AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
SCIENTIFIC ASSEMBLY
1999

The Medicine Behind Chest Pain Centers: Wave of the Future or Passing Fad?

Increasingly, hospitals across the country are establishing chest pain centers. The question remains, however, of whether this is really an improvement in patient care or just a marketing tool. The lecturer will review the current data on observation units for chest pain, including the AHCPR trial. Issues of diagnostic accuracy, patient satisfaction, cost, and disease management will also be discussed. Finally, the lecturer will present an argument either in support of or in opposition to these units as true advances in patient care.

- Discuss the current published data relating to chest pain observation units.
- Describe how the use of chest pain centers affects the cost, diagnostic accuracy, and disease management of patients with ischemic heart disease.
- Based on the data presented, formulate an opinion on whether chest pain units offer a real advance in patient management.

TH-233
Thursday, October 14, 1999
12:00 PM - 12:55 PM
Room # N219
Las Vegas Convention Center

*Principle Investigator
Dade Bhering Corporation

FACULTY

*J Stephen Bohan, MD, FACEP

Instructor, Harvard Medical School; Clinical Director/Director of Observation Medicine, Department of Emergency Medicine, Brigham and Women's Hospital, Boston, Massachusetts

INTRODUCTION TO EPISTAXIS

Epistaxis is a common medical emergency that affects people of all ages. There is no gender predilection to this condition. Most people have at least one nosebleed at some point in their lives. This may be a minimal problem for a patient who can readily control the nosebleed by simply applying direct pressure to the nostrils. However, patients with uncontrolled hemorrhages often arrive in the emergency department and require emergent treatment. Most often bleeding can be treated by an emergency physician with a few relatively simple techniques. Regardless of which method is used to stop the bleeding, all emergency physician should develop a protocol or strategy that *they* are most comfortable with. At times epistaxis may be extensive and difficult to control requiring a consultation with a specialist.

EPIDEMIOLOGY

Epistaxis affects people in all age groups but is most common in the elderly. The most common etiologies vary by age group. Children tend to bleed secondarily to self-induced digital trauma. Adolescents bleed secondary to facial trauma associated with athletic activity or fighting. In the elderly, nosebleeds are generally the result of underlying atherosclerotic heart disease and uncontrolled hypertension.

Few episodes of epistaxis require actual hospitalization. According to one study conducted at the Los Angeles County General Hospital approximately 0.15% of all emergency room admissions were due to epistaxis. The majority of patients hospitalized for epistaxis stay between 2 to 5 days with 12 % of patients remaining hospitalized for one week or more.

Factors which dictate the length of stay include rebleeding after removal of the initial packing, severity of the patient's other medical conditions, and the presence of any bleeding disorders. Of all hospitalized patients, 29% required transfusions and 5.6% required surgical intervention.

LOCATION OF BLEEDING

The majority of nosebleeds occur in a region in the anterior nasal septum called Kiesselbachs's plexus. This region contains the rich anatomoses of the distal branches of the anterior ethmoidal artery, the superior labial artery, the greater palatine artery and the sphenopalatine artery. The vessels in this area are covered by thin mucosa and there is a paucity of connective tissue to cushion the vessels from the external trauma. The thin mucosa combined with vascualartity of Kiesselbach's plexus makes this region of the septum more prone to bleeding from digital trauma and inflammation. In fact 90% of all epistaxis occurs in Kiesselbach's plexus while only 10% of epistaxis occurs posterior to this area or from the lateral nasal wall.

ANATOMY

Blood supply to the nose originates from both the internal and external carotid arteries and their numerous anatomoses. A life threatening hemorrhage is possible if a large vessel is torn or ruptures, resulting in bleeding that is difficult to control. Understanding the course of the blood vessels and their branches will aid the emergency physician in determining the optimal approach to patients with epistaxis.

Branches of the Internal Carotid Artery to the nasal septum

The nasal septum receives its blood supply from the internal carotid artery via branches from the ophthalmic artery. After entering the orbit from the superior orbital fissure, the ophthalmic artery divides into ten branches. Two of these major branches, the Anterior Ethmoidal Artery and the Posterior Ethmoidal Artery, pierce the bone of the medial wall of the orbit at the point where the lamina papyracea of the ethmoid bone articulates with the orbital portion of the frontal bone (frontoethmiod suture). From their position high in the ethmoid sinuses, the two arteries supply the mucosa and send important branches to the superior portion of the nasal cavity, particularly to the septum. The branches of the anterior ethmoid artery supply the anterior third of the nasal septum which includes small branches to Kiesselbach's plexus. The branches of the posterior ethmoid artery supply the posterior third of the septum.

Branches of the External Carotid Artery to the nasal septum

The external carotid artery supplies blood to the nasal septum via the superior labial artery and via terminal branches of the internal maxillary artery. The superior labial artery, which also supplies blood to the upper lip, enters the nose just lateral to the anterior nasal spine to supply blood to the anterior third of the nasal septum in Kiesselbach's plexus.

The internal maxillary artery is a major branch of the external carotid artery that passes deep to the neck of the mandible to enter the infratemporal fossa and then courses medially through the pterygopalatine fissure to enter the pterygopalatine fossa. The terminal branch of the internal maxillary artery becomes the sphenopalatine artery. This artery enters the nasal cavity posteriorly where it supplies the mucosa of both the lateral wall and septum. Another terminal branch of the internal maxillary artery in the pterygopalatine fossa is the descending palatine artery. It courses inferiorly through the greater palatine canal as the greater palatine artery and then turns anteriorly and travels along the junction between the alveolar ridge and palatal process of the palatine and maxillary bones. It subsequently courses superiorly through the incisor foramen to supply blood to the anterior septum in Kiesselbach's plexus.

ETIOLOGY

There are numerous local and systemic causes for epistaxis. Local etiologies are anatomic, pathologic, and physiologic characteristics of the nose that predispose it to bleeding. Examples include injury from trauma, inflammation, nasal septal deviation, the use of nasal sprays, breakdown of tumors and postsurgical bleeding. Digital trauma is the number one cause of epistaxis in children. Sinusitis and viral rhinitis can cause significant inflammation and friability of the nasal mucosa, making it more susceptible to hemorrhage. Dry air is a significant factor in producing nasal bleeding, and peaks during the winter months. Nasal septal deviation will produce eddy current leading to local areas of crusting which may bleed when separated by picking or blowing the nose.

<u>Local Etiology</u>

- Trauma
- Inflammation
- Nasal Septal Deviation
- Chronic use of Nasal Sprays
- Breakdown of Nasal Tumors
- Post -surgical bleeding
- Foreign Bodies
- Iatrogenic
  - Insertion of nasogastric tubes
  - Nasotracheal Intubation

<u>Systemic Etiology</u>

- Atherosclerosis associated with Hypertension
- Blood Dyscrasias
- Osler-Weber-Rendu Disease
- Anticoagulants
- Idiopathic

RELATIONSHIP OF BLOOD PRESSURE TO EPISTAXIS

It is difficult to prove that having elevated blood pressure may lead to epistaxis. In one longitudinal study of over 6000 patients, average systolic and diastolic blood pressures were measured. The incidence of various symptoms such as headache and epistaxis were recorded by the patient. The survey results showed no significant increase in the incidence of epistaxis for patients with chronically elevated systolic or diastolic blood pressures. However, other studies of patients presenting to the emergency department with active bleeding revealed that there was a higher incidence of elevated blood pressures at the time of presentation.

In the elderly patient whose bleeding appears to originate from a more posterior location, the accumulation of atheromatous material in the arteries supplying the nasal mucosa is probably the contributing factor. In these patients, the muscular tunica media of the arteries is replaced by fibrous and collagenous elements with occasional calcification. This reduces the vessel's elasticity and prevents adequate vessel contraction during the episode of epistaxis. Therefore patients with atherosclerosis and hypertension who are experiencing profuse posterior bleeding are much more difficult to control.

HISTORY AND DIAGNOSIS

Some patients will present to the emergency department with a history of intermittent bleeding which has subsided. This is frustrating both to the physician and to- the patient. In these cases it is important to obtain a history of any medications, bleeding tendencies, and pertinent medical history. The decision to actively investigate the source of bleeding in a patient who is not currently bleeding will depend upon the frequency and severity of prior episodes. At the very least the emergency physician should perform a complete intranasal exam with the *expectation* that this manipulation may provoke rebleeding.

When a patient is bleeding heavily, the primary effort should be directed at controlling the hemorrhage, and obtaining a medical history becomes secondary. If patient appears to be unstable always remember the ABCs. The patient should be placed on a stretcher and IV access should obtained. The patient is placed on a monitor and vital signs monitored. Placement of supplemental oxygen may prove difficult with profuse bleeding form the nose. If the airway becomes compromised secondary to profuse bleeding the patient may require emergent intubation.

Use of proper equipment is essential to the successful evaluation of the epistaxis patient. A headlight that provides a focused beam of light into the nasal cavities and permits the physician have both hands free for examination and manipulation is crucial. The physician should be prepared to quickly determine the side and the site which is the primary source of bleeding and should have the proper equipment at his disposal with which to control it.

BASIC EQUIPMENT

- Head lamp (consider battery operated headlamp)
- Nasal speculum
- Cotton tipped applicators (Q tips)
- Bayonet forceps with cotton pledgets
- Expandable intranasal tampons (Merocel, Rhinorocket)

MEDICATIONS:

VASOCONTRICTORS

- Phenylephrine (0.5 %-1.0 %)
- Cocaine 4%
- Oxymetozaline (Afrin)
- Epinephrine (1:1,000)

ANESTHETICS:

- Lidocaine 4%
- Cocaine 4%
- Pontocaine 2%

TREATMENT: GENERAL MANAGEMENT

The physician must utilize universal precautions. Blood particles from epistaxis may become aerosolized when patients cough, blow their nose or sneeze. Therefore, prior to attending a patient with active epistaxis, the physician must wear protective eye wear, a mask, gloves, and a protective gown.

The patient should be placed in the upright position in an examination chair. This will prevent aspiration and facilitate the physical examination. In the unlikely event that the patient should become hypotensive, the chair should have the capacity to be reclined.

APPROACH

If the bleeding is mild to moderate, there is generally time to perform an examination of the nasal cavity. An intranasal examination is very difficult during an active nosebleed and requires the physician to use both hands simultaneously. One hand holds the nasal speculum and the other uses a Frazier tip suction to remove clots from the nasal cavity. Visualization is extremely difficult when a "third hand" is used to shine a flashlight into the patient's nose. For best visualization, the physician should wear a headlight as previously described. If a headlamp is not available, a flashlight can serve as a substitute but is much less effective. A topical vasoconstrictor combined with a topical anesthetic will facilitate the examination and will frequently slow the bleeding. Lidocaine 4% combined with phenylephrine applied on a cotton tipped applicator(s) is effective and usually well tolerated by the patient. A 4% cocaine solution is a viable alternative but the problems associated with cocaine must be kept in mind. After adequate time for the local anesthesia to take effect, the applicator is removed. Blood clots in the nasal cavity are removed by careful suctioning with a Frazier catheter. This may help determine the exact point of bleeding. In contrast, if bleeding is profuse and placement of a Q tip is insufficient, a cotton pledget(s)

moistened with a vasoconstrictor or placing a compressed nasal tampon (moistened with a vasoconstrictor after intranasal placement) may be effective in slowing the bleeding. These can then be removed to examine the intranasal cavity and cauterize the area. Although unusual, there are times when the patient is hemorrhaging so quickly that the nose must be packed without a careful inspection. In these cases both nostrils should be packed with half inch gauze. If the bleeding continues with a well placed anterior pack, then a posterior pack will be necessary.

When the site of bleeding is apparent, the physician should attempt to definitively control the area of bleeding. The method of hemostasis will depend on several factors:

FACTORS:

- Anterior bleed
- Posterior bleed
- Discrete site
- Diffuse bleeding
- Rate of bleeding
- Stability of the patient

AVAILABLE METHODS:

- Silver nitrate sticks
- Electrocautery
- Vaseline gauze
- Compressed intranasal sponges
- Intranasal balloons
- Foley catheters

DEFINITIVE TREATMENT

For anterior epistaxis occurring from Kiesselbach's plexus, follow the standard protocol for managing any nosebleed. Fresh blood and clots are suctioned clear from the nasal cavity. If a slight ooze from a vessel is seen, silver nitrate may cauterize the area of bleeding. The sticks are rolled over the vessel for several seconds which will chemically cauterize the vessel. Care must be taken not to touch the silver nitrate over the same area for more than 20 seconds since excssive cauterization will devitalize the mucosa on the opposite side of the septum and could lead to a septal perforation. For similar reasons, the corresponding area of mucosa on the opposite side should never be cauterized during the same visit. Silver nitrate will not work effectively on vessels that are bleeding moderately to severely. The use of suction adjacent to the site of bleeding will facilitate the action of the silver nitrate. On the other

hand, silver nitrate is ideal for patient with inactive epistaxis who have a prominent Kiesselbach's plexus. Once the area has been cauterized a small amount of topical antibiotic ointment is placed over the cauterized area. Some authors recommend placing an absorbable pack made from Surgicel™ or Gelfoam™ over the cauterized area. The function of the absorbable pack is to prevent the freshly cauterized surface clot from dislodging. The patient is sent home with oral antibiotics to cover *Staphylococcus aureus* if an absorbable pack is in place. The patient is instructed to keep the nose humidified by frequently using saline nasal sprays, to refrain from blowing their nose and touse a room humidifier.

A variety of other options are available for the treatment of anterior epistaxis. Minor bleeding or mucosal oozing may be treated with Merocel ™ or Rhinorocket™ intranasal tampons. This type of packing will expand upon contact with any fluid and will exert pressure onto the mucosa. First the tampon is rapidly inserted until the proximal end is flush with the nasal ala. Saline drops are then applied to end of the tampon to hasten the expansion. Finally the free end of the suture attached to the tampon is taped to the cheek to facilitate removal of the pack one to two days later. The patients are given a prescription for normal saline drops to keep the tampon moist. Many physicians recommend the use of antibiotics to reduce the chance of toxic shock syndrome from the overgrowth of the bacteria *Staphylococcus aureus*.

Patients who have friable nasal mucosa or have a bleeding problem are at risk of subsequent epistaxis when standard packs are removed. A viable alternative for these patients is the use of an absorbable pack made from Gelfoam™ or Surgicel™ . This type of packing should be gently inserted and pressed up against the surface of the mucosa. This will eventually fall out or be blown out by the patient naturally. These packs work especially well with patients on chemotherapy.

If the patient has failed the methods previously described, a "traditional" ½" Vaseline gauze is necessary. While this type of pack is not as well tolerated as the other methods described, it is a very effective procedure. The gauze is placed along the floor of the nasal cavity with a bayonet forceps. The nasal cavity is packed in a layered fashion from the floor to the superior aspect of the nasal cavity and requires between 36" to 72" of gauze. In most cases, the opposite nostril is packed to brace the septum in the midline and maintain pressure on the actively bleeding side.

POSTERIOR EPISTAXIS

The definition of posterior epistaxis is bleeding that does not stop with an adequate anterior pack. It is necessary that the emergency physician consult the otolaryngologist when placing a posterior pack because these patients will require admission to the hospital once the pack has been placed.

The treatment of a patient with posterior epistaxis utilizes the same general principals as that of a patient with anterior epistaxis: rapid assessment

of the bleeding, stabilization of the patient, suctioning of blood clots, and the use of vasocontrictive and anesthetic agents.

The function of the posterior pack is to act as a buttress in the nasopharynx. The posterior pack will not stop bleeding since it does not exert any direct pressure on the actual site of bleeding. However, since the anterior pack will fit snugly against the posterior pack, the entire nasal cavity will become occluded. This combination will not only prevent blood from being aspirated or swallowed but will allow a clot formation within the nasal cavity which will effectively stop most bleeding.

There are four types of posterior packs:

- Traditional posterior pack
- Foley catheter 14 French with 30 cc balloon
- Posterior epistaxis balloon catheters
- Merocel™ posterior nasal sponges

The traditional posterior pack uses a dental roll or a tonsil pack placed into the nasopharynx. The pack is placed by using rubber catheters placed through the nostril and brought out of the mouth. The pack is then attached to the catheter and pulled into place in the nasopharynx and taped to the cheek. A formal anterior pack is then placed. Although this is the "traditional" posterior pack it is not well tolerated by the patient and can be quite difficult to place.

To use a Foley catheter with a 30 cc balloon, the distal tip of the catheter is cut close to the balloon. The catheter is then inserted in the side of the nose which is actively bleeding. The balloon is inflated with saline just to the point where the soft palate is displaced. Gentle traction is applied to the proximal section of the catheter at the level of the nasal ala. Gauze is then placed around this section of the tubing just anterior to the ala and the Foley catheter is secured in place with a clamp. It is *essential* that the gauze acts as a cushion to prevent necrosis of the nasal ala or columella because excessive pressure from the clamp can cause necrosis of this area within 24 to 36 hours.

Various balloon catheters have been designed to treat posterior bleeding. Usually these nasal packs consist of two balloons that are inflated with saline. The smaller and more distal of the two balloons fills the nasopharynx and acts as a posterior pack. The larger and more proximal balloon fills the nasal cavity and acts as an anterior pack. When time permits the nasal cavity should be anesthetized as previously described. After lubricating the catheter with a sterile water soluble gel, the physician should slide the bevel of the catheter along the septum until the distal portion touches the posterior pharynx. The posterior balloon is inflated first with saline according to the manufacturer's recommendations. Gentle traction is then applied to the catheter and the anterior balloon is inflated. The physician should take note of the amount in each balloon so additional saline may be added if the bleeding persists. It is recommended that an anterior pack if placed in the opposite nasal cavity to keep the cartilaginous septum from deviating.

Following any type of posterior pack all patients should will need consultation with an otolaryngologist. These patients require admission to the hospital for antibiotic therapy and observation of possible hypoxia associated with posterior packing termed the "nasopulmonary reflex". The exact mechanism of this reflex is not well understood. The elderly patients are particularly at risk. All patients with posterior packing should be placed in a monitored setting , placed on a pulse oximeter and a cardiac monitor. Usually the pack is left in place for 2 to 5 days. If bleeding persists, the patient may need selective embolization or surgical ligation of the vessels that supply the area of bleeding.

CONCLUSION:

Most patients who present to the emergency department with epistaxis can be managed by an emergency physician. The effectiveness of various management options will depend upon the experience of the physician, use of the proper equipment, and the presentation of the patient. In general patients with obvious sites of bleeding will be successfully treated and discharged by the emergency physician with outpatient follow up. The success rate for patients with non-discernible site or profuse bleeding will be lower and may require consultation.

SELECTED READING

Crumley R: *Common Problems of the Head and Neck Region*. Philadelphia, W.B. Saunders, 1997

Suen J.Y: *Emergencies in Otolaryngology*. New York, NY, Churchill Livingstone, 1987

Yanagisawa E: *Color Atlas of Diagnostic Endoscopy in Otorhinolaryngology*. New York, NY, Igaku-Shoin Medical Publishing, 1995

Bracklin S.A: Positive Pressure Technique for Nasal Body Removal in Children. Ann Emerg Med. 1995;25:554

Toner J.G et al: *Comparison of Electro and Chemical Cautery in the Treatment of Anterior Epistaxis*. J Laryngol Otol 1990; 104:617

Viducich R.A. et al: *Posterior Epistaxis: Clinical Feature and Acute Complications.* Ann Emerg Med. 1995;25:592

Williams J.W, Simel D. L: *Does this Patient Have Sinusitis: Diagnosis acute Sinusitits by History and Physical Examination*. JAMA 1993;270: 1242