'One I did earlier' ...

Epistaxis: nasal blood supply and treatment options

Embolisation: when is it used and why?

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INTRODUCTION

Epistaxis is the term used for nose bleeds. It occurs in approximately 60% of people during their lifetimes, with 6% of those people requiring or seeking medical attention.^(1,2) Currently there are no NICE guidelines for the treatment of patients suffering from intractable epistaxis.

The anatomy and blood supply to the nose is complex and involves branches arising from both the internal and external carotid arteries. Treatments vary, but usually follow the same path starting with simple conservative treatment then moving onto more complex treatments including cautery, vessel ligation and, the focus of this article, embolisation. Various materials are used to embolise the vessels and have been reviewed.

Reports of epistaxis occur more frequently in the colder, dryer months of the year; generally occurring more frequently in males than females. There is also an increasing incidence with age, with 70% of adult males over 60 years having experienced an episode.⁽³⁾

The causes of epistaxis can be local or systemic, and are classified by the location either as an anterior or posterior. The most common are anterior bleeds and occurring in an area known as Kiesselbach's area, or Little's area. This is a localised region of mucosa in the anteroinferior region of the nasal septum, where four arteries anastomose forming Kiesselbach's plexus, named after Wilhelm Kiesselbach (1839-1902), a German otolaryngologist.⁽⁴⁾

ANATOMY OF THE NOSE

Blood supply

The arterial blood supply to the nasal region comes from both the internal and external carotid arteries. The external carotid supplies most of the nasal fossa via branches that form the internal maxillary arteries, which are the greater palatine artery and the sphenopalatine artery. The sphenopalatine artery supplies the nasal fossa via its lateral and medial branches, with the lateral branch supplying the middle, inferior and superior turbinates and the middle branch supplying the nasal septum. The greater palatine artery is a terminal branch of the maxillary artery.

The external carotid supplies the superior labial branch of the inferior nasal septum where it joins to form an anastomosis with medial branches of the sphenopalatine artery. The medial wall of the nasal vestibule, which is the most anterior part of the nasal cavity, is supplied by the superior labial artery, which is a branch of the facial artery.

The internal carotid artery gives off branches, usually from the ophthalmic artery, which forms the posterior and anterior ethmoidal arteries. This passes through the cribriform plate and forms an anastomosis with branches of the sphenopalatine artery, and hence forms the Kiesselbach's area or Little's area.⁽⁴⁾

Epistaxis occurrence

Epistaxis can be mild or severe, and in rare cases even fatal. The majority of instances require no intervention, or just simple nasal packing.⁽⁵⁾

Anterior nosebleeds, occurring in Kiesselbach's area, are the most common, accounting for 90% of cases. This is due to the rich anastomotic blood supply. These are usually easy to manage and usually do not require hospitalisation. The further 10%, occurring posterior, generally occur in the older population, with one report showing the mean age to be 64 years.⁽⁶⁾ The pathogenesis of posterior epistaxis is unknown, but due to the common occurrence in older populations the cause may be seen to be linked to age-related vascular degeneration. Due to the location of such bleeds, management is much more difficult.⁽⁷⁾

Aetiology

The major aetiological factors for epistaxis can be of local cause, as in trauma or systemic, such as coagulation disorders, for example self-induced digital trauma (nose picking) which is common occurrence in children, polyps and foreign bodies, haemophilia or drug-induced coagulopathies due to the administration of warfarin or aspirin.⁽²⁾

Current guidelines and management plans for treating epistaxis

Currently there are no NICE guidelines for the management of epistaxis and all NHS trusts are guided by their own policies and procedures, yet the majority of institutions (85% as noted in a UK survey) do not have a written policy or protocol, and therefore decisions on management are being made at the time of admission with no guidance on the optimum therapeutic intervention for the patient.^(8,9)

The institution to which the author is linked has its own local policies for the treatment and management of patients attending the hospital with epistaxis, and these policies and guidelines closely follow those in the literature details and are detailed below. Staff members who are involved in such care are required to complete a competency statement to ensure they are aware of how to treat such patients.⁽¹⁰⁾

Management of epistaxis patients

On admission of a patient with epistaxis, it is essential that the examining practitioner is prepared and ready. This means donning gloves and personal protective equipment. In any emergency the patient's 'ABC's' are the most important and

the patient must be resuscitated before any interventions can be carried out. The first intervention is pinching of the nose. This may be required for 10-15 minutes. Ice packs placed over the nose may also be helpful. If this procedure fails to work the next step is cauterisation.

Cauterisation requires local anaesthetic spray and, if available, a vasoconstrictor spray, a headlight, speculum and silver nitrate cautery sticks or bipolar diathermy. The spray is administered to each nostril. Once the area of bleeding is identified, the silver nitrate stick is applied for approximately ten seconds or bipolar diathermy used.^(9,11)

Essential features of history in epistaxis

- history of nasal trauma
- family history of bleeding
- hypertension, current medications and how well it is controlled
- history of diseases
- use of anticoagulants
- other medications, eg for diabetes or coronary artery disease

If cautery fails, anterior nasal packing needs to be considered. Additional equipment required includes ribbon gauze impregnated with bismuth iodoform paraffin paste (BIPP), Vaseline® gauze or Merocel® packs. Another pack on the market is the Rapid Rhino®, which in a clinical trial has been proved as effective as the Merocel packs but has shown significantly lower scores for discomfort during its insertion and removal.⁽¹²⁾

If there is continued bleeding after insertion of an anterior pack, then post-nasal packing should be considered. For this procedure, there are various post-nasal packs available.

If after 24 hours there are still signs of bleeding through the pack, or the patient re-bleeds, then this should be considered as a case for surgery. Surgery is dependent on the vessel that is bleeding and involves ligation of affected vessel. This initially requires an examination under general anaesthesia with further cauterisation using bipolar diathermy and endoscopic sphenopalatine artery ligation. The anaesthetic itself poses specific challenges from the perspective of airway management as well as the general risks associated with major blood loss and medical co-morbidity. This procedure has been deemed safe and of a low morbidity in comparison to ligation of the maxillary or external carotid arteries.⁽¹³⁾

Embolisation is another technique which can be used for intractable epistaxis, and is particularly good for use in patients who are unable or unfit to have a general anaesthetic and surgery, or for whom surgery has failed. It does, however, carry its own risks and complications.

Specific treatments for posterior bleeds

Angiographic embolisation is a treatment method adopted in some cases of intractable epistaxis, but due to its limited availability is not always an option or possibility for all patients. The aim of embolisation is to decrease arterial inflow and aid haemostasis by allowing clotting and epithelial repair.

Literature regarding angiographic embolisation dates back to 1974, when Sokoloff first described the method in two cases.⁽¹⁴⁾

Much has been written on the procedure, its efficacy, success and complications, yet the procedure still remains a last-resort treatment for the majority of patients suffering intractable epistaxis. The procedure requires an experienced neuro-radiologist, so is limited in its availability. Many hospitals can therefore offer only ligation treatments. Complications of the various treatments are going to be reviewed with the aim to determine the best course of treatment for patients.

ANGIOGRAPHIC EMBOLISATION

Description of the procedure

The angiography pays particular attention to the external carotid artery and its branch to the internal maxillary artery.

The usual approach is femoral, with the administration of local anaesthetic. A 4-6 French gauge guiding catheter is used and is advanced up to the internal or external carotid arteries bilaterally. A diagnostic angiogram is performed using a contrast medium, and the ipsilateral internal maxillary artery is identified and catheterised.

Diagnostic angiograms are extremely important and must be carefully analysed prior to proceeding due to potential 'dangerous anastomosis'. These include connections between the internal and external carotid arteries, which could potentially allow embolic material to pass from one vessel to the other and become a possible infarction risk.

Once the angiograms have been analysed and no 'dangerous anastomosis' identified, bleeding vessels are located and their arterial supply is then microcatheterised. Embolisation is then performed on the identified vessel. If the vessel cannot be identified or visualised, then bilateral internal maxillary arteries are embolised.

Embolisation is stopped when flow in the distal branches of the embolised vessel is significantly slow. Repeat angiography is then performed to ascertain the extent of embolisation achieved.^(15,16,17) Embolisation is carried out using a variety of embolic agents – coils, polyvinyl alcohol and gelfoam being the most common used in epistaxis.

Embolic agents and materials

Coils

Coils are subdivided into micro and macro coils. Microcoils are the coils used to embolise in epistaxis. The significant advantage of embolising using coils is that they can be precisely placed under fluoroscopic control. Occlusion of the vessel occurs due to thrombosis induced by the coil; to increase the thrombotic effect Dacron® wood is attached to the end of the coils. An advantage for the use of coils is that they are highly thrombogenic and radio-opaque. A disadvantage of coils is the potential for collateralisation, which results in persistence of blood flow to the embolised vessel and difficulty in repeating the procedure.

Polyvinyl alcohol (PVA)

Polyvinyl alcohol is available in a variety of sizes up to 710 microns and is used with a microcatheter for delivery. It is usually delivered in a mixture of contrast medium and sodium chloride. PVA embolisation depends on thrombus formation, where the vessel is embolised via the thrombus rather than the particle itself. It causes an inflammatory reaction, which is therefore responsible for the thrombus.

It is a permanent embolic agent and recanalisation only has a low frequency. It is not absorbed and this adds to the permanent occlusion formed.⁽¹⁸⁾

Gelfoam®

Gelfoam® is a water-soluble gelatine sponge. It can be cut to size and absorbs many times its own weight in fluids. It is absorbed fully within a few weeks and is intended for temporary vessel occlusion while further collateral vessels are formed.⁽¹⁸⁾ Other materials are used and include balloons and collagen, but are less common.

Embolisation

Contraindications

The risk of 'dangerous anastomosis' has already been discussed and its presence is a contraindication, because of the risk of embolic stroke. It is also contraindicated in cases where bleeding is found to be from the anterior or posterior ethmoidal artery. Embolisation is contraindicated in these cases due to the risk of embolising the ophthalmic artery, which would carry a very high risk of blindness.^(4,18)

Complications associated with embolisation

Monocular vision loss is a complication of occlusion of the ipsilateral ophthalmic artery. Symptoms of the complications include fever, which usually resolves after 12-24 hours, bradycardia caused by injection within the maxillary artery, facial pain and numbness, jaw ache, headaches and facial oedema. More severe complications include transient ischemic attacks, and nasal tip necrosis and alar cartilage necrosis. In most cases, the symptoms resolve within seven days, but more severe complications can arise, such as blindness and strokes.^(15, 17, 19-22)

LITERATURE REVIEW

Review of embolic agents

Four separate studies were reviewed looking at the different embolic agents used, the different outcomes and complications encountered. The studies were chosen for their relevance, year of publication and similarity in design. The studies were all carried out over long periods of time, ranging from three to nine years.^(17, 19, 21, 22)

Lesley studied 20 cases symbolised with platinum coils.⁽¹⁹⁾ This study had a 95% success rate, the definition of success being remaining free of recurrent nose bleeds requiring medical or surgical intervention with 100% technical success rate. The study found that 95% of patients suffered no complications, and one patient (5%) suffered transient unilateral facial pain. Nasal packing was removed the next day.

Anderson studied polyvinyl alcohol particles.⁽²¹⁾ The participants in this study were divided into two groups. Group A was mainly treated without nasal packing, and 15 procedures were carried out on nine patients: 12/15 (80%) had reduction in epistaxis frequency and duration, but 2/15 (13%) had significant improvement and 1/15 (7%) had worsening of symptoms. In Group B, 15 procedures were carried out on 13 patients: 7/15 (47%) had no further bleeding and 2/15 (13%) were embolised twice and 4/15 (26%) experienced a reduced frequency and duration of bleeding. In total, the failure rate was 13%, as 2/15 did not have an improvement in symptoms. The complication rate was also high for this study: one patient experienced a serious complication, nasal tip necrosis, which healed three weeks post procedure; 2/22 experienced

headaches; and 11/22 experienced facial pain. Although none of the complications were permanent, 50% did have a complication of one kind or another.

Fukutsuji studied 270 patients admitted with epistaxis, of whom 22 underwent embolisation.⁽²²⁾ A total of 23 procedures were undertaken. The embolic material used in this study was gelatine sponge and microcoils. The success rate for this study was defined as no further bleeding at seven days post-procedure and was found to be 17/22 (77.3%), with five patients requiring further packing and one patient requiring ligation. The longterm success rate was shown to be 95% and was defined as no further bleeding after the seven days. The complication rate was high for this study (59%): which included 6/22 (27%) suffering facial pain; 3/22 (14%) facial numbness; 2/22 (9%) headaches; 2/22 (9%) jaw pain; and 1/22 (4.5%) with facial oedema. All symptoms were short-term, no longterm complications were seen.

Oguni studied 37 patients;⁽¹⁷⁾ 31 men and six women were identified, with a total of 40 procedures carried out. The short-term success rate, defined as no re-bleed within seven days, was shown to be 35/37 (94.6%), with just the two patients experiencing further bleeds. The longterm success rate was also found to be 94.6%, with one of the two being cured with just further conservative treatments. The other patient who experienced longer-term re-bleeding also had other risk factors. The re-bleeding occurred 26 days post-embolisation, and also 31 and 52 months post-further surgical treatment. The overall complication rate was found to be 45%, with all cases being short-term complications. The complications included nine patients with facial pain, seven with headaches and two who experienced fever. All complications resolved within seven days with no longterm complications seen.

CONCLUSION

The editor is grateful to the authors for their review, which sends a powerful and timely political message. Here is a new treatment for an old condition. It saves lives and is minimally invasive. However, the way in which specialist services are commissioned means that patients may have to endure other ineffective treatments and become sicker and sicker before transfer to a specialist centre is justified. It's a point that commissioners must take into consideration when weighing strategic matters. A bit like the vascular 'debate' ... but on the other hand it is vascular, of a specialist type!

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