



ORIGINAL ARTICLE

Ligation of the Sphenopalatine Artery in Posterior Epistaxis. Retrospective Study of 50 Patients[☆]

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KEYWORDS

Sphenopalatine artery;
Endoscopic ligation;
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Abstract

Objectives: The aim of this study was to evaluate the efficacy of endoscopic ligation of the sphenopalatine artery in the treatment of severe posterior epistaxis.

Methods: We have carried out a retrospective study on 50 patients hospitalised with posterior recurrent epistaxis, in whom posterior nasal packing was not effective. All of them underwent surgical treatment, with endoscopic ligation of the sphenopalatine artery to control the epistaxis.

Results: Only seven patients had a new epistaxis after surgery. One of them is being studied for some kind of coagulopathy, another patient was controlled by ligation of the anterior ethmoidal artery and it was necessary to ligate the contralateral sphenopalatine artery in a third patient. The other four patients were controlled with posterior nasal packing and discharged two days after surgery, without any complications.

Conclusions: We believe that endoscopic ligation of the sphenopalatine artery is a safe technique, with fewer complications than other methods such as posterior packing or embolization. © 2010 Elsevier España, S.L. All rights reserved.

PALABRAS CLAVE

Arteria esfenopalatina;
Ligadura endoscópica;
Epistaxis posterior;
Endoscopia nasal

Ligadura de la arteria esfenopalatina en la epistaxis recidivante posterior. Estudio retrospectivo de 50 pacientes

Resumen

Objetivos: Queremos estudiar la efectividad y las ventajas de la ligadura de la arteria esfenopalatina en el tratamiento de la epistaxis recurrente posterior.

Métodos: Hemos realizado un estudio retrospectivo sobre un total de 50 pacientes ingresados en nuestro servicio por epistaxis recidivante posterior en los que el taponamiento nasal posterior resultó ineficaz. A todos ellos se les realizó la ligadura endoscópica de la arteria esfenopalatina para controlar dicha hemorragia.

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Resultados: De todos los pacientes intervenidos, sólo 7 presentaron recidiva de la epistaxis. Uno de ellos fue resuelto ligando la arteria etmoidal anterior; otro ligando, asimismo, la arteria esfenopalatina contralateral; otro se encuentra en estudio por una alteración de la coagulación no filiada, ya que se le han ligado las arterias esfenopalatina, etmoidal anterior y etmoidal posterior homolaterales, y las epistaxis persisten; y los 4 restantes se controlaron con un taponamiento nasal anteroposterior. El resto de pacientes fue dado de alta a los 2 días de la intervención, sin recidiva ni otras complicaciones relacionadas con la intervención.

Conclusiones: Creemos que la ligadura endoscópica de la arteria esfenopalatina es una técnica segura, con escasos efectos secundarios, que minimiza las molestias y complicaciones de otros métodos como el taponamiento nasal o la embolización arterial.

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Introduction

Epistaxis is one of the most common emergencies in otolaryngology and its prevalence is 12% in the general population.¹ Nevertheless, only 10% of patients with epistaxis go to the doctor, and only 1% of these require a surgical intervention.²⁻⁴

Up to 90% of epistaxis cases have their origin in the Kiesselbach area, and remit with an anterior tamponade and rest, but 10% are epistaxis of the posterior nasal areas that require more aggressive blockages, or other means for their control. Therapeutic alternative in cases where plugging fails is arterial embolization or ligation of the sphenopalatine, internal maxillary, anterior or posterior ethmoid or external carotid arteries, all with their own risks and complications.

Special attention should be paid to concomitant disease processes of the patient. This is because, in addition to being mostly elderly people, in many cases they also suffer hypertension, coagulopathy, or coronary artery disease. Another fact to consider is that, in addition to spontaneous epistaxis, the sphenopalatine artery may present traumatism during endoscopic surgery, particularly when removing the perpendicular plate of the palatine bone to create a broad middle antrotomy, or when performing an ethmoidectomy.⁵ In these cases, we must be prepared to dissect and cauterize this artery in the same surgical procedure, so as to control intraoperative haemorrhage.

The sphenopalatine artery is the main blood supply to the posterior area of the nasal fossa. It is a terminal branch of the internal maxillary artery, which in turn is a branch of the external carotid artery. It leaves the pterygopalatine fossa through the sphenopalatine foramen to enter the nasal fossa. The artery is normally divided into 2 branches, so when it exits the sphenopalatine orifice it may do so as a common trunk or, more frequently, already divided into its 2 branches. These branches are the septal artery, which runs along the anteroinferior wall of the sphenoid to reach the posterior side of the septum, and the posterolateral nasal artery, which irrigates the lateral nasal wall by ramifications which reach the middle and inferior turbinates.⁶

In 1970, Prades described the microsurgical approach to ligate the sphenopalatine artery at the level of its exit from the sphenopalatine foramen, through the pterygopalatine

fossa.^{7,8} In 1987, Sulsenti used the Prades bivalve speculum, and by microscopic vision performed its ligation in the middle meatus.⁷ In 1992, Budrovich and Saetti were the first to describe intranasal endoscopic approaches to access the artery and carry out its ligation.^{1,5,9,10}

The aim of our study was to present the benefits of sphenopalatine artery ligation over other methods used to control posterior epistaxis, and to recommend its use in indicated cases, given its efficacy and few complications.

Material and Methods

The surgical technique is relatively simple once sufficient practice has been acquired.^{1,3,6,7,11-13} For this procedure, the first thing to do is displace the middle turbinate medially to gain access to the middle meatus. It will sometimes be necessary to carry out a septoplasty previously, in cases when septal deviation prevents adequate access. Epinephrine solution is injected into the submucosa of the posterior lateral wall of the middle meatus to be able to easily dissect the mucoperiosteal flap. An incision in the form of an 'L' is made in the mucosa of the lateral nasal wall, 1 cm anterior to the insertion of the middle turbinate, continuing through the insertion of the inferior turbinate. Next, a mucoperiosteal flap is separated in a cranial and dorsal direction, until reaching the sphenopalatine foramen. Some authors recommend always performing a maxillary antrotomy, so as to use the posterior wall of the maxillary sinus as a reference. Another key anatomical reference is the ethmoidal crest, which will help to locate the arterial trunk, or its branches. Normally, the artery is divided just before exiting the sphenopalatine orifice, in the pterygomaxillary fossa. The first branch that is usually found is the posterolateral nasal artery, and the dissection should continue to be expanded in a posterior direction, to find the posterior nasal artery.^{3,4,8} Some authors suggest cauterization in 2 stages.¹⁴ In that case, the incision described is performed first, but subsequently, instead of extending the dissection to find more branches, the middle turbinate is lateralized, making an incision of 2-3 mm posterior to the posterior border of the middle turbinate to locate the posterior septal artery, which is found by elevating the mucosa of the anterior wall of the sphenoid. Even if this artery is not located, which

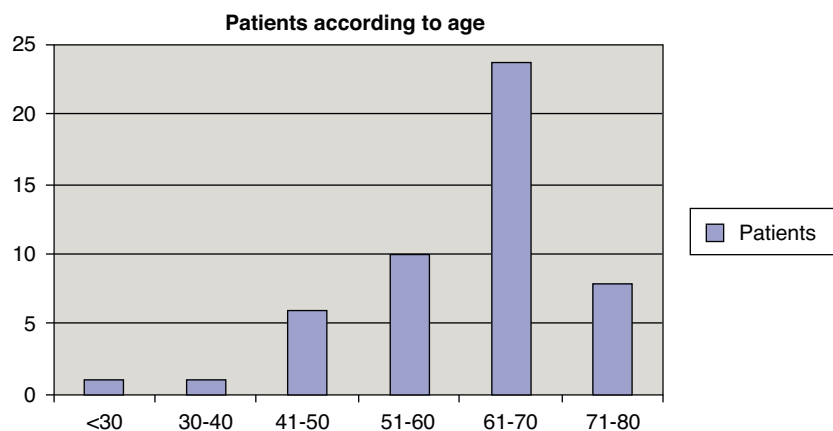


Figure 1 Distribution of patients according to age groups.

is sometimes very difficult, cauterizing the area where the bleeding started is usually sufficient.

After locating all the arterial branches and dissecting them carefully, the next step is cauterizing them with bipolar forceps. An alternative to cauterization is clamping the artery with endoscopic clips. After this, the mucoperiosteal flap is put back in place and the whole area is covered with Surgicel®. There is no need for nasal packing, but Vaseline cotton can be used and then removed after the first few hours. The patient can be discharged after 24 h.

Some authors propose ligating both arteries, the sphenopalatine and the anterior ethmoidal, in the same act so as to resolve the epistaxis more safely.¹⁵

In our study, we reviewed a total of 50 patients intervened at our department between September 2007 and March 2010, aged between 26 and 79 years, with a mean age of 61 years (Fig. 1). Of these, 37 were male (74%) and 13 female (26%). As for the nasal fossa affected, 28 cases were on the right fossa (56%), and 22 were on the left (44%). When considering concomitant diseases, we found that 28 suffered from arterial hypertension (56%), 5 were type II diabetics (10%), 22 suffered some type of heart disease (44%) and 7 were diagnosed with a haematological disease (14%). In none of them was the epistaxis due to a previous surgery. As additional data, one patient had a bleeding disorder of unknown aetiology and another patient was a cocaine addict. With regard to usual medication, 18 patients (36%) were taking antiaggregants and 12 were taking anticoagulants (24%). When these patients attended the emergency service of our hospital, 23 of them (46%) had already received one or more previous blockages with no resolution, and all required the placement of a posterior packing.

In addition, 2 patients had been previously, but ineffectively, embolized (4%) and 15 patients (30%) required administration of 2 or more packed red blood cells due to blood loss in the days before surgery (Table 1).

Results

All patients intervened had a posterior packing, in spite of which the epistaxis was not controlled. The interventions were performed under general anaesthesia and endoscopic sinus surgery using a lens of 0°. We dissected the area around

the sphenopalatine orifice, using the bipolar scalpel to cauterize all of its branches found. In 18 patients (36%), we identified one branch; in 30 patients (60%), we found 2 branches; and we found up to 3 branches (4%) in 2 patients.

In 5 patients, it was necessary to perform an endoscopic septoplasty to access the middle meatus.

Of all patients intervened, so far 7 have presented epistaxis again. The first is under study due to a haemorrhagic disease of unknown aetiology, since after several interventions (nasal dermoplasty, ligation of the anterior and posterior ethmoidal arteries, 2 embolizations), frequent bleeding continues. The second patient suffered a new epistaxis 2 years after the first intervention. We proceeded to check the arterial ligation, to rule out a possible failure in the sealing or a revascularization of the area and, likewise, the contralateral sphenopalatine artery was cauterized. The third patient bled a few hours after the operation, and this was solved by cauterizing the anterior ethmoidal artery, without any signs of new bleeding 6 months after surgery. In the remaining 4 patients, the epistaxis was repeated at 5, 7, 8, and 14 months after surgery, respectively, but it was controlled with an anteroposterior nasal packing maintained for 4 days; none of them required a new intervention.

The only complications we observed in our patients were crusts and nasal dryness in the first days after surgery, and recurrence. One patient suffered a bronchoaspiration at the time of intubation, so this patient had to be admitted to the ICU for 2 days after surgery. The case was fully solved without any further complications.

Discussion

We must be clear about the key anatomic landmarks to locate the arteries quickly and effectively. The most consistent of these is the ethmoidal crest, which is a protrusion of the bone where the perpendicular plate of the palatine bone meets the most posteroinferior portion of the ethmoid. This crest is found in 100% of cases, located just in front of and somewhat above the sphenopalatine orifice in 98% of patients.^{11,13,16} In turn, in 80% of cases, the sphenopalatine foramen is located in the transition between the middle and superior meatus,^{3,11,14} covered by the posterior part of

Table 1 Data Found in Our Study.

	Frequency
Gender	
Male	37 (74%)
Female	13 (26%)
Age	
<41	2 (4%)
41–60	16 (32%)
>60	32 (64%)
Nasal fossa	
Right	28 (56%)
Left	22 (44%)
AH	
Yes	28 (56%)
No	22 (44%)
Cardiopathy	
Yes	22 (44%)
No	28 (56%)
Haematological disease	
Yes	7 (14%)
No	43 (86%)
Anti-aggregation	
Yes	18 (36%)
No	32 (64%)
Anticoagulation	
Yes	12 (24%)
No	38 (76%)
Diabetes mellitus	
Yes	5 (10%)
No	45 (90%)
Anterior tamponade	
Yes	23 (46%)
No	27 (54%)
Embolization	
Yes	2 (4%)
No	48 (96%)
Transfusion	
Yes	15 (30%)
No	35 (70%)

the middle turbinate insertion; while in 20%, it is above the horizontal plate of the middle turbinate.¹⁴

There are also some anatomical variations, such as the existence of an accessory foramen, which is found in nearly 10% of cases,¹⁴ or variable branching of the artery, which can lead to failures in the surgery.

In 80% of cases, the artery leaves the pterygopalatine fossa already branched, with 2 branches being found in 76%–80%, 3 branches in 15%–22% and 4 branches in 2%–5%.^{3,14,17} We recall that in our study, the percentage in which there were 2 branches was relatively lower, specifically 60%. The nasopalatine artery and posterolateral nasal artery were identified in most cases, with the second having a larger calibre.¹⁷ The two arteries should be linked

to prevent possible relapses. Artery ligation at this level is considered a good option, since it is sufficiently proximal to prevent further bleeding, and sufficiently distal to prevent retrograde flow and anastomosis with the contralateral arteries.

Special care should be exercised when performing this technique in children, given that although the anatomical relationships are constant, the distances between them are not, and there is a risk of causing intracranial damage or a CSF fistula. The sphenopalatine artery should not be ligated in children unless correctly sized endoscopic equipment is available. The embolization of the internal maxillary artery may be a more appropriate alternative, especially in children younger than 10 years old.¹⁸

The success rate of sphenopalatine artery ligation is 95%^{3,11,12,19} and the failure rate is thus 5%–10%.^{2,14} Early failure is that occurring in the first 2 weeks after surgery, and may be due either to release of the clips, if these have been used instead of bipolar coagulation, or to an arterial branch that has not been ligated.^{1,2,12} There is evidence that the success rate is higher if the artery is coagulated with diathermy than if it is occluded with clips.¹ Long-term failure may be due to the fact that ethmoidal arteries and nasopharyngeal vessels can restore flow beyond the proximal occlusion.

The great advantage offered by this technique is that it decreases the average hospital stay by more than 3 days,¹² reducing the average hospital stay to about 2.6–3.9 days.¹

This technique has no serious complications. The most common is nasal crusting; other, much rarer ones, are formation of synechia, septal perforation, acute sinusitis, paresthesia in the soft palate or nose and xerophthalmia.^{10,20} The only published specific complication is necrosis of the inferior turbinate in one patient who had suffered multiple prior blockages.^{12,13,18,20}

Moreover, the rate of complications has not been associated with any predictive data, such as bilateral surgery, surgery for nasal polyps or concomitant septoplasty.¹

Next, we compare the data we have obtained with traditional alternative methods to treat cases of recurrent posterior epistaxis.

Posterior nasal packing is a very uncomfortable method for the patient, which also has a high risk of failure (26%–52%),⁴ mainly due to the fact that the turbinate prevents direct pressure on the bleeding point, causing the need for repeated blockages. Mucosal traumatism causes necrosis and further bleeding, leading to a vicious circle. In addition, it has a high rate of complications (69%), such as synechia, sinusitis, lesions in the nasal mucosa, local infections, septal perforation, orbital cellulitis, necrosis of the nasal ala, fracture of the lamina papyracea, perforation of the palate and alterations in the middle ear. Other complications that are also possible, although very rare, include pyogenic granuloma, allergy, toxic shock syndrome, OSAS, hypoventilation, chest pain, hypoxia, possible aspiration if the tamponade is moved, altered arterial blood gases, bradycardia, hypotension and infectious endocarditis.^{3,5,7,19}

Angiography with embolization of the bleeding branch is reserved, in principle, for cases with contraindication for surgery, or if it has failed.

The success rate is 75%–95%,^{10,19} but there is a high rate of complications (27%).^{3,7} The most common complications

are neurological (50%),¹⁹ such as hemiplegia, ophthalmoplegia, facial paralysis or paresthesia, blindness and strokes, caused by accidental embolization of cerebral arteries.^{3,9,19} This percentage seems to have declined steadily, although we have not found studies which endorse this observation.

Cauterizing the bleeding mucosa by endoscopic surgery has the disadvantage that it can sometimes worsen bleeding. It may also create an area of damaged mucosa that bleeds persistently. Its failure rate is 17%–33%.¹⁹ Complications that can be observed are thermal damage to neural structures, obstruction of the nasolacrimal duct, palatal stunning of the palatine nerve by heat stress and traumatism of the optic nerve if the patient has previously undergone ethmoidectomy.³

Ligation of the internal maxillary artery has a success rate of 90%.² The rate of complications is 28%,² and these are mainly due to the surgical approach, since it is done through a Caldwell–Luc technique. They can include pain during chewing, dental numbness, oroantral fistula, sinusitis, facial pain, facial or dental paresthesia, infraorbital nerve injury, blindness, ophthalmoplegia and xerophthalmia.^{3,19}

Lastly, ligation of the external carotid, in addition to all the side effects due to the lack of distal irrigation and the complicated surgery, may damage the vagus and hypoglossal nerves, among other structures.

Conclusions

We conclude by stating that sphenopalatine artery ligation is an effective, fast and secure option, as well as a first-line procedure to treat cases of incoercible posterior epistaxis.^{1,4,20} Therefore, some authors even recommend its use as a first option, without waiting for the failure of posterior tamponade.^{1,17}

Its advantages, in addition to its effectiveness in the resolution of epistaxis, are that it reduces hospital stay and hospital costs and eliminates the morbidity caused by posterior tamponades.¹²

As requirements for this surgery, it is important to have a certain endoscopic experience, as well as the correct material for its implementation, by arterial clips or bipolar forceps.

Conflict of Interest

The authors have no conflicts of interest to declare.

References

1. Reza SA, Maani T, Hajioff D, Saleh H, Mackay I. Outcome of endoscopic sphenopalatine artery occlusion for intractable epistaxis: a 10-year experience. *Laryngoscope*. 2007;117:1452–6.
2. Kamani T, Shaw S, Ali A, Manjaly G, Jeffrey M. Sphenopalatine–sphenopalatine anastomosis: a unique cause of intractable epistaxis, safely treated with microcatheter embolization: a case report. *J Med Case Rep*. 2007; 1:125.
3. Simmen D, Raghavan U, Rudolf H, Malestar M, Groscurth P, Jones N. The anatomy of the sphenopalatine artery for the endoscopic sinus surgeon. *Am J Rhinol*. 2006;20:502–5.
4. Abdelkader M, Leong SC, White PS. Endoscopic control of the sphenopalatine artery for epistaxis: long-term results. *J Laryngol Otol*. 2007;121:759–62.
5. Cassano M, Longo M, Fiocca-Matthews E, Giudice AM. Endoscopic intraoperative control of epistaxis in nasal surgery. *Auris Nasus Larynx*. 2010;37:178–84.
6. Holzmann D, Kaufmann T, Pedrini P, Valavanis A. Posterior epistaxis: endonasal exposure and occlusion of the branches of the sphenopalatine artery. *Eur Arch Otorhinolaryngol*. 2003;260:425–8.
7. Shah A, Stachler R, Krouse J. Endoscopic ligation of the sphenopalatine artery as a primary management of severe posterior epistaxis in patients with coagulopathy. *Ear Nose Throat J*. 2005;84:296–7, 306.
8. Asanau A, Timoshenko A, Vercherin P, Martin C, Prades JM. Sphenopalatine and anterior ethmoidal artery ligation for severe epistaxis. *Ann Otol Rhinol Laryngol*. 2009;118:639–44.
9. Voegels R, Thomé D, Vasquez P, Butugan O. Endoscopic ligation of the sphenopalatine artery for severe posterior epistaxis. *Otolaryngol Head Neck Surg*. 2001;124:464–7.
10. Seno S, Arikata M, Sakurai H, Owaki S, Fukui J, Suzuki M, et al. Endoscopic ligation of the sphenopalatine artery and the maxillary artery for the treatment of intractable posterior epistaxis. *Am J Rhinol Allergy*. 2009;23:197–9.
11. Pádua F, Voegels R. Severe posterior epistaxis. Endoscopic surgical anatomy. *Laryngoscope*. 2008;118:156–61.
12. Trinidad G, Rejas E, González A, Pantoja C, Mora M, Blasco A. Aspectos prácticos sobre el tratamiento endoscópico de la epistaxis. *Acta Otorrinolaringol Esp*. 2006;57:394–400.
13. Pothier D, MacKeith S, Youngs R. Short communications: sphenopalatine artery ligation: technical note. *J Laryngol Otol*. 2005;119:810–2.
14. Midilli R, Orhan M, Saylam C, Akyildiz S, Gode S, Karci B. Anatomic variations of sphenopalatine artery and minimally invasive surgical cauterization procedure. *Am J Rhinol Allergy*. 2009;23:e38–41.
15. Snyderman C, Goldman S, Carrau R, Ferguson B, Grandis J. Endoscopic sphenopalatine artery ligation is an effective method of treatment for posterior epistaxis. *Am J Rhinol*. 1999;13:137–40.
16. Rejas E, Trinidad G, Álvarez J, Carrasco F, Pino V, Blasco A. Utilidad del tratamiento quirúrgico de la epistaxis grave mediante abordaje endoscópico de las arterias esfenopalatina y etmoidal anterior. *Acta Otorrinolaringol Esp*. 2006;57:228–34.
17. Vergara J, Ordóñez LE. Comparación del manejo quirúrgico versus no quirúrgico en pacientes con epistaxis posterior. *Acta Otorrinolaringol Esp*. 2006;57:41–6.
18. Isaacson G, Monge J. Arterial ligation for pediatric epistaxis: developmental anatomy. *Am J Rhinol*. 2003;17:75–81.
19. Schwartzbauer H, Shete M, Tami T. Endoscopic anatomy of the sphenopalatine and posterior nasal arteries: implications for the endoscopic management of epistaxis. *Am J Rhinol*. 2003;17:63–6.
20. Wiorowski M, Schultz P, Perrot JB, Gentine A, Debry C. Indications and results of cauterization by endoscopic approach of the sphenopalatine artery in severe posterior epistaxis. *Auris Nasus Larynx*. 2004;31:131–3.