until it reached to the vocal cords.

During this period, patients were awake and co-operated well with the anesthesiologists. Time was recorded in seconds, from the start of insertion of fiber-optic laryngoscope in the nares till visualization of vocal cords (T_1) and from visualization of vocal cords to successful intubation (T_2). We did not use other facilitating techniques like head flexion and jaw thrust. A time period of more than 180 s for the procedure or inability to intubate was considered as failed intubation.

Statistical analysis was performed using the SPSS version 16.

Result

A total of 50 patients who were planned for elective surgery under general anaethesia were randomised in the study. There were not statistically significant difference between the groups regarding age, gender, BMI, mallampatti classifiction and ASA class [Table 1]. There was no exclusion of patients due to any procedural problem in either group.

We performed independent sample t–test [unpaired] between conventional and nasal 18 groups. The results show T_1 [33.16±7.96] is shorter in the nasal 18 group as compare to the conventional group [56.76±17.08] which is significant [p< 0.005]. T_2 duration was 35.16±9.83 and 31.20±6.9 in nasal 18 and conventional group respectively which is not significant [p< 0.106] [Table-2].

Discussion

Fibre optic intubation can be done orally or nasally. The nasal approach is preferred in patient with a large tongue, limited mouth opening, tracheal deviation or jaw abnormalities [6].

The major reason for difficulty in advancing an endotracheal tube over a fiberscope is considered to be deviation of the course of the tube from that of the fibrescope towards the epiglottis, arytenoids cartilage, pyriform fossa or esophagus [8,9,10].

Lee et al concluded that optimal length of pre-inserted tracheal tube for nasal fiberoptic intubation can be predicted using a newly developed formula with three patient parameters, namely, height, the NM distance, and weight. Application of this equation in the clinical setting should facilitate nasal fiberoptic intubation [11].

If we choose to pass the tube first, how much tube should be inseretd to visualized the laryngeal inlet is a challenge. A reasonable approach is to insert the tube to approximately 16-18 cm while directing the ETT toward the contralateral nipple [7].

Flexometalic armored tube and insertion of predetermined length of tube upto 18 mark at ala nasi significantly improved the success rate of fiber optic intubation in our study.

We choose 18 number because when 18 mark tube is reached at the nasal alae the endotracheal tube has sufficiently advanced to reach a point close to vocal cord [7,11].

Nasal bleeding and oral secretion may obscure vision in conventional method while in nasal 18 method, the tube act as a passage to guide the fiberscope to visualize the vocal cord which avoid this problem. Hence T_1 was shorter in nasal 18 method compare to conventional method.

Nasal- 18 method for fiber optic intubation is relatively simple, comfortable and easy technique for the learner. Early visualization of glottis and minimal twisting of fiberscope increase the confidence of anesthesiologist.

Mohammad et al concluded that the nasal 18 method reduces the time needed for successful fiber optic nasal intubation [7]. In this study we can say nasal 18 method allowed to perform fiberscopy with greater speed and comfort. Although we had limitation of number of patients. Hence the same

Table 1: Demographic parameters

Parameters	Both groups [n=50]
Age [years]	34.9 ± 11.8
Gender [n] male: female	21/29
BMI [kg/m^2]	22.6 ±1.9
ASA physical status [n]: I/II	34/16
Mallampatti classification [n]: I/II	18/32

Data are expreesed as mean ± SD. SD- standard deviation
BMI: Body mass index, ASA: American Society of Anaesthesiologist

Table 2: Time duration in conventional and nasal 18 techniques

Time both groups	Conventional	Nasal 18	P value
T_1 [sec.]	56.76±17.08	33.16±7.96	0.000
T_2 [sec.]	31.20±6.9	35.16±9.83	0.106

T_1= time from the start of insertion of the fibre scope into nares till visulisation of vocal cords.
T_2= time from visulisation of vocal cords to complete intubation

study should be done with large number of patients to confirm the result. This technique should be part of the fiberoptic nasal intubation.

Conclusion

We can state that Nasal -18 method is easy for learner with greater speed of intubation as compare to conventional method.

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Original Research Article

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Assessment of Clinical Performance of Supraglottic Airway Devices in Adults for Short Surgical Procedures

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Abstract

Aim: In the present study we compared the clinical performance of the I-gel and LMA in terms of the effectiveness and safety administration in anesthetized patients. *Materials & Methods:* A total of 100 patients with requirement of different abdominal surgery were included in the study. Water soluble jelly was used to lubricate I-gel and LMA-Proseal. An experience anaesthesiologist inserted each of the devices. Both the devices were set by taping the tube over the chin and lubricated gastric tube was situated into the stomach through the gastric channel. *Results:* The average airway sealing pressure with LMA – ProSeal was 29.6 cm H_2O and with I-gel was 25.27 cm H_2O, the difference was set up to be statistically significant ($p<0.05$). There was no occurrence of bronchospasm/laryngospasm, aspiration/regurgitation and hoarseness in both the groups. *Conclusion:* I-gel is a straight forward tool which is uncomplicated to insert without much of manipulations quickly. It has a possible benefit of effectual seal force which is fewer as compared to LMA-Proseal, but is sufficient to avoid aspiration and preserve an effective ventilation and oxygenation.

Keywords: Adult; Abdominal Surgery; I-gel; LMA-Proseal.

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Introduction

Supraglottic airway devices with gastric access tubes are ever more being utilized in surgery needs general anaesthesia and positive pressure ventilation. The I-gel is a throwaway supraglottic airway tool with noninflatable cuff and is prepared from thermoplastic elastomer, which is different laryngeal masks [1].

The manufacturer states that I-gel is proper for hypopharyngeal anatomy, offers good perilaryngeal sealing, and diminish the jeopardy of airway obstacle by preventing intraoral trauma and folding of epiglottis, owing to the device's soft and gel-like structure [2]. It is composed of a soft, gel-like, transparent, thermoplastic elastomer. It is intended to attain a mirrored impression of the pharyngeal and laryngeal arrangement and to give a perilaryngeal seal without cuff inflation [3].

The manufacturer states that I-gel is appropriate for hypopharyngeal anatomy, gives high-quality perilaryngeal sealing, and decreases the danger of airway obstruction by preventing intraoral trauma and folding of epiglottis, due to the device's soft and gel-like structure [2,4]. I-gel is a fresh supraglottic airway apparatus with anatomically planned, non-

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inflatable mask, which is soft gel like and translucent made of medical grade thermoplastic elastomer called styrene ethylene butadiene styrene [5].

The soft no inflatable cuff fits of laughter warmly onto the perilaryngeal framework and its incline slander in the proximal aperture of the esophagus, thus separating oropharyngeal opening from the laryngeal opening [6]. The device has a buccal cavity stabilizer which has a tendency to adjust its form to the oropharyngeal curvature of the patient. This buccal cavity stabilizer houses airway tubing and a disconnect gastric channel [7].

The LMA, on the other hand, is one more supraglottic device introduced in 2007, with many alike description to the I-gel: single use; existence of a drain tube to divide the gastrointestinal tract from the respiratory tract; and built-in bite block. It vary from the i-gel in that it is build of medical grade silicone, and has an inflatable cuff, a reinforced tip, and an elliptical, anatomically shaped, semi-rigid airway tube [8].

We evaluate the clinical recital of the I-gel and LMA in terms of the effectiveness and protection administration in anesthetized patients on controlled ventilation, undergo elective surgical actions with reverence to airway sealing pressure, simplicity of insertion, insertion efforts, alleviate of gastric tube assignment, and difficulties.

Materials & Methods

A total of 100 patients with requirement of different abdominal surgery were incorporated in the study. The patients with recognized difficulty of airway, mouth opening fewer than 2.5 cm, cervical spine illness and gastroesophageal reflux disease and those in necessity of crisis surgeries were expelled from the study.

Patients were given alprazolam 0.25 mg orally at 10 p.m. the night prior to surgery and yet again 2 hours earlier to surgery with 1-2 sips of water. Glycopyrrolate 0.2 mg, metoclopramide 10 mg, and ranitidine 50 mg were delievered intravenously (IV) to the patients 45 minutes earlier to the surgery. Baseline parameters were noted. Anaesthesia was induced with fentanyl 2 μg/kg and propofol 2-2.5 mg/kg IV.

Water soluble jelly was used to lubricate I-gel and LMA-Proseal. An experience anaesthesiologist inserted each of the devices. Both the devices were fixed by taping the tube over the chin and lubricated gastric tube was placed into the stomach through the gastric channel. Preservation was accomplished by oxygen, nitrous oxide, isoflurane and intermittent doses of intravenous vecuronium. Intraoperative heart rate, noninvasive blood pressure, oxygen saturation and end tidal carbon dioxide were documented ahead of induction and at 1 and 5 minutes following placing of device and then at every 5 minutes interval till the end of surgery.

The ease of insertion of device was too recorded. Ease was defined as no confrontation to insertion in the pharynx in a single maneuver. In a tricky insertion there was opposition to insertion or additional than one maneuver was requisite for the accurate placement of the device.

The ease of placement of gastric tube was too recorded and its accurate position was established by injection of air and epigastric auscultation or aspiration of gastric contents. Breakdown of gastric tube assignment was also recorded.

The airway sealing pressure was resolute by concluding the expiratory valve of the circle system at a rigid gas flow of 3 L/minute and recording the airway pressure at which equilibrium was accomplished. Gas leakage was indomitable at the mouth by the perceptible escape or by uncovering of an audible noise using a stethoscope placed just lateral to thyroid cartilage. Blood discoloration of the device and tongue, lip and dental distress were recorded. Pharynaolaryngeal morbidity was measured as hoarseness of voice in the post-anaesthesia care unit and 24 hours consequently.

Statistical Analysis

Qualitative data will be expressed as percentages and proportions. Quantitative data will be expressed as mean and standard deviation. The differences between two groups with respect to continuous variables will be analysed using t-test while categorical variables will be analysed using chi-square test. All the statistical tests will be performed in SPSS version 15 software. P value <0.05 will be considered as statistically significant while P value < 0.01 will be considered as statistically highly significant. The between group comparison of compressive strength of samples in Group A and B was done using One-way ANOVA test. Within group comparison was done using Bonferroni correction test. In the tests, p value of ≤ 0.05 was considered as statistically significant.

Results

No statistical difference was obtained in respect to the demographic and surgical particulars between the two groups (Table1). Only three attempts were allowed or made for the insertion of the I-gel or LMA-ProSeal.

The average airway sealing pressure with LMA–ProSeal was 29.6 cm H_2O and with I-gel was 25.27 cm H_2O, the difference was found to be statistically significant ($p<0.05$) (Table 2). The ease of insertion was more with I-gel (48/50) than with LMA–ProSeal (43/50) which was statistically significant ($p<0.05$) (Table 2). The success rate at initial effort of insertion was 50/50 (100%) for I-gel and 48/50 (93.3%) for LMA–ProSeal this relation was statistically not significant. (Table 2) The ease of insertion of gastric tube was further with I-gel (50/50) than with LMA–ProSeal (42/50) (Table 3). Tongue, lip & dental trauma was extra with LMA–ProSeal (10/50) than with I-gel (3/50) and blood staining of the device was additional with LMA–ProSeal (6/50) than with I-gel (2/50) but the findings were not statistically significant (Table 3). There was no occurrence of bronchospasm/ laryngospasm, aspiration/ regurgitation and hoarseness in both the groups (Table 3).

Table 1: Demographic data comparison of two groups

Particulars	Grou p 1 (I-gel)	Group 2 (LMA – Pro Seal)
Age (yrs)	41.26 ± 14.54	40.45 ± 14.44
Weight (kg)	64.24 ± 9.93	63.56 ± 8.99
Hernioplasty	20	23
Lap. Cholecysterctomy	10	12
Tibial plating	8	7
Humerus plating	8	4
Skin grafting	4	4

Table 2: Comparison of airway sealing pressure, ease of insertion and insertion attempts

Parameters	I-gel	LMA – ProSeal	P - value
Ease of insertion			
Easy	50	42	< 0.05
Difficult	0	8	
Airway sealing pressure	26.28	27.29	< 0.05
Insertion attempts			
1	50	48	
2	0	2	>0.05
3	0	0	
Failed	0	0	

Table 3: Comparison of other parameters

Parameter	I-gel	LMA-ProSeal	p-value
Ease of gastric tube insertion			
Easy	50	42	
Difficult	0	8	>0.05
Failed	0	0	
Blood staining of device			
Yes	2	6	>0.05
No	48	44	
Tongue – lip – dental trauma			
Yes	3	10	>0.05
No	47	40	
Bronchospasm	0	0	
Hoarseness	0	0	
Regurgitation	0	0	

Discussion

In our present study, the airway sealing pressure was calculated by concluding the expiratory valve of the circle system at a set fresh gas flow until airway pressure reached a steady value. From the findings of the study, we found that I-gel is as effectual as LMA-Proseal in given that airway throughout forced ventilation of lungs. The airway sealing pressure was elevated with LMA-Proseal as compare to I-gel, the dissimilarity was found to be statistically significant. Keller C. et al. and Lopez Gil et al. compared four kinds of dimensions of the airway sealing, pressure, at the end it was done that all four test were outstanding.

The ease of insertion was established to be additional with I-gel as contrast to LMA-ProSeal. The incidence staining of the device was further with LMA-ProSeal than with I-gel & tongue, lip & dental trauma was additional with LMA-ProSeal than with I-gel. on the other hand the difference between the two groups were not significant. Also the incidences with the ease of position of gastric tube assignment in reverence to I-gel & LMA-ProSeal were not significant. Both groups had no occurrence of bronchospam/laryngospasm, aspiration and hoarseness. A small number of the authors did planned the complexity in using the LMA-ProSeal, Initially Levintan and Kinkle supposed that the dejected leading edge of the exaggerated mask present in the LMA can catch the edge of epiglottis and reason it to down fold or impede correct assignment under the tongue [9].

Conclusion

I-gel is a simple device which is easy to insert without much of manipulations rapidly. It has a potential advantage of effective seal pressure which is less as compared to LMA-ProSeal, but is enough to prevent aspiration and maintain an effective ventilation and oxygenation. Lack of inflatable cuff also resulted in lower incidence of sore throat. Thus an I-gel can be a useful tool for maintaining airway and intermittent positive pressure ventilation.

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Original Research Article

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A Comparative Study of the Efficacy of Oral Gabapentin and Melatonin on Post Operative Pain and Analgesic Consumption in Patients Undergoing Modified Radical Mastectomy

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Abstract

High levels of post operative pain and anxiety increases patient discomfort and post operative morbidity. Anxiolytic and analgesic effects of melatonin improves control of post operative pain by controlling higher anxiety that accompanies surgical intervention. This study compares antinociceptive effects of both melatonin and gabapentin premedication on post operative pain and analgesic requirement. *Methods:* Ninety female patients undergoing modified radical mastectomy were randomly divided into three groups of 30 each where Group G given Gabapentin 600 mg, Group M given Melatonin 6 mg, Group C given placebo tablet 90 minutes before surgery. Post operative pain, sedation scores and post operative analgesic consumption was assessed for 24 hrs. *Results:* Visual analogue scale (VAS) score were lower in the group G and group M as compared to group C. Sedation score recorded highest in Group M followed by Group G and least in Group C. Time to first analgesic requirement was 16.58±4.47 hrs in Group G, 6.09±5.12 hrs in Group M and 2.80±0.83 hr in Group C ($p<0.0001$). Total 24 hr post operative diclofenac requirement in Group G (96.77±34.60) was significantly lower than Group C (166.93±31.87) and M (142.74±44.81) ($p<0.0001$). *Conclusion:* Both melatonin and gabapentin reduced post operative pain and analgesic consumption. Gabapentin had higher analgesic effect while melatonin was more sedative. Administration of melatonin before surgery may accelerate the resynchronization of circardian rhythm in the post operative period suggesting better recovery quality.

Keywords: Gabapentin; Melatonin; Female Patients; Post Operative Pain; Modified Radical Mastectomy.

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Introduction

The most expected and frequent problems in post operative context and event are pain and anxiety. High levels of post operative pain and anxiety increase patients discomfort, analgesic consumption, delay discharge and increases overall post operative morbidity [1,2].

The concept of pre-emptive analgesia is an analgesic treatment started before the surgical procedure , to protect the cental nervous system (CNS) from deleterious effect of noxious stimuli and the patient from the resulting allodynia and increase pain [3]. Moreover, pre operative anxiety is shown to have increased post operative analgesic requirement.

Benzodiazepines and opioids are the most commonly used drugs at present for reducing anxiety and pain. They however impair psychomotor function, cause excessive sedation, increases incidence of post operative nausea and vomiting (PONV), urinary retention etc. This increases overall post operative morbidity [4].

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Pre-emptive melatonin accelerate the resynchronization of circardian rhythm in the post operative period and this may be the cause of melatonin effect on pain and anxiety which augment pattern of disruption in stressful conditions [5]. In addition inhibition of pro-inflammatory cytokines and activation of opioid and melatonin MT_1 and MT_2 receptors are responsible for analgesic action of melatonin [6,7]. Even large doses of melatonin do not cause impairment of fine motor skill, memory or visual sensitivity [8].

Gabapentin was introduced in 1993 as an adjuvant anticonvulsant drug and subsequently, it was used in treating various chronic pain conditions [9,10,11,12]. Recently its use is extended into the management of acute conditions in the peri operative periods. Many clinical trials have shown the efficacy of gabapentin for post operative analgesia and pre operative anxiolysis [13,14,15].

This study was designed to compare the efficacy of melatonin and gabapentin with that of placebo in reducing postoperative pain and analgesic requirement, prolongation of analgesia as well as their side effects.

Materials and Methods

After taking approval from the ethical committee and informed consent from the patients and relatives, 90 adult women of ASA 1 and 2, in the age group of 18-60 years, who were posted for modified radical mastectomy (MRM) were selected with 30 patients in each group.

Exclusion criteria included ASA grade 3 and above, analgesics given within 24 hours prior to surgery, history of allergy or contraindication to the study drug, drug addiction, BMI > 40 , h/o chronic pain, regular medication with analgesics, patients with significant medical or psychiatric problems.

No premedication was given on the day of operation. The patients were randomly allocated into three groups.

Group G (N = 30): Tab. Gabapentin (600 mg) 300 mg two tab.

Group M (N = 30): Tab. Melatonin (6 mg) 3 mg two tab.

Group C (N=30): Tab. Placebo 2 placebo tablets as control.

The study drugs were given 90 minutes prior to surgery.

The anesthetic technique was identical in all the patients. Induction of anaesthesia was done with IV Glycopyrrolate (0.01mg/kg), Thiopentone sodium (5-7 mg/kg), Fentanyl 1-2 μg/kg and Vecuronium bromide 0.1 – 0.2 mg/kg. Airway was secured with proper sized endotracheal tube. Maintainance with O_2 + N_2O+ Sevoflurane + Vecuronium. After completion of surgery, reversal of anaesthesia was done with Glycopyrrolate 0.02 mg/kg IV and Neostigmine 0.05 mg/kg IV and after full muscle tone and power trachea was extubated.

Postoperatively the following parameters were recorded every 30 minutes for the first 2 hours and then at 4, 6, 8, 12and 24 hours.

1. *Pain assessed by visual analogue scale (VAS)*

   where 0 = "no pain" while score of 10 = "worst imaginable pain".

2. *Sedation score:*

   0- alert on conversant

   1-awake but drowsy

   2-asleep but arousable

   3-asleep and not arousable

3. *Time to first analgesic requirement.*
4. *Total analgesic consumption in 24 hours* when VAS score was ≥ 4, injection diclofenac (75mg) intravenous diluted was given slowly as a Rescue analgesic.
5. *Side effects* like nausea, vomiting, headache, dizziness, skin rash, urinary retention and visual disturbances.

Observation

All data were recorded and expressed in terms of mean±standard deviation. P value< 0.05 was considered significant. Statistical software from www. Graphpad/instate3 site was used.

Table 1 The groups were comparable with respect to age, weight, and duration of surgery. Mean age (year), wt (kg) and surgical duration in all the three groups were comparable and statistically not significant (P> 0.05).

Table 2 shows the VAS score was significantly lower in group M and group G as compared with group C starting immediately and in the post operative period ($p < 0.05$). Also VAS score was significantly lower in group G as compared to group M. ($p<0.05$)

Three cases of group G and two cases of group M did not require any analgesic in the 24 hour postoperative period.

Twenty five cases of group C and one case of group M required analgesic dose in the immediate post operative period.

Table 3 shows Sedation score was significantly more with melatonin group as compared to group G and C.

Table 4 shows that the Time to first analgesic requirement was 16.58±4.47 hrs in Group G, 6.09±5.12 hrs in Group M and 2.80±0.83 hr in Group C. The p- value of group G vs group M <0.05 while that of group G and M vs group C< 0.001 Total 24 hr post operative diclofenac requirement in Group G (96.77±34.60) was significantly lower than Group C (166.93±31.87) and M (142.74±44.81) (p<0.0001).

Table 5 shows that the most common side effect in group G was somnolence and headache, while in group M it was drowsiness, dizziness and while in group C it was nausea and vomiting.

Table 1: Demographic data

Variables	Group G (n=30)	Group M (n=30)	Group C (n=30)	P value
Age (years)	53.16±9.53	52.93±10.12	52.86±8.77	0.99
Weight (kgs)	54.93±11.66	56.83±14.34	60.06±15.26	0.353
Duration Of Surgery (mins)	112.36±10.80	110.63±11.41	110.7±11.21	0.793

Data expressed as mean±sd. Mean age (yr) and wt (kg) in all the groups are comparable and statistically not significant (p>0.05). Mean surgical duration in all the groups is statistically not significant (p>0.05).

Table 2: Vas score at different time intervals

Vas Score	Group G	Group M	Group C
0 min	1.67±0.65[b]	2.54±0.88[ba]	3.61±0.76
30 mins	1.38±0.84[b]	2.29±0.64[ba]	3.29±0.90
1 hr	1.38±0.55[b]	2.74±0.81[ba]	2.67±0.79
2 hr	1.41±0.92[b]	2.87±0.92[ba]	2.61±0.95
4 hr	1±1[b]	3.45±1.09[ba]	3.54±0.72
6 hr	1.87±0.61[b]	2.70±1.2[ba]	3.09±1.07
12 hr	1.03±0.91[b]	2.03±0.91[ba]	2.67±0.70
24 hr	1.64±0.66[b]	2.45±0.80[ba]	2.46±0.84

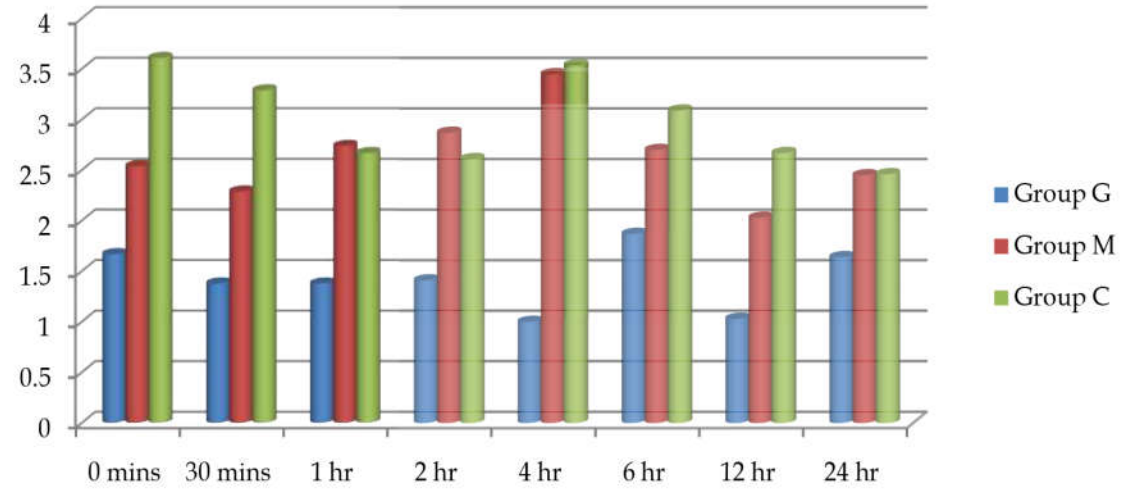
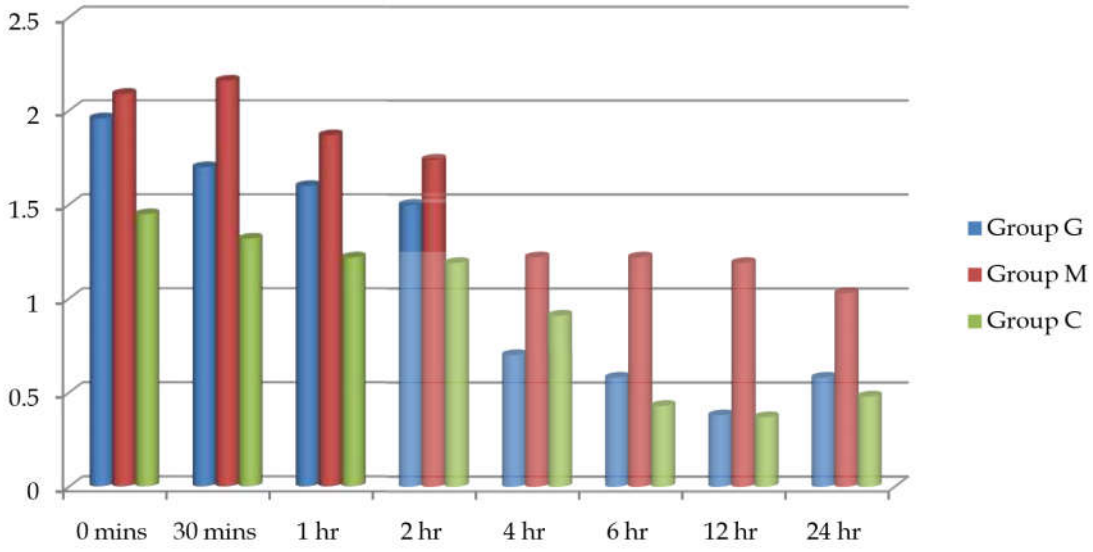


Table 1: Vas score at different time intervals

Data expressed as mean±SD.
[a]P value < 0.05 in Group G & Group M versus Group C.
[b]P value < 0.05 in Group G versus Group M.



Graph 3: Sedation score at different time intervals

Data expressed as mean±SD.
[a]P value < 0.05 in Group G & Group M versus Group C.
[b]P value < 0.05 in Group G versus Group M.

Table 3: Sedation score at different time intervals

Sedation score	Group G	Group M	Group C
0 mins	1.96±0.31[a]	2.09±0.64[ba]	1.45±0.50
30 mins	1.7±0.47[a]	2.16±0.37[ba]	1.32±0.47
1 hr	1.6±0.42[a]	1.87±0.34[ba]	1.22±0.42
2 hr	1.5±0.34[a]	1.74±0.44[ba]	1.19±0.40
4 hr	0.70±0.46[a]	1.22±0.56[ba]	0.91±0.37
6 hr	0.58±0.50[a]	1.22±0.56[ba]	0.43±0.51
12 hr	0.38±0.49[a]	1.19±0.41[ba]	0.37±0.54
24 hr	0.58±0.50[a]	1.03±0.48[ba]	0.48±0.50

Table 4: Time to first analgesic and rescue analgesic requirement

Variables	Group G (mean ± SD)	Group M (mean ± SD)	Group C (mean ± SD)
Time to first analgesic requirement(hrs)	16.58±4.47[b]	6.09±5.12[ab]	2.80±0.83
Total diclofenac requirement(mg)	96.77±34.60[a]	142.74±44.81[ab]	166.93±31.87

[a]P value < 0.001 Group G & Group M versus Group C
[b]P value < 0.05 Group G versus Group M

Table 5: Side effect

Variables	Group G	Group M	Group C
Drowsiness	2	6	0
Nausea	4	1	9
Vomiting	5	1	8
Headache	5	2	2
Blurred Vision	1	0	0
Fatigue	0	0	1
Pruritus	0	0	2

Discussion

This study demonstrates that both melatonin and gabapentin given 90 minutes before induction reduced post operative pain and analgesic requirement compared to placebo. Gabapentin 600 mg had higher analgesic effect while Melatonin 6 mg had more sedative effect.

Preemptive analgesia is more efficacious in reducing post operative pain, preoperative anxiolysis, attenuation of the haemodynamic response to laryngoscopy and intubation and preventing chronic post surgical pain [16].

Wilhemsen M et al. in his review found that melatonin has analgesic action in all experimental studies regardless of mode of pain induction [17]. They also found that route of administration of melatonin is irrelevant in analgesic action and analgesia is dose dependent.

Gabapentin was used preoperatively as previous animal experiments showed pretreatment with gabapentin was more effective and longer lasting than post operative treatment [18].

We administered the study drugs 90 minutes prior to surgery as after oral administration a peak melatonin concentration is reached approximately in 60 minutes and thereafter its concentration declines over a four hour period [19]. While after oral administration a peak gabapentin concentration is reached approximately in two to three hours and its concentration declines over six to eight hours [16].

The chosen dose of gabapentin (600mg) is the most commonly used single dose in the treatment of acute and chronic pain trials and could be given 1-2 hour before surgey [20]. Pandey et al studied different doses of gabapentin premedication (300 mg, 600mg, 900 mg,1200mg) in patients undergoing lumber discectomy [21]. The optimal dose they found was 600 mg as with higher dose side effects are more with no further reduction in pain. V. K. Grover et al in their randomized placebo controlled trial with single dose of 600 mg gabapentin concluded that 600 mg gabapentin produces effective and significant post operative analgesia after total mastectomy without significant side effects [22].

Exogenous melatonin dose range from 3 to 15mg and was administered 90-100 min before induction via oral [5,23,24,25,26] and sublingual route. [27,28,29]. We chose 6 mg melatonin as it is commonly used dose in the treatment of acute and chronic pain trials and also the optimal effective analgesic dose of melatonin is still unclear. Ionescu et al. used 3 mg melatonin as a premedication for laproscopic cholecystectomy and found that is associated with anxiolysis, analgesic property and better recovery profile without impairment of psychomotor function post operatively [23,27]. Caumo et al. compared 5 mg melatonin and 100 microgm clonidine with placebo given night before surgery and one hour before surgery and found both the drugs comparable in terms of anxiolysis and post operative analgesic consumption [24]. Study with 10 mg oral melatonin premedication 90 minutes before cataract surgery found that melatonin has anxiolytic, increased analgesic, and IOP reducing effects [25] and same dose before IVRA reduced tourniquet related pain and improved perioperative analgesia [26]. Contradictory result were found with 10 mg oral melatonin study by capuzzo et al. where there was no significant reduction in anxiety and pain in elderly patients undergoing elective surgery [30].

Four studies with melatonin showed improvement in pain scores compared to placebo and that was statistically significant ($p<0.05$) [5,24,25,26] and three studies results for pain scores were contradictory [27,28,29]. Naguib et al and Acil et al found no significant difference in pain scores in melatonin group as compared to placebo group post operatively where they used only a single dose of melatonin and placebo [27,28]. However caumo et al found statistically significant reduction in pain scores post operatively using dual dose of melatonin and clonidine [24]. Ajori et al. in his study of 600 mg preemptive gabapentin orally in patients undergoing abdominal hysterectomy found that gabapentin group had significantly lower VAS scores at every time interval compared to placebo group [31].

In our study VAS scores were significantly lower in group G as compared to group M. Similar results were found in previous study with 6 mg melatonin and 600 mg gabapentin in patients undergoing elective abdominal surgery [18]. VAS scores were significantly lower in both the study groups as compared to placebo at all the levels. Three cases of group G and two cases of group M did not require any analgesic drug during first 24 hours postoperative.

Caumo et al in his study of melatonin and clonidine found that the anxiolytic effect of both drugs reduced postoperative morphine consumption by more than 30% in patients undergoing abdominal hysterectomy. The incidence of post operative moderate to intense pain was 33.2% and 40% in melatonin and clonidine group respectively compared with 92.3% in placebo group [24]. K. Radwan et al. found that time to first

analgesic demand was 16 hr, 4 hr, 0 hr in group G(600 mg), group M (6 mg) and group C respectively ($p<0.001$). The total postoperative analgesic requirement in 24 hr is significantly lower in group G(72.4±15.8) than group M (97.4±10.9) and C (126.4±14.5) [18]. MB Khezri et al. in their study found that time to first analgesic request prolonged in group M3(208.19±122.66min) compared to group M6(196.82±127.25min) and placebo group P(152.13±79.4 min) [32]. Increasing the dose of melatonin to 6 mg failed to enhance analgesia and increased the incidence of headache. V.S Hoseini et al in his study of 6 mg melatonin, 600 mg gabapentin and 0.2mg clonidine premedication concluded that melatonin premedication has similar efficacy as clonidine and gabapentin for reducing postoperative pain and also reducing narcotic consumption [33]. Dalia AN et al. in his study of Melatonin 6 mg vs pregabalin 150 mg given one hour before induction in gynecological surgery found that the time for first analgesic demand in group M (114.3±4.8) minute and group P (118.1±6.2) minute and the number of patients requiring Diclofenac at six hours [group M (50%) vs group P (40%)] and 12 hours [group M (60%) vs group P (40%)] postoperatively were similar in both groups [34]. PWH Peng in his metaanalysis on gabapentin for postoperative pain control concluded that gabapentin decreases analgesic consumption and opioid related adverse effect however it is associated with increased incidence of sedation and dizziness [35].

In our study time to first analgesic requirement was prolonged in group G as compared to group M and C.

Borazaa H. et al. in his study of pre emptive oral melatonin 6 mg in dual dose, the night before and one hour before surgery found reduced pain scores and tramadol consumption and improved sleep quality with increased sedation score post operatively in patients undergoing elective prostatectomy [36]. Acil M et al. found increased level of sedation only at 90 minute after premedication with melatonin versus placebo ($p<0.05$) [27]. Naguib and Samarkandi in his study on 75 women who received premedication with 5 mg melatonin 100 minutes preoperatively found significant decrease in anxiety level and increase in sedation level before operation [28].

In our study patients who received melatonin had more sedation score than group G and C at all the readings post operatively. ($p<0.001$).

Melatonin has excellent safety profile and is well tolerated even with very high doses [37,38,39]. A metaanalysis conducted by Buscemi N et al found headache, nausea, drowsiness and dizziness to be the most common side effects of melatonin and concluded that melatonin is safe for short term use [40]. Large dose of melatonin (20mg) administered to children without any adverse effect apart from sedation [41].

The most frequent side effects in group G of our study were headache, dizziness and somnolence. Headache and drowsiness were more common in group M while in group C the most common complaint was pain, nausea, vomiting and urinary retention. These results were similar to those of K Randwan et al. [18] and Ismail & Movafi [25].

There was no significant difference in vital signs during operation and post operative period among three groups.

Conclusion

Pre-emptive oral dose of 600 mg of gabapentin and 6 mg of melatonin reduces the pain score and analgesic requirements in the first 24 hours in patients undergoing MRM surgery. Gabapentin had higher analgesic effect, while melatonin was more sedative. Owing to its axiolytic effects, melatonin can be administered whenever anxiety seems to be more marked during the perioperative period, otherwise gabapentin is preferable.

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Original Research Article

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Emergence and Recovery Characteristics After Desflurane Versus Sevoflurane Anaesthesia: A Prospective Comparative Study

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Abstract

Background and Aims: Selection of inhalational anaesthetic agents are based on their safety, emergence and recovery characteristics and side effects. This study was to assess the emergence and recovery characteristics and side effect profile of desflurane and sevoflurane. *Methods:* 110 patients undergoing general anaesthesia for procedures below two hours were randomly assigned into two equal groups (n = 55). After intravenous induction, anaesthesia was maintained with 1.0 MAC (Minimum Alveolar Concentration) of desflurane (Group D) or sevoflurane (Group S) which was discontinued on skin closure. In Post-Anaesthesia Care Unit (PACU) patients were assessed by Modified Aldrete Scoring System and the emergence time was noted as the time to respond to verbal command. Patients were then assessed by Modified Post Anaesthetic Discharge Scoring System (PADSS) for their recovery from anaesthesia. Post-anaesthesia complications if any were also recorded. All parametric data were statistically analysed using Student's *t*-test and non-parametric data by Chi-square test. *Results:* Both groups were similar demographically with respect to age and sex ($p > 0.05$). Administration of desflurane resulted in faster emergence than sevoflurane (19±3.7 min vs. 27.04±6.7min, $p < 0.01$). The early and delayed recovery time were faster with desflurane than sevoflurane with $P< 0.01$. Side effects were also lesser with Group D when compared to Group S. *Conclusion:* Desflurane was found to be superior to sevoflurane as inhalational anaesthetic agent for short surgical procedures in terms of its faster emergence and rapid recovery with minimal side effects.

Keywords: Desflurane; Sevoflurane; Emergence; Recovery.

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Introduction

General anaesthesia is a state of controlled, reversible state of loss of consciousness produced by the administration of one or more anaesthetic agents. Anaesthetic agents used may be either intravenous or inhalational (volatile) agents or a combination of these. Induction of anaesthesia with intravenous agent followed by maintenance with inhalational agents is commonly used in current practice due to patient acceptability, safety profile and smooth emergence with minimal side effects.Inhalational anaesthetic agents allow rapid emergence from anaesthesia because of less blood solubility and easy titrability.

History of anaesthesia can be traced from the first successful public demonstration of inhalational anaesthesia by WTG Morton on October 16,1846 using diethyl ether. Even before this, Humphrey Davy in 1779 has suggested the

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anaesthetic properties of nitrous oxide and has been used as inhalational anaesthetic agent by Horace Wells from1844 for dental extractions. Inhalational anaesthetic agents are still the 'backbone' of modern anaesthetic practice due to its ease of administration, titratability, smooth emergence with quick recovery [1].

The ideal inhalational anaesthetic should produce smooth rapid induction with optimal operating conditions having rapid emergence and minimal side effects. Efforts to develop such a drug has led to the invention of various halogenated anaesthetic agents like halothane, isoflurane, desflurane and sevoflurane. However, evenwith these newer agents, there are side effects and problems with metabolism that keep them away from being the 'ideal' anaesthetic agent [2].

Desflurane and sevoflurane are among the most commonly administered inhaled anaesthetic drugs today due to their favourable pharmacokinetic profiles and lower incidence of untoward side effects [3]. Both of these drugs are halogenated ethers with low blood gas partition coefficients which allow rapid equilibration between delivered concentration and the effect site in central nervous system producing faster emergence from anaesthesia as compared to the older inhalation anaesthetic drugs [4].

Early emergence and speedy recovery from anaesthesia is advantageous due to the early return of patient's airway and other protective reflexes enhancing speedy recovery. This is specifically advantageous in short surgical procedures were the patients attain early "home readiness" for discharge, thus reducing the financial burden to the family.

This study was to compare the emergence and recovery characteristics and side effect profile in patients undergoing general anaesthesia receiving desflurane or sevoflurane as the inhalational agent for the maintenance of anaesthesia.

Methods

The study was undertaken atGovernment Medical College, Kozhikode, a tertiary care teaching hospital during a one-year period from July 2015. After obtaining Institutional Ethics Committee approval and patients consent, 110 patients between 18-65 years of age with no complicating systemic disorders [American Society of Anaesthesiologists' physical status (ASA PS) Class I or II] [5] scheduled for elective surgical procedures of less than two hours under general anaesthesia were included for analysis in this prospective comparative study. Pregnant and lactating women were excluded from the study.

The 110 patients were randomly allocated into two equal groups (n=55) by computer-generated random number table, Group D to receive desflurane and Group S, sevoflurane as the inhalational anaesthetic agent for the maintenance of anaesthesia. After routine pre-anaesthetic evaluation and written informed consent, all the patients were premedicated on the previous night with tab. alprazolam 0.25 mg and tab ranitdine 150 mg orally and were fasted 8 hours before surgery.

In the operating room, intravenous access was established in the non-dominant forearm. Electrocardiogram (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2) and capnography ($EtCO_2$) were monitored. All the patients were given ondansetron 4mg, glycopyrrolate 0.2mg and fentanyl 2µg/kg intravenously before the induction of anaesthesia.

After preoxygenation, general anaesthesia was induced with sodium thiopentone (5-6 mg/kg) followed by lignocaine (1.5 mg/kg) and suxamethonium (2mg/kg) intravenously. After tracheal intubation, capnogram was connected and bilateral equal air entry confirmed, followed by vecuronium (0.1mg/kg) which was repeated intravenously to maintain neuromuscular blockade. Intravenous infusion of paracetamol 1 g was started for intraoperative analgesia.

General anaesthesia was maintained by intermittent positive pressure ventilation (IPPV) using a mixture of 60% nitrous oxide (N_2O), 40% oxygen (O_2) and the test inhalational anaesthetic agent, either desflurane in Group D patients or sevoflurane in Group S patients at 1.0 MAC (Minimum Alveolar Concentration). The inhalational anaesthetic agent was discontinued towards the end of the surgery at the initiation of skin closure and this time was noted. Later, residual neuromuscular blockade was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg) intravenously followed by tracheal extubation on recovery with return of airway reflexes.

The time from stoppage of the inhalational anaesthetic agent to the patient response to verbal command (lifting of the hand) was noted as the emergence time. The patients were then shifted to the Post-Anaesthesia Care Unit (PACU) and assessed by Modified Aldrete Scoring System [6] (Table 1) every 5 min. When a score of 9 was attained,

which was taken as early recovery time, patients were shifted to second stage recovery. In second stage recovery area, patients were assessed by Modified Post Anaesthetic Discharge Scoring System (PADSS) [7] every 15 min and were transferred to the post-surgical ward when they attained a score of 9. This time was noted as delayed recovery time. Any post-anaesthesia complications like nausea, vomiting, heaviness of head, headache and delirium if present were also recorded.

The primary outcome variables studied were the emergence time, early recovery time and delayed recovery time. Statistical analysis was done using PASW statistics 18 software. The data collected was analysed and the results were tabulated using Statistical Package for the Social Sciences (SPSS). All parametric data were presented as mean±SD and non-parametric data were tabulated. Parametric data were statistically analysed using Student's *t*- test and non-parametric data by Chi-square test. $p< 0.05$ was considered as statistically significant in all the analyses.

Results

One hundred ten patients undergoing surgical procedures under general anaesthesia of less than two hours were enrolled in the study. This included thyroidectomy, mastectomy, parotidectomy, branchial cyst and thyroglossal cyst excisions. They were divided as two equal groups (n=55), Group D were administered desflurane and Group S, sevoflurane as the inhalational anaesthetic drug for maintenance of anaesthesia. Both the groups did not show statistically significant differences in the demographic data comparing the age and sex ($p> 0.05$) as shown in figure 1 and 2. Our results showed statistically significant difference between the emergence and recovery profiles among the two groups with $p< 0.01$.

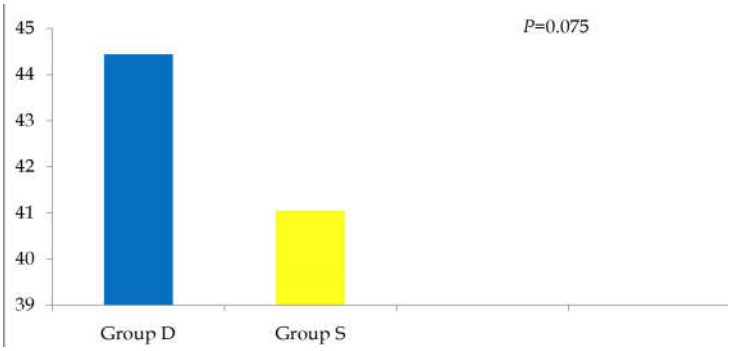

Fig. 1: Age distribution

Table 1: Modified Aldrete Scoring System

Criteria	Point Value
Oxygenation	
SpO_2> 92% on room air	2
SpO_2> 90% on room air	1
SpO_2< 90% on room air	0
Respiration	
Breathes deeply and coughs freely	2
Dyspnoeic, shallow or limited breathing	1
Apnoea	0
Circulation	
Blood pressure ± 20 mm Hg of normal	2
Blood pressure ± 20 – 50 mm Hg of normal	1
Blood pressure more than ± 50 mm Hg of normal	0
Consciousness	
Fully awake	2
Arousable on calling	1
Not responsive	0
Activity	
Moves all extremeties	2
Moves two extremeties	1
No movement	0

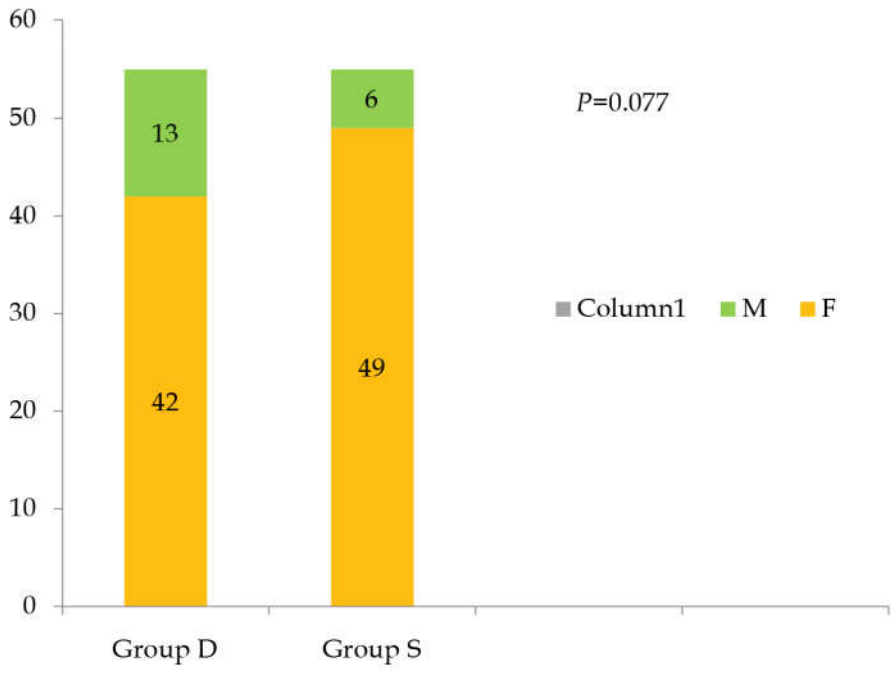

Fig. 2: Sex distribution

Table 2: Modified Post Anaesthetic Discharge Scoring System (PADSS)

Categories	Points
Vital signs	
BP and HR ± 20% of preoperative value	2
BP and HR ± 20% - 40% of preoperative value	1
BP and HR ± 40% of preoperative value	0
Ambulation	
Steady gait, no dizziness	2
Requires assistance	1
Unable to ambulate	0
Nausea and vomiting	
No or minimal/treated with oral medication	2
Moderate/treated with parenteral medication	1
Severe/continues despite treatment	0
Pain	
Minimal / no pain (Numerical Analogue Scale = 0-3)	2
Moderate (Numerical Analogue Scale = 4-6)	1
Severe (Numerical Analogue Scale = 7-10)	0
Surgical bleeding	
None or Minimal	2
Moderate	1
Severe	0

Table 3: Emergence time

Group	Number of patients[n]	Mean(min.)	Standard Deviation
D	55	19	3.717
S	55	27.04	6.719

We found that maintenance of anaesthesia with desflurane resulted in early emergence with mean value of 19±3.7 min versus 27.04±6.7 min with sevoflurane. This difference of 8.04 min was statistically significant with $p< 0.01$ (Table 3). The early recovery time as assessed by Modified Aldrete Scoring System was found to be faster with Group D with a mean value of 25.64±4.5 min versus 44.45±9.1 min with Group S, which was also statistically significant with $p< 0.01$ (Table 4). The delayed recovery time as assessed by PADSS had a mean value of 34.45±6.9 min with Group D versus 65.82±10.8 min with Group S (Table 5). This was also statistically significant with $p< 0.01$.

Regarding the side effect profile in the postoperative period, in Group D, two patients had heaviness of head. Among the Group S patients, five patients had delirium, eight had headache and ten had heaviness of head (Table 6).

Table 4: Early Recovery time

Group	Number of patients[n]	Mean(min.)	Standard Deviation
D	55	25.64	4.519
S	55	44.45	9.112

Table 5: Delayed Recovery time

Group	Number of patients[n]	Mean(min.)	Standard Deviation
D	55	34.45	6.984
S	55	65.82	10.877

Table 6: Postoperative side effects

Side Effects	Group S	Group D
Delirium	5	Nil
Headache	8	Nil
Heaviness of head	10	2

Discussion

Inhalational anaesthetic agents are commonly used to maintain general anaesthesia as they are easy to deliver with relatively stable haemodynamic profile having smooth induction and emergence. The speed of recovery from general anaesthesia is determined by the pharmacodynamic profile of the anaesthetic agents.

We compared the emergence and recovery characteristics of two commonly used inhalational anaesthetic agents, desflurane versus sevoflurane. Two groups of 55 patients each who underwent surgical procedures of less than two hours duration under general anaesthesia were included. After intravenous induction, general anaesthesia was maintained by either desflurane or sevoflurane and their recovery characteristics on awakening from anaesthesia were studied.

Demographic data comparing the age, sex showed no statistically significant difference among both the groups ($p> 0.05$). There was statistical difference between the emergence and recovery profiles from general anaesthesia between the two groups of patients who received desflurane versus sevoflurane. The time from stoppage of the test drug to response to verbal command, which was the ability to lift hand was taken as the emergence time. We observed that maintenance of anaesthesia with desflurane resulted in early emergence with a mean value of 19±3.7 min versus 27.04±6.7 min with sevoflurane. This difference of 8.04 min was found to be statistically significant with $p< 0.01$. The data is consistent with the faster kinetic profile of desfluranecompared to sevoflurane. This resulted in reduction in recovery time from anaesthesia, enabling early shifting of the patient from the operating room.

In our study, the early recovery parameters, which was a total score of 9 in Modified Aldrete scoring system. This was achieved much faster in patients who were given desflurane with a mean time of 25.64±4.5 min compared with sevoflurane whose mean time was 44.45±9.1 min. Studies have found that only early recovery was faster with desflurane compared to sevoflurane even when the duration of surgery exceeded two hours. Eger and colleagues showed that recovery was faster with desflurane than sevoflurane which is comparable to our study [8].

The delayed recovery time, assessed by Modified PADSS, was 34.45±6.9 min with desflurane group, while with sevoflurane group it was 65.82±10.8 min. There appears a significant early return to normal activities by patients who received desflurane. This finding is in conflict with the study of Heavner et al. [9] and Tarazi et al. [10].

Regarding the side effect profile, among the patients who received desflurane, only two patients complained of heaviness of head. However, in those who received sevoflurane, five patients had delirium, eight complained of headache and ten had heaviness of head.

Our study had several limitations, of which the lack of investigator blinding was a major one, which could influence the

results due to individual bias. As the study was limited to short exposure of anaesthesia below two hours, the effect of the drugs after lengthy procedures cannot be commented upon. We maintained a constant minute volume and fresh gas flow throughout the procedure, and at the end there was abrupt discontinuation of the inhaled anaesthetic agent. Further studies are required to examine whether gradual tapering of the anaesthetic agent affects emergence time in a different way. Use of monitors like bi spectral index (BIS) to titrate the drugs for the depth of anaesthesia was not done. Objective end points were used to assess the recovery profile, which can have individual variations. Further studies are needed to study the effect of gradual tapering of inhalational anaesthetic agents on emergence phenomenon.

Conclusion

From this study, we conclude that desflurane provides early emergence from anaesthesia compared to sevoflurane when used for surgical procedures below two hours. The early recovery and delayed recovery times were also faster with desflurane than from sevoflurane anaesthesia. The postoperative recovery profile was better with desflurane than sevoflurane, due to the lesser incidence of side effects. Hence desflurane was found to be superior to sevoflurane as an inhalational anaesthetic agent for short surgical procedures below two hours due to its faster emergence, rapid recovery with minimal side effects.

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Original Research Article

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Endotracheal Tube Cuff Pressure Monitoring Prospective Double Blind Randomised Control Study

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Abstract

Background: Endotracheal intubation by William McEwan in1878 remained the foundation stone of modern anesthesia. After successful use of laryngoscope and demonstration of laryngoscopy technique by Chevalier Jackson in 1913, endotracheal intubation achieved many milestones but it is not without complication. Following tracheal intubation, surgery, post-extubation there is an association of laryngotracheal morbidities such as a sore throat and hoarseness of voice [3,4] even in short duration of surgeries. *objectives*: To evaluate the efficacy of perioperative cuff pressure monitoring in decreasing the incidence of a postoperative sore throat and hoarseness of voice after oro-tracheal general anesthesia. *Materials and Methods*: We conducted this study as a double-blind randomized control trial in sixty patients who met the study criteria and underwent endotracheal general anesthesia in Karpaga Vinayga Institute of Medical Sciences and Research Institute. Totally sixty patients, each group has thirty patients. Group A - Study group (those who underwent cuff pressure monitoring) Group B - Control group. *Results*: The incidence of a sore throat and hoarseness of voice were present in both groups. The percentage of above two sequelae were found appreciably lower in Group A compared to Group B. *Conclusion*: Patients undergoing general anesthesia with endotracheal intubation show significantly reduced the relative risk of developing post-operative sore throat and hoarseness of voice when endotracheal tube cuff pressure monitoring is done.

Keywords: Endotracheal Intubation; Minimal Leak Test; Sore Throat; Hoarseness of Voice; Cuff Pressure.

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Introduction

Laryngotracheal morbidity is frequent after tracheal intubation [1]. Following tracheal intubation, sore throat and hoarseness of voice were the most common complaints which are sometimes more agonizing than post-operative pain [2]. These complications have an incidence ranging from 24% to 90% [3]. Mucosal damage occurring at the level of endotracheal tube cuff is thought to be causative factor [4], though the exact pathophysiology is not elucidated clearly. Tracheal perfusion pressure is 20-30 mm of Hg and an increase in mean mucosal perfusion pressure (22 mm of Hg) [5] causes the mucosal damage which disrupts the submucosal basement membrane and sloughing of epithelial lining which is spotty and completely heals in 2-3 days [6]. The high inflation pressure of endotracheal tube cuff initially and diffusion of nitrous oxide into the cuff intraoperatively were found to be main implicating causes of postoperative airway complications in patients undergoing general anesthesia with endotracheal tube intubation [4]. Though various

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methods were described to minimize the diffusion of nitrous oxide and reduction of postoperative airway complications the best method is continuous routine monitoring of cuff pressure [7]. This study was designed to evaluate the efficiency of reducing the incidence and severity of tracheal lesions postoperatively by monitoring the endotracheal tube cuff pressure perioperatively.

Materials and Methods

We conduct this study as a double-blind randomized control trial in sixty patients who met the study criteria and underwent endotracheal general anesthesia in Karpaga Vinayaga Institute of Medical Sciences and Research center. Group A-Study group (cuff pressure monitored group) Group B - Control group. Inclusion criteria of the patients undergoing this study were ASA grade I and II, 20-60 years of age, Elective surgery duration of surgery 1-4 hours. Exclusion criteria were ASA grade III and IV, Upper respiratory tract infections pre-operatively, anticipated difficult airway, surgeries involving head and neck, more than one intubation attempt, traumatic intubation, laryngoscopic Cormac Lehane grading 3 and 4, contraindications for nitrous oxide use and surgeries exceeding more than four hours. Portex cuff pressure monitor was used for minimal leak test and to measure the cuff pressure changes. One port of this monitor is attached to a syringe to deflate and inflate the cuff which is equipped with a one-way valve and a pressure gauge to adjust the desired pressure and the other port is attached to the pilot balloon. A minimal leak test was done by placing diaphragm of the stethoscope over the laryngeal area and endotracheal to be cuff is inflated until the air leak is gone. The patient was connected to ventilator and cuff pressure was decreased in small portions until a minimal air leak is heard. This air leak pressure is considered as the baseline mucosal perfusion pressure. Baseline mucosal perfusion pressure values were noted in both groups. In Group A cuff pressure monitoring was done every 10 minutes either by inflating or deflating and baseline cuff pressure was maintained till the end of surgery.

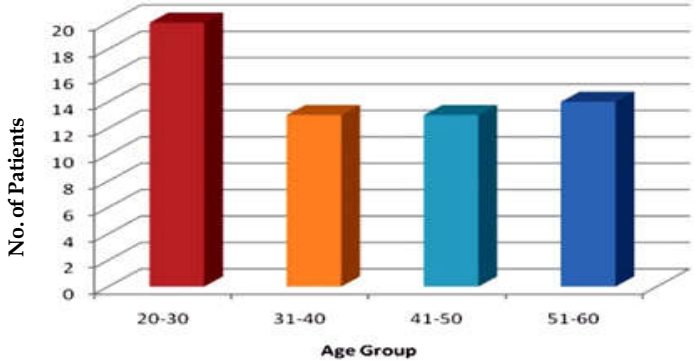
In Group B baseline mucosal pressure noted but no monitoring done in maintaining the baseline perfusion pressure and values were noted every 10 minutes. Anesthesia was given with Fi02 33%, N_2O, and sevoflurane. At the end of surgery patients were extubated following adequate reversal with Neostigmine 0.05mg/kg and Glycopyrrolate 0.01mg/kg. Anesthesia duration from the commencement to the cessation of N2the 0 was noted in both groups. After 24 hours both the group were interviewed by a blinded observer regarding the occurrence of a sore throat by the visual analog scale and hoarseness of voice by a change in the timbre of the voice. The results were rea corded separately.

Statistical Analysis

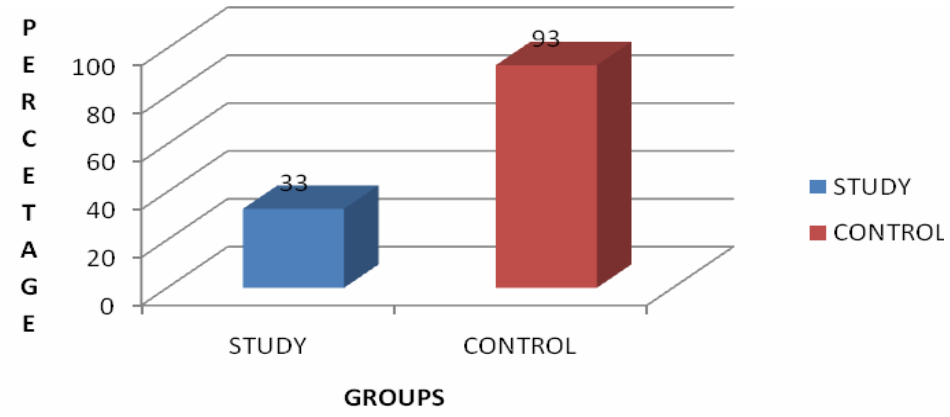
A t-test was used as a means to analyze the mean and standard deviation of age, sex, and duration of surgery. A signed ficant P value less than 0.05 was considered. Fisher's exact test was used to compare the occurrence of a sore throat and hoarseness of voice in both the groups and a P value less than 0.05 were considered significant. The relationship between surgical al duration, the incidence oan f a sore throat were compared with Fisher's exact test. Signifícthe ant association found if the P value is less than 0.05.

Results

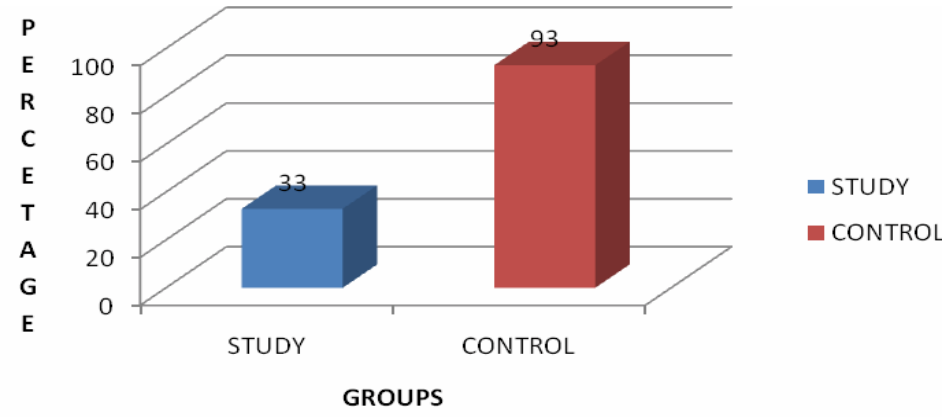
This prospective randomized double-blind study included sixty adults of age ranging from 20 - 60 yea ars and ASA grade I and II, who were randomly allocated to either group. Group A consisted of 30 patients who underwent cuff pressure monitoring and Group B consisted of 30 patients who didn't have cuff press they are monitoring (Graph 1-4).



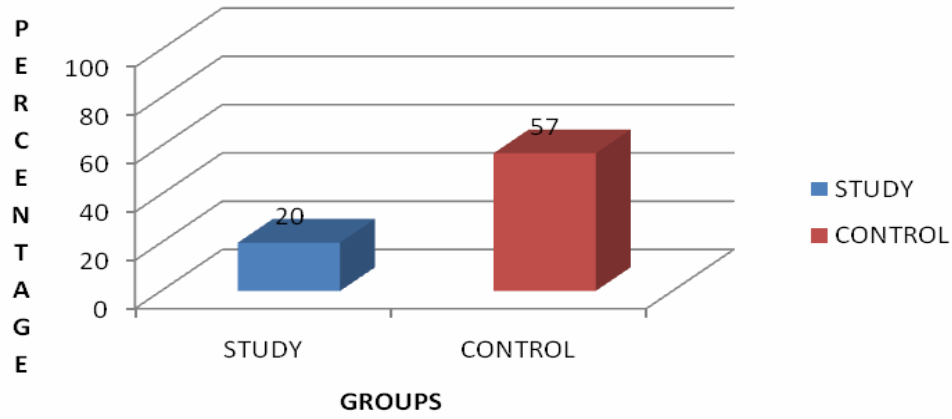
Graph 1: Demographic Data (P Value > 0.05)



Graph 2: The incident ce of a sore throat found to be 33% in the study group and 93% in control group (p Value < 0.05)



Graph 3: The incidence of hoarseness of voice found to be 20% in the study group and 57% in control group (p Value < 0.05)



Graph 4: The duration of surgery was compared with the severity of a sore throat which was found to increase in the severity of a sore throat with an increase in duration of surgery.

Discussion

After endotracheal lube extubation, postoperative sore throat and hoarseness of voice are of common occurrence. Anesthetic drugs, intubation time, number of intubation attempts, gastric tube insertion [8] are the variables implicated in this. By studying the effect these variables, Christenson et al. [8] concluded the incidences of postoperative sore throat and hoarseness of voice were higher in females. intubation with succinylcholine, surgeries involving the movement of head and neck and nasogastric tube insertion. Hence we removed these confounding variables. from our study. William Bernard et al. [9] study revealed initial high cuff pressure with large volume as well as diffusion of N_2O during the surgery were the causative factors for a sore throat and hoarseness of voice. Perbe - Hans Joachim et al[7] study revealed the mucosal injury and occurrence of a sore throat can be prevented by monitoring the endotracheal tube cuff pressure intraoperatively by maintaining the pressure below baseline mucosal perfusion pressure.

Hans Mondeo et al. [10] quoted cuff pressure more than 30 mm of Hg tracheal mucosa becomes ischemic and to keep the cuff pressure below 20 mm of Hg. Ayub Chakib et al. [11] cited the incidence of 21% in the study group and 65% in control group. Hence, we decided to find the baseline mucosal perfusion pressure by minimal leak test and monitoring was done every 10 minutes to maintain this baseline value in study Group A, which showered 33% incidence of postoperative sore throat. In Group B, baseline mucosal perfusion pressure is found by a minimal leak test were monitoring was not done showed 93% incidence of a sore throat. The probable reason for Ayub Chakib et al. [11] study was the difference in height to weight ratio between Indian population being comparatively smaller than the western population. Hence use of smaller size endotracheal tube 7.5 size for an adult female and 8 size for an adult male was followed in our study which also contributes for the incidence of a sore throat. H.N. Tu et al. [12] found that tracheal injury correlated with cuff pressure changes, which was done by bronchoscopic evaluation and grading of a sore throat. In our study, we believe that patients clinical symptoms would be more relevant and hence we evaluated and graded a sore throat by VAS scoring system and hoarseness by a change in the timbre of voice. In our study analysis of a sore throat by VAS system showed a lower incidence of postoperative sore throat and hoarseness of voice in the study group compared to the control group. Hence monitoring of cuff pressure not only decreases the incidence of a sore throat but also reduce its severity. Association of hoarseness of voice with the severe post-operative sore throat of higher VAS score had hoarseness of voice which was 20% in our study group and 57% in control group having a significant P value of 0.0073.

Conclusion

Monitoring of cuff pressure significantly reduces the incidence and security of a sore throat. It also reduces the hoarseness of voice. It reduces the relative risk of developing postoperative sore throat and hoarseness of voice. It reduces the relative risk of developing postoperative sore throat and hoarseness of voice in patients after general anesthesia with Endotracheal Intubation.

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Original Research Article

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A Comparative Study of Combined Spinal Epidural with Epidural for Labour Analgesia Using Lower Concentrations of Bupivacaine and Fentanyl

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Abstract

Aim: 1. To compare the analgesic efficacy of combined spinal epidural with epidural for labour analgesia using lower concentrations of Bupivacaine and Fentanyl. 2. To asses the effects of these agents on the maternal physiology, progress and duration of labour, mode of delivery, foetal and neonatal outcome. *Methods* : A total of 40 labouring parturients of ASA 1 & 2 have been divided in to 2 groups (Epidural group & Combined Spinal Epidural group) with 20 in each group. Epidural group received 10 ml of 0.0625% Bupivacaine and 50 mcg of Fentanyl epiduraly as initial bolus, followed by intermittent epidural top ups of 7 ml of 0.0625% Bupivacaine and 2mcg/ml of Fentanyl every 1 hr. Combined Spinal Epidural group received 1.5 ml solution containing 0.625 mg of Bupivacaine and 25 mcg of Fentanyl intrathecally and followed 2 hrs later by intermittent top ups of 6 ml of 0.0625% Bupivacaine and 2mcg/ml of Fentanyl every 1 hr. *Results* : With respect to the onset and quality of analgesia in Epidural and CSE groups, there were statistically significant differences. Analgesic efficacy was compared in terms of Time of first painless contraction, Time of loss of sensation to pin prick, visual analogue pain scales during first and second stage, Episiotomy pain relief and global assessment of quality of analgesia. CSE group showed statistically significant differences in terms of onset and quality of analgesia. No significant variations in duration and mode of delivery, maternal side effects and neonatal outcome. *Conclusion*: CSE when compared to plain Epidural produced statistically significant pain relief and the side effects produced by combining Fentanyl and Bupivacaine on maternal power, passage and passenger were minimal, proving that the CSE is a safer and good alternative to epidural for labour analgesia.

Keywords: Bupivacaine; Combined Spinal Epidural; Epidural; Fentanyl; Parturients; Foetus.

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Introduction

Pain is an unpleasant sensation localised to a part of the body. Is is often described in terms of a penetrating or tissue destructive process or of a bodily or emotional reaction . Labour pain has the important biologic function of indicating the gravida that labour is imminent. It should be effectively relieved once it has served its function, because persistent severe pain has harmful effects on the mother and on the foetus and the newborn.

There are several methods available for relieving labour pain, among them regional anaesthesia technique is the most popular.

Current obstetric analgesia practice aims to provide effective pain relief while minimising motor blockade. Lowering the concentration of Bupivacaine in epidural infusions has reduced the

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occurrence of motor blockade but even with dilute Bupivacaine infusions, moderate to sever motor blockade has been shown to occur in almost 44% of women. Motor blockade has been shown to reduce maternal satisfaction with epidural analgesia.

Efforts to improve epidural analgesia led to the anaesthesiologists popularising the Combined Spinal Epidural technique (CSE) for analgesia in labour. This technique involved an initial intrathecal injection of opioid (Fentanyl) and Bupivacaine to establish analgesia and subsequent epidural injections to restore and maintain analgesia. The doses of drugs involved were such that ambulation in labour was possible without any functional impairment of balance.

Methods

After obtaining proper written informed consent from the patients and approval of institutional ethical committee, 40 labouring parturients of ASA physical status 1 and 2 were included in the study. Inclusion criteria were nulliparous women in the age group of 18-24 years, uncomplicated pregnancy, active labour (cervical dilatation of 2-3 cm), single Foetus in vertex presentation, gestational age >37 weeks and ASA 1 and 2. Exclusion criteria were ASA 3 and 4, very early labour, complicated pregnancies, malpresentation/multiple pregnancy and gestational age <37weeks, bleeding diathesis local sepsis and women those who have received concomitant parenteral opioids.

This study was conducted in a prospective randomised manner and a total of 40 labouring parturients were included, equally divided in to 2 groups. Epidural group (E) and Combined Spinal Epidural (CSE) group. Epidural group received 10 ml of 0.0625% Bupivacaine and 50 mcg of Fentanyl epiduraly as initial bolus, followed by intermittent epidural top ups of 7 ml of 0.0625% of Bupivacaine and 2mcg/ml of Fentanyl at regular time intervals of 1 hour. CSE group received 1.5 ml solution containing 0.625 mg of Bupivacaine and 25 mcg of Fentanyl intrathecally and followed 2 hours later by intermittent epidural top ups of 6 ml of 0.0625% Bupivacaine and 2 mcg/ml of Fentanyl at regular time intervals of 1 hour.

In this study 0.5% Bupivacaine Hydrochloride manufactured by **Neon Pharma**, Fentanyl citrate 50 mcg/ml manufactured by **Neon Laboratories Ltd.** and Normal saline by **Parenteral Drugs (India) Ltd.** were used. All the solutions were prepared under strict aseptic conditions by the anaesthesiologists involved in the administration of the technique.

The Specific Gravity of the injected solution was 1.009 and was hyperbaric relative to Cerebro Spinal Fluid (1.006)

In this study, Combined spinal Epidural technique was performed with PORTEX CSE kit and epidural technique was performed with VYGON Tuohy epidural needle.

Before starting the procedureVisual Analogue Scale (VAS) was explained to the patients, where '0' represented no pain and '10' represented worst possible pain.

In the operating room appropriate equipments for airway management including Paediatric endotracheal tubes and all emergency drugs including opioid antagonists were kept ready. Patient was shifted to the operating theatre with the left lateral tilt when the labour was well established with cervical dilatation of 2-3 cm, the horizontal position of the operating table was checked and the patient was placed on it.The non invasive BP monitor, pulse oximetry were connected and baseline maternal pulse rate, BP, respiratory rate, SpO2 and foetal heart rate were recorded. All these patients were preloaded with 500 ml Ringer lactate after securing IV line with 18G venous cannula.

Under strict aseptic precautions group E patients received lumbar epidural in right lateral position using a Tuohy needle at L2-3 interspinous space and epidural space was identified by loss of resistance to air and 19G epidural catheter was then passed cephalad. After negative aspiration test, a test dose of 3 ml 1% Lidocaine with 15mcg of Epinephrine was given to rule out intravascular or intrathecal catheter placement. 5 minutes after the test dose these patients were given 10 ml of 0.0625% Bupivacaine with 50mcg of Fentanyl as initial bolus, followed by intermittent epidural top ups of 7ml of Bupivacaine 0.0625% and 2mcg/ml of Fentanyl at regular time intervals of one hour.

In CSE group patients using CSE kit lumbar epidural space was identified first then 27G pencil point spinal needle (needle through needle technique) was inserted through the epidural needle and after reaching the subarachanoid space 1.5 ml of solution containing 0.625mg of Bupivacaine with 25mcg Fentanyl was given over 10 seconds.Then 19 G epidural catheter was advanced in the epidural space. Top ups of 6ml of 0.0625% Bupivacaine with 2mcg/ml of Fentanyl were given 2 hours later then at regular time intervals of 1 hour. Epidural test dose was purposely omitted to avoid interference with spinal analgesia level.

During the late first and second stages of labour, both the groups were given 10ml of 0.0625% Bupivacaine and 2mcg/ml of Fentanyl in the sitting posture. All the patients in both groups have received oxytocin infusion 5 units in 500 ml of 5% dextrose to augment labour.

Maternal heart rate, BP, SpO2, respiratory rate and foetal heart rate were monitored at 2, 5, 10, 15, 30, 45 minutes after first bolus and then every 30 minutes. Labour progress was assessed by hourly pervaginal examinations by the obstetrician to assess the degree of cervical dilatation.

The time to first painless contraction was taken as the onset of analgesia which was also assessed by loss of sensation to pin pricks. Duration of analgesia was defined as the time interval between intrathecal injection and request for epidural top up.

Motor blockade was assessed using a modified Bromage scale at 5 minutes interval.

0 = Able to raise straight leg against resistance

1 = Unable to raise straight leg but able to flex knee

2 = unable to flex knee but able to flex ankles

3 = unable to move hip, knee or ankle

Analgesia assessment were carried out at 5 minutes interval throughout the study period. Testing for cold and pinprick was performed at 2 minutes interval for the first 20 minutes and every 5 minutes thereafter. Vibration sense was assessed with tuning fork tested at both the knee and the ankle. Proprioception was assessed by testing the joint position sense at the metatarsophalangeal joint of both big toes. Both these functions were tested with the patients eye closed, at 2 minutes interval for first 20 minutes and every 5 minutes thereafter.

The presence and occurrence of maternal complications like dural puncture, pruritus, urinary retention, sedation, nausea vomiting and respiratory depression were recorded .

The sedation was assessed by a bedside sedation scale..

0 = patient alert

1 = mild - occasionally drowsy; easily aroused

2 = moderate - frequently drowsy ; easily aroused

3 = somnolent ; difficult to arouse

Mode of delivery was noted and if instrumental or caesarean, the reasons were noted.

Episiotomy pain relief was assessed by a simple grading,

0 = no pain

1 = tolerable pain

2 = intolerable pain

Duration of all stages of labour were noted.

Neonatal outcome was assessed by APGAR score (Table 1) at 1, 5 and 10 minutes.

Table 1: APGAR score

SIGN	Score 0	1	2
Heart rate	Absent	< 100/min	> 100/min
Respiratory Effort	Absent	Slow, irregular	Good, crying
Colour	Blue, pale	Body pink, extremities blue (Acrocyanosis)	Completely Pink
Reflex irritability	Absent	Grimace	Cough, sneeze
Muscle tone	Limp	Some flexion of extremeities	Active motion

Statistical analysis

Mean and Standard deviation were estimated from samples of each study group. Mean values were compared by students independent 't' test. Proportion of different characteristics and categorical variables were estimated from each study group which were compared by Chi-square test (M x N), Chi-square with Yates continuity correction, Fischers exact test appropriately. In this study 'p' value < 0.05 was considered as level significance.

Results

Patients in both the groups were similar with respect to age, height, weight, gestational age, cervical dilatation, visual analogue pain scale before procedure (Table 2).

Onset of analgesia was analysed by both objective and subjective measures (Figure 1 & Table 3).

The mean time of onset of loss of first painless contraction and loss of sensation to pin prick were faster in CSE group which were statistically significant.

Visual Analogue Pain scale (Mean±SD) (Table 4).

Table 2: Maternal Characteristics Mean +/- SD

	E Group	CSE Group	P value	Significance
Age in years	20.4 +/- 1.2	20.35 +/- 1.9	0.76	NS
Height (cm)	150.1 +/- 3.8	151.75+/- 1.03	0.76	NS
Weight (kg)	53.8+/- 3.2	53.3+/- 3.5	0.64	NS
Gestational age (Wks)	39+/- 1.3	38.5+/- 1.4	0.25	NS
Cervical dilatation (cm)	3.4 +/- 0.5	3.5 +/- 0.62	0.58	NS
VAS base	7.9 +/- 0.5	8.2 +/- 0.5	0.07	NS

Table 3: Onset of Analgesia (Mean +/- SD)

	E Group	CSE Group	P value	Significance
Time of first painless contraction (sec)	523.1 +/- 121.9	259.5 +/- 20.2	<0.0001	S
Onset of loss of sensation to pinprick (sec)	480.0 +/- 77.9	183.0 +/- 16.1	<0.0001	S

Table 4: Visual Analogue Pain Scale (Mean +/- SD)

	E Group	CSE Group	P value	Significance
First stage	1.46 +/- 0.37	1.01 +/- 0.06	<0.0001	S
Second stage	3.55 +/- 0.51	3.15 +/- 0.37	<0.007	S

Table 5: Episiotomy Pain Relief

	E Group (n = 19)	CSE Group (n=18)
0	3(15.7%0	0
1	14 (73.6%)	16 (88.8%)
2	2 (10.5%)	2(11.1%)
0 = No Pain	1 = Tolerable pain	2 = Intolerable pain

Table 6: Global Assessment of Quality of Analgesia

	E Group(n =20)	CSE Group (n=20)
0	0	0
1	17(85%)	17(85%)
2	3(15%)	3(15%)
0= Worse than expected	1 = about as expected	2 = better than expected

Table 7: Maximal Height of Sensory Blockade

	E Group(n =20)	CSE Group (n=20)
>T6	0	0
T6 - T10	19	18
<T10	0	0

Table 8: (Maximal Motor Blockade)

Modified Bromage scale	E Group(n =20)	CSE Group (n=19)
0	17(85%)	18(84.7%)
1	3(15%)	1(5.2%)
2	0	0
3	0	0

Table 9: Maternal Vital Signs

	E Group	CSE Group	P value	Significance
Pulse rate	96.8 +/- 6.6	88.4+/- 4.6	<0.0001	S
Respiratory rate	18.7 +/- 1.6	17.0 +/- 1.4	0.25	NS
SpO2	98.6 +/- 0.8	99.0 +/- 0.6	0.07	NS
SBP	120.8 +/- 5.8	108.0 +/- 2.8	0.04	S
DBP	79.0 +/- 3.8	74.1 +/- 5.3	0.002	S
MAP	92 +/- 4.2	85 +/- 3.2	0.04	S

VAS during first and second stages of labour showed statistically significant differences with better quality of analgesia in CSE group.

Duration of spinal analgesia was 120±16 minutes in the CSE group

Episiotomy pain relief (Table 5)

With regards to pain relief during episiotomy in epidural group, out of 19 mothers 14 had tolerable pain 2 had intolerable pain and 3 had no pain. In CSE group out of 18 mothers, 16 had tolerable pain and 2 had intolerable pain.

Global assessment of quality of analgesia (Table 6)

Mothers in postpartum period gave their opinion regarding the quality of analgesia which were comparable in both the groups.

Maximal height of sensory blockade (Table 7)

In both the groups, the maximal sensory level was confined to T6 - T10.

Maximal motor blockade (Table 8)

With regards to motor blockade as assessed by Modified Bromage Scale,in the Epidural group 17 had no motor blockade and 3 had grade 1 motor blockade and in CSE group 8 had no motor blockade and 1 had grade 2 motor blockade.

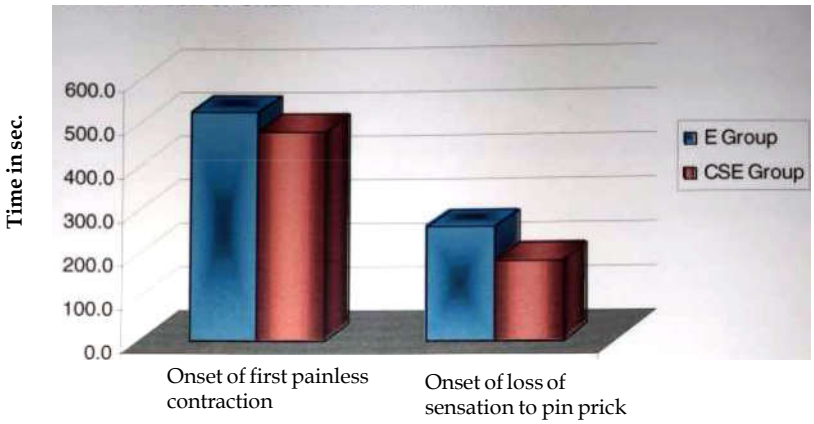
Maternal vital signs (Fig. 2, Fig. 3 & Table.9)

The maternal vital signs like pulse rate, SBP and DBP were showing statistically significant differences in CSE group.No significant differences were observed in respiratory rate and SpO_2.

Mode of delivery (Table 10)

There were not much differences in mode of delivery in both the groups. One mother in CSE group have been taken up for

Comparison of onset by subjective and objective measures



Comparison of mean visual analogue scale

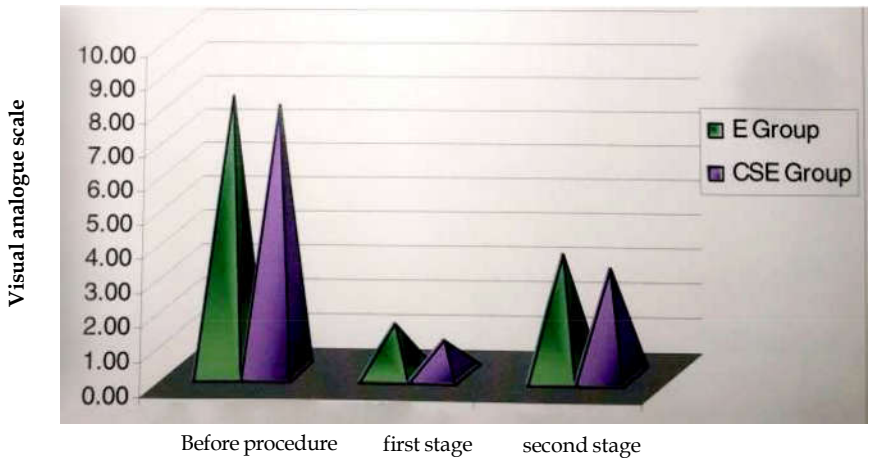


Fig. 1:

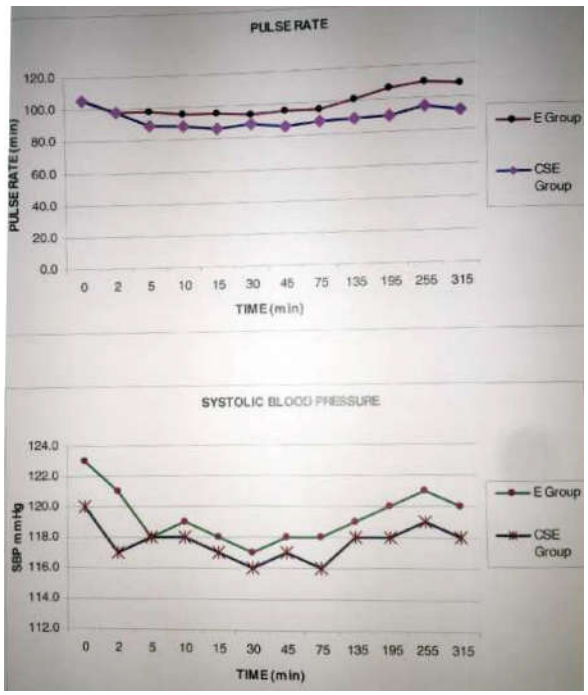


Fig. 2:

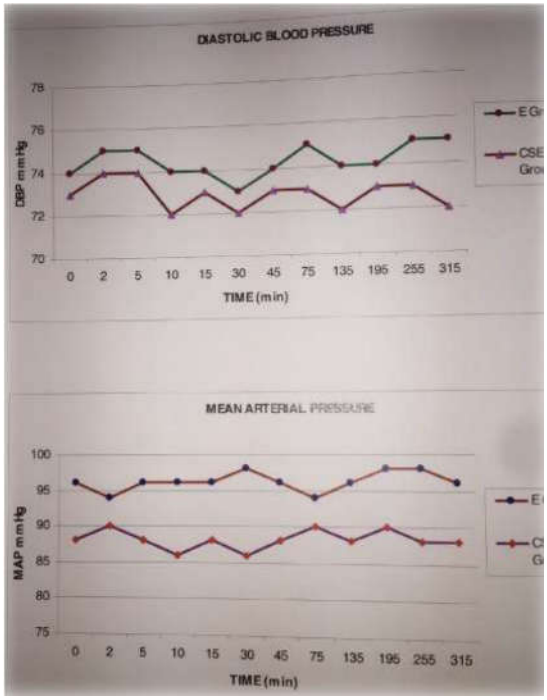


Fig. 3:

Table 10: Mode of Delivery

	E Group (n =20)	CSE Group (n =20)
Natural	19 (95%)	18 (90%)
Outlet forceps	1 (5%)	1(5%)
Low mid cavity forceps	0	0
Caesarean	0	1(5%)

Table 11: Duration of Labour

Duration of Labour (min)	E Group (n = 20)	CSE Group (n = 20)	P Value	Significance
Total duration	266 +/- 56.5	273.8 +/- 34.6	0.60	NS
First Stage	221.0 +/- 44.9	218.5 +/- 35.6	0.85	NS
Second stage	55.0 +/- 15.2	59.3 +/- 11.8	0.06	NS

Table 12: Maternal Side Effects

	E Group(n =20)	CSE Group (n =20)
Dural puncture	0	0
Venous punture	1	0
Pruritus	0	12
Urinary retension	14	12
Nausea/Vomiting	1	0
Rigor	0	0
Sedation	0	0
Hypotension	0	0
Respiratory depression	0	0

Table 13: Foetal Heart Rate

	E Group	CSE Group	P value	Significance
FHR	128 +/- 2.9	129+/- 2.0	0.90	NS

Table 14: Newborn APGAR Score

		E Group (n=19)	CSE Group(n=19)
1 min	<7	1	1
	7-10	19	19
5 min	<7	0	0
	7-10	20	20
10 min	<7	0	0
	7-10	20	20

caesarean section due to obstetric reason.

Duration of labour(Table.11)

The mean duration of first and second stages of labour as well as total duration of labour did not show any significant differences.

Maternal side effects (Table. 12)

The incidence of side effects varies. Almost 60% of parturients of CSE group had pruritus which was peculiar to this group which was relieved without any measures. 70% of epidural groups and 60% of CSE group had urinary retention. No mothers in both the groups had sedation, rigor, hypotension or respiratory depression.

Foetal heart rate (Table 13)

No significant differences were observed in both the groups.

Newborn APGAR score (Table 14)

Except one new born in both the groups who had APGAR score of 6 at 1min, all others had APGAR score of above 7 at 1 min. These 2 newborns were admitted in newborn intensive care unit for observation and got discharged after 2 days with out any problems.

Discussion

Labour pain is the only physiological function in the body which gives rise to pain during child birth. The parturient often must work hard through distressing, exhausting long hours to deliver her baby. Is it necessary to allow the parturient to experience pain in this scientific era? The main focus of this study was providing adequate pain relief with minimal side effects on maternal power (uterine activity and progress of labour), passage(birth canal), passenger (Foetus).

In this study we have compared CSE with Epidural to provide adequate analgesia during labour.

(1) Lee et al. 1999, compared the effects of 2 doses of intrathecal fentanyl and Bupivacaine

(2) Palmer et al. 1999, proved that addition of Fentanyl to Bupivacaine for intra thecal labour analgesia modestly increases the duration and speeds the onset of analgesia.

The mean time of onset of first painless contraction was 523.1±121.9 sec on "E" group and 2 59.5±20.2 in CSE group, a 50% reduction in latency.

The mean time for onset of loss of sensation to pinprick was 480.0±77.9 sec in "E" group and 183.0 ±16.1 in CSE group, a 60% reduction in onset time.

The quality of analgesia in terms of percentage reduction were 80% in first stage and 55% in seconds stage in "E" group compared to 85% in first stage and 60% in second stage in CSE group.

With respect to episiotomy pain relief 80% of cases in both "E" and CSE groups had tolerable pain and 20% cases of both groups had intolerable pain.

Pain relief as assessed by the patient indicate 85% had about as expected, 15% better than expected, 0% had worse than expected level pain relief in both groups.

Maximal upper level of sensory blockade was confirmed to T6-T10 in 100% of patients in both the groups.

Maximal motor blockade assessed by modified Bromage scale showed 94% of cases in CSE group with grade 0 motor blockade compared with 84% cases of "E"group. Only 6% of cases in CSE group had grade 1 motor blockade compared with 16% cases in "E" group.

Haemodynamic stability was better in CSE group when compared with E group

The incidence of forceps delivery was 5% in both the groups

Incidence of caesarean section was 5% in CSE group compared with 0% in E group

The commonest side effect observed was urinary retention in 70% of cases in E group Vs 60% in CSE group

Almost 60% of cases in CSE group had pruritus compared with 0% in E group.

No significant variation in foetal heart rate recorded in both the groups

No significant variation in neonatal outcome in both the groups.

Conclusion

From this study it is concluded that combined spinal epidural technique produced statistically significant pain relief when compared to epidural alone. The side effects produced by combining Fentanyl and Bupivacaine on maternal power, passage and passenger were minimal, proving that the CSE is a safe and good alternative to epidural for labour analgesia.

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Original Research Article

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A Comparative Evaluation of Efficacy of Intrathecal Nalbuphine and Butorphanol as Adjuvant to Hyperbaric Bupivacaine 0.5% for Lower Limb Surgery

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Abstract

Background: Subarachnoid block is the most preferred technique for anaesthetic management for lower limb surgeries. Various adjuvants have been used to improve the efficacy local anaesthetics by hastening the onset and prolonging the duration of sensory and motor block. The present study aims to compare the efficacy of intrathecal nalbuphine with butorphanol as adjuvant to 0.5% hyperbaric bupivacaine for lower limb surgery. *Methods:* 90 patients belonging to ASA status I and II of either sex were randomly divided into three groups of 30 each to receive either butorphanol 25 µg (Group A) or nalbuphine 400 mcg (Group B) or normal saline 0.5 ml (Group C) with 2.5 mL 0.5% hyperbaric bupivacaine, making intrathecal drug volume to 3mL in each group. Sensory and motor block characteristics in terms of time to onset and duration were recorded as the primary end points. Drug related side effects of pruritus, nausea/vomiting, and respiratory depression were recorded as the secondary outcomes. *Results:* The three groups were comparable regarding the demographic profile. The time to onset of sensory block was shortened in patients of group A and B as compared to group C, more so in group A. The mean time of 2 dermatomal regression was significantly more in Group B as compared to Group A and Group C ($p=0.003$, $p<0.001$) and significantly more in Group A as compared to Group C ($p<0.001$). Onset of motor block and time required to attain complete motor block (motor bromage 2 and 3 respectively) were comparable between the three groups and statistically not significant Duration of motor block was significantly more in group B as compared to Group A and Group C ($p<0.001$, $p<0.001$) and comparable between Group A and Group C .Furthermore, duration of motor block was maximum in Group B as compared to Group A (<0.001). No drug related side effects were observed in either group. *Conclusions:* Intrathecal Butorphanol 25 mcg showed faster onset of sensory block whereas nalbuphine 400 mcg showed prolonged duration of sensory and motor block as adjuvant to hyperbaric bupivacaine 0.5%.

Keywords: Intrathecal; Nalbuphine; Butorphanol.

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Introduction

Spinal anesthesia is the most preferred technique for conduct of anaesthesia management for lower limb surgeries.it provides benifits of lesser blood loss, lower incidence of deep vein thrombosis and postoperative analgesia. A limited duration of action is a major drawback of this technique. Even though major advances have been made in local anesthetic chemistry, synthesis of an ideal agent remains elusive. An agent with a longer duration of action, shorter onset time, and a more selective sight of action is sought. Adjuvants are those drugs which, when co-administered with local anesthetic agents, may improve the speed of onset and

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duration of analgesia and counteract disadvantageous effects of local anesthetics. By adding these adjuvants, the dose of local anesthetics like bupivacaine can be reduced, thereby reducing its side effects. Combination allows for a reduction in doses of both classes of drugs, thus lessening the likelihood of side effects attributable to each.

The mechanism by which opioids affect LA action is through a G-protein-coupled-receptor system. Opioids competitively bind to specific receptors to induce pain relief by hyperpolarizing the afferent sensory neurons in which the receptors are imbedded. Hyperpolarization of the cell membrane by an opiate decreases the propagation of neuronal action potentials thereby inhibiting afferent pain signals. Eventually this produces a decrease in the perception of pain [1]. Factors such as dose, lipophilicity, site of injection and condition of the milieu into which the injection is made, play an important role on the eventual effect produced [2,3].

Nalbuphine and Butorphanol belong to phenanthrene group of agonist antagonists, having agonist action on kappa receptor and antagonistic or partial agonist property at mu receptor. They are synthetically prepared, having similar pharmacological properties [5,6].

Therefore, in this study, an attempt was made to compare the efficacy of intrathecal Butorphanol and Nalbuphine as an adjuvant to Bupivacaine 0.5% heavy for lower limb surgeries.

Methods

After obtaining institutional ethical committee approval and informed written consent from the patients this randomised controlled study was carried out in the department of anaesthesiology, SRMSIMS, Bareilly, on 90 patients between 18-60 years of age and ASA grade I and II physical status scheduled to undergo lower limb sungeries under SAB.

Patient denying consent, allergy to any anesthetic drug, infection at the site of injection,patient on anticoagulants or bleeding disorder, ASA III and IVand patients on tranquilizers, hypnotics, sedatives, and other psychotropicdrugs were excluded from the study.

Pre anesthetic checkup was done on the previous day and on morning of surgery. Routine and specific investigations were noted.

Patients were randomly allocated into 3 groups each having 30 patients.

Group A - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + butorphanol 25µg (0.5 ml)

Group B - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + nalbuphine 400ug (0.5 ml)

Group C - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + normal saline (0.5 ml)

All the patients were kept fasting overnight prior to the scheduled day of operation.

Patients received Inj. Ranitidine 50mg IV as premedication after entering the operation theatre. All standard monitors (ECG, NIBP, SpO2) were applied. Baseline BP, PR, RR were recorded. All patients were preloaded through 18 G cannula with 10 ml/kg of RL solution. Under all aseptic precautions, lumbar puncture was performed in the L3-4. Intervertebral space using 25 G Quincke's spinal needle in sitting position. The patient received either one of the drug solution. Patients were turned supine and position of table was kept horizontal. Recording of HR, SBP, DBP, MAP, SpO2 and RR was done every 3 min. for 15 min., every 5 min. for 30 min., every 15 min. till 3 hours. In the intra operative period, crystalloid solutions (Ringer Lactate) 4ml/kg/hr was infused. The onset of sensory block was tested by pin-prick method using a 24G hypodermic needle every 2 minutes until the level had stabilized for 4 consecutive tests. Motor block was assessed by modified Bromage scale.

The following parameters were noted:

1. Time to onset of sensory block (i.e. time from intrathecal injection of drug to complete loss of sensation to pin prick at T10).
2. Time taken to achieve the highest level of sensory block (time from intrathecal injection to highest level of sensory block).
3. The time for two dermatomal segments regression of sensory level.
4. Time to onset of motor block by Modified Bromage Score (time from intrathecal injection to achievement of Bromage 2).
5. Time taken to achieve complete motor block by Modified Bromage Score (time from intrathecal injection to achievement of Bromage 3).
6. Duration of motor block will be noted (time from Bromage 3 to Bromage 2).

Statistical analysis was performed by the SPSS program for Windows, version 17.0. Continuous variables are presented as mean±SD, and categorical variables are presented as absolute numbers and

percentage. Data were checked for normality before statistical analysis using Shaipro Wilk test. Normally distributed continuous variables were compared using ANOVA. If the F value was significant and variance was homogeneous, Tukey multiplecomparison test was used to assess the differences between the individual groups; otherwise, Tamhane's T2 test was used. Categorical variables were analyzed using the chi square test. For all statistical tests, a p value less than 0.05 was taken to indicate a significant difference.

Results

The present study compared effect of nalbuphine (400 mcg in 0.5 ml), butorphanol (25 mcg in 0.5 ml) and normal saline (0.5 ml) with bupivacaine on the onset and duration of sensory and motor block when administered by intrathecal route as an adjuvant to bupivacaine 0.5% heavy (2.5 ml)

There was no significant difference in age, sex, ASA physical status, preoperative vitals among the three groups. Thus, we conclude that age, sex and ASA physical status and preoperative vitals in three groups were comparable.

The Mean±SD onset of sensory block in Group A, Group B and Group C respectively. It was found that there was significant difference among three groups ($p<0.001$). Post hoc analysis showed that mean onset of sensory block was significantly early in Group A and Group B as compared to Group C ($p<0.001$, $p<0.001$). Furthermore, mean onset of sensory block was faster in Group A as compared to Group B (<0.001).

The Mean±SD time of 2 dermatomal regression was121.33±3.51,125.07±4.74 and 148.7±5.38 in Group

Demographic Profile

Table 1: Comparison of age in study groups

	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value
Age	34.10 ± 12.17	31.53 ± 11.39	36.07 ± 12.91	0.05

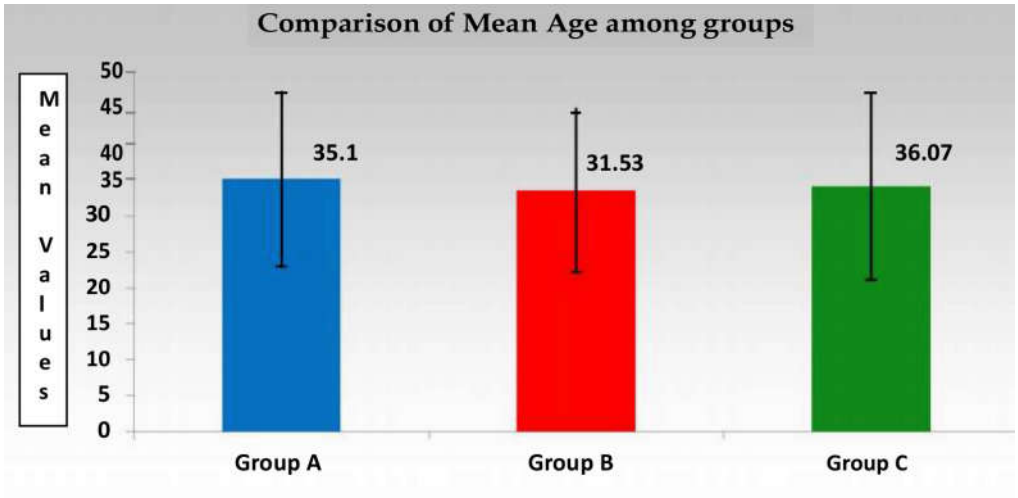

Fig. 1: Comparison of age in study groups

Table 2: Comparison of height and weight in study groups

	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value
Height (cm)	162 ± 4.63	163.23 ± 4.23	161.67 ± 4.41	0.057
Weight (KG)	65.93 ± 4.97	64.43 ± 6.66	63.50 ± 4.91	0.639

A, Group B and Group C respectively. It was found that there was significant difference among three groups (p<0.001). Post hoc analysis showed that mean time of 2 dermatomal regression was significantly more in Group B as compared to Group A and Group C (p=0.003, p<0.001) and significantly more in Group A as compared to Group C (p<0.001).

The Mean ± SD for the time to onset of motor block was 2.53±0.86, 2.87±0.97 and 2.87±1.07 in Group A, Group B and Group C respectively. It was found that there was no significant difference among three groups (p = 0.314) .

The Mean±SD for the time to motor bromage 3 was 5.17±0.98, 5.50±1.07 and 5.63±0.85 in Group A, Group B and Group C respectively. It was found that there was no significant difference among three groups (p = 0.167) .

The Mean±SD duration of motor block in Group A, Group B and Group C was 120.37±2.31, 127.9±6.82, 120.63±4.37 respectively. It was found that there was significant difference among three groups (p<0.001). Post hoc analysis showed that duration of motor block was significantly more in Group B as compared to Group A and Group C (p<0.001, p<0.001) and comparable between Group A and Group C (p = 0.988). Furthermore, duration of motor block was maximum in Group B as compared to Group A (<0.001).

Table 3: Comparison of gender distribution among groups

Sex	Group A Frequency (%)	Group B Frequency (%)	Group C Frequency (%)	P Value
F	8 (26.7%)	4 (13.3%)	3 (10.0%)	
M	22(73.3%)	26(86.7%)	27(90.0%)	
Total	30(100%)	30(100%)	30(100%)	

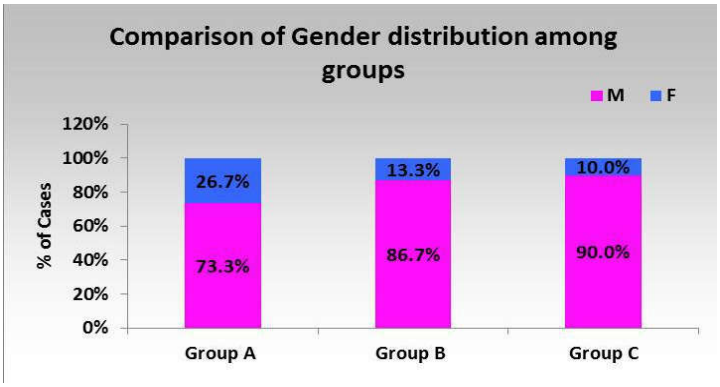

Fig. 2: Comparison of gender distribution among groups

Table 4: Comparison of ASA grade between groups

ASA	Group A (n=30) Frequency (%)	Group B (n=30) Frequency (%)	Group C (n=30) Frequency (%)	P Value
I	19 (63.3%)	17 (63.3%)	16 (53.3%)	0.049
II	11 (36.7%)	13 (36.7%)	14 (46.7%)	
Total	30 (100%)	30 (100%)	30 (100%)	

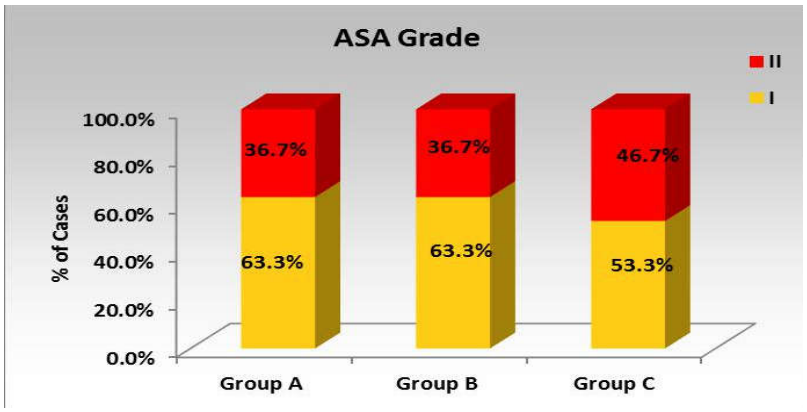

Fig. 3: Comparison of ASA grade between groups

Hemodynamics Changes

Table 5: Comparison of Heart Rate (HR) changes among groups

HR (per min)	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value Group A V/S Group B	Group A V/S Group C	Group B V/S Group C
00 min	80.83±10.76	79.43±9.9	81.2±12.67	0.879	0.991	
03 min	72.67±11.57	72.13±8.2	74.67±11.9	0.98	0.751	0.632
06 min	72.53±12.78	70.2±7.53	73.37±12.7	0.703	0.956	0.525
09 min	72.40±11.29	69.67±8.4	72.67± 1.86	0.581	0.995	0.521
12 min	69.97± 12.27	69.43±9.3	71.77±13.1	0.698	0.823	0.721
15 min	73.30 ± 11.59	70.93±8.3	73.63±12.7	0.685	0.992	0.612
20 min	70.77 ± 12.56	70.33±8.7	71.83±12.4	0.988	0.930	0.867
25 min	70.87 ± 11.51	70.87±9.1	71.60±11.6	1.000	0.963	0.963
30 min	71.03 ± 10.74	70.00±7.8	71.07±10.8	0.914	1.000	0.909
45min	69.89 ± 11.08	69.37±9.2	69.05±11.3	0.980	0.950	0.993
60min	71.15 ± 9.81	71.20±8.8	70.88 ± 9.79	1.000	0.994	0.991
75min	70.77 ± 9.19	70.80±7.3	70.23 ± 8.76	1.000	0.968	0.964
90min	72.20 ± 9.06	72.17±7.1	71.90 ± 8.58	1.000	0.989	0.992
105min	71.13 ± 8.06	uu.53±7.2	70.73 ± 7.33	0.754	0.977	0.628
120min	70.10 ± 8.27	72.53±8.0	69.90 ± 7.85	0.476	0.995	0.419
135min	70.30 ± 8.4	73.306	71.17 ± 7.63	0.282	0.898	0.524
150min	72.73 ± 12.49	73.63±7.0	73.47±12.3	0.945	0.963	0.988
165 min	72.33 ± 12.54	73.03±6.4	72.53±12.1	0.965	0.997	0.982
180min	70.67±16.77	73.83±5.8	71.03±16.3	0.654	0.994	0.717

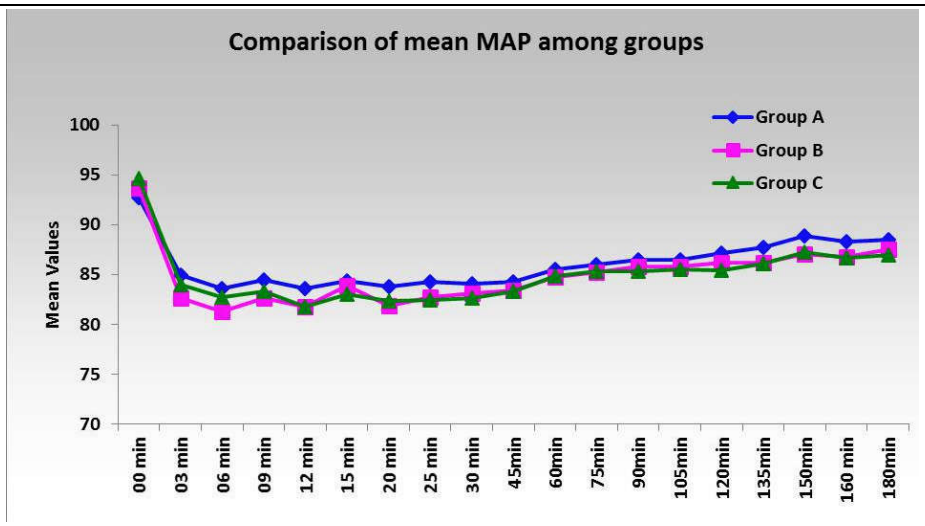

Fig. 4: Comparison of Heart Rate (HR) changes among groups

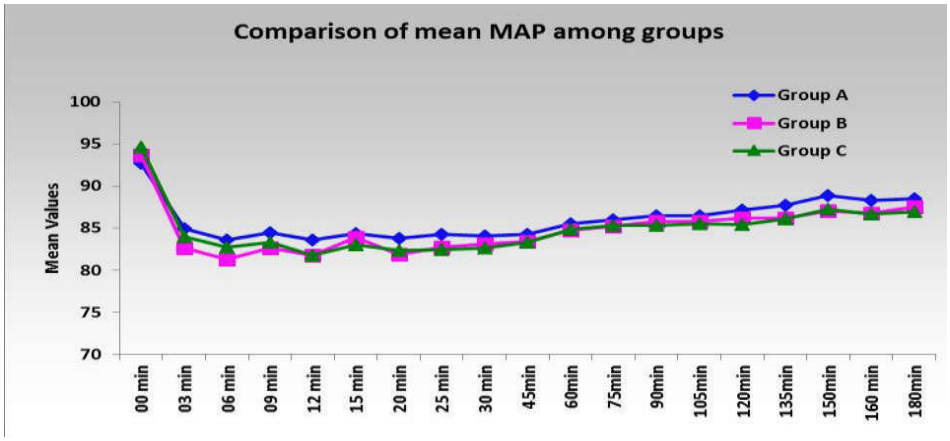

Fig. 5: Comparison of Mean Arterial Pressure (MAP) among groups

Table 6: Comparison of Mean Arterial Pressure (MAP) among groups

MAP (mm of Hg)	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value Group A V/S Group B	Group A V/S Group C	Group B V/S Group C
00 min	92.69±6.4	93.64 ± 8.79	94.64 ± 8.49	0.888	0.610	0.878
03 min	84.89±5.5	82.59 ± 7.15	83.98 ± 10.82	0.521	0.902	0.787
06 min	83.54±5.7	81.31 ± 7.01	82.71 ± 10.78	0.539	0.917	0.783
09 min	84.48±7.1	82.59 ± 7.32	83.31 ± 11.43	0.687	0.866	0.946
12 min	83.59±7.0	81.74 ± 7.74	81.72 ± 11.33	0.702	0.696	1.000
15 min	84.38±6.1	83.83 ± 7.26	83.00 ± 10.97	0.966	0.800	0.922
20 min	83.74±7.2	81.87 ± 8.83	82.36 ± 12.01	0.728	0.840	0.979
25 min	84.21±7.1	82.74 ± 9.12	82.46 ± 12.12	0.827	0.762	0.993
30 min	84.06±6.6	83.09 ± 8.42	82.63 ± 11.88	0.913	0.822	0.980
45min	84.27±7.9	83.37 ± 9.82	83.29 ± 12.88	0.940	0.930	1.000
60min	85.54±7.3	84.72 ± 9.35	84.81 ± 12.32	0.944	0.956	0.999
75min	86.00±6.8	85.24 ± 9.19	85.36 ±11.46	0.948	0.962	0.999
90min	86.49±6.8	85.79 ±9.15	85.33 ± 11.95	0.957	0.886	0.981
105min	86.51±6.8	85.77 ± 8.79	85.53 ± 12.11	0.951	0.916	0.995
120min	87.13±7.0	86.14 ± 7.97	85.44 ± 11.74	0.908	0.756	0.953
135min	87.71±7.2	86.19 ± 8.55	86.09 ± 12.2	0.811	0.789	0.999
150min	88.87±6.5	87.07 ± 7.88	87.2 ± 11.64	0.716	0.751	0.998
165 min	88.33±6.3	86.73 ± 8.46	86.64 ±11.53	0.773	0.750	0.999
180min	88.52±6.1	87.49 ± 8.30	86.97 ± 11.49	0.895	0.779	0.972

Table 7: Comparison of changes in Respiratory Rate (RR) between groups

RR (cpm)	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	P Value Group A V/S Group B	Group A V/S Group C	Group B V/S Group C
00 min	13.97 ± 1.69	14.23 ± 1.72	13.63 ± 1.65	0.814	0.725	0.357
03 min	12.83 ± 1.12	12.73 ± 1.05	12.73 ± 1.05	0.931	0.931	1.000
06 min	13.13 ± 1.48	13.03 ± 1.38	13.03 ± 1.38	0.959	0.959	1.000
09 min	13.50 ± 1.17	13.37 ± 1.19	13.37 ± 1.19	0.900	0.900	1.000
12 min	13.37 ± 0.96	13.30 ± 0.84	13.30 ± 0.84	0.954	0.954	1.000
15 min	13.80 ± 1.06	13.77 ± 0.94	13.77 ± 0.94	0.990	0.990	1.000
20 min	13.60 ± 1.22	13.47 ± 1.17	13.47 ± 1.17	0.901	0.901	1.000
25 min	13.80 ± 1.10	13.73 ± 1.08	13.73 ± 1.08	0.969	0.969	1.000
30 min	13.23 ± 1.22	13.13 ± 1.22	13.13 ± 1.22	0.946	0.946	1.000
45min	13.50 ± 1.23	13.37 ± 1.27	13.37 ± 1.27	0.911	0.911	1.000
60min	12.97 ± 1.54	12.83 ± 1.44	12.83 ± 1.44	9.350	0.935	1.000
75min	13.20 ± 1.03	13.10 ± 1.00	13.10 ± 1.00	0.922	0.922	1.000
90min	12.80 ± 1.24	12.7 ± 1.21	12.77 ± 1.19	0.946	0.994	0.975
105min	12.97 ± 1.27	12.9 ± 1.30	13.00 ± 1.26	0.978	0.994	0.951
120min	13.13 ± 0.94	13.03 ± 0.89	13.00 ± 0.91	0.906	0.839	0.989
135min	13.17 ± 1.02	13.03 ± 1.03	13.07 ± 0.98	0.866	0.922	0.991
150min	12.87 ± 0.90	12.90 ± 0.96	12.93 ± 0.98	0.990	0.960	0.990
165min	12.97 ± 1.00	12.93 ± 1.02	12.97 ± 0.96	0.991	1.000	0.991
180min	12.97 ± 0.96	13.00 ± 0.95	13.03 ± 0.96	0.990	0.961	0.990

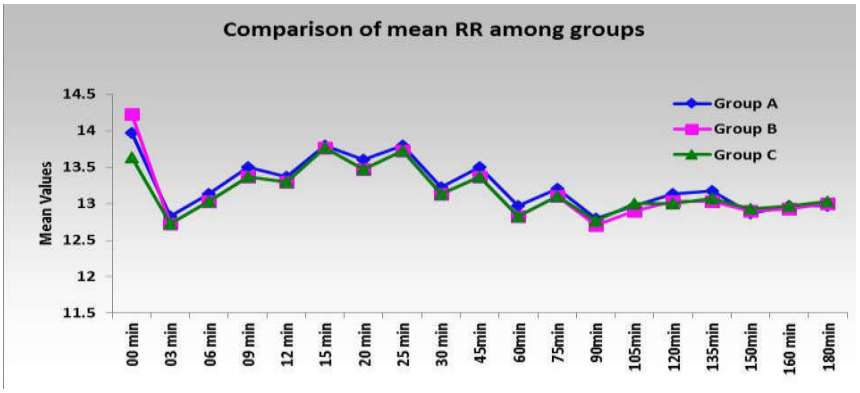

Fig. 6: Comparison of changes in Respiratory Rate (RR) between groups

Onset of Sensory Block

Table 8: Comparison of time to Sensory Onset

	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	Group A V/S Group B	P Value Group A V/S Group C	Group B V/S Group C
Time of onset of sensory block (T10) (sec)	108.63 ± 2.54	162.9 ± 2.4	65.67 ± 6.32	<0.001	<0.001	<0.001

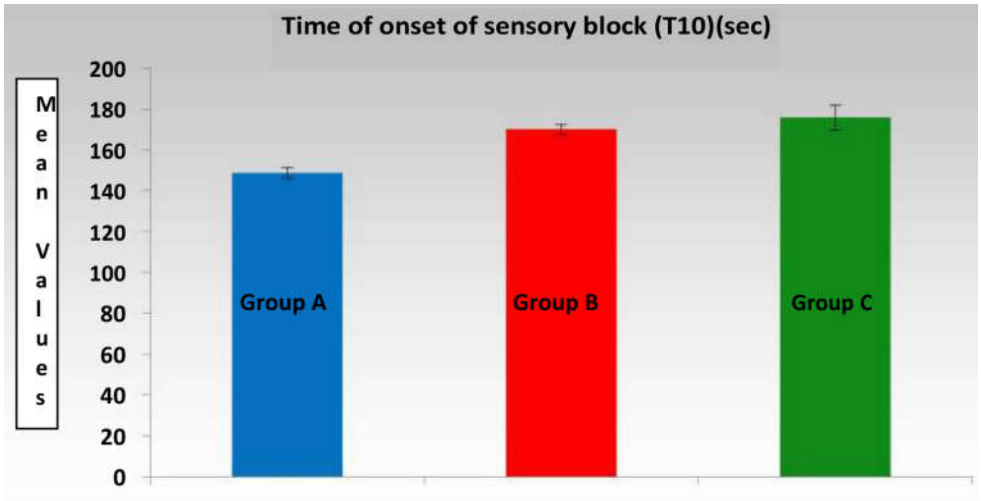

Fig. 7: Comparison of time to Sensory Onset

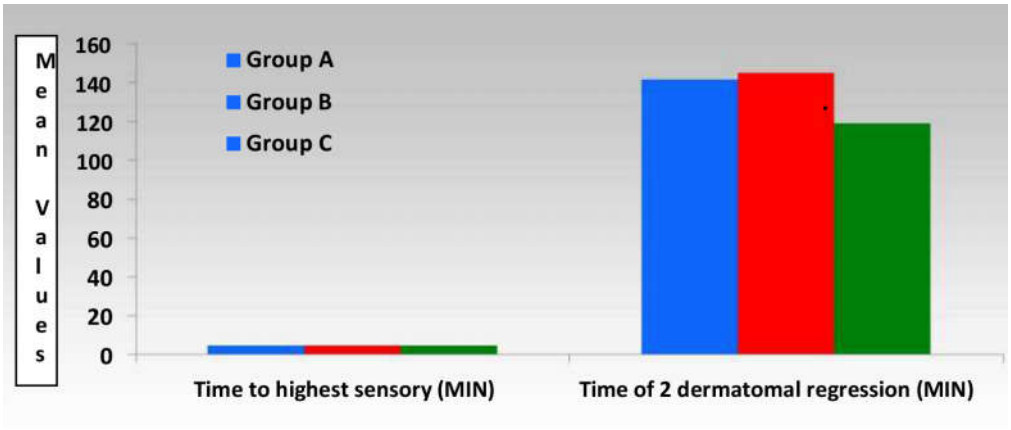

Fig. 8: Comparison of Time to achieve Highest Sensory Level and Duration of Sensory Block

Table 9: Comparison of Time to achieve Highest Sensory Level and Duration of Sensory Block

	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	Group A V/S Group B	P Value Group A V/S Group C	Group B V/S Group C
Time to highest Sensory (MIN)	2.3 ± 0.92	2.63 ± 1.16	42.70 ± 1.12	0.228	0.253	0.294
Time of 2 dermatomal regression (MIN)	121.33 ± 3.51	125.07 ± 4.74	148.70 ± 5.38	0.003	<0.001	<0.001

Table 10: Comparison of Onset and Duration of Motor Block

	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	Group C (n=30) Mean ± SD	Group A V/S Group B	P Value Group A V/S Group C	Group B V/S Group C
onset of motor block (Time to motor bromage 2 MIN)	3.53 ± 0.86	3.87 ± 0.97	3.87 ± 1.07	0.418	0.469	1
time to complete motor block (motor bromage 3 min)	4.17 ± 0.98	4.50 ± 1.07	4.63 ± 0.85	0.218	0.057	0.604
Duration of motor block (MIN)	120.37 ± 2.31	127.90 ± 6.82	120.63 ± 4.37	<0.001	0.988	<0.001

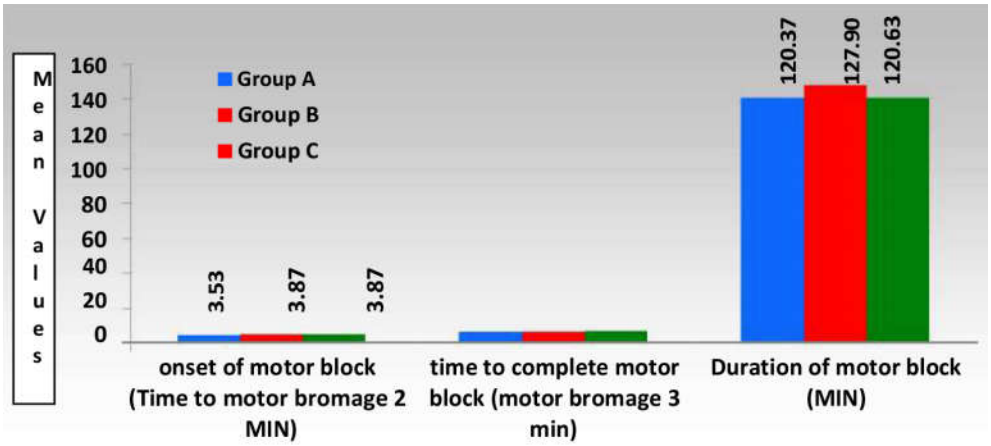

Fig. 9: Comparison of Onset and Duration of Motor Block

Adverse Effects

Table 11: Comparison of adverse effects among groups

Adverse effects	Group A Frequency (%)	Group B Frequency (%)	Group C Frequency (%)	P Value
Pruritus	0	0	0	
Nausea/vomiting	0	0	0	
Respiratory depression	0	0	0	

Discussion

In the present study we have compared the efficacy of nalbuphine (400 mcg in 0.5 ml), butorphanol (25 mcg in 0.5 ml) and normal saline (0.5 ml) with bupivacaine when administered by intrathecal route as an adjuvant to bupivacaine 0.5 % heavy (2.5 ml).

We have conducted this study on patients undergoing elective lower limb surgeries under spinal anesthesia.

90 patients of ASA grade I and II were divided into 3 equal groups of 30 patients each i.e. Group A (butorphanol), Group B (nalbuphine) and Group C (normal saline).

Group A - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + Butorphanol 25µg (0.5 ml)

Group B - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + nalbuphine 400ug (0.5 ml)

Group C - Intrathecal bupivacaine 0.5% heavy (2.5 ml) + normal saline (0.5 ml)

Patient characteristics across the groups

There were no significant differences in patient's age, sex distribution, weight, height and ASA status. Thus all 3 groups were comparable with respect to their demographic profile.

Onset of Sensory Blockade

Onset of sensory block was considered as the time

from intrathecal injection of drug to complete loss of sensation to pin prick at T10 level.

The onset of sensory block during present study was found to be earliest with Butorphanol (148.63± 2.54 sec) followed by Nalbuphine (169.90±2.40 sec) and Control (175.67±6.32 seconds) respectively and difference among them was found to be significant, ($p<0.001$). The onset was significantly faster with butorphanol and nalbuphine as compared to control group ($p<0.001$) ($p<0.001$). Also butorphanol group showed significantly earlier onset as compared to nalbuphine group ($p<0.001$).

Shaheda P et al, in their study to evaluate of the effect of intrathecal Nalbuphine as an adjuvant to spinal Bupivacaine for postoperative analgesia in patients undergoing abdominal hysterectomy found that the onset of sensory block was faster with Nalbuphine 1mg Group (1.63±0.57) as compared to control group (3.23±1.03) which was both statistically and clinically significant. Also similar results were observed by Ahluwalia P and Shakooh S in their respective studies that the onset of sensory block was faster with Nalbuphine (0.8 mg) Group as compared to control group which was both statistically and clinically significant [10,20]. Mukherjee et al in their study on intrathecal Nalbuphine as an adjuvant to subarachnoid block at doses of 0.2mg, 0.4mg and 0.8mg observed earlier sensory onset with nalbuphine groups without significant difference between different doses of nalbuphine [14].

Meitei AJ et al recorded delayed sensory onset with butorphanol group 25mcg (31.68+5.436) compared to control group (29.87+5.673) which was statistically and clinically insignificant whereas we found that butorphanol group shows significantly early onset of sensory block as compared to control group [21].

Also study done by Chari VR et al. on addition of intrathecal Butorphanol 25µg to bupivacaine 0.5% heavy to patients undergoing lower segment caesarean section, showed that onset of sensory block was comparable between both the butorphanol and control groups [15]. Also study conducted by Jyothi B. et al. on comparison of analgesic effect of different doses of intrathecal nalbuphine – 0.8, 1.6 and 2.5 mg with Bupivacaine and bupivacaine alone for lower abdominal and orthopedic surgeries, they found that onset was comparable among the groups with no difference on addition of increased doses of nalbuphine [18].

Similarly Tiwari A.K. et al. in their study compared intrathecal bupivacaine with a combination of nalbuphine and bupivacaine for subarachnoid block at doses of 0.2mg and 0.4 mg observed that onset of sensory block was comparable in all the groups [16].

Time Taken to Achieve the Highest level of Sensory Block

In our study, the time to attain highest level of sensory block was 4.3±0.92, 4.63±1.16 and 4.70±1.12 in Butorphanol, Nalbuphine and control group respectively. It was found that there was no significant difference among three groups ($p= 0.305$) and the groups were comparable.

In the study conducted by Meitei A.J. et al. on evaluation of intrathecal Bupivacaine alone and bupivacaine with butorphanol for lower segment caesarean section, they found that time taken to attain highest level of sensory blockade was similar and clinically and statistically insignificant ($p= 0.196$) between Butorphanol (297.50±115.1) and control group (242.80±89.7) [21] .

Similar results were observed by Chari VR et al. in their study of addition of intrathecal Butorphanol 25µg to bupivacaine 0.5% heavy to patients undergoing lower segment caesarean section, where they found that highest level of sensory block was attained by butorphanol group in 5.53±1.5 min and by control in 4.77±1.46 min which was statistically insignificant.($p>0.05$) [15].

This finding does not correlate with the values observed by Kaur M. et al. who in their study on comparison of intrathecal bupivacaine alone, sufentanil or butorphanol in combination with bupivacaine for endoscopic urological surgery, recorded delay in time required to attain highest sensory with butorphanol group (10.43±1.63) compared to control group (9.17±1.64) which was statistically and clinically significant [12].

The time for Two Dermatomal Segments Regression of sensory level

Duration of sensory block i.e. time to 2 dermatomal segment regression was longest with Nalbuphine group (145.07±4.74 min) followed by Butorphanol group (141.33±3.51 min) and Control group (118.70±5.38 min) in that order with significant difference ($p<0.001$). Duration of sensory block was significantly more with nalbuphine as compared to butorphanol ($p= 0.003$) and control group ($p<0.001$). Moreover, duration of sensory block was more with butorphanol as compared to control ($p<0.001$). Similarly, in study by Kaur M, Chari VR and Meitei AJ the duration of sensory block was found to be

prolonged with butorphanol as compared to control group [12,15,20]. Also Ahluwalia P, Shahedha P and Shakooh S, in their respective studies observed that addition of nalbuphine prolongs the duration of sensory block which was in agreement with the present study [10,20]. Similarly Jyothi B. et al in their study on comparison of analgesic effect of different doses of intrathecal nalbuphine – 0.8, 1.6 and 2.5 mg with bupivacaine and bupivacaine alone for lower abdominal and orthopedic surgeries observed significantly prolonged duration of sensory block in groups containing nalbuphine but was comparable among the different doses [18]. Whereas Mukherjee A and Tiwari AK observed that sensory block duration was significantly prolonged with higher doses of nalbuphine [14,16].

Onset of motor block and time to complete motor block

The time to onset of motor block (i.e. time from intrathecal injection to achievement of bromage 2) was 4.53±0.86, 4.87±0.97 and 4.87±1.07 minutes in Butorphanol, Nalbuphine and control group respectively. Also, the time taken to attain complete motor block (i.e. time from intrathecal injection to achievement of motor bromage 3) was 6.17±0.98, 6.50±1.07 and 6.63±0.85 minutes in Butorphanol, Nalbuphine and control group respectively. It was found that there was no significant difference among three groups regarding onset time and time to complete motor block ($p=0.314$), ($p=0.167$) respectively and the groups were comparable. Similarly Chari VR observed that time to onset ofmotor block and time to complete motor block were comparable in both butorphanol and control group [15]. Similar results were seen in studies done by Mukherjee A, Tiwari AK and Ahluwalia P were they observed that onset of motor block was comparable between nalbuphine and control group [14,16,20]. Also Meitei AJ observed that onset of motor block was comparable but control group reached complete motor block earlier as compared to butorphanol [21].

Whereas Shahedha P and Shakooh S in their respective studies observed faster onset of motor block with nalbuphine which was not in concordance to our study [21].

Duration of Motor Block

In our study, the duration of motor block was significantly prolonged in nalbuphine group (147.90±6.82 min) as compared to butorphanol and control ($p<0.001$). Whereas, the duration was comparable with butorphanol and control ($p = 0.988$).

Similar results were seen in studies conducted by Kaur M and Meitei AJ who observed comparable duration of motor block in butorphanol and control groups [12,20]. Also Ahluwalia P and Shakooh S in their respective studies observed that nalbuphine significantly prolongs the duration of motor block which were in agreement to our study [20,21]. Whereas Mukherjee A and Tiwari AK observed comparable duration of motor block between nalbuphine and control group despite increasing the dose of nalbuphine [14,16].

Conclusion

The addition of Nalbuphine in strength of 400 mcg and Butorphanol in strength of 25 mcg to 0.5% hyperbaric Bupivacaine intrathecally provide rapid onset and longer duration of sensory block. Though butorphanol showed rapid onset of sensory block as compared to Nalbuphine, the sensory block was longer lasting with Nalbuphine. Nalbuphine also increases the duration of motor block whereas Butorphanol does not.

Thus from our study, we conclude that both Butorphanol and Nalbuphine can be used as a safe adjuvant to local anesthetic for spinal anesthesia. Butorphanol showed faster onset of action and more prolonged duration of analgesia whereas Nalbuphine showed prolonged duration of sensor and motor block. This could be of value in geriatric patients undergoing lower limb surgeries as the quality and duration of block may be improved with a lower dose of local anaesthetic. Also the side effects like pruritus and the risk of respiratory depression may be obviated with the use of opioid agonist antagonist.

Since these two adjuvants have not been compared prior to the present study further studies are required in different centers with larger sample size.

Declarations

Funding: none

Conflict of interest: none

Ethical approval

Institutional ethical committee

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Comparison of Morphine with Nalbuphine as an Adjuvant to Caudal Bupivacaine: A Double blinded Randomized Study

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Abstract

Context: Caudal analgesia is the most preferred technique for pain relief in paediatric population using local anaesthetic drug along with other adjuvants such as morphine, fentanyl, nalbuphine, tramadol, clonidine. *Aim:* To compare the efficacy and assess the complications of morphine and nalbuphine as an adjuvant to caudal bupivacaine for post-operative analgesia. *Settings and Design:* It is a prospective randomized double blind control study , conducted in Melmaruvathur Adhiparasakthi Institute of Medical Sciences & Research over a period of six months from August 2017 to January 2018 after getting ethical approval. *Methods and Material:* Children fulfilling the inclusion criteria were randomly allocated to receive 1ml/kg of caudal bupivacaine 0.25% either with morphine 50ug/kg (group M) or nalbuphine 0.2 mg/kg (group N) following general anaesthesia. Post operative pain scores assessed using FLACC score and sedation using Modified Wilson scoring. Complications such as respiratory depression, vomiting, & pruritis were also noted. *Statistical analysis used:* Statistical analysis was performed using appropriate test with Graphic prism 5.0 software. *Results:* Two groups are comparable in age, sex & weight. The post operative pain scores were less in group M compared to group N and they are statistically significant ($p<0.05$) only at 0 (0.500±0.124 vs 0.866±0.114), 1 (0.667±0.66 vs 1.200±0.78) & 2 (1.400±0.498 vs 2.000±0.830) hours but they were not statistically significant at 4 (2.133±0.776 vs 2.567±1.006), 8 (3.400±0.959vs 4.200±1.003), & 12 hours (5.733±0.827 vs 6.500±1.841). Requirement of rescue analgesic were significantly longer in group M (11.93±1.98 hrs) compared to group N (9.150±1.29) and they are statistically significant ($p< 0.05$). Post operative sedation score are statistically significant between two groups. *Conclusions:* As an adjuvant to bupivacaine ,morphine has prolonged the duration of analgesia and decreased the use of rescue analgesic for around 12 hours but at this therapeutic dose, it is associated with higher life threatening complications such as respiratory depression, and other complications like nausea and vomiting whereas Nalbuphine has decreased the use of rescue analgesic for more than 8 hours and has not produced above mentioned complication . Hence the usage of morphine as an adjuvant can be replaced with nalbuphine in Pediatric surgeries.

Keywords: Caudal Analgesia; Morphine; Nalbuphine; Bupivacaine.

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Introduction

Pain control is the cornerstone in the management of pediatric anaesthesia as it alleviates patient distress and aids in rapid uncomplicated recovery. The incidence of pain was found to be 44% following surgery in pediatric population, out of which 64% patients had moderate to severe pain [1].

Caudal block is one popular reliable and safe technique that provides intraoperative and

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postoperative analgesia in lower abdominal ,lower limb, and urogenital surgeries in paediatric age groups[2]. Most of the time it is used for analgesia as an adjunct for general anaesthesia than as a sole anaesthesia but associated with one major disadvantage of shorter duration of action.

Various adjuvants were used to prolong the duration of block such as opioids, clonidine, neostigmine, tramadol, ketamine [3-5]. Opiods are commonly used as an adjunct to prolong the duration of block which includes morphine, tramadol, nalbuphine, fentanyl [3]. Morphine a natural opioid which acts on μ, κ, δ receptors used commonly since its discovery. It is associated with various side effects such as nausea vomiting, pruritis, urinary retention and life threatening respiratory depression. Even though it is associated with various adverse effects, the quality and duration of analgesia remains unmatched.

Nalbuphine is a mixed κ-agonist and μ-antagonist opioid of the phenanthrene group [6]. It is related in its chemical structure to the opioid antagonist naloxone. It provides good analgesia with minimal sedation, minimal nausea and vomiting, less respiratory depression and stable cardiovascular functions. Nalbuphine being an agonist- antagonist opioid is less likely to cause side effects such as pruritis, respiratory depression, urinary retention, excessive sedation, because of its action at kappa receptors [7-8]. The aim of this randomized double blind controlled trial was to compare the duration of post-operative analgesia, sedation and other side effects of single shot caudal epidural morphine versus nalbuphine mixed with bupivacaine in childrens in childrens undergoing herniotomy, phimosis repair.

Materials and Methods

After obtaining written informed consent from guardian and Research ethics committee approval from the institution this randomized controlled study was conducted in Melmaruvathur Adhiparasakthi Institute of Medical Science & Research over a period of six months from August 2017 to January 2018. Total of 60 patients of ASA classification I, Age 2-6 years old of either sex undergoing elective surgery such as herniotomy, phimosis repair were included in the study. Exclusion criteria includes abnormal coagulation profile, mental retardation, allergic to study drugs, infection at the site of injection, congenital anomaly of the sacrum.

After fulfilling the inclusion criteria patients were randomly assigned into two groups using the lottery method. Group M (n-30) received caudal bupivacaine 0.25% with morphine 50ug/kg and the other group N (n-30) received caudal bupivacaine 0.25% with 0.2 mg/kg nalbuphine. Total volume of 1ml/kg is used in all groups irrespective of the group.

All patients were kept fasting as per ASA NPO guidelines. After checking informed consent patient shifted to operative room and standard monitors such as NIBP, ECG, SpO_2, were attached. General anaesthesia induced with sevoflurane 6-8% with O_2 100% and intravenous (iv) line secured. ET tube of appropriate size selected and intubation achieved with succinylcholine 1mg/kg iv. Anaesthesia maintained with O_2:N_2O (50:50), Sevoflurane 1-2% with Atracurium at appropriate dose with controlled ventilation.

Patients positioned in lateral decubitus position, using 24G hypodermic needle, after negative aspiration for blood, patients of group M received 1ml/kg of 0.25% bupivacaine with 50ug/kg morphine and group N received 1ml/kg of 0.25% bupivacaine with 0.2mg/kg of nalbuphine. Documentation of SpO_2, PR, ECG, NIBP were monitored every 5 minutes until end of the surgery.

Patients with anal wink reflex were presumed to have incorrect drug placement and excluded from the study. Any increase in PR, BP >20% of its baseline value defined as inadequate analgesia. After surgery NM blockade was reversed and patient transferred to postoperative room and observed for 12 hours.

Primary outcome of the study is to know the duration of analgesia and time of rescue analgesia using pain score- FLACC score. FLACC (FACE, LEG, ACTIVITY, CRY, CONSOLABILITY) pain scale (Table 1) is a measurement used to assess pain in children between the age of 2 months and 7 years or in individuals not able to communicate, the score ranges from 0-10. Pain score of >4 is taken as time of first analgesic request, 0 is taken as no pain, and score of 10 as severe pain [9].

Secondary outcome to assess sedation score using Modified Wilsons sedation score (Table 2) and score ranging from 1-4, in which 1 indicates alert and maximum score of 4 indicates asleep, not arousal by verbal contact and complications such as respiratory depression, vomiting, pruritis are noted [3]. Respiratory depression is defined as fall in O_2 saturation (SpO_2-<92%) and decrease in respiratory rate [3]. Intravenous paracetamol used for rescue pain at a dose of 15mg/kg with minimum 4hours interval.

Table 1: FLACC Scale

Parameters	FLACC Behavioural pain assessment scale Score 0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdraw, disinterested	Frequent to constant frown, cleanched jaw, quivering chain
Leg	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Crying	No cry(awake or sleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs; frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to; distractible	Difficult to console or comfort

Score: 0:no pain; 1-3:mid pain; 4-7:moderate pain; 8-10:severe pain, FLACC:face, legs, activity, cry, and consolability.

Table 2: Modified Wilsons sedation score

Value	Patient state
0	Awake and alert
1	Minimally sedated:tired/sleepy, appropriate response to verbal conversation, and/or sound
2	Moderately sedated:somnolent/sleeping, easily aroused with light tactile stimulation or asimple verbal command.
3	Deeply sedated: deep sleep, aroused only with sigificant physical stimulation
4	Arousable

Statistical Analysis

Statistical analysis done using Graphic Prism software version 5. Data's were summarized using mean, standard deviation, median for quantitative variables and frequency, relative frequency for categorical variables. Quatitative variables analysed using Unpaired t-test, and categorical variables using chi square test.

Results

A total of 60 patients were included in the study, and randomly divided into Group M (n- 30 patients) and Group N (n-30 patients). Two groups were comparable in respect to age, gender, and weight of the patients. The mean age of the patient in group M found to be 4.167±1.25(Mean±SD) and group N 4.067±1.363.The mean weight of the patient in group M & group N are 14.93±2.63 and 14.07±2.53 respectively (Table 3).

Postoperative FLACC pain scores were less in group M compared to group N, and they were statistically significant($p<0.05$) at 0 (0.500±0.124 vs 0.866±0.114), 1 (0.667±0.660 vs 1.200±0.714), & 2 hours (1.400±0.498 vs 2.000±0.714) only but they were not statistically significant at 4 (2.133±0.776vs 2.567±1.006), 8 (3.400±0.959 vs 4.200±1.003), & 12 hours (5.733±0.827 vs 6.500±1.841) (Table 4). Post operative sedation scores were statistically significant ($p<0.05$) between Group M & N at 0, 1, 2, 4, 8, & 12 hours. But 8 patients of group M had

Table 3: Demographic data

	Group M	Group N	p- value
Age (Years)	4.167±1.25	4.067±1.363	0.771
Weight (Kg)	14.93±2.63	14.07±2.53	0.198
Sex (Male/Female)	21/9	19/11	-

Datas are expressed in Mean ± SD (Standard Deviation)

Table 4: FLACC pain score

	Group M	Group N	p-value
0 HRS	0.500±0.124	0.866±0.114	0.034
1 HRS	0.667±0.660	1.200±0.714	0.004
2 HRS	1.400±0.498	2.000±0.714	0.001
4 HRS	2.133±0.776	2.567±1.006	0.066
8 HRS	3.400±0.959	4.200±1.003	0.063
12 HRS	5.733±0.827	6.500±1.841	0.529

Table 5: Time of analgesic request & complications

	Group M (n-30)	Group N (n-30)	p-value
Time for rescue analgesics	11.93±1.98	9.150±1.297	<0.001
Complications (respiratory depression, vomiting, pruritis)	8	0	-

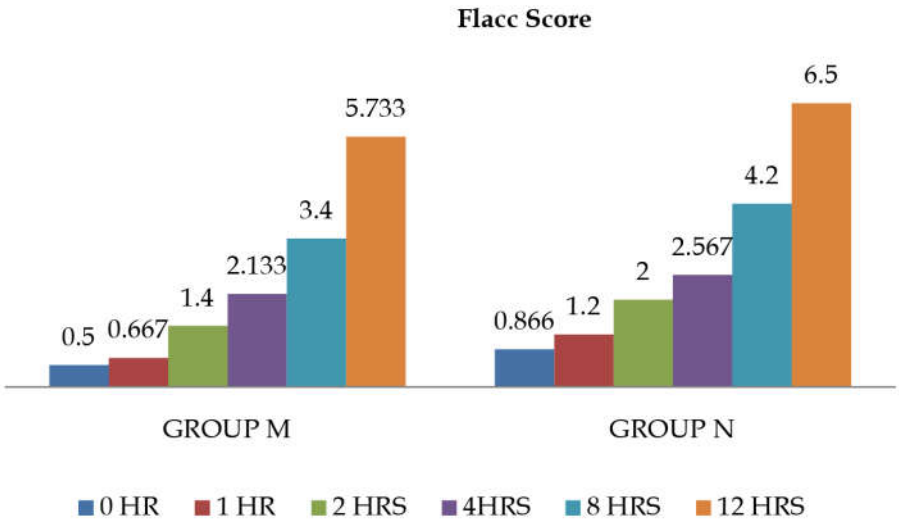

Fig. 1: Comparison of FLACC scale in both groups

complications like respiratory depression, vomiting and pruritis whereas none of the patients in group N had complication.

The first time requirement of postoperative analgesics was significantly longer in Group M (11.93±1.98) compared to group N (9.150±1.297) and they are statistically significant (p value<0.05) (Table 5).

Discussion

Caudal block is one of the most commonly perfomed blocks in paediatric population [3]. Local anaesthesia drugs are commonly used in caudal block for postoperative analgesia purpose. To decrease the toxicity of local anaesthesia drugs and to prolong the duration of analgesia, various adjuncts are used, especially opiods like morphine, fentanyl, nalbuphine, tramadol etc [4].

Two groups were comparable in respect to age, gender, and weight of the patient. The present study compares the use of caudal bupivacaine with adjuvants morphine and nalbuphine for postoperative analgesia using FLACC pain score and the time needed for rescue analgesics. Previous studies have demonstrated use of various dose of morphine for analgesic efficacy and their associated complications. Nalbuphine is also used as adjunct in caudal block and their efficacy has been studied. So this study was made to compare the efficacy of morphine and nalbuphine in caudal block and at the same time comparing the incidence of complication produced by these drugs at their therapeutic effect.

Assessment of pain scores in children is difficult, as they are unable to explain their feelings

especially in infantile age groups. Therefore in children no scale is considered as universal, so we used FLACC score to assess pain similar to Salama et al. [2].

In this study we found the pain scores in nalbuphine group were substantially more after 4 hours of surgery and their analgesic effect lasted for more than 8 hours, whereas in morphine group the analgesic effect lasted more than 12 hours. This results are similar to other study conducted by Salama et al. [2] a randomised control study in which they compared group LN receiving 0.125% levobupivacaine with nalbuphine 0.2mg/kg 1ml/kg and group L receiving 0.25% levobupivacaine 1ml/kg. The analgesic effect in group LN is similar to our study that lasted for more than 6 hours. Baduni et al. [3] used three different doses of morphine in three groups as 30ug/kg (GROUP I), 50ug/kg (GROUP II) and 70ug/ kg GROUP III) and the duration of analgesia in group II (50ug/ kg) is similar to our study. At the same time in our study complications associated with caudal opioids such as respiratory depression, nausea/vomiting is especially higher in opioid agonist group such as morphine as compared to agonist- antagonist drugs such as Nalbuphine [6]. Respiratory depression, the most deleterious side effect of caudal morphine increases with increase in dose of morphine as reported by Budani et al.[3] in which 3 patients had respiratory depression which is similar to our study. In our study 8 patients of group M had complications like respiratory depression, vomiting and pruritis whereas none of the patients in group N had complication like these. Similar to our study Vetter et al.[11] had compared single dose of caudal morphine 50ug/kg, clonidine 2ug/kg and hydromorphone 1ug/kg and they have found that morphine provides sustained initial analgesia, though with a higher incidence of postoperative nausea, vomiting and respiratory depression.

Conclusion

In conclusion we found that, as an adjuvant to bupivacaine, morphine has prolonged the duration of analgesia and decreased the use of rescue analgesic for around 12 hours but at this therapeutic dose, it is associated with higher life threatening complications such as respiratory depression, and other complications like nausea and vomiting whereas Nalbuphine has decreased the use of rescue analgesic for more than 8 hrs and has not produced above mentioned complication. Hence the usage of morphine as an adjuvant can be replaced with nalbuphine in Pediatric surgeries.

Acknowledgement

We are thankful to the department of General surgery and Urology for their kind cooperation to undergo this study.

Key Messages

Eventhough morphine and nalbuphine are good adjuvants for bupivacaine, the incidence of complications are higher in patients receiving morphine . Hence the morphine usage can replaced with nalbuphine in pediatric surgeries

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Original Research Article

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Comparative Study of Intrathecal Hyperbaric Bupivacaine, Hyperbaric Bupivacaine with Clonidine and Hyperbaric Bupivacaine with Magnesium Sulphate for Perioperative Pain Relief in Lower Limb and Infraumblical Surgeries

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Abstract

Background: Spinal anaesthesia is the primary anaesthetic technique for many types of surgery. Limiting the dose of local anaesthetic used in spinal anaesthesia has been an aggressive topic of study as it will achieve rapid anaesthetic recovery as well as reduce the incidence and severity of its side effects. *Context:* In our study we compared clonidine and magnesium as adjuvants to hyperbaric bupivacaine in spinal anaesthesia in terms of duration of sensory and motor block, sedation, respiratory depression and haemodynamic parameters. *AIM:* To compare Clonidine and Magnesium sulphate as adjuvants to bupivacaine heavy 0.5% for spinal anaesthesia in patients undergoing infraumbilical surgeries in terms of analgesic efficacy, duration of sensory block and adverse effects. *Settings and Design:* Conducted in ASA I-II patients with age group 18-60 years undergoing infraumbilical surgical procedures. Patients were randomly divided into three groups each of 25 patients. Group 1 (B) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine 0.2 ml NS; Group 2 (BC) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine+0.2 ml clonidine (30μg); Group 3 (BM) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine+0.2 ml MgSO4 (100mg. *Statistical analysis used:* The data of the study were recorded in the record chart and results were evaluated using statistical tests (ANOVA, student t-test, chi-square test and post hoc test, F-test whichever was applicable). *Results:* The onset of sensory block and motor block was significantly delayed in group BM as compared to group B and BC. The duration of motor block was significantly prolonged in the Group BM and BC as compared to Group B. *Conclusions:* Magnesium is superior to Clonidine as an adjuvant to bupivacaine for infraumbilical and lower limb surgeries.

Keywords: Hyperbaric Bupivacaine; Lower Limbs; Infraumblical Surgery; Clonidine; Magnesium Sulphate; Pain; Spinal Anesthesia.

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Introduction

Spinal anaesthesia, since its origin has been extensively used for lower abdominal and lower extremity surgeries with advantages over general anaesthesia like optimal operative conditions, minimal intraoperative blood loss, less incidence of post operative morbidity, intense analgesia and sufficient muscle relaxation for surgery[1]. Traditionally local anaesthetic solution of hyperbaric bupivacaine is most frequently used drug in spinal anaesthesia. After years of extensive research on different pharmacological agents studies are now being done with adjuvants like clonidine, fentanyl, dextomeditidine, magnesium and others. The focus of these studies is on increasing the duration of action of spinal

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anaesthesia, having better haemodynamic stability as well as using lesser amount of local anaesthetic agent.

Intrathecal clonidine is being extensively evaluated as an alternative to neuraxial opioids for control of pain and has proved to be potent analgesic, free from at least some of the opioid related side effects [2]. Intrathecal clonidine produces dose dependent analgesia and prolongs the duration of intrathecally administered local anaesthetics and has potent antinociceptive properties. Clonidine acts on alpha 2 adrenoceptors that are located on primary afferent terminals on neurons in the superficial laminae of the spinal cord and within several brainstem nuclei implicated in analgesia, supporting the possibility of analgesic action at peripheral, spinal and brainstem sites [3].

Magnesium sulphate was used intrathecally as early as 1906 by Meltzer and Haubold and was found to potentiate analgesia caused by other intrathecal agents. One of the important mechanisms for the persistence of postoperative pain is considered to be due to central sensitization which increases the excitability of spinal neurons [4]. This sensitization has been found dependent on N-Methyl D-Aspartate (NMDA) receptors activating excitatory aspartates and glutamates on dorsal horn. Magnesium sulphate is a noncompetitive antagonist of NMDA receptor. It has the potential to prevent central sensitization from peripheral nociceptive stimulation in a voltage dependant manner [5]. The analgesic effect is not due to direct action of magnesium but due to prevention of subsequent NMDA activation.

The aim of our study was to compare Clonidine and Magnesium sulphate as adjuvants to bupivacaine heavy 0.5% for spinal anaesthesia in patients undergoing infraumbilical surgeries in terms of analgesic efficacy, duration of sensory block and adverse effects.

Materials and Methods

The design of the study was prospective randomized control study. After obtaining informed consent from the patients and approval from the ethical committee of Indira Gandhi Medical College, Shimla, this study was conducted in ASA I-II patients with age group 18-60 years undergoing infraumbilical and lower limb surgical procedures within the time period extending from 1st July 2015 to 30th June 2016. Patients were randomly divided into three groups each of 25 patients.

- Group 1(B) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine + 0.2 ml normal saline.
- Group 2(BC) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine + 0.2 ml clonidine (30µg).
- Group 3(BM) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric

All patients were premedicated with tablet alprazolam 0.50 mg per orally night before surgery and 3 hours prior to surgery with a sip of water.

Monitoring was started with heart rate, non invasive blood pressure, pulse oximeter and electrocardiogram. Intravenous line was secured with 18 gauge cannula and intravenous infusion was started with crystalloid fluids. Spinal anaesthesia was given using 26 gauge Quincke's needle under all aseptic conditions at L_3– L_4 interspace in sitting position. Drugs were given slowly intrathecally at the rate of 0.2ml/second. Immediately after injecting the drug patients were kept in supine position.

Blood pressure (systolic blood pressure, diastolic blood pressure, mean arterial pressure), heart rate and peripheral oxygen saturation (SpO_2) were measured every 5 minutes for first 60 minutes, than every 10 minutes for next 1 hour. Vitals of all the patients were monitored for 2 hours after giving spinal anaesthesia.

The Following Parameters were Observed

- Onset of sensory block: from the time of injecting drug into subarachnoid space till complete analgesia at the level of T_{10}.
- Onset of motor block: assessed every 2 minutes till complete motor block will be achieved as per Modified Bromage Scale. (Score 1)

Modified Bromage Scale

Score	Definition
1	Total motor block
2	Total motor block, patient can only move his/her feet
3	Partial motor block, patient can move his/her knees
4	Patient can lift his/ her leg but cannot hold the position
5	No hip function, patient can lift and hold his/her leg for 10 seconds
6	No motor block

- Duration of sensory block: the time taken for two segment regression of the block from the maximum sensory block level.
- Duration of motor block: taken as the time from complete motor block (Modified Bromage 1) to time when lower limb can be moved freely (Modified Bromage 6).
- Sedation assessment: using Ramsay Sedation Scale.
- Side effects like Hypotenstion(mean blood pressure recording less than 20% of baseline), Bradycardia(heart rate less than 50/min), Respiratory depression(RR< 8 breath/min or SpO_2 < 90%), nausea, vomiting.

Analysis of data among groups was performed using appropriate statistical tests.

Inclusion Criteria

ASA physical status I or II with normal coagulation profile with age between 18 to 60 years, undergoing infraumbilical and lower limb surgical procedures within the time period extending from 1st July 2015 to 30th June 2016

Exclusion Criteria

Patients with history of allergy to amide local anaesthetics or clonidine or magnesium, bleeding or coagulation abnormalities, peripheral neuropathy, raised intracranial pressure, demyelinating central nervous disorders, local sepsis, spinal deformities, psychiatric diseases, valvular heart diseases and pregnant patients .

Study plan

All patients were premedicated with tablet alprazolam 0.50 mg per orally night before surgery and 3 hours prior to surgery with a sip of water.

Monitoring was started with heart rate, non invasive blood pressure, pulse oximeter and electrocardiogram. Intravenous line was secured with 18 gauge cannula and intravenous infusion was started with crystalloid fluids. Spinal anaesthesia was given using 26 gauge Quincke's needle under all aseptic conditions at L_3–L_4 interspace in sitting position. Drugs were given slowly intrathecally at the rate of 0.2ml/second. Immediately after injecting the drug patients were kept in supine position.

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- Side effects like Hypotenstion(mean blood pressure recording less than 20% of baseline), Bradycardia(heart rate less than 50/min), Respiratory depression(RR< 8 breath/min or SpO_2 < 90%), nausea, vomiting.

Analysis of data among groups was performed using appropriate statistical tests.

Statistical Analysis

Statistical analysis of data among groups was performed by using appropriate tests (ANOVA, Student t test, post hoc test).

Results

1. All the three groups were comparable in demographic variables like age and sex distribution. (p-value > 0.05)
2. The baseline parameters like heart rate, mean arterial blood pressure, and SpO_2 were comparable in three groups. (p-value > 0.05)
3. The onset of sensory block was significantly delayed in group BM as compared to group B and BC (Table 1).
4. The onset of motor block was significantly delayed in group BM as compared to group B and BC (Table 3).
5. The maximum sensory block level reached was significantly higher when we added Magnesium and Clonidine as an intrathecal adjuvants to Bupivacaine respectively (more with Magnesium than clonidine) (Table 2).
6. The time required to reach the maximum sensory level was significantly delayed in Group BM as compared to Group B and BC (Table 1).
7. The time for two segment regression was significantly more in Group BM and BC as compared to Group B (Table 3).
8. The duration of motor block was significantly prolonged in the Group BM and BC as compared to Group B (Table 3).
9. The sedation scores were more in the Group BC as compared to Group BM which were more than those in Group B which had least sedation scores (Table 4).

Table 1: Sensory assessment

Sr. No.	Group of Patients	TOS Mean	TOS S.D.	TOS p-value	Tmax Mean	Tmax S.D.	Tmax p-value
1	B	4.08	0.64	.607 (B Vs BC)	5.88	0.72	.267 (B Vs BC)
2	BC	4.40	1.53	.000** (BC Vs BM)	6.36	1.29	.000** (BC Vs BM)
3	BM	7.04	1.20	.000** (B Vs BM)	9.44	1.16	.000** (B Vs BM)

p > 0.05= not significant, p <0.05=significant (*), p < 0.001=highly significant (**)

Group 1 (B group) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine + 0.2 ml normal saline. Group 2 (BC) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine + 0.2 ml clonidine (30µg). Group 3(BM) received 14 mg (2.8ml of 0.5%) preservative free hyperbaric bupivacaine + 0.2 ml $MgSO_4$ (100mg).

Table 2: Maximum level of sensory block achieved

Sr. No.	HS Level	B No.	B % age	BC No.	BC % age	BM No.	BM % age	p- value
1.	T_4	0	0	6	24	9	36	
2.	T_5	3	12	9	36	10	40	
3.	T_6	10	40	6	24	5	20	0.000
4.	T_7	5	20	1	4	1	4	
5.	T_8	7	28	3	12	0	0	

p > 0.05= not significant, p <0.05=significant (*), p < 0.001=highly significant (**)

Table 3: Time for two segment regression and motor assessment

Sr. No.	Group of Patients	T_2seg reg Mean	T_2seg reg S.D.	T_2seg reg p-value	TOM Mean	TOM S.D.	TOM p-value	Motor duration Mean	Motor duration S.D.	Motor duration p-value
1	B	129.48	15.30	.000** (B Vs BC)	7.08	0.81	.888 (B Vs BC)	226.42	29.83	.000** (B Vs BC)
2	BC	169.72	11.85	.000** (BC Vs BM	6.96	1.13	.000** (BC Vs BM)	335.88	42.74	.000** (BC Vs BM)
3	BM	216.44	14.94	.000** (B Vs BM)	8.32	0.75	.000** (B Vs BM)	401.92	26.67	.000** (B Vs BM)

p > 0.05= not significant, p <0.05=significant (*), p < 0.001=highly significant (**)
T_2seg reg (Time for 2 segment Regression), **TOM** (time of onset of motar block)

Table 4: Assessment of sedation score

Sedation score	B		BC		BM		p-value
	Number of patients	%age	Number of patients	%age	Number of patients	%age	
1	3	12	0	0	1	4	
2	19	76	6	24	15	60	
3	3	12	11	44	9	36	
4	0	0	8	32	0	0	.000**
5	0	0	0	0	0	0	
6	0	0	0	0	0	0	

p > 0.05= not significant, p <0.05=significant (*), p < 0.001=highly significant (**)

Table 5: Assessment of side effects

Parameter	Group B		Group BC		Group BM		p-value
	Number	% age	number	% age	Number	% age	
Nausea	0	0	0	0	0	0	NS
Bradycardia	1	4	3	12	1	4	.435
Shivering	0	0	0	0	0	0	NS
Respiratory depression	0	0	3	12	2	8	.132

Table 6: Comparison of hypotension given in group B, BC and BM

Incidence of Hypotension	B		BC		BM		p-value
	Number of patients	%age	Number of patients	%age	Number of patients	%age	
Absent	20	80	13	52	18	72	
Present	5	20	12	48	7	28	0.004

10. None of the patients in any group experienced nausea, vomiting or shivering (Table 5).
11. 20% patients in group B, 48% patients in group BC and 28% patients in group BM had hypotension (Table 6).
12. 4% patients in group B, 12% patients in group BC and 4% patients in group BM had bradycardia (Table 5).
13. 12% patients in group BC and 8% patients in group BM had respiratory depression (Table 5).

Discussion

Not many studies have compared clonidine and magnesium as adjuvants to hyperbaric bupivacaine in spinal anaesthesia for infraumblical surgeries. Hence a study was undertaken to find out the effectiveness of hyperbaric 0.5% bupivacaine in subarachnoid block in infraumblical surgeries and also to compare clonidine and magnesium sulphate as adjuvants to hyperbaric 0.5% bupivacaine for spinal anaesthesia in patients undergoing infraumbilical surgeries in terms of analgesic efficacy, duration of sensory block, quality of sensory block and adverse effects.

- In our study, the mean time for onset of sensory block in group B was 4.08 minutes, in group BC was 4.40 minutes and group BM was 7.04 minutes. Our study compared with the study conducted by Shende et al. [6] who found no significant difference regarding the onset of sensory block at T10 level in both the clonidine groups and control group. Our study also compared with the study conducted by Khalili et al. [7] who had evaluated the effect of adding Mg to intrathecal hyperbaric bupivacaine and found that the onset of the sensory block was slower in the $MgSO_4$ group than in the control group.

  Our study does not compare with the study done by Tabdar et al. [8] who found early onset of sensory block in the Magnesium 100 mg group as compared to the control (hyperbaric bupivacaine 0.5%) group. The delay in onset of sensory blockade in our study is most probably caused by Mg causing an adverse change in the pH of the cerebrospinal fluid leading to delay in the onset.
- In our study, time for 2 segment sensory regression in control group B, BC and BM groups were

129.48 minutes, 169.72 minutes and 216.44 minutes respectively which was statistically significant. Our study corresponds to the study conducted by Shende et al. [6], Sethi et al. [9] , Saxena et al. [10], Agarwal et al. [12], Prabha et al. [13] who found that the regression of the level of sensory analgesia by two segments was significantly longer in the the clonidine group as compared to the control group ($p<0.001$). Our study corresponds to the study conducted by Tabdar et al. [8], Nath et al. [11] who found that the regression of the level of sensory analgesia by two segments was significantly longer in the the Magnesium group as compared to the control group ($P<0.001$).

- In our study, the duration of motor block was 226.42 min, 335.88 min and 401.92 min in control group B, group BC and group BM respectively which was highly significant statistically with a p-value of 0.000.Similar observations were made with the studies conducted by Shende et al. [6], Sethi et al. [9], Saxena et al. [10] and Prabha et al. [13] where they have found longer duration of motor blockade in clonidine groups compared to control group.Similar observations were made with the studies conducted by Khalili et al. [7] , Tabdar et al. [8] and Nath et al. [11] where they have found longer duration of motor blockade in Magnesium groups compared to control group.
- Our study showed that the patients receiving bupivacaine and bupivacaine with Magnesium had minimal sedation but when we added clonidine in bupivacaine, the sedation scores were more. Similar observations have been made in studies conducted by Shende et al. [6], Sethi et al. [9], Saxena et al. [10], Nath et al. [11]. Clonidine acting directly on the locus ceruleus produces increased incidence of sedation.
- In our study, heart changes can be explained by the fact that clonidine at dose of 30 micrograms does not cause stastically significant decrease in heart rate. The changes in systolic and mean arterial blood pressure readings are attributed to clonidine. Magnesium as adjuvant to bupivacaine doesnot cause stastically significant changes in any of the haemodynamic parameters. Similar hemodynamic changes were observed in the studies conducted by Tabdar et al. [8], Nath et al. [11], Agarwal et al. [12] and Prabha et al. [13] , Clonidine reduces sympathetic drive in the nucleus tractus solitarius and locus ceruleus of the brainstem, by activation of postsynaptic alpha2-adrenoceptors. In the periphery, activation of presynaptic alpha-2 adrenoceptors by clonidine at sympathetic terminals reduces their release of norepinephrine, which could cause vasorelaxation and reduced chronotropic drive.

Conclusion

In conclusion, both 30 µg clonidine and 100 mg Magnesium are an attractive alternative as an adjuvant with bupivacaine in subarachnoid block for infraumblical surgical procedures especially in those that need quite long time with minimal side effects and excellent quality of spinal analgesia. But on account of greater duration of sensory and motor block and lesser incidence of side effects like hypotension, on the basis of our study Magnesium is superior to Clonidine as an adjuvant to bupivacaine for infraumbilical and lower limb surgeries.

Acknowledgement

None

Conflict of Interest: Nil

Key Messages

Magnesium is superior to Clonidine as an adjuvant to bupivacaine for infraumbilical and lower limb surgeries.

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Original Research Article

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A Comparative Study of Intubating Conditions between Propofol-Fentanyl-Midazolam and Propofol-Fentanyl-Lignocaine Groups without Neuromuscular Blocking Agents

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Abstract

Introduction: Tracheal Intubation without the use of neuromuscular blocking drugs was used to assess the airway by laryngoscopy. We compared the effect of midazolam and lignocaine on intubating conditions along with propofol and fentanyl for intubating without neuromuscular blockers. *Aim:* To compare the intubating conditions and cardiovascular changes (post induction) between fentanyl, midazolam, propofol and fentanyl, lignocaine, propofol groups without using neuromuscular blocking agents. *Materials and Methods:* It is a prospective double blind randomized controlled study. After getting the ethical committee approval and informed written consent hundred patients undergoing elective surgical procedure under general anaesthesia with endotracheal intubation were selected. Group (M) received propofol 2.5mg/kg, fentanyl 2µg/kg, midazolam 0.03mg/kg. Group (L) received propofol 2.5mg/kg, fentanyl 2µg/kg, lidocaine 1.5mg/. Laryngoscopy was done 40 s after propofol administration. The patient's trachea was intubated with an appropriate size cuffed tracheal tube. *Results:* There is no statistical significance in patient characteristics and mallampatti and Cormack–lehane grading between these two groups.The statistical significance less time for laryngoscopy duration and Intubation attempt was successful in all (100%) patients in the M group than in the L group 43 out of 50 patients (86%). Changes in Mean arterial pressure was less with midazolam group than lignocaine group. *Conclusion:* We conclude that the propofol–fentanyl – midazolam combination is better compared to propofol– fentanyl– lignocaine combination in providing clinically acceptable conditions for intubation without significant cardiovascular changes without the use of neuromuscular blocking agents

Keywords: Midazolam; Lignocaine; Propofol; Layrngoscopy.

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Introduction

Tracheal Intubation without the use of neuromuscular blocking drugs was used to assess the airway by laryngoscopy and be useful in both predicted and unexpected difficult intubation and also in cases where neuromuscular blocking agents are either contraindicated or not required. The cardiovascular response to laryngoscopy and endotracheal intubation peaks at 1-2 minutes and returns to normal within 5-10 minutes.Though these sympatho adrenal responses are probably of little consequence in healthy individuals, it is hazardous to those patients with systemic diseases.

Aim: To compare the intubating conditions and cardiovascular changes (post induction) between

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fentanyl, midazolam, propofol and fentanyl, lignocaine, propofol groups without using neuromuscular blocking agents.

Materials and Methods

It is a prospective double blind randomized controlled study. The study was approved by the ethical Committee.

After getting the informed written consent hundred patients undergoing elective general surgical procedure under general anaesthesia with endotracheal intubation were selected and randomly divided into two equal groups.

Group (M): Fifty patients received propofol 2.5mg/kg, fentanyl 2µg/kg, midazolam 0.03mg/kg.

Group (L): Fifty patients received propofol 2.5mg/kg, fentanyl 2µg/kg, lidocaine 1.5mg/kg.

Inclusion Criteria

ASA I & II

Age 20-50yrs

All cases requiring GA

Exclusion Criteria

ASA III and IV

difficult airways Patients with

Patients posted for emergency surgery

Allergy to drugs

Randomization was done by draw of lots.The anaesthetist performing and scoring the laryngoscopy grading and tracheal intubation was blinded to the randomization group and the rest of the study was conducted by investigator who was blinded to the drug injected.

Patients shifted to operating table after 45 minutes. Intravenous access established with 18 gauges cannula and intravenous fluids started. Pre-oxygenation was done with 100% oxygen for 5 minutes.

M Group received propofol 2.5mg/kg, fentanyl 2 µg/kg, midazolam 0.03 mg/kg

L group received propofol 2.5mg/kg, fentanyl 2 µg/kg, lignocaine 1.5 mg/kg. Fentanyl and midazolam were administered 5min and lignocaine 20s before induction of anaesthesia with propofol.

Laryngoscopy was done 40s after propofol administration. The patient's trachea was intubated with an appropriate size cuffed tracheal tube and the cuff was inflated. Anaesthesia was maintained with 66% nitrous oxide in oxygen and 0.6% isoflurane using a carbondioxide absorption circuit. After intubation the haemodynamic measurements were obtained up to 5mins of post intubation period.

Statistical Analysis

All recorded data were entered SPSS 16.0V Software for determining the statistical significance. Mean and standard deviation for continuous variable and Percentages are given for categorical variables. Student's t test was used to compare the two groups on mean values of various parameters. Chisquare test was used to compare the two groups for categorical variables. P value taken for significance is <0.05.

Results

There is no statistical significance in patient characteristics and mallampatti and Cormack – lehane grading between these two groups.The statistical significance less time for laryngoscopy duration (p value is 0.00). In midazolam group compared to the lignocaine group.Mask ventilation was easy in all patients. Intubation attempt was successful in all (100%) patients in the M group and in the L group 43 out of 50 patients (86%) had successful intubation. There is no rocuronium requirement in the M group and in the L group seven patients required rocuronium (p value 0.01). Patients who are all received rocuronium were intubated successfully.

Overall clinically acceptable intubating conditions was 40 out of 50 patients (80%) in the compared to 28 out of 40 patients (56%) in L group. This difference was statistically significant (p value 0.01) (Table 1 and 2).

Laryngoscopy was easy in all patients in the M group. Laryngoscopy was difficult in 18 (36%) out of 50 patients in the L group (p value 0.00). seven patients in the L group had closed vocal cords requiring administration of rocuronium before intubation (p value 0.01).

Twenty two patients (44%) in the L group had sustained coughing (> 10 s) on intubation compared with the M group 5(10%) although this is statistically significant (p value is 0.00).

Table 1:

Group Duration Laryngoscopy (S)	N	Mean±Std. Deviation (S)	Minimum Duration (S)	Maximum Duration (S)	P value
M	50	13.62±1.652	11	17	0.00
L	50	15.4±2.1	12	19	

Group Laryngoscopy (S)	Grade	Frequency (N)	Percentage (%)	P value
M	Easy	50	100	0.00
L	Easy	32	64	
	Difficult	18	36	

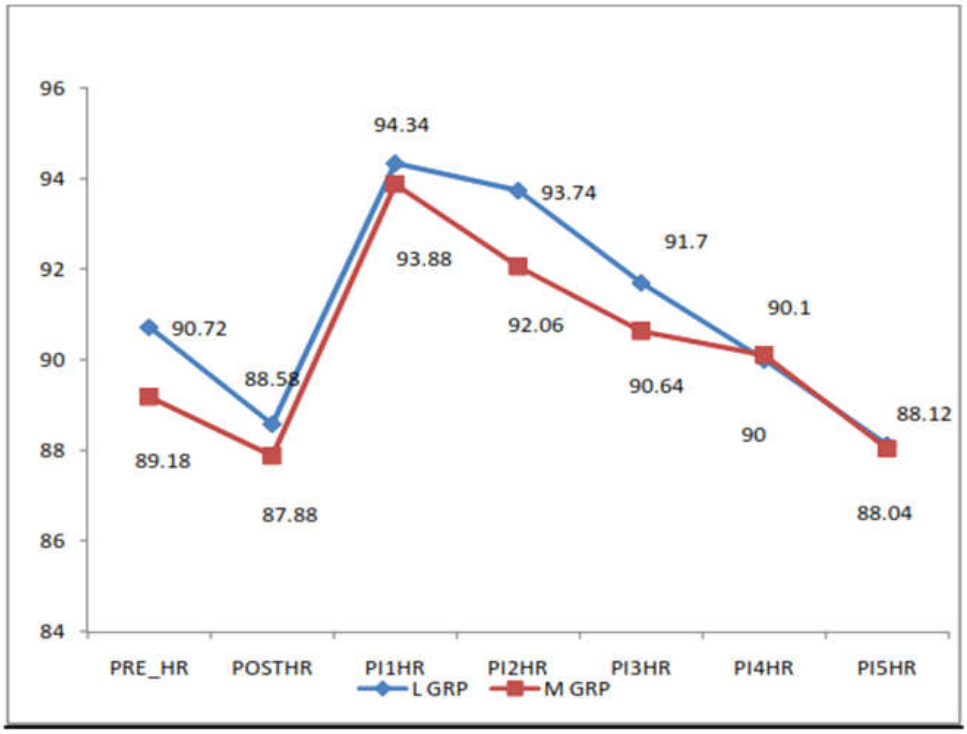

Fig. 1: Heart rate (per minute)

Table 2:

Group	Vocal cord Position	Frequency (N)	Percentage (%)	Rocuronium Requirement	P Value
M	Abduct	50	100	0	0.006
L	Abduct	43	86	0	
	Closed	7	14	7	

Group	Intubating conditions	Frequency (n)	Percentage (%)	Total	Rocuronium Requirement	P value
M	CA	40	80	50	0	0.01
	C-UA	10	20	100		
L	CA	28	56	50	7	
	C-UA	22	44	100		

CA – Clinically acceptable C-UA – Clinically unacceptable

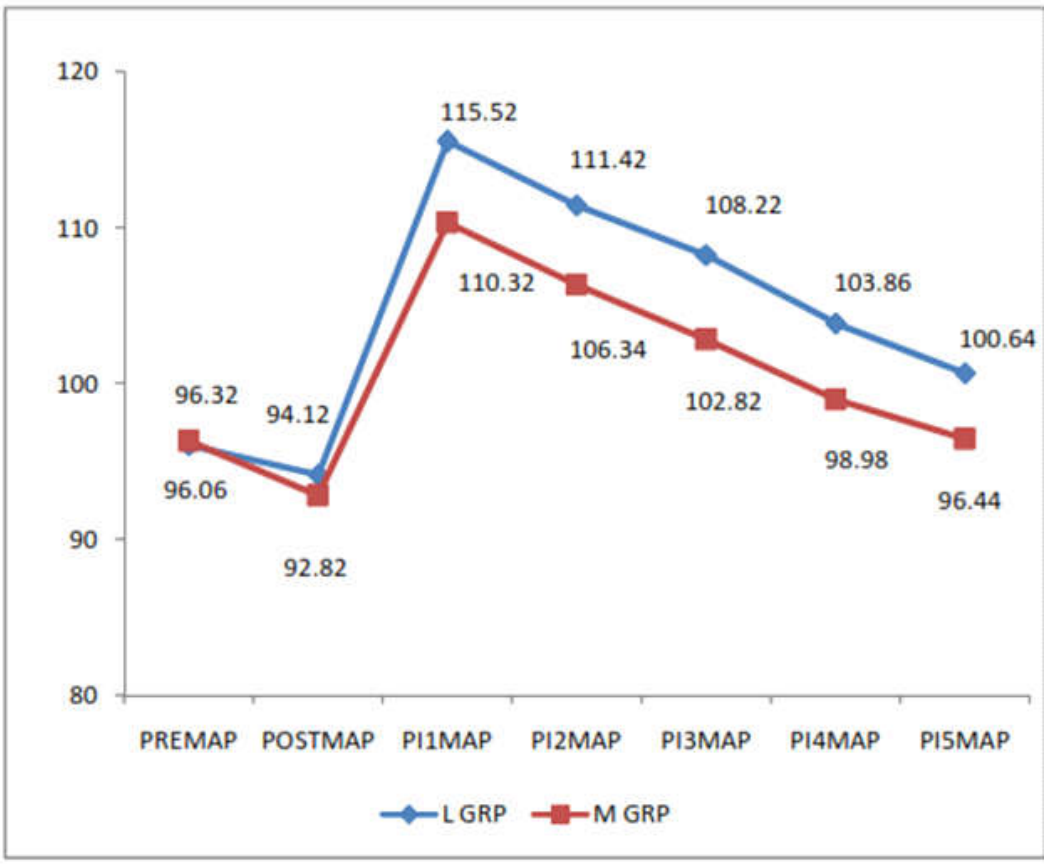

Fig. 2: Mean Arterial Pressure (mmhg)

In the L group 18 patients (36%) had vigorous limb movement compared with no limb movement in the M group (p value is 0.00).

Cardiovascular responses to induction and intubation are compared in both groups. There is no significant difference in heart rate of both groups. Statistical significance is not observed between the two groups up to induction (p value more than 0.05). After induction there is significant difference on mean arterial pressure between these two groups till the end of the study (p value less than 0.00). Between these two groups better hemodynamic stability was observed in M group. (Figure 1 and 2).

Oxygen saturation was maintained between 96% - 100% before as well as after induction of anaesthesia and tracheal intubation. There were no episodes of laryngospasm, bronchospasm, masseter spasm, or generalized rigidity were observed.

Discussion

Demographic profile

The two groups were comparable with respect to age, sex, height and weight in our study and are correlating with study done by prakash et al. [20] whose study also shows no statistical difference in patient characters.

Mallampatti grading

Airways of both group were compared and 44 patients (88%) in the M group, 45 patients (90%) in the L group comes under MPC grade – I, 6 patients (12%) in the M group , 5 patients(10%) in the L group comes under MPC grade –II. There is no statistical significance between these two groups. Prakash et al. [20] his study also showed no statistical difference between two groups in Mallampatti grading. Cormack and lehane laryngoscopy grading

Laryngoscopy view of both groups were compared and 45 patients (90%) in the M group, 47 patients (94%) in the L group comes under CLG grade–I, 5 patients (10%) in the M group, 3 patients (6%) in the L group comes under MPC grade–II. Thus the two groups did not differ statistically with respect to laryngoscopic view.

Prakash et al. [20] study which also no statistical difference between two groups in mallampatti grading.

Laryngoscopic duration

Duration of the laryngoscopy is defined as the time from start of laryngoscopy until tracheal intubation and removal of laryngoscope blade from the mouth. Laryngoscopy was performed 40 sec after propofol administration, maximum laryngoscopy duration in M group duration was 17sec, and L group it is 19 sec, minimum laryngoscopy duration of both groups are respectively 11secs (M), 12secs (L). Mean laryngoscopy duration of both groups are respectively 13.62secs (M), 15.4secs (L). Laryngoscopy duration was statistically significant between these two groups.

Prakash et al. [20] showed no statistical difference between two groups in laryngoscopy duration.

Laryngoscopy

In M group laryngoscopy was easy in all patients (100%) whereas in L group 32 (64%) had easy laryngoscopy, 18 (36%) had difficult laryngoscopy. It is statistically significant. In M group laryngoscopy was better than L group.

Prakash et al. [20] study showed Laryngoscopy was easy in all patients in the M group but difficult in two out of 40 patients in the L group

Lewis et al. [16] (1948) also showed in his study that there was difficulty in performing laryngoscopy in six patients. He used thiopental sodium as the sole agent to facilitate tracheal intubation without using neuromuscular blocking agents

Vocal cord position

It is abducted in 50 out of 50 patients in M group, 43 out of 50 patients in L group. In the L (lidocaine) group seven patients had closed vocal cords requiring rocuronium for intubation. It is statistically significant (p value 0.01). This is in concurrence with prakash et al. [20] study which showed five patients in the L (lidocaine) group had closed vocal cords and so these patients required rocuronium for intubation.

Coughing

In our study twenty two patients (44%) in the L (lidocaine1.5 mg/kg) group had sustained coughing (> 10 s) on intubation compared with five patients (10%) in the M (midazolam) group. This is statistically significant. p value is 0.00.

Prakash et al. [20] study showed sustained coughing (> 10 s) in the L group (17 patients) during intubation compared with the M group (10 patients).

Davidson et al. [5](1993) studied tracheal intubation with propofol, alfentanil and with or without intravenous lignocaine. His study showed better cough suppressant effect in lignocaine.

Houlton et al. [19] (1979) study showed equal cough suppressant effect in lidocaine compared to bronchodilators.

Yukiola et al. [32] (1985) study showed decreased incidence of cough when 2 mg/kg of intravenous lidocaine was given one to five minutes before intubation.

Hiller et al. [10] (1993) study showed lignocaine 1 mg/kg not enough to suppress the cough. He concluded that higher dose of lignocaine was required to suppress the cough reflex with propofol induction.

In the L group 18 patients (36%) had vigorous limb movement compared with no limb movement in the M group (p value is 0.00). This is in concurrence with Prakash et al. [20] study which showed that six patients in the L (lidocaine) group had slight limb movement compared with no limb movement observed in the M group.

Intubating conditions

In our study M group shows better intubating conditions in 40 out of 50 patients (80%), compared to 28 out of 50 patients (56%) in L Group. Clinically unacceptable intubating conditions in both groups was respectively 10 (20%) in M (g), 22(44%) in L (g). This difference was statistically significant (P value 0.01). There is no rocuronium requirement in M group. In L group seven patients required rocuronium, and over all intubating conditions were better in M group.

Prakash et al. [20] study showed better intubating conditions in midazolam group compared to lignocaine group.

Lewis et al. [16] (1948) studied after administration of thiopentone sodium 500-750 mg in 200 patients for oral intubation or blind nasal intubation without muscle relaxants. There were two failures in the blind nasal group.

Keaveny et al. [13] (1988) in his study used propofol 3 mg/kg and showed better intubating conditions.

Barker et al. [2] (1992) study showed lower incidence of laryngospasm and vocal cord movements following propofol induction compared to thiopentone induction, and is due to greater depression of laryngeal reflexes by propofol.

Grant et al. [7] (1998) study showed better intubating conditions with propofol 2 mg/kg and pre treatment with remifentanil 2 μg/kg. This dose was equal to 4 μg/kg of fentanyl.

Mulholland et al. [17] (1991) study showed no significant difference was found in the intubating conditions with intravenous pre-treatment with lignocaine 1.5 mg/kg.

Grange et al. [6] (1993) observed no significant difference in the quality of intubating conditions with intravenous pre-treatment with lignocaine or alfentanil.

Klemola et al. [15] (2000) study showed better intubating conditions was observed in remifentanil 4μg/kg –propofol 2.5 mg/kg comination.

Trabold et al. [29] (2004) study showed better intubating conditions was observed when remifentanil 1μg/kg was given after propofol 2.5 mg/kg with midazolam 0.03 mg/kg.

Heart Rate

In our study cardiovascular responses to induction and endo tracheal intubation were compared with midazolam and lidocaine groups. In both groups no difference in heart rate was found. (p value more than 0.05). This is in concurrence with prakash et al. [20] study that showed that there is no statistical significance in heart rate between two groups.

Mulholland et al. [17] (1991) study showed no difference in the heart rate to intubation with propofol (2.5 mg/kg) induction with pre-treatment with lignocaine 1.5 mg/kg.

Mean arterial pressure

In our study there was significant difference in mean arterial pressure after induction between these two groups till the end of the study. (P value less than 0.00). Between these two groups better cardiovascular stability was observed in M group. This is in concurrence with Prakash et al. [20] study that showed that there was statistical significance in mean arterial pressue between two groups. In his study better cardiovascular stability was observed in M group compared to L group.

Saarnivaara et al. [26] (1991) study showed better cardiovascular stability in propofol 2.5 mg/kg with alfentanil 30 μg/kg pretreatment Mulholland et al. [17] (1991) study showed no difference in the mean arterial pressure to intubation with propofol (2.5 mg/kg) induction with pre-treatment with lignocaine 1.5 mg/kg.

Klemola et al. [15] (2000) study showed better cardiovascular stability was observed in remifentanil 4μg/kg with propofol 2.5 mg/kg combination.

Trabold et al. [29] (2004) study showed better cardiovascular stability was observed in remifentanil 1μg/kg was given after s 2.5 mg/kg with midazolam 0.03 mg/kg.

Side Effects

In our study there were no episodes of laryngospasm, bronchospasm, masseter spasm, or generalized rigidity. This is in concurrence with Lewis et al. [16] study which showed that problems like coughing, laryngospasm occur during thiopentone induction alone without using neuromuscular blocking agents.

The propofol (2.5 mg/kg) induction has greater depression of laryngeal reflexes than an equipotent dose of thiopentone. The incidence of laryngospasm was lower with propofol compared to thiopentone [13].

The addition of fentanyl and midazolam potentiate the effects of propofol and reduce the dose requirement of propofol. Both propofol and midazolam has synergestic action due to interaction at GABA-A receptors in the central nervous system. The propofol dose was reduced by 52% in the presence of midazolam Midazolam has synergistic action with fentanyl for induction of anaesthesia. This synergistic effect is due to potentiation between opioids and benzodiazepines [1].

The cough suppressant effect of intravenous lignocaine is due to brain stem depression [11]. Lignocaine may act by anaesthetizing peripheral cough receptors in the trachea and hypopharynx [19] or by increasing the depth of general anaesthesia [8].

Endotracheal intubation is a stronger stimulus than laryngoscopy. Propofol with fentanyl combination was able to suppress motor and hemodynamic reactions to various noxious stimuli. Laryngoscopy was easier in most of the patients with either technique [14].

The tracheal intubation without neuromuscular blocking agents are not advised in patients with a full stomach, elderly patients and those with cardiovascular or cerebrovascular disease and in those patients undergoing neurosurgery or ophthalmic procedures.

The potentially serious and undesirable side-effects of succinylcholine are avoided and side effects such as anaphylaxis that can occur with the use of non-depolarizing drugs are avoided. The short acting opioids, such as remifentanil and alfentanil, when used in combination with propofol for

tracheal intubation are more advantageous in the aspect of good depth of anaesthesia and also stable hemodynamic profile [31]. In our study we used fentanyl as a opioid in combination with midazolam, propofol and lidocaine. Midazolam has synergestic action with fentanyl and propofol. So, the intubating condions and cardiovascular responses were better in propofol, midazolam and fentanyl group patients [32].

Conclusion

We conclude that the propofol–fentanyl–midazolam combination is better compared to propofol–fentanyl–lignocaine combination in providing clinically acceptable conditions for intubation without significant cardiovascular changes without the use of neuromuscular blocking agents.

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Conflict of Interest: Nil

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Comparative Study of Postoperative Analgesia with Epidural Bupivacaine Versus Epidural Bupivacaine and Tramadol

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Abstract

Background: Pain is constant and predominant complaint of individual following, most surgical intervention. Epidural narcotics have been in large number of studies for treatment of postoperative epidural n arcotic like morphine has adverse effects like respiratory depression, drug dependence and cannot be used in elderly. Hence this clinical study of epidural bupivacaine and epidural bupivacaine plus tramadol is undertaken to evaluate the feasibility has ef fective analgesia for postoperative pain relief. *Objectives:* To compare epidural bupivacaine and epidural bupivacaine plus tramadol for postoperative analgesia focusing on onset of analgesia, duration of analgesia, cardiorespiratory effects like pulse rate, blood pressure and respiratory rate, sedation. *Methods:* 100 patients belonging to ASA physical status I & II scheduled for abdominal, pelvic, lower limb surgeries, were randomly selected for study are divided into two groups of 50 patients each. Group B patient received 10 ml of 0.125% bupivacaine epidurally. Group B+T patient received 10ml of 0.125% bupivacaine+ 50 mg tramadol epidurally during their postoperative period, when they complain pain for the first time onset and duration of analgesia, haemodynamic parameters and adverse effects if any were studied. *Results:* There was no significant difference be tween two groups in mean time of onset of analgesia, 14.40±0.85 minutes with group B and 14.62±0.69 minutes with group B+T (p-value 0.14), total duration of analgesia in group B was 231.6±9.1 minutes and in group B+T was 350.60±15.9 minutes which was significant (p-value <0.05). Quality of postoperative analgesia, haemodynamic parameters and side effects were comparable between both groups. *Conclusion:* Epidural bupivacaine (10ml of 0.125%) plus 50 mg tramadol combination not only provides an adequate, rapid, excellent postoperative analgesia, but also has significant longer duration of analgesia compared to bupivacaine alone.

Keywords: Bupivacaine; Tramadol; Epidural; Postoperative Analgesia.

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Introduction

Pain has been a major concern of humankind since our beginning and it has been the object of ubiquitous efforts to understand and to control it. Today, as then, proper management of pain remains one of the most important and most pressing issues of society in general, the scientific community and the health care professionals in particular.

Pain is a consistent and predominent complaint of most individuals following most surgical interventions. Because of pain, these disadvantaged patients are often unable to breathe adequately and cough effectively. They may not be able to move enough even to carry out their own daily needs.

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Due to this, they may experience feelings of helplessness, fear, anxiety, low mode and loss of self control. The anesthesiologists, the health care providers have, the first and foremost, a moral and ethical obligation to help all patients manage their pain adequately, which may lead to better outcomes for both the patient and the health care system.

Various modalities have been tried to relieve the post-operative pain. Epidural analgesia with various drugs have been tried. Epidural narcotics have been tried in large number of studies for the treatment of post-operative pain. Epidural narcotics like morphine have adverse effects like, respiratory depression, drug dependence, pruritis and cannot be used in the elderly.

Tramadol, an opioid agonist and monoamine reuptake blocker has been shown to be a peri-operative analgesic without respiratory depression. It's analgesic potency is 1/5th to 1/10th as morphine. But it also has side affects like nausea, vomiting, urinary retention and hypotension.

Management of post operative pain is one of the most challenging and gratifying domains of anaesthesia. Use of epidural blockade has increased steadily in popularity for the management of moderate to severe pain following surgery. Anaesthetic drugs like lignocaine, bupivacaine along with analgesic additives like opioids and tramadol has been tried to reduce the post operative pain.

Bupivacaine is a local anesthetic drug belonging to amino amide group. It is the most commonly used local anesthetic in epidural anesthesia in post operative pain management. However sequel of sympathetic blockade like hypotension, urinary retention and loss of perineal sensation can occur with epidural bupivacaine. Bupivacaine is the currently available local anaesthetics with long duration of action and its maximum analgesic effect is upto 6-12 hours [1,2].

In recent years use of epidural narcotics has become wide spread. However the side effects like nausea, vomiting, and respiratory depression have lead to search for drugs with least side effects. Low dose offers new dimensions in the management of post-operative pain in Epidural administration of opioids in combination with local anaesthetic agents [3].

Tramadol, a synthetic opioid of amino cyclo hexanol group with analgesic properties has a low preferential action at mu opioid receptor. Tramadol, a synthetic 4-phenyl-piperidine analog of codeine, is a racemic mixture of two enantiomers, with synergistic anti-nociceptive interaction [4].

Equi analgesic dose of tramadol has much less effect on respiratory centre and thus has a high therapeutic action. Tramadol is equal in potency to pethidine. Epidural tramadol can provide effective post operative analgesia.

Hence this clinical study of epidural bupivacaine in comparison with epidural bupivacaine and tramadol is under taken to evaluate their feasibility as effective analgesics for post-operative pain relief.

The aim of present study is to determine the Effectiveness of Bupivacaine and Bupivacaine with Tramadol in post operative pain management.

Objectives

Comparison of epidural bupivacaine and epidural bupivacaine with tramadol for postoperative analgesia in relation with Onset of analgesia, Duration of analgesia, Cardio respiratory effects like pulse rate, blood pressure and respiratory rate and Sedation.

Methodology

The present study was conducted on patients undergoing surgery in Bapuji Hospital, Chigateri General Hospital and Women and Children Hospital attached to J.J.M. Medical College, Davangere.

Methods for Collection of Data

100 patients undergoing gynecological, lower abdominal, lower limb and urological surgeries would be randomly selected. Informed consent would be taken. Result values recorded using a preset proforma.

Inclusion Criteria

- ASA class I and II
- Aged between 20 to 60 years
- SBP 100-139- mmgHg
- DBP 60-89 mmgHg

Exclusion Criteria

- All patients above ASA-III grade
- All known contraindications to epidural anaesthesia like

① Patients with raised intracranial pressure

② Coagulation defects or haemophiliacs and patients on anticoagulants.

③ Uncooperative or apprehensive patients

④ Severe haemorrhage or shock

⑤ Local inflammation / infection

- In patients where epidural anaesthesia had to be converted to general anaesthesia.
- Patients who are pregnant and lactating mothers.

Anaesthesia Technique

The present study conducted on patients two groups of 50 each randomly

a. Group B - Patient receiving epidural 10 ml of bupivacaine (0.125%).

b. Group B+T - Patient receiving epidural 10 ml of bupivacaine (0.125%) and tramadol (50 mg).

After aseptic preparation of skin and local infiltration, an epidural puncture would be made by loss of resistance technique to air at L3/L4 or L2/L3 with Tuohy needle. Epidural catheter passed through the needle. Needle removed and catheter secured. 3cc of 2% xylocaine with adrenaline would be given as test dose. Intra operative anaesthesia achieved by sole epidural anaesthesia technique. The study begins in the post operative ward, when patient complained of pain, clinically correlating with visual analogue score (VAS) of 3, the test drug would be given epidurally by a randomized single blinded manner and onset of analgesia, duration of analgesia, vital parameters and sedation are noted.

Investigations like: Blood : Haemoglobin, TC, DC, BT, CT, RBS, Blood urea, Serum creatinine, HbsAg, HIV Chest X-ray, ECG Urine: Albumin, sugar and microscopy.

Observations made

a. Onset of analgesia

b. Duration of analgesia:

Duration of analgesia was calculated from the time of giving the drug to VAS score > 3.

c. Degree / quality of analgesia:

Quality of analgesia was assessed by Verbal response score.

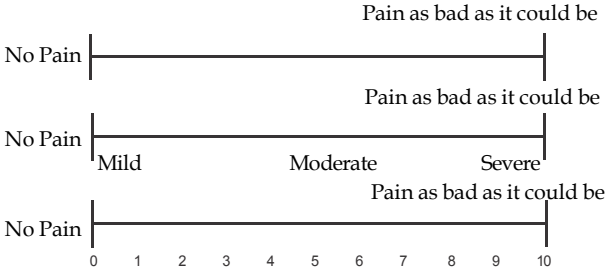

Fig. 1: Visual analogue score

Five point verbal response score (VRS)

Score	Subjective	
0	No pain relief	0%
1	Little (poor) pain relief	25% pain relief
2	Some (fair) pain relief	50% pain relief
3	A lot of (good) pain relief	75% pain relief
4	Complete pain relief	100% pain relief

d. Cardio-respiratory effects:

Cardiorespiratory effects were assessed by monitoring PR, SBP, DBP, and RR at 0, 1, 3, 5, 10, 20, 30, 45 and 60 minutes.

e. Side effects (if any) were noted

All the observations and particulars of each patient were recorded in a proforma.

Statistical Analysis

Descriptive statistics such as mean, SD and percentage was used to present the data. Comparison between two groups for quantitative data was done by using student 't test and for qualitative data was done by using chi-square test. A p-value less than 0.05 were considered as significant.

Results

The minimum age of the patient was 21 years and maximum age was 60 years. Age incidences between the two group were comparable.

In group B there were 2 males (4%) and 48 females (96%). In group B+T there were 4 males (8%) and 46 females (92%), sex distribution between the two groups were comparable.

Table 1: Time of onset of analgesia

Parameter	Bupivacaine		Bupivacaine + Tramadol		Mean Diff.	P- value
	Mean	SD	Mean	SD		
Onset of analgesia (min)	14.40	0.857	14.62	0.635	0.220	0.148 NS

Table 2: Duration of analgesia and Quality of analgesia

Parameter	Bupivacaine		Bupivacaine + Tramadol		Mean Diff.	P-value
	Mean	SD	Mean	SD		
Duration (min)	231.6	9.116	350.60	15.960	119.0	<0.001 Significant
Quality of analgesia	3.74	0.44	3.84	0.37	0.1	0.224 NS

Table 3: Pulse rate

Pulse rate (beats/min)	Bupivacaine		Bupivacaine + Tramadol		Mean diff.	p- value	Sig.
	Mean	SD	Mean	SD			
0 min	86.62	8.03	85.04	7.53	1.58	0.31	NS
1 min	86.32	8.103	84.92	7.62	1.40	0.37	NS
3 min	85.54	7.56	84.24	7.54	1.40	0.35	NS
5 min	85.16	7.41	84.0	7.59	1.16	0.43	NS
10 min	83.78	7.77	83.96	7.40	0.18	0.90	NS
15 min	83.66	8.17	83.46	7.49	0.20	0.89	NS
20 min	82.94	8.56	83.50	7.82	0.56	0.73	NS
30 min	82.64	8.13	82.96	7.21	0.32	0.83	NS
45 min	82.46	7.79	82.68	7.04	0.22	0.88	NS
60 min	81.62	6.84	82.72	7.23	1.1	0.43	NS

Table 4 : Systolic blood pressure (SBP)

SBP (mmHg)	Bupivacaine		Bupivacaine + Tramadol		Mean diff.	p- value	Sig.
	Mean	SD	Mean	SD			
0 min	123.2	5.55	120.32	6.53	2.88	0.001	S
1 min	123.04	5.49	119.84	6.33	3.20	0.02	S
3 min	120.80	5.64	118.00	5.99	2.80	0.008	S
5 min	119.64	5.85	116.48	6.17	3.16	0.01	S
10 min	118.24	5.68	115.20	5.88	3.04	0.01	S
15 min	117.05	5.88	113.40	6.03	3.64	<0.00	S
20 min	115.28	5.56	111.72	5.98	3.56	<0.00	S
30 min	114.12	5.53	110.32	5.90	3.80	<0.00	S
45 min	112.28	5.48	109.32	5.56	2.96	0.001	S
60 min	110.72	4.94	108.48	5.42	2.24	0.03	S

The mean time of onset of analgesia in group B was 14.40±0.857 minutes, in group B+T the mean time of onset was 14.62±0.635. The findings showed that the difference between the time of onset of analgesia in the two groups were statistically not significant (p=0.148) (Table 1).

The mean duration of analgesia in group B was 231.6±9.116 minutes and in group B+T was 350.60±15.960 minutes. The findings showed that time duration of analgesia in group B+T was statistically significant more compared to Group B (p<0.0001). In group B the mean of the quality of analgesia assessed by visual response score was 3.74 and in group B+T, mean score was 3.84. The findings showed that the quality of analgesia between the two groups were statistically insignificant (p=0.22) (Table 2).

The results revealed that the pulse rate between the two groups measured at 0, 1, 3,5, 10, 15, 20,30,45 and 60 minutes were statistically insignificant (p>0.05) (Table 3).

The result showed that the systolic blood pressure between the two groups measured at 0,1,3,5,10, 20,30,45 and 60 minutes were statistically significant (p<0.0001) (Table 4).

Statistical analysis by student s unpaired-t test showed that the diastolic blood pressure between the two groups measured at 0, 1, 3, 5, 10, 15, 20, 30, 45, and 60 minutes were statistically significant (Table 5).

Statistical analysis by student s unpaired-t test showed that the respiratory rate between the two groups measured at 0, 1, 3, 5, 10, 15, 20, 30, 45, and 60 minutes were statistically insignificant (Table 6).

In group B no side effects seen and in group B+T 4, patients had sedation. There is no significant difference of side effects between two groups (p=0.13) (Table 7).

Discussion

Management of post-operative pain still poses lot of challenge to anaesthetists paradoxically after all the efforts taken to make the intra-operative period pain free and stress free, the patient is left to fend themselves in the post-operative period.

"Pain free at rest" is a reasonable aim. Pain relief is necessary for both humanitarian and therapeutic reasons. Uncontrolled pain in the postoperative period can have detrimental physiological effects.

1. Pain can greatly impede the return of normal pulmonary function, inability to cough, bronchospasm–all leads to atelectasis and hypoxemia especially in upper abdominal and thoracic surgeries.
2. Pain promotes immobility and hence the development of deep vein thrombosis.
3. Alteration in the stress response to surgery, increased catecholamine release, increased oxygen demand and increased cardiac work.
4. Increased catabolic response to surgical trauma and impaired immune mechanisms and delayed wound healing.

Table 5: Diastolic blood pressure (DBP)

DBP (mmHg)	Bupivacaine		Bupivacaine + Tramadol		Mean diff.	p- value	Sig.
	Mean	SD	Mean	SD			
0 min	81.24	3.93	78.96	4.16	2.28	0.00	S
1 min	80.84	3.89	78.84	4.08	2.00	0.01	S
3 min	79.32	3.86	76.76	3.87	2.56	0.00	S
5 min	78.04	3.90	75.68	3.82	2.36	0.00	S
10 min	77.12	4.06	74.40	3.93	2.72	0.00	S
15 min	75.88	4.48	73.04	3.92	2.84	0.00	S
20 min	74.68	4.34	72.00	3.65	2.68	0.00	S
30 min	73.04	3.90	71.08	3.75	1.96	0.01	S
45 min	72.32	3.64	70.24	4.07	2.08	0.00	S
60 min	71.36	3.39	69.96	4.05	1.40	0.06	NS

* Student s unpaired „t test

Table 6: Respiratory rate (rr)

Respiratory rate (RR)	Bupivacaine		Bupivacaine + Tramadol		Mean diff.	p- value	Sig.
	Mean	SD	Mean	SD			
0 min	16.24	1.09	15.94	0.89	0.30	0.13	NS
1 min	16.16	1.06	15.74	0.94	0.40	0.05	NS
3 min	15.82	0.96	15.50	0.90	0.32	0.09	NS
5 min	15.62	1.04	15.42	1.03	0.20	0.33	NS
10 min	15.48	0.93	15.20	1.05	0.28	0.16	NS
15 min	15.18	0.87	14.96	1.02	0.22	0.25	NS
20 min	15.06	0.81	14.94	0.95	0.12	0.50	NS
30 min	15.08	0.77	14.80	0.94	0.28	0.11	NS
45 min	14.88	0.68	14.60	0.96	0.28	0.09	NS
60 min	14.72	0.75	14.36	0.94	0.36	0.03	S

* Student s unpaired t-test

Table 7: Side effects

Side effects	Bupivacaine		Bupivacaine + Tramadol		P-value
	No	%	No	%	
Nil	50	100	46	92	0.13
Sedation	0	0	4	8	

Hence, its relief undoubtedly decreases morbidity and mortality. In recent times, the role of epidural tramadol for the relief of postoperative pain promotes a new platform in this field. This is because of low preferential action at μ opioid receptor. Equation an analgesic dose of tramadol than much less effect on respiratory center and than has a high therapeutic action.

Bupivacaine is a long acting amide local anesthetic. It is 3-4 times more potent than lignocaine. It was synthesized by Ekenstam et al in 1957. Bupivacaine when used epidurally for postoperative analgesia causes good pain relief with mild hypotension and motor blockade as its chief side effects.

Here an attempt is made to assess the efficacy of Bupivacaine and Bupivacaine + Tramadol combination through epidural route in management of postoperative pain.

A total number of 100 patients, belonging to age group 20-60 have been taken. Out of which mean age of Group B (receiving epidural Bupivacaine was 41.9 years and in group Bupivacaine + Tramadol was 42.3 years. Hence, all of these groups were comparable as regards to age.

Patients undergoing lower abdominal, lower limb gynaecological and urological surgeries were selected, patients were randomly divided in 2 groups of 50 each; group B (Bupivacaine) and group B+T (Bupivacaine + Tramadol). All surgeries were done under epidural anaesthesia. In postoperative period as soon as patients complained of pain, patients in group B received 10 ml of 0.125% isobaric bupivacaine and group B+T received 10 ml of 0.125% isobaric Bupivacaine + 50 mg Tramadol epidurally.

Onset of Analgesia

In our study, the mean time of onset of analgesia in group B (Bupivacaine) was 14.40 minutes and in group B+T (Bupivacaine + Tramadol) was 14.62 minutes. The statistical analysis showed that, the difference in time of onset of analgesia in the 2 groups were statistically insignificant ($p>0.05$).

A study comparing combination of 50 mg Tramadol to 0.5% Bupivacaine and 50 mg fentanyl + 0.5% bupivacaine, by Duman A, et al. shown that there is no difference in the onset of analgesia in combination of 50 mg Tramadol to 0.5% Bupivacaine. These findings were similar to our study [5].

Duration of Analgesia

In our study the mean duration of analgesia in group B was 231.6 minutes and in group B+T was 350.6 minutes. The duration of analgesia when compared between the two groups was statistically significant ($p<0.001$).

In a study by Saleem Sabar et al. [6], 60 patients equally divided into 2 groups. Group I received 0.5% Bupivacaine 20ml epdiurally and group II received 0.5% Bupivacaine 20 ml and Inj. Tramadol 1.5mg/kg epidurally. The results were out of 60 patients the duration of postoperative analgesia in group I was 3.8±0.28 hours and in group II it was 7.60±0.31. Conclusion was that addition of tramadol 1.5 mg/kg to 0.5% Bupivacaine given epidurally produces prolonged postoperative analgesia as compared to Bupivacaine alone in patients undergoing lower abdominal surgeries. In the study by Singh et al the mean duration of analgesia in Group A patients was found to be 180.00±15.19 minutes, whereas in Group B patients it was 300.88±22.07 minutes [3].

Quality of Analgesia

Quality of analgesia was assessed at the time when rescue analgesia was given to the patient using verbal response score. In our study there was no significant difference in the quality of analgesia between in the two groups.

Saleem Sabar et al. [6], did a study comparing 0.5% bupivacaine and 0.5% Bupivacaine + 1.5 mg/kg Tramadol. Their study showed that both the group had effective analgesia and there was no difference in the quality of analgesia between the groups.

Cardio Respiratory Effects: Pulse Rate and Blood Pressure

In our study the two groups did not differ significantly in pulse rate and changes in these parameters were insignificant in these two groups and there was change in blood pressure, which was statistically significant between two groups in our study.

In a study by Saleem Sabar et al. [6], comparing 0.5% bupivacaine and 0.5% Bupivacaine + Tramadol showed that haemodynamic changes were similar and comparable between the two groups. The findings in above mentioned studies are comparable to our study.

Respiratory rate

In our study the two groups did not differ significantly in respiratory rate at any interval. The changes in the respiratory rate were insignificant between the two groups.

A study conducted by Saleem Sabar et al. [6], also showed that there were no significant changes in the respiratory rate between the two groups.

Side effects

In our study 4 patients in the Bupivacaine+ Tramadol group (B+T) had sedation. No patient in the Bupivacaine group had sedation. The side effects between the two groups were found to be insignificant.

A study conducted by Akrity et al. [7], also showed that the side effects were statistically insignificant between the two groups. In their study no patient in the Bupivacaine group had sedation. The findings in above mentioned studies are comparable to our study.

Conclusion

It was concluded that epidural Bupivacaine and epidural Bupivacaine + Tramadol combination provide an adequate, rapid and excellent postoperative analgesia.

The duration of analgesia was found to be longer when tramadol was added to Bupivacaine.

There were no significant differences in onset, quality of analgesia, respiratory effects when tramadol was added to Bupivacaine and there was significant fall in BP in both groups, which may be attributed by Bupivacaine. There was no significant increase in the incidence of side effects with the addition of Tramadol.

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Original Research Article

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Comparison of Intravenous Tramadole versus Rectal Tramadole for Postoperative Analgesia Following Appendectomy

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Abstract

Background and Aim: Tramadol is atypical opioid having central as well as peripheral analgesic action. It acts on opioid receptors as well as having effect on neuronal reuptake of nor epinephrine and serotonin. In this study, the effects of tramadol given by two different routes, intravenous and rectal, were compared in terms of analgesic efficacy and duration as well as its side effects in appendectomy patients. *Material and Methods:* Forty patients of acute appendicitis undergone appendectomy under spinal anesthesia between age group of 20 to 50 years, of either sex having weight of 40 to 70 kg and ASA 1 or 2 physical status were included in the study to receive either Tramadol 100mg intravenously (Group A) or 100 mg rectal suppository (Group B) at the end of surgery. First onset of pain, VAS score, rescue analgesic requirement and side effects noted. *Results:* Demographic parameters were comparable in both groups. Mean duration of first onset of pain in group B (417.5±128.22min) was longer than group A (304±86.16 min) and it was statistically significant (tailed significance value of 0.0010). Rescue analgesic requirement was significantly prolonged in group B than group A. Also incidence of postoperative vomiting was less in group B than group A (5% Vs 20%). *Conclusion:* Rectal tramadol can be better alternative to intravenous tramadol for postoperative analgesia in appendectomy.

Keywords: Analgesia; Appendicitis; Pain; Tramadol.

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Introduction

Pain is a subjective manifestation of unpleasant, personal and nontransferable experience and includes both sensory-discriminative and motivational affective components. Surgical pain is produced by tissue injury involving physical and chemical body mechanisms. The Joint Commission Accreditation of Healthcare Organizations 1 has described pain as the fifth vital sign in 2001. Due to its importance, pain should be evaluated and recorded along with other vital record keeping. Surgery is important cause of acute pain. Acute appendicitis is a very common disease with prevalence of 8.6 and 6.6% among men and women respectivelly [2,3,4]. Generally 7% of total population undergoes appendectomy. Something between 30 to 40% patients undergoing abdominal surgery suffer from moderate to severe pain [5]. Various parameters such as type of surgery, duration of surgery, type of anesthesia, mental and emotional status of patient etc. influence the severity of pain felt by patient [6]. For decreasing postoperative pain different methods

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and medicines are used. These include different opioid, non-steroidal anti inflammatory drugs (NSAID), local anesthetic infiltration, use of PCA (patient controlled analgesia) pumps, epidural technique and so on. Opioid and NSAID are cost effective and very commonly used. Systemic opioid use, can be associated with side effects such as nausea, vomiting, respiratory depression, constipation, itching, dizziness etc [7,8]. In addition systemic NSAID can be associated with rash, analgesic nephropathy, exacerbation of peptic ulcer disease, bleeding etc. Tramadol is atypical opioid that have moderate affinity for mu receptor and weak kappa and delta opioid receptor affinity. In addition mu opioid agonist effect, tramadol enhances the function of spinal descending inhibitory pathway by inhibition of neuronal reuptake of nor epinephrine and serotonin as well as pre-synaptic stimulation of serotonin release. Tramadol is well tolerated by patients. Compared to morphine, tramadol has much less respiratory depression, cardiac depression, light headedness and sedative effect. Also addiction and abuse is much less with tramadol [9,10,11]. The only troublesome side effect of tramadol is nausea and vomiting. That can be prevented by antiemetic drugs [12,13]. Tramadol is available in all formulations i.e. oral, injectable (intramuscular, intravenous, intrathecal) and rectal. Tramadol used by different routes such as intravenous, intramuscular, rectal or local infiltration etc. have analgesic efficacy with different duration and variable incidence of side effects [14,15,16,17]. Some found local infiltration of tramadol and rectal tramadol having longer analgesic duration with less nausea and vomiting incidence. Intravenous tramadol is commonly used. However, rectal route of tramadol is not much studied. With this background we have decided to compare intravenous tramadol 100mg versus rectal tramadol 100mg for postoperative analgesia in appendectomy patients with following objectives: To study analgesic efficacy and duration with intravenous and rectal routes of drug administration and to study incidence of side effects if any.

Material and Methods

The study was prospective, randomized, comparative and hospital based. It was conducted on forty patients of either sex, presented with acute appendicitis and undergone emergency appendectomy by Mcburney's approach under spinal anesthesia after appropriate approval.

Inclusion Criteria

1. Age group of 20 to 50 years
2. Weight of 40 to 70 kg
3. American society of anesthesiologist's (ASA) 1 or 2 physical status.
4. Patient with written informed valid consent.

Exclusion Criteria

1. Pediatric and geriatric debilitated patients
2. Patient having known drug allergy
3. Patient with ASA status of 3 or more
4. Patients found to have intra-abdominal collection on ultrasonography (suggestive of appendicular perforation).

With complete evaluation, investigations and written informed valid consent patients were randomly divided into two groups of 20 each as group A or group B by picking up random numbered chits labeled as either 'Intravenous' or 'Rectal'. Also preoperatively patients were explained about visual analogue scale (VAS), a 10 cm line with 0 cm equaling no pain and 10 cm worst pain ever felt.

After taking patient on operation table multipara monitor applied and baseline parameters noted. Intravenous line secured with 20 gauge intracath and infusion of ringer lactate started with injection ranitidine 50mg and injection metoclopramide 10 mg added to it. Spinal anesthesia given with 25 gauge spinal needle in L3-L4 interspace with 0.5% bupivacaine heavy 3 c.c. with desired level of T6. Appendectomy done by Mcburney's approach. At the end of surgery depending upon randomization 100 mg tramadol given intravenously to group A patients and 100 mg tramadol suppository inserted per rectally in group B patients for postoperative analgesia by anesthesia resident who picked up random numbered chit. Also he was not involved in any data collection. This was considered 0 hour. Both patient and data collecting anesthetist did not know the route of administration of tramadol. Post operatively time of first onset of pain noted. Also VAS score noted at 1, 2, 4, 6, 8, 10, 12 & 14 hour. At VAS score of 4 or more rescue analgesic had given with injection diclofenac 75 mg intramuscularly. Postoperatively side effects if any were noted. Incidence of nausea-vomiting and local rectal site burning or discomfort noted in all patients of both groups.

Statistical Analysis

Qualitative data will be expressed as percentages and proportions. Quantitative data will be expressed as mean and standard deviation. The differences between two groups with respect to continuous variables will be analysed using t-test while categorical variables will be analysed using chi-square test. All the statistical tests will be performed in SPSS version 15 software. p value <0.05 will be considered as statistically significant while P value < 0.01 will be considered as statistically highly significant. The between group comparison of compressive strength of samples in Group A and B was done using One- way ANOVA test. Within group comparison was done using Bonferroni correction test. In the tests, p value of ≤ 0.05 was considered as statistically significant.

Results

Demographic parameters like age, sex and weight were comparable in both groups (Table 1). In our trial with randomization sex ratio was comparable in both groups. 16 patients had ASA status of 1 and 4 had ASA status of 2 in each group. In group A out of 4 patients of ASA 2 two patients had controlled hypertension, one had controlled diabetes and one had mild anemia. In group B two patients had controlled hypertension, one had asthma history and one had borderline raised liver enzymes.

Discussion

Pain is an unpleasant sensory and emotional experience of varying intensity. It can be caused by actual or potential damage or described in such type of damage. Postoperative pain is important in causing psychological trauma to the patient. It leads to a restless and uncooperative patient. Meticulous management of postoperative pain is very important for early mobilization and discharge of patient as well as for good patient satisfaction. Opioid are commonly used in management of postoperative pain. Tramadol is atypical opioid being having action on opioid receptor as well as effect on nor epinephrine and serotonin pathways. It has fewer side effects as compared to morphine. It thus seems that tramadol may be suitable to treat postoperative pain. Use of same drug by different routes lead to alteration in onset, duration, efficacy and incidence of side effects. In per operative period, considering NBM (nil by mouth) period oral route is not feasible and may cause gastric bloating, nausea or vomiting. Intramuscular route is painful. After intravenous administration of tramadol peak concentrations are reached rapidly. This has been associated with postoperative nausea and vomiting. This limits the use of tramadol as a postoperative analgesic, especially in day surgery [18]. Rectal suppository of tramadol may be an alternative in this situation. In our study we have compared intravenous versus rectal tramadol for postoperative analgesia in appendectomy patients. Patients when awake generally dislike rectal administration of drug. In our study we introduced tramadol suppository under effect of spinal anesthesia at the end of surgery, avoiding patient discomfort. A rectal dose of 1.5–2.0 mg/kg is therapeutic [19]. Therefore; we selected a dose of 100 mg in our study for suppository. Tramadol is rapidly distributed after intravenous administration and the onset is fast with a distribution half-life in the initial phase of 6 minute [20]. After rectal administration, tramadol was detected from 5 minute up to 10 hour in dogs. After suppository, though absorption of the active ingredient was rapid, its metabolism quickly transformed the parent drug to high levels metabolites such as N-desmethyl-tramadol (M2) and N, O-didesmethyl-tramadol (M5) [21]. The exact

Table 1: Demographic parameters of study participants

Parameters	Group A(IV tramadol) Mean±SD	Group B(Rectal tramadol) Mean±SD	1-tailed significance value
Age (Years)	29.95±8.8998	27.8±8.6304	0.2214
Weight (kg)	58.65±3.8835	58.3±4.9214	0.4020
Sex (M/F)	12/8	12/8	

Table 2: Duration of surgery among study participants

Parameters	Group A(IV tramadol) Mean±SD	Group B(Rectal tramadol) Mean±SD	1-tailed significance value
Duration of surgery (minute)	54.75±12.5105	50.5±12.9675	0.1490

Table 3: Rescue analgesic requirement No. of patients with %

A t hour	Group A (IV tramadol)	Group B (Rectal tramadol
1	0	0
2	0	0
4	0	0
6	9 (45%)	1 (5%)
8	8 (40%)	8 (40%)
10	3 (15%)	3 (15%)
12	0	2 (10%)
14	0	5 (25%)

duration of analgesia after tramadol suppository is to be studied in brief yet. In our study the mean duration of analgesia i.e. mean duration of first onset of pain in rectal tramadol group was longer i.e. 417.5±128.22 minute as compared to 307±86.16 minute in intravenous tramadol group which was statistically significant. We studied VAS score in both groups and gave rescue analgesic at score of 4 or more. In our study, it was shown that 45% of the patients needed first rescue analgesic at 6 hour in intravenous tramadol group (group A) whereas only 5% of the patients in rectal tramadol group (group B) needed it, which was a significantly lower proportion. By the end of 8 hours and 10 hrs total of 85% and all 100% patients received rescue analgesic in intravenous tramadol group respectively. By the end of 8 hours and 10 hours total of only 45% and 65% patients in suppository group received rescue analgesia respectively. Remaining 10% and 25% patients in suppository group needed rescue analgesia at 12 and 14 hours respectively. (Table 3) Thus the duration of analgesia was prolonged with Group B, which was observed by time for first onset of pain, time for need of rescue analgesic and percentage of patients who required it in both groups. The maximal plasma concentrations of tramadol and its metabolite (O-demethylatedtramadol) were 200 and 35 ng/ml at 2.4 (1.0) and 3.9 (1.1) hour after rectal administration. After the 2 mg/kg dose of tramadol, the time interval of therapeutic concentration would be 8.6 (1.1) hour and it could be correlated with the duration of analgesia. M1 contributes to the analgesic effect of rectally administered tramadol, one- to four-times higher than the parent compound. The mean absolute bioavailability after rectal administration is 78% [22]. Tramadol is having nausea and vomiting as troublesome side effect. Different authors studied this side effect by using tramadol by different route. In our study 1 patient (5%) in group B had single episode of vomiting postoperatively as against 4 patients (20%) in group A and all were responded to ondansetron injection. No one patient from both groups was complaining of local rectal site burning. Our all above results are comparable to previous studies [15,16,17,24]. M. Lotfalizade et al. [15] studied diclofenac suppository against intravenous tramadol injection and combination of these two for analgesia in caesarean section and found mean analgesic duration of 134.7 minutes in intravenous tramadol group. Dr. V. Khazin et al. [23] studied postoperative analgesia with rectal tramadol and indomethacin for diagnostic curettage and early termination of pregnancy. They found rectal tramadol provides superior postoperative analgesia with minimal adverse effects.

Thus various oral, rectal and parenteral formulations of tramadol are available. The rectal route may represent a practical alternative. Limitations of our study are that we have used convenient sampling method. Also we have studied postoperative analgesia only for 14 hours. Elaboration of postoperative nausea-vomiting may require large sample size. Further prospective studies with large sample size are warranted.

Conclusion

Duration of analgesia is prolonged with rectal route of tramadol. It also adds to increase patient comfort by minimizing postoperative nausea-vomiting. Thus we conclude that rectal tramadol suppository can be better alternative to intravenous tramadol with longer postoperative analgesia in appendectomy patients with minimal side effects.

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A Prospective Comparative Study of Combined Spinal Epidural with (0.1%) Ropivacaine versus (0.1%) Levobupivacaine with Fentanyl for Labour Analgesia

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Abstract

Background: Various studies have been conducted regarding efficacy of Bupivacaine, Levobupivacaine and Ropivacaine; all these drugs provide adequate analgesia without significant effect on duration of Labour and neonatal outcome. But Levobupivacaine and ropivacaine has been encouraged in low dose that is 0.1%, because of more safety and less motor block. *Material and Method:* Parturients with singleton pregnancy, cephalic presentation and active labour were selected for this study as per exclusion and inclusion criteria, they were randomized by computer generated randomization table into two groups. Each group consists of 30 patients – group I and group II. Group I parturients received 3mg of isobaric Levobupivacaine with 25ug fentanyl intrathecally followed by epidural top ups of 14ml 0.125% isobaric Levobupivacaine and 30ug fentanyl making total volume of 15ml. Group II parturients in this group received 4mg isobaric ropivacaine with 25ug fentanyl intrathecally followed by epidural top-ups of 14ml 0.2% isobaric ropivacaine and 30ug fentanyl making total volume of 15ml. *Result:* Similar both group were statistically comparable to each other with respect to height, weight, ASA scare and cervical dilatation. Regarding block characteristics, the maximal dermatomal level of sensory block achieved in group I was T5 and in group II it was T6 with P value 0.04. Seven parturient in group I and five parturient in group II has developed grade 1 motor blockade. The mean time of onset of analgesia was 4.52 min in group I and 5.95 min in group II with P value 0.00001. The duration of analgesia was longer in group I then group II (107.06±13.06 versus 91.43±9.38) with P value 0.00001. The number of epidural top up requirement was less in group I then group II (1.287±0.192 versus 1.71±0.267) with P value 0.00053. *Discussion and Conclusion*: Onset of analgesia was early in group I then group II.The duration of analgesia was longer in group I then group II, The number of epidural top-up requirement was more in group II. To conclude both drugs found to be effective in respect to onset and duration of analgesia but Levobupivacaine was better than ropivacaine.

Keywords: Ropivacaine; Levobupivacaine; Labour Analgesia.

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Introduction

Labor pain is very intense which involves both psychological and physiological factors. This pain is subjective and having interpersonal variability. The pattern of pain differs from pregnancy to pregnancy [1]. Ether was introduced by James, Y. Simpson in obstetrics analgesia in year 1847, since than the search for perfect agent and perfect method for labour analgesia started [2].

At present concept of labour analgesia is changed and gained popularity. Pain during labour is a result of complex interactions. The progress of

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labour is divided in to three stages. In stage I pain is caused by mechanical dilatation of cervix and contraction of uterine muscle. It is mediated by T10 to L1 spinal segments. In stage II pain is due to stretching of the vagina, and perineum. The pain is carried out through T12, to L1 and S2 to S4 spinal segments [1,3].

Labor is only severe pain which is accepted by the patients, but it effects fetomaternal well-being as well. Because of stress of pain various chemical mediators are released like, nor adrenaline, adrenaline, corticotrophins, which has deleterious effect on mother and foetus.Maternal effect ranges from prolongation of labour to compensatory metabolic acidosis. Labour pain promote acidosis in foetus as well [3,4]. The ultimate aim of labour analgesia is to eliminate these responses without affecting maternal safety, progress of labor and fetal well-being.Various pharmacological and non-pharmacological methods are available for pain relief but neuraxial analgesia is considered to be gold standard.

In 1943 Hingson and Edward et al. published an article in JAMA on continuous caudal anaesthesia and they emphasized that they have produced analgesia by continuous bathing the nerve trunk of sacral and lumber plexus with in the peridural space [5]. But combined spinal and epidural analgesia has become more popular now, because of its rapid onset, short duration, increased rate of cervical dilation and good maternal satisfaction. This is proved by the work of R.E. collis et al. They found that low dose combined spinal epidural technique is associated with faster onset, less motor block and greater self control [6].

Bupivacaine is used extensively for combined spinal epidural block but its cardio toxicity, neurotoxicity and high incidence of motor blocks leads to increase interest in newer drugs like Levobupivacaine and ropivacaine.

Various studies have been conducted regarding efficacy of Bupivacaine, Levobupivacaine and Ropivacaine; all these drugs provide adequate analgesia without significant effect on duration of Labour and neonatal outcome. But Levobupivacaine and ropivacaine has been encouraged in low dose that is 0.1%, because of more safety and less motor block [7,8].

The present study has been designed to compare the quality of analgesia with Levobupivacaine versus ropivacaine in combination with fentanyl, in combined spinal epidural analgesia. Primary objective of this labour study is to study the quality of analgesia and the secondary objective is to compare onset, degree and duration of block, maternal and fetal outcome, and side effects,

Maternal and Method

Present study is a randomised double blind trail conducted in the dept.of anaesthesia Konaseema institute of medical science Amalapuram Andhra Pradesh from November 2016 to April 2018.

Study Population

Sixty parturientswith singleton pregnancy, cephalic presentation and active labour were selected for this study as per exclusion and inclusion criteria, they were randomized by computer generated randomization table into two groups. Each group consists of 30 patients – group I and group II.

Group I parturients received 3mg of isobaric Levobupivacaine with 25ug fentanyl intrathecally followed by epidural top ups of 14ml 0.125% isobaric Levobupivacaine and 30ug fentanyl making total volume of 15ml.

Group II parturients in this group received 4mg isobaric ropivacaine with 25ug fentanyl intrathecally followed by epidural top-ups of 14ml 0.2% isobaric ropivacaine and 30ug fentanyl making total volume of15ml.

Inclusion Criteria

-Term gestation, cephalic presentation, Inactive first stage of labour,

-Planned booked case,

-Cervical dilatation>3cm and <5cm

- ASI I and II

- AGE 20 to 35yrs

-Height>150cm

Exclusion Criteria

-Placenta previa,

-Inertia uteri

-CPD

-Diabetes, Asthma, Epilepsy, thyroid disorder

-Spinal abnormality.

Preparation of the parturients

In addition to routine preparation for delivery they were prepared for epidural block also. A detailed general examination was performed and base line HR, BP and respiratory rate was recorded. A detailed pelvic examination, onset of active labour and cervical

dilatation was assessed by attending obstetrician. I.V line was Started with ½ to 1 litre of RL. Equipment for resuscitation of mother and baby was kept ready.

The drug preparation was done by senior resident, as per group allocation and for which investigator is blinded. The parturients were placed in left lateral decubitus position, local infiltration with 1cc of 2% lignocaine in the L3-4/ L4-L5. 18- Gauge Touchy needle was placed in slowly in to the epidural space using the loss of resistance to air technique. Intrathecal injection was given by 25- gauge quincke needle and then epidural catheter was inserted 3-5cm into the epidural space.

Epidural bolus dose was given when the parturient reported two consecutive painful contraction or VAS> 3. The onset of analgesia was taken as time taken for achieving visual analogue scale lessthen 3. The level of sensory block was assessed by loss of sensation to pinprick using 22-guage hypodermic blunt needle. Highest degree of sensory block was noted. The assessment of motor block was done by modified Bromage scale.

0 No motor blockage

1 Unable to lift leg straight

2 Not able to flex knees

3 Not able to flex ankles

Onset and duration of motor block were also reported. Duration of analgesia was taken as time interval form the onset of analgesia till the return of painful contraction or till regression of sensory level to below T12.

Base line maternal pulse rate and blood pressure recorded and again these parameters are recorded after block at every 5 minutes interval in first 20min, then at 30 min, and every 15min thereafter. Fetal heart rate was monitored by cardiotocograph. Hypotension was defined when fall in SBP was 20% to 30% from the base line, bradycardia was defined when pulse rate was, less than 60beats/min and treated appropriately. Progress of labour was observed closely after instituting block. If there is requirement of instrumental delivery the epidural dose was repeated every 15min before procedure in both groups. If there is evidence of fetal distress or failure of progress of labour, caesarean section was performed by the block with 0.5% Levobupivacaine in group I and 0.5% Ropivacaine in group II.

Side effects and complications were recorded. APGAR score at 1 and 5thmin was used to access neonatal well being .patient satisfaction score was recorded as 1= excellent, 2= good and 3= poor.

Ethics

Before start of this study approval was taken from institutional ethics committee. A written informed consent was taken from all the parturients before enrolment in study.

Statistical Analysis

Data was analysed by using SPSS 16.0 the parametric data was analysed by unpaired T-test and nonparametric data was analysed by chi square test. P value <0.05 was considered statistically significant.

Result

As per Table 1 mean age of parturient in group I was 25.66yrs in comparison to 26.733 yrs in group IIwith p- value 0.24 and they are comparable to each other statistically. Similar both group were statistically comparable to each other with respect to height, weight, ASA scare and cervical dilatation.

Regarding block characteristics, the maximal dermatomal level of sensory block achieved in group I was T5 and in group II it was T6 with P value 0.04. Seven parturient in group I and five parturient in group II has developed grade 1 motor blockade. The mean time of onset of analgesia was 4.52 min in group I and 5.95 min in group II with p value 0.00001. The duration of analgesia was longer in group I then group II (107.06+13.06 versus 91.43+9.38) with P value 0.00001. The number of epidural top up requirement was less in group I then group II (1.287+0.192 versus 1.71+0.267) with p value 0.00053. Labour characteristic of both the group were statistically comparable to each other as per Table 2,3.

Table 1: Base line characteristics of the study participants

Parameters	Group-I (mean)	Group –II (mean)	P value
Age (yrs)	25.666±5.77	26.733±6.13	0.249095
Height(m)	154.833±3.688	155.77±3.67	0.169231
Weight(kg)	66.03±8.59	64.84±6.37	0.272802
Baseline VAS	9.46±47	9.66±0.48	0.6804
Cervical (cm) dilatation.	3.88±0.65	3.71±0.59	0.2073

As per Table 4 ,28 parturients in group I and 29 parturients in group II have normal vaginal delivery. One parturient in group I have forceps delivery. One parturient in each group required LSCS. Apgar score were similar or in both group with P value >0.05.

As per Table 5 the basal vital parameters were statistically comparable to each other in both groups, with p value >0.05.

Regarding side effect and patient satisfaction, 23 parturients in group I and 24 parturients in group II have pruritus, 2 parturients in group I and 1 parturient in group II has developed hypotension, 2 parturients in each group has developed urinary retention.

Eighteen patient in group I explained her experience excellent, 12 patients told good, but in

Table 2: Block characteristics

Parameters	Group - I (mean)	Group –II (mean)	P value
Maximum dermatomal sensory level achieved	T_5	T_6	0.04
Motor block (Bromage>0)	7/30	5/30	0.518
Onset of analgesia	4.52±.396	5.95±0.92	0.00001
Duration of analgesia	107.06±13.06	91.43±9.38	0.00001
Number of epidural top ups.	1.287±0.192	1.71±0.267	0.00053

Table 3: Labour characteristics

Variables	Group - I (mean)	Group –II (mean)	P value
Duration of first stage (min)	578.33±50.59	589.9±56.13	0.2065
Duration of second stage (min)	87.33±6.201	85.61±6.50	0.151410
Duration of third stage (min)	6.94±4.201	6.31±2.50	0.0911
Total duration of labour (min)	694.759±64.7	700.655± 64.7	0.3542

Table 4: Fetomaternal outcome

Parameter	Group - I (mean)	Group –II (mean)	P value
Normal vaginal delivery	28	29	-
forceps	1	0	-
LSCS	1	1	-
Apgar 1 min(mean)	7.32±0.24	7.48±0.142	0.2462
Apgar 5 min(mean)	8.84±0.32	8.94±0.42	0.4142

Table 5: Basal vital parameters

Variables	Group - I (mean)	Group –II (mean)	P value
SBP (mm of Hg)	123.92±7.89	126.42±10.05	0.37578
DBP (mm of HG)	78.07±7.19	77.93±4.2	0.689
RR (per min)	24.14±4.27	23.67±3.32	0.17890
HR (per min)	97.54±5.99	98.642±6.02	0.134216
Spo2	98.94±0.243	9901.±0.143	0.9463
FHR (beats min)	128.46±6.72	129.732±4.32	0.4321

Table 6: Complication, side effects patient satisfaction

Parameters	Group - I (mean)	Group –II (mean)	P value
Pruritus	23(76.67)	24(80%)	Chi square state= 2.090 p=0.754001
Hypotension	2/30	1/30	Chi square state=0.3500 p=0.553617
Urinary retentions	2/30	2/30	Chi square state= 0 p=1
Patient			
Excellent	18	14	Chi square statistic 0.971 p value
Good	12	14	0.615375
Poor	0	2	

group II 14 patient told excellent, 14 patient told good but two patient told poor, which was not significant statistically.

Discussion

Neuraxial labour analgesia is gold standard technique for providing labour analgesia. Various effective local anaesthetic agents are used for this and it is becoming more popular.

Levobupivacaine and Ropivacaine are used in low concentration, and have replaced bupivacaine slowly because of its cardio and neurotoxicity. Studies havebeen conducted to examine the role of Levobupivacaine and ropivacaine in labour analgesia. As per the study of casati et al Levobupivacaine is more potent then ropivacaine in nerve block, low concentration of these drugs are effective in pain relief [9]. Similar study was conducted by M.C. Atienzar et al in labour analgesia. He observed thatthese drugs produces adequate epidural analgesia and sensory and motor block are greater with bupivacaine then Levobupivacaine. Greater sensory and motor separation will be advantage when motor block is undesirable [10].

Both the groups were statically comparable to each other in with respect to base line characteristics.

In present study the highest dermatomal sensory level achieved was T5 in group I and T6 in group II which is supported by the work of J.P. Attri et al. [11] but the study of T.N. Chethanananda et al. the maximum dermatomal sensory level achieved was T 6 in both group [12]. The onset of motor block was 7 out of 30 in Levobupivacaine group and 5 out of 30 in ropivacaine which was measured by Bromage scale, this difference was not significant. Low dose of these drugs are having greater motor and sensory separation, this finding is supported by camorica et al. [13]. Onset of analgesia was early in group I then group II. As per priyankachuttani et al duration was early in Levobupivacaine group which support our study but the study of N.L purdie does not corroborate with our finding [14,15]. The duration of analgesia was longer in group I then group II, which is supported by work J.P Attri et al. [11] and Kim et al. [16]. The number of epidural top-up requirement was more in group II which corroborates with the study of N.L. purdie et al. [15]. The basal vital parameters and duration of labour was statically comparable to each other in both groups.

Mode of delivery was not different in both group, cause of one LSCS and one forcep delivery in group I was mainly obstetric in region which is supported by the work of Priyankachuttani et al. [14].

Apgar scare was more than 7 in both group at 1 min and more than 8 at 5 min in both group which corroborates withthe work of N.L. purdie et al. [15]. Parturients satisfaction and risk factor as statistically comparative each other in both group, Levobupivacaine group satisfaction was better than ropivacaine, which is supported by the work of P. Chuttani et al., Purdi et al. and Lee B B et al. [14,15,17].

Regarding difference in the side effect both groups has not reached statisticallysignificant level.Both group of patients developed hypotension having p=0.553617. Complications like pruritus and urinary retention was also not significant (p=0.754 and p=1). This finding is supported by the work of Joginder Pal Atri et al. [11].

Conclusion

From present study we would like to conclude that both drugs found to be effective in respect to onset and duration of analgesia but Levobupivacaine has early onset of analgesia and better sensory and motor separation so it is was better thanropivacaine. Duration of labour was not prolonged and no babies required resuscitation. Complication and side effect of both group are same.

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A Comparative Study between Intrathecal Bupivacaine with Clonidine vs Bupivacaine with Neostigmine for Vaginal Hysterectomies: A Randomized Double Blinded Study

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Abstract

Introduction: Vaginal hysterectomy is the most common surgery done under spinal anaesthesia. The combination of local anaesthetics with adjuvants is getting more popular for better post-operative analgesia. *Aim:* The purpose of our study is to evaluate and compare the addition of clonidine and neostigmine to intrathecal bupivacaine for prolongation of post-operative analgesia. *Materials & Methods:* This was a prospective, randomized, controlled, double blind study carried out in patients undergoing vaginal hysterectomies. 50 patients of ASA grade I & II between 45-60years of age were assigned to 2 groups. Group BC: received 0.5ml of intrathecal clonidine (75µg) along with 2.5ml of 0.5% Bupivacaine Group BN: received 0.5ml of intrathecal neostigmine(50µg) along with 2.5ml of 0.5%bupivacaine. *Results:* Sensory block onset, level of sensory block, duration of analgesia, motor block onset, duration of motor block, degree of motor block and recovery from motor block and incidence of side-effects are evaluated. *Conclusion:* We concludefrom our study that intrathecal neostigmine 50µg added to 12.5 mg hyperbaric bupivacaine significantly hastens the onset of sensory and motor block when compared to 75µg clonidine and duration of analgesia is more prolonged with clonidine than neostigmine.

Keywords: Neostigmine; Clonidine; Post-Operative Analgesia**.**

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Introduction

Vaginal hysterectomy is the most common surgical procedure done under spinal anaesthesia**.** Regional anaesthesia in particular spinal anaesthesia was widely used nowadays to perform surgeries of lower abdomen and lower extremities. Several studies proved that regional anaesthesia produces less blood loss and there will be decreased incidence of deep vein thrombosis, allows improved pain relief and devoid of adverse effects of general anaesthesia like nausea, sorethroat and altered mental status and cognisive dysfunction. Regional anaesthesia also leads to good pain relief ranging from few hours to several hours. Goodpain

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relief results in short hospital stay and improved patient ability during postoperative period.

Local anaesthetics are commonly used for regional anaesthesia, but due to their short duration of action may lead to early postoperative analgesic requirement. Several therapeutic regimens i.e local anaesthetics along with adjuvants have been tried for intra and postoperative pain relief and increasing regional anaesthetic period but no drug have been identified without associated side effects [1]. Various drugs that can be added to local anaestheticsinclude opioids and nonopioids drugs.

Clonidine is a selective partial agonist for α_2 adrenergic receptors, the analgesic effect following its intrathecal administration is mediated spinally through the activation of postsynaptic α_2 receptors in substantia gelatinosa of the spinal cord. The intrathecal administration of clonidine prolongs both sensory and motor block and also post operative analgesia [2].

Neostigmine is one of nonopioid, anticholinesterase agent used to produce analgesia by activating descending pain inhibitory pathways [3]. It acts by increasing acetylcholine at synapses. Both clonidine and neostigmine have shown effect withlocal anaesthetics, so we considered these two drugs as adjuvants to local anaesthetics and compared their equivalent doses effects.

The purpose of the study was to asses the anaesthetic effects of both clonidine and neostigmine as adjuvants to local anaesthetic Bupivacaine given intrathecally in patients undergoing vaginal hysterectomies.

Materials & Methods

After ethical committee approval 50 patient of ASA grade I & II, aged between 45 to 60 years were assigned to 2 groups by computer generated randomization table. This was a prospective randomized double blinded study performed in our institute from June 2017 to January 2018. Informed consent was taken.

Exclusion criteria include those contraindicated for regional anaesthesia including local infection, haemorrhagic disorders, drug hypersensitivity, muscular disorders and central and peripheral neuropathies and known allergy to study drugs.The selected patients were divided into two groups.

Group BC-received 0.5ml of intrathecal clonidine 75 μg+2.5ml of 0.5%hyperbaric Bupivacaine.

Group BN-received 0.5ml of intrathecal neostigmine 50μg+2.5ml of 0.5% hyperbaric Bupivacaine.

The volume of the solution given intrathecally is 3ml in both groups. The patient and the monitoring anaesthesiologist were blinded to the study solutions. Intravenous line was secured and all the patients were preloaded with 10ml of ringer lactate. The standard monitoring included ECG, pulseoximetry and NIBP and the base line parameters are recorded prior tospinal blockade. Spinal blockade was done in lateral position, at L_3-L_4 level by midline approach with 25G Quinkie' s needle and the study drug was injected after free flow of CSF. After the intrathecal injection, patient repositioned in supine position. After subarachnoid block the following parameters were noted.

Sensory block onset, level of block, the motor block onset and completion of motor block, and recovery from block, total duration of analgesia i.e. time from onset of analgesia to the point where the patient complains of pain or requiring rescue analgesics or visual analog scale (VAS>4) were noted. Sensory block was assessed byusing pinprick test. Motor block was evaluated by Modified Bromage scale as below:

0- Without motor block.

1- Impossibility of hip flexion

2- Impossibility of knee flexion

3- Impossibility of ankle flexion.

The intraoperative and recovery phase complications like nausea, vomiting,itching, dysnoea, respiratory rate less than 10/mt, hypoxia, bradycardia, and hypotension were recorded.

Statistical Analysis

The data arepresented as mean and standard deviation. All categorial data analysed using Fischer exact test and Chi-Square test as required and continuous variables using Student 't' test. Value of $p<0.05$ was considered significant. Graph pad prism version 7 (California corp.inc) was used for statistical analysis.

Results

The mean age in Group BC was 48±6yrs and in Group BN is 52±8 yrs. The mean weight in Group BC was 50±4kgs and in Group BNwas 52±6 kgs and the mean height in Group BC was 150±5cms and in Group BN was 150±5cms. So the demographics and duration of surgery were comparable between the two groups. (Table 1).

Table 1:

	Group BC	Group BN
Age	48±8	52±8
Weight	50±4	52±6
Height	150±5	150±5

The mean time of onset of sensory blockade was 140±15 secs in Group BC and in Group BN was 85±20 secs with p value of <0.05 which is stastistically significant. The mean time of onset of motor block was 200±20 secs in Group BC and in Group BN was100±15 secswith p value of <0.05 which is stastistically significant. The mean total duration of sensory block was 302±30 mintsin Group BC and in Group BN was 260±20 mts with p value of < 0.05 which is highly significant. The mean total duration of motor block was 200±40 mts in Group BC and in Group BN was 180±30 mts. (Table 2 and 3).

The mean time for rescue analgesic was longer for Group BC when compared with patients in Group BN ($p < 0.05$). Group BN patients has significantly higher overall 24hrs VAS scores when compared to patients in Group BC ($p< 0.05$). (Graph 1).

Bradycardia is seen in both groups with no significant difference. 5 pts in clonidine & 6 pts in neostigmine required atropine. Hypotension is significantly higher in BC group (15 compared to 5) than BN group and required intervention with mephentermine 6mg. (Graph 2).

Sedation scores are significantly higher in BC (RSS 4) than BN (2) group. Respiratory depression was not noted in both the groups.

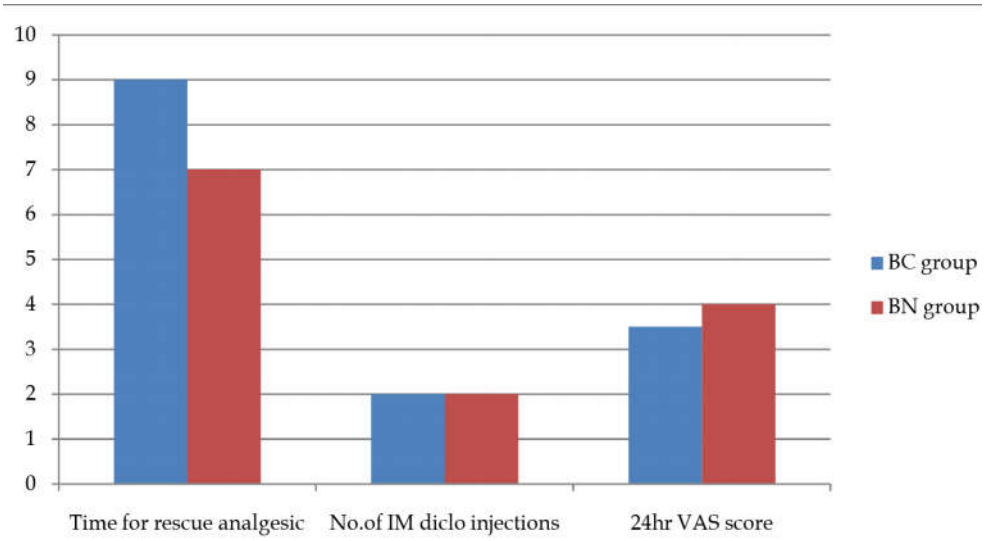
PONV is significantly higher in BN (4) than BC (2) group.

Table 2: Sensory characteristics

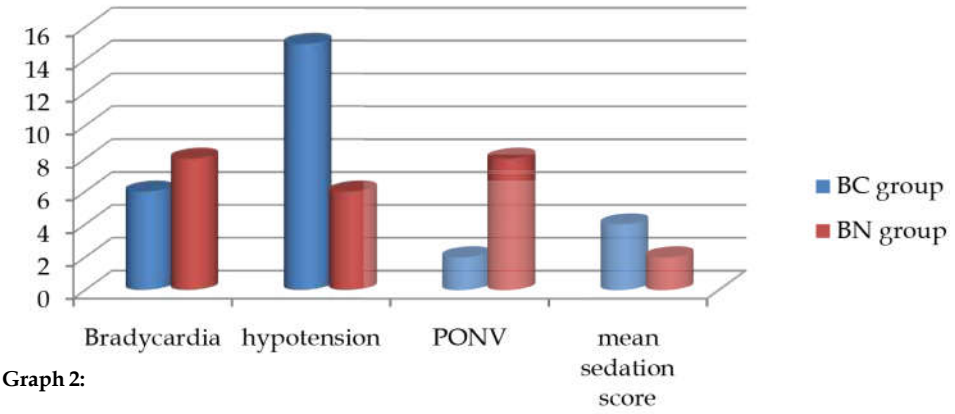
Variable	Group BC	Group BN	P value
Mean onset time	140±15 secs,	85±20 secs,	0.0001
Mean cephalad spread	T6	T6	
Mean total duration of absolute analegesia	302±30 mins	260±20 mins	0.0002

Table 3: Motor Characteristics

Variable	Group BC	Group BN	P value
Mean time to attain max motor block	200±20 secs,	100±15 secs,	0.0001
Quality of block	Bormage grade III→100%	Bormage grade III→100%	
Duration of block	200±40 mins	180±30 mins	0.0001



Graph 1:



Graph 2:

Discussion

Our study results shows that low dose of intrathecal Neostigmine added to intrathecal Bupivacaine increased the mean time of onset of sensory and motor blockade when compared to low dose of Clonidine added to intrathecal bupivacaine and also there is prolongation of duration of analgesia with low dose clonidine when compared to intrathecal Neostigmine combined with bupivacaine.

Clonidine is a selective partial agonist for $\alpha_2$adrenergic receptors. Intrathecal clonidine produced analgesia is mediated through activation of postsynaptic α_2 receptors in subtantiagelatinosa of spinal cord [4].

Several previous studies proved that intrathecal clonidine combined with local anaesthetics and opioids can be used for labour analgesia and orthopaedic surgeries [5-7]. Clonidine in low doses have shown to prolong sensory blockade and has prolonged postoperative analgesia for Gynecological surgeries, knee arthroscopies and ambulatory inguinal herniorrhaphy.

Higher doses of clonidine have reported to cause hypotension andmarked sedation. So we choose low dose of intrathecal clonidine. Systemic, epidural administration of clonidine produces sedation, a central effect of α_2 adrenergic receptors noted in the dose range of 150-450µg and in our study it was not observed in Group BC due to use of low dose of clonidine.

Neostigmine produced analgesia depends on the release of NO in the spinal cord and also by increasing acetylcholine in the spinal synapses which leads to prolonged stimulation of nicotinic and muscarinic receptors. Dose of Neostigmine is selected based on the previous studies which showed that low doses of neostigmine intrathecally produced prolonged postoperative analgesia without side effects. The overall results of our study correlates with studies by Hye Ma [8] who declared that intrathecal neostigmine was associated with less haemodynamic fluctuations. Incidence of nausea and vomitings is less in both groups.

Hence in the present study, we noticed that onset for sensory blockade was hastened with addition of neostigmine. We also noted that duration of analgesia was prolonged with addition of clonidine compared to neostigmine. This correlates with the study by Yoganarasimha et al. [9].

In present study, the mean time for motor block onset and the mean time taken for maximum motor blockade was significantly faster in neostigmine group than compared to group BC [10]. Neostigmine produces nausea and vomitings and this was observed in our study also, 7 patients out of 25 had PONV which can be explained due to rostral spread of drug to brainstem [11]. Bradycardia was seen in 30% of neostigmine group 7-10 min after injection of drug, with a mean heart rate of 52-58. Bradycardia with clonidine is seen around 20-30 min after injection of drug. All the pts responded well to Atropine 0.6mg. Sedation scores for BC group [4] is higher than BN group [2].Time for rescue analgesic is prolonged in both groups andit is more in Clonidine group.

Conclusion

The use of intrathecal neostigmine 50 µg added to 12.5 mg hyperbaric bupivacaine significantly hastens the onset of sensory and motor block when compared to 75 µg clonidine. Clonidine prolongs duration of analgesia more than neostigmine, but is associated with hypotension,which can be easily managed with vasopressors.

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Efficacy of Epidural 0.75% Ropivacaine vs. Epidural 0.5% Bupivacaine for Adult Patients undergoing Major Lower Abdominal Surgeries: A Double Blind Randomized Control Study

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Abstract

Context: In view of the wider application of regional anesthetic procedure in modern anaesthesia practice, there is a need for local anesthetic with desirable properties like longer duration of sensory blockade for post operative analgesia and moderate duration of motor paralysis for surgical relaxation. *Null hypothesis:* Epidurally administered 20 ml of 0.75% Ropivacaine is not effective in comparison to 20 ml of 0.5% Bupivacaine for major lower abdominal surgeries in adult patients. *Aims:* To study the efficacy of epidurally administered 20 ml of 0.75% Ropivacaine in comparison to 20 ml of 0.5% Bupivacaine for major lower abdominal surgeries in adult patients. *Settings and design:* Hospital based double blind randomized controlled study carried out at Department of Anesthesiology, Shadan Institute of Medical Sciences, Hyderabad *Methods:* 50 eligible patients were included. They were divided into two groups of 25 each randomly. Group R with 25 patients were given 20 ml of 0.75% Ropivacaine epidurally. Group B with 25 patients were given 20 ml of 0.5% Bupivacaine epidurally. *Results:* There was no statistically significant difference among the two groups in terms of duration, quality and onset of sensory as well as motor blockade. Post operative analgesia duration was also similar among them. Two groups did not differ significantly in terms of side effects and hemodynamic stability. (p value > 0.05; statistically insignificant) *Conclusion:* Our study concluded that 20 ml of 0.75% epidural Ropivacaine produced equally effective and good quality as well as duration of sensory and motor blockade and post operative analgesia when compared to 20 ml of 0.5% epidural Bupivacaine for various lower abdominal surgeries.

Keywords: Epidural Anesthesia; Ropivacaine; Bupivacaine; Surgery; Blockade.

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Introduction

The "International Association for the Study of Pain" "IASP" defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage". Pain during surgery is often underestimated and under treated. Being purely subjective, pain and its intensity vary widely among patients. The threshold of pain is variable largely because of its emotional component. The relief of pain during surgery is "the raison d' etre" of anesthesiology. It is right to say that the anesthesiologist's experience, acquired in the field, should be extended into the postoperative period, as this has many beneficial effects for the patient [1].

While; the intra-operative pain, experienced by the patient has been underestimated; that of post-

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operative pain relief been neglected to a large extent. In this context, many anesthesiologists have advocated various methods to counter pain both intra-operatively and extending into the post-operative period much to the satisfaction of the patients. The cost of general anaesthesia, the skill and specialized equipment needed for its administration coupled with an different supply of anesthetic gases and drugs and lack of monitoring equipment especially in peripheral areas in a country like India made Regional Anesthetic techniques as choice because they are relatively inexpensive and easy to administer [2].

Regional anaesthesia is currently the most effective method of reducing the stress response especially in patients with surgical procedures involving the lower body. In view of the wider application of regional anesthetic procedure in modern anaesthesia practice, there is a need for local anesthetic with desirable properties like longer duration of sensory blockade for post operative analgesia and moderate duration of motor paralysis for surgical relaxation. The amide local anesthetics Bupivacaine is the most widely used local anesthetic. It is a racemic mixture of the dextro & levo stereoisomers. However the dextro enantiomer makes Bupivacaine a more cardio toxic drug [3].

In 1979 Albright [4] published an alarming editorial in which he associated long acting local anesthetic Bupivacaine and Etidocaine with cardiac arrest during regional anesthesia for Caesarian section using 0.75% Bupivacaine. It has been proved that it is better to use "single enantiomer compounds" rather than "racemic agents [1]." "Ropivacaine the recently introduced propyl homologue of Bupivacaine is a pure S (-) enantiomer." "It is associated with a reduced incidence of both cardiovascular and central nervous system toxicity, a concern with racemic Bupivacaine [5]."

It is less lipophilic than Bupivacaine. This reduced lipophilicity is responsible for lesser degree of motor blockade, greater differential blockade, less CNS and Cardio toxicity when compared to highly lipophilic Bupivacaine. Present study was carried out to study the efficacy of epidurally administered 20 ml of 0.75% Ropivacaine in comparison to 20 ml of 0.5% Bupivacaine for major lower abdominal surgeries in adult patients.

Materials and Methods

Source of Data

Hospital based double blind randomized controlled study carried out at Department of Anesthesiology, Shadan Institute of Medical Sciences, Hyderabad from July 2016 to June 2017. The study was approved by the Hospital Ethical Committee.

Method of Collection of Data

A total no. of 50 patients, 25 in each group with inclusion and exclusion criteria were selected for the study, patients were randomly allocated to each group by lottery method.

Inclusion Criteria

- ASA grade I and II physical status, aged between 16-45 years, belonging to both the sexes undergoing lower abdominal surgeries.

Exclusion Criteria

- Patients with ASA grade III, IV & V.
- Patients having sensitivity to local anesthetics
- Any Patient found to have local infection at the site of injection
- Uncooperative patients

Methods

Pre-Anesthetic Evaluation

Details of the present study were explained to all patients and then informed consent was taken. Data pertaining to history, general as well as systemic examination was recorded in the pre designed study questionnaire for the present study. All patients were given brief on "linear visual analogue scale (VAS)" "using 10 cm scale."

Premedication

All the patients were pre-medicated with 0.1-0.5 mg/kg Midazolam IM 45-60 min prior to the procedure.

Procedure

Before the start of the case, PR, RR, BP and SpO_2 was assessed. All patients receiced 150-200 ml RL co-load. Epidural anesthesia was given in left lateral position. After local infiltration with 1% Lignocaine, 18 G Tuohy needle was used. L3-L4 interspace was identified. 1% lignocaine was used for local infiltration, by "loss of resistance" technique. 18 G epidural catheter was threaded through the needle

into epidural space for 3-4 cm and secured with adhesive tapes to the back. After negative aspiration for blood and CSF, 3 ml of 1.5% Lignocaine with 15 mcg of Adrenaline 31 was given as test dose and the patient was turned to supine position. After 5 min if there is no adverse reaction for the test dose, intravascular and intrathecal placement was ruled out, and the study drugs and control drugs, were administered.

First group who received 0.75% Ropivacaine epidurally was labeled as Group R having 25 patients. Second group who received 0.5% Bupivacaine epidurally was labeled as Group B having 25 patients.

Patient was asked to respond to pin prick to assess the level of sensory block. SpO_2, PR, RR, BP were monitored regularly. Side effects were noted down.

Modified bromage scale [6] was used to assess onset of motor blockade.

Score	Bromage Scale
0	The patient is able to move the hip, knee and ankle
1	Patient is unable to move the hip but is able to move the knee and ankle
2	Patient is unable to move the hip and knee but is able to move the ankle
3	Patient is unable to move the hip knee and ankle

At the end of the surgery the patients were shifted to post operative ward. They were monitored for every 30 min first six hours and there after every hour for 24 hours period. If there was any fall in blood pressure, intravenous fluids were rushed and if the fall was more than 30% below the baseline value inj. Mephenteramine was given in titrated doses. If the pulse rate was less than 50/ minute inj. Atropine 0.6 mg IV was given. If respiratory rate was less than 10/min then respiratory depression was diagnosed. Once the VAS reading was five or more, analgesia duration was measured.

Statistical Analysis

Sample size determination: The sample size for the study was calculated with the aim of showing a difference between treatments in duration of motor block, with a mean difference of at least one hour. Based on the published literature, the standard deviation of Bromage 1 motor block was assumed to be approximately 0.9 hr. With 25 patients in each group and using a significance level of 0.05, the power of the study was 95%. The calculation was made using the t test, based on the assumptions of normally distributed data, and equal variances. Hence the sample size was chosen as 50.

At the end of the study all the data was compiled and statistically analyzed using Diagrammatic representation, Descriptive data presented as mean ±SD, Continuous data analyzed by paired or unpaired "t" test, Chi–square test to analyze Statistical difference between the two groups.

Results

Table 1 shows age and sex distribution of study subjects. Maximum patients were in the age group of 26-35 years. Females were more than the males. Both the groups were similar in the demographic characteristics.

Table 2 shows anthropometric characteristics of study subjects. Patients from both the groups had similar height and weight. Thus they were comparable to each other.

Table 3 shows types of surgery carried out among the study subjects. Abdominal hysterectomy was the most common surgery performed in both the groups. Both the groups were found to be similar in terms of type of surgery performed.

Table 4 shows comparison of anesthetic characteristics among the two groups. Sensory block onset mean time was 14.2±4.12 min and 14.96±3.16 min in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$).

Table 1: Age and sex distribution of study subjects

Demographic characteristics		Group R (N = 25)	Group B (N = 25)
Age (years)	16-25	6	8
	26-35	11	10
	36-45	8	7
Sex	Male	9	11
	Female	16	14

Sensory blockade duration was 224.36±26.34 min and 211.06±24.43 min. in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$).

Analgesia duration was 274±27.44 min and 260.48±22.36 min in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$). Motor blockade onset was 27.8±7.26 min and 27.6±7.29 min in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$). Motor blockade duration was 165.8±23.74 min and 174.92±20.10 min in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$)

Motor blockade intensity was not significantly different among the two groups in group R & B respectively. It was not much different as seen from "t" test ($p > 0.05$).

Table 2: Anthropometric characteristics of study subjects

Anthropometric characteristics		Group R (N = 25)	Group B (N = 25)
Weight (kg)	Range	35-64	35-65
	Mean	47.96	47.28
	SD	20.5	21.21
Height (cm)	Range	145-164	145-168
	Mean	155.76	155.32

Table 3: Types of surgery carried out among the study subjects

Types of surgery	Group R (N = 25)	Group B (N = 25)
Hernioplasty	4	4
Eversion of sac	2	3
Amputation of penis	1	1
Urethroplasty	1	1
Appendicectomy	4	4
Abdominal hysterectomy	6	7
Vaginal hysterectomy	5	2
Ovariotomy	2	3
Total	25	25

Table 4: Comparison of anesthetic characteristics among the two groups

Anesthetic characteristics		Group R (N = 25)	Group B (N = 25)	P value
onset of sensory block	Range	5-25	10-22	> 0.05
(Time in minutes)	Mean	14.20	14.96	
	SD	4.12	3.16	
duration of sensory blockade	Range	175-300	165-240	> 0.05
(Time in minutes)	Mean	224.36	211.06	
	SD	26.34	24.43	
duration of analgesia	Range	230-320	220-300	> 0.05
(Time in minutes)	Mean	274	260-48	
	SD	27.44	22.36	
onset of motor blockade	Range	6-40	15-43	> 0.05
(Time in minutes)	Mean	27.8	27.6	
	SD	7.26	7.29	
duration of motor blockade	Range	126-216	130-210	> 0.05
(Time in minutes)	Mean	165.8	174.92	
	SD	23.74	20.10	
intensity of motor blockade	1	2	2	> 0.05
(Bromage scale)	2	20	22	
	3	3	1	
	4	0	0	
2 segment regression time	Range	95-111	85-130	> 0.05
(Time in minutes)	Mean	105.16	111.64	
	SD	8.64	24.79	

Table 5: Comparison of intra operative hemodynamics among the two groups

	Mean PR	SD	Mean BP	SD	Mean RR	SD	Mean SPO_2	SD
Group R	74	2	110	15	14	1.9	98	0.8
Group B	77	1.8	115	20	15	1.7	99	0.7

Table 6: Comparison of side effects among the two groups

Side effects	Group R		Group B	
	Number	Percentage	Number	Percentage
Bradycardia	1	4	2	8
Hypotension	1	4	2	8
Urinary retention	0	0	1	4

Table 5 shows comparison of intra operative hemodynamics among the two groups. the mean values of pulse, blood pressure, respiration rate and SpO_2 were not much different from each other in either groups.

Table 6 shows side effects of Epidural Anaesthesia among the two groups. Incidence of side effects in both the groups was not difference from each other.

Discussion

Provision of clinically effective and satisfactory intra-operative and post-operative analgesia is not only important on humanitarian grounds but also because of the deleterious effects of pain on various organ system and negative input of pain on post-operative recovery. Regional Anaesthesia is an excellent choice which provides effective intra & post operative analgesia with a single technique which is being possible due to the availability of long acting amidelocal anesthetics like Bupivacaine and Ropivacaine.

Ropivacaine is a new long-acting amide type local anaesthetic that has been the focus of interest because of its increased cardiovascular and Central nervous system safety compared with Bupivacaine. Other advantages of Ropivacaine over Bupivacaine include a greater sensorimotor differential block and shorter elimination half-life (t(1/2)), with a lower potential for accumulation. The most important attribute of Ropivacaine, however, is its increased margin of safety compared with Bupivacaine when given in equal doses [8].

Ropivacaine is pure S enantiomer form and less Cardio-toxic than Bupivacaine. It is less lipophilic than Bupivacaine. This reduced lipophilicity is responsible for lesser degree of motor blockade, greater differential blockade, less CNS and Cardio toxicity when compared to highly lipophilic Bupivacaine. At lower doses Ropivacaine produces greater differentiation between sensory and motor blocks, hence very useful for post-operative analgesia and painless labour where motor block is undesirable.

Many post-marketing studies have focused on the comparisons of efficacy in blocks and toxicity profiles of Bupivacaine versus Ropivacaine. Recent animal toxicity studies confirm the results of original studies showing that Ropivacaine has less cardiovascular toxicity than Bupivacaine with respect to direct myocardial depression, success of resuscitation and arrhythmogenic potential when given in equal doses. Reduced cardiotoxicity may be a distinct characteristic of Ropivacaine. A review of current literature suggests that, at clinically relevant doses, Ropivacaine provides the lowest potential risk of cardiotoxicity for inadvertent intravascular injection [12].

A clinical study by Wolff AP et al. [7] showed that the degree of motor blockade with Ropivacaine increased as the epidural dose increased from 100 mg to 250 mg for hip surgeries.

The maximum recommended dose of Bupivacaine is 150 mg, So that the potential to improve the degree of motor block by simply increasing the dose of Bupivacaine is limited, due to the risk of systemic toxicity A large no. of studies and clinical experience have shown that the efficacy of Ropivacaine is equivalent to Bupivacaine when used in equal doses [8,9].

However, the wider margin of safety of Ropivacaine allows the use of higher doses, thus ensuring effective motor blockade with less risk of toxicity. Kampe S et al. [10] concluded that Ropivacaine 0.75% & Bupivacaine 0.5% produced equally satisfactory epidural block for elective caesarean section.

Hence, in our study we evaluated the efficacy of 20 ml of 0.75% Ropivacaine with 20 ml of 0.5% Bupivacaine to be used as epidural anaesthesia for patients who underwent surgeries of lower abdomen. It was found that both the agents were effective to be used as epidural anaesthesia for patients who underwent surgeries of lower abdomen. Ropivacaine is safer than Bupivacaine and hence can be used in large doses. Though the concentration of Ropivacaine is higher, the equipotent doses of Ropivacaine and Bupivacaine compared in this study produced a sensory block profile that was comparable among the two groups and was not significant statistically.

The duration and intensity of motor block with 0.75% Ropivacaine in our study was similar to 0.5% Bupivacaine and the motor block characteristics of the two drugs appear to be clinically indistinguishable. Many Randomised clinical trials have demonstrated the efficacy of Ropivacaine in providing a profound sensory and motor block suitable for surgical anaesthesia, post operative analgesia & labour pain relief. In our study, the quality of post operative analgesia in both groups was good. A similar degree of pain relief was observed in the two groups with out differences in the volume of local anesthetic consumed. Intra-operative hemodynamics were stable in all the patients of both groups throughout the study period.

The incidence of side effects like hypotension, nausea or vomiting, shivering, urinary retention was very less in both the groups and statistically insignificant.

An ideal local anesthetic for surgery would meet the following criteria.

1. Rapid onset of action
2. Profound sensory blockade and adequate motor blockade
3. Rapid cessation of motor block following surgery allowing early restoration of mobility
4. Well tolerated at high doses with low risk of systemic tonicity

Ropivacaine meets these Criteria by providing effective and well tolerated anaesthesia for surgery. The anesthetic effects are dose-dependent so that the degree of sensory and motor blockade was predictable.

In conclusion, Ropivacaine is a well tolerated regional anesthetic effective for surgical anaesthesia, post operative analgesia & painless labour with slightly less potency than Bupivacaine when administered intra-thecally or epidurally with lesser motor blockade and less systemic toxicity [11].

Our study showed that there were no statistically significant differences in quality and duration of sensory and motor block profiles and proved that 0.75% Ropivacaine is equipotent to 0.5% Bupivacaine but with greater margin of safety.

Conclusion

Our study concluded that 20 ml of 0.75% epidural Ropivacaine produced equally effective and good quality as well as duration of sensory and motor blockade and post operative analgesia when compared to 20 ml of 0.5% epidural Bupivacaine for various lower abdominal surgeries.

Since both Ropivacaine and Bupivacaine are equal in efficacy, Ropivacaine being a pure s-enantiomer carries lesser cardiovascular and central nervous system toxicity, as evident from other studies, hence seems to be a safer alternative.

Key Message

We can say that Ropivacaine as well Bupivacaine can be used depending upon the choice of anesthetist as both are equally effective.

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Original Research Article

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Comparative Study of Stylet Angulation of 60° and 90° for the Ease of Endotracheal Intubation with McGrath Videolaryngoscope

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Abstract

Introduction: Videolaryngoscopes facilitate the tracheal intubation by enabling anaesthetists to have a superior vision of the larynx with minimal manipulation of the oral-pharyngeal-laryngeal structures. Studies have indicated that video laryngoscopes improve the success rate of intubation and significantly reduce intubation difficulties. However, an improved view is not always an assurance of intubation success due to the nature of oral-pharyngeal-laryngeal axis. For this reason, Endotracheal tube be must be at an angle between 450 and 900 to enter the larynx. *Aim:* This study was conducted to determine the optimal angles (between 600 and 900) of the stylet when using McGrath video laryngoscopes for the ease of intubation. *Methods:* This study involved 100 patients of both male and female who were undergoing elective surgeries that required endotracheal intubation. The patients involved were aged between 19 years and 70 years. Patients were indiscriminately divided into two equal groups, 50 patients for 600 (n=50) and 50 patients for 900 (n=50). This study excluded patients that required rapid sequence intubation; ASA III, IV, and V; patients that required emergency surgeries; and patients who had a scored four in the mallampati test. The following parameters Intubation time (Sec), Glottic opening Grade, Failure of First Attempt, Ease of Intubation, the presence of Bleeding were assessed. *Results:* Category variables were analyzed using the Chi-square test while continuous variables were analyzed using the independent t-test between 600 and 900 groups. All the selected 100 patients completed this study. All the patients in 600 group intubated successfully with 1st attempt and within 50 seconds. In contrast, intubation of six patients failed in the group 900. *Conclusion:* The results of this study indicated that the level intubation difficulty and glottic grade were not significantly different between two groups.

Keywords: Stylet Angulation; McGrath; Videolaryngoscopes; Airway.

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Introduction

Management of the patient's airway is an essential skill for anesthetists. Even though severe airway complications are rare during anaesthesia, the adverse complications can be life-threatening. According to the Fourth Audit Project of the anaesthetists reported that out of the 133 reported airway complications, 16 led to death and three patients sustained brain damage. Therefore, to minimize mortality and morbidity, it is essential that anaesthetists the endowed with essential airway management techniques [1,14].

The McGrath Videolaryngoscope provides laryngoscopic views. However, it is difficult to direct the endotracheal tube [1,7,8]. The

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videolaryngoscope facilitates the tracheal intubation by enabling anaesthetists to have a superior vision of the larynx with minimal exposure of the oral-pharyngeal-laryngeal [8]. Studies have indicated that videolaryngoscope improve the success rate of intubation and significantly reduce intubation difficulties. The McGrath, like other videolaryngoscopes, offers a superior laryngeal view together with better airway management for patients [5,13]. However, an improved view is not always an assurance of intubation success due to the nature larynx axes. For this reason, the tip of endotracheal duct must pass through an angle between 45° and 90° to enter the larynx. Manufacturers recommend an angle between 45° and 90° to have an optimal view of the larynx. This study was conducted to determine the optimal angles (between 60° and 90°) of the stylet when using McGrath videolaryngoscopes.

Methods

This study involved 100 patients of both male and female who were undergoing selected surgeries that required endotracheal intubation. Approval by the institutional officials and written permission was obtained from the participating patients. The patients involved were aged between 19 years and 70 years. This study excluded patients that required rapid sequence intubation; ASA III, IV, and V; patients that required emergency surgeries; and patients who had a scored four in the mallampati test.

Patients were indiscriminately divided into two equal groups, 50 patients for 60° (n=50) and 50 patients for 90° (n=50). Standard monitors (ECG, SpO_2, and NIBP) were attached after patients arrived in the operation room. A standardized anaesthetic was introduced. Patients were also premeditated with midazolam 0.05mg/kg, glycopyrrolate 0.005mg/kg, and fentanyl 2 micrograms/kg. Patients were also induced with propofol 1-2 mg/kg. The participant patients were given the neuromuscular blocking drug vecuronium 0.1 mg/kg to aid tracheal intubation. Laryngoscopy was done using McGrath video laryngoscope, and the Glottic opening was visualized. For the 90° group, intubation was done with 90°-angled stylet ETT while for the 60° group; intubation was done with 60°-angled stylet ETT. Time of intubation was recorded for each patient. Other outcomes recorded were as follows: ease of intubation failed intubation at first attempt, Glottic grade, and presence of oropharyngeal bleeding. If the change of tube was necessary, only the time of the first tube was noted (Table 1).

Statistical Analysis

Category variables were analyzed using the Chi-square test while continuous variables were analyzed using the independent t-test between 60° and 90° groups. $p \leq 0.05$ was considered statistically significant for 95% confidence level. The table below summarizes the study findings (Table 2).

Table 1: Demographic Data of Patients that Participated in the Study

Patient Characteristics	Group 60^0	Group 90^0	P Value
Male: Female	22:28	24:26	0.532
Age in Years	42 ±13	43 ±13	0.824
Weight (kg)	65± 12	68±12	0.679
Height (cm)	168± 8	170±8	0.457
ASA 1/2	42/8	44/6	0.820
Mouth Opening (cm)	5.4 ±1.1	5.2± 0.9	0.318
Mallampati Grade 1/2/3	41/8/1	40/9/1	0.841

Table 2: Summary of study findings

Parameters	Group 60^0	Group 90^0	P Value
Intubation time (Sec)	28.2 ±6.8	33.5± 9.8	0.022
Glottic Grade 1/2a/2b/3/4	38/8/2/2/0	32/10/8/0/0	0.658
Failed First Attempt	50/0	38/12	0.116
Ease of Intubation Easy/Intermediate/Difficult	45/5/0	38/6/6	0.070
Bleeding Yes/No	48/2	43/7	0.718

Results

All the selected 100 patients completed this. All the patients in 60° group intubated successfully with 1st attempt and within 50 seconds. In contrast, intubation of six patients failed in the group 90°. The results of this study indicated that the level intubation difficulty and glottic grade were not significantly different between two groups.

Discussion

Currently, the incidence of difficulties direct intubation in intensive care units is as high as 20%. Video technology in the healthcare sector has facilitated the development of video laryngoscopes like the McGrath to help in difficulties in airway management [8,9,10,11]. Videolaryngoscopes have improved safety by avoiding preventable intubation attempts. Videolaryngoscopes make it possible for the entire anaesthesia team to assess the progress congruently [15,16]. This facilitates cohesion and communication of the team and improving coordination between the operator and the assistant(s) [4].

According to Ömür et al. [6], the correct use of stylet leads to efficient use of the D-blade stylet, C-MAC D blade, hockey stick stylet, and CoPilot stylet; decreased intubation time and painless passage of the vocal cords [16]. Various studies on the best angle-stylet for indicating intubation with 60^0-Glidescope and 60^0-malleable stylet provides the best outcome [12]. It is also easier to pass the TTI and tube with 60^0 compared to 90^0 tubes. Previous studies indicate that the 90^0 stylet has a tendency bend inwards making it hard to pass the tube through the trachea at the vocal cord [3].

Conclusion

In the present study, it was found that the 60° stylletted tube McGrath videolaryngoscopes were an effective aid for airway management with a high intubation success rate and its ability to quickly secure the patients' airways. According to this study, the intubation time in 90^0 was significantly longer than in 60°. Therefore, it is logical to conclude that it was difficult to use 90°-stylet than the 60°-stylet when using the McGrath. Hence, McGrath videolaryngoscope, 60° angled stylet is more efficient than 90°angled stylet as it allowed for faster orotracheal intubation.

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Dexmeditomedine vs Esmolol for Hypotensive Anaesthesia in Oro-Maxillo Facial Surgeries in Tertiary Care Hospital, Kanchipuram District

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Abstract

Introduction: Oro-maxillofacial surgeries are done worldwide. Extensive blood loss is a major concern in these surgeries. To make these procedures uncomplicated we need a good co-operating surgical and anesthesiologist team, very less tissue bleeding making surgical field clean and clear. Controlled hypotension[1,2] technique is employed or maxilla facial surgeries in which the systolic blood pressure is reduced to 80-90 mm of Hg, mean arterial pressure reduced to 55% to 60% or mean arterial pressure reduced 30% of baseline value. *Aim of the Study*: In this study we compared dexmeditomedine and esmolol and their effectiveness and advantage for controlled hypotension in oral-maxillofacial surgeries. *Materials and Methodology*: This study was conducted at Karpaga Vinayaga Institute of Medical Sciences and Research Centre as a double-blind randomised control trial involving 50 patients 25 in each group posted for our-maxillofacial surgery. Heart rate and Blood pressure were measured preoperatively, at 15 minutes 30min and 45 min after induction and during surgery, 10 min after infusion drug stoppage, at the end of surgery. After extubation emergence time of both the drugs after surgery was recorded. In both groups sedation scores were measured at 15,30 and 60 min after surgery ended. Intra-operative serum cortisol level were measured in both the groups and recorded separately. *Results*: In both groups target mean arterial pressure of 55-60 mm of Hg was achieved. In esmolol group heart rate and blood pressure was higher than dexmeditomedine group at 5 and 10 min. stoppage of study drug and at end of surgery. Dexmeditomedine group showed higher emergence time and sedation score at 15 and 30 min of surgery. There was no difference found intraoperatively in relation to serum cortisol level between the two groups. *Conclusion*: The observation in this study shows that dexmeditomedine and esmolol are equally effective in producing controlled hypotension with haemodynamic stability in oro-Castillo facial surgeries. Apart from the above dexmedetomidine has additional advantage of sedation and analgesic-sparing effect in compared to esmolol.

Keywords: Hypotension; Oro-Maxillofacial Surgeries; Esmolol; Dexmeditomedine.

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Introduction

Oro-maxilla facial surgeries [2] are associated with extensive blood loss making operating field bloody and requiring transmission of blood. The technique used to control blood loss and making surgical field clear intraoperatively is called controlled hypotension. It should be done with an ideal hypotensive agent [3] which has ease of administration, predictable hypotensive response, the absence of serious adverse effect and maintenance of adequate perfusion for end organs. Though many anesthetic agents and

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vasoactive drugs are used to produce controlled hypotension in this study we produced control hypotension using dexmeditomedine and esmolol. Dexmeditomedine [4,5,6] is a potent alpha2 adrenoreceptor agonist with a sedative. Analgesic and sympatholytic property. It decreases Noradrenaline release causing a reduction in heart rate and means arterial pressure [7]. It has sedative property and added an analgesic-sparing effect which is not associated with significant respiratory depression (opioid sparing drug). It decreases the activity of a Non-adrenergic neuron in Locus Cerulus of the brain stem and thereby increasing the activity of inhibitory GABA neurons in the ventral-lateral preoptic nucleus and cause sedation [8]. Esmolol [9] is a cardioselective B1 receptor blocker having a rapid onset and short duration of action with no significant intrinsic sympathomimetic on membrane stabilizing activity at therapeutic doses. It acts on by blocking B - adrenergic receptors of the sympathetic nervous system and decreases the force and rate of heart contraction [9]. These Beta receptors are found in heart and other organs of the body. In this prospective randomized control trial, we compared dexmedetomidine and esmolol has a hypotensive agent for controlled hypotension in oro-maxillofacial surgeries and evaluated their properties, quality of the surgical field, time to recovery and presence of any added advantages.

Materials and Methods

This study was a prospective randomized double-blind control trial involving fifty patients 25 in dexmedetomidine (D) group and 25 in esmolol (E) group undergoing oro-maxillofacial surgery in Karpaga Vinayaga Institute of Medical Sciences and Research Centre. As per our institution protocol a detailed history, routine blood investigations. like complete blood count, renal function test, serum electrolytes, chest X-ray and ECG were taken. Criteria fulfilling patients were randomly allocated to one of the study groups after getting consent from them. The allocation was done on the basis of the computerized randomized list. In both the groups pre-medication with Glycopyrollate 0.2 mg IM 45 min prior to surgery, Midazolam 0.05 mg/kg IV and Fentanyl 2 micro/kg IV were given. In group (E) esmolol 1mg/kg IV over 1 min as a loading dose and a infusion 0.5-0.8mg/kg/hr IV before induction was given. Titration of infusion dose was done to obtain a mean arterial pressure between 55-65mm of Hg. In group (D) dexmeditomedine, 1micro/kg diluted in 10ml of 0.9% saline was given as a loading dose over 10min and an infusion at the rate of 0.5 to 0.8micro / kg/hr before induction. Infusion dose was titrated to obtain a mean arterial pressure 55-65mm of Hg. In this study both the groups received same inducing agent propofol 1-2mg/kg and surgery was done by the same surgeon who was blinded to a hypotensive agent used so as to ensure the consistency and estimation of surgical field quality. Evaluation was done by following parameters such as heart rate and blood pressure pre-operatively and after induction, 15, 30, 45 min during surgery, 5 and 10 min after stopping the study drugs, at the end of surgery, after extubation, intraoperative serum cortisol level, emergence time, quality of surgical field, post-anesthetic recovery score by modified Aldrete score, sedation score (Ramsay sedation score) at 15, 30 and 60 min and first rescue analgesia.

Results

Our study included fifty patients who were randomly allocated to either D group or E group. Age, weight, ASA grading was noted. The outcomes measured are heart rate, Blood pressure. Serum control level, emergence time, quality of the surgical field, post-anesthesia recovery score, sedation score and first rescue analgesia were recorded as follows.

Table 1: Demographic Data

Study Group	Group D	Group E	P Value
Age (years)	33.08+7.3	31.84+8.6	0.5
Weight (Kg)	56+9.1	57.04+9.7	0.7

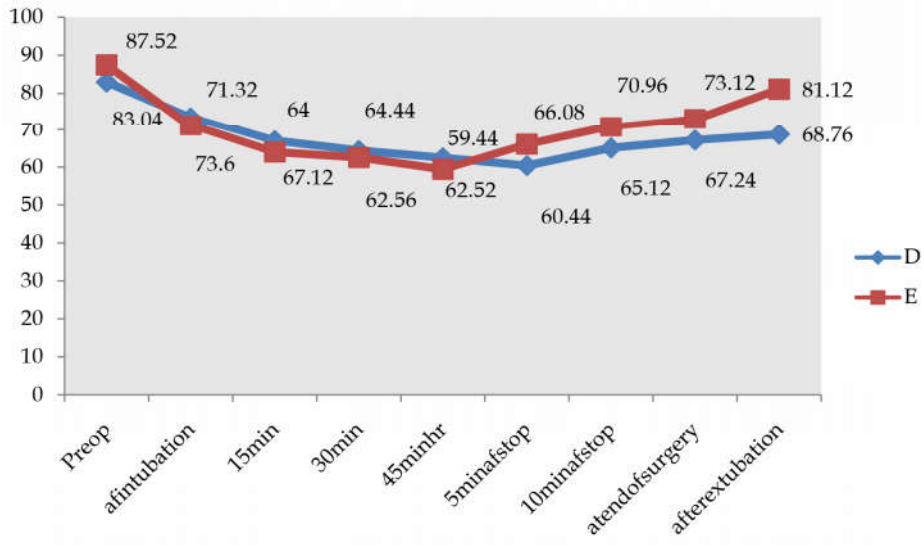
Graph 1 Comparision of heart rate for two groups pre-operatively (p Value 0.058), after induction at 15 (p Value 0.082), 30 (p Value 0.05) and 45 (p Value 0.09) min during surgery showed no significant statistical differences. Heart rate comparison at 5 (p Value <0.001), 10 min (p Value 0.002) after stoppage of study drug, at the end of surgery (p Value 0.002) were higher in Group E than Group D.

Graph 2 Comparision of systolic blood pressure showed no statistical significance preoperatively (p Value 0.098), 15 min (p Value 0.05), 30 min (p Value 0.08), 45 min (p Value 0.17) of surgery. Statistically significant difference in systolic blood pressure was found in 5 (p Value <0.001), 10 min (p Value <0.001) after stoppage of drug, end of surgery (p Value <

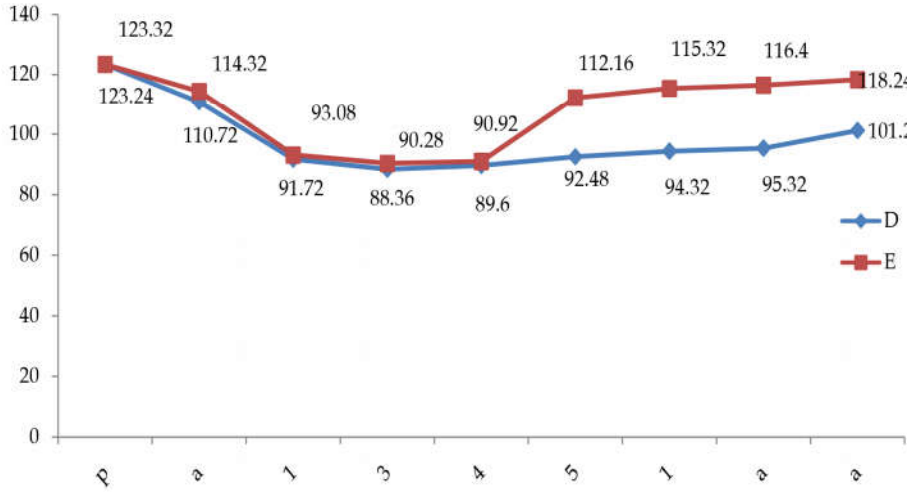
0.001) and after extubation (p Value <0.001) with high systolic blood pressure in Group E than Group D.

Graph 3 Comparision of diastolic blood pressure between two groups showed no statistical difference preoperatively (p Value 0.27), intubation (p Value 0.31), 15 min (p Value 0.54), 30 min (p Value 0.15), 45 min (p Value 0.19) during surgery. Statistically significant difference was found after 5 min (p Value<0.001), 10 min (p Value < 0.001) of drugs stoppage, end of surgery (p Value < 0.001) and at extubation (p Value in which diastolic Blood pressure was higher in Group E and Group D).

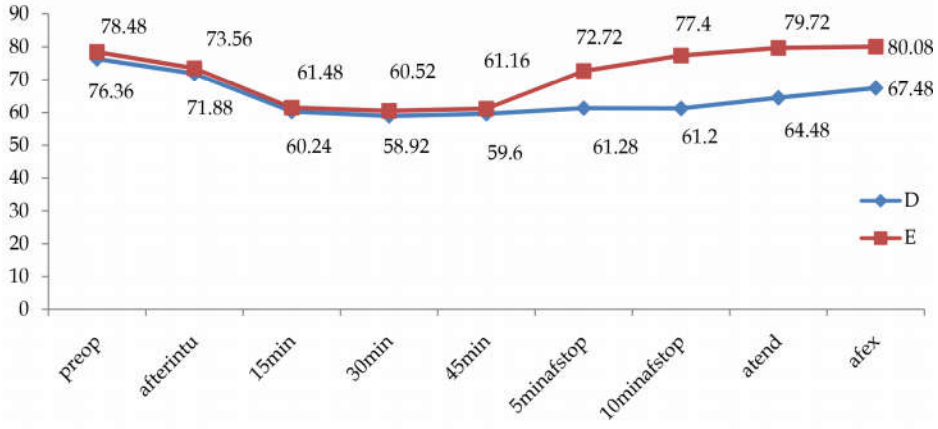
Graph 1:



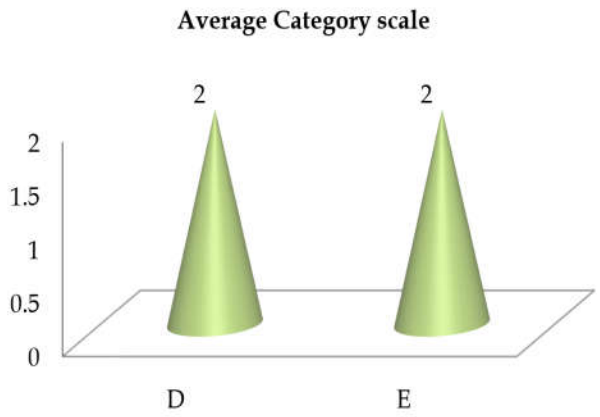
Graph 2:



Graph 4:



Quality of Surgical Field – Average Category Scale



Daigram 1:

Table 2 Comparison of Emergence time showed the statistically significant difference between two group. Group D higher than Group E. Post Anesthesia Recovery Score showed statistical differences between two groups. To achieve a modified Aldrete score of more than 9 the time take by Group D was higher than group E. Sedation Score revealed statistically significant difference at 15, 30 min after surgery with Group D higher than group E. No statistical difference was found 60 min after surgery in both groups. Rescue Analgesia showed statistical differences in which time for rescue analgesia is higher in Group D than Group E.

Discussion

Oro-maxillofacial surgeries are widely performed and it requires a skillful team and a clear operating field. Many studies have stated the advantages of hypotensive anesthesia in these surgeries. In our study we compared the effects of Dexmeditomedine a loading dose of 1micro/kg over 10 min followed by 0.4-0.8 micro/kg/hr infusion with Esmolol a loading dose of 1mg/kg over 1 min followed by infusion 0.4-0.8 mg/kg/hr for controlled hypotension in oro-maxillofacial surgeries. Shen et al. [10] found heart rate and blood pressure was significantly reduced by using esmolol for hypotensive anesthesia in FESS. Malhotra et al. [11] found that use of dexmedetomidine for hypotensive anesthesia lower mean arterial pressure and heart rate. In our study we compared dexmeditomedine with esmolol in which both the drugs are equally comparable preoperatively and intra-operatively. But at 5min, 10 min after stoppage of study drug infusion, at end of surgery, after extubation dexmeditomedine showed lower mean arterial pressure and heart rate which was consistent with above two studies. Farah Nasreen et al. [12] studied the effects of dexmeditomedine in hypotensive anesthesia in middle ear surgery showed improved bloodless operating field. Boezaart et al. [9] compared Sodium Nitroprusside with esmolol and found that superior surgical field was seen with esmolol. In our study we compared dexmedetomidine with esmolol which showed equally comparable clear operating field which was consistent with the above study. Abdullah Aydin Ozcan et al. [13] compared remifentanil with dexmedetomidine for hypotensive anesthesia in FESS and found dexmeditomedine has a prolonged emergence time. In our study dexmedetomidine had a prolonged emergence time than esmolol. Koi IO et al. [14] compared dexmeditomedine with esmolol for hypotensive anesthesia in tympanoplasty and found esmolol had a shorter recovery which was also consistent in our study. Turan et al. [15] compared esmolol, remifentanil, dexmedetomidine and found that post-extubation recovery score was long in dexmeditomedine than the other two. In our study we had higher post-anesthesia recovery score in Group D than Group E. CR Patel et al. [16] study found that dexmeditomedine had higher postoperative sedation score than the control group. In our study sedation score was significantly higher in group D

Table 2: Serum cortisol level intra-operatively showed no statistical difference between the two groups

Parameters	Group D	Group E	P value
Serum Cortisol level (Intraoperatively)	4.04+0.5	3.75+0.5	0.007
Emergence Time	13.14+1.1	7.62+1.3	0.00
Post Anesthesia Recovery (Modified Aldrete score more than 9)	15.4+1.8	10.86+0.9	0.00
Sedation Score at 15 mins	2.76+0.4	2.36+0.4	0.00
Sedation Score at 30 mins	2.64+0.4	2.28+0.4	0.01
Sedation Score at 60 mins	2	2	
Time to first rescue analgesia	64.4+7.9	40.64+5.5	0.00

at 15 and 30 min after surgery when compared to esmolol and at 60 min there was no difference in sedation score in both the group. Gurbet et al. [17] study found that postoperative analgesic requirement was lower when dexmeditomedine used intraoperatively. Guptha et al. [18] studied that dexmeditomedine had lower pain score and time for rescue analgesia was longer. In our study we found dexmeditomedine having significantly long time for rescue analgesia than esmold group. Sarpkaya et al. [19] study found lower serum cortisol level in dexmeditomedine group than the control group when dexmedetomidine was used perioperatively for surgical stress response in hypotension patients. In our study intraoperative serum cortisol level was only measured and it had no significant differences in both the groups.

Conclusion

This study reveals that both Esmolol and Dexmeditomedine can be effectively used in controlled hypertension for oro-maxillofacial surgeries. Both were equally comparable with respect to the quality of the surgical field and intra-operative hemodynamics. Compared with Esmolol Dexmedetomidine had an added advantage of inherent analgesic property and sedation property.

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Original Research Article

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A Comparative Evaluation of Intrathecal Administration of Hyperbaric Bupivacaine alone and in Combination of Different Low Doses of Hyperbaric Bupivacaine with Fentanyl in Cesarean Section

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Abstract

Background: This randomized study was conducted to compare the synergistic effect of intrathecally administered fentanyl and hyperbaric bupivacaine on hemodynamic, sensory and motor block characteristics alongwith their side effects. *Context:* This randomized study was done on pregnant women undergoing caesarean section under spinal anaesthesia. *Aims:* To compare and determine the efficacy of spinal anaesthesia with bupivacaine alone and in combination of different low doses of bupivacaine with additive fentanyl. *Settings and Design:* This study included 75 pregnant women scheduled for caesarean section who were then randomized into three groups of twenty five each. Group 1 (B group) received 12.5 mg (2.5 ml) of 0.5% of hyperbaric bupivacaine intrathecally, Group 2 (BF1 group) received 10 mg (2 ml) of 0.5% of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl intrathecally, Group 3 (BF2group) received 8 mg (1.6ml of 0.5%) of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl + 0.4 ml normal saline intrathecally. *Statistical analysis used:* The data of the study were recorded in the record chart and results were evaluated using statistical tests (ANOVA, student t-test, chi-square test and post hoc test, F-test whichever was applicable *Results:* Onset of sensory block to T10 dermatome occurred faster with increasing bupivacaine doses. Onset of motor block and duration of motor block was also longer in group B as compared to BF1 and BF2. The addition of Fentanyl to Bupivacaine significantly delayed the postoperative pain and sensory recovery. *Conclusions:* Spinal anaesthesia for cesarean delivery using low dose hyperbaric bupivacaine in combination with fentanyl is associated with significantly less hypotension, vasopressor requirement and nausea.

Keywords: Bupivacaine; Caesarean Section; Fentanyl; Spinal Anesthesia.

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Introduction

Spinal anaesthesia is most commonly used for patients who require surgical anaesthesia for procedures that involve the lower abdomen, lower extremities, perineum and pelvic girdle.

In the past, general anaesthesia was considered to be the technique of choice. But now the number of caesarean sections performed under general anaesthesia has dropped significantly because of airway problems in pregnancy due to anatomical and physiological changes causing airway oedema, breast enlargement and excessive weight gain and risk of pulmonary aspiration in general anaesthesia in obstetric patients [1].

Spinal anaesthesia has many advantages over general anaesthesia like minimum physiological disturbance resulting in minimum stress response, rapid onset of action, superior blockade, cost

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effectiveness and less chances of postoperative morbidity [2], avoidance of multiple drugs required for general anaesthesia, less neonatal exposure to highly depressant drugs, decreased risk of pulmonary aspiration and awake mother at the birth of her child [3]. Local anaesthetic agents have always been the drugs of choice for spinal anaesthesia. Intrathecal bupivacaine alone may be insufficient to provide complete analgesia despite high sensory block. But large doses of bupivacaine are associated with hypotension and delayed recovery of motor block. Hence adjuvants are added to decrease the dose of LA required. Opioids are the commonest adjuvant drugs added to the local anaesthetics for improved intra-operative and postoperative analgesia.

Fentanyl is one of the most commonly used opioid for caesarean section as it improves intraoperative and postoperative analgesia [8]. It has been found to be safe and effective both in terms of neonatal and maternal outcome [17]. Because of high lipid solubility, it undergoes rapid uptake by the spinal cord and hence the chances of respiratory depression are less.

Many studies were done to know synergistic effect of intrathecal fentanyl with bupivacaine in spinal anaesthesia for caesarean section. The combination of low dose bupivacaine with fentanyl makes it possible to achieve adequate spinal anaesthesia with minimal haemodynamic changes. Hence this study was undertaken to investigate whether this synergistic phenomenon could be used to provide less frequent hypotension and side effects without compromising spinal anaesthesia for caesarean section.

Materials and Methods

A comparative clinical study of subarachnoid block with 0.5% hyperbaric bupivacaine alone and 0.5% hyperbaric bupivacaine used in different doses with fixed dose of 12.5 µg fentanyl was conducted in ASA grade I-II patients with age between 20-35 years and weight 50-70kg at IGMC Shimla, after obtaining permission from ethical committee. 75 patients who had to undergo caesarean section were enrolled for this study and they were divided into three groups with 25 patients in each group. Every patient received total 2.5 ml of drug intrathecally as described below: Group 1 (B group) received 12.5 mg (2.5 ml) of 0.5% of hyperbaric bupivacaine intrathecally, Group 2 (BF1 group) received 10 mg (2 ml) of 0.5% of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl intrathecally, Group 3 (BF2group) received 8 mg (1.6ml of 0.5%) of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl + 0.4 ml normal saline intrathecally.

Inclusion Criteria

ASA physical status I or II with normal coagulation profile, age between 18 to 30 years, weight between 45 and 70 kg.

Exclusion Criteria

Twin pregnancy, severe anaemia, pregnancy induced hypertension, history of allergy to local anaesthetics, fentanyl**,** patients with a history of diabetes, respiratory, liver, renal, cardiovascular diseases, uncooperative patients, neurological disorder, musculoskeletal deformity.

Study Plan

Preanaesthetic examination was carried out in detail including detailed history regarding coexisting medical problems, current medications, allergies, previous anaesthetic and surgical experience. General physical examination, vital parameters (pulse rate, blood pressure), systemic examination, airway assessment and spine examination was done in every patient. Routine preoperative investigations including haemogram, blood sugar (Fasting /Random); electrocardiography were also done. Study protocol was explained to all the patients during preanaesthetic evaluation after taking written informed consent. The participants were made familiar with a 10 point visual analogue scale (where 0 is no pain and 10 is the worst imaginable pain).

After shifting patient on the operating table, nil by mouth was confirmed and monitors like pulse oximeter, non-invasive blood pressure, electrocardiographic electrodes were applied. Baseline heart rate, blood pressure and arterial oxygen saturation (SpO_2) were noted. Intravenous access was secured using 18G venous cannula and intravenous infusion was started with crystalloids fluid. The patients were placed in right lateral position on a horizontal table. After drapping the area with sterile towel, L3/L4 space was selected and by using 26G spinal needle subarachnoid block was performed under all aseptic precautions. Immediately after procedure patient was shifted to supine position, in 15-30 degree head down position. Oxygen was given through ventimask at the rate of 4 l/ min. All patients received Inj. oxytocin 10 units in drip after delivery of baby. Neonatal outcome was assessed using APGAR score at 1 and 5

min. Incidence of APGAR score <7 was recorded and if respiratory depression occurred it was reversed by inj. naloxone in a dose of 0.1mg/kg intramuscularly. Intraoperatively pulse, non invasive blood pressure and SpO_2 were measured every 3 min for the first 15 min then every 5 min for next 15 min and thereafter every 10 min till 90 min.

Sensory Block Assessment

Onset of action was noted from the time of injecting the drug into subarachnoid space till complete analgesia at the level of T 10. Level of sensory block was checked bilaterally by loss of pinprick sensation to 23G hypodermic blunt needle and dermatomal level was tested every 2 min until the highest level was stabilized for four consecutive tests. Maximum level achieved was noted. After that, sensory level assessment was continued every 10 min till there was two segment regression of the block. Onset of two segment regression of the block was taken as the time from the onset of sensory block to the time taken for sensory regression to two segments below T6 level achieved. Complete sensory recovery was noted and was defined as the return of sensation of great toe.

Motor block assessment

The onset of motor block was defined as the time from the injection of drug in subarachnoid space till the patient was unable to raise the extended legs (grade 1). The degree of motor block was assessed with Bromage scale. Duration of motor blockade was calculated from the time of injecting the drug into subarachnoid space to the recovery of motor blockade (Bromage grade 0). Intraoperative side effects such as hypotension, nausea, vomiting, pruritus, maternal respiratory depression were noted till the end of surgery. Hypotension was defined as a decrease in systolic blood pressure of less than 90 mm of Hg. Hypotension was treated with Inj. Mephentermine 6mg intravenous bolus as needed.

Continuous monitoring of oxygen saturation was done. If bradycardia (heart rate less than 60 beats per min) occurred, it was treated with i.v. injection of atropine 0.6mg. Respiratory depression was defined as respiratory rate less than 10 per min. Inj. Ondansetron 4mg intravenous was given for nausea & vomiting.

Assessment of analgesia

This was taken as the time interval between injection of the spinal drug to first report of pain. Postoperatively the patients were evaluated for pain at the operation site with visual analogue scale (0 = No pain, 10 = Worst pain). On complaining of pain (VAS-3), inj. tramadol intramuscularly was given as rescue analgesia.

Statistical Analysis

Statistical analysis of data among groups was performed by using appropriate tests (ANOVA, Student t test, post hoc test).

Results

There were 25 patients in each group of total 75 patients, and there were no significant differences between three groups with respect to age and weight (p>0.05) (Table 1).

Mean time of onset of sensory block in group B was 1.60±0.50 min, in group BF1 was 1.88±0.52 min and in group BF2 was 2.16±0.59 min which was statistically significant (p<0.05) (Table 2).

Maximum patients in group B attained the highest sensory level of T4 (76%) and in group BF1 maximum patients achieved highest sensory level of T5 (52%) and also in group BF2 maximum patients attained highest sensory level T5 (68%) and this difference

Table 1: Demographic Data

Parameter	Group B Mean ±S.D	Group BF1 Mean ±S.D	Group BF2 Mean ±S.D	P value
Age (years)	28.48±2.57	27.36±2.93	28.24±3.77	0.579
Weight(Kg)	65.76±4.21	62.36±3.75	63.36±4.64	0.645

p > 0.05= not significant, p <0.05=significant (*), p< 0.001=highly significant (**)

The baseline parameters in all three groups were found to be comparable and the differences were statistically insignificant (p>0.05) [Table 2].

Abbreviations: Group 1 (B group) received 12.5 mg (2.5 ml) of 0.5% of hyperbaric bupivacaine intrathecally, Group 2 (BF1 group) received 10 mg (2 ml) of 0.5% of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl intrathecally, Group 3 (BF2group) received 8 mg (1.6ml of 0.5%) of hyperbaric bupivacaine + 12.5µg (0.5ml) fentanyl + 0.4 ml normal saline intrathecally.

was found statistically significant ($p<0.05$) (Table 3).

Mean time taken for two segment sensory regression in group B was 91.08±5.27 min, in group BF1 was 91.78±8.07 min, and in group BF2 was 88.08± 5.23 min, this difference between the different groups was not statistically significant ($p>0.05$) (Table 3).

The mean time for effective analgesia in group B was 226.01±7.04 min, in group BF1 was 339.85± 10.28 min, and in group BF2 was 327.28±12.90 min, which was statistically significant ($p<0.05$) (Table 3).

The mean time for effective analgesia in group B was 199.80±11.08 min, in group BF1 was 208.56±5.26 min, and in group BF2 was 203.96±5.97 min, which was statistically significant ($p<0.05$) (Table 3).

The mean time of onset of motor block in group B was 2.56±0.51 min, in group BF1 was 2.68±0.48 min and in group BF2 was 2.76±0.60 min, this difference was not statistically significant among the groups even on intergroup comparison ($p>0.05$) (Table 3).

The mean time for complete recovery of motor blockade in group B was 184.24±7.61 min, in group BF1 was 171.00±8.46 min, and in group BF2 was 163.28±7.11 min, which was statistically significant among all the groups ($p<0.05$) (Table 3).

The apgar score was calculated at 1 min and 5 min interval and it was found comparable in all the three groups ($p>0.05$) (Table 4).

Amongst the side effects, on comparing the different groups hypotension was present in 40% of patients in group B, 20% of patients in group BF1 and none of patients in group BF2, which was statistically significant ($p<0.05$) (Table 5). None of the patient among the different groups had any pruritus or respiratory depression.

Discussion

General anaesthesia is associated with higher mortality rate in comparison to regional anaesthesia. This is one of the most important reason for increased use of regional anaesthesia, but regional anaesthesia is not without risk. Deaths in regional anaesthesia are primarily related to

Table 2: Baseline Parameters of the patients in three groups

Parameter	Groups			P value
	Group B Mean ± S.D	Group BF1 Mean ± S.D	Group BF2 Mean ± S.D	
HR (bpm)	86.64±9.84	87.60±8.12	90.00±8.31	0.385
SBP (mmHg)	119.28±9.31	116.12±5.63	120.92±7.56	0.077
DBP(mmHg)	68.88±7.40	70.12±8.08	71.64±7.67	0.453
MAP(mmHg)	86.56±6.96	85.36±5.65	88.04±6.63	0.342
SpO2	98.40±1.19	98.88±0.60	99.08±0.40	0.084

p > 0.05= not significant, p <0.05=significant (*), p< 0.001=highly significant (**)

Abbreviations: HR- Heart rate, SBP- systolic blood pressure, DBP- diastolic blood pressure, MAP- mean arterial pressure, SpO_2- saturation of oxygen

Table 3: Time related parameters of sensory and motor blocks in the groups

Variables	Group B Mean ± SD	Group BF1 Mean ± SD	Group BF2 Mean ± SD	P value
Onset of sensory block	1.60 ± 0.50	1.88 ± 0.52	2.16 ± 0.59	0.003*
Maximum sensory level	T4	T5	T6	0.003*
Time for two segment regression	91.08 ± 5.27	91.78 ± 8.07	88.08 ± 5.23	0.150
Complete sensory recovery	199.80 ±11.08	208.56 ± 5.26	203.96 ± 5.97	0.001**
Onset of motor block	2..56 ± 0.51	2.68 ± 0.48	2.76 ± 0.60	0.409
Duration of Motor Block	184.24 ± 7.61	171.00 ± 8.46	163.28 ± 7.11	0.010*
Total duration of effective analgesia	226.01 ± 7.04	339.85 ± 10.28	327.28 ± 12.90	0.001**

Table 4: APGAR score

APGAR score	Group B	Group BF1	Group BF2	P value
1 min	7-8	7-8	7-8	0.987
5 min	9-10	9-10	9-10	0.879

p > 0.05= not significant, p <0.05=significant (*), p< 0.001=highly significant (**)

Table 5: Side effects

Variables	Group B N=25	Group BF1 N=25	Group BF2 N=25
Hypotension	10 (40%)	5 (20%)	0 (0%)
Bradycardia	1 (4%)	0 (0%)	0 (0%)
Nausea	5 (20%)	1 (4%)	0 (0.0%)
Pruritus	0 (0.0%)	0 (0%)	0 (0%)
Respiratory depression	0 (0.0%)	0 (0.0%)	0 (0.0%)

excessive high regional blocks and toxicity of local anaesthetics. Opioids are well known to improve the analgesic potency of local anesthetics, if administered intrathecally a short acting lipophilic opioid is known to augment the quality of subarachnoid block. Fentanyl is a lipophilic opioid and is preferred for having a rapid onset and short duration of action with lesser incidence of respiratory depressions. Therefore in this study fentanyl was added to bupivacaine with the aim of providing adequate depth of anaesthesia with lesser doses of bupivacaine, thereby reducing chances of high block. The dose of fentanyl 12.5 microgram had been chosen in ourstudy, because it was mid range for doses quoted inthe literature [3,7].

In our study time of onset of sensory block was comparable in group B and BF1 and group BF1 and BF2. Whereas it was significantly lower in group B in comparison to group BF2, hence it can be concluded that time of onset of sensory block goes on increasing with decreasing the dose of bupivacaine and further addition of fentanyl to bupivacaine leads to dilution of bupivacaine concentration resulting in increase in the duration of onset of sensory block.

Our result are in accordance with the result observed by Bogra et al. [12], who observed that the onset of sensory block to T6 occurred faster with increasing bupivacaine doses in bupivacaine only groups. Therefore addition of fentanyl to bupivacaine did not alter the onset of sensory block. This finding is consistent with the findings of study conducted by Biswas et al. [11] and Harsoor et al. [13] Similar observations were made by Hunt et al. [13] and Shende et al. [5]

In the present study on comparing the highest sensory level, difference was found statistically significant between group B and BF2, whereas the difference was comparable between group B and BF1, group BF1 and BF2. Thus we concluded that on increasing the dose of bupivacaine significantly more number of patients attained highest sensory level. As the highest sensory level attained was more in group B than in group BF1 and BF2 which means that addition of fentanyl to bupivacaine did not change the height of block as the analgesia of opioid is not associated with sympathetic nervous system denervation. Our findings are consistent with the result of Biswas et al. [11], Harsoor et al. [13], and Choi et al. [17] Choi et al. [17] in their study observed a significant difference in attainment of higher sensory level in bupivacaine 12mg group and the difference between 8mg and 10mg bupivacaine groups was comparable as in our study. Similar results were observed in Biswas et al. [11] using 10mg Bupivacaine and Harsoor et al. [13] using 8mg of bupivacaine.

The mean time taken for two segment sensory regression was comparable among all the three groups. Our results were in agreement with the study done by Kotwani et al. [14], where time for two segment sensory regression in group B was 91 min and in group BF was 73 min, which was statistically not significant. Similar results were obtained in the study by Ben David et al. [10], in their study the time to two segment regression was 53 and 67 min in bupivacaine and bupivacaine plus fentanyl groups respectively, which was not significant. Similar results were also obtained in the study by Belzarena et al. [6].

In the present study mean time for effective analgesia in group B was 226.01±7.04 min, in group BF1 was 339.85±10.28 min and in group BF2 was 327.28±12.90 min, which was statistically significant, however this difference was statistically significant between group B and BF1, group B and BF2, whereas the time of effective analgesia between group BF1 and BF2 was comparable. This difference between group B, BF1 and BF2 was explained on the basis of synergistic effect of addition of fentanyl to bupivacaine. Hence we concluded that addition of fentanyl to bupivacaine significantly increased the time of effective analgesia among the bupivacaine plus fentanyl groups. This finding is consistent with the results of the study done by Hunt et al. [3], Biswas et al. [11], Bogra et al. [12] and Harsoor et al. [13]. Results of the studies done by Belzarena et al. [6] and Singh et al. [9] also in line with the results of our study.

In the present study, the time for complete sensory recovery in group BF1 was maximum followed by group BF2 and then Group B, although this difference was significant only between group B and BF1. This difference between group B, BF1 can be explained on the basis of synergistic effect of addition of fentanyl to bupivacaine. This finding is consistent with the results of the study done by Belzarena et al. [6], Harbhej Singh et al. [9] and Biswas et al. [11].

The onset of motor blockade was clinically earlier in group B than in group BF1 followed by group BF2, but was statistically non significant. Hence it can be concluded that fentanyl has no effect on motor blockade. This finding is consistent with Study done by Bogra et al .[12], Gajbhare et al. [15] and Ahmed NU et al. [16].

In our study as we increased the dose of bupivacaine, the total duration of motor blockade also increased among different groups and this finding is consistent with study done by Bogra J et al. [12] and Choi DH et al. [17] where they observed that increase in bupivacaine dose prolongs the motor recovery. The study done by Hunt CO et al. [3], Singh H et al. [9] and Biswas BN et al. [11] concluded that addition of fentanyl does not alter the duration of motor block which was consistent with the results of our study.

Apgar score was normal in all three groups and there were no significant difference in neonatal apgar score among the groups at 1 and 5 min, thus we conclude that there was no effect on neonatal respiration, which were similar with observations of study conducted by Hunt et al. [3] and Shinde et al. [5].

Systolic blood pressure decreased from the baseline value in all the three groups and fall in blood pressure was maximum in group B then group BF1 followed by group BF2. Thus decrease in systolic blood pressure can be explained on the basis of higher dose of bupivacaine significantly decreased SBP mostly due to more sympathetic blockade by higher doses of bupivacaine. Diastolic blood pressure decreased from the baseline value in all the three groups but the difference was not statistically significant between the groups.

Mean arterial pressure decreased from the baseline value in all the three groups but the difference was not statistically significant. This finding is consistent with the study done by Bogra et al. [12], Seyedhejazi Gandam et al. [18] and Madarek et al. [19].

Oxygen saturation was recorded during the procedure at regular intervals; the saturation was comparable in all the three groups with no evidence of respiratory distress any time during the procedure.

In this study different side effects of the drug were recorded and compared among the different groups. In the present study hypotension was present in 40% of patients in group B, 20% of patients in group BF1 and none of patients in group BF2. This difference was statistically significant among these groups. Thus we concluded that incidence of hypotension increases with increasing the dose of bupivacaine. Our study results are comparable to the study done by Bogra et al.[12], Gandam et al. [18], Seyedhejazi and Madarek et al. [19].

Nausea was seen in 20% patients in group B, 4% patients in group BF1 and none in group BF2. The higher incidence of nausea may be due to high dose of bupivacaine in group B. This suggests that the addition of fentanyl does not increase the incidence of nausea. Various studies by Ben David et al. [10], Biswas et al. [11] and Bogra et al. [12] also correlate with our findings.

Bradycardia was observed only in 4% of patients in group B and none in the other groups and this difference was not statistically significant among different groups ($p>0.05$). This result concurs with Hunt et al. [3], Singh et al. [9] and Biswas et al. [11], and Choi DH et al. [17].

In the present study we did not notice any incidence of pruritus, maternal or neonatal respiratory depression among different groups. This finding is consistent with study done by Hunt et al. [3], Singh et al. [9] and Biswas et al. [11].

Conclusion

In our study, we observed that spinal anaesthesia for cesarean delivery using low dose hyperbaric bupivacaine in combination with fentanyl is associated with significantly less hypotension, vasopressor requirement and nausea than spinal anaesthesia with conventional dose of hyperbaric bupivacaine and without any untoward effects. This combination has been shown to improve quality of spinal anaesthesia for cesarean delivery. Therefore, low dose bupivacaine with fentanyl gives adequate intraoperative analgesia and thus making it a reliable alternative. Even then more studies are required to verify a reliable minimum dose of bupivacaine with fentanyl for spinal anaesthesia in cesarean delivery.

Acknowledgement

None

Conflict of Interest: Nil

Key Messages

Spinal anaesthesia for cesarean delivery using low dose hyperbaric bupivacaine in combination with fentanyl is associated with significantly less hypotension,

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Original Research Article

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A Prospective Randomised Control Study to Compare Hyperglycemic Stress Response to General Anaesthesia in Non Diabetics and Controlled Diabetics Posted for Elective Surgical Procedures

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Abstract

Diabetic patients presenting for elective surgical procedures will place an increasing burden on anaesthetic services. The effects of surgical stress and anesthesia result in a a hypermetabolic stress response, referred to as "stress hyperglycemia". The aim of the study is to compare stress response to general anaesthesia by measuring the rise in blood glucose levels in controlled diabetics posted for elective surgical procedures in comparision with non-diabetic patients .Study was conducted in Department of Anaesthesiology, Osmania Medical College/Hospital, Hyderabad during 2010-2012 in Fifty ASA Grade I & Grade II patients. Institutional Ethics Committee has approved the study, written and informe consent was obtained from the patients. The study population were in the age group of 35-55 years, of either sex divided into two groups scheduled for elective surgical procedures of 2 hours of duration *(viz., laporatomy, thyroidectomy*). A Opiod (Fentanyl) and Propofol based balanced general anaesthesia technique adequately attenuates Hyperglycemic Stress Response in Controlled Diabetics.

Keywords: Stress Response; Chronic Hyperglycemia; General Anaesthesia; Opioids; Cortisol; Hypothalamo-Pituatory Adrenal Axis (HPAA Axis); Diabetes Mellitus.

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Introduction

Diabetes Mellitus is a group of multisystem metabolic disease known to mankind since ancient times, first reported in Egyptian manuscript [1] with increased incidence in surgical patients in recent years [1]. It is characterized by presence of chronic hyperglycemia due to impaired insulin secretion or decreased tissue response leading to impaired *metabolism* of carbohydrates, lipids and proteins. The chronic hyperglycemia results in long term multiorgan dysfunction especially eyes, kidneys heart and blood vessels .The distinction between type 1 and type 2 DM was made in 1936 [3] and Type 2 DM was first described as a component of metabolic syndrome (1988) [4]. Incidence of diabetes in surgical patients is about 2% to 4%[5].

Under anaesthesia Stress Hyperglycemia in diabetics could lead to increased incidence of acute diabetic complications resulting in postoperative morbidity and mortality [6,7]. Therefore, discussing the effects of general anaesthesia in diabetic patients posted for elective surgeries were necessary.

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Diabetus Mellitus

Diabetes is a group of metabolic diseases mellitus is a state of relative or absolute insulin deficiency. American Diabetes Association (ADA) and World Health Organization (WHO) published new recommendations for diagnosis of diabetes mellitus [8, 9 ,10] and advise a reduction in the threshold limit for fasting plasma glucose concentrations. ADA recommendations focus on Fasting Plasma Glucose (FPG) and WHO focuses on Oral Glucose Tolerance Test (OGTT) for diagnosis.

Classification of Diabetes Mellitus

WHO and ADA recommend a more aetiologically based nomenclature for Classification of Diabetes Mellitus [8] and this system identifies four types. Type I (pancreatic B cell destruction) , Type II (defective insulin secretion/insulin resistance), "other specific types" and gestational diabetes [9,10]. Diabetes may be diagnosed based on the plasma glucose criteria, either the fasting plasma glucose (FPG) or the 2-h plasma glucose (2-h PG) value after a 75-goral glucose tolerance test (OGTT) or the A1C criteria [11,12,13].

Criteria for the Diagnosis of Diabetes [14]

FPG ≥ 126 mg/dL (7.0mmol/L). Fasting is defined as no calorie intake for at least 8hrs*

Or

2-hrs PG ≥ 200 mg/dL (11.1 mmol/L) during an OGTT. The test should be performed as described by the WHO, glucose load equivalent of 75 g anhydrous glucose dissolved in water.*

Or

HbA1C ≥ 6.5% (48 mmol/mol). The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*

Or

Classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dL (11.1 mmol/L).

*In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing.

Diagnostic Tests for Diabetes

The diagnostic test should be performed using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) and standardized or traceable to the Diabetes Control and Complications Trial reference assay. HbA1C is a stable glycosylated form of haemoglobin represents the average glucose level over time can be used an index of glycemic control . 5.7% is normal, >6.5 diabetes. The HbA1c test is currently considered the best measure of overall blood glucose control and of the risk of developing diabetic complications in the future. The test measures the percentage of hemoglobin molecules in the blood that have glucose attached to them. *Estimated Average Glucose (eAG)* – From HbA1c value average plasma glucose level over previous 3 months may be calculated approximately using *the ADAG linear regression formula*, eAG: 28.7 x HbA1c — 46.7 = eAG (in mg/dl). Stress response to anaesthesia and surgery is a physiological response characterized by hormonal and metabolic changes . The components of stress response are :

1. Endocrine response with pituitary hormone secretion and insulin resistance,
2. Sympathetic nervous system activation and
3. Immunologic and Hematologic changes.

The net metabolic effect of stress response (Neuro- Endocrinal outflow) is increased blood glucose levels. Diabetics have higher morbidity and mortality as surgical patients. Hyperglycemia during surgery presents unique challenges and produces deleterious effects on immune system and on the response to endotoxin. An understanding of physiological changes of stress response and its effects along with knowledge of precipitating factors and applying modulatory therapeutic methods in time allows even major procedures to be performed safely in Diabetic patients [15–17] . The development of these adverse effects is likely related to the numerous adverse cellular and biochemical events that occur as a result of hyperglycemia [18, 19]. Blood coagulation is activated by hyperglycemia, as circulating prothrombin fragments and D-dimers are increased, and platelet aggregation and thrombosis occur [20]. Inflammation and activation of proinflammatory cytokines is also induced by hyperglycemia. Hyperglycemia also abolishes intrinsic myocardial protective mechanisms, such as ischemic preconditioning [21].

Thus, hyperglycemia interacts at cellular and biochemical level in numerous ways, which may be responsible for the adverse effects associated with hyperglycemia.

This study analyses and compares hyperglycemic response during anaesthesia and surgical stress environment in a well controlled diabetes and non diabetic patients scheduled for elective surgeries.

Materials and Methods

The present study was conducted in Department of Anaesthesiology, Osmania Medical College/ Hospital during 2009-2012, to evaluate and compare the stress response to general anaesthesia and surgery in controlled diabetics and non diabetics posted for elective surgeries under General anaesthesia. A Fifty ASA Grade I & Grade II patients belonging to either sex in the age group 35-55yrs age group were selected randomly for the study. Patients were scheduled for elective surgical procedures of 1-2 hours of duration *(viz., laporatomy, thyroidectomy,*) and were divided into two groups Group D (Controlled Diabetics) and Group N (Non Diabetics) of 25 patients each. The rise in blood glucose was taken as a measure of stress response to surgery and anaesthesia in both the study groups for the following reasons (i) Simple test (ii) Cost effective (iii) Reliable (iv) Easy to perform and (v) Results are obtained with in the shortest possible time (5–10 seconds).

All surgeries were performed under general anaesthesia and intraoperatively blood glucose levels were estimated from finger prick capillary blood samples with glucometer. The study had approval from Institutional ethical committee and written, informed consent of all patients. Pre-operative assessment was done a day before and other systemic diseases were excluded. Standard NPO guidelines were advised, in diabetics insulin and oral anti diabetic drugs were precluded from night before operation. On day of surgery patients were wheeled into operating room and preoperative blood sugar levels were measured by Glucometer and noted, an i.v. access was secured and 0.9% normal saline infusion started @ 100 ml/hr as a part of no glucose protocol. A standard general anaesthesia technique (opioid+propofol + muscle relaxant) technique was adopted in both study groups– Premedication: Glycopyrrolate-0.2mg, Ondansetron-4mg, Fentanyl 2mcg/kg i.v. Induction & intubation: Propofol 2mg/kg+ Vecuronum 4mg, Maintenance: O_2: N_2O 2:2 lit/min, Vecuronium, Isoflurane 1% conc., Closed circuit with CO_2 absorber, Controlled Ventilation (Datex Ohmeda Aestiva anaesthesia workstation). At end of surgery neuromuscular block was reversed with neostigmine 0.05mg/kg and glycopyrrolate 10µg/kg and trachea extubated after pharyngeal suction. Intraoperatively vital signs were monitored with Philips Multichannel monitor and following parameters were recorded ECG, NIBP, SpO_2 & HR, rise in Blood Glucose levels was measured using glucometer utilizing glucose oxidase - reagent strip test method. Estimation was done at specified intervals intraoperatively as follows:

- Pre operatively fasting blood sugar
- 5 mins after intubation
- 30 mins after intubation
- Post operatively 5 min after extubation

Inclusion Criteria

1. ASA Gr I & Gr II
2. Age 35-55yrs
3. HbA1c level 5-7%
4. Elective surgeries of < 2hrs

Exclusion Criteria

1. ASA Gr.III & Gr IV
2. Blood Glucose ≤ 60mg%
3. HbA1c ≥ 7%
4. Uncontrolled Diabetes
5. Surgeries > 2hrs duration

Observations and Results

In the present study, Blood sugar levels were measured in both study groups at predetermined time intervals as mentioned and results were compared and analysed statistically Demographic data showing Age, Weight, Sex in both study groups were comparable without any statistical significance (p >0.05). Pre-operative Blood Sugar levels in both study groups: Group N - 88.16 (±9.55), Group D- 89.44(±16.83) were comparable and statistically insignificant (p value – 0.077). The trends of blood sugar levels at various time intervals in comparable between study groups at 5mins:: Group N 86.92(±10.77), Group D 89.96(±6.4); 30mins:: Group N 103.44(±14.09) Group D 108.44(±9.01) , and at 5mins after extubation Group N 117.60(±16.61) Group D 124.76 (±11.65, p values - 5min (after intubation): 0.23, 30min(after intubation) : 0.14 , 5min (after extubation): 0.08— statistically insignificant, percentage rise in blood sugar levels in both study groups at various time intervals were compared and analysed , intubation response showed a decrease of 1.064% in non diabetics.and a 0.63% increase in controlled diabetics. At the end of 30 mins and 5mins after extubation, blood sugar levels in Controlled diabetics showed a 3.57% increasewhen compared with non-diabetics at both time intervals. Blood

Table 1: Demographic data of study population

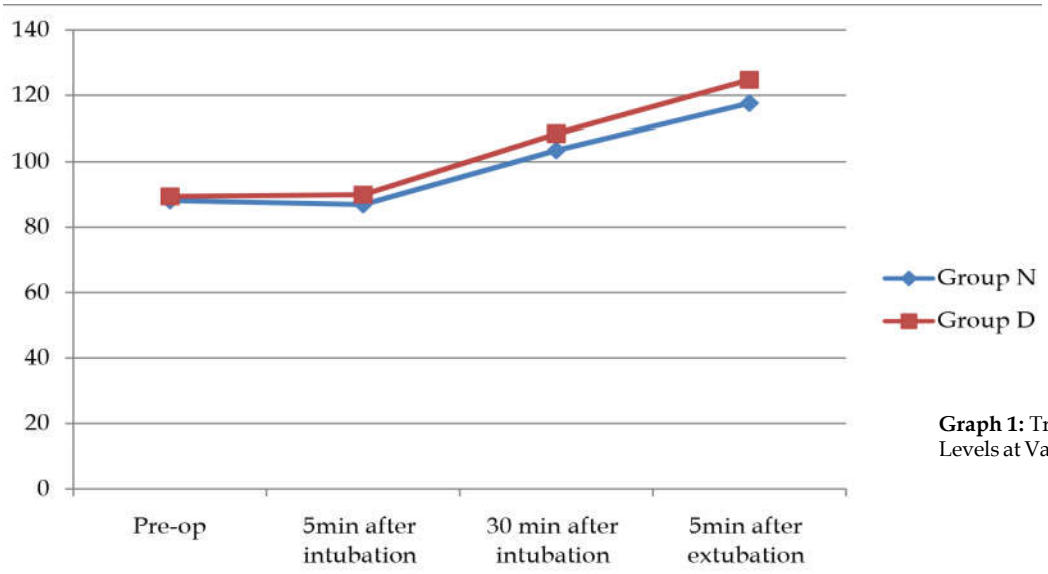
	Demographic Data		
	Group N	Group D	'P' value
Age in yrs (Mean) (S. D.)	42.96 yrs (5.70)	45.48yrs (4.64)	(0.092)
Wt in kgs (Mean) (S. D.)	49.36 (4.16)	52.44yrs (7.97)	(0.093)
M : F Ratio	10: 15	13.12	

Table 2: Trends of Blood Sugar Levels at Various Time Intervals

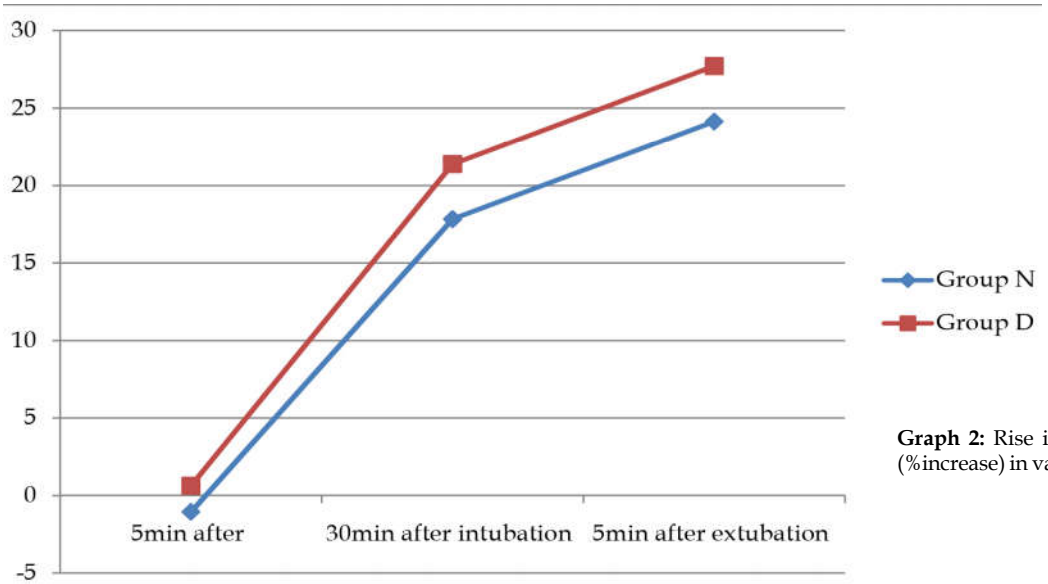
Group	Pre-Operative	5min after Intubation	30min after Intubation	5min after Extubation
Group N	88.16(9.56)	86.92(10.77)	103.44(14.09)	117.6(16.61)
Group D	89.44(16.83)	89.96(6.4)	108.44(9.01)	124.76(11.65)

Table 3: Rise in Blood Sugar levels (% increase) at various intervals

Group	5min after Intubation	30min after Intubation	5min after Extubation
Group N	-1.06% (10.16)	17.82% (14.16)	24.15% (9.5)
Group C	0.63% (7.3)	21.39% (11.01)	27.72% (11.65)



Graph 1: Trends of Blood Sugars Levels at Various Time Intervals



Graph 2: Rise in Blood sugar levels (%increase) in various time intervals

glucose values in both study groups during study were in the range of 63-151 mg%, the minimum and maximum mean blood glucose values were 88-125mg/dl, both values are in the physiological range. The average mean value of HbA1c in diabetic group was 6.24±0.64.

Discussion

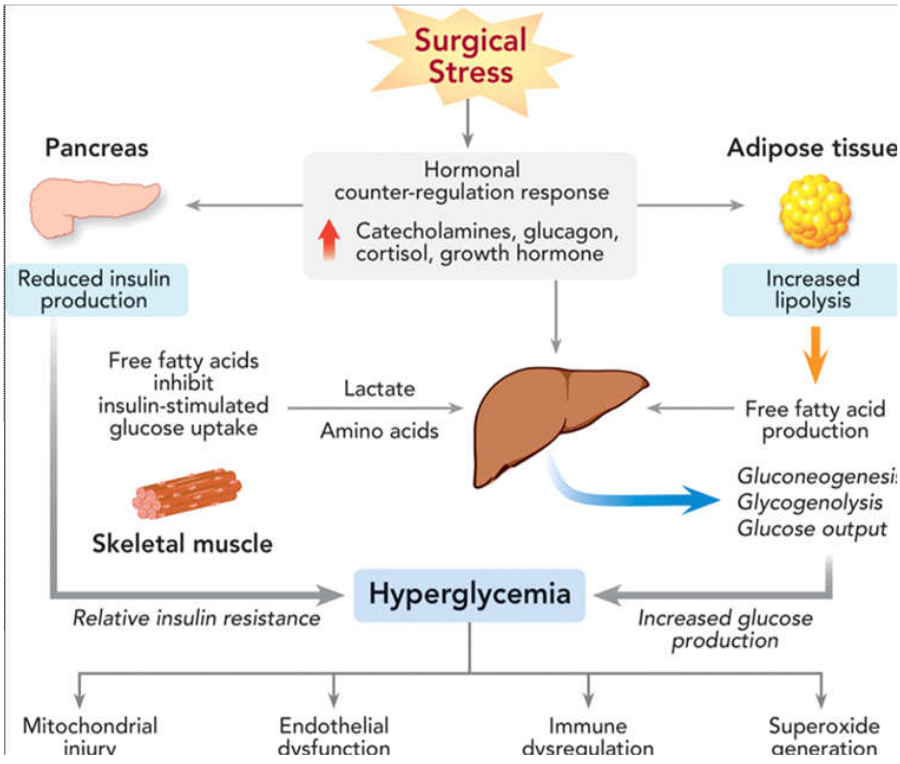
Surgeries are considered a combination of multiple factors including tissue damage, fasting, blood-loss, effects of medication and temperature changes giving rise to stress response [22]. HPAA activation initiates the sympatho-adrenal stress response to surgery & anaesthesia [23,24]. Leading to increased pituatory hormone secretion, in specific, increase in Cortisol and Catecholamines [25,26]. Stress response is a state of relative insulin deficiency–reduced insulin secretion and increased insulin resistance [27] Increased cortisol and catecholamines reduce insulin sensitivity , GH has an anti-insulin effect [28,29]. Net effect of stress response is increased secretion of catabolic hormones lead to– neoglucogenesis & hyperglycemia. Thus stress response may be quantified by hyperglycemia. The metabolic changes are proportional to severity of surgical trauma and major intraabdominal operations produce significant changes in cortisol and blood glucose levels [30]. Hyperglycemic response to surgery and anaesthesia is in relation to duration and extent of stress (Clark RJ 10968, 1970). Hyperglycemia in the perioperative period can cause dehydration, fluid shifts, electrolyte abnormalities, a predisposition to infection, impaired wound healing, as well as ketoacidosis and hyperosmolar states [1]. Blood levels of ACTH, cortisol, epinephrine, norepinephrine and PRL has been used for evaluating stress [31]. Hormonal and Metabolic changes result in marked glucose intolerance and high incidence of stress hyperglycemia (Allison,Tomlin, Chamberlain 1968, Clareal,1970) and ketosis [32].

Metabolic responses to surgery and anaesthesia

Hormonal	Metabolic
Secretion of stress hormones	Increased
Cortisol	gluconeogenesis and
Catecholamines	glycogenolysis
Glucagon	Hyoerglycemia
Growth Hormone	Lipolysis
Cytokines	Protein breakdown
Relative decrease in insulin secretion	
Peripheral insulin resistance	

In diabetics changes described above result in increased insulin demand and risk of postoperative hyperglycemia which has a significant impact on occurrence of postoperative complications. [33,34,35, 36,37,38,39], Anesthetic drugs, have a variable effect on glycemic control , large doses of sedatives and hypnotics cause an abnormal blood sugar response (1954 hunter and Greenberg). pre-medicants act on neural mechanism controlling ACTH secretion and increase or inhibit the secretion.

Dexmedetomidine reduces serum cortisol levels which was not different statistically [40]. Most of drugs used, including neuroleptic drugs, opioids, thiopentone, propofol and sevoflurane have been found to stimulate PRL release during anesthesia [41,42,43]. Morphine and other opioids (fentanyl, sufentanil and alfentanil)



abolished ACTH and cortisol secretion at clinically used doses.[41]. Intravenous induction agent etomidate decrease steroidogenesis mediated by reversible blockade of 11-beta-hydroxylase activity and suppress adrenocortical function [44]. The literature reports a standard induction dose of etomidate can cause acute adrenocortical insufficiency and crisis [45] and subsequent decrease in hyperglycemic response to surgery [46]. Benzodiazepines in high doses (midazolam 0.2-0.4 mg 30 kg^{-1} and infusion of 0.9-0.125 mg kg^{-1} h^{-1}) inhibit steroid production at Hypothalamo pituatory level and decrease ACTH secretion and stimulate GH release [47], Effects of propofol on the synpathoadrenal system are well documented [48,49]. Propofol significantly suppresses circulating cortisol and abolished the cortisol response to surgery (Tetsuchiro sakai, David O' Flaaharty et al. (1995). Opiates influence centrally mediated neuro endocrine responses - modulate nociception at different levels of neuraxis and block sympathetic nervous system activity and HPAA [50]. Volatile anesthetic agents (in vitro)inhibit insulin production triggered by glucose, result in a hyperglycemic response [51,52], sevoflurane significantly decreased plasma concentrations of ACTH, cortisol and GH when compared to isoflurane [48]. Fentanyl abolishes the hyperglycemic stress response and reduce cortisol and GH responses better than halothane. The response to neuromuscular blocking agents is normal in diabetic patients and choice of depends on renal function and anesthetics selection is according to severity of various systemic diseases (such as DM , HTN & CAD). Further studies must be completed in order to understand the full clinical effects of this response in diabetic patients undergoing surgery. To insure proper perioperative management of diabetics, clinicians should be aware of anesthetic agents tend to cause hyperglycemia [53]. In the present study both groups were premedicated with glycopyrrolate 0.2mg , Ondansetron 4mg and fentanyl 2mcg/kg , induction with propofol 2 mg/kg. In this study propofol and fentanyl anaesthesia adequately attenuated the stress respone to intubation in both groups non-diabeticpatients showed 1.064% decrease and diabetics an increase by 0.63% rise in blood sugar levels. At the end of 30 min and after extubation the rise of blood glucose level showed a difference of only 3.57% between both study groups and the rise is statistically insignificant . The results of the above study show that hyperglycemic stress response is mild in both groups, diabetic group showed a slightly higher values but with in normal physiological range. The mean values of blood glucose in the study groups were within normal physiological range of 88-125mg/dl. In present study Propofol significantly suppressed circulating cortisol results of this study adhere to work of Tetsuhiro Sakai, David'O Flaherty (1995), which showed propofol completely abolished cortisol response to surgery intraoperatively and subsequent rise in blood sugar levels. Propofol/sufentanil anaesthesia effectively and significantly attenuates rise in intra operative glucose levels. In our study a balanced anaesthesia technique using a combination of Fentanyl and propofol effectively attenuated the rise in intraoperative blood glucose levels in both groups (Thomas Schrickar 2000). This study gives us an opportunity in understanding attenuation of hyperglycemic stress response to anaesthesia and surgery, and this knowledge also allows devising a balanced general anaesthesia technique by choosing a combination of various anaestheti drugs. This knowledge allows us to insure proper perioperative management of surgical stress in diabetic patients, minimize intraoperative use of insulin regimens, and importance of preoperative glycemic control in decreasing morbidity and mortality. This study attempts to determine levels of pre-operative HbA1c in Diabetic patients to ensure smooth and uneventful perioperative course and a value of <6, 5% can be recommended as a guideline.

Conclusion

Diabetic patients may require surgery as a consequence of their disease process or otherwise, optimal anesthesiologic management of these patients is challenging and crucial. It is essential to blunt the stress hormones secretion in order to prevent postoperative complications. Hyperglycemic stress response to anaesthesia and surgery in diabetic patients can be minimized by a well planned and well conducted balanced general anaesthesia technique. Intraoperatively propofol and opioids completely abolished ACTH and cortisol secretion which resulted in lesser degree of rise in blood sugar levels during surgery which is statistically not significant when compared to non-diabetics . Thus a meticulous glycemic control prior to elective surgery is required; if possible, HbA1c should be brought to normal levels before elective surgeries and is an essential part of perioperative care of diabetic patients.

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