Epistaxis: Diagnosis and Treatment

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Oral and maxillofacial surgeons are called on to evaluate and treat various emergencies, including acute epistaxis. Epistaxis is relatively benign in nature, but it can produce a serious, life-threatening situation. It has been estimated that up to 60% of the population has had at least 1 episode of epistaxis throughout their lifetime. Of this group, 6% seek medical care to treat epistaxis, with 1.6 in 10,000 requiring hospitalization. With fewer and fewer otorhinolaryngologists participating on hospital call schedules, it is critical for the oral and maxillofacial surgeon to be familiar with the anatomy, diagnosis, and treatment of acute epistaxis and associated medical concerns. Considerations concerning mechanism of injury, coagulopathies, and potential treatment options need to be assessed quickly and accurately to ensure the most appropriate treatment and positive outcome for the patient. The need to treat epistaxis in an emergent setting will often require the involvement of an oral and maxillofacial surgeon. By reviewing the anatomy, potential complications arising from associated medical conditions, and treatment options, patients can be accurately assessed and treated appropriately.

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Defined as active bleeding from the nose, epistaxis is a commonly occurring phenomenon. It is estimated that approximately 60% of the population at 1 time or another in their lifetime will suffer from varying degrees of epistaxis.1 Fortunately, only 6% of these people will require medical treatment to control and stop the hemorrhage. Often a result of traumatic or mechanical causes, epistaxis can progress to uncontrolled, significant hemorrhage, lasting longer than an hour, requiring medical assistance to control.2

Common etiologies of epistaxis include assault, athletics, foreign body, traumatic intubation, orthognathic surgery, oncological surgery, arteriovenous malformations, blood dyscrasias, and medications, to name a few. In persistent bleeding cases, prompt and appropriate first-line management of the condition is important to minimize patient morbidity and mortality.3 (Fig 1).

In situations in which epistaxis is able to be adequately controlled with conservative measures, the condition is termed uncomplicated epistaxis. Treatment options include nasal packing, electrocautery, and the use of vasoconstrictive agents.

Those cases in which conservative therapy fails, requiring more extensive intervention, is referred to as intractable epistaxis. For nasal hemorrhage that is refractory, posterior nasal packing, vessel ligation, endoscopic surgery, or interventional radiological procedures for embolization are options for the treatment of intractable epistaxis.

Anatomical Considerations

The nasal cavity is divided into 3 main areas: the anterior nasal cavity, the posterior nasal cavity, and the superior nasal cavity.

The most common site of bleeding is from the plexus of vessels at the anteroinferior aspect of the nasal septum in the anterior nasal cavity. This area, most commonly referred to as the Kiesselbach plexus, is also known as Little’s Area. This area is particularly prone to drying, as well as digital trauma. Collateral circulation in this region is provided by terminal branches of the internal and external carotid arteries. Approximately 90% to 95% of all cases of epistaxis arise from this anterior septal vasculature.4 (Fig 2).

The plexus is composed of branches from both the anterior and posterior ethmoid arteries. Both are terminal branches of the ophthalmic artery, branching from the internal carotid artery. Contributing branches from the sphenopalatine and greater palatine arteries are present, arising from the internal
maxillary artery after its departure from the external carotid artery. In the most anterior aspect of the septum, small branches from the superior labial artery appear, supplied by the facial artery.

Most bleeding from Little’s Area is self-limiting, requiring no treatment. Those bleeds requiring treatment are often easily controlled with local, conservative measures.

The posterior nasal cavity is the source for roughly 5 to 10% of occurrences of epistaxis. Septal vasculature in this area is composed mainly of branches of the sphenopalatine and descending palatine arteries, which are branches of the internal maxillary artery. A small contribution from the posterior ethmoid artery is often present.

Located in the posterior half of the inferior turbinate is a venous network known as the Woodruff plexus, which is the most common source of venous bleeding in this area.

Hemorrhage in the posterior nasal cavity is often more difficult to locate and visualize, leading to increased difficulty to control.

The anterior and occasionally the posterior ethmoid arteries are the usual source for superior cavity bleeding.

**Initiation of Treatment**

As with any condition, a concise assessment of the history of the present illness is essential. A time line of the current condition needs to be made quickly, with a description of the nature and amount of bleeding that has occurred. This information can be used to consider the need for fluid resuscitation and volume replacement therapy. Intravenous access for fluid replacement should be obtained early, because the onset of hypovolemia is insidious. Appropriate laboratory studies can be useful in evaluating the patient. A complete blood count and a coagulation panel should be considered if large volumes of blood have been lost and the nature of the hemorrhage seems inconsistent with the cause of the bleeding. Platelet function tests should be ordered as appropriate.

The examination of the patient can occur simultaneously with the review of the history of the present illness and review of medical history. It is important to establish a thorough history from the patient or family members. Information, such as recurrent episodes, frequency, local trauma, and drug or alcohol abuse, is extremely valuable. Family history of bleeding disorders and cardiovascular diseases also help to establish an etiology and help to direct the appropriate course of treatment. Patients taking nonsteroidal anti-inflammatory medications, aspirin, plavix, coumadin, or other anticoagulants can present an interesting and challenging problem regarding hemostasis.

A good light source is essential. The examination is made easier with a nasal speculum, bayonet forceps, and appropriate suction. Existing packing and blood clots need to be removed to enable visualization of the septum, superior nasal areas, and lateral nasal walls. If a discrete bleed is encountered, direct cauterization with an electrocautery unit is indicated. However, because this is the exception rather than the rule, the use of vasoconstrictive and hemostatic...
agents in conjunction with appropriate packing is indicated at this time.

Throughout the initial evaluation and treatment phase, considerations to control hypertension, if present, need to be made. Often, patients who are hemorrhaging are anxious and will display a relative hypertensive state, whereas other patients may currently be under a physician’s care for hypertension.

Approximately 15% of all cases of epistaxis requiring medical treatment involve anticoagulation therapy of 1 type or another. The most common therapies include aspirin, nonsteroidal anti-inflammatory drugs, plavix, and coumadin to name a few. Administration of platelets or fresh frozen plasma need to be considered at this time if appropriate, after reviewing necessary laboratory values.

**Local Measures**

Inspection of the nasal cavity under direct visualization is essential. Adequate lighting with an appropriately sized nasal speculum is required. Bayonet nasal forceps are invaluable in retrieving nasal packs and clotted blood and in placement of packing. The anterior, posterior, and superior cavities of the nose need to be inspected. Lavage of each nare with warm saline will allow for better visualization of the bleeding areas and will also accelerate activation of the clotting cascade.

Locally applied vasoconstrictors can assist in visualization and control of nasal bleeding. Aqueous cocaine in a concentration of 4% has long been used for both its vasoconstrictive capabilities and its anesthetic properties. Alternatively, oxymetazoline, the active ingredient in nasal decongestant sprays, possesses remarkable vasoconstrictive abilities.

Chemical or electrical cauterization is ideal for small, discrete bleeds, which are easily identifiable on initial examination with proper lighting and nasal speculum after removal of existing packing and clots. If direct visualization of a discrete bleed is not possible, indirect attempts at cauterization should be abandoned.

After administration of topical anesthetic (either 4% aqueous cocaine or viscous lidocaine on cottonoid nasal pledgets), silver nitrate sticks or small electrocautery units can be used. Circumferential cauterization around the bleeding site prior to directly cauterizing the bleeding site affords the best results. Care must be taken to avoid prolonged contact with the electrocautery unit at the septum as perforations could result. Dehiscence of tissue with resultant rebleeding is an additional concern with cautery.

In situations of excessive and intractable bleeding, cauterization may not be a feasible treatment option due to impaired visualization and interference of excessive hemorrhage. In such cases, the next and most common treatment for persistent epistaxis is nasal packing.

Nasal packing can consist of anterior nasal packing, posterior nasal packing or a combination of both. Most commonly, a combination of the two is used secondary to inability to visualize the location of the bleed. Various methods of nasal packing with a myriad of packing materials have been proposed. Most often, for uncomplicated hemorrhage, the first line of treatment is a nasal tampon (Merocele; Medtronic Xomed, Jacksonville, FL or Rhino Rocket; Denver Splint Corp, Englewood, CO). Fabricated of compressed polyvinyl acetal, which expands on contact with fluid, nasal tampons come in many different forms—from simple nasal packs in various sizes, to shaped, Doyle packs that fill the superior nasal cavity and the anterior nasal cavity. Nasal tampons that incorporate airways are also available. However, the airways tend to become obstructed easily with clotted blood. Generally, a nasal tampon functions to pack the anterior nasal cavity and, to a lesser extent, the posterior nasal cavity. Longer tampons can often aid with increased packing in the posterior cavity; however, a further discussion of posterior packing follows (Fig 3).

Initially, nasal tampons should be lubricated with petrolatum jelly or perhaps more appropriately with an antibiotic ointment. This will lubricate insertion of the nasal tampon along the floor of the nose, and the antibiotic ointment will help prevent the occurrence of toxic shock syndrome secondary to *Staphylococcus aureus* infection.

Toxic shock syndrome is a result of the exotoxins liberated from the gram-positive *Staphylococcus aureus* cocci. Systemically, the exotoxins produce symptoms that include fever, rash, hypotension, gastrointestinal disturbances and mental status changes. Potentially life threatening, prevention of toxic shock syndrome is the key, because antibiotics are useless in
combating the exotoxin liberated from the cell wall. *Staphylococcus*-appropriate systemic antibiotics will not prevent colonization of *Staphylococcus aureus* in the nasal tampons but can reduce the incidence of toxic shock syndrome. Therefore, the use of antibiotic ointment in conjunction with planned removal of the packing within 48 to 72 hours will nearly eliminate the risk of toxic shock syndrome. Systemic antibiotics are recommended for the prevention of sinusitis while the packings are in place.10

Adjunct hemostatic agents can be used in association with cautery and nasal packing. Gelfoam (Pharmacy, Kalamazoo, MI), purified bovine collagen, can be used as a vehicle for anesthetics and vasoconstrictors. Surgicel (Johnson and Johnson, Piscataway, NJ), oxidized regenerated cellulose, conforms to irregular surfaces and acts to stabilize clots. It too can be used as a vehicle for vasoconstrictive and hemostatic agents. Avitene (Davol, Murray Hill, NJ), microfibrillar purified sheep collagen, has been described for use in controlling epistaxis. Walike and Chinn corroborate the use of Avitene. They state that Avitene was shown to control hemorrhage where electrocautery and packing had failed because of Avitene’s tendency to adhere to every wet surface, promoting clot formation and stabilization.11

Used in association with topical thrombin, these materials can often control bleeding in areas where cautery is unsuccessful.

Failure to control intractable epistaxis from a posterior location necessitates the use of additional aids to achieve tamponade of the posterior nasal passage. The goal is to occlude the posterior nasopharynx, allowing for packing of the posterior nasal cavity.

Commonly, large Foley catheters can be placed bilaterally and passed to the posterior pharyngeal wall. Prior to placement, the catheter tip should be trimmed to avoid irritation and potential necrosis as it contacts the posterior pharyngeal wall. The balloons can then be inflated with appropriate volumes of saline (air-filled balloons tend to deflate over time) and the catheter pulled anteriorly to occlude the posterior choanae with the inflated balloons. Typically, only 3 to 5 mL of saline is necessary per side. The catheters can then be secured anteriorly with a large suture, an umbilical clip, or tied to one another, maintaining slight tension to prevent slippage of the inflated balloons into the oropharynx. Care should be taken to cushion the nostrils and columella from the secured catheters anteriorly. The nasal cavity can then be packed with a variety of material including iodoform gauze or nasal tampons.12

Alternatively, an Epistat (Medtronic Xomed, Jacksonville, FL) nasal catheter can be inserted and then augmented as needed with iodoform gauze packing or nasal tampons as appropriate. The Epistat consists of a small, high pressure-low volume balloon designed to occlude the choana posteriorly. A second, larger, low pressure-high volume balloon is intended to fill the posterior nasal cavity. Appropriately placed, an Epistat can effectively control a posterior bleed (Fig 4).

Complications associated with both anterior and posterior nasal packing include patient discomfort, otitis media, sinus obstruction, pressure necrosis of mucosa and cartilage, toxic shock syndrome, and hypoventilation.13 Other considerations include the possibility of short-term sleep apnea and a rare nasopulmonary reflex resulting in a drop of arterial oxygen pressure by as much as 15 mm Hg. Both conditions are potentially troublesome in patients with heart or lung disease.14

Patients who have anterior nasal packings placed can be sent home once assurance is made that the hemorrhage has ceased. These patients need close follow-up over the next several days to ensure that the packing is removed at an appropriate time in an acceptable manner and to verify that recurrent hemorrhage does not become an issue. In addition, patients with labile hypotension should be admitted for observation and maintenance.

Those cases of severe epistaxis requiring posterior nasal packing require hospitalization with close monitoring of oxygenation and effectiveness of nasal packing. Care should be taken in patients with bleeding disorders, because nasal packing can induce trauma and pressure necrosis in the mucosa, leading to ulceration and more intense bleeding in an otherwise controllable patient. With this in mind, purified collagen or oxidized cellulose impregnated with topical thrombin may be a suitable alternative to packing.

![Epistat](image.png)

Patients who have sustained significant blood loss, show symptomatic or unstable vital signs, report a complex medical history including coagulopathies and hypertension, and the elderly, should be hospitalized to ensure adequate measures are taken to control and ultimately eliminate hemorrhage.

**Invasive Measures**

Intractable epistaxis requires the addition of further modalities to treat what initially may have been thought to be uncomplicated epistaxis.

Having failed to control hemorrhage with attempts at both anterior and posterior nasal packing, alternative methods to control hemorrhage must be explored.

Historically, the external carotid artery was ligated. However, over time, with a better understanding of the anatomy, this has evolved to ligation of the internal maxillary artery via a transantral approach. Ligation of the internal maxillary artery has been associated with a significant failure rate, in part because of the difficulty in identifying the correct vessel or its terminal branches via a transantral approach. In addition, the Caldwell-Luc approach can cause sinusitis, infraorbital nerve damage, dental injury, oroantral fistulas, blindness, and ophthalmoplegia.\(^{15}\)

Now, there is a better understanding of the local anatomy with associated nasal vasculature and an appreciation of the significance of the sphenopalatine artery as the most distal blood supply for the major part of the nasal cavity.\(^{16}\) Endoscopic nasal surgery, with cauterization or ligation of the sphenopalatine artery on its entry into the nasal cavity, has been shown to be effective and minimally invasive in treating and controlling intractable epistaxis.\(^{17}\) In conjunction with ligation of the anterior ethmoid artery via a modified Lynch incision, a higher rate of success has been reported when a site of bleeding cannot be identified explicitly. Rarely is the posterior ethmoid artery ligated because of its close proximity to the optic nerve.\(^{18}\)

Most cases of intractable epistaxis are posterior, and their control poses a unique surgical challenge. Surgical control of epistaxis remains an option; however, with the ever-improving technology and techniques used with interventional radiological procedures, endovascular treatment of epistaxis through selective embolization has emerged as the treatment of choice for persistent, intractable epistaxis. Since the first report by Sokoloff et al in 1974, there have been many reports of endovascular treatment for spontaneous intractable nasal bleeding.\(^{19}\)

With the patient sedated if necessary, and under local anesthesia, the femoral artery is catheterized by means of a standard percutaneous technique. Angiography of the external and internal carotid distribution is performed to rule out the presence of vascular abnormality. After selective angiography of the internal maxillary artery, if there is no evidence of reflux or abnormal anastomosis to the internal carotid or vertebral artery, embolization is carried out with one of a variety of occlusive agents, including polyvinyl alcohol particles, gelatin sponge, butyl-cyanoacrylate, metal coils, or concentrated alcohol. The source of the bleeding can be visualized directly by extravasation of contrast substance. If there is no extravasation of contrast material, visible clinical information about the source of the bleeding is required, and the vessel related to the suspected territory of the bleeding is treated. The angigram is analyzed for collateral vessels and reflux into adjacent vessels. The vascular flow is studied with fluoroscopy after injection of contrast material to assess the velocity of flow during the injection to prevent reflux into normal vessels. Contrast material is added to the embolization material if not already radiopaque to visualize the exit of the material from the catheter to the lesion area. Injection of embolization material is repeated until there is fluoroscopic and clinical visible reduction or cessation of flow in the targeted area. In hereditary hemorrhagic telangiectasia (Osler-Weber-Rendu disease), the embolization is easily repeatable in the ongoing management of recurrent epistaxis. In hereditary hemorrhagic telangiectasia, the facial artery has been shown to be implicated as the source of collateral hemorrhage.

\[\text{FIGURE 5. Anterior ethmoid ligation: a, anterior ethmoid artery; b, posterior ethmoid artery.}\]

circulation after initial therapy and is readily amenable to further embolization.

Care should be taken to limit the distal distribution of occlusive material to the indicated vessel, because aberrant anastomoses could result in undesirable interruption of flow to unaffected areas, leading to blindness, tissue slough, and other negative side effects, including facial palsy and cerebrovascular accident.

The application of platinum coils during embolization or placement of vascular clips surgically prevents the possibility of future embolization if there is need for a repeat procedure in the event of recurrent bleeding. In a comparison of efficacy between transantral ligation and embolization in intractable epistaxis, the literature shows success rates between 85% and 94% for embolization. Various other studies report success as high as 97%.

Complication rates vary from 6% to 21%, with permanent deficits rare.

Therapeutic endovascular embolization offers distinct advantages in the management of intractable epistaxis. The technique is both efficient and safe, and it allows rapid completion of the obliteration of the most distal blood vessels, which enables more accurate and superior hemostasis. The embolization procedure is easily repeatable in cases of recurrent, intractable epistaxis.

The goal of embolization is simply to reduce the arterial pressure head to the affected region without

causing any ischemic damage to the nasal soft tissues. This in turn allows the body to heal itself.20,25

In the case of bleeding from ethmoidal arteries, it is theoretically possible to embolize through ophthalmic arteries by using microcatheters. This is not always feasible, however, and there is a high probability that it will cause blindness because of inadvertent embolization to retinal and posterior ciliary arteries. Therefore, surgical clipping or cauterization may be the treatment of choice for an anterior ethmoidal bleed20,27 (Fig 5).

Complicating Medical Conditions

In a prospective study to investigate the role and relevance of clotting profiles in the management of epistaxis, Jones et al7 discovered that 48% of 37 patients studied had abnormal clotting profiles. Half of these clotting abnormalities could have been predicted from a routine history, but half could not. Of the 37 patients studied, 1 patient had von Willebrand’s disease and 8 patients were taking warfarin. Of the 8 patients taking warfarin, 2 had international normalized ratio levels above the therapeutic range. In many instances, an episode of epistaxis may be the only indication of an underlying coagulation disorder, the diagnosis of which could lead to the treatment of an otherwise unknown condition and prevention of serious sequelae.

Laboratory coagulation values can aid in identifying an underlying etiology or contribution to the hemorrhage. Clotting factor deficiency secondary to heritable conditions, including hemophilia A, hemophilia B, and von Willebrand’s disease, need to be considered when treating a patient with either uncomplicated or intractable epistaxis. Coagulation abnormalities can occur in someone with an extensive history of alcohol abuse or a history of hepatitis. Platelet dysfunction disorders vary from thrombocytopenia to the simple administration of a daily 81-mg dose of aspirin.

These patients may require further laboratory studies including liver function tests, factor levels, or platelet function testing. Therapy may include the administration of packed platelet, vitamin K, fresh frozen plasma, or prothrombotic agents to control the epistaxis. Severe cases of intractable epistaxis with significant blood loss may require blood transfusion.

The effects of local factors such as trauma, inflammation, and neoplasia are accentuated in the patient on anticoagulant therapy. Hypertension has not been implicated as a cause of epistaxis; however, a hypertensive state can contribute to persistence and worsening of epistaxis. Monitoring of a patient’s blood pressure prior to and during treatment is important to determine the need for pharmacological intervention where necessary to assist with control of hypertension.7,28

In conclusion, the management of epistaxis involves many factors with regard to the treatment and ultimate control of the condition. A thorough knowledge of the anatomy of the nasal cavity and surrounding region is imperative in the effective management of nasal hemorrhage. The treating oral and maxillofacial surgeon needs to have a complete understanding of the available treatment modalities and have a step-wise plan formulated prior to initiating care. A review of the medical history and an accurate assessment of the history of the present condition needs to be performed in a concise and timely fashion so as not to delay the proper treatment of the patient. Initial modalities of control may be conservative, but an awareness and plan for the next step in the sequence of treatment is essential to effectively stay 1 step ahead of what could become a serious, life-threatening condition, especially in those patients with a history of coagulopathy and recurrent epistaxis (Fig 6).

References


