e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2022; 12(12); 110-117

Original Research Article

Evaluation of the Surgical Field in Functional Endoscopic Sinus Surgery: A Comparative Study of Propofol versus Sevoflurane Anaesthesia

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Received: 10-10-2022 / Revised: 12-11-2022 / Accepted: 05-12-2022

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Conflict of interest: Nil

Abstract

Background and Aims: Hypotensive anaesthesia, to provide a bloodless field plays a very important role in the success of FESS. Among several agents, Sevoflurane and Propofol have been commonly used for the purpose globally.

Objectives: This study was done to compare the overall efficacy of Sevoflurane and Propofol as an agent for hypotensive anaesthesia in FESS.

Materials and Methods: Hundred patients, between 16-50 years, of either sex, belonging to ASA physical Status I or II, having Mallampatti Score 1 or 2 and posted for endoscopic sinus surgery were equally divided into two groups. After giving general anaesthesia with endotracheal intubation, patients in Group P received Infusion Propofol, starting at 12 mg/kg/hr for 10 minutes followed by 10mg/kg/hr for the next 10 minutes and then continued at 8 mg/kg/hr, whereas those in Group S received Sevoflurane at a dial concentration of 2%. Both the groups aimed a target MAP as 65 – 75mmHg. Intraoperative haemodynamics were assessed every 5 minutes, whereas quality of surgical field and Surgeon's satisfaction was checked at 30 and 60 minutes. The amount of intraoperative blood loss and postoperative sedation, nausea, vomiting, bradycardia and hypotension were taken into consideration.

Results: Patients receiving Propofol maintained a better haemodynamic profile, with low blood pressure and heart rate all throughout the procedure. Amount of intraoperative blood loss was also less with a better quality of surgical field and surgeon’s satisfaction score in the same group as compared to those receiving Sevoflurane.

Conclusion: Propofol is overall more efficacious than Sevoflurane to achieve hypotensive anaesthesia during Functional endoscopic sinus surgery (FESS).

Keywords: Sevoflurane, Propofol, FESS, Hypotensive anaesthesia.

Introduction

Allergic chronic rhinosinusitis is a significant health problem and a definite cause of morbidity nowadays. Chronic cases are treated primarily by medications including steroids, however surgical interventions are recommended in refractory cases. Functional endoscopic sinus surgery (FESS) has been widely accepted as the surgery of choice in present times, with the success of the procedure being mostly dependent on the intraoperative surgical field conditions [1,2].

This is primarily because the presence of significant bleeding in the surgical field can result in significant hindrance in recognition of the anatomical landmarks, thus making the identification of the drainage pathways of the sinuses difficult. Severe inflammation of the sinuses, from chronic infection or the presence of pus and/or fungus debri increases the vascularity which again contribute to more bleeding, thereby increasing the risk of complication, including postoperative nasal synechiae, anosmia, CSF leak causing meningitis and many more [1-3].

Various studies have also been carried out highlighting the increased propensity of severe perioperative hemorrhage requiring transfusion during FESS, thus leading to greater hospital stay and readmission rates.

It is therefore critical to optimize the surgical field by reducing the amount of intraoperative bleeding. Several methods have been used to achieve this goal, Trendelenburg positioning, use of preoperative steroids, topical local anesthetics and decongestants [2-4]. However, controlled hypotension by different anesthetic techniques has been of significant importance in recent times, where achievement of deliberate reduction of systemic blood pressure is done using different techniques3,4. Mean arterial blood pressure (MAP) can be reduced 30% below a patient's baseline MAP, with a minimum MAP of 65-75 mm Hg being clinically acceptable [3,4].

There are different pharmacological agents that produce controlled hypotension like propofol, magnesium sulphate [3-6], inhalational agents like sevoflurane, isoflurane, desflurane [3-5,7,8] intravenous alpha 2 agonists like clonidine [9,10], dexmetedomidine [11], vasodilators like sodium nitroprusside [12], adrenergic beta blockers such as esmolol, metoprolol; or short acting opioids like fentanyl or remifentanil [13-16].

Both Propofol and Sevoflurane are commonly used agents nowadays for induction as also maintenance of anesthesia. They have also been used for conduction of hypotensive anesthesia in FESS in several studies, though the advantage of one over the other is yet to be properly established as many studies have not been conducted so far, comparing them [17-20].

This study was thus conducted to compare the efficacy of Propofol and Sevoflurane for controlled hypotension in FESS, along with assessing their effects on the amount of intraoperative blood loss, condition of the surgical field and overall surgeon's satisfaction.

Materials and Methods

After getting the institutional ethics committee approval, this prospective, parallel-group interventional study was carried out among a total of 100 patients. Age between 16-50 years, of either sex, ASA physical Status I or II,

Mallampatti Score 1 or 2 and posted for endoscopic sinus surgery expected to be done within one and half to two hours were included in the study. On the other hand, patients who refused to participate, were posted for emergency surgeries, expected difficult intubation, pregnancy, alcohol and drug abuse, allergic to the study drugs and patients who refused to participate were excluded from the study.

A thorough preanesthetic checkup was done for all the included patients after taking their written informed consent. Patients were then, randomly divided by computer generated random number into two equal groups, Group P (Propofol) and Group S (Sevoflurane) with 50 patients in each of them. Among those, 8 patients, with 4 in each group were cancelled due to various reasons ranging from unexpected difficult intubation to sudden hypertension on operation table.

Once the patients entered the operating room, ASA standard monitors were attached, and baseline vitals, including heart rate (HR), systolic, diastolic and mean blood pressures (SBP, DBP, MAP) and SpO2 were monitored. Two intravenous lines were secured, one for infusion of Propofol and the other for administration of fluids and other drugs. All the patients were started with Lactated Ringers solution and after preoxygenation with 100% oxygen, patients were premedicated with fentanyl (1 µg/kg) and induced with 2 mg/kg of Propofol. After ensuring adequate ventilation muscle relaxation was done by Vecuronium 0.08 to 0.1 mg/kg.

The oropharynx was packed with a saline soaked throat pack following endotracheal intubation with a standard sized PVC cuffed tube. Maintenance of anesthesia was done with 66% N2O in 33% O2 along with one of the followings -

Patients in Group P received Infusion Propofol starting at 12 mg/kg/hr for 10 minutes followed by 10mg/kg/hr for the next 10 minutes and then continued at 8 mg/kg/hr.as per the Bristol regimen.22 whereas those in Group S received Sevoflurane at a dial concentration of 2%. Both the groups aimed a target MAP as 65 – 75mmHg.

In patients of either group, who failed to achieve the targeted mean arterial pressure, the vasodilator nitroglycerine was used as infusion and the dose was moderated to the effect.

Any episode of further hypotension, defined by MAP < 65mmHg was treated with a bolus of IV fluids and IV Mephenteramine 6mg bolus.

If MAP > 75mmHg, assessment of case profile was done and Inj Fentanyl 1 µg/kg and/or Inj. Vecuronium 1mg were repeated. If there was still no expected response, then Nitroglycerine (NTG) infusion at 0.3µg/kg/min was started which was then further increased by 0.3µg/kg/min with an interval of 5 min to allow equilibration of serum therapeutic levels.

Any event of tachycardia or bradycardia was managed with Inj. Esmolol or Inj. Atropine respectively.

Both Sevoflurane and Propofol infusion were stopped about 10 minutes before the end of the procedure. Reversal was done with Inj. neostigmine 50 µg/kg + Inj. Glycopyrrolate 8 µg/kg.and

Intraoperative assessment of HR, SBP, DBP, MAP, SpO2 were made every 5 minutes, whereas quality of surgical field (Fromme Boezzart scale) and Surgeon's satisfaction was checked at 30 and 60 minutes [21].

For the assessment of blood loss during the surgery, the blood suctioned from the surgical area was collected in a suction bottle to which heparin was added. Additionally, the nasal gauze packs soaked with blood were also counted.

Each gauze strip measured 4 inches long and ½ inch wide were considered to hold 2 ml of blood and partially soaked gauze strip were considered to hold 1 ml of blood. A preoperative Haemoglobin and a postoperative one, 6 hours after the surgery, were also

measured in each patient and they were compared to detect the difference as another mode to assess the amount of intraoperative blood loss.

Among the postoperative adverse effects sedation, nausea, vomiting, bradycardia and hypotension were taken into consideration.

The sample size was calculated based on the previous study by Ahn HJ,Chung SK,Dhong HJ[8]. Taking the significant level as 0.05, power as 80% and difference between mean as 9.4 and standard deviation in both groups as 5.67 and 5.67 respectively, the required sample size was calculated as 46 in each group making the total sample size 92 which was converted to a round figure and the total sample size of 100 with 50 in each group was finally taken. After calculating the dropouts of eight patients the final calculation was done.

Regarding the final analysis, the variables were entered into SPSS, version 20, statistical software for analysis and the differences in the proportions were tested for statistical significance using non parametric chi-square test for variants measured on nominal scale. When testing for two groups, student "t" test was used to test for statistical significance in the differences of the two means. A p-value of <0.05 was considered as statistically significant.

Results

Table 1 shows that both the groups were comparable demographically.

Table 1: Distribution of study subjects according to mean (SD) age, gender and ASA among the groups of patients

Criteria		Group S (n = 46)	Group P (n = 46)	p value
Age in years (Mean ± SD)	16-20	10 ± 21.74	12 ± 26.09	0.908
	21-30	32 ± 69.57	29 ± 63.04	
	31-40	2 ± 4.35	3 ± 6.52	
	41-50	2 ± 4.35	2 ± 4.35	
Sex	Male	20 ± 43.48	17± 36.96	0.524
	Female	26 ± 56.52	29 ± 63.04	
ASA	I	42 ± 91.3	42 ± 91.3	1.000
	II	4 ± 8.7	4 ± 8.7	

Table 2 shows the distribution of heart rates in both the groups in the measured time frames. Heart rates were significantly higher in Group S at 15, 20 and 25 minutes.

Table 2: Distribution of heart rate among the patients

Time (minutes)	Group S (n = 46) (Mean ± SD)	Group P (n = 46) (Mean ± SD)	p value
Baseline	84.50 ± 10.57	84.43 ± 10.34	0.994
5	88.39 ± 9.29	88.35 ± 9.35	0.912
10	88.00 ± 7.61	87.96 ± 7.78	0.930
15	97.74 ± 11.64	84.78 ± 4.35	**<0.001**
20	94.13 ± 9.94	84.43 ± 4.75	**<0.001**
25	93.17 ± 10.03	85.78 ± 4.90	**<0.001**
30	87.39 ± 7.62	85.91 ± 5.42	0.633
40	88.26 ± 6.97	86.61 ± 5.58	0.378
50	86.54 ± 6.13	87.26 ± 5.32	0.221
60	83.04 ± 4.78	79.91 ± 5.15	**0.010**

Table 3 compares the distribution of MAP in the two groups. MAP was significantly higher in Group S from 15 minutes onwards, whereas it was well maintained in Group P.

Table 3: Distribution of Mean arterial Pressure (MAP) among the patients

Time (minutes)	Group S (n = 46) (Mean ± SD)	Group P (n = 46) (Mean ± SD)	p value
Baseline	88.33 ± 9.10	88.63 ± 4.60	0.268
5	88.34 ± 9.09	88.65 ± 4.58	0.266
10	83.80 ± 8.03	81.67 ± 4.94	0.541
15	83.41 ± 6.00	70.13 ± 5.05	**<0.001**
20	82.72 ± 6.15	69.70 ± 3.42	**<0.001**
25	82.48 ± 6.88	69.00 ± 3.60	**<0.001**
30	82.33 ± 6.79	67.65 ± 4.12	**<0.001**
40	80.96 ± 4.53	68.04 ± 3.68	**<0.001**
50	80.52 ± 4.27	72.26 ± 3.90	**<0.001**
60	79.41 ± 5.18	77.35 ± 4.11	**0.006**

Comparison between Surgeon's Satisfaction Score and Surgical Field status are done in Table 4, which shows all the Criteria were significantly better in Group P than Group S.

Table 4: Comparison of Surgeon's Satisfaction, Surgical Field and Sedation Score between Groups S and Group P

Criteria		Group S (n = 46) (Mean ± SD)	Group P (n = 46) (Mean ± SD)	p value
Surgeon's Satisfaction Scale	30 minutes	2.46 ± 0.55	2.91 ± 0.76	**0.004**
	60 minutes	3.35 ± 0.67	3.26 ± 0.71	0.572
Surgical Field	30 minutes	2.80 ± 1.02	2.00 ± 0.73	**<0.001**
	60 minutes	1.02 ± 0.71	0.59 ± 0.50	**0.003**

As per Table 5, intraoperative blood loss and decrease in postoperative Hb% were both significantly more in Group S.

Table 5: Comparison between the amount of blood loss and the difference between preop Hb and postop Hb between Groups S and Group P

Criteria	Group S (n = 46) (Mean ± SD)	Group P (n = 46) (Mean ± SD)	p value
Blood Loss (in ml)	301.83 ± 99.31	154.30 ± 32.70	**<0.001**
Difference between preop Hb and postop Hb (in gm/dl)	2.21 ± 0.90	0.31 ± 0.17	**<0.001**

Table 6 shows the incidences of adverse reactions in either group. Significantly higher number of patients in Group S had incidences of Nausea and Sedation. Bradycardia was little more in Group P, whereas Hypotension was more in Group S, though these two were statistically insignificant.

Table 6: Comparison between the postoperative adverse events between Groups S and Group P

Criteria	Group S (n = 46) Number (Percentage)	Group P (n = 46) Number (Percentage)	p value
Nausea	13 (28.26)	0 (0)	**<0.001**
Sedation	13 (28.26)	29 (63.04)	**0.001**
Bradycardia	8 (17.39)	10 (21.74)	0.599
Hypotension	15 (32.61)	7 (15.22)	0.051

Discussion

The mainstay of surgical management of chronic rhinosinusitis in recent times is Functional endoscopic sinus surgery (FESS), the success of which is highly dependent on a bloodless surgical field. The primary goal of an anaesthesiologist in FESS procedure thus, is to provide better surgical access by creating a blood less operating field along with conducting a balanced anaesthesia and prompt recovery. To provide a blood less operating field, venous, capillary and arterial bleeding needs to be controlled. A 15-20º reversed Trendelenberg position and uses of decongestants nasal packs can take care of the first two respectively, whereas induced hypotension is considered the gold standard to reduce the mean arterial pressure to around 70 mmHg. Among the various agents for achieving the last, Propofol and Sevoflurane have been widely used globally.

This study was done to compare the efficacy of Sevoflurane and Propofol as maintenance anaesthesia in reducing intra operative blood loss and improving the surgical field.

In this study, the two comparable groups received the same mode of induction with similar dosage of drugs. Intraoperative mean arterial pressure was maintained around 65 -75 mmHg with the use of a deep plane of anaesthesia with either sevoflurane or propofol. In patients who failed to achieve the targeted mean arterial pressure, the vasodilator nitroglycerine was used.

The mean arterial pressure was significantly higher in Group S from 15 minutes onwards whereas the intraoperative heart rate was also found to be lower in Group P. Thus, a comparable number of patients in Group S required nitroglycerine infusion for maintaining the intraoperative mean arterial pressure at around 70 mmHg.

In the evaluation of the surgical field by surgeon using Fromme Boezzart scale, Group P provided a better score over Group S [21].

There was also a marked difference in the intra operative blood loss between the two groups with Group P providing less blood loss.

Chaaban *et al* in a Prospective randomized study in 33 patients studied blood loss during Endoscopic sinus surgery comparing Propofol with Sevoflurane and found that blood loss per hour in the TIVA group was 78.5ml/hr whereas that in the Sevoflurane group was 80.3ml/hr [22]. The Propofol group had a lower rate of blood loss compared with the Sevoflurane group.

Miłoński J *et al* in their study between 3 groups using Sevoflurane-Fentanyl, Sevoflurane-Remifentanil and Propofol-Remifentanil concluded that Propofol-Remifentanil group had a better control of perioperative bleeding [23].

Ajula KS *et al* in their study comparing Isoflurane based inhalational Anesthesia (IA) with TIVA with Propofol in FESS, concluded that TIVA with propofol caused lesser blood loss than using Isoflurane [24].

However, in a study by Yoo HS *et al* using Propofol-Remifentanil, Sevoflurane-Remifentanil and Desflurane-Remifentanil in FESS, no significant difference in surgical grade scores were found among the three groups [25].

Total intravenous anaesthesia (TIVA) with propofol, compared to inhaled anaesthesia (IA), has been proposed to reduce bleeding and improve surgical field quality during endoscopic sinus surgery (ESS), but prior meta-analyses have not been conclusive TIVA with propofol, in comparison to IA, may improve surgical field quality, reduce blood loss, and decrease operative time for ESS. Remifentanil is the preferred short-acting opioid for TIVA in ESS.

Jigisha B Mehta, Vandana Parmar in their study produced controlled hypotension with propofol and isoflurane and compared

intraoperative blood loss, duration of surgery, operative field condition [26]. They concluded that both propofol and isoflurane were effective in producing controlled hypotension, but anaesthesia with propofol was associated with less blood loss, shorter duration of surgery and better surgical field condition compared to isoflurane.

In their study, Ajula KS *et al* also compared surgical fields between Isoflurane based inhalational anesthesia and TIVA with Propofol24. They came to the conclusion that there was improved quality of surgical field at the end of surgery in Propofol group than that in Sevoflurane group.

Intra operative problems like hypertension, arrhythmia, tachycardia and ischemia were not encountered in either of the groups. Postoperative complications like nausea was encountered more in Group S but sedation was found more in Group P, both of which were statistically significant.

Conclusion

Sevoflurane and Propofol both produce excellent intra-operative conditions during anaesthesia for FESS however, Propofol provided a lower intraoperative mean arterial blood pressure and lower heart rates, which were more ideal for induced hypotensive states, resulting in lesser intra operative blood loss with better visualization of the surgical field. Thus, from this study we can conclude that Propofol based anaesthesia is overall better than Sevoflurane based anaesthesia during Functional endoscopic sinus surgery (FESS).

References

1. Stankiewicz JA. Complications of endoscopic intranasal ethmoidectomy. Laryngoscope 1987;97:1270-3.
2. Robert slack, Grant Bates.Functional endoscopic sinus surgery. Laryngoscope1990;10.
3. Van Aken H, Edward D. Deliberate hypotension. In: Ronald D Miller ed. Millers Anesthesia. Jr 8th edition, 2016.
4. Barash PG. Inhaled Anesthetics. In: PaulG Barash ed. Clinical Anesthesia. 8th edition 2009;415.
5. JH Ryu.Controlled hypotension for middle ear surgery: a comparison between remifentanil and magnesium sulphate. Br J Anaesth;2009-academic.oup.co.
6. N. M. Elsharnouby. Magnesium sulphate as a technique of hypotensive anaesthesia. Br J Anaesth 2006; 96 (6):727-731.
7. Wormald PJ, Van Renen G, Perks J, Jones JA, Langton-Hewer CD. The effect of total intravenous anaesthesia compared with inhalational anaesthesia on the surgical field during endoscopic sinus surgery. Am J Rhinol 2005;19(5):514-20.
8. Ahn HJ, Chung SK, Dhong HJ, Kim HY, Ahn JH, Lee SM, Hahm TS, Kim JK. Comparison of surgical conditions during propofol or sevoflurane anaesthesia for endoscopic sinus surgery. Br J Anaesth. 2008;100(1):50-4.
9. Toivonen J, Kaukinen S. Clonidine premedication: a useful adjunct in producing deliberate hypotension. Acta Anaesthesiol Scand 1990;34:653-7.
10. Maroof M, Khan RM, Bhatti TH. Clonidine premedication for induced hypotension with total intravenous anaesthesia for middle ear microsurgery. Can J Anaesth 1994;41:164-5.
11. Bayazit Dikmen, Fazilet Sahin, Dilsen Ornek, Yasar Pala, Oya Kilci, Eyup Horasanli, Mehmet Canturk Anesthesiology and Reanimation Clinic, Ankara Training & Research Hospital, Turkey. Dexmedetomidine for Controlled Hypotension In Middle Ear Surgery with Low-Flow Anesthesia.. Int. Adv. Otol. 2010;6(3):331-336.
12. Boezaart AP,Vander Merwe J , Coetzee A .Comparison of sodium nitroprusside and esmolol-induced controlled hypotension

for functional endoscopic sinus surgery. Can J Anaesth 1995;42: 373-6.
13. Turan G, Dincer E, Ozgultekin A, Uslu C, Ormanci F, Akgun N. Comparison Of Dexmedetomidine, Remifentanil And Esmolol In Controlled Hypotensive Anaesthesia. Eur J Anesthesiol. 2008;25:65-66.
14. Leticia Delgado – Herrera, Randall D. Ostroff and Sharon A. Rogers. Sevoflurane: Approaching the ideal inhalational anaesthetic – A pharmacologic, pharamacoeconomic and clinical review. CNS Drugs Reviews: 7(1):48-120:
15. Cafiero T, Cavallo LM, Franqiosa A, Burrelli R, Garqiulo G, Cappabianca P, de Dvites E. Clinical comparison of remifentanil-sevoflurane versus remifentanil propofol for endoscopic endonasal transsphenoidal surgery. Eur J Anaesthesiol 2007 May; 24(5):441-6.
16. Manola M, De Luca E, Moscillo L, Mastella A. Using remifentanil and sufentanil in functional endoscopic sinus surgery to improve surgical conditions. ORL J Otorhinolaryngol Relat Spec March 2005; 67(2):83-6.
17. 15. Leopold H J Eberhart, Benedikt J. Folz, Hinnerk Wulf, Golz Geldner. Intravenous anaesthesia provides optimal surgical conditions during microscopic and endoscopic sinus surgery. Laryngoscope 2003 Aug; 113(8):1369-73.
18. Pavlin JD, Colley PS, Weymuller EA Jr, Van Norman G, Gunn HC, Koerschgen ME. Propofol versus isoflurane for endoscopic sinus surgery. Am J Otolaryngol 1999; 20(2):96-101.
19. Kolia NR, L-X Man. Total intravenous anaesthesia versus inhaled anaesthesia for endoscopic sinus surgery: a meta-analysis of randomized controlled trials. Rhinology 2019 1;57(6):402-410.
20. Nimmo AF, Absalom AR, Bagshaw O, Biswas A, Cook TM, Costello A, Grimes S, Mulvey D, Shinde S, Whitehouse T, Wiles MD. Guidelines for the safe practice of total intravenous anaesthesia (TIVA). Joint Guidelines from the Association of Anaesthetists and the Society for Intravenous Anaesthesia. Anaesthesia. 2018;74(2):211-224.
21. Fromme GA, MacKenzie RA, Gould AB, Lund BA, Offord KP. Controlled hypotension for orthognathic surgery. Anesth Analg. 1986;65(6):683–686.
22. 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(5):510–514.
23. Miłoński, J, Zielińska-Bliźniewska H., Golusiński, W. *et al.* Effects of three different types of anaesthesia on perioperative bleeding control in functional endoscopic sinus surgery. Eur Arch Otorhinolaryngol 2013;270:2045–2050.
24. Aujla KS, Kaur M, Gupta R, Singh S, Bhanupreet, Tavleen. A study to compare the quality of surgical field using total intravenous anesthesia (with propofol) versus inhalational anesthesia (with isoflurane) for functional endoscopic sinus surgeries. Anesth Essays Res 2017;11:606-10.
25. Yoo HS, Han JH, Park SW, Kim KS. Comparison of surgical condition in endoscopic sinus surgery using remifentanil combined with propofol, sevoflurane, or desflurane. Korean J Anesthesiol. 2010;59(6):377-82.
26. Mehta JB, Parmar V, Oza V. Comparison of different methods of general anaesthesia for controlled hypotension in functional endoscopic sinus surgery (FESS). Indian Journal of Clinical Anaesthesia, 2018;5(4):523-528.