

Transnasal endoscopic ligation of the sphenopalatine artery for posterior epistaxis: A preliminary report of another technique

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- Objectives** : *To study the efficacy and morbidity of the technique of transnasal endoscopic ligation of the sphenopalatine artery for posterior epistaxis.*
- Setting** : *Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University.*
- Research design** : *Retrospective study*
- Patients** : *All patients meeting the criteria for posterior epistaxis requiring ligation of the sphenopalatine artery from January to July 1999.*
- Surgical technique** : *The main branches of the sphenopalatine artery were ligated at the medial aspect of the sphenopalatine foramen. Our technique is different from other techniques in some points. It is performed intranasally without entering the maxillary sinus. The bone lateral and superior to the fibrovascular bundle found near the ethmoidal crest and also the adjacent ethmoidal crest are removed in order to reach the medial aspect of the sphenopalatine foramen to make sure that all of the main branches of the sphenopalatine artery are identified and ligated.*

Results : *Both of the two illustrative cases were treated successfully without complications such as recurrent bleeding or palatal numbness.*

Conclusions : *Regarding the efficacy, safety-morbidity, patient comfort, and cost, transnasal endoscopic ligation of the sphenopalatine artery should be a treatment of choice for posterior intractable epistaxis. The preliminary results showed that this procedure can be effectively performed intranasally. It does not need a large middle meatal antrostomy or a canine fossa antroscopy, but the bone lateral and superior to the fibrovascular bundle found near the ethmoidal crest and also the adjacent ethmoidal crest should be removed.*

Key words : *Posterior epistaxis, Sphenopalatine artery, Endoscope.*

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ทรงกลด เอี่ยมจตุรภัทร, ศิริพรชัย สุภนกร. การผ่าตัดผูกหลอดเลือดแดง sphenopalatine ผ่านทางจมูกโดยใช้ endoscope ในผู้ป่วยที่มีเลือดกำเดาออกในส่วนหลังของโพรงจมูก: รายงานเบื้องต้นของเทคนิคการผ่าตัดอีกแบบหนึ่ง. จุฬาลงกรณ์เวชสาร 2542 ๕.ค; 43(12): 863-72

- วัตถุประสงค์** : เพื่อศึกษาประสิทธิภาพ และภาวะแทรกซ้อนที่อาจเกิดขึ้นจากการผ่าตัดผูกหลอดเลือดแดง sphenopalatine ผ่านทางจมูกโดยใช้ endoscope ในผู้ป่วยที่มีเลือดกำเดาออกในส่วนหลังของโพรงจมูกด้วยเทคนิคการผ่าตัดที่แตกต่างจากเดิม
- สถานที่ทำการศึกษา** : ภาควิชาโสต นาสิก ลาริงซ์วิทยา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
- รูปแบบการวิจัย** : การศึกษาย้อนหลัง
- ผู้ป่วยที่ได้ทำการศึกษา** : ผู้ป่วยทุกรายที่เข้าหลักเกณฑ์ที่ต้องผ่าตัดผูกหลอดเลือดแดงเพื่อห้ามเลือด ตั้งแต่เดือนมกราคม ถึง กรกฎาคม 2542
- เทคนิคการผ่าตัด** : แตกต่างจากเทคนิคการผ่าตัดเดิม ใช้การผ่าตัดที่ผนังด้านข้างของโพรงจมูก โดยไม่ต้องทำผ่าตัดเข้าไปในโพรงอากาศ maxillary และเมื่อพบแขนงของหลอดเลือดแดง sphenopalatine แล้ว ให้ตามแขนงหลอดเลือดไปหา sphenopalatine foramen โดยการเอากระดูกที่อยู่ด้านข้าง และด้านบนของแขนงหลอดเลือด รวมถึงกระดูก ethmoidal crest ส่วนที่อยู่ติดกันออก เพื่อที่จะได้ผูกแขนงใหญ่ของหลอดเลือดแดง sphenopalatine ครบทุกแขนง
- ผลการศึกษา** : ผู้ป่วยทั้งหมด 2 ราย ที่เข้าหลักเกณฑ์ ได้ผลดีจากการผ่าตัด เลือดหยุดไหลทันที และไม่มีผลข้างเคียงใด ๆ
- วิจารณ์และสรุป** : เมื่อพิจารณาถึงประสิทธิภาพ ความปลอดภัย ภาวะแทรกซ้อนที่อาจเกิดขึ้น ความทุกข์ทรมานของผู้ป่วย และค่าใช้จ่ายแล้ว การผ่าตัดผูกหลอดเลือดแดง sphenopalatine ผ่านทางจมูกโดยใช้ endoscope น่าจะเป็นวิธีที่ดีที่สุดในการรักษาผู้ป่วยกลุ่มนี้ ผลการศึกษาในเบื้องต้นแสดงให้เห็นว่าวิธีนี้สามารถทำผ่าตัดได้ผ่านทางจมูกโดยไม่ต้องผ่าตัดเข้าไปในโพรงอากาศ maxillary แต่ควรเอากระดูกที่อยู่ด้านข้างและด้านบนของแขนงหลอดเลือดแดงที่พบในตอนแรกออกไปด้วย เพื่อที่จะได้ผูกแขนงใหญ่ของหลอดเลือดแดง sphenopalatine ได้ทุกแขนง

The majority of epistaxis cases are not severe, and are usually localized to Kiesselbach's plexus on the anterior nasal septum. It can be easily controlled locally either by direct external pressure, topical vasoconstrictive agent, anterior nasal packing, chemical cautery, or electrocautery. More severe epistaxis usually reflects bleeding from branches of the sphenopalatine or anterior ethmoid arteries.⁽¹⁾ Sometimes, bleeding from branches of the sphenopalatine artery can not be controlled by anterior nasal packing. Epistaxis that can not be treated effectively by anterior nasal packing is practically defined as posterior epistaxis.⁽²⁾ There are many treatment options to control posterior epistaxis, including anterior with posterior nasal packing, endoscopic cauterization, external carotid artery ligation, internal maxillary artery ligation, sphenopalatine artery ligation, and arterial embolization.⁽³⁾ Anterior with posterior nasal packing needs hospitalization, has been shown to increase nocturnal episodes of hypoxia,⁽⁴⁾ may induce or exacerbate obstructive sleep apnea,⁽⁵⁾ and has high failure rates ranging from 26% to 52%.⁽⁶⁾ Posterior endoscopic cauterization has success rates of 67% to 90%^(3,7) which means that additional treatment is often necessary. In external carotid artery ligation, a high rate of rebleeding is also noted (45%).⁽⁸⁾ This may be a result of flow from anastomotic connections with the ipsilateral internal carotid or the opposite carotid system.⁽³⁾ Internal maxillary artery ligation, a more distal arterial ligation than external carotid artery ligation, has better success rates ranging from 75% to 100%.⁽⁹⁻¹¹⁾ This technique is more difficult and failure may occur due to the variability of arterial branching in the pterygopalatine fossa causing failure to identify all branches.^(3,9,12-14)

Complications of the transantral approach may include infraorbital numbness, oroantral fistula, dental injury, sinusitis, and rarely blindness⁽¹¹⁾ whereas the transoral approach complications include trismus, cheek swelling, and paresthesias of the tongue and/or mandibular dentition due to neurapraxic injury to the inferior alveolar nerve.⁽¹⁵⁾ Arterial embolization has reported success rates in control of epistaxis of 67% to 91%.^(3,7,16-19) The potential major complications include stroke, facial paralysis, facial numbness, and skin necrosis.^(3,16-19)

Endoscopic ligation of the sphenopalatine artery is another treatment option for posterior epistaxis. It seems to have less recurrent epistaxis than internal maxillary artery ligation since the vessel is ligated directly closest to the site of bleeding, thus precluding the development of collateral blood flow.^(20,21) This procedure is also faster, technically easier, and has less morbidity than internal maxillary artery ligation.^(1,20-23)

Regarding the optimal treatment for posterior epistaxis, controversy still exists based on issues of efficacy, safety-morbidity, length of hospitalization, experience of the surgeon, and cost. To date, we have chosen transnasal endoscopic ligation of the sphenopalatine artery for all patients requiring posterior nasal packing (posterior epistaxis) or patients with recurrent epistaxis, and we have reserved arterial embolization for patients who have medical contraindications to surgery, when surgery can not be performed due to anatomical abnormalities, or in patients who have failed a surgical arterial ligation.

Patients and Methods

From January to July 1999, two patients met

the criteria for intractable posterior epistaxis. Both had the transnasal endoscopic sphenopalatine artery ligation to control the epistaxis.

Surgical Technique

We prefer general anesthesia for this procedure because of less risk of aspiration of blood and less patient discomfort. After general anesthesia with orotracheal intubation, anterior and/or posterior nasal packs are removed and replaced with cotton pledgets soaked in tymazoline or oxymetazoline (0.05%) solution. After waiting for 5 to 10 minutes, the oral cavity is exposed and a transpalatal sphenopalatine injection is done with 1.5 ml of 1% lidocaine with 1:100,000 epinephrine. The cotton pledgets are removed and then the uncinat process and the area of the posterior aspect of the middle meatus including the basal lamella are injected with 1% lidocaine with 1:100,000 epinephrine using a 25-gauge spinal needle under the 0° endoscope. Then the

previous cotton pledgets are replaced and kept in place for 5 minutes.

A standard infundibulotomy is performed by removal of the lower portion of the uncinat process with back biting forceps. This provides more room for introduction of the endoscope and also prevents postoperative obstruction of the maxillary sinus. In patients who have large ethmoid bulla, removal of the ethmoid bulla is also helpful to provide additional exposure.

A vertical mucoperiosteal incision is then made with the sharp end of a Cottle elevator about 1 centimeter anterior to the caudal border of the middle turbinate, starting from the inferior aspect of the middle turbinate attachment to the superior aspect of the inferior turbinate attachment. A subperiosteal dissection is performed posteriorly until a small bony crest called the ethmoidal crest is encountered. The ethmoidal crest is the crest in the perpendicular plate of the palatine bone which articulates with the

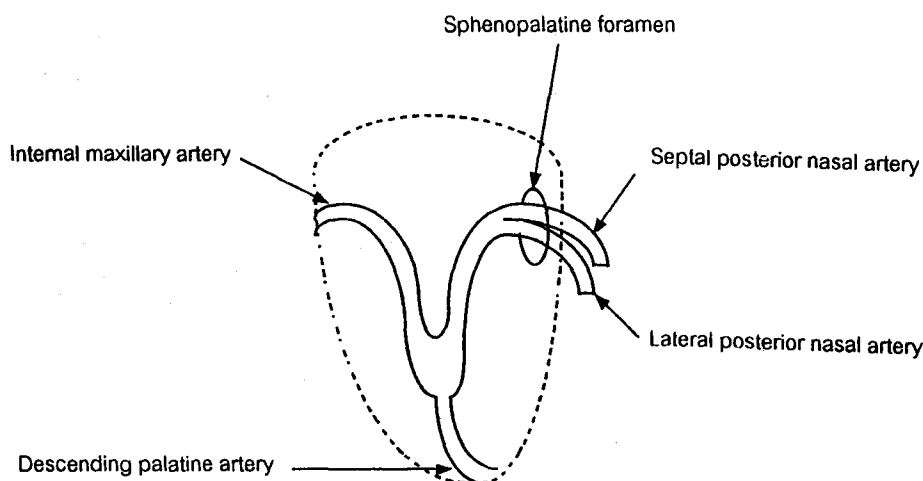


Figure 1. Right sphenopalatine foramen and two main branches of the sphenopalatine artery (lateral posterior nasal and septal posterior nasal arteries).

middle turbinate.⁽²⁴⁾ Just posterior and inferior to the ethmoidal crest, the sphenopalatine artery or its branch can usually be identified. The branch found first should be the lateral posterior nasal artery which runs anteriorly and inferiorly. After this artery is identified, the bone lateral and superior to this vessel and also the adjacent ethmoidal crest are removed with a small Kerrison rongeur. Removal of these bones is done in order to reach the medial aspect of the sphenopalatine foramen to make sure that all of the main branches of the sphenopalatine artery are identified. At this point, two main branches of the sphenopalatine artery, the lateral posterior nasal (posterior nasal or nasopalatine) artery and the septal posterior nasal (sphenopalatine) artery, are identified and each artery is double ligated using the hemoclips. The surgical site is placed with a small piece of microfibrillar collagen. The mucoperiosteal flap is then returned and a small piece of gelfoam is placed at the medial aspect of the mucoperiosteal flap.

Results

From January to July 1999, two patients met the criteria for intractable posterior epistaxis requiring transnasal endoscopic ligation of the sphenopalatine artery.

Case 1

A 56-year-old male was referred to King Chulalongkorn Memorial Hospital for further management of severe posterior epistaxis after having had anterior with posterior nasal packing. His past history revealed he had nasopharyngeal carcinoma and was treated with radiation and chemotherapy ten years prior with no recurrence of the tumor. He had a history

of hypertension. His first anterior with posterior nasal packing has been done 7 days earlier and kept in place for 5 days without any complications. Two days after removal of the nasal packs, bleeding recurred and the second anterior with posterior nasal packing was repeated. Two days after the second anterior with posterior nasal packing, he developed toxic shock syndrome. All of the nasal packs were then removed. After removal of the nasal packs he did not have further bleeding and the toxic shock syndrome resolved. Five days later, he started to have bleeding again. The temporary anterior nasal packing could not effectively control the bleeding so he was sent to the operating room for endoscopic ligation of the sphenopalatine artery by the technique described above. Postoperatively, he had no further bleeding and was uneventfully discharged from the hospital.

Case 2

A 55-year-old male presented with intermittent spontaneous epistaxis on the right side for a day. He had no history of hypertension. He initially responded well to anterior nasal packing. One day later, he started to have bleeding again despite having the anterior nasal packs. Physical examination during the bleeding confirmed posterior epistaxis. Transnasal endoscopic ligation of the sphenopalatine artery was then performed successfully on the right side. The patient was discharged from the hospital one day after surgery without any complications or recurrent bleeding.

These two illustrative cases were treated successfully by the technique we described above and the patients had no complications such as recurrent bleeding or palatal numbness.

Discussion

There are many treatment options to control posterior epistaxis. Although anterior with posterior nasal packing can be done very easily, it has many disadvantages such as patient discomfort, risk of hypoxia or obstructive sleep apnea,^(4,5) toxic shock syndrome, and a high failure rate of 26% to 52%.⁽⁶⁾ Posterior endoscopic cauterization is quite safe and easy to perform in the outpatient clinic but it has a success rate of 67% to 90%^(3,7) which means that additional treatment is often necessary. In our experience, we usually met the patients after several anterior nasal packings and the nasal mucosa was not healthy, causing difficulty in locating the site of initial bleeding. Arterial embolization also may have serious complications including stroke, facial numbness, facial paralysis, and skin necrosis.^(3,16-19)

These considerations have led to early use of vascular ligation to control epistaxis in an attempt to improve patient comfort and to minimize hospitalization, recurrent bleeding, the necessity for transfusion, morbidity, and even mortality. Arterial embolization is reserved for patients who have medical contraindications to surgery, when surgery can not be performed due to any anatomical abnormalities, or for those who have failed a surgical arterial ligation.

Concerning the vascular ligations, the external carotid artery ligation has a high failure rate due to the collateral flow from anastomotic connections with the ipsilateral internal carotid or the opposite carotid system,⁽³⁾ so this procedure is not a good option. Internal maxillary artery ligation has a higher success rate (75% to 100%⁽⁸⁻¹¹⁾) but it requires more operative time, is more technically difficult to identify all the branches,⁽³⁾ and has more morbidity than sphenopa-

latine artery ligation.^(11,20,21) Additionally, does it need to ligate too many branches of the internal maxillary artery to control epistaxis ?

In regard to surgical ligations, sphenopalatine artery ligation has gained more popularity among otolaryngologists as a treatment of choice for posterior epistaxis and has a success rate of 93% to 100%.^(1,20-23) The branches of the artery are ligated closer to the bleeding site precluding the possibilities of collateral blood flow. In 1982, Simpson et al.⁽²¹⁾ demonstrated a sphenopalatine artery ligation technique via a medial transantral approach without entering the pterygopalatine fossa while using an operating microscope. Advantages of this technique include direct and specific ligation of the end vessels avoiding most possibilities of collateral blood supply to a bleeding point, ease and speed of operation, and avoidance of complications associated with surgery in the pterygopalatine fossa. Winstead⁽²⁰⁾ also reported a technique of microscopic transantral sphenopalatine artery ligation similar to the technique reported by Simpson et al.⁽²¹⁾ and he recommended it as the preferred procedure for vessel ligation in severe posterior epistaxis. White⁽²²⁾ advocated an endoscopic approach through a large middle meatal antrostomy almost to the level of the roof and posterior wall of the maxillary sinus combined with a canine fossa antrostomy for inserting the endoscope. White's technique has less morbidity than the previous transantral sphenopalatine artery ligation due to the need for only a small canine fossa antrostomy. Snyderman et al.⁽¹⁾ showed a technique of endoscopic ligation of the sphenopalatine artery that is similar to White's. They created a large middle meatal antrostomy to the level of the posterior wall of the

maxillary sinus. The ethmoid bulla and the anterior ethmoid cells are usually opened to provide additional exposure and prevent postoperative obstruction of the ethmoid sinus. If the patient has a wide middle meatal space that allows for the placement of multiple instruments simultaneously, they believe that a canine fossa antroscopy is not necessary. In 1998, Pritikin et al.⁽²³⁾ reported less surgical manipulation at the medial aspect of the sphenopalatine foramen similar to the technique of Budrovich et al.⁽²⁵⁾ and Christmas et al.⁽²⁶⁾ By using an endoscope, a vertical mucosal incision is made at the posterior lateral nasal wall. The mucoperiosteal flap is then elevated posteriorly until the sphenopalatine artery and posterior nasal artery were found posterior and inferior to the ethmoidal crest. These two vessels are then ligated at this site without further dissection to the sphenopalatine foramen. They successfully used this technique for all ten of their patients.

Our technique is similar to those of Snyderman et al.⁽¹⁾ and Pritikin et al.⁽²³⁾ but different in some aspects. We also perform the infundibulotomy to provide more room for insertion of the endoscope. We think the canine fossa antroscopy is not necessary for insertion of the endoscope and the large middle meatal antrostomy is also not necessary because the fibrovascular bundle can be identified near the ethmoidal crest at the posterior lateral nasal wall. Then we can follow this fibrovascular bundle to the sphenopalatine foramen. In a study of thirty adult cadaveric heads (60 sides), Navarro et al.⁽¹⁴⁾ found the sphenopalatine artery bifurcated in the pterygopalatine fossa, before piecing the sphenopalatine foramen, but always close to it. They also found that in four cases (6.66%) the lateral posterior nasal artery left the fossa through

an accessory foramen, inferior to the sphenopalatine foramen. Morton et al.⁽¹³⁾ defined the lateral posterior nasal artery as the posterior nasal artery and the septal posterior nasal artery as the sphenopalatine artery. In their study of 30 adult cadaveric specimens, they found sphenopalatine/posterior nasal branching at the sphenopalatine foramen in 21 of 30 specimens, post-sphenopalatine foramen in 5 of 30 specimens, and pre-sphenopalatine foramen in 4 of 30 specimens. Regarding this possible variability of arterial branching, removal of the bone lateral and superior to the fibrovascular bundle found near the ethmoidal crest and the adjacent ethmoidal crest should be performed to make sure that all of the main branches of the sphenopalatine artery are identified and ligated.

Conclusions

There are many treatment options for controlling posterior epistaxis. Regarding the efficacy, safety, morbidity, patient comfort, and cost, transnasal endoscopic ligation of the sphenopalatine artery should be selected as a treatment method instead of anterior with posterior nasal packing or other surgical vascular ligations. This procedure can be effectively performed intranasally. It does not need a large middle meatal antrostomy or a canine fossa antroscopy, but removal of the bone lateral and superior to the fibrovascular bundle found near the ethmoidal crest and also the adjacent ethmoidal crest is required in order to reach the medial aspect of the sphenopalatine foramen to make sure that all of the main branches of the sphenopalatine artery are identified and double ligated with hemoclips. After the arteries are ligated, the surgical site is lightly packed with a small piece of microfibrillar collagen or gelfoam.

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