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Review Article

Sphenopalatine artery ligation: a brief review

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ABSTRACT

Nasal bleeds ,anterior or posterior necessitate varied stepladder interventions like the simple thumb-index finger pinch technique , insertion of spindle cotton plug or the layered roller gauze, the latex urological Sir Foleys catheter and its fine grade silicone modifications, feeding vessel bipolarization or embolization. The middle turbinate being the line of demarcation between the internal and external carotid supply to the nose. The anterior and posterior ethmoid arteries are the distributaries of the internal carotid system. The former is ligated or fulgurated via the external Howarth or the intranasal endoscopic approach. The sphenopalatine artery is the primary distributary of the external carotid system to the nasal and the paranasal region, which is accessed trans-nasally or trans-antrally and ligated, clipped or fulgurated in uncontrolled epistaxis. Endoscopic visualization facilitates the procedure. The intervention is precise, quick and avoids the uncomfortable sequel of conventional nasal tamponade, like excess nasal crusting, anosmia, cacosmia and cheek paraesthesia.

Keywords: Epistaxis, Endoscopic, Ligation, Sphenopalatine artery, Transnasal

INTRODUCTION

Most anterior epistaxis originates primarily from the Kiesselbach's plexus, whereas posterior epistaxis is less common and originates from branches of the sphenopalatine artery. Since the Chandler and Serrins conventional canine fossa access to the internal maxillary artery to the transnasal Budrovich and Saetti's endoscopic sphenopalatine artery ligation, multiple modalities have been practiced to manage nasal bleeds.[1,2]

Risk factors include local trauma, foreign body insertion, substance abuse, neoplasms, inherited bleeding diatheses or acquired coagulopathies. Nasal bleeds, anterior or posterior necessitate varied stepladder interventions like the simple thumb-index finger pinch technique, insertion of spindle cotton plug or the layered roller gauze, the latex urological Sir Foleys catheter, its fine grade silicone modifications, feeding vessel bipolarization or embolization. The middle turbinate being the line of demarcation between the internal and external carotid supply to the nose. The anterior and posterior ethmoid arteries are the distributaries of the internal carotid system.

The former is ligated or fulgurated via the external Howarth or the intranasal endoscopic approach. Modern-day management of epistaxis is a little more sophisticated, with the advent of new products, rigid endoscopes, improved surgical techniques and arterial embolization. The sphenopalatine artery ligation is the most preferred modality and is chosen on the basis of control of bleed, without requirement of any additional interventions and with minimal to none complications or sequel.

REVIEW

Trans-antral ligation

Trans-antral ligation of the internal maxillary artery was initially advocated by Chandler and Serrins in 1965, which was extensively utilized to treat intractable posterior epistaxis ever since.[1] Though with high success rate, the untoward sequel was oroantral fistula and infraorbital nerve injury.

Sphenopalatine artery ligation

Endoscopic trans-nasal sphenopalatine artery ligation is the recent modality. Budrovich and Saetti in 1992 first described endoscopic sphenopalatine artery ligation utilizing a 1 cm vertical incision immediately proximal to the insertion of posterior margin of the middle turbinate. Subperiosteal dissection traces the sphenopalatine artery at the sphenopalatine foramen. White suggested accessing the artery within the pterygomaxillary space necessitates a wide middle meatal antrostomy as artery is often difficult to isolate medial to the foramen.[2] Minimal instrumentation i.e., the basic endoscopic sinus surgery set and a clip applicator are required. Moreover, there is low risk of intra-orbital and cerebral complications.[3] The surgical and anesthesia duration is less than that required for conventional artery ligation techniques.[4] These issues are of concern for subjects who are elderly, weak and with coexisting morbidities.

Arterial ligation vs nasal compression packing

Leung et al, noted that the posterior packing is uncomfortable, lengthens hospitalization and increases the incidence up to 52%, of recurrent bleed.[5] In embolization and sphenopalatine artery ligation, the rebleed incidence is less than 10%. Rudmik and Leung's model based economic review concluded that transnasal sphenopalatine arterial ligation was economical than embolization for intractable epistaxis.[5] Dedhia et al, study documented that after stabilization with a posterior pack, it is cost-effective to resort to transnasal sphenopalatine arterial ligation rather than prolonged posterior packing.[6,7]

The lowest-risk interventions appear to be posterior packing after transnasal sphenopalatine arterial ligation or transnasal sphenopalatine arterial ligation as a first-line choice. Leung et al, emphasized that transnasal sphenopalatine arterial ligation to be the primary modality to reduce patient risk and encourage the most effective use of healthcare resources when the risk outcomes are paired with cost-effectiveness.[5] Surgical intervention a primary modality for posterior epistaxis is not popular despite it recognized morbidity and efficacy. For posterior epistaxis, Wang and Vogel preferred artery ligation over antero-posterior packing, citing reduced failure rates (14.3 vs 26.2%), lower rates of minor complications (40% vs 68%), and a seven-fold difference in the category of life-threatening complications.[7] Wang and Vogel demonstrated a 2.2-day reduction in hospital stay for artery ligation, however, no cost analysis was undertaken. Gandomi et al, hypothesized that the sphenopalatine artery being the terminal branch of the internal maxillary artery and is lying quite distal to cause retrograde and anastomotic blood flow from other vessels.[8] Therefore, sphenopalatine arterial ligation is undertaken.

Transantral approach has been preceded by the endoscopic transnasal route. Gandomi 27 subject study included sphenopalatine artery ligation of 30 arteries, which had bilateral intervention in 3 subjects.[8] Age ranged from 15 to 78 years. Bipolar diathermy was employed with follow-up for 6.2 months. After surgery, there was no recurrence in the first 24 hours. In first two weeks after surgery (the early post-operative phase), there were 3 recurrent epistaxis; in two of them required anterior nasal packing was done, while the third patient did not require medical treatment. Within the first seven days (early post-operative 9 time) and two months (late post-operative period), one experienced recurrent epistaxis.

Conservative measures, such as anterior nasal packing and local cautery, also had an impact on this patient. These four patients did not require any additional surgical procedures. As a result, their study's success rate was 87%. Barnes et al, 317 subject study advocated admissions for acute epistaxis and direct cautery, for management of bleeding, visibility of the bleeding site can be facilitated by the general anesthesia and skilled assistants.[10] Arterial ligation is resorted to when this is still not possible or there is doubt about the established control. Snyderman et al, 38 subject study involved endoscopic closure of the sphenopalatine artery. 13% experienced a severe recurrence of their epistaxis and required additional surgical intervention.

Side effects noted were paraesthesia of the palate and nose (13%) and nasal crusting (34%). A three-day hospital stay was the median (range: one to ten) Even in posterior epistaxis, endoscopic transnasal sphenopalatine artery ligation can be utilized. Snyderman et al, concluded that of all the alternatives available for the final management of posterior epistaxis, this one should be given priority. With excellent success and minimal morbidity, with respect to internal maxillary artery ligation, success rate of 92% for sphenopalatine artery ligation is quite good.[11]

Most complications are mild and self-limiting and are related to the preoperative interventions like nasal cautery and packing. Patients feel less discomfort from this technique compared to posterior nasal packing or transantral ligation. Moreover, patients require a short hospital stay of one to two days in ligation technique. Klotz et al, analysis surgical management of posterior epistaxis which included internal maxillary artery

ligation, cautery, sphenopalatine artery ligation concluded 90% of all surgical operations for posterior epistaxis were successful on average, compared to 62% for anterior-posterior packing and 75% for embolization.[12,13] Compared to patients treated surgically (2.1 d) or with embolization (2.6 d), the packing-only group had a considerably longer mean hospitalization duration (5.29 d). The average cost of hospitalization for each patient was $5136 for effective posterior packing, $3851 for surgical therapy and $5697 for embolization.

Compared to usual packing, surgery resulted in a $1846 cost savings per patient. The groups' respective complication rates did not differ significantly. Satoshi et al, performed unilateral endoscopic ligation of the sphenopalatine artery on seven individuals, while one patient with Osler's disease underwent bilateral ligation[14]. The hemoclip, designed for neurosurgery, was used to cut the artery. In subjects with narrow nose, it may not always be possible to ligate the sphenopalatine artery without the use of large forceps. Three subjects underwent endoscopic maxillary artery ligation as their nasal cavity was too narrow to apply the hemoclip.

In these interventions, the sphenopalatine and maxillary arteries could be identified in every patient and the results were effective. External ligation of the ethmoidal arteries was not required. Postoperative period was uneventful and no complications occurred during or after the procedure. Onur et al, advised, on failure of anterior nasal packing or occurrence of posterior epistaxis, 48–72 hours after pack removal, sphenopalatine artery ligation should be resorted to sphenopalatine artery ligation without anterior nasal packing for posterior epistaxis is often the primary modality.[15]

Success of posterior nasal packing in posterior epistaxis is lower than sphenopalatine ligation, with incidence of recurrent bleed between 26% to 52%. Sphenopalatine artery ligation reduces the hospitalization duration, the financial burden and also improves quality of life vis a vis posterior packing.

Anterior nasal packing following sphenopalatine artery ligation

There is a controversial issue of necessity of anterior nasal packing following sphenopalatine artery ligation. Nasal packing need not be done again once the bleeding artery has been located and clipped. Some emphasize anterior nasal packing does not reduce the likelihood of rebleeding and thus advise against it following sphenopalatine artery ligation. On the contrary, post intervention bleeding from mucosa occurs from flap elevation on the lateral wall during surgery. Consequently, nasal packing can be placed anteriorly following sphenopalatine artery ligation. Abdelkader et al, undertook the earliest long term and documented excellent long-term control of intractable posterior epistaxis by sphenopalatine artery ligation.[16] While the local complication rate is extremely low, the not insignificant post-operative mortality rate seen in this series is indicative of the poor cardio-respiratory status of many of these patients. The study emphasized that endoscopic sphenopalatine artery ligation was better than other interventions, namely ligation of the external carotid artery or internal maxillary artery via trans-antral access.

Their study included 45 arteries out which, 43 patients (30 males and 13 women) needed unilateral ligation and 2 required bilateral ligation. The age range of these patients was 37 to 85 years, with an average of 68.5 years. Prior to entering the operating room, patients were admitted for an average of 2.3 days and they were relieved from the hospital 1.5 days later. Of the procedures performed, twenty-seven (60%) involved clipping only, ten (22%) involved both clipping and diathermy and eight (18%) used diathermy only 35. The average follow-up period for all patients was 15.8 months, with a range of nine to 24 months.

Within the first 24 hours following surgery, no patient in the current study experienced recurrent epistaxis. Holzmann et al, evaluated endoscopic sphenopalatine artery coagulation and noted that artery treated with coagulation alone recanalizes in a few days.[17] Therefore, occlusion of an artery with transection and coagulation of both bleeding ends has to be undertaken. Cutting the artery is better than coagulation as insufficient coagulation keeps the vessel open.

Moreover, there is the likelihood that the bleeding pedicle might regress into the pterygopalatine fossa. Abdelkar et al, documented that rebleeds are consequent to a variety of causes, primarily clip dislodgement or the presence of rich collateral vessels, but this failure rate may be somewhat explained by the existence of many branches at the site where the sphenopalatine artery emerges from its foramen.[16]

Anterior ethmoid artery ligation

Barnes et al, recorded that in traumatic or postsurgical epistaxis, nasal or ethmoid bone fractures cause bleeding away from the sphenopalatine artery distribution, anterior ethmoid artery ligation is crucial.[10] Attempts to achieve anterior ethmoidal artery ligation by endoscopic or transcaruncular methods to avoid external scars. Woolford and Jones attempted the endonasal route which necessitates an approach to the artery via the lamina papyracea or mesentery.[18]

In 20 percent of cases or less, the former was possible. In most circumstances, the latter method performed through the lamina -seems safe and practical, subject to surgeon's dexterity. Pre and intraoperative computed tomography scans as well as image guidance are essential in either situation.

CONCLUSION

Vis a Vis, the transnasal endoscopic sphenopalatine artery access and bipolar fulguration or clapping is the recent therapeutic modality in persistent epistaxis with minimal morbidity.

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