



SPA ligation is generally indicated for intractable posterior epistaxis that does not settle following 24hrs of adequate anterior and posterior nasal packing, and for recurrent unilateral epistaxis unrelated to an underlying systemic disease or a drug related blood dyscrasia.

Anatomy of the sphenopalatine artery

The sphenopalatine artery (SPA) is one of the terminal branches of the internal maxillary artery (IMA) which originates from the external carotid artery system. It provides 90% of the blood supply to the nasal cavity *i.e.* the lateral nasal wall, the turbinates and most of the nasal septum. The anterior and superior nasal septum is supplied by the anterior and posterior ethmoidal arteries which originate from the ophthalmic artery (internal carotid artery system). The sphenopalatine artery is one of six terminal branches of the 3rd or pterygomaxillary portion of the internal maxillary artery (Figure 1). These 6 branches all originate in the pterygopalatine fossa which is located behind the medial part of the posterior wall of the maxillary sinus (Figures 2, 3 & 4).

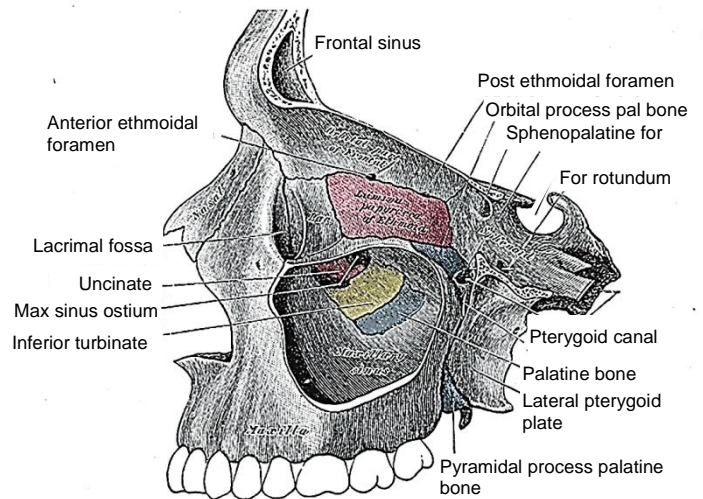


Figure 2: Picture showing the left maxillary sinus and the sphenopalatine foramen located behind the posterior wall of the maxillary sinus

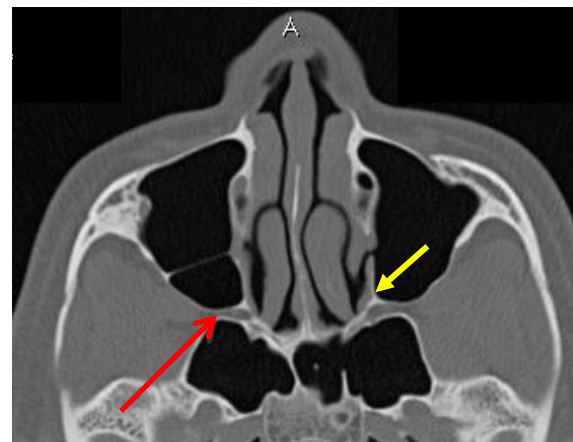


Figure 3: Axial CT scan of sinuses with red arrow pointing to the SPA and pterygopalatine fossa, and the yellow arrow pointing to the crista ethmoidalis

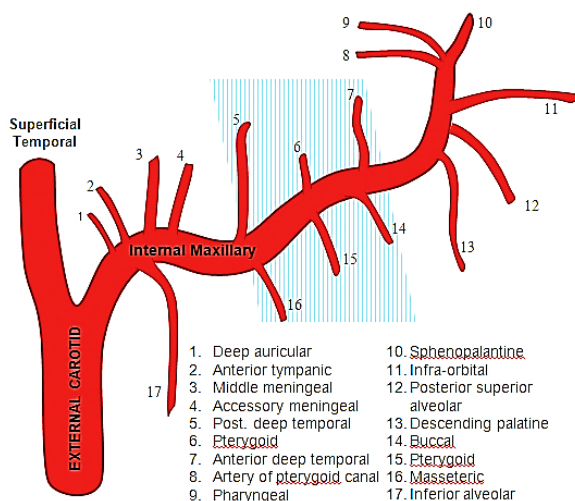


Figure 1: Branches of internal maxillary artery

The sphenopalatine artery may have 1-10 branches, with 97% of patients having ≥ 2 branches and 67% having ≥ 3 branches. All branches arise from the SPA in the pterygomaxillary fissure and enter the nasal cavity as separate blood vessels. The most anterior branch is the largest and exits through the sphenopalatine foramen. This branch needs to be clipped or cauterised and cut to be able to determine the presence of

more posteriorly-located vessels. Other branches of the SPA may exit posterior to the main branch or superior or inferior to the SPA foramen.

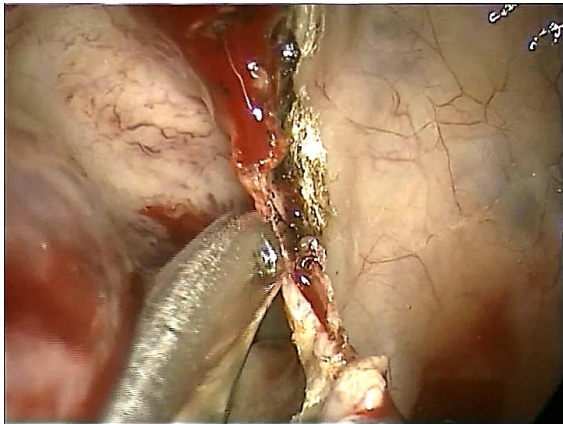


Fig 4: Endoscopic view showing the posterior wall of the left maxillary sinus; the instrument is just anterior to where the crista ethmoidalis would be located

Preoperative consent

Patients need to be informed that

- The procedure might fail following which angiography and embolization could be required to control bleeding
- Cauterising the SPA too vigorously can injure the nasopalatine nerve or its branches and cause palatal numbness (Figure 5)

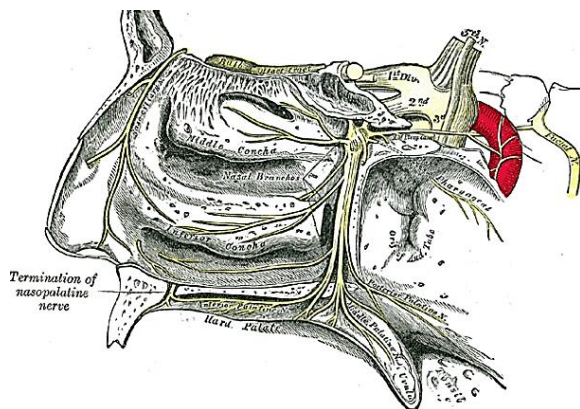


Figure 5: Diagram showing the right sphenopalatine foramen with the nasopalatine nerve which can be injured during SPA ligation, exiting the foramen

Anaesthesia, Positioning and Draping

1. SPA ligation is usually performed under general anaesthesia with a cuffed endotracheal tube to protect the airway
2. Local anaesthesia is not advisable since patients with epistaxis will have blood running down the pharynx causing coughing and possible aspiration of blood
3. The anaesthetist should optimise the surgical field by keeping the patient normotensive with a slow heart rate
4. Total intravenous anaesthesia (TIVA) is the author's preference
5. Insert a throat pack if there is significant bleeding or if it is anticipated, to avoid aspiration of blood and to avoid blood entering the stomach and causing post-operative nausea and vomiting
6. Place the patient supine with the head level or slightly flexed to 15 degrees and slightly rotated towards the surgeon
7. Close the eyes and cover them with see-through adhesive plastic sheeting; the drapes should not obscure the eyes

Initial surgical steps

1. Remove all nasal packing
2. Irrigate the nasal cavity with warm saline
3. Apply topical anaesthesia by inserting ribbon gauze or neurosurgical patties soaked in 2ml of 1:1000 adrenaline between the inferior turbinate and the nasal septum and in the middle meatus if possible.
4. Oxymetazoline can be used instead of adrenaline in patients with cardiac disease

SPA ligation: Surgical steps (Left side)

1. Endoscopically inspect the nasal cavity, nasopharynx, entire nasal septum, turbinates and lateral wall of the nose

2. If an obvious bleeder is found, bipolar cautery is applied to the area and a decision is made whether to proceed with an SPA ligation or not. If any doubt exists whether the cauterised vessel was responsible for the bleeding, proceed to SPA ligation
3. Irrigate the maxillary sinus by means of a proof puncture via the inferior meatus to clear blood from the sinus
4. Inject 0.5-1ml of 1:80 000 adrenaline with lignocaine into the axilla of the middle turbinate and into the posterior insertion of the middle turbinate to the lateral nasal wall. It is essential to inject slowly to avoid sudden increases in blood pressure
5. Advance a 0 degree, 18cm rigid endoscope into the posterior nasal cavity by guiding the endoscope between the inferior and middle turbinates
6. Once the nasopharynx is reached, the endoscope is retracted slightly into the posterior end of the middle meatus, just lateral to the most posterior part of the middle turbinate where it inserts into the lateral nasal wall
7. Gently medialise the posterior part of the middle turbinate taking care not to fracture the middle turbinate at its attachment to the cribriform plate as this may cause a CSF leak. There is no need to medialise the anterior portion of the middle turbinate
8. Palpate the lateral nasal wall to locate the posterior fontanelle. The fontanelle is a mucosa-covered 'ostium' and is located posterior to the uncinate process, under the bullae ethmoidalis and about 1cm anterior to where the middle turbinate attaches to the lateral nasal wall posteriorly. This defect in the bony medial wall of the maxilla can be clearly palpated
9. Make a vertical mucoperiosteal incision immediately behind the posterior fontanelle. This is about 1cm anterior to the posterior insertion of the middle

turbinate. The incision should be about 1cm in length and should extend from high up in the middle meatus (at the level of the basal lamella) to the inferior turbinate

10. Dissect submucosally in a posterior direction from the vertical incision behind the posterior fontanelle
11. The first structure to be encountered is the crista ethmoidalis (*Figure 6*). It is an important landmark as the SPA is located just posterior to it. Take care when dissecting around this area not to accidentally disrupt the SPA as this can cause significant bleeding

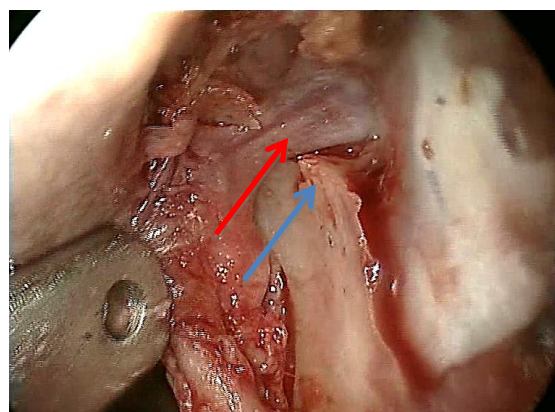


Figure 6: Blue arrow points to crista ethmoidalis; SPA is visible behind it (red arrow)

12. Elevate a mucoperiosteal flap to expose the SPA as it exits its foramen (*Figure 7*)

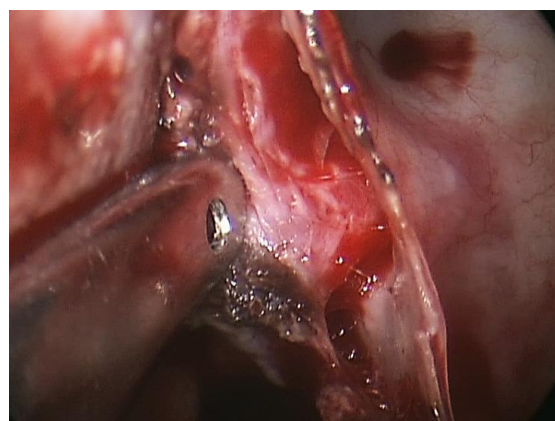


Figure 7: SPA as it exits the SP-foramen

- Use a Kerrison punch or Upcut to remove the crista ethmoidalis and to follow the SPA laterally into the pterygopalatine fossa (*Figure 8*)

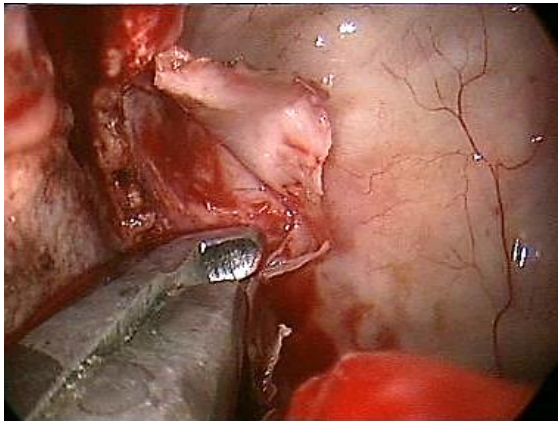


Figure 8: Removing crista ethmoidalis with a Kerrison upcut punch to expose pterygopalatine fossa behind maxillary sinus

- Identify the main or anterior branch of the SPA (*Figure 9*)

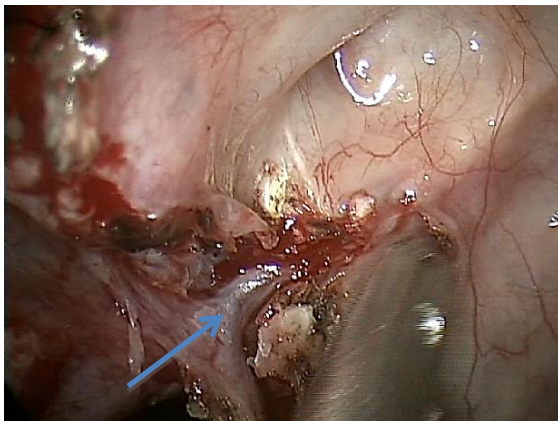


Figure 9: The most anterior or main branch of the SPA is identified (blue arrow) and followed into the pterygopalatine fossa for a few millimetres

- Either cauterize the vessel with bipolar cautery or apply a Ligaclip (*Figure 10*)
The author prefers bipolar cautery as Ligaclips often are dislodged
- Transect the artery to provide access to determine the presence of more arterial branches posteriorly, superiorly and inferiorly (*Figure 10*)

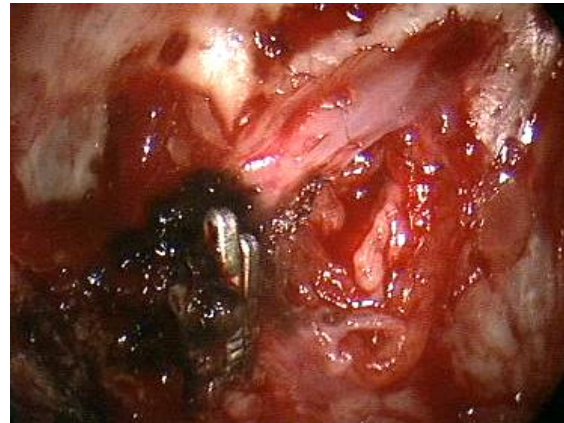


Fig. 10: Two ligaclips applied to the proximal end of the SPA. The artery was cut to find posteriorly-located branches

- Replace the mucosal flap and place a small piece of Surgicell over the mucosal flap; no additional nasal packing is required
- Observe the patient in hospital overnight

Alternative technique in the event that the SPA is not found

It may be difficult to locate the SPA especially in the following circumstances:

- An oedematous nose secondary to nasal packing
- Anatomical anomalies *e.g.* deviated nasal septum, large concha bullosa *etc.*
- Limited space in the nasal cavity due to a combination of the above factors and/or large turbinates

If the tip of the endoscope cannot be positioned in the posterior part of the middle meatus and limited space prevents one from making the mucosal incision, the following should be done:

- Do a standard uncinectomy, preserving the superior part of the uncinata
- Enlarge the maxillary sinus ostium posteriorly using a through-cutting Blakesley forceps until the posterior wall of the maxillary sinus is encountered (*Figure 4*)

3. This provides sufficient access so that the mucoperiosteal flap can be raised from the level of the posterior wall of the maxillary sinus (*Figure 7*)
4. Occasionally a limited septoplasty or reduction of a concha bullosa is required to gain adequate access to the posterior middle meatus

Postoperative instructions

1. The patient is discharged the following day with topical Oxymetazoline nasal spray for 5 days
2. Instruct the patient not to blow the nose for at least 48 hours and only gently thereafter
3. Oral antibiotics are not routinely required; neither is nasal douching
4. The patient is seen after 2 weeks to ensure that no further bleeding has occurred

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