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Original Research Article

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A Comparative Evaluation of Thiopentone Sodium and Propofol as Inducing Agent for Caesarean Section

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Abstract

The success of anaesthesia in obstetrics depends largely upon surgical demand and materno-foetal well being. Hence the aim of anaesthesia is to provide safety and comfort to the mother, minimal neonatal depression and optimal working condition for the obstetrician. Propofol 2.5 mg/kg was compared with thiopentone sodium 5mg/kg as induction agent for elective caesarean section. A total of 90 healthy pregnant patients of ASA I and II, who were scheduled for elective caesarean section were included in this study and were randomly allocated into 3 groups. Group I- Thiopentone sodium 2.5% (5mg/kg), group II- Propofol 0.5% (2 mg/kg) and group III- Propofol 1% (2mg/kg). Induction was smooth and rapid with both Propofol and Thiopentone with minimal incidence of side effects. Induction time was found to be shortest with Propofol 1% (40.1±6.11 seconds) as compared to Thiopentone sodium 2.5% (47.2±7.26 seconds) and Propofol 0.5% (70.5±19.58 seconds). Mean arterial pressure was lower in Propofol 1% group during the induction and intra-operatively. Other hemodynamic changes were similar in all three groups. Apnoea occurred less frequently with Propofol 1% (10%) than with Thiopentone sodium (43.33%). Pain on injection (6.66%) and awareness (10%) was found with Propofol whereas cough (3.33%), hiccup (6.66%) and nausea & vomiting (33.33%) were observed with Thiopentone sodium. Recovery time was shorter with clear headedness with Propofol. There was no significant neonatal depression as assessed by Apgar score. Propofol appears to be a better alternative to Thiopentone sodium as induction agent for caesarean section.

Keyword: General Anaesthesia; Caesarean Section; Propofol; Thiopentone Sodium; Apgar Score.

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Introduction

A woman in labour posses one of the most critical problem to the anaesthetist. The anaesthetic care of the obstetric patient differs from that of her non-pregnant counterpart because of the physiological changes in the parturient, the presence of a second individual (the foetus) who is also affected by the anaesthetic process and the fact that the majority of request for anaesthesia are unplanned and urgent.

The choice of anaesthetic technique between general and regional anaesthesia, which depends on patients preference to existing medical condition, the reason of surgery, the degree of urgency and the anaesthetist judgement and experience.

Regional anaesthesia is the most commonly employed technique as compared to general anaesthesia, as it is cost effective and has minimal incidence of aspiration in emergency caesarean sections, where parturient is considered as full

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stomach. Though regional anaesthesia is a time consuming procedure and does not allay anxiety and fear of this particular group of patients who are tired, anxious and exhausted and want to become unconscious as early as possible to avoid surgical stress. Moreover, there is an increased chance of hypotension which may produce serious foetal hypoxia affecting thereby the neonatal outcome.

General anaesthesia, the alternative technique for caesarean section overcomes the problems of regional anaesthesia. A good general anaesthesia is fundamental to the success and feasibility of obstetric surgery practice. An ideal induction agent for caesarean section should be rapid and smooth acting, shorter in duration, devoid of cardiovascular and respiratory side effects and should be safe for both mother and foetus, should give good operating conditions and also devoid of post operative nausea and vomiting.

After introduction in 1934 by Water and Lundy, thiopentone sodium because of its property of rapidly acting, act in one arm-brain circulation, producing peaceful sleep, gained rapid acceptance worldwide and it remains to this day the commonest used induction agent for obstetric surgery. Although, thiopentone sodium is quite safe but is not devoid of certain adverse effects like cardiovascular and respiratory depression, cough, hiccup, pain and thrombophlebitis at the site of injection, nausea, vomiting, prolonged somnolence, psychic problems, motor disturbances, acute tolerance, true cutaneous allergy, anaphylaxis, laryngospasm, bronchspasm and neonatal depression.

After thiopentone sodium, many intravenous induction agents such as propanidid,althesin, etomidate, diazepam, midazolam and ketamine were introduced but they lost their popularity because of their adverse effects.

Now presently propofol, the most recent nonbarbiturate intravenous anaesthetic agent is introduced into the clinical practice by Kay and Rolly in 1977. They confirmed the potential of propofol as an anaesthetic induction agent. Because of its rapid onset of action, short duration with rapid and clear headed emergence and lack of cumulative effect, it has become very popular. It is also known to exert antiemetic action.

Aim of Study

1. To evaluate the efficacy of propofol as an induction agent as compared to thiopentone sodium.
2. To assess maternal and foetal well being during propofol induction against thiopentone sodium for caesarean sections.

Material and Method

The present study was conducted on 90 young pregnant patients of ASA I and ASA II, scheduled for elective caesarean section under general anaesthesia, admitted in the department of Obstetrics and Gynaecology.

Criteria for including the patients in the study are:

1. Patients with no antipartum haemorrhage.
2. Patients with no cardiac disease like valvular heart disease.
3. Patients with no foetal distress.
4. Patients with no pregnancy induced hypertension or eclampsia.
5. Patients with no full stomach.
6. Patients with no associated medical problems like diabetes, liver disease etc.

Each selected patient was randomly assigned to one of the three following groups, containing 30 patients each and depending on the induction agent used.

Group I- Thiopentone sodium 2.5%, 5mg/kg

Group II- Prpofol 0.5% 2mg/kg

Group III- Propofol 1% 2mg/kg

Thorough pre-anaesthetic check up was done and detailed clinical history was obtained from all selected patients regarding

- Any past or present history of disease of respiratory system, cardiovascular system, hepatobiliary system, renal and central nervous system.
  - Any drug allergy.
  - Previous drug intake.
  - Course of present pregnancy.
  - Course of previous pregnancies and complications if any.
  - Any previous anaesthetic administration.
  - Any drug abuse, addiction or habituation.
  - Social and economic status.

All patients were assured and reassured during pre-anaesthetic check up. Proposed technique of

anaesthesia was explained in detail and a written informed consent was obtained. Patients were kept fasting for 8-12 hrs prior to surgery. Injection metoclopramide 0.2 mg/kg and injection ranitidine 1.0 mg/kg were given intramuscularly 45 minutes before induction of anaesthesia. Injection atropine 15µgm/kg was given intravenously 5 min before induction of anaesthesia in the operation theatre through a secured I.V. line using 5% dextrose solution.

Pre-oxygenation was done with 100% oxygen for 3-5 minutes. Patients were induced either by Thiopentone sodium 5 mg/kg (group I) or Propofol 2 mg/kg 0.5% solution by adding equal amount of 5% dextrose (group II) or Propofol 1% (group III) through slow intravenous injection over a period of 30 seconds. Ventilation was assisted with 100% oxygen as and when apnoea occurred. Laryngoscopy was then performed under the effect of suxamethonium 1.5 mg/kg and proper size endotrachial tube was introduced atraumatically and connected to anaesthesia machine via Bain's rebreathing circuit and IPPV was started. Anaesthesia was maintained with N_2O and O_2 in 60:40 ratio and Vecuronium bromide 0.8 mg/kg. On completion of surgery, residual neuro-muscular block was reversed by Neostigmine 45 µgm/kg and glycopyrroalate 10 µgm/kg with slow intravenous injection.

Following data were observed and recorded during induction of anaesthesia.

- Pain on injection.
- Induction time in seconds from injection to spontaneous closure or loss of eyelash reflex.
- Abnormal limb movements
- Presence or absence of apnoea
- Pulse rate
- Blood pressure- Systolic and diastolic during induction, during laryngoscopy and then at regular interval till the end of surgery.
- Arterial oxygen saturation
- Side effects if any like cough, hiccup, brochospasm and laryngospasm.
- Post operatively patients were enquired about acceptance with particular reference to induction phase and any incidence of awareness during anaesthesia.

Observations

Table 1 shows that longest time for induction of anaesthesia was found in group II (Propofol 0.5%) which was 70.5±19.58 seconds, followed by group I (Thiopentone sodium 2.5%) 47.20±7.26 seconds, whereas it was shortest in group III (Propofol 1%).

Differences between group I and II and group I and III was statistically very highly significant ($p<0.001$).

Table 2 shows that in all three groups there were very highly significant ($p<0.001$) rise in mean pulse rate till the end of surgery from pre-induction level.

Table 3 shows that there was very highly significant ($p<0.001$) fall in mean arterial pressure during induction in group I while insignificant ($p>0.05$) fall in group III.

Table 1: Time for onset of induction (seconds)

Time	Group I	Group II	Group III
Mean ± S.D.	47.20±7.26	70.5±19.58***	40.1±6.11***

*** Denotes very highly significant ($p<0.001$)

Table 2: Changes in mean pulse rate

Time interval	Group I	Group II	Group III
Pre-induction	97.40±13.72	103.8±23.04	92±17.61
During induction	122.4±15.24***	127±19.51***	107.4±17.66***
During intubation	123.0±18.67***	121.4±14.04***	112.3±10.41**
After 5 min	116.0±13.88***	118.4±12.43**	109.6±13.01***
After 15 min	112.6±15.65**	124.0±14.03***	113.0±14.17***
After 30 min	113.0±15.76**	124.0±12.44***	117.3±14.47***
After 45 min	116.2±18.85***	126.6±12.67***	115.2±14.95**
Just after extubation	128.8±15.09***	137.0±17.67***	120.0±22.93***
15 min after extubation	112.2±15.89**	118.2±21.20**	102.0±11.89***

*Denotes significant change ($p<0.05$)
**denotes highly significant change ($p<0.01$)
***denotes very highly significant change ($p<0.001$)

Table 3: Change in mean arterial pressure Mean+S.D. mmHg

Time interval	Group I	Group II	Group III
Pre-induction	93.99±5.71	93.39±5.53	94.53±5.90
During induction	90.53±5.09	93.32±5.76	92.53±4.24
During intubation	105.53±3.97***	105.39±4.99***	103.53±3.82***
After 5 min	104.46±3.55***	105.39±4.99**	96.06±4.78
After 15 min	95.66±4.79	104.26±4.60**	95.19±4.08
After 30 min	96.26±4.57	103.13±2.91**	95.39±4.92
After 45 min	98.99±3.56	103.73±3.42**	95.13±4.12
Just after extubation	103.66±3.50***	106.19±4.39***	102.52±2.88***
15 min after extubation	95.33±4.53	94.73±5.30	96.52±5.39

*denotes significant change ($p<0.05$)
**denotes highly significant change ($p<0.01$)
***denotes very highly significant change ($p<0.001$)

Table 4: Change in Apgar scores

Groups	At 1 min	At 2 min	At 3 min	At 4 min	At 5 min
Group I	6.0±1.36	7.4±1.13	8.0±1.11	9.0±0.45	9.9±0.30
Group II	5.8±0.88	7.0±0.78	7.9±0.71	8.3±1.02	9.7±0.65
Group III	6.5±1.77	7.6±1.65	8.2±0.99	9.3±0.79	9.9±0.30

Table 5: Complications

Complications	Group I	Group II	Group III
Pain on injection	02	01	02
Laryngospasm	-	-	-
Bronchospasm	-	-	-
Apnoea	13	-	03
Cough	01	-	-
Hiccup	02	-	-
Abnormal limb movements	-	01	02
Thrombophlebitis	03	-	01
Nausea and vomiting	10	-	-
Awareness intra-operatively	-	02	01

In all the three groups, very highly significant ($p<0.001$) rise in mean arterial pressure during intubation was found, and early return of mean arterial pressure in group III as compared to group I and II.

Table 4 shows that lowest Apgar score at 1 min was found in group II (Propofol 0.5%) 5.80±0.88, whereas highest was in group III (Propofol 1%) 6.5±1.77.

Difference between group I and II and group I and III was statistically insignificant ($p>0.05$).

Table 5 shows that pain on injection site was experienced by 02 patients in group I, 01 patient in group II and 02 patients in group III.

Prevalence of apnoea was seen in group I where 21 patients had cessation of breathing during induction, while it appeared only in 03 patients in group III.

Hiccup was experienced by 02 patients in group I, while not seen in group II and III.

Abnormal limb movements were experienced by 02 patients in group III and 01 in group II, while it was not seen in group I.

Nausea and vomiting and incidence of post-operative thrombophlebitis were mostly observed in patients of group I.

Awareness during surgery was found in 02 patients in group II while in 01 patient in group III.

Discussion

The introduction of Propofol into clinical practice of intravenous anaesthesia has put yet another feather in the cap of anaesthesiology. Propofol allows smooth, safe and rapid induction in one arm-

brain circulation time. Redistribution quickly clears it from the blood rich organs and unlike Thiopentone it does not accumulate in the body. This allows Propofol infusions to be used to maintain anaesthesia. Less post-operative nausea and vomiting and faster emergence are characterized by the absence of post-operative confusion and sedation. Rapid recovery from anaesthesia would be advantageous in obstetric patients because of the increased risk of aspiration which may occur in post-operative period. Seeing the foresaid advantage of Propofol, it was decided to evaluate its use for induction of anaesthesia in comparison to conventional intravenous anaesthetic Thiopentone sodium for caesarean section.

After analyzing the obtained data from this study, induction time was observed to be fastest with 1% Propofol than Thiopentone sodium and 0.5% Propofol. Mean induction time was maximum (70.5±19.58 seconds) in group II, minimum (40.1±6.11 seconds) in group III and in between (47.2±7.26 seconds) in group I. Finding of rapid induction with Propofol is in conformity with Kotur P.F. et al (2000) [1].

Thiopentone sodium and Propofol exert their action through GABA receptors. Thiopentone sodium and Propofol being highly lipophilic in nature rapidly crosses the blood-brain barrier thus accounting for rapid onset of action.

The doses used for induction was fixed according to body weight which was adequate to reach the induction criteria. Doses used by Gint et al. (1990) [2], Celleno D et al. (1989) [3] were almost similar.

In this study, there was a highly significant ($p<0.01$) increase in mean pulse rate from pre-induction values at induction, during intubation, 5 minutes, 15 minutes, 30 minutes and 45 minutes after intubation. Thus confirming the views of Valtonen M et al. (1989) [4] Tumukunde J et al. (2015) [5], Siafaka et al. (1992) [6] and Kotur P F et al. (2000) who found a similar rise in mean pulse rate in all the groups.

Since Thiopentone produces peripheral vasodilatation causing pooling of blood in the extremities and reduction in the venous return to the heart leading thereby to decrease in cardiac output. There is some degree of tachycardia (10-20%), which with lower doses contribute to maintenance of the blood pressure and cardiac output. Higher doses causes increased myocardial depression and vasodilatation but tolerable with normal cardiovascular system.

Propofol decreases arterial blood pressure during induction of anaesthesia. An induction dose of 2 to 2.5 mg/kg produces a 25-40 % reduction of systolic blood pressure. Similar changes are seen in mean and diastolic blood pressure. The decrease in arterial pressure is associated with a decrease in cardiac output/cardiac index (about 15%), stroke volume index (about 20%) and systemic vascular resistance (15-25%), left ventricular stroke work index is also decreased (30%). Heart rate does not change significantly after an induction dose of propofol because it either resets or inhibit the baroreflex, thus reducing the tachycardic response to hypotension.

It was observed in all the three groups showing rising tendency in blood pressure particularly at intubation varied significant to highly significant. In group III, there was early return of blood pressure to pre-operative level at 5 minute after intubation, in group I return of blood pressure at 15 minute after intubation, while in group II blood pressure was raised throughout the surgery. Moore J et al. (1989) [7] found that hemodynamic response to Propofol and Thiopentone were similar. Gin T et al. (1990) [8] concluded that post induction arterial pressures were similar to pre-induction values with no differences. Following intubation, the rise in systolic blood pressure was greater and was found slower in returning to baseline values in the Thiopentone group. Yau G et al. (1991) [9] found that hypertensive response after intubation was of shorter duration in the Propofol group compared with Thiopentone. Djordjevic B et al. (1998) [10] concluded that following induction of anaesthesia, a significantly greater decrease of blood pressure was found with Propofol, when compared with the patients in Thiopentone group. findings of this study corresponds with their studies.

Apgar scores were found 8 at 5 minutes in all three groups, although lowest Apgar score at 1 minute was found in group II (5.8±0.88), whereas highest was in group I (6.5±1.77), but difference between group I and II, and group I and III was statistically insignificant. Findings of this study is in conformity with Kanto J et al. (1990) [11] and with other studies [12,13,14], who concluded that on the basis of Apgar scores and blood gas analysis of the foeto-placental unit, Propofol appears to be a a safe alternative to other available induction agents. Gin T et al. (1990) [15] concluded that neonatal apgar scores, neurobehavioral testing and umbilical catecholamine, blood gas tension and oxygen content analysis were similar between Propofol and Thiopentone groups.

Pain on injection was experienced by 2 patients each in group I and III, and 1 patient in group II. Thrombophlebitis had occurred in 3 patients in group I and in 1 patient in group III. These

complications in group I was due to alkaline nature of solution and more frequent when small veins are used for induction. Abnormal limb movement was seen in 2 patients in group III and in 1 patient in group II. Apnoea had occurred maximum in group I (13 patients) whereas only in 3 patients in group III. Propofol affects the respiratory system in a manner qualitatively similar to the action of Thiopentone. Findings were found similar to the studies of Taylor M B et al. (1986) [16] and Goodman N W et al. (1987) [17]. Apnoea after an induction dose of Propofol: The incidence and duration of apnoea appear to be dose dependent and speed of injection. An induction dose of Propofol results in 25-30% incidence of apnoea. This was concluded by Taylor M B et al. (1986) [16].

Nausea and vomiting was found in 10 patients in group I, whereas none in group II and III. Absence of nausea and vomiting in Propofol group is confirmatory with the findings of other studies, in which it is concluded that Propofol possess singnificant antiemetic activity.

Awareness intra-operatively was found in 2 patients in group II and in 1 patient in group III, and was not found in group I. In conformity of Celleno D et al. (1993) [18] and Bischoff et al. (2011) [19] , who concluded that awareness during surgery at higher infusion rate has been found in lighter planes of anaesthesia with Propofol and Midazolam as compared to Thiopentone sodium. Compared to patients of group II and III, patients of group I remains sedated for prolonged period after surgery, although they were arousable. Thus it appears that Propofol is a good induction agent for obstetric patients in the sense that it preserves materno-foetal well being. It appears to have an edge over Thiopentone by producing rapid and clear headed recovery and absence of nausea and vomiting, thus minimizing the chances of post-operative aspiration pneumonitis.

Conclusion

In this study, induction time was found to be shortest, smooth, better cardiac and respiratory stability, better Apgar score, minimum side effects and complications with Propofol 1% in group III.

Thus it can be concluded that Propofol 1% is an effective, safe and reasonable alternative to Thiopentone sodium 2.5% as an inducing agent for general anaesthesia in caesarean section.

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Comparing Effects of Intravenous Esmolol and Diltiazem for Attenuatinghemodynamic Responses to Laryngoscopy and Intubation

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Abstract

Introduction: Laryngoscopy and intubation of trachea are integral part of general anesthesia which can trigger adverse hemodynamic responses. These are unpredictable reflex sympathetic stimulations that may cause tachycardia, hypertension and arrhythmias. These short duration responses get amplified in high risk patients with likelihood of even pulmonary oedema and cerebrovascular accidents. These responses can be blunted by means like drugs and nerve blocks. Our study was designed to compare actions of intravenous (IV) esmolol (1mg/kg) and ditiazem (0.2mg/kg) to attenuate these responses. *Material and Methods:* 80 consenting, ASA I/II adults posted for elective non-cardiac, non- neurologic operations were included in this randomised, double blinded, clinical comparative study. Parameters recorded were ECG, heart rate (HR), systolic BP (SBP), diastolic BP (DBP), mean arterial BP (MAP), ST segment values, SpO2, arrhythmia analysis and incidence of any required rescue medication. Baseline values (mean of three readings, 1 minute apart) of HR, SBP, DBP, MAP, ST segment and SpO_2 were recorded before induction of anesthesia. General anesthesia was given and study drug was injected 1 min. after muscle relaxant and intubation was done 2 min. thereafter. Abovesaid parameter values were recorded at intubation and every minute thereafter, till 10 min. post-intubation. Effects were statistically analysed. *Statistical analysis and results:* Unpaired t-test and generalized estimation equation were used for quantitative variables (e.g. HR, BP) to compare mean levels at different times points between two groups. Paired t-test was used for determining significance within the group at different time points. Chi-square/Fischer exact test (for categorical variable like arrhythmia) and non-parametric Mannwhitney test (in case data did not follow normal distribution) were planned,but were not required. *Results:* Both drugs control the heart rate well. Esmolol controls it better. At 10 minutes after intubation both achieve similar HR values. Both drugs control the SBP, DBP and MAP. Diltiazem controls it better. At 10 min. after intubation, both achieve similar BP values. Both drugs safely attenuate hemodynamic response to laryngoscopy and intubation, as there were no arrhythmias, ST changes of significance or requirements of rescue medications in any patient.

Keywords: Laryngoscopy; Tracheal Intubation; Hemodynamic Response.

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Introduction

Laryngoscopy and tracheal intubation are integral part of anesthesia since their first description, in 1921, by Rowbotham& Mc Gill [1]. Reid & Brace [2] recognised that these procedures trigger adverse hemodynamic responses These sympathetic reflexes, due to epipharyngeal & laryngeal stimulation, cause tachycardia, hypertension & arrhythmias [3,4].

These short lived, variable & unpredictable responses

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get amplified in hypertensives [5] and highrisk patients with cardiovascular & cerebrovascular disease, anomalies of cerebral vessels and raised ICP [6]. Such patients may even get pulmonary oedema [7], myocardial insufficiency & CVA [8]. Blunting of them can be achieved by means like drugs and nerve blocks.

We designed our study to compare blunting of hemodynamic response to laryngoscopy & intubation by Esmolol and Diltiazem.

Material and Methods

After hospital ethics committee's approval,80 consenting, ASA I/II adult patients (18-60 years old) of either sex, posted for elective non-cardiac and non-neurologic surgeries were enrolled in our study. Patients were randomly divided into 2 groups of 40 each (Group1 & Group 2) according to a computerised random table.

Group 1 received Inj. Esmolol - 1mg/kg and Group 2 received Inj. Diltiazem – 0.2 mg/kg, both 2 minutes before laryngoscopy.

An independent investigator prepared the study drug, diluted it to 10 ml., not disclosing the name to worker inducing anesthesia till the end of the study on that patient.

All patients were fasted overnight. All patients received tablet ranitidine–150 mg and tablet alprazolam 0.25 mg the night before surgery. In Operation theatre, IV line and monitors were attached.

Three readings each of HR, SBP, DBP, MAP, ST segment value, 1 minute apart, were taken. Mean of three values of each parameter were recorded as baseline value.

Induction of anesthesiawas done in sequence for all patients, i.e., fentanyl-2 mic/kg, 3 min. of proxygenation, thiopentone-4-6 mg/kg till loss of eyelash reflex, check ventilation, vecuronium - 0.1 mg/kg, mask ventilation with 50:50, O_2+N_2O and 1% isoflurane,

Study drug was injected 1 min. after vecuronium. Group 1 received Inj. Esmolol - 1mg/kg and Group 2 received Inj. Diltiazem – 0.2 mg/kg, both 2 minutes before laryngoscopy. Laryngoscopy was done 2 min. after study drug by ananesthesiologist with experience of more than 100 laryngoscopies.

Anesthesia was maintained with 50:50 - O_2+ N_2O and 1 % isoflurane for next 10 minutes. HR, SBP, DBP, MAP & ST segment values were recorded at 0, 1, 2, 3, 4, 6, 8, 10 minutes starting with time of laryngoscopy. No painting, draping or surgery was done during the period of observation

Statistical Analysis

Assuming the mean difference in systolic blood pressure as 10±6.4(9) in the esmolol group and diltiazem group 8±0.9, taking as 20% mean difference between both the drugs, a = 0.05 and power = 80% the minimum number of subjects under each group would be 35, however, 40 patients were taken in each group.

For quantitative variables such as systolic blood pressure, diastolic blood pressure and heart rate the mean level was compared at different points of time between two groups by unpaired student t-test, and generalised estimation equation. In case data do not follow a normal distribution the parametric Mannwhitney test would be applied, however it was not necessary to apply in our study as the data had a normal distribution. For determining the statistical significance within each group over a different point of time, the paired t-test were applied.

For categorical variable (eg. Arrhythmia) the Chi-square / Fischer exact test was planned to be applied, however, it was not needed in our study as there was no incidence of arrythmia. Statistically significant level was considered as p=0.05.

Observations and Results

The demography of two groups was similar statistically (Table 1).

Table 1: Demographic Profile

		Esmelol	Diltiazem	p value
Age	Range	19-60	18-55	
	Mean	32.25	34.95	p=0.382
	Standard Deviation	11.83	11.58	(p>0.05)
Weight	Range (kg)	30-80	30.75	
	Mean	54.87	55.55	p=0.786
	Standard Deviation	12.45	9.44	(p>0.05)
Gender	Male	18	19	
	Female	22	21	

Fig. 1:

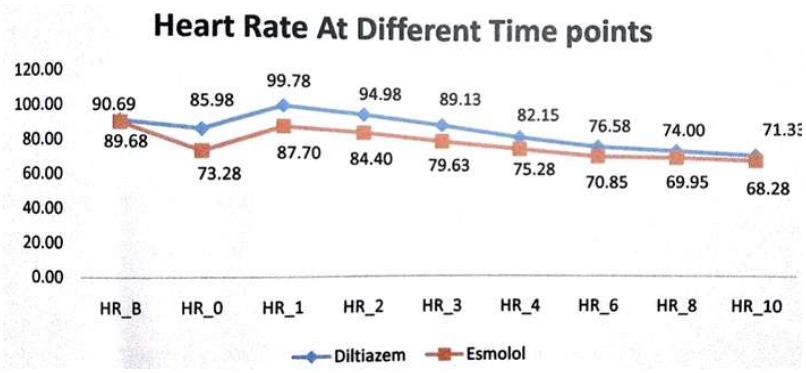


Fig. 2:

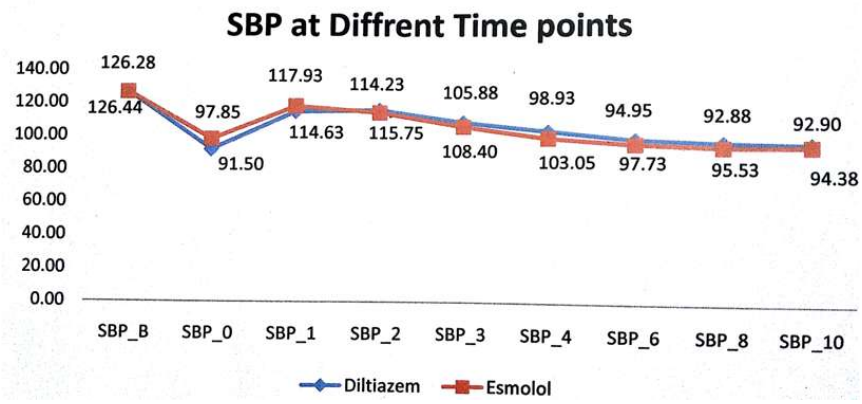


Table 2: Comparison of esmolol and diltiazem on systolic blood pressure (SBP) at different points

Heart Rate	Diltiazem	Esmolol	P value
HR Baseline	90.7± 16.1	89.68± 13.55	0.763
HR0	85.98± 12.54	73.28± 8.74	0
HR1	99.78± 14.25	87.7± 11.41	0
HR2	94.98± 14.42	84.4± 11.75	0.001
HR3	89.13±14.92	79.63± 10.81	0.002
HR4	82.15± 13.24	75.27± 10.63	0.012
HR6	76.58± 12.43	70.85± 10.53	0.029
HR8	74± 13.32	69.95± 10.48	0.134
HR10	71.33± 12.98	68.27± 10.39	0.249

Table 3: Comparison of esmolol and diltiazem on diastolic blood pressure at different time points

SBP	Diltiazem	Esmolol	P value
SBP Baseline	126.44±11.69	126.28±13.76	0.955
SBP0	91.5±4.62	97.85±13.02	0.004
SBP1	114.63±14.69	117.9±18.35	0.377
SBP2	115.75±14.35	114.3±17.32	0.669
SBP3	108.4±11.18	105.8±15.64	0.408
SBP4	103.05±10.06	98.9±10.11	0.071
SBP6	97.73±8.97	94.95±6.97	0.126
SBP8	95.53±8.88	92.9±5.22	0.108
SBP10	94.38±6.46	92.9±6.03	0.294

Esmolol caused significant fall of HR from baseline at all times, except 1 minute after laryngoscopy (not significant), ultimately causing fall of 24% at 10 minutes post-laryngoscopy Diltiazem caused significant fall of HR at all times, except a significant rise, 1 minute after laryngoscopy, till a 21% fall at 10 minutes post-laryngoscopy. Unpaired t-testing revealed the two drugs reduce HR similarly from 2 minutes post-laryngoscopy (Table 2 and Graph 1).

Both drugs caused significant SBP fall at all time intervals. Diltiazem caused greater fall than esmolol. SBP fell similarly in both groups at all times (Table 3 and Graph 2).

Both drugs caused significant fall of DBP from baseline at all times, except at 1minute post-laryngoscopy (fall not significant). Both drugs reduced DBP similarly at all times (Table 4 and Graph 3).

Both drugs cause significant fall of MAP at all times after injection, except 1 minute post-laryngoscopy (fall not significant). Both drugs affect MAP similarly at all observed times (Table 5 Graph 4).

Table 4: Comparison of esmolol and diltiazem on mean arterial pressure at different time points

DBP	Diltiazem	Esmolol	P value
DBP Baseline	78.62±9.50	80.71±9.72	0.333
DBP0	54.27±7.13	60.20±12.27	0.010
DBP1	76.05±13.65	78.15±16.01	0.529
DBP2	71.95±13.09	73.05±14.18	0.719
DBP3	66.73±9.36	66.55±13.36	0.946
DBP4	62.4±8.82	61.98±8.08	0.822
DBP6	58.75±8.27	57.9±5.59	0.591
DBP8	57.23±8.48	56.13±4.43	0.469
DBP10	56.25±8.33	55.85±4.91	0.794

Table 5: Comparison of the effect of both the Drugs on mean arterial pressure at different time points

MAP	DILTIAZEM	ESMOLOL	P VALUE++
MAP Baseline	94.55±9.63	95.90±10.26	0.55
MAP0	66.68±5.69	72.75±11.84	0.00
MAP1	88.91±13.15	91.41±16.09	0.45
MAP2	86.55±12.93	86.78±14.85	0.94
MAP3	80.62±9.40	79.68±13.77	0.72
MAP4	75.75±8.74	74.29±8.27	0.39
MAP6	71.74±8.14	70.25±5.39	0.34
MAP8	69.99±8029	68.38±3.94	0.27
MAP10	68.96±7.28	68.2±4.52	0.58

Fig. 3:

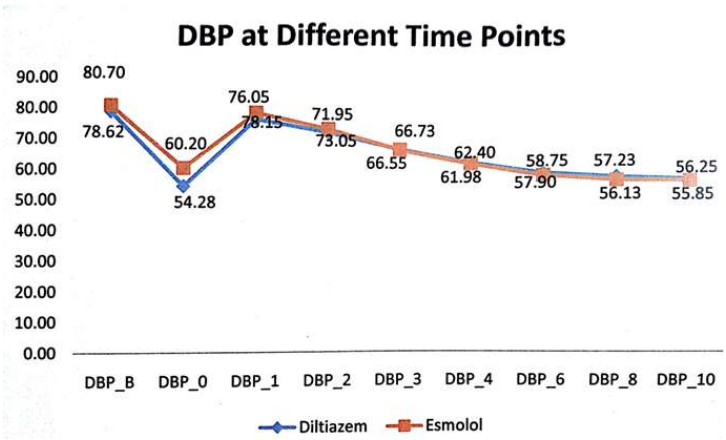
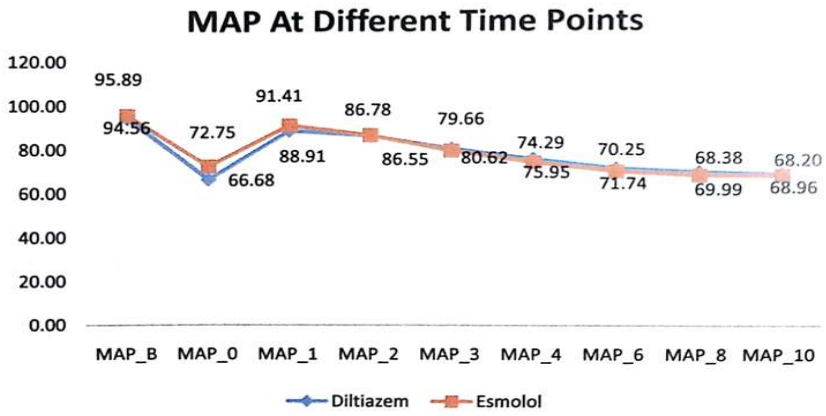


Fig. 4:



Discussion

Laryngoscopy and tracheal intubation are an integral step of anaesthetic practice and associated with stress response of increased blood pressure, heart rate and cardiac dysrhythmias [1-4].

This stress response may be transitory but can have adverse outcome in high risk patients like those with cardiovascular diseases, increased intracranial pressure or anomalies of cerebral vessels [5-8].

An increase in mean arterial pressure of 25mm of Hg and 20-40 torr when compared with awake control levels and 35-60 torr when compared with pre-intubation values [3] have been reported after the placement of endotracheal tube.

The purpose of our study was to observe the effects of esmolol and diltiazem, which are known to alter the hemodynamic response to laryngoscopy and tracheal intubation and compare their effects.

Esmolol on heart rate:

In our study, esmolol caused a statistically significant decrease in heart rate till the time of laryngoscopy, heart rate increased to baseline values 1 minute after laryngoscopy, after which it continued to fall for 10 minutes.

In the study done by Kumar S [9] in the year 2003 to compare the efficacy of esmolol, diltiazem,and magnesium sulphate in attenuation of hemodynamic response to laryngoscopy and intubation, there was a similar decrease in heart rate till laryngoscopy, insignificant rise in heart rate immediately after intubation with a gradual decrease after that. These findings are similar to our findings.

In the study done in 1990 by Oxorn [10] who compared two doses of esmolol (100 mg and 200 mg) with placebo, there was fall in heart rate following laryngoscopy and tracheal intubation with both doses. In our study there was a statistically significant fall before and till 10 minutes after laryngoscopy and intubation, compared with baseline values. The findings of the above study are in accordance with our study.

In a study done by Helfman SM et al. [11] in 1991 to compare the efficacy of lignocaine, fentanyl and esmolol it was concluded that esmolol reliably attenuated the rise in heart rate. This is also in accordance with our study where esmolol has prevented any rise of heart rate above the baseline value.

In another study conducted by Yuan et al. [12] in the year 1994 to compare the effects of two different bolus doses of esmolol it was found that there was significant fall of heart rate following administration of both 100mg and 200 mg of esmolol. In our study there was also significant decrease in heart rate following esmolol administration.

In the year 1996 Feng and Chan et al. [13] studying the effects of lidocaine, fentanyl and esmolol in attenuation of hemodynamic response to laryngoscopy and tracheal intubation found the incidence of tachycardia in 15% patients administered with esmolol. In our study there was no incidence of tachycardia in any patient administered with esmolol.

Another study conducted by Sharma et al. [14] in 1996 to compare the efficacy of two bolus doses of esmolol it was found that 100mg IVbolus of esmolol maintained heart rate comparable to baseline values whereas 200mg esmolol IV bolus resulted in heart rate lower than baseline values. In our study, the heart rate remained statistically significantly lower than the baseline values at all the time intervals except the 1st minute following laryngoscopy and tracheal intubation.

It is notable that we used (as per the hospital protocol for ASA 1 and 2 patients) isoflurane and fentanyl along with the study drugs.

Effect of Esmolol on Blood Pressure

In our study,Esmolol decreased SBP,DBP and MAP at all study times with a slight rise immediately after intubation (which however was still below baseline).

In 2003 Kumar S [9] compared the efficacy of esmolol, diltiazem and magnesium sulphate in attenuation of hemodynamic response to laryngoscopy and tracheal intubation. They reported less rise of blood pressure in esmolol group after laryngoscopy than control group, however post-laryngoscopy blood pressures were significantly higher than baseline values. These findings are different from ours.

In 1990, Oxorn D, Hill J. et al. [10] studied the effects of IV bolus esmolol 100mg, 200mg and placebo. They reported that SBP was below baseline with 200mg group only. As per the protocol of anaesthesia followed by us, 1mg/kg esmolol was sufficient to attenuate hypertensive response.

Helfman SM et al. [11] in 1991, conducted a study to compare the efficacy of 200mg lignocaine, 200mcg fentanyl and 150mg of esmolol in attenuation of hemodynamic response to tracheal intubation. They concluded that esmolol alone reliably controlled the hypertensive response. This is similar to our study.

In the year 1994 Yuan et al. [12], studied the effect of single bolus dose of esmolol in two doses of 100mg and 200mg resulted in significant decrease in SBP till 8 minutes after laryngoscopy. Use of only 1mg/kg esmolol in our study along with our protocol of anaesthesia ensured similar results.

Feng &chan et al. [13], studying lidocaine, fentanyl, esmolol (2mg/kg) found only esmolol reliably controlled the pressor response. We found a dose of 1mg/kg to be effective controller of pressor response.

In 1996, Sharma et al. [14] compared the efficacy of two bolus doses of esmolol to blunt this pressor response in treated hypertensives. Esmolol 100 mg maintained ABP & HR compared to basal values ($p>0.05$), whereas esmolol 200 mg showed lower than basal values throughout the study. Our study shows esmolol 1mg/kg effectively attenuates response.

Diltiazem on HR

Kumar S [9], reported rise of HR after diltiazem injection & further rise after laryngoscopy for 5 minutes. They used glycopyrrolate, diazepam & halothane. Use of glycopyrrolate, probably contributed to such a high rise of HR. With our protocol, for first three minutes after intubation, HR was near baseline or more than that.Thereafter, significant reduction of HR was noted.

In 1996 Mikawa et al. [15], compared the effect of nicardipine, verapamil and diltiazem in controlling the cardiovascular response to tracheal intubation. They found that the heart rate increased before and after laryngoscopy. The rise of HR was statistically significant till 5 minutes post intubation. In our study there was a significant fall in heart rate, following drug administration, just before laryngoscopy and a significant rise in heart rate 1 min after intubation. The heart rate decreased below the baseline values after 3 minutes.

Nishina et al. [16] in 1995 conducted a study on effect of diltiazem in attenuation of cardiovascular response to tracheal extubation and emergence from anaesthesia. They found that IV diltiazem in both doses (0.1mg/kg and 0.2mg/kg) failed to attenuate the increase in heart rate following tracheal extubation. In our study (conducted for intubation) the heart rate also increased 1 min. after tracheal intubationand then gradually decreased.

In 1990 Mikawa et al. [17] investigated the effect of diltiazem on cardiovascular response to tracheal intubation and found that IV diltiazem given 1 minute before laryngoscopy failed to protect against increase in heart rate after laryngoscopy. In our study there occurred significant rise in heart rate 1 minute following laryngoscopy and tracheal intubation but there after it gradually decreased to less than baseline by the 10th minute.

Diltiazem on Blood Pressure

In our study, diltiazem caused statistically significant fall in SBP, DBP and MAP just before laryngoscopy which increased1 minute after intubation& then continued to decrease till 10 minutes after intubation. At all times the parameters were less than the baseline values.

In the study of Kumar S [9], it was found that there was statistically significant fall of SBP and DBP following its administration. Both SBP and DBP increased above the baseline value 1 minute after intubation and then continued to decrease till 5 minutes. As per the protocol of anaesthesia followed by us using diltiazem 0.2mg/kg, though SBP and DBP followed similar trend but at no time , the values were more than the baseline reading.

In the study done by Mikawa et al. [15], to compare the efficacy of diltiazem, verapamil and nicardipine to control pressor response tracheal intubation, they found that diltiazem 0.2mg/kg given as per their protocol (diazepam, fentanyl, thiopentone, vecuronium, preceded by two doses of atropine premedication) caused significant increase in SBP and DBP after tracheal intubation followed by a decrease in both the parameters till 5 minutes. As per the protocol of anaesthesia followed by us using diltiazem 0.2mg/kg , though SBP and DBP followed similar trend but at no time , the values wkjere more than the baseline reading.

Kahorunishina et al. [16], conducted a study on effect of diltiazem in attenuation of cardiovascular response to tracheal extubation and emergence from anaesthesia and found that IV diltiazem in dose of 0.2mg/kg attenuated the pressor response to tracheal extubation. This is like our study of diltiazem for intubation.

Mikawa et al. [17], found that IV diltiazem given 1 minute before laryngoscopy attenuated the cardiovascular response. This is like our study of diltiazem for tracheal intubation.

Limitations of Our Study

- Depth of anaesthesia was monitored only clinically.
- Degree of neuromuscular relaxation was monitored clinically and observing CO_2 graph.

- Fentanyl and isoflurane are known to modulate response to laryngoscopy and intubation.

Conclusions and Recommendations

Based on the present double blinded clinical comparative study, the following conclusions canbe made.

- Both esmolol and diltiazem cause statistically significant fall of systolic blood pressure, diltiazem more than esmolol until laryngoscopy.
- The systolic blood pressure remains low similarly with both the drugs after laryngoscopy and intubation.
- Both esmolol and diltiazem cause statistically significant fall of diastolic blood pressure, diltiazem more than esmolol until laryngoscopy.
- The diastolic blood pressure remains low similarly with both the drugs after laryngoscopy and intubation.
- Both esmolol and diltiazem cause statistically significant fall of mean arterial pressure, diltiazem more than esmolol until laryngoscopy.
- The mean arterial pressure remains low similarly with both the drugs after laryngoscopy and intubation.
- There were no episodes of arrhythmia or significant ST changes in any patient.

Thus, esmolol causes better hemodynamic attenuation of response to laryngoscopy and tracheal intubation, than diltiazem.

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Original Research Article

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Intravenous Sedation for Tympanoplasty – Comparison of I.V. Dexmedetomidine and Nalbuphine with I.V. Dexmedetomidine and Fentanyl

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Abstract

Introduction: Monitored Anaesthesia Care (MAC) involves administration of local anaesthesia (LA) with intravenous sedatives, anxiolytic and analgesic drugs with detailed monitoring of vital parameters. In tympanoplasty, reconstruction of tympanic membrane with or without ossicular reconstruction is done. To avoid pain, decrease bleeding IV sedation with local anaesthesia is preferred. In this study we compared the effects of Inj. Dexmedetomidine and Inj. Nalbuphine versus Inj. Dexmedetomidine and Inj. Fentanyl. *Aims and objectives:* 1. To compare the sedation effects and analgesic effects of Dexmedetomidine (1mcg/kg) / Nalbuphine (100 mcg/kg) and Dexmedetomidine (1mcg/kg) /Fentanyl (1mcg/kg) in I.V. sedation in Tympanoplasty. 2. To compare Heart rate, Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure, Respiratory Rate, Oxygen Saturation ($SpO_{2)}$ and Surgeon's Satisfaction Score. *Material and method:* 60 patients undergoing tympanoplasty surgery under MAC were randomly divided in two groups of 30 each according to chit block method in addition toInj. Dexmedetomidine 1µgm/kg received either inj. Nalbuphine 100µgm/kg (Group N) or inj. Fentanyl 1µgm/kg (Group F) intravenously for sedation along with local anaesthesia during surgery. Ramsay sedation score (RSS), Visual analogue score (VAS), Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean arterial pressure (MAP), Respiratory Rate (RR), Oxygen Saturation (SpO_2) were recorded after giving both the drugs at the interval of 2, 4, 6, 8, 10, 30, 60, 90, 120 minutes. *Result:* We observed that RSS score was more and VAS score was less in group N than group F. This indicates that sedation and analgesia was better in Dexmedetomidine with Nalbuphine group than Dexmedetomidine with Fentanyl group. Decrease in heart rate, Systolic Blood Pressure and Diastolic Blood Pressure, Mean Arterial Pressure was statistically significant in group N than group F. This indicates that Dexmedetomidine with Nalbuphine provides better cardiovascular stability. Rescue analgesic requirement was comparable in both groups. *Conclusion:* From this study, we concluded that, intravenous Inj.Dexmedetomidine with Inj. Nalbuphine provides better sedation and analgesia, good hemodynamic stability, good surgeon's satisfaction score without side effects. It also reduces the requirement of rescue sedation and analgesia as compared to Inj.Dexmedetomidine with Inj.Fentanyl in patients undergoing Tympanoplasty under local anaesthesia with monitored anaesthesia care. Thus Dexmedetomidine with Nalbuphine is a better alternative to Dexmedetomidine with Fentanyl as sedation for middle ear surgery.

Keywords: Tympanoplasty; Dexmedetomidine; Nalbuphine.

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Introduction

Monitored Anaesthesia Care (MAC) involves administration of local anaesthesia (LA) with intravenous sedatives, anxiolytic and analgesic drugs with monitoring of vital parameters. Monitored anaesthesia care is indicated in various ENT surgeries in which an adequate sedation and analgesia are desirable for the comfort of both the

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patient and surgeon. It is cost-effective, causes less bleeding, allow to test hearing intra-operatively has faster recovery and can provide postoperative analgesia.

Tympanoplasty is superficial, less invasive surgery but patient may feel discomfort due to pain, noise of suction, middle ear instrumentation and head-neck position. Pain will lead to sympathetic stimulation, a restlessness, tachycardia, hypertension leading to increased bleeding in surgical field.

Many drugs have been used for sedation during surgery under local anaesthesia with MAC including Propofol, benzodiazepines and opioids. Midazolam is the most frequently used sedative and well tolerated when used in MAC. Alfa-2 adrenoreceptor agonists i.e. Clonidine and Dexmedetomidine have been recently used preoperatively for their sedation without respiratory depression [1], analgesic, and sympatholytic and cardiovascular stabilising effects with reduced anaesthetic requirements. It decreases sympathetic outflow and hence, it reduces bleeding significantly.

This study was undertaken to evaluate and compare the effects of inj. Dexmedetomidine and inj. Nalbuphine versus inj. Dexmedetomidine and Inj. Fentanyl with respect to sedation, analgesia and hemodynamic stability intraoperative in patients undergoing tympanoplasty under local anaesthesia with monitored anaesthesia care.

Aims & Objectives

To compare the efficacy of I.V. Dexmedetomidine with Nalbuphine versus I.V. Dexmedetomidine with Fentanyl during Tympanoplasty under Local Anaesthesia with Monitored Anaesthesia.

To study and compare the sedation and analgesic effect of Dexmedetomidine (1mcg/kg)/ Nalbuphine (100 mcg/kg) with Dexmedetomidine (1mcg/kg) / Fentanyl (1mcg/kg) in I.V. sedation for Tympanoplasty. Also to compare effect on Heart rate, Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure, Respiratory Rate, Oxygen Saturation (SpO_2).

Material and Method

We conducted a Prospective, Randomized, double blind, clinical study after approval of institutional medical ethics committee and written informed consent was obtained from all patients participating in the study. 60 patients of ASA Grade I & II, age between 18 - 60 years undergoing Tympanoplasty under local anaesthesia with 2% Lignocaine plus adrenaline 1:200000 and I.V. sedation with in either Dexmedetomidine with Nalbuphine or Dexmedetomidine with Fentanyl. Patients were divided in two groups of 30 each allocated randomly by chit block method in two groups, Group N and Group F Group N received Inj. Dexmedetomidine 1 mcg/kg I.V. in 100 ml normal saline over 10 min followed by Inj. Nalbuphine100 mcg/kg in 10 ml normal saline bolus over 5 min. Group F received Inj. Dexmedetomidine 1 mcg/kg I.V. in 100 ml normal saline over 10 min followed by Inj.Fentanyl1 mcg/kg in 10 ml normal saline bolus over 5 min.

Standard monitoring including ECG, noninvasive BP and pulse oximetry were applied to patients and baseline vitals were recorded. I.V. line was secured with 20G cannula, antiemetic premedication drug i.e. Inj. Ondensetron 0.15 mg/kg I.V. was administered and I.V. Ringer Lactate solution 2ml/kg/hr was started. O_2 was administered with nasal cannula at a rate 4 lit/min. To maintain the double blind nature of study, anaesthesiologist who was not involved in study prepared the drug bolus to fixed volume. The anaesthesiologists conducting the case, surgeons and patients were blinded to group assignment.

Local anaesthesia was given by ENT surgeons using 6-7 ml of 2% Lignocaine with Adrenaline (1:2,00000) in the postauricular area to block greater auricular & lesser occipital nerves in the incisura terminalis while administration of intravenous drugs. Dose of Lignocaine with adrenaline should not exceed >5 mg/kg.

Ramsay sedation score (RSS), Visual analougue score (VAS), Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean arterial pressure (MAP), Respiratory Rate (RR), Oxygen Saturation (SpO_2) were recorded after giving both the drugs at the interval of 2, 4, 6, 8, 10, 30, 60, 90, 120 min of surgery.

After completion of surgery patients were shifted to Post Anaesthesia Care Unit and I.V. Inj Diclofenac 1.5mg/kg was given for postoperative analgesia.

After the loading dose of the drug, Ramsay Sedation Score (RSS) was assessed with target sedation of RSS 3. If patient complains of pain, Inj Propofol 100-300mcg/kg I.V. bolus with Inj Fentanyl at 1 mcg/kg was given. If still patient complains of pain general anaesthesia was given and was excluded from the study.

Sedation score was analysed by Ramsay Sedation Scale (RSS) as follows-

Grade 1 Patient is anxious and agitated or restless, or both.

Grade 2 Patient is co-operative, oriented, and tranquil.

Grade 3 Patient responds to commands only.

Grade 4 Patient exhibits brisk response to light glabellar tap or loud auditory stimulus.

Grade 5 Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus.

Grade 6 Patient exhibits no response.

Analgesia was assessed by Visual Analogue Scale (VAS) as one to ten where one is mimimum pain while ten is severe pain.

Adverse effects namely Bradycardia, Hypotension, desaturation, nausea,vomiting, dry mouth or any other events during procedure were noted andtreated accordingly.

Bradycardia was defined as pulse rate < 60 beats/ min or <20% of baseline heart rate and was treated with I.V. Atropine Sulphate 0.01mg/kg. Hypotensionwas defined as Mean Arterial Pressure <60 mm of Hg or systolic blood pressure <20% of baseline level and was treated with fluid therapy and when this therapy was inadequate then I.V. Mephenteramine 6mg in incremental doses was administered if required.

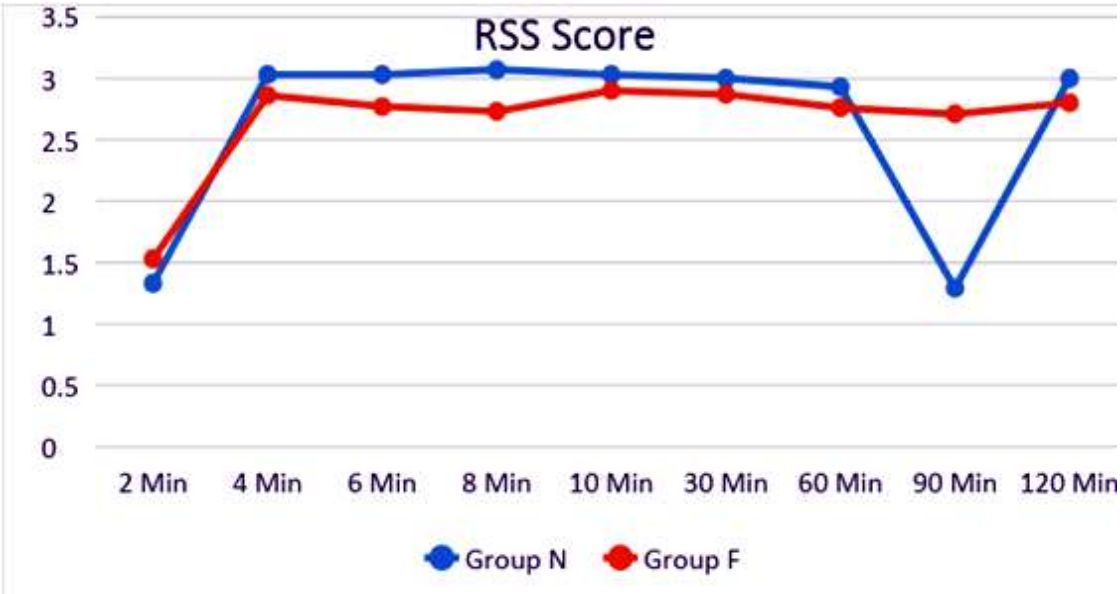
Desaturation was defined as SpO_2 < 90% and was treated by increasing O_2 flow at a rate 6 lit/min via Hudson's Face mask or bag mask ventilation if required.Bradypnea (respiratory rate is less than 8 per min) was treated withassisting or supporting the ventilation on mask.

Data was expressed as Mean + Standard Deviation (SD). Demographic data and complications were analyzed using Chi-square test and haemodynamic variables were analyzed using paired and unpaired't' test.'p' value less than 0.05 was considered statistically significant.

Result

In our study we observed that both groups were comparable as per age, sex, weight and ASA grade is considered. RSS was more in group N than group F. (Graph 1)There was statistically significant difference between RSS among the two groups at 6, 8 and 90 min duration during the surgical time with p value <0.05. The difference was not statistically significant at the end of 2 min, 4 min, 10 min, 30min, 60 min and 120 min with p value > 0.05. This indicates that sedation was better in Dexmedetomidine with Nalbuphine group than Dexmedetomidine with Fentanyl group.

VAS was less in group N than group F. The difference was statistically significant. The VAS score was higher in Group F than group N at 6, 8, 10, 30, 60, 90, 120 min. This indicates that Dexmedetomidine with Nalbuphine provided better analgesia than Dexmedetomidine with Fentanyl. One patient from group N while three patients from group F required rescue sedation. Additional analgesic requirement

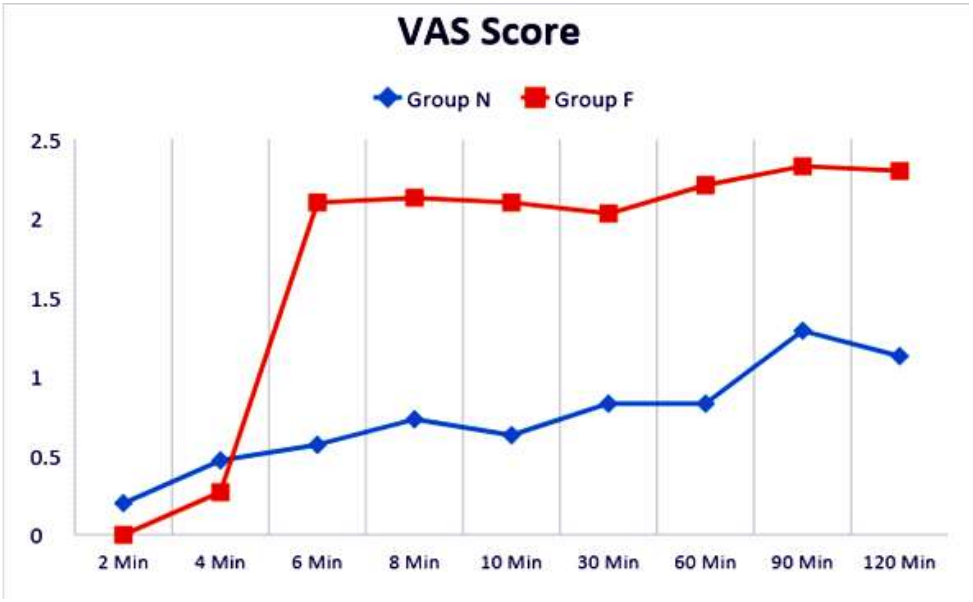


Graph 1: RSS Score among Two Groups

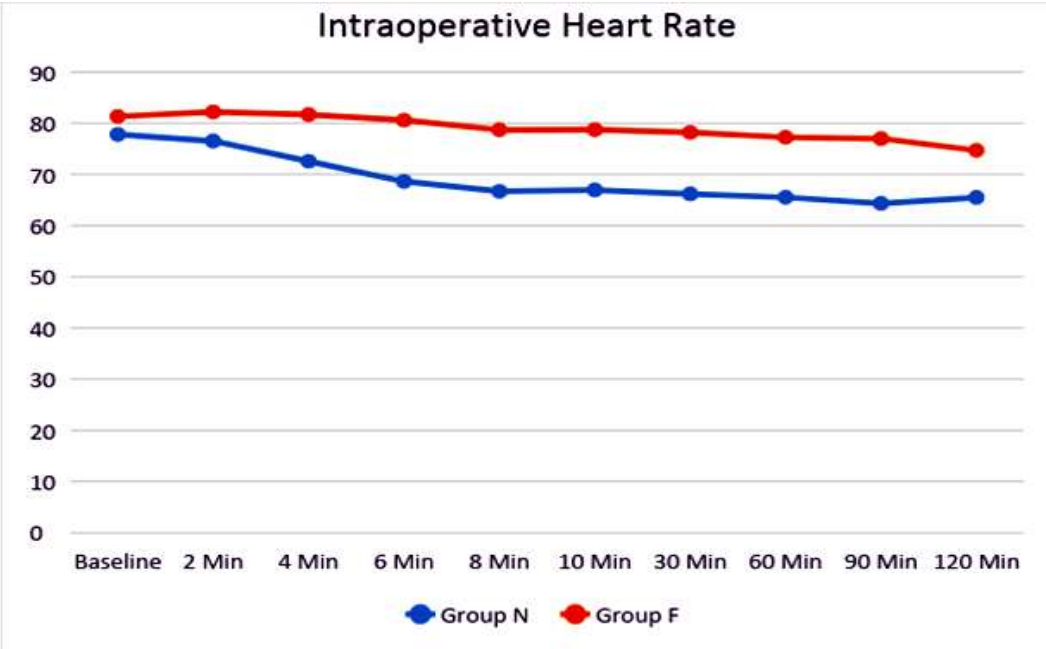
was not statistically significant. Three patients from group N while seven patients from group F required rescue analgesia. (Graph 2).

Decrease in heart rate was statistically significant in group N thangroup F. In Group N baseline mean HR was 77.8±7.74/min while in Group F baselinemean HR was 81.33±11.34/min. Both the groups were comparable at baseline HR (p=0.164). In group N, HR decreased to 72.57±6.33/min at the end of 4 min and was continued till the end of surgery with statistically significant difference (p = 0.001). In group F the mean HR did not decrease significantly. This indicates that Dexmedetomidine with Nalbuphine provides better cardiovascular stability. (Graph 3).

In Group N, the baseline means SBP was 117.8±10.78 mm Hg and In Group F, mean SBP was 121.33±10.4 mm Hg,which were comparable (p= 0.201) in both groups. In group N at 4 min SBP decreased to 112.2±11.4 mm Hg. The difference was statistically



Graph 2: VAS Score among Two Groups

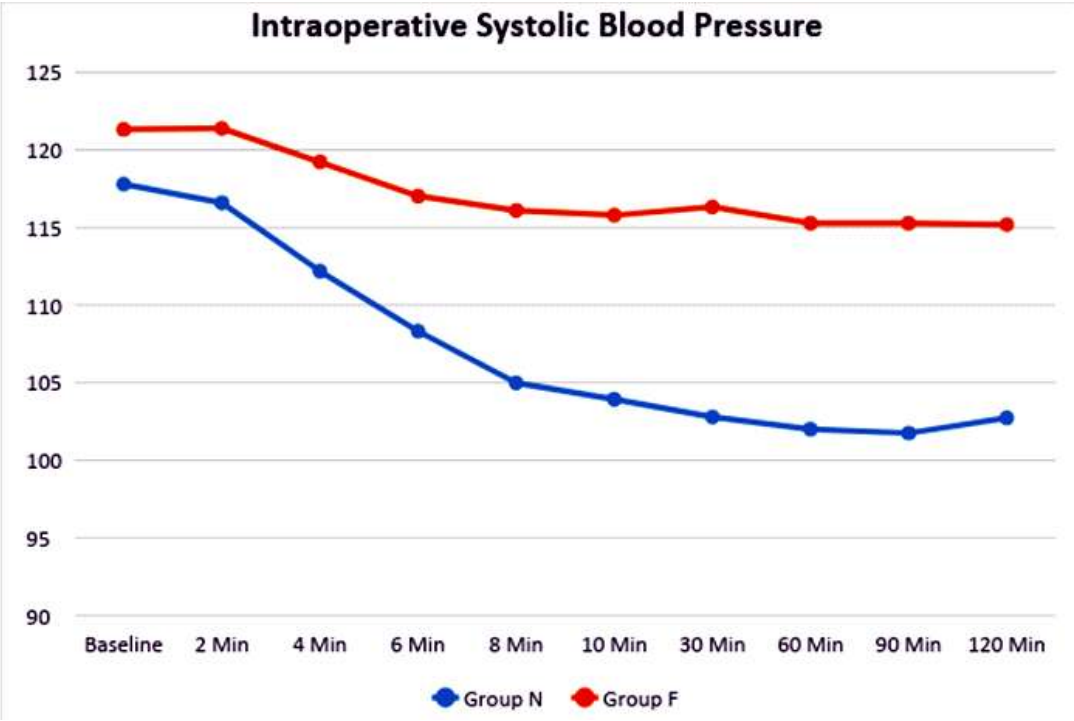


Graph 3: Intraoperative mean heart rate (HR in beats/min)

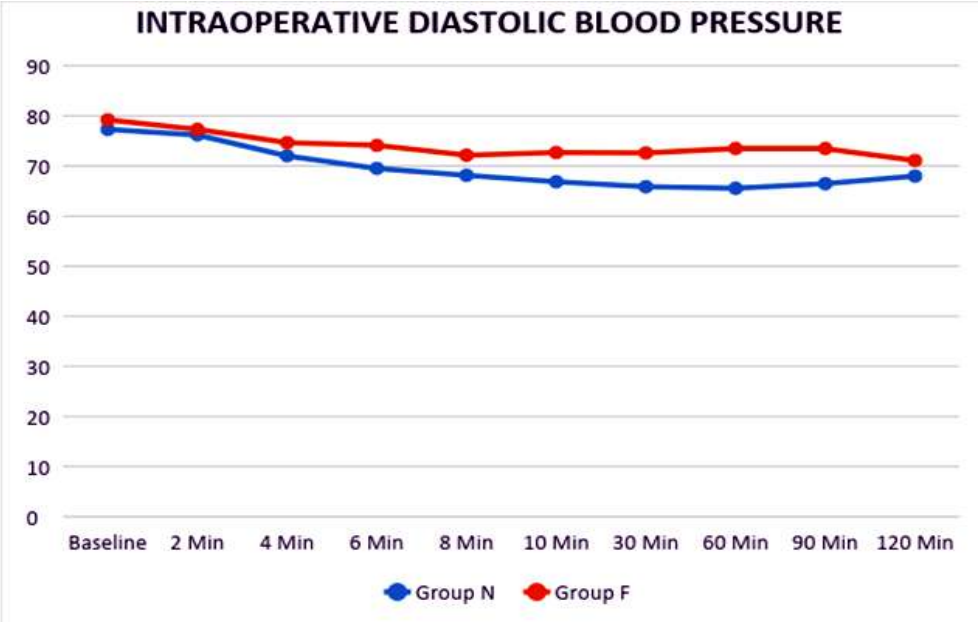
significant (p = 0.001). In group F there was no any significant reduction at 4 min but 6 mins onwards it was significantly reduced (p=0.001) till end of surgery. Decraese in Systolic Blood Pressure and Diastolic Blood Pressure, Mean Arterial Pressure were statistically significant in group N than group F. This indicates that Dexmedetomidine with Nalbuphine provides better cardiovascular stability (Graph 4,5 and 6).

Oxygen saturation and RR were maintained within normal limits in both the groups. They were comparable in both the groups and hence statistically not significant. No significant side effects were noted in both the groups. It was not statistically significant.

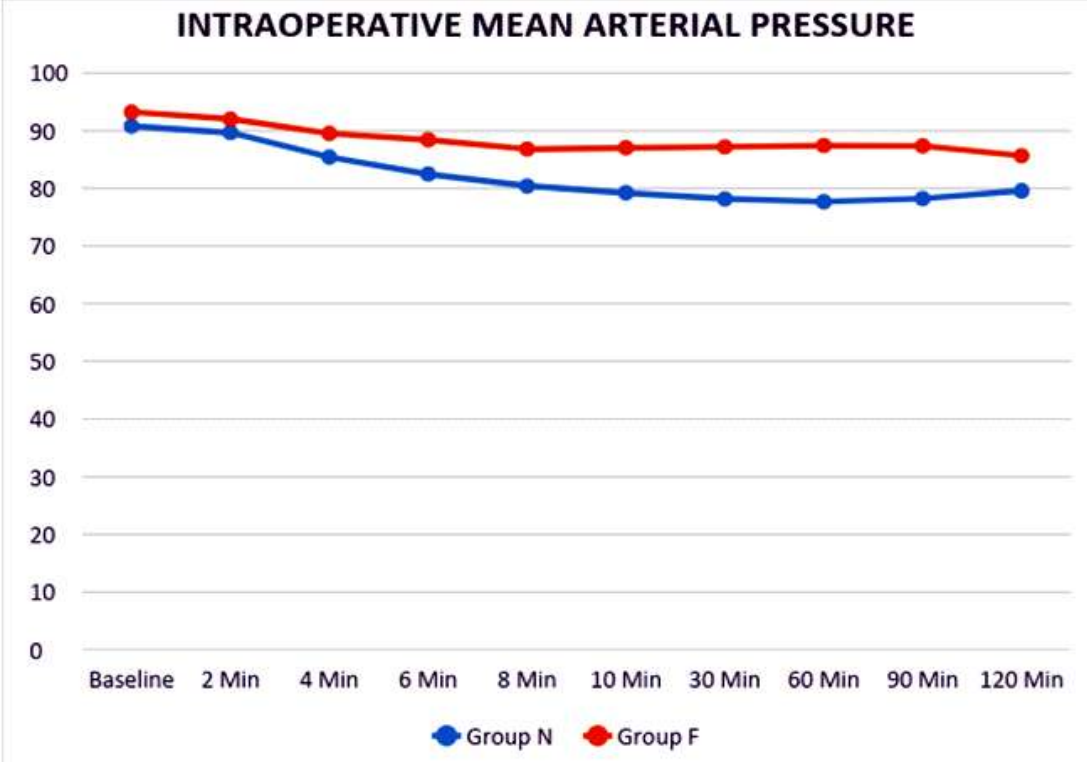
Additional sedation requirement was not statistically significant (Graph 7).



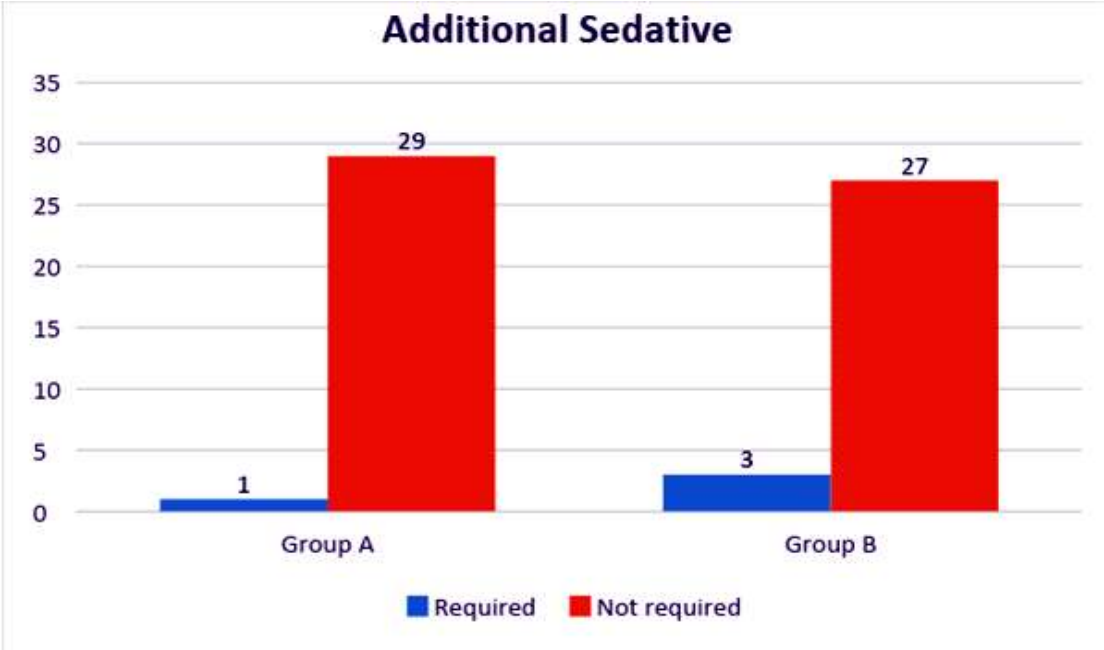
Graph 4: Intraoperative systolic blood pressure (SBP in mmHg)



Graph 5: Intraoperative diastolic blood pressure (DBP in mmHg)



Graph 6: Intraoperative mean arterial pressure (MAP in mmHg)



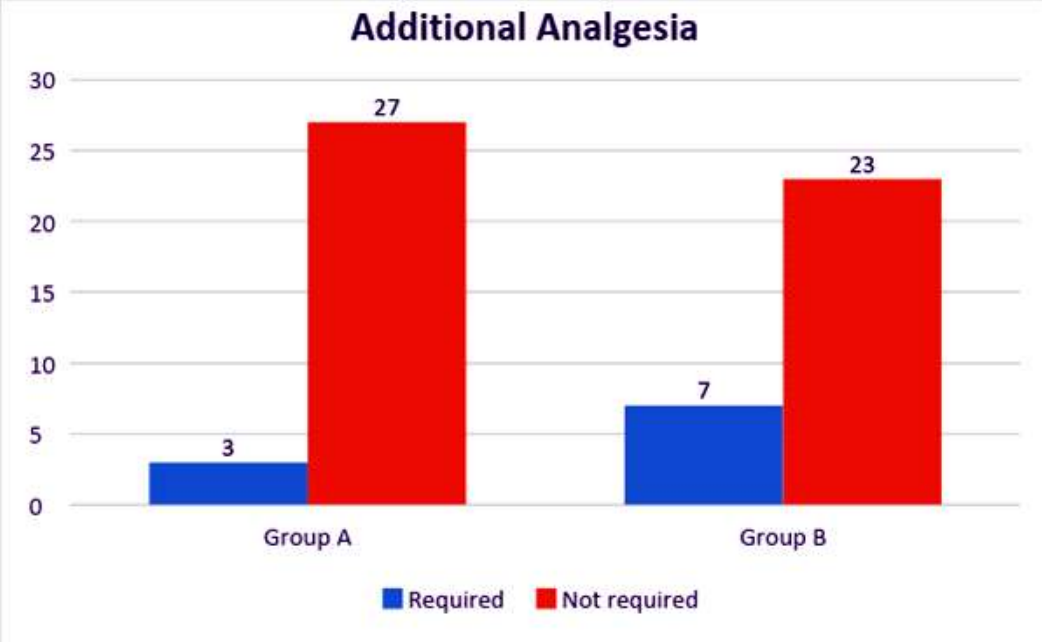
Graph 7: Distribution according to Additional Sedative

Additional analgesia in both the groups was not statistically significant (Graph 8).

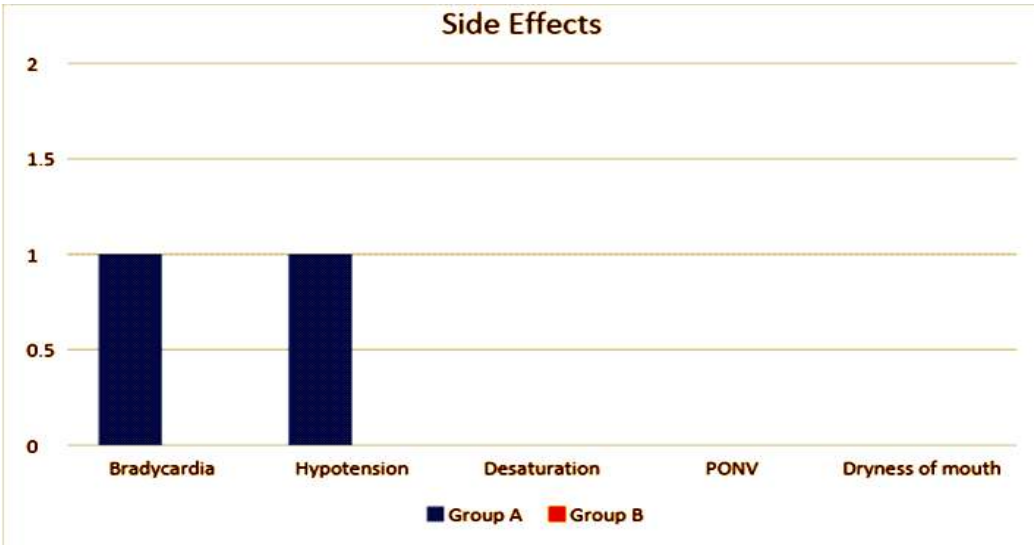
No significant side effects were noted in the two group (Graph 9).

Discussion

Monitored anaesthesia care (MAC) involves administration of local anaesthesia with



Graph 8: Distribution according to Additional Analgesia



Graph 9: Distribution according to Side Effects

intravenous sedatives, anxiolytic and analgesic drugs with monitoring of vital parameters. It is indicated in middle ear surgery in which an adequate sedation and analgesia are desirable for the comfort and safety of patient [2]. Conscious sedation is defined as a state of altered or reduced consciousness in which the patient is able to maintain his vitals [3,4].

During tympanoplasty pain may lead to restless patient with sympathetic stimulation, tachycardia, hypertension and increased bleeding. Intraoperative bleeding may lead to prolongation of surgery and graft rejection. Hence, it is important to have a bloodless surgical field. Several drugs have been used for sedation during surgery under local anaesthesia with monitored anaesthesia care including Propofol, Benzodiazepines and Opioids. However, Propofolmay cause deep sedation, disorientation and unconsciousness [3], Benzodiazepins may result in confusion, particularly in elderly and opioids are associated with postoperative nausea and vomiting, increased risk of respiratory depression [5].

Combining opioid with Dexmedetomidine have synergistic effect and better intra-operative

sedation, analgesia, hemodynamic stability and better surgeon's satisfaction score [6]. Combination of two drugs from the beginning of procedure allows the use of lower dose of each agent and thus decreases its undesired effects [7]. Synergism of Dexmedetomidine with other opioids decreases the need of complementary opioid analgesics [8]. Dexmedetomidine and Morphine combination significantly enhances analgesic effect of Morphine, reduces PCA Morphine requirements and coexisting Morphine induced nausea without causing bradycardia or hypotension, sedation, respiratory depression [8].

Alka Kewalramani, S.S. Jaitawat et al. compared Dexmedetomidine with Dexmedetomidine and Butorphanol as an adjuvant I.V. for MAC in Tympanoplasty and myringoplasty. They noted that RSS was better in Dexmedetomidine with Butorphanol group which proves that Dexmedetomidine along with opioid provides better sedation [6] which was our observation too. Kazim Karaaslan, Fahrettin Yilmaz, et al. noted that amount of PCA administered rescue analgesic Tramadol was higher in patients who used Midazolam than in patients who received Dexmedetomidine [10]. This shows that Dexmedetomidine has opioid sparing action too and decreases the requirement of other analgesics.

In our study we observed that intraoperative RSS was better in group N Dexmedetomidine with Nalbuphine than group F Dexmedetomidine with Fentanyl at 6, 8 and 90mins. Only one patient from group N required Inj.propofol asrescue sedation and three patients from group F required Inj. Propofol , lower vas score in group N than in group Fwith less requirement of rescue analgesic in group N, Similar result was noted by Mahmoud Hassan Mohamed, Karim Youssef Kamal Hakim, et al. who compared I.V. Dexmedetomidine and Nalbuphine with Midazolam and Nalbuphine in ear surgeries under MAC. They observed that RSS was better in Dexmedetomidine with Nalbuphine, rescue analgesic requirement in Dexmedetomidine with Nalbuphine was 34% while it is 60% in Midazolam with Nalbuphine group. Also they noticed significant hypotension and bradycardia in pateints of Dexmedetomidine with Nalbuphine group than Dexmedetomidine with Fentanyl group [11]. There was no statistically significant difference between the 2 groups as regardsrespiratory rate, saturation when they compared Dexmedetomidine and Nalbuphine with Midazolam and Nalbuphine [11].

Srinivasa Rao Nallam et al. (2017)compared I.V. (Dexmedetomidine and Nalbuphine) with (Propofol and Nalbuphine) in patientts undergoing middle ear surgeries. He also observed that Dexmedetomidine with Nalbuphine provides better sedation and analgesia as we observed in this study [7]. Also they obsereved that there is decrease in HR and MAP in Dexmedetomidine and Nalbuphine group with bradycardia in 36% patients while only in 6% patients who received Propofol with Nalbuphine and 16 patients from Dexmedetomidine with Nalbuphine group and 7 patients from Propofol with Nalbuphine group had hypotension.

Dr Gauri M Panjabi et al. compared I.V. Nalbuphine with I.V. Fentanyl for postoperative analgesia in patients undergoing short surgical procedure under general anaesthesia. She observed that Nalbuphine provides better analgesia than Fentany with less respiratory depression in Nalbuphine than Fentanyl group [12]. In our study we also observed that Dexmedetomidine with Nalbuphine provides better quality of analgesia than Dexmedetomidine with Fentanyl. T.F.L inet alcompared I.V. Dexmedetomidine with Morphine versus I.V. Morphine in patients undergoing total abdominal hysterectomy. Decreased in heart rate and MAP seen in Dexmedetomidine with Morphine group. Thus Dexmedetomidine with opioid causes more reduction in HR and MAP than Dexmedetomidine [9]. This shows that Dexmedetomidine provides controlled hypotension with surgical field. In our study Dexmedetomidine was used in both the groups so effect on pulse rate and blood pressure were comparable in both groups.

S. Goksu, H. Arik, et al. conducted a study for FESS surgery under LA with sedation divided in two groups placebo (NS infusion) and Dexmedetomidine (bolus followed by infusion). They observed that postoperative nausea and vomiting rates were significantly lower in the Dexmedetomidine group [13]. According to Parikh DA et al. 7 patients from Dexmedetomidine group showed dry mouth. More incidence of side effects seen may be due to infusion of Dexmedetomidine along with the bolus dose [14].

Dexmedetomidine is the most selective central $\alpha 2$ adrenoceptor agonist, providing dose-dependent sedation, analgesia, sympatholysis and anxiolysis without respiratory depression. The sedative effect is rapid, stable and keep patient arousable. Sedation and analgesic property of Dexmedetomidine is attributed to stimulation of $\alpha 2$ adrenoreceptor in Locus ceruleus in brain and modulation of transmission nociceptive signal in CNS and

spinal level [6]. Due to sympatholytic effect it attenuates the stressresponse to surgery.

It has opioid sparing effect which provides hemodynamic stability in intra and postoperative period. Hypotension and bradycardia have been observed in studies doneearlier with Dexmedetomidine. These effects are known to be related tothe dose, route of administration, and infusion rate (in intravenous administrations) [10,15,16,17,18]. It does not cause respiratory depression because its effects are not mediated by the Y aminobutyric system [14].

Reports of its use state that alpha-2 agonist effect is more specific but not alpha-1 effect (200:1 for clonidine & 1600:1 for Dexmedetomidine), on administration of low and moderate doses and slow rates of infusion [11]. Consequently, peripheral vasoconstriction and hypertension would not be expected in these instances. Dexmedetomidine causes controlled hypotension & thus provides better surgical (bloodless) field for microscopic surgery compared with other drugs like Midazolam,Propofol.

Nalbuphine is a synthetic opioid which acts as an agonist at kappareceptors and an antagonist at mu receptors. It has analgesic potency equivalent to that of Morphine. When administered with mu agonist opioid analgesics (Morphine, Fentanyl) it may partially reverse or block opioid induced respiratory depression from mu agonist analgesic. Its onset of action is within 2-3 mins after I.V. administration and plasma halflife is 5 hours. Thus Nalbuphine has short duration of action and rapid clearance than other opioids and less side effects like over sedation, pruritus, respiratory depressionand urinary retention.

Fentanyl is mu opioid agonist. Its analgesic property is 75-125 times more than Morphine. After I.V. administration, onset of action is within 1-2 minsand duration of action is 60 mins. Due to stimulation of central nucleus, there is decrease in heart rate which is dependent on dose and speed of injection. Fall in BP is due to decreased SVR through centally mediated reduction in sympathetic tone. It causes dose dependent respiratory depression.

As Nalbuphine is not subject to the restriction of the Misuse of drugs act it is available freely [12].

Infusion of Dexmedetomidine gives better results in aspects of sedation, analgesia, rescue sedation & analgesia drug requirement compared to bolus dose but patients may have more side effects. Limitation of our study is that we used Dexmedetomidine as bolus dose only and even though BIS monitoring is more reliable parameter than RSS for monitoring sedation we used RSS due to unavailability of BIS. So it needs to be studied further by use of infusion of Dexmedetomidine along with BIS monitoring.

Conclusion

From this study, we concluded that, intravenous Inj. Dexmedetomidine with Inj. Nalbuphine provides better sedation and analgesia, good hemodynamic stability, good surgeon's satisfaction score without side effects. It also reduces the requirement of rescue sedation and analgesia as compared to Inj. Dexmedetomidine with Inj. Fentanyl in patients undergoing Tympanoplasty under local anaesthesia with monitored anaesthesia care. Thus Dexmedetomidine with Nalbuphine is a better alternative to Dexmedetomidine with Fentanyl as sedation for middle ear surgery.

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Original Research Article

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Chronic Knee Osteoarthritis: Intra - articular Sodium Hyaluronic Acid and Radiofrequency Neurotomy of Genicular Nerve

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Abstract

Background: Various modalities have been used for treatment of chronic knee osteoarthritis but with limited benefits. Radiofrequency neurotomy of genicular nerve is emerging as newer modality for pain relief with few complications. The present study was designed with an aim to compare combination of intra articular sodium hyaluronic acid and genicular radiofrequency neurotomy with intra articular sodium hyaluronic acid alone in chronic osteoarthritis patients. *Methods:* 40 patients of either sex, age 40-65 years suffering from knee pain due to advanced osteoarthritis with no benefit from conservative measures were randomly allocated into two groups. In Group A, intra articular sodium hyaluronic acid 6mL was injected under aseptic precautions. In Group B, intra articular sodium hyaluronic acid was followed by radio frequency neurotomy of genicular nerves. All patients were followed with pre-operative and post- operative procedure outcome measurement at 1 week, 4 weeks, 12 weeks and 6 months. *Results:* Both groups were comparable with respect to age, height, weight, gender and BMI (Body Mass Index). Reduction in VAS (Visual Analogue Scale) and improvement in OKS (Oxford Knee Score) was better in Group B as compared to Group A at 1 week, 4 weeks, 12 weeks and 6 months post procedure, all differences being highly significant ($p<0.001$). *Conclusion:* Combined therapy with intra articular sodium hyaluronic acid and genicular radiofrequency neurotomy is a safe, effective and minimally invasive procedure for knee osteoarthritis. It provides better pain relief and functional recovery of joints as compared to intra - articular sodium hyaluronic acid alone.

Keywords: Hyaluronic Acid; Radiofrequency; Genicular; Osteoarthritis; Knee.

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Introduction

Chronic knee osteoarthritis is the most common joint disease. Nearly 80% of population demonstrates radiographic evidence of osteoarthritis by the age of 65 years [1,2]. Risk factors for osteoarthritis are aging, obesity, injury and congenital anomalies. Osteoarthritis results in symptoms such as –

1. Pain around the joint which is aggravated by weight bearing.
2. Restricted movement.
3. Stiffness
4. Sleep disturbance
5. Psycho-social disability [3–6]

Biomechanical stress over joint components leads to biochemical changes in articular cartilage and synovial membrane. Various modalities have been used for treatment of osteoarthritis by pharmacological and non-pharmacological methods but with limited benefits. With long term NSAIDs,

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side effects are more [7,8]. Glucosamine and intra-articular steroids provide limited benefits.

Intra-articular viscosupplementation with substances like sodium hyaluronic acid is evolving. In osteoarthritis, there is loss of hyaluronic acid from synovial fluid. Therefore, supplementation will help in reduction of pain and stiffness [9]. This complementary therapy has variable response [10 – 12]. Radiofrequency neurotomy of genicular nerves is emerging as newer modality for pain relief in osteoarthritis in elderly patients with few complications, especially for the patients who are not appropriate surgical patients or not willing for surgery. The articular branches supplying the knee joint arise from various nerves - femoral, common peroneal, saphenous, tibial and obturator [13,14]. The articular branches around knee are known as genicular nerves. Studies comparing response of sodium hyaluronic acid are highly variable and studies for radiofrequency neurotomy of genicular nerves are limited. Therefore, the present study was designed with an aim to compare intraarticular sodium hyaluronic acid and RF genicular neurotomy combined with intraarticular sodium hyaluronic acid in chronic osteoarthritis patients.

Methods

This randomized control study was conducted from July, 2015 to March, 2016. Written inform consent was taken from all patients. 40 patients either sex, age 40-65 years suffering from knee pain due to advanced osteoarthritis with no benefit from pharmacological agents like NSAID's were randomly allocated into two groups:

Group A (n=20) - Intraarticular sodium hyaluronic acid

Group B (n=20) - Radiofrequency neurotomy of genicular nerves +Intraarticular sodium hyaluronic acid

Inclusion criteria were presence of chronic knee pain osteoarthritis (more than 3 months), radiologicallytibio femoral osteoarthritis (Kellgren Lawrence grade 2-4) and patients refractory to oral analgesics and intra-articular steroid. Exclusion criteria were patients on anticoagulants and bleeding disorders, pacemakers, acute knee pain, previous knee surgery, allergic to sodium hyaluronic acid and presence of psychiatric disorders.

The patients who were eligible underwent diagnostic genicular nerve block of –

1. Superior lateral genicular nerve (SL)
2. Superior medial genicular nerve (SM)
3. Inferior medial genicular nerve (IM)

Diagnostic block was done with 2 ml of 1% injection lignocaine under fluoroscopic guidance. Diagnostic block was recorded as positive if patients had greater than 50% pain relief for more than 24 hours. Patients with positive response were included in study. Sodium hyaluronic acid skin hyper sensitivity test was done in all patients. Patients were hypersensitivity reaction were excluded from study.

Under sterile condition patients were placed in supine position on fluoroscopy compatible operation table, with support of pillow under popliteal fossa of knee. In AP view, knee joint and junction of epicondyle with shaft was visualized. In Group A, intra-articular sodium hyaluronic acid was injected (Inj. Hyorth XL 6 ml) under aseptic precautions. After infiltration of 1ml of 1% lignocaine to skin and subcutaneous tissue with 26 G hypodermic needle, 22G spinal needle was placed intra - articularly in the knee.Placement was confirmed in AP and lateral view under fluoroscopy and sodium hyaluronic acid 6 ml was injected.

In Group B, intra-articular sodium hyaluronic acid was injected (Inj. Hyorth XL 6ml) after radiofrequency neurotomy of genicular nerves. Skin and subcutaneous tissue were infiltrated with 1% lignocaine 1 ml at SM genicular nerve, SL genicular nerve and IM genicular nerve locations. RF cannulasof 10 cm length, 10mm active tip (Baylis Medical Company Inc., Canada) were advanced at all 3 points under fluoroscopic guidance one by one percutaneously at junction of shaft and epicondyle of lateral and medial side of femur, and medial junction of tibia with end on view until bony contact was made. Sensory and motor stimulation was checked with RF machine (Baylis Medical Company Inc., Canada; Pain management generator) by connecting RF electrodes to RF cannulas. Sensory stimulation was checked with 50 Hz and 0.5 V for location of genicular nerve. Motor stimulation was checked with 2 Hz and 2 V. Inj. lignocaine 1% 2ml was injected and RF electrode was inserted into RF cannula. RF generator was activated at 80^0C for 90 seconds at each point. All patients in both groups were instructed to continue medication for osteoarthritis after the procedure.

All patients were followed with post - procedure outcome measurement at 1 week, 4 weeks, 12 weeks and 6 months. Basal and post procedural Visual Analog Scale (10 mm), Kellgren Lawrence grading system of weight bearing radiograph and Oxford knee scoring system were noted.

Statistical analysis was done with SPSS package for Microsoft Excel. For weight, height and BMI Student's 't' test was used. For patients' variables like sex, OKS, VAS Fisher's exact test and Chi Square test were used. p value <0.05 was considered statistically significant.

Results

Both groups were comparable with respect to age, sex, height, weight and BMI. (Table 1) Reduction in VAS scores (Table 3, Figure 1) and improvement in OKS (Table 4, Figure 2) was better in Group II compared to Group I at 1 week, 4 weeks, 12 weeks and 6 months post procedure, all differences being highly significant (p<0.001). Therefore, in our study pain relief was there in both groups at 6 months but it was better in Group II vs Group I (p<0.001).

Table 1: Demographic parameters in both groups

Parameters	Group A Mean± SD	Group B Mean± SD	P- value
Age (yrs)	62.5± 2.93	63.0 ± 2.82	>0.05
Weight (kgs)	65.0± 7.07	64.5 ± 0.70	0.14
Height (cms)	158 ± 7.07	160 ± 4.24	0.087
BMI	26. ± 0.56	25.25 ± 1.06	0.56
Sex (F/M)	16/4	18/2	0.66

Table 2: Kellgren Lawrence grading for knee X-ray in both groups

Kellgren Lawrence grading	Group A	Group B
Grade II	4	4
Grade III	10	10
Grade IV	6	6

Table 3: Visual Analogue Scale (0 to 10 mm) in both groups

	Group A	Group B	P value
Basal	8.5 ± 0.7	8. 5 ± 0.76	0.16
1 Week	3.0 ± 0.4	2.5 ± 0.64	0.001
4 Week	2.0 ± 0.85	2.0 ± 0.52	0.002
12 Week	3.5 ± 0.71	1.5 ± 0.41	< 0.001
6 Months	4.0 ± 0.52	2.0 ± 0.67	< 0.001

Table 4: Oxford Knee Scores in both groups

	Group A		Group B		P- Value
	Group	Score	Group	Score	
Basal	Grade-II	20	Grade-II	20	>0.05
1 Week	Grade-II	18	Grade-II	10	0.006
	Grade-III	2	Grade-III	10	
4 Weeks	Grade-II	9	Grade-III	20	<0.001
	Grade-III	11	---	---	
12 Weeks	Grade-II	5	Grade-III	15	0.021
	Grade-III	14	Grade-IV	5	
	Grade-IV	1	---	---	
6 Months	Grade-II	1	Grade-III	6	<0.001
	Grade-III	17	Grade-IV	14	
	Grade-IV	2	---	---	

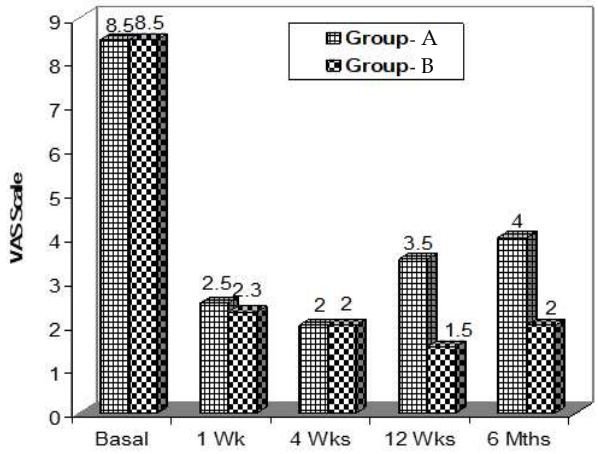

Fig. 1: Visual Analogue Scale (0 to 10 mm) in both groups

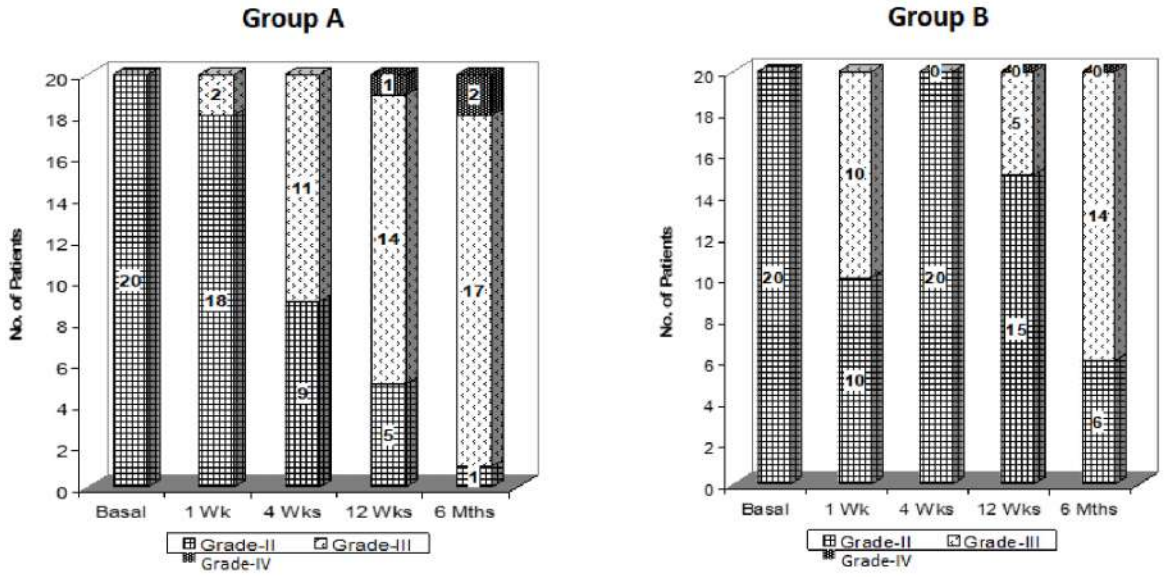

Fig. 2: Oxford Knee Scoring in both groups

Discussion

Chronic knee osteoarthritis is often difficult to manage with traditional non surgical management. Viscosupplementation is a newly available option for patients with symptomatic knee osteoarthritis for intra articular injections [13]. Radiofrequency genicular neurotomy is a newer therapeutic alternative for chronic knee pain [15]. Osteoarthritis is characterized by loss of articular cartilage. A reduction in elastic and viscous properties of synovial fluid occurs. The molecular weight and concentration of the naturally occurring hyaluronic acid decreases. This decreases lubrication and is the main cause for pain production [16,17]. In osteoarthritis, hyaluronic acid binds to CD4 receptors of chondrocytes supporting the role of sodium hyaluronic acid in cartilage [18]. The higher molecular weight of sodium hyaluronic acid may make it more efficacious than hyaluronic acid because of its longer period of residence in joint space due to slower resorption and enhanced viscoelastic property [16,19].

Altman RD et al. conducted a study involving three groups, Group 1 (Inj. Sodium Hyaluronic acid, n=62), Group 2 (Control, I/A saline, n =65), Group 3 (NSAID naproxen orally, n=63). At 26 weeks, slight pain or pain free, 47.6% in Group 1 vs 33.1% in control group (p=0.039) vs 36.9% in Naproxen group (p=0.22). So, pain relief was comparatively better in sodium hyaluronic acid group [20]. Wobig M et al. conducted a randomized study involving two groups, Group 1 (n=57) Hylon 2ml intra articular for knee osteoarthritis vs Group 2 (n=60) 2mL normal saline intra articular for knee osteoarthritis. At 12 weeks, 47% of the Group 1 was pain free vs 8% in Group 2 (p<0.001). At 26 weeks, 39% in Group 1 vs 13% in Group 2 (p<0.001) [21]. The results of our study prove the benefit of genicular

RF neurotomy of knee along with intra articular sodium hyaluronic acid for chronic osteoarthritis knee patients in whom there is not much response for conservative treatment and suboptimal response for intra articular sodium hyaluronic acid alone.

Conclusion

Combined therapy with intraarticular sodium hyaluronic acid (which triggers cartilage regeneration and provides lubrication to joints) and genicular RF neurotomy is a safe, effective and minimally invasive procedure for knee osteoarthritis, provides better pain relief and functional recovery of joints. Therefore, it has advantage over intraarticular sodium hyaluronic acid alone in providing better pain relief and for longer duration. This combined therapy is effective alternative for knee replacement surgery in elderly patients.

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Original Research Article

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A Prospective Randomised Study of the Effects of Pregabalin Oral Versus Dexmedetomidine Infusion on Intra Operative Hemodynamic Stability in Patients Undergoing Laparoscopic Cholecystectomy

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Abstract

Context: Many agents are being tried to prevent acute changes in hemodynamics taking place during surgery as a result of intubation and other invasive procedures. Over the period of time dexmedetomidine has evolved as safe and hemodynamically stable anesthetic agent over most of the other agents. *Aims:* To study efficacy of dexmedetomidine over oral pregabalin in patients undergoing laparoscopic cholecystectomy. *Settings and design:* Present study was prospective randomized controlled study carried out at Apollo hospitals, Jubilee Hills, Hyderabad. *Material and methods:* 50 eligible patients undergoing laparoscopic cholecystectomy as per study criteria were divided randomly into two groups. One group with 25 patients received dexmedetomidine (Group D) and other group with 25 patients received oral pregabalin. Both the groups were compared for mean arterial pressure and heart rate from pre-operative period till post-operative period. *Statistical analysis:* Students t test was used to find the association between two mean. p value less than 0.05 was taken as statistically significant. *Results:* Both the groups were comparable to each other in terms of baseline characteristics. Pre-operative mean arterial blood pressure and heart was also comparable between the two groups. But it was significantly lower in group D compared to group P right from induction to extubation. *Conclusion:* We hereby conclude that dexmedetomidine is superior to oral pregabalin and provides better hemodynamic stability to patients undergoing laparoscopic cholecystectomy.

Keywords: Pregabalin; Dexmedetomidine; Hemodynamic Stability; Laparoscopy; Cholecystectomy.

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Introduction

With the advent in the medical sciences, new airway devices have been seen in recent years. But in airway management, even today the gold standards are tracheal intubation and rigid laryngoscopy. Patients undergoing these invasive procedures i.e. tracheal intubation and rigid laryngoscopy are often at risk of hemodynamic instability. During instrumentation, there is stimulation of parapharyngeal and epipharyngeal areas and nerves which leads to discharge of sympathoadrenal products and this in turn leads to changes in the hemodynamic stability of the patients. The heart rate and blood pressure increases. There can also be an increase in the intraocular as well as intracranial pressure. There is increased cardiac output which leads to an increase in the mean arterial blood pressure. Some patients can even experience arrhythmias. If the patient is in

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compromised state like suffering from cardiovascular diseases then this is a challenge for the anesthetists. In such patients hemodynamic changes can lead to serious outcomes like left ventricular failure, and even cerebral hemorrhage or myocardial ischemia. These are more likely to develop in cases of patients having hypertension [1].

To overcome these side effects various agents have been tried so that the patients do not experience these hemodynamic changes. Pregabalin and dexmedetomidine are tried and few studies compared their effects. Dexmedetomidine exerts its effects as it is an α_2-adrenoreceptor agonist. Its effects are exerted by peripheral as well as central mechanisms. At low doses, it causes the reduction in the norepinephrine release and inhibits the neurotransmission in the sympathetic nerves [2]. Thus on an average overall it leads to the decrease in the circulating catecholamines and causes decrease in the blood pressure and also decrease in the heart rate [3].

As mentioned above, during the procedure of intubation, in patients with coronary artery disease, there might be occurrence of myocardial ischemia. Such patients tend to develop myocardial infarction after surgery. Dexmedetomidine is well known to reduce such adverse events. Studies have been carried out to study the effectiveness of dexmedetomidine in patients undergoing cardiac surgery. They found that in patients who were given dexmedetomidine the outcome was better in terms of complications and mortality [4].

Dexmedetomidine when given with other general anesthetic agents improves their action and also reduce the dose required. It provides stable hemodynamics for the patients [5]. Pregabalin is also time tested and has anxiolytic, anticonvulsant and analgesic properties [6]. Pregabalin has been found to be very effective to minimize the requirement of analgesics after surgery for the patients [7]. The pressor response caused by laryngoscopy or caused by endotracheal intubation is attenuated by oral pregabalin [8].

Hence present study was carried out to study of the effects of pregabalin oral versus dexmedetomidine infusion on intra operative hemodynamic stability in patients undergoing laparoscopic cholecystectomy.

Methods

The present study was undertaken at Apollo Hospitals, Jubilee Hills, Hyderabad during the period of 2012- 2013.

Study Design

A prospective randomized double blind clinical study was carried out on 50 cases that were randomized into two groups; 25 cases for Pregabalin in one group and 25 cases for Dexmedetomidine in another group. Only ASA class I and II between age group of 20 to 55 years were selected for the study.

Study Location

Apollo hospitals, Jubilee Hills, Hyderabad.

Study Period

One year period from 18/08/2012 to 18/08/2013.

Study Inclusion Criteria

1. ASA I and II adult patients.
2. Age between 20 to 55 years.
3. With no systemic disorders.
4. Patients undergoing laparoscopic cholecystectomy.

Study Exclusion Criteria

1. Patients unwilling for the study.
2. Patients with Hypertension
3. Patients with Diabetes mellitus
4. Obese with BMI > 30.
5. Known case of coronary artery disease or cerebro vascular disease.
6. Known case of pre op hypotension.
7. Laparoscopic cholecystectomy converted to open cholecystectomy.

Sample Size

During the study period, 696 patients underwent Laparoscopic cholecystectomy. Out of which, 558 patients belonged to 22-55 yrs of age. Among 558 patients, 462 belonged to ASA- I & ASA –II. 310 patients did not give consent for the study. So finally 152 patients were considered initially but in that 152, 43 members were excluded as they were hypertensive, 26 members were excluded due to diabetes, 21 members due to obesity and 12 cases were converted to open cholecystectomy. So finally the sample size became 50 after meeting the inclusion and exclusion criteria.

Study Procedure

First the fifty patients were screened for Laparoscopic cholecystectomy, and then they were checked to meet the criteria. Informed consent was taken, then assigned them in to study groups Pregabalin (P) and Dexmedetomidine (D) by randomization by taking chits from a box of 25 (P) and 25 (D).

Study proforma used to fill patient demographic details, and enter tabular data of monitoring of hemodynamic parameters.

Equipment Used

Infusion pump

Infusion set.

Monitors used Philips multi Parameter

1. NIBP (non invasive blood pressure).
2. Pulse oximeter (for heart rate and SpO_2 measurement).
3. $EtCO_2$ (side stream).
4. ECG.
5. Urine output.

Anesthetic machine, resuscitation equipment and drugs were checked and kept ready, before undertaking the procedure.

Once the patient arrived in the operation theatre, the patient was kept on routine monitoring like NIBP, Pulse oxymetry and ECG. Recording of baseline parameters like arterial oxygen saturation, mean arterial blood pressure and heart rate was recorded.

Study Drugs

The patients in-group D received Dexmedetomidine 0.4 ug/kg bolus over 20 min followed by 0.2 ug/kg/hr while patients in group P received normal saline in an identical syringe. Patients in group P received Pregabalin 75 mg orally two hour before the surgery while patients in group D received placebo orally two hours before the surgery.

Study Procedure

Fifty (50 ml) identical syringe was used to prepare dexmedetomidine. The dose was 200 μg i.e. 2 ml. It was added in 0.9% normal saline. Normal saline 38 ml plus dexmedetomidine 2 ml total 40 ml volume gave a concentration of 5 μg ml/1. This infusion was given to the patients for 20 min at a rate of 0.4 mcg/kg/hr. they were also given fentanyl in a dose of 2 μg /kg and propofol was given in a dose of 2 mg/kg. Vecuronium was given in a dose of 0.1 mg/kg so that endotracheal intubation can be facilitated.

Carbon dioxide in a dose of 2 lit/min was used to create pneumoperitoneum. Throughout the entire procedure of laparoscopy, the intra abdominal pressure was maintained at less than 14 mmHg. The $EtCO_2$ level was maintained at 35-40 mmHg by mechanical ventilation. Nitroglycerine infusion was given to manage the intra operative hypertension. Dexmedetomidine infusion was stopped immediately after surgery. Neostigmine was given to reverse the neuromuscular block. Finally tracheal extubation was done. Adverse events were noted down during the period after surgery.

During Study Procedure and Monitoring

1. Patients under study should not receive benzodiazepines on the day of procedure.
2. Intra abdominal pressure was restricted to 14 mmHg.
3. $EtCO_2$ was maintained below 35 mmHg at any course of the procedure.
4. Isofluorane, and nitroglycerin and metoprolol were kept as rescue drugs.
5. Atropine was kept ready to counter the bradycardia, and inotropes was kept ready to counter any untoward hypotension.

Two groups (Group D and Group P) are compared in terms of relative efficacy and analgesia with regards to Age, Sex (male/female), Weight, Heart rate, Mean arterial pressure,

Statistical Analysis

All the study data entered in to an electronic data spread sheet and quantitative data is presented as mean±standard deviation. Comparison among the study groups was done by using unpaired t-test. The statistical analysis was done using unpaired t-test, Welch's corrected Graph pad instat version 3.00 for windows 7 Graph pad software, San Diego, California, USA. P value < 0.05 is considered as statistically significant. Data entry and analysis was done using Excel program.

Results

Fifty patients were divided into two groups randomly.

a. Group D (Dexmedetomidine) – 25 patients.

b. Group P (Pregabalin) – 25 patients.

The patients in-group D received Dexmedetomidine 0.4 ug/kg bolus over 20 min followed by 0.2 ug/kg/hr while patients in group P received normal saline in an identical syringe. Patients in group P received Pregabalin 75 mg orally two hour before the surgery while patients in group D received placebo orally two hours before the surgery.

Table 1 shows comparison of baseline characteristics among the two groups. Both the groups of the patients were comparable in age and weight. The parameters were normally distributed. There was no significant difference in age and weight between the both groups as the p value is 0.4 for Age and 0.6 for weight of the patients respectively.

Table 2 shows comparison of mean arterial pressure (MAP) among the two groups. The parameters were normally distributed. The MAP was not significantly different pre operatively. But was significantly lower in dexmedetomidine group from induction of anesthesia till extubation compared to pregabalin group ($p<0.05$).

Table 3 shows comparison of heart rate among the two groups. The heart rate was not significantly different pre operatively. But was significantly lower in dexmedetomidine group from induction of anesthesia till extubation compared to pregabalin group ($p < 0.05$).

Table 1: Comparison of baseline characteristics among the two groups

Baseline characteristics	Group D		Group P		P value	Interpretation
	Mean	SD	Mean	SD		
Age (years)	40.5	11.35	42.56	9.3	0.4	Not significant
Sex (M/F)	13/12		13/12			
Weight (kg)	55.24	10.16	56.34	9.5	0.6	Not significant

Table 2: Comparison of mean arterial pressure (MAP) among the two groups

MAP (mmHg)	Group D		Group P		P value	Interpretation
	Mean	SD	Mean	SD		
Pre operative	99.42	7.01	102.48	8.16	0.16	Not significant
Induction	65.17	7.48	92.68	6.56	0.0001	Significant
Intubation	89.76	5.39	99.56	5.08	0.0001	Significant
15 min	92.13	5.57	101.32	4.02	0.0001	Significant
30 min	92.17	6.84	99.6	4.19	0.0001	Significant
45 min	86.5	7.64	99.36	4.5	0.0001	Significant
60 min	87.3	7.94	95.56	4.87	0.0001	Significant
75 min	90.79	6.47	98.2	4.61	0.0001	Significant
Extubation	87.42	5.84	107.4	4.61	0.0001	Significant
1 hour post op	91.44	5.56	90.79	6.74	0.6	Not significant

Table 3: Comparison of heart rate among the two groups

MAP (mmHg)	Group D		Group P		P value	Interpretation
	Mean	SD	Mean	SD		
Pre operative	81.17	10.80	83.68	8.37	0.30	Not significant
Induction	76.54	7.96	78.24	11.51	0.0001	Significant
Intubation	76.54	7.80	96.76	8.84	0.0001	Significant
15 min	75.17	8.98	94.73	11.43	0.0001	Significant
30 min	76.54	8.70	91.72	6.41	0.0001	Significant
45 min	76.33	8.35	94.60	7.47	0.0001	Significant
60 min	76.63	6.61	92.84	8.06	0.0001	Significant
75 min	75.04	6.61	92.84	8.06	0.0001	Significant
Extubation	84.76	8.66	91.04	11.43	0.0001	Significant
1 hour post op	90.44	6.65	88.17	8.55	0.40	Not significant

Discussion

In this study, the mean age of the patients in group D was 40.5 years and in Group P it was 42.56 years. There was no significant difference in age between the two groups ($p > 0.05$). The mean weight in Group D patients was 55.24 kg and group P patients were 56.34 kg and had no significant difference ($p > 0.05$). In Group D out of 25 patients, there were 13 male and 12 female. In Group P also same number of male and females were there.

From induction to extubation, mean arterial pressures were at significantly lower side in Group D compared to Group P. Intubation response was also less in group D. At 15 minutes and 30 minutes of intra operative period, the mean arterial pressures were raised: 92.13 mmHg at 15 minutes and 92.17 mmHg at 30 minutes in Group D and 101.32 mmHg at 15 minutes and 99.6 mmHg at 30 minutes in Group P. This might be because of skin incision, laparoscopic ports insertion, carbon-dioxide pneumoperitoneum. From induction to extubation, comparison of mean arterial pressure in Group D and Group P was highly statistically significant (p value < 0.01). Pre operative changes in mean heart rate 81.17 beats/min in Group D and 83.68 beats/min in Group P showed no significant difference in these findings (p value 0.30), so these values were taken as base line values. From induction to extubation, there was significant change in mean heart rate compared between Group D and Group P (p value < 0.01), which was highly statistically significant. There was increase in 20-25 beats/min in group P compared to group D during intra operative period. One hour after post operative period, there was no significant change in mean heart rate compared between these two groups (p value 0.40), which was not statistically significant.

Peng PWH et al. [9] found in their study that perioperative administration of pregabalin 75 mg provided limited analgesic benefit in the postoperative period. The fall in blood pressure and heart rate with induction was more in Group D than Group P, might be due to the synergistic with propofol, and dexmedetomidine as both causes hypotension. Extubation was smooth and uneventful in Group D with good control of haemodynamics. But in Group P, there was increase in mean arterial pressures and heart rate during the extubation.

Guler G et al. [10] observed and compared the effects of pregabalin and dexmedetomidine among patients who underwent laparoscopic cholecystectomy on hemodynamics. They noted that the dexmedetomidine group was hemodynamically more stable than pregabalin group. These findings are similar to the findings of the present study.

Hall JE et al. [11] and Guo TZ et al. [12] underlined the mechanism of action of dexmedetomidine. They narrated that dexmedetomidine acts by activating the receptors in brain and spinal cord and this leads to the inhibition of firing by neurons. This inhibition is the reason for low blood pressure, low heart rate and analgesia exerted by dexmedetomidine.

Our study confirms that hemodynamic changes (rise in mean arterial pressure and heart rate) were attenuated by dexmedetomidine infusion during laparoscopic cholecystectomy more than in comparison to the pregabalin.

In several study reports, dexmedetomidine infusion rates ranging from 0.1 to 10-μg kg-1 hr-1 have been used. The studies with higher infusion rates had more incidences of adverse effects like hypotension and bradycardia. In this study, we used dexmedetomidine in an infusion rate of 0.2 μg kg-1hr-1 during laparoscopic cholecystectomy and did not observe significant incidence of hypotension or bradycardia. Dexmedetomidine causes sedation but it does not cause delay in the recovery time as shown in the study.

Conclusions

1. Stress response or pressor response was better attenuated with Dexmedetomidine than Pregabalin.
2. Good attenuation of heart rate response was achieved with Dexmedetomidine compared to Pregabalin.
3. Dexmedetomidine provides good intraoperative protection against hemodynamic response to surgical stimuli, laparoscopic port insertion, and carbon dioxide pneumoperitoneum.
4. Good attenuation of extubation response was more with Dexmedetomidine.
5. Dexmedetomidine provides good sedative effect in comparison with Pregabalin.

Key messages

Dexmedetomidine should be used instead of any other anesthetic drugs in patients undergoing laparoscopic cholecystectomy.

Prior publication: Nil

Support: Nil

Conflicts of interest: Nil

Permissions: All necessary permissions have been taken

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Original Research Article

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Tamsulosin Reduces Incidence of Post Operative Urinary Retention Post Spinal Anaesthesia: A Pilot Study

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Abstract

Introduction: One of the most common post-operative complaints after spinal anaesthesia is post-operative urinary retention (POUR). The prophylactic effect of tamsulosin in reducing POUR in post spinal anaesthesia has not been investigated in a large scale; therefore the present pilot study was conducted to investigate the efficacy of tamsulosin compared with placebo in preventing POUR before undertaking larger study. *Material and Methods:* After obtaining the approval from ethical justification committee of Indira Gandhi Medical College and associated hospitals, Shimla 50 patients of ASA I and ASA II aged 20-60 years of either sex posted for lower limb /lower abdominal surgery under spinal anaesthesia were included in the study. Patients were randomised into two groups of single dose of 0.4 mg Tamsulosin and placebo. *Conclusion:* It was found that single dose of Tamsulosin decreases the incidence of POUR in patients post spinal anaesthesia.

Keywords: Urinary Retention; Catheterisation; Alpha 1a Adrenergic Receptor Antagonist.

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Introduction

Subarachnoid (spinal) block is a safe and effective alternative to general anaesthesia when the surgical site is located on the lower extremities, perineum (e.g., surgery on the genitalia or anus) and lower abdominal wall (e.g., inguinal herniorrhaphy). One of the most common post-operative complaints is post-operative urinary retention (POUR) which may be loosely defined as the inability to void despite a full bladder. There is 50% chance of patients getting UTI if patients are catheterized for more than 2 dayswhich can cause significant pain, bladder discomfort, anxiety, and increased cost, resulting in prolonged hospital stays [1-4]. Tamsulosin and alfuzosin are safe selective α1-adrenergic receptor blockers characterized by their favourable side effects profiles [5,6]. The prophylactic effect of tamsulosin in reducing POUR has not been investigated in a large randomized double-blind study; therefore the present pilot study was conducted to investigate the

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efficacy of tamsulosin compared with placebo in preventing POUR before undertaking larger study.

Material and Methods

After obtaining the approval from ethical justification committee of Indira Gandhi Medical College and associated hospitals, Shimla 50 patients of ASA I and ASA II aged 20-60 years of either sex posted for lower limb /lower abdominal surgery under spinal anaesthesia were included in the study.

This was an observational prospective randomized double-blind placebo controlled study was taken in this department.

Group T (Tamsulosin) patients were given orally single dose of Tamsulosin tablet 0.4 mg a night before surgery.

Group C (Control) patients were also given similar shaped and coloured placebo tablet in the same schedule.

These drugs were coded and given by the investigator who was not involved in further study ensuring double blinding. After data assimilation the codes were broken and statistical analysis was done using appropriate statistical test.

Exclusion Criteria

1 Any diagnosed case of urinary tract disease or catheterized.
2 Allergy and contraindication to tamsulosin tablet.
3 Serious sulfa allergy.
4 Current use of α-blocker or initiation of one of these medication during the intervention phase of the study will result in subject withdrawal from the study.
5 Current warfarin use.

Data to be Recorded

Any patient received spinal anaesthesia with Bupivacaine heavy was enrolled.

1. Type of surgery: Abdominal or lower limb surgery were noted.
2. Dose of Intrathecal Bupivacaine-H
3. Adjuvant – if any.

All patients were closely followed for 24 hours post operatively for voiding and were graded into various voiding difficulty grades as given:

Grade 0: Spontaneous voiding without difficulty.

Grade 1: Voiding with difficulty.

Grade 2: Intermittent single evacuation of bladder.

Grade 3: Intermittent repeated evacuation of bladder.

Grade 4: Continuous catheterization.

Results

The results are given in the from Tables 3-5 after demographic data (Tables 1 & 2).

Table 1: Age-wise distribution between two groups

Age groups (yrs)	Group T %age	Group C %age	p-value
20- 29	30	12	0.109
30- 39	28	32	
40-49	18	16	
50-60	24	40	

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

Table 2: Sensory block level noted in two groups

Sensory Level	Groups		p- value
	T	C	
T4	1	1	0.161
T5	8	8	
T6	11	15	
T7	4	1	
T8	1	0	

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

Table 3: Distribution of VDG between two groups

VDG	Groups		p-value
	T	C	
G0	18	12	0.021
G1	4	4	
G2	2	2	
G3	1	3	
G4	0	4	

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

Table 4: Distribution of VDG according to age

Age	Group	G0	G1	G2	G3	G4	p-value
20-29	**T**	8	0	0	0	0	0.529
	C	3	0	0	0	0	
30-39	**T**	6	1	0	0	0	0.190
	C	6	2	0	0	0	
40-49	**T**	4	2	0	0	0	0.528
	C	3	0	1	0	0	
50-60	**T**	1	1	1	0	1	0.000**
	C	1	2	1	3	3	

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

Table 5: Voiding difficulty in relation to sensory block

Level of Sensory Block	Groups	VD SCORE					p-value
		G0	G1	G2	G3	G4	
T4	T	0	1	0	0	0	0.157
	C	0	0	0	1	0	
T5	T	4	2	1	0	1	0.173
	C	1	2	1	2	2	
T6	T	9	1	1	0	0	0.304
	C	10	2	1	1	1	
T7	T	3	1	0	0	0	0.101
	C	0	0	0	1	0	
T8	T	1	0	0	0	0	0
	C	0	0	0	0	0	

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

Discussion

Post-operative urinary retention is a well-established and commonly encountered problem across all surgical specialties with an incidence ranging from 5% to 75%, in patients undergoing spinal anaesthesia [7-9]. Factors like underlying disease, effects of anaesthetic agents, peri-operative fluid therapy, instrumentation, surgical intervention, bladder outlet problems, post-operative immobilization, postoperative pain and use of narcotics for the same, duration of surgery, gender and age [10].

Subjects of both group (T & C) enrolled in the study had experienced difficulty in voiding of different grades.In group 'T' 72%, 16%, 8%, 2% and 2% patients had voiding difficulty of grades G0, G1, G2, G3 and G4 respectively. Similarly in group 'C' 48%, 18%, 6%, 14% and 14% patients had voiding difficulty of grades G0, G1, G2, G3 and G4 respectively.

There are different criteria to define POUR ranging from clinical palpation of bladder to inability to pass urine to amount of urine evacuated or seen by ultrasound [9,11-18]. There is an urgent need to lay down the guidelines for definition, time of catheterization and treatment of pour by combined efforts of various specialities like urologists, surgeons, anaesthetist and other related branches. We chose clinical voiding difficulty grading for our study.

When we evaluated overall data between both the groups we found that there was significant difference in incidence and severity of voiding difficulties. As many as 7 patients in the non tamsulosin, i.e., control group had to be catheterised for prolonged period compared from only one in tamsulosin group. 14 patients were in grade 3 & 4 in control group c.f. only 2 patients in Tamsulosin group. Similar findings were obtained in a study by Madani et al. [19] where they studied effectiveness of tamsulosin in prevention of post-operative urinary retention. They found that POUR in patients who received tamsulosin was significantly lower than placebo, as 5.9% of the patients treated with tamsulosin and 21.1% placebo group, reported urinary retention following surgery ($p = 0.001$). In a study among 626 patients, undertaken by Ahmad et al. [20] to assess preventive effects of tamsulosin on POUR post anorectal surgeries under spinal anaesthesia, they found that use of tamsulosin (0.4 mg oral tamsulosin 6h preoperatively and 6-8 h post-operatively) led to reduction in incidence of post operative urinary retention. Similar to findings of our study, Mohammad-fallah et al. [21] also found that perioperative Tamsulosin represents effective strategy to reduce the risk of POUR in patients undergoing inguinal herniorrhaphy.Another study was undertaken by Akkoc et al. [22] where they studied prophylactic effects of alpha-blockers on post operative urinary retention in 180 patients undergoing surgery under spinal anaesthesia. They also found that incidence of urinary retention (defined in their study as painful suprapubic bulge, confirmed by 500ml of urinary evacuation post catheterization) was significantly lower in tamsulosin group, being 5%, compared from 25% in control group. They also thus suggested as in our own study that pre operative tasmsulosin reduces incidence of POUR and also need for urinary catheterization after surgeries under spinal anaesthesia.

In different studies [16,23,24] it was demonstrated that post operative urinary retention increases with age and the risk increases by 2.4 to 2.6 time in patients over 50 years of age is due to progressive neuronal degeneration leading to bladder dysfunction and problem of benign prostatic hypertrophy.

This is similar to finding in our study where we found that incidence of grade 3 and grade 4 voiding problems, that is need for frequent evacuations and/ or persistant catheterization was most prevalent in patients having age more than 50 years, being 28%in control group, where as it was negligible in younger patients, compared to only one in tamsulosix group (above 50 years).

In our study when we compared the effects of tamsulosin in either sex in both group, it was found that the incidence of grade 3 and grade 4 difficulties in voiding was seen mostly in male patients, seen in 13 out of 41 male patients (31%) whereas only one female patient had similar grade complaint out of 9 female patients in control group (11%); findings were similar to previous studies [16,25].

Out of different co-morbidities diabetes mellitus, due to its neuropathic effect may have some significance in POUR [26], but we found no significant difference in relation to diabetes mellitus in small group of 5 patients having the disease.

Detrusormuscle is completely relaxed after 2-5 minutes of spinal anaesthesia and its recovery depends on the duration of sensory block above the S2 and S3 sacral segments. Sensory block is regressed to S3 level after 7-8 hours post spinal anaesthesia. After the regression of sensory block to S3 level it further takes approximately 15 minutes for detrusor muscles functions to start, it may take 1-3 hours post sensory regression for normal function of detrusor to start [27]. In our study there was no significant variation in post operative urinary retention in relation to height of sensory block level like in other studies [28]. Fentanyl was the commonest adjuvant used in our study and we found that there was aggravation of POUR due to it, a finding corroborated by other studies [29,30].

Conclusion

Thus we conclude that short tamsulosin therapy during peri-operative 0.4 mg oral tab 10-12 hours preoperatively in our pilot study. However, we recommend that this study be carried out more extensively on larger samples on different populations to arrive at a final conclusion regarding the validity of tamsulosin drug usage.

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Original Research Article

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A Comparative Study of Dexmedetomidine verses Clonidine as Adjuvant with Hyperbaric Bupivacaine under Spinal Anesthesia for Gynecological Surgeries

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Abstract

Background: Newer α_2 agonist agents have created a new chapter in faster and prolongation of neuraxial block and good postoperative analgesia**.** Intrathecal Dexmedetomidine studied in comparison with clonidine along with bupivacaine given intrathecaly for gynaecological surgeries. *Materials & Method*: patients belonging to the age group of 30-60 years posted for gynecological surgeries were taken for study. Patients were randomized into two groups, group D (30) received 15mg hyperbaric bubivacaine with 15 mcg Dexmedetomidine and group C received 15mg hyperbaric bubivacaine with 60mcg clonidine intrathecal. The quality of anaesthesia is evaluated by the onset of sensory and motor block, maximum height of sensory block, segmental regression of sensory block and total duration of motor block. Rescue analgesia required during the postoperative period was recorded. *Result:* Prolonged duration of sensory and motor block was feature of patients received dexmedetomidine. These patients are also hemodynamically stable with lack of sedation. Which is statistically significant ($p < .001$). The rescue analgesia time was 587 minutes in dexmedetomidine when compares to clonidine 408 minutes. *Conclusion:* Intrathecal dexmedetomidine causes good quality of anesthesia in the intraoperative period with prolonged postoperative analgesia with less requirement of rescue analgesia when compare to intrathecal clonidine.

Keywords: Dexmedetomidine; Clonidine; Motor Block; Hyperbaric; Bubivacaine.

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Introduction

Various adjuvant are used with local anaesthetics for spinal anaesthesia to have good quality of anaesthesia and less demand for analgesia in post operative period [1].

Dexmedetomidine is an α_2-adrenoreceptor agonist and approved as an intravenous sedative drug. Intrathecal Dexmedetomidine inhibits the release of substance p from spinal cord .

Clonidine Alpha -2 adrenergic agonists produce clinical effects by binding to alpha -2 receptors. Alpha -2 afferent terminals are situated all over the central nervosa system.

In this background the Present study undertaken to evaluate the effect of Dexmedetomidine and Clonidine with bupivacaine under spinal anaesthesia in gynaecological surgeries.

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Materials and Method

The prospective randomized study was conducted on patients undergoing gynaecological surgeries under subarachnoid block in vani villas hospital and Bowring and lady Curzon hospital. Study period of march 2015 to august 2016. Institutional ethical committee approval taken .

All female patients between the age group of 30 to 60 years without any co morbid diseases with ASA I-II included in the study. Patients taking any chronic medication, morbid obesity, post spinal instrumentation and bleeding disorder were excluded from the study.

The patients were allocated randomly into two groups of 30 patients each by using the computer randomization table (www.randomizer.org).

Group D (n = 30): Hyperbaric bupivacaine 15 mg with 15mcg (micro-grames) of Dexmedtomidine.

Group C(n = 30): Hyperbaric bupivacaine 15 mg with 60mcg of Clonidine. Both volumes were made to 3.5 ml with normal saline in both the groups.

All patients were kept overnight fasting (8-10 hours) previous day of surgery. Anxiolytic medication and Tab Rantac 150 mg was given pervious night of surgery. Inj. Rantac 50 mg intravenously was given before surgery.

In preoperative room for all the patients, intravenous line taken and patients were per loaded with 10-15 ml/per body wt of ringer lactate in 20-30 minutes. Multimonitor like ECG, pulsoxymeter non invasive blood pressure were connected and baseline values taken before spinal anaesthesia.

The spinal anaesthesia performed in L3-L4 space in the lateral position in all patients with 25 or 26 spinal needle under aseptic percussion. The spinal given time as zero time of the study and all the measurements were recorded from that time.

Following Subarachnoid Block, patients were made to lie supine. Sensory testing will be assessed by loss of pinprick sensation to 23 G sterile hypodermic needles for onset and dermatome level will be tested every 1 minute (min) for the first 5 min. There after sensory block was monitored at regular interval till the end of surgery. Motor block was assed according to the Bromage scale at regular interval. Intraoperative and post operative period sedation was assed by Ramaswamy sedation scale at every 10 minutes throught the procedure.

Those patients failure achieve an adequate level and converted to General Anaesthesia were not taken into consideration. Haemodynamic variables were recorded at 1 minute (min), and next for every 3 min for 15 min and then for 5 min for the next half-hour and every 10 min thereafter up to 120 min after the block. Postoperatively Patient was monitored at regular interval of time for 24 hours.

Any haemodynamic abnormalities like fall in blood pressure or bradicaria were treated with intravenous medication like Mephentermine and atropine with the appropriative dosage.

In the intraoperative and postoperative period adverse effect like itching, gastritis, respiratory depression and cardiac changes were noted.

Statistical analysis done using SPSS 15.0 evaluation version. Chi-square test- compare nominal categorical data between study groups. Student t test has been used to find the significance of study parameters on a continuous scale between two groups. The Mann Whitney U test has been used to find the significance between two groups for parameters on non-interval scale.

Result

Study group patients were comparable to each other in terms of demographic characteristics and anthropometric data. The time of onset of sensory and motor block was much earlier in the dexmedetomidine group than clonadine group [Table 1].

Two segment regression was slower in dexmedetomidine compared to clonadine group [Table 2]. The time taken to regrace from the highest level of sensory block to S1 was 527± and 302±min in dexmedetomidine and clonadine respectively, which is statistically significant.

On set of motor block bromage gr 3 was 4.5±08 and 4.92±1.23 min in dexmedetomidine and clonadine respectively [Figure 1,2] . Regression of bromage gr 3 prolonged in dexmedetomidine with 478±15 min when compares to clonadine i e 255±18 min [Table 2].

The mean values of mean arterial pressure and heart rate were comparable between the two groups throughout the intra-operative and post-operative period.

In both the groups sedation score was not more than grade 3 according to Ramaswamy scale. Post operative pain scores were very low in the dexmedetomidine group (587±58 min) compare to clonadine group(408±15 min) [Figure 2]. The rescue

analgesia requirement was minimum in group D compare to group C in 24 hours of post operative period.This is statistically significant.

In the intraoperative period regarding heamodynamicaly minimal side effects are absorbed in group C compared to group D. There was no incidence of nausea, vomiting and respiratory depression in both groups.

Table 1: Demographic profile

Demography	Group D	Group C
Age (years)	42.21±3.8	44.35±4.08
Height (CM)	158±1.3	156±1.8
ASA 1:2	21:9	22:8
Weight(KG)	65.13±13.4	64.42±9.6
Duration of Surgery (min)	180±45	170±40

Table 2: Summary of results

Parameters	Group D	Group C	P value
ONSET OF SENSORY BLOCK(min)	4.05±74	4.71±08	0.001
2 SEGMENT REGRESSION (min)	200.60±30.90	103.00±28.00	0.001
TIME OF SENSORY REGRESSION TO S1 (min)	527±19	302±9	.0001
ONSET OF MOTOR BLOCK MODIFIED BROMAGE 3(min)	4.5±0.8	4.92±1.23	0.001
TIME OF RESCUE ANALGESIA(min)	587±58	408±15	.0001
REGRESSION TO BROMAGE 0(min)	478±15	255±18	<.0001

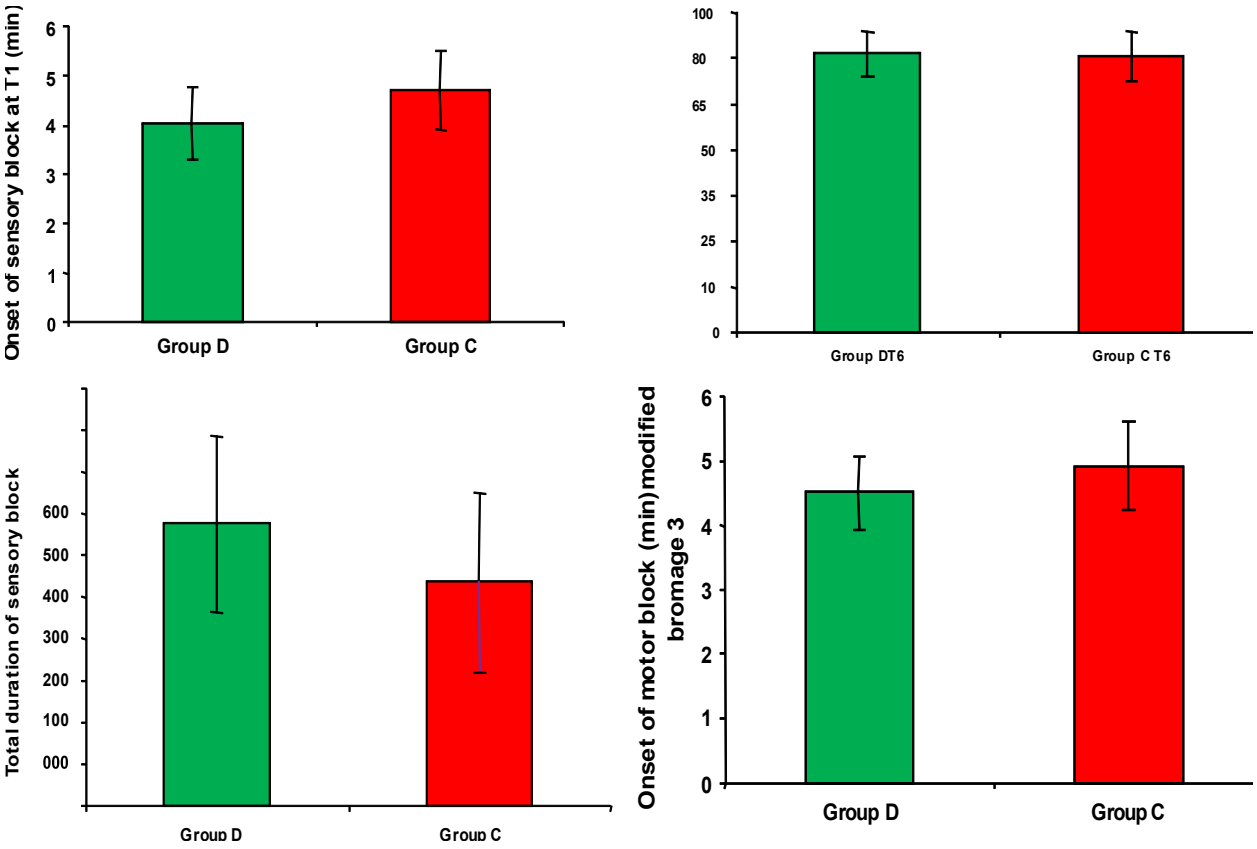

Fig. 1:

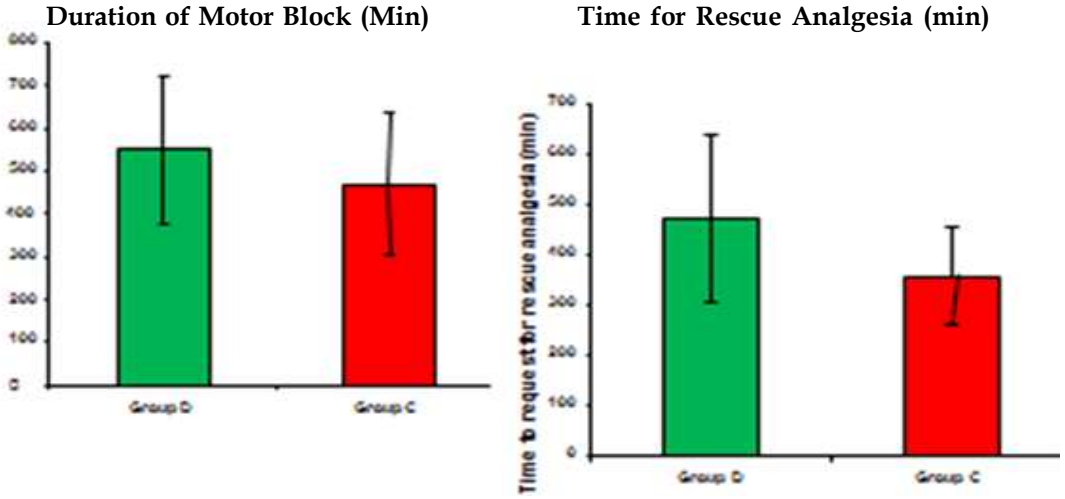

Fig. 2:

Discussion

Spinal anesthesia is the most common method of technique in gynaecological surgeries. Spinal anesthesia with hyperbaric bupivacaine provide good quality of anaeshesia, but lack of post operative analgesia. Due to above mentioned reason various adjuvant are added to hyperbaric bupivacaine for spinal anesthesia to have post operative analgesia. The common adjuvant used in spinal anesthesia is Dexmedetomidine, clonidine, tramadol, fentanyl and magnesium.

Dexmedetomidine is an α_2-adrenoreceptor agonist with S-enantiomer of medetomidine with a higher specificity for α2-adrenoreceptor (α2: α1, 1620: 1) compared to clonidine (α2: α1, 220: 1) . Alpha-2 receptors are present all our the CNS system and alpha-2 afferent terminals present in spinal cord nuclei, plays important role in analgesia. This explains that analgesic action Dexmedetomidine when it's given through neuro axial route.

Literature reveled when Dexmedetomidine used in dose of 3mcg to 15mcg along with bupivacaine for spinal anesthesia conferred good quality of anesthesia in terms of onset of the block and longer duration block with stable heamodynamics with less sedation.

Clonidinehydrochloride, animidazoline derivative was originally developed as a nasal decongestant and a vasoconstrictor. Clonidine produces clinical effects by binding to alpha-2 adrenergic agonist receptors. Clonidine analgesic effects are more pronounced after Neuro axial administration.

Shah. et al. and Gurduth et al. used 60 mcg of clonodine along with bupavcaine for SAB in gynecological cases. In the present study also we used 60 mcg of clonodine for SAB group C, while group D received 15mcg of Dexmedetomidine [2].

The onset time of sensory block is almost similar in both group D (4.05±0.8min) and group C (4.09± 1.23min). The similar study conducted by Maharani et al. also documents 4.10±1.06 min of onset time for sensory block with a dose of 10 mcg Dexmedetomidine [3]. Sethie et al. also reports that sensory block onset time was delayed with 60 mcg of clonodine.

The group D (527min) for two segment regression and time of regression to S1 was prolonged compared to group C (302 min). This observation is similar to that of Mahima et al. who also reported 598 min with dose 15mcg of dexmedetomidine. The study conducted by Gunjan et al. two segment regression was shorter duration with clonodine which is similar to our study [4].

Diphi N. Anandni et al. observed early onset of motor block in dexmedetomidine comparison to clnodine, which is similar to our study. The study conducted by Hala et al. also noted that intra spinal dexmedetomidine causes early onset of motor block.

In present study 15mcg intra spinal dexmedetomidine increases the duration of motor block in group Die 492min. The study, conducted with dexmedetomidine 10 mcg intrathecaly by Parake et al. noted 341 min motor block. The present study motor block was prolonged due to higher doses of dexmedetomidine. The motor block was shorter duration of 255 min in group C. Shorter duration of motor block with clonodine was also a feature noted by Munraju et al.[5].

In the present study, mean arterial pressure and heart rate are comparable in both the groups. But

seven Patients in (23%)dexmedetomidine and five patients in (15%) group clnodine had bradicardia and were treated with atropine .Three patients on (10%) dexmedetomidine and two patients on (6%) clnodine were severely hypotensive were requiring 3 to 6 mg of mephentriomen I V in divided doses.

This decreases heart rate and blood pressure. Baroreceptor reflex and heart rate response to presser agent is well preserved with the use of dexmedetomidine, Thus hypotension and bradycardia are easily treatable conferring hemodynamic stability.

This observation is similar to the study conducted by Anandandm et al and Yektas et al. [6]. Hence, we also agree with Shaguftanaaz et al that one has to be vigilant since a good number of patients had a fall in heart rate and blood pressure while using 15 mcg doses of dexmedetomidine.

In the present study sedation scores are used as per the ramaswomy sedation score was grade 3 in both groups. Hala et al. and Mehmooda et al. reported sedation score of 3 and 2 with 15mcg and 10 mcg of dexmedetomidine respectively which is similar to our study. But Kothari et al. observed that most of the patients were in grade 2 on sedation scale with dose of 50mcg of clonodine [7].

The post operative analgesia was 587± 58 mins in group D. Which is statistically significant (p= <0.001) . More prolonged analgesia provided by the 15 ug of dexmedetomidine was not only covering the intraoperative period, but also covered the postoperative period with less demand for the rescue analgesia in first 24 hours. Rescue analgesia needed in Abdula hamid et al. (5mcg) and Ranjani guptha et al. (5mcg) study was after 381 and 433 min respectively, almost similar to our study [8,9].

Rescue analgesia was needed after 362.84 min as reported by Muniraj et al. with 50mcg of clonodine [5]. We observe 408mins of rescue analgesia with 60mcg of clonodine and is statistically significant. Intrathecal dexmeditomidine produces its analgesic effect by blocking the release of adrenaline from afferent nerve terminals in spinal cord Dexmeditomidine is 8 times more potent than clonodine.

The minimal side effects like nausea, vomiting and shivering observed in group D due to antinociception action of dexmedetomidine in the spinal cord.

Shagufta naaz et al. noted that nausea and vomiting less with intrathecal dexmeditomidine due to higher grade of sedation. Bajwa et al. concluded that intrathecal dexmeditomidine also has an anti-shivering property [10].

Conclusion

Dexmedetomidine can be an alternative to clonidine when administered with bupevicane as adjuvant for spinal anesthesia provides faster onset and longer duration of sensory and motor block with prolonged postoperative analgesia with comfortable sedation.

Prior publication: NIL

Support: NIL

Conflicts of interest: NIL

Reference

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Original Research Article

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Evaluation of I-Gel and LMA-C Clinical Presentation in Anaesthetized Patients

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Abstract

Introduction: I-gel and LMA-C are most commonly used supraglottic air way devices to secure the airway during general anaesthesia our main objectives were to compare the ease of insertion, duration of insertion and number of attempts of insertion between I-gel group and LMA-C group. *Methodology:* Prospective randomized study conducted in SVMCH & RC Puducherry, during the period Oct 2015 to Mar 2017. Total patients 120 were divided into two groups LMA-C, *n* = 60 and I-gel, *n* = 60 by randomized method. SPSS 23 Version software was applied for *t* test as mean±SD for continuous variables and chi-square test used for categorical variables. *Results:* I-gel was more easily inserted then LMA-C group (90%, 85%) respectively and was statistically non-significant (p>0.05). Duration of insertion was shorter in I-gel group compared to LMA-C group (9.7±1.02 Vs 17.2±1.99) respectively and statistically highly significant (p<0.001). First attempt success rate was (95% Vs 91.6%) between I-gel and LMA-C group. Number of insertion attempts between these groups were statistically non significant (p>0.05). *Conclusions:* Duration of insertion of highly shorter in I-gel group. Ease of insertion and first attempt success rate makes and I-gel a suitable alternative for elective surgeries under general anaesthesia.

Keywords: LMA-C (Laryngeal Mask airway-Classic); I-gel; SAD (Supraglottic Airway Device); Ease of Insertion; Duration of Insertion.

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Introduction

Airway management is the major responsibility of the anaesthesiologists to provide adequate ventilation to the patients and reduce the airway related problems which are the most common cause of anaesthesia related morbidity and mortality [1]. Tracheal intubation is the gold standard method for maintaining a patent airway during general anaesthesia [2]. Laryngoscope and intubation produce hemodynamically detrimental reflex sympathetic stimulation and are associated with increase in level of plasma catecholamine's, hypertension, tachycardia, myocardial ischemia, ventricular arrhythmias and intracranial hypertension [3]. Many types of supra-glottic devices are available for maintaining patent airway during emergency and elective surgical procedures. LMA with an inflatable cuff has been most commonly used since many years. The I-gel is an unique supraglottic device made up of medical grade thermoplastic elastomer that has a non-inflatable cuff that fits snugly in to the peri-laryngeal structures. It has provision to

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introduce a gastric catheter. Its safer use has been confirmed by various studies [4,5]. Many comparative studies between I-gel and LMA- classic demonstrate that I-gel establish a good seal, more easily placed and it lead to less trauma. In the present study we compare I-gel with LMA-C during general anaesthesia with regard to attempts of insertion, ease of insertion, and time required for insertion.

Materials and Methods

This study was conducted between October 2015 to March 2017 at Sri Venkateshwaraa Medical College and Hospital & Research Centre, Puducherry. The study protocol was approved by the Institutional Ethics Committee (IEC) clearance and informed consent from all patients were obtained. All statistical analysis were performed by using SPSS version 23.0 software package as it is licensed with the SVMCH & RC. *t*- Test was used to compare and computed as mean±SD for continuous variables and chi-square test used for categorical variables. We used 95% CI and the results were accepted as statistically significant if $p< 0.05$ are shown in Table 1. A total of 120 patients aged between 18-60 years-both sex, scheduled for various elective surgical procedures lasting for 60 to 90 minutes under general anaesthesia belonging to ASA class I and II were included in the study. Patients with history of hypersensitivity for one or more medications, latex allergy, patients having abnormality of the neck, upper respiratory tract, history of obstructive sleep apnea and patients who underwent thoracic, abdominal and neurosurgical procedures were excluded from the study.

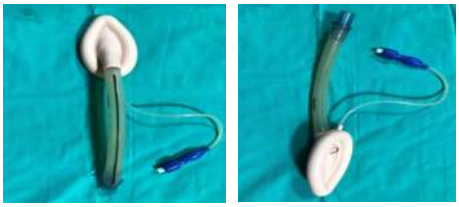
These patients were randomized into two groups (group LMA-C, n = 60 & group I-gel, n = 60) by a computer-generated random number table. Pre-operative assessment was done to all the patients included in the study one day before the surgery, informed written consent taken and fasting advice was given on the night before surgery. On the day of surgery patients shifted to operation theatre and intra-venous line secured and administration of lactated Ringer's solution started. Pre- medication done with inj Ondansetron 4mg IV, inj glycopyrrolate (0.01mg/kg IV), inj midazolam (0.05 mg/kg IV), inj fentanyl (2 microgram/kg IV). Patients were connected to monitor and baseline heart rate, blood pressure, SpO_2 and ECG recorded. All patients were pre-oxygenated with 100% oxygen 5 minutes, induced with inj propofol (2.5 mg/kg IV) and inj atracurium (0.5 mg/kg IV) as muscle relaxant. Jaw relaxation and loss of eyelash reflexes confirmed.

Patients head placed in sniffing position, lubricated I-gel was held along the integral bite block and introduced into the mouth and slided downwards and backwards along the hard palate gently until definitive resistance is felt. I-gel connected with breathing circuit and ventilated manually. LMA-C was inserted by classic method and the cuff was inflated with recommended volume of air according to the size of LMA (size 3 classic-LMA for patients weighing 30-50 kgs, size 4 for 50-70 kgs and size 5 for patients of 70-100 kgs). Number of attempts noted and it was considered failure if airway is not secured with maximum of three attempts, alternatively patient was intubated with adequate sized endotracheal tube and excluded from the study. Each attempt of insertion could last not more than 60 seconds in between the attempts patient maintained on IPPV with a face mask to maintain SpO_2. Insertion is considered easy if there is no resistance to insertion in pharynx in a single maneuver, insertion is considered difficult if there is resistance to insertion and more than one maneuver is required for correct placement of LMA.

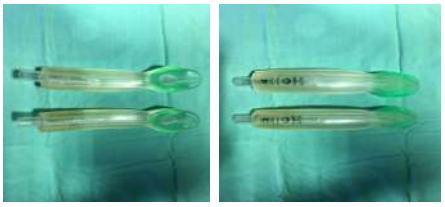
Duration of insertion is considered from removal of face mask to connection of LMA to patient end of the anaesthesia circuit. Effective placement confirmed by occurrence of square wave pattern capnography, bilateral chest moment and equal air entry on auscultation during manual ventilation and maintenance of anaesthesia is with mixture of 66% N_2O in 33% O_2 and 1% isoflurane. N_2O and isoflurane were discontinued at the end of surgery. Neuromuscular blockade was reversed with inj Neostigmine (0.05mg/kg IV) and Inj glycopyrrolate (0.01mg/kg IV). After reversal of blockade, on spontaneous eye opening I-gel or LMA-C was removed.

In Table 1 there is no significant difference in ease of insertion between LMA-C and I-gel (p=0.585) and there was highly significant difference in duration of insertion with mean value ranges 17.2±1.99 and 9.7±

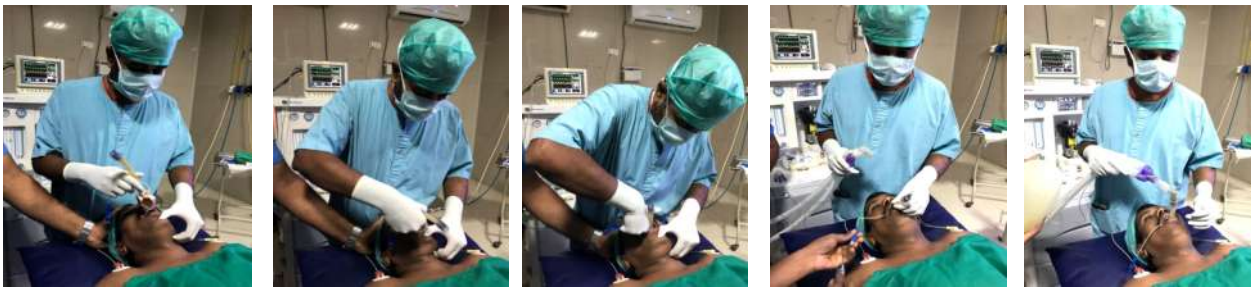
LMA-C



I-gel



Method of insertion of LMA-C



Method of insertion of I-gel

0.02 for LMA-C and I-gel groups respectively (p = < 0.0001). In Table 2 the current study, the duration of insertion of I-gel (9.7±1.02) was shorter compared to LMA-C (17.2±1.99) which was statistically highly significant between the two groups (p< 0.0001). In table 3 there is no significant difference in no of attempts of insertion of devices between LMA-C and I-gel groups (p=0.464). In table 4 in this study, insertion of I-gel was successful in first attempt in 57 (95%) patients as compared to 55 (92%) first time insertion with LMA-C. Airway manipulation like jaw thrust was required during second attempt insertion in 3 patient of I-gel insertion and 5 patients with LMA-C insertions.The attempt of insertion was not statistically significant between the two groups (p>0.05).

Table 1: Comparison of ease and duration of insertion between groups

EI	LMA-C	IGEL	P value
Easy	51	54	0.585
Satisfactory	6	3	
Difficult	3	3	
Duration of insertion	17.2 ± 1.99	9.7 ± 1.02	< 0.0001

Table 2: Showing the duration of insertion of SAD in various studies

S. No	Year of study & author	SAD	Duration of insertion (Seconds)	p-value
1	2009 Francksen H et al	I-gel LMA-C	5±(10-60) 17(11-180)	0.45.(NS)
2	2010 Helmy M et al	I-gel LMA-C	15.62±4.9 26.2±17.7	0.0023(S)
3	2010 Ansar Ali et al	I-gel LMA-C	10.76±5.53 10.90±5.17	0.92(NS)
4	2012 Jeevan Singh et al	I-gel LMA-C	19.3 23.5	<0.05 (S)

S. No	Year of study & author	SAD	Duration of insertion (Seconds)	p-value
5	2013 Haq Dad Durrani et al	I-gel LMA-C	9.12±2413 9.86±3.147	0.893(NS)
6	2014 Priyamvada Gupta et al	I-gel LMA-C	29.32±6.88 36.72±7.33	<0.05 (S)
7	2014 Seyed Mohammed et al	I-gel LMA-C	14.93±4.6 27.1±16.7	<0.05 (S)
8	2015 Shwetha K.M. et al	I-gel LMA-C	17.12±3.42 25.62±5.28	<0.001 (S)
9	2015 G.Venkateshwarlu et al	I-gel LMA-C	40.15±9.65 46.09±8.67	0.0266
10	2016 G . Srinivas Rao et al	I-gel LMA-C	17.26±2.93 24.9±4.82	0.0001 (S)
11	2016 Smitha R Engineer et al	I-gel LMA-C	53.1±5.966 57.76±9.817	0.005
12	Present Study	I-gel LMA-C	9.7±1.02 17.2±1.99	< 0.0001 (S)

Table 3: Comparison of number of insertion attempt between Groups

IA	LMA-C	I-gel	Total	P value
First Attempt	55	57	112	0.464
Second Attempt	5	3	8	
Total	60	60	120	

Table 4: Showing number of attempts of insertion in various studies

S. No	Year of study & author	SAD	1st Attempt Insertion %	2nd Attempt Insertion %	3rd Attempt Insertion %	p-value
1	2009 Franksen H et al	I-gel LMA-C	90 85	10 12	10 2	0.001(s)
2	2009 Janakiraman C et al	I-gel LMA-C	54 86	30 6	16 8	0.001(s)
3	2010 Helmy M et al	I-gel LMA-C	96 95	7.5 15	2.5 5	<.005(S)
4	2010 Ansar Ali et al	I-gel LMA-C	94 60	6 10		NS
5	2012 Jeevan Singh et al	I-gel LMA-C	91.7 79.2	8.3 20.8		S
6	2013 Haq Dad Durrani et al	I-gel LMA-C	92 92	4 4	4 4	1(NS)
7	2014 Priyam Vada et al	I-gel LMA-C	82.5 77.5	15 20	2.5 2.5	0.986 (NS)
8	2016 Smita R Engineer	I-gel LMA-C	88 90	12 10	0 0	0.004
9	PRESENT STUDY	I-gel LMA-C	95 92	5 8	0 0	0.464 (NS)

Discussion

Supraglottic airway devices have filled the gap between face mask, jaw holding, laryngoscopy and endotracheal intubation. LMA-C and I-gel are simple alternative to face mask and endotracheal intubation in uncomplicated surgical procedures. The results of this study with regard to ease of insertion, mean insertion time and attempts of

insertion with first attempt success rate are in compliance with previous studies. Ease of insertion was comparable in I-gel group and LMA-C group and it was statistically non significant in our study (p=0.585). This was similar to study conducted by Haq Dad Durrani et al. [16] (p= 0.844) and can also be correlated with previous studies. On other hand in a study conducted by Jeevan singh et al [7]. they encountered more ease of insertion with I-gel 22/ 24 than that with LMA-C group (p=0.023) which is statistically significant. The time for insertion was considered according to the study conducted by Seyed Mohammed et al. [9] from picking up the device to confirmation of effective ventilation by bilateral chest movement, square wave pattern capnography, normal range end tidal CO_2 and stable SpO_2 (>95%).

In our study, the duration of insertion was lower with mean insertion time of (9.7±1.02) seconds in I-gel group and 17.2±1.99 seconds in LMA-C group respectively and was highly significant (p<0.0001). This was contradicting with the study conducted by Haq Dad Durrani et al. [16] (p=0.089). Helmy mentioned that mean insertion time was 15.6±24.9 seconds in I-gel group and 26.2±17.7 seconds in LMA-C group (p=0.0023). The I-gel SAD is made of thermoplastic elastomer and has no cuff to be inflated after its insertion, hence requires less time for successful insertion as compared to LMA-C, which has a cuff to be inflated after its insertion.

Consistent with our results, Helmy AM et al. [6] Jeevan Singh et al. [7] Priyamvada Gupta et al. [8] Seyed Mohammed et al. [9] Shwetha K.M et al. [10] Venkateshwarlu G et al. [11] Dilek Erdogan Ari et al. [12] Srinivas Rao G et al. [13] Smita R Engineer et al. [14] also had significant difference in the insertion times as shown in Table 2.

In our study number of attempts of insertion with first attempt success rate was 95% Vs 91.6% between I-gel group and LMA-C group but statistically non-significant (p>0.05). Very similar results were found in studies conducted by Ansar Ali et al. [15] Haq Dad Durrani et al. [16] as shown in table 4. However, Janakiraman et al. [5] had first attempt success rate significantly higher in LMA group 86% than I-gel group 54%. They replaced I-gel in second attempt with appropriate size and rate went up to LMA-C 92% and I-gel 84%.

Conclusion

We conclude that LMA-C and I-gel were comparable in terms of ease of insertion, duration of insertion and number of attempts of insertion. Shorter duration of insertion was highly significant in I-gel group and makes it a suitable alternative to secure a quicker airway than LMA-C in elective surgical procedures under general anaesthesia. I-gel was easier to insert and higher first attempt success rate reduces airway trauma and potential complications during general anaesthesia.

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Original Research Article

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A Prospective Randomized Study of Percutaneous Tracheostomy versus Surgical Tracheostomy

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Abstract

Aim: Aim of study was to compare Percutaneous Tracheostomy (PT) and Surgical Tracheostomy (ST) both for complications, duration of procedure ,cost and easy of doing it. Objective of our study was to find out time taken to heal tracheal stoma. *Method:* 100 of Tracheostomy patients were randomly divided in to two groups (n =50 for both groups) with confidence level of 95%. Two consultants allocated 25 patients of each group for to do procedure. Procedure-related variables (length of skin incision, duration, difficulty), early complications like 'bleeding & trauma, pneumothorax, pneumomediastinum, subcutaneous emphysema, loss of airway', vitals, economic aspects were evaluated by the operating consultant. Procedure related (up to14 days) complications like local infection, haematoma & bleeding, trachea-innominate fistula, tracheo-esophageal fistula, were evaluated daily by consultant blinded to the technique used. Air leak closure/ healing and long-term complications like cosmetic deformity, tracheal stenosis, tracheomalacia, delayed stomal healing were evaluated 3 months after decannulation by another consultant blinded to the surgical technique. *Results:* PT had more incidence of minor perioperative complications and ST had more long-term complications, statistical significance between two groups was absent. Time taken to perform PT and tissue trauma with PT were lesser than ST Group. Vitals were better maintained with PT Group. Air leak closure after decannulation was earlier in PT group and aesthetically, scar was smaller with PT group. *Conclusion*: PT was preferrable because of lesser duration of procedure, smaller incision with comparable complication rate and faster stomal healing.

Keywords: Complications; Cost; Healing; Percutaneous Tracheostomy; Randomized Trial; Surgical Tracheostomy.

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Introduction

Tracheostomy is one of the most frequent surgical procedures carried out in ICU [1]. Seldinger-based insertion method of PT was developed by Ciaglia and Colleagues [2] in 1985 Trachea is nearly cylindrical & flattened posteriorly, D shaped in cross section with incomplete cartilaginous rings anteriorly and laterally, a straight membranous wall posteriorly. Trachea measures about 11 cm in length and is chondromembranous. It starts from the inferior part of the larynx (cricoid cartilage) in the neck, opposite the C6 vertebrae up to intervertebral disk between T4-5 vertebrae in the thorax, where it divides into the right and left bronchi [3].

In early 20th century Chevalier Jackson introduced clear guidelines which made tracheotomy safer and

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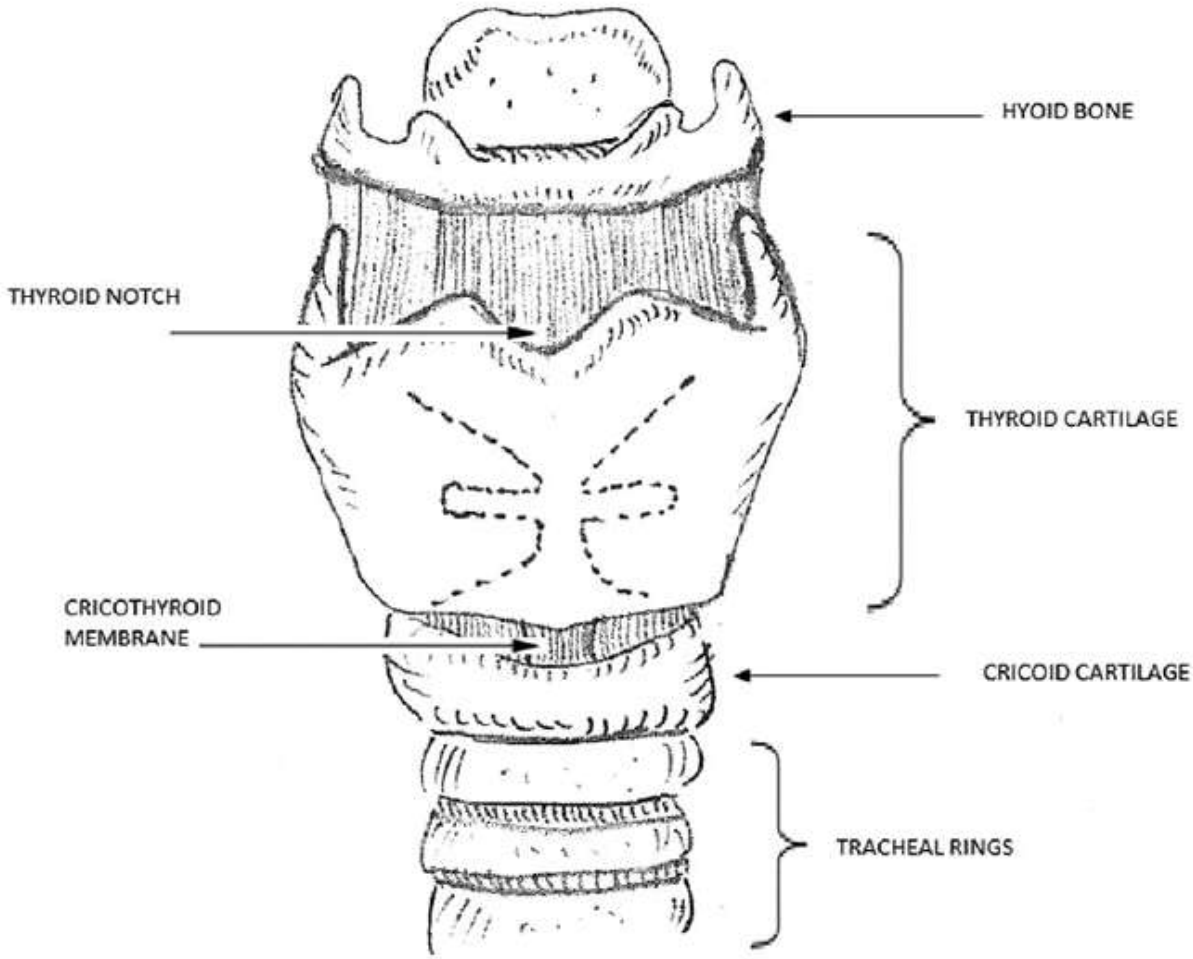


Photograph 1:

viable procedure. With advances in technology and increasing interest in minimally invasive procedures variations of the open tracheostomy have evolved over the last half a century [4].

Though Tracheostomy is safer, it is not without risk. Morbidity for Tracheostomy ranges from 4% to 10%, mortality is less than 1% [5]. Better material and high volume-low pressure cuff in Tracheostomy Tube (TT) has resulted in lower morbidity. PT was invented to reduce morbidity and mortality .

There are two popular techniques of PT-One with series of dilators and second with Guidewire Dilating Forceps which we choosed.

PT can be done blindly or by Bronchoscope which is technically difficult and causes interruption in ventilation. But reduced trauma to trachea and oesophagus by using Bronchoscope out-weights potential risks. Aim of our study is to find out which of PT and ST is better than other.

Methods

Study was carried out in ICU and SICU with written informed consent with approval of hospital Ethical Committee.

Patient Selection

Patients who needed mechanical ventilation for cardiac, respiratory, neurological dysfunction for prolonged period, usually after seven to ten days of intubation on elective basis and who were not going to be extubated in another seven days atleast were included in study. Patients who needed mechanical ventilation due to acute respiratory distress and needed airway access in urgency but intubation was not feasible eg. supraglottic or glottic neoplasm, laryngeal trauma or stenosis, midface fractures were included in study.

Patients whose relatives were unwilling to give consent were excluded from study. Patients having local infection, history of irradiation of neck or short neck, obesity, distortion of anatomy of neck by hematoma, tumour, previous neck surgery, high innominate artery, severe coagulopathy, hemodynamic instability, poor prognosis were also excluded from study. Children below 12 years of age were also excluded from study. Situation where airway access was emergency & endotracheal intubation was feasible and of choice, was also barred from study.

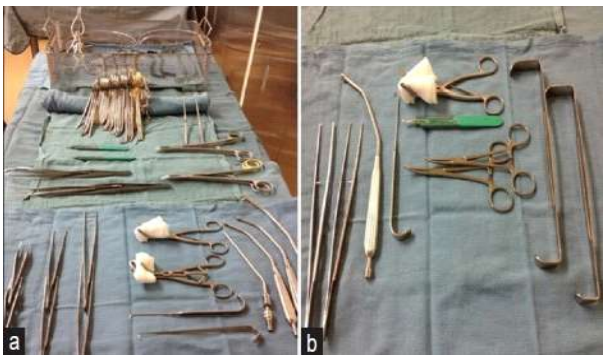
For elective procedure , patients were kept NBM as per protocol (no Ryle's Tube feeding). Parameters to be monitored were ECG, SpO_2, Blood Pressure, Capnography during the procedure.

In both ST and PT, patient's shoulders elevated by shoulder rolls with head extension thus elevating the larynx and exposing more of the upper trachea. Skin from chin to below clavicle was made sterile by antiseptic solution and drapes were placed [6]. Antibiotic cover usually given before 30 to 60 minutes prior to planned procedure and given immediately in emergency situation .

ST usually done in Operation Theatre under General Anaesthesia and can also be done in ICU under Local Anaesthesia (lidocaine) with Sedation. After infiltrating vasoconstrictor (adrenaline 1:100000), skin over the 2nd tracheal ring identified, a vertical incision about 3 cm in length required caudally. Care was taken for to avoid cutting deeper tissue of thyroid isthmus and large neck veins. Sharp dissection was carried out to cut subcutaneous tissue and platysma muscle. Bleeding was controlled by hemostasis, ties and electrocautery. Blunt dissection parallel to the long axis of trachea was carried out up to trachea with retracting strap muscles laterally. If thyroid gland lies superior to the 3rd ring of trachea, it was retracted superiorly. Isthmus retracted cephalad and rarely divided with a tie. Once trachea was reached after dissecting pretracheal fascia, ring was lifted with tracheal hook and two circumferential sutures were placed around the third tracheal ring bi-laterally. The portion of the trachea between second and fourth tracheal ring cut with traction by laterally placed sutures, leaving behind a hole in the anterior tracheal wall. Tracheostomy Tube (TT) inserted through hole with giving counter traction to trachea with sutures. Sutures kept in place to assist re-insertion in case of accidental removal of TT. TT was secured by sutures and tapes around neck

For PT , after giving position ,vertical skin incision was made without sharp dissection beyond the skin incision. Endotracheal tube (if intubated) was withdrawn enough to place the cuff at the level of the glottis. A specially designed catheter with needle inside, attached to fluid filled syringe was inserted vertically in to trachea through incision usually between second and third tracheal ring with constantly negative pressure on syringe plunger. Position in to trachea was confirmed by air withdrawn in to syringe and by bronchoscope, both. Bronchoscope was not used in cases where primary pathology involved larynx. Needle was withdrawn keeping catheter inside the trachea. Guide wire was inserted downward in to trachea through catheter. Catheter was removed. Dilator was used to dilate the tract over the guide-wire. Dilator was removed and then sharp tipped specially designed dilating forcep was passed over the guide-wire inside trachea, it was spread to create path up to tracheal stoma. Forcep was removed keeping guide-wire in situ. A TT was placed over guide-wire through the passage created. Placement of the tube was confirmed again by visualizing the tracheo-bronchial tree by endoscope through tube. TT was secured to the skin with sutures and tape.

Data was analyzed using Graphpad quick-cals software. *P* value was reported at the 95% confidence interval and *P* value < 0.05 was considered significant.



Photograph 2:

Photograph 3:

Results

PT group had 33 males and 17 females , while ST group had 35 males and 15 females.

ST group had 49 patients who were on ventilator with ETT and 1 patient of laryngeal pathology. PT group had 48 patients who were on ventilator with ETT and 2 patients of Emergency Tracheostomy with laryngeal pathology and facial trauma.

One patient of PT group was converted in to ST and that patient had taken longer time for executing Tracheostomy.

Average length of skin incision in ST group was 3 cm, while PT group had skin incision of around 2 cm which was quite smaller.

In corporate hospitals cost of ST is anywhere between Rs 15000 to 20000 and higher ,while cost of PT was around 12000 Rs. Use of operation theatre, anaesthetists, man power rendered ST costlier in corporate hospitals.

PT was more easier to perform than ST, as per our experience. Preprocedural preparation was less with PT. Less man power needed in PT group.

Both the group had maintained vitals, but PT group had less incidence of fluctuations. Eight patients of ST group had rise in pulse and blood pressure above 20% of baseline, while two patients of PT group had rise in pulse and blood pressure above 20% of baseline. One patient of PT group had desaturation while doing Bronchoscopy .

We observed bleeding in both the Group was of minor type and could be easily handled. In one patient of PT Group, patient had developed hematoma around the Tracheostomy site, which was self limiting and did not alter outcome .

Three patients of each Group had developed local cellulitis at stomal site, which responded to antibiotics. Four patients of ST Group and five patients of PT Group had developed Pneumonia over period of time, which was difficult to ascribe to the procedure as it could be due to varied etiology. In one patient of PT group, while we were advancing the needle with negative aspiration, we aspirated blood before entering in to trachea , may be due to accidentally traversing the vessel probably the artery. We abandoned the procedure and converted in to ST.

Table 1: Indication for Tracheostomy

Group	Prolonged Mechanical Ventilation	Emergency Tracheostomy
ST	49	1
PT	48	2

Table 2: Average Time Taken for Procedure (From Skin incision to insertion of TT, in minutes)

Group	Average Time
ST	21.8
PT	12.2

Table 3: Comparison of Complications

Early Complications	Group ST	Group PT	P value
Bleeding	8	7	P value 0.6531
Hematoma	0	1	
Pneumothorax	0	0	
Pneumomediastinum	0	0	
Subcutaneous - Emphysema	1	4	
Respiratory	0	1	
Infection Of Stoma	3	3	
TO Fistula	0	0	
Tracheo-innominate Fistula	0	0	
Failed attempt	0	1	
Late Complications			P value 0.1682
Tracheal Stenosis	1	0	
Tracheomalacia	0	0	
Cosmetic Deformity	2	1	
Delayed Healing	1	0	

A patient of PT group had pulled out TT due to his aggressive behaviour, which was reinserted with help of fibreoptic bronchoscope.

After decannulation and in patients who were still hospitalised, we had found air leak stopped average on 8th day in ST group, while in PT group air leak stopped on 6th day after decannulation. Wound healing was also faster in PT group.

Only eleven patients had turned up for follow up . So it was difficult for us to get accurate data of long term complications from selected patient population. Out of seven patients of ST Group who had come for follow up, one patient had tracheal stenosis causing stridor on exertion and two patients complained about unesthetic scar and one patient had delayed stomal healing. Patient of delayed stomal healing was given surgical treatment for closure of stoma . Three patients of ST group had complained about depression at stomal site after healing. Out of four patients of PT Group who had come for follow up, one patient had complained of keloid formation .

Discussion

We had chosen dilation technique using forceps in Seldinger fashion for PT ,though many reports suggested that technique with serial dilators was used more commonly [7] without any proven advantage over forcep technique .In our study , we had converted endotracheal intubation in to tracheostomy as mode of airway access on individual basis usually after seven to ten days of endotracheal intubation and mechanical ventilation. Angus DC had shown that Tracheostomy should be instituted after around 10 days of initiation of mechanical ventilation by endotracheal intubation [8].

A patient who has an upper airway obstruction with can not be intubated - can not be ventilated condition, must have an immediate artificial airway [9]. There are several case reports of successful PT in an emergency situation [10] .

When Tracheostomy performed in Obese patients, it can lead to massive bleeding and loss of airway, so We had excluded Obese patients from our study though few reports have shown safety .

Though PT found to be more safe and provided tight fit of the tract around cannula causing compression of small bleeding vessels, we had excluded patients with coagulation abnormalities from our study. Though a study by Veelo DP suggested that mild coagulation disorders (PT <20 seconds, Platelet count between 40-100.10^9 /litre, use of aspirin-clopidogrel) are no longer contraindications for the PT [11].

In our study, average time taken to perform PT was considerably lower than time taken to perform ST. A study by Farahanchi had similar observation [12].

In our study, PT group had smaller skin incision than ST group. A study by Claudin Gysin had similar results [13].

The cost was low because there were no operating room charges or anaesthetists fees [14]. The consultant's fee for tracheostomy was obviously lower with PT. The shorter operating time needed for PT was a cost advantage when done at the bedside. PT done using disposable kits under bronchoscopic guidance. In government run hospitals, PT more expensive than open surgical tracheostomy when both were done at the bedside [15]. While in corporate hospitals cost of ST is higher than the cost of PT.

Scheduling and preparation time for PT was lesser than ST. Assistant is always needed in ST group for retraction and keeping surgical field clear of blood. It was easier to perform PT than ST because lesser resources needed.

In our study, both group had almost comparable complications without any statistical significance. Vitals were maintained in both the Groups but PT Group had less fluctuations ST needed infiltration of lidocaine with vasoconstrictor, which might have resulted in rise in pulse and blood pressure. Four patients of PT group had mild subcutaneous emphysema around stomal opening, because ventilation was again initiated after confirmation of needle placement by bronchoscope.

As Tracheostomy patients are critically ill and many of them do not survive. This made it difficult to study its long term complications. One patient of ST Group had developed tracheal stenosis with more than 50% reduction in diameter by granulation tissue, he was sent to higher centre for further management. Scott K Epstein had recommended Tracheal Stenting for such cases [16] . We did not observe other long term complications of tracheostomy like tracheomalacia or tracheoinnominate artery fistula due to lack of follow up, but C A Grant had published a case report of trachea-innominate artery fistula following PT [17]. Incidence of cosmetic deformity was less and patient's acceptance in follow up was more for PT. A study by Kevin M Higgins showed that PT produced less scarring [18].

Though incidence of infection of stoma was same, PT was found to be better for cardiac surgery

patients who may develop mediastinitis with TT, initial reports suggested PT a better option for such cases [19].

There were reports of lower rates of acute complications under endoscopic guidance. However, there was no adequate data showing that endoscopic-guided tracheostomy was superior to the 'blind' one [20]. But for safety we preferred to confirm PT placement by bronchoscopy. Fibreoptic bronchoscope also proved helpful in case of accidental removal of TT. In one patient of PT group, there was accidental removal of TT on third day by aggressive patient . But it was immediately diagnosed. We immediately covered opening in the neck and started mask ventilation. SpO_2 went down to 91% from 98%. Fibreoptic bronchoscope was used to reinsert TT through immature stomal passage. Patient had mild subcutaneous emphysema for two days . As per Peggy A Seidman, maturation of stoma usually takes 5 days [21], before that reinsertion of TT is usually difficult .

One patient of ST group needed surgical closure due to persistent stoma, incidence of it varies between 4-8% as per various reports.

Conclusion

PT was done quickly with almost same early complication rate as ST with quicker healing and lesser long term complications.

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Original Research Article

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To Compare and Evaluate Hemodynamic Effect of Propofol and Etofol as Induction Agents in Elective Surgeries

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Abstract

Introduction: Various intravenous induction agents like propofol, ketamine and etomidate are available now a day to the anaesthetist but they also cause attenuation of axis leading to a decrease in heart rate and blood pressure. To achieve haemodynamic stability during induction is one of the major challenge and goal of the anaesthetist. *Aims and objectives:* To evaluate the hemodynamic effect of propofol and etofol as induction agents in elective surgeries under general anaesthesia . *Material and Methodology:* Sixty (60) ASA grade I and II patients of age group (18-60 years) were divided randomly into two study groups of thirty patients each, as follows:

Group I-Propofol 2 mg/kg was given intravenously as induction agent

Group II-Etofol (0.15mg/kg etomidate and 1mg/kg propofol) was given intravenously as induction agent.

Results: In group II (Etofol) lesser fall in haemodynamic parameters at induction and upto 60 minutes ($p>0.05$)of induction as compared to group I (Propofol). *Conclusion:* Etofol is more haemodynamically stable than propofol alone during induction.

Keywords: Propofol; Etomidate; Etofol; Haemodynamic; Induction.

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Introduction

During induction the anaesthesiologist is mainly concerned with attenuating the stress response and maintaining haemodynamic stability. The concentration of catecholamines like adrenaline and noradrenaline are increased in response to the stimulus of laryngoscopy and intubation [1]. Laryngoscopy and intubation produces the stress response which leads to haemodynamic changes especially in patients with various risk factors like hypertension and ischaemic heart disease [2]. A wide range of intravenous induction agents is now available to the anaesthetist like ketamine, thiopentone, etomidate, propofol and etofol. They are used to lower the stress response to laryngoscopy and intubation and to maintain better hemodynamic stability at the time of induction and during surgery. Inductionagentshave side effects like vasodilation, myoclonic seizures, nausea, vomiting and attenuation of Autonomic Nervous System thereby decreasing blood pressure. Each intravenous anaesthetic induction agent affects hemodynamic changes differently. Propofol a non opioid,non barbiturate is a sedative agent which has a rapid

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onset and short duration of action with adverse effects like hypotension and injection pain [3,4]. It also leads to bradycardia by increasing the production and release of nitrous oxide [5]. Etomidate is a potent ,short acting anaesthetic which causes minimal histamine release and produces stable haemodynamics.But most common side effects with this drug are pain on injection, excitatory events and myoclonus [6]. The use of etofol as an induction agent are rare and studies which compare propofol and etofol as induction agent are also very few.

Aims and Objectives

To evaluate and compare the efficacy of propofol and admixture of propofol and etomidate (etofol) as induction agent in maintaining haemodynamic stability in elective surgery under general anesthesia.

Material and Methods

This prospective randomised double blind study was conducted in the Department of Anaesthesiology at our centre in India, after approval from the Ethical Committee on 60 patients of 18 to 60 years age, of either sex, of ASA grade I and II posted for elective surgeries lasting for approximately 2 hrs under general anesthesia. Patient having cardiac disease, hypertension, respiratory disease, cereberovascular disease, Mallampati grade III-IV, epilepsy and pregnancy were not included in the study. All patients were kept fasting for 8 hours prior to surgery and an informed consent was taken from the patients. In the operation theatre standard anaesthesia monitors were attatched. An 18 G intravenous cannula was secured and I/V fluid was started. Injection Midazolam 0.025 mg/kg i/v and Injection Nalbuphine 0.1mg/kg i/v were given as premedication. Patients were randomly divided in two groups and randomization was done by computer generated random number tables. Considering 95% of confidence interval and power of the test as 80%, sample size was calculated as 30 in each group. Group I received injection Propofol 2mg/kg i/v and group II injection Etofol (0.15mg/kg etomidate and 1mg/kg propofol) i/v for induction. All study drugs were prepared by the anaesthesiologist who was blinded to the details of the study. Injection Rocuronium 1.2mg/mg i/v was given as muscle relaxant. Laryngoscopy and endotracheal intubation was done by an experienced anaesthesiologist and duration of laryngoscopy was kept to less than 10 seconds. Proper placement of ETT was confirmed by capnography and bilateral auscultation of the chest. Anaesthesia was maintained with Isoflurane 1%-1.5% and equal mixture of Oxygen-Nitrous Oxide. Injection Rocuronium was given as intermittent boluses as and when required. The various haemodynamic parameters like heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure were measured before induction, at induction (i.e 0 minute) and at 1,2,5,10,20,30 and 60 minutes after induction by an anaesthesiologist who was blinded to the study.

Statistical Analysis

Data was analysed by computer software package SSPS version 20.0 for windows. Categorial data like gender was presented as number. Age, weight, heart rate and blood pressure as Mean ± Standard Deviation (S.D). Inter group comparison of blood pressure and heart rate was done using ANOVA. p value of <0.05 was considered to be statistically significant.

Results

The two groups were comparable in terms of age,weight and sex. (Table 1). The mean heart rate (H.R) atbaseline was 81.5±12.3 beats per minute in group I and in group II it was 81.2±11.8 which were comparable to each other and statistically non significant. The heart rate in group I decreased to 69.2±10.5 and in group II to 74.4±9.1 at 1 minute post induction.This difference was statistically significant ($p<0.05$). Statistically non significant difference was observed at 0 min and from 2 min till 60 minutes of induction (p-value >0.05) (Table 2). The mean systolic blood pressure (SBP) at baseline in Group I was 137.9±4.3, in group II it was 134.8±9.1 which were comparable to each other and statistically non significant (p value=0.122). Statistically significant fall in SBP was observed in group I at 0 minute (at time of induction) and at 1min, 2min, 5min,10min, 30min and 60 minutes of induction (p-value=0.000). In group I versus group II a significant fall in SBP at 0 min,1 min, 2 min, 5min, 10min, 30 min, and 60 minutes of induction (p value 0.000). (Table 3). The mean diastolic blood pressure (DBP) at baseline in Group I was 87.4±4.0, in group II it was 88.1±3.3 which were comparable to each other and statistically non significant (p value=0.539). Statistically significant fall in SBP was observed in group I versus group II at 0 minute, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction (p-value=0.00) (Table 4). The baseline mean bloodpressure (MBP) in Group I was 104.3±3.9,and in group II it was 103.6±4.4 which were comparable to each other and statistically non

significant (p value=0.504). Statistically significant fall in MBP was observed in group I versus group II at 0 min, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction. (p-value=0.000) (Table 5).

Discussion

General anesthetic induction agents cause hypotension via cardio vascular depression and suppression of the autonomic nervous system. On the other hand laryngoscopy and endotracheal

Table 1: Comparison of Demographic variables of patients in both the groups

Variables	Group I	Group II	P value	Statistical significance
Age (years)	37.62±9.06	37.60±9.64	0.265	NS
Gender (male/female)	20/10	18/12	0.279	NS
Weight (kg)	58.2±1.6	58.1±1.8	0.900	NS

Table 2: Comparison of Heart Rate between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	81.5±12.3	81.2±11.8	0.910	NS
O minute	73.0±11.4	75.8±9.2	0.273	NS
1 minute	69.2±10.5	74.4±9.1	0.035	S
2 minute	79.0±8.5	78.7±8.3	0.887	NS
5 minute	76.5±9.0	76.5±7.8	1.000	NS
10 minute	75.2±10.2	75.5±7.6	0.898	NS
30 minute	74.5±10.3	74.9±7.4	0.871	NS
60 minute	74.6±9.7	74.3±7.5	0.899	NS

Table 3: Comparison of Systolic Blood Pressure (SBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	137±4.3	134.8±9.1	0.122	NS
O minute	102.2±8.1	126.4±10.1	0.000	S
1 minute	94.2±9.4	122.3±10.7	0.000	S
2 minute	94.8±7.4	128.8±5.6	0.000	S
5 minute	95.7±6.4	124.7±6.3	0.000	S
10 minute	96.7±6.5	125.0±6.5	0.000	S
30 minute	98.5±5.3	126.8±8.8	0.000	S
60 minute	99.6±5.5	125.8±7.0	0.000	S

Table 4: Comparison of Diastolic Blood Pressure (DBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	87.4±4.0	88.1±3.3	0.539s	NS
O minute	58.1±6.2	81.4±5.4	0.000	S
1 minute	56.2±5.7	76.2±7.2	0.000	S
2 minute	57.7±5.5	81.0±5.2	0.000	S
5 minute	57.0±4.6	80.8±4.8	0.000	S
10 minute	56.5±4.2	80.0±4.7	0.000	S
30 minute	58.5±5.1	79.5±5.2	0.000	S
60 minute	58.0±4.4	81.3.±6.0	0.000	S

Table 5: Comparison of Mean Blood Pressure (MBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	104.3±3.9	103.6±4.4	0.504	NS
O minute	72.4±6.4	97.3±5.6	0.000ss	S
1 minute	68.4±6.3	92.1±7.4	0.000	S
2 minute	69.6±5.1	97.4±4.4	0.000	S
5 minute	69.5±4.7	96.1±4.5	0.000	S
10 minute	69.6±4.1	95.7±3.5	0.000	S
30 minute	70.9±4.7	95.6±5.4	0.000	S
60 minute	71.6±3.8	96.0±4.7	0.000	S

intubation produces a vasopressor response like increase in the blood pressure and heart rate. Various attempts have been made to over come and attenuate hemodynamic instability during induction, larynoscopy, and intubation. In many studies induction agents, either alone or in combination have been used to achieve minimum cardiovascular effects. Now a days Propofol is preferred as an induction agent. Etomidate is used because it is haemodynamically stable intravenous induction agent. Recently Hacettepe University, reported that etofol which is a combination of etomidate and propofol can be used as an induction agent.

In our study there was a statistically significant fall in heart rate at 1 minute in group I versus group II. Propofol causes bradycardia due to release of nitrous oxide. In 2012 Pandey AK et al. did a study to compare the haemodynamic effects of propfol and etomidate at induction and also compared the serum cortisol levels in patients undergoing coronary artery bypass graft surgery. Patients were allocated randomly to receive either propofol or etomidate for induction and anaesthesia was maintained in both the groups with sevoflurane, vecuronium and fentanyl upto a total dose of 20μgm/kg.They found that etomidate is more haemodynamically stable in terms of heart rate, systolic blood pressur and diastolic blood pressure than propfol at induction,The serum cortisol levels in the propofol group increased more than two times and in the etomidate group decreaed to fifty percent on weaning from cardiopulmonary bypass [7]. In 2014 Supriya A et aldid a study comparing propofol and etomidate in patients undergoing general anaesthesia and found that patients who received etomidate showed little change in mean arterial pressure and heart rate in comparison to those who received propofol from the baseline value ($p>0.05$) [8]. Hosseinzadeh H et al. (2013) did a study comparing the effects of propofol, etomidate and etofol as a induction agents on haemodynamic stability after LMA insertion in elective surgeries on 90 patients of ASA grade I and II. In group P (propfol 2.5mg/kg), Group E (Etomidate 0.3mg/kg) and Group P+E (propfol 1mg/kg plus etomidate 0.2mg/kg). Heart rate, systolic blood pressure, diastolic blood pressure were measured before induction and 30 seconds after induction and found that there was a significant fall in systolic blood pressure in group1 (Propofol) in comparison to group II (Etomidate) and group III (Etofol) (p-value < 0.05). They found etomidate plus propfol as an effective alternative to profol and etomidate for facilitating LMA insertion with the added advantage lack of cardiovascular depression [9]

In our study statistically significant decrease ($p<0.05$) SBP, DBP, MBP in propofol group at induction and upto 60 minutes as compared to Etofolgroup. Propofol is used in dose of 1-2.5mg/kg. Etomidate is an imidazole ester used as an induction agent in dose of 0.3mg/kg. It causes less cardiovascular depression than propofol and a small reduction in cardiac output and blood pressure. But has adverse effects like myoclonus and adrenal suppression. The combination of propofol and etomidate helps to balance the decrease in haemodynamic variables caused by propofol alone as etomidate is more haemodynamically stable and the dose of propofol required is also less. Meena et al. (2016) compared the efficacy of three different anaesthesia induction agents (Propofol ,Etomidate and Propfol and Etomidate) in haemodynamic stability during induction and following endotracheal intubation in elective surgery. The patients were randomly placed into three groups.GroupI was induced with Propofol (2.5 mg/kg), Group II with Etomidate (0.3mg/kg) and Group III with Propofol 1mg/kg plus Etomidate 0.2mg/kg. There was significant fall in systolic blood pressure in group I (Propofol) as compared to group II (Etomidate) and group III (Etofol). Etofol was haemodynamically more stable as compared to propofol or etomidate alone at 1 minute of induction [10] Findings of our study are comparable with the studies of Hosseinzadeh H et al and Meena et al. OzgurYagan et al. in 2015did a study on 90 patients which were randomly divided into three groups of 30 patients each.Group P received propofol 2.5mg/kg, group E received Etomidate 0.3mg/kg and group PE received Propofol 1.5mg/kg plus etomidate 0.15mg/kg as induction agents and compared the various haemodynamic parameters and found etomidate propofol combination can be better alternative to either propofol and etomidate [11]. Findings of our study are comparable with OzgurYagan et al. Finding of our study are consistent with the study of Criado A et al in which significant reduction in stroke volume, cardiac output and MBP was found at various time intervals [12]. Moller et al. in their study on 48 patients used propofol or etomidate for induction of general anaesthesia and compared the MAP, cardiac index (CI) and systemic vascular resistance (SVR). The MAP was significantly higher in the etomidate group as compared to propofol group after induction [13]. The findings of our study are also consistent to the studies of Moller et al.

Etofol use as an induction agent is limited because it has to be prepared by combining propfol and etomidate and a readymade solution of etofol is not

available for use in patients . We did not measure the plasma cortisol levels and adrenal corticotropin levels in our study which was a limiting factor in our study.

Summary and Conclusion

The combination of propofol and etomidate (Etofol) has better hemodynamic stability than propofol alone. Thus Etofol can be preferred over propofol alone for induction of anaesthesia .

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Original Research Article

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A Prospective Randomised Double-Blind Comparative Study of Bolus versus Fractionated Dose Injection in Spinal Anaesthesia for Pregnant Women undergoing elective Caesarean Section

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Abstract

Background: Elective or emergency caesarean sections are routinely done under spinal anaesthesia (SA) with bolus dose of local anaesthetic drugs. SA with bolus dose injection provides rapid onset of action but with profound hypotension and can compromise the uteroplacental blood flow which in turn may lead to foetal acid base abnormalities.In our study we hypothesised that by using low dose bupivacaine in fractionated manner to achieve the adequate anaesthesia and stable haemodynamics andcompared with bolus dose of local anaesthetic drug in SA. The following variables were observed: onset of sensory and motor blockade, Mean Arterial Pressure (MAP) Heart Rate (HR), and duration of analgesia in patients undergoing elective lower segment caesareansection (LSCS). *Methods*: This study was conducted in sixty pregnant women who are undergoing elective lower segment caesarean section (LSCS) after taking permission from the institutional ethical committee. The pregnant women were divided into two groups. Group A patients received single bolus dose of bupivacaine heavy (0.5%) and Group B received the same dose of drug Bupivacaine in fractionated dose with two third of it initially followed by remaining one third dose after 60 secs. The intraoperative haemodynamics (MAP, HR) and duration of analgesia, time of onset and regression of sensory and motor blockade were recorded and analysed with appropriate statistical analysis. *Results:* The haemodynamics were more stable in group B patients as compared to group A. The requirement of vasopressor was significantly less in group B in contrast to group A (2.40±3.1 vs 5.50±3.79). There was statistically significant ($p<0.05$) delay in the sensory and motor onset in group B. The duration of analgesia was significantly longer in group B than group A (188.97±18.80 vs 154±22.56).There was no significant difference in the Apgar scores between the two groups ($p>0.05$). *Conclusion:* Fractionated dose of local anaesthetic drug in SA provided more haemodynamic stability and longer duration of analgesia compared to the bolus dose of local anaesthetic drug.

Keywords: SA; LSCS; Dose Fractionation; Hypotension; Analgesia.

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Introduction

Spinal anaesthesia is the most preferred anaesthetic technique for both elective and emergency lower segment caesarean section (LSCS). The most common side effect observed in these cases is hypotension which has profound effect on maternal and neonatal morbidity [1]. The various measures like low dose bupivacaine, prophylactic use of vasopressors, left uterine displacement, preloading or co-loading of crystalloids or colloids are being used to prevent maternal hypotension but with little success [2,3,4].

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Several factors like height, weight, pregnancy and anatomical changes influence the dose of local anaesthetic drug for its intensity and duration of spinal block [5]. Bhadeka Jigisha et al. [6] compared the fractionated dose with bolus dose in SA for haemodynamic stability and duration of analgesia in patients undergoing elective LSCS. In the study of Bhadeka Jigisha et al. [6] two thirds of the total dose of injection bupivacaine heavy (0.5%) was given initially followed by one third dose after 90 secs, while Bina Patel et al. [7] administered one half of the total calculated dose after 90 secs in sitting position and both concluded that there was greater haemodynamic stability, dense block and longer duration of analgesia in the fractionated dose of injection of SA. In another study after spinal injection patient was made to sit for another 30 secs before making supine and observed a slow predicted and desired level of analgesia in elderly patients [8]. We have contemplated a prospective randomised double blind comparative study with bolus vs fractionated dose by giving two thirds of the dose initially and then one third dose after 60 secs by using Bupivacaine heavy 0.5% 2 cc to observe the onset of sensory and motor blockade, MAP, HR, Apgar score and duration of analgesia in pregnantwomen undergoing elective LSCS.

Materials and Methods

The present study was carried out in sixty pregnantwomen (thirty in each group) from April 2016 to December 2017 in MRMCW (Malla Reddy Medical College for Women) after the Institutional ethics committee approval and written informed consent.

Study Population

The Sample size was calculated for repeated measures of ANOVA, taking Cohen's effect size of f=0.20 with alpha =0.05 and 1- beta (power) = 0.99, because the haemodynamic parameters were recorded repeatedly during our study at 12 levels. Total sample size was 54, however because of possibility of dropout cases we have taken total of 60 cases (30 in each group).

The women included were of American Society of Anaesthesiologists' (ASA) physical status I–II, age from 18 to 40 years, height from 145 to 170 cm, singleton pregnancies posted for elective LSCS under SA. The women with pre-existing diseases, pregnancy induced hypertension, cardiovascular, cerebrovascular disease, any contraindication to SA, weighing <50 kg or >110 kg, taller than 170 cm or shorter than 140 cm, severely altered mental status, unco-operative patients, spine deformities and history of laminectomy were excluded from the study.

Randomisation Procedure

The patients were randomly divided into two groups using computer generated sequential number placed in sealed envelopes and opened only before the commencement of the study. The study was double blinded so that the women and the assessor were unaware of the group. Only the attending consultant administering the SA knew the group allocation.

Study Procedure

All the women were premedicated with pantoprazole 40 mgIV. Standard monitors such as electrocardiogram (ECG), pulse oximeter (SpO_2) and non-invasive blood pressure (NIBP) were attached to the patient, and baseline blood pressure and heart rate (HR) were recorded. Intravenous (IV) line was started with 18-gauge IV cannula and preloaded with 10–15 ml/kg Ringer's lactate (RL) solution over period of 10 min.

SA was given in sitting position with 25gauge Quincke spinal needle in L3–L4 or L4–L5 interspace. After free flow of cerebrospinal fluid, 2ml of bupivacaine 0.5% heavy was injected with 5 ml syringe in all our cases according to respective groups A and B. The group A patients received a single bolus dose of bupivacaine over 10 secs. The group B patients received fractionated dose of bupivacaine with two thirds of the total calculated dose given initially followed by onethirds dose after 60 secs, both doses given at a rate of 0.2 ml/sec. The drug was injected with 5 ml syringe. After the initial twothirds of the dose, the syringe was kept in situ attached to the spinal needle for remaining 60 secs to avoid the CSF leak and then the remaining onethirds of the dose was administered. The women were turned to the supine position with a wedge under the right hip in both the groups and were supplemented with oxygen by Hudson mask at 5 L/min.

Intraoperatively, following parameters were monitored: Continuous ECG, HR, NIBP and SpO_2. The MAP and HR were monitored at base line, just before subarachnoid block, then at 2, 4, 6, 8, 10, 15, 20, 30, 40, 50, and 60 minutes after giving SA (TB, T0,

T2, T4, T6, T8, T10, T15, T20, T25, T30, T40, T50 and T60).

Hypotension was treated when mean arterial pressure (MAP) decreased ≤ 20% of baseline with injection mephentarmine 5 mg given IV and repeated whenever needed. Hypotensive episodes and mephentarmine used were recorded for each patient. HR of < 50 beats/min was considered as bradycardia and treated with IV atropine 0.6 mg.

We assessed and recorded time of onset, level and regression of motor and sensory block. The confirmation of sensory block was assessed by loss of sensation to pinprick. Motor blockage was assessed by a modified Bromage scale. These tests were performed every 5 min till the achievement of maximum sensory and motor block (Bromage scale 3) and every 30 min postoperatively until the sensory and motor variables were back to normal. The onset time of sensory or motor blockade was defined as the interval between intrathecal administration and time to achieve maximum block height or a modified Bromage score of 3, respectively.

The surgical incision was allowed when loss of pinprick sensation reached the T8 dermatome level bilaterally and when Bromage scale of three was achieved. Patients with inadequate sensory blockade and requiring conversion to general anaesthesia were excluded from the study.

After delivery, we administered IV oxytocin 5 IU IV slowly and 15 IU in 500 ml RL. The incidence of nausea, vomiting, respiratory distress, shivering, pruritus, urinary retention was noted for 24 h postoperatively and treated accordingly. The attending paediatrician assessed Apgar scores at 1 and 5 min.

The duration of sensory blockade was defined as the interval from intrathecal administration of local anaesthetic to S2 segment regression. The duration of motor blockade was defined as the time interval from the onset of motor block to the time of achievement of modified Bromage scale zero (0).

Modified Bromage scale was used to assess motor block:

1. Grade 0 – No motor block.
2. Grade 1 – Inability to raise an extended leg, able to move knees and feet
3. Grade 2 – Inability to raise an extended leg, able to move knees but able to move feet.
4. Grade 3 – Complete motor block of lower limb.

Pain was assessed with the linear visual analogue scale (VAS) every 30 min postoperatively for the first 2 hrs afterwards hourly up to 6 hrs. The duration of analgesia was defined as the time from intrathecal injection till the first demand for rescue analgesic when VAS was ≥ 4. The patient was given diclofenac sodium 75 mg intramuscular as rescue analgesic.

Visual Analog Score (VAS), (0 to 10 cm where 0= no pain and 10= worst pain ever felt).

Statistical analysis

The normality distribution of the data was confirmed by Kolmogorov-Smirnov test. The continuous data was displayed by mean and standard deviation and discretedata as Median and interquartile range (IQR).

As all the assumptions of T-test & ANOVA were accomplished, Student t test used to compare the continuous data of the two groups and ANOVA (repeated measures) was performed for haemodynamic parameters, followed by Tukey-Kramer multiple comparison analysis. The discrete data Apgar score was compared by using Mann-Whitney U test. The chi-square test was performed for categorical data. The p value of < 0.05 was considered as significant.

Results

Demographic variables age, height and weight were comparable between the two groups (Table 1).

Table 1: Demographic variables

Demographic variables	Mean±SD Group A	Mean±SD Group B	p values
Age (yrs)	24.10±3.61	24.60±3.44	0.5852
Height(cms)	156.73±4.88	155.87±5.77	0.5325
Weight(kg)	61.97±8.45	60.63±8.44	0.5474

HR was statistically significant at T6, T8, T10, 15, T20, T25 minutes between the two groups ($p< 0.05$) (Table 2), however there was no statistically significant difference in MAP between the two groups (Table 3). (Fig. 1,2).

When analysed within the groups the haemodynamic variables in both the groups were significantly ($p<0.05$) different at all time intervals in comparison to TB and T0 levels (Figure 1,2).

The onset of sensory,motor blockade and two segment sensory regression was delayed in the study group B and this difference was statistically significant ($p<0.05$). The duration of sensory and motor regression was also significantly ($p<0.05$)

Table 2: Heart Rate (HR) in both the groups

HR (Beats/min)	Group A (Mean±SD)	Group B (Mean±SD)	p value
TB (Basal)	99.17±15.59	97.77±13.62	0.712
T0	99.40±14.41	95.93±16.03	0.382
T2	100.07±19.11	95.97±18.81	0.405
T4	95.00±17.42	101.23±19.82	0.200
T6	87.80± 17.42	98.10±23.07	0.009*
T8	80.77±15.71	95.87±23.07	0.004*
T10	84.73±15.83	95.67±19.21	0.019 *
T15	86.83±18.54	98.87±16.35	0.009*
T20	90.37±13.31	98.67±14.50	0.025*
T25	92.17±13.56	101.00±15.18	0.021*
T30	92.87±16.73	100.03±13.40	0.072
T40	91.23±14.21	96.33±10.99	0.125
T50	88.50±11.96	93.97±10.59	0.065
T60	85.87±9.81	91.30±11.36	0.522

Note: * statistically significant.

Table 3: Mean Blood Pressure (MAP) in both the groups

MAP (mmHg)	Group A (Mean±SD)	Group B (Mean±SD)	p value
TB (Basal)	84.90±9.58	86.50±10.06	0.530
T0	83.53±12.65	85.80±12.31	0.485
T2	74.43±17.14	79.13±12.11	0.225
T4	68.63±16.34	71.30±14.07	0.501
T6	68.03±13.67	70.73±11.80	0.416
T8	71.50±13.24	70.97±11.96	0.871
T10	74.27±13.23	71.13±11.67	0.335
T15	71.83±12.55	68.61±10.24	0.276
T20	70.83±12.67	69.70±10.62	0.708
T25	71.37±12.38	67.37±11.58	0.201
T30	71.27±10.72	66.23±11.29	0.082
T40	71.70±9.87	71.13±9.67	0.823
T50	74.87±10.23	75.07±9.87	0.939
T60	75.93±9.22	73.80±8.10	0.347

Note: * statistically significant

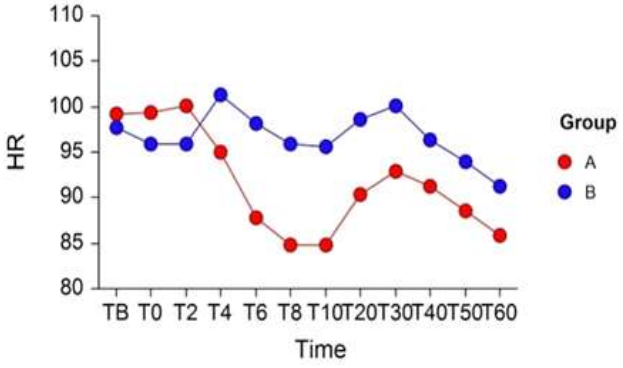

Fig. 1: Depicting the mean Heart Rate (HR) in both the groups

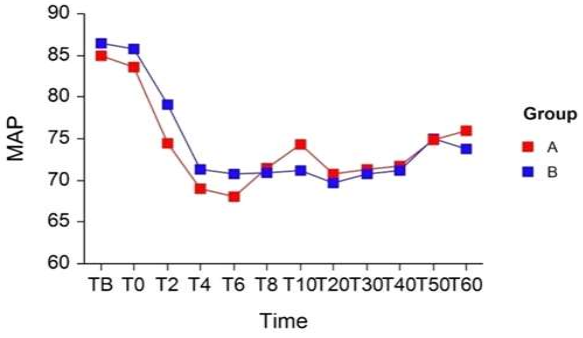

Fig. 2: Depicting the mean Arterial Pressure (MAP) in both the groups

Table 4: Showing different variables in both the groups

Variables in mins (Mean±SD)	Group A	Group B	P value
Onset of sensory block	2.50±0.68	4.00±1.41	0.0001*
Onset of motor blockade	4.97±1.59	7.23±2.50	0.0001*
Two segment sensory regression	97.13±24.85	74.43±19.68	0.0002*
Duration of motor block	180.oo±26.73	204.67±21.81	0.0002*
Duration of analgesia	154±22.56	188.97±18.80	0.0001*
Apgar Score(IQR)	8±1	8.5±10	0.199
Mephenteramine used(mg)	5.50±3.79	2.40±3.1	0.0010*

Note: * statistically significant.

prolonged in group B. There was no statistically significant difference in the Apgar scores between the two groups ($p>0.05$). The requirement of mephenteramine which was used as rescuedrug to control blood pressure was significantly ($p<0.05$) different in between the groups and more in group A (Table 3).

Quality of sensory and motor blockade were comparable in both the groups with no rescue analgesic requirement. The adverse effects like nausea, vomiting and shivering monitored intra and post operatively were comparable in both the groups.

Discussion

Even though spinal anaesthesia is the most preferred, safe and economical anaesthetic technique for both elective and emergency lower segment caesarean section (LSCS), the most common side effect like hypotension, maternal and neonatal morbidity [1] are not successfully reduced. The following measures were used to prevent maternal hypotension: low dose bupivacaine, prophylactic use of vasopressors, left uterine displacement, preloading or co-loading of crystalloids or colloids are but of little success [2,3,4]. The incidence of hypotension is reported to be approximately 90% of cases, if preventive measures are not taken [2,9].

Several factors like height, weight, pregnancy and anatomical changes influence the dose of local anaesthetic drug for its intensity and duration of the block.In the study conducted by Danelli et al. [5] dose of 0.5% hyperbaric bupivacaine in relation to patient's height was used; they concluded that a dose as low as 0.06 mg/cm height represents the dose of intrathecal bupivacaine providing effective spinal block in 95% of women undergoing elective caesarean section. Many studies were published to reduce the height of sensory block and hypotension using opioid as additives to the local anaesthetics for SA. Himabindu et al. [10] used fentanyl as additive to LA and concluded that there is faster onset of sensory blockade with haemodynamic stability and prolonged duration analgesia.

BadhekaJigisha et al. [6] compared fractionated dose with bolus dose in SA for patients undergoing elective LSCS. In their study, fractionated dose with twothirds of the total dose of injection bupivacaine heavy (0.5%) was given initially followed by onethird dose after 90 sec. Where as in the study by Bina Patel et al. [7] in PIH patients, one half of the total calculated dosewas given initially and the remaining half dose was administered after 90 secs in sitting position and both concluded that there was greater haemodynamic stability, dense block and longer duration of analgesia in the fractionated dose of injection of SA. In another study after spinal injection patient was made to sit for 30 seconds before making supine and observed that slow predicted and desired level of analgesia was obtained in elderly patients [8]. As the waiting times after SA are different in different studies [6,7] we have waited 60 seconds after giving the initial twothirds of the total calculated dose and then the remaining onethird dose was given. We observed onset of sensory and motor blockade, haemodynamics, Apgar score and duration of analgesia in patients undergoing elective LSCS.

Our study results are comparable to the study of Bhadeka Jigisha et al.[6] in providing stable HR in the fractionated dose group. However, there was no significant change in MAP in our study in both the groups, probably because the BP was maintained with the use of mephenteramine.

Fahmy et al. [11] compared the circulatory and anaesthetic effects of bolus versus fractionated administration of bupivacaine and concluded that when the same dose of bupivacaine is administered in a fractionated manner, it is associated with lesser degree of hypotension. Our study is inagreement with the study of Bina Patel et al. [7] who observed more stable haemodynamics and less vasopressors requirement with fractionated dose SA as compared to the single bolus use of SA in LSCS. Favarel et al. [12]

in his study on titrated dose of Bupivacaine studied a randomised trial in 60 patients undergoing hip fracture surgery and concluded that was safer, more efûcient and provide better cardiovascular stability than a single bolus dose.

Our study results are in concurrence with the study of Agrawal N et al. [8] who concluded that sitting position for 30 seconds after spinal anaesthesia helps to prevent high spinal and gives better haemodynamic stability.

In our study, there was delay in the onset of both sensory and motor block in the fractionated dose of SA and is same as the study of Agrawal N et al.[8] Essam E et al. [13] also observed faster onset of spinal anaesthesia in patients who were made supine immediately after subarachnoid block as compared to who were kept sitting for 30 secs. The above study results in concurrence with our study results. There was early onset of both sensory and motor blockade in the fractionated group as compared to bolus group in studies conducted by BhadekaJigisha et al[6] and Bina Patel et al. [8] which contradicts our study results. The fractionated dose of Bupivacaine prolonged the duration of sensory and motor blockade in the study of Fahmy and colleagues [10] and this is inagreement with our study. Similarly, our study results are in concurrence with the studies of Bhadeka Jigisha et al. [6] and Bina Patel et al. [9] with regard to prolonged duration of analgesia.

Apgar scores were slightly better in the group B in comparison to the conventional method group but not statistically significant and these results are similarto the study results of Bhadeka Jigisha et al.[6] and Bina Patel et al.[7].

Conclusion

Even slight alteration in the spinal anaesthetic technique, by giving the calculated dose in fractionated manner as compared to the bolus injection can give better outcome in patients undergoing elective LSCS. High spinal block and sudden hypotension can be prevented by using this method. This makes the fractionated dose method as an acceptable and safe alternative technique in LSCS.

Acknowledgement

Nil

Conflict of Interest

Nil

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Original Research Article

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A Study on the Efficacy of Single Dose Intravenous Paracetamol and Intravenous Fentanyl for Intraoperative and Postoperative Pain Relief in Dilatation and Evacuation

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Abstract

Background and Aims: Dilatation and evacuation is a common Obstetrics day care procedure. However, it is a painful experience for the woman both during the intraoperative and postoperative period. Hence the purpose of this study was to compare single dose intravenous Paracetamol and intravenous Fentanyl for intraoperative and postoperative pain relief in dilatation and evacuation. *Materials and Method:* Sixty female patients were randomly included and divided into two groups of 30 patients each. Group P received intravenous (IV) paracetamol 15 mg/kg in the preoperative waiting area 15 min before starting the procedure. Group F received IV fentanyl 2 mcg/kg at induction of anaesthesia. Intraoperative and postoperative vitals along with postoperative pain scores on a numerical rating scale at 5, 15, and 30 min intervals after surgery were recorded. *Results:* Pain scores observed with paracetamol were not significantly different from that of fentanyl. Side effects were observed less with paracetamol. *Conclusion:* The study demonstrates the usefulness of IV paracetamol which may be as effective as fentanyl in dilation and evacuation procedures without the major side effects of fentanyl.Paracetamol is also more cost effective.

Keywords: Dilatation and Evacuation; Pain Relief; Paracetamol; Fentanyl.

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Introduction

The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual tissue damage or described in terms of such damage [1]".

Adequate pain relief should be considered as a basic human right. Failure to relieve pain is morally and ethically unacceptable. Providing rapid and effective relief of pain remains a humanitarian issue, whereas allowing patients to suffer as a result of inadequate analgesia may be considered a breach of fundamental human rights [2,3,4].

Patients subjected to inadequate pain relief are often unable to breathe adequately, cough effectively, move enough even to attend to their own needs or participate in the rehabilitation and hence they experience the feeling of helplessness, fear and anxiety.

The term Dilatation and Evacuation (D and E) is used to describe all techniques of transcervical operative uterine evacuation performed in the first trimester of pregnancy before the 12th week of gestation [5]. D and E is a painful procedure and so good pain relief is necessary apart from avoiding untoward vagal responses.

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D and E is commonly performed as a day care procedure in obstetrics. Due to requirement of early discharge, this procedure requires an anaesthetic technique than can provide rapid recovery [6].

Various groups of drugs are now available for controlling intra-operative and post-operative pain. These include opioids like fentanyl, acetaminophens like paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) like diclofenac, alpha 2 adrenergic agonists like clonidine, N-methyl-D-aspartate (NMDA) receptor blockers like ketamine and local anaesthetics like bupivacaine.

Fentanyl is a potent synthetic opioid analgesic with a rapid onset, short duration of action. It is a strong agonist at μ- opioid receptors. Fentanyl decreases the anaesthetic requirement of other anaesthetic agents by providing antinociceptive effects that the intravenous agents do not provide[7]. It is suggested that a plasma concentration of approximately 1 ng/ml would be necessary for postoperative pain relief. Its adverse effects are respiratory depression, pruritis, skeletal and thoracic muscle rigidity [8] which may delay discharge, especially in day care surgeries. It is neither freely available nor cost effective.

Paracetamol is a commonly used non-opioid analgesic commonly used for the treatment of acute pain [9]. It is an effective and safe component in multimodal analgesia in combination with opioids and NSAIDs. Paracetamol has a different mechanism of action compared with other analgesics like opiates and NSAIDs which have considerable adverse effects [10]. Side effects of intravenous paracetamol are rare. These include rash, blood disorders and hypotension on infusion.

Materials and Method

Institute Ethics Committee clearance was obtained before commencement of the study. A prospective, randomized, interventional study was done between August 2015 and September 2017. All patients were subjected to a thorough pre- anaesthetic evaluation and relevant laboratory investigations were carried out. The patients were explained about the study in the language which is feasible to them and informed consent was obtained. The study was conducted on 60 American Society of Anaesthesiologist I and II fit patients (30 in each group) scheduled for elective and emergency Dilatation and Evacuation under general anaesthesia.

All patients were thoroughly evaluated pre-operatively. All necessary and relevant laboratory and other investigations were carried out. All patients were kept nil per oral for 6 hours prior to surgery. In the pre-operative room, the patient's pulse and blood pressure were taken with the patient lying comfortably in supine position. Patients were explained about assessment of pain by Visual Analogue Scale (VAS) 0-10 scales. The interpretation of pain scores was assessed as follows: 0 - no pain, 1-4 mild, 5-7 moderate and 8-10 - severe.

Group P received IV paracetamol 15 mg/kg in the preoperative area 15 min prior the start of surgical procedure.

The conduct and technique of general anaesthesia was same for both groups. After application of standard monitoring (non-invasive blood pressure [NIBP], electrocardiogram (ECG), and pulse oximetry (SpO_2), patients were premedicated with Inj. Glycopyrrolate 0.004mg/kg, Inj. Midazolam 0.02mg/kg and Inj. Ondansetron 0.1mg/kg. In addition to this, patients in Group F received 2mcg/kg body weight of fentanyl. Patients were preoxygenated for 3 minutes with 100% oxygen. Intravenous Propofol 1-2mg/kg body weight was used for induction of anaesthesia.

Ventilation was maintained with Bain's circuit and appropriate sized face mask.

Anaesthesia was maintained with O_2 + N_2O + Isoflurane (0.8%-1%). Readings were observed and noted every 3 minutes from the start of the procedure until the end. Inadequate pain control during the surgical procedure was assumed if heart rate, blood pressure or respiratory rate increased by 20% above the baseline. The rescue analgesia consisted of Inj.fentanyl 25mcg increments in the intraoperative period for both the paracetamol and fentanyl groups.

At the completion of the surgery, patients were allowed to regain consciousness and were transferred to the recovery room once they responded to verbal command

In the recovery room pain score according to the Visual Analogue Scale were recorded at intervals of 5, 15 and 30 minutes in each group. If pain scores were greater than 5, rescue analgesic of fentanyl 25mcg increments were given. The total dose of rescue analgesic aliquots was noted and recorded. In addition to this, the rest of the vital parameters (pulse, blood pressure, oxygen saturation and ECG) were monitored in the recovery room.

Adverse effects were noted and treated in each group accordingly.

Thus, the efficacy of postoperative pain relief in both the groups were assessed.

Patients were transferred to the ward once the vital parameters were stable.

Statistical Analysis

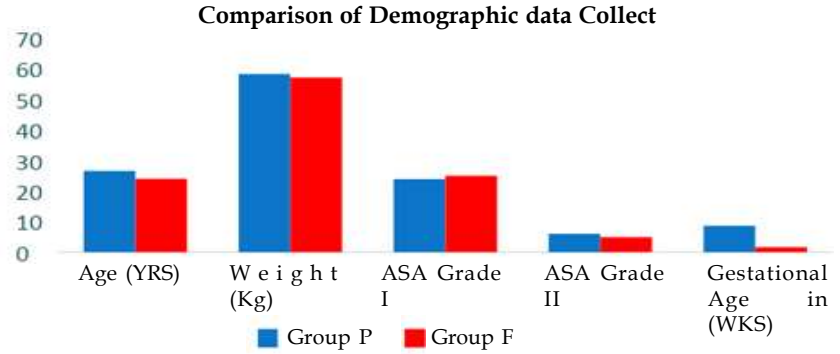
All the results obtained in both the groups were tabulated and compared clinically as well as statistically. All the data were expressed as mean with standard deviation (SD).

The quantitative data was analysed using test of significance based on "Z" test. Inferences and conclusions of the study were drawn based on the statistical analysis. p values < 0.05 was taken as significant and p value <0.001 as highly significant.

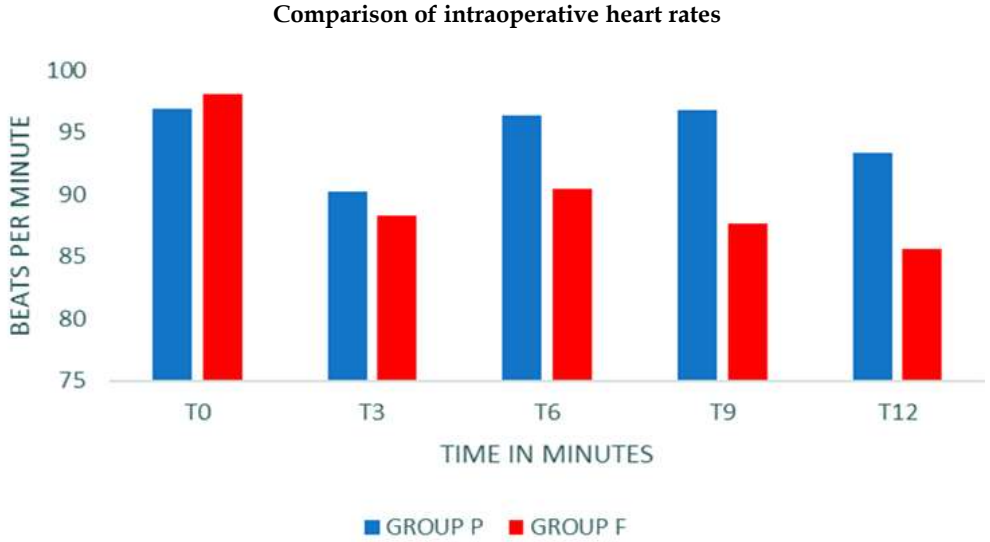
Sample size was calculated using Winpepi statistical package at a significance level of 5% with power 80%. A total sample size of 60 cases (30 cases in each group was obtained).

Results

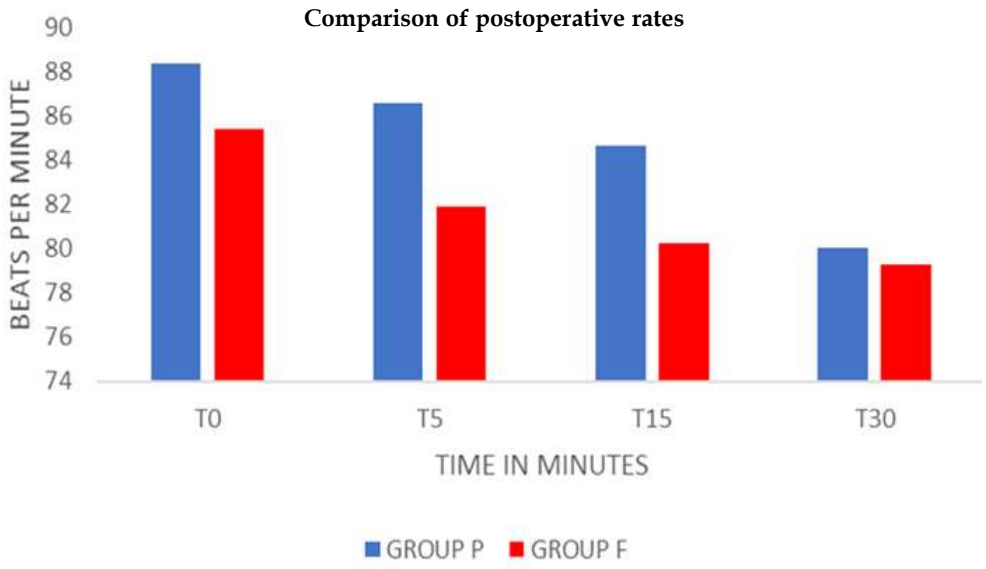
A total of 60 patients who underwent D&E requiring general anaesthesia were studied. They were randomly allocated in IV fentanyl and paracetamol group. There was no drop out during the study. It was observed that there was no significant difference between the groups with respect to age, weight, period of gestation and ASA status of the patients (Graph 1 to 13).



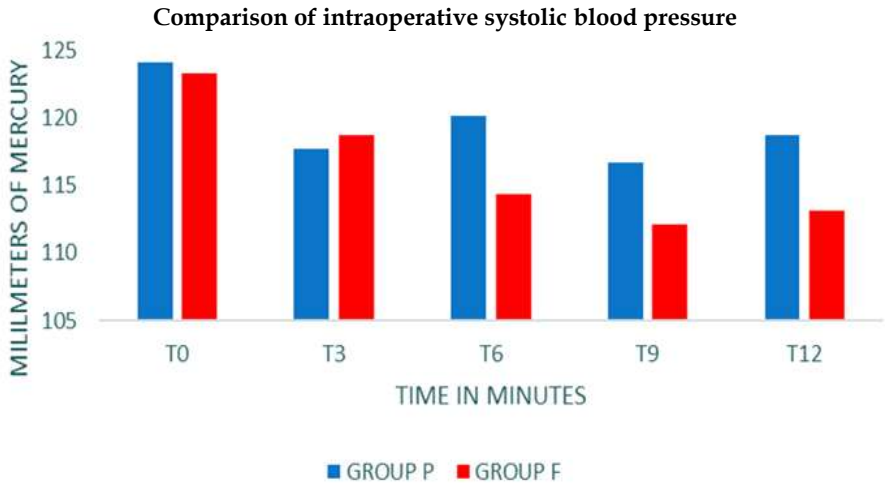
Graph 1: Comparison of Demographic data



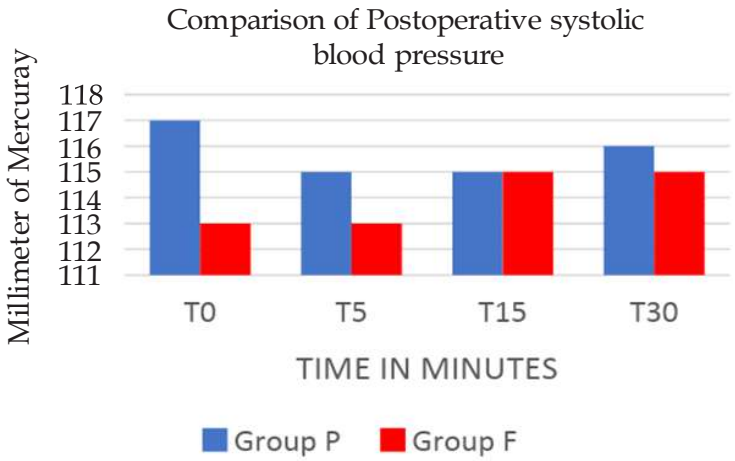
Graph 2: Comparison of intraoperative heart rates



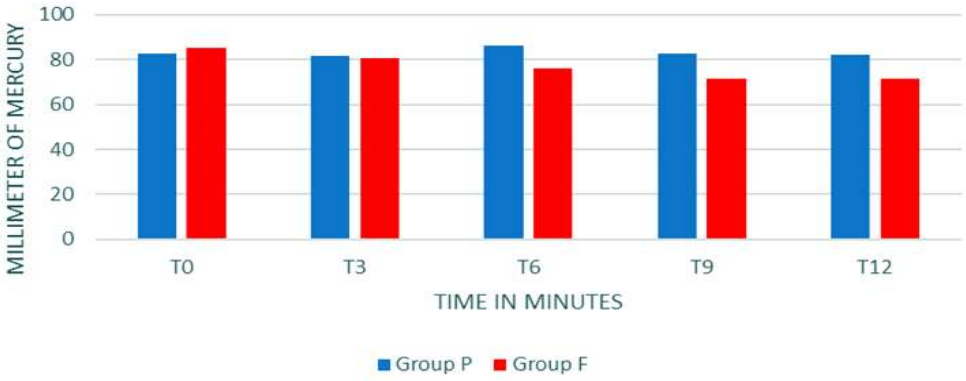
Graph 3: Comparison of postoperative heart rates



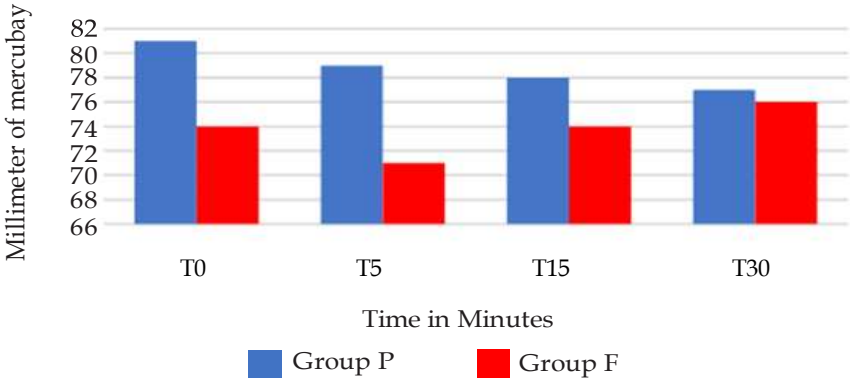
Graph 4: Comparison of intraoperative systolic blood pressure



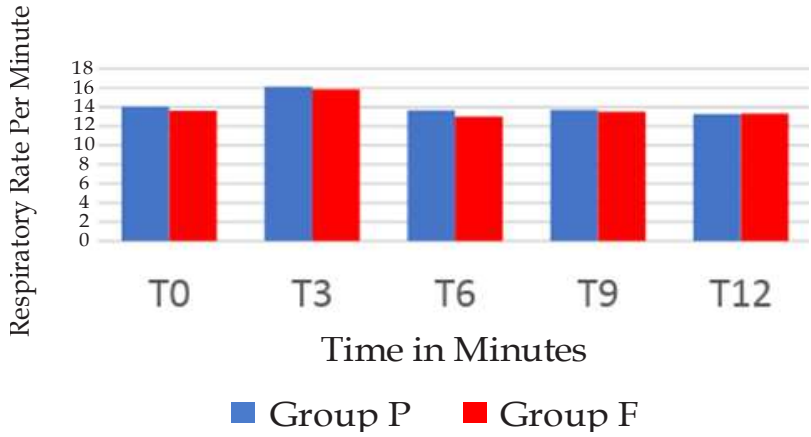
Graph 5: Comparison of postoperative systolic blood pressure



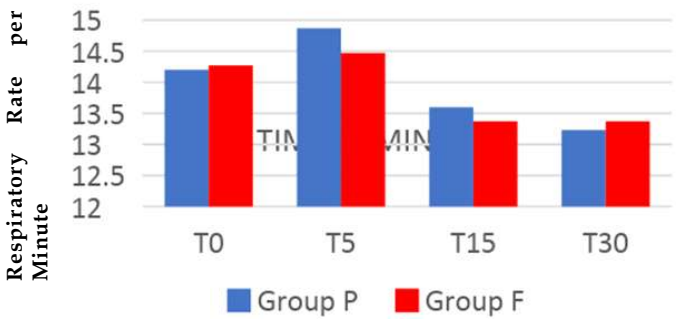
Graph 6: Comparison of intraoperative diastolic blood pressure



Graph 7: Comparison of postoperative diastolic blood pressure



Graph 8: Comparison of intraoperative respiratory rate



Graph 9: Comparison of postoperative respiratory rate

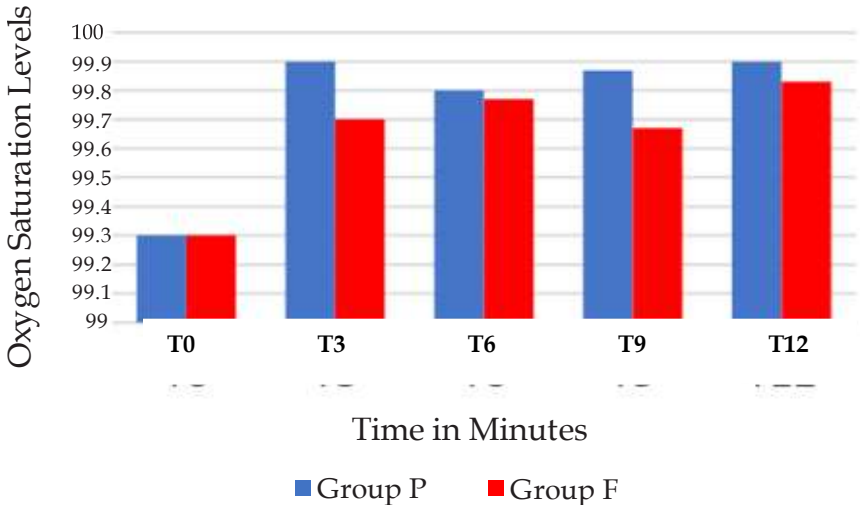


Table 10: Comparison of intraoperative saturation levels

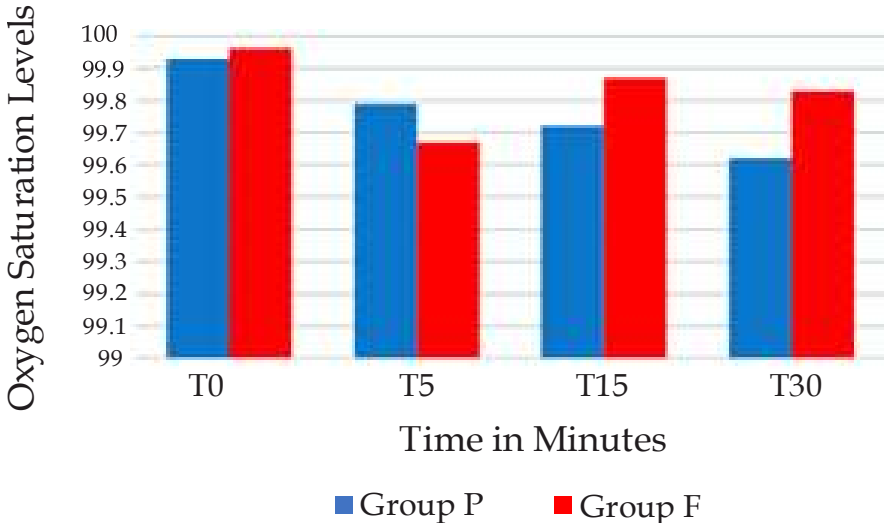
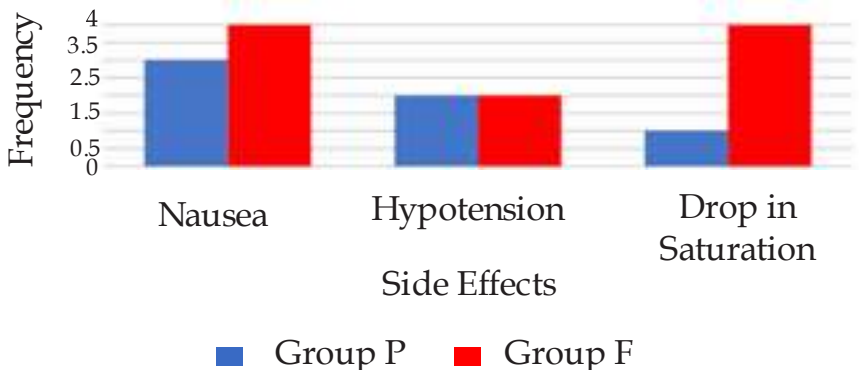
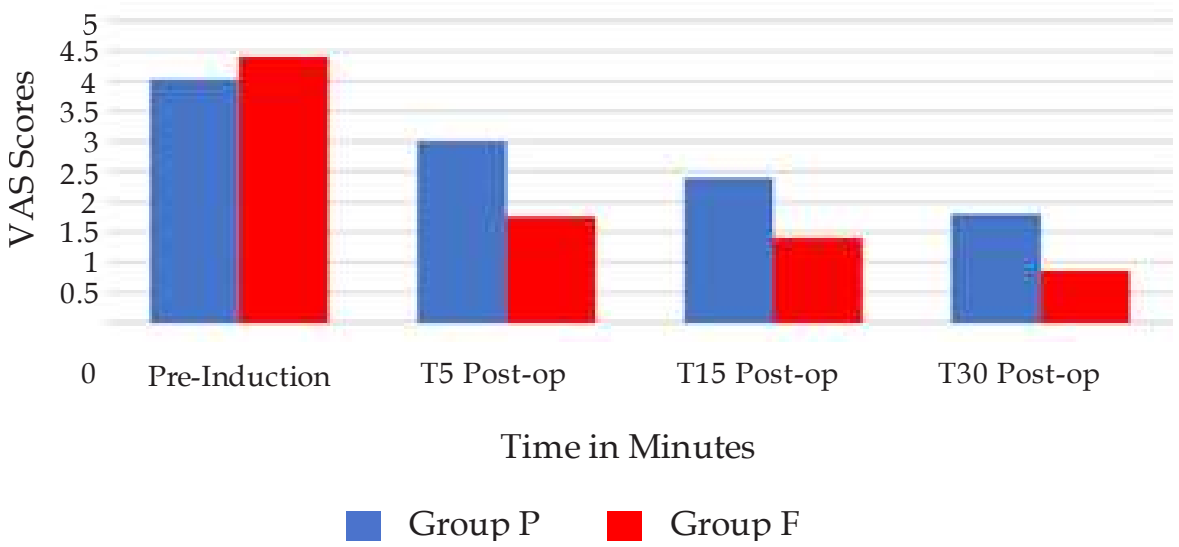


Table 11: Comparison of postoperative saturation levels



Graph 12: Comparison of side effects of the two drugs



Graph 13: Comparison of Visual Analogue Scale

Discussion

Pain in the intraoperative and postoperative period can lead to emotional and mental trauma with unpleasant sensory experience. Pain is precipitated by surgery and is often associated with autonomic, endocrine, metabolic, physiological and behavioural response. Relief of pain is of paramount importance to the patient as it causes discomfort and also leads to delayed mobilization with its associated complications and longer duration of stay in the hospital.

With a good analgesic treatment plan, not just the anxiety associated with the procedure but also the morbidity, cost and length of hospital stay is reduced. Although dilatation and evacuation is a brief procedure, it is associated with mild to moderate pain.

Fentanyl is a short acting synthetic opioid commonly used for intraoperative and postoperative pain relief in a day care procedure. Fentanyl is highly lipid soluble and acts rapidly. Its onset of action is in 2 minutes and duration of action is 30-60 mins. Its adverse effects are respiratory depression, pruritis, skeletal and thoracic muscle rigidity.

Paracetamol is a non-opioid analgesia. It is an effective and safe drug for managing mild to moderate pain. Its main advantage being that it is devoid of side effects commonly seen with the use of opioid analgesics.

Sinatra et al. [11] compared IV paracetamol with placebo after orthopaedic lower limb surgery. They found that IV paracetamol administered over a 24-h period in patients with moderate to severe pain after orthopaedic lower limb surgery provided rapid and effective analgesia and was well-tolerated.

El-Hamamsy M, El-Kawaly H, Aziz hegazy M [12] in 2016 studied the post-operative use of intravenous paracetamol versus that of intravenous fentanyl in patients who were posted for lower limb orthopaedic surgeries. Their study showed that intravenous paracetamol was as good an analgesic as fentanyl and also improved the ability of the patients to be mobilized quicker with fewer adverse effects.

Memis D, Inal M, Kavalci G, Sezer A, Sut N [13] concluded in their study that not only did paracetamol reduce the use of opioids, the time to extubate the patient post-operation was reduced and the opioid related adverse effects were reduced in patients who received paracetamol. Early extubation in the paracetamol group was explained by reduced sedation as compare to the opioid group.

Ali M, Shamim F, Chughtai S. et al. [14] studied the difference between intravenous paracetamol and fentanyl for intraoperative and postoperative pain relief in dilatation and evacuation. The study concluded that there was no significant difference in the postoperative period at postoperative time intervals of 5, 15, 30 minutes. However, in our study, postoperatively mean heart rate in group F was significantly lower during the first 15 minutes postoperatively as compared to group.

Talmage D et al. [15] observed a significant drop in the heart rates of their study patients who were given Inj. Fentanyl during induction of anaesthesia. They attributed this bradycardia to the central vagotonic effects of fentanyl.

Thus, in our study Inj. Paracetamol proved to reduce intraoperative and postoperative pain in the patients undergoing Dilatation and Evacuation as seen with satisfactory VAS scores. Pain relief with Paracetamol was similar to that with Inj. Fentanyl but without respiratory depression or major side effects of Fentanyl.

Conclusion

Our study validates the use of a single dose of Inj. Paracetamol given intravenously at 15 mg/kg body weight for intraoperative and postoperative pain relief management in Dilatation and Evacuation as there was stable haemodynamic profile, no respiratory depression, no significant complications of the drug and a good VAS score.

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Comparative Study of Intrathecal Bupivacaine with 50 and 75 µg Clonidine in Lower Abdominal Surgeries

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Abstract

Background: Spinal anaesthesia is a safe, reliable, inexpensive technique of providing anaesthesia and blunts autonomic, somatic and endocrine responses. It has many advantages; the limited duration of action appears to be one of its downsides. Clonidine, a partial α2 adrenoceptor agonist, has been shown as an effective and safe drug. It prolongs the action of local anaesthetics and reduces the dosage requirement. *Aims:* To compare the efficacy of intrathecal bupivacaine in combination with 50 µg and 75 µg of clonidine in lower abdominal surgeries. *Materials and Methods:* 60 patients scheduled for lower abdominal surgeries, aged 18-65 years with ASA grade I-II satisfying inclusion criteria were recruited for the study and were randomly divided into two groups of 30 each. Group C50 received Inj. clonidine 50 µg added to 15mg hyperbaric bupivacaine and Group C75 received Inj. clonidine 75 µg added to 15mg hyperbaric bupivacaine. Spinal block characteristics, haemodynamic changes and side effects were recorded. *Results:* Onset of sensory and motor blockade was earlier in group C75 as compared to group C50 but statistically insignificant. Maximum sensory block achieved was T4 in group C75 and T5 in group C50. Two segment regression duration, duration of analgesia, duration of sensory blockade and motor blockade were statistically significantly prolonged in group C75 as compared to group C50. Patients maintained haemodynamic stability. Sedation scoring and side effects were comparable in both the groups. Data was analysed using Chi-square test and Independent t test. *Conclusions:* 75µg Clonidine when added to intrathecal bupivacaine prolongs anaesthesia and postoperative analgesia compared to clonidine 50µg.

Keywords: Clonidine; Hyperbaric Bupivacaine; Spinal Anaesthesia.

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Introduction

Spinal anaesthesia is a commonly used technique for infra-umblical surgeries. It is safe, reliable and inexpensive technique of providing surgical anaesthesia. It offers effective postoperative analgesia and blunts autonomic, somatic and endocrine responses [1].

Hyperbaric bupivacaine 0.5% is three to four times more potent than lignocaine and prolongs duration of action with the disadvantage of slower onset of action [2].

Various drugs like opioids and nonopioids are used as intrathecal adjuvants along with local anaesthetic agents [3]. α2-receptor agonists when used as neuraxial adjuvants improve the quality of perioperative analgesia and alsominimizes the

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anaesthetic dosage requirement, particularly in high-risk patients and in ambulatory procedures [4].

Clonidine, a partial α2 adrenoceptor agonist, has been shown as an effective and safe drug when used intrathecally. It prolongs the duration of action of local anaesthetics and reduces the dosage requirement [5].

In this study, we aimed to evaluate the efficacy of clonidine in two different doses when added to bupivacaine on quality of anaesthesia, time of onset of spinal blockade, intensity of motorblock, duration of analgesia, haemodynamic stability and any side effects.

Objectives

To compare the time taken for the onset, duration of sensory and motor block, two segment regression duration, total duration of analgesia, haemodynamic changes, sedation scoring, any side effects and complications following intrathecal administration of 15 mg of 0.5% hyperbaric bupivacaine with either 50μg or 75μg clonidine in patients undergoing lower abdominal surgeries.

Materials and Methods

After obtaining approval from Institutional Ethics Committee a written informed consent was taken. A prospective randomized double blind study was planned. Patients scheduled for lower abdominal surgeries, aged 18-60 years with American Society of Anaesthesiologists (ASA) physical status class I and II with normal airway (Mallampati grade 1 or 2) were recruited for the study. A total of 60 patients were randomly divided into two groups (30 each). Group C50 received Inj.clonidine 50μg added to 15 mg (3.0ml) hyperbaric bupivacaine intrathecally and group C75 received Inj.clonidine 75μg added to 15 mg (3.0ml) hyperbaric bupivacaine intrathecally.

The exclusion criteria were patient's refusal, history of allergies to any study medications, gross spinal abnormality, localised skin sepsis, haemorrhagic diathesis, neurological involvement / diseases, with head injury, raised intra cranial pressure, raised intra ocular pressure, psychiatric disorders, asthma, epilepsy and thyroid diseases.

On the previous day of surgery, preoperative assessment was done for each patient and written informed consent was taken. Patients were kept nil per oral for solids for 8 hrs and clear fluids 2 hrs before surgery. All patients were premedicated on the night before surgery with tablet ranitidine 150mg and tablet alprazolam 0.25mg.

On the day of surgery in the preoperative room, an intravenous line was secured with 18 gauge cannula and preloaded with Ringer lactate 15ml/kg half an hour before anaesthesia. Monitoring was done using multiparameter monitor having pulse oximetry, ECG and NIBP.

Spinal anaesthesia was administered in left lateral position. Under aseptic precautions, spinal block was performed at level of L3-L4 through a midline approach using 25G Quincke spinal needle and hyperbaric bupivacaine 3.0 ml (15mg) with clonidine either 50 μg or 75μg. The total volume made up to 3.5 ml was injected with operative table kept horizontal. Patients were turned to supine posture immediately and supplemental oxygen given.The time at which injection completed was considered zero time of study.

The following parameters were noted, onset of sensory blockade (T10 level) and motor blockade, maximum level of sensory blockade attained, time to two segments sensory regression, total duration of analgesia which was determined by time to rescue analgesia (VAS ≥ 4), total duration of sensory blockade(regression to S1dermatome)and motor blockade (recovery to bromage 0), level of sedation and side effects like nausea, vomiting , hypotension and bradycardia were noted.

Sensory blockade was tested using pinprick method with a blunt tipped 27G needle. Quality of analgesia was assessed by visual analogue scale.

Visual analogue scale for pain [6]: 0- No pain, 1-3 Mild pain, 4-6 Moderate pain, 7-10 severe pain.

Motor blockade was assessed using modified Bromage scale [7]. Bromage scale: Grade Definition: 0- Full flexion of knee and feet, 1- Inability to raise extended leg; able to move knee and feet, 2- Inability to raise extended leg and move knee; able to move feet, 3- Complete block of lower limb.

Level of sedation was assessedby Ramsay sedation scale [8].

Scale 1–patient is anxious, agitated or restless, Scale 2 –patient is co-operative, oriented and tranquil alert, Scale 3- patient responds to commands, Scale 4 –patient is asleep but with brisk response to light glabellar tap or loud auditory stimulus, Scale 5 - patient is asleep with sluggish response to light glabellar tap or loud auditory stimulus, Scale 6 – patient is asleep, with no response.

Haemodynamic monitoring was done during the block every 5 mins for first 15 mins and every 10 mins

for next 30 mins and once in 15 mins till the end of surgery and post operatively every hourly.

Hypotension was defined as mean arterial pressure falling more than 20% mm Hg of preoperative value or SBP less than 100 mmHg and was treated by increasing the fluid infusion and with inj. mephenteramine 3-6 mg in bolus doses and bradycardia was defined as heart rate less than 60 beats /min and was treated with 0.6mg of inj.atropine.

Post operative pain was assessed by Visual Analogue Scale (VAS), rescue analgesic inj.diclofenac 75 mg intramuscularly was given if VAS was more than 4 .

Statistical Analysis

Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version (IBM) software. Categorical data was represented in the form of frequencies and proportions. Chi-square was used as test of significance. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two groups. p value <0.05 was considered as statistically significant.

Statistical evaluation of data or parameters was done as follows: Sample size was estimated by using the mean duration of motor block from the study Raj Bahadur Singh et al. [9] with 99% Confidence limit and 90% power, sample size of 17 was obtained in each group. With 10% nonresponse sample size of $17 + 1.7 \approx 20$ cases were included in each group.

Results

In our present study both the groups were comparable with regard to demographic profiles as shown in Table 1.

Spinal block characteristics between the groups are shown in Table 2.

Earlier sensory onset was seen in group C75 than in C50 with no statistical significance between the groups. With regard to maximum level of sensory blockade, in C50 group and C75 majority i.e. 83.3% and 46.7% had T6 sensory blockade and 40% in C75 and 10% in C50 group had T5 Sensory blockade. 1 patient (3.3%) in C75 had T4 sensory blockade.This difference in height of sensory blockade was statistically significant (p = 0.021)

Onset of motor block was faster in group C75 as compared to group C50 but there was no statistical significant difference between the groups. Maximum motor blockade attained in both the groups was bromage 3. Duration of two segment regression, duration of analgesia,duration of sensory and motor blockade were statistically significantly prolonged in C75 than C50 (p< 0.001).

Table 1: Demographic profile of the patients

Parameters	Group				P value
	C50 (n=30)		C75 (n=30)		
	Mean	SD	Mean	SD	
Age in years	45.77	17.67	44.07	11.67	0.662
Weight in kgs	62.47	8.30	63.60	7.69	0.585
Sex ratioin % male	13	43.3%	13	43.3%	1.000
Female	17	56.7%	17	56.7%	1.000
Height in cms	174.85	3.5	173.77	6.2	0.354

Table 2: Spinal block characteristics between two groups

Parameters	Group				P value
	C50		C75		
	Mean	SD	Mean	SD	
Onset of sensory blockade in seconds	163.37	40.61	150.00	39.50	0.201
Onset of motor blockade in seconds	213.23	49.07	202.67	48.71	0.406
Two segment regression in minutes	200.0	53.8	234.0	47.8	0.012*
Duration of analgesia in minutes (time to rescue analgesia i.e., when VAS≥4)	248.4	51.5	313.2	73.8	<0.001*
Duration of sensory blockade in minutes (S1segment regression)	302	47.1	378	13.8	<0.001*
Duration of motor blockade in minutes	209.7	20.10	275.3	31.9	<0.001*

Patients were monitored for hemodynamics at varying intervals from baseline to next 24 hours. There were significant changes in mean heart rate and mean arterial blood pressure after spinal anaesthesia at varying intervals as depicted in Table 4,5 and figure 1,2.

With regard to side effects, in group C50, 1 patient (3.3%) had bradycardia and 2 patients (6.7%) had hypotension and in group C75, 9 patients (30.3%) had bradycardia and 12 patients (40.3%) had hypotension. 1patient in group C75 complained of nausea. Bradycardia was treated with inj atropine 0.6mg intravenously and hypotension was treated with oxygen, intra venous fluids and inj. mephentermine as 6mg incremental doses. Hemodynamic changes though clinically significant,

Table 3: Heart rate comparison between two groups at different intervals

	Group				P value
	C50		C75		
	Mean	SD	Mean	SD	
Baseline	83.57	10.93	81.33	7.15	0.353
Immediately	81.43	12.45	74.60	7.19	0.012*
10 Min	75.70	9.13	70.13	8.96	0.02*
30 Min	71.40	7.87	76.77	10.25	0.027*
60 Min	74.37	9.13	78.97	7.30	0.035*
120 Min	75.63	9.69	84.37	7.02	<0.001*
180 Min	76.17	10.08	83.27	7.61	0.003*
240 Min	75.50	9.90	82.97	7.54	0.002*
300 Min	76.10	9.32	82.77	6.88	0.003*
360 Min	76.90	9.65	82.87	5.81	0.005*
420 Min	77.67	9.52	83.43	4.35	0.004*

Table 4: Mean arterial pressure comparison between two groups at different intervals

	Group				P value
	C50		C75		
	Mean	SD	Mean	SD	
Baseline	96.47	8.09	98.87	9.39	0.293
Immediately	92.20	8.46	87.97	7.59	0.046*
10 Min	87.37	9.06	81.83	8.28	0.016*
30 Min	84.40	9.68	78.53	8.71	0.016*
60 Min	87.97	8.42	81.00	7.32	0.001*
120 Min	89.80	7.87	97.93	9.95	0.001*
180 Min	90.73	7.99	97.20	9.30	0.005*
240 Min	91.60	8.02	98.47	8.44	0.002*
300 Min	92.70	7.26	98.23	9.39	0.013*
360 Min	92.70	7.89	98.53	9.08	0.01*
420 Min	93.53	8.05	98.57	8.90	0.025*

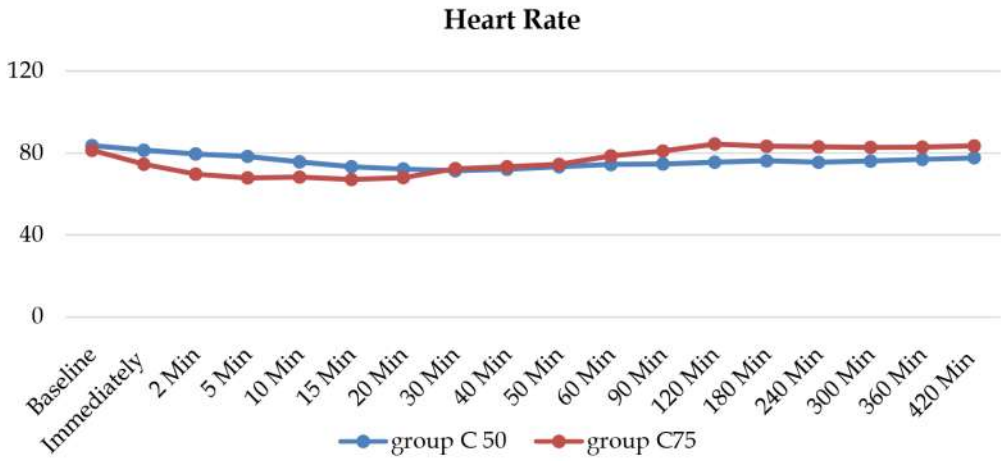

Fig. 1: Line diagram showing heart rate comparison between two groups at different intervals

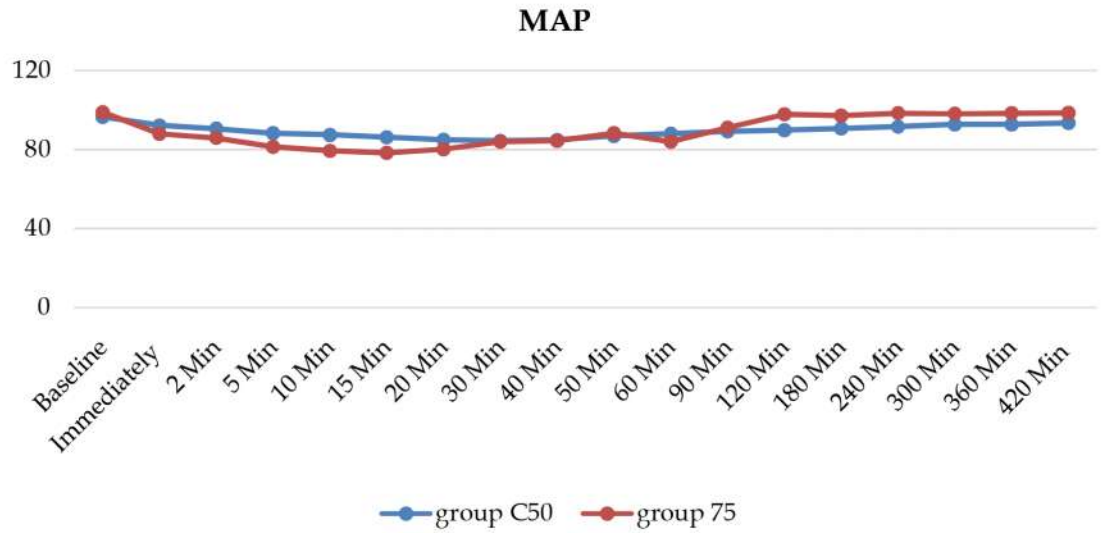

Fig. 2: Line diagram showing MAP comparison between two groups at different intervals

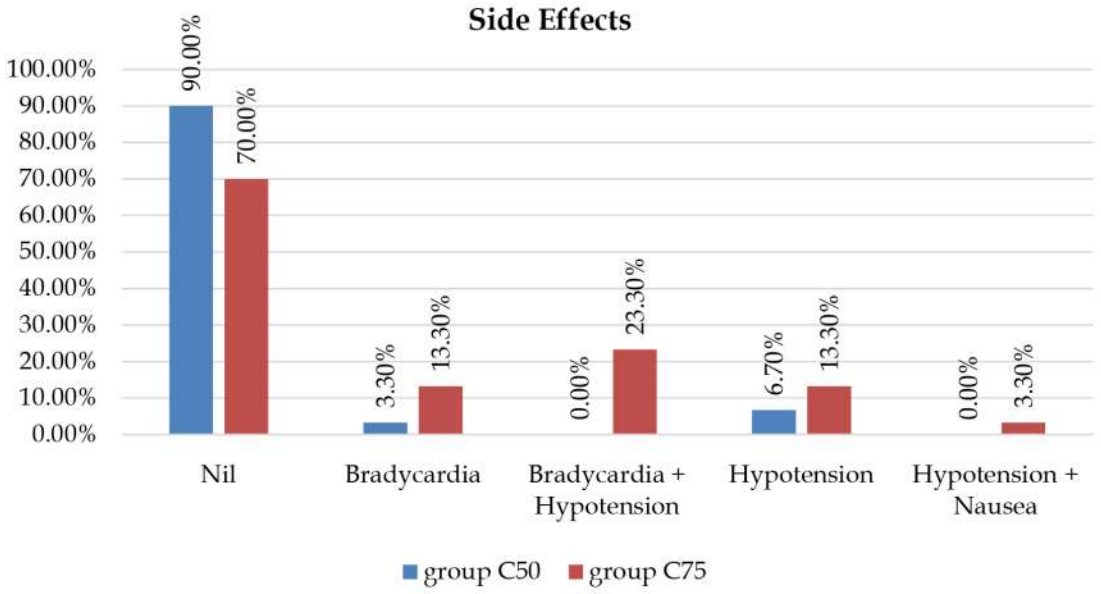

Fig. 3: Bar diagram showing Side effects comparison between two groups

were statistically insignificant. There was no significant difference in side effects between two groups (p = 0.239) as shown in Figure 3.

The sedation scoring was more in group C75 compared to group C50 but clinically insignificant. Patients were easily arousable. Patients were also monitored for other side effects like respiratory depression, dryness of mouth, vomiting and adverse effects, no such incidences were seen.

Discussion

Subarachnoid block has been most extensively used for lower abdominal and lower limb surgeries because of its simplicity, speed, reliability and advantage of avoiding polypharmacy. The aim of it is to provide optimal surgical conditions and offer post op analgesia with minimal side effects. Commonly used local anaesthetics for intrathecal anaesthesia are lignocaine and bupivacaine. Bupivacaine 0.5% heavy single intrathecal injection provides analgesia for about 2-2.5hrs, but the postoperative analgesic duration is limited [9]. Hence, providing intrathecal additive to these local anaesthetics forms a reliable and reproducible method of prolonging post-operative analgesia and to prolong the duration of anaesthesia. As this technique is simple and less cumbersome, it has gained a wide acceptance. Various adjuvant drugs

have been added to local anaesthetics like opioids and non-opioids [3]. α2-receptor agonists like clonidine and dexmedetomidine when used as neuraxial adjuvants improve the quality of perioperative analgesia and also minimize the local anaesthetic dosage requirement [4]. Intrathecal α2-receptor agonists are found to have anti nociceptive action on both somatic and visceral pain [10].

The analgesic effect of clonidine when administered intrathecallyis mediated spinally through the activation of postsynaptic α-2 receptors in substantia gelatinosa of the spinal cord [11-14]. It also activates the descending inhibitory pathway thereby decreasing the release of nociceptive substances from gelatinosa [11].

Various authors have shown that intrathecal clonidine potentiates bupivacaine induced spinal sensory block and motor block and reduces the analgesic requirement in the early postoperative periodwithout the side effects of opioids [5,15-18]. Very low doses of intrathecal clonidine such as 15-30 μg in humans found no hemodynamic instability [17-19]. Studies using 37.5-150 μg reported significant hypotension and bradycardia [17,20]. Intrathecal clonidine at usual doses 1-2 μg/kg is associated with bradycardia, hypotension and sedation [9].

Hence many authors attempted adding adjuvants to intrathecal bupivacaine to offer prolonged duration of analgesia to the patients. As there were no studies comparing 50μg and 75μg clonidine we have taken up this study.

In our study, we designed this randomized double-blind study to evaluate the postoperative analgesic effect, sensory and motor blockade and hemodynamic effects of two different doses of intrathecal clonidine added to bupivacaine in patients undergoing lower abdominal surgeries.

Our results showed that addition of clonidine in 2 different doses (50 and 75 μg) increases duration of sensory block, motor block, analgesia in patients undergoing spinal block with minimal hemodynamic instability in group using 75 μg of clonidine.

There was no significant difference in onset of sensory block between the groups. Addition of 50 μg of clonidine intrathecally did enhance the onset of sensory block and this finding is similar to that of study conducted by Singh RB et al. [9] and Pal R et al. [21].

Author Yoganarasimha et al. [22], in his study using 75μg of clonidine intrathecally showed addition of clonidine increases bupivacaine induced spinal blockade, providing prolonged post-operative analgesia and better surgical conditions.

Addition of clonidine enhanced onset of motor block but there was no statistically significant differencebetween two groups. Authors Yoganarasimha et al. [22] and Pal R et al. [21] in their studies showed addition of clonidine enhanced onset of motor block.

In our study maximum level ofsensory blockade attained was T4 in one patient in group C75 and T5 in 3 patients in group C50. Majority of patient attained T6 level, 83.3% (25/30 patients) in group C50 and 46.7% (14/30 patients) in group C75. The difference of height was statistically significant. Author Grandhe RP et al. [20] in his study compared combination of 1 μg/kg of clonidine and 1.5 μg/kg clonidine with bupivacaine in lower limb surgery patients and reported that maximum level attained was T6 in group using 1μg/kg and T5 in group using 1.5μg/kg.

With regard to time taken for two segment regression, group using 75μg clonidine had prolonged duration of two segment regression with statistical significance than group with 50 μg clonidine which was similar to study done by Thakur A et al. [23] and Sethi B S. [17] Author Thakur A et al. [23] compared addition of intrathecal clonidine 15 μg and 30 μg to hyperbaric bupivacaine in patients undergoing inguinal herniorraphy and concluded that two segment regression time was prolonged in group using 30 μg than group using 15 μg. In study done by Sethi BS et al. [22] using 1μg/kg clonidine intrathecally two segment regression was 218min similar to our study in group with 50 μg (200±53.8 mins).

Duration of analgesia was prolonged with statistical significance in group C75 compared to group C50 which was similar to studies done by RB Singh et al. [9] Thakur A et al. [23] and Dobrynjov I et al. [19]

Author RB Singh et al. [9] in his study using 50μg clonidine intrathecally reported duration of analgesia as 254.8±84.19 min which is similar to our study in group A (248.8±51.5 min). Author Dobrynjov I et al. [19] reported addition of 15 μg and 30 μg to bupivacaine prolonged time to first analgesic required and reduced post-operative pain.

Total duration of sensory blockade was prolonged significantly in group C75 compared to group C50 which was similar to study done by Strebel. S et al. [12], Dobrynjov I et al. [19] and DeKock M et al. [24] Author Dobrynjov I et al. [19] and Strebel S et al. [12] from their studies concluded duration of sensory was prolonged by addition of intrathecal clonidine in dose dependent manner.

De KockM et al. [24] in his study compared addition of 45 µg and 75 µg clonidine to bupivacaine and concluded addition of 75 µg significantly prolonged sensory and motor blockade.

Total duration of motor block was prolonged with statistical significance in group using 75 µg compared to group using 50 µg similar to study done by Sethi BS et al. [17] and Grandhe RP et al. [20] Author Sethi BS et al. [17] studied the efficacy of addition of intrathecal clonidine 1 µg/kg as adjuvant to bupivacaine and reported that duration of motor block was 205 min where as in our study in group using 50 µg , duration of motor block was 209.7±20 min.

Heart rate and BP remained relatively stable intra operatively and post operatively. In our study at baseline there was no significant difference in mean heart rate between 2 groups. Significant difference in heart rate was observed at various interval after spinal anaesthesia. Bradycardia was observed in 1 patient (3.3%) in group C50 and 9 patients in group C75 (30.3%). Bajwa BS et al. [25] in his study using 50 µg clonidine reported 1 patient had bradycardia which is similar to our study. Author Sethi BS et al. [17] observed few incidences of hypotension and bradycardia with 1 µg/kg clonidine used intrathecally.

Significant difference in MAP was observed between 2 groups at various intervals after spinal anaesthesia with increased incidence of hypotension in group C75, 2 patients (6.7%) in group C50 and 12 patients (40.3%) in group C75 had hypotension. Author Grandhe RP et al. [20] in his study reported significant decrease in MAP in clonidine group. There was significant incidences of hypotension requiring fluid or vasopressors as shown by Thakur A et al. [23] Hypotension was more in clonidine group with 30 µg than 15µg. Increasein doses increased incidencesof hypotension as shown by authors Dobrynjov I et al. [19] and Grandhe RP et al. [20] Author Yoganarasimha et al. [22] in his study using 75 µg of clonidine observed hypotension in 40% patients (10/25) and 6 patients had hypotension and bradycardia requiring atropine. Author RB Singh et al. [9] reported gradual decrease in MAP in 6% patients (3/50) requiring vasopressor in clonidine group similar to our study.

In our study there was no significant difference observed in sedation scores with patients in both groups. Author Pal R et al. [21] observed high sedation score with clonidine group compared with fentanyl and buprenorphine groups. Bajwa BS et al. [25] observed more sedation in clonidine group, 8 patients (16%) were drowsy and difficult to arouse. Author Sethi BS et al. [17] observed high sedation score in clonidine group using 1 µg/kg of clonidine intrathecally. Author Bhar S et al. [26] in his study reported that sedation was more in clonidine group when compared to neostigmine and dextrose groups.

Nausea was seen in 1 patient in group C75. Author Dobrynjov I et al. [19] reported nausea and vomiting in 1 patient in clonidine group using 15µg and 2 patients in group using 30 µg. Fewer incidences of nausea and vomiting was seen in the study done by Yoganarasimha et al. [22]. There was no incidence of respiratory depression and other adverse effects observed in both groups.

Conclusion

Addition of 75 µg of clonidine to intrathecal bupivacaine provides dose dependent prolonged sensory and motor block and effectively prolongs duration of postoperative analgesia than 50µg with minimal hemodynamic instability which requires constant vigilant monitoring.

Acknowledgement

I sincerely thank Dr. Ravi. M, our Professor for his support and guidance while conducting the study.

Key Messages

Spinal anaesthesia is safe technique for lower abdominal surgeries, local anaesthetics along with adjuvants shortens the onset and prolongs the duration of action and postoperative analgesia. Alpha 2 agonists are considered to improve the quality of anaesthesia better compared to other adjuvants. Clonidine in lower dosage maintained better haemodynamic stability.

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Conflicting Interest: None

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Original Research Article

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Comparison of Two Different doses of Clonidine Hydrochloride as an Adjuvant to Epidural Bupivacaine for Postoperative Analgesia

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Abstract

Context: The study was planned to assess the comparative efficacy, duration of analgesia block characteristics and hemodynamic or any adverse events on combining clonidine in two different doses with epidural Bupivacaine as adjuvant. *Settings and Design:* This study was an interventional, prospective, double blind, parallel group, randomised clinical study conducted on patients undergoing elective lower abdominal and lower limb surgeries. *Methods and Material:* This study was conducted on 80 patients of the American Society of Anesthesiologists (ASA) grade I or II, age 18 to 59 years and included both genders. In Study group A (n =40) 5ml (75µg) of the clonidine hydrochloride-bupivacaine solution added to 10 ml of 0.5% Bupivacaine to make a volume of 15 ml and given via epidural route. Study group B (n =40) 4ml (60µg) of clonidine hydrochloride-bupivacaine solution added to 11 ml of 0.5% Bupivacaine to make a volume of 15 ml and given via epidural route. Our aim was to compare the following factors in two groups – Onset of sensory and motor block, Level of sensory block, Duration of motor blockade and sensory analgesia, hemodynamic changes and adverse events if any. *Statistical analysis used:* The statistical analysis was done using the sample "t" test and chi-square test. The cleaned and checked data was entered in the computer through software Graph Pad Instat 3.1 and output was assessed. $P < 0.05$ was considered significant. *Results:* Onset of anesthesia was shorter in group B as compared to group A. The mean time for onset of sensory block and motor block in group A were 8.17±1.15 and 19.55±1.5 minutes respectively and in group B were 7.42±1.01 and17.17±1.37 minutes respectively and they were statically very highly significant ($p < 0.001$). The establishment of complete motor blockade was earlier in B group which was statistically highly significant ($p < 0.001$). There was no significant difference in respiratory depression, systolic and diastolic blood pressure in both the groups ($p>0.05$). *Conclusions:* both the doses of clonidine (60µg and 75µg) when administered through the epidural route with 0.5% Bupivacaine provide effective analgesia during intraoperative period. But in postoperative period, 75µg clonidine with 0.5% Bupivacaine provide prolonged analgesia as compared to 60µg clonidine without any significant increase in side effects and change in hemodynamic profile.

Keywords: Clonidine; Epidural; Bupivacaine; Postoperative Analgesia; Haemodynamics.

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Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage [1]. In pursuit of relief of pain, particularly pain during and after surgery, many attempts have been made since time immemorial. Pain is a natural protective gift but postoperative pain or its abnormal

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persistence, has a lot of disadvantageous effects. Postoperative pain is associated with delayed recovery from surgery, hypoventilation and its consequences, delayed ambulation with increased thromboembolic phenomenon, increases sympathetic stimulation and increased cardiac work load. Poorly relieved and prolonged pain may produce negative physical and psychological effects leading to sleeplessness, depression and psychosomatic changes [2].

Regional anaesthesia is noted for its simplicity, safety, and effectiveness. Anaesthesia with an efficient block, having least onset time and which can be prolonged with least complications is one of the challenges faced by the anaesthesiologist. A recent meta-analysis of multiple comparisons of neuraxial blockade to general anaesthesia has shown a significant reduction in mortality and morbidity with regional techniques [3]. Despite many advances in pain management, postoperative pain still remains an important cause of suffering [4].

Lower abdominal and lower limb surgeries may be performed under local, regional (spinal or epidural) or general anaesthesia, but neuraxial blockade is preferred mode of anaesthesia [5]. Major advantage of epidural anaesthesia over spinal anaesthesia is the ability to titrate the extent and duration of anaesthesia. Epidural analgesia provides better postoperative analgesia than parenteral opioids [6]. Also there is no limitation for the duration of surgery if an epidural catheter is in place. It can also be used as a modality for post-operative pain relief.

Local anaesthetics alone have been used for many years for central neuraxial blockade. In recent years, use of intrathecal and epidural adjuvant to local anaesthetics has gained popularity with the aim of prolonging the duration of block, better success rate and patient satisfaction, decreased resource utilization compared with general and faster recovery. Adequate pain management is essential to facilitate rehabilitation and accelerate functional recovery, enabling patients to return to their normal activity more quickly. Addition of an adjuvant has further enhanced the effectiveness of local anaesthetics as they not only help in intensifying and prolonging the blockade effect but also help in reduction of the doses of local anaesthetics and thus eliminating a few side effects [7,8]. Adjuvant like morphine, fentanyl, ketamine, neostigmine, midazolam, clonidine etc. have been used for this purpose.

Here, we have evaluated the block characteristics and hemodynamic or any adverse events on combining clonidine in two different doses with epidural Bupivacaine as adjuvant and comparing it for infra-umbilical surgeries.

Materials and Methods

This study was an interventional, prospective, double blind, parallel group, randomised clinical study conducted on patients undergoing elective lower abdominal and lower limb surgeries. The study conformed to the Helsinki declaration (World Medical Association, 1995) and the applicable guidelines for good clinical practices were looked into consideration. After approval of institutional ethical committee written informed consent were obtained from all the patients before the enrolment in the study. The exclusion criteria were patients refusal, ASA grade III and IV, infection at the site of injection, coagulopathy or on anti-coagulation therapy, congenital abnormalities of lower spine and meninges, active disease of central nervous system, history of alcohol abuse, history of allergy to local anaesthetics, any history of cardiopulmonary, renal, hepatic, neurological and psychiatric disorders, morbid obesity (BMI > 30 Kg/m2). This study was conducted on 80 patients of the American Society of Anesthesiologists (ASA) grade I or II, age 18 to 59 years and included both genders. Each patient fulfilling eligibility criteria was randomly allocated in two different groups (Group A & Group B) and were given a computer generated code in random way so that each patient is assigned to a group by chance not by choice. The codes were kept under sealed envelope by a person not involved in study.

A prospective sample size calculation indicated that 35 patients were required in each group to have a 80% power to detect a 25% difference at an Type I (α) error of 0.05 for the duration of analgesia and assuming a drop out of 10%, 40 patients was included in each study group.

Clonidine hydrochloride 150 µg (1 ml) diluted with 0.5% bupivacaine 9ml to make a concentration of 15µg/ml, then it will be mixed to 0.5% bupivacaine to make equivalence strength of 15 ml. Based on this, the study group will be divided into -

In Study group A (n =40) 5ml (75µg) of clonidine hydrochloride-bupivacaine solution added to 10 ml of 0.5% Bupivacaine to make a volume of 15 ml and given via epidural route.

In Study group B (n =40) 4ml (60µg) of clonidine hydrochloride-bupivacaine solution added to 11 ml of 0.5% Bupivacaine to make a volume of 15 ml and given via epidural route.

Preparation included an overnight fast of 8 hours before the surgery, premedication with a night before and on the morning of surgery with oral tablet alprazolam 0.25mg and tab ranitidine 150 mg. Time of epidural injection of the study drug was noted as "zero time". The onset of sensory block was tested by pin prick method using a 27 gauge hypodermic needle. The time of onset was taken from zero time to loss of bilateral pin prick sensation. The time interval between zero times to the patient inability to lift the straight extended leg (Modified Bromage scale 1) was recorded as onset time for motor block. The highest level of sensory blockade was assessed by pin prick method using a hypodermic needle. The highest dermatome level blocked was noted and recorded after the onset of motor block. Degree of motor block was assessed by Modified Bromage scale.

Modified Bromage Scale

0 - Able to raise leg straight, full flexion of knee and feet (Full movement)

1- Inability to raise leg, just able to flex knees, full flexion of feet

2- Unable to flex knees, but some flexion of feet possible

3-Unable to move leg or feet (No movement)

The duration of motor block was taken from zero time to complete regression of motor block (Ability to lift the extended leg i.e. Modified Bromage scale 0).

Duration of sensory analgesia was noted and recorded from the time when epidural drug was given to postoperative follow up till the patients complained of pain. Patients were asked to point out the intensity of their pain on visual analogue scale. Time at which patients complained of pain more than 5cm on the visual analogue scale was noted. That point was taken as the end point off air analgesia and was managed by the top-up doses of 8ml of 0.125% Bupivacaine for relief of postoperative pain. Time of first rescue analgesic required and VAS score at that time was noted.

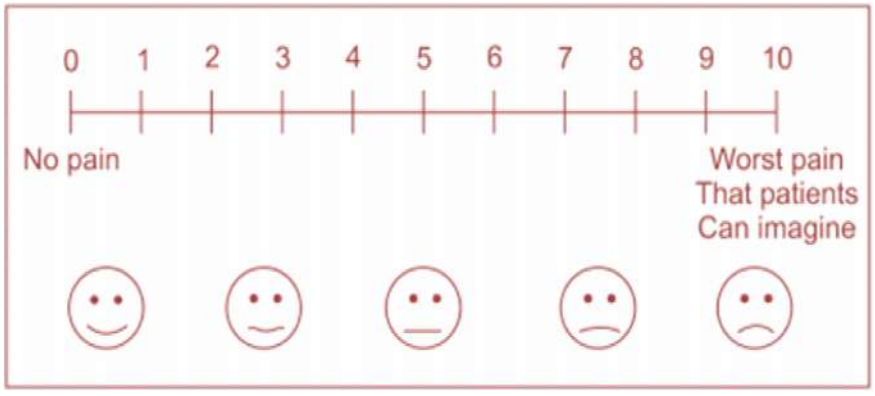
Patients were monitored for heart rate, blood pressure and respiratory rate at 0, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120 and 180 minutes after administration of epidural block. Side effects such as nausea, vomiting, hypotension, bradycardia, sedation, respiratory depression and retention of urine observed for, recorded and treated accordingly. The nature of the procedure was explained and the patients were taught to assess the intensity of pain using the visual analogue scale (VAS). In the visual analogue scale the patients were shown a scale of 10 cm length. Zero end of the scale was taken as "No Pain" and 10 cm marked as "Maximum Pain". Intensity of pain increases gradually from "0" to "10". Patients were instructed to point the intensity of pain on scale.

For the purpose of assessing the pain: 0-2.5 cm taken as no pain, 2.5-5 cm taken as mild pain, 5-7.5 cm taken as moderate pain, 7.5-10 cm taken as severe pain.

Predesigned patients record form (PRF), case record form (CRF) and other required formats were used for collecting and recording the data obtained at the time of intervention inside operation theatre. PRF was served the purpose of source data verification document. The data checked manually for correction of some minor errors like digit mistake, wrong unit measurement, data format mistakes etc. The statistical analysis was done using sample "t" test and chi square test. The cleaned and checked data was entered in computer through software Graph Pad Instat 3.1 and output was assessed. $P < 0.05$ was considered significant.

Results

Results are presented as Mean±SD for parametric data and as percentage for non-parametric data. Table 1 compares demographic profile among both groups. Both groups were



comparable with respect to their demographic profile. There was no significant difference in age, sex and weight.

Onset of anesthesia was shorter in group B as compared to group A. The mean time for onset of sensory block and motor block in group A were 8.17±1.15 and 19.55±1.5 minutes respectively and in group B were 7.42±1.01 and17.17±1.37 minutes respectively and they were statically very highly significant ($p < 0.001$). However, once sensory level was established at T6-T7 level, there was no noticeable

Table 1: Demographic characteristics

Characteristics	0.5%Bupivacaine + Clonidine 60µg (Group A)	0.5%Bupivacaine + Clonidine 75µg (Group B)	Remarks
Age	39.3±11.35	40.2±10.46	t=0.34 p=0.74 Not Significant (NS) P > 0.05
Sex	25:15	27:13	$\chi 2 = 0.055$, df = 1 p = 0.81 Not Significant p > 0.05
Weight	55.18±5.12	56.32±4.91	t=1.02 p=0.31 Not Significant P > 0.05

Table 2: Time of onset of sensory, motor block, duration of motor block and sensory analgesia

Parameter	0.5% Bupivacaine + Clonidine 60µg (Group A)	0.5% Bupivacaine + Clonidine 75µg (Group B)	Remarks
Onset of Sensory Block (Min)	8.175±1.15	7.42±1.01	t = 3.553, P < 0.001 Highly Significant
Onset of Motor Block (Min)	19.55±1.52	17.175±1.37	t = 7.384, p< 0.001 Highly Significant
Duration of Motor Block (Min)	241.40±15.72	257.23±15.53	t = 4.63, p< 0.001 Highly Significant
Duration Of Sensory Analgesia (Min)	351.10±20.38	372.32±21.54	t = 4.80, p < 0.001 Highly Significant

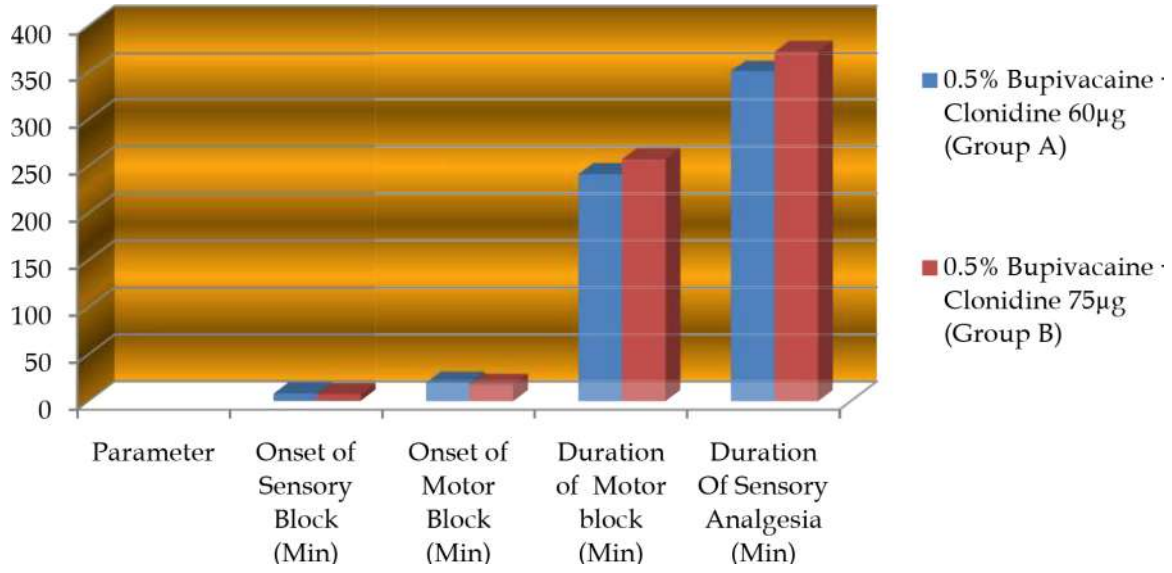


Fig. 1: Time of onset of sensory, motor block, duration of motor block and sensory analgesia

difference in sensory anaesthesia in either of the group throughout the surgical procedure. The establishment of complete motor blockade was earlier in B group which was statistically highly significant. ($p< 0.001$) as shown in Table 2.

Table 2 also shows that the mean duration of motor block and sensory analgesia in group A was 241.40±15.72 and 351.10±20.38 minutes respectively, whereas in group B it was 257.23±15.53 and 372.32±21.54 minutes respectively (Figure 1). The p value was <0.001, indicating that the difference was statistically highly significant. This implied that the duration of motor block and sensory analgesia in group B were significantly higher than group A.

Table 3 shows that there was no significant difference in heart rate and mean respiratory ratein both the group at any time during or after the procedure. However, there was equal incidence of fall in heart rate in both the group upto 45 minutes. Thereafter, heart rate remained almost stable without any significant fluctuation in both the group (Figure 2).

Table 3: Heart rate (HR)and respiratory rate (RR) comparison

Time interval(min)	0.5% Bupivacaine + Clonidine 60µg (Group A)	0.5% Bupivacaine + Clonidine 75µg (Group B)	Heart rate		0.5% Bupivacaine + Clonidine 60µg (Group A	0.5% Bupivacaine + Clonidine 75µg (Group B)	Respiratory rate		
	Mean±SD (HR)	Mean± SD (HR)	t value	P value	Mean±SD (RR)	Mean±SD (RR)	t value	P value	
0	82.90±4.46	82.80±4.31	0.10	0.91	13.95±0.96	13.70±1.16	0.91	0.37	NS
5	82.20±4.63	81.92±4.30	0.27	0.78	14.30±0.76	14.05±1.01	1.22	0.23	NS
10	81.68±3.98	81.65±3.98	0.02	0.98	14.52±0.93	14.40±0.70	0.87	0.39	NS
15	79.62±4.58	78.87±4.31	0.95	0.35	14.65±0.83	14.50±1.01	0.76	0.45	NS
20	78.72±3.98	78.40±3.93	0.42	0.67	15.07±1.23	14.82±1.30	0.89	0.37	NS
25	76.37±4.30	76.10±4.35	0.19	0.85	15.12±1.20	14.90±0.78	0.95	0.35	NS
30	75.05±4.24	74.80±4.31	0.30	0.76	14.75±1.28	14.62±0.84	0.51	0.61	NS
45	74.42±4.28	74.20±4.30	0.27	0.78	14.75±0.70	14.60±0.98	0.73	0.47	NS
60	75.30±4.51	74.90±4.28	0.45	0.65	14.45±0.96	14.32±0.94	0.56	0.57	NS
90	77.07±4.60	76.50±4.31	0.66	0.51	14.55±0.78	14.45±0.68	0.63	0.53	NS
120	78.67±4.44	78.10±4.10	0.70	0.49	14.40±0.74	14.35±0.95	0.25	0.80	NS
180	79.87±4.40	79.65±4.35	0.26	0.79	14.32±0.69	14.20±0.76	0.84	0.40	NS

Table 4: Systolic blood pressure (SBP) andDiastolic blood pressure (DBP) comparison

Time interval(min)	0.5% Bupivacaine + Clonidine 60µg (Group A)	0.5% Bupivacaine + Clonidine 75µg (Group B)	SBP		0.5% Bupivacaine + Clonidine 60µg (Group A	0.5% Bupivacaine + Clonidine 75µg (Group B)	DBP		
	Mean±SD (SBP)	Mean± SD (SBP)	t value	P value	Mean±SD (DBP)	Mean±SD (DBP)	t value	P value	
0	121.05±6.53	120.32±7.03	0.48	0.63	79.90±4.49	79.30±4.90	0.57	0.57	NS
5	115.60±6.30	114.25±6.68	0.93	0.35	76.78±4.68	76.57±4.84	0.19	0.84	NS
10	111.37±6.87	110.30±6.60	0.71	0.48	74.42±4.65	73.95±4.73	0.45	0.65	NS
15	107.60±6.57	106.80±6.40	0.55	0.58	72.32±4.45	72.00±4.52	0.32	0.74	NS
20	105.30±6.07	104.70±6.20	0.48	0.66	70.37±4.43	70.05±4.01	0.35	0.72	NS
25	105.05±4.73	104.67±4.97	0.35	0.73	68.87±4.10	68.60±3.61	0.34	0.74	NS
30	106.30±4.50	105.97±4.54	0.32	0.74	69.17±3.40	68.87±3.20	0.39	0.70	NS
45	108.37±4.80	108.35±4.99	0.02	0.98	71.17±3.15	70.70±3.11	0.66	0.51	NS
60	110.42±4.60	110.15±4.84	0.26	0.79	72.40±3.36	72.00±3.38	0.51	0.61	NS
90	111.87±4.90	111.42±4.97	0.40	0.68	73.80±3.36	73.12±3.46	0.92	0.36	NS
120	113.62±4.92	113.72±4.89	0.09	0.92	75.50±4.02	75.07±3.59	0.52	0.60	NS
180	115.32±4.96	115.15±5.16	0.15	0.87	77.15±3.74	76.35±3.68	0.98	0.33	NS

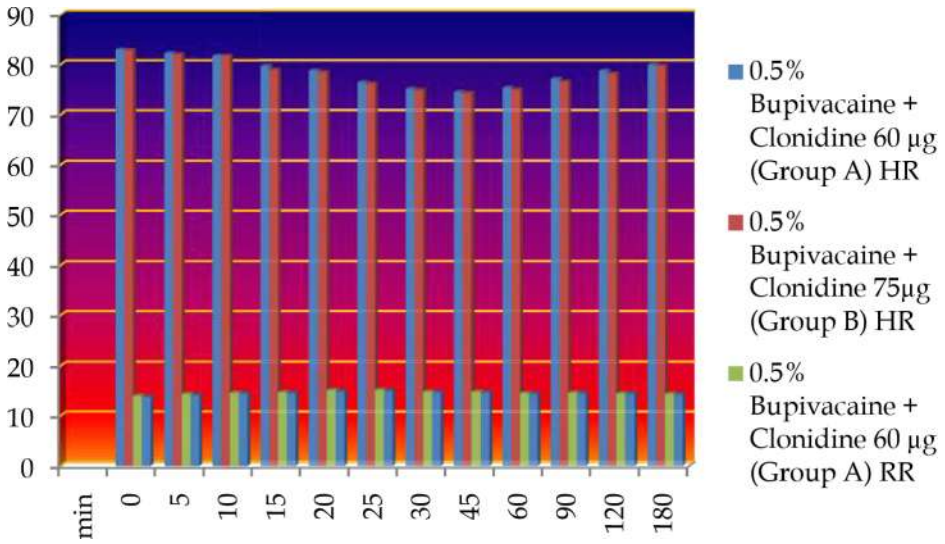


Fig. 2: Heart rate (HR)and respiratory rate (RR) comparison

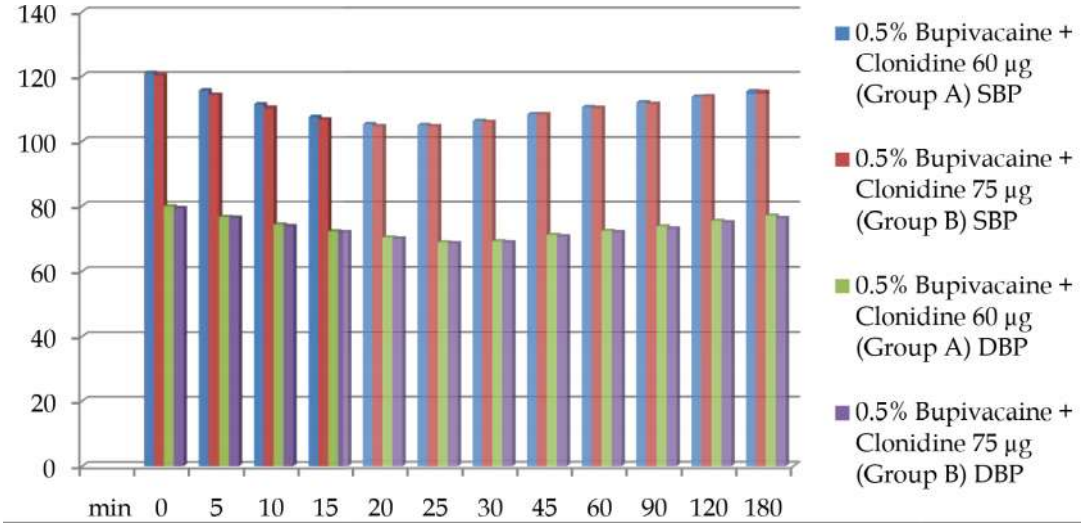


Fig. 3: Systolic blood pressure (SBP) andDiastolic blood pressure (DBP) comparison

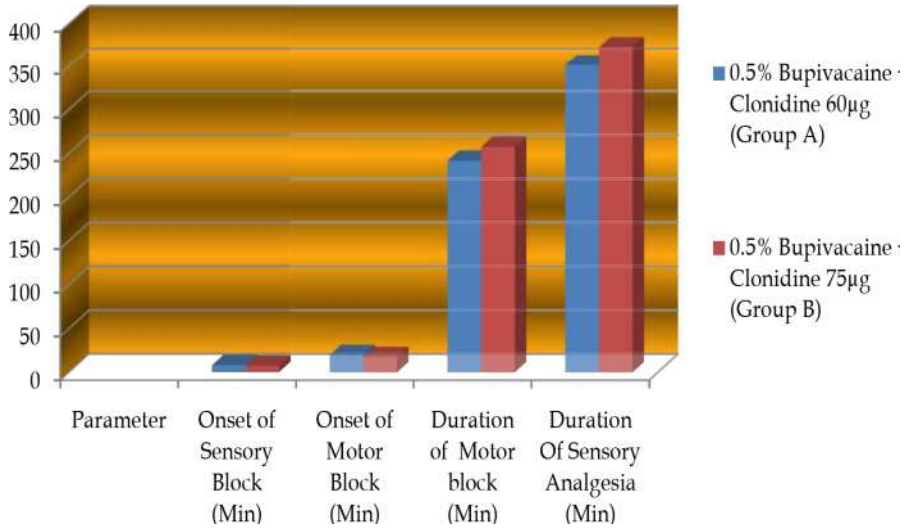


Fig. 4: Side effects

Table 5: Side effects

Side effects	0.5% Bupivacaine + Clonidine 60µg (Group A)		0.5% Bupivacaine + Clonidine 75µg (Group B)		Remarks
	No.	%	No.	%	P value
Hypotension	2	5	3	7.5	
Bradycardia	0	0	0	0	
Respiratory Depression	0	0	0	0	
Dry Mouth	2	5	2	5	
Sedation	1	2.5	2	5	>0.05
Nausea	2	5	1	2.5	
Vomiting	1	2.5	1	2.5	
Retention of urine	0	0	0	0	

There was equivalent decrease in systolic blood pressure in both the group which can be due to hypotensive action of clonidine.But no significant difference in systolic blood pressure was noted in both the groups (p>0.05). There was no significant difference in diastolic blood pressure in both the groups (p>0.05). However, equivalent fall in diastolic blood pressure was shown in both the group as shown in Table 4. Figure 3 shows the graphical representation of fall in systolic and diastolic blood pressure.

In group A 5% patients had hypotension, dry mouth, nausea and 2.5% had sedation and vomiting while in group B 7.5% had hypotension, 5% had dry mouth, sedation and 2.5% had nausea and vomiting (Figure 4). There was no significant difference between the two groups with regard to these side effects. (p> 0.05) as shown in Table 5.

Discussion

The incidence of postoperative pain varies with individual patients. The state of pain following a surgical procedure is a combination of pain as a specific sensation due to nociceptive response to tissue damage and pain as a suffering. Uncontrolled postoperative pain can result in several negative physiological effects that include disturbances of respiratory, cardiac, gastrointestinal, coagulation, renal, endocrine, autonomic and central nervous system function. Addition of adjuvant to local anaesthetic through epidural route increases the duration of analgesia and intensity of block with minimum stress response, thereby resulting in early ambulation and lesser postoperative morbidity.

In our study, the mean time for onset of sensory block and motor block in group A was 8.17±1.5 and 19.55±1.5 minutes respectively and 7.43±1.01 and and few minutes earlier in group B as 17.17±1.38 minutes in group B respectively. The difference was statistically highly significant. So it indicates that addition of clonidine as an adjuvant in dose of 75µg shortens the onset of sensory blockade in comparison to 60µg. (p<0.001). Previous studies [9, 10,11,12,13] concluded that that addition of clonidine as an adjuvant shortens the onset of sensory and motor blockade which is similar to our study. Highest level of sensory block was assessed by alcohol wick method after the onset of motor block. In our study, patients of group A attained the following level of sensory block: 65% attained T6 level, 25% attained T7 level, 5% attained T8 level, 2.5% attained T9 and T10 level each. In group B , 55% attained T6 level followed by 30% attaining T7 level, 2.5% attaining T8 level, 7.5% attained T9 level and 5% attained T10 level. This implied that the highest level of sensory block achieved in both groups were similar (p=0.49). Brockway MS et al. [14] conducted a study comparing 0.5% and 0.75% Bupivacaine with 0.5%, 0.75% and 1% Ropivacaine. They found the mean upper limit of sensory block to be T6. Duration of motor blockade was assessed from the time of administration of the drug to complete motor recovery (Bromage scale 0). In our study, the mean duration of motor block in group A was 241.40±15.72 minutes whereas in group B it was 257.23±15.53 minutes. This difference was statistically highly significant (t value = 6.91) (p < 0.001). Karki G et al. [11] concluded that that addition of clonidine prolongs the duration of motor block which is comparable to our study. Malinovsky JM et al. [15] concluded that the intensity and duration of motor block of intrathecal ropivacaine were similar with bupivacaine. Parikh TJ et al. [16] in their study found that first rescue analgesia required after 7.45 ±0.44 hours in clonidine group as compared to 8.35± 0.42 h in morphine group. They concluded that epidural morphine plus bupivacaine has a longer duration of analgesia as compared to epidural clonidine plus bupivacaine for postoperative analgesia. Krishnamoorthy K et al. [17][7] in their

study used low dose of clonidine and found that addition of clonidine prolongs the duration of analgesia which is comparable to our study.

In our study, Baseline systolic BP, diastolic BP and heart rate were comparable. After epidural anaesthesia, there was fall in systolic, diastolic BP and HR in each group. However, there was equal incidence of fall in heart rate in both the group upto 45 minutes .Thereafter, heart rate remained almost stable without any significant fluctuation in both the group. This can be possibly due to the effect of clonidine. There was no significant difference in heart rate in both group in peri or postoperative period. However Gupta S et al. [9] studied that a comparison of homodynamic effects of the drug shows statistically highly significant fall in MAP at 30 minute and decrease in heart rate at 60 minute intraoperatively in the Clonidine group as compared to control group. Karki G et al. [11] found that there was fall in systolic, diastolic BP and HR but after 45 minutes they returned to baseline value. Studies conducted by Hayashi Y et al. [18] and Eisenach et al. [19] concluded the fact that central mediated hypotensive effect of clonidine is mainly due to inhibition of sympathetic outflow and the potentiating effect of parasympathetic nervous system activity. In contrast, adding 150µg clonidine to a smaller dose of bupivacaine (5mg) cause a greater decrease in blood pressure. Sia AT et al. [20] concluded the fact that clonidine does not produce an additional hypotensive effect when combined with local anaesthetics, there is a potential for exacerbating hemodynamic depression from the combination of intrathecal clonidine with opioids. In the study conducted by Brockway MS et al. [21] the systolic and diastolic blood pressure decreased by about 20% from the baseline values over the first 20 minutes whereas heart rate tended to increase over first 15 minutes and thereafter decrease to slightly less than the baseline. This was comparable to our study.

In our study use of either 60µg or 75µg of clonidine with bupivacaine resulted in slight fall in blood pressure which is similar to above studies and requiring injection mephentermine in some patients of both groups after epidural anaesthesia. There was no significant variation in blood pressure in both the group. None of our patients experienced respiratory depression and no changes in mean respiratory rate between both groups and differences were statically non-significant which was corroborated with other studies [9,11,21,22,23,24].

In group A 5% patients had hypotension, dry mouth, nausea and 2.5% had sedation and vomiting while in group B 7.5% had hypotension, 5% had dry mouth, sedation and 2.5% had nausea and vomiting indicating no significant difference between the two groups with regard to these side effects ($p > 0.05$). Few patients developed moderate hypotension in both groups and were treated by injection mephentermine upto a maximum dose of 18mg. Hemodynamic side effects like hypotension and bradycardia neither had any major impact nor any squeal on the intraoperative or postoperative period in our study groups. Any side effects like hypotension, bradycardia and transient sedation are mainly depend upon doses and routes of administration of clonidine such as intrathecal or epidural route [18,19]. Previous studies [18,25,26] concluded that 150µg intrathecal clonidine produces notable side effects including hypotension, sedation and dry mouth, although no delayed hypotension or bradycardia in women undergoing caesarean section operations. We found fewer studies [18,27,28] concluded the fact that interaction of clonidine with central $\alpha 2$ receptors causes sedation similar to our study while augmentation of parasympathetic system and inhibition of sympathetic outflow activity are mainly responsible for centrally mediated hemodynamic effects. These effect become more pronounced with larger intrathecal doses (>450µg) of clonidine.

Klimscha W et al. [29] compared epidural clonidine and bupivacaine with intrathecal clonidine and bupivacaine. They reported that the spinal route led to a significantly greater reduction in blood pressure with no additional analgesia. In contrast to above studies our study concluded that epidural clonidine and bupivacaine led to a moderate reduction in blood pressure in few patients but they are clinically not significant with increase in duration of postoperative analgesia.

Conclusion

Based on this clinical comparative study, we concluded that both the doses of clonidine (60µg and 75µg) when administered through epidural route with 0.5% bupivacaine provide effective analgesia during intraoperative period. But in postoperative period, 75µg clonidine with 0.5% Bupivacaine provide prolonged analgesia as compared to 60µg clonidine without any significant increase in side effects and change in hemodynamic profile. Hence, 75µg clonidine is more effective as an adjuvant to local anaesthetics when used through epidural route for postoperative analgesia.

Key Messages

75µg clonidine is more effective as an adjuvant to local anaesthetics in comparison to 60 µg when used through epidural route for postoperative analgesia.

Conflict of Interest: NIL

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Original Research Article

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Evaluation of Dexmedetomidine as an Additive to Ropivacaine for Popliteal Approach for Sciatic Nerve Block for Foot Surgeries

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Abstract

Introduction: Peripheral nerve blocks are used in varieties of surgical and diagnostic procedures. Various methods or approaches have been tried to prolong the duration of nerve blocks. Dexmedetomidine acts selectively on alpha-2 adrenergic receptor agonist and can be a promising adjuvant to local anaesthetics. Our study evaluates the clinical efficacy of dexmedetomidine added to Ropivacaine for sciatic nerve block. *Material and Methods*: Patients undergoing foot surgeries were divided randomly into two groups. Group RS (n = 30): received 19.5 ml of 0.75% Ropivacaine and 0.5 ml saline for sciatic nerve block via popliteal approach and Group RD (n = 30): received 19.5 ml of 0.75% Ropivacaine with 0.5 ml (50 mg) of dexmedetomidine. *Result:* The onset time of sensory block (mean) in minutes was 8.64±2.4 in RS Group, 5.78±2.7 in RD Group ($p < 0.001$). The mean time for onset of motor block, in minutes, was 10.42±3.6 in RS Group, 8.78±1.7 in RD Group ($p < 0.001$). The difference in regards to duration of sensory and motor block was statistically significant, with RD Group faring better than RS Group. The mean time to rescue analgesia, in minutes, was 339.8±29.31 in Group RS and 512.43±30.92 in Group RD ($p < 0.001$). The quality of anaesthesia was better and sedation scores were more in group RD versus group RS. *Conclusion*: The overall quality of anesthesia achieved with 50 μg dexmedetomidine as an additive to 0.75% Ropivacaine is more effective in terms of duration and intensity of analgesia in comparison to 0.75% Ropivacaine alone.

Keywords: Adrenergic α2-Receptor Agonists; Ultrasonography; Dexmedetomidine; Sciatic Nerve.

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Introduction

Nerve block, now a day's is a very commonly used regional anaesthesia technique in various procedures ranging from diagnostic to surgical and interventional ones. There are a few limitations which are inherent to perioperative peripheral nerve block techniques like the duration of block is limited and hence patient may require analgesics early in postoperative period. Along with that, there is possibility of side effects of opioids on the central nervous, hemodynamic and respiratory systems.

Various methods or approaches can be tried to enhance the duration of nerve block. One good alternative is Continuous catheter technique, but it has logistical challenges like continuous observation of catheter is required and its associated complications such as catheter displacement [1] and infection [2-4]. Other alternatives include addition of adjuvant drugs such as alpha-2 adrenergic receptor agonists, opioids, ketamine, dexamethasone to increase block duration [5-6].

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Dexmedetomidine [7,8] is a highly selective alpha-2 adrenergic receptor agonist with various properties such as analgesic, sympatholytic, sedative and amnestic . Various studies have been published which include both clinical and Experimental trials, with various doses ranging between 20 and 150 μg of Dexmedetomidine as an additive to local anaesthetics [1,9-14]. In 2004, Dexmedetomidine was used for the first time as an additive to supplement intravenous regional anesthesia [15]. In recent years, it has been investigated and found effective in both clinical studies [7] and animal models as an adjuvant to local anaesthetics during peripheral nerve blockade [17,18]. Esmaoglu et al. [19] reported improvement in the quality of the block (that is early onset time and extended duration of block) in their axillary brachial plexus block in which dexmedetomidine was used as an adjuvant to levobupivacaine. Brummett et al. [17] also found that adding dexmedetomidine to Ropivacaine caused nearly 75% increase in analgesic duration in rats. However, the investigations are confined to a single terminal nerve branches like ulnarnerve or brachial plexusblockade for upper extremity block [20]. The combination of dexmedetomidine with local anaesthetics for nerve block, helps to prolong the time to first use of systemic analgesia which makes it clinically relevant. Therefore we designed our present prospective, randomised and double blinded study to evaluate the block characteristics of Ropivacaine alone, and with dexmedetomidine (50 μg) as adjuvant for popliteal approach to sciatic nerve block (PSNB) and its effect on block characteristics like sensory and motor onset and duration. We used a surrogate pharmacodynamic parameter (i.e. duration of sensory blockade) in the present study to evaluate the addition of dexmedetomidine to Ropivacaine for this nerve block.

Material and Methods

The present study was carried out in our institute over a period of 1 year from Jan 2017 to Dec 2017. After ethical committee approval, Written and informed consent was obtained from the patients for their participation in the present study. Patients of both sexes, with American Society of Anaesthesiologists (ASA) physical status I and II, between 18 and 60 years, undergoing foot surgeries, were enrolled in our study. Patients were randomized to receive sciatic nerve block via popliteal approach and were randomly allocated into two groups. The patients, who consented, were divided into two groups, by allocating them a random number by chit in the box method. Sixty patients were allocated into one of the groups: Group RS (n = 30): Received 19.5 ml of 0.75% Ropivacaine and 0.5 ml normal saline. Group RD (n = 30): Received 19.5 ml of 0.75% Ropivacaine with 0.5 ml (50 μg) dexmedetomidine for nerve block anaesthesia. Popliteal block was performed under USG guidance. Patient was observed for 24 hrs.

Inclusion Criteria

Patients who were scheduled for elective foot surgeries such as debridement of foot/ankle and toe surgeries were screened.

Exclusion Criteria

Patient refusal, diabetes mellitus, history of allergy to local anaesthetic or dexmedetomidine, infection at site of injection site, psychiatric disorders or likely to be uncooperative during surgery, patients already treated with alpha2 adrenoreceptor agonist, pregnant patients were excluded.

Baseline hemodynamic parameters, heart rate, NonInvasive Blood Pressure (NIBP), Mean Arterial Pressure (MAP), pulse oximetry, respiratory rate, and temperature were recorded. ASA standard monitors were attached (pulse oximeter, ECG, NIBP, RR, temprature). Patients were premedicated with i.v. midazolam 1.5 mg before performing block to allay anxiety. Ultrasonography-guided sciatic Nerve Block Technique via popliteal approach- After intravenous (IV) access, patient was turned to lateral decubitus position and skin preparation was done with povidone- iodine. In the popliteal fossa, the sciatic nerve was identified by ultrasonography (Sonosite) using a linear array 6 to15-M Hz ultrasonography probe. Nerve was visualised along its course till it divides into the tibial nerve and common peroneal nerve. After skin infiltration with local anaestheic, a 21-G short-bevel insulated needle was inserted and advanced under a short axis view of the target utilizing an in-plane needling approach. The LA mixture was then deposited under direct ultrasonographic visualization (total volume of 20mL) inside the facial plane of the common paraneural sheath, below and above the sciatic nerve at the point where the tibial nerve and common peroneal nerve unite. "Donut" signs indicated successful distribution of the study solution around the posterior tibial nerve and the common peroneal nerve. The mixture was injected in 5-mL aliquots with intermittent confirmation of negative blood aspiration.

Ropivacaine was chosen as the local anaesthetic because of its favorable clinical [21,22] and toxicity profile [23]. Of the avail-able concentrations, the 0.75% concentration was selected based on previous studies [21,24]. Ropivacaine 0.75% (19.5 mL) was mixed with either 0.5 mL of saline (control group) and 0.5 mL of dexmedetomidine (50 mcg), according to randomization. The drug or the mixture was prepared by the pharmacist (blinded) and the blinded block performer was blinded also. In total, 20 mL of local anaesthetic mixture was injected. Two anaesthesiologists, experienced with the popliteal block performed all blocks. An assistant blinded to group allocation evaluated sensory and motor block every 2 minutes after injection till 20 minutes and every 5 minutes i.e 25 and 30 min.

Parameters

Assessment of Sensory and Motor Blockade- The onset of Sensory and motor block and the duration of the block were noted by observer. The baseline assessment was done before block placement. Second, the onset of sensory and motor block was assessed at 2-minute intervals starting 2 minutes after block placement upto 20minutes, then again at 25 and 30 minutes after the sciatic nerve block. The onset time for sensory or motor block, more than 30 minutes was determined as a failed block. The sensory and motor block duration was assessed at the end of surgery and then at 2, 4, 6, 8, and 24 hours to avoid disturbing patient's sleep in wards after surgery. Evaluation of sensory and motor block duration was done by asking a set of questions: "When did the patient start to feel sensation returning in the foot," "The time at which pain was felt in the foot," and "Time at which patient could move toes on the operated side?". Inj. Paracetamol 1 gm was given as first rescue analgesic for the patients requiring supplemental analgesia in wards. Sensory assessment of nerve block was performed in dermatomal area using pinprick test (contralateral extremity was taken as a control). Motor blockade was then assessed using a 3-point scoring system, with 0- indicating normal muscle power or 5/5; 1- reduced muscle power (2 to 4/5); only plantar or dorsiflexion; and 2-complete motor block (0/5) no plantar and dorsal flexion.

Onset of motor block and duration were identified as follows: onset of motor block from the end of injection to complete motor blockade and motor block duration from the end of injection to complete return of baseline motor strength.

Evaluation of quality of Surgical Anaesthesia - Quality of surgical anaesthesia was assessed and divided into 1 of 3 levels as follows:1,excellent (complete surgical anaesthesia without the requirement of any supplemental medications); 2, good to intermediate (very mild discomfort requiring very small amounts of sedation, e.g., routine sedation was inj. Midazolam 1.5mg; and 3-poor (block failure that required conversion to general anaesthesia).

Sedation Score- sedation level (30 minutes after block) was assessed using the Ramsay sedation scale [25] where 0-2 points represents inadequate sedation, 2 to 4 points indicates satisfactory sedation, and >4 points signify excessive sedation as follows:

1. Patient fully awake and oriented;
2. Patient cooperative, drowsy and tranquil;
3. Patient asleep but responds to oral commands;
4. Asleep but awakened by response to light glabellar tap or auditory stimulus;
5. Asleep and sluggish responding to light glabellar tap or auditory stimulus;
6. Asleep without any response to light glabellar tap or auditory stimulus.

The onset time for Sensory block onset time: time from performance of the block to pinprick 0% in dermatomal spread. Duration of sensory block: time during which pinprick 0% persisted in all areas. Complete recovery from sensory block: time from performance of the block to pinprick 100% in all sensory areas. Time to use of first systemic analgesia was recorded. Side effects such as nausea/vomiting, hypotension, bradycardia, pruritus etc were recorded. Hemodynamic parameters were monitored after block till end of surgery.

Monitoring for Evidence of Adverse Effects- Commonly observed adverse effects [26] from dexmedetomidine administration are excessive sedation (1 to 6 as defined above), respiratory depression (respiratory rate of 10 breaths/min), nausea, vomiting, hypotension (mean arterial pressure - 20% decrease from baseline), and bradycardia (heart rate of 50 beats/min). Atropine and ephedrine were prepared and kept ready if needed for treatment of hypotension and/or bradycardia.

Statistical Analysis

A pilot trial which was conducted initially to access sciatic nerve sensory block onset time using 5 patients in each group suggested a mean (SD) of 8.6 (3.5) min in the RS group and 12.2 (4.5) min in the RD group. Therefore, a 2-tailed type I error of 5% and type II error of 10% (α ¼ 0.05, β ¼ 0.1) required, a sample size of 28 patients per group by sample size [PASS] 11.0. Considering potential dropouts, 30 patients were recruited in each group. Student's t test was used

to compare quantitative variables with normal distribution, which included variables like the onset time and duration of sensory and motor blockade. Chi square analysis was used for comparison of categorical variables. All data are presented as mean (SD), and p value of 0.05 was considered statistically significant.

Results

Eighty five patients were screened and 21 patients were excluded (not meeting inclusion criteria-6, declined to participate -14, other reason -1). 64 patients were randomized and 2 were excluded from each group because of block failure and hence

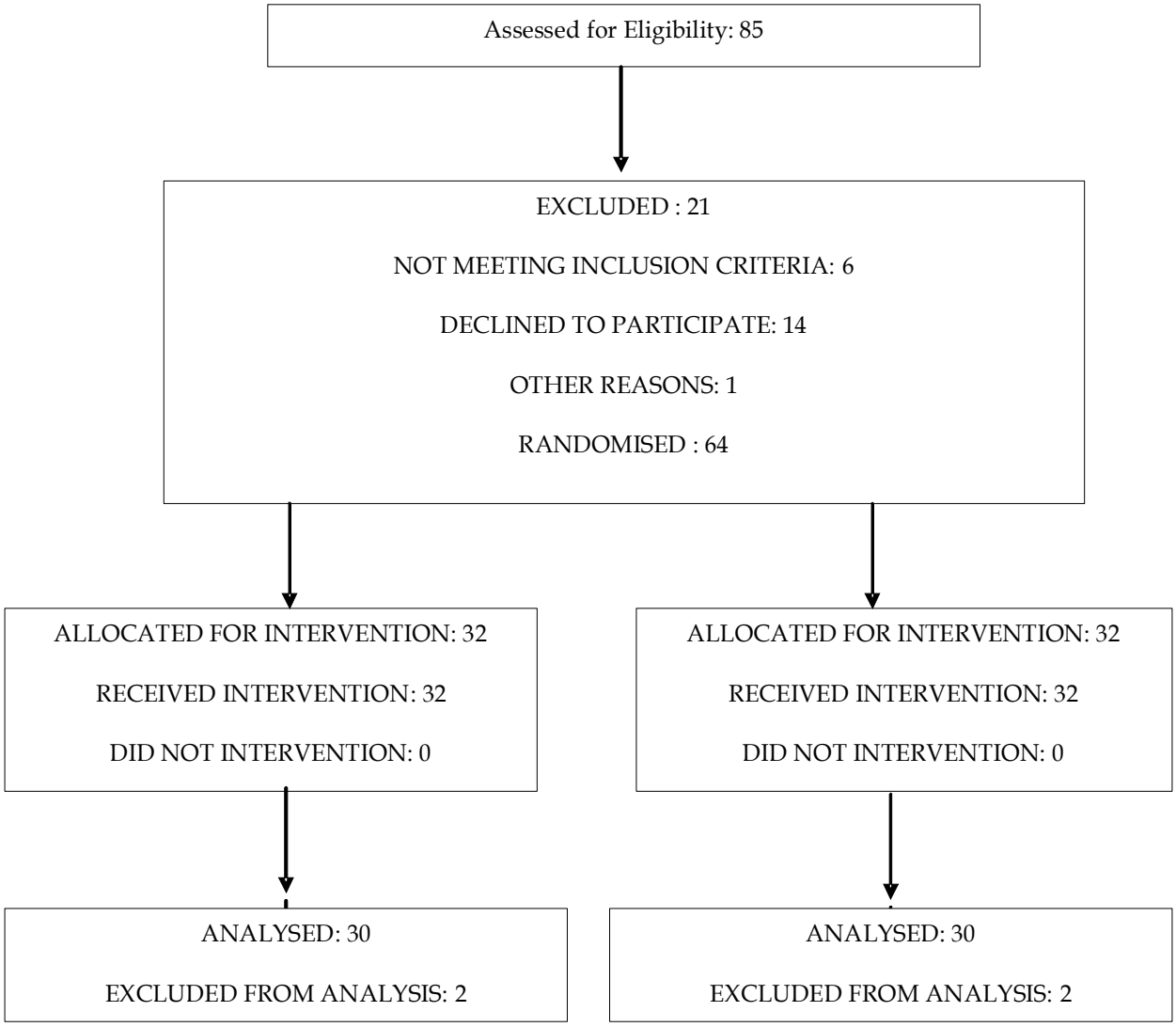

Fig. 1:

Table 1: Demographic profile

Groups	Group RS	Group RD	P Value
Mean age (years)	43.67±13.93	45.63±12.81	0.5428
Duration of surgery(min)	56±10.11	57±11.20	0.6282
Weight (kg)	68.45±9.65	70.71±10.82	0.7064
Height(cm)	166.36±7.59	163.47±8.89	0.5457
Sex (M:F) distribution	14:16	18:12	

Table 2: Block variables

Groups	RS group mean (SD)	RD group mean(SD)	P value
Sensory onset time (min)	8.64±2.4	5.78±2.7	<0.001
Motor onset time(min)	10.42±3.6	8.78±1.7	<0.001
Duration of sensory block(min)	323.65±21.23	466.24±29.84	<0.001
Duration of motor block(min)	248.67±28.34	276.41±33.41	<0.001
Time for first analgesic (min)	339.31±29.31	512.43±30.92	<0.001

Table 3: Quality of surgical anaesthesia

Anaesthesia characteristics	Group RS	Group RD	P value
Excellent	10	16	<0.001
Good to intermediate	20	14	<0.001
Poor	0	0	0.00

Table 4: Sedation score

Sedation score	Group RS	Group RD	P value
0-2	30	26	<0.001
2-4	0	4	<0.001
>4	0	0	0.00

Table 5: Side effects

	Group RS	Group RD	P value
Nausea/vomiting	0	0	0.00
Bradycardia	1	2	>0.05
Hypotension	0	0	0.00
Pruritus	0	0	0.00
Shivering	0	0	0.00

60 patients were analysed (Figure 1). Both groups (RS and RD) had similar demographic characteristics in terms of equal numbers of males and females, similar ages ranging from 18 to 60 years, and comparable characteristics in terms of patient height and weight (p value 0.05) (Table 1).

The mean time for sensory onset was 8.64±2.4 min in RS group versus 5.78±2.7 min in RD group (Table 2). The mean onset time for motor block was 10.42±3.6 min and 8.78±1.7min in RD group. The duration of sensory block was 323.65±21.23 min in RS group versus 446.24±29.84 min in RD group. The mean duration of motor block was 248.67±28.34 min in RS versus 276±18.65 min in RD group which was significant (p value <0.001). The time of first rescue analgesic was 339.8±29.31 in group RS and 512.43±30.92 in group RD (p value<0.001). The quality of surgical anaesthesia was excellent in 10 patients in group RS and 16 patients in group RD (p value<0.001), good to intermediate in 20 patients in group RS and 14 patients in group RD (p value <0.001), poor in 2 patients (required conversion to general anaesthesia) in each group and hence they were excluded from the study (Table 3). No nerve block associated or dexmedetomidine-related adverse effects were reported. Patients in RD group were more sedated than group RS (Table 4). Excessive sedation, respiratory depression, nausea, vomiting, hypotension, or bradycardia was observed in neither group of patients (Table 5). Postoperative

clinical examination of patients revealed no impairment of sensory or motor function and no evidence or symptoms of nerve injury.

Discussion

Various experimental, animal and clinical trials have investigated Dexmedetomidine as an additive drug for regional anaesthesia. Brummett et al. [17,18] reported that dexmedetomidine has sedative, analgesic, hemodynamic stabilizing properties and sympatholytic pharmacological effects. They also reported that addition of dexmedetomidine prolonged the duration of sciatic nerve block by using different long-acting local anaesthetic drugs in rats. They used alpha-2-adrenergic receptor agonist and reported increase in duration of thermal anti-nociception and analgesia in few animal studies. The perineural mechanism of action has also been confirmed by Brummett et al. [17] in animals. Brummett et al. [27] have also concluded that perineural dexmedetomidine added to Ropivacaine for sciatic nerve blockade in rats prolonged duration of analgesia by probably blocking the hyperpolarization-activated cation current and not by an α2-adrenoceptor antagonist. Centrally, α2 agonists also inhibit the release of substance P in the nociceptive pathway, mostly at the level of the dorsal root neuron and by activation of α2-adrenoceptors in the locus coeruleus [28]. Multiple randomized controlled trials have been conducted since 2004, when dexmedetomidine was used [15] for the first time. A recent meta-analysis was conducted to examine its effectiveness as an additive to peripheral nerve block [29]. Abdallah et al. recently published a meta-analysis in which they examined four studies of dexmedetomidine as an additive for brachial plexus blocks [29]. The analysis concluded that addition of dexmedetomidine significantly prolonged mean motor block by 268 minutes and the time to first analgesic by 345 minutes. However, in their study the mean sensory block prolongation of 284 minutes was not statistically significant. The doses used in the four studies looking at brachial plexus blocks were 30mcg, 100mcg, 0.75mcg/kg, and 1mcg/kg. None of their studies examined in this analysis described hypotension as an adverse effect, and incidence of bradycardia was less than 10% . Our results are consistent with them.

Another recent study stated that the dexmedetomidine as an adjuvant to ropivacaine for cervical plexus block increased the duration of block by approximately 50 minutes [30]. In another volunteer study, dexmedetomidine was added to Ropivacaine for ulnar nerve blocks and prolonged the analgesia by 200-minute [31]. In contrast, dexmedetomidine when administered systemically, increased the duration of analgesia by only 50 minutes. In another volunteer study, in which dexmedetomidine was added to Ropivacaine for posterior tibial nerve blocks, resulted in a prolongation of analgesia duration by approximately five hours [32]. Another recent study reported that the duration of sensory and motor block with dexmedetomidine as an adjuvant to bupivacaine supraclavicular blocks was almost twice as long, when compared to the addition of clonidine [33]. In our study, we have found that addition of Dexmedetomidine (50μg) to 20 ml of Ropivacaine 0.75% in ultrasound guided sciatic nerve block via popliteal approach resulted in quicker onset time for sensory and motor block, it prolonged the duration of both sensory and motor block and delayed time for first resque analgesia and quality of anaesthesia was better when compared with Ropivacaine alone.

Limitations of study

The small sample size of our study cannot assess for all efficacy and safety parameters of perineural dexmedetomidine administration. Dexmedetomidine use in patients with co-morbidities needs to be investigated further.

Conclusion

Addition of dexmedetomidine to Ropivacaine resulted in early onset, prolongs duration of sensory block and delayed requirement of first analgesic in post operative period. Advantages like quicker onset and longer duration of nerve block can deliver both clinical and economic benefits in optimal patient care. However, further studies on perineural dexmedetomidine doses and their response, efficacy, and safety profile are needed.

Conflict of Interest: NIL.

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A Comparative Study of Hemodynamic Response and Ease of Intubation in Patients Intubated by Direct Laryngoscopy Versus Lightwand

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Abstract

Introduction: Direct laryngoscopic endotracheal intubation is associated with varying degrees of sympathetic activity which may be detrimental in patients with coexisting conditions, such as coronary artery disease, elevated intracranial pressure and asthma. Lightwand intubation, on the other hand, by avoiding direct laryngoscopy, is expected to cause lesser hemodynamic variations. *Aim:* This randomised and prospective study intends to compare the hemodynamic response to intubation and ease of intubation by both these procedures. *Settings and design*: Prospective randomised single blind study. *Material Methods*: Hundred normotensive patients of either sex, age 18 to 60 years, ASA I & II, with normal airway scheduled to undergo elective surgeries under general anaesthesia were included in the study. They were randomly divided into two groups-DL (direct laryngoscopic intubation) & LW (lightwand intubation). Preoperatively heart rate, systolic, diastolic and mean blood pressure were recorded. Above parameters were also noted at 0, 1, 3, 5 minutes after intubation in both the groups. The time taken and the number of attempts required for successful intubation were noted. Results were statistically analysed. *Statistical analysis used:* Paired and unpaired student's t-test. *Results*: Hemodynamic response was more in DL group than in LW group which was statistically significant. Whereas, time taken for intubation was statistically significantly more with lightwand (20.08±7.07 secs) as compared to direct laryngoscopic intubation (16.94±4.55 secs). *Conclusion*: Lightwand intubation was associated with lesser hemodynamic response however the time taken for intubation by lightwand was more as compared to direct laryngoscopic intubation.

Keywords: Lightwand; Direct Laryngoscopy; Endotracheal Intubation; Time Taken for Intubation.

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Introduction

Endotracheal intubation is traditionally performed by direct vision using a laryngoscope. The success of intubation by laryngoscopy depends largely on the experience of the intubator and the patient's upper airway anatomy. Occasionally, however, even in the hands of experienced anaesthesiologist, intubation by direct vision can be difficult or impossible. At times it is not even possible to introduce the blade of the laryngoscope in patients with restricted mouth opening, tumors of the oropharynx and post burn contractures involving the face and neck. In such cases tracheal intubation has to be performed blindly. Blind intubations are often fraught with failures. Awake intubation with the help of fibreoptic bronchoscope has made dealing with such airways easy, but still many centres in India lack this facility.

Endotracheal intubation using laryngoscope is frequently associated with an increase in arterial blood pressure and heart rate. The organs involved

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in this sympathetic response to laryngoscopy and endotracheal intubation are base of tongue, epiglottis, soft palate, pharynx, epipharyngeal regions and larynx, which are extensively innervated by autonomic nervous system. Stimulation of these areas, particularly the epipharyngeal region (most sensitive area according to Tomori et al.) [1], leads to various cardiovascular changes, coughing, laryngospasm, bronchospasm, vomiting and pulmonary aspiration and increase in intracranial and intraocular pressure.

Over the years, new devices have been developed to successfully intubate the trachea and thereby provide useful alternatives to the standard technique of intubation using the laryngoscope. One of these devices is the lightwand.

The lightwand is a lighted stylet. It utilizes the principle of transillumination of the soft tissues of the anterior neck to facilitate tracheal intubation. Its use was first described by Yamura et al. [2] in 1951 for nasotracheal intubation.

Lightwand intubating device is an effective and safe aid to endotracheal intubation. The wand consists of a durable, flexible plastic shaft with a bright light bulb affixed to the distal end. Use of lightwand to intubate is expected to cause less adrenergic stimulation and sympathetic overactivity because elevation of epiglottis by laryngoscope blade is not required [3]. However, whether the haemodynamic responses to intubation with lightwand differ from those with direct laryngoscope is controversial. Also, since it is a gentle technique not involving much manipulation of the soft tissues the incidence of sore throat and mucosal injuries are also reported to be lesser than laryngoscopic intubation [4].

This study was designed to compare ease of intubation (time required for intubation) and hemodynamic response (changes in heart rate and blood pressure) to intubation by direct laryngoscopy, versus intubation with lightwand in adults with normal airways.

Material and Methods

This prospective, randomized study was conducted after approval by the Hospital Ethics Committee. Hundred patients between eighteen and sixty years of age of either sex with MPC I and II belonging to ASA grade I and II scheduled for elective surgery requiring general anaesthesia with endotracheal intubation were included in the study. Patients were labeled to be normotensive if they had no history of hypertension and their blood pressure on three occasions was less than 140/90 mm Hg.

Exclusion Criteria

1. Patients with MPC grade III and IV (anticipated difficult intubation)
2. History of previous difficult endotracheal intubation
3. Pregnant patients
4. Hypertensive patients (preoperative systolic blood pressure >140 mmHg and diastolic blood pressure >90 mmHg)
5. Patients with coexisting factors like rheumatoid arthritis, thyroid goiter and other causes of anticipated difficult intubation
6. Patients scheduled for major cardiovascular and thoracic surgery.
7. Coughing, arrhythmia or desaturation less than 90% during the procedure

Via computer generated randomization table, patients were divided into two groups-

1. Those intubated by direct laryngoscopy (DL)
2. Those intubated with lightwand (LW)

Preoperatively all patients were evaluated for history and clinical examination. Investigations according to the coexisting systemic illness and surgical procedure were done. They were also explained regarding the study and anaesthetic management. A written, valid & informed consent was obtained from each patient.

Night prior to the surgery, patients were given Alprazolam 0.25 mg P.O. and Omeprazole 20 mg P.O. Patients were fasting for atleast 6 hours before the surgery.

All patients were premedicated with Glycopyrolate 4 µg/kg intramuscularly half hour before surgery. Age and sex were noted. Inside the OT, baseline heart rate, blood pressure and oxygen saturation were recorded with multifunction monitor. Ondansetron 0.08 mg/kg i.v., Midazolam 0.03 mg/kg i.v. and Fentanyl 2 mcg/kg i.v. with supplemental oxygen were given.

The patients were positioned with standard pillow under head to achieve the ideal Chevalier Jackson position for direct laryngoscopy. For lightwand insertion, patient's head and neck were placed in neutral position.

Patients were induced with Thiopental sodium 5 mg/kg iv followed by Suxamethonium chloride 2 mg/kg iv after checking ventilation. Intubation was performed with cuffed polyvinyl chloride (Portex) endotracheal tube of optimum size (No. 7.5 for females and No.8.5 for males) by a single observer experienced in both lightwand insertion and direct laryngoscopy.

In DL group, direct laryngoscopy was performed with Macintosh blade (No. 3 for females and No. 4 for males) and the trachea was intubated with cuffed endotracheal tube. External manipulation of the larynx was used when necessary during laryngoscopy. The laryngoscope was removed after disappearance of black line on endotracheal tube. The position of the endotracheal tube was confirmed by 5-points auscultation.

In LW group, the lightwand was lubricated with water soluble K-Y jelly and introduced into the cuffed endotracheal tube. The distal end of the tube was bent to a 90 degree angle. Room lights were dimmed. The endotracheal tube with lightwand was introduced into the oral cavity after opening the jaw and advanced until midline illumination was observed in the anterior neck. The endotracheal tube was advanced until the glow disappeared behind the sternum. After the removal of the lightwand, the position of the endotracheal tube was confirmed by 5-points auscultation.

The duration of each attempt as the time from the introduction of the device (layngoscope or lightwand) into the oral cavity till its removal, was recorded with a stopwatch by an independent observer.

Three attempts were allowed for each intubating technique. Oxygenation was permitted between each attempt. Failure to intubate was defined as the inability to place the endotracheal tube into the trachea after three attempts. An alternative technique was used to intubate the trachea after a failed intubation. The total time taken for intubation (TTI) was defined as the sum of the durations of all intubation attempts (as many as three) before the use of the alternative intubating technique. Failed inubations i.e. those requiring more than three attempts were excluded from the study.

The hemodynamic changes in the form of heart rate, blood pressure and oxygen saturation at the time of intubation (0 min), at 1 minute, 3 minutes and 5 minutes following successful tracheal intubation in DL & LW group were recorded. Routine anaesthesia management was continued thereafter.

The observations were recorded, tabulated and analysed statistically by using paired and unpaired student's t-test. The results were discussed. Conclusions were drawn based on the results of statistical analysis.

Results

Demographic comparison

In group DL and group LW, the demographic profile of the patients was distributed with no significance (Table 1).The analysis was done by paired t-test.

Comparison of heart rate (beats/min)

Baseline heart rate of patients in both DL and LW groups were similar (statistically insignificant). However, the heart rate increased at 0 minute, 1 minute & 3 minutes after intubation in both the groups and the difference in heart rate was statistically significant ($p<0.05$) (Table 2). In both the groups, the mean heart rate returned to baseline at the end of 5 minutes and the difference was statistically insignificant.

Comparison of systolic blood pressure (SBP) (mmHg) in group DL and LW.

The systolic blood pressure immediately after intubation, showed a higher rise with laryngoscopic intubation at 0 minute, 1 minute & 3 minutes as compared to lightwand intubation (Table 3). Moreover, the rise in systolic blood pressure

Table 1: Demographic parameters

	Group		p-value
	DL	LW	
n (no. of patients)	50	50	
Age (years)	33.64 ± 9.07	37.44 ± 12.42	0.087
Gender			
Male	25	28	0.547
Female	25	22	
Weight (kg)	60.84 ± 7.46	62.62 ± 7.56	0.239
MPC			
I	34	38	0.371
II	16	12	
ASA			
I	40	38	0.629
II-	10	12	

Table 2: Comparison of heart rate in both groups

Heart rate at	Heart rate (Mean ± SD) beats/min		p-value
	DL (n=50)	LW (n=50)	
Baseline	82.60 ± 11.15	81.54 ± 10.41	0.624
0 min	109.00 ± 13.12	101.56 ± 11.73	0.004
1st min	98.82 ± 12.53	92.52 ± 12.98	0.015
3rd min	89.20 ± 10.92	85.30 ± 14.36	0.023
5th min	81.64 ± 11.45	78.20 ± 12.40	0.153

Table 3: Comparison of systolic blood pressure (SBP) mmHg in both groups

SBP at	SBP (Mean ± SD) for Groups in mmHg		p-value
	DL (n=50)	LW (n=50)	
Baseline	128.36 ± 11.71	130.14 ± 13.63	0.486
0 min	153.92 ± 26.08	144.58 ± 18.31	0.041
1st min	141.76 ± 13.59	135.10 ± 18.25	0.041
3rd min	132.76 ± 13.07	122.36 ± 16.32	0.001
5th min	117.06 ± 10.73	116.78 ± 11.41	0.900

Table 4: Comparison of Diastolic blood pressure (DBP) (mmHg) in both groups

DBP	DBP (Mean ± SD) for Groups in mmHg		p-value
	DL (n=50)	LW (n=50)	
Baseline	76.72 ± 9.44	76.02 ± 8.03	0.691
At 0 min	98.16 ± 13.56	92.78 ± 12.10	0.039
at 1st min	90.04 ± 13.66	82.78 ± 13.16	0.008
at 3rd min	78.58 ± 13.20	72.50 ± 12.00	0.018
at 5th min	68.56 ± 9.57	69.44 ± 8.10	0.621

Table 5: Comparison of Mean arterial pressure (MAP) (mmHg) in both groups

MAP at	MAP (Mean ± SD) for Groups in mmHg		p-value
	DL (n=50)	LW (n=50)	
Baseline	93.93 ± 8.22	94.06 ± 9.73	0.944
After intubation at 0 min	116.74 ± 13.53	110.04 ± 13.85	0.016
1st min	107.28 ± 11.61	100.22 ± 14.48	0.008
3rd min	95.30 ± 11.04	93.78 ± 13.90	0.016
5th min	84.72 ± 7.90	85.22 ± 9.64	0.780

normalised by 3 minutes in patients intubated with lightwand, whereas it was still on higher side at 3 minutes in laryngoscopic intubated patients. On comparing, the SBP in DL group was statistically more immediately after intubation, at 1 min and at 3 mins than LW group. However, SBP at 5 mins showed no significant difference.

Comparison of Diastolic blood pressure (DBP) (mmHg) in group DL and LW.

The diastolic blood pressure also showed an initial rise at 0 & 1 minute from baseline following intubation in both the groups (Table 4). This normalised by the end of 3 minutes after intubation in both the groups. The rise in diastolic blood pressure was lesser in LW group as compared to DL group and is statistically significant. At 5 mins again the difference in diastolic blood pressure was statistically insignificant.

Comparison of Mean arterial pressure (MAP) (mmHg) in group DL and LW.

The mean blood pressure at 0 min showed a significant rise in DL group than in LW group (Table 5). This response gradually decreased and normalised by 3 minutes in both the groups but the difference was still statistically significant ($p<0.05$). At 5 mins the difference in mean blood pressure was again found to be statistically insignificant.

Comparison of Time Taken for Intubation (seconds) in group DL and LW.

In this study, all intubations in the direct laryngoscopy group were done at the first attempt, while in lightwand group, two patients required a second attempt for intubation. The mean total time taken for intubation was 16.94±4.55 seconds for laryngoscopy group as against 20.08±7.07 seconds

for lightwand intubated group. This difference was found to be statistically significant ($p<0.05$) (Table 6).

Table 6: Time taken for intubation in both groups

Group	Number of patients	Time in Secs (Mean ± SD)	p-value
DL	50	16.94 ± 4.55	0.0147
LW	50	20.08 ± 7.07	

Discussion

The present study was conducted to compare the magnitude and duration of pressor response to direct laryngoscopy guided and lightwand guided endotracheal intubation. We have also compared the time taken for intubation in both the intubation techniques.

The results showed that in DL group, the hemodynamic response was sustained for 3 minutes and normalised by 5 minutes except diastolic blood pressure which normalised by 3 minutes. All patients in DL group were intubated at the first attempt with mean intubation time of 16 secs.

In LW group hemodynamic response was of short duration (3 minutes). Forty eight patients were intubated in first attempt, while two patients required second attempt for intubation with mean intubation time of 20 secs.

When compared, it was observed that hemodynamic response after intubation was statistically significantly more in DL group than in LW group. The time taken for intubation, on the other hand, was statistically significantly more with lightwand as compared with direct laryngoscopic intubation.

Results from several authors [5-9] suggest that the sympathoadrenal response to ETT intubation arise from stimulation of the supraglottic region by tissue tension induced by laryngoscopy.

In the comparison by Hirabayashi et al. [10], the maximum mean arterial pressure changes were similar between groups. They observed that in the lightwand intubation technique since the jaw was grasped & lifted upward to clear the tongue and epiglottis off the posterior pharyngeal wall, though gentle compared with the direct vision laryngoscopy, was enough to cause hemodynamic changes similar to direct laryngosopy.

Nishikawa et al. [11] compared the effects of the lightwand technique with those of direct-vision laryngoscopy in normotensive and hypertensive patients. The results showed that the lightwand technique had significantly lower hemodynamic changes after intubation in comparison with the laryngoscopic technique in normotensive patients. However, in hypertensive patients, there was no difference in hemodynamic changes between the two techniques. They thought that a lack of direct stimuli to the mouth and larynx as one of the main explainantions for the small hemodynamc changes in normotensive patients intubated with lightwand and though it was not enough to cause a hyperdynamic response in normotensive patients, it was sufficient to produce hypertension in hypertensive patients. The lightwand technique in their study needed significantly more attempts and a longer time for intubation than the laryngoscopic technique. In hypertensive patients, they found a significant correlation between the hemodynamic changes and the number of attempts at intubation.

In another study by Takahashi et al., the hemodynamic responses to tracheal intubation were observed by dividing the groups into three [12]. The lightwand group received tracheal intubation with lightwand, the laryngoscope-intubation group received tracheal intubation with a direct-vision laryngoscope (Macintosh blade), and the laryngoscopy-alone group received laryngoscopy alone. The magnitude of hemodynamic changes associated with intubation with the lightwand were found to be almost the same as that with the direct laryngoscope and were likely to occur because of direct tracheal irritation rather than direct stimulation of the larynx.

Kihara et al. [13] compared hemodynamic responses in normotensive and hypertensive patients among three intubation devices: the Macintosh laryngoscope (LS), the Trachlight™ lightwand (LW), and the intubating laryngeal mask airway (ILM). In normotensive patients, there were no differences in any hemodynamic variables among the three devices. In hypertensive patients, blood pressure in the LS group were significantly higher than the ILM and LW groups for 2 min after intubation, but there were no differences in HR among the devices. The number of intubation attempts was similar among groups, but intubation time was longer for the ILM group. They observed that both the ILM and the LW attenuated the hemodynamic stress response to tracheal intubation compared with the LS in hypertensive patients but not in normotensive patients as this was only clinically detectable in hypertensive patients. The reduction in stimulation was related to lack of distortion of sensitive extraglottic structures by the ILM and LW. They concluded that ILM and LW may be preferable to

LS in hypertensive patients where attenuation of hemodynamic stress responses is desired.

One study assessed the cardiovascular changes after either lightwand or conventional laryngoscopic endotracheal intubation in patients with coronary artery disease [14]. The mean arterial blood pressures and heart rate increased significantly after intubation. There was a tendency for the lightwand group to have lower arterial blood pressures and slower HR. However, the differences between the two groups did not reach statistical significance. Requirements for drugs to control heart rate and mean arterial pressure were also similar in both groups. They suggested that the circulatory response to intubation was mainly due to stimulation of the trachea by the endotracheal tube rather than stimulation of the glottis by the laryngoscope. They concluded that, in patients with coronary artery disease, a lightwand intubation technique does not reduce the hemodynamic responses associated with intubation when compared to standard direct-vision intubation with a laryngoscope and in this type of patient, pharmacologic manipulations might prove more effective to control the hemodynamic changes associated with tracheal intubation.

Kanaide et al. [15] evaluated hemodynamic and catecholamine responses during tracheal intubation using lightwand in elderly patients with hypertension. They found no significant difference between groups. They concluded that lightwand has no advantage over a laryngoscope in terms of hemodynamic and plasma catecholamine responses to tracheal intubation in elderly patients with hypertension, despite a shorter intubation time.

Rhee et al. [16] compared hemodynamic responses in 40 patients with difficult airway (MPC grade 2 & 3) between the Macintosh laryngoscope and the lightwand intubating device. Mean arterial pressure increased significantly 90 seconds after intubation in laryngoscope group compared to in lightwand group ($p < 0.05$), and also remained higher than preintubation value for longer time compared to in lightwand group ($p < 0.05$).

Another study by Shrikanth Srinivasan et al. [4] compared orotracheal intubation using the Trachlight v/s Macintosh laryngoscope for: success rate; time taken for intubation; hemodynamic responses and complications encountered with either device. The success rate was comparable in both groups. Time taken for intubation was significantly longer with Trachlight (20.2sec v/s 11.8 sec). However, hemodynamic responses to intubation were significantly lesser both in magnitude and duration with Trachlight compared to laryngoscopy. They concluded that the combined stimulation of the larynx and the trachea in the laryngoscopy group, was more intense than the stimulation of the trachea alone, as in the Trachlight group.

In the same year, Byung Yoo et al. [17] compared the difference in hemodynamic responses to intubation between the lightwand and direct laryngoscope, and examined the correlation between blood pressure elevation and intubation time. They applied their results to the Hassan's equation (i.e. Blood pressure elevation = intensity of stimulation × duration time of stimulation), and found that there were no difference of blood pressure elevation and intubation time between both groups, and thus there was no difference in the intensity of stimulation between lightwand group and direct laryngoscopy group. They postulated that if there is no difference in the stimulation intensity, then the degree of blood pressure elevation would have a linear relation to the intubation time.

Naveed et al. [18] studied hemodynamic response and airway morbidity following tracheal intubation between direct laryngoscopy, video laryngoscopy and lightwand techniques and found that no benefit was achieved by using any of the 3 intubation techniques for attenuation of hemodynamic changes. There was also a higher incidence of sore throat associated with trachlight intubation than with laryngoscopy and video laryngoscopy

The results of this study showed that the lightwand intubation technique caused smaller hemodynamic changes than the direct laryngoscopy. In the lightwand technique, grasping of the jaw and lifting it upward by using the thumb and index finger to make a clear passage for the tracheal tube may be sufficient to cause hemodynamic change [11]. However, this procedure was not used in the present study. During laryngoscopy the mouth is required to be wide open, the epiglottis elevated, brought forward and lifted by the laryngoscope. As this maneuvering was not used during intubation by lightwand, there was a smaller hyperdynamic response due to stimulation of the periglottic area. Although it is not obvious how much laryngoscopy-induced stimulation directly contributes to hemodynamic changes after endotracheal intubation, a lack of direct stimuli to the mouth and the epiglottis could be one of the explanations for the small hemodynamic changes in patients intubated by the lightwand technique. Thus the results of our study are consistent with the results of Srinivasan et al. [4], Nishikawa et al. [11], Kihara et al. [13], and Lee et al. [16], while the results by Hirabayashi et al. [9], Shinji Takahashi et al. [12], Felix Montes et al. [14], Kanaide et al. [15], Byung

Yoo et al. [17] and Naveed et al. [18] showed no difference in lightwand and laryngoscopic intubation with respect to hemodynamic changes.

The time taken for intubation with lightwand was longer as direct visualization of vocal cords was not done. Instead, a well circumscribed tracheal glow of the lightwand was the only indirect guide of the position of the tube. This difference in time is partly counteracted by the time taken for insertion of tube during laryngoscopy, as the tube is already inserted over the lightwand. This could be the reason that Hung et al showed a shorter duration of intubation, while Kihara et al. [13] and Takahashi et al. [12] showed no difference in time taken for intubation between the devices. The findings of Shrikanth Srinivasan et al. [4] and Nishikawa et al. [11] with respect to time taken for intubation are comparable with the present study showing more time required for intubation with lightwand.

Conclusion

In conclusion, insertion of lightwand is associated with a lesser hemodynamic response than direct laryngoscopic endotracheal intubation. The rise in hemodynamic variables with lightwand is sustained for a shorter period of time than endotracheal intubation by laryngoscopy. This definitely can be a boon for patients with cardiovascular disease. Time taken for intubation by lightwand, however, is more as compared to direct laryngoscopic intubation, which might limit its use.

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Assessment of Knowledge and Impact of Training on Cardiopulmonary Resuscitation among the Registered Nurses in a Tertiary Care Hospital

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Abstract

Context: Cardiac arrest whether in the hospital or outside hospital is considered as a major medical emergency and it should be treated immediately.The survival and outcome of a cardiac arrest depends on the early initiation of BLS. The nurses are expected to update their knowledge as per BLS-AHA guidelines to ensure timely recognition of cardiac arrest and to initiate the chain of survival as early as possible. *Aims:* To evaluate the knowledge about cardiopulmonary resuscitation among nurses before and after the formal certified CPR training program in a tertiary care hospital. *Material and Methods:* It is a cross sectional descriptive study and it was conducted by the department of Anaesthesiology by involving the Nurses at Melmaruvathur Adhiparasakthi Institute of Medical sciences and Research from February to March 2018.Totally 186 nurses were consented from various workplace and different educational status for this study. A validated and pre-tested questionnaires which contains 20 questions which evaluated the knowledge, attitude and practices towards the cardiopulmonary resuscitation (CPR) was distributed to the nurses for pretest and posttest after training. The correct answer score assigned was 1 and wrong answer score was 0 thus making the total score as 20. *Results:* Among the total 186 nurses 98.92% (n=184) were females and 1.08% (n=2) were males. Majority were between the age group of 26 to 30 years and their working experience ranging from 2 to 10 years. Many of the participants 45.7% (n=85) had no formal training in CPR and (n=101) 54.3% had undergone CPR training during their study period. 118 (63.44%) nurses had studied B.Sc nursing and 68 (36.56%) were Diploma in nursing. Among them 113 (60.75%)were working in medical and surgical ward, 22 (11.83%) in casualty, 30 (16.13%) in ICU, 21 (11.29%) in OT. The mean±SD of the overall total knowledge score was 42.37±4.8 and 67.1±3.37 in pre and post test respectively there was significant improvement and association between the total scores in pretest and post test ($P<0.05$) and also there was a strong association between the workplace and the total scores ($p<0.0001$). *Conclusion*: In conclusion the Knowledge practices and attitude of the participants regarding CPR were low before training and found adequate after training. Thus, more educational interventions and training programs should be provided periodically among the nurses.

Keywords: Basic Life Support (BLS)**;** Cardiopulmonary Resuscitation(CPR); Training; Knowledge; Nurses.

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Introduction

The most important critical component of basic life support is cardio pulmonary resuscitation (CPR). It along with defibrillation is the first line response for the cardiac arrest patient. The CPR includes delivering high quality chest compression, opening the airway and maintaining the oxygenation in blood circulation [1].

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Cardiovascular disease is a leading cause of mortality and it accounts to 30% worldwide [1]. The peak age of sudden cardiac arrest is between 45 and 75 years [2]. The incidence of cardio vascular disease increases even in HIV patients due to antiretroviral therapy since it increases the risk of atherosclerosis and coronary artery disease which leads to cardiac arrest [2-4].

Early cardio pulmonary resuscitation (CPR) of cardiac arrest patients leads to facilitates the survival. All the health care professionals should have adequate knowledge about CPR and it should be done only by skilled, trained and knowledgeable person. Health care professional especially nurses knowledge about CPR varies in developed countries [5]. Many studies done in CPR in USA, UK revealed the low level of knowledge and skills about CPR among the nurses.

Nursing personnel should be aware of the significance of BLS in life threatening situation because most of the time physician may not be available near the patient and hence the nurses should be capable to do the CPR in emergency situation. (marzooq – H 2009) has done a study to assess nurses skills in CPR [6,7]. Preusch et al. [8] and Kalhori et al. [9] reported that based on the 2005 guidelines for the CPR nurses knowledge on CPR is low. Passali et al. reported that the level of awareness regarding basic life support (BLS) and advanced life support (ALS) principles among nurses and doctors of Greece not sufficient [10]. And also a delay in drug administration due to insufficient knowledge of the staff on medication was reported in some studies [11].

Nurses are the most important members in health care system and they need to know the basic skills and experience that are needed to do CPR. Many literature quoted that sudden cardiac arrest can be treated by a timely given CPR and it is consider to be an important medical emergency technique. The important elements of understanding and acquiring the knowledge and skills by the nurses are frequent training programs for the nurses. Also the americian heart association (AHA) revised the CPR guidelines in the year 2010 and hence the nurses should update their knowledge on CPR to ensure quality patient care Hence the aim of this study is to evaluate the knowledge about cardiopulmonary resuscitation among nurses before and after the formal certified CPR training program.

Materials and Methods

Study Design

This is a cross sectional descriptive study conducted by the department of Anaesthesiology at Melmaruvathur adhiparasakthi Institute of Medical sciences and Research–Tertiary care hospital in Tamilnadu, South India from February to March 2018, Data was collected from the participants using pre-tested, validated and self administered questionnaires which evaluated the knowledge towards the cardiopulmonary resuscitation (CPR) among nurses.

Study Subjects

The subjects were the nurses who were working in various departments.They either had a Bachelor's degree (B.Sc) or Diploma in nursing and Midwifery .

Inclusion and Exclusion Criteria

All the nurses on duty who were volunteered and given consent to participate were included and the nurses on leave or duty off were excluded from the study.

Method of data collection

A questionnaire form comprising of 20 multiple choice questions on BLS which were framed by getting an expert opinion was used as the data collection tool. It was distributed to the Nursing staffs who agreed to participate in this study and given adequate time about 30 minutes to answer these questions. The socio-demographic characteristics of the nurses such as Age, educational degree ((B.sc or Diploma in nursing) , working stations and previous knowledge and training towards cardiopulmonary resuscitation (CPR) were also analysed. After that the investigator conducted a training programs which includes video demonstration and explanation about CPR procedure and hands on demonstration and again the same questionnaire was given to the participants to answer the correct responses. The correct answer score assigned was 1 and wrong answer score was 0 thus making the total score as 20.A total of 186 nurses who were included in the study. And the nurses were informed for not writing their names on the questionnaire.

Statistical Analysis

The data obtained were analysed by using graph pad prism 5.0 software. The data were presented as percentage, mean, standard deviation (SD). The p value < 0.05 was considered as statiscally significant.

Results

Nurses were assessed for their knowledge on Cardiopulmonary resuscitation by using self-structured questionnaire before and after CPR training. The observed results showed out of 186 respondents 98.92%(n=184) were females and 1.08%(n=2) were males. Majority were between the age group of 26 to 30 years [Table 1] and their working experience ranging from 2 to 10 years. As many of the participants 45.7% (n=85) had no formal training in CPR and (n=101) 54.3% had undergone CPR training during their study period, 118 (63.44%) nurses had studied B.Sc nursing and 68 (36.56%) were Midwifery and Diploma in nursing. Among them 113 (60.75%)were working in medical and surgical ward, 22 (11.83%) in casualty, 30 (16.13%) in ICU, 21 (11.29%) in OT [Table 2] .The lowest score assessed in the questionnaire was 2 in pretest and 7 in post test after training and it was statistically significant $p<0.0001$with the mean score out of 20 questionnaire was 8.47 and 13.41 in pre and post test respectively [Table 3].

Table 1: Demographic details of Registered Nurses

		Frequency	Percentage
Gender	Female	184	98.92
	Male	2	1.08
Age	Less than 25	49	26.34
	26-30	101	54.30
	31-35	15	8.06
	36-40	9	4.84
	41-45	7	3.76
	>46	5	2.69

Table 2: Professional Education and Experience and Place of work of Registered Nurses

		Frequency	Percentage
Education	B.Sc Nursing	118	63.44
	Diploma in Nursing and Midwifery	68	36.56
Experience	< 2 years	7	3.76
	2-4	123	66.13
	5-7	37	19.89
	8-12	8	4.30
	>12	11	5.91
Place of work	Medical and surgical ward	113	60.75
	Casualty	22	11.83
	ICU	30	16.13
	OT	21	11.29

Table 3: Highest and lowest score in pre test and Post test

	Pre test		Post test	
	Lowest score	Highest score	Lowest score	Highest score
Overall	2	16	7	19
Based on Qualification				
B. Sc	6	18	8	19
Diploma in Nursing and Midwifery	2	11	7	19
Based on place of work				
Ward (113)	2	10	7	19
Casualty(22)	9	15	10	19
ICU(30)	10	18	11	19
OT(21)	9	12	12	17

Comparison of the nurses total scores with their educational status that is B.Sc nursing and Diploma in nursing, the mean ±SD of the overall total scores was 8.47±0.212 in pretest and 13.41±0.204 in post test and there was a strong association between the knowledge scores and educational status of the participants and it was statistically significant p<0.0001 [Table 4]. Likewise in comparison with the workplace regarding the knowledge and attitude about cardiopulmonary resuscitation there was a lacunae in the nurses who were working in the ward and OT followed by casualty and ICU nurses and it was correctly pointed out here by conducting the training sessions in CPR with pre and post test and it was found to be statistically significant with p<0.0001 it was depicted in [Table 4].

Responses of the Nurses to Individual Questions

A high percentage 82.6% of the nurses knew about the depth of the chest compression in an adult. However only 54.5% nurses knew the component of CPR. Regarding the basic knowledge and identification of cardiac arrest the nurses should know how and where to check pulse for an adults and infants, where to move a patient to perform appropriate CPR and where the rescuer should be and how long the CPR can be performed fortunately the mean of 53.42±6.8 had an adequate knowledge in pretest and was improved to the mean of 74.30±1.6 which was a drastic responses obtained after an effective training session and similar to this findings the knowledge and attitude regarding chest compression, maintenance of airway and breathing and finally choking and its management had an excellent responses with the mean of 63.18±4.9, 67.08±3.5, 63.86±3.5 in post test respectively in comparison with poor performance in pretest with the mean of 36.12±4.1, 40.00±4.1 and 39.94±4.2 respectively. The details of the nurses responses in pre and post test of the individual questionnaire are listed in [Table 5] and it was statistically significant p <0.05.

Table 4: Mean and the Standard deviation of Pretest and Post test score based on their Qualification & place of work

	Pre test	Post test	p value [significant if P < 0.05]
Overall	8.47±0.212	13.41±0.204	P < 0.0001
		Based on Qualification	
B. Sc	10.08±0.280	14.12±0.279	P < 0.0001
Diploma in Nursing and Midwifery	6.67±0.279	13.29±0.373	P < 0.0001
		Based on place of work	
Ward	6.75±0.162	13.12±0.273	P < 0.0001
Casualty	11.73±0.384	14.59±0.608	P < 0.0001
ICU	13.47±0.411	15.70±0.368	P < 0.0001
OT	10.38±0.200	14.10±0.307	P < 0.0001

Table 5: Types of Questions and the Percentage of correct responses in pre and post test by the Nurses

		Pre test	Post test	Mean and SD pre test	Mean and SD post test	p value significant
	Basic knowledge and identification of cardiac arrest Over all			42.37±4.8	67.1±3.37	yes P < 0.05
A	**Basic knowledge and identification of cardiac arrest**					
1	Where should you check for a pulse in an adult?	66.8	76.6	53.42 ± 6.8	74.30 ± 1.6	yes P < 0.05
2	Where should you check for a pulse in an infant?	33.2	68.5			
3	In which of the following situations is moving a patient during CPR appropriate?	44.7	75.6			
4	Where the rescuer should be while performing CPR?	52.4	77.6			
5	Basic Life Support should be continued until?	70	73.2			
B	**External cardiac compressions and AED**					
6	What is the correct depth of chest compressions in an adult?	46.5	82.6	36.12± 4.1	63.18± 4.9	yes P < 0.05
7	A child is not breathing but has a pulse rate of 30 per minute. The rescuers should?	25.5	58.5			
8	Early defibrillation for adults is important because?	31.8	58.8			
9	Where should you place your hands on the chest of a victim when you are performing chest compressions?	45.5	61.5			

		Pre test	Post test	Mean and SD pre test	Mean and SD post test	p value significant
10	Which of the following is NOT a component of high quality CPR?	31.3	54.5			
C	**Maintenance of Airway and Breathing**					
11	A Victim probably has a neck injury. What is the correct way to open the airway?	49.6	69.2	40.00± 4.1	67.08± 3.5	yes P < 0.05
12	A Child is gasping for breath but has a pulse rate of 100 per minute. The rescuers should?	35.7	64.2			
13	How do you know that your rescue breath is effective?	29.7	55.8			
14	The best way to allow the chest to recoil after compression is to?	35.1	68.6			
15	The most common cause of airway obstruction in unresponsive adults is?	49.9	77.6			
D	**Chocking and its management**					
16	A 50 year-old man who has been eating a mutton piece in a restaurant abruptly stands up and grabs his neck. The rescuer determines that the victim becomes unresponsive, then appropriate step is?	25.6	55.5	39.94 ± 4.2	63.86 ± 3.5	yes P < 0.05
17	An infant who had been choking is responsive and struggling for breath. The rescuer should?	37.9	60.8			
18	Effort to relieve choking should be stopped when?	47.8	71.6			
19	To relieve choking in a responsive child, you should perform?	49.2	72.8			
20	An infant who had been choking is unresponsive and no breathing. The rescuer should?	39.2	58.6			

The level of knowledge based on the questions before and after training showed that the highest defect in the knowledge before training regarding the infant CPR and what the rescuer should do in choking condition of the infants [Table 5] and it also showed that the overall mean level of knowledge before training was 42.37±4.8 average and insufficient and after training was 67.1±3.37 excellent and this was statistically significant $p < 0.05$. The results also showed that there was a positive correlation between pretest and post test knowledge scores ($p<0.0001$) and 82.6% of the respondents were very much satisfied with this training.

Discussion

Cardiopulmonary resuscitation is associated with a higher percentage of patient survival [12]. Adequate knowledge is essential for nursing staff to give an effective CPR to save patient lives .This study emphasis on the importance of CPR knowledge of the nurses in the hospital. This study revealed that the nurses had inadequate knowledge with lowest score of 2 out of 20 questions that was 10% before CPR training session and obtained an adequate knowledge with the highest score of 19 out of 20 questions that was 95% after training and there was a significant difference between the mean of scores of the pretest and post test. These findings indicate that it is imperative for nurses to get periodic, regular CPR training sessions and updating the CPR techniques and it is an inevitable professional requirements for all nurses working in hospitals. The nurses knowledge were inadequate during pretest and this was concurrent with the study done by Madden et al. [13] in Ireland and Marzooq et al.[7] in Bahrain .

In the study done by Bakhsha et al. [14] and Rajeswaran L et al. [1] entitled the effect of CPR training on the knowledge of the healthcare nurses before training was very low which confirms the results of the present study before the training of the participants and also in Bakhsha's study it was observed that after training the level of knowledge was considerably increased.

In this study, the mean score of knowledge of the nurses after the training had a significant difference with the mean score of their knowledge before training ($p<0.05$). Davies and Madden proved the effect of retraining on CPR ability in their study [13].

Our findings indicate that participants in the age group of over 40 years performed worse than the younger age groups. This may be due to the fact that the older age group had inadequate exposure earlier in their career owing to a lack of training resources and CPR training opportunities. This finding is

similar to the findings from elsewhere that older health care providers obtained lower scores than younger health care providers during the course of being evaluated for their advance life support knowledge [15].

In our study, participants who underwent in-service education and CPR training performed better than nurses who never had any exposure to CPR training programmes. This is also supported by recent studies conducted in India [16] and in Brazil [17,18] where nurses with BLS training performed better than the nurses who never had any training.

Many authors had reported that nurses working in high-risk areas such as Intensive Care Unit (ICU) and nurses who work continuously with complicated and risky patients are more interested to develop and maintain their competence in CPR than other health care professionals [19] Similar to these authors, nurses working in ICU included in our study also competent in CPR knowledge. The study also showed a highly statistically significant difference that was found between nurse's level of education and the total mean of CPR knowledge scores (P <0.0001). Nurses with a bachelor's degree had the highest mean (14.12) as observed by Marzooq [7] and To clarify, nurses with a diploma degree has only two years of experience that are slightly different from those in a bachelor's degree in nursing. A B.Sc nursing staffs on other hand, gets better opportunities to perform CPR. However, a nursing diploma will get only theoretical knowledge and they always will be lacking in trainings regarding CPR and first aid courses.

In a study conducted in Kenya, age, gender and work experience did not have any significant impact in CPR knowledge among nurses [20] and it was not concurrent with our present study. However, there are no large, well-conducted studies available in the literature describing the effect of gender in knowledge about resuscitation and thus future studies should evaluate gender differences in CPR performance.

Finally, the results of the current study after training with the post test assessment revealed a statistically significant differences between the ward nurses work and the total mean of CPR knowledge scores ($p < 0.001$). ICU had the highest mean (15.70) followed by the Casualty with a mean of (14.59) and then by OT with a mean of (14.10) followed by medical and surgical ward nurses with a mean of (13.12). These findings not concurrent with the study done by Bajracharya and Nagarkotil et al. [21] it showed that only 2% of high-care unit nurses in their teaching hospital had sufficient knowledge of BLS and CPR. However, this study states that nurses working in the ICU, Casualty are more exposed to critical situations (cardiac arrests, choking, etc.,) and are expected to respond more quickly. As a result, nurses working in these wards are required to have a BLS license unlike those working in other wards. In addition, training and exposure to real situations increase both the knowledge and confidence of a nurse.

All nurses should attend mandatory CPR training to prevent deterioration in their CPR knowledge and skills.Frequently conducted CPR training skills could increase the survival rate of cardiac arrest victims [22]

Limitations

The current study had few limitations that is only 50% of the nurses were included in this study thus leading to low response rate.

Conclusion

The present study found that the nurses had inadequate knowledge regarding CPR techniques and it suggests the regular and periodic CPR training and education programs to nurses will refresh their knowledge and are crucial for updating the AHA guidelines regarding CPR techniques .Nurses are the integral part of the healthcare system and are perceived to be knowledgeable in providing care to the patients. Several studies revealed that the cognitive domain of nurses on CPR can be improved with in service training and education. The optimal frequency with which CPR training should be implemented atleast every 6 months, in order to avoid deterioration in nurses CPR knowledge and skills. Anesthesiologists must identify those nurses with inadequate knowledge and concentrating in educating them periodically.

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Key Messages

This study emphasis on periodic CPR training program for quality health care.

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Original Research Article

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Comparison between Incidence of Emergence Agitation in Pre-school Age Group with that of Older Children undergoing Sevoflurane Anaesthesia

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Abstract

Background: Emergence agitation (EA) is a known fact after general anaesthesia which is observed more in children and that too after sevoflurane anaesthesia. Dexmedetomidine and propofol are both known to reduce EA when used in prophylactic doses. The aim of our study was to compare the incidence of EA in preschool age group (< 5 years) with that of older children (> 5 - 12 years) in both dexmedetomidine and propofol group. *Methods:* Total 100 children having age less than 12 years and belonging to ASA I and II were included in the study. All of them received sevoflurane as inhalational anaesthetic agent. They were randomly divided in to two groups. About 5 minutes before the end of surgery, patients in group A received 0.3 µg/kg dexmedetomidine and group B patients received 1mg/kg propofol. The incidence of EA in both the groups was measured with Aono's four point scale upon arrival in the post anaesthesia care recovery room. The database was analyzed using stata 12, epi-info software and p value of < 0.05 was considered as level of significance. *Results:* The incidences of EA in < 5 years age group in group A and B was 21.05% and 40.91% respectively whereas; it was 3.23% and 21.43% in > 5 -12 years age group. *Conclusion:* The incidences of EA were higher in pre-school (≤ 5 years) age group as compared to older children (> 5 -12 years) age group in both group A and B who received dexmedetomidine at a dose of 0.3 ug/kg and propofol at a dose of 1mg/kg respectively.

Keywords: Emergence Agitation; Sevoflurane; Dexmedetomidine; Propofol; Aono's Four Point Scale.

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Introduction

Invention of inhalational anaesthetic agents helped paediatric anaesthesia to grow and inhalation agents are amongst the mainstays of paediatric anaesthesia, as children are often induced by mask before venous access is obtained [1]. Desired properties of an ideal agent included inherent stability, lack of inflammability in combination with oxygen or nitrous oxide, low blood: gas solubility to allow rapid induction and recovery from anaesthesia as well as rapid control of the anaesthesia depth, lack of irritation to airway passages, minimal respiratory and cardiovascular effects as well as reversible central nervous system (CNS) effects, wide therapeutic index, absence of toxicity or other unwanted effects with normal doses or repeated exposure, and no interaction or toxicity with other drugs [2].

In literatures, the term "emergence agitation" has been used in places of "emergence delirium", "emergence excitement" or "post-anaesthetic excitement" in order to describe an irritable, uncooperative and inconsolable patient upon emergence from anaesthesia [3,4]. It is more common

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with the use of newer volatile anaesthetic agents like sevoflurane [5]. Although in most of the cases, it is self-limiting that develops in the early phase of awakening from anaesthesia. Generally short lasting (5-15 min), but EA can be severe and may result in physical harm to the patient and particularly to surgical sites [3,6].

The exact incidence of EA is difficult to establish, but according to various literatues a more frequent incidence is found in children (12-13%) [7]. Its occurrence after sevoflurane anaesthesia can even go up to 80% [8].

Apart from various non pharmacological methods, numerous pharmacological agents like dexamethasone, opioids, NSAID-analgesics, benzodiazepines, propofol, alpha-2 (α_2) agonists were used in the perioperative period for reducing the occurrence of EA after sevoflurane-based anaesthesia.

Materials and Methodology

This study was conducted at a tertiary teaching centre (medical college) in central India after obtaining approval from the Institutional Ethics Committee. This was a prospective, randomized comparative study. Total 100 children receiving sevoflurane anaesthesia were included in this study after meeting the eligibility criteria's.

Inclusion Criteria

1. American Society of Anesthesiologist's (ASA) physical status I and II patients.
2. Patients aged <12 year of either sex.
3. Patients receiving sevoflurane for induction and maintenance of general anaesthesia.
4. Patients whose parent / guardian gave consent for this study.

Exclusion Criteria

1. Patients receiving any other inhalational general anaesthetic agent other than sevoflurane were excluded.
2. Patients whose parent/guardian did not give consent.
3. Patients who had neurological disease or psychological issues.
4. Patients who were already on treatment with sedatives.

Study Procedure

Pre-anaesthetic check-up (PAC) was done. Baseline Investigations like hemoglobin, complete blood count, blood group were documented. After obtaining PAC fitness, those who were planned for sevoflurane based general anaesthesia were selected for the study.

Parents/guardians were provided with written information consent form before patients were shifted to operation theater. Face to face detail discussion was done regarding the anaesthesia technique and all their queries were solved. Children were fasted for 8 hours prior to surgery. They received oral midazolam 0.5 mg/kg approximately 30 mins before separation from the parents. An electrocardiograph, pulse oximeter and noninvasive blood pressure monitor were attached to the patients after shifting to operating table.

Patients were randomized into two groups, Group A and Group B; each containing 50 patients. Randomization was done by using simple sealed opaque envelope technique. Group A received 0.3 µg/kg dexmedetomidine and group B received 1mg/kg propofol as intravenous infusion over 5 minutes.

General anaesthesia was induced with sevoflurane with nitrous oxide in oxygen via a face mask. Intravenous cannula was inserted under sevoflurane anaesthesia. Ondansetron 0.15 mg/kg I.V., glycopyrolate 6 mcg/kg I.V., fentanyl 2 mcg/kg IV administered intravenously. Patients were intubated with endotracheal tubes after giving atracurium 0.6 mg/kg I.V and were provided controlled ventilation. Anaesthesia was maintained with 50% nitrous oxide in oxygen, supplemented by an end-tidal concentration of 2-3% sevoflurane to keep an end-tidal carbon-dioxide of 35±5 mm hg. Top-up of muscle relaxant was given as needed in between. All patients received 15 mg/kg paracetamol I.V. slowly approximately 15 minutes before the completion of surgery for control of post-operative pain.

Approximately about 5 minutes before the end of the surgery, patients in group A received 0.3 µg/kg dexmedetomidine diluted in 10 ml of 0.9% normal saline and group B patients received 1mg/kg propofol. Experimental drugs were administered as continuous intravenous infusion over last 5 minutes of surgery through syringe pump following which sevoflurane was stopped simultaneously along with end of surgery.

To avoid bias, EA was assessed upon arrival to post anaesthesia recovery room by an independent

anaesthesiologist who was not present inside the operation theatre during surgeries and was not aware about what drugs the patients received.

The incidence of emergence agitation was evaluated using Aono's four point scale [9,10]; scores of one and two were considered as absence of emergence agitation and scores of three and four were considered as presence of it.

Table 1: Aono's four point scale [9,10]

Calm	1
Not calm but could be easily calmed	2
Moderately agitated or restless	3
Combative, excited or disoriented	4

Any peri operative adverse events like laryngospasm, bronchospasm, hypotension, bradycardia, cardiac arrhythmia, anaphylaxis, oxygen desaturation episodes, vomiting were recorded if were present in any of the study subjects.

Statistical Analysis

All the data were entered into the microsoft excel database from paper pro-forma. During the data entry, data were checked for any error or missing data. After resolution of all issues, the database was analyzed using stata 12, epi-info software and p value of < 0.05 was considered as level of significance. Following analyses were performed.

- Results were expressed as the number, percentages, mean±standard deviation as appropriate and statistical analysis was performed for each group.
- Comparison of numerical variables between the study groups was done using Student's t test for independent samples. For comparing categorical data, Chi square (X^2) test was performed. Fisher's exact test was used instead when the expected frequency was less than 5.
- p value < 0.05 was considered statistically significant.

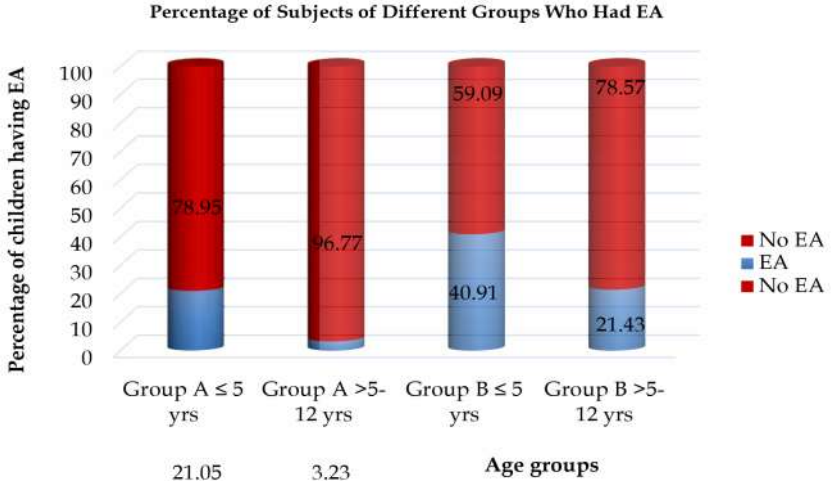
Results

Two studied groups were comparable to each other in respect to patient's characteristics like age, sex, weight, ASA status, types of surgeries as well as duration of surgery and anaesthesia.

Table 2 and graph 1 show the comparison of age group of the subjects who had emergence agitation. Here, it is seen that the incidence of EA is much higher in ≤ 5 yrs age-group as compared to > 5 – 12 years age group (21.05 % versus 3.23% in Group A and 40.91% versus 21.43% in Group B).

Table 2: Age-Group comparison of study subjects who had Emergence Agitation

Age Groups	Group A(n=50)			Group B(n=50)		
	Study subjects	Positive for EA	Percentage of EA	Study subjects	Positive for EA	Percentage of EA
≤ 5 Years	19	4	21.05 %	22	9	40.91 %
> 5-12 Years	31	1	3.23 %	28	6	21.43 %



Graph 1: Percentage of subjects in different age group who had Emergence Agitation

Table 3: Comparison of emergence agitation in different age groups in the form of 2 x 2 contingency table

Group	Emergence agitation	≤ 5 years	> 5 – 12 years	P Value (< 0.05 is significant)
Group A	Present	4	1	0.1244
	Absent	15	30	(Not significant)
Group B	Present	9	6	0.2381
	Absent	13	22	(Not significant)

Table 3 shows the comparison of emergence agitation in different age groups in both group A and B; where we can find that there were no statistically significant differences of emergence agitation between ≤ 5 years and > 5 -12 years age groups in any of the study groups; ie; dexmedetomidine (group A) or propofol (group B).

Perioperatively no serious adverse events such as laryngospasm, bronchospasm, bradycardia, hypotension, cardiac arrhythmia, anaphylaxis, oxygen desaturation episodes were recorded in any of the study subjects.

Discussion

With development in paediatric anaesthesia, poorly soluble newer inhalational agents like sevoflurane and desflurane came into routine anaesthesia practice. In today's era, sevoflurane is preferred anaesthetic agent for induction and maintenance in paediatric anaesthesia due to its properties like low pungency, non-irritant to airways and a low blood : gas partition coefficient [11]. It can be rapidly and conveniently administered without discomfort, and its low solubility facilitates precise control over the depth of anaesthesia and a rapid and smooth induction and emergence from general anaesthesia.

Eckenhoff et al. [12] first described emergence agitation (EA) in the early 1960's and it is considered as landmark study in this context. EA which results in self injury, poor surgical outcome, parental dissatisfaction, increase in hospital stay with enhanced nursing cost is a known morbidity after sevoflurane anaesthesia [13].

No single aetiology has been determined to explain this phenomenon. But recently a number of studies have examined various patients, anaesthetics and surgical factors that may increase the incidence of EA.

The highest incidence of EA has been seen in children between 2 and 5 years of age [9,14]. Aono compared preschool children to older school age children (6–10 years) receiving sevoflurane anaesthesia and found a markedly increased incidence of EA in the younger age group [9]. In a few studies, the authors have mentioned the role of brain maturation on delirium, with some relating EA susceptibility in children to the development of the hippocampus and cholinergic function [15,16]. Further, a study by Martini showed that neurotransmitter levels in paediatric brains were analogous to levels in brains that had undergone normal age-related changes. Diminished levels of acetyl-choline, dopamine, norepinephrine and aminobutyric acid were neuro-physiological findings characteristic of both the geriatric and paediatric populations [15]. Disturbance to these neurotransmitters have been implicated as precipitating factors for delirium in a significant number of studies.

We have observed in our study that in both the groups incidences of EA were higher in ≤ 5 years age group as compared to > 5-12 years age group which was 21.05% versus 3.23% in dexmedetomidine group and 40.91 % versus 21.43% in propofol group (Table 2 and Graph 1). Although from statistical point of view, there were no significant difference between the two age groups

Aono et al. [9] similarly found in their study that highest incidences of EA seen in less than 5 years age group children. They hypothesized that psychological immaturity, poor ability to cope up with sudden awakening in a strange environment coupled with the rapid recovery potential of sevoflurane caused the greater incidences of EA in the preschool age group.

Although in our study, clinically the incidences of EA were higher in pre-school age group children; but when we compared it statistically, we found that there was no significant statistical difference of EA between ≤ 5 years and > 5 -12 years age group children in any of the group A or B (Table 3).

Post-operative pain is considered as one of the possible risk factors for EA [15]. Pain was not a confounding factor in our study as we have administered I.V. paracetamol at a dose of 15 mg/kg for control of post-operative pain in both the groups.

One limitation of our study was that we did not have a control group and hence could not estimate incidence of EA in patients where no prophylactic drug was used. Amongst many pharmacological agents, dexmedetomidine [17,18] and propofol [19,20] both being evaluated in various studies for the prevention of EA and they have proven safety profile and efficacy. So, we assume that if we had a control group, the incidences of EA in both preschool and older children would had been even higher than what we found in dexmedetomidine or propofol group.

Since last half a century, EA has been studied and reported in the literatures [12]. However, there are still many questions that needs to be answered. Obviously, further trials are required to discover the underlying causes of EA and to determine which factors might help, predict and potentially prevent it [8]. To reduce emergence agitation, it is advisable to identify children at risk and take preventive measures, such as reducing preoperative anxiety, removing postoperative pain, providing a quiet, stress-free environment for recovery, allow parent/guardian to remain in the recovery room if feasible.

Conclusions

From our study, we can conclude that clinically the incidences of emergence agitation were higher in pre-school age group as compared to older children who received sevoflurane anaesthesia; although statistically this difference was insignificant.

Key Message

Since last half a century, EA has been studied and reported in the literatures. It is an important issue in paediatric anaesthesia and is associated with parental dissatisfaction, increased nursing cost. It delays discharge and affects the surgical outcome adversely. To reduce emergence agitation, it is advisable to identify children at risk and take preventive measures.

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Original Research Article

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Efficacy of USG Guided Subcostal Transversus Abdominis Plane Block for Postoperative Analgesia after Laparoscopic Cholecystectomy

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Abstract

Backgroud and Aims: The advent of ultrasound guided techniques has led to increased interest in Transversus Abdominis Plane block (TAP) for abdominal surgeries. Recently the transversus abdominis plane block (TAP block) has been used as a part of multimodal analgesia with promising results. The oblique subcostal approach (OSTAP block), a variant of the TAP block, produces reliable supra umbilical analgesia. This study aimed to compare the efficacy of ultrasound guided OSTAP block with portsite infiltration in laparoscopic cholecystectomy for postoperative analgesia. *Methods:* Eighty patients scheduled to undergo laparoscopic cholecystectomy under general anaesthesia were divided into two groups: Group A (n=40) patients received oblique subcostal transversus abdominis plane block with 15 ml of 0.25% bupivacaine on each side and Group B (n=40) received local portsite wound infiltration with 30 ml of 0.25% bupivacaine in all four ports. The primary and secondary outcome variables were postoperative pain relief, duration of analgesia, rescue analgesic requirement and any side effects, which were noted. *Results:* The postoperative VAS scores were significantly lower in group A (OSTAP) compared to group B (Portsite) at 0, 1, 2 and 3 hours postoperatively. OSTAP block resulted in longer duration of analgesia as compared to portsite infiltration. The mean duration of analgesia recorded in OSTAP group A was 5.68±2.08 hours and in portsite infiltration group B was 2.53±1.19 hours. The total dosage demand for rescue analgesia in first 24 hours was also less in the study group A compared to group B i.e 91.87±31.71mg of diclofenac sodium in group A and in group B was 135.01±34.80 mg. Postoperative nausea vomiting score though was less in group A than in group B but there was no statistically significant difference in between the groups. *Conclusion:* The results suggest that the use of Ultrasound guided bilateral oblique subcostal transversus abdominis plane block reduces postoperative pain scores, prolongs the duration of analgesia and decreases demand for rescue analgesia without causing any adverse effects in comparison to portsite infiltration.

Keywords: Transverses Abdominis; Bupivacaine; Portsite; Postoperative; Analgesia.

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Introduction

Pain is the most common human experience bringing patient to medical care; a symptom frequently encountered in clinical practice and is consistent and predominant complaint of most individuals following surgical intervention [1]. Since Eric Mouret's first laparoscopic cholecystectomy in 1987, this procedure has become the gold standard treatment for symptomatic cholelithiasis. The reasons behind the increasing number of laparoscopic surgeries are improved healing time as compared to open surgery resulting in early recovery and discharge from the hospitals [2,3]. Pain after laparoscopic cholecystectomy is considered to arise from 3 main

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sources: i.e., incision sites, the pneumoperitoneum and the post cholecystectomy wound within the liver.[4] The TAP block is a peripheral nerve block designed to anaesthetize the nerves supplying the anterior abdominal wall (T_6 to T_{11}). Since standard landmark based approach to the TAP block is inaccurate and the incidence of peritoneal placement is high, an ultrasound guidedapproach was first described in 2007 by Hebbard et al. [5] In 2008, Hebbard et al. [6] described another ultrasound guided tap block technique designed for upper abdominal surgery referred to as the oblique subcostalapproach. The search for ideal postoperative analgesia regimens following laparoscopic cholecystectomy still continues which should facilitate high quality analgesia with low incidence of postoperative nausea and vomiting so as to provide early hospital discharge. Our study aimed to compare the analgesic efficacy of the OSTAP block using bupivacaine in laparoscopic cholecystectomy with the portsite infiltration.

Methods

It was a prospective, randomized, double blind, controlled clinical trial. The study protocol was approved by the institutional ethics committee and written informed consent was obtained from all patients recruited from August 2016 to September 2017. This study was carried out on 80 American Society of Anesthesiologists' (ASA) physical status I and II patients of both gender, in the age group of 20–60 years, scheduled for laparoscopic cholecystectomy under GA. Patient's refusal for block, history of cardiac, renal or hepatic disease, CNS disorders, neuropathy, bleeding disorders, hypersensitivity to local anaesthetics, local infection at the site and BMI >30 formed the exclusion criteria. The anaesthetic procedure was explained to the patients enrolled for study.

All patients were kept nil orally as per protocol. They were given premedication in the form of tablet Alprazolam 0.5 mg and tablet Ranitidine 150 mg 2 hours prior to surgery . On arrival in operation theatre, intravenous line was secured in nondominant upper limb using an 18 gauge IV cannula and crystalloid fluid was started. Patients received a standard general anaesthetic regimen consisting of injection fentanyl (2 mg/kg) iv, injection propofol (2 mg/kg) iv and injection atracurium (0.5 mg/kg) iv for intubation during induction. Anaesthesia was maintained with N_2O, O_2 and isoflurane (66%, 33% and 1% MAC) respectively. An intermittent dose of injection atracurium (0.1mg/kg) iv was given for adequate muscle relaxation. Ventilation was adjusted to maintain end tidal CO_2 between 30 to 40 mm of Hg, whereas intra abdominal pressure was maintained between 10 to 12 mm of Hg. In group A before the surgery started, bilateral oblique subcostal transversus abdominis plane block was performed aseptically under ultrasound guidance (Sonosite Micromax) using linear probe (6-13 MHz frequency). The rectus abdominis and transversus abdominis muscles were identified near the costal margin and xyphoid. A 22 G echogenic needle advanced by an ultrasound guided inplane (medial to lateral) technique through rectus muscle 2 to 3 cm medial to the probe. Once the tip of the needle was visualized in between the rectus muscle and transversus abdominis muscle facial plane, 1 ml of normal saline was injected to open the plane and after confirmation of hypoechoic area on ultrasonography imaging, injection of 15 ml of drug solution was given. Hydrodissection was demonstrated by the needle passing along the oblique subcostal line inferolaterally from xyphoid towards the anterior part of the iliac crest. A contralateral oblique subcostal transversus abdominis plane block was subsequently performed in similar manner with 15 ml of 0.25 % bupivacaine. In group B 30 ml of 0.25% bupivacaine was infiltrated at the portsites by surgeon as 7.5 ml at the epigastric port, 7.5 ml at the umbilical port and 7.5 ml at each two working port, before the surgery started. At the end of surgery, isoflurane and N_2O was turned off and muscle relaxation was reversed with injection neostigmine (50 mcg/kg) and injection glycopyrrolate 0.08 mg/kg intravenously. Patients were extubated, once they demonstrated spontaneous eye opening, good cough reflex, hand grip and were able to generate good tidal volume. The time of arrival in the postoperative unit was defined as 0 hour postoperatively. For the first 24 hours, the protocol for postoperative analgesia consisted of standard orders for intravenous diclofenac 75 mg on demand for VAS> 4. Postoperatively, the patients were evaluated for pain, nausea or vomiting, in the post anaesthesia care unit at 0 1, 2, 3, 4, 6, 8, 12, 24 hours by an investigator blinded to group assigned. Postoperatively, pain level at rest (supine) and pain on movement (sitting up from supine) was quantified with a 10 cm visual analogue scale (VAS) pain score.

1. Patients were asked to rate the pain they experience over 24 hours postoperatively on a 10 cm VAS (visual analogue scale) between no pain – 0 very severe pain – 10
2. Patients were asked to rate the severity of nausea, vomiting on three point scale no nausea, no

vomiting -0 nausea present, no vomiting -1, nausea present, vomiting present -2

The primary outcome measure in this study was the time to first analgesic request. The secondary outcome measure included the number of supplemental analgesic requirements, VAS pain scores at different time interval, nausea and vomiting and any other side effects.

Results

The total number of patients enrolled during the study was 85 for the two groups; 5 patients were excluded from study because of conversion to open cholecystectomy [Figure 1]. Thus, the total number of patients completing the study was 40 in each group. They were comparable to each other with respect to age, body mass index (BMI), and ASA status [Table 1]. VAS measurements were performed to assess the quality of analgesia. The OSTAP group had a

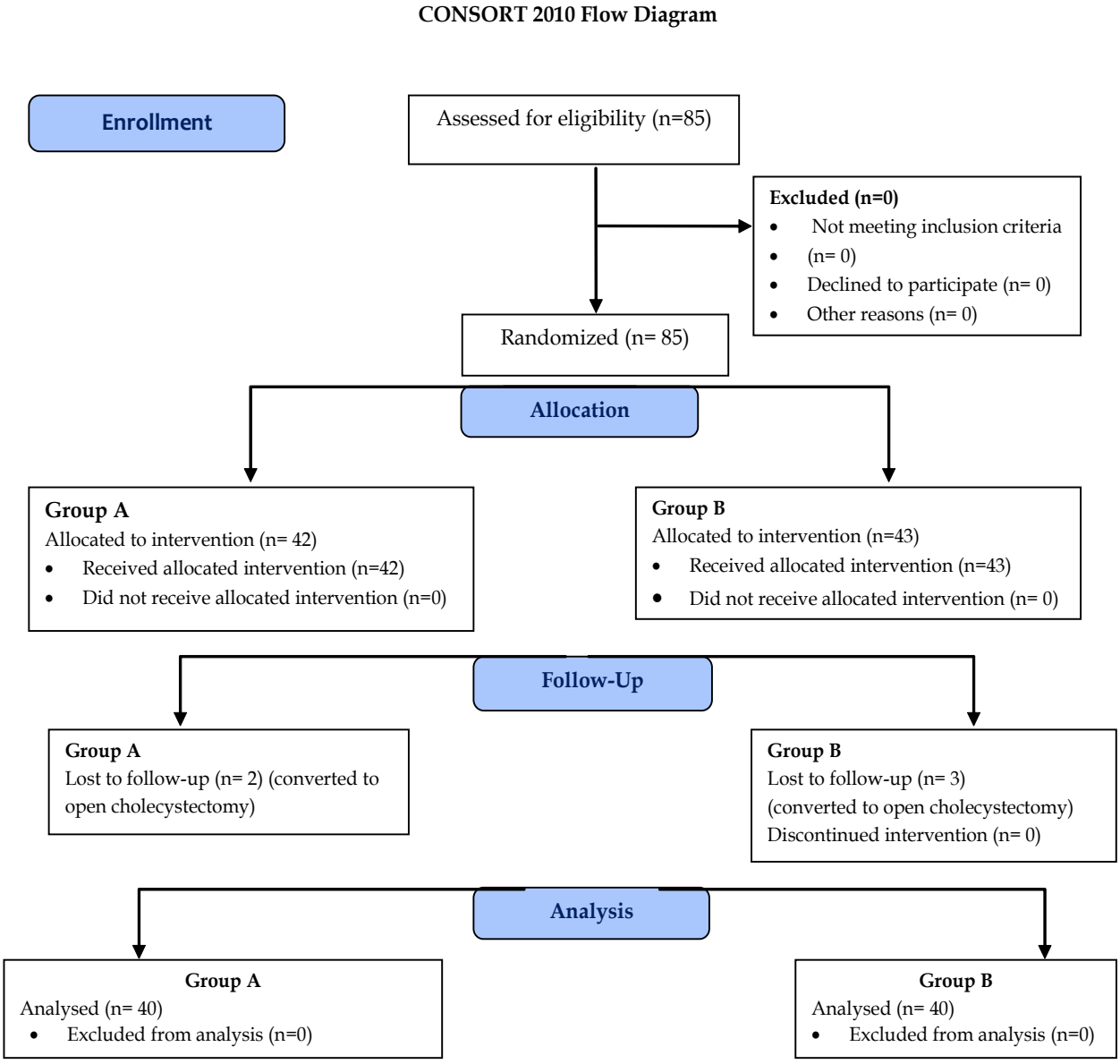


Fig. 1: Flow chart of patients recruited and analyzed in two groups

statistically significant lower VAS scores at 0, 1, 2, 3 hours postoperatively both at rest and on movement (Table 2 & 3) (Figure 2 & 3). Total duration of analgesia (defined as time interval between shifting patient to PACU and demand for first rescue analgesic) was more in OSTAP group as compared to portsite infiltration group. In OSTAP group, pain free period was 5.68±2.08 hours while it was 2.53±1.19 hours in local infiltration group ($p< 0.000$) [Table 4, Figure 4a]. 24 hours postoperative analgesic requirements was significantly lower in OSTAP group than in portsite infiltration group (i.e 91.87±31.71 mg in 40 patients of OSTAP group and 135.01±34.80 mg in 40 patients of portsite infiltration group(Table 4, Figure 4b). Both groups were comparable in terms of PONV scores (Table 4) (Figure 4c).

Table 1:

Parameter		Group A	Group B	p value
Age (years) mean±SD		41.03±10.46	42.03±11.75	0.689
BMI mean±SD		24.05±2.97	23.42±2.18	0.283
ASA grade	I	28(70%)	29(72.5%)	
(no %)	II	12(30%)	11(27.5%)	0.738

p value <0.05 (significant)

Table 2: (VAS scores at rest)

VAS scores	Group A	Group B	P values
0 hours	0.40±1.01	2.10±1.21	0.000
1 hours	1.28±1.33	3.05±1.13	0.001
2 hours	2.15±1.09	3.05±1.11	0.000
3 hours	2.45±0.09	3.85±1.25	0.000
4 hours	3.23±1.14	3.15±1.21	0.776
6 hours	3.61±1.01	3.53±0.78	0.728
8 hours	3.78±1.36	3.58±1.36	0.367
12 hours	2.32±1.32	2.78±1.31	0.122
24 hours	0.88±1.22	1.35±1.12	0.074

p value <0.05 (significant)

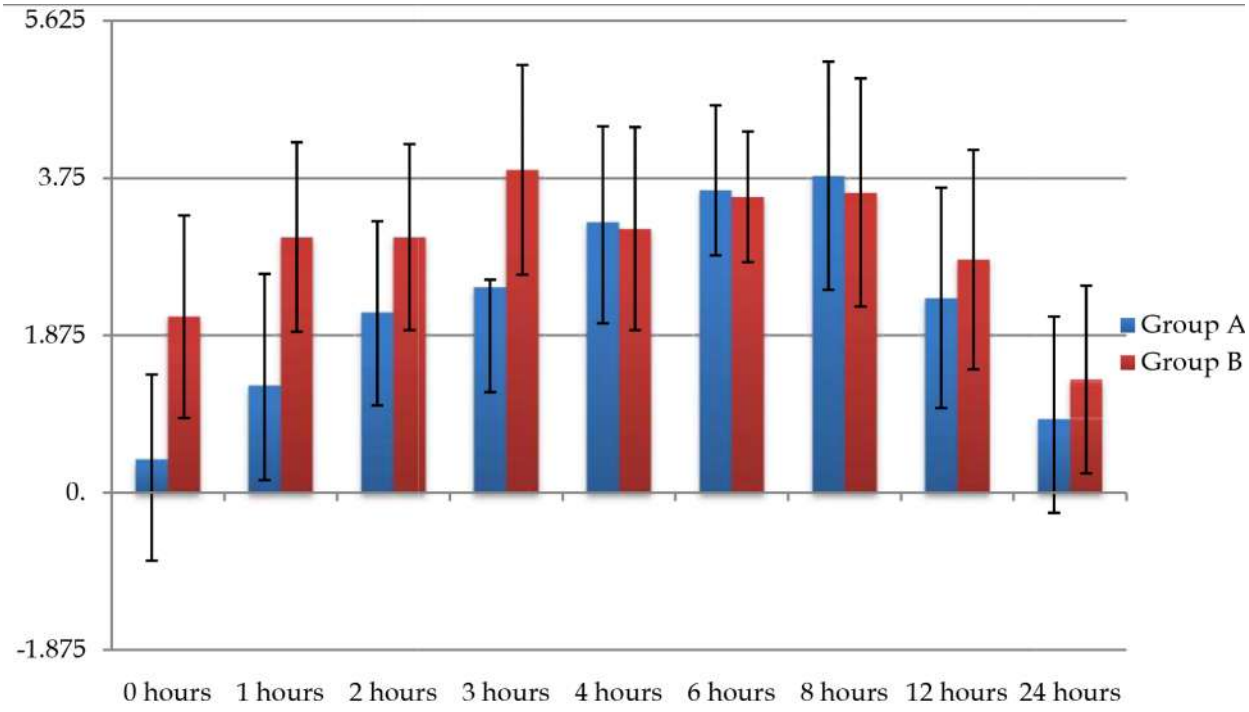


Fig. 2: VAS scores at rest

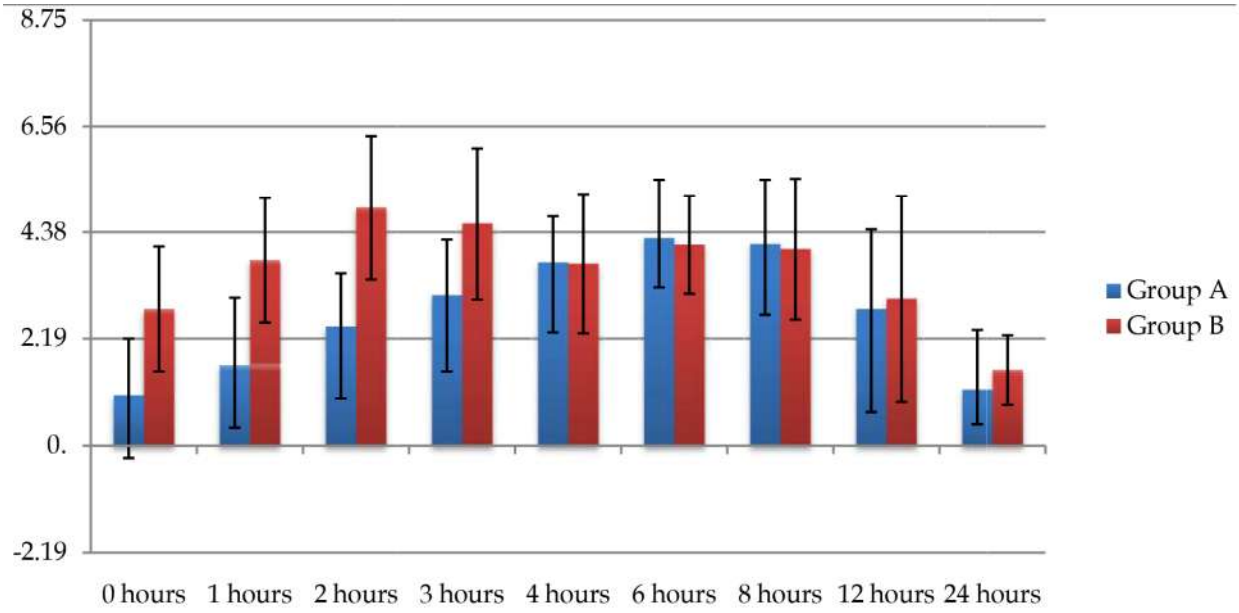


Fig. 3: (VAS scores on movement)

Table 3: VAS scores on movement

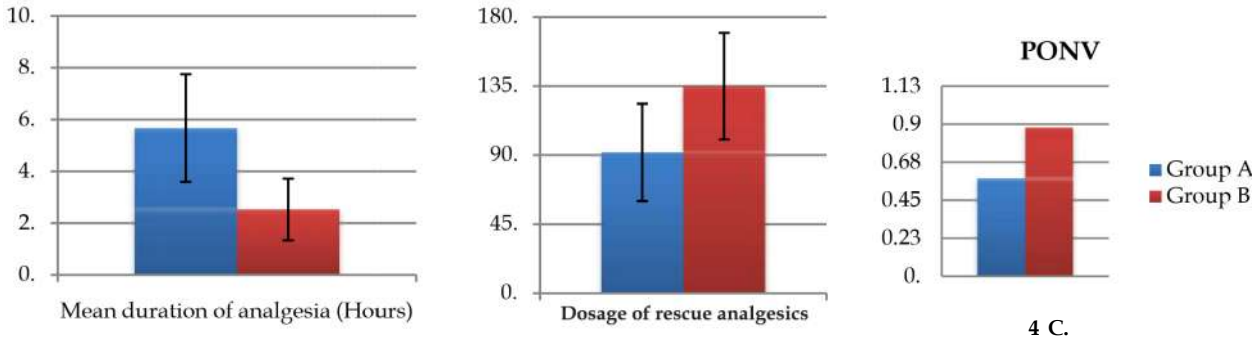
VAS scores	Group A	Group B	P values
0 hours	1.03±1.16	2.80±1.28	0.000
1 hours	1.65±1.38	3.80±1.28	0.000
2 hours	2.45±1.08	4.88±1.48	0.000
3 hours	3.08±1.14	4.55±1.56	0.000
4hours	3.75±0.95	3.73±1.43	0.927
6 hours	4.25±1.21	4.12±1.01	0.671
8 hours	4.13±1.33	4.03±1.45	0.755
12 hours	2.80±1.63	3.01±2.11	0.467
24 hours	1.15±1.22	1.55±0.71	0.117

P value <0.05 (significant)

Table 4: Other Variables

Parameter	Group A	Group B	P value
Mean duration of analgesia (Hours)	5.68 ± 2.08	2.53 ± 1.19	0.000
Dosage of rescue analgesics (doses of Diclofenac in mg)	91.87 ± 31.71	135.01 ± 34.80	0.000
PONV	0.58 ± 0.67	0.88 ± 0.82	0.078

P value <0.05 (significant)



4 A. **4 B.** **4 C.**

Fig. 4:

Discussion

Laparoscopic cholecystectomy is one of the common surgeries performed by general surgeons worldwide. Despite its many benefits, including reduced postoperative pain, smaller scars, shorter hospital stay, shorter convalescence period, and decreased risk of complications compared with open cholecystectomy, majority of patients undergoing elective laparoscopic cholecystectomy are still observed in the hospital overnight for postoperative pain and complications [7].

Over the time, methods for providing postoperative analgesia have changed from iv opioids, central neuroaxial block, intraperitoneal and portsite infiltration to regional blocks like TAP block. TAP infiltration was originally described as a landmark guided abdominal field block for postoperative pain management. As spread of the local anaesthetic is critical for analgesic efficacy, the use of an ultrasound guided technique was a logical progression for this block. In response to clinical variations, this technique had evolved further to multiple and single injections as well as to lateral, subcostal, and posterior approaches [8]. Ultrasound guided OSTAP block is an expanding regional anaesthesia technique that provides good analgesia to the skin and musculature of the anterior abdominal wall and has proved to be an effective component of multimodal analgesic regimen for a wide variety of abdominal procedures including large bowel resection, open/laparoscopic appendicectomy, gastrectomy, upper abdominal surgeries and laparoscopic cholecystectomy [9,10]. Most randomized controlled trials demonstrate the efficacy of ultrasound guided OSTAP block by highlighting some combination of reduced postoperative opioid requirement, lower pain scores, and reduction in opioid-related side effects. Potential advantages include its simplicity and effectiveness in providing analgesia, appropriateness for surgical procedures where parietal pain is a significant component of postoperative pain. The analgesic benefit of TAP block in laparoscopic cholecystectomy has already been established by both landmark based approach and ultrasound guided approach. Therefore, we intended to compare the efficacy of ultrasound guided oblique subcostal TAP block for postoperative analgesia in patients scheduled for laparoscopic cholecystectomy with portsite infiltration.

Tolchard et al. [11] compared the efficacy of subcostal tap block with portsite infiltration in laparoscopic cholecystectomy and demonstrated lower VAS scores in OSTAP at 1 and 4 hours postoperatively. C M Breazu et al. [12] observed significant reduction in VAS score in first 24 hours postoperativly in OSTAP block with bupivacaine than in OSTAP with placebo. Our results are consistent with these studies and shows the efficacy of OSTAP block using 0.25% bupivaciane for postoperative analgesia.

Another advantage afforded by OSTAP block is that it provides longer duration of analgesia as compared to portsite infiltration. The mean duration of analgesia recorded in our study in OSTAP group (A) was 5.68±2.08 hours and in portsite infiltration group (B) was 2.53±1.19 hours. Most of the authors have claimed a mean duration of analgesia as 4-6 hours with the use of plain bupivacaine in tap block and our study also shows similar results [13,14,15]. The prolonged duration of bupivacaine in TAP block has also been attributed to the poor vascularity of transverse abdominis plane as demonstrated by Mcdonnell et al. [13] Very few studies have been reported which compared the duration of postoperative analgesia in patients receiving OSTAP block with portsite infiltration in laparoscopic cholecystectomy. The results of our present study were more consistent with the study conducted by Mohamed and colleagues [15] who compared the efficacy of OSTAP block with portsite infiltration in 63 patients undergoing laparoscopic sleeve gastrectomy. In their study recorded time for first rescue analgesic in OSTAP group was 340±72 min and in portsite infiltration group was 266±33 min which was statistically significant and is similar to the results of our study. Tramadol consumption in 24 hour postoperative period in patients undergoing laparoscopic cholecystectomy was significantly more in control group (267.1±108.6 mg) than in OSTAP group (126.3±54.2 mg) respectively (p=0.001) which is similar to our study. Mean dosage requirement of rescue analgesia (in mg) in our study in OSTAP group was 91.87±31.71 mg and 135.01±34.80 mg in portsite infiltration group. Our results show that total dosage of rescue analgesics required in 24 hour postoperative period is significantly less in OSTAP group than in portsite infiltration group. Authors [12,16,17] have used different analgesic agents while iv diclofenac was the rescue analgesia in our study, so though a direct comparison between these studies is questionable but it can be considered till further studies for evaluation are available.

Our study did not find any statistically and clinically significant differences in PONV scores and none of the patient in either group had any procedure related complications like injury to viscera or any local complication.

Our data supports prolonged action of bupivacaine on peripheral nerves in OSTAP block leading to better pain scores, decrease in postoperative analgesic requirements, PONV scores and complications.

Conclusion

We concluded that the use of Ultrasound guided bilateral oblique subcostal transversus abdominis plane block reduces postoperative pain scores, prolongs the duration of analgesia and decreases demand for rescue analgesia without causing any adverse effects in comparison to portsite infiltration. So it is recommended that Ultrasound guided oblique subcostal TAP block can be safely used as a part of multimodal analgesia for better postoperative pain scores and prolonged duration of analgesia, thereby reducing the rescue analgesic requirement with better patient satisfaction.

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Original Research Article

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Comparing Effects of Isoflurane, Sevoflurane and Desflurane, using TEE, on Diastolic Dysfunction of Patients Undergoing CABG

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Abstract

Introduction: Diastolic dysfunction is a cause of morbidity and mortality in patients of coronary artery with normal systolic function. Diastolic dysfunction is highly predictive of adverse events after myocardial infarction. Transesophageal Echocardiography (TEE) is a non-invasive tool to investigate and diagnose perioperative diastolic dysfunction, which may influence the anesthetic management and post-operative outcome. This study was designed to compare the effects of Isoflurane Sevoflurane and desflurane on left ventricular diastolic dysfunction, using TEE in patients posted for CABG. *Materials and Methods:* 90 consenting adult patients, below the age of 70 years with grade 1 diastolic dysfunction posted for elective CABG surgery were included in this randomized cross sectional observational study and randomly divided in 3 groups of 30 patients each using a sealed envelope method. Group I received isoflurane, group S received sevoflurane & group D, desflurane. Ventricular relaxation criteria measured by the TEE were E (early diastolic peak velocity across the mitral valve), A (late diastolic peak velocity across the mitral valve), E/A ratio, S/D ratio, deceleration time (DT), e' (early mitral annular velocity), E/e' ratio. Parameters measured by the PA catheter were pulmonary artery pressure (PAP), pulmonary capillary wedge pressure (PCWP), stroke volume (SV), cardiac output (CO), systemic vascular resistance (SVR), systemic vascular resistance index (SVRI), pulmonary vascular resistance (PVR). Other hemodynamic parameters recorded were mean arterial blood pressure (MAP), central venous pressure (CVP), heart rate (HR), oxygen saturation (SpO_2). *Statistical analysis and Results:* Descriptive statistics like mean, median and proportions were used to describe the study results. Binary or ordinal data were expressed as number (%) and continuous numeric variables were expressed as Mean±SD. Qualitivedata was analyzed by Pearsons chi square test. Analysis of variance was done for repeated measure of continuous variables by one way ANOVA. A p value of < 0.05 was considered as statistically significant. Significant improvement was seen in all the left ventricular relaxation indices as measured by TEE after using the three inhalational agents in the study. *Conclusion:* Our study establishes the safety of all the three inhalational agents which are currently used in cardiac anesthesia. The pre-existing grade 1 diastolic dysfunction in patients remained the same. It is recommended to study this with larger sample size.

Keywords: Diastolic Dysfunction; CABG; TEE.

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Introduction

Diastolic dysfunction is acause of morbidity and mortality in patients of coronary artery disease and is seen in 50% cases of congestive heart failure (CHF) with preserved systolic function [1].

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Cardiac surgery patients having perioperative diastolic dysfunction have beenassociated with a longer hospital stay, difficult weaning from cardiopulmonary bypass,post-operative CHF and prolonged requirement for inotropes [2,3].

Isoflurane, sevoflurane and desflurane are essential for balanced anaesthesia. However, their effects on left ventricular (LV) diastolic function have not been precisely defined.

Transesophageal Echocardiography (TEE) is a non-invasive tool to diagnose perioperative diastolic dysfunction, which may influence the anesthetic management and post-operative outcome.

This study wasdesigned to compare the effects of Isoflurane sevoflurane and desflurane on left ventricular diastolic dysfunction, using TEE in patients posted for Coronary Artery Bypass Grafting (CABG).

Materials and Methods

After approval of hospital ethics committee, 90 consenting adult patients, below the age of 70 years with grade 1 diastolic dysfunction posted for elective CABG surgery were included in this randomized cross sectional observational study.

The patients were randomly divided into 3 groups of 30 patients each using a sealed envelope method. Group Ireceived isoflurane, group S received sevoflurane & group D, desflurane.

A complete pre-anaesthesia evaluation of allthe patients was done before their allotment in the three groups including a full (pre-induction) 2DECHO. Preoperatively, patients took all prescribed drugs on the morning of operation except ACE-inhibitors.

Patients with an ejection fraction of less than 50%, significant ventricular arrhythmias, atrial fibrillation, hypertrophic obstructive cardiomyopathy, with pericardial disease, valvular heart disease, on inotropes, coexisting severe renal,neurological and respiratory distress were excluded from this study.

All patients were shifted to the operating room with oxygen given by a venturi mask. Intravenous cannulae wereinserted after local anaesthesia under asepsis. Premedication of injection fentanyl 1mcg/kg and midazolam 0.03mg/kg were given intravenously. Arterial line was inserted under local anaesthesia and invasive blood pressure monitoring initiated. Baseline activated clotting time and arterial blood gas analysis (ABG) were done.

Anaesthesia was induced withinj fentanyl 5 mcg/kg,pancuronium 0.1mg/kg, etomidate 0.3 mg/kg in all the three groups. After intubation, patients received an internal jugular vascular sheath.A swan ganz catheter was inserted through the sheath till wedge position.

A TEE ECHO probe was inserted and a second full 2D ECHO (post induction) was done to have baseline diastolic (LV relaxation) data. At the same time second ABG sample was taken.

Randomly, either of the three inhalational agents were started at 1 MAC (as calculated and displayed by the anesthesia machine) and continued for 10 minutes. Transesophageal 2D ECHO evaluation was done 10 minutes after inhalational agent and final (post- inhalational) diastolic data were noted. All hemodynamic and pulmonary artery (PA) catheter data were stored in the server with snapshot values earmarked for use of the study. Surgery was started only after the post–inhalational ECHO and ABG were done.

Ventricular relaxation criteria measured by the TEE were E (early diastolic peak velocity across the mitral valve), A (late diastolic peak velocity across the mitral valve), E/A ratio, S/D ratio, deceleration time (DT), e' (early mitral annular velocity) and E/e' ratio.

Parameters measured with the PA catheter were pulmonary artery pressure (PAP), pulmonary capillary wedge pressure (PCWP), stroke volume (SV), stroke volume index (SVI), cardiac output (CO), cardiac index (CI), systemic vascular resistance (SVR), systemic vascular resistance index (SVRI), pulmonary vascular resistance (PVR), pulmonary vascular resistance index (PVRI).

Other hemodynamic parameters recorded were mean arterial blood pressure (MAP), central venous pressure (CVP), heart rate (HR), oxygen saturation (SpO_2).

No intravenous anesthetic agent was given for 20 minutes before & 20 minutes after the start of inhalational agent.Cardiac filling pressures (CVP, PCWP, SVRI) were kept as near baseline as possible, i.e. within 20% of baseline values.

No Surgical work wasdone until the end of the final (post-inhalational) TEE readings.

Results and Statistical analysis

Descriptive statistics like mean, median and proportions were used to describe the study results.

Binary or ordinal data were expressed as number (%) and continuous numeric variables were expressed as Mean±SD. Qualitative data was analyzed by Pearsons chi square test. Analysis of variance was done for repeated measure of continuous variables by one-way ANOVA. Software used for analysis was SPSS version 17.0. A p value of <0.05 was considered as statistically significant.

The patients of our study in all the three groups were similar in terms of demographicdata as seen in Table 1.

Statistically significant improvement in the E values were observed post inhalational agent use in all the three groups.

Normal range = 50-90 cm/sec. E values improved significantly in all individual groups All values remained within grade 1 diastolic dysfunction. Comparably similar in all groups

Normal range is > 1-1.5. Grade 1 diastolic dysfunction is ≥ 1 Grade 2 diastolic dysfunction is ≥ 1.5 Significant improvement seen in all the three groups

Statistically significant improvement in the E/A ratio was observed in all the three groups post use of an inhalational agent.

Significant reduction in deceleration time was observed in all the three groups after the inhalational agent was used.

Table 1: Demographic and Anthropometric Characteristics

Group	No. of patients (n)	Gender Distribution		Mean Age (in years)	Height (cm)	Weight (kg)	Body Surface Area
		Male	Female				
Desflurane	30	30	0	59.37	163.57 ± 18.91	67.93 ± 18.11	1.73 ± 0.14
Isoflurane	30	30	0	58.33	166.17 ± 4.28	65.37 ± 10.19	1.74 ± 0.13
Sevoflurane	30	29	1	58.83	167.40 ± 4.07	68.33 ± 9.91	1.78 ± 0.14

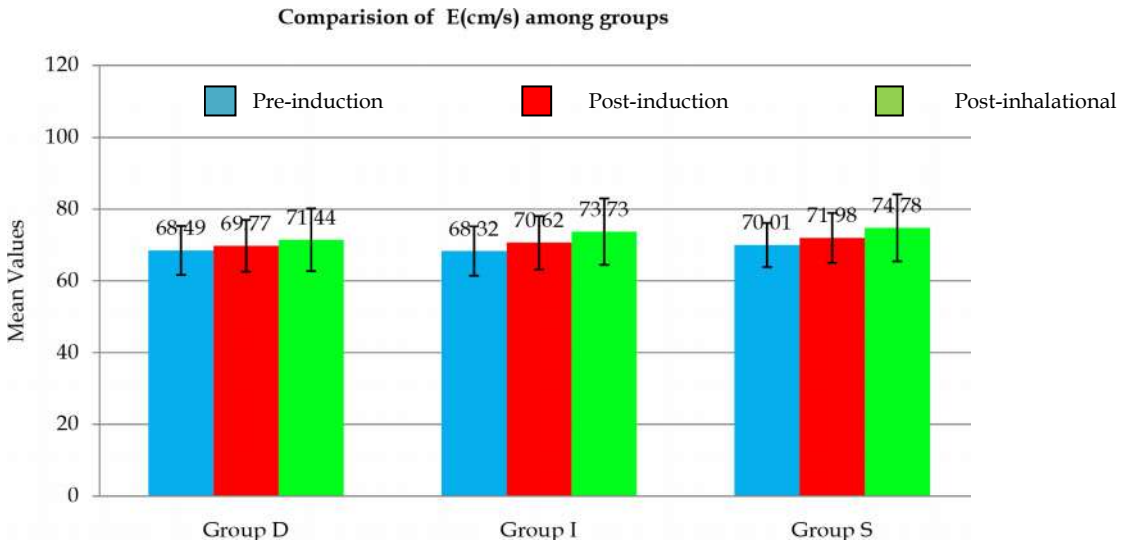

Fig. 1: Pre-induction Post-induction Post-inhalational

Table 2: Comparison of relaxation criteria (E values) in individual groups

E(cm/s)	Group D		Group I		Group S	
	Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Pre induction	68.49 ± 6.85		68.32 ± 7.20		70.01 ± 8.74	
Post induction	69.77 ± 6.88	0.003	70.62 ± 7.45	<0.001	71.98 ± 9.26	<0.001
Post inhalational	71.44 ± 6.17	<0.001	73.73 ± 6.94	<0.001	74.78 ± 9.33	<0.001

Normal range = 50-90 cm/sec.
E values improved significantly in all individual groups
All values remained within grade 1 diastolic dysfunction.
Comparably similar in all groups

Table 3: Comparison of relaxation criteria (E/A ratio) in individual groups

E/A	Group D		Group I		Group S	
	Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Pre induction	0.849± 0.044		0.846 ± 0.05		0.85 ± 0.05	
Post induction	0.87 ± 0.04	0.004	0.87 ± 0.04	<0.001	0.87 ± 0.06	0.001
Post inhalational	0.90 ± 0.05	<0.001	0.94 ± 0.09	<0.001	0.93 ± 0.11	<0.001

Normal range is > 1-1.5.
Grade 1 diastolic dysfunction is ≥1
Grade2diastolic dysfunction is ≥1.5
Significant improvement seen in all the three groups

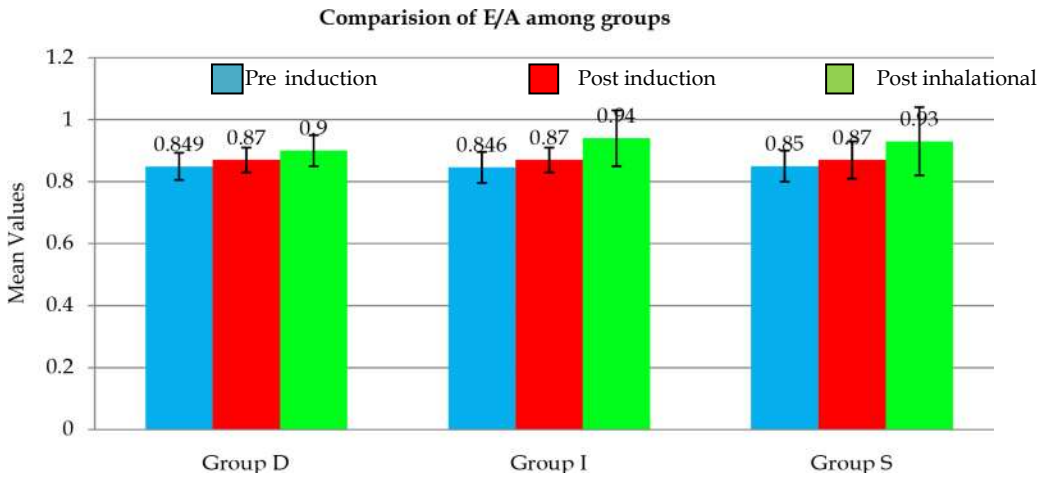

Fig. 2: Pre induction Post induction Post inhalational

Table 4: Comparison of relaxation criteria (e' values) in individual groups

e'(cm/sec)	Group D		Group I		Group S	
	Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Pre induction	8.48 ± 0.51		8.55 ± 0.50		8.57 ± 0.44	
Post induction	8.48 ± 0.52	0.801	8.58 ± 0.44	0.271	8.55 ± 0.43	0.573
Post inhalational	8.91 ± 0.77	0.001	8.61 ± 0.72	0.706	8.51 ± 0.71	0.645

Normal range = 10-14 cm/sec
Grade 1 diastolic dysfunction = 8-10 cm/sec
Grade 2 diastolic dysfunction ≤ 8 cm/sec
Significant improvement (moving towards normal) in Group D

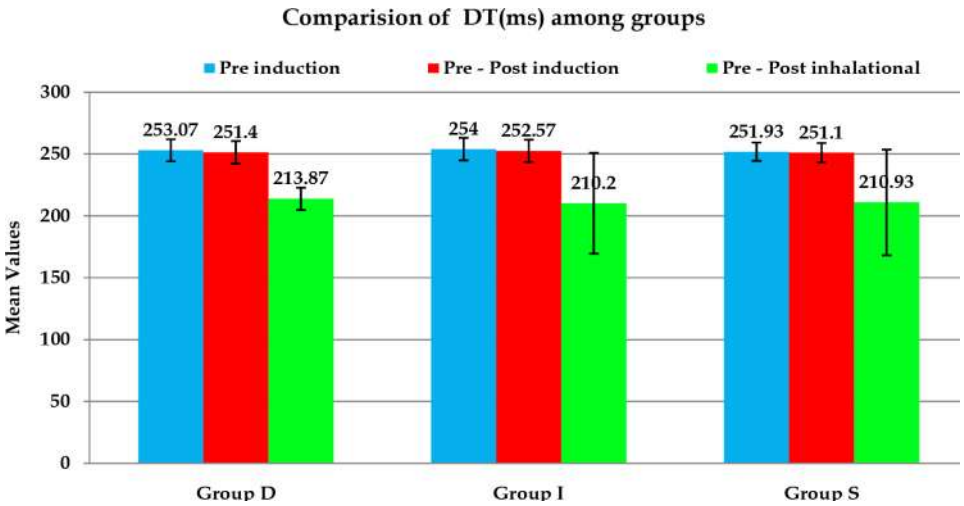

Fig. 3:

Table 5: Comparison of relaxation criteria (E/e' values) between groups

E/e'	Group D Mean ± SD	Group I Mean ± SD	Group S Mean ± SD
Pre induction	8.24 ± 0.65	8.65 ± 1.49	8.79 ± 1.59
Post induction	8.21 ± 0.57	8.23 ± 0.76	8.40 ± 0.95
Post inhalational	8.08 ± 0.62	8.0 ± 0.75	8.16 ± 0.85

Normal range = 5-8 cm/sec
Grade 1 diastolic dysfunction = 8-10 cm/sec
Grade 2 diastolic dysfunction = >15 cm/sec
Results obtained are comparable in all groups.

Discussion

The effect of volatile anesthetic agents on LV diastolic function has been investigated in numerous animal studies and in vitro experiments with myocardial tissue. The human research is limited to a few publications only.

Sarkar S et al. [4], in their review article pertaining to patients ofischemic heart disease with preexisting LV diastolic dysfunction concludedthat isoflurane, sevoflurane and desflurane do not have any detrimental effects on LV diastolic dysfunction and infact improvement was noticed in relaxation criteria. A similar observation was also noted in our study as seen in Fig 1 and Table 2 in which the diastolic dysfunction remained grade 1 in all the three groups. Beneficial effects were noted in E/A ratio, DT in patients of all three groups as seen in Table 3, Fig 2 and Fig 3.

However, the hemodynamic measurements in the former study were noted once the surgery had commenced which contrasts with our study in which all measurements were noted before surgery began and hence the effects of surgical stress have been nullified.

Filipovic M. et al. [5] in theirresearch article studied the effects of sevoflurane and propofol in patients with pre-existing diastolic dysfunction and concluded that during anesthesia and IPPV, there was no difference in e' between the study groups. They also noted that Sevoflurane impaired systolic atrial and ventricular functions. In our study patients depicted a similar effect on e' (early LV filling velocity) as seen in Table 4.

Oxorn et al. [6] reported in their study of healthy patients undergoing peripheral orthopedic surgery that isoflurane at MAC 1 and 1.5 resulted in decreased A velocity, shortening of the deceleration time and at both (MAC 1 and 1.5) doses caused an equal increase in the E/A ratio. No changes in E velocity and S/D ratio were seen.These findings on healthy patients are consistent with our findings on patients of CAD with grade 1 diastolic dysfunction as seen in table 5 and Fig 3.

Neuhauser et al. [7], in their study of patients with diastolic dysfunction, noted that there was an increase in Eleading to a larger E/A ratio and DT decreased with isoflurane. They concluded that changes in loading conditions as well as theinotropic state are more likely to cause the LV to operate on a steeper region of thepressure-volume curve, rather than direct alterations of the intrinsic viscoelasticproperties of the myocardium. These findings on diastolic dysfunction are consistent with our findings on patients of CAD with grade 1 diastolic dysfunction as seen in fig 2 and 3.

Bollinger et al. [8] concluded that desflurane and isoflurane, and most likely sevoflurane, have no clinically relevant negative effect on early diastolic relaxation in young subjects without cardiovascular disease. We also have similar findings in our study pertaining to the inhalational agents but in our study, we evaluated patients of IHD with grade 1 diastolic dysfunction.

Houltz et al. [9] investigated the effects of halothane and isoflurane in controlling the stress response to sternotomy and concluded that both impair the early diastolic relaxation in patients of IHD. This is in contrast to our study where there was a significant improvement in the E values in all the groups.

Hemodynamic viewpoints indicate thatthe three inhalational agents (isoflurane, sevoflurane and desflurane) are statistically safe for patients with coronary artery disease with grade 1 diastolic dysfunction.

Conclusion

Anesthesiologists strive to find an ideal inhalational agent which is cardiostable and does not worsen the already reduced myocardial function of patients with ischemic heart disease.

Our study establishes the safety of all the three inhalational agents which are currently used in cardiac anesthesia. The pre –existing grade 1 diastolic dysfunction in patients remained the same.It is recommended however to do this study in a larger number of patients.

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Original Research Article

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Dexmedetomidine as an Anaesthetic Adjuvant in ENT Surgeries

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Abstract

Context: Dexmedetomidine is an alpha 2 receptor agonist with sympatholytic, analgesic and sedative effects. This study was designed to study the anaesthetic sparing effect of dexmedetomidine and to compare the efficacy of dexmedetomidine with fentanyl. *Aims:* 1) to study the effect of dexmedetomidine and compare dexmedetomidine with fentanyl in patients undergoing ENT surgeries. *Methods and Material:* After approval from institutional ethical committee a prospective randomized controlled study was conducted in forty ASA class 1 and 2 patients posted for ENT surgeries. Patients were randomly divided into two groups. Dexmedetomidine group received a bolus dose of 1mcg/kg body weight over ten minutes followed by infusion at the rate of 0.4mcg/kg/minute. Fentanyl group patients received 2mcg/kg fentanyl five minutes before the induction. Haemodynamic parameters were measured at specific end points. The anaesthetic and analgesic requirement was noted. *Statistical analysis used:* Data was analysed using computer statistical software system openepi. The unpaired t-test was used for intergroup comparisons except where specified. Probability values $p < 0.05$ were considered significant and $p < 0.001$ were considered highly significant. *Results:* It was noted that there was no significant difference haemodynamic parameters and quality of surgical field. The average sevoflurane during the first hour of surgery was significantly lower in group D. The incidence of post-operative nausea and vomiting was significantly lower in group F. *Conclusions:* Dexmedetomidine used in the dose of 1mcg/kg IV bolus followed by 0.4mcg/kg/hour provides effective and well tolerated alternative to fentanyl in reducing the requirement of analgesic and anaesthetic agents.

Keywords: Dexmedetomidine; Fentanyl; Anaesthetic Sparing Effect; Hypotensive Anaesthesia.

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Introduction

Dexmedetomidine is an alpha 2 receptor agonist, which produces analgesia, hypnosis, sedation, anxiolytics and reduces the requirement of anaesthetic agents [1]. Dexmedetomidine has been used as a sole sedative for non-invasive procedures and as an adjunct for invasive procedures. It has been suggested that dexmedetomidine influences core components of an anaesthetic regimen, such as analgesia, hypnosis and memory function and has the ability to reduce both anaesthetic and analgesic requirements in the perioperative period. The purpose of this study was to use intravenous dexmedetomidine as an anaesthetic adjuvant and compare dexmedetomidine with fentanyl.

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Materials and Methods

After approval from institutional ethical committee of government medical college Surat this study was conducted in government medical college, New Civil Hospital Surat. Patients posted in ENT operative list were included in this study. Forty ASA class I and II patients were enrolled into the study. They were divided into two groups by computer generated table of random numbers. Dexmedetomidine group (group D) and fentanyl group (group F). Patients in dexmedetomidine group received dexmedetomidine intravenous bolus dose 1 microgram per kg body weight diluted in hundred ml of normal saline over 10 minutes just before induction of anaesthesia followed by dexmedetomidine infusion at the rate of 0.4mcg/kg/hr delivered through a syringe infusion pump. 100mcg of dexmedetomidine was diluted in 50 ml of normal saline to obtain a concentration of 2mcg/ml. Patients in fentanyl group received 2mcg/kg fentanyl IV, 5 minutes before induction followed by saline placebo infusion. The primary aims of the study was

1. To study the effect of dexmedetomidine and compare dexmedetomidine with fentanyl in reduction of requirement of inhalational anaesthetic agent in patients undergoing ENT surgeries.
2. To study and compare the haemodynamic effects of dexmedetomidine with fentanyl. The secondary aims of the study were
    1. To study the analgesic sparing effects of dexmedetomidine.
    2. To evaluate the influence of dexmedetomidine in the incidence of post-operative nausea and vomiting and compare the same with fentanyl.
    3. To review the effect of dexmedetomidine and fentanyl in quality of surgical field.

Patients with the following conditions were excluded from the study a) history of allergy to alpha agonist or sulpha drugs b) pregnant and lactating mothers and morbidly obese patients c) heart block d) presence of clinically significant neurologic, cardiac, renal, hepatic, gastrointestinal endocrinal diseases Informed consent was taken from all patients. Patients received inj Midazolam 0.02mg/kg IV just before shifting the patient to the operation theatre. On arrival to operation theatre, routine monitoring (ECG, pulse oximetry, NIBP) were started. After obtaining baseline measurement of heart rate and blood pressure patients dexmedetomidine group received a bolus dose of 1mcg/kg body weight in 100ml normal saline over ten minutes, patients in group F received saline. In fentanyl group patients received 2mcg/kg fentanyl diluted in 10 ml NS five minutes before the induction of anaesthesia and patients in group D received 10 ml normal saline. In dexmedetomidine group patients received dexmedetomidine infusion at the rate of 0.4mcg/kg/hr. throughout the surgery through syringe infusion pump which contained dexmedetomidine 2mcg/ml. In fentanyl group patients received normal saline infusion; the rate of infusion was decided presuming that it was dexmedetomidine infusion. Patients were monitored and the parameters were noted by an anaesthesiologist blinded to the study. Patients were induced with propofol IV and rocuronium 0.9mg/kg IV. The dose of propofol required was noted. Patients were maintained on sevoflurane and O_2 and N_2O and vecuronium. Hemodynamic values were recorded at specific end-points after bolus dose, 1 minute after induction, 1 minute after intubation, 3minutes after tracheal intubation, 5 minutes after tracheal intubation, at skin incision, 5 and 10 minutes after skin incision and subsequently at 10 minute intervals. As agent monitors were not available sevoflurane vaporizer dial settings were recorded every 10 minutes. Systolic blood pressure was maintained within ±20% of baseline values by adjusting the inspired sevoflurane concentration. Hypotension was defined as systolic blood pressure value <20% of baseline value or systolic blood pressure <80 whichever is lower on two consecutive readings within two to three minutes, not responding to decrease in sevoflurane concentration were given 200ml fluid bolus. It was decided that if hypotension persists ephedrine 5-10mg would be given and if hypotension was not responding to the above measures then infusion of the study medication would be stopped. As all patients required hypotensive field in this study therefore hypertension was defined as systolic arterial pressure > 20% of baseline value or systolic blood pressure greater than 110 mm of hg whichever is lower on two consecutive readings within two to three minutes. Hypertension not responding to increase in sevoflurane concentration was treated with fentanyl 1 microgram/kg IV. Tachycardia in this study was defined as heart rate >20% baseline or heart rate >100/minute for more than 2 minutes. Tachycardia despite of increase in inspired sevoflurane concentration was treated with fentanyl 1microgram/kg IV. Bradycardia (defined as heart rate <20% of baseline value on two consecutive readings within 2-3 minutes or heart rate <50 whichever is lower) was treated with atropine 0.6mg IV bolus. The need for the following rescue measures was recorded: Increase in sevoflurane concentration,

ephedrine, atropine, fentanyl, stopping of study medication. Infusion of study medication was discontinued after the completion of the wound closure. After removal of the laryngeal pack, sevoflurane was discontinued. Residual neuromuscular block was reversed with adequate dose of neostigmine and glycopyrolate and tracheal extubation was performed. Patients were observed in post anaesthesia recovery room for adverse effects during post-operative period. The patients were assessed for pain at thirty minutes and one hour using VRS score. Patients were asked to rate pain on a scale of zero to ten where zero stands for no pain and ten stands for worst pain imaginable. When VRS was greater than four patients, were treated with inj diclofenac sodium 75mg IV. Number of patients who developed nausea and vomiting in the first hour and the need for rescue antiemetic therapy was recorded. Patients were observed for other complications like shivering, arrhythmias. Surgeons were asked to grade the quality of surgical field as per their impression into 1) Excellent 2) Good 3) Poor.

Data was analysed using computer statistical software system openepi (open source epidemiological statistics for public health). All data was presented as mean and standard deviation (SD), except where specified. The unpaired t-test was used for intergroup comparisons except where specified. Probability values $p<0.05$ were considered significant and $p<0.001$ were considered highly significant.

Results

There was no significant difference in age, sex, weight, gender, duration of surgery between the two groups. It was observed that mean propofol requirement in group D and group F were 2.14(±0.25) mg/kg and 2.87(±0.326) mg/kg respectively. The difference between the two groups was not statistically significant ($p>0.05$). It was observed that there was no significant difference between heart rate, systolic blood pressure and diastolic blood pressure after induction and following intubation. ($p<0.05$) (Figure 1, 2, 3) Table 1. Haemodynamic parameters were noted at incision, 5 minutes after incision and subsequently at 10 minute intervals throughout the surgery. It was noted that there was no clinically significant difference in heart rate, systolic arterial pressure and diastolic arterial pressure between the two groups (Figure 4, 5, 6). The average sevoflurane during the first hour of surgery in group F was 1.946 (±0.44) and group D was 1.473 (±0.76). The difference was statistically significant ($p<0.05$). 7 patients in group F and 1 patient in group D required supplemental dose of fentanyl and the difference between the two groups were statistically significant ($p<0.05$). It was observed that in group D, 2 patients developed hypertension

Table 1: Demographic Profile and duration of surgery

Demographic profile and Duration of surgery	Group F(n=20)	Group D(n=20)	P value
Mean age (years)	26(±5.695)	23.45(±7.45)	>0.05
Mean weight (kg)	47.25(±5.25)	48.f(±3.284)	>0.05
Sex, m/f	8/12	12/8	
Mean duration (mins)	75.5(30.34)	95(39.80)	>0.05

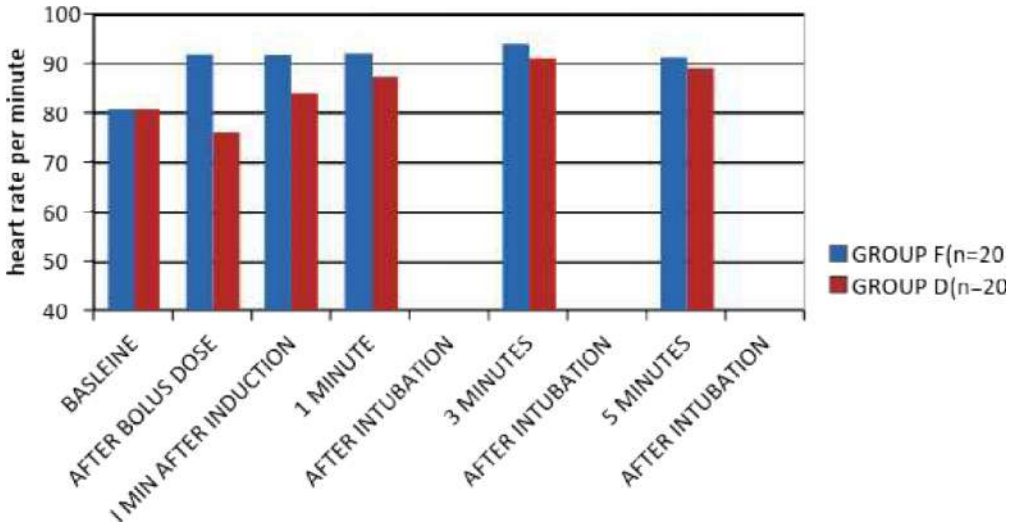

Fig. 1: Mean heart rate during induction of anaesthesia

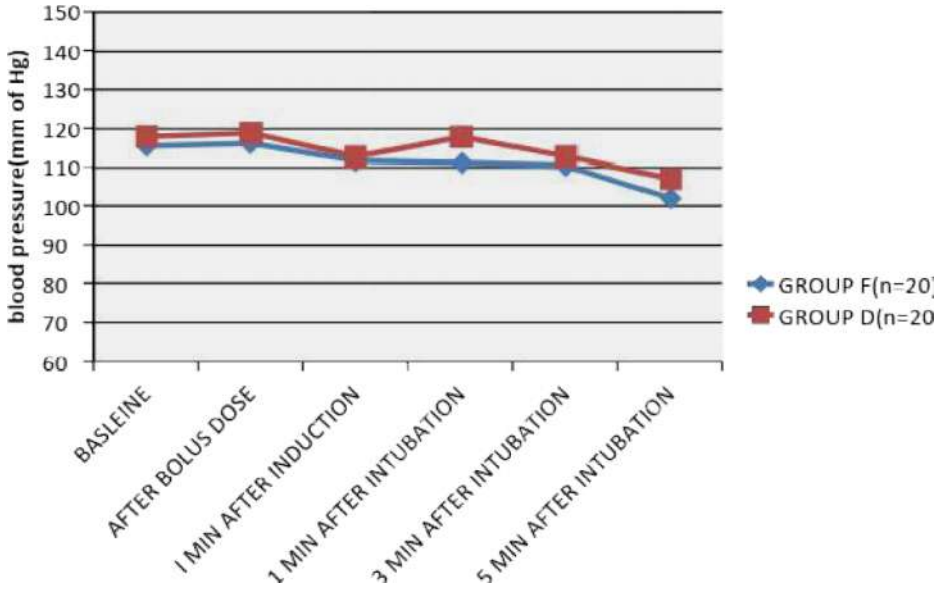

Fig. 2: Mean systolic blood pressure during induction of anaesthesia

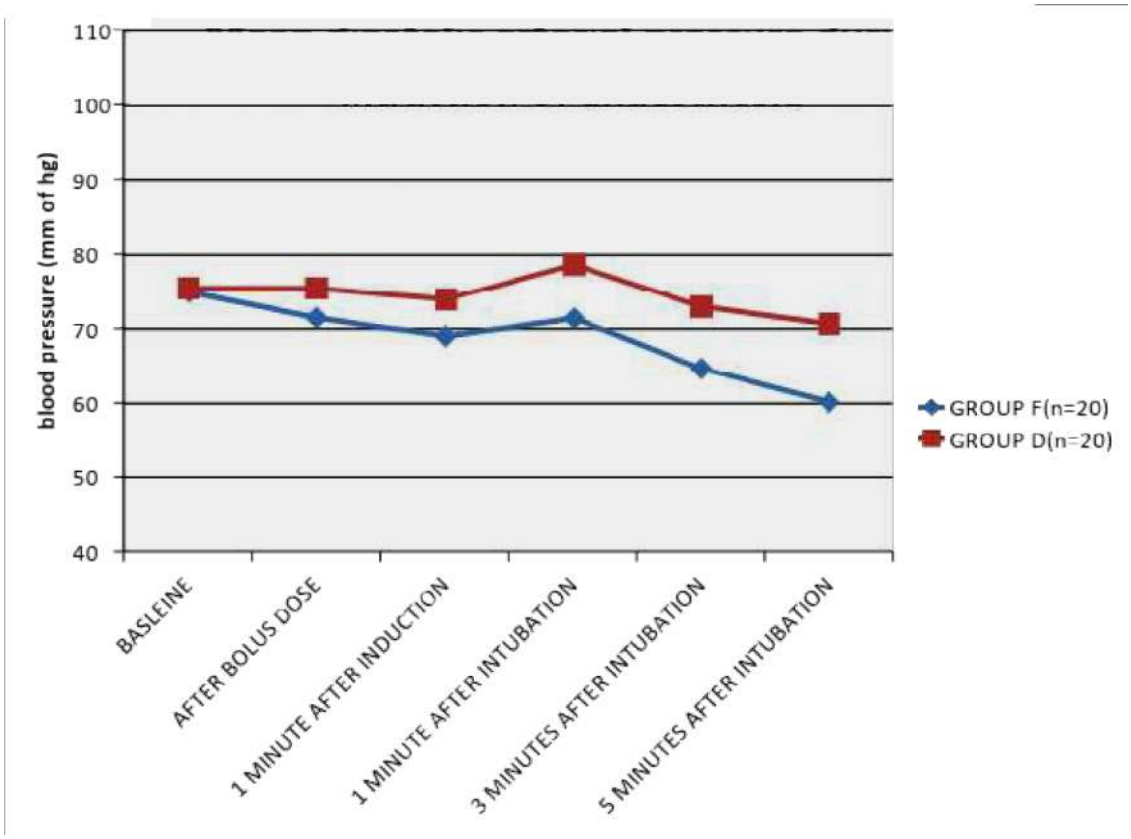

Fig. 3: Mean diastolic blood pressure during induction of anaesthesia

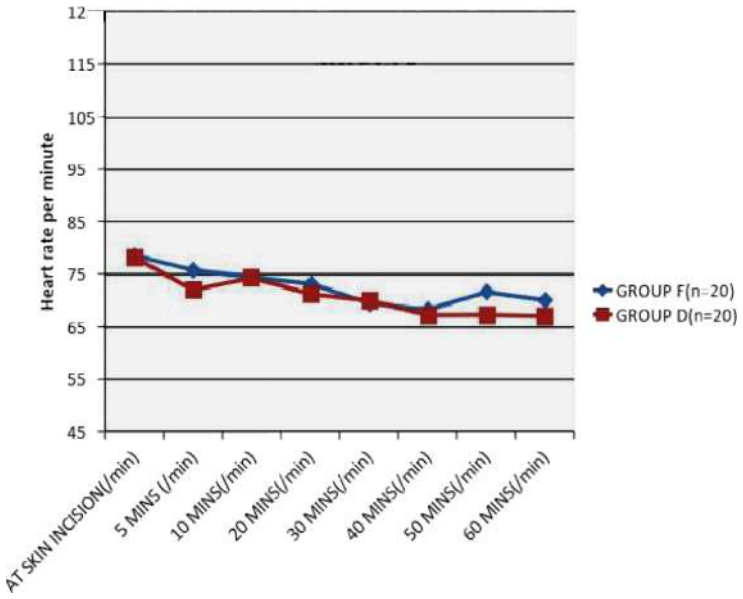

Fig. 4: Mean heart rate during the first hour of surgery

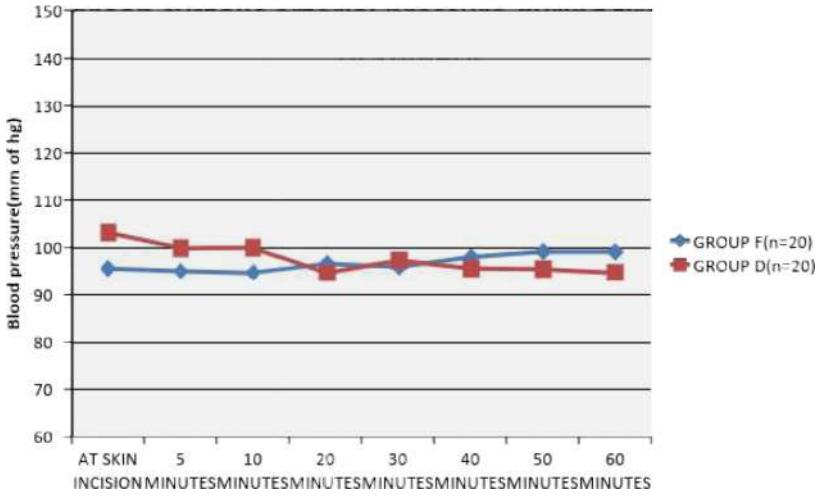

Fig. 5: Mean systolic blood pressure during the first hour of surgery

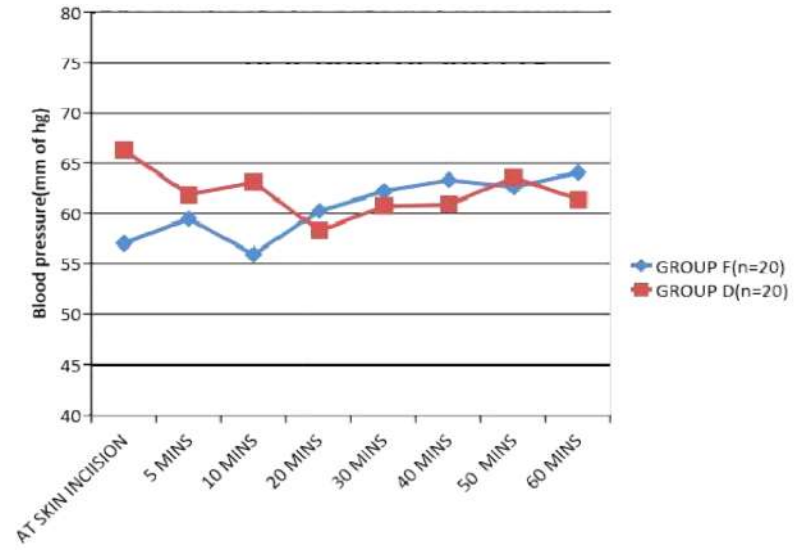

Fig. 6: Mean diastolic blood pressure during the first hour of surgery

and in group F, 4 patients developed hypertension, however the difference was not statistically significant ($p<0.05$). There was no significant difference in the incidence of tachycardia and bradycardia between the two groups. None of the patients developed hypotension, shivering or arrhythmia. VRS was assessed at 30 minutes and 1 hour. The mean VRS score at half an hour in group D was 1.4 (±1.729) and group F was 3.2 (±0.489) and the difference was statistically highly significant ($p<0.01$). The mean VRS score at thirty to sixty minutes was 1.4 (±1.729) in group F and 1.7 (±1.729) in group D the difference was statistically insignificant ($p>0.05$). There was significant difference between the analgesic requirement at 30 minutes between the two groups, 7 patients in group F and only one patient in group D required analgesic supplement. Between 30 to 60 minutes 1 patient in group F and 2 patients in group D required analgesic and the difference was statistically insignificant ($p>0.05$). 1 patient in group D and 7 patients in group F developed nausea therefore required antiemetic. The difference between the two groups was statistically significant ($p<0.05$). There was no significant difference in the quality of surgical filed between both the groups (Figure 7). Tab 2.

Discussion

Perioperative stress associated with surgery and anesthesia leads to stimulation of sympathetic nervous system causing an increase in arterial blood pressure and heart rate. In ENT surgeries even minimal bleeding can make the surgeons work difficult by obscuring the operative filed. Complications have been reported in ENT surgeries under GA resulting from impaired visibility due to excessive bleeding. High dose of potent inhaled anaesthetics have been used in the past to improve

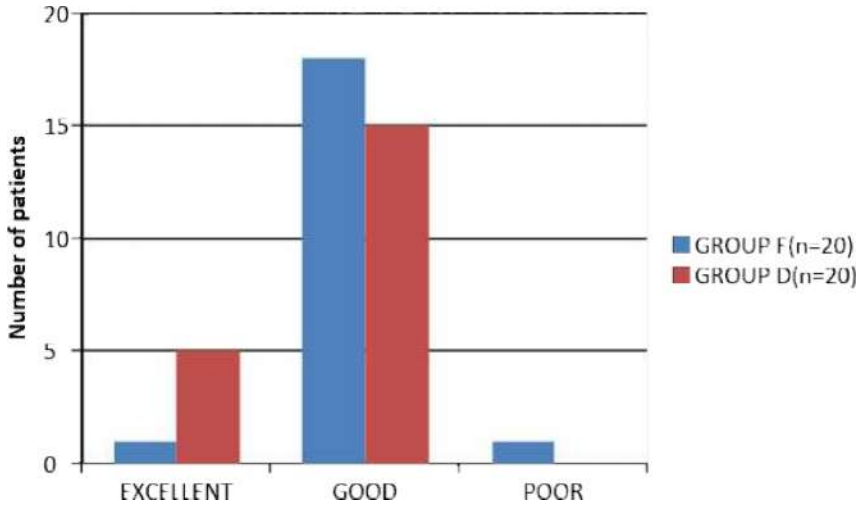

Fig. 7: Quality of surgical field.

Table 2: Complications

	Group F(n=20)	Group D(n=20)	P value
Hypertension	4	2	0.675
Hypotension	0	0	
Tachycardia	5	1	0.1843
Bradycardia	1	2	0.99
Shivering	0	0	
Arrythmia	0	0	

quality of anaesthesia but there was always the risk of delayed recovery from anaesthesia. Various agents like magnesium sulphate, vasodilators like sodium nitroprusside, nitroglycerine have been used to achieve controlled hypotensive anaesthesia. Dexmedetomidine is a highly selective alpha 2 receptor agonist with sedative, analgesic and anaesthetic sparing effect. This study was designed to study the anaesthetic sparing effect of dexmedetomidine and to compare the efficacy of dexmedetomidine with fentanyl in terms of quality of surgical field, haemodynamic stability and to assess any possible side effects. It was decided to give dexmedetomidine bolus dose of 1mcg/kg/hr. over ten minutes in this study as a higher rate of infusion has a tendency to produce hypertension due to action on the alpha 2B receptors on the vascular smooth muscles cells [1]. In most of the studies conducted before dexmedetomidine was used in the dose of 0.2 to 0.8mcg/kg/hr. IV infusion [4,5 and 6] but the incidence of complications like hypotension was more with 0.8mcg/kg/hr. [9]. Therefore dexmedetomidine infusion at the rate of 0.4mcg/kg/hr. was used to provide haemodynamic stability with minimum adverse reactions. Patients in fentanyl group received fentanyl at the dose of 2mcg/kg/hour diluted in 10 ml NS 5 minutes prior to induction. Fentanyl at the dose of 1.5-5mcg/kg/hr given 3 to 5 minutes before induction blunts haemodynamic response to tracheal intubation [3]. Fentanyl is also known to reduce the inhalational anaesthetic requirement. Fentanyl is a potent opioid analgesic, which has been used as an anaesthetic adjuvant over the years. Therefore it was decided to compare dexmedetomidine with fentanyl.

Dexmedetomidine produces sedation; amnesia decreases the requirement of inhaled anaesthetic agents. The dose of propofol required for induction of anaesthesia was noted to assess whether dexmedetomidine has any superior effect over fentanyl regarding effect on induction dose of propofol. There was no significant difference between doses of propofol required for induction between the two groups. The mean heart rate, systolic arterial pressure and diastolic arterial pressure were comparable between the two groups. There was no significant difference in mean pulse rate, systolic arterial pressure and diastolic arterial pressure between the two groups after bolus dose, 1 minute after induction, 1, 3 and 5 minutes after induction. In

this study the haemodynamic parameters were maintained between 20% of baseline by varying the inhaled sevoflurane concentration. It was observed that the mean of average sevoflurane requirement in the first hour of surgery was significantly lower in dexmedetomidine group compared to fentanyl group

Dexmedetomidine provides analgesia through its action at the central and peripheral sites. Alpha-2-Adrenergic receptors located at nerve endings may have a role in the analgesic effect of the drug by preventing norepinephrine release [1]. Dexmedetomidine acts on the alpha 2 receptors in the spinal cord and reduces the transmission of nociceptive signals to brain centers. Dexmedetomidine also inhibits the release of substance P from the dorsal cord of the spinal cord, leading to primary analgesic effects [1,2]. The requirement of supplemental dose of fentanyl was significantly lower in patients in dexmedetomidine group. We also observed that dexmedetomidine provides better post-operative pain relief and reduces the requirement of analgesics in the immediate post-operative.

Dexmedetomidine acts on central presynaptic alpha 2 receptors in the ventrolateral medulla, especially in the nucleus tractussolitarius and decreases the central sympathetic outflow [1]. The basic effects of alpha 2 agonists on the cardiovascular system are decreased heart rate; decreased systemic vascular resistance; and indirectly decreased myocardial cardiac output, and systemic blood pressure. Fentanyl is a potent opioid analgesic which is known to produce hemodynamic stability. The hemodynamic effects of dexmedetomidine were comparable with fentanyl. The quality of the surgical field was also comparable in both the groups. Although hypotension has been described in patients receiving dexmedetomidine, this exaggerated physiological effect is seen only after loading dose or in patients with pre-existing hypovolemic [2]. In this study dexmedetomidine was used at a low dose of 0.4mcg/kg/min, at this dose dexmedetomidine does not produce significant bradycardia or hypotension. The limitations of this study were that invasive blood pressure monitoring, BIS monitor and agent monitors were not used, the availability of these monitors would provide more accurate results.

Conclusion

Dexmedetomidine used in the dose of 1mcg/kg IV bolus followed by 0.4mcg/kg/hour produces effective and well tolerated alternative to fentanyl to reduce the requirement of analgesic and anaesthetic agents. It attenuates laryngoscopic reflex and provides intraoperative haemodynamic stability. The quality of surgical field is acceptable without any significant side effects in patients undergoing ENT Surgeries.

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Conflict of Interest: nil

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Original Research Article

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A Study of First Aid Knowledge Acquired by Pre-Hospital Trauma Technician Trainees in a Tertiary Care Hospital: A Retrospective Observational Study

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Abstract

Aim: Pre-hospital trauma students first aid skills assessment at various stages of training. *Design:* Retrospective observational study. *Material and Methods*: In our study, First Aid skills and knowledge were assessed of five batches of Pre-hospital Trauma Technicians. From each batch twenty students were pre-tested for knowledge in Basic Life Support Skills (BLSS) work shop. These Pre-hospital trauma technician students were from science stream, high school Pass out, who were selected on the basis of merit and counseling, the consent of students was obtained after an explanation of nature and purpose of study. These students were assessed as follows: (1) As fresher during ten days orientation program. (2) As pre-hospital trauma students (8-month completion) (3) As Pre-hospital Trauma technician interns, posted at PGIMER, Dr RML Hospital, New Delhi and its ambulances (11 month). *Statistical Analysis:* Quantitative variables were compared using Kruskal Wallisand Mann Whitney test was used for comparison between two groups. Jonckheere-Terpstra Test was used for comparison across various time periods. A p value of <0.05 was considered statistically significant. *Results:* In our study, statistically significant improvement in performance was seen after 8 months and again statistically significant improvement was seen at 11 months completion of Pre-hospital Trauma Technician training Program. *Conclusions and Recommendation:* Our Study shows that teaching alongwith practical workenhancesfirst aid skills and performance. Repeated teaching and learning by doing practical work enhances performance. Practising lifesaving skills periodically is significant for good performance outcome.

Keywords: Golden Hour; First Aid; Accountability; Questionnaire.

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Introduction

According to WHO "Global Status Report on Road Safety 2013" more than 1.2 million people die in road accidents every year and as many as 50 million are injured [1].

Systematic and integrated approach adopted towards management of trauma cases can prevent deaths and disabilities due to road accidents to a large extent. Extending appropriate care during the period between injury and initial stabilization of the patient is the most critical period for patient's survival. Quick first aid, rapid transportation of the victim and initiation of treatment within golden hour [2] by a trained person are pre-requisites of trauma care management.

The Pre-hospital trauma technician is an integral part of trauma systems and among the first responders for trauma victims The Pre-hospital trauma technicians are the first responders in emergency and accident situations and are required to undertake the following:

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- Assess the extent of injury
- Stabilise the patient
- Strive to transfer the patient to the nearest trauma care facility within the golden hour [2]

This is a course meant to have qualifiedpre-trauma technicians to be employed for BLS/ACLS ambulances placed across the highways of entire country, this programme was initiated by Director General Health Services of India [3]. These technicians undergo 9 months of training followed by 3 months of internship in tertiary care hospital and in BLS/ACLS ambulance.

Interactive classroom teachings followed using following teaching aids:

- CPR mannikin
- Intubation mannikin
- IV-line mannikin
- Airway management equipments
- Splints, cervical collar, spinal boards, tourniquets, catheter, chest tubes
- Audio-visual presentations of various trauma cases
- Ambulance posting- BLS, ACLS
- Ambu bag
- Respiratory aids
- Models for practical training

They are qualified paramedics to impart first aid and transfer people from site of accident to nearest trauma centre. The prompt and proper provision of emergency care and rapid transport of injured victim from the scene of injury to a health care facility can save lives, reduce the incidence of short-term disability and dramatically improve long-term outcome.

Materials and Methods

In our study, we assessed knowledge of First Aid skills of five batches of Pre-hospital Trauma Technicians over a period of five years (2014-2018). From each batch twenty students were pre-tested for knowledge in a Basic Life Skills workshop. These Pre-hospital trauma technician students were science stream, high school pass outs who were selected on the basis of merit and counselling. The consent of students was obtained after an explanation of nature and purpose of study. These students were assessed by standardized questionnaire as follows:

1. As fresh students during ten days orientation program of the course (Group A).
2. As pre-hospital trauma students at 8-month completion (Group B).
3. As Pre-hospital Trauma technician interns at 11months (Group C).

The same instructor trained all groups, to overcome intra observer bias. The instructor had relevant qualification for training Basic lifesaving skills Knowledge and skills of participants were tested before the educational intervention. Fresher's did not have previous knowledge of Basic Life Support whereas the other groups had knowledge of Basic Life support. Check for Scene safety, check for response, call for help, check for Circulation, Airway and breathing within 10 seconds, check for effective chest compressions on manikins with minimal interruption and application of AED after its arrival were taught to them. Assessment was done through a standard questionnaire [4] with ten multiple choice questions with four options each. Each question carried one mark with maximum score of ten and minimum of zero. Same questionnaire was used for assessment at the above the above said time interval.

Standard Questionnaire

1. In general, a splint should be….
   a. Loose, so that the victim can still move the injured limb.
   b. Snug, but not so tight that it slows circulation.
   c. Tied with cravats over the injured area.
   d. None of the above.
2. A victim has lost a lot of blood through a deep cut in his leg. He is breathing fast and seems paleand restless. He is probably….
   a. Having a stroke.
   b. Having a heart attack.
   c. In shock.
   d. Choking.
3. What would you do when caring for a seizure victim?
   a. Remove nearby objects which might cause injury.
   b. Place small objects such as rolled up piece of cloth between victims teeth.
   c. Try to hold person still.
   d. All of the above.
4. You should suspect that a victim has head and spine injuries for-
   a. An accident involving a lightning strike.

b. A person found unconscious for unknown reasons.
c. A fall from height greater than victim's height.
d. All of the above.

5. A victim has a large piece of glass sticking out of her leg. You should?
a. Leave the glass in her leg and control the bleeding.
b. Call local emergency phone number.
c. Remove the glass and control the bleeding.
d. Both a and b.

6. What would be your first concern at the scene where a person has been seriously burned?
a. Check for scene safety first.
b. Check victims breathing and pulse.
c. Call local emergency phone number.
d. Cooling the burned area.

7. How can you reduce the risk of disease transmission when caring for open, bleeding wounds?
a. Wash your hands immediately after giving care.
b. Avoid direct contact with blood.
c. Use protective barriers such as gloves or plastic wrap.
d. All of the above.

8. Where is the carotid artery located?
a. Inside the wrist just above the hand.
b. On the neck to the right or left side of the windpipe.
c. Behind the knee cap.
d. Inside the arm between the elbow and shoulder.

9. For an infant who is choking, you would perform….
a. The Heimlich maneuver.
b. CPR
c. Back blows and chest thrusts.
d. Hold the infant upside down and strike between the shoulder blades

10. You approach a victim that is unconscious and wearing a medical alert tag indicating a diabetic condition. You would:
a. Begin Rescue Breathing
b. Begin CPR
c. Administer the victim's insulin
d. Check victim for breathing & pulse

Answers: 1(b); 2(c); 3 (a); 4 (d); 5(d) ;6(a); 7(d); 8(b); 9(c); 10(d).

Type of Study: Retrospective Observational study.

Statistical Analysis

Sample Size

In the absence of previous study, Cohen's effect size is used to calculate sample size of one sample with a continuous outcome variable. To detect medium scale ES (.65) for difference in marks with respect to time, the minimum required sample size with 80% power of study and two-sided alpha of 5%was 19 patients per group. So sample size taken is 300 (20 per group for each year). Formula used

$n>=(2*(Z_{á}+Z_{â})^2)/(ES)^2$

Where $Z_{á}$ is value of Z at two-sided alpha error of 5% and $Z_{â}$ is value of Z at power of 80% and ES is effect size.

Analysis

Continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non-parametric test was used. Quantitative variables were compared using Kruskal Wallis test (as the data sets were not normally distributed) between three groups and Mann Whitney test was used for comparison between two groups. Jonckheere-Terpstra Test was used for comparison across various time period. A p value of <0.05 will be considered statistically significant. The data will be entered in MS EXCEL spreadsheet and analysis will be done using Statistical Package for Social Sciences (SPSS) version 21.0.

Results

Comparison of data shows (Table 1) average marks increased from 2.7± 0.98 (group A) to 6.35± 1.18 (group B) to 9.1±0.64 (group C) in 2014 with significant p value of <0.0001.

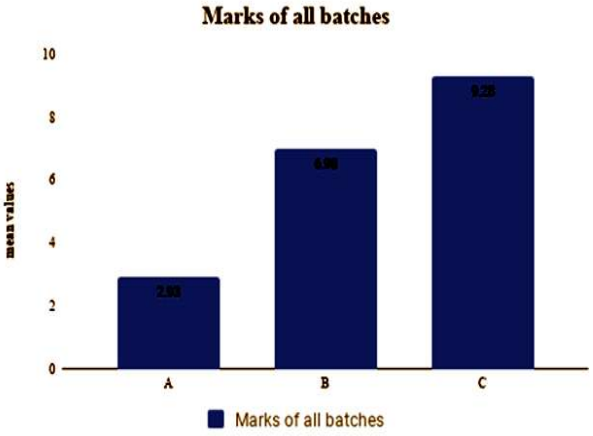
Similarly average marks increased from 2.9±0.97 (group A) to 6.75±1.65 (group B) to 9.15±0.88 (group C), 2.9±0.97 (group A) to 7.25±1.55 (group B) to 9.5±0.69 (group C), 3.25±0.91 (group A) to 7.3±1.53 (group B) to 9.15±0.88 (group C), 2.9±0.97 (group A) to 7.25±1.55 (group B) to 9.5±0.69 (group C) in

2015, 2016, 2017, 2018 respectively with significant p values <0.0001.

Pre-hospital Trauma Students (Group A), Basic lifesaving skills were found much below the desired optimum skills. The Knowledge in Group B is significantly increased, and furthermore in Group C. This reflects that both learning and knowledge retention is possible by repeated and structured learning strategies.

Discussion

Retention of Knowledge is a long-term problem in medical sciences. Studies suggest that approximately two-third to three-fourth of knowledge is retained after one year, with a further



Graph 1: Showing comparison of average marks of all batches

Table 1: Showing comparison of marks across different groups

	A	B	C	P value	A vs B	A vs C	B vs C
(I)2014 Batch				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.7 ± 0.98	6.35 ± 1.18	9.1 ± 0.64				
Median	3	6	9				
Min-Max	1-4	5-8	8-10				
Inter quartile Range	2 - 3	5 - 7.500	9 - 9.500				
(II) 2015 Batch				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	6.75 ± 1.65	9.15 ± 0.88				
Median	3	6	9				
Min-Max	1-4	5-9	7-10				
Inter quartile Range	2 - 4	5 - 8	9 – 10				
(III) 2016 Batch				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	7.25 ± 1.55	9.5 ± 0.69				
Median	3	8	10				
Min-Max	1-4	4-9	8-10				
Inter quartile Range	2 - 4	6 - 8	9 – 10				
(IV) 2017 Batch				<.0001	<.0001	<.0001	0.0001
Sample size	20	20	20				
Mean ± Stdev	3.25 ± 0.91	7.3 ± 1.53	9.15 ± 0.88				
Median	3	8	9				
Min-Max	1-5	4-9	7-10				
Inter quartile Range	3 - 4	6 - 8.500	9 – 10				
(V) 2018 Batch				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	7.25 ± 1.55	9.5 ± 0.69				
Median	3	8	10				
Min-Max	1-4	4-9	8-10				
Inter quartile Range	2 - 4	6 - 8	9 – 10				

Combined average marks for all the years can be seen in table 2 and graph 1

Table 2: Showing combined average marks for all years

	A	B	C
Marks of all batches	2.93	6.98	9.28

decrease to slightly below fifty percent in the next year [5].

Human memory is imperfect; thus, periodic review is required for the long-term preservation of knowledge and skills. Forgetting is influenced by the temporal distribution of study. For more than a century, psychologists have noted that temporally spaced practice leads to more robust and durable learning than massed practice. Teachers commonly introduce material in sections and evaluate students at the completion of each section [6].

A prerequisite for achieving optimum lifesaving skills is lifelong learning so that own practice performance will improve. Continuous medical education is essential for retaining and updating knowledge [7].

Interactive and clinical based learning is the most effective form of learning. All medical professionals should devise strategy to deliver life skills effectively. Assessment of knowledge periodically through workshop and conferences is also essential. Accountability [8] is necessary to deliver high standard of care of patient.

A self-regulated profession holds it members accountable to the public it serves for the continuous development of the competencies they profess to hold. A central component of competence is professionalism, which requires lifelong learning that leads to improved performance in practice. Any profession accomplishes accountability by providing its members periodic measurement of performance using reliable and valid instruments and judging performance against evidence-based standards, providing graduate and continuing medical education (CME) programs that advance members knowledge and skills to meet these standards, and publicly certifying those who do so. [9,10] Educational institutes can provide the opportunity for lifelong learning by including the programme of continuing medical education (CME) [11].

Self-assessment, as used in CME, could more accurately be called "guided self-audit," which refers to the activities physicians personally perform to assess their level of competence. Self-audit is an active process of looking systematically at the product of the physician's work (as in chart reviews) or clinical judgments (as in answering multiple choice questions) in contrast to the potentially more passive process of self-rating performance on a clinical examination or solution of a clinical problem. This latter process involves guesswork rather than the analysis of data.

Uncovering a gap in knowledge or in clinical performancemotivates self-directed professionals to take action to correct it. When the gap is discovered through self-assessment or self-audit, it seems to have more impact than one exposed by someone else. The American Board of Internal Medicine's initialexperience with physicians completing a practice improvement module, which includes self-audit of medical records tocalculate quality of care measures. When physicians received their results in structured feedback, they saw and felt the gap in their performance compared with their impression that they were doing much better. Because physicians personally collected the data for measurement, they saw the gaps in performance for individual patients and the structured feedback for the sample was powerful and credible [12].

Integrated education is crucial to meet the conditions for efficient and effective continuing education [12]. In our study we imparted both theory and hands on skill training to our students.

Pre-hospital Trauma Students (Group A), Basic lifesaving skills were found much below the desired optimum skills. This reflects that Pre-Hospital care in developing world is at nascent stages. The knowledge of first aid skills is lacking in high school pass out children. The result of the study shows that fresher's who were high school pass out were deficient in life saving skills so basic lifesaving skills should be made compulsory for all students as a part of School Curriculum.

The Knowledge in Group B is significantly increased, and furthermore in Group C. This reflects that both learning and knowledge retention is possible by repeated and structured learning strategies.

Currently, there is lack of central body, which can govern paramedic education in developing countries. Awareness of Pre-hospital care and first aid skills in common public is negligible [13].

First responder in a pre-hospital scenario could be a nonprofessional or paramedic. Therefore, it is essential that common public be trained in basic lifesaving and first aid skills.

Patient care in a pre-hospital casualty is challenging in terms of equipment, resources and work force. Improvement of Pre-hospital care is essential for preventing deaths in first golden hour of disease or injury.

Conclusion

Our Study shows that learning first aid skills can enhance performance. Learning of knowledge and retaining it are both important for optimum performance. Practising Lifesaving skills periodically is significant for good performance outcomes. In Pre-hospital Scenario public knowledge in life saving skills is essential to manage victims of trauma and injury. First Aid training should be compulsorily included in Schools and colleges. Public should be thought about the Good Samaritan act, and have willingness to help fellow citizens. Setting up a Paramedical Council is of paramount importance to set accountability of Pre-hospital Trauma Technicians in the developing world. Also, it is essential to for Pre-hospital trauma technicians to undergo certifications exams and Licenses and continuous medical education and keep their knowledge up to date.

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Pain on Injection: Comparison between Propofol LCT vs Propofol MCT-LCT

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Abstract

Background and Aims: Propofol is widelyused for induction andmaintenance of anaesthesia. It has the disadvantage of causing sharp pain on injection which can interfere with smooth induction of anaesthesia. The aim of the study was to compare the incidence and intensity of injection pain with medium chain triglyceride/ long chain triglyceride (MCT-LCT) propofol and long chain triglyceride (LCT) propofol during intravenous induction of anaesthesia. *Methods and Material:* Two hundred adult patients belonging to ASA physical status I or II, scheduled for elective surgeries under general anaesthesia were selected and randomly allocated to two groups L and M. Group L received 3 cc of LCT propofol and Group M received 3ccof MCT-LCT propofol . Patients were observed and questioned after 30sec of injection and pain was scored on a 4 point scale. Pain recall was done on the same 4 point scale 30 minutes postoperatively. *Statistical Analysis:* Data was collected and analysed using Fisher's exact test and unpaired t test. Statistical significance was taken as $p< 0.05$. *Results:* Both the incidence and intensity of pain was greater in group L compared with group M (p=0.0002). The mean pain score was also higher in group L (2.71) when compared with group M (1.08). The difference between two groups with regard to recollection of pain on injection of propofol was statistically significant (p=0.0001). *Conclusion:* Propofol MCT-LCT reduces both intensity and incidence of pain on injection.

Keywords: Pain on Injection; MCT Propofol; MCT-LCT Propofol.

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Introduction

Ever since Kay and Rolly introduced propofol in 1977, it is widely used for induction and maintenance of anaesthesia. Propofol because of its titratable level of anaesthesia, rapid recovery and minimal side effects is considered as an ideal induction agent [1]. Pain on injection is one of the disadvantages of propofol.

Propofol induced injection pain can cause agitation and interfere with smooth induction. Various mechanisms are responsible for this including venous irritation and activation of kallikrein and bradykinin [2]. Incidence of propofol injection pain has been estimated between 28 - 90% in adults [3]. Considering its clinical importance and frequency propofol induced pain was ranked seventh among 33 clinical concerns [4].

Various pharmacological methods (e.g., pre-treatment with lignocaine, fentanyl, tramadol, ketamine, ondansetron, garnisetron) [5,6,7,8,9] and non-pharmacological methods(e.g., injecting into larger veins, cooling, or warming) [10,11] have been

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used with varying results. A new formulation of propofol consisting of long-chain triglycerides (LCT) and medium- chain triglycerides (MCT) emulsion has been advocated to reduce injection pain compared with propofol LCT in adults and teenagers [12].

This prospective, double-blind, randomized study was conducted to compare the incidence and intensity of injection pain and recall of injection pain postoperatively with different formulations of propofol, propofol LCT with propofol MCT-LCT in adult patients undergoing elective surgery requiring general anaesthesia.

Materials and Methods

After obtaining approval from hospital ethics committee and informed consent from the patients, 200 patients belonging to American Society of Anaesthesiology (ASA) physical status I and II, of either sex, aged between 18 and 60 years, undergoing elective surgery under general anaesthesia, were studied. Patients less than 18 years or more than 60 years, patients with IHD, psychiatric or neurological disorders, patients belonging to ASA physical status III or IV, patients undergoing emergency surgery, morbidly obese patients, patients who were receiving analgesics before surgery, patients with history of hypersensitivity to the study drug were excluded from study. A thorough pre-anaesthetic evaluation with general physical and systemic examination was done the evening before the proposed surgery. Patients were kept fasting 6 h for solids and 2 h for clear liquids prior to surgery. The anaesthetic technique used and verbal rating scale was explained to the patient.

All the patients falling under inclusion criteria were numbered and every nth patient was selected by Systematic Random Sampling Procedure. The patients were randomly allocated into 2 groups of 100 patients each, LCT propofol group (Group L) or MCT-LCT propofol group (Group M) using computer generated random numbers and sealed envelope which were opened just before shifting the patient to the operation theatre.

On arrival of patient to the operating room, 18G intravenous cannula was inserted into cephalic vein of the non-dominant hand. Heart rate, non-invasive blood pressure (NIBP), electrocardiograph (ECG), peripheral oxygen saturation (SpO_2) was monitored and baseline values were noted. Verbal rating scale was again explained to the patient. Anaesthetic drugs were prepared by the same person who opened the envelope but was not involved in the intraoperative management or post-operative assessment of the patients. No analgesic drug was given to the patient before injecting propofol.

Induction of anaesthesia was done with either 1% LCT propofol (2mg/kg)(Group L) or 1% MCT-LCT propofol (2mg/kg) (Group M). 3 ml of study drug was injected (LCT/MCT-LCT propofol) was injected over 15 seconds. Then, patients were asked to rate the severity of injection pain. Pain was assessed using verbal rating scale and was assessed 15 seconds following injection.

Pain Score	Description
0	No pain
1	Mild pain
2	Moderate pain
3	Severe pain
4	Extreme pain

Following this, induction of anaesthesia was continued with the rest of the calculated propofol dose and fentany 12μg/kg was given to all patients. Patients were then intubated with appropriate size endotracheal tube after giving vecuronium. Anaesthesia was maintained with isoflurane, oxygen-nitrous oxide (50:50). ECG, heart rate, NIBP, SpO_2, and end-tidal carbon dioxide was monitored throughout. After the completion of operating procedure patient was extubated and shifted to Post anaesthesia care unit and asked to recall propofol injection pain on complete regain of consciousness. Recall of injection pain was scored using same pain score.

The primary outcomes of the study were incidence and severity of injection pain and postoperative recall of propofol injection pain. The secondary outcomes were haemodynamic changes and adverse events if any.

Data was collected and statistical analysis was performed using SPSS version 20. Descriptive statistics such as range, mean, standard deviation (SD) were used to summarize the baseline clinical and demographic profile of the patients Categorical data were analysed using Fisher's exact tests, and unpaired t test. Statistical significance was taken as $p < 0.05$

Statistical Analysis:

Table 1 shows the demographic distribution in the study. There was no significant difference in demographic profile of the patients in both groups. Females (57%) were majority in both the groups. Majority of patients in both the groups belonged to ASA grade 1.

Table 2 shows comparison of pain score on propofol injection in 2 groups. All patients complained of pain in Group L. Most patients complained of moderate to severe pain, 8 patients complained of extreme pain. 13 patients in group M had no pain on injection, majority of patients in group M complained of mild pain.

Fischers exact test was used to determine the incidence of pain in two groups. The difference between two groups with regard to incidence of pain on injection of propofol was statistically significant (p = 0.0002).

The mean pain score with respect to injection of propofol in group M was 1.08 and in group L was 2.71. The difference between two groups with regard to intensity of pain on injection of propofol was statistically significant (p=0.0001).

Table 3 shows comparison of recollection of propofol injection pain in 2 groups. 18 patients in group M had no memory of pain on injection of propofol. All patients were able to recall pain on injection of propofol in group L. Mean pain score of 0.98 was recorded in group M as compared 1.75 in group L. The difference between two groups with regard to recollection of pain on injection of propofol was statistically significant p=0.0001.

There were no significant changes in heart rate and blood pressure in both the groups. No adverse events were noted in both the groups.

Discussion

Propofol due to its unique properties like smooth induction, rapid recovery, low incidence of nausea and vomiting, attenuation of upper airway reflexes is the preferred intravenous anaesthetic agent used for induction and maintenance of anaesthesia [13]. Propofol is extensively used in day care surgery, paediatrics, cardiac and neuroanaesthesia. Pain on injection, hypotension, and myoclonus are few of the major side effects associated with propofol [14].

Table 1: Demographic profile

Patient characteristics	Group M (n=100)	Group L (n=100)
Age (years)	36.62±11.84	38.8±11.34
Body Weight (kg)	56.36± 10.38	57.18±9.60
Sex (male/female)	41/59	45/55
ASA PS (1/2)	69/31	68/32

Values expressed as mean±SD. ASA PS – American Society of Anaesthesiologist Physical Status; SD – standard deviation; n- number of patients

Table 2: Pain score of patients on propofol injection

Pain score	Group M (n)	Group L (n)
0	13	0
1	69	5
2	15	27
3	3	60
4	0	8

M- MCT-LCT propofol group; L- LCT propofol group; n- Number of patients

Table 3: Comparison of recollection pain

Pain score	Group M(n)	Group L(n)
0	18	0
1	66	33
2	16	59
3	0	8
4	0	0

M- MCT-LCT propofol group; L- LCT propofol group; n- Number of patients

Several mechanisms including activation of pain mediators, endothelial irritation, osmolality differences have been proposed for causation of injection pain with propofol [15]. Several mechanisms of pain on injection have been suggested, but investigators have shown that the free concentration of propofol in the aqueous phase may be the most important factor [16]. Several methods comprising of both non pharmacological and pharmacological have been tried with varying degree of success for prevention of injection pain. The mixing of propofol emulsion with any other drug is not recommended by the manufactures because emulsions are thermodynamically unstable despite the use of stabilizing agent and potential of introducing contaminants into the emulsion, because LCT fat emulsion can serve as excellent growth media [17]. Different preparations of propofol have been tried in various clinical studies to decrease pain on injection. Propofol MCT-LCT formulations have been reported to reduce injection pain in various studies.

In a study conducted by Kinoshita et al., to compare the incidence and intensity of pain on intravenous injection of propofol using long chain and long chain/medium chain propofol emulsion showed pain of LCT propofol injection was stronger than MCT-LCT propofol. As incidence of pain on propofol injection, VAS on MCT-LCT propofol and LCT propofol gave score as 0 and 23.5 (p=0.0019).They concluded that propofol with emulsion of long and medium-chain triglyceride appears to reduce the injection pain than with emulsion of only long-chain triglycerides [18].

In our study in both MCT-LCT and LCT propofol groups, the age distribution ranged from 18-60 years with a mean age for MCT-LCT propofol group being 36.62 and for LCT propofol group being 38.80. The difference in age between both groups was not statistically significant. In children, younger the age, higher is the incidence and severity of pain on propofol injection attributable to the smaller size of vein in younger children [19].

We excluded the patients who received benzodiazepine premedication because it may reduce recall of unpleasant or painful injection during induction. The incidence of pain on injection of propofol in MCT-LCT group was 87% which was less than LCT propofol group which was 100%. The difference in two groups were statistically significant (p=0.0002).The difference between two groups with regard to intensity of pain on injection of propofol was statistically significant (p=0.0001).

18 patients in MCT-LCT propofol group had no memory of pain on injection of propofol. All patients were able to recall pain on injection of propofol in LCT propofol group. Mean pain score of 0.98 was recorded in MCT-LCT group as compared to 1.75 in LCT propofol group. The difference between two groups with regard to recollection of pain on injection of propofol was statistically significant (p=0.0001).

Our study had few limitations. We could have used tourniquet for occlusion at mid forearm, and also drug could have been injected using syringe pump thereby time required for injection of study drug would have been more precise.

Conclusion

Propofol MCT-LCT significantly reduces the incidence as well as the severity of injection pain. It also reduces recall of injection pain when compared with LCT propofol.

Conflicts of Interest: There are no conflicts of interest.

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Comparison of Dexmedetomidine vs. Pentazocine – Promethazine for Tympanoplasty under MAC: A Randomized Double Blind Study

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Abstract

Aim: To compare effectiveness of Dexmedetomidine with Pentazocine - Promethazine combination for intraoperative sedation under MAC for tympanoplasty under local anesthesia (LA). *Methodology*: Total 120 patients undergoing tympanoplasty under LA divided in to two groups randomly to receive either IV dexmedetomidine 1 µg/kg over 10mins followed by 0.2 µg/kg/h infusion (Group D) or Pentazocine 0.6mg/Kg and Inj. Promethazine 0.5 mg/kg IV diluted in 10ml normal saline over 10mins followed by 0.2 µg/kg/h infusion of normal saline (Group P). Sedation was titrated to RSS of 3. Vital parameters like HR, BP, SpO_2, requirement of rescue analgesics, intraoperative bleeding scale, surgeon satisfaction score (Likert Scale) and Post Anesthesia Recovery Score (Modified Aldrete Score) were recorded and analyzed. *Result*s: Intraoperative HR and MAP in Group D were lower than the baseline values and corresponding values in Group P ($p<0.05$). Intraoperative sedation in Group D was more than Group P (4 vs. 2 in a scale of 6). Intraoperative bleeding scale and surgeon satisfaction score was better in Group D than Group P (median interquartile range (IQR) 9 (8-10) vs. 8 (6.5-9.5) and 9 (8.5-9.5) vs. 8 (6.75-9.25), $p = 0.0001$ for both). Mean VAS for pain was more in group D than group P. Time for rescue analgesic was high with Group P while modified Aldrete score was high in Group D. Rate of occurrence of adverse drug reaction (ADR) was not statistically significant among two groups ($p > 0.05$). *Conclusion*: Dexmedetomidine is comparable to pentazocine - promethazine combination for sedation and analgesia in tympanoplasty with better surgical field and surgeon satisfaction, with better hemodynamic stability.

Keywords: Dexmedetomidine; Pentazocine - Promethazine; Sedation; Tympanoplasty; Monitored Anesthesia Care.

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Introduction

One of the commonest conditions encountered in ENT outpatient department are Perforation of the tympanic membrane and middle ear pathologies. Middle ear surgeries can be carried out under general or local anesthesia [1-3]. Tympanoplasty, most commonly performed ear surgery, involves reconstruction of perforated tympanic membrane with or without reconstruction of ossicles [1]. It is usually done with under local anesthesia (LA) with Monitored anesthesia care (MAC). Less bleeding, cost effectiveness, early recovery and assessment of ontable hearing during tympanoplasty are advantages of using local anesthesia. Patient's anxiety caused by noise during surgery, dizziness and discomfort due to positioning of head and neck etc are most common disadvantages of local anesthesia during tympanoplasty [2-5]. These problems can easily be overcome by administering appropriate sedatives as monitored anesthesia care. Most

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important elements of MAC are sedation, analgesia and control of anxiety [6]. During surgical procedure inhibition of movement by patient can be bring by Judicious use of MAC and patient still can respond to verbal commands as required for the surgical stage of operation.

During MAC, wide variety of centrally active IV and inhaled drugs have been used including barbiturates, benzodiazepines, ketamine, propofol, opioid and nonopioid analgesics, α-agonists, and nitrous oxide [7,8]. Usually two or more drug groups are combined and these drugs are administered pre-operatively in doses which can achieve desired clinical response with minimal respiratory depression and hemodynamic fluctuations [9-12]. Benzodiazepines and opioids combination increases risk of hypoxia and apnoea [9,10]. Opioids can be used as the sole supplement to local anesthetics but they fail to produce reliable sedation in absence of respiratory depression. α_2-agonists usually reduce central sympathetic outflow and have shown to produce anxiolysis and sedation at doses which produces relatively very less adverse effects [11]. These drugs also help in attenuating the hemodynamic responses associated with anaesthesia by reducing sympathetic outflow. Nausea-vomiting caused by Pentazocine can becounteracting by a sedative drug Promethazine. So, combination of pentazocine - promethazine is preferred for MAC [13].

By considering benefits of dexmedetomidine and pentazocine - promethazine, safety of use and desired therapeutic response achievement lead to increase in their use for the day care surgeries now a day. It is a common practice to use combinations of drugs for sedation and analgesia and focus is also shifting from the physician controlled techniques to patient controlled techniques due to level of stimulation and discomfort produced during ambulatory surgical procedures varies widely among different patients. There is no standard dosage regimen or dosage formulation that can be applied to all patients undergoing MAC. The need of the current anesthetic practice is tailor made approach for each patient. Proper knowledge and skills are required for designing such regimens and to use all the drugs effectively.

Therefore, this study was planned to compare effectiveness of intraoperative sedation as MAC between Dexmedetomidine and Pentazocine - Promethazine for tympanoplasty surgery under local anesthesia.

Methodology

This randomized, prospective, controlled, double blind study was carried out in patients undergoing tympanoplasty surgery in otorhinolaryngology department of a tertiary care, teaching, rural hospital in western India.

Ethical Consideration

The study protocol was approved by ethics the institutional committee of the institute. Written informed consent was obtained from all the participants before enrolling them for the study.

Participant Selection

Total 120 patients meeting inclusion-exclusion criteria could be enrolled for the study after screening all the patients undergoing tympanoplasty. Inclusion criteria for the study were age of 18-50 years and of either gender, patients having grade ASA I & II, having Mallampati grading of airway I & II and planned for tympanoplasty under LA. Exclusion criteria were patients with any cardiac disease, chronic obstructive lung disease, renal and hepatic insufficiency, CNS disorders, pregnant and lactating female, and sensitivity to LA drug and allergy to drugs.

Study Procedure

The patients were counseled in detail about sedation, LA and operative procedure.All the patients were underwent Pre-anaesthetic checkup including detailed history, general and systemic examination and investigations. The visual analogue scale (VAS) (0-10, where 0 indicated no pain while 10 indicated maximum pain) was explained to the patients. Preoperatively patients were advised to remain nil by mouth for atleast 8 hours. Patient was shifted to operation theatre after confirming starvation and consent. All baseline vital parameters; HR, SBP, DBP, MAP and SpO_2 were recorded by multi-para monitor. Ringer lactate solution was started after Intravenous (IV) access was secured. All the patients were given oxygenat 2 L/min via nasal cannula. As pre-medications, Inj. Ranitidine 1mg/kg, inj. Ondansetron 0.08mg/kg and inj. Glycopyrolate 0.004mg/kg IV were given to all patients

All eligible patients were allocated in two groups randomly by chit method. The anesthesiologist conducting the case, patients and anesthesiologist in the post anesthesia care unit (PACU) were all blinded to group assignment.Blinded observer

recorded the data and the anesthesiologist who did not participate in patient management or data collection had prepared the drugs

Group D: This group received Dexmedetomidine 1 μg/kg in 10ml normal saline (NS) over 10 minutes followed by it's infusion at a rate of 0.2 μg/kg /hr through infusion pump.

Group P: This group received a standard dose of Pentazocine 0.6mg/kg and Inj.Promethazine 0.5 mg/kg IV in 10ml NS over 10 minutes followed by infusion of 0.2 μg/kg/hr of NS through infusion pump.

LA was administered by surgeon using 2% Lignocaine with Adrenaline (1:2,00,000) to block greater auricular, lesser occipital, auriculotemporal nerves and four quadrants of the external auditory canal, After RSS of 3 was achieved. 2% Lignocaine and Adrenaline (1:1,00,000) were used for the Infiltration of operative field. Surgery was commenced after confirmation of adequate analgesia. Patient's response to LA infiltration was evaluated for pain and body movement. Pain was recorded on 10 point VAS.

Vital parameters were recorded intraoperatively every 2 minutes during loading dose of study drugs and at 10 minutes intervals till the end of surgery. At, every 10 minutes sedation level was assessed by RSS, if RSS <3 IV midazolam 0.01mg/kg was administered in either group. VAS was used for Intraoperative pain evaluation. LA infiltration at surgical site (2-3 ml) and rescue IV fentanyl 1μg/kg was used for inadequate analgesia.Approximately 15 min before end of surgery, maintenance infusion was discontinued at the time of closure. All adverse events like bradycardia (HR<45 beats/min), hypotension (MAP<50 mmHg sustained for >10 min), respiratory depression (respiratory rate <10bpm), oxygen desaturation, (SpO_2< 90%), nausea or vomiting were recorded. Bradycardia was managed with IV Atropine and IV fluids or IV Mephenteramine used for management of Hypotension.Surgical field was graded in terms of bleeding by the blinded surgeon using the scale developed by Boezaart at the end of surgery [11,12]. Likert scale was used for assessment of surgeon's satisfaction.

Patients were shifted to post anesthesia care unit and monitored for hemodynamic parameters, analgesia and adverse events if any within 2 hours after completion of surgery. Every 30 min RSS was assessed and first rescue analgesic was given at VAS >4 and was documented. patients were observed for 24 hours post operatively. All data were recorded in a structured case record form.

Statistical Analysis

All the data were recorded as appropriate as actual frequency, percentage, mean, standard deviation. Data entry was done in Microsoft excel andepi info software was used for analyzing data. The Chi Square Test was used for analyzing all the qualitative data and students' paired and unpaired t test as appropriatefor quantitative data. p value<0.05 was considered statistically significant.

Results

There were total 60 patients in each group.In group D, all 60 patients had received Dexmedetomidine and all 60 patients in group P had received a standard dose of Pentazocine in combination with Promethazine. Basic profile of study participants was shown in Table 1. Both the groups had no statistically significant difference in respect to mean age and mean weight. There were total 22 participants of ASA I and 38 participants of ASA II in group D where as in group P, there were total 40 participants of ASA I and 20 participants of ASA II.

Figure 1 shows comparison of trend of mean heart rate of both the groups at different time starting from a baseline to at the end of procedure and till post operative phase.In Group P, a steady decline of heart rate was observed.

Figure 2 shows comparison of mean of systolic and diastolic blood pressure in both groups at different time. sy Blood pressure was well maintained in both the groups. It was observed that, In Group D both stolic and diastolic blood pressure was maintained at lower side in in comparison with Group P. It was seen from the figure 3 that Mean Arterial Pressure (MAP) was slightly lower in Group D than Group P.

Table 2 shows comparison of means of difference of heart rate at different time. The mean and standard deviation of Difference between heart rate at baseline and at 30 mins for all participants was taken and was noted in both groups. It was shown that difference heart rate between observations at baseline and at 30 mins was statistically significant (p-Value < 0.05). Similarly, there is also statistically significant mean of difference between heart rate at Baseline and at the end of surgery was noted in both groups.

Ramsay sedation score was used to measure Intraoperative sedation. There was statistically significant difference between the two studied groups revealed, where the P group (2 in a scale of 6) showed less sedation than the D group (4 in a scale

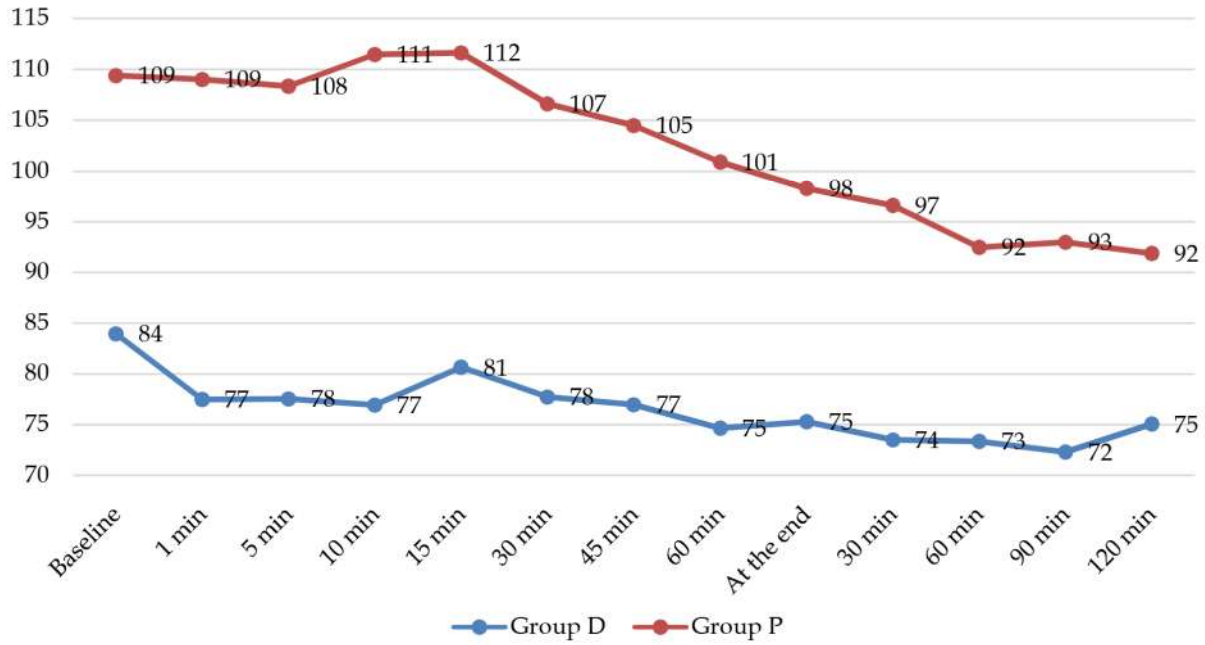

Fig. 1: Trend of Mean HR in both group

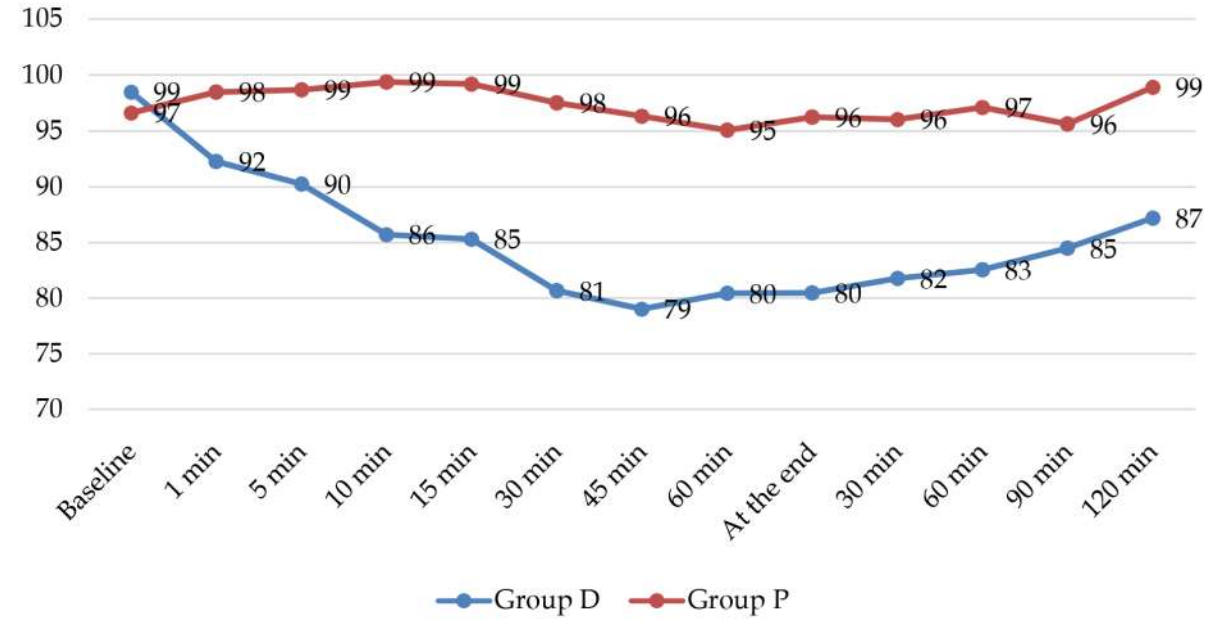

Fig. 2: Trend of SBP and DBP in both group

Table 1: Demographic profile of patients

Parameter	Group D (n=60)	Group P (n=60)	p-Value*
Age (Years)	33.3± 11.8	33.03± 13.52	0.93
Weight (kg)	52± 12.93	49.74± 11.20	0.47
Sex (M:F)	13:17	16:14	-
ASA(I/II)	38:22	40:20	-

Expressed as mean and SD and proportion; Chi square test- p value <0.05 was considered significant
Group D: dexmedetomidine group
Group P: pentazocine – promethazine group

of 6) as shown in Table 3. As shown in Table 4, Mean VAS for pain, time to rescue analgesic was high with P group as compared to D group while time to achieve Aldrete score of 10 was high in D group.

Different adverse events encountered in the study participants were shown in Table 5 . In group P, 5 patients reported nausea and vomiting while 8 patients developed tachycardia and 3 patients developed respiratory depression. In group D, 8 and 4 patients respectively reported bradycardia and hypotension. There is not any statistically significant difference in rate of occurrence of ADR among the two groups (p>0.05).

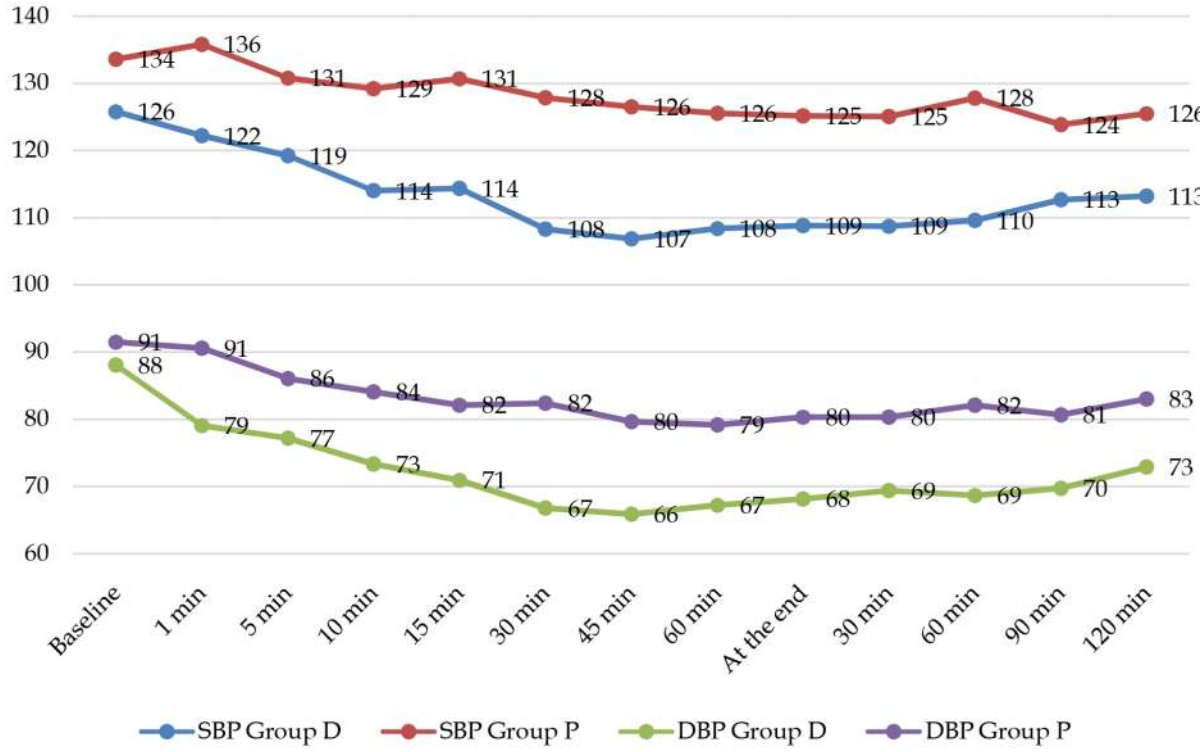

Fig. 3: Trend of MAP in both group

Table 2: Comparison of means of difference of heart rate at different time

Heart Rate	Group D	Group P	p-Value
Mean of difference between observations at Baseline and at 30 mins	11.0±9.6	20.0±19.0	0.02
Mean of difference between observations at Baseline and at the end of surgery	10.8±9.6	22.0±17.0	0.002

Expressed as mean and SD and proportion; Unpaired t test; p value <0.05 was considered significant
Group D: dexmedetomidine group
Group P: pentazocine – promethazine group

Table 3: Comparison of Surgeon satisfaction score, Intra operative bleeding score and Sedation score of patients in both groups

Study variables	Group D n=60 (Median)	Group P n=60(Median)	P value
Surgeon satisfaction score	6 – 7 (5.4)	3 - 4 (3.5)	0.01
Intra operative bleeding	1-2(1)	2-3 (2.5)	0.01
Sedation score	3-4(4)	1-2(2)	0.02

Expressed as Median (IQR) and P value
Group D: dexmedetomidine group
Group P: pentazocine – promethazine group

Table 4: Comparison of Pain score (VAS), F1irst rescue analgesic time and Modified Alderete score of patients in both groups

Study variables	Group D n=60 (Median)	Group P n=60(Median)
VAS pain score	3-5 (4.1)	6-7(6.3)
Time to first rescue analgesic (min)	70-92(81)	91-124 (100)
Time to achieve Aldrete score of 10 (min)	32-50(42)	62-98(78)

Group D: dexmedetomidine group
Group P: pentazocine – promethazine group

Table 5: Reported adverse events in study patients of both groups

Event	Group D	Group P
Nausea – vomiting	0	5
Tachycardia	0	8
Hypotension	4	0
Bradycardia	8	0
Respiratory depression	0	3
Dry mouth	2	0
Total	14	16

Group D: dexmedetomidine group
Group P: pentazocine – promethazine group

Discussion

Monitored anaesthesia careis being increasingly used for performing different ENT surgeries. Basic principle is to supplement sedation along with local anesthesia so that less bleeding during surgery occurs, hearing can be tested intra-operatively and any immediate complications can be detected early and managed accordingly [6-8]. If patient is screened and selected properly and counseled appropriately MAC can achieve good patient's as well as surgeon's satisfaction. Different drugs are used for MAC but no standard regimen can be designed which can be fitted to all patients. Primary aim of this study was to compare the effectiveness of dexmedetomidine with pentazocine-promethazine combination for MAC with local anesthesia.

Dexmedetomidine is an imidazole compound and highly selective α2 adrenoreceptor agonist. Dexmedetomidine has been studied by many researchers and proven to have many advantages [14,15] Dexmedetomidine can reduce sympathetic over activity and related symptoms during anesthesia if administered in proper dosage. The drug is approved by United States Food and Drug Administartion (USFDA) and Drug Controller General of India (DCGI) for analgesia and sedation during different surgeries and in ICU [16-18]. Mechanism of action of dexmedetomidine is by activation of presynaptically located α2 receptor inhibits release of sympathetic neurotransmitter release leading to termination of pain signal propogation and Postsynaptic α2 receptor activation in CNS inhibits sympathetic activity in vasomotor centre leads to dose dependent decrease in BP and HR. [16-21]. Considering these advantages, dexmedetomidine is being used increasingly in anesthetic practice as MAC also. On other hand, pentazocine is synthetic, mixed agonist-antagonist type of opioid analgesic. Promethazine, a neuroleptic drug has strong sedative, antiemetic and anticholinergic property. Traditionally, this combination is used commonly for patients undergoing short surgeries under sedation or surgeries under MAC [13].

In this study, loading dose of Dexmedetomidine 1μg/kg was selected based on previous studies and because of its short distribution half-life of 5-6 minutes,it was given as infusion [22-24,30].On analyzing cardiovascular parameters in both study groups, there is statistically significant difference ($p<0.05$) between two group, HR and MAP maintained at lower side in group D than group P.Findings can be explained easily by property of dexmedetomidine to reduce sympathetic activity in body. The same findings have been reported in studies of Arain SR et al. [24] and Alhashemi JA [25]. This result also suggest dexmedetomidine helps in producing controlled hypotension which can be contributing factor for producing significantly more bloodless field at the operative site and less intraoperative bleeding in group D as compared to Group P ($p<0.05$). These findings are also conquering

with results of the similar study by Durums et al. [26]. Stable hemodynamics, controlled hypotension and decreased bleeding could be responsible for better surgeons' satisfaction score in group D in our study.

On analyzing safety of drugs used, predictable ADRs were reported in both groups,there was no statistically difference in rate of occurrence of ADR among the groups. In our study,promethazine was associated with some respiratory depression while dexmedetomidine caused no respiratory depression although both study drugs provide adequate levels of sedation. Dexmedetomidine does not cause respiratory depression as its effects are not mediated by GABA system. These findings are similar to other studies by Karaaslan K et al. [27], Parikh DA et al. [28], Cheung CW et al. [29] and Har A et al. [30].

Intra operative VAS pain score was lower in group D than group P. Due to very less half-life of dexmedetomidine; requirement of rescue analgesic was early after stoppage of infusion in group D. These findings are similar to studies of Hall JE, Arain SR, Ebert TJ et al. [24] and Karaaslan K et al. [27]. Due to involvement of natural sleep pathway of dexmedetomidine sedation and reduced sympathetic activity,the aldrete score was high in group D [28,29,30].

Although this study has compared the dexmedetomidine and pentazocine-promethazine in MAC, with local anesthesia, the study was single centered. Therefore, variations in genetic, racial and other factors could not be analyzed. Larger studies evaluating these aspects are required in future for enhancing quality of MAC for betterment of patients.

Conclusion

Our study demonstrates that dexmedetomidine has better sedation, analgesia, stable hemodynamics, lesser bleeding and better surgeon satisfaction for MAC compare to pentazocine-promethazine combination in tympanoplasty surgery under local anesthesia.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of the GMERS Medical College, Gandhinagar approval letter no: GMERSMCG/IEC/4/2017; dated 9th February 2017. All participants were explained clearly about nature and purpose of study and written informed consent was obtained.

Consent for Publication

All the participants were ensured about non-disclosure of their identity at any stage of study including publication of data and consent for publication was also obtained.

Availability of Data and Material

Details of all the data mentioned in the study can be obtained from corresponding author in case of any query of further clarification.

Competing interests / Conflict of interest: None

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Melatonin Alprazolam Combination: Evaluation for Hemodynamic Stability during Intubation and Post Operative Analgesia in Patients Undergoing Cholecystectomy

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Abstract

Background: Many drugs have been used for attenuating hemodynamic response to intubation and laryngoscopy during general anesthesia, to provide post operative analgesia and to decrease the analgesic consumption in post operative period. The present study was conducted to evaluate the effects of low dose Melatonin and Alprazolam combination in patients undergoing laparoscopic cholecystectomy under general anesthesia. *Materials and Methods:* Fifty adult patient of either sex, aged between 20-50 years with American Society of Anesthesiologist (ASA) grade I and II presenting for laparoscopic cholecystectomy were divided into two groups. Group I (Gp I, n=25) acted as a control group and received placebo as tablet B complex and Group II, (test group Gp II, n=25) received Tab. Melatonin (3mg) and Alprazolam (0.25mg) combination one hour before surgery. The primary objectives were to assess the sedation score, effect on induction dose of Propofol and hemodynamic response to laryngoscopy and intubation. Secondary objectives were to assess the post operative Fentanyl consumption in first 24 hours. *Statistical Analysis:* The data thus obtained was analyzed using Epi-info and SPSS 16 software and various suitable statistical tests like Student t test, ANOVA, Chi-square test, Mann Whitney test etc. were applied. P-values > 0.05 were considered to be not significant, p-values < 0.05 were considered to be significant and p-values < 0.001 were considered to be highly significant. *Results:* The level of sedation in Gp II was significantly higher as compared to Gp I at one hour of giving the test drug(0.88±0.332 vs. 0.00±0.00, p value <0.001). The mean dose of Propofol for induction of general anesthesia was significantly reduced in Gp II (109.20±17.540 in Gp I and 87.60±17.388 in Gp II respectively, p value< 0.001). Both groups showed rise in heart rate and mean blood pressure following laryngoscopy and intubation up to three minutes but the rise was significantly more in Gp I as compared to Gp II at all time intervals . Significant decrease in total number of doses (5.12 ±0.833 vs. 4.12±0.332, p<0.001) as well as mean total fentanyl consumption (316.88 vs. 246.86, p<0.001) was noted in Gp II. No adverse effect was noted during the study which can be attributed to test drug. *Conclusion*: Low dose melatonin and alprazolam combination when given one hour before the surgery provides many advantages. It produces sedated patients which are easily arousable, decrease dose of induction agent, decrease the increase in heart rate and mean arterial blood pressure following laryngoscopy and intubation. It also reduces the post operative fentanyl consumption in first twenty four hours following surgery.

Keywords: Alprazolam; Melatonin; Post Operative Analgesia; Sedation.

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Introduction

Preoperative anxiety and stress are common in patients awaiting surgery and is described as unpleasant state of uneasiness secondary to concerned about a disease, hospitalization, anesthesia, surgery and also fear of unknown [1,2]. If anxiety is sufficiently marked then it leads to

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sympathetic stimulation with resultant increase in heart rate and blood pressure, ventricular ectopic beats or ischemic features in ECG and is associated with slower and complicated postoperative recovery [3,4].

Laryngoscopy and intubation is associated with several unwanted hemodynamic responses such as tachycardia, hypertension, arrhythmias and increased circulating catecholamines [5]. Hypertension and tachycardia are two dynamic predictors of peri-operative cardiac morbidity, so prevention of these responses during laryngoscopy and intubation remains an important clinical goal for the patients with cardiac or cerebral disease [6]. These effects are deleterious in susceptible individuals culminating in peri-operative myocardial ischemia, acute heart failure and cerebro vascular accidents [7]. Several methods have been used to attenuate hemodynamic response to laryngoscopy and intubation such as pretreatment with beta blockers, calcium channel blockers, opioids , nitroglycerine, dexmedetomidine etc. [8,9,10].

Melatonin (5-methoxy-N-acetyltryptamine) is a hormone found in all living organisms, from algae to humans [11]. In humans melatonin is produced mainly by pineal gland (acts as endocrine hormone) and to lesser extent by GIT and retina (acts as paracrine hormone). Melatonin is synthesized from amino acid tryptophan via 5-hydroxyindole-O-methyl transferase enzyme pathway [12,13]. The biological effects are produced via melatonin receptors MT1 and MT2. Clinical applications of melatonin include its use for insomnia, jet lag and other types of misalignments in the circadian rhythm [14,15,16].

Melatonin has been used as premedication drug for anxiolysis. When used alone in higher doses, it provides sedation, reduction in dose of induction agent, post operative analgesia resulting in fewer requirements of post operative analgesics [17]. The present study was carried out to determine the effectiveness of low dose melatonin in combination with alprazolam in decreasing anxiety and attenuating hemodynamic response to laryngoscopy /intubation. The post operative analgesic requirement in first twenty four hours was also evaluated.

Material and Methods

After approval of institutional research ethics committee, the study was conducted in prospective randomized double blind manner in patients undergoing laparoscopic cholecystectomy under general anesthesia. The patients willing to participate in this study were informed about the purpose of this study, procedure details, and their informed consent in writing were obtained. The patients were also informed that they can opt out of the study any time without assigning any reason.

The target sample of 50 patients was divided into two groups of 25 patients in each group using random allocation software. The random number was kept in envelope under custody of consultant in charge and the envelope was opened one hour before surgery and the patient was assigned to respective group. Post premedication observations during laryngoscopy and intubation and follow up were made by independent anesthetist not associated with first team thus making it blind to trial participants, data collectors and analyzers.

The inclusion criteria included patients between 20-50 years of age, of either sex, ASA grade I and II, undergoing laparoscopic cholecystectomy under general anesthesia

Exclusion criteria included known hypersensitivity to any of drug used, ASA grade III or above, patient refusal to participate in study, pregnancy and lactation, use of psychotropic drugs or drug abuse, any language and communication difficulties, hemorrhagic diathesis, on anti platelet/anti coagulant therapy, history of Diabetes, Asthma, Renal or hepatic insufficiencies and any psychiatric illness.

Procedure

All the patients were visited one day before the surgery. The general physical examination was carried out and routine investigations were noted**.** Informed consent for participation in the study was taken from all patients after explaining the procedure in detail. All patients were given premedication with 7.5mg Tab. Midazolam (Tab. Mezolam by Neon Laboratories Limited) at bedtime prior to the day of surgery. Next day, one hour before the surgery the patients were assessed for Sedation Score: (grade 0 - Alert, conversant, grade 1- Awake but drowsy, grade 2- Asleep but arousable and grade 3 - Asleep and not arousable).

The patients were assigned to one of the groups using random allocation software.

Group I (Gp I, n=25) acted as a control group and received placebo as tablet B Complex (Cobadex forte by Glaxo Smith Kline Pharmaceuticals Ltd.)

Group II, test group, (Gp II, n=25) received Tab. Melatonin (3mg) and Alprazolam (0.25mg) combination (Tablet Stresnil by Aristo Pharmaceuticals Pvt. Ltd.)

Heart Rate, SpO_2, MAP and ECG were recorded before giving premedication as per the allocated group. They were assessed again at 30 minutes and 1 hour later for the same parameters with continuous monitoring in between. On arrival in the operating room, intravenous line was secured with 18G intravenous cannula. Monitoring of noninvasive blood pressure (NIBP), heart rate, electrocardiogram and arterial oxygen saturation (SpO2) was carried out and the basal readings were noted. A uniform anesthetic technique was used. Pre induction analgesia was given with Inj. Fentanyl at dose of 2µg/kg followed by pre-oxygenation for 3 minutes with 100% oxygen. Anaesthesia was induced by slowly injecting Inj. Propofol and the dose at which eyelash-reflex/verbal response was lost was noted, followed by administration of Inj. Atracurium at a dose of 0.6 mg/kg for muscle relaxation for intubation of trachea. Intubation was done 3 minutes after administering Inj. Atracurium. Vital parameters were recorded post intubation every one minute for the first five minutes and then every five minutes. Analgesic top-up was provided with Inj. Fentanyl (0.5µg/kg) as and when required. The patients were also observed for any special event during the surgery. General Anaesthesia was maintained with oxygen (33%), Nitrous Oxide (66%) and Isoflurane (0.1- 1.5%).

During the Post Anesthesia Care, the patients were observed for adverse effects, if any, and requirement for analgesics every 1 hour during the first four hours and then every four hours for the next 20 hours. Analgesic requirement of the patient were met on demand basis with Inj. Fentanyl (1µgm/kg i/v), the response was awaited and if required, a further top up with Inj. Fentanyl (0.5µgm/kg i/v) was given after 10 minutes.

Statistical Analysis

The data thus obtained was analyzed using Epi-info and SPSS 16 software and various suitable statistical tests like Student t test, ANOVA, Chi-square test, Mann Whitney test etc. were applied. p-values > 0.05 were considered to be not significant, p-values < 0.05 were considered to be significant and p-values < 0.001 were considered to be highly significant.

Observations and Results

Demographic Data

Both groups were comparable in age, weight and sex distribution (p value > 0.05). Incidentally, majority of patients in both groups were females. The ratio of female versus male in Gp I was 20:5, and in Gp II was 21:4 which was not statistically significant (Table 1).

Baseline Vitals and Sedation Score

The patients were continuously monitored and HR, MAP, SpO_2 and ECG were recorded twice at an interval of half an hour each. In both groups, the changes in the vitals were found to be insignificant at half an hour (T30) and one hour (T60) after giving premedication (p-values > 0.05).

All the 25 patients in Gp I had a sedation Score of 0 at T30 and T60. At time T30 the mean sedation score in Gp II was 0.24±0.436 and at time T_{60} the mean sedation score in Gp II was 0.88±0.332 (p-value < 0.05). There was a significant difference in sedation score in two groups at one hour after administering the test drug as most of patients in Gp II were awake but drowsy (Table 3).

Anesthetic Drugs

The dose of Fentanyl and Atracurium administered in the both groups were comparable as doses were based on body weight. The mean dose of Propofol required in Gp II was significantly lower than in Gp I. Mean dose of Propofol consumed in Gp I was 109.20±17.540 and in Gp II was 87.60±17.388 (p-value < 0.05) (Table 3).

Vitals (HR, SpO_2, MAP and ECG) were recorded just before and after intubation and post intubation every 1minute for the first 5 minutes and then every 5 minutes till completion of surgery.

The values of mean heart rate before intubation were taken as baseline value and were compared with the mean heart rate post laryngoscopy/intubation, using student t-test within each group. In both groups it was observed that there was a significant difference in the heart rate till three minutes post intubation.

Table 1: Demographic data

	Gp I	Gp II	
Mean age (yrs)	39.4±10.5	39.12±9.6	> 0.05
Mean weight(Kg)	61.56±9.23	59.92±8.25	0.787
Number of females	20/25(80%)	21/25(88%)	> 0.05
Number of males	5/25(20%)	4/25 (16%)	> 0.05

Table 2: Post laryngoscopy/intubation hemodynamic changes (T-bi-before intubation,Tai- after intubation, T1-T5 minutes after intubation)

		Gp 1	p-value intragroup Gp I	Gp II	p-value intragroup Gp II	Intergroup p-value Gp I & II
Heart rate	T bi	81.24±14.684		76.04±7.855		0.315
	T ai	103.32±16.703	Tbi-ai- 0.000	86.16±9.428	Tbi-ai- 0.000	0.000
	T 1	101.40±17.732	Tbi-T_1-0.000	85.88±10.600	Tbi-T_1-0.000	0.001
	T2	96.52±17.176	Tbi-T_2-0.000	84.04±10.002	Tbi-T_2-0.001	0.005
	T 3	92.48±15.524	Tbi-T_3- 0.003	83.72±10.04	Tbi-T_3- 0.007	0.047
	T4	89.72±15.350	Tbi-T_4-0.051	82.96±9.489	Tbi-T_4-0.066	0.146
	T5	86.84±14.389	Tbi-T_5-0.598	81.68±9.344	Tbi-T_5-0.056	0.282
MAP	T bi	74.64±11.554		77.44±11.181		0.651
	T ai	110.68±17.902	Tbi-ai- 0.000	86.80±11.218	Tbi-ai- 0.000	0.000
	T 1	103.48±5.796	Tbi-T_1-0.000	87.24±9.951	Tbi-T_1-0.000	0.000
	T2	94.80±12.777	Tbi-T_2-0.000	85.76±9.351	Tbi-T_2-0.009	0.011
	T 3	88.48±11.211	Tbi-T_3- 0.001	82.20±8.578	Tbi-T_3- 1.000	0.069
	T4	84.20±11.053	Tbi-T_4-0.046	81.48±7.235	Tbi-T_4-1.000	0.565
	T5	83.20±11.737	Tbi-T_5-0.279	82.16±8.320	Tbi-T_5-1.000	0.932

Table 3: Mean sedation score, Propofol dose and post operative analgesic requirement in first 24 hours

	Gp I	Gp II	p value
Mean sedation score T_0	0.00±0.00	0.00±0.00	NA
T_{30}	0.00±0.00	0.24±0.436	0.078
T^{60}	0.00±0.00	0.88±0.332	0.000
Propofol requirement	109.20±17.54	87.60±17.38	0.000
Total fentanyl doses in post op period (24 hrs)	5.12±0.833	4.12±0.332	
Total fentanyl consumed in first 24 hrs (µgm)	316.88	246.86	0.000

The heart rate before intubation in both groups was comparable. In Gp I heart rate after laryngoscopy/intubation increased significantly and lasted up to three minutes post intubation (p-value <0.003). In Gp II there was significant increase in heart rate in post intubation period and it remained elevated till three minutes (p-value 0.007). The intergroup comparison of mean heart rate at different time intervals shows that increase in heart rate was more in Gp I as compared to Gp II (Table 2).

The mean arterial pressure just before laryngoscopy and intubation in both groups was comparable. The mean post intubation values of MAP were significantly increased in Gp I till 4 minutes post intubation, while in Gp II the values were significantly increased until 2 minutes after intubation. The values of mean MAP with standard deviation in two groups are depicted and the intra group and inter group comparison of mean MAP is given in Table. 2

The mean oxygen saturation was found to be comparable between both groups at all the times with a p-value more than 0.05.

During the first 24 hours of Post operative period, the analgesic requirement of the patients were met on demand basis with Inj.fentanyl (1µgm/kg i/v), and if required, a further top up with Inj.fentanyl (0.5µgm/kg) was given after 10 minutes. The number of doses and amount administered, on demand basis, were recorded for the next 24 hours. The mean number of inj.fentanyl doses required in Gp I was 5.12 while in Gp II it was 4.12. The amount of fentanyl required in Gp I was 316.88µgm and in Gp II was 246.86 µgm in first 24 hours post operatively. There was a highly significant decrease in requirement for postoperative analgesia in the patients of Group II as compared to Group I. (p <0.001) (Table 3).

Discussion

It is evident from various studies that pre operative anxiety and stress are common in patients awaiting surgery and also leads to increased requirement of anaesthetic induction agents and post operative analgesic drugs. Laryngoscopy, intubation and post operative pain are associated with sympathetic

stimulation leading to hypertension, tachycardia and even arrhythmias. These effects are deleterious in susceptible individuals like the patients with cardiac or cerebral disease culminating into peri operative complications. Melatonin has a sedative, anxiolytic, hypnotic, analgesic, anti-inflammatory properties and is gaining popularity as premedication drug. Alprazolam possesses anxiolytic, sedative, skeletal muscle relaxant and amnesic properties.

In present study we compared the low dose Melatonin / Alprazolam combination with placebo on the basis of their ability to sedate, to alter dose of inducing agent, attenuating hemodynamic response during laryngoscopy / intubation and post operative analgesic requirement. The two groups were comparable on the basis of age, weight, sex distribution and base line vitals one hour before surgery. The females formed the majority in both groups.

While no sedation was noted in Gp I after giving placebo drug at any time, there was significant sedation present in Gp II at one hour of giving the test drug (0.88± 0.332, p value < 0.05) with most of patients awake but drowsy. Similar results were obtained by Pokharel et al. in their study showing that Melatonin and Alprazolam when used alone or in combination causes sedation.

The mean dose of Propofol required to induce sleep was significantly lower in Gp II (87.60±17.388) as compared to Gp I (109.20±17.540). Similar results were obtained by Pokharel et al. and Turkistani and coworkers in their study [18,19].

In both groups it was observed that there was a significant difference in heart rate and MAP when post intubation values were compared to before intubation values within the group. This increase was significantly more in Gp I as compared to Gp II (p-value <0.05). Similar results were reported by Mohamed and co worker but in their study the attenuation of MAP lasted for ten minutes when compared with control group [20].

The mean number of doses and total fentanyl drug used in Gp I was 5.12 and 316.88µgm and in Gp II was 4.12 and 246.86µgm respectively. There was a significant reduction in number of doses required and total consumption of fentanyl in Gp II as compared to Gp I in first 24 hours of post operative period. Similar results were reported by Radwan and associates when they used melatonin in dose of 6 mg [21]. Borazan and associates also reported similar results but in their study they used melatonin in dose of 6 mg night before and one hour before surgery [22].

No side effect was noted during observation period.

Conclusion

Low dose combination of Melatonin (3 mg) and Alprazolam (0.25 mg) is effective in reducing preoperative anxiety, decreasing the dose of induction agent, attenuating the hemodynamic response to laryngoscopy and intubation and also reducing the number of doses and total dose of fentanyl required in post operative period for pain relief. The above combination produces less unwanted side effects like increased sedation which is seen when melatonin is used in higher doses of 6 mg or more. This combination can be safely prescribed for patients undergoing surgery under general anesthesia.

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Comparative Study of Propofol Versus Thiopentone Using Glycopyrrolate as Anticholinergic Drug and Succinylcholine as Muscle Relaxant in Modified Electroconvulsive Therapy

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Abstract

Introduction : Electroconvulsive Therapy (ECT) induces seizure to treat depression and other psychiatric disorders .To prevent musculoskeletal injuries and to produce amnesia, anaesthesia is needed during ECT. *Aim*: To compare propofol and thiopentone in patients posted for modified ECT. *Materials and Methods*: Study was conducted on ASA Grade I and II patients (total 100) posted for ECT. They were randomly divided equally in Propofol Group (Group P) and Thiopentone Group (Group T) (n=50 for each group). Each patient underwent series of bilateral ECT. In both the groups, Inj. Oandansetron 4 mg and Inj. Glycopyrrolate 0.2 mg were given intravenously (iv) 3 minutes before giving the drug under study. Inj.Thiopentone (2.5%)was given in the dose of 2 mg/kg iv in Group T and Inj. Propofol (1%) was given in the dose of 1 mg/kg iv in Group P, followed by Inj Succinlyscoline 0.5 mg/kg iv in both the Groups. Onset of action(induction time), mean stimulus charge, duration of seizure, number of missed seizures, vital parameters (hemodynamic parameters), duration of recovery from anaesthesia (response to verbal command), complications were compared. All patients were evaluated by the psychiatrist on the BDI (Beck Depression Inventory) scale after completion of the treatment. *Results*: Mean seizure duration was shorter in Group P than Group T (44.18±1.24 seconds versus 55.52±1.05 seconds). Mean stimuls charge was 149.50±1.25 mC (Millicoulomb) in Group P and 136.22±0.96 mC in Group T. Number of ECTs required to attain therapeutic goal was higher in Group P than Group T (8.16±0.24 versus 6.46±0.21). Propofol was associated with lower increase in blood pressure. Induction time and Recovery were faster in Group P than Group T. There was no difference in treatment outcome. *Conclusion*: Propofol decreases seizure duration even with higher stimulus charge. Propofol increases number of ECT required for treatment. Induction time and recovery both were faster with propofol.

Keywords: ECT; Propofol; Seizures; Thiopentone; Hemodynamic Parameters.

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Introduction

ECT is given in conscious patient (direct ECT causing musculoskeletal complications) and in anaesthetized patient (Modified ECT) to induce brain for seizure activity [1]. Anaesthesia drugs given in Modified ECT should have rapid onset of action , short duration and early recovery because overdose can shorten seizure activity and optimum seizure activity is essential for treatment . Drug profile should help in fast tracking and early discharge of patient [2].

In ECT, the electrical stimulus results in generalized tonic activity for approximately 10 to 15 seconds followed by generalized clonic activity for variable period lasting up to 120 seconds. The seizure should ideally last for 25 seconds to 75 seconds at its optimum. Seizure duration less than 15 seconds is

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considered as inadequate and more than 120 seconds is not required. Modified ECT is typically administered as a series of treatments two to three times a week for 6 to 12 treatments, in its acute phase. Maintenance therapy can be performed at progressively increasing intervals from once a week to once a month to prevent relapses [3].

In ECT, Constant current devices automatically adjust strength of the current as per resistance in the circuit. Seizure threshold is around 50-100 mC (millicoulombs) initially. 50 to 100% suprathreshold is sufficient for bilateral ECT [4]. Repetitive ECT increases threshold for inducing seizure activity. Anaesthesia drugs can change seizure threshold .Propofol has short seizure duration, Thiopentone also reduces seizure activity [5]. Lower electrical doses fail to induce seizure activity and higher electrical doses cause cognitive dysfunction.

ECT has cardiovascular and cerebral effects which needs attention of anaesthetist. The cardiovascular effects result from autonomic nervous system (ANS) activation during ECT procedure. This leads to an initial 10–15 s of parasympathetic discharge resulting in bradycardia and occasional asystole (the tonic phase). This is followed by a pronounced sympathetic response of hypertension, tachycardia and other arrhythmias peaking 1 min after ECT stimulation and generally resolving within 5–10 min thereafter (the clonic phase). There is increased cerebral metabolic rate (CMR) and cerebral oxygen consumption which results in a marked increase in cerebral blood flow (CBF) and intracranial pressure (ICP). Furthermore, there is increased intraocular and intragastric pressure. Short-term memory loss is also common [6].

Non-memory cognitive functions (intelligence and judgement) are unaffected [7].

Anaesthesia is given for to produce amnesia and to prevent musculoskeletal /cardiac complications.

Materials and Methods

Study was approved by Institutional Ethical Committee and written informed consent obtained from patients and relatives for procedure and for to be part of the study.

Patients who were between 18 to 60 years of age with major depressive disorder, mania schizophrenia, schizoaffective disorder were included in the study [8]. ASA Grade III, IV and V patients were excluded from study. Patients with pheocromocytoma, recent myocardial infarction, recent stroke or intracranial surgery, angina, CHF, cardiac pacemaker, severe osteoporosis, major bone fractures, glaucoma, retinal detachment, pregnancy, history of allergy to drugs or any contraindication as like porphyria were excluded from the study [9].

Patients were subjected to pre-anesthesia check up and routine investigations as per protocol. Patients were kept nil by mouth for six hours as per protocol and had continued antipsychotic treatment until the day of the procedure. All patients were monitored for ECG, Heart Rate, blood pressure, SpO_2 from beginning up to 30 minutes following ECT.

All patients preoxygenated with 100% oxygen for 3 minutes and received Inj Glycopyrrolate 0.2 mg/kg iv and Inj Oandansetron 4 mg iv. Group P patients received Inj Propofol 1 mg/kg iv and Group T patients received Inj Thiopentone 2 mg/kg iv, followed by Inj Succinylscoline 0.5 mg/kg iv to patients of both the groups. Induction Time was noted from drug dose given to loss of eyelash reflex. All patients ventilated with Mapleson D breathing system (Bain's circuit). After fasciculations subsided, Bite block was inserted to prevent tongue bite. ECT given to produce seizures and seizure duration was monitored by isolated limb method. Subsequently, all patients ventilated until spontaneous breathing returned. Duration of recovery was recorded from injection of anesthetic agent to time taken to obey verbal commands such as opening of eyes.

Data was analysed by Graph Pad Prism 7 software. Value of $p<0.05$ was considered statistically significant.

Results

Data shows that patients taking ECT have male preponderance and in younger age group.

Mean Induction Time was 18.46±0.30 seconds for Group P and 20.05±0.26 seconds for Group T. P value < 0.0001 ($p < 0.05$ .Statistically it was significant).

Mean stimulus charge was 149.50±1.25 mC in Group P and 136 .22± 0.96 mC in Group T; p value < 0.0001 u Mean seizure duration was shorter in Group P than Group T (44.18±1.24 seconds versus 55.52± 1.05 seconds; $p < 0.0001$).

Number of ECTs required to attain therapeutic goal was higher in Group P than Group T (8.16±0.24 versus 6.46±0.21 P value < 0.0001 ($p<0.05$ significant difference statistically).

In Group P mean SpO_2 was 98.9 and in Group T it was 99. Statistically it was insignificant.

Table 1: Demographic data

Group	Male	Female
P	30	20
T	32	18

Table 2: Mean Age

Group	Mean Age
P	34.5
T	36.1

Table 3: Hemodynamic parameters (Mean Value)

Time	Pulse Rate		Systolic Blood Pressure		Diastolic Blood Pressure	
	Group P	Group T	Group P	Group T	Group P	Group T
Baseline	83.4	84.2	121.2	119.8	77.8	77.2
After Giving Inj.Glycopyrrolate	96.1	97.8	124.3	123.2	77.9	77.9
Induction	95.3	100.5	114.4	121.1	74.3	75.1
ECT	95.2	103.5	116.2	122.4	75.0	75.5
15 seconds after ECT	94.2	101.6	116.9	124.8	75.1	78.5
1 minute after ECT	98.2	102.1	124.6	132.6	80.2	83.3
2 minutes after ECT	99.4	105.2	129.3	135.2	86.9	87.9
3 minutes after ECT	102.2	107.6	139.6	146.7	88.2	89.4
5 minutes after ECT	99.1	103.7	130.2	136.4	86.4	86.3
10 minutes after ECT	94.4	100.6	125.3	128.5	82.8	84.2
30 minutes after ECT	88.2	90.2	120.2	122.6	78.9	79.1

Table 4: Complications

	Group P	Group T
Pain On Injection	13	1
Nausea-Vomiting	1	-
Rhythm Disturbance after Induction and ECT	3	3
Missed seizures or seizure duration<15 seconds	1	-
Short term memory loss	2	1
Musculoskeletal injury	-	-

P value – 0.2473 (P >0.05 , no statistical difference)

Mean duration of Recovery was 6.70±0.23 minutes in Group P versus 8.02±0.18 minutes in Group T, p < 0.0001 (p< 0.05 statistically significant difference).

In a patient of Group P, ECT could not elicit desired seizure activity at first shock and second shock with higher intensity was used to elicit seizures. In one patient of Group T loss of eyelash reflex could not be achieved with Thiopentone's dose of 2 mg/kg iv, additional 1mg/kg of dose was given for achieving hypnosis. 3 patients of Group T had occasional VPCs after ECT which resolved at their own. 2 patients of Group P had APCs and 1 patient of Group P had VPCs after ECT which subsided automatically.

Mean BDI score was 6.94±0.20 in Group P and 7.08±0.15 in Group T at the time of completion of ECT sessions, which was statistically insignificant (p value 0.1570).

Discussion

The use of electroconvulsive therapy (ECT) to provoke a generalized epileptic seizure was first described in 1938 and was performed without anaesthesia for almost 30 years [10]. It was associated with fractures of bones, dislocation of the joints , biting of the tongue, tearing of muscle fibers and may be intense vasovagal shock in ECT. So, anaesthesia and muscle relaxation was needed; this anaesthesia based ECT is called as Modified ECT [11].

In so previous research articles , inclusion criteria and exclusion criteria of the patients are almost same. We had excluded pregnant patients and patients with pacemakers from our study. But recently published report by Michael Ho has stated that pregnant patients and patients with pacemaker can be given ECT. Anti tachydysrhythmia function of pacemaker should be disabled, magnet and external pacemaker should be kept available [12].

Both Tricyclic antidepressants & MAOIs can augment effect of barbiturates, increase sleep time and duration of anaesthesia, so lower doses of barbiturates is recommended [13]. We have used Inj Thiopentone sodium with dose of 2 mg/kg iv, so many of studies have shown 2 to 5 mg/kg iv thiopentone dosage for ECT but higher doses not needed as intubation is not required in ECT.

As per study by Maria Moral et al. higher doses of propofol is associated with strong anticonvulsant effect and reduced seizure duration [14]. ECT does not require usual induction dose of 1.5 mg/kg to 2 mg/kg of propofol as like in routine anaesthesia purpose and at the same time, dose of propofol should be adequate enough to produce hypnosis .

Glycopyrrolate is a quaternary compound and does not cross blood brain barrier, it does not increase seizure induced tachycardia [15]. In various studies, atropine is shown to produce more tachycardia during ECT which is harmful to the patient.

In ECT, paralysis need not to be complete as intubation is seldom required. So ,0.5 mg/kg dose of Succinylscoline is adequate [16].

Induction time in Group P was shorter than Group T. A study by Jignesh Patel et al., had similar result [17]. In our study we calculated induction time from the point at which full dose of drug given intravenously to loss of eyelash reflex (which roughly correlates with arm-brain circulation time). In various studies, induction time was calculated from initiation of infusion of drug (fixed 20 seconds of infusion time) up to loss of eyelash reflex.

In our study mean stimulus charge for Group P was 149.50±1.25 mC and for Group T was 136.22±0.96 mC. A study by Ka Fai Chung had similar results [18].

In a study by Villalonga A et al. had shown that seizure duration less than 15 seconds and more than 120 seconds produces less favourable response to ECT [19]. In our study, duration of seizure was adequate enough to produce desired treatment. one patient of Group P had registered very brief seizures following ECT, subsequent shock with higher stimulus charge was given to produce desired seizure duration. So many of research has proved that propofol has strong anticonvulsant activity.

In our study, we had observed that heart rate had reduced slightly during first 15 seconds after ECT due to parasympathetic stimulation. In around 3 minutes of ECT, heart rate and blood pressure had attained peak. Increase in heart rate and blood pressure started resolving within 5 to 10 minutes of ECT. A study by Maulik Gandhi et al. had similar results [20]. Group P had lower rise of heart rate and blood pressure than Group T . In certain studies , Inj atropine 0.6 mg/kg iv was used as anticholinergic which was associated with higher rise in heart rate than our study [21].

So many of the past studies have shown that sympathetic stimulation after ECT is associated with cardiac rhythm disturbances which can be fatal if it affects hemodynamics and persists for longer time. In our study also we had observed VPCs in both the groups and APCc in Group P. Group P had more complains of pain on injection and had nausea,vomiting in 2% of patients. Propofol has effect on Bundle of His conduction and causes Sinus node recovery time lengthening. Propofol can contribute bradycardia during initial parasympathetic predominance after ECT. In our study, we had not seen severe bradycardia which affects hemodynamics of the patient.

In a study by Anish Patel , it was shown than propofol is associated with higher stimulus charge and shorter seizures[22]. 2 patients of Group P had short term memory loss compared to 1 patients of Group T. Memory loss can be due to higher stimulus charge associated with Group P though seizure duration was less.

A study conducted by Alok Kumar stated that the total BDI score ranges from 0-63, with 0-9 being normal, rising to 10-18 during mild to moderate depression, 19-29 during moderate to severe depression, and rising to > 30 during an extreme severe depression [23]. His study had similar results on BDI. Almost identical BDI results show that no difference in outcome of treatment in both the Groups.

Conclusion

Propofol decreases seizure duration and requires higher stimulus charge. Propofol increases number of ECT required for treatment. Induction time and recovery both were faster with propofol. Incidence of minor complications are more with propofol though statistically insignificant.

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Original Research Article

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A Critical Evaluation of Safety and Efficacy of Spinal Anesthesia in Comparison with General Anesthesia in Percutaneous Nephrolithotomy

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Abstract

Context: Percutaneous nephrolithotomy (PCNL) under general anesthesia plays a major role in larger size kidney stones, but in many times spinal anesthesia will be more advantageous owing to better hemodynamic stability and also equally effective in relieving pain. *Aim:* The aim of this current study is to compare the safety and effectiveness of spinal anesthesia with general anesthesia in percutaneous nephrolithotomy. *Settings and Design:* It is a randomized prospective study done in MelmaruvathurAdhiparasakthi Institute of Medical sciences and research from April 2016 to April 2018. *Methods and Material:* 100 patients who were undergoing PCNL were randomly selected and divided into two groups. Group SA (n=50) received total dose 3.4 ml of 0.5% hyperbaric Bupivacaine with 0.6mg of Nalbuphine. Group GA (n=50) received premedication with Glycopyrolate and Fentanyl and they were anesthetised with Propofol and Succcinylcholine Anesthesia was maintained with Vecuronium and N_2O/O_2/Isoflurane. Heart rate, mean arterial blood pressure and complications like hypotension, bradycardia were recorded intraoperatively and postoperatively. *Statistical analysis used:* Statistical analysis were calculated with the graph pad prism 5.0 software. The data were expressed as a mean and standard deviation.All the quatitative variables were analysed using Unpaired t-test. *Results:* Pulse rate at 5, 10, 45, 60 minutesintra operatively and at 0, 3, 5 hours postoperatively were significantly less in patients receiving spinal anesthesia group when compared to general anesthesia group ($p<0.0001$). Mean arterial pressure at 5, 10, 15, 20, 25, 30, 45, 60 minutes intra operatively and at 0, 3, 5 hours postoperatively was found to be less in spinal anesthesia group then the GA group ($p< 0.0001$). The VAS score at 0, 3, 5, 8 hours was found to be less and statistically significant in spinal anesthesia group as compared to general anaesthsia group (0.66±0.51/4.14±0.75, 1.38±0.49/5.4±0.61, 1.8±0.45/4.32±0.47, 3.78±0.58/4.34±0.47). Moreover analgesic requirement of tramadol more than 100mg was lower in SA group than GA group. *Conclusions:* Our study shows that spinal anesthesia for PCNL is relativelysafe and equally effective alternative to general anesthesia with better hemodynamic stability, lower postoperative pain, minimal analgesic requirements, and early recovery.

Keywords: PCNL; Spinal Anesthesia; VAS Score; General Anesthesia; Hemodynamics, Analgesia.

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Introduction

Urinary tract stone is a major and common health problem with an increasing incidence, prevalence and frequency of recurrence . PCNL is a choice of treatment for removing large pelvic stones, upper ureteric stones and staghorn stone [1-3]. It is a minimally invasive procedure but usually done under general anesthesia. However PCNL done under GA have risk of developing postop atelectasis. Moreover other complications of GA like nausea, vomiting, drug reactions, displacement of ET tube, injury to tongue, rarely spinal cord injury while shifting the patient

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from supine to prone can also occur. Whereas Spinal anesthesia provide less drug intake, reduced intraoperative bleeding and less postoperative pain and reduced requirement of analgesic [4-7]. The important factor in spinal anesthesia is the hemodynamic variation likely the hypotension and bradycardia [8-13]. Some studies have quoted that spinal anesthesia has better outcomes with less cost when compared to GA. However, there is no such studies done in comparison made by BP and PR during intra and postoperatively [1-3]. Hence, in this study, in addition to efficacy we tend to compare the safety of SA in terms of hemodynamic variables such as heart rate and their mean arterial pressure during surgery and postoperatively.

The aim of this current study is to compare the safety and effectiveness of spinal anesthesia with general anesthesia in percutaneous nephrolithotomy by comparing the heart rate, mean arterial pressure and pain.

Materials and Methods

Hundred (100) patients of ASA physical status I & II which includes both male and female, in the age group of 20 to 55 years who were scheduled for percutaneous nephrolithotomy with stone size of less than 2cm were enrolled in this study after getting ethical committee approval and obtaining informed written consent from the patient. This is a randomized control study which is done prospectively in Melmaruvathur Adhiparasakthi Institute of Medical Sciences & Research over a period of two years from April 2016 to April 2018.Patient with anticipated difficult intubation, cardiovascular disease, bleeding disorders,spinal anomalies, local site infections were excluded from this study. Patients were randomly allocated into two groups according to computer generated random number.

All patients were assessed and explained about visual analogue pain score, where zero indicates no pain, ten indicative of severe unbearable pain. Patients were premedicated as per our protocol with tablet Alprazolam 0.25 mg and tablet Ranitidine 150mg orally at night before the day of surgery. On arrival to the preoperative room, patient was cannulated with 18 gauge iv cannula into the peripheral vein, ringer lactate infusion were started as per perioperative fluid requirement. Monitors like noninvasive blood pressure, ECG and SpO_2 were connected. Patient were then shifted to operative room.

Group SA patients received a total volume 3.4 ml of 0.5% hyperbaric Bupivacaine with an adjuvant of 0.6mg of nalbuphine at L3-L4 intervertebral space in lateral position using 26 gauge quinke's needle. Adequacy of Sensory blockade (T6) was checked by a 24 g hypodermic needle. Adequacy of motor blockade was assessed with bromage scale. Intraoperative fall in BP is corrected with Inj.Ephedrine 6 mg IV stat with IV fluid rush. Before shifting the patient to prone position we make sure that the level is fixed and does not go beyond T5 and other measures to prevent high spinal like using soft small towel rolls under the chest and pelvis instead of regular boldsters, keeping the OT Table flat throught the procedure were taken.

Group GA patients received General Anesthesia. All patients were premedicated with Inj. Glycopyrolate 0.2 mg and Inj. Fentanyl 2ug/kg iv 10 min before inducing the patient, then after adequate preoxygenation for 3-5 minutes with 100% oxygen General anesthesia was induced with Inj.Propofol 2mg/kg and intubation facilitated with Inj.Succinylcholine 2mg/kg, patients were intubated with appropriate size ET tubes and connected to ventilator after confirming bilateral air entry. Anesthesia was maintained with Inj.vecuronium and isoflurane 1% and N_2O & O_2 in a ratio of 50/50. Once the procedure was over, after getting adequate attempts patients were reversed with Inj.Neostigmine 40 ug/kg and Inj.Glycopyrolate 4 ug/kg and patients were extubated, when full motor power and spontaneous respiration was established.

Patients were monitored for heart rate, mean arterial pressure and oxygen saturation intraoperatively at 0, 5, 10, 15, 20, 25, 30, 45, 60 minutes respectively.

Patients were monitored for 12 hours (0, 3, 5, 8, 10, 12) in SICU for heart rate , mean arterial pressure, and VAS scoring. Patients were also observed for any post operative complications like nausea, vomiting hypotension, bradycardia, back pain and postural headache. The Visual analog score is a psychometric pain response scale which is a horizontal line starting from no pain which is indicated as 0 to worst pain which is indicated as 10. Patient were asked to mark on the line when he feels which type of pain. Patients who has a VAS score greater than 4 will receive 100 mg of tramadol intravenously.

Statistical analysis were calculated with the graph pad prism 5.0 software. The data were expressed as a mean and standard deviation. All the quatitative variables were analysed using Unpaired t-test. A value is considered statistically significant if the 'p' value of <0.0001 .

Results

A total of 100 patients were enrolled in this study. In both groups Patients were comparable with respect to Age, ASA physical status, sex, weight and duration of surgery as shown in Table 1. The Table 2 & 3 shows that at 5, 10, 45, 60 minutes the intra operative mean pulse rate in SA group is statistically significant from GA group ($p < 0.0001$) and at 0, 3, 5 hours the postoperative mean pulse rate in SA group is statistically significant from GA group ($p<0.0001$). When mean arterial pressure compared between the two groups statistically significant ($p<0.0001$) differences were observed at 5, 10, 15, 20, 25, 30, 45, 60 minutes in intra operative and at 0, 3, 5 and 8 hours postoperative period respectively as shown in Table 4 & 5. When compared the VAS score between the two groups, statistically significant differences were found at 0, 3, 5, 8 hours postoperatively Table 6 ($p < 0.0001$). Analgesic requirement of tramadol more than 100mg is less in SA group when compared to GA group as shown in Table 7.

Table 1: Demographic data and duration of surgery

Data	Group SA	Group GA	P value
Age	41.92±9.24	43.38+9.41	0.4359
ASA(I:II)	36:14	37:13	
Sex(male:female)	30:20	28:22	
Weight	59.74±6.83	61.52±6.15	0.1743
Duration of surgery	84.30±1.40	88.6±2.23	0.1058

Data are presented as mean±SD, SD: Standard Deviation, and number of patient as percentage ASA.American Society of Anesthesiologist

Table 2: Comparison of intraoperative pulse rate

Time Interval(MIN)	SA Group	GA Group	P value
0	76.50±7.14	76.26±7.12	0.8667
5	87.90±3.29	98.42±6.24	P<0.0001
10	84.12±2.56	87.74±3.33	P<0.0001
15	89.52±3.44	89.35±4.71	0.8356
20	85.70±3.41	85.68±4.47	0.9800
25	81.86±2.00	82.10±4.25	0.7191
30	89.64±4.02	89.54±4.62	0.9085
45	85.96±2.70	90.68±3.83	P<0.0001
60	83.76±2.51	92.82±4.26	P<0.0001

Data are presented as mean= ± SD, $p<0.0001$ is statistically significant, SD: Standard Deviation

Table 3: Comparison of Postoperative pulse rate

Time Interval(HOURS)	SA Group	GA Group	P Value
0	82.32±1.99	95.50±4.24	P<0.0001
3	84.32±2.14	90.20±4.09	P<0.0001
5	85.74±2.73	90.76±4.62	P<0.0001
8	84.30±2.36	85.40±2.65	0.0309
10	88.70±2.46	87.68±3.39	0.0885
12	88.16±2.72	89.20±3.72	0.1148

Data are presented as mean=±SD, $p<0.0001$ is statistically significant, SD: Standard Deviation

Table 4: Comparison of intraoperative mean arterial pressure

Time Interval (MIN)	SA Group	GA Group	P value
0	94.82±4.89	93.54±13.26	0.5234
5	86.68±3.08	107.5±4.9	P<0.0001
10	82.14±2.69	102.2±3.51	P<0.0001
15	76.82±3.14	94.20±3.75	P<0.0001
20	73.96±2.77	85.48±4.69	P<0.0001
25	80.02±3.31	88.20±3.67	P<0.0001
30	81.76±2.76	84.74±2.38	P<0.0001
45	86.40±3.08	93.32±2.83	P<0.0001
60	89.60±4.47	97.52±7.65	P<0.0001

Data are presented as mean=±SD, $p<0.0001$ is statistically significant, SD: Standard Deviation

Table 5: Comparison of postoperative mean arterial pressure

Time Interval (HOURS)	SA Group	GA Group	P value
0	89.86±4.13	101.5±3.89	P<0.0001
3	89.32±4.04	100.5±3.77	P<0.0001
5	87.42±3.87	99.82±4.98	P<0.0001
8	90.56±2.61	86.84±4.59	P<0.0001
10	92.74±3.06	94.88±3.43	0.0014
12	94.48±3.08	92.72±3.18	0.0060

Data are presented as mean= ± SD, p<0.0001 is statistically significant, SD : Standard Deviation

Table 6: Comparison of visual analog scale

Time Interval (HOURS)	SA Group	GA Group	P value
0	0.66±0.51	4.14±0.75	P<0.0001
3	1.38±0.49	5.4±0.61	P<0.0001
5	1.8±0.45	4.32±0.47	P<0.0001
8	3.78±0.58	4.34±0.47	P<0.0001
10	3.14±0.35	3.24±0.43	0.2063
12	3.5±0.5	3.3±0.4	0.0416

Data are presented as mean= ± SD, p<0.0001 is statistically significant, SD: Standard Deviation

Table 7: Comparison of analgesic demand

Analgesic Demand up to 24 HRS	SA Group		GA Group	
	No	%	No	%
<100 MG	38	76	15	30
>100 MG	12	24	35	70
Total	50	100	50	100

Discussion

PCNL is the treatment of choice for removing large pelvic stones, upper ureteric stones, staghorn stone and in case of failed ESWL since it is a minimally invasive procedure . Although PCNL is done under GA because it needs prone position , it has its own merits and demerits. The risk of complications related to position, multi drug exposure, atelectasis etc are all associated with general anesthesia. Now a days PCNL under spinal anesthesia is gaining popularity. There are also several studies which shows that surgeries which required prone position can also be done spinal anesthesia without having major complications [8-14]. It has many advantages like simple technique, prolonged postoperative pain relief, reduced need of analgesic requirement and reduction of side effects from multildrug exposure from GA [2-4]. Kuzgunbay et al. shown that combined spinal - epidural anesthesia is a relatively easy technique in PCNL operations, as the efficacy is same like that of general anesthesia and safety were also not affected in spinal anesthesia [1].

The present study compared the hemodynamic changes, visual analog scale, postoperative analgesic requirements and side effects between spinal and general anesthesia in 100 patients over a period of two years who underwent PCNL surgery. Patients were comparable in both groups with respect to demographic details like age, ASA physical status, weight and sex. When compared the VAS score between the two groups, statistically significant differences were found at 0 (0.66±0.51, 4.41±0.75), 3 (1.38±0.49, 5.4±0.61), 5 (1.8±0.45, 4.32±0.47), 8 (3.78± 0.58, 4.34±0.47) hours postoperatively. Analgesic requirement was low in group SA when compared with group GA. In this study statistically significant difference is found when hemodynamic changes like mean pulse rate intraoperatively at 5, 10, 45 & 60 mins and postoperatively at 0, 3, 5 hours respectively. Similarly statistically significant difference is found in the mean arterial pressure observed intraoperatively (i.e, 5 to 60 mins) except the baseline measurement and postoperatively at 0, 3, 5 and 8 hours respectively.

Similar to our results , Elbealy et al also found that the mean arterial pressure was significantly lower in regional anesthesia group when compared with GA group from 5 to 90 mins intraoperatively following anesthesia [5].

Movasseghi G et al observed that spinal anesthesia is as effective and safe as general anesthesia for PCNL Surgeries. Patients in spinal anesthesia group required smaller amount of analgesics and better hemodynamic stabillity during surgery and recovery [4].

In our study, We compared the VAS score between the two groups, and it was statistically significant at 0, 3, 5, 8 hours postoperatively. Analgesic requirement was low in group SA when compared with group GA. . Karasu D et al. found the Postoperative analgesic requirement was assessed using the Visual Analog Score (VAS). Patients with VAS >3 were given 75 mg diclofenac sodium for analgesia.It has been found that the number of the patients who needs a rescue analgesic within the 1st hour postoperative was significantly higher in General anesthesia group when compared to Regional anesthesia group [6]. Cicek et al demonstrated that PCNL under SA patients have shorter duration of surgery, minimal analgesic requirements and shorter hospitalization [7]. Tangpaitoon et al found that postoperative tramadol requirement was found to be lower in regional anesthesia group when compared to general anesthesia group [8].

Conclusion

The present study concludes that spinal anesthesia is relatively a safe and effective alternative to general anesthesia for PCNL surgery, which is associated with better hemodynamic stability, lower postoperative pain, minimal analgesic requirements, and early recovery of the patients.

Acknowledgement

We are thankful to the department of urology for their kind cooperation to undergo this study and also we owe our gratitude to the authors, and publishers of all those journals from where the literature for our article has been discussed

Conflict of Interest

No conflict of interest.

Key Messages

Spinal anesthesia can be a safe and effective technique for PCNL surgery when compared to General anesthesia due to better hemodynamic stability and it can avoids all complications of general anesthesia.

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Case Report

Indian Journal of Anesthesia and Analgesia
2018; 5(11): 1958-1960
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Anaesthesia for Complex Cyanotic Congenital Cardiac Disease in a Child for Emergency Laparotomy

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Abstract

Transposition of great arteries is a rare and serious congenital cyanotic disorder in which two main arteries leaving the heart are reversed or transposed. Transposition of the great arteries changes the way blood circulates through the body, leaving a shortage of oxygen in blood flowing through the heart to the rest of the body. These patients are at high risk of peri-operative mortality due to ventricular dysfunction, chronic hypoxia, hyper-cyanotic spells, polycythemia and infective endocarditis [1]. Very limited studies are available regarding anaesthetic consideration in patients with uncorrected D-TGA with other congenital cardiac defects like ventricular septal defect (VSD) and pulmonic stenosis. This case report highlights the anaesthetic challenges in an uncorrected transposition of great arteries along with other congenital cardiac defects for an emergency non-cardiac surgery in a critically ill pediatric patient.

Keywords: Transposition of Great Arteries (TGA); Ventricular Septal Defect (VSD); Pulmonic Stenosis; Cyanosis; Hypoxia; Laparotomy; Pediatric Anaesthesia.

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Introduction

D-Transposition is the commonest diagnosed cyanotic congenital heart disease. We hereby present a case of uncorrected transposition of great arteries (D-TGA) with severe infundibular pulmonary stenosis (PS) with bidirectional VSD, posted for emergency exploratory laparotomy for suspected sub-acute intestinal obstruction (acute abdomen).

Case Report

A 12-year old male patient, weighing 20 kg, presented to the pediatric emergency with complaint of fever, abdominal pain with distension and malena for three days. Thr child had history of cyanosis on crying and during any exertional activity. Preoperative examination revealed a body temperature of 101degrees Fahrenheit, heart rate 130 beats per minute (bpm), respiratory rate 24/min, SpO_2 57% (on the face mask with FiO_2 of 0.6), severe clubbing of fingers grade 3, and central cyanosis. On chest auscultation, breath sounds were decreased at the bases of lungs bilaterally, and a pan-systolic murmur of grade 3 was heard. Preoperative investigation showed haemoglobin 17.2 gm/dl, total leucocyte count 16,700/cu-mm, platelet count 1.8lakh/cu-mm, with normal kidney and liver function tests. X-ray of the abdomen

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showed multiple air-fluid levels. In echocardiography, TGA with severe infundibular pulmonary stenosis with peak pulmonary gradient of 80mm of Hg, severe tricuspid regurgitation and non-routable large mid-muscular bidirectional VSD was found. Electrocardiogram showed right axis deviation and right ventricular hypertrophy. In arterial blood gas analysis (pre-operative ABG), pH 7.498, pCO_2- 22.9, pO_2 – 38.3, HCO_3- 17.4 was found, indicating metabolic acidosis with respiratory alkalosis.

Emergency exploratory laparotomy was planned under general anaesthesia. A pediatric cardiologist opinion was sought and infective endocarditis prophylaxis was administered(the child was on vancomycin 360 mg QID and amikacin 360 mg OD).

A patient was wheeled into the operation theatre with oxygen by face mask. All standard ASA essential monitors were attached (ECG, Pulse, SpO_2, $EtCO_2$, BP, and Temperature). Blood pressure of 100/60 mm of Hg was recorded; SpO_2 of 57% on face mask oxygen was noted. Intravenous paracetamol 15mg/kg was given, as the patient was febrile. In view of the acute abdomen with sub-acute intestinal obstruction, a modified rapid sequence induction with cricoid pressure was planned after adequate pre-oxygenation. Premedication was done with injection midazolam 0.5mg IV, injection fentanyl 2microgram/kg i.v. was given in titrated doses slowly. Injection etomidate 0.25mg/kg i.v. and rocuronium bromide 0.9mg/kg i.v. were administered. Patients' trachea was intubated with a cuffed endotracheal tube of size 5mm internal diameter. Cricoid pressure was applied as soon as injection etomidate i.v. was given and the cricoid pressure was released when a patient's trachea was intubated with a cuffed ETT size 5mm and the cuff was inflated and bilateral air entry was confirmed.

Thereafter, an arterial line was secured in the left radial artery and the central line was placed right internal jugular vein, using Seldinger technique. Invasive, beat-to-beat blood pressure monitoring and central venous pressure monitoring was done. Urinary bladder catheterization was done for hourly urine output monitoring. Nitrous oxide was not used, instead, the air was used as carrier gas. During surgery, adequate hydration was maintained with (room temperature) Plasmalyte crystalloid solution to maintain a CVP of 8 to 10 cm H_2O. Anaesthesia was maintained with isoflurane (MAC of 1 -1.2) with oxygen along with intravenous, titratedPropofol infusion was started and on volume controlled ventilation to maintain an end-tidal CO_2 between 34-38 was achieved. Cold sponging of fore-head and axilla was done to reduce body temperature. Injection phenylephrine was prepared and loaded in a syringe so that it can be given promptly whenever there is a need to increase the systemic vascular resistance in the event of a hyper-cyanotic spell. The patient was hemodynamically stable for the entire duration of surgery, lasting 2 hrs. Urine output at the end of surgery was 50 ml. Intraoperatively, a stricture was found in the ileum for which ileostomy was done by the surgical team. Injection tramadol was given for postoperative pain relief and the abdominal incision was infiltrated with 10 ml of 0.25% bupivacaine. The patient was shifted to pediatric ICU in intubated condition and after 4 hours, he was extubated, after evaluating the ABG and ventilatory parameters. After extubation, the patient maintained SpO_2 of 70-75%. Fever subsided after 24 hours. The child was later referred to the cardiac surgery unit for definitive correction of the congenital cardiac anomaly.

Discussion

Transposition of great arteries is a cyanotic congenital heart disease where both the arteries arising from the ventricles are reversed, meaning the aorta arises from the right ventricle and the pulmonary trunk arises from the left ventricle. There is a parallel circulation in which blood from the right atrium goes to the right ventricle and then to the aorta, blood from the left atrium goes to the left ventricle and then to the pulmonary artery. Both the pulmonary and systemic circulations are separate and parallel. Survival1 depends on the presence of atrial, ventricular or aortopulmonary communications. These communications allow mixing of oxygenated and deoxygenated blood. Oxygen saturation depends on the inter-circulatory mixing of blood through the shunt. The pulmonary vascular resistance should be maintained so that pulmonary blood flow is maintained and oxygenation of blood takes place so that the SpO_2 is maintained. If the pulmonary vascular resistance is increased, then blood flow to the lungs decreases and deoxygenated blood increases in circulation, causing a fall in SpO_2.

Our patient had D-TGA with VSD with infundibular pulmonary stenosis, this warrants avoidance of peri-operative dehydration, maintenance of systemic vascular resistance, pulmonary vascular resistance and minimizing an increase in oxygen consumption, all of which are central to a successful outcome [2]. These patients have polycythemia as a compensatory response to

improve oxygen saturation at the expense of hyperviscosity. Hence, they are at increased risk of thrombosis and stroke. There is an increased risk of perioperative bleeding due to multiple coagulation factor deficiencies, necessitating coagulation studies. Chronic hypoxia has adverse effects on the heart leading to the reduction in ventricular diastolic compliance and myocardial reserve. Chronic renal hypoxia leads to an increase in serum urea and creatinine levels [3]. A preoperative echocardiography and chest radiography should be done. Factors increasing sympathetic drive should be avoided such as light anaesthesia, pain, acidaemia, hypoxia, hypercarbia, and hypothermia [4,5]. Fentanyl, Sevoflurane and Etomidate were chosen because they have minimal effect on systemic vascular resistance and pulmonary vascular resistance [6]. N_2O was avoided because it increases pulmonary vascular resistance and can also expand the air bubbles which are accidentally entrained from the surgical site or intravenous line leading to paradoxical air embolism. Utmost care should be taken to avoid air bubbles going in the circulation, either through the intravenous tubing or through the surgical site [7]. Care must be taken to adequately hydrate the patient in the peri-operative period to avoid hyper-viscosity. There is a risk of peri-operative "tet spells" or hyper-cyanotic episodes in these patients, due to sudden decreases in pulmonary blood flow, which may be difficult to manage. Injection phenylephrine hydrochloride was kept ready, as this drug increases the systemic vascular resistance and increases the pulmonary blood flow and in turn, increases the oxygen saturation.

Conclusions

Complex and mixed congenital cardiac lesions can be quite challenging to manage, especially in an emergency setting, where there may be limited time available for evaluation and optimization. This case was unique as the child had several, serious uncorrected cardiac lesions in the presence of fever, clubbing and central cyanosis. Prevention, prompt recognition and treatment of 'tet' spells are of paramount priority.

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Indian Journal of Cancer Education and Research	Semiannual	9000	8500	703	664
Indian Journal of Communicable Diseases	Semiannual	8500	8000	664	625
Indian Journal of Dental Education	Quarterly	5500	5000	430	391
Indian Journal of Diabetes and Endocrinology	Semiannual	8000	7500	597	560
Indian Journal of Emergency Medicine	Bi-Monthly	12500	12000	977	938
Indian Journal of Forensic Medicine and Pathology	Quarterly	16000	15500	1250	1211
Indian Journal of Forensic Odontology	Semiannual	5500	5000	430	391
Indian Journal of Genetics and Molecular Research	Semiannual	7000	6500	547	508
Indian Journal of Hospital Administration	Semiannual	7000	6500	547	508
Indian Journal of Hospital Infection	Semiannual	12500	12000	938	901
Indian Journal of Law and Human Behavior	Tri-Annual	6000	5500	469	430
Indian Journal of Legal Medicine	Semiannual	8500	8000	607	550
Indian Journal of Library and Information Science	Triannual	9500	9000	742	703
Indian Journal of Maternal-Fetal & Neonatal Medicine	Tri-Annual	9500	9000	742	703
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	6500	6000	508	469
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 and Emergency Pediatrics	Quarterly	9500	9000	742	703
Indian Journal of Waste Management	Semiannual	9500	8500	742	664
International Journal of Food, Nutrition & Dietetics	Triannual	5500	5000	430	391
International Journal of Neurology and Neurosurgery	Quarterly	10500	10000	820	781
International Journal of Pediatric Nursing	Triannual	5500	5000	430	391
International Journal of Political Science	Semiannual	6000	5500	450	413
International Journal of Practical Nursing	Triannual	5500	5000	430	391
International Physiology	Triannual	7500	7000	586	547
Journal of Animal Feed Science and Technology	Semiannual	7800	7300	609	570
Journal of Cardiovascular Medicine and Surgery	Quarterly	10000	9500	781	742
Journal of Forensic Chemistry and Toxicology	Semiannual	9500	9000	742	703
Journal of Global Medical Education and Research	Semiannual	5900	5500	440	410
Journal of Global Public Health	Semiannual	12000	11500	896	858
Journal of Microbiology and Related Research	Semiannual	8500	8000	664	625
Journal of Nurse Midwifery and Maternal Health	Triannual	5500	5000	430	391
Journal of Orthopedic Education	Triannual	5500	5000	430	391
Journal of Pharmaceutical and Medicinal Chemistry	Semiannual	16500	16000	1289	1250
Journal of Plastic Surgery and Transplantation	Semiannual	26400	25900	2063	2023
Journal of Practical Biochemistry and Biophysics	Semiannual	7000	6500	547	508
Journal of Psychiatric Nursing	Triannual	5500	5000	430	391
Journal of Social Welfare and Management	Triannual	7500	7000	586	547
New Indian Journal of Surgery	Monthly	8000	7500	625	586
Ophthalmology and Allied Sciences	Quarterly	6000	5500	469	430
Otolaryngology International	Semiannual	5500	5000	430	391
Pediatric Education and Research	Triannual	7500	7000	586	547
Physiotherapy and Occupational Therapy Journal	Quarterly	9000	8500	703	664
RFP Indian Journal of Medical Psychiatry	Semiannual	8000	7500	625	586
RFP Journal of Gerontology and Geriatric Nursing	Semiannual	5500	5000	430	391
Urology, Nephrology and Andrology International	Semiannual	7500	7000	586	547

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