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Role of Pterygopalatine Fossa Block on Intra-Operative Heart Rate and Blood Pressure During Endoscopic Sinus Surgery at a Tertiary Care Centre

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Abstract

Background: Functional Endoscopic Sinus Surgery (FESS) is a physiological and also well accepted surgical treatment for chronic sinus disease that is unresponsive to medical treatment. The most frequent intraoperative complication is bleeding. Various methods are being tried to reduce the bleeding during FESS. But, none of these methods consistently provide the desirable bloodless field for the surgeons. Blockage of Pterygopalatine Fossa (PPF) through the greater palatine foramen is an alternative approach to reduce blood loss during ESS, which is an easy procedure, associated with little complication. Pterygopalatine Fossa Block (PPFB) along with general anaesthesia is effective in patients undergoing FESS surgery. **Aims and Objectives:** To assess the effect on and the difference in heart rate and blood pressure after pterygopalatine fossa block during FESS surgery. **Materials and Methodology:** 25 Patients with bilateral nasal pathology undergoing FESS were selected from ENT wards after a written informed consent. The PPFB was done only on one side, while the opposite nostril acted as control, thus each case acted as their own control. Various vital parameters like – heart rate (HR), blood pressure [(BP) systolic and diastolic] were calculated every 15 mins and their average noted. Surgery on the first side was completed and then followed by surgery on the second side. Applying paired-t Test, results were obtained. **Results and Conclusion:** There was a significant fall in heart rate and blood pressure. There was a positive correlation between these factors. "p value" was found to be highly significant in both the parameters tested. Pterygopalatine fossa block is an effective adjunct to general anaesthesia for controlling heart rate and blood pressure during FESS surgery.

Keywords: Blood Pressure, FESS, Heart Rate, Pterygopalatine Fossa

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1. Introduction

FESS is a physiological and well accepted surgical treatment for chronic sinus disease that is unresponsive to medical treatment[1]. The most frequent intraoperative complication is bleeding which still remains an unanswered challenge for both, Surgeons and the Anaesthetists. During FESS, major blood loss is uncommon but even a small amount of bleeding disturbs the endoscopic surgical field, increasing the likelihood of complications, lengthens the operative time and thus, an incomplete surgery[1,2].

Surgical bleeding is even more relevant in head-neck-face surgeries as most of the techniques to control bleeding, used in other parts of the body, cannot be used in surgery of the nasal cavities and paranasal sinuses, specifically like FESS, as the endoscopic view itself is very narrow.

Many different methods have been tried to reduce the bleeding during FESS - nasal packing, bipolar diathermy, topical vasoconstrictors (Moffett's solution)[3,4] and induced hypotension[5] - each having varying complications and success rates. However, none of the above have consistently provided the desirable bloodless field for FESS[1,6,7].

Blockage of PPF via the greater palatine foramen is an alternative approach to reduce blood loss[8]. PPF Block in addition to general anaesthesia is effective in patients undergoing FESS surgery via blockage of the major source of supply to the nose - the maxillary artery. Vasoconstriction of this artery may significantly reduce the blood supply to the nose, and the pressure on ganglion reduces algesia thus, minimizing bleeding during the procedure. PPF block limits anaesthetic agent consumption, attenuates post-operative analgesic requirement and improves the surgical field by minimizing blood loss. As this method is effective and relatively-safe, the PPFB may be used as a supplement to general anaesthesia for FESS[9].

However, very few review articles are available to clarify the benefits of PPF block under general anaesthesia in FESS. Therefore, our aim was to study this effect of pterygopalatine block in achieving a surgically bloodless field perioperatively. We monitored two intra-operative parameters – Heart Rate and Blood Pressure to estimate bleeding.

2. Aims and Objectives

To assess the effect on and the difference achieved in heart rate and blood pressure after pterygopalatine fossa block during FESS surgery.

3. Materials and Methodology

This comparative interventional study was conducted in the Dept. of ENT, Dr. Vasantrao Pawar Medical College, Nashik over two years from August 2017 to December 2019. 25 Patients with bilateral nasal pathology undergoing FESS were selected from ENT wards after obtaining a written, informed consent under institutional ethical committee guidelines. The PPFB was done only on one side, while the opposite nostril acted as control, thus each case acted as their own control and the side was decided by block randomization.

3.1 Inclusion Criteria

- Patients above 18 years of age.
- Patients with bilateral nasal disease, including nasal polyposis and chronic rhinosinusitis.

3.2 Exclusion Criteria

- Patients with uncontrolled systemic diseases like diabetes (DM), hypertension (HTN), chronic renal failure.
- Patients using anticoagulants.
- Patients with any bleeding diathesis.
- Patients presenting with acute infection.
- Patients with systemic disease affecting the nose.
- Patients with hypersensitivity to lignocaine.
- Patients not fit to undergo general anaesthesia.

A written informed consent was taken from all patients and they were treated with antibiotic course, decongestants and/or steroids preoperatively. All relevant preanesthetic investigations were done preoperatively, nasal endoscopy and CT scans were done and the patients were prepared for surgery[10]. Since all the patients enrolled were having a bilateral disease, one nostril acted as test and the other as control.

Prior to beginning the surgery, both nostrils were infiltrated with 2 ml of lignocaine 2% with adrenaline

1:2,00,000. Besides, nasal packs soaked in 4% lignocaine with adrenaline solution, were placed in both the nostrils for 10 minutes prior to starting the surgery. Few patients underwent septoplasty before proceeding with the steps of FESS. The blood collection and baseline vitals at the end of septoplasty were noted separately. Haemostasis was achieved, after which pterygopalatine fossa block was given on one side. This was determined by block randomization technique prior to enrolment for surgery, with the anaesthetist and patient being blinded about the side where block was given. The vitals – heart rate (HR), blood pressure [(BP) systolic and diastolic] were calculated every 15 mins from the time of surgery and their average noted. Surgery on the first side was completed and then followed by surgery on the second side.

3.3 Operative Technique

Pterygopalatine infiltration was done inserting a needle via the greater palatine foramen and canal into the pterygopalatine fossa. The greater palatine foramen was located by digital palpation at the junction of the hard and soft palate opposite the 2nd upper molar. A 1 ½ inch needle of 26 gauge was inserted into the greater palatine canal at a depth of 25mm and an angle of 45 degrees. The surgeon injected 1 ml of local anaesthetic Lignocaine 2% and adrenaline in the ratio 1:2,00,000 into the pterygopalatine fossa. The immediate effect was to see blanching of the palate. The control side was not injected with any placebo or medications. The operating surgeon remained the same for both test and control side. The subjects then underwent clearance of the disease from all the sinuses during the surgery.

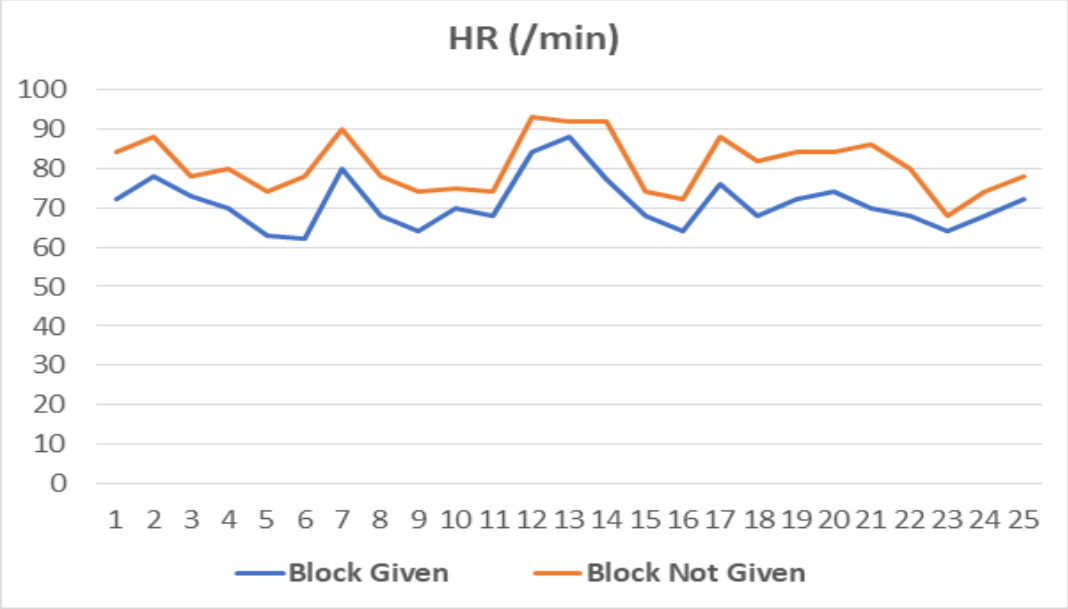
Operative steps, finding and complications, if any, were tabulated. With all due precautions taken, the study conducted here had no risk involved for the patient. It was an additional step to the already followed protocol, for achieving a bloodless surgical field.

3.4 Statistical Analysis

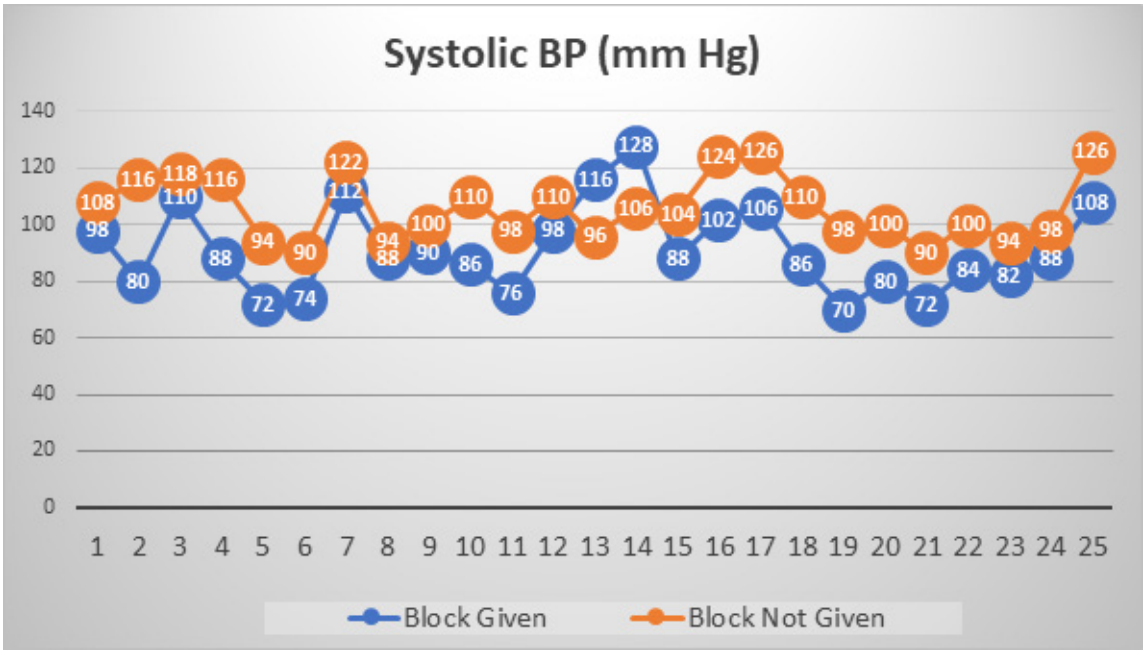
The quantitative data was represented as mean ± SD. Categorical and nominal data was expressed in percentage. The paired t-test was used for analysing quantitative data. The significance threshold of p-value was set at <0.05.

4. Results

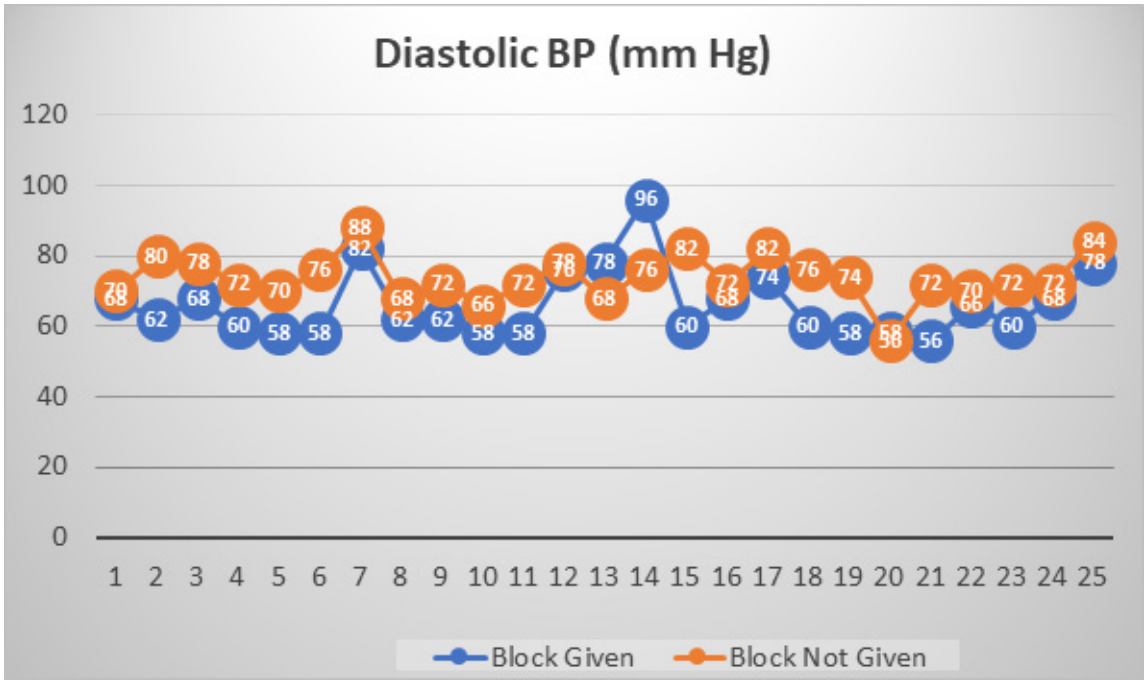
25 patients were selected for the study. Each was operated for bilateral FESS surgery. The age group most commonly affected was 31- 40 years (32%) followed by 21-30 years (28%). Of 25 patients, maximum number of patients were male 16 (64%). The most common diagnosis were



Graph 1. Average heart rate among the study participants with and without PPFB.



Graph 2. Average systolic BP among the study participants with and without PPFB.



Graph 3. Average diastolic BP among the study participants with and without PPFB.

bilateral chronic sinusitis (52%) and inflammatory nasal polyps (48%).

The parameter of Heart Rate (HR) was assessed, before and after infiltration of pterygopalatine fossa. (graph 1) There was significant improvement. Similarly, the Blood

Paired t - Test						
	Parameters Compared	**Mean**	**N**	**Std. Deviation**	**Std. Error Mean**	**Sig. (2-tailed)**
Pair 1	Systolic BP (PPF Block Given)	91.2800	25	15.36099	3.07220	.000*
	Systolic BP (PPF Block Not Given)	105.9200	25	11.40877	2.28175	
Pair 2	Diastolic BP (PPF Block Given)	66.0800	25	9.78911	1.95782	.000*
	Diastolic BP (PPF Block Not Given)	73.8400	25	6.58078	1.31616	
Pair 3	Heart rate (/min) (PPF Block Given)	71.24	25	6.495	1.299	.000*
	Heart rate (/min) (PPF Block Not Given)	80.80	25	7.030	1.406	

*highly significant

Pressure (BP) also showed significant improvement in cases where PPF block was given (graph 2 and 3).

The Heart Rate and Blood Pressure were found to affect blood loss intra-operatively. On applying Paired t –Test, there was a positive correlation between these factors. "p value" was found to be highly significant in both the parameters tested above. The surgical grade given by Boezaart[11] on the side of block remained 1 or 2 while on side without block was 3 or 4. It being a subjective evaluation was not added to our analysis and conclusion.

5. Discussion

FESS has been advocated for decades for sino-nasal pathology. It is a narrow field and is surrounded by vital structures, such as orbit and brain. Thus, even a small amount of bleed during surgery can soil the tip of the endoscope and obscure the field. Repeated soiling of the tip of the endoscope prolongs the procedure. Besides, the uncinate process, middle turbinate and frontal recess are notorious for their anatomical variations[12], operating under such compromised conditions increases the risk of injury to the adjacent vital structures. Also, under poor visualization, damage to the mucosa may further lead to postoperative synechiae formation. Hence, an optimal visual field is crucial for a surgeon.

The methods used for achieving a bloodless field for performing safe and clean FESS thus, cannot be overemphasized. There are many methods, both pre-operatively and intra-operatively, to control bleeding during FESS as described in the literature.

In our study, 25 patients were operated for bilateral FESS. Since one single patient was to act as both case and control for comparison, the bias of operating surgeon, operating techniques, physiological parameters of patient, co-morbidities of the patients and difference in operating conditions were automatically eliminated while comparing parameters between case and control side. This makes the above conducted study, even more focused, concentrated and significant.

In 1935, Averbukh and colleagues[13] described surgical access to the pterygopalatine fossa through a trans-palatine technique and access is gained to the sphenopalatine ganglion as well as the V2 nerve for the

treatment of trigeminal neuralgia. They concluded that the surgery can be performed under local anaesthesia. Vasoconstrictor is infiltrated into this space, it targets the third part of the maxillary artery as it enters the pterygopalatine fossa which causes vasospasm of the maxillary artery, thus reducing the blood supply to the nasal cavity mucosa along the sinuses and septum.

In two separate studies by R. Bhardwaj *et al.*[14] and Wormald PJ *et al.*[15]; Xylocaine (2ml of 2%) with 1:100000 adrenaline was used for the PPF block. While in a similar study by R Mathew, 1:80,00 of 2% xylocaine with adrenaline was used, they haven't specified the quantity[1]. In another study by Shenoy VS, 2 ml of 1:80,000 solution of adrenaline with 2% lignocaine[16]. All these studies showed a significant effect of pterygopalatine fossa block in controlling bleeding, corroborating with our findings. Paudel *et al.*[17] concluded that PPF block provided more stable haemodynamics, good operative conditions by lowering blood loss. Another study showed reduced total blood loss, shortened surgery time and reduced overall blood loss in similar intervention[18].

Since topical vasoconstrictors may cause temporary tachycardia[8], and sometimes even systemic side effects like headache and raised blood pressure, we opted for 2% xylocaine with adrenaline in a more diluted concentration of 1:2,00,000 in a quantity of 1ml for the pterygopalatine block.

As per a study undertaken at Belgrade[19], dimensions of PPF were found to be inconsistent; volume (0.1–1 cm^3), width (1–9 mm) and depth (6–22 mm) show the greatest variations. The volume of the pterygopalatine fossa[20] in most dried skulls was <1 cm^3. The quantity of LA injected (3 ml) greatly exceeds the volume of the pterygopalatine fossa. Smaller quantities of LA may. enter the infraorbital canal or the middle cranial fossa through the foramen rotundum. The latter can explain the sudden attack of headache described in some patients[21] or more serious complication, such as inadvertent brain-stem anaesthesia[22]. Thus, we opted for 1-1.5ml of local anaesthesia as sufficient to block the fossa. A pilot study found that maxillary nerve trunk block via greater palatine canal is possible in 61.67% of cases by depositing 1.2 ml 2% lidocaine with 1:50.000 epinephrine, there were no differences with the use of 1.8 ml of anaesthesia. This study is based on suggestions made by Coronado *et al.*, with minimum amount necessary to minimize risks that may affect important neurovascular elements of common cavities of the skull[23].We therefore used 1 ml to minimize the risk of over-infiltration.

No placebo was used in our study in the control side. Thus, we compared not only the local vasoconstriction effect, but also pressure tamponade effect due to the amount of drug infiltrated.

6. Conclusion

The otorhinolaryngology and dental literature describe the pterygopalatine fossa infiltration with vasoconstrictors and local anaesthesia through the greater palatine foramen. There is a small learning curve for giving this block, but once expertized, it is an easy and effective technique. It avoids systemic complications from the techniques tried prior to it. Although complications can occur if the needle is pierced much deeper, which may lead to an injury of the maxillary artery and adrenaline solution can get absorbed.

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