Managing epistaxis

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Epistaxis is a common clinical condition treated by otolaryngologists. Use of a laser or cautery with endoscopy can be helpful for refractory anterior epistaxis. For posterior epistaxis, we review the current literature on the effectiveness of traditional posterior packing, selective endoscopic point coagulation, endoscopic sphenopalatine artery ligation, and neurointerventional embolization. Although the literature suggests that endoscopic management of posterior epistaxis (point cauterization or sphenopalatine artery ligation) is likely to be effective clinically and in terms of cost, the experience with angiography and embolization at the University of California San Francisco, has also been successful. Curr Opin Otolaryngol Head Neck Surg 2000, 8:37-42 2000 Lippincott Williams & Wilkins, Inc.

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Abbreviations

IMAX infernal maxillary artery
SPA sphenopaltine artery

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Epistaxis is a common otolaryngologic affliction: sixty percent of the US population may have an episode of epistaxis, and 6% of that 60% seek medical attention [1]. Epistaxis is thought to be more common in men than in women, and it occurs more often during the dry winter months [2]. The initial management of epistaxis is intended to control the bleeding and then subsequently identify and correct the underlying cause of the bleeding. In this article, current management options are reviewed.

Anatomy

The blood supply to the nose arises from both the external and internal carotid arteries. The internal carotid artery gives rise to the ophthalmic artery and, ultimately, to the larger anterior and smaller posterior ethmoid arteries. Both ethmoid arteries pass through the periorbital fascia at the level of the cribriform plate. The medial branches supply the superior septum and Little's area the lateral branches supply the superior and middle turbinates.

The external carotid artery supplies blood primarily through the internal maxillary artery (IMAX), which enters the pterygopalatine fossa and courses in a serpentine fashion medially. The IMAX branches that provide blood to the nose include the greater palatine artery, the pharyngeal artery, the posterior nasal artery, and the sphenopalatine artery (SPA). The greater palatine artery supplies the septum and floor of the nose. The SPA and the ethmoid arteries are the main contributors to the confluence of vessels forming the Kiesselbach plexus. The posterior nasal artery supplies the lateral nasal wall and the turbinates. It anastomoses with branches of the pharyngeal artery to form the Woodruff plexus. The facial artery, via the labial artery, sends twigs to the nasal vestibule.

Nasal bleeding is broadly categorized as anterior or posterior. Approximately 80% of nasal bleeding is anterior, occurring at the anterior inferior septum supplied by the Kiesselbach plexus. Posterior bleeding derives from the Woodruff plexus.

Epistaxis results from an interaction of factors damaging the nasal mucosa and vessel walls. These include environmental, local, and systemic factors and medications that affect clotting. Table I lists the contributors to nasal bleeding that should be identified and corrected.

Management of epistaxis

The management of epistaxis can be divided into nonsurgical and surgical approaches. Traditionally, most otolaryngologists

Table 1. Causes of epistaxis

Environmental factors
Humidity
Temperature
Local factors
Trauma
Septal deviation
Iatrogenic factors
Foreign body
Tumor
Systemic factors
Hypertension
Renal disease
Alcohol use
Coagulation and vascular abnormalities

proceed along an algorithm of increasing intervention. Anterior rhinoscopy is done with removal of clots under adequate local analgesia or anesthesia and vasoconstriction (produced by cocaine pledgets, tetracaine, or afrin). If a source of bleeding is identified, it is cauterized with electrocautery or silver nitrate. A prospective study showed no difference in the efficacy of these two methods, but patient comfort was increased with silver nitrate [3]. if cautery does not control bleeding, an anterior nasal pack (Merocel [Xomed Surgical Products, Jacksonville, FL, USA];Gelfoam [Pharmacia & Upjohn, Kalamazoo, MI, USA]; Avitene (Med Chem Products, Woburn, MA, USA); Merogel [Xomed Surgical Products, Jacksonville, FL. USA]; or Vaseline [Chesebrough-Pond, Greenwich, CT, USA]-impregnated gauze strips) is placed. This is done largely on an outpatient basis.

It is generally accepted that management of anterior epistaxis includes cautery, anterior nasal packing, or both, but the role of posterior or intractable epistaxis remains controversial. The treatments for posterior epistaxis include endoscopy with point cauterization, posterior nasal packing, arterial ligation (endoscopic or open), and embolization. Several authors advocate the use of rigid endoscopy in patients with bleeding that is not readily controlled or visualized with anterior rhinoscopy alone. In one study [4], endoscopic technique with point suction bovie cautery allowed direct control of posterior bleeding in 11 of 12 patients without the need for nasal packing or general anesthesia. The hospital stay was reduced to 2.7 days compared with 4.5 days in tradition-ally managed patients (they received posterior packs) 14]. Agrifoglio and Frikart [5••] treated 139 patients with endoscopic point cauterization. They achieved hemostasis in 82% of patients on the first attempt and in 92% of patients overall. Other studies show that rigid endoscopy under general anesthesia is also a cost-effective and acceptable measure. O'Leary-Stickney et al [6] demonstrated control in five of six patients, and four patients were discharged within 24 hours. In the one patient who had failure, IMAX ligation was done intraoperatively when electrocautery failed to maintain hemostasis. These studies all conclude that the endoscope allowed visualization and direct treatment of posterior bleeding. The patients had a significantly shorter duration of hospitalization. Indeed, these articles suggest that if this technique were widely adopted in preference to the blind insertion of nasal packing or balloons, the morbidity associated with the control of posterior epistaxis would be greatly reduced.

When posterior packing is necessary, several different types are available, including dental roll packs, Foley catheters, and commercially available inflatable balloons (ie, Epistat [Xomed Surgical Products Jacksonville, FL. USA]). Because patients with posterior packs are at increased risk for hypoxic episodes. myocardial infarction, stroke, and death [4,7•], they are often admitted to the intensive care unit for observation. However. Monte et al. [7•] show that most patients with posterior packs can be treated in specialized ear, nose, and throat wards with continuous pulse oximetry. Selectively admitting patients at increased risk for complications to the intensive care unit allows patients to be treated in a cost-effective manner without increasing complications.

Stangcrup er at [8] compare standard tamponade packing treatment with hot water irrigation for posterior epistaxis. Hot water irrigation has been used to obtain hemostasis in obstetric bleeding events before and after delivery and has been described as a treatment for epistaxis. In the study by Stangerup et al., a balloon catheter sealed the posterior choana to minimize aspiration, and 500 ml of 50 degrees celcius water was then forcibly introduced into the nasal cavity. Possible mechanisms for hemostasis include edema and narrowing of the intranasal lumen, vasodilation of mucosal vessels (which decreases flow and intraluminal pressure). and cleaning of blood coagulates from the nose. Patients treated with hot water irrigation had a shorter hospital stay (averages of 4.0 days for the tamponade group; 2.9 days for the hot water irrigation group), had less nasal trauma, and had significantly less pain.

When limited measures fail, several more interventional options exist (Table 2). Chandler and Serrins [9] first described and popularized IMAX ligation in 1965. Since then, this technique has gained widespread acceptance by otolaryngologists as a surgical intervention for the control of epistaxis after failure of posterior packing. Typically, windows arc created in the anterior (Caldwell-Luc approach) and posterior walls of the maxillary sinus, and the IMAX and its branches are identified. Ligating clips are placed. However, identification and control of the vessels can be technically difficult. Indeed, in one study, 15 of 100 patients undergoing IMAX ligation developed postoperative bleeding [10].

Causes of this bleeding included inability to identify the IMAX (in six cases), blood flow through partially closed clips on the IMAX (in two cases), bleeding from posterior ethmoid arteries (in two cases), and collateral revascularization (in two cases). The combination of IMAX ligation and anterior ethmoid ligation [11] has proven to be highly effective for the control of epistaxis. None of 14 patients had failure with the combined procedure, whereas three of 15 had failure with IMAX ligation alone. All three failures were subsequently treated successfully with anterior ethmoid coagulation. Surgical intervention, however, is not without risk. Complications include blindness, decreased lacrimiation, local infection, infra-orbital nerve injury, oroantral fistula, sinusitis, and epiphora.

Preliminary findings show that the evolution of IMAX ligation into a less invasive and more selective procedure involving SPA ligation first transantrally (12,13)

Table 2. Interventions for epistaxis

Anterior epistaxis
Electrocautery, silver nitrate
Anterior nasal pack (eg, Merocel, Vaseline gauze, or gel foam)
Posterior epistaxis
Rigid endoscopy under local anesthesia with electrocautery
Posterior nasal pack (eg, dental roll, Foley catheter, or Epistat)
Hot water irrigation
Internal maxillary artery ligation
Sphenopalatine artery ligation (transantral or endoscopic)
Anterior or posterior ethmoid artery ligation
Angiography and embolization
Carotid artery ligation

and then endoscopically [14-16,17•] has been efficacious. Several series suggest that endoscopic ligation of the SPA is a viable alternative to posterior packing and transantral IMAX ligation and avoids the complications associated with these procedures. Direct endoscopie ligation at the medial sphenopalatine foramen avoids most chances for collateral blood supply to a bleeding point because the site of ligation is distal to both the pharyngeal artery and the descending palatine artery. It is much faster to complete ligation of the SPA than to locate and ligate several vessels after a complicated pterygopalatine fossa dissection. If endoscopic SPA ligation does not control bleeding, subsequent ligation of the anterior ethmoid artery is advocated.

Selective angiography and embolization for epistaxis is often done at tertiary care centers. It may be used after the failure of surgical ligation or as a primary treatment [10,18-22••]. In one series, the most common cause of primary failure of embolization was ethmoid bleeding, which persisted until surgical ligation of the anterior ethmoid artery was accomplished (seven of nine failures in 31 patients) [19]. Embolization, however, has its own inherent risks, which include blindness, facial paralysis, stroke, and death. Several larger series report the incidence of long-term morbidity (ie. blindness or stroke) to be 0.0% to 2.0% [20-23]. In addition, patients with anomalous connections between the external and internal carotid arteries are at significantly increased risk for these complications and should not undergo embolization. Nevertheless, embolization remains effective in the treatment of posterior epistaxis and has a lower complication rate overall compared with IMAX ligation and posterior packs [20,23,24••] Comparisons of the cost of angiography and IMAX ligation vary. Two studies [21,24••] show surgery to cost $600 to $1600 more. Strong et at [25] show embolization to cost an average of $800 more, but this is attributable to an expensive angiography suite fee.

A cost-effective approach

A review of the literature indicates that for patients who first present with posterior epistaxis, evaluation with rigid endoscopy for point cauterization should be done. Barlow et al. [26] show almost equivalent failure rates with embolization, ligation, and endoscopic cautery. Therefore, the decreased cost of endoscopy and the lesser morbidity associated with packs, ligation, and embolization make endoscopy a compelling first choice. Failure of point cautery necessitates placement of a posterior pack, which may be left in for 24 to 72 hours. For recurrent bleeding through a posterior pack or upon the pack's removal, institutional expertise and costs may dictate whether endoscopic SPA ligation or embolization is done. Snyderman et at [17] recently found no major complications and a 34% rate of minor sequelae (nasal crusting and paresthesia of the palate and nose) with SPA ligation in 38 patients. However, more series are needed to show whether the findings of Cullen and Tami [24••] for IMAX ligation compared with embolization hold true for endoscopic SPA ligation compared with embolization. Cullen and Tami reviewed 20 studies determining the complication and failure rates of IMAX ligation and embolization. They conclude that IMAX ligation is more effective than embolization but that it is associated with a higher rate of minor complications. Major complication rates for the two procedures are similar, but the types of major complications associated with embolization (blindness and stroke) are more serious than those associated with ligation. Future studies should compare the efficacy and complication rates of endoseopic SPA ligation and embolization.

Current opinion in epistaxis

At the University of California San Francisco, we currently divide epistaxis into three broad categories: anterior epistaxis, posterior epistaxis, and special problems. Our management protocol for these problems is partly based on the interests and strengths of the various divisions of the allied services available at our tertiary care center. For anterior epistaxis requiring intervention, we are apt to attempt treatment of the epistaxis with dissolvable packing soaked in Afrin, if possible. In addition to regular Gelfoam (Pharmacia & Upjohn, Kalamazoo, MI, USA), several products are available, such as Merogel, which is soft and relatively atraumatic. If dissolvable packing fails, it usually does so soon after placement. For patients whose bleeding can be localized, we prefer a trip to the office laser suite, where the CO, laser with a nasal attachment can be used to point coagulate any troublesome bleeding areas. Often, a small submucosal vessel is identified bubbling up from under the mucosa. and these types of bleeding points are efficiently addressed with the laser. If this attempt fails or if a specific site cannot be identified, soft-sponge packing, such as Merocel packing, can be placed after being coated with Bacitracin ointment or a similar water-soluble antibiotic gel. In these patients with anterior epistaxis, a drug history with special attention to aspirin use is taken. With the frequent use of baby aspirin by patients who are under the care of internists and cardiologists, we find that aspirin-derived platelet dysfunction is a common cofactor. An "aspirin holiday" is often recommended. If a patient returns after initial interven¬tion with troublesome recurrent bleeding, we often recommend screening coagulation studies consisting of a leukocyte count with differential, a platelet count, measurement of hemoglobin concentration and hemat¬ocrit, and a prothrombin time/partial thromboplastin time (PT/PTT) to help rule out underlying coagulopathy. Rarely, a trip to the operating room for controlled endoscopy and KTP or SLT laser cautery is necessary in refractory patients or children who cannot tolerate office-based intervention. Of course, initial examination of the

patient sometimes identifies anatomic abnormalities, such as septal spurs. that may (if seemingly involved in the epistaxis event) suggest a need for surgical correction.

Posterior epistaxis seems to be less common in northern California than in areas with more severe winter climates. When it presents, it is usually suspected because of failure of an adequate anterior pack. Under these circumstances, a posterior pack, usually with an Epistat balloon, is placed. Once the bleeding is initially controlled with a posterior pack, a complete blood count, PT, and PTT are routinely sent to the laboratory along with a type and cross in case of the need for future transfusion. The patient is admitted to the hospital and receives supplemental oxygen via a face tent with humidified oxygen. The balloon is usually left inflated for 24 to 72 hours and is then deflated. If breakthrough bleeding occurs while the balloon is inflated or if the patient bleeds during a deflation trial, a consultation is called to the neurointerventional radiology group. This group performs selective IMAX occlusion by using an angiographic technique. Often,the results of arteriography allow the neurointerventional team to identify the specific bleeding artery. If that artery is thought to be from the anterior ethmoidal system, the patient is scheduled for surgical anterior ethmoid artery ligation under general anesthesia if IMAX angio-occlusion fails. In our experience, the anterior ethmoid artery contributes to the bleeding event about 15% of the time. This current protocol has been established at our center on the basis of two major factors: (1) The neurointerventional team is very capable. available, and interested in this type of clinical problem, and (2) our results with this approach have been clinically successful. If this team approach were not easily available, we would doubtless be more likely to approach posterior epistaxis via a selective SPA ligation, as described by Snyderman et al. [17], or via a formal, open IMAX ligation done using the Caldwell-Luc approach, as in the past.
Special problems in epistaxis. such as patients with hereditary hemorrhagic telangiectasia (Weber-Osler-Rendu syndrome) or coagulopathies, can be clinically challenging. For patients with hereditary hemorrhagic telangiectasia. we often call consultations to help search the gastrointestinal, pulmonary, and central nervous systems for associated bleeding sites in other locations. Our management of refractory epistaxis in these patients is based on the maximization of manmade and local treatment of the anterior nasal lining. Humidity, saline, steam, vasoconstrictors, water-soluble ointments. dietary iron supplementation, aspirin avoidance, and education in self-nasal packing are mainstays. Surgical intervention can be challenging and usually only temporarily alleviates bleeding during severe bleeding periods. The KTP laser has been found to be useful in these patients, as Byahatti et at report [27]. However. after long-term and multiple applications. septa] perforation can result. The SLT contact Yag laser can also be used for severe bleeding episodes. Although septodermoplasty as described by Saunders [28] is an option, most patients seem unwilling to accept the inevitable crusting that will result with this technique. This. combined with the prospect that telangiectases will eventually involve the skin graft, usually temper the patient's desire to select this surgical option. Estrogen or other hormonal therapy has not been advocated because of potential side effects (which are especially troublesome for men). Nasal closure procedures, as described by Lund and Howard 1291, have not been attempted at UCSF, although the reported results seem promising. In our experience, interventional angiographic occlusion has not been successful, but Weisman et al [30] found it helpful in one patient. Our poor results may be related to the tendency of mucosal nasal blood flow to return to normal within 2 to 8 days after embolization, as shown ill the swine model [31]. Similar vascular collateralizatinn may occur in humans, suggesting thtionrophylactic INIA occlusion is unlikely to protect against future episodes of epistaxis. Finally, it should be noted that some groups, on the basis of initially promising results, recommend free vascularized omentum grafts or temporoparietal fascia vascularized grafts to resurface the nasal lining.

Coagulopathic patients, such as those with Von Willebrand's disease or low platelet counts clue to systemic disease, can also present a clinical challenge. If such patients are hospitalized, insertion of a nasogastric tube often results in a consultation due to ensuing bleeding from the nose. Emphasis is given to correcting underlying coagulopathies in close consultation with the hematology service. This may include the use of desmopressin acetate in patients with Von Willebrand disease or the use of supplemental blood products as directed by the hematology service. Local control is predicated on avoiding removable packing whenever possible. Avitene; topical thrombin; or dissoluble packing, such as Gelfoam, is used in preference to Vaseline gauze and Merocel sponges. Education of the services that primarily care for such patients centers on recommending the use of oxymetazoline and lidocaine spray before insertion of a nasal tube. It is hoped that this will minimize traumatically induced iatrogenic epistaxis.

Conclusions

Epistaxis remains a common clinical condition treated by otolaryngologists. Laser or cautery use under endoscopic control can he helpful in rendoscopicnterior epistaxis. For posterior epistaxis, "high-tech" alternatives to traditional posterior packing can be rewarding. Such techniques include selective endoscopic point coagulation, endoscopic SPA ligation, and neurointerventional radiologic angiographic arterial occlusion. The experience with angiographic management of posterior epistaxis at the University of California, San Francisco, has been clinically successful, and this approach is currently preferred by our group. The special and difficult problem of hereditary hemorrhagic telangiectasia, although it remains challenging managed with teamwork and patience.

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