Original Article

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An Observational Study to Compare Dexmedetomidine and Esmolol for Induced Hypotension in Nasal Surgeries

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Abstract

Aims & Objectives: To Compare the effectof IV infusion of Dexmedetomidine and Esmolol for induced hypotension during nasal surgeries under general anaesthesia.

To Compare

- Hemodynamic changes
- Intraoperative surgical field
- Sedation and analgesia in post-operative period between the groups.

Materials and Methods: 60 patients for nasal surgeries under ASA I/II were allocated in 2 groups. All the patients were premedicated, induced and maintained inusual manner. *Group D*: received Inj. Dexmedetomidine1 µg/kg as a loading dose over 20 minutes followed by an infusion of 0.2-0.6 µg/kg/hr IV. *Group E*: received Inj. Esmolol 1mg/kg as a loading dose over 1 minute followed by an infusion of0.4-0.8 mg/kg/hr IV. Intra operative Heart rate, Mean arterial pressure, surgical field ,post-operative sedation and analgesia were evaluated. *Results and Summary*: There was no significant difference of MAP and Heart rate in both groups intraoperatively , but there was significant difference at the end of surgery.There was no significant difference in the amount of blood loss in both groups. Mean postoperative sedation score was significantly higherin D than in E group. The duration of first analgesic request was significantly longer in D than E group. No side effects were observed. *Conclusion*: Dexmedetomidine or Esmolol is effective in providing ideal surgical field during nasal Surgeries, but compared with Esmolol, Dexmedetomidine offers the advantage of sedation and analgesia.

Keywords: Nasal Surgeries; Dexmedetomidine; Esmolol.

Introduction

Endoscopic nasal surgeries have several advantages over conventional techniques [1]. Complication like haemorrhage was reported most commonly after Endoscopic Intranasal Ethmoidectomy [2]. Induced hypotension helps to limit intraoperative blood loss.

Esmolol is an ultrashort acting selective β_1 adrenergic antagonist. It has rapid onset of action without development of rebound hypertension [3].

Dexmedetomidine is potent α_2 adrenergic receptor agonist. It acts on peripheral and central nervous system [4]. It has sedative, analgesic effects [5].

Observational study to compare efficacy and safety of dexmedetomidine and esmolol as a hypotensive agent in nasal surgeries with regard to amount of blood loss, quality of the surgical field, sedation, and analgesia.

Method

This is observational prospective study conducted at Sumandeep Vidyapeeth University, and Dhiraj Hospital, Piparia, Dist.-Vadodara. After approval from the local ethical committee, 60 ASA physical status I or II patients aging 20-60 years scheduled for elective nasal surgery were selected for the study. Patients with coronary artery disease, renal, hepatic or cerebral insufficiency, patients with coagulopathies or receiving drugs influencing blood coagulation and chronic hypertension were excluded from the study. The patients were assessed clinically in addition to ECG, chest X ray and basic laboratory tests and written informed consent was obtained. Patients included in this study were assigned according to computer generated to receive either dexmedetomidine (D-group *n*=30) or esmolol (E-group *n*=30).

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In the operating room, two cannulae were inserted, one for infusion of dexmedetomidine or esmolol and the second for administration of fluids and other drugs. In D-group, patients received loading dose of 1 μg/kg dexmedetomidine diluted in 0.9% saline infused over 20 minutes before induction of anaesthesia, followed by continuous infusion in the range of 0.2- 0.6 μg/kg/hr. In E group, patients received esmolol as a loading dose of 1 mg/kg over 1 minute followed by continuous infusion in the range of 0.4-0.8 mg/kg/hr. In both groups infusion rate was titrated to maintain Mean Arterial Pressure (MAP) within 55-75 mmHg. All patients were premedicated with IV Inj. glycopyrrolate 0.004 mg/kg, Inj. ondansetron 0.1 mg/kg and Inj. midazolam 0.05 mg/kg. Patients were induced with propofol 2-2.5 mg/kg. Endotracheal intubation was facilitated with succinylcholine 1.5 - 2mg/kg with suitable sized cuffed tube. Anaesthesia was maintained with O_2, N_2O, isoflurane & Inj. atracurium with mechanical ventilation. Oropharyngeal pack was used. Nitroglycerine was to infused if these target limits could not be achieved with upper most doses. The drug infusion rate was then decreased when targeted MAP was achieved. Respiratory rate (RR) and tidal volume (TV) were adjusted according to body weight. Patients were placed in a 10° reverse Trendlenburg position to improve venous drainage. In both groups cotton soaked with epinephrine in a concentration of 1:2,00,000 was inserted into the nasal cavity to minimize blood loss.When MAP reached the desired range (55-75 mmHg) and maintained forabout 10 minutes, surgeon estimated the quality of the surgical field using Frommes' Bleeding Scale [6].

Frommes' Bleeding scale for assessment of intraoperative surgical field:

0 - No bleeding, Ideal Surgical Field

1 - Mild bleeding – Aspiration not required

2 - Mild bleeding –occasional requirement of aspiration.

3 - Significant bleeding–frequent aspiration required. If aspiration is discontinued for 5 seconds surgical field is impaired

4 - Diffused bleeding – continuous aspiration required.

5 - Abundant Bleeding, even with continuous aspiration surgical field is obscured and surgery not possible

Surgeon was blinded to the hypotensive agent used. The ideal scale value for surgical condition was predetermined to be two or three. The total blood loss was measured from the suction apparatus. Infusion of the study drugs was stopped five minutes before the anticipated end of surgery, and isoflurane was stopped at the end of the surgery and the residual neuromuscular blockade was antagonized with neostigmine (0.05 mg/kg) and glycopyrrolate (0.008 mg/kg).

Monitoring included non-invasive blood pressure measurement, pulse rate and arterial oxygen saturation. These parameters were recorded preoperatively (baseline), after administration of hypotensive agents, intraoperatively at regular intervalsand after stoppage of hypotensive agents. Requirement for additional hypotensive agent (nitroglycerine) was recorded. After extubation and full recovery, patients were transferred to the postanesthesia care unit (PACU) for observation. Postoperative pain was evaluated using a Visual Analogue Scale (0-10), and first analgesic rescue was given when it was $\geq$ 4. Sedation score [7] was measured using the Ramsay scale at 5,15,30 and 60 minutes after tracheal extubation:

Ramsay Sedation scorefor assessment of post-operative sedation:

1 - anxious, agitated, or restless.

2 - cooperative, oriented, and tranquil.

3 - responsive to commands.

4 - asleep, but with brisk response to light, glabellar tap, or loud auditory stimulus.

5 - asleep, sluggish response to glabellar tap, or auditory stimulus.

6 - asleep, no response.

Results

60 patients who fulfilled the criteria were included in this study. Demographic data regarding age, sex and ASA (I/II) were comparable between the groups.

Out of 60 patients :

10 patients posted for FESS

21 patients posted for septoplasty

29 patients posted for septoplasty with FESS,

Baseline values of MAP were comparable in both groups. There was a significant reduction of MAP intraoperatively in both groups compared to baseline value. In both groups the desired MAP (55-75 mmHg) was observed with no intergroup significant differences either after induction or during hypotensive period. In both groups, an additional hypotensive agent (nitroglycerine) was not required

intraoperatively. At 5 and 10 minutes after stoppage of hypotensive agents, at end of surgery and after recovery, MAP was significantly lower in D group than E group(P<0.001). [Table 1, Graph 1]

Baseline values of pulse rate were comparable in both groups.Pulse rate decreased significantly compared to baseline after administration of loading dose in both groups.There were no intergroup significant differences in pulse rate after induction or during the hypotensive period. Pulse rate showed significant increase in E group at 5 and 10 minutes after stoppage of hypotensive agent, at end of surgery and after recovery compared to D group(P<0.001). [Table 2, Graph 2].

Table 1: Mean arterial blood pressure (mm of Hg) of the studied groups

Time	D group		E group		
	Mean	SD	Mean	SD	P value
Base line	86.83333	4.503511	84.86667	4.15836	0.0841
5 min	75.66667	2.48212	76.53333	4.614321	0.3687
10 min	73.36667	1.920548	74.23333	2.955805	0.1833
15 min	68.9	2.294671	69.7	1.932481	0.1494
30 min	61.36667	1.49674	61.83333	2.118609	0.3265
60 min	58.7	2.394678	59.6	1.693802	0.0982
90 min	56.43333	1.568732	56.33333	1.561019	0.8054
120 min	62.9	2.218263	84.3	2.246069	0.0001

Table 2: Mean Pulse rate (bpm) of the studied groups

Time	D Group		E Group		
	Mean	Sd	Mean	Sd	P Value
Base line	86.26667	4.084735	85.76667	4.980537	0.6723
5 min	73.2	2.441029	74.8	5.579519	0.1555
10 min	70.86207	1.626293	71	5.626293	0.8978
15 min	68.86667	2.080009	67.76667	4.264394	0.2092
30 min	62.53333	2.515241	62.86667	3.339764	0.6640
60 min	61.4	1.544735	61.06667	3.236999	0.6127
90 min	59.86667	2.41737	58.4	3.783813	0.0788
120 min	65.06667	2.517981	93.93333	2.490441	0.0001

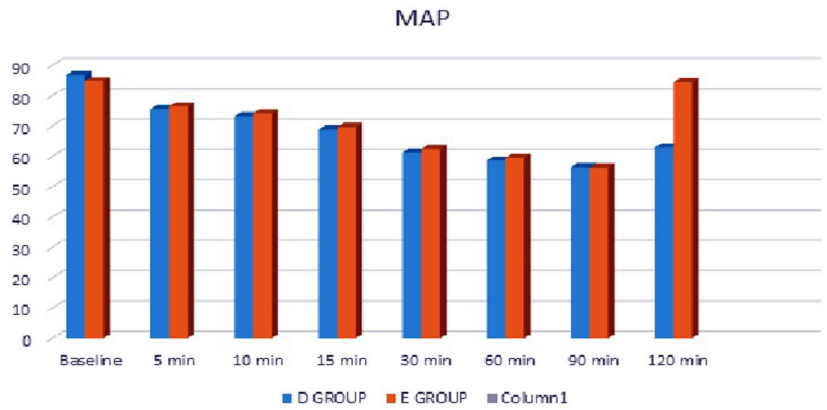

Fig. 1: Mean arterial blood pressure (mm of Hg) of the studied groups

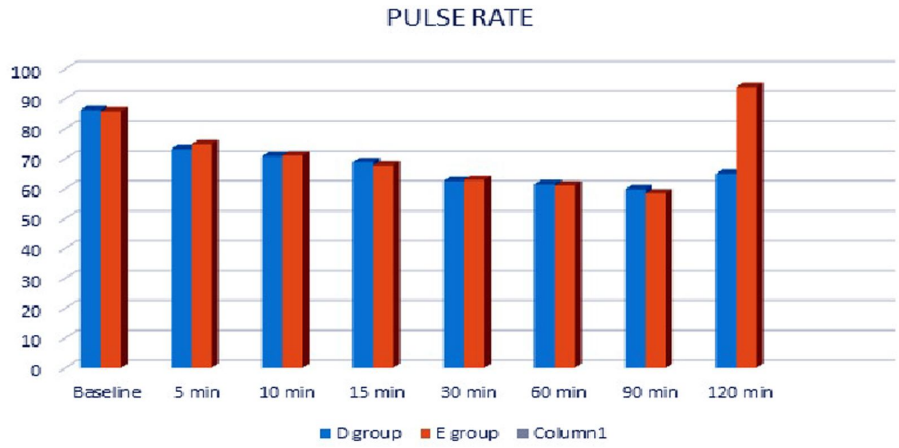

Fig. 2: Mean Pulse rate (bpm) of the studied groups

Table 3: Frommes' Bleeding Scale (0-5) during hypotensive anaesthesia periods [Median (Range)] and Blood loss during surgeries

Time	D Group		E Group		
	Mean	SD	Mean	SD	P value
5 min	2.3	0.466092	3.066667	0.449776	0.0001
10 min	2.333333	0.479463	2.233333	0.430183	0.3987
15 min	2.166667	0.379049	2.133333	0.345746	0.7232
30 min	2.233333	0.430183	2.3	0.466092	0.5670
60 min	2.3	0.466092	2.266667	0.449776	0.7790
90 min	2.233333	0.430183	2.166667	0.379049	0.5267
120 min	2.133333	0.345746	2.033333	0.182574	0.1666
Blood Loss During Surgeries					
	Mean	SD	Mean	SD	P value
Blood Loss	88.66667	12.24276	87.03333	11.49058	0.5962

Table 4: Ramsay Sedation scores and time to first analgesic request

Time	D group		E group		
	Mean	SD	Mean	SD	P value
5 min	4.033333	0.718395	3.166667	0.461133	0.0001
15 min	3.9	0.661764	2.366667	0.490133	0.0001
30 min	3.166667	0.530669	2.133333	0.345746	0.0001
60 min	2.366667	0.490133	2.066667	0.253708	0.0042
	D group		E group		
Time recorded to first analgesic request	Mean	Sd	Mean	Sd	P value
	46.33333	5.862407	25.23333	3.74795	0.0001

The Frommes' Bleeding scale for quality of surgical field was comparable in both groups. Scores for the bloodless surgical field were low in both groups; the median range of scores was 2.2 in both groups.There was no significant difference in the surgical field in both groups ($P>0.05$), but at 5 minutes after induction there was significant difference in the surgical field in both groups ($P<0.001$). There was no significant

difference in the blood loss in both groups (P>0.05). [Table 3].

The mean postoperative sedation score was significantly higher in D group than in E group at 5,15, 30 and 60 minutes (P<0.005).Time recorded to first analgesic request was significantly longer in D group than E group (46.33±5.86 minutesversus 25.23±3.74 minutes) respectively (P<0.001) [Table 4]

No postoperative nausea or vomiting observed in both groups.

Discussion

Intraoperative bleeding is one of the major problems in endoscopic surgery of sinuses. Controlled arterial hypotension significantly reduced intraoperative hemorrhage and improved the visibility of the operative field in endoscopic rhinosurgery [8]. In our study dexmedetomidine and esmolol, both were effective in achieving MAP of 55 to 75 mmHg, lowering the heart rate and providing bloodless surgical field during FESS and septoplasty.

Patients who were treated with dexmedetomidine 20 minutes before induction of anaesthesia had significant decrease in MAP and pulse rate after administration of loading dose. Dexmedetomidine induced hemodynamic profile can be attributed to the known sympatholytic effect of α_2 agonists. The α_2-receptors are involved in regulating the autonomic and cardiovascular systems. α_2 receptors are located on blood vessels, where they mediate vasoconstriction, and on sympathetic terminal, where they inhibit, norepinephrine release [9].

The efficacy of dexmedetomidine in providing better surgical and less blood loss during controlled hypotension was previously reported during tympanoplasty, septoplasty and maxillofacial surgery [10,11,12].

Esmolol lowers arterial blood pressure through a decrease in cardiac output secondary to negative chronotropic and ionotropic effects of β adrenergic antagonism. It provided a stable course of controlled hypotension and produces beneficial effects in the surgical field and in blood conservation during tympanoplasty [13].

Dexmedetomidine and Esmolol both are effective in providing good surgical field, with an additional effect of analgesia and sedation by dexmedetomidine as compared to Esmolol during FESS surgeries [14].

Dexmedetomidine has sedative effect via central actions in the locus ceruleus and in the dorsal horn of the spinal cord [15].

Conclusion

This study demonstrated that dexmedetomidine or esmolol is safer agent for controlled hypotension and both are effective in providing ideal surgical field during Nasal Surgeries. Compared with esmolol, dexmedetomidine offers the advantage of analgesia and sedation.

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