# The Outcome of Endoscopic Ligation of Sphenopalatine Artery in Severe and Recurrent Posterior Epistaxis

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#### ABSTRACT

**Background:** Epistaxis is defined as bleeding from the nose. It is the most common otolaryngological emergency, posterior one remains a challenging and difficult problem facing the otolaryngologist.

**Objective:** To evaluate the result of endoscopic sphenopalatine artery ligation in treatment of patients with severe posterior epistaxis.

**Methods:** This case-series study was done in the Medical City, Martyr Ghazi Al-Hariri for surgical specialties hospital, ENT department, during the period between the first of August 2018 and the first of October 2019. Twenty patients were enrolled, all of them were complaining from posterior epistaxis which cannot be controlled by cautery and anterior and posterior nasal packing. They were subjected to endoscopic endonasal sphenopalatine artery ligation and followed up for 3 months.

**Results:** The mean age of the patients was  $53.2 \pm 11.4$  years (ranged between 29 and 71 years). They were 14 males and six females, 12 right side and eight left side, seven patients were hypertension and three patients have diabetes mellitus, five patients were on antiplatelet drugs, two patients on anticoagulant drugs and three patients have on both. The bleedings in 13 patients were controlled by clipping, in three patients by bipolar diathermy and in four patients by both. There was no significant association between surgical failure and comorbidity (p value 0.788), and antiplatelet and anticoagulant drugs intake (p value 0.071). The success rate was 90%.

**Conclusions:** Sphenopalatine artery ligation is a safe and effective procedure in the management of intractable posterior epistaxis. The use of antiplatelet or anticoagulant drugs and comorbidity (hypertension and diabetes mellitus) do not appear as factors affecting the surgical outcome.

Keywords: Epistaxis, Nasal endoscope, Sphenopalatine artery ligation, Clipping.

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Epistaxis is the most common otolaryngological emergency and affects up to 60% of the population in their lifetime, and 6% requires medical attention<sup>(1)</sup>. It has been estimated that nose bleeding affect 108 per 100,000 population per year<sup>(2)</sup>. In England and Wales, an average of 10.2 per 100,000 patients are admitted for an average stay of 2.9 days in a 3-month period<sup>(3)</sup>, and in the United States 17 per 100,000 (6%) are admitted<sup>(4)</sup>. Peaks in incidence are seen in those under 10 years of age and in people aged over 40 years $^{(5,6)}$ .

The sphenopalatine artery (SPA) is the most important supply to the nasal cavity. It enters through the sphenopalatine foramen and immediately divides into posterior septal and posterior lateral rami<sup>(7)</sup>. The posterior lateral division gives the inferior and middle turbinate arteries. The inferior and middle turbinate arteries run in bony tunnels within the turbinates. The posterior septal branch of the sphenopalatine artery runs medially across the face of the sphenoid to the posterior part of the septum undulating then takes an course anteroinferiorly in the muco-perichondrium. Its terminal branches anastomose in Little's area<sup>(8)</sup>.

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The aim of this study was to present the benefits of sphenopalatine artery ligation over other methods used to control posterior epistaxis.

### –Methods

Approval from the local ethics committee and written informed consent by the patients have been obtained for the present study. All patients were complaining from severe posterior epistaxis cannot be controlled by cautery and/or anterior and posterior nasal packing, and all were assessed.by thorough history and examination (anterior rhinoscopy and rigid naso-endoscopy). Some of them were sent for CT scan of nose and paranasal sinuses and CT angiogram. Blood investigations (CBC, PT, PTT, INR, bleeding time, renal function test and liver function test). CXR. ECG and Echo study (in selected cases) were sent to evaluate patients fitness for undergoing endoscopic sphenopalatine artery ligation (ESPAL).

Informed consents were taken from patients regarding the planned surgery, nasal pack and follow up. The patients were collected from the emergency room, the outpatient clinic and the reception room in the ward of otolaryngology department. Some patients received blood transfusion. The patients who were using antiaggregant or anticoagulant drugs were consulted with department of cardiology.

Twenty patients were enrolled according to inclusion and exclusion criteria. This study is a case-series study was done in the Medical City, Martyr Ghazi Al-Hariri for Surgical Specialties in the ENT department, from the first of August 2018 to the first of October 2019.

Inclusion criteria: All patients with posterior epistaxis which cannot be controlled by cautery and/or anterior and posterior nasal packing and recurrent severe posterior epistaxis.

Exclusion criteria: Correctable coagulopathy, patients with sino-nasal tumors, patients unfit for surgery, bleeding diathesis (e.g. leukemia, Von Willebrand disease) and hereditary hemorrhagic telangiectasia.

Using general anesthesia through orotracheal tube, pharyngeal pack. Proper position of patient was achieved by reverse Trendelenburg position with head elevated 15 degrees and tilted toward the surgeon and the endotracheal tube was placed on the opposite side, good alignment of surgeon, patient and video monitor. Sterilization and draping were done. Preparation of nasal cavity with pledgets soaked with 0.1 or 0.05% xylometazoline for 10 minutes and asking the anesthetist for hypotensive technique to achieve good hemostasis.

Thorough nasal endoscopy was performed to identify the normal landmarks and to seeking for bleeding sites, clots, crusts and any other pathology. Patients who diagnosed to have septal deviation or concha bullosa that interfered with our procedure were underwent preceding septoplasty or conchoplasty or both of them according to condition. Medialization of middle turbinate was made with freer elevator to gain access.to middle meatus.

The uncinate process was initially mobilized by a ball-tipped probe and then resected of inferior part with backbiter forceps or with sickle knife. Middle meatus antrostomy was performed, the natural ostium was identified with a ball-tipped probe and then the antrostomy was widened posteriorly and inferiorly with blakeslev through cut forceps. Mucoperiosteal flap was elevated from the lateral nasal wall with cottle nasal elevator posterior to antrostomy posteriorly until reaching to sphenopalatine foramen, where the neurovascular sleeve was identified just posterior to crista ethmoidalis. Ligation of sphenopalatine artery was performed with a clip applier (one or two medium-sized hemoclips was placed), by bipolar cautery (when the hemoclips cannot be applied securely) or by both, (Figure 1).

The surgical site was irrigated with warm saline and small piece of gelfoam was put over the haemoclip. Packing was sometimes placed (merocel tampon) for mucosal bleeding. In some cases, the SPA ligation was done by incision made approximately 8 mm anterior to and under cover of the posterior end of middle turbinate (without middle meatus antrostomy), the incision was carried down to the bone and then a mucosal flap was elevated posteriorly until reaching to the fibroneuorovascular sleeve.



Figure 1: Steps of ESPAL (the pictures are from different patients) A: suctioning of clots from the nasal cavity, B: medialization of middle turbinate, C: uncinectomy, D: middle meatus antrostomy, E: elevation of mucoperiosteal flap, F: identification of SPA, G and H: SPA ligation with clip applier. (MT: Middle turbinate, UP: Uncinated process, MMA: Middle meatus antrostomy, SPA: Sphenopalatine artery, MPF: Mucoperiosteal flap, MS: Maxillary sinus)

The patients were stayed overnight and received ceftriaxone vial 1mg twice per day and acetaminophen tab 500 mg three times per day. The pack was removed (if it was placed) next morning and the patients were discharged home on cefixime tablet 400 mg once daily and acetaminophen tablet 500 mg three times per day for 7 days and nasal wash for 2 weeks. Follow up was done in the first week, second week, one month and after three months. The follow up was including evaluation and assessment of successful of the surgery and observation if there are any complications. Successful surgical outcome was considered when the patient had no further bleeding required readmission to the operating room, re-packing, cauterization or other interventions -Results

Twenty patients were operated upon, their age was ranged from 29 to 71 years, the mean age was  $53.2 \pm 11.4$  years.

Posterior epistaxis was found to be commoner in male patients 14 (70%) than in female patients 6 (30%).

The most common operated side of bleeding was the right side 12 (60%) while the left side was 8 (40%), all were unilateral.

Seven (35%) patients were hypertensive (HT) and three (15%) patients were had

diabetes mellitus (DM), (Figure 2). There was no significant association between the comorbidity (HT and DM) and the success of the operation (p value 0.788), (Table 1).

Five (25%) patients were on antiplatelet drugs, two (10%) patients on anticoagulant drugs and three (15%) patients were on both antiplatelet and anticoagulant drugs, (Figure 3). There was no significant association between antiplatelet and anticoagulant drugs intake and the success of the operation (p- value 0.071), (Table 1).



Figure 2: Frequency distribution of the sample according to the comorbidity (n = 20).



Figure 3: Frequency distribution of the sample according to the medication (n= 20).

Variable		Succeeded		Failed		P value
		No.	%	No.	%	
Comorbidity	None	9	90	1	10	0.788 <sup>(NS)</sup>
	HT	6	85.7	1	14.3	
	DM	3	100	0	0	
Medication	None	10	100	0	0	0.071 <sup>(NS)</sup>
	Anticoagulant	1	50	1	50	
	Antiplatelet	5	100	0	0	
	Anticoagulant with Antiplatelet	2	66.7	1	33.3	
NS not significant at	alpha level of 0.05			•		•

#### Table 1 Relationship between success and the categorical variables (no. 20).

In this study, three (15%) patients had undergone ESPAL associated with septoplasty and one (5%) patient had undergone ESPAL associated with conchoplasty.

Thirteen (65%) patients were ligated by clipping, 3 (15%) patients were controlled by bipolar diathermy and 4 (20%) patients were ligated by both (clipping + diathermy), (Figure 4).

Fourteen (70%) patients were discharged to the ward without packing and only 6 (30%) patients were needed placing anterior packing at the end of the operation due to mucosal bleeding.

Intraoperative complications were not documented; minor postoperative complications were documented during the follow up period. Nasal crusting was noticed in two (10%) patients in first visit, both of them were resolved in next visit, (Figure 5).

During the period of follow up, successful surgical outcome was considered when the patient had no further bleeding required readmission to the operating room, repacking, cauterization or other interventions. The ESPAL was successful in controlling the posterior epistaxis in eighteen (90%) patients and failed in two (10%) patients, (Figure 6).



Figure 4: Frequency distribution of the sample according to the method of ligation (n = 20).



Figure 5: Frequency distribution of the sample according to the complications (n = 20).



Figure 6: Frequency distribution of the sample according to the sucsess rate (n = 20).

## **Discussion**

In this study, twenty patients were operated, the mean age was 53.2 ± 11.4 years and the age ranged from 29 years to 71 years. In Ailbhe M. McDermott et al study<sup>(9)</sup>, the mean age was  $62.6 \pm 15.6$ years. Bhaskar Ram et al<sup>(10)</sup>, mean age was 59.5 years and the range was between 23 and 77 years<sup>(11)</sup>. Shi Ying Hey et al<sup>(12)</sup>, mean age was 58.2 years. Thakar, CJ Sharan<sup>(13)</sup>, mean age was 45 years. Richard Louis Voegels et al<sup>(14)</sup>, mean age was 42 years. From these finding we conclude the most effected ages were the middle and old ages, this can be explained that the middle and old ages are more effected due to comorbidity and arteriosclerosis.

In the current study, the male patients were 70% while females 30% which was similar to most studies  $^{(9-15)}$ .

The more common side of bleeding in this study was the right side 12(60%) while the left side was 8(40%), all were unilateral. In Onur İsmi et al study<sup>(11)</sup>, 60.6% were right side and 39.3% were left side, which goes with the current study, the same was in Beatriz Agreda et al study<sup>(15)</sup>, 56% were right side and 44% were left side. While in Bhaskar Ram et al study<sup>(10)</sup>, 66% were left side and 33% were right side which was in contrary to the current study, similar result of Richard Louis Voegels et al study<sup>(14)</sup>, 45% were left side, 45% were right side and 0.9 were bilateral, which did not go with the current study. From these findings we can

conclude there is no side predilection of posterior epistaxis.

In current study, 35% of the operated patients had hypertension and 15% had diabetes mellitus, there was no statistically significant association between the comorbidity and the success of the operation (p value 0.788). In a study done by Onur İsmi et al<sup>(11)</sup>, HT was present in 56.6% of the patients, and stated that there was no statistically significant relationship between the hypertension and surgical failure (p value 0.564), this consistent with the current study. Similar findings from other two studies done by Nouraei SA et al<sup>(16)</sup> and Limura et al<sup>(17)</sup>, stated that there was no statistically significant relationship between the hypertension and surgical failure.

In the current study, 25% of the patients were on antiplatelet drugs, 10% were on anticoagulant drugs and 15% on both (antiplatelet and anticoagulant), and there was no significant association between antiplatelet and anticoagulant drugs intake and the success of the operation (p value 0.071). In a study done by Ailbhe M. McDermott et al<sup>(9)</sup>, they found that 42% of the patients were on antiplatelet or other anticoagulant drugs and noticed that the use of antiplatelet or anticoagulant prior to admission did not influence bleeding rates after SPA ligation (16% vs 12.5%, p > 0.99%) this agrees with the current study. Another study performed by Onur İsmi et al<sup>(11)</sup> support the findings of the current study, they found that 50% of the patients were on antiplatelet drugs and 30% on anticoagulant drugs, and they stated that there was no significant relationship re-bleeding and using between of antiplatelet drugs (p 0.224) or anticoagulant (p 0.534).

In the current study, 15% of the patients had undergone ESPAL associated with septoplasty because of severe septal deviation was preclude the visualization and 5% had undergone ESPAL associated by conchoplasty because of large concha bullosa was preventing the access to the middle meatus. Ailbhe M. McDermott et al<sup>(9)</sup>, stated that 27% of the patients were undergone ESPAL preceded by septoplasty. Onur İsmi et al<sup>(11)</sup>, stated that 20% of the patients were undergone ESPAL preceded by septoplasty. Beatriz Agreda et al<sup>(15)</sup>, in 10% of the patients, it was necessary to perform endoscopic septoplasty to access to the middle meatus.

In current study 65% of the patients were ligated by clipping, 15% were controlled by diathermy(was performed when the vessel torn or the hemoclip cannot be applied securely) and 20% were ligated by both (clipping and diathermy). Ailbhe M. McDermott et al<sup>(9)</sup>, 69% of the patients were ligated with clipping , 18% with bipolar diathermy and 13% with both, this agrees with the current study. Shi Ying Hey et al <sup>(12)</sup>, 24.6% of the patiens were ligated with clipping , 40% with bipolar diathermy, 27.7% were with both and 7% were not recorded, this disagrees with the current studv.

In the current study, 14 (70%) were discharged to the ward without packing and only 6 (30%) patients needed to place anterior packing at the end of the operation. In a study done by Ailbhe M. McDermott et al<sup>(9)</sup>, anterior packing was placed in 22.2% of the patients, this goes with the current study. A study done by Bhaskar Ram et al<sup>(10)</sup>, stated that none of the patients were required any postoperative nasal packing. In other two studies which were done by Onur İsmi et al<sup>(11)</sup> and A. Thakar, C J Sharan<sup>(13)</sup>, anterior packing was placed in all of the patients.

During the follow up period, the patients were checked for complications and if there is re-bleeding, nasal crusting were noticed in two (10%) patients, both of them were resolved in next visit. In Shi Ying Hey et al study<sup>(12)</sup>, there were two postoperative complications recorded. One patient sustained an ipsilateral corneal abrasion due to the routine untaping of the eye. One patient developed postoperative adhesions due to extensive and unsuccessful silver nitrate cautery prior to ESPAL. Beatriz Agreda et al<sup>(15)</sup> recorded that the only complication observed were crusts and nasal dryness in the first day after surgery, and one patient suffered a bronchoaspiration at the time of intubation (admitted to the ICU and fully resolved). Studies done by Bhaskar Ram et al<sup>(10)</sup>, A. Thakar, C J sharan<sup>(13)</sup> and Richard Louis Voegels et al<sup>(14)</sup>, stated that there were no any complications related to the procedure.

Successful surgical outcome was considered when the patient had no further bleeding required readmission to the operating room, repacking, cauterization or other interventions during the period of follow up. In the current study, success was recorded in 18 (90%) patients and failure of surgery was recorded in two (10%) patients (one case had rebleeding after 24 hours from removing the pack, he was readmitted operating room and anterior to the ethmoidal artery ligation with external approach was done. The other case rebled after 14 days, readmitted and treated conservatively. The success rate of ESPAL in multiple studies ranged from 87% to 100% with different periods of follow up (9-13,15)

In conclusion: SPA ligation is a safe and effective procedure in the management of intractable posterior epistaxis. The use of antiplatelet or anticoagulant drugs and presence of hypertension and DM do not appear affecting the surgical outcome.

Recommendations: SPA ligation to be considered earlier in the management of posterior epistaxis especially in patients who poorly tolerate posterior packing. Further studies with large number of patients and long period of follow up are needed.

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