Endoscopic Sphenopalatine Artery Cauterization Under Local Anesthesia for Posterior Epistaxis: A Prospective Cohort Study of its Tolerability and Efficacy

Original Investigation

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Abstract

Objective: To assess the tolerability and efficacy of endoscopic sphenopalatine artery cauterization (ESPAC) under local anesthesia (LA) in managing posterior epistaxis.

Methods: It was a prospective, cohort study, conducted in the Otorhinolaryngology Department of a tertiary-level hospital. Patients aged 18 years or above with posterior epistaxis who underwent ESPAC under LA were included. The tolerability of the procedure was reflected by the intraoperative pain measured using an 11-point numerical rating scale while the rebleed rate up to three months postoperatively denoted its efficacy.

Results: A total of 35 patients, 23 males and 12 females, aged 31 to 86 years (mean 57.42 ± 12.94) were included. Five out of 35 (14.2%) patients needed additional procedures besides ESPAC; 82.8% (29/35) had pterygopalatine fossa (PPF) block before ESPAC. The numerical rating scale reflecting the intraoperative pain ranged from 1 to 7 with a mean of 3.6 (± 1.7). The mean score was slightly higher in females than in males. Similarly, those who did not receive PPF block had a higher mean score than those who received it; however, the differences were not statistically significant. Meanwhile, the mean score was the same (3.6) irrespective of any additional procedure besides ESPAC. Amongst the 30 patients who completed the three-month follow-up, two patients rebled, so the overall success rate amounted to 93.3% in three months.

Conclusion: Based on the outcome of this study, ESPAC under LA for posterior epistaxis is well tolerated and is as efficacious as under general anesthesia.

Keywords: Epistaxis, endoscopic surgical procedure, local anesthesia, pterygopalatine fossa, cautery, pain

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Introduction

Posterior epistaxis accounts for 5-10% of all epistaxis usually affecting the elderly with the sphenopalatine artery as the major contributor (80%) (1,2). Owing to its posterior location, it is difficult to localize and control with anterior rhinoscopy (1-3). Endoscopic sphenopalatine artery ligation (ESPAL) or cauterization has recently gained preference over the traditional nasal packing (NP) as first-line management for posterior epistaxis

mostly due to its high efficacy ranging from 76% to 100%, reduced morbidity including pain, shorter hospital stay and subsequently reduced cost (1-5).

Endoscopic sphenopalatine artery cauterization (ESPAC) is generally performed under general anesthesia (GA) (2,3,6). However, this can be unsafe for those patients with high anesthetic risk. Under such conditions, prolonging NP or embolization has been suggested; however, these procedures have lesser success rates of 62% and 75 %, respectively, and are not without complications (2,7,8). Hence, considering ESPAC under LA is an alternative for posterior epistaxis (8). There are only a handful of studies that have demonstrated the success of this procedure under LA (5,9,10). This is the only prospective study with a fairly large number of ESPAC performed under LA. It assesses the tolerability of ESPAC under LA and its efficacy in controlling posterior epistaxis.

Methods

This is a prospective cohort study of 35 patients who underwent ESPAC under LA. Ethical approval was obtained from the Institutional Review Committee of Tribhuvan University Teaching Hospital – Maharajgunj Medical Campus prior to the study [date: 22.09.2019, ref: 133/(6-11) E²/076/077]. All patients were informed about the objective of the study and signed the written consent form.

The sample size was calculated based on the prevalence of ESPAC for posterior epistaxis (2.3%) taking a 5% margin error. Patients aged 18 years or above presenting to the Otorhinolaryngology Department of a tertiary-level hospital with posterior epistaxis were included. Patients with post-traumatic epistaxis, bleeding nasal mass, previous nasal surgery including ESPAC, bleeding disorder, and anxiety disorder were excluded. ESPAC was offered to patients with posterior epistaxis confirmed on nasal endoscopy; with two or more bleeding episodes in the last two weeks or active bleeding needing nasal packing at the time of hospital admission. The department had a low threshold for offering ESPAC for posterior epistaxis due to the limited healthcare facilities in the country providing services for epistaxis and the difficulty for patients from distant areas to visit the hospital regularly. The procedures were performed between October 2019 to January 2022 with a gap of ten months between March 2020 to January 2021 due to the Coronavirus disease-2019 (COVID-19) pandemic.

A day before surgery, the patients were verbally explained about the procedure ESPAC to be performed under LA. Patients were shown the 11-point numerical rating scale (NRS) that would be used to rate the severity of pain they could experience intraoperatively the next day, and explained how totally the severity of pain with the numbers on a scale of 0 "no pain" to 10 "the worst pain imaginable". Premedication using an intramuscular injection of pethidine (1 mg/kg) and promethazine (0.5 mg/kg) was given half an hour before the procedure in the preoperative room as per the department policy. After the patient was transferred to the operating theater, an ipsilateral pterygopalatine fossa (PPF) block was given via the greater palatine foramen (GPF). The depression of the foramen was palpated intra-orally on the hard palate medial to the third molar as recommended by previous studies (5,11). 2 mL of 2% lidocaine with 1:2,00,000 adrenaline was infiltrated through the GPF to the PPF with subsequent blanching of the hard palate. A 25-gauze needle bent at 2.5 cm from the tip at an angle of 45 degrees was used for the PPF block based on the configuration of the needle advocated by a cadaveric study (12). Aspiration before infiltration was done to avoid inadvertent infiltration into any vessel (Figure 1).

For ESPAC, the patient was placed in reverse Trendelenburg position with a 15-degree head elevation. The nasal cavity including the middle meatus was decongested and anesthetized topically using pieces of Merocel® (Medtronic Inc., Minneapolis, MN, USA) impregnated with a mixture of 1 mL of 1:1000 adrenaline in 30 mL 4 % lidocaine. Further, the posterior part of the middle meatus was infiltrated under endoscopic guidance with 2 mL of 2% lidocaine with 1:2,00,000 adrenaline using a 22-gauze spinal needle. In case septoplasty was needed, the septum was infiltrated on both sides. A piece of Merocel® (Medtronic Xomed, Jacksonville, FL, USA) secured with a thread was placed snuggly at the choana to prevent any local anesthetic or blood from tricking into the throat.

A curvilinear incision was made on the lateral wall of the middle meatus around 1 cm anterior to the posterior end of the middle turbinate. Middle meatal antrostomy was done where landmarks were unidentifiable. The mucoperiosteal flap was raised until the crista ethmoidalis (CE) was visualized. The SPA located posterior to CE exiting the sphenopalatine foramen was cauterized using bipolar cautery set at 20 watts (Figure 2). The mucoperiosteal flap was repositioned and

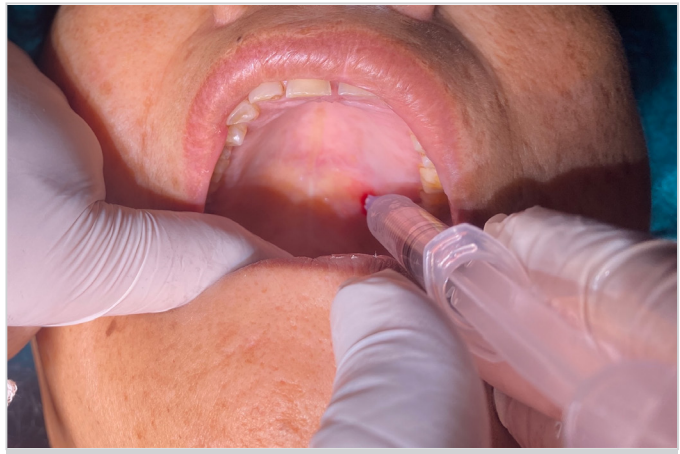

Figure 1. Left pterygopalatine fossa block

an absorbable gelatin sponge piece was placed on top. Nasal packing was not done. Patients were discharged the following day if no further nose bleeding occurred. Oral antibiotics, analgesics, and topical decongestants were prescribed for a week and gentle saline douching was advised for two weeks.

The outcomes measured were tolerability and efficacy of the procedure.

Tolerability

This was assessed by intraoperative pain. Two hours postoperatively, patients were asked to fill out the NRS to rate the intraoperative pain. This was to allow pethidine to wear off and also avoid recall bias. Bleeding, hard palate numbness, or other complications, if any, were noted.

Efficacy

The rebleed rate reflected efficacy. Patients were followed-up in two weeks and three months or when rebleeding occurred. At the two-week follow-up, patients were assessed for rebleeding or hard palate numbness. At three months, patients were followed up by telephone or in person for any bleeding.

Statistical Analysis

The data was entered in Microsoft® Excel (Version 16.72) The descriptive data were presented in range, mean, and standard deviation, and the inferential statistics in unpaired t-test.

Results

Eighteen of the 35 patients underwent ESPAC between October 2019 and February 2020. The procedure had to be discontinued due to COVID-19 until routine ESPAC was resumed. The remaining 17 patients underwent ESPAC between January 2021 to January 2022.

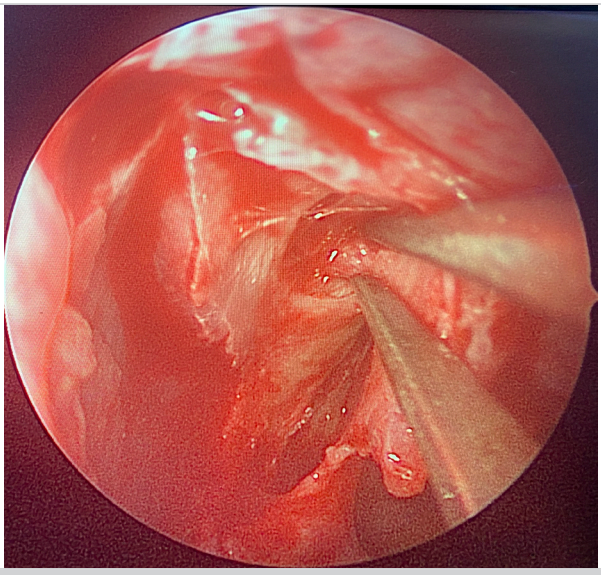

Figure 2. Sphenopalatine artery located exiting the sphenopalatine foramen posterior to crista ethmoidalis

The ages of the patients ranged from 31 to 86 years, with the mean age being 57.42 (±12.94) years. Males were nearly twice as many as females (1.9:1). Hypertension was the most common comorbidity. All patients except one had unilateral bleeding. Most patients (23/35) had nasal packing on an average of 3.45 (±1.28) days (range 1-7 days) before ESPAC. Five out of 35 (14.2%) patients needed additional procedures besides ESPAC. While 82.8% (29/35) had PPF block before ESPAC, the remaining six did not due to difficulty locating GPF (Table 1).

None of the patients had their procedure abandoned owing to intraoperative bleeding, intolerable pain, or adverse effects of LA with adrenaline.

Outcomes

Tolerability-Intraoperative Pain

The overall NRS score ranged from 1 to 7 with a mean of 3.6 (±1.7). The mean score was slightly higher in females than in males. Similarly, those who did not receive PPF block had a higher mean score than those who received it; however, the differences were not statistically significant. Meanwhile, the mean score based on the surgical procedure was the same irrespective of any additional procedure besides ESPAC (Table 2). None of the patients had an alteration in the hard palate sensation in the immediate postoperative period or the two-week follow-up.

Efficacy-Rebleed Rate

Initially, all patients were followed-up up to two weeks; however, five were lost to follow-up at the third month. Two patients rebled; one, on postoperative day two and another after a month postoperatively. The first patient was managed with nasal packing whilst the second was managed conservatively. Both had only unilateral ESPAC. Excluding the drop-outs, the overall success rate of ESPAC in three months was 93.3% (28/30).

Discussion

Epistaxis commonly affects elderly patients who tend to have multiple comorbidities which increases anesthetic risk (5,9). This was echoed in this study also with the mean age of the patients being 58.34 (±12.9) years and most of them (30/35) having comorbidities, predominantly hypertension. Elderly patients with coronary atherosclerosis are unlikely to tolerate systemic hypotension induced by GA needed for bloodless surgical fields. Hence, considering LA with vasoconstrictors is an alternative to control local bleeding without inducing

systemic hypotension, avoiding the risk related to GA (5). Several studies predominantly on dental or oral procedures have assessed the safety of LA with vasoconstrictors in cardiovascular-compromised patients. The judicious use of LA with vasoconstrictors has been found relatively safe in this category of patients (13-15).

Various nasal procedures like cosmetic or reconstructive surgery, polypectomy, turbinectomy, nasal bone fracture

Table 1. Demographics of patients (n=35)

			Number of patients
Gender	Male		23
	Female		12
Comorbidities	Hypertension		17
	Hypertension with	Diabetes mellitus	4
		Diabetes mellitus and hypothyroidism	1
		Rheumatoid arthritis	1
		Alcohol withdrawal syndrome	1
	Alcoholic hepatitis		2
	COPD		3
	Peripheral vascular disease		1
	None		5
Side of bleeding	Right		18
	Left		16
	Bilateral		1
Type of nasal packing	Rapid Rhino® (Smith & Nephew, Andover, MA, USA)		18
	Gelatin sponge		3
	Merocel® (Medtronic Xomed, Jacksonville, FL, USA)		2
	None		12
Type of procedure	Unilateral ESPAC		30
	Unilateral ESPAC with	Septoplasty	2
		Middle meatal antrostomy	1
		Septoplasty and middle meatal antrostomy	1
	Bilateral ESPAC with septoplasty		1
PPF block	Given		29
	Not given		6

COPD: Chronic obstructive pulmonary disease, ESPAC: Endoscopic sphenopalatine artery cauterization, PPF: Pterygopalatine fossa

Table 2. Severity of intraoperative pain (n=35)

	11-point Numerical Rating Scale		
	Range	Mean (SD)	p-value
Gender			
Male (23)	1-7	3.4	0.634
Female (12)	2-6	3.7	
Additional PPF block			
Overall (35)	1-7	3.6 (±1.7)	
Given (29)	1-7	3.6 (±1.7)	0.053
Not given (6)	3-7	3.8 (±1.7)	
Surgical procedures (n)			
ESPAC only (30)	1-7	3.6 (±1.6)	0.42
ESPAC with others (5)	2-7	3.6 (±1.7)	

SD: Standard deviation, ESPAC: Endoscopic sphenopalatine artery cauterization, PPF: Pterygopalatine fossa

Table 3. Comparison of the outcomes of ESPAC/ESPAL in different studies

Author and publication year	Number of patients	Type of anesthesia	Type of surgery	Follow-up in months	Success rate (%)
Jonas et al. (5) 2010	2	LA infiltration and PPF block without sedation	ESPAL – 1 With AEA - 1	3	100
Soyka et al. (8) 2011	36	GA	ESPAL - 31 With AEA - 5	1	97
Yung et al. (9) 2016	21	Topical LA without sedation	ESPAC - 21	3	76
İsmi et al. (3) 2016	30	GA	ESPAL - 30	6-30 (mean 15)	90
Sireci et al. (2) 2018	8	GA	ESPAC	6	100
Hervochon et al. (6) 2018	83	GA	ESPAC Unilateral- 36 Bilateral- 47	1	Unilateral- 75% Bilateral- 91.5
Galili et al. (7) 2021	76	GA	ESPAC+ ESPAL	1 month	92.1

LA: Local anesthesia, GA: General anesthesia, PPF: Pterygopalatine fossa, ESPAL: Endoscopic sphenopalatine artery ligation, AEA: Anterior ethmoidal artery, ESPAC: Endoscopic sphenopalatine artery cauterization

reduction, and small tumor resection have been performed under local or regional anesthesia with good intraoperative conditions and patient tolerance (16).

In our study, intramuscular pethidine and promethazine were administered before LA into the PPF and the middle meatus. Preemptive light sedation has been found to facilitate anesthetic and surgical procedures by alleviating anxiety, which reflects on patient satisfaction (16).

PPF block using local anesthetic and vasoconstrictor via the greater palatine canal serves two purposes pertinent to nasal surgery (5). It causes vasospasm of the third part of the maxillary artery ultimately reducing blood flow to the SPA. It also blocks the terminal branches of the maxillary nerve hence anesthetizing the lateral nasal wall and posterior part of the septum supplied by the nasopalatine nerve and posterior nasal branches of the maxillary artery (5). PPF block as an add-on to GA has been reported to reduce intraoperative bleeding during endoscopic sinus surgery without any complication and also lower early post-operative pain after endonasal surgery (17,18). Jonas et al. (5) reported successfully treating two posterior epistaxis cases, a 20-year-old with cystic fibrosis and a 44-year-old with post-head injury stroke with ESPAL and anterior ethmoidal artery ligation for the second patient under PPF block, without sedation as they were deemed unfit for GA. Probable complications of this block are intravascular injection, infraorbital nerve injury, and anesthesia or injury of the orbital nerves (12). Fortunately, none of our patients who received PPF block had any of these complications. Emergency ESPAC by Yung et al. (9) in 21 patients under topical LA using 0.75 mL of 25% cocaine paste without sedation was tolerated well. Therefore, good local or regional anesthesia has been considered a suitable alternative to GA to perform ESPAC (8).

NRS, a reliable scale for self-evaluation of acute pain was used to evaluate the intra-operative pain in this study (19). The pain rating relates to the measure of satisfaction with the degree of analgesia. The value "4" is usually interpreted as meeting the patient's goal for anesthesia (20). Based on the correlation of NRS with objective pain score (OPS) for acute postoperative pain, where OPS "1" and "2" mean inadequate analgesia needing rescue analgesia in the form of fentanyl and "3" means adequate analgesia with the implementation of paracetamol as rescue analgesia, whilst "4" means adequate analgesia needing no intervention, NRS 2-5 equates to OPS 3 and NRS ≥ 6 equates to OPS 1 and 2 (21). In our study, the mean NRS score was 3.6, which indicated the degree of analgesia offered during the procedure was adequate. It remained almost similar irrespective of gender, additional nasal procedure, or PPF block. This pain score is comparable to the median visual analog scale amounting to 3 for ESPAC under GA in the prospective study by Nikolaou et al. (22) where the pain scale was compared amongst 61 patients (45 with anterior epistaxis, 16 with posterior epistaxis) for Rapid Rhino (RR) (Smith & Nephew, Andover, MA, USA) packing, surgery, and balloon packing. The pain scale reflecting the discomfort during or after the procedure, recorded in the consequent postoperative outpatient visit was less for ESPAC (3) as compared to RR packing (6) and balloon packing (7.5). In a two-cycle audit, Yung et al. (9) assessed the discomfort on a 5-point scale on 21 patients for emergency ESPAC under topical LA. The mean intraoperative discomfort scale improved from 3.2 to 1.6 in the second audit after incorporating changes like placing a temporary tampon at choana and local anesthetics in the vicinity of SPA, respectively, based on feedback from the previous audit. None of the procedures were abandoned or converted to GA due to technical difficulties or patient intolerance in their study as observed in our study also.

The success rate of ESPAC in three months in our study was 93.3% (28/30). This is on par with other studies (Table 3) (2,3-5). Of the two patients who rebled, one was managed conservatively and the other with nasal packing. None of them needed revision ESPAC. Although the exact cause of rebleeding in our study was not known, rebleeding post-ESPAC can occur due to various reasons. The likely reasons could be due to the existence of more than one branch of the SPA while it exits from the foramen, failure to clip or cauterize the posterior septal branch, presence of collateral vessels or slippage of clips, or accompanying anterior ethmoid artery bleeding (3).

The likely complications of ESPAC include increased nasal crusting, palatal numbness septal perforation, and partial middle turbinate necrosis in the case of bilateral ESPAC (2, 5, 6). Although nasal crusting was common, more so due to nasal packing, none of the patients in our study had any other complications.

The strength of this study includes the inclusion of a large series of patients who underwent ESPAC under LA. The limitation of recall bias for intraoperative pain was overcome by assessing the pain after two hours of the procedure. Although multiple surgeons were involved, all of them followed the same protocol. Six patients did not receive PPF block due to difficulty locating GPF consequent to probable anatomical variation however this did not alter the main outcome (11).

Conclusion

Based on the outcome of this study, ESPAC under LA for posterior epistaxis is well tolerated and is as efficacious as under general anesthesia. Performing ESPAC under LA routinely is apt for resource-constrained healthcare setups with limited GA slots not only for patients with higher anesthetic risk but also for otherwise healthy patients. This will help prevent a backlog of patients needing ESPAC.

Ethics

Ethics Committee Approval: This is a prospective cohort study of 35 patients who underwent ESPAC under LA. Ethical approval was obtained from the Institutional Review Committee of Institute of Medicine, Tribhuvan University prior to the study [date: 22.09.2019, ref: 133/(6-11) E2/076/077].

Informed Consent: All patients were informed about the objective of the study and signed the written consent form.

Footnotes

Authorship Contributions

Surgical and Medical Practices: U.G., N.T., Concept: U.G., Design: U.G., N.T., S.K., Data Collection and/or Processing: U.G., N.T., S.K., Analysis and/or Interpretation: U.G., N.T., S.K., Literature Search: U.G., N.T., S.K., Writing: U.G., N.T., S.K.

Conflict of Interest: The authors have no conflicts of interest to declare.

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Main Points

- Endoscopic sphenopalatine artery cauterization (ESPAC) is generally performed under general anesthesia (GA). Only a few studies have explored the possibility of performing it under local anesthesia (LA), especially for patients deemed unfit for GA.
- In this cohort study, the tolerability of the procedure under LA was assessed in 35 and efficacy in 30 patients. This is the largest cohort of this kind.
- The main outcomes, tolerability were assessed by numerical rating scale (NRS) pain score and the efficacy by rebleeding rate in three months.
- The procedure was well tolerated under LA and had a success rate on par with published literature assessing its efficacy under GA.
- This study supports the feasibility of performing ESPAC under LA not only on high-risk GA cases but also on a routine basis and can be opted as a better first-line management option than

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