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EFFECT OF PTERYGOPALATINE FOSSA LIDOCAINE: ADRENALINE INJECTION ON SURGICAL FIELD DURING ENDOSCOPIC NASAL SURGERY

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Abstract

Bleeding into the surgical field is a major issue faced by endoscopic surgeons particularly if it is performed in narrow confines of the nasal cavity.

Aim: To determine whether infiltration of a mixture of lidocaine: adrenaline into pterygopalatine fossa has an effect on intraoperative field bleeding during endoscopic nasal surgery.

Patients and Methods: A prospective, double blinded study was undertaken to assess 88 patients who had endoscopic nasal surgery indicated for chronic sinusitis with or without nasal polyps and dacryocystorhinostomy. Patients who received injection were selected randomly and the same anaesthetist infiltrated a solution of 2% lidocaine and 1:100,000 adrenaline into pterygopalatine fossa of all patients. All operations were undertaken by the same surgeon who assessed intraoperative bleeding every 15 minutes according to Boezaart and Van der Merwe grading system.

Results: The difference in the degrees of bleeding among patients who received *versus* those who did not receive injection was not statistically significant (*p-value* = 0.36).

Conclusion: According to the dose of treatment and conditions applied in these operations, it seems that pterygopalatine fossa injection with lidocaine: adrenaline does not decrease intraoperative bleeding during endoscopic nasal surgery.

Keywords: Pterygopalatine Fossa, Lidocaine, Adrenaline, Endoscopic Sinus Surgery, Chronic rhinosinusitis with nasal polyp, dacryocystorhinostomy.

Introduction

Endoscopic sinus surgery is one of the most important operations in ENT. However, this operation can lead to serious complications if there is intranasal bleeding occurs while performing the procedure. These complications can include injury to skull base which might end with cerebrospinal fluid leak. Improper visualization can also result in orbital penetration and damaging the intraocular muscles or optic nerve.

To minimize the risk of the above disastrous consequences, it is essential to work in a dry field. Therefore, many surgeons have applied different techniques to reduce intraoperative bleeding. Elevation of the patient's head, for example, has been used to decrease venous return.[1] Preoperative application of intranasal decongestant, such as oxymetazoline, cocaine, and topical adrenalin has been also applied.[2,3] Other approaches, such as Bipolar diathermy, microdebrider, packing, controlled hypotensive technique were also used.[4-8]

One of the methods to reduce blood flow to the nasal cavity is by creating a state of vasospasm in the main arterial supply of the nasal cavity which is the sphenopalatine artery. This can be achieved by infiltration of Pterygopalatine fossa with lidocaine and adrenaline. This place communicates with the oral cavity via the greater palatine foramen; therefore, the vasoconstrictors can be injected into this foramen in order to cause effective vasospasm.[9-11]

As a method to decrease intraoperative bleeding in endoscopic sinus surgery, we designed this study to test the effectiveness of this approach.

Patients and methods

This is a prospective study including 88 patients was undertaken over a year from January 2023 to December 2023. Patients who were involved in this study had chronic rhinosinusitis with or without nasal polyposis which were approved by computed tomography of the nose and paranasal sinuses. Also, patients who required dacryocystorhinostomy (DCR) were included in this study.

Patients with bleeding tendency, on medications that increase risk of bleeding, allergy to lidocaine and hypertension were all excluded from the study. All patients underwent complete ENT assessment, including endoscopic examination and staging of the disease. Preoperative investigations included CT scan of the nose

and paranasal sinuses as well as biochemical and hematological tests.

In this study we divided the patients into three groups according to the disease they had; chronic rhinosinusitis with nasal polyposis (CRSWNP), chronic rhinosinusitis without nasal polyp (CRSWONP) and DCR.

We performed all the operations under general anesthesia and before starting the operation, the greater palatine foramen was located which is usually lies about 3-5 mm anterior to the posterior margin of the hard palate. One of the anesthetists used 25-g needle to inject slowly 2 ml of lidocaine 2% with 1:100,000 adrenaline into the pterygopalatine fossa (PPF) 15 minutes before starting the operation. Mucosal blanching in the area surrounding the pterygopalatine foramen was considered as a confirmation of successful infiltration. The same anesthetist performed the injections and the patients who received the infiltration were selected randomly. All patients undergone endoscopic nasal surgery and intraoperative bleeding were assessed during the surgery according to Boezaart and Van der Merwe grading system[12] (Table I). The surgeon assessed the surgical field every 15 minutes. Same surgeon performed all procedures and they did not know which patient was infiltrated. Statistical analysis was performed using SPSS version 26.0 and GraphPad Prism version 8.4.3. Descriptive statistics were used to analyze these data. Numerical variables were expressed as frequencies and percentages. *P-value* (probability value) was found to be significant if *P-value* ≤ 0.05, very significant ≤ 0.01 and highly significant when *P-value* ≤ 0.001.

Table I: Boezaart and Van der Merwe grading system[12]

Grades	Surgical field
Grade-1	Cadaveric conditions with minimal suction required
Grade-2	Minimal bleeding with infrequent suction required
Grade-3	Brisk bleeding with frequent suction required
Grade-4	Bleeding covers surgical field after removal of suction before instrument can
Grade-5	Uncontrolled bleeding: bleeding out of nostril on removal of suction

Results

Demography of the study

Out of 88 patients included in the present study, 43 (≃ 49%) were males and 45(≃ 51%) were females (Figure 1A).

Age of participants ranged from 16 to 50 years and they were categorized into three groups (0-20, 21-40 and > 40) (Figure 1B). It is obvious that most of our patients were aged 21-40, with 44.3%.

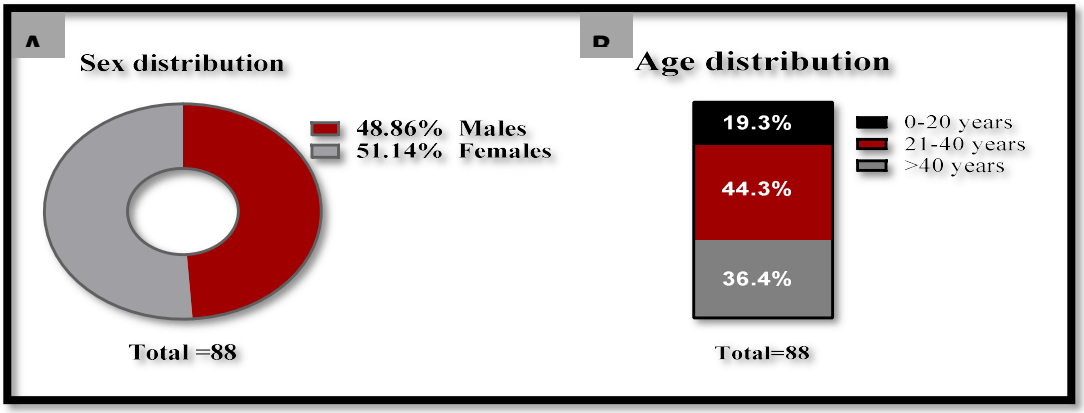

Figure 1: Demography of the study

Types of disease CRSWONP was the commonest disease that patients were complaint of, at nearly 56% (49 patients), while CRSWNP and DCR patients accounted for 27.3% and 17%, respectively (Figure-2).

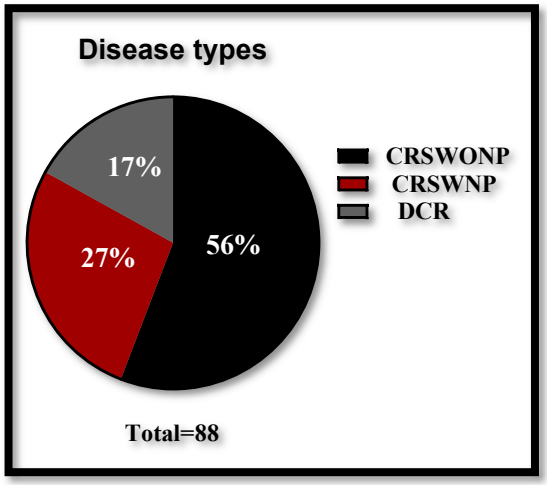

Figure 2: Disease types

Bleeding grades

Regardless of being received the injection or not, participants with grade-2 are found to occupy the highest percentage at 45.5%. This is followed by grade-3 at 34%, and grade-4 were less common at 16%. Grade-5; however, were the least at only 2.3% (see Figure-3).

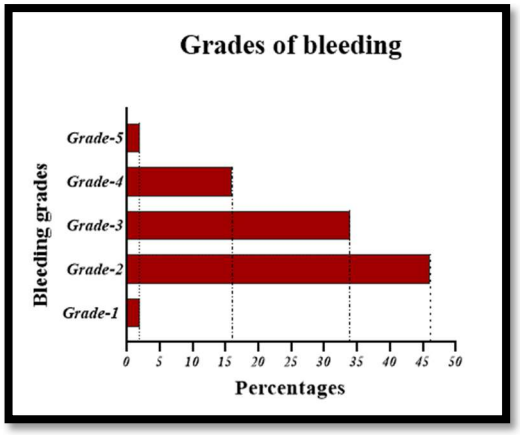

Figure 3: Grades of bleeding

The association between type of the disease and bleeding grades with regards to the injection given

As it is demonstrated in Table II below, patients with CRSWNP who received the injection were 11 patients, while those who were not injected were 13. Notably, out of all levels studied, grade-3 is found to be the most common at nearly 46% in both groups. We found that no patient of those who received the injection developed grade-5 bleeding versus one patient among the other group developed bleeding at this grade. Nevertheless, no statistical significance is detected. The amount of bleeding in both groups were not significantly different as *P-value* is 0.711.

Among the 49 patients who had CRSWONP, 24 patients received lidocaine: adrenaline injection. There was no significant difference in bleeding levels between those who received and did not receive infiltration, *P-value* =0.657. Interestingly, most patients are noticed to be in grade-2 bleeding level irrespective of the state of infiltration (>50%). Grade-3 was 7% lesser in patients who received lidocaine: adrenaline, 29% *versus* 36%.

In our study, only 15 patients underwent DCR procedure. Seven patients received lidocaine adrenaline injections. The intraoperative bleeding level was minimum with infrequent suction required (Grade-2) in 71.4% of patients with infiltration and 75% of non-infiltrated patients.

Table II: Type of the diseases versus bleeding grades with regards to the injection given

Type of diseases			Bleeding grade					Total	P-value
			Grade-1 n(%)	Grade-2 n(%)	Grade-3 n(%)	Grade-4 n(%)	Grade -5 n(%)		
CRSWNP	Injection	with		2(18.2%)	5 (45.5%)	4(36.4%)	0(0%)	11	0.71
		without		1(7.7%)	6 (46.2%)	5 (38.5%)	1(7.7 %)	13	
CRSWONP		with	1 (4.2%)	13(54.2 %)	7 (29.2%)	3 (12.5%)	0(0%)	24	0.66
		without	0 (0%)	13(52.0 %)	9 (36.0%)	2 (8.0%)	1(4.0 %)	25	
DCR		with	1(14.3 %)	5(71.4%)	1(14.3%)			7	0.51
		without	0 (0%)	6(75.0%)	2(25.0%)			8	
Total		with	2 (4.8%)	20(47.6 %)	13(31.0 %)	7(16.7%)	0(0%)	42	0.36
		without	0 (0%)	20(43.5 %)	17(37.0 %)	7(15.2%)	2(4.3 %)	46	
	Total		2 (2.3%)	40(45.5 %)	30(34.1 %)	14(15.9 %)	2(2.3 %)	88	

On the other hand, we noticed a statistical difference in bleeding grades according to the type of nasal disease regardless if they received injection or not (Table III). 80% of cases with DCR reached grade-1 and grade-2, compared to 55.1% of CRSWONP and 12.5% of CRSWNP reached the same bleeding grades. In contrast, grade 3, 4 and 5 bleeding were highest among patients with CRSWNP (87.5%) and least in DCR patients (20%).

Table III: Type of the diseases versus bleeding grades regardless to the injection

Type of disease		Bleeding grade					Total
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	
CRSWNP	Count	0	3	11	9	1	24
	%	0.0%	12.5%	45.8%	37.5%	4.2%	100.0%
CRSWONP	Count	1	26	16	5	1	49
	%	2.0%	53.1%	32.7%	10.2%	2.0%	100.0%
DCR	Count	1	11	3	0	0	15
	%	6.7%	73.3%	20.0%	0.0%	0.0%	100.0%
Total	Count	2	40	30	14	2	88
	%	2.3%	45.5%	34.1%	15.9%	2.3%	100.0%

P-value = 0 .002; means there is statistical difference in bleeding grades according to the disease type

Discussion

It is true that disastrous intraoperative bleeding while performing Endoscopic sinus surgery (ESS) is rarely encountered. However, bleeding in minimal level may have serious consequences on the surgical field and visibility of important structures which in turn can cause risky complications or improper procedure. Therefore, different methods have been used to minimize bleeding during sinus surgery.[1]

In this study we investigated the effect of lidocaine: adrenaline injection to the pterygopalatine fossa on the bleeding grades while operating three types of nasal pathologies that we mostly operated in our centre. These operations included chronic rhinosinusitis with and without nasal polyposis and nasolacrimal duct obstruction which required DCR. We found that there was difference in bleeding grades between patients who received or did not receive injection for surgical management of different diseases. Bleeding grade 5 was not seen in any patients infiltrated with lidocaine: adrenaline, compared to 4.3% of non-injected patients who reached this bleeding level; however, this difference is not significant statistically.

In our study, it is clear that intraoperative bleeding was higher among patients who had

CRSWNP, followed by CRSWONP and DCR. This result is possibly due to the fact of that the severity of inflammation in patients with chronic sinusitis who had or had not polyps been high comparing to DCR.

This is in consistent with VALDES et al who studied the effect of xylocaine adrenaline injection to pterygopalatine fossa on one side and compared this to the non-injected side for 45 patients (30 men and 15 women) with chronic rhinosinusitis. They found no significant changes between the degree of bleeding on both sides ($p = 0.161$). in addition, they concluded that the injection did not reduce duration of surgery which we did not assess in our study.[13] Unfortunately, we did not study the effect on duration.

By contrast, Wormald et al, who performed the first prospective study (in 2005) to evaluate the role of epinephrine and Lidocaine infiltration into the pterygopalatine fossa, concluded a significant benefit ($p = 0.01$) regarding surgical field on the injected side. In this study, 55 patients (24 females and 31 males) underwent ESS due to CRS associated with nasal polyposis (n = 25), without nasal polyposis (n = 23) or with fungal sinusitis (n = 7). Compared to our study, we did not include fungal sinusitis; however, we had DCR cases. [9]

Shenoy et al. enrolled 68 patients (30 women and 38 men) underwent ESS due to CRS with or without nasal polyposis and also with fungal sinusitis. They found that the surgical field improved significantly on the blocked side.[14] Kamel et al also concluded that bleeding and duration of surgery were less in injected side comparing to non-injected side with a P value < 0.001.[15]

Limitation of the study

Adrenaline-soaked patties were used after injection of lidocaine: adrenaline solution in all patients. The drawback is that the number and duration of using these packs were not necessarily to be equal and this could affect the bleeding degree. We recommend to use same number of patties and for same duration for all patients in further similar study.

Conclusion

Our results show that there is no benefit from infiltrating the pterygopalatine fossa before starting FESS because this does not improve surgical field bleeding intraoperatively.

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Data Collection and Analysis: 1,2,3,4
Responsibility for Statistical Analysis: 5
Writing the Article: 1, 5
Critical Review: 1, 2, 3,4,5
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Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.

Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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