A COMPARISON OF TWO DIFFERENT DOSES OF DEXMEDETOMIDINE INFUSION DURING MAINTENANCE OF GENERAL ANAESTHESIA IN PATIENTS UNDERGOING SPINE SURGERIES, FUNCTIONAL ENDOSCOPIC SINUS SURGERY AND MIDDLE EAR SURGERIES

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ABSTRACT

BACKGROUND

This study is undertaken to compare the hemodynamic effects and reduction in the doses of volatile anaesthetics and muscle relaxants using two different doses of dexmedetomidine infusion during maintenance of anaesthesia in spine, functional endoscopic sinus surgery and middle ear surgeries.

METHODS

Sixty patients are randomly divided into 2 groups of 30 each. After shifting to the operation theatre baseline vitals were recorded. Anesthesia induced with thiopentone sodium and intubation done with the help of succinylcholine and maintained with oxygen, nitrous oxide and isoflurane. After 1 min of intubation, maintenance infusion of dexmedetomidine (0.4 mcg/kg/hr and 0.7 mcg/kg/hr for patients allotted in 2 separate groups) was started and stopped 15 min before end of surgery. Hemodynamic parameters and any reduction in the doses of volatile anaesthetics and muscle relaxants was noted.

RESULTS

Dexmedetomidine infusion (0.4 mcg/kg/hr and 0.7 mcg/kg/hr) in both groups reduced the requirements of muscle relaxants and volatile anaesthetics. Hemodynamic stability was better in the group receiving 0.4 mcg/kg/hr. Patients receiving 0.7 mcg/kg/hr had higher incidence of hypotension, bradycardia and delayed emergence from anaesthesia.

CONCLUSION

Dexmedetomidine infusion at 0.4 mcg/kg/hr during maintenance of anaesthesia in spine surgery, FESS and middle ear surgery would be good option to reduce the requirements of volatile anaesthetics, muscle relaxants and for better hemodynamic stability.

OBJECTIVE OF STUDY: Primary Objective

To compare and evaluate the hemodynamic effects and reduction in requirements of volatile anaesthetics and muscle relaxants with two different doses of dexmedetomidine infusion during maintenance of general anaesthesia in patients undergoing spine, FESS and middle ear surgeries.

KEYWORDS

Hemodynamic Parameters, Dexmedetomidine, Isoflurane.

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INTRODUCTION: A good intra operative surgical field is met when there occurs minimal bleeding during surgery and when a balanced sympatholytic state has been successfully achieved. A good level of intraoperative sedation reduces the stress response and provides anxiolysis.[1] Of the numerous drugs administered in the past, sedative-hypnotics are associated with a tendency to prolong mechanical ventilation and delayed post-operative recovery. Raised preoperative anxiety levels adversely impacts postoperative pain and recovery. A few investigators have demonstrated that less anxious patients experience less pain.[1] Studies have suggested that anxious patients require increasing doses of anaesthetic agents in order to establish and maintain a haemodynamically stable state.[2]

The development of dexmedetomidine is an attempt to provide the surgeon with a good surgical field and ensure haemodynamic stability and sympatholysis. It possesses the characteristics of an ideal sedative-hypnotic agent like rapid onset of action, allows rapid recovery after discontinuation

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and maintains a unique sedation (patient appears to be asleep but is readily arousable).[3]

Dexmedetomidine is the most recent agent in this group of α2 agonists approved by FDA in 1999 for use in humans for analgesia and sedation,[4] sympatholytic and haemodynamically stabilizing properties.[5] It is increasingly being used as a sedative for monitored anaesthesia care because of its analgesic properties, "co-operative sedation", and lack of respiratory depression.[6] Although safe, bradycardia and hypotension are the most predictable and frequent side effects.[7] Dexmedetomidine has shown to consistently reduce anaesthetic requirements. In particular, this review focuses on dexmedetomidine utilization as an infusion in spine surgeries, functional endoscopic sinus surgery and middle ear surgeries to compare the efficacy of two different doses of dexmedetomidine infusion on intraoperative haemodynamics and requirement of anaesthetic agents.

The present study is undertaken to compare the hemodynamic effects and reduction in the doses of volatile anaesthetics and muscle relaxants using two different doses of dexmedetomidine infusion during maintenance of anaesthesia in spine, functional endoscopic sinus surgery and middle ear surgeries.

MATERIALS AND METHODS: Sixty patients belonging to American Society of Anaesthesiologists physical status grade I and II, aged between 18 to 60 years, undergoing spine, FESS and middle ear surgeries were randomly selected. Informed written consent was taken. Result values were recorded using a preset proforma. Institutional ethical committee clearance was obtained.

Inclusion Criteria: Age group of 18-60 years. ASA grade I and II and patients coming for elective surgical procedures.

Exclusion Criteria: ASA grade III and IV. Patient refusal. History of allergy to the study drug. Body Mass Index (BMI) <18 or >30 kg/m^2. Hepatic, renal and cardiovascular dysfunction, pregnant or breast feeding patients were excluded from the study. Preoperative heart rate <50 beats per minute. First or second or third degree heart block and patients on beta blockers were excluded from the study.

Procedure: All patients were subjected to detailed pre-anaesthetic evaluation, routine and special investigations with clinical history and systemic examination. An 18-gauge intravenous cannula was secured and intravenous fluids preferably ringer lactate was started at 6 ml/kg. Patients were kept nil orally 6-8 hrs prior to induction. These patients were randomly divided into 2 groups of 30 each. The method of randomization applied was in the pattern 'A', 'A', 'B', 'B', 'A', 'A' and so on.

After shifting the patient to the operating room baseline vitals were recorded using multipara monitor measuring heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), peripheral oxygen saturation (SPO2). All patients were pre medicated with Inj. Glycopyrrolate 0.004 mg/kg and Inj. Midazolam 0.02 mg/kg intravenously in operation theatre. Dexmedetomidine loading dose at 1 mcg/kg/body weight was administered over 10 mins in all patients.

All patients were induced with Inj. Thiopentone till the loss of eyelash reflex and intubation was facilitated with Inj. Succinylcholine 1.0 mg/kg intravenously. Anesthesia was maintained with nitrous oxide and oxygen mixture (60:40) and isoflurane using a closed circuit. After 1 min of intubation, maintenance infusion of dexmedetomidine was started as following and stopped 15 mins before surgery.
Group A-Inj. Dexmedetomidine 0.4 µg/kg/hr and
Group B-Inj. Dexmedetomidine 0.7 µg/kg/hr.

After the effect of succinylcholine was dissipated, Inj. vecuronium bromide 0.08 mg/kg bolus dose was administered, with additional 0.02 mg/kg doses to achieve and maintain relaxation.

Intraoperative monitoring was documented during preinduction, after loading dose of dexmedetomidine, after induction, and then every 5 minutes till the end of surgery. Intra-operatively, isoflurane was started at a vaporizer dial concentration of 0.4% and was increased by 0.2% increments at ten minute intervals until hemodynamic variables was such that mean arterial pressure was maintained within -20% to +15% and heart rate within -20% to +20% limits off the patient's preoperative baseline values. Isoflurane concentration was increased if any clinical signs of light anaesthesia such as hypertension, tachycardia, sweating and movement was observed. After the hemodynamic values were maintained for 4 mins the concentration of isoflurane was reduced by 0.2% decrements. Isoflurane and dexmedetomidine infusion was shut off 15 minutes before the end of surgery.

Atropine 0.6 mg IV was administered if heart rate decreased to less than 50 beats per minute. Hypotension (MAP <65 mmHg) was treated with vasopressors such as ephedrine. Residual neuromuscular blockade was reversed with Inj. Glycopyrrolate 10 mcg/kg and Inj. Neostigmine 0.05 mg/kg and patient was extubated. Sedation was evaluated using Ramsay Sedation Scale which was measured following extubation and then till 4 hours post extubation.

The following Ramsay sedation scale was used: 1. Anxious and agitated or restless or both. 2. Co-operative, oriented, tranquil. 3. Responsive to verbal commands, drowsy. 4. Asleep, brisk response to light, glabellar tap or auditory stimulus. 5. Asleep, slow response to light glabellar tap or auditory stimulus. 6. No response to stimulation.

Parameters Evaluated:

1. Reduction in isoflurane concentration from baseline and average requirement of muscle relaxants were recorded.
2. Heart Rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were recorded prior to drug infusion, pre induction, 1 min post intubation, 5 min post intubation and then every 5 mins till end of surgery.

RESULTS:

	Group A	Group B	P value
Age(yrs)	36.5±3.26	40.06±4.2	0.235(ns)
Weight(kgs)	58.4±10.3	57.3±9.7	0.599(ns)
Systolic BP (mm of Hg)	100.7±4.6	94.2±5.6	<0.001(sig)
Diastolic BP (mm of Hg)	67.02±5.4	59.8±4.6	<0.001(sig)
MAP (mm of Hg)	78.2±4.5	71.3±3.8	<0.001(sig)
Heart rate (bpm)	66.14±5.15	60.3±4.9	<0.001(sig)
Isoflurane concentration (%)	0.47±0.06	0.23±0.03	<0.001(sig)
Muscle relaxant(mg)	9.2±0.8	7.2±0.7	<0.001(sig)
Sedation score	1.8±0.62	4.06±0.69	<0.001(sig)

Table 1

Both the groups were similar with respect to age and weight and there was no significant difference in terms of age, sex & body weight. The mean systolic BP, diastolic BP, MAP and heart rate was lower in Group B and the dose of isoflurane concentration and muscle relaxant used was lower in Group B which was statistically significant.

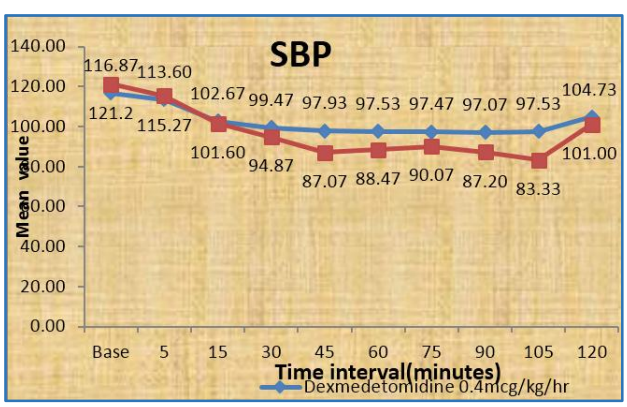
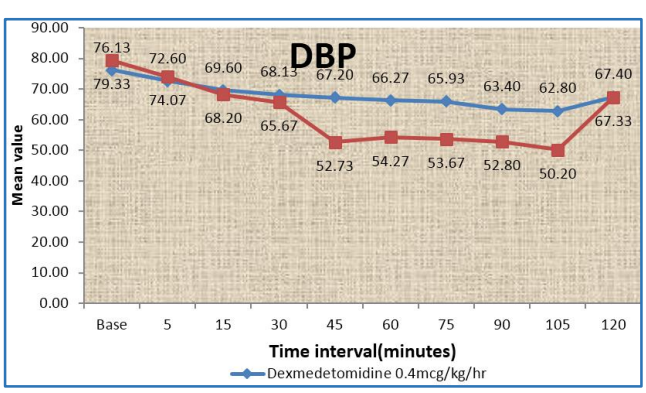


Fig. 1



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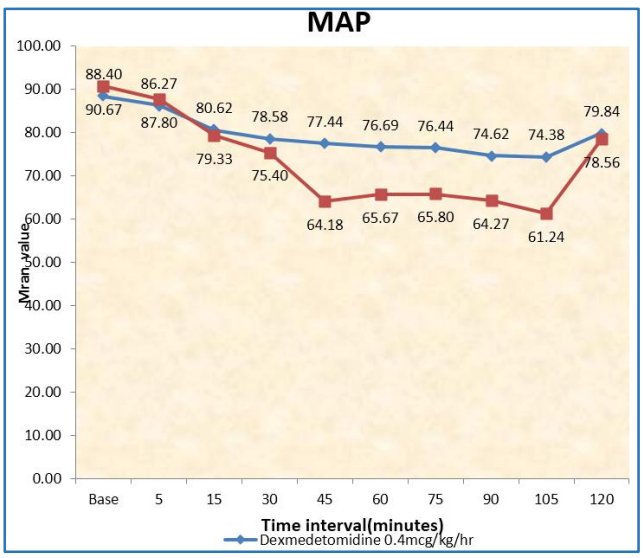

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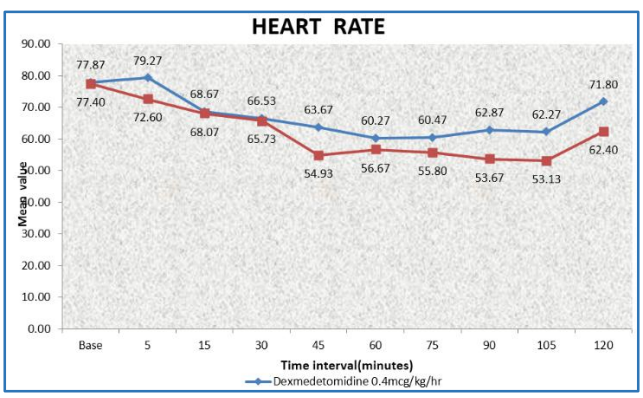

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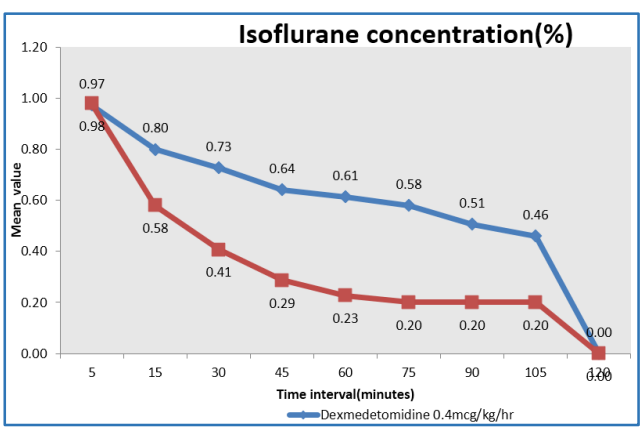

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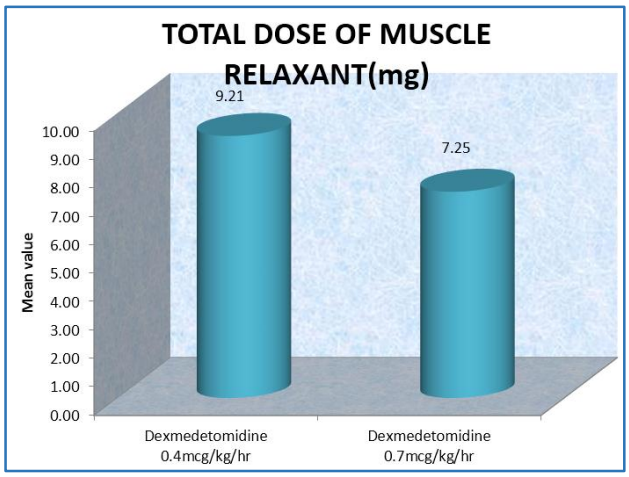

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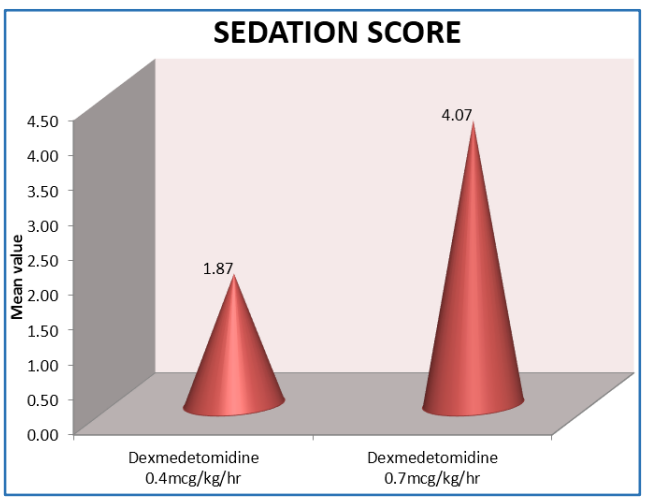

Fig. 7

DISCUSSION: We found that dexmedetomidine infusion provided a better hemodynamic stability and also reduced the requirements of volatile anaesthetics and muscle relaxants, which was significant in Group B. Alpha-2 agonists are known to afford hemodynamic stability during the intra operative period due to sympatholytic properties. These clinical characteristics make this intravenous agent a potentially attractive adjunct for surgeries conducted under general anaesthesia in ENT and spine surgeries.[8] Dexmedetomidine offers a potential advantage in surgeries performed on spine in prone position with additional desirable end points being neuro protection and good surgical bloodless field.[9] Dexmedetomidine infusion reduces the requirements of volatile anaesthetics and muscle relaxants.[10]

CONCLUSION:

- Dexmedetomidine intravenous infusion in a dose of 0.7 mcg/kg/hr and 0.4 mcg/kg/hr both provide good hemodynamic stability and reduced requirements of intraoperative anaesthetic agents which was better with 0.7 mcg/kg/hr.
- Increased incidence of intraoperative hypotension and bradycardia noted in patients receiving 0.7 mcg/kg/hr.
- Sedation score was higher in patients receiving 0.7 mcg/kg/hr which led to delayed extubation.

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