Bilateral Sphenopalatine Artery Embolisation in Panfacial fractures-a case report

Jayita Poduval [1*], Mark C Arokiaraj [2], Vinay Bhat [3], Nishant Savery [4]

1 MS, DNB (ENT), Assistant Professor, Department of ENT,PIMS,Pondicherry, India
2 MD, DM (Cardiology), Professor and Head, Department of Cardiology, PIMS, Pondicherry, India
3 MS (ENT), Assistant Professor, Department of ENT, PIMS, Pondicherry, India
4 MBBS,2nd year post-graduate student, Department of ENT, PIMS, Pondicherry, India

**** Corresponding Author:*** Jayita Poduval
D-2-7, JIPMER Campus, Dhanvantari Nagar, Pondicherry, India-600506
Tel: +91-9787702447 | Email: drjayitapoduval@gmail.com

Abstract

Objective: To explore the possibility of performing bilateral superselective sphenopalatine artery ligation to control severe epistaxis encountered in multiple facial injuries, thus avoiding surgery and its associated morbidity.

Case description: This is the report of the first case done in our institution based on the principle of superselective embolisation of the sphenopalatine artery on both sides in order to control intractable nosebleed in the background of poor surgical and anaesthetic risk.

Result: Bilateral superselective sphenopalatine artery ligation effectively and safely controlled severe epistaxis in a single case of multiple facial fractures.

Conclusion: This is the first documented case of superselective embolisation of the sphenopalatine artery on both sides to manage a case of severe traumatic epistaxis. An extensive, expensive, difficult, and somewhat dubious surgical procedure was thus avoided. Replication of this procedure in indicated and selected cases in various centres involving more numbers of subjects could establish a new protocol for the management of intractable traumatic epistaxis.

Key Words: Epistaxis, Facial Injuries, Sphenopalatine Artery, Ligation, Angiography, Bilateral Superselective Embolisation

Case Report

A 19-year-old male suffered a Road Traffic Accident causing panfacial fractures and fracture shaft of femur on the right. The 3-D CT showed a fracture of the right zygomatico-maxillary complex, dento-alveolar fractures and fractures of the posterior orbital wall, and fracture of the left maxillary sinus with nasal, ethmoid, pterygoid fractures.

Fig 1: 3-D CT of panfacial fractures

Fig 2: Axial CT showing pterygoid plate fractures

During the facio-maxillary procedure 4 days later, he developed torrential nasal bleeding for which anterior nasal packing was done, and he sought further treatment at our hospital.

The patient underwent orthopaedic surgery the following day under spinal epidural anaesthesia. Immediately, post-operatively, while the patient was still on the fracture table, he again developed nasal bleeding with the nasal pack in situ and so transoral endotracheal intubation was done under general anaesthesia. The nasal pack was removed and incessant and torrential bleeding was noted. After several attempts with Foley's catheter, posterior and anterior nasal packing was done with roller gauze and the epistaxis controlled.

Anticipating recurrence of bleeding at the time of pack removal a carotid angiogram was done two days later. On angiography, the right external carotid, maxillary and sphenopalatine vessels were visualized and aneurysms or arterio-venous malformations ruled out. Superselective embolisation of the sphenopalatine artery was then done on the right side; the left side was also visualized by angiography and superselective embolisation of the sphenopalatine carried out, with polyvinyl alcohol of particle size 500 microns.

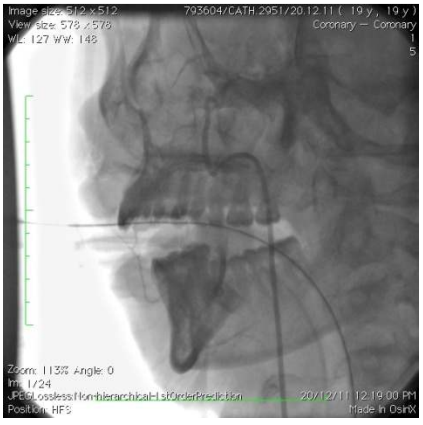

Fig 3: Sphenopalatine artery defined

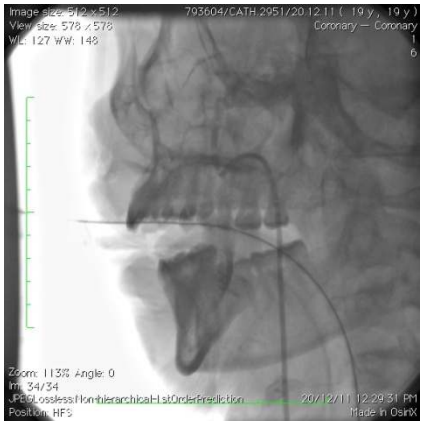

Fig 4: Embolic material in sphenopalatine artery

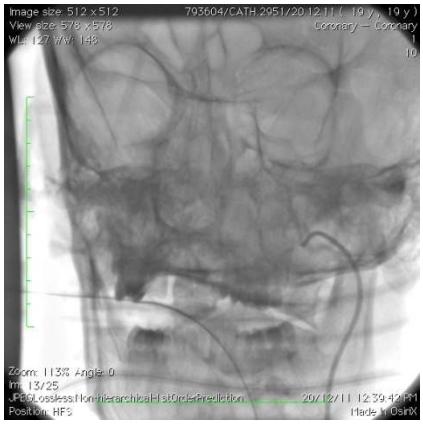

Fig 5: Immediate post-occlusion

The following day the anterior and posterior nasal packs were removed and the patient extubated.

There was no oozing or bleeding at the time of pack removal. The palate and nasal mucosa were pink and healthy following the pack removal even though a mild pallor over the palate was noticed temporarily on the day of embolisation immediately following the procedure. The patient was eventually transferred to plastic surgery for management of the facial injuries and no further morbidity was recorded on follow-up as far as the nose was concerned.

Discussion

Epistaxis, or nosebleed, is a common occurrence in the general population, and the commonest ENT emergency.[1] A study done in 1982 has estimated that about 60% of people experience an episode of epistaxis at least once in their lifetime, out of which about 6% require treatment.[2] Only about 1% require surgical treatment.[3] The causes of epistaxis are vast and varied and include local problems like deviated nasal septum, rhinosinusitis and facial injuries to systemic causes like hypertension, alcohol abuse and anticoagulant use. All of these factors can cause anterior or posterior nasal bleeding, though anterior epistaxis is generally less calamitous and more easily brought under control. Most cases of anterior epistaxis are managed by primary or secondary measures like pinching the alae, chemical or electrical cauterization, nasal tamponade with anterior nasal packing, and/or in a few selected cases septoplasty, along with stabilization of the haemodynamics of the patient and evaluation and treatment of the primary cause. Posterior epistaxis, by contrast, can be rapidly exsanguinating, and requires aggressive measures. Facial injuries, especially those found in road traffic accidents, are a common cause of posterior epistaxis, and the sphenopalatine artery is the commonest and most important vessel involved.[4]

Intractable epistaxis refers to those cases where conservative management with medication, cautery or tamponade fails. Intractable epistaxis is controlled by arterial ligation surgically or

embolisation of the bleeding vessel radiologically. Surgery includes maxillary artery ligation by open approach, or endoscopic ligation of the sphenopalatine artery. A few cases continue to bleed in spite of this, and surgical control in such cases is directed at the anterior ethmoidal, and if required, the external carotid artery.

Arterial ligation is facilitated by initially infiltrating the region of the greater palatine foramen, which is a useful, but often difficult, procedure that can be performed as the patient is being prepared for the operating suite.[5] Endoscopic sphenopalatine artery ligation requires the same equipment as other endoscopic nasal and sinus surgeries but there is a relatively steep learning curve. Complications arising out of arterial ligation are not many but the chances of rebleeding are significant. The failure rate for SPA ligation is 0–16% [3], similar to that for ligation of the internal maxillary artery 5–15%.[6]

The main hindrance to surgical control of epistaxis is unfavourable circumstances in the form of extensive local and regional injuries and factors like polytrauma and extremes of age, leading to poor surgical and anaesthesia risk.

With the advent of angiography and interventional radiology and cardiology, indirect visualization of vessels and control of bleeding at distant sites have become feasible. Embolisation for the control of epistaxis was first performed in 1974.[7] The Seldinger technique[8], refinements in angiography of cerebral and carotid circulation, safe and effective materials for embolisation, better training of personnel and shorter hospital stay have paved the way for embolisation as a viable alternative in the control of severe epistaxis. Using the Seldinger technique, biplane angiography and road-mapping[9], the carotid circulation on side is visualized and the internal carotid and its branches are carefully avoided in order to protect the cerebral circulation. The external carotid artery is then located and all its branches are identified one by one. The procedure is repeated on the other side. It is important to try to localize the bleeding vessel prior to occluding it[10], as embolisation is an irreversible procedure. Angiography also identifies abnormal circulation, aneurysms and arteriovenous malformations. As haemostatic control is better if embolic materials can target the peripheral vessels[11], and complications less, superselective embolisation of the ipsilateral sphenopalatine artery is performed depending on the laterality of the bleed.

Mahadevia et al have observed that most cases of intractable epistaxis have diffuse, bilateral mucosal congestion and hypervascularity on catheter angiography with no clearly identifiable source of bleeding.[9] Their study has recommended superselective bilateral embolisation in cases of intractable epistaxis, the rationale being the finding of generalized hyperaemia, poor localization of the bleeding vessel and cross-circulation leading to recurrence of bleeding.

Materials used to embolise and occlude the offending vessel are gelfoam, polyvinyl alcohol (PVA), steel or tantalum coiIs and NBCA (N-butyl-cyanoacrylate) glue of size not less than 150-200 microns, best results being obtained with particle size of 250-350 microns.[9] It must be noted that rupture of or bleeding from either of the ethmoidal arteries is not treated by occluding it in this manner as the chances of embolic material entering the cerebral circulation are very high. Such cases are better managed by an external approach or endoscopic clipping.[12]

Superselective embolisation is especially useful in cases of facial injuries in which multiple, and sometimes comminuted, skull base fractures may be present. These could be difficult to access

and not amenable to repair or reduction. Continued manipulation, malalignment, loose segments of bone and the formation of arteriovenous malformations can make epistaxis control by tamponade unsuccessful, and prone to recurrence of bleeding on pack removal or after surgical ligation. In some cases, surgical failures have occurred because the clip used for ligation was found to lie not on, but alongside, the vessel.[9] Traumatic arteriovenous or arterio-arterial anastomoses[13], which could cause torrential bleeding during open surgery, could be preferentially embolised. Vascular injuries in the neck, which are often present along with facial injuries, could be investigated using angiography and effectively occluded.[14]

It is therefore worth considering angiographic embolisation as the first line of treatment in extensive facial injuries, though currently embolisation is primarily practised for tumours[15], mainly to devascularise the lesion, control inaccessible vessels, minimize blood loss, protect nearby structures, enhance visualization and avoid surgical complications.[16] Only in certain cases of juvenile nasopharyngeal angiofibroma (JNA), where skull base involvement is present, pre-operative embolisation may be avoided. This is because deep extensions of angiofibroma into the fissures and foramina of the skull base are better assessed when they bleed during surgery and attempts can be made to remove them. Embolisation in these cases may lead to such extensions being undetected, thus resulting in a higher recurrence rate.[17]

The complication rate of superselective embolisation is 0-8%.[18] Complications include major problems like cerebrovascular accident (CVA), blindness, ocular paralysis, facial nerve palsy and soft tissue necrosis, and minor events like fever and local pain in the groin, facial pain, jaw pain and headache, facial oedema, confusion, numbness and paraesthesia.[19] Instances of rebleeding are more and major complications are more common if superselective embolisation is not performed. For instance, bilateral embolisation of the internal maxillary has been reported to cause hard palate necrosis[20], and caution advised against such a procedure.

Though embolisation may be necessary in selected cases, or preferred over surgical treatment, infrastructure and trained personnel for angiographic evaluation and embolisation may not always be available. This may be considered an important limitation of this procedure.

Conclusion

Bilateral superselective sphenopalatine artery embolisation is a rational procedure in cases of intractable epistaxis, especially that due to extensive facial and head and neck injuries, and to our knowledge, has not yet been reported in the literature. Though randomized controlled studies using this method may be difficult to execute, prospective case series, preferably multicentre, are needed to conclusively establish it as a safe and cost-effective procedure for the first-line management of severe epistaxis.

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Conflict of Interest: None declared

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