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Epistaxis and catastrophic nasal bleeding

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Epistaxis is the most common otolaryngologic emergency. Its severity may range from mild to life threatening. Management of acute epistaxis varies depending on its severity, etiology, and site of bleeding. Endoscopic control of epistaxis is considered a highly effective and cost-effective treatment. It is important for the surgeon to weigh the potential benefits and risks. Ligation and cauterization of the sphenopalatine artery and anterior and posterior ethmoidal arteries is discussed. A plan of action and control of catastrophic bleeding from the internal carotid artery or cavernous sinus are also discussed.

Introduction

Epistaxis is the most common otolaryngologic emergency. Two-thirds of the population has a history of epistaxis during their life, with approximately 6% needing medical attention. Ranging from mild to life threatening, epistaxis is more frequent in children younger than 10 years and adults older than 40 years and occurs more often during cold winter months. It is most commonly idiopathic but causes including primary neoplasm, trauma, and iatrogenic events do occur. Comorbidities such as hypertension, and coagulopathies, as well as usage of anticoagulation medication and nasal septal abnormalities are major risk factors for epistaxis. The basic mechanism of epistaxis is unclear. Theories include superficial normal vessels, varices, telangiectasia, or aneurysms. Hypotension, which usually is a late sign, and tachycardia, are indication of significant blood loss, especially in young individuals.[1-5]

There are different approaches to classify epistaxis from a management standpoint. It can be classified as anterior or posterior epistaxis, based on the site of bleeding, but there are no clear definitions of either. Most cases with intractable epistaxis would be classified as posterior owing to poor visualization, and hence the epistaxis that fails to stop with aggressive bilateral anterior packing may be termed posterior epistaxis. Another definition of posterior epistaxis is bleeding arising posterior to the maxillary sinus ostium.[1,6] Epistaxis also can be classified based on the source of bleeding as venous or arterial and into high-flow or low-flow based on the rate of bleeding. Venous bleeding can involve low flow, such as mucosal oozing, or it can be high-flow bleeding from structures such as the cavernous sinus. Similarly, arterial bleeding can be low flow, as occurs from small perforating vessels, or high flow, as is the case with carotid artery injuries.[7]

Epistaxis is often controlled with first-line interventions such as chemical or thermal cautery, hemostatic agents, or nasal packing. Uncontrollable bleeding with these methods may need surgical intervention. Transnasal endoscopic sphenopalatine artery (SPA) ligation or cauterization provides excellent control.[3,6,5] In 1965, Chandler and Serrins described the transantral approach to ligating the maxillary artery in the pterygopalatine fossa. In 1976, Prades described a microsurgical approach for ligating the SPA at its foramen, as a surgical landmark for Vidian nerve. In 1985, Stamm et al described the transnasal microscope approach to SPA ligation and showed a 94% success rate for controlling intractable posterior epistaxis with reduced patient morbidity. In 1992, Budrovich reported endonasal endoscopic approaches for

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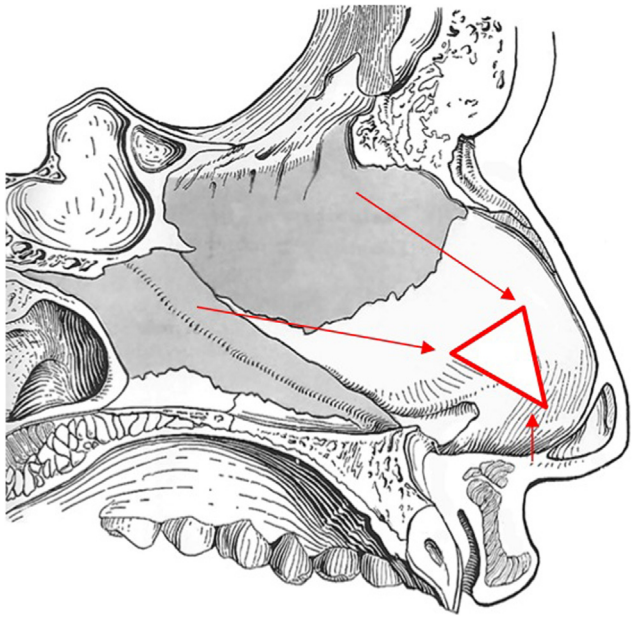

Figure 1 Kiesselbach plexus (Little area). The anastomotic triangle in the caudal septum is formed by thin-walled terminal branches of ethmoidal arteries, SPA, and the superior labial artery. (Adapted with permission from Casiano et al.[15]) (Color version of figure is available online.)

SPA ligation to treat epistaxis.[6,8-12] Alternately, surgical ligation of the anterior or posterior ethmoid arteries may be indicated if this is the source of uncontrolled hemorrhage.

Anatomy

Knowing the anatomy is of great importance. Both internal carotid artery (ICA) and external carotid artery (ECA) anastomose with each other to supply the nasal cavity. The ophthalmic branch of the ICA branches intraorbitally to give rise to the anterior ethmoid artery (AEA) and the posterior ethmoid artery (PEA). The internal maxillary artery (IMA) branch of the ECA gives rise to the SPA. The anastomotic triangle in the caudal septum known as Kiesselbach plexus (or also known as Little area) is formed by large thin-walled terminal branches of 3 major arteries (Figure 1). These arteries are the ethmoidal arteries (AEA and PEA), SPA, and the superior labial artery.[7] This area is the most common site for epistaxis (90%-95%). Most cases of posterior epistaxis involve the SPA, which is the terminal branch of the IMA. On the contrary, bleeding due to AEA is uncommon. However, it usually occurs in patients with facial trauma, skull base fractures, or iatrogenic injury.[1,3,6-13]

The SPA enters the nasal cavity from the sphenopalatine foramen (SPF) in the posterior lateral wall and divides into a septal branch, which courses posteromedially along the inferior portion of the sphenoid rostrum, just inferior to the sphenoid sinus ostium, and a conchal branch, that supplies the lateral wall below the middle turbinates. The SPF is circular or oval in shape. It is usually found in the posterior part of the superior meatus at the transition between the middle meatus and superior meatus, higher than the posterior attachment of the middle turbinate, and approximately 6.5 cm from the nasal spine. Therefore, during dissection, the lower limit should be the inferior edge of the posterior attachment of the middle turbinate.[1,3,14,6,15] The ethmoid crest (crista ethmoidalis) is a small crest of the ascending process of the palatine bone that meets the posterior aspect of the middle turbinate.[17] This bony "pointer" is an important surgical landmark as it usually points to the SPF (Figure 2). The SPF may consist of 1 common large opening (Class I in 20%), 2 separate openings with a smaller inferior opening and divided by a membranous or fibrotic bridge (Class II in 70%), or 2 separate openings, a large superior and small inferior opening, divided by a bony bridge (Class III in 10%). Other variations also may exist (Figure 3).[1,3,14,6,4,15,16,5,17]

The AEA and PEA are branches of the ophthalmic artery, running on the medial wall of the orbital beneath the lower border of the superior oblique muscle. Branches of ethmoidal arteries may occur within the ethmoid roof. They then enter the cranial cavity medially to the cribriform plate area. Both give meningeal branches to the dura as they enter intracranially (Figures 4 and 6). The AEA can be seen in the space between periorbita and lamina papyracea (LP), 2 cm posterior to the lacrimal crest, as it is penetrating the periorbita into its bony canal, coursing through the roof of the ethmoid sinus at the attachment of the ethmoid bulla lamella, or along the posterior aspect of the frontal recess. The AEA may also course within a mesentery (in 36%), a few millimeters below the level of the bony ethmoid roof. When located in a mesentery, it can be identified on computer tomography (CT) and tends to coexist with Keros type 2 or 3 cribriform plates (Figure 5).[3,6,15,18]

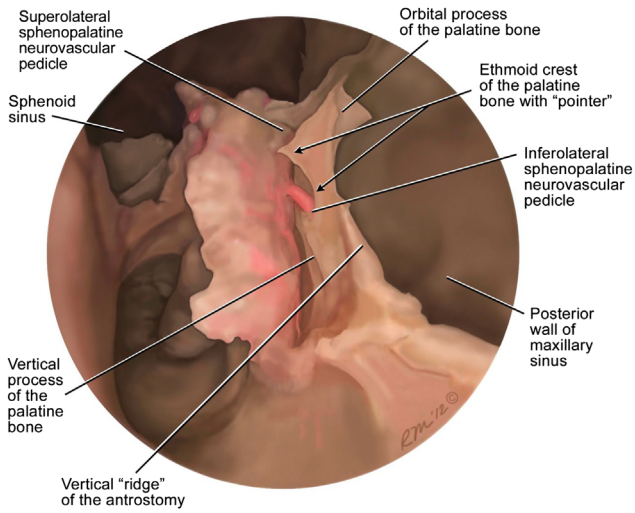

Figure 2 Ethmoid crest (crista ethmoidalis). A diagram showing the left nasal cavity with an opened maxillary sinus and sphenoid sinus. Ethmoid crest (crista ethmoidalis) is shown as it is an important surgical landmark pointing toward sphenopalatine foramen. (Adapted with permission from Casiano et al.[15]) (Color version of figure is available online.)