FIGURE 243-6. Reduction of dislocated mandible technique in a seated patient. The thumbs are placed over the molars, and pressure is applied downward and backward.

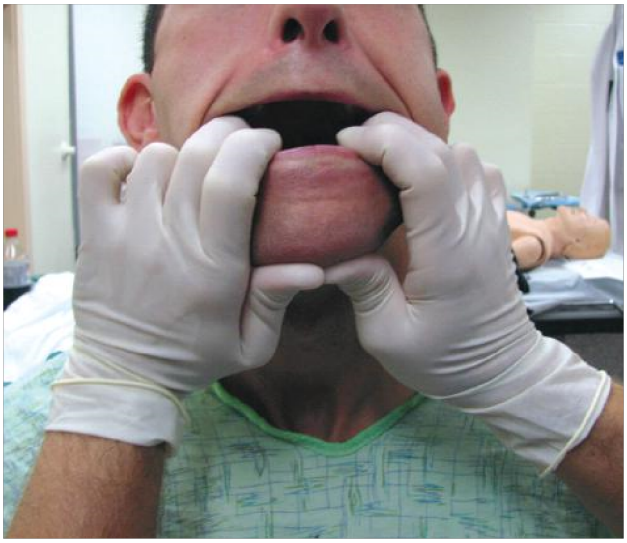

FIGURE 243-8. Wrist pivot method for mandibular reduction. The operator's thumbs are placed on the mentum, applying upward force, while the fingers apply downward force on the body of the mandible.

few layers of gauze over gloved thumbs for protection, in case the mandible snaps closed after reduction.[33]

Facing the patient, place gloved thumbs in the patient's mouth, over the occlusal surfaces of the mandibular molars, as far back as possible. Curve your fingers beneath the angle and body of the mandible. Using the thumbs, **apply pressure downward and backward (toward the patient)**. Slightly opening the jaw may help disengage the condyle from the anterior eminence (**Figure 243-6**). When the dislocation is bilateral, it may be easier to relocate one side at a time.

In the second technique, with the patient recumbent and supine, stand at the head of the bed, place the thumbs on the molars, and apply downward and backward pressure (toward the stretcher) (**Figure 243-7**).[33]

In addition to the above common methods, other approaches include the ipsilateral, in which the thumb is externally used to apply downward pressure on the displaced condyle; the wrist pivot method, in which the healthcare provider's thumbs are placed on the mentum, applying upward force, while the fingers apply downward force on the body of the mandible (**Figure 243-8**); and the gag reflex approach. In the gag reflex method, the provider stimulates the patient's soft palate with a tongue blade or dental mirror, thereby producing muscle relaxation and descent of the mandible, resulting in relocation of the condyle.[33]

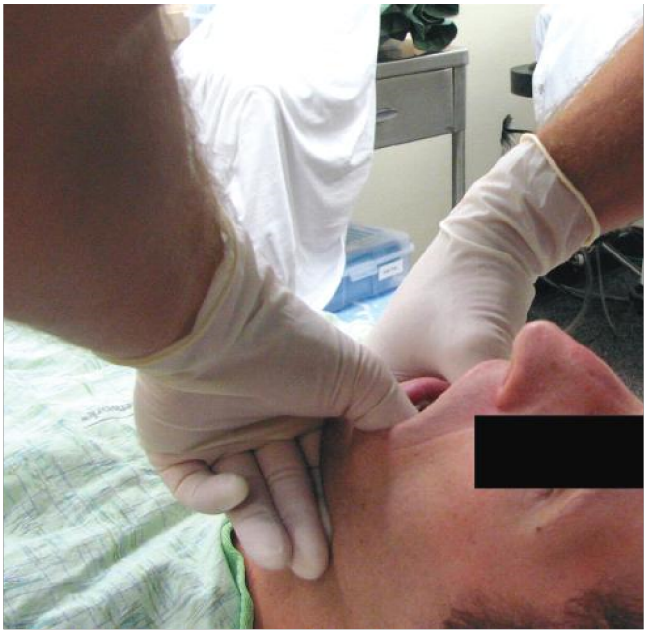

FIGURE 243-7. Alternate mandibular reduction technique, with the examiner behind and above the reclined patient. Place the thumbs on the molars and apply downward and backward pressure (toward the stretcher).

After successful reduction, the patient should be able to close his or her mouth immediately. Postreduction radiographs usually are not needed unless the procedure was difficult or traumatic or there is significant postreduction pain. Complications from the reduction itself are unusual but can include iatrogenic fracture or avulsion of the articular cartilage.

Dislocations that are open, superior, associated with fracture, have any nerve injury, or are irreducible by closed technique should be referred urgently to an otolaryngologist or maxillofacial surgeon.

Following successful reduction of an acute dislocation, patients may be discharged home, placed on a soft diet, and cautioned against opening their mouths >2 cm for the following 2 weeks.[33] Advise patients to support the mandible with a hand when they yawn. Nonsteroidal analgesics may help the initial discomfort. Elective referral to an oral maxillofacial surgeon is recommended. In severe cases, intermaxillary fixation may be required to control jaw motion during healing. Chronic dislocations may require operative intervention.

REFERENCES

The complete reference list is available online at www.TintinalliEM.com.

CHAPTER 244

Nose and Sinuses

Henderson D. McGinnis

EPISTAXIS

EPIDEMIOLOGY

Epistaxis occurs most frequently in children under 10 years old and in those over 70 years old.[1] Local causes of epistaxis include digital trauma, a deviated septum, dry air exposure, rhinosinusitis, neoplasia, or chemical

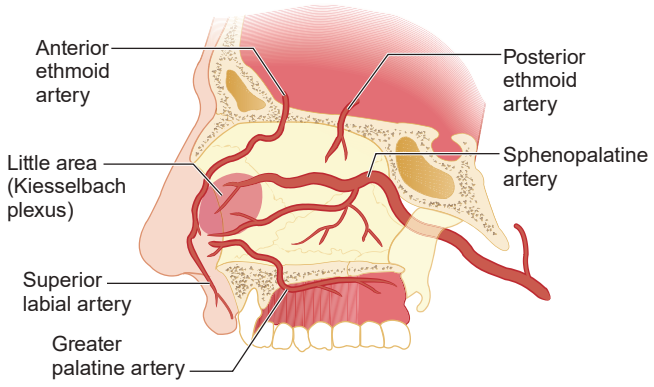

FIGURE 244-1. Arterial blood supply to the nasal cavity. The most common site of nasal hemorrhage is at Little's area of the nasal septum. The most common origin of posterior epistaxis is from the sphenopalatine artery.

irritants such as inhaled corticosteroids or chronic nasal cannula oxygen use. Systemic factors that increase the risk of bleeding include chronic renal insufficiency, alcoholism, hypertension, vascular malformations such as hereditary hemorrhagic telangiectasia, or any kind of coagulopathy, including warfarin administration, von Willebrand's disease, or hemophilia.[2]

ANATOMY AND PATHOPHYSIOLOGY

The superior labial branch of the facial artery joins the anterior ethmoidal and terminal branch of the sphenopalatine artery to form Kiesselbach plexus on the anterior nasal septum, which is the source of 90% of nosebleeds and can usually be visualized with anterior rhinoscopy (**Figure 244-1**). The most likely source for posterior bleeds is the sphenopalatine artery, which is a terminal division of the internal maxillary artery (branch of the external carotid system). Endoscopic or open surgical techniques are needed to visualize the vessel.[2,3] Sensory innervation is detailed in **Figure 244-2**.

CLINICAL FEATURES

A directed history and physical examination is usually sufficient to identify the source of acute epistaxis. Ask about prior or recurrent epistaxis, duration and severity of the current episode, and laterality.

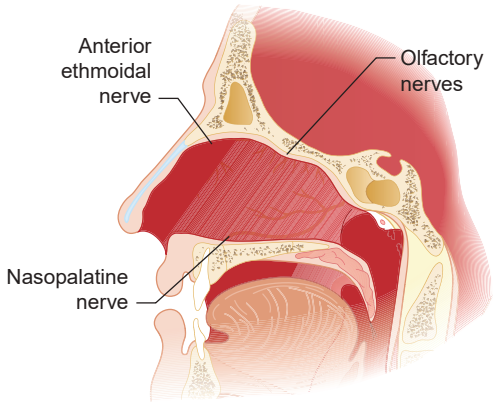

FIGURE 244-2. Sensory innervation of the external nose. [Reproduced with permission from Reichman EF, Simon RR: *Emergency Medicine Procedures.* © 2004, Eric F. Reichman, PhD, MD, and Robert R. Simon, MD.]

Ask specifically about nonsteroidal anti-inflammatory drugs, warfarin, heparin, or aspirin use. Alcohol or cocaine abuse, trauma, prior head and neck procedures, and a personal and family history of coagulopathy should be assessed.

Make preparations for nasal examination and tamponade. The ED should have a preprepared, readily available epistaxis kit or cart. The kit should include a nasal speculum, bayonet forceps, headlamp, suction catheter, cotton pledgets, 0.05% oxymetazoline and 4% lidocaine solutions, silver nitrate swabs, and some combination of absorbable and nonabsorbable materials for anterior and posterior packing.

Assemble a good light source, suction, and a nasal speculum. Have the patient seated and in the "sniffing" position. The sniffing position is achieved by having the patient flex and extend the head while keeping the base of the nose straight ahead. With the patient in this position, brace the speculum by resting the index finger on the tip of the nose and insert the speculum with the handle parallel to the floor. Open the blades in a cephalad-to-caudad direction to visualize the bleeding site and facilitate the performance of direct hemostatic techniques.

DIAGNOSIS

Differentiating an anterior versus posterior source of bleeding is important for treatment and disposition; failure to identify the source of bleeding is associated with rebleeding and return for treatment.[4] The division between anterior and posterior bleeding in the ED is often based on the ability to visualize the site of bleeding with a light source and a nasal speculum.[5] Generally, the diagnosis of posterior hemorrhage is only made in the ED once measures to control anterior bleeding have failed. Clinical features suggestive of a posterior source include elderly patients with either inherited or acquired coagulopathy, a significant amount of hemorrhage visible in the posterior nasopharynx, hemorrhage from bilateral nares, or epistaxis uncontrolled with either anterior rhinoscopy or an anterior pack.[6] Laboratory evaluation or other ancillary studies are not required unless management of comorbid illness requires it or the hemorrhage is poorly controlled. In the latter case, collect blood for CBC, type and cross-match, and coagulation studies if coagulopathy is suspected.

TREATMENT

Initial ED management for epistaxis begins with a rapid primary survey addressing potential airway or hemodynamic compromise. Obtain IV access in patients with severe bleeding, and request cross-matched blood if there is hemodynamic instability. The need for transfusion is more common in patients with posterior epistaxis and those on anticoagulants.[7] Reversal of coagulopathy with blood products can be considered based on clotting studies and individual patient context. Rapid reduction of blood pressure during an episode of acute epistaxis is generally not advised.[8] For uncontrolled epistaxis requiring packing or surgical intervention, gentle reduction of persistent hypertension reduces hydrostatic pressure and thereby may aid clot formation.[8]

DIRECT NASAL PRESSURE

First, ask the patient to blow the nose to expel clots to prepare mucosa for topical vasoconstrictors. Instill a topical vasoconstrictor such as oxymetazoline or phenylephrine. The patient should lean forward in the "sniffing" position and pinch the soft nares between the thumb and the middle finger for a full 10 to 15 minutes, breathing through the mouth. If the patient is uncooperative, fashion a hands-free pressure device made from two tongue depressors that are taped together between halfway and two thirds of the way up the depressors. Place the device on the nose and leave it undisturbed for 10 to 15 minutes. These initial measures are often sufficient to achieve hemostasis and facilitate further examination by anterior rhinoscopy.

CHEMICAL CAUTERIZATION

If two attempts at direct pressure have failed, chemical cauterization with silver nitrate is the next appropriate step for mild bleeding. Before cautery, anesthetize the nasal mucosa using three cotton pledgets soaked in a 1:1 mixture of 0.05% oxymetazoline and 4% lidocaine solution.[2] Do not attempt chemical cautery unless the bleeding vessel is visualized. Electrical cautery should be left to the otolaryngologist due to the risk of septal perforation.

After visualizing the (anterior) bleeding site, silver nitrate sticks may be judiciously placed just proximal to the bleeding source on the anterior nasal septum. Silver nitrate requires a relatively bloodless field, as the chemical reaction leading to precipitation of silver metal and tissue coagulation cannot proceed in the setting of active hemorrhage due to washout of substrate. Once a relatively bloodless field is achieved, gently and briefly (a few seconds) apply silver nitrate directly to the bleeding site. Chemical cautery should never be attempted on both sides of the nasal septum. Subsequent attempts on the same side of the nasal septum should be separated by 4 to 6 weeks to avoid perforation.[9]

THROMBOGENIC FOAMS AND GELS

Thrombogenic foams and gels are a good option, and they may be considered after attempts at chemical cautery have failed and before insertion of nasal tampons. Gelfoam□ and Surgicel□ (oxidized cellulose) are effective hemostatic agents that can be placed simultaneously on visualized bleeding mucosa, and they are bioabsorbable, so removal is not needed. FloSeal□, a hemostatic gelatin matrix that is mixed in a syringe with thrombin and injected into the nasal cavity, may decrease episodes of rebleeding and the need for specialty follow-up compared to other agents.[10] A 2013 randomized controlled trial involving 216 patients demonstrated that 5 mL of the injectable form of tranexamic acid, equal to 500 milligrams, applied topically to the nasal mucosa using a 15-cm piece of cotton pledget, stopped anterior epistaxis in 70% of patients, compared to a 31% success rate in those who received anterior packing alone.[11] There were no adverse events. Topical use of injectable tranexamic acid may prove to be a valuable procoagulant.

ANTERIOR NASAL PACKING

Anterior nasal packing can be placed if direct pressure, vasoconstrictors, or chemical cautery are unsuccessful in controlling epistaxis and if thrombotic foams and gels are not available. A variety of nasal balloons or sponges are available, or an anterior pack created by layering ribbon gauze in the nasal cavity can be used.

ANTERIOR EPISTAXIS BALLOONS

Anterior epistaxis balloons (Rapid Rhino□) are easy to use and more comfortable for the patient than layered strip gauze or nasal sponges. Anterior epistaxis balloons are available in different lengths and are coated with cellulose or other materials that promote platelet aggregation. Soak the balloon with water, insert it gently along the floor of the nasal cavity, and inflate slowly with air until the bleeding stops. Stop inflation if the patient develops discomfort. Do not inflate with saline; if a saline-filled balloon ruptures, aspiration could result. Read specific insertion instructions for each product before use. If there is a drawstring at the distal end, tape the drawstring to the face to secure the balloon in place.

PREFORMED NASAL TAMPONS OR SPONGES

Preformed nasal tampons or sponges are made of synthetic material that expands after hydration (**Figure 244-3**). These devices are commercially available in 5- and 10-cm lengths, for anterior and posterior packing, respectively. One product is Merocel□, a compressed dehydrated polyvinyl acetate sponge. Coat the sponge with water-soluble antibiotic ointment and insert it gently along the floor of the nasal cavity. If the tampon has not expanded within 30 seconds of placement, gently irrigate it (while in place) with 5 mL of normal saline to promote expansion. An alternative method is to cut the Merocel□ pack lengthwise in two equal halves, and coat each half with lubricating ointment. Insert the two halves parallel to each other and parallel with the nasal septum; irrigate each half with about 2 mL of normal saline. This method may provide better compression of septal bleeding.[12] Whichever method is used, tape the drawstring to the face (Figure 244-3) to secure the tampon in place and prevent inadvertent aspiration. Merocel□ nasal packs work effectively but sometimes cause more pain than balloons with removal.[13]

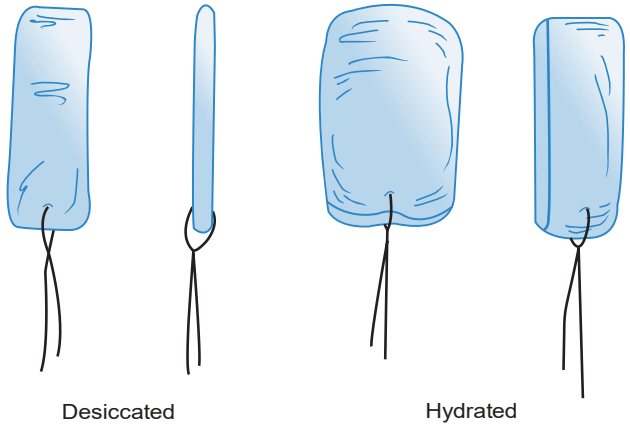

FIGURE 244-3. The Merocel□ nasal sponge in its desiccated (*left*) and hydrated (*right*) forms.

RIBBON GAUZE PACKING

If the preceding devices are unavailable, ribbon gauze packing can be placed to control epistaxis (**Figure 244-4**).

POSTERIOR NASAL PACKING

Failure to control hemorrhage after direct pressure, optimal use of vasoconstrictors, cautery, and anterior packing suggests (but is not diagnostic of) posterior bleeding. Bilateral anterior packing may help augment tamponade of the nasal septum. If that is not successful, the previously mentioned devices are usually available in longer lengths to provide posterior packing. If longer posterior-length packs do not work, ear, nose, and throat (ENT) consultation and assistance are needed. Posterior packing is associated with higher complication rates, including pressure necrosis, infection, hypoxia, and cardiac dysrhythmias, especially in patients with underlying cardiopulmonary disease, and thus, posterior packing is generally applied as a temporizing measure while awaiting ENT support. A formal nasal block may be required for analgesia, as posterior packing is often quite uncomfortable for the patient, but topical anesthesia may be sufficient if applied properly. The Rapid Rhino□ has both an anterior (5.5 cm) and posterior (7.5 cm) balloon that can be inflated as required to tamponade bleeding. **Figure 244-5** shows the placement of a dual balloon catheter. All posterior packing should be accompanied by an anterior pack.

If resources are limited, a satisfactory posterior pack can be achieved using a 14-French Foley catheter. The procedure is as follows. Place the patient in "sniffing position," and anesthetize the nasal mucosa by placing three cotton pledgets soaked in a 1:1 mixture of 4% lidocaine solution and 0.05% oxymetazoline intranasally for 5 minutes. Consider cutting off the Foley tip beyond the balloon as the tip may stimulate the gag reflex. Lubricate the distal third of the catheter with lidocaine gel, and advance the Foley catheter along the floor of the nasal cavity until the end is visualized in the posterior oropharynx. Inflate the balloon with 7 mL of air, and gently retract the catheter approximately 2 to 3 cm until it is lodged in the choanal arch of the posterior nasopharynx. Do not use saline for balloon insufflation because rupture could result in aspiration. If the balloon slides back into the nasal cavity, deflate the balloon, and advance the catheter as before. Inflate with 10 mL of air in total, and retract to secure the balloon. Avoid using more than 10 mL

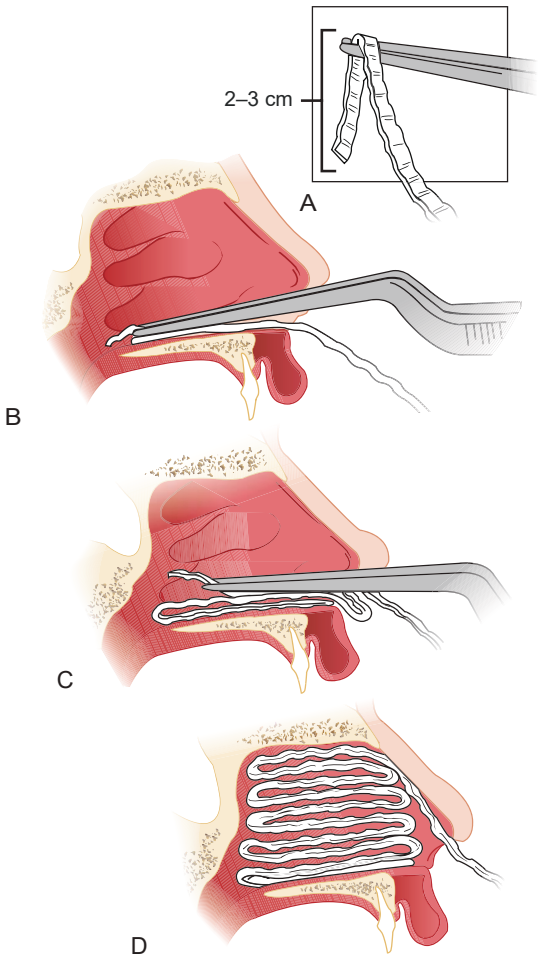

FIGURE 244-4. The key to placement of an anterior nasal pack that will control epistaxis adequately and stay in place is to lay the packing into the nasal cavity in an accordion-like manner so that part of each layer of packing lies anteriorly, preventing the gauze from falling posteriorly into the nasopharynx. **A.** The first layer of $^1/_4$-inch petrolatum-impregnated gauze strip is grasped approximately 2 to 3 cm from its end. **B.** The first layer is then placed on the floor of the nose through the nasal speculum (not pictured here). The bayonet forceps and nasal speculum are then withdrawn. **C.** The nasal speculum is reintroduced on top of the first layer of packing, and a second layer is placed in an identical manner. After several layers have been placed, it is often useful to reintroduce the bayonet forceps to push the previously placed packing down onto the floor of the nose, making it tighter and more secure. **D.** A complete anterior nasal pack can tamponade a bleeding point anywhere in the anterior nasal cavities and will stay in place until removed by the provider or patient.

of air to prevent risk of pressure necrosis. Secure the pack by taping the catheter to the patient's cheek.

In patients requiring posterior packing or in cases of uncontrolled anterior epistaxis, early ENT intervention reduces charges and length of stay.[14] Approximately 10% of patients admitted for epistaxis require invasive therapy; success is similar for arterial ligation or embolization, but cost and risk of stroke are higher for patients receiving embolization.[15]

DISPOSITION AND FOLLOW□ UP

If hemorrhage is controlled and hemodynamic stability is ensured over a period of observation (1 hour or more in the ED), patients with anterior epistaxis can be discharged home with ENT follow-up within 48 hours ideally. Provide patients with instructions for simple techniques to control repeat hemorrhage, and consider prescription of inhaled vasoconstrictors such as oxymetazoline for rebleeding. Patients

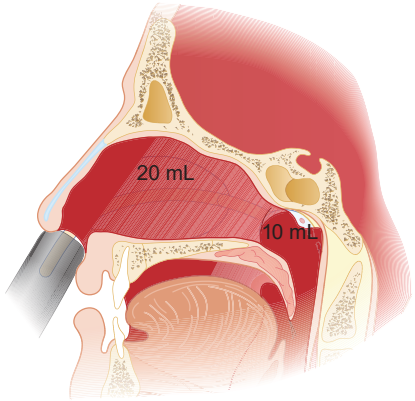

FIGURE 244-5. A dual balloon epistaxis catheter providing anterior and posterior compression. Overinflation of the posterior balloon may cause pressure necrosis; avoid using more than 10 mL.

on warfarin with INR levels in the desired range may continue medication. Discontinue nonsteroidal anti-inflammatory drugs for 3 to 4 days. If anterior packing with either absorbable or nonabsorbable material is going to be in place for more than 48 hours, an antibiotic with staphylococcal coverage such as amoxicillin-clavulanic acid has been traditionally recommended to prevent infection with *Staphylococcus aureus* and possible associated toxic shock syndrome.[16] However, benefit is not clear.[17,18] If the packing will be removed in 24 to 36 hours, prophylactic antibiotics may not be needed.[16] Consider potential drug interactions that may increase bleeding.[19] Instruct the patient to follow-up with ENT or return to the ED in 2 to 3 days for removal of nonbiodegradable packing. If the patient requires posterior packing, admission is strongly advised to monitor for complications.

NASAL FRACTURES AND SEPTAL HEMATOMA

ANATOMY

The nasal pyramid is formed by two rectangular-shaped bones that articulate with the frontal bone, the frontal process of the maxilla, and the perpendicular plate of the ethmoid to form a "tent-like" configuration (**Figures 244-6 and 244-7**). A large proportion of the structural integrity is maintained by a cartilaginous framework of the nasal septum, lateral processes, and medial and lateral crura of the alar cartilages (**Figure 244-8**).

CLINICAL FEATURES

Determine the mechanism of injury to evaluate the potential location of displaced bony fragments and to assess other associated pathology, especially head and neck injury. Assess the midface, zygomatic arch, orbits, sinuses, teeth, and cervical spine. Naso-orbital-ethmoid injuries are characterized by a broad, flattened nasal bridge with increased intercanthal distance (**Figure 244-9**). Malocclusion and palatal instability suggest Le Fort's fracture (see chapter 255, "Trauma to the Face").

NASAL EXAMINATION

After a general exam, perform an examination of the nose to include an external assessment for bony crepitus, deformity, and edema (**Figure 244-10**). Periorbital ecchymosis in the absence of other findings of orbital injury is suggestive of nasal fracture.[6] Profuse epistaxis may also suggest nasal fracture. Nasal bone mobility, which is virtually diagnostic of fracture, is appreciated by grasping the dorsum of the nose between the thumb and index finger and attempting to rock the nasal

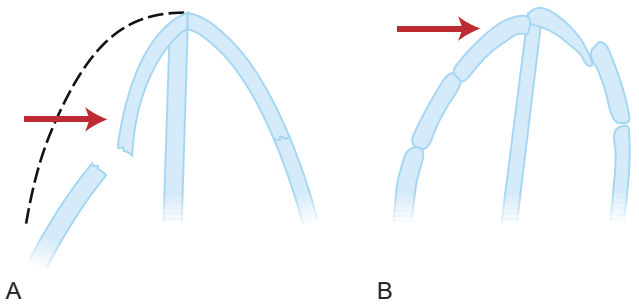

FIGURE 244-6. A and B. Lateral impact nasal injury. [Reproduced with permission from Reichman EF, Simon RR: *Emergency Medicine Procedures*. © 2004, Eric F. Reichman, PhD, MD, and Robert R. Simon, MD.]

pyramid back and forth.[6] Perform anterior rhinoscopy after obtaining a relatively bloodless field with topical vasoconstrictors and evacuation of clots. Key components of the internal examination should include assessment for mucosal lacerations, septal fractures or deviation, and septal hematoma.

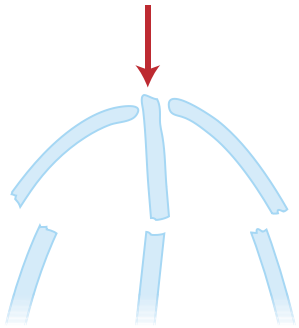

FIGURE 244-7. Frontal impact nasal injury. [Reproduced with permission from Reichman EF, Simon RR: *Emergency Medicine Procedures*. © 2004, Eric F. Reichman, PhD, MD, and Robert R. Simon, MD.]

DIAGNOSIS AND IMAGING

The diagnosis of nasal fracture is clinical, and radiologic confirmation of isolated nasal fracture is not required. The results of plain films rarely change management.[20,21] The indications for closed reduction are limited to alleviation of nasal obstruction and correcting deformity to improve cosmesis. These indications are best evaluated clinically at the bedside and usually are not emergency procedures.[20] Ultrasonography is an alternative to plain radiographs for the diagnosis of nasal fractures and has sensitivities and specificities similar to plain radiography[22-24] (**Figures 244-11 and 244-12**). CT scanning is not needed for isolated nasal fractures and is best reserved when there is concern for intracranial injury or other facial fractures.[25]

TREATMENT

The main priority is the exclusion of other associated traumatic injuries (see chapter 255) and nasal septal hematoma (see septal hematoma section below). Nasal fractures with overlying lacerations should be treated similarly to other open fractures. Concern for cerebrospinal fluid rhinorrhea or otorrhea requires further imaging and otolaryngologic or neurosurgical consultation. Nasal fractures in children should be referred to an ENT specialist within 2 to 4 days to account for rapid healing in children.[6]

Once serious injury is excluded, the management of uncomplicated nasal fractures is dictated by the timing of the examination in relation to the injury and ability to evaluate for significant displacement of the nasal pyramid. Early in the course, significant soft tissue swelling may obscure an adequate physical examination. If the patient presents immediately after the injury event, there may be opportunity to reduce a displaced nasal fracture before edema distorts the landmarks. Otherwise, it is prudent to recommend ENT consultation for an elective closed reduction within 6 to 10 days of the initial insult. Because of the development of fibrous connective tissue along the fracture line, failure to perform an adequate reduction within this time frame may result in an unacceptable cosmetic outcome and may ultimately require rhinoseptoplasty.[26] Most nasal fractures do not require immediate intervention and can be managed at ENT follow-up within the specified time frame of 6 to 10 days. Closed reduction is best left to the ENT specialist.

NASAL SEPTAL HEMATOMA

Vascular supply to the septal cartilage is provided through the perichondrium. A hematoma lifts the perichondrium, disrupting blood

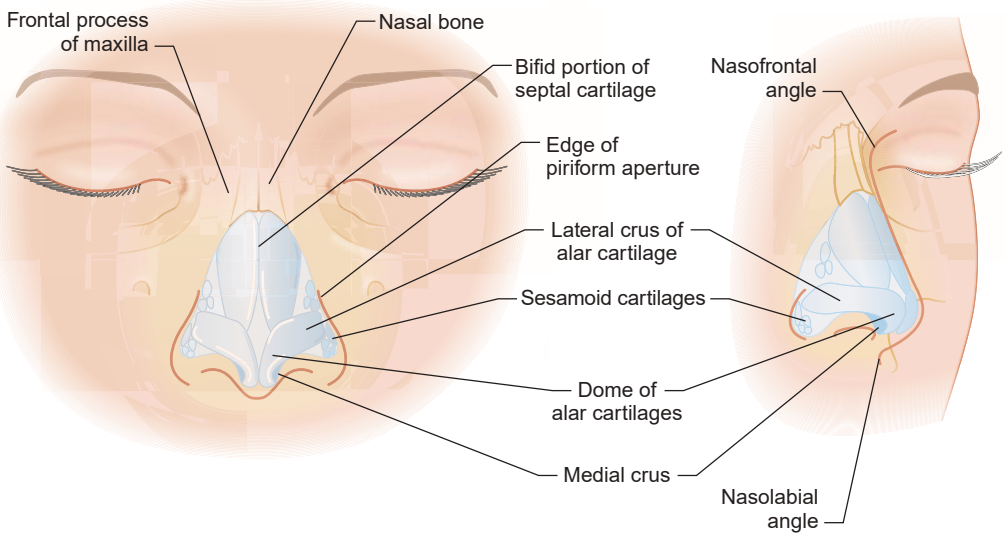

FIGURE 244-8. The nasal cartilages and the keystone area where they articulate with the nasal bones. [Reproduced with permission from Reichman EF, Simon RR: *Emergency Medicine Procedures*. © 2004, Eric F. Reichman, PhD, MD, and Robert R. Simon, MD.]

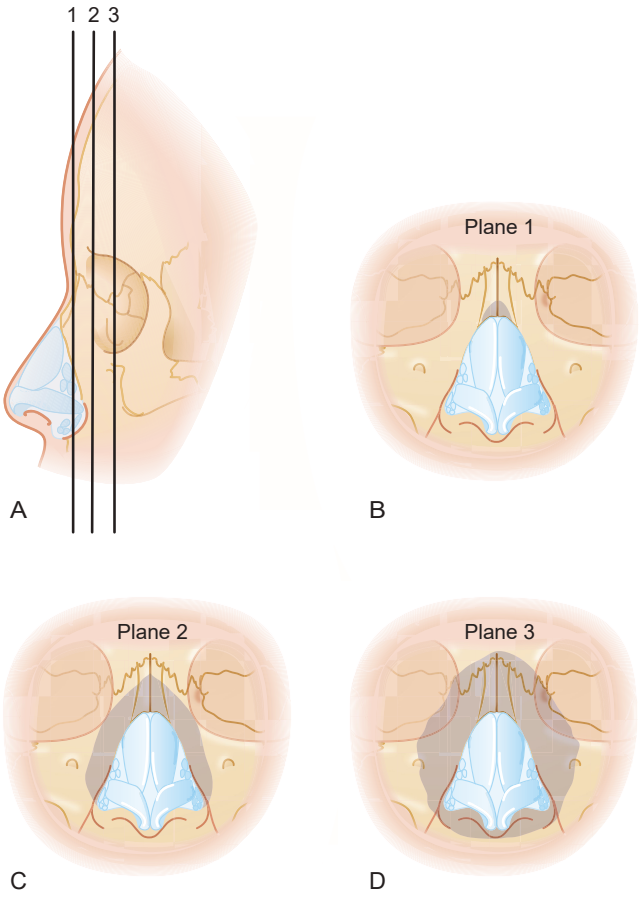

FIGURE 244-9. A through D. Stranc and Robertson classification of frontal impact injury. Plane 3 injury results in naso-orbital-ethmoid disruption.

supply to the cartilage. If a septal hematoma is identified, incise and drain the hematoma urgently to avoid ischemic necrosis of the nasal septum (**Figures 13 and 14**). Necrosis can lead to saddle deformity and nasal obstruction, ultimately requiring rhinoseptoplasty. Because pooled, clotted blood is a nidus for infection, unidentified septal hematomas can develop into abscesses. Systemic symptoms developing after facial trauma should prompt investigation for nasal septal abscess, and any suspicion should prompt ENT referral, urgent surgical drainage, and IV antibiotics to avoid serious complications. Untreated infected hematomas not only increase risk for saddle deformity and a poor functional outcome but can also spread contiguously, leading to osteomyelitis, cavernous sinus thrombosis, meningitis, and intracranial abscesses.[27]

DRAINAGE OF NASAL SEPTAL HEMATOMA

The procedure for incision and drainage of a nasal septal hematoma is as follows:

1. Place patient in "sniffing position," and be prepared to perform adequate anterior rhinoscopy with a nasal speculum, light source, suction, irrigation, and packing materials.
2. Properly anesthetize the nasal mucosa by placing three cotton pledgets soaked in a 1:1 mixture of 4% lidocaine solution for 5 minutes, followed by infiltrative anesthesia if required.
3. Although sterile technique cannot be fully achieved in the nasal cavity, use sterile instruments, and keep the operative area as clean as possible with irrigation of foreign debris.

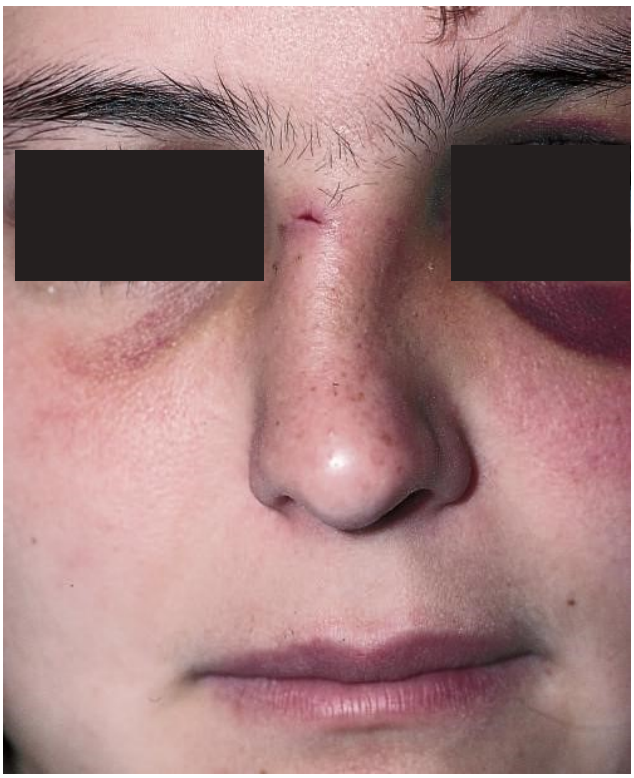

FIGURE 244-10. Nasal fracture clearly identifiable on physical examination with deformity and periorbital ecchymosis. [Photo contributed by David W. Munter. Reproduced with permission from Knoop K, Stack L, Storrow A, Thurman RJ: *Atlas of Emergency Medicine,* 3rd ed. © 2010, McGraw-Hill, New York.]

4. While obtaining adequate visualization of the hematoma with the nasal speculum, make a small horizontal incision superficially through the mucosa, making sure you do not incise the cartilaginous septum.
5. Evacuate the clot with Frazier suction or with forceps.
6. Perform bilateral anterior nasal packing with nasal tampons coated in topical antibiotic ointment to prevent reaccumulation of the clot and keep the septum midline.
7. Discharge with 24-hour ENT of ED follow-up.[28] Some recommend the use of prophylactic antibiotics for patients with packing in place, but this is not necessary if the packing will be removed in 24 to 36 hours.

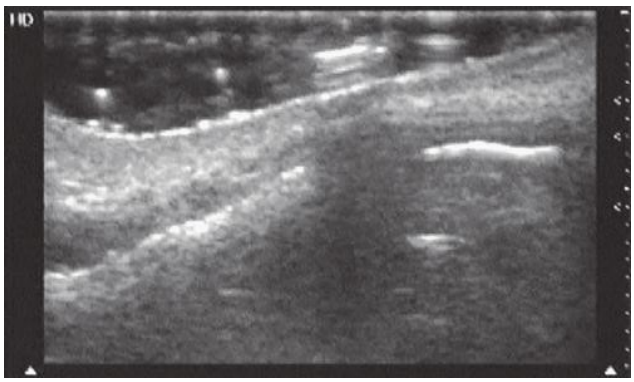

FIGURE 244-11. US still image of nasal fracture demonstrating cortical disruption. A large gap is seen between bone fragments. [Reproduced with permission from Ma OJ, Mateer JR, Blaivas M: *Emergency Ultrasound,* 2nd ed. © 2008, McGraw-Hill, New York.]

FIGURE 244-12. Nasal radiograph lateral view demonstrating depressed nasal fracture with cortical disruption. [Photo contributed by Lorenz F. Lassen, MD. Reproduced with permission from Knoop K, Stack L, Storrow A, Thurman RJ: *Atlas of Emergency Medicine*, 3rd ed. © 2010, McGraw-Hill, New York.]

NASAL FOREIGN BODIES

Although nasal foreign bodies are most common in children (see chapter 117, "Nose and Sinus Disorders in Infants and Children"), they should also be considered in psychiatric and mentally retarded adults.[29,30] Morbidity of undiagnosed nasal foreign bodies includes aspiration, infection, pressure necrosis, or perforation. Consider a nasal foreign body in patients with purulent unilateral nasal discharge or recurrent unilateral epistaxis. It is important to recognize button battery impaction because it may cause liquefaction necrosis and septal perforation.[31] Plain radiography is a potential tool for foreign body identification, but many objects are not radiopaque.[32] Nasal foreign body removal is discussed in the Pediatric Section, "The Nose and Sinuses."

SINUSITIS AND RHINOSINUSITIS

Sinusitis is inflammation of the mucosal lining of the paranasal sinuses. There are six nasal sinuses: two maxillary and two frontal sinuses, and a single ethmoid and frontal sinus. Rhinosinusitis is defined as an inflammation of the paranasal sinuses and the nasal cavity. The term *rhinosinusitis* is preferred because sinusitis is almost always accompanied by rhinitis.[33] Depending on the duration of the disease, rhinosinusitis is classified into acute (<4 weeks), subacute (4 to 12 weeks), or chronic (>12 weeks).[34-36]

PATHOPHYSIOLOGY

All six paranasal sinuses are coated by respiratory mucociliary epithelium, and the sinuses drain through the ostia into the nose. Any type of acute inflammation of the mucosa leads to obstruction of the ostia, accumulation of secretions within the sinuses, and reabsorption of air, resulting in negative pressure in the sinuses and clinical symptoms. Acute rhinosinusitis, like otitis media, is usually viral. *Haemophilus influenzae* and *Streptococcus pneumoniae* are the usual organisms in acute bacterial rhinosinusitis.[37] Chronic infections are usually due to anaerobes, gram-negative bacteria, *Staphylococcus aureus*, and, occasionally, fungi, especially in the immunocompromised.[35]

CLINICAL FEATURES

Acute rhinosinusitis is defined by two or more of the following symptoms: blockage or congestion of the nose, facial pain or pressure, diminished ability to smell or detect odors, and either anterior or posterior nasal discharge, for 7 days to 4 weeks. Additional symptoms can include tooth pain, fever, or sinus pressure while bending forward or changing head position.[35] On physical examination, the patient may have pain and tenderness over the sinuses with percussion. Inspect the face for swelling and redness, and inspect the nose for mucosal swelling, anatomic abnormality, and foreign bodies. Also perform a neurologic examination, and examine the ears, eyes, and

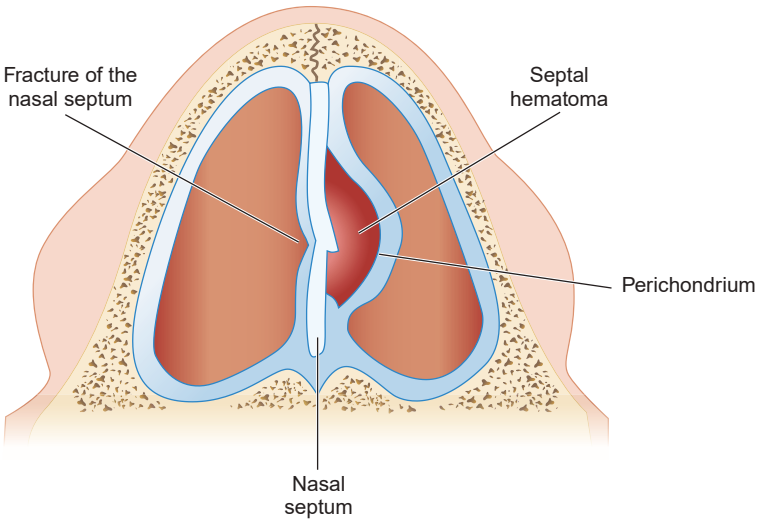

FIGURE 244-13. Graphic depiction of nasal septal hematoma. [Reproduced with permission from Reichman EF, Simon RR: *Emergency Medicine Procedures.* © 2004, Eric F. Reichman, PhD, MD, and Robert R. Simon, MD.]

FIGURE 244-14. Trauma patient with nasal septal hematoma in the right nares. [Photo contributed by Lawrence B. Stack, MD. Reproduced with permission from Knoop K, Stack L, Storrow A, Thurman RJ: *Atlas of Emergency Medicine*, 3rd ed. © 2010, McGraw-Hill, New York.]

teeth to evaluate for extension of disease. Subacute and chronic sinusitis persist for 4 weeks or more.

DIAGNOSIS

The diagnosis of uncomplicated **acute rhinosinusitis** is clinical.[37] Plain sinus radiographs or CT scans are not needed. The symptoms of acute rhinosinusitis are similar to a common cold or viral upper respiratory infection, but symptom duration ranges from 7 days to up to 12 weeks.[37] CT scans are helpful to diagnose complications in a toxic patient or to evaluate for intracranial extension. The differential diagnosis of rhinosinusitis includes migraine headache, craniofacial neoplasm, foreign body retention, and dental caries.

TREATMENT

The treatment for **acute uncomplicated rhinosinusitis** is generally supportive. Nasal saline irrigation alone, or in conjunction with other adjunctive measures like nasal decongestants, may decrease symptom severity.[34] Restrict the use of topical decongestants like oxymetazoline to approximately 3 days to avoid rebound mucosal congestion or edema (rhinitis medicamentosa). Topical (intranasal spray) corticosteroids may shorten the duration of illness.[38]

In a 2014 Cochrane database systematic review analyzing the efficacy of antibiotic therapy, the authors concluded that antibiotics may provide a small treatment effect in patients with symptoms of rhinosinusitis lasting >7 days.[33] However, because 80% of patients treated with placebo also improved within 2 weeks, it is unclear whether the treatment effect is clinically significant. In general, **antibiotics should be reserved for patients with purulent nasal secretions and severe symptoms for ≥7 days.** If antibiotics are prescribed, amoxicillin is recommended as first-line therapy for most adults,[37] at a dose of 500 milligrams PO three times per day. Patients with penicillin allergies may receive macrolide antibiotics or trimethoprim-sulfamethoxazole.[37] For patients who have received antibiotics within the past 4 to 6 weeks, consider a fluoroquinolone or high-dose amoxicillin-clavulanate.[34] Use caution in selection of antibiotics in patients who are on oral anticoagulation.[19] In the aforementioned Cochrane review, comparisons between different classes of antibiotics showed no significant difference.[33] Follow-up with a primary care provider is advised.

Patients with **subacute, chronic or recurrent rhinosinusitis** should be evaluated for conditions that modify management, such as allergy, cystic fibrosis, or immunocompromise. Outpatient noncontrasted CT of the sinuses can evaluate for invasion of neighboring tissues and neoplasms.[34] Bacterial cultures may be helpful to tailor therapy in outpatients who are at risk for multidrug-resistant organisms. ENT follow-up is advised.[37,39]

COMPLICATIONS

Complications of rhinosinusitis are mostly related to extension of the infection beyond usual anatomic boundaries. Meningitis, cavernous sinus thrombosis, and intracranial abscesses are rare but important complications associated with contiguous spread of sinus disease. Up to 75% of cases of orbital cellulitis, which can lead to blindness through venous congestion and ischemia of the optic nerve, are attributable to disease of the sinuses.[37] Frontal sinusitis can lead to osteomyelitis of the frontal bone with a doughy swelling of the forehead called *Pott's puffy tumor*, and can also be associated with an extradural or subdural empyema. In general, patients with these deeper infections usually appear systemically ill or have focal neurologic signs and require admission and IV antibiotics.

REFERENCES

The complete reference list is available online at www.TintinalliEM.com.

CHAPTER 245

Oral and Dental Emergencies

Ronald W. Beaudreau

ORAL AND DENTAL ANATOMY

The normal adult dentition consists of 32 permanent teeth. The adult dentition has four types of teeth: 8 incisors, 4 canines, 8 premolars, and 12 molars. The primary or deciduous dentition consists of 20 teeth of three types: 8 incisors, 4 canines, and 8 molars. **Figure 245-1** shows the

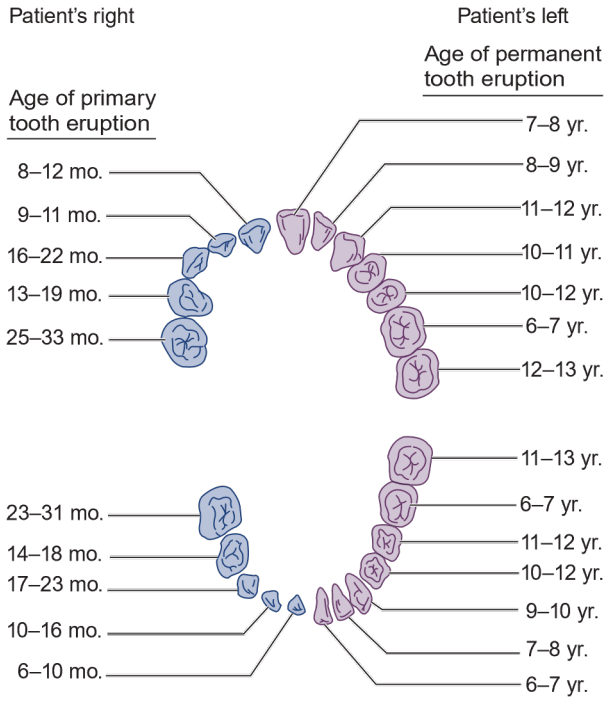

FIGURE 245-1. Normal eruptive patterns of the primary and permanent dentition. mo. = month; yr. = years.