Epistaxis

Abstract
Although a common disorder, nosebleeds can cause significant morbidity and are occasionally fatal. The standard method of managing heavy bleeding has been to insert impregnated ribbon gauze packs and admit patients for bed rest, often for several days. There are now several available options, each of which will be discussed within this article.

The use of selective arterial embolization and management of hereditary haemorrhagic telangiectasia will also be discussed.

Keywords
Epistaxis, Sphenopalatine, Nasal packs, Arterial Ligation, Embolization.

Introduction
Nosebleeds are a common disorder that can be very disabling and alarming to the sufferer but induce anything but enthusiasm from the on call trainee. With good first line measures, most can be rapidly controlled, but occasionally, resuscitation may be required.

Fortunately, death is rare, but the effects of severe nosebleed must not be underestimated.

The term 'epistaxis' is Latin, derived from the Greek, epistazein (epi – above, over: stazein – to drip).

Nosebleeds can occur at any age, but recurrent epistaxis is particularly common in childhood, giving a bimodal distribution. In adults the incidence rises with age, peaking in the 6th decade (Figure 1).

Recurrent nose bleeds in children below the age of 2 years are unusual and should alert the clinician to the possibility of a serious underlying medical condition or child abuse.

A seasonal variation has been described, with more hospital admissions for nose bleeds occurring in the autumn and winter months, as illustrated by the hospital admission HES data for 2009/8 (Figure 2).

Vascular anatomy

Arterial supply
The nasal mucosa is supplied by branches from the internal and external carotid arterial systems that run in the mucoperiosteum and mucoperichondrium (Figure 3). However, the branches to the turbinates’ run in bony canals.

The dominant supply of arterial blood comes from the external carotid artery via the maxillary artery and sphenopalatine artery. The latter enters the posterolateral section of the nose through the pterygomaxillary fissure. It is important to appreciate that there is considerable variation in the anatomy of the sphenopalatine artery at this location, and there may be several branches. The main sphenopalatine artery divides into a lateral and medial branch: the lateral branch supplies the lateral wall of the nasal cavity and the inferior turbinate; the medial branch runs across the anterior sphenoid wall onto the nasal septum where it divides into three.

Arterial blood from the internal carotid system reaches the nose via the ophthalmic artery that enters the orbit via the superior orbital fissure and travels anteromedially to give origin to the posterior and anterior ethmoidal arteries. The anterior ethmoidal artery is the dominant branch, and the posterior ethmoidal artery may be absent in 30% of noses. These arteries pass through the fronto-ethmoidal suture to travel in bony canals in the fovea ethmoidalis before traversing the lateral lamella of the cribriform plate to enter the anterior cranial fossa. Both arteries then branch and some run inferiorty to enter the superior nasal cavity.

Venous supply
The veins generally follow the arteries, but additional emissary veins connect the venous drainage to the cavernous plexus.

A relatively common finding is a prominent retrocolumella vein that runs parallel to the mucocutaneous junction.

Anastomoses
A rich arterial anastomosis of large thin-walled vessels occurs within the mucosa over the anterior nasal septum. These vessels are often clearly visible in children with recurrent epistaxis: the site is referred to as Little’s area or Kiesselbach’s plexus, named after the 2 authors who ascribed nosebleeds to vessels in this region of the nose (Figure 4). James Little, who was professor of surgery in Vermont, New York, wrote the first description in 1879 and Wilhelm Kiesselbach, who was lecturer in otology at Erlangen, followed this by his own description in 1884.

Another vascular plexus that is easily seen endoscopically after applying a vasoconstrictor
Epistaxis

to the nasal mucosa is Woodruff’s: this is a venous plexus seen posterolaterally adjacent to the inferior turbinate and was described in 1949 by George Woodruff to explain the cause of severe posterior epistaxis.9

Classification

There are several ways of classifying epistaxis. Anterior and posterior epistaxis refers to the site of the bleeding vessel, but this lacks precision: it has been suggested that the line of the piriform aperture be used as the reference line in this classification.

Primary epistaxis refers to spontaneous idiopathic bleeding whereas secondary epistaxis occurs due to a known cause; acute is self-explanatory but differs from chronic recurrent epistaxis where there is often a long history of intermittent bleeding; medical and surgical epistaxis offers a practical suggestion in that physicians should be involved in the care of patients with the former.

Clinical Features

Acute epistaxis

In an acute spontaneous heavy epistaxis, the site and side of bleeding can be difficult to determine, but with good vasoconstriction and endoscopy, the bleeding site may be identified. Most arise from the nasal septum, with an estimated 30% arising from the lateral nasal wall.7 There is no preference between sides.

Acute bleeds in adults are often traumatic or post-surgery. However, adults, and particularly the elderly, can present with severe acute spontaneous bleeds and may be agitated, distressed and hypovolaemic and anaemic. There may also be other significant comorbidities.

Chronic recurrent epistaxis

This condition is seen most frequently in children, in whom bleeding is typically from prominent fragile vessels within the mucosa overlying the anterior nasal septum. Enquiry should be made with regard to allergy and rhinitis. Moist crusts are often observed within the anterior nasal cavity. Bleeding is often bilateral.

In the adult population, bleeding may be due to other nasal pathology or from vessels other than those of the anterior nasal septum. Bleeding is typically unilateral and heavy. Enquiry should be made with regard to medication other and known or potential comorbidities. In particular, anticoagulants and antiplatelet drugs should be noted and haematological conditions excluded.

Local cause of bleeding include a haemangioma, telangiectasia, septal ulceration, septal perforation, and rarely, granulomatous conditions and tumours.

An important but potentially serious disorder that presents with frequent heavy bleeds is hereditary haemorrhagic telangiectasia. These patients develop multiple small vascular anomalies on the skin and mucosal surfaces, affecting the nasal mucosa, lips and oral cavity. Vascular malformations can also occur in the gastrointestinal tract, brain, liver and spine. The cause is genetic, due to autosomal dominant inheritance.

Associated features

The deviated nasal septum

It is well-recognized from clinical practice that mucosa overlying a septal deflection or spur is often dry and atrophic. However, the evidence-base for septal deviation predisposing to epistaxis is weak.

Hypertension

Hypertension is likely to prolong an acute bleed, but there is no evidence to support hypertension as a cause of epistaxis.8,9 Also, the severity of hypertension has been reported to be unrelated to the incidence of epistaxis.10

Coagulation disorders

Drugs that impair platelet function such as aspirin, other non-steroidal anti-inflammatory agents and clopidogrel, increase the risk of epistaxis. Warfarin will have a similar effect, particularly if the INR is not well controlled.

Inherited coagulopathies such as von Willebrand’s disease and secondary coagulopathies due to conditions like leukaemia can predispose to nose bleeds.

Alcoholism and cirrhosis

Alcohol can induce platelet dysfunction but chronic alcohol abuse can induce liver disease with a secondary coagulation disorder due to impaired protein synthesis.11 The production of a spectrum of coagulation factors and inhibitory factors is subsequently impaired, and activation factors are not cleared.

Pregnancy

Hormonal changes during pregnancy induce increased nasal blood flow. The prevalence in epistaxis has been reported to be greater in pregnant compared to no-pregnant women, being 20% and 6% respectively.12

Management

The acute bleed

The first priorities in this situation are to safeguard the airway and control the bleeding. The patients should sit leaning forward and the soft parts of the nose should be pinched and compressed for 10-15 minutes if necessary. Vascular access may be required to correct hypovolaemia and for haemodynamic support.

If the bleeding continues, the patient should be managed in a suitable treatment room with suction facilities. Health professionals should wear suitable protective clothing. The nasal cavities should be sprayed with a vasoconstrictor/anaesthetic such as 0.5% phenylephrine and 5% lidocaine solution 10 minutes before proceeding with any other intervention. Blood clots should be cleared and the nose examined with a bright headlight or an endoscope.

If a bleeding vessel is identified, cautery in the form of a silver nitrate stick or bipolar diathermy can be applied. Should silver nitrate get onto the upper lip, it will stain the skin brown, but this can be avoided by washing the contaminated skin with saline immediately after contact.

Endoscopic electrocautery

Once the mucosal vessels in the nasal cavities have been fully vasoconstricted, the bleeding site can be coagulated by a fine bipolar diathermy instrument under direct endoscopic control. This method of control often obviates the need for packing the nose but is very dependent on medical staff having suitable endoscopic skills. However, the benefits of this modality are that hospital stay can be avoided or shortened.
Epistaxis

Nasal packs
It may be necessary to pack the nose should bleeding continue. The standard method of nasal packing for many years was to insert ribbon gauze impregnated with petroleum jelly or bismuth iodiform paraffin paste. However, these methods are generally unpleasant for the patient, traumatic to the nasal mucosa and carry potential complication: BIPP can induce hypersensitivity and petroleum jelly can induce an unusual foreign body reaction called myosporerosis, and cause intranasal adhesions. A recent technique that is less traumatic to the nasal mucosa and just as effective is to insert a compressed polyvinyl acetate (PVA) expandable polymer sponge (MerocelTM).13

An alternative device is to insert a balloon coated with a lubricated carboxymethylcellulose (CMC) fabric (Rapid Rhino®). These devices have either a single or double balloon, are easy to insert, atraumatic and comfortable for the patient, but they are not necessarily more effective than others means of packing.

Many still consider that bilateral packs are more effective than unilateral packs but there is no evidence to support this. Packs also carry a risk of complications: they may become displaced posteriorly and compromise the airway or cause septal ulceration and perforation or long-term adhesions. They may induce hypoxia and rarely may lead to toxic shock syndrome (Table 1).

Once a pack has been inserted it is usual practice to admit the patient and prescribe suitable analgesia.

In recalcitrant posterior bleeds it may be necessary to insert a posterior nasal pack into the nasopharynx. This is an unusual occurrence but requires general anaesthesia. The pack is secured with ties passed around the columella but the underlying skin must be protected to avoid pressure necrosis and ulceration. A good alternative before progressing to this is to inflate a Foley catheter balloon in the nasopharynx and insert an anterior ribbon gauze pack to tamponade the bleeding.

Management of medication
Many patients who are admitted with epistaxis are taking aspirin, clopidogrel or warfarin. There is little point in stopping these drugs as recovery of coagulation or platelet function will take several days: the risk of a re-bleed in not increased by continuing with warfarin therapy.14 However, should the international normalised ratio (INR) be grossly elevated, warfarin should be stopped and the advice of a haematologist should be considered, especially if bleeding not controlled.

Tranexamic acid is an antifibrinolytic that inhibits fibrinolysis. This may be used to try to prevent re-bleeds but no statistically beneficial effect has been demonstrated.15 Side effects include nausea and vomiting and it should not be prescribed in patients with a history of thromboembolic disease.

Antibiotics are often prescribed in patients with nasal packs, but there is no evidence to support their effect in this situation, and the rare possibility of toxic shock syndrome can still occur.16

Surgical procedures
Surgical procedures are reserved for those patients that have significant recurrent bleeding after conservative measures have been tried. However, early intervention is recommended to shorten hospital stay and minimize the morbidity.

Direct endoscopic diathermy
Endoscopic examination after maximal vasoconstriction of the mucosa will often identify the bleeding site and facilitate diathermy of the vessels. Both bipolar and monopolar diathermy may be used but extreme caution must be applied to the latter. The risk of monopolar diathermy is deep thermal injury and this may induce a septal perforation or more seriously blindness should this be used applied near to the orbital apex. However, the judicious use of a suction diathermy with a ball is a very effective means of sealing a bleeding vessel.

Septoplasty
Septoplasty in the acute situation is helpful on occasions in patients with a significant septal deviation when re-bleeding occurs after packing. This will not only facilitate insertion of an effective pack but also enables a thorough endoscopic examination of the nasal cavities: a specific bleeding point can then be treated at the same time.

Arterial ligation procedures
Arterial ligation usually refers to sphenopalatine occlusion in current practice and is generally reserved for patients who continue to have significant bleeding after a nasal pack. Ligation of the anterior and posterior ethmoidal arteries via a medial orbital approach may be indicated in heavy bleeding due to facial trauma with fronto-ethmoidal fractures. The older procedures of trans-antral maxillary artery ligation and external carotid artery ligation distal to the lingual branch have now been superseded.

The sphenopalatine artery is displayed endoscopically as it enters the nose posterolaterally through the pterygomaxillary fissure just behind the ethmoidal crest of the palatine bone. Once exposed, the artery can be occluded by ligacips or bipolar diathermy, or a combination of the two. It is important for the surgeon to appreciate that there may be more than one artery and that other branches should be sought and occluded.1,4 The operation is generally effective in controlling recurrent bleeding and it should be possible to leave the nose without a pack.

Other interventional procedures

Haemostatic Gels and Solutions
Innovative biodegradable materials that promote haemostasis by providing a stable platform for fibrin deposition and platelet aggregation have recently been developed. Unlike nasal packs, these materials are able to spread throughout the interstices of the nasal cavity and make direct contact

Table 1: Complications of nasal packing.

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<tr>
<th>Main complications</th>
<th>Pack displacement into oropharynx</th>
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<tr>
<td></td>
<td>Bleeding from mucosal trauma</td>
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<td></td>
<td>Sinusitis</td>
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<td>Less common</td>
<td>Pressure necrosis</td>
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<tr>
<td>complications</td>
<td>BIPP sensitivity</td>
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<td></td>
<td>Significant hyposia</td>
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<td></td>
<td>Toxic shock syndrome</td>
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<td>Long-term sequelae</td>
<td>Septal perforation</td>
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<td>Adhesion formation</td>
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Epistaxis

with the bleeding site. Examples include oxidized cellulose, microfibrillar collagen, porcine or bovine gelatin, fibrin glue (aprotinin, fibrinogen and thrombin) and human thrombin solutions. A preparation of thrombin-coated gelatin granules (Floseal, Baxter) converts fibrinogen to fibrin, thus controlling active bleeding, even if platelets or coagulation factors are low. It is hoped that such innovations will greatly benefit patients by reducing the need for nasal packs and hospital admission.

An alternative mechanism of action that has recently been developed is a new aminopolysaccharide known as chitosan. Chitosan is a mucoadherent biocompatible polymer that is strongly cationic and attracts red blood cells to adhere to the site of bleeding.

Selective arterial embolization

Selective catheterisation of the maxillary artery via the femoral artery is a technique that requires specialized skills from an experienced radiologist and is therefore not available in all hospitals. However, it does enable an alternative modality of treatment in patients with severe nose bleeds who persistently re-bleed on removing nasal packs, especially when operative intervention is associated with high risk.

A variety of emboli have been described and these include micro-coils, polyvinyl alcohol particles, dextran microspheres, absorbable gelatin sponge or detachable balloons.

Although complications are uncommon, they are potentially serious and cranial nerve palsies, visual defect, stroke and death have been reported.

Chronic recurrent epistaxis

This condition is most commonly seen in children in whom it is invariably due to fragile prominent vessels overlying the anterior nasal septum. Although they are amenable to cautery by applying silver nitrate, the application of an antiseptic-antibiotic cream four times daily for 10 days (Naseptin - chlorhexidine hydrochloride 1%, neomycin sulphate 3250 units/g) is often effective. Nasoep does contain arachis (peanut) oil and should be avoided in children with peanut allergy, soya or neomycin sensitivity.

Recurrent bleeding in adults is often not so straightforward though. Bleeding from atrophic or ulcerated septal mucosa will only be worsened by applying silver nitrate and is best treated with antibiotic -antiseptic cream alone. A small haemangioma can cause profuse bleeding and lesonial diathermy is more effective than the application of silver nitrate, which may induce an acute bleed in the clinic.

Hereditary haemorrhagic telangiectasia (HHT)

Patients with HHT often present with frequent heavy bilateral nose bleeds that are difficult to control. The nasal lesions are typically multiple and found mainly in the anterior part of the nasal cavity on both sepal and lateral nasal walls. Caution by silver nitrate in the clinic is usually ineffective. These patients are best admitted for endoscopic laser treatment or diathermy in theatre. Laser treatment with an argon or KTP laser is most effective and will generally provide patients with good control for a few months. However, some patients will continue to have severe bleeds and require recurrent transfusion. In this situation, a septodermoplasty or occlusion of the anterior nares by a Young’s procedure is justified. In a septodermoplasty, the mucosa over the cartilaginous nasal septum is excised leaving the mucoperichondrium intact; the raw surface is then covered by a split skin graft. Young’s procedure is reported as being extremely effective but patients often prefer to defer this to avoid having a completely blocked nose.

Declarartion of interest

Mr Andrew Lau was re-imbursed by Baxter Medical for travelling to the ERS in Toulouse to present a paper on epistaxis and the use of Floseal.

References