Original Research Article

Comparison of quality of surgical field and hemodynamic changes with total intravenous anaesthesia and monitored anaesthesia care using local anaesthesia with conscious sedation in patients undergoing elective endoscopic sinus surgery for fungal granuloma

Sanjeev Kumar Singla[1*], Ankush Singla[2], SK Malhotra[3], Shiv Lal Soni[4], Parul Gupta[5]

[1,2]Assistant Professor, Department of Anaesthesia and Intensive Care Adesh Institute of Medical Sciences and Research Bathinda, House no.13, North Estate, Bathinda, Punjab-151001, INDIA.
[3]Professor, Department of Anaesthesia, and Intensive Care Maharshi Markendeshwer Institute of Medical Sciences and Research Molana, Punjab, INDIA.
[4]Assistant Professor, [5]Senior Resident, Department of Anaesthesia and Intensive Care Post Graduate Institute of Medical Education and Research, Chandigarh -160012, INDIA.
Email: ankush.singla54@gmail.com, drskmalhotra@yahoo.com, dr.shivsoni@gmail.com, parul.gpt123@gmail.com

Abstract

Background: The sinus disease is common among all age groups. The approach to sinus disease with endoscopic procedures has gained wide spread acceptance among otorhinolaryngologists. Currently, ESS is commonly performed as a day care procedure. The anaesthetic technique should also be selected on this basis. The anaesthetic agents of choice should have a short duration of action so that there is rapid recovery of the patient after the surgical procedure and patient is fit for early discharge. **Materials and Methods** -This prospective randomized open level study was conducted in 30 ASA I-II patients of either sex, 20-50 years of age, undergoing elective ESS. All the patients were divided into two groups according to the randomized table using card method. GROUP 1: This group included 15 patients undergoing ESS using TIVA with propofol and GROUP 2: This group included patients who were given monitored anaesthesia care using local anaesthesia and conscious sedation. In this group, patients who did not tolerate the procedure under this technique were converted to TIVA group. **Results:** In our study we had to rescue one female patient in group 2 with TIVA. The duration of surgical procedure was 67.00±6.21 minutes in group 1 patients and 50.00 ±11.18 min in group 2 patients. This result was statistically significant. The surgical field score was between 2 and 3 in both the groups. But in group 1, 8 (53%) patients had a score of 2 and seven (47%) had a score of 3. In group 2, 14 (93%) patients had a score of 2 and one (7%) patient had a score of 3. This was statistically significant ($p<0.05$). **Conclusion:** The duration of endoscopic sinus surgery is significantly less and surgical field conditions in terms of bleeding are better despite high mean arterial blood pressure when performed under monitored anaesthesia care and local anaesthesia as compared to total intravenous anaesthesia.

Key Word: fungal granuloma.

[*]**Address for Correspondence:**
Dr Ankush Singla, Assistant professor, adesh Institute of Medical Sciences and Research, Bathinda, House no. 13, North Estate, Bathinda, 151001.
Email: ankush.singla54@gmail.com

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INTRODUCTION

The sinus disease is common among all the age groups. The approach to sinus disease with endoscopic procedures has gained wide spread acceptance among otorhinolaryngologists. This technique enhances surgeon's ability to treat both limited and wide spread disease by providing excellent illumination and visualization[1] The various procedures performed by endoscopic sinus surgery (ESS) include infundibulotomy, ethmoidectomy, turbinectomy, maxillary sinostomy, septoplasty, rhinoplasty etc. The surgery for chronic sinusitis is mainly performed microscopically and endoscopically through transnasal route.[2] Currently, ESS is commonly performed as a day care procedure.[3] The anaesthetic technique should also be selected on this basis. The anaesthetic agents of choice should have a short duration of action so that there is rapid recovery of the patient after the surgical procedure and patient is fit for early discharge. Additional consideration for ESS is bloodless field during anaesthesia and surgery because even small amount of bleeding can hinder the confined area of visibility. Most of the patients undergoing ESS have inflamed tissues in nasal cavities and there is increase in the vascularity of these inflamed tissues due to the disease process. This hinders the view of surgical filed because of increased bleeding during this procedure.[2] To provide optimal surgical field and patient's comfort is the most important intraoperative consideration of anaesthetic technique selected for this procedure.[4] Keeping these considerations in view ESS has been performed under total intravenous anaesthesia (TIVA) using propofol or monitored anaesthesia care with local anaesthesia and conscious sedation.[5,6] The advantages of TIVA include good intraoperative analgesia, does not require patient cooperation and reduces the risk of aspiration of secretions, blood or irrigation fluids. However the patient is not able to communicate early symptoms of any complication that may occur during the procedure like orbital penetration. It only depends upon the skill of the surgeon to detect and prevent any such complication. There is limited literature available comparing these two techniques of anaesthesia for ESS and in the absence of a clearly defined guidelines, the choice of anaesthesia is frequently left to the surgeon's and patient's subjective preference. Hence, we have planned this study to compare the hemodynamic changes and the quality of surgical field under TIVA with monitored anaesthesia care using local anaesthesia and conscious sedation in patients undergoing elective ESS.

Statistical Analysis: Demographic data was compared using Student's t-test and Chi-square test. Data was expressed as mean $\pm$ SD. Chi square test was used for analysis of quality of surgical field and student's t-test was applied for analysis of hemodynamic changes. p value of < 0.05 was considered as statistically significant.

MATERIALS AND METHODS

After clearance from the Institutional Ethics Committee, this prospective randomized open level study was conducted in 30 ASA I-II patients of either sex, 20-50 years of age, undergoing elective ESS over a period of 2 years. Patients with bleeding disorder, receiving anticoagulants and with a history of allergy to local anaesthetics were excluded from the study. All the patients underwent preoperative anaesthetic evaluation prior to elective surgery in the PAC clinic. All patients were kept nil per os for 8 hours and premedicated with tablet diazepam 0.15 mg/kg, an evening before and on the morning of surgery. After arrival in the operation theatre, standard monitoring included ECG, NIBP and SpO_2. Intravenous line was secured and normal saline was started at 2ml/kg/min. All the patients were divided into two groups according to the randomized table using card method.

GROUP1: This group included 15 patients undergoing ESS using TIVA with propofol. All the patients in this group received Fentanyl 1-2 µg/kg body weight intravenously for analgesia. They were induced using proprofol 2mg/kg body weight and tracheal intubation was facilitated by vecuronium 0.1mg/kg body weight given intravenously. Subsequently, anaesthesia was maintained with continuous propofol infusion of 50-100 µg/kg /min and 66% nitrous oxide in oxygen was used with intermittent positive pressure ventilation. Infusion rate of propofol was titrated to hemodynamic parameters. However, no more than 8 mg/kg/hour of propofol was given. At the end of the procedure, propfol infusion and nitrous oxide were stopped. Neuromuscular blockade was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg and trachea was extubated when the patient was fully conscious and able to protect his airway.

GROUP 2: This group included patients who were given monitored anaesthesia care using local anaesthesia and conscious sedation. The local anaesthesia was given with

2% lignocaine with 1:200000 adrenaline by infiltration technique by the surgeon. The dose of lignocaine did not exceeded 7mg/kg using the above solution. Conscious sedation was given with fentanyl 1-2 µg/kg body weight and midazolam 0.02-0.04 mg/kg body weight intravenously in titration to patient's response. In this group, those patients who did not tolerate the procedure under this technique were converted to TIVA as described for group 1 patients. The number of such rescued patients was noted. In both the groups, heart rate by ECG, $SpO_2$by pulse oximetry and systolic/mean/diastolic blood pressures by non-invasive blood pressure were recorded at 5 minutes intervals intraoperatively and hourly postoperatively till the patients were shifted out of the recovery. In addition, any intraoperative or postoperative complication or side effect was noted in both the groups.

Subjective assessment of blood loss was done by the surgeon according to 6 point scale adapted from Fromme *et al*[7]

1. Stands for no bleeding (cadaveric condition
2. Slight bleeding and no suction required
3. Slight bleeding, occasional suctioning required
4. Moderate bleeding frequent suctioning is required; bleeding threatens surgical field a few seconds after suction is removed.
5. Moderate bleeding, frequent suctioning required; bleeding threatens surgical field directly after suction is removed
6. Severe bleeding, constant suctioning required; appear faster than can be removed by suction surgical field severely threatened.

Ideal categories scale values for surgical field were considered in those patients who fell between scale 2 and 3.

RESULTS

In this prospective, randomized, open level study, 30 patients of ASA status I-II, undergoing elective ESS for fungal granuloma, were included. Patients were randomly divided into two groups. Group 1 (TIVA) and Group 2 (MAC). One female patient in group 2 was rescued and was enrolled in the study in group 2 for statistical comparison.

Table 1: Demographic data

Parameter	Group 1	Group 2	P-value
Age (years) (Mean ± SD)	35.66±11.96	33.86±10.85	0.666
Weight (Kg) (Mean± SD)	58.00±10.16	58.47±8.33	0.892
Sex (M/F)	9/6	13/2	0.125
ASA (I/II)	13/2	14/1	1.000

Table 2: comparison between two Groups

	Group 1 (Mean± SD)	Group 2 (Mean ± SD)	P-Value
Duration of Surgery (min)	67.00±6.21	50.00±6.21	0.000*
GOSF	(n=15)	(n=15)	
2	8(53%)	14(93%)	0.035*
3	7(47%)	1(7%)	

*P<0.05, statistically significant

Hemodynamic parameters: The intraopertive hemodynamic changes including heart rate, systolic /diastolic/ mean blood pressure and SpO_2 were as follows.

Table 3: comparison of heart between two groups

Time (min)	Group 1 (Mean± SD)	Group 2 (Mean±SD)	P-Value
0	84.67±8.49 (n=15)	78.33±9.39 (n=15)	0.062
10	88.00±11.60 (n=15)	77.53±8.99 (=15)	0.010*
20	79.13±7.26 (n=15)	78.27±7.03 (n=15)	0.742
30	75.87±6.58 (n=15)	78.73±7.17 (n=15)	0.264
40	77.60±7.08 (n=15)	80.08±8.00 (n=13)	0.393
50	77.93±4.87 (n=15)	79.00±7.65 (n=8)	0.686
60	81.84±6.97 (n=13)	79.67±8.08 (n=3)	0.277
70	86.89±5.90 (n=9)	87.00±0.00 (n=1)	0.286
75	82.50±10.60 (n=2)	88.00±0.00 (n=1)	0.745

*P<0.05, statistically significant

Table 4: Comparison of mean blood pressure between two group

Time (min)	Group 1 (Mean±SD)	Group 2 (Mean±SD)	P-value
0	95.60±6.31 (n=15)	91.33±6.52 (n=15)	0.080
10	97.80±11.52 (n=15)	90.60±6.89 (n=15)	0.047*
20	83.13±9.16 (n=15)	89.26±4.65 (n=15)	0.029*
30	81.87±7.96 (n=15)	91.06±7.55 (n=15)	0.003*
40	84.00±7.60 (n=15)	93.46±7.16 (n=13)	0.002*
50	83.93±7.86 (n=15)	96.37±9.75 (n=8)	0.003*
60	90.84±9.22 (n=13)	98.33±5.50 (n=3)	0.205
70	99.55±8.36 (n=9)	96.00±0.00 (n=1)	0.697
75	99.00±8.48 (n=2)	91.00±0.00 (n=1)	0.582

*P <0.05 statistically significant

Group1 (TIVA) included 15 patients, out of which 9 were male and 6 were female, mean age was 35.66±10.16 years, mean weight was 58±10.16 Kg. Propofol was used for induction and maintenance of anaesthesia. For maintenance, we used propofol maximum up to the dose of 8mg/kg/hr. Thirteen patients belonged to ASA I status and 2 patients belonged to ASAII status. All ASA II the patients were suffering from hypertension.

Group2 (MAC) included 15 patients, out of which 13 were male and 2 were female, mean age was 33.86±10.85 years, mean weight was 58.47±8.33. Fourteen patients were of ASA I status and 1 patient was of ASA II status. ASA II patient was suffering from hypertension. We used fentanyl up to 2 µg/kg intravenously for analgesia and midazolam upto 0.04 mg/kg intravenously for sedation. None of the patient was over sedated. In our study, we had to rescue one female patient with TIVA. The duration of surgical procedure was 67.00±6.21 minutes in group 1 patients and 50.00±11.18 minutes in group 2 patients. This was statistically significant. The surgical field score was between 2 and 3 in both the groups. But in group 1, 8 (53%) patients had score of 2 and 7 (47%) had a score of 3. In group 2, 14 (93%) patients had a score of 2 and one (7%) patient had a score of 3. This was statistically significant ($P<0.05$).

Hemodynamic Changes: Heart rate was greater in group 1 at 5 and 10 minutes. This was due to intubation response. Mean blood pressure was higher in group 1 patients at 10 min. of procedure. But after 20 min. of procedure, these were higher in group 2 patients upto 55 min. of the procedure. These were statistically significant ($P<0.05$). This was due to maintenance of depth of anaesthesia in group 1 patients, but the anaesthetic depth was same in group 2 patients throughout the procedure. The arterial oxygen saturation by pulse oximetry was comparable between the two groups. Although, mean blood pressure was greater than 80 mmHg in group 1 patients, the quality of surgical field was within the ideal scale. In group 2 patients, the mean blood pressure was greater than 89 mmHg, despite this, the quality of surgical field was better than group 1 in this group ($P=0.035$). The statistical significance of high blood pressure in group 2 after 45 minutes is not of relevance as the number of participating patients in study was different after 45 minutes. In more number of patients in this group, the surgery was over. Hence, the comparison of the two groups beyond this time period is not likely to yield results with valid significance.

DISCUSSION

Endoscopic sinus surgery is an increasingly popular technique being employed for the treatment of both limited and widespread sinus disease by providing excellent illumination and visualization.[8,9] Chronic and recurrent acute sinusitis, nasal polyposis, CSF leaks, orbital decompression and spheno-ethmoidectomy are some of the conditions for which ESS is commonly employed. [10-13]Excessive bleeding that occurs due to the rich vascularity of the nose not only makes the surgical procedure difficult and lengthy but also, increases the incidence of the complications such as orbital perforation or dural puncture, bleeding and medial rectus muscle injury.[14,23] In order to avoid these problems, hypotensive anaesthesia is usually employed during ESS. Various drugs used for this purpose include sodium nitroprusside, nitroglycerine, βblockers like esmolol, metoprolol and atenolol, high doses of inhalational agents like halothane and isoflurane.[19-22] But, none of the above mentioned agents have been unequivocally accepted[2] Each hypotensive technique is associated with specific disadvantages. These comprise of reflex tachycardia, rebound hypertension, tachyphylaxis and cyanide intoxication following sodium nitroprusside administration, myocardial depression with β- blockers and delayed recovery after use of high doses of inhalational agents. Besides this, reverse trendelenberg position and local vasoconstrictors are also employed to reduce the venous congestion. ESS can be performed under general anaesthesia or local anaesthesia with conscious sedation[15,16] TIVA is commonly preferred by the surgeons in order to avoid any patient movement at a critical stage of endoscopic manipulation, where patients are unco-operative , anxious or grossly advanced disease.[18] We had conducted this study to compare the quality surgical field and the hemodynamic changes under TIVA with monitored anesthesia care using local anaesthesia and conscious sedation in patients undergoing elective ESS for fungal granuloma We had chosen the single disease fungal granuloma because it is the most common disease for which ESS is performed in our institute and also for the uniformity for surgical field comparison because bleeding may be more or less in different surgical procedures. The technique was performed by the same surgeon to decrease the subjective error in determining the grade of surgical field. Endoscopic sinus surgery is commonly performed surgical procedure both under TIVA and MAC with local anaesthesia. There is no scientific literature available at present regarding the haemodynamic changes and quality of surgical field taken together during TIVA and MAC in patients undergoing this procedure. We conducted this study to compare these aspects in 30 fungal granuloma patients undergoing ESS by the same surgeon. In our study, all the 30 patients were of ASA physical status I-II, aged 20-50 years and belonged to both sexes. They were randomly divided into two groups, Group 1 (TIVA),

Group 2 (MAC). One female patient in group 2 was given TIVA due to non cooperation. The data of this patient was excluded from statistical comparison and one another patient was enrolled in the study in group 2. The patients in both the groups were comparable in their demographic data like mean age, mean weight, ASA status and baseline hemodynamic parameters. The duration of surgical procedure was more in group 1 patients than group 2 patients. This duration in group 1 was significantly greater than group 2 because of the preparation for the general anaesthesia, more bleeding during the procedure and the time taken for recovery after anaesthesia. The surgical field score was between 2 and 3 in both the groups. However, in group 1, 53% had a score of 2 and 47% had a score of 3 as compared to group 2 where 93% had a score of 2 and 7% had a score of 3. This indicates significantly more bleeding in group 1 as compared to group 2 due to vasodilatation in local area under TIVA. The heart rate and mean arterial blood pressure was significantly higher in group 1 patients than group 2 patients at 10 min of procedure. This was due to sympathetic response during laryngoscopy. However, after 20 min of the surgical procedure the mean arterial blood pressure in group 1 was significantly lower than group 2. This can be due to vasodilatory effect of TIVA. Despite lower mean blood pressure in group 1 and higher mean blood pressure in group 2, the bleeding in group 2 was less. This may be due to application of vasoconstrictive solution to the local area in group 2 patients. After the surgery was complete, nasal packing was done which makes it necessary that the patient should breathe through his mouth. This needs to be explained to the patient during preanaesthetic checkup. Also, it should be made sure that the patient is fully awake with laryngeal and pharyngeal reflexes intact so as to avoid aspiration in the immediate postoperative period following extubation and this procedure is done usually on day care basis, therefore, short acting anaesthetic agents should be used.[26] The ESS performed under monitored anaesthesia care using local anaesthesia and conscious sedation was associated with lesser operative time, lesser blood loss, better quality of surgical field, decreased cost of surgery and no airway instrumentation. The results of our study were comparable to previous study by Fodok *et al*.[6] There were no complications as a result of surgical procedure or anaesthesia in both the groups.

CONCLUSION

The duration of endoscopic sinus surgery is significantly less as well as surgical field conditions in terms of bleeding are better despite high mean arterial blood pressure when performed under monitored anaesthesia care and local anaesthesia as compared to total intravenous anaesthesia. However, endoscopic sinus surgery under monitored anaesthesia care with local anaesthesia requires cooperation of the patient. This may not be a suitable anaesthetic technique for anxious and uncooperative patients.

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