ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Comparison of Dexmedetomidine Versus Propofol Infusion in Functional Endoscopic Sinus Surgery (FESS) to Induce Controlled Hypotension in a Tertiary Care Centre

Dharavath Sujatha[1], Krishna Diddi[2], J S Soumya[3], Saba Sultana,[4] Doddoju Veera Bhadreshwara Anusha, [5]

[1,4]Senior resident, Department of Anaesthesia, Government medical college, Mahabubnagar, Telangana, India
[2]Assistant Professor, Department of Anaesthesia, Government medical college, Mahabubnagar, Telangana, India
[3]Associate professor, Department of Anaesthesia, Government medical college, Mahabubnagar, Telangana, India
[5]Associate professor, Department of Community Medicine, RVM institute of medical sciences and research centre, Siddipet, Telangana, India.

Abstract

Background: Functional endoscopic sinus surgery (FESS) is a commonly employed surgery in patients with rhinosinusitis. Intraoperative local bleeding is a major problem in this surgery. Controlled hypotension is a method by which arterial blood pressure is decreased in a deliberate but predictable manner to increase surgical field visibility. The aim of our study was to compare Dexmedetomidine and Propofol to induce hypotension and also to find out which is better. **Material and Methods:** A comparative study of Dexmedetomidine versus Propofol to induce controlled hypotension was done in 100 (GROUP D-50 patients given Dexmeditomidine, GROUP P-50 patients given Propofol) adult patients posted for FESS. Study was undertaken during January 2020 to September 2021 at Govt ENT hospital, Koti, Hyderabad after institutional ethical committee clearance, and informed consent from the patients. Outcome compared among the two groups was vitals, quality of surgical field, blood loss and sedation score. **Results:** Two groups were comparable with respect to age, weight, ASA and Comorbidities. Vitals were comparable preoperatively in both the groups. Mean arterial pressure was higher in propofol group patients compare to dexmedetomidine group. But this association was statistically significant from 30 to 45 min & 90-120min. **Conclusion:** It was observed from our study that both Dexmedetomedine and Propofol can be used for controlled hypotensive anaesthesia in FESS also Dexmedetomidine and Propofol both can be effectively used to induce hypotension.

Keywords: Functional Endoscopic Sinus Surgery (FESS), Dexmedetomidine, Propofol, controlled hypotension.

Corresponding Author: Dr. Doddoju Veera Bhadreshwara Anusha, Associate professor, Department of Community Medicine, RVM institute of medical sciences and research centre, H.NO: 2-51/1Laxmakkapally village, Mulugu mandal, Siddipet District, Telengana, India.

Introduction

Functional Endoscopic Sinus Surgery (FESS) is the commonly employed surgery in patients with rhinosinusitis. Local bleeding in these techniques is difficult to control due to anatomical and pathological characteristics. Even minimal bleeding impairs the visibility of the surgical field and lengthens the time of surgery in FESS. Reduced visibility of the surgical field inturn results in increased risk of dangerous vascular, orbital and intracranial complications. Hence the role of an anesthesiologist is extremely important in reducing bleeding.[1]

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Controlled hypotension is a method by which the arterial blood pressure is decreased in a deliberate but predictable manner to limit intraoperative blood loss and to provide the best possible surgical field for operating.[2-4]

For achieving controlled hypotension, several agents such as nitroglycerine,[5] higher dose of inhaled anesthetics,[6] and vasodilator such as sodium nitroprusside,[7] β-blocker,[8] have been used either alone or in combination with each other. However, an ideal agent for inducing controlled hypotension cannot be asserted. Propofol and dexmedetomidine can be pharmacological methods to induce controlled hypotension.

Propofol is a modulator of gamma amino butyric acid (GABA-A) receptor with sedative, hypnotic, sympathetic inhibitory effects and profound respiratory depressant action. It was also been used for controlled hypotension. It reduces arterial blood pressure by drop in systemic vascular resistance, preload and cardiac contractility.[9,10]

Dexmedetomidine is a α2-adrenoceptor agonist with sedative, anxiolytic, sympatholytic, analgesic-sparing effects, and minimal depression of respiratory function. It is potent and highly selective for α2-receptors.[11] The α2-receptors are involved in regulating the autonomic and cardiovascular system. In blood vessels, these receptors cause vasoconstriction, and in the sympathetic terminals they inhibit the release of norepinephrine.[12]

In our study, an attempt was made to compare intraoperative bleeding and the quality of surgical field during controlled hypotensive anaesthesia induced by either intravenous propofol or dexmedetomidine when performing FESS under General Anaesthesia.

Material and Methods

After obtaining Institutional ethical committee approval, a randomized prospective study was done during January 2020 to September 2021 in patients undergoing elective FESS at in a tertiary care hospital, Hyderabad.

Inclusion Criteria

- ASA Physical Status I and II
- Age 18 – 40 yrs
- Posted for elective Functional endoscopic Sinus Surgeries

Exclusion Criteria

- Known Hypersensitivity to Dexmedetomidine or Propofol
- Patients not willing for participation

Sample size: 100 patients

Patients have been randomly selected for the present study. The patients were randomly allocated into two groups comprising of 50 patients in each group. Group D received Dexmedetomidine and Group P received Propofol.

Methods: Preanesthetic check up and appropriate investigations were done, written informed consent was taken and patients were kept nill by oral for 8 hrs.

Patients were shifted to operation room and preoperative vitals were monitored and recorded (ECG, noninvasive arterial BP, ETCO2 and oxygen saturation measurement). 18-G intravenous catheter was inserted. All patients were premedicated with intravenous midazolam 0.05 mg/kg. General anaesthesia was induced. Patients in group D received Dexmedetomidine 0.4-0.8 μg/kg/hr in 500ml 0.9% normal saline started after the induction. Patients in group P received Propofol 75 – 100 μg/kg/min in 500ml 0.9% normal saline. The nasal mucosae of all the patients were infiltrated using 4ml of 2% xylocaine with adrenaline (1 : 200 000). Target MAP for controlled hypotension was 60–70 mmHg, which was maintained in all patients.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Perioperatively vitals were monitored and recorded. Outcome measured were heart rate, MAP, Quality of surgical field, blood loss and sedation score at 15min,30min and 60 min after surgery. Dexmedetomidine/Propofol infusion was stopped approximately 5 min before the expected end of surgery and monitoring of vitals continued. Residual paralysis was reversed with neostigmine0.05mg/kg and glycopyrrolate0.08mg/kg iv and after complete recovery patients were extubated. The highest infusion dose for each patient was recorded.

Procedure: Quality of surgical field is assessed by AVERAGE CATEGORY SCALE. 0=Absence of bleeding, 1=slight bleeding, suctioning of blood not necessary, 2=slight bleeding, sometimes blood has to be suctioned out, 3=slight bleeding, sometimes blood has to be evacuated, visible operative field for some seconds after evacuation, 4=average bleeding, blood has to be often evacuated, operative field is visible only right after evacuation 5=high bleeding, constant blood evacuation is needed, sometimes bleeding exceeds evacuation as per Fromme et al.[13]

Sedation Score Assesed by Using Ramsay Sedation Score: Score 1 - Patient is anxious, agitated or restless or both, Score 2 - Patient is cooperative, oriented and tranquil, Score 3 - Patient responds to commands only, Score 4 - Patient exhibits brisk response to light, glabellar tap or loud auditory stimulus, Score 5 - Patient exhibits sluggish response to light, glabellar tap or loud auditory stimulus, Score 6 - Patient exhibits no response.[14]

Reflex tachycardia (persistent rise in heart rate>20% from baseline or absolute value of heart rate>120/min for a period of 10 min or more) was treated with Inj. esmolol 0.5 mg/kg IV. Severe hypotension below the targeted level occurred, hypotensive drugs were discontinued and mephenteramine 6mg was given if needed, and the patient was excluded from the study. Bradycardia (decrease in heart rate< 20% from baseline or <50 min) was treated with Inj. atropine 0.01mg/kg or 0.6 mg IV and the patient was excluded from the study. Postoperative complications, duration of surgical intervention (from beginning to end of surgical procedure) and surgeon satisfaction were recorded. Blood loss volume, measured in suction bottle and by the visual estimation of the soaked swabs was recorded.

Data analysis: The variables were entered into SPSS, version 22. Data presented as frequency, percentage, Mean and standard deviation. Chi-square test and student "t" Test was used for statistical analysis with p value of < 0.05 as significant.

RESULTS

Patients belonging to Group D and Group P were comparable with respect to age, weight, comorbidities and ASA status and it was not significant statistically. [Table 1].

Comparison showed no statistical significant differences in Pulse rate (PR) (p=0.250), systolic blood pressure (SBP) (p=0.888), diastolic blood pressure (DBP) (p=0.443), mean arterial blood pressure (MAP) (p=0.534), Saturation (SPO2) (p=0.843) preoperatively. So both groups were comparable with respect to vitals preoperatively. [Table 2]

After inducing controlled hypotension, Mean pulse rate compared between two groups, after induction and intraoperatively till the end of surgery. Mean PR was higher in group P patients compared to group D. But this association was statistically significant at 45,50,60 & 120min where p value was <0.05. [Figure 1]

Table 1: Distribution by patients characteristics

Parameters	Sub- group	Group D	Group P	P value
Age (years) Mean±SD		30.16±8.834	29.34±10.440	0.673
Weight (Kg) Mean±SD		61.02±4.578	61.46±6.606	0.700
Diabetes Mellitus (n/%)	Present	7(14%)	8(16%)	0.779
	Absent	43(86%)	42(84%)	

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Hypertension (n/%)	Present	11(22%)	12(24%)	0.836
	Absent	39(78%)	(3876%)	
ASA (n/%)	Grade 1	39(78%)	38(76%)	0.812
	Grade 2	11(22%)	12(24%)	

Table 2: Distribution by baseline vital parameters

Group	**Group D**	**Group P**	**P Value**
	Mean±S. D		
PR	79.58±7.359	77.86±7.497	P= 0.250
SBP	124.14±10.091	123.86±9.659	P=0.888
DBP	77.98±7.069	79.06±6.952	P=0.443
MAP	93.36±4.783	93.99±5.24	P=0.534
SPO2 (%)	99.46±0.503	99.44±0.501	P= 0.843

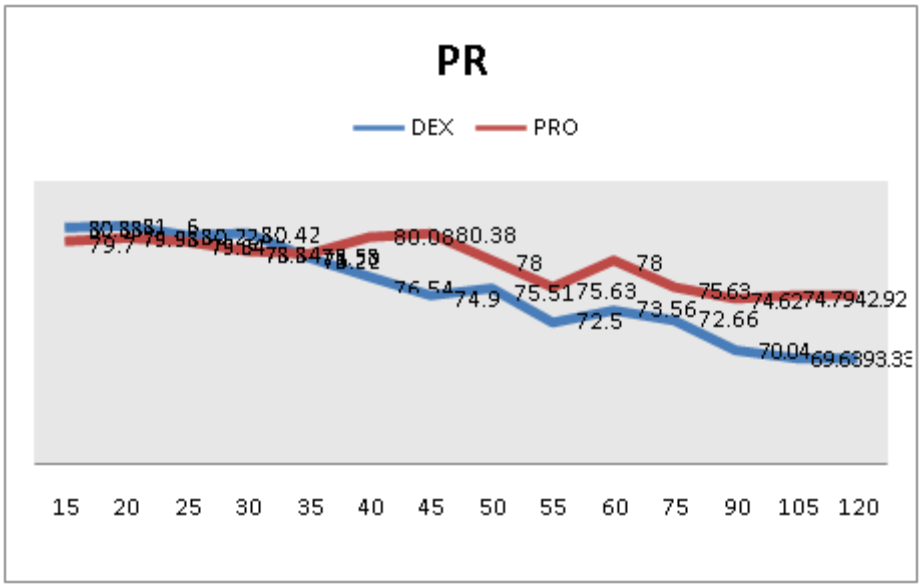

Figure 1: Comparison of Pulse rate between the groups intraoperatively

Mean arterial pressure was higher in group P patients compare to group D. But this association was statistically significant from 30 to 45 min & 90-120min. [Figure 2]

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

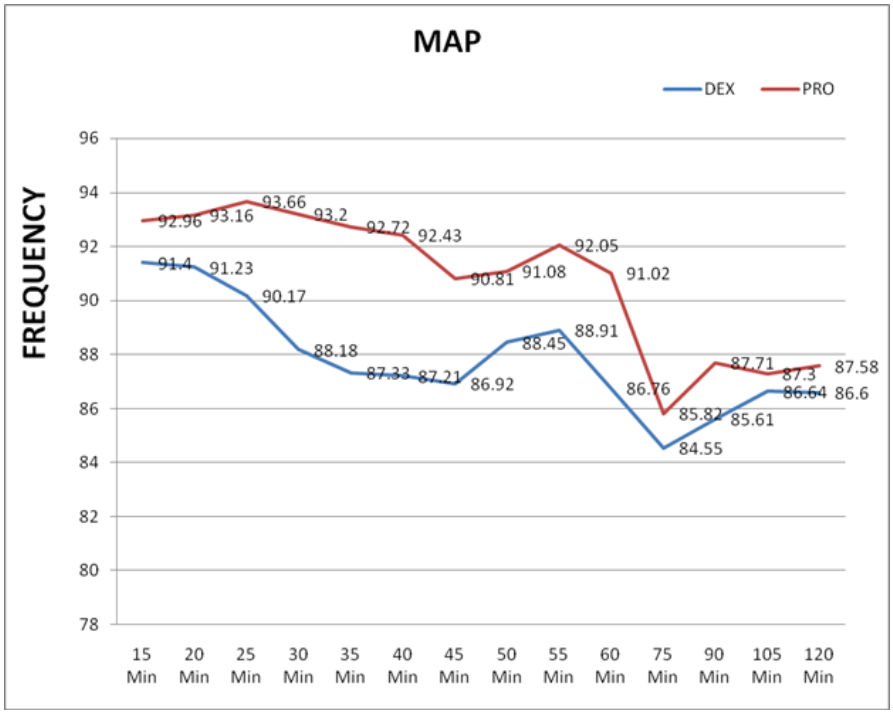

Figure 2: Comparison of mean arterial pressure between the two groups intraoperatively

As per average category scale, score given by surgeon was grade 2 in 92% and 90% of patients respectively in group D and group P and grade 3 in 8% and 10% of patients in group D and group P respectively, which means both drugs have similar effects on quality of surgical fields. [Table 3]

Table 3: Quality of surgical field - averge category scale

Average category scale grade	Group D	Group P	Total
Grade 2	46(92%)	45(90%)	91(91%)
Grade 3	4(8%)	5(10%)	9(9%)
Total	50	50	100

Average blood loss in both groups was comparable. There is no significant association between two groups. Comparison between two groups showed that there is statistically significant differences in sedation score at 30 min (P value=0.02) after surgery. Sedation scores were statistically higher in Propofol group than Dexmedetomedine group. No complications were detected in any of the patients. [Table 4]

Table 4: Mean blood loss, sedation score and complication rates in Group D versus Group P

Variables	Subcategory	Group D N=50	Group P N=50	P Value
Mean blood loss		98.72±0.671	99.12±0.773	P=0.702
Ramsay sedation score	15 min	2.44±0.535	2.62±0.532	0.093
	30 min	2.22±0.44	2.42±0.52	0.023
	60 min	2±0.19	2±0.22	1
Complications	Yes	0(0%)	0(0%)	Not applicable
	No	50(100%)	50(100%)	

DISCUSSION

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Functional endoscopic sinus surgery is one of the routinely performed surgeries. The use of hypotensive anaesthesia during endoscopic sinus surgery has greatly reduced blood loss and improved visibility and quality of surgical field. As vital organ perfusion as well as tissue perfusion is decided by mean Arterial Pressure (MAP); MAP is our primary parameters to assess the efficacy and safety of Dexmedetomidine and Propofol as a hypotensive agent in Functional Endoscopic Sinus surgery. Visibility of surgical field assessed with the use of Average Category Scale (ACS) Score as per reference from Fromme et al and also to measure the amount of blood loss.[13]

In this study patients were comparable in both groups with regards to age and weight. Hemodynamic parameters also were comparable in both groups.

In our study, we found that the PR and MAP decreased following administration of loading dose of dexmedetomidine more compare to propofol group patients. At the end of surgery and after extubation PR and MAP was significantly lower in dexmedetomidine group than propofol group. This association was statistically significant at some time intervals. Malhotra et al studied the effect of dexmedetomidine in hypotensive anaesthesia in patient undergoing FESS and found that MAP and PR were significantly lower with the use of dexmedetomidine.15 Basar et al. examined the effect of dexmedetomidine with a single dose of 0.5 μg/kg 10min before induction of anaesthesia, and they stated that the drug could significantly decrease the MAP and PR.[16]

In present study mean blood loss in propofol group was 99.12±0.773 and in group D was 98.72±0.671which was not statically significant. In study by Bharathwaj DK mean total blood loss in Dexmed group was around 83.75 ±14.796 ml; which was low compare to present study. Mean total blood loss in group propofol (96.25 ± 16.123 ml) was significantly higher than for the dexmedetomidine group.[17]

In our study, the quality of surgical field as scored by surgeon, we found that both propofol and dexmedetomidine were effective in producing a surgical field with improved visibility (average category scale=2). Similar to present study Moshiri, et al. the bleeding was not significantly different in the two groups, and surgeon had relatively high satisfaction with both drugs.[18] Shams et al. also employed scale adopted from Fromme et al.and compared the efficacy of dexmeditomedine and esmolol in assessing the quality of surgical field. Both groups had a median score of 2, that is majority of patients having score 2 ,which is comparable to our study.[19] Basar et al. opined Dexmedetomidine impact on establishing better surgical conditions and less bleeding during controlled hypotension in tympanoplasty, septoplasty, and maxillofacial surgeries has been reported.[12]

In present study majority of propofol group patients having high sedation score when compared to dexmedetomidine group at 15 min and 30 min after surgery. Shams et al, observed that sedation scores achieved in group D was significantly lower than group esmolal.[19] Thus a lower score in dexmedetomidine group suggests that patients were not under deep sedation compared to propofol which helps in early postoperative recovery.

CONCLUSION

Both propofol and dexmedetomidine can be effectively used in controlled hypotension for FESS. Both groups were comparable with respect to quality of surgical field. Post-operative sedation scores were significantly higher with propofol when compared to dexmedetomidine. Dexmedetomidine have decreased SBP, DBP, MAP and HR when compared to Propofol. This study also shows that dexmedetomidine has added advantage of decreased stress response during intubation and extubation when compared with propofol.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

REFERENCES

1. Cincikas D. Ivaskevicius J, Martinkenas JL, Balseris S. A role of anaesthesiologist in reducing surgical bleeding in endoscopic sinus surgery. Medicina 2010; 46: 730- 734.
2. Kol IO, Kaygusuz K, Yildirim A, Dogan M, Gursoy S, Yucel E, et al. Controlled hypotension with desflurane combined with esmolol or dexmedetomidin during tympanoplasty in adults: A double-blind, randomized, controlled trial.Current Therapeutic Research 2009; 70: 197-208
3. Rodrigo C. Induced hypotension during anesthesia with special reference to orthognathic surgery. Anesth Prog. 1995;42(2):41–58.
4. Qiu, X., Tan, Z., Tang, W. et al. Effects of controlled hypotension with restrictive transfusion on intraoperative blood loss and systemic oxygen metabolism in elderly patients who underwent lumbar fusion. Trials 22, 99 (2021). https://doi.org/10.1186/s13063-020-05015-5
5. Mishra A, Singh RB, Choubey S, Tripathi RK, Sarkar A. A comparison between nitroprusside and nitroglycerine for hypotensive anesthesia in ear, nose, and throat surgeries: A double-blind randomized study. Med J DY Patil Univ 2015;8:182-8.
6. Dal D, Celiker V, Ozer E, Basgül E, Salman MA, Aypar U. Induced hypotension for tympanoplasty: A comparison of desflurane, isoflurane and sevoflurane. Eur J Anesthesiol 2004;21:902-6.
7. Jacobi KE, Böhm BE, Rickauer AJ, Jacobi C, Hemmerling TM. Moderate controlled hypotension with sodium nitroprusside does not improve surgical conditions or decrease blood loss in endoscopic sinus surgery. J Clin Anesth 2000;12:202-7.
8. Puthenveettil N, Rajan S, Kumar L, Nair SG. A comparison of effects of oral premedication with clonidine and metoprolol on intraoperative hemodynamics and surgical conditions during functional endoscopic sinus surgery. Anesth Essays Res 2013;7:371-5.
9. Marzban S, Haddadi S, Mahmoudi Nia H, Heidarzadeh A, Nemati S, Naderi Nabi B. Comparison of surgical conditions during propofol or isoflurane anesthesia for endoscopic sinus surgery. Anesth Pain Med 2013;3:234 8.
10. Chaaban MR, Baroody FM, Gottlieb O, Naclerio RM. Blood loss during endoscopic sinus surgery with propofol or sevoflurane: A randomized clinical trial. JAMA Otolaryngol Head Neck Surg 2013;139:510 4
11. Berrin Iik, Mustafa Arslan*, Özgür Özsoylar and Mehmet Akçabay. The Effects of 2-Adrenergic Receptor Agonist Dexmedetomidine on Hemodynamic Response in Direct Laryngoscopy. The OpenOtorhinolaryngology Journal, 2007, 1, 5-11 5.
12. Basar H, Akpinar S, Doganci N, et al. The efficacy of preanaesthetic ingle dose dexmedetomidine on induction, hemodynamic and CVS parameters. J Clin Anesth 2008;20(6):431–436. DOI: 10.1016/j. jclinane.2008.04.007.
13. Fromme GA, MacKenzie RA, Gould AB Jr, Lund BA, Offord KP. Controlled hypotension for orthognatic surgery. Anesth Analg 1986;65:683 6.
14. Role of Ramsay Sedation Scale in sedative dosage modulation for critically-ill intubated patients. Deol H, Dimtri F, Minaie A, Surani S, Udeani G. Chest. 2017;152:0.
15. Malhotra SK ,Kumar S, Arora S, Gupta A-Effect of dexmedetomidine on quality of surgical field and requirement of hypotensive agents during endoscopic sinus surgery under general anaesthesia-European journal of anaesthesiology june 2013 volume 30 pg 2718.
16. Basar H, Akpinar S, Doganci N, et al. The efficacy of preanaesthetic ingle dose dexmedetomidine on induction, hemodynamic and CVS parameters. J Clin Anesth 2008;20(6):431–436. DOI: 10.1016/j. jclinane.2008.04.007.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

17. Bharathwaj DK, Kmath SS. Comparison of dexmedetomidine vs propofol- based anesthesia for controlled hypotension in endoscopic sinus surgery. South Afr J Anaesth Analg 2018. DOI: 10.1080/22201181.2018.1517484.
18. Moshiri E, Modir H, Yazdi B, et al. Comparison of the effects of propofol and dexmedetomidine on controlled hypotension and bleeding during endoscopic sinus surgery. Ann Trop Med Public Health 2017;10(3):721–725.
19. Shams T, El Bahnasawe NS, Abu-Samra M, et al. Induced hypotension for functional endoscopic sinus surgery: A comparative study of dexmedetomidine versus esmolol. Saudi J Anaesthesia. 2013;7(2):175–80.