

Original Article

The Effect of Pterygopalatine Fossa Block (PPFB) during Endoscopic Sinus Surgery (ESS) on Intraoperative Bleeding: A Randomized Control Trial

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Abstract

Background: Bleeding is the frequent intraoperative complication in most of the surgeries and remains a challenge for the surgeons and anesthesiologists. Major blood loss during FESS is rare but even a small amount of bleeding disturbs the endoscopic surgery field, increases the likelihood of complications, lengthens the time of surgery and results in incomplete surgery. The greater palatine canal (GPC) local injection is used to limit posterior bleeding during sinus surgery.

Objective: To study the effect of pterygopalatine fossa block on intraoperative bleeding and operative field optimization during endoscopic sinus surgery.

Methods: Prospective double blind randomized control trial. Thirty six patients were recruited in the study who also acted as their own control. PPFB was done only on one side of the nostril and the side was randomized by the lottery; neither the patient nor the operating surgeons were aware of the laterality. Boezaart score was used to quantify the intra-operative blood loss.

Results: Blood loss between block group and non-block group was compared. Patients in block group had more stable hemodynamics with no fluctuations, better visibility of the surgical field and decreased blood loss as compared with non-block group.

Conclusion: Greater palatine fossa block is a useful adjunct in patients undergoing endoscopic sinus surgery. It provided more stable hemodynamics, good operative conditions by lowering blood loss.

Key words: Bleeding, FESS, Pterygopalatine

Introduction

Bleeding is the frequent intraoperative complication in most of the surgeries and remains a challenge for the Surgeons and Anaestheologists. It hinders the adequate visualization of the surgical field (VSF) and, thus, increases the rate of complications. Surgical bleeding is even more relevant in otorhinolaryngology as many of the techniques used in other parts of the body to control bleeding cannot be used in surgery of the nasal cavities and paranasal sinuses, specifically during endoscopic sinus surgery (ESS). Major

blood loss during ESS is rare but even a small amount of bleeding disturbs the endoscopic surgery field, increases the likelihood of complication, lengthens the time of surgery and results in incomplete surgery.^{1,2} Many methods are being tried to reduce the bleeding during ESS. Bipolar diathermy, packing, topical vasoconstrictors and induced hypotension are the most commonly used techniques with varying success rate and complications. Of these, diathermy may result in local tissue damage and subsequent bleeding. Topical vasoconstrictors may result in hemodynamic instability, mainly in patients with history of hypertension or ischemic heart disease. Hypotensive anesthesia exposed the patients to more anesthetic drugs and consequently their

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side effects. Furthermore, none of these methods consistently provide the desirable bloodless field for the surgeons.^{1,3,4} It seems also reasonable to prevent perioperative increases in sympathetic tone by providing adequate anaesthetic depth and analgesia. Several previous studies proved that good surgical conditions during FESS could be achieved by opioid-based total intravenous (TIVA) or inhalational anaesthesia without further need for vasoactive drugs. However, the use of excess narcotics has its significant postoperative disadvantages; including: decreased alertness, inadequate spontaneous breathing and more nausea and vomiting. Regional analgesic techniques during general anaesthesia is known to inhibit intraoperative and postoperative noxious stimuli and can therefore, be used as a better alternative to high doses of narcotics avoiding their inconvenient drawbacks.⁵ Many methods are described to access the amount of blood loss during ESS; either measured by total collection in suction apparatus, through soaked gauge or by the hindrances offered by bleeding during surgery.⁶

Another alternative approach to reduce blood loss during ESS is blockage of pterygopalatine fossa (PPF) through the greater palatine foramen. It is an easy procedure, associated with little complication. Pterygopalatine fossa block (PPFB) along with general anaesthesia is effective in patients undergoing Sinonasal surgery. This method reduces anaesthetic agent consumption, improves the surgical field by reducing blood loss, attenuates post-operative analgesic requirement. In view of its effectiveness and relative -safety, the PPFB may be used as a supplement to GA Sino-nasal surgery.⁷ However, there are few available researches to clarify the benefits of bilateral sphenopalatine ganglion block under general

anaesthesia in ESS. Therefore, this randomized double blinded study was designed to test the hypothesis that PPF block under general anaesthesia could provide good surgical conditions, decrease blood loss in patients undergoing ESS.

Methods

A prospective randomized comparative study between pterygopalatine fossa block verses no block during endoscopic sinus surgery was conducted in the department of otorhinolaryngology after approval from the ethical board. The outcome measured was grading of blood loss between the groups. Initially, 45 patients consented for the study but we were able to localize pterygopalatine fossa intra-operatively in 36 patients only. Finally, thirty six patients were recruited in the study and they also acted as their own control. Pterygopalatine fossa block (PPFB) was done only on one side of the nostril and the side was randomized by the lottery. Neither the patient nor the operating surgeons were aware of the laterality. The block was not given by the operating surgeon; instead, it was given by another surgeon who was neither taking part in surgery nor in assessment of bleeding, and he/she used to leave operating room after giving the block. Patients of age more than 16 years with diagnosis of chronic rhinosinusitis with or without nasal polyposis and having the bilaterally similar extent of the disease were included in the study after taking the informed written consent. Pregnant, lactating mother and patients with psychological problems who couldn't comply with the protocol were excluded from the study. Similarly, patients with systemic disease affecting the nose were also excluded from the study. The study, thus, consisted of two groups, each consisting of 36

randomized sides of the each patients, one with PPFB called group 'A' and the other without it called group 'B'. Before undergoing surgeries; subjects underwent subjective assessment of symptoms, endoscopic staging of the disease, CT staging of the disease along with routine hematological and biochemical investigations. ESS was performed as per the Messerklinger technique by the principle investigator as well as by co-investigators. All cases were performed under GA. Before start of ESS, the pterygopalatine fossa (PPF) of group 'A' was infiltrated with 2 ml of 2% lidocaine 1:80,000 adrenaline through the greater palatine foramen (GPF). The GPF is located just anterior to the posterior edge of hard palate opposite to the second molar tooth. It is usually half way between the tooth and midline of the hard palate. A 25-g needle was used to perform this injection through the mouth bent at 25 mm from the tip at an angle of 45°. This ensured optimal penetration of the pterygopalatine fossa with deposition of the local anesthetic into the fossa and maximal vasospasm of the maxillary artery with a minimal risk to the orbital content, infra-orbital nerve and maxillary artery. Because the greater palatine canal and hard palate form an angle of 60°, the needle should be bent at 45° to facilitate the passage of needle through the canal and to prevent the needle from penetrating too far into PPF. The extent of the procedure was tailored to the extent of sinus disease as documented by nasal endoscopy and CT scan findings. At the commencement of surgery and at regular 30 minutes intervals, the surgical field assessment was done by the surgeon who was not aware of the laterality of PPFB. Surgical field was assessed using the scale given in table originally described by Froome et al, but

adapted by Boezaart et al as per the following table.

| Grading of bleeding | Surgical field |
|----------------------------|---|
| Grade 1 | Cadaveric condition with minimal suction required |
| Grade 2 | Minimal bleeding with infrequent suction required |
| Grade 3 | Brisk bleeding with frequent suction |
| Grade 4 | Bleeding covers surgical field after removal of suction before surgical instrument can perform maneuver |
| Grade 5 | Uncontrolled bleeding. Bleeding out of nostril on removal of suction |

Each grade of bleeding was assigned corresponding score of 1- 5 for analyzing data.

In addition, the blood loss was assessed in milliliters per unit of time and total blood loss was measured as that collected in the suction with apparatus at end of procedure. At the end of the procedure, nasal packing with antibiotic soaked ribbon gauze was kept on each side and taken out 2 days later. Operative steps, finding and complications were recorded in every case. After ESS, all patients were prescribed a 2 week course of twice daily use of 500 mg cefuroxime. Alkaline nasal douche and twice daily use of 2 sprays (100 microgram) of fluticasone propionate intranasal spray into each nostril was advised for 12 weeks.

Results

Table 1: Comparison of disease activity between right and left side

| Side | Number | Mean | Std. deviation | P value |
|-------|--------|------|----------------|---------|
| Right | 36 | 9.55 | 1.67 | 0.168 |
| Left | 36 | 9.87 | 1.45 | |

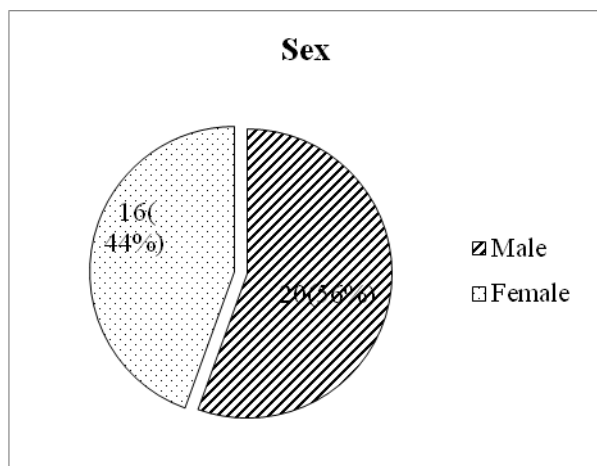


Figure 1: Sex distribution

Initially 45 patients were included for the study but we were able to localize pterygopalatine fossa in only 36 patients. Finally, 36 patients were taken for the analysis. Out of 36 patients included in the study, 20 (56%) were male and 16 (44%) were female (figure 1). The study group ranged from 16 to 72 years of age. The most common age group was between 16-30 consisting of 58.33% of all study population. The mean age was 33 and median age was 28 (figure 2). The disease activity of bilateral nostril was measured with Lund and Macay CT scan grading, the mean score in right side was 9.55 and which was 9.87 in left side and the difference was not statistically significant (p

0.168) (Table 1). Intra operative bleeding and surgical field visualization was graded according to Boezart grading in which smaller the grade, less will be the bleeding and better operative visual field. The Boezart grade was 2.23 in pterygopalatine fossa block group and it was 3.23 in control side and the difference was statistically significant (p< 0.001) (Table 2).

Table 2: Comparison of bleeding between PPFB group and control group

| Boezart Grading | Number | Mean | Std Deviation | P value |
|-----------------|--------|------|---------------|---------|
| Block side | 36 | 2.23 | 0.49 | <0.001 |
| Control side | 36 | 3.23 | 0.56 | |

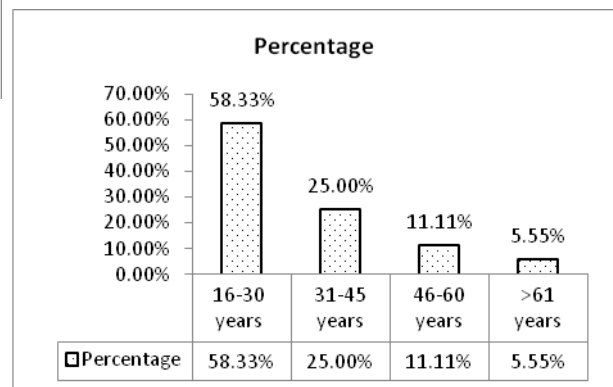


Figure 2: Age group distribution

We found weak correlation between preoperative disease activity and intraoperative bleeding; the coefficient of correlation was 0.202 (Table 3).

Table 3: Correlation between disease pre-operative activity and intra-operative bleeding

| | | Lund & Macay Grading (Pre-op disease activity) | Boezzart Grading (Intra-op bleeding) |
|--|----------------------------------|--|--------------------------------------|
| Lund & Macay Grading (Pre-op disease activity) | Correlation coefficient N= 36 | 1 | 0.202 0.116 |
| Boezzart Grading (Intra-op bleeding) | Correlation coefficient N= 36 | 0.202 0.116 | 1 |

Discussion

The safety of ESS depends, in part, on a dry surgical field. Pterygopalatine fossa infiltration has been used in different procedures, including ESS, septorhinoplasty and dental regional anaesthesia and for control of posterior epistaxis.^{18,19} It has been adopted routinely by some sinus surgeons but is not universally used. In the current study, we wanted to investigate the effect of the pterygopalatine fossa injection on the surgical field and blood loss during surgery. A previously described injection technique was used, which ensures optimal penetration through the greater palatine canal at its inferior aspect, with maximal vasospasm and minimal risk to the orbital contents, infra orbital nerve and maxillary artery.¹⁴

In our study, majority of the patients were in the age range of 16-30 years and male outnumbered

female consisting of 56% of total study population. We failed to localize the pterygopalatine fossa in 20% of patients as we used anatomical landmarks only to localize the injection site, similar rate of failure was observed by Douglas et al who latter suggested intraoperative image guidance injection technique that reduces the failed injection rate significantly.¹⁴ There was no adverse event because of injection to pterygopalatine fossa. In our study, there was weak correlation between preoperative disease activity and intraoperative bleeding, which is considered as one of the factors determining the intra operative blood loss; the correlation coefficient was 0.202.

In our study, the bleeding was less in pterygopalatine fossa block side as compared to control side and the difference was statistically significant ($p < 0.001$). Similarly, Wormald et al found injection of the pterygopalatine fossa resulted in an improved surgical field during endoscopic sinus surgery.¹³ Contrary to our findings, Valdes et al found no significant differences between injected and non-injected sides in terms of the subjective outcome of surgical field grade or the objective outcomes of blood loss and surgery duration.²⁰

Conclusion

This study showed that pterygopalatine fossa block significantly reduces the intraoperative bleeding during endoscopic sinus surgery and optimizes the surgical field. However, larger prospective, randomized studies are required to provide support for its discontinuation.

References

1. Wormald PJ. Endoscopic Sinus Surgery: Anatomy, Three-Dimensional reconstruction and Surgical Technique. New York: Thieme; 2005. 7-12 p.

2. Drozdowski A, Sieškiewicz A, Siemiakowski A. [Reduction of intraoperative bleeding during functional endoscopic sinus surgery]. *Anestezjol Intensywna Ter.* 2011;43(1):45-50.
3. Riegler EV, Gunter JB, Lusk RP, Muntz HR, Weiss KL. Comparison of vasoconstrictors for functional endoscopic sinus surgery in children. *The Laryngoscope.* 1992;102(7):820-3.
4. Shaw CL, Dymock RB, Cowin A, Wormald PJ. Effect of packing on nasal mucosa of sheep. *J Laryngol Amp Otol.* 2000;114(7):506-9.
5. Higashizawa T, Koga Y. Effect of infraorbital nerve block under general anesthesia on consumption of isoflurane and postoperative pain in endoscopic endonasal maxillary sinus surgery. *J Anesth.* 2001;15(3):136-8.
6. Boezaart AP, van der Merwe J, Coetzee A. Comparison of sodium nitroprusside- and esmolol-induced controlled hypotension for functional endoscopic sinus surgery. *Can J Anaesth J Can Anesth.* 1995;42(5 Pt 1):373-6.
7. Ahmed HM, Abu-Zaid EH. Role of intraoperative endoscopic sphenopalatine ganglion block in sinonasal surgery. *J Med Sci.* 2007;(7):1297-1303.
8. Sieskiewicz A, Olszewska E, Rogowski M, Grycz E. Preoperative corticosteroid oral therapy and intraoperative bleeding during functional endoscopic sinus surgery in patients with severe nasal polyposis: a preliminary investigation. *Ann Otol Rhinol Laryngol.* 2006;115(7):490-4.
9. Činčikas D, Ivaškevičius J. Application of controlled arterial hypotension in endoscopic rhinosurgery. *Medicina (Mex).* 2003;39(9):852-9.
10. Simpson P. Perioperative blood loss and its reduction: the role of the anaesthetist. *BJA Br J Anaesth.* 1992;69(5):498-507.
11. Reiz S, Bålfors E, Sørensen MB, Ariola S, Friedman A, Truedsson H. Isoflurane- a Powerful Coronary Vasodilator in Patients with Coronary Artery Disease. *Anesthesiology.* 1983;1;59(2):91-7.
12. Matthews BL, Smith LE, Jones R, Miller C, Brookschmidt JK. Endoscopic sinus surgery: outcome in 155 cases. *Otolaryngol Neck Surg.* 1991;104(2):244-5.
13. Wormald PJ, Athanasiadis T, Rees G, Robinson S. An Evaluation of Effect of Pterygopalatine Fossa Injection with Local Anesthetic and Adrenalin in the Control of Nasal Bleeding during Endoscopic Sinus Surgery. *Am J Rhinol.* 2005; 1;19(3):288-92.
14. Douglas R, Wormald PJ. Pterygopalatine fossa infiltration through the greater palatine foramen: where to bend the needle. *The Laryngoscope.* 2006;116(7):1255-7.
15. Wormald PJ, Wee DTH, van Hasselt CA. Endoscopic Ligation of the Sphenopalatine Artery for Refractory Posterior Epistaxis. *Am J Rhinol.* 2000;1;14(4):261-4.
16. Williams WT, Ghorayeb BY. Incisive canal and pterygopalatine fossa injection for hemostasis in septorhinoplasty. *The Laryngoscope.* 1990;1;100(11):1245-7.
17. Dunlevy TM, O'Malley TP, Postma GN. Optimal concentration of epinephrine for

- vasoconstriction in neck surgery. *The Laryngoscope*. 1996;106(11):1412-4.
18. Aoun G, Zaarour I, Sokhn S, Nasseh I. Maxillary nerve block via the greater palatine canal: An old technique revisited. *J IntSocPrev Community Dent*. 2015;5(5):359-64.
19. Bharadwaj VK, Novotny GM. Greater palatine canal injection: an alternative to the posterior nasal packing and arterial ligation in epistaxis. *J Otolaryngol*. 1986;15(2):94-100.
20. Valdes CJ, Badaai YA, Bogado M, Samaha M. Does pterygopalatine canal injection with local anaesthetic and adrenaline decrease bleeding during functional endoscopic sinus surgery? *J Laryngol Amp Otol*. 2014;128(9):814-7.