



Anaesthesiology

A STUDY ON THE EFFECTIVENESS OF DEXMEDETOMIDINE AND ESMOLOL FOR INDUCED HYPOTENSION IN FUNCTIONAL ENDOSCOPIC SINUS SURGERIES DONE UNDER GENERAL ANAESTHESIA.

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KEYWORDS :**INTRODUCTION:**

Controlled hypotension or induced hypotension is a technique in which the arterial blood pressure is decreased in a predictable and deliberate manner in order to facilitate surgery and to reduce bleeding and transfusion requirement. Intraoperative bleeding can cause poor visibility of surgical field and is of major problem during Functional Endoscopic Sinus Surgery (FESS), as it prolongs the duration of surgery and many complications may arise as a result of impaired visibility.

Various means have been used to control intraoperative bleeding during Functional Endoscopic Sinus Surgery. Intravenous hypotensive drugs are easy to administer, have faster onset of action, and have effects that disappear quickly when administration is discontinued. They have rapid elimination without toxic metabolites.

Dexmedetomidine, a centrally acting α -2 agonist, has been used in achieving controlled hypotension. Dexmedetomidine has sedative, analgesic properties, which are very beneficial. Esmolol is an ultra short acting selective β -1 adrenergic antagonist that is frequently used for induced hypotension. Esmolol also has additional advantages of opioid sparing effect and reduced postoperative analgesic requirement. Intraoperative use of esmolol reduces anesthetic requirements and reduces the use of opioids perioperatively.

This study is designed to compare the efficacy and safety of Dexmedetomidine and Esmolol as hypotensive agents in Functional Endoscopic Sinus Surgeries. The quality of the surgical field, recovery profile, and post-operative analgesia are also compared.

AIM OF THE STUDY

To compare the efficacy of Dexmedetomidine and Esmolol for induced hypotension in Functional Endoscopic Sinus Surgeries done under GA.

MATERIALS AND METHODS

The study was carried out in the ENT Department, Viswa Bharathi Medical College, Kurnool after obtaining institutional ethical committee approval

Study Design

This was a randomized, prospective, single blinded, comparative study.

The study was started after receiving Institutional Ethical Committee approval and written informed consent from all the patients.

Randomization

Simple randomized sampling was done by computer generated random numbers.

Sample Size

Sixty patients were studied, randomized into two groups of 30 each.

Group Allocation

Patients were allocated into two groups:

- Group A (n= 30) : Patients receiving Dexmedetomidine
- Group B (n= 30) : Patients receiving Esmolol

Inclusion Criteria

Age 20-50 yrs
ASA I & II
Written informed consent
Posted for FESS surgery

Exclusion Criteria

Patient refusal
ASA grade III and IV
Known allergy to study drug
Recurrent sinus surgery
Hypertension
Patients with coagulopathies or receiving drugs influencing blood coagulation
Coronary Artery Disease
Renal, Hepatic or Cerebral insufficiency

CONDUCT OF ANAESTHESIA:

Efficacy of the above two drugs was compared taking into account the following:

- Hemodynamic parameters- Systolic Blood Pressure, Diastolic Blood Pressure & Mean Arterial Pressure, Pulse Rate, End Tidal Carbon dioxide, SPO2 - intra operatively & post operatively
- Average Category Score for assessment of intraoperative surgical field
- Time to first analgesic request.

Pre Operative Preparation

The patients were pre operatively assessed; they were explained about the purpose of the study and about the possible adverse events that can occur due to the study drug, and written informed consent was obtained from the patients. On arrival of the patient in the operating room, monitors were connected and baseline values were recorded. Two cannulae were inserted, one for infusion of the study drug and the other for administration of fluids and other drugs. All patients were premedicated with IV Glycopyrrolate 5 μ g/kg and IV Midazolam 0.05 mg/kg. Patients were induced with IV Propofol 1-2 mg/kg. IV Fentanyl 2 μ g/kg was given for intraoperative analgesia. Endotracheal intubation was facilitated with IV Atracurium 0.5 mg/kg with suitable sized cuffed tube. Anesthesia was maintained with Sevoflurane 1.5%. All patients were mechanically ventilated with Nitrous oxide and oxygen (60% : 40%). In Group A, patients received loading dose of 1 μ g/kg Dexmedetomidine diluted in 10 ml 0.9% saline infused over 10 min, before induction of anesthesia, followed by continuous infusion of 0.4 – 0.8 μ g/kg/h. In Group B, patients received Esmolol as a loading dose 1 mg/kg, infused over 1 min, before induction of anesthesia, followed by continuous infusion of 0.4-0.8 mg/kg/h.

The Following Parameters Were Monitored And Recorded Intraoperatively:

Hemodynamic parameters were recorded every minute for the first 5 minutes and every 5 minutes during the first hour, and every 15 minutes thereafter, until the end of surgery. Intraoperatively, the Mean Arterial Pressure was maintained within a range of 55-65 mmHg, by adjusting the dose of the study drug within the dose range specified earlier. When the MAP reached the desired range (55-65 mmHg) and was maintained for at least 10 minutes, the surgeon estimated the quality of the surgical field using a predefined category scale. Infusion of the study drug was stopped five minutes before the anticipated end of surgery. Sevoflurane was stopped at the end of the surgery. Residual neuromuscular

blockade was reversed with Neostigmine (0.05 mg/kg) and Glycopyrrolate (0.01 mg/kg).Emergence time is recorded. Postoperative recovery was evaluated using a Modified Aldrete Score (0-10), and time needed to achieve ≥ 9 was recorded.

RESULTS

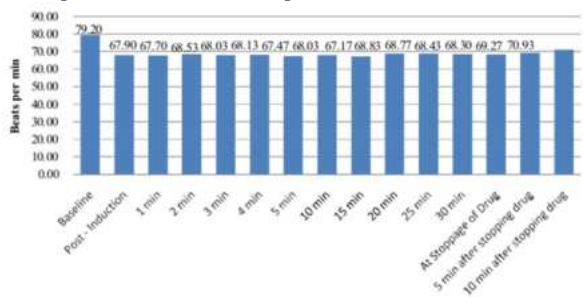
Group A: Dexmedetomidine
Group B: Esmolol

INTRAOPERATIVE HEMODYNAMIC PARAMETERS
Intraoperative Pulse Rate (beats/minute)

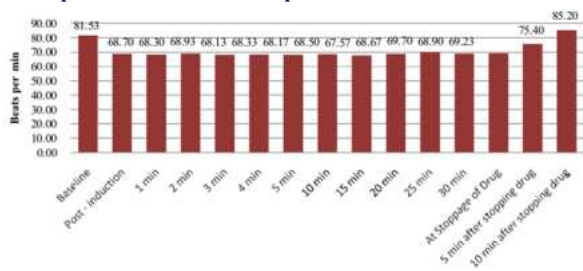
Time	Group A		Group B		'p' value	Significance
	Mean	S.D.	Mean	S.D.		
Baseline	79.20	6.03	81.53	5.96	0.137	Not Significant
Post induction	67.90	5.57	68.70	4.58	0.546	Not Significant
1 min	67.70	4.82	68.30	4.68	0.652	Not Significant
2 min	68.53	5.43	68.93	5.23	0.742	Not Significant
3 min	68.03	4.23	68.13	4.18	0.563	Not Significant
4 min	68.13	5.65	68.33	5.12	0.536	Not Significant
5 min	67.47	3.38	68.17	4.65	0.638	Not Significant
10 min	68.03	3.37	68.50	3.63	0.608	Not Significant
15 min	67.17	3.87	67.57	3.62	0.612	Not Significant
20 min	68.83	3.54	68.67	3.52	0.856	Not Significant
25 min	68.77	3.56	69.70	3.86	0.752	Not Significant
30 min	68.43	4.56	68.90	3.28	0.651	Not Significant
At stoppage of drug	68.30	4.13	69.23	3.31	0.338	Not Significant
5 min after stoppage	69.27	4.57	75.40	5.49	<0.0001	Significant
10 min after stoppage	70.93	4.51	85.20	6.31	<0.0001	Significant

The pulse rates remained comparable between the two groups throughout the intraoperative period, till the stoppage of the study drug. At 5 minutes (75.40 ± 5.49 vs 69.27 ± 4.57 ; p value <0.0001) and 10 minutes (85.20 ± 6.31 vs 70.93 ± 4.51 ; p value <0.0001) following stoppage of the drug, the pulse rates in Esmolol group were significantly higher than that in Dexmedetomidine group.

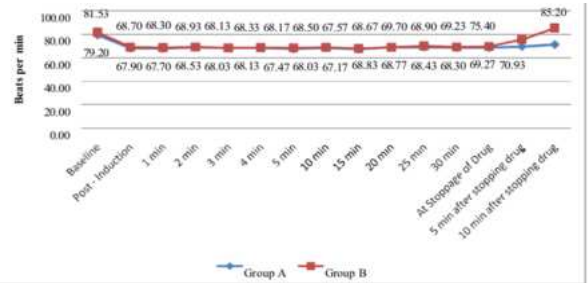
Intraoperative Pulse Rate Group A



Intraoperative Pulse Rate Group B



Intraoperative Pulse Rate

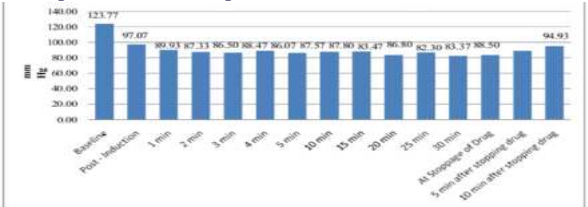


Intraoperative Systolic Blood Pressure (mmHg)

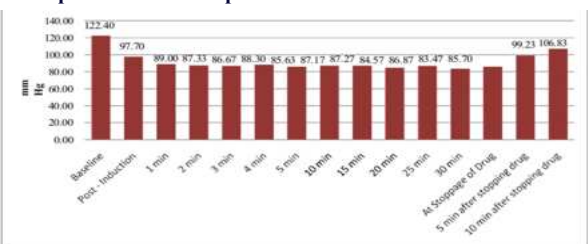
Time	Group A		Group B		'p' value	Significance
	Mean	S.D.	Mean	S.D.		
Baseline	123.77	8.50	122.40	8.55	0.537	Not Significant
Post induction	97.07	7.21	97.70	7.62	0.742	Not Significant
1 min	89.93	6.32	89.00	6.89	0.598	Not Significant
2 min	87.33	5.32	87.33	5.87	0.654	Not Significant
3 min	86.50	3.78	86.67	3.89	0.723	Not Significant
4 min	88.47	4.53	88.30	4.37	0.698	Not Significant
5 min	86.07	5.23	85.63	5.76	0.712	Not Significant
10 min	87.57	4.37	87.17	3.81	0.707	Not Significant
15 min	87.80	5.32	87.27	5.21	0.767	Not Significant
20 min	83.47	5.08	84.57	4.60	0.383	Not Significant
25 min	86.80	4.23	86.87	4.12	0.653	Not Significant
30 min	82.30	5.34	83.47	4.19	0.351	Not Significant
At stoppage of drug	83.37	4.15	85.70	3.48	0.022	Significant
5 min after stoppage	88.50	4.50	99.23	5.07	<0.0001	Significant
10 min after stoppage	94.93	5.81	106.83	8.75	<0.0001	Significant

Intraoperative Systolic Blood Pressure remained comparable between the two groups during the first 30 minutes of surgery. At stoppage of the study drug, the SBP was significantly higher in the Esmolol group compared to the Dexmedetomidine group (85.70 ± 3.48 vs 83.37 ± 4.15 ; p value 0.022). At 5 minutes (99.23 ± 5.07 vs 88.50 ± 4.50 ; p value <0.0001) and 10 minutes (106.83 ± 8.75 vs 94.93 ± 5.81 ; p value <0.0001), the SBP was significantly higher in the Esmolol group compared to the Dexmedetomidine group.

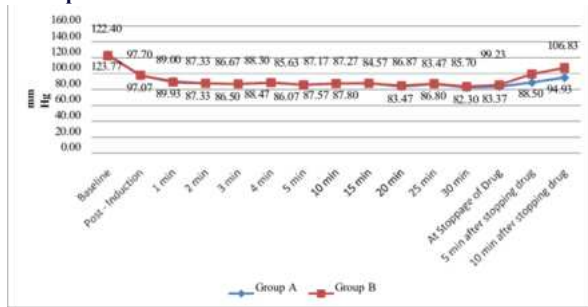
Intraoperative SBP Group A



Intraoperative SBP Group B



Intraoperative SBP

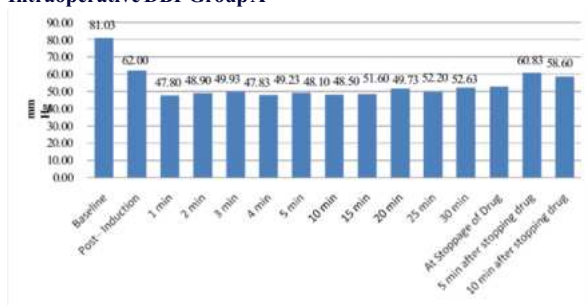


Intraoperative Diastolic Blood Pressure (mm Hg)

Time	Group A Mean	S.D.	Group B Mean	S.D.	'p' value	Significance
Baseline	81.03	4.89	81.63	4.90	0.637	Not Significant
Post induction	62.00	6.12	62.97	4.67	0.632	Not Significant
1 min	47.80	6.23	47.33	6.76	0.532	Not Significant
2 min	48.90	5.36	49.03	5.76	0.735	Not Significant
3 min	49.93	4.76	49.77	4.89	0.532	Not Significant
4 min	47.83	5.32	48.10	5.98	0.422	Not Significant
5 min	49.23	4.98	49.67	5.32	0.436	Not Significant
10 min	48.10	4.86	48.03	3.98	0.954	Not Significant
15 min	48.50	5.32	48.80	5.21	0.756	Not Significant
20 min	51.60	4.45	49.83	3.32	0.087	Not Significant
25 min	49.73	5.87	49.00	5.32	0.321	Not Significant
30 min	52.20	4.96	51.37	4.24	0.487	Not Significant
At stoppage of drug	52.63	4.89	52.03	5.37	0.653	Not Significant
5 min after stoppage	60.83	5.68	61.73	10.50	0.681	Not Significant
10 min after stoppage	58.60	5.35	62.37	10.31	0.081	Not Significant

The intraoperative Diastolic Blood Pressure remained comparable throughout the intraoperative period, even after stoppage of the study drug.

Intraoperative DBP Group A



Intraoperative DBP Group B



INTRAOPERATIVE DBP

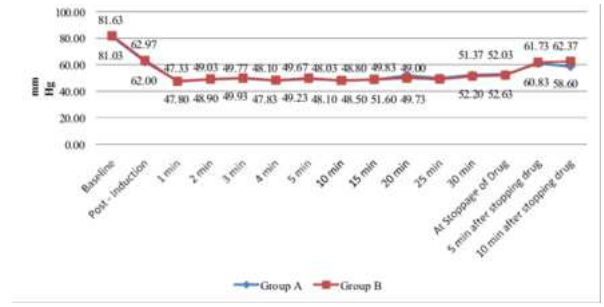


Table :Intraoperative Mean Arterial Pressure (mm Hg)

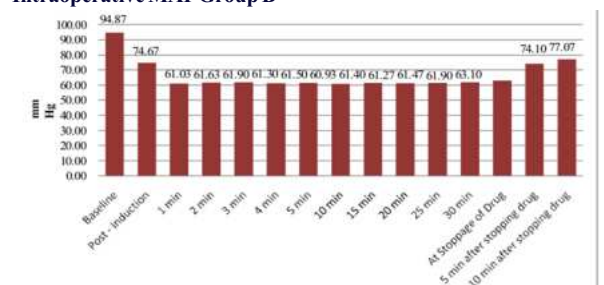
Time	Group A Mean	S.D.	Group B Mean	S.D.	'p' value	Significance
Baseline	94.83	5.70	94.87	5.78	0.982	Not Significant
Post induction	74.80	5.78	72.60	5.09	0.123	Not Significant
1 min	61.70	5.34	61.03	5.21	0.342	Not Significant
2 min	61.50	3.72	61.63	3.87	0.252	Not Significant
3 min	62.00	4.72	61.90	4.56	0.542	Not Significant
4 min	61.23	4.56	61.30	4.12	0.712	Not Significant
5 min	61.33	3.21	61.50	3.67	0.675	Not Significant
10 min	61.10	2.71	60.93	2.72	0.813	Not Significant
20 min	62.07	2.84	61.27	2.15	0.223	Not Significant
30 min	62.00	2.49	61.90	2.86	0.886	Not Significant
At stoppage of drug	62.73	3.12	63.10	3.58	0.674	Not Significant
5 min after stoppage	69.90	3.98	74.10	6.51	0.004	Significant
10 min after stoppage	70.53	3.00	77.07	5.53	<0.0001	Significant

The Mean Arterial Pressures remained comparable between the two groups till the stoppage of the study drug. At 5 min (74.10 ± 6.51 vs 69.90 ± 3.98 ; p value 0.004) and 10 min (77.07 ± 5.53 vs 70.53 ± 3.00 ; p value < 0.0001), the Mean Arterial Pressures were significantly higher in the Esmolol group compared to that of the Dexmedetomidine group.

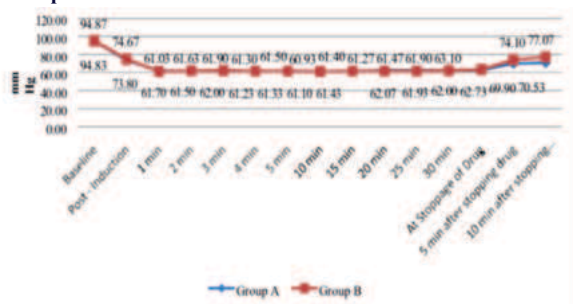
Intraoperative MAP Group A



Intraoperative MAP Group B



Intraoperative MAP



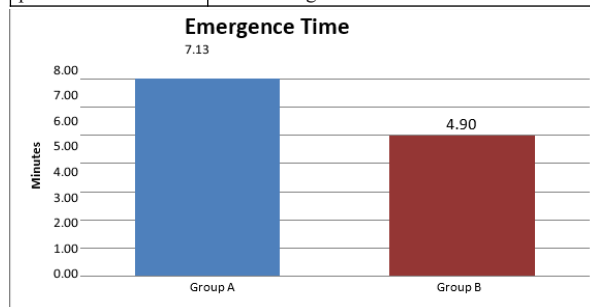
Average Category Score

Time	Group A		Group B		'p' value	Significance
	Mean	S.D.	Mean	S.D.		
10 min	2.03	0.49	2.07	0.45	0.789	Not Significant
20 min	1.87	0.51	1.87	0.43	0.968	Not Significant
30 min	1.97	0.49	1.97	0.41	0.992	Not Significant

The Average Category Score to assess the quality of surgical field was comparable between the two groups at 10 min, 20 min and 30 min during the surgery.

Emergence Time

Parameter	Group A	Group B
Range	5 - 9	3 - 8
Mean	7.13	4.90
S.D.	1.01	1.21
'p'	<0.0001 Significant	



DISCUSSION

Several studies have revealed that controlled hypotension is beneficial during Functional Endoscopic Sinus Surgeries in terms of improved surgical field visibility and thereby shorter duration of surgery and better outcome. Dexmedetomidine is compared with Esmolol with regards to efficacy as a hypotensive agent.

In our study, we observed that there was a significant fall in heart rate and blood pressure following induction in both the groups. Both the drugs were effective in maintaining the intraoperative mean arterial pressure within the target pressure of 55 – 65 mm of Hg. No other additional drugs or Sevoflurane were needed to maintain the MAP within the desired range. The quality of surgical field, assessed by the operating surgeon using Average Category Score, was comparable between the two groups at 10 min, 20 min and 30 min of surgery.

Systolic blood pressure was lower in the Dexmedetomidine group at the time of stoppage of the study drug. After stoppage of the study drug, the pulse rate, systolic blood pressure and mean arterial pressure were significantly lower in the Dexmedetomidine group (measured at 5 min and 10 min after stoppage of the study drug), while diastolic blood pressure remained comparable between the two groups.

Emergence time, measured as the time between stoppage of anesthetic agents to response to commands, was significantly longer in the Dexmedetomidine group showing that the Dexmedetomidine group had a delayed recovery compared to the Esmolol group. The time to reach Modified Aldrete Score of ≥ 9 was significantly longer in the Dexmedetomidine group.

In the postoperative period, the pulse rates of the patients belonging to

Esmolol group were significantly higher than those in Dexmedetomidine group. Systolic and diastolic blood pressures were significantly higher in the Esmolol group during first 60 minutes in the postoperative period. By 90 minutes, the systolic and diastolic blood pressures were comparable between the two groups.

Sedation score was comparable between the two groups in the postoperative period. In the post operative period, the sedation score of the patients in the Esmolol group were lower compared to that of Dexmedetomidine. By 60 minutes in the postoperative period, the sedation score of patients belonging to both the groups became comparable.

The first analgesic request was significantly earlier in the Esmolol group compared to the Dexmedetomidine group. So we observed that post operative pain relief is significantly better with Dexmedetomidine compared to Esmolol.

SUMMARY

Both Dexmedetomidine and Esmolol are effective in providing induced hypotension during Functional Endoscopic Sinus Surgery. Average Category Scores were comparable with both Dexmedetomidine and Esmolol. Hemodynamic parameters were comparable between both the groups intraoperatively. Esmolol results in a higher heart rate and blood pressure during the post operative period compared to Dexmedetomidine. Post operatively, first analgesic request was earlier in the Esmolol group compared to Dexmedetomidine.

CONCLUSION

Both Dexmedetomidine and Esmolol are effective in providing ideal surgical conditions during Functional Endoscopic Sinus Surgery. Dexmedetomidine has the advantage of longer post operative pain relief. However, Esmolol has the advantage of faster recovery compared to Dexmedetomidine.

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