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Diagnosis and management of nasal fractures

James Chan, MD, Sam P. Most, MD

From the Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, Stanford University School of Medicine, Stanford, California.

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The nasal bony–cartilaginous framework provides support to the nose and maintains airway patency. The cartilaginous and bony components are both susceptible to fracture. Nasal fractures are one of the most common facial injuries, occurring across a broad spectrum of age groups. Inadequate acute injury treatment can lead to persistent airway obstruction and nasal deformities that are subsequently more difficult to correct. Herein we discuss common presentations of nasal fractures, classifications, and options for treatment.

The nasal pyramid is composed of thin bone that projects prominently from the midface. Epidemiologic studies indicate that nasal fractures represent more than half of all facial fractures and are the most commonly fractured facial bone.[1,2] Mechanisms of injury include assaults, motor vehicle accidents, falls, and sports injuries. Nasal fractures occur frequently in both the pediatric and adult populations.[3] Inadequate acute injury treatment can lead to persistent airway obstruction and nasal deformities that are subsequently more difficult to correct.

Anatomy

The nasal bony–cartilaginous framework includes the paired immobile bony pyramid, the semirigid attached upper lateral cartilages, and the nasal septum (Figure 1). These components provide support to the nose and assist in maintaining airway patency. The cartilaginous and bony components are both susceptible to fracture. Although many authors have described classification systems for nasal fractures, no uniform system is advocated or applied. Stranc[4] described a classification system that is often cited in the literature. He classified nasal fractures into lateral oblique and frontal based on direction of force (Table 1). The lateral oblique fractures range from a unilateral nasal bone fracture, which results in the depression of the nasal sidewall, to unilateral depression and lateralization of the contralateral nasal bone, with fracturing of the frontal process of the maxilla. Frontal-type injuries are less common and include 3 types based on the plane of injury. Type 1 does not extend posterior to a line drawn from the lower nasal bones to the maxillary spine. Type 2 injuries involve flattening of the cartilaginous and bony structures, septal fractures, and intranasal mucosal injuries. Type 3 injuries result in severe collapse of the nasal bones and upper lateral cartilages, with telescoping of the septum. Associated intracranial and orbital injuries may occur.

Diagnosis

History

A thorough history can provide insight into the type of injury that was sustained. Depending on the mechanism, direction, and force of injury, attention can be focused on the nasal bones, upper lateral cartilages, and septum. Additionally, suspicion of intracranial injury or other facial fractures necessitates a complete trauma workup. The patient should be asked about any perceived changes in nasal form that resulted from the trauma. The presence and degree of nasal airway obstruction before and after the injury should be determined. Any history of previous trauma and surgeries also should be obtained.

Physical examination

Evaluating the external nasal skeletal structure involves visual analysis and palpation. The nasal bones should be evaluated for asymmetries, protuberances, depressions, de-

Address reprint requests and correspondence: Sam P. Most, MD, 801 Welch Road, Stanford, CA 95306.
E-mail address: smost@ohns.stanford.edu.

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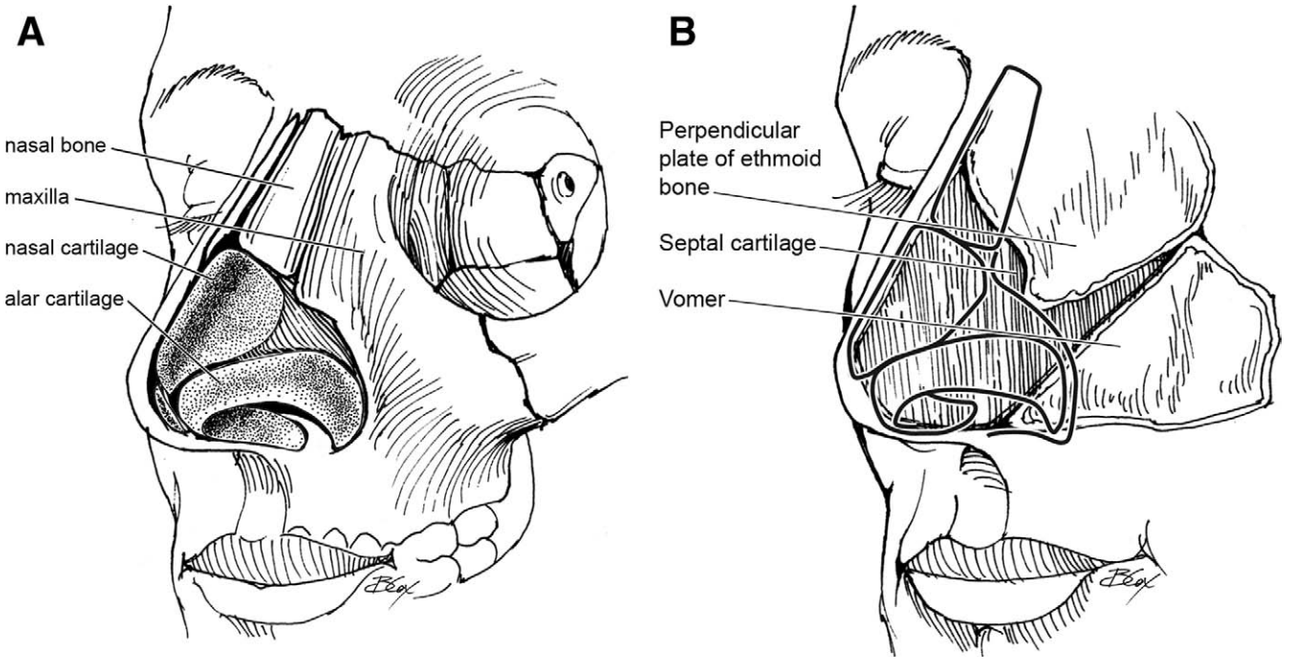

Figure 1 The nasal bony-cartilaginous framework consists of paired nasal bones, upper and lower cartilages, and a midline septum. Its prominence on the face renders it prone to injury. (A) External landmarks; (B) Cut-away view of septal anatomy.

viations, and step-off deformities. Comparison with photographs of the patient's nose taken before injury may be beneficial. Intranasal examination should be undertaken to evaluate the septum for septal hematomas and airway obstruction. The presence of hematoma requires immediate drainage. Drainage can be accomplished by incising the septal mucosa in a horizontal direction at the inferior edge of the hematoma. Any clots can be suctioned and evacuated. The septal flap is left unsutured to allow residual blood to drain. The patient is then treated with a course of antibiotics.

Imaging

Routine imaging is not necessary for isolated nasal injuries.[5,6] Patients often will present to a specialist with previously obtained x-rays or computed tomography scans. A review of these scans often will compliment the evaluation and help rule-out any associated bony fractures of the craniofacial skeleton. However, decisions regarding treatment of the nasal fracture are based on physical examination and clinical judgment.

Table 1 Stranc classification of nasal fractures

Lateral oblique
Unilateral nasal bone fracture with depression of bone
Unilateral depression and lateralization of the contralateral nasal bone
Bilateral nasal bone involvement with fracturing of the frontal process of the maxilla
Frontal
Type 1: Does not extend posterior to a line drawn from the lower nasal bones to the maxillary spine
Type 2: Flattening of the cartilaginous and bony structures, septal fractures, and intranasal mucosal injuries
Type 3: Severe collapse of the nasal bones and upper lateral cartilages with telescoping of the septum. Associated intracranial and orbital injuries may occur

Treatment

Timing

Nasal fracture treatment principles were first described by the Egyptians, followed by the Greeks, and have undergone few modifications.[7] Timing for treatment varies throughout the literature. Most studies suggest treatment between 3 and 30 days.[2,8,9] Our treatment approach for acute management of nasal fractures is evaluation within 2 to 3 hours, before significant edema occurs, or after 3 to 5 days, to allow edema to resolve. In general, we perform closed reduction before 14 days in adults, and within 10 days for children.

Long-standing traumatic nasal deformities require formal septorhinoplasty. A detailed discussion of surgery for the crooked nose is beyond the scope of this review. The treatment of the crooked nose involves management of the external bony-cartilaginous framework as well as the septum.[10] In some cases, extracorporeal septoplasty may be required.[11-14]

Approach

Closed and open approaches have been described in the literature for acute nasal fracture treatment. Closed reduction of nasal fractures combines the most straightforward approach with the least morbidity, with success rates ranging from 60% to 90%.[8] Inadequate reduction or postreduction nasal deformities requiring septoplasty or septorhino-

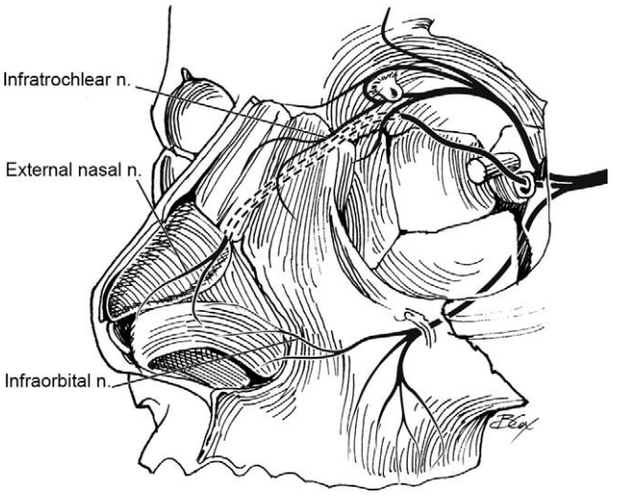

Figure 2 The key nerves to block for closed reduction of nasal fractures include the infraorbital, external nasal (branch of V1), and infratrochlear nerve.

plasty occur in as many as 50% of cases.[9] Therefore, some authors advocate an initial open approach and point to the difficulty of posttraumatic rhinoplasties.[8,9] In our opinion, the acute treatment of nasal fractures should be individualized with closed reduction the mainstay of treatment. Open, approaches should be reserved for severe cases that cannot be adequately reduced in a closed fashion, or Stranc frontal type 3 injuries associated with severe craniofacial injury (eg, naso-orbito-ethmoid fractures).

Local versus general anesthesia

Management of acute nasal fractures can be performed with local anesthesia in the office or under general anesthesia in the operating room. Studies have demonstrated the safety and efficacy of closed reduction under local anesthesia.[15,16] For the majority of patients, closed reduction in the office setting with judicious use of local anesthetic can be safely and effectively performed. The exception to this is uncooperative or pediatric patients.

Injection consists of 1% lidocaine with 1:100,000 epinephrine along the lateral aspect of the nasal bones, the premaxilla, and intranasally along the septum. Additional injections of key nerves, including the infraorbital nerve and nasociliary nerve of the first branch of the trigeminal nerve, can provide adequate field block (Figure 2). The nose is also decongested with oxymetazoline or neo-Synephrine nasal sprays. This process takes several minutes to achieve adequate anesthesia.

Technique of closed reduction

Depressed segments of nasal bone can usually be reduced with Boies or Freer elevators (Figure 3). The elevator

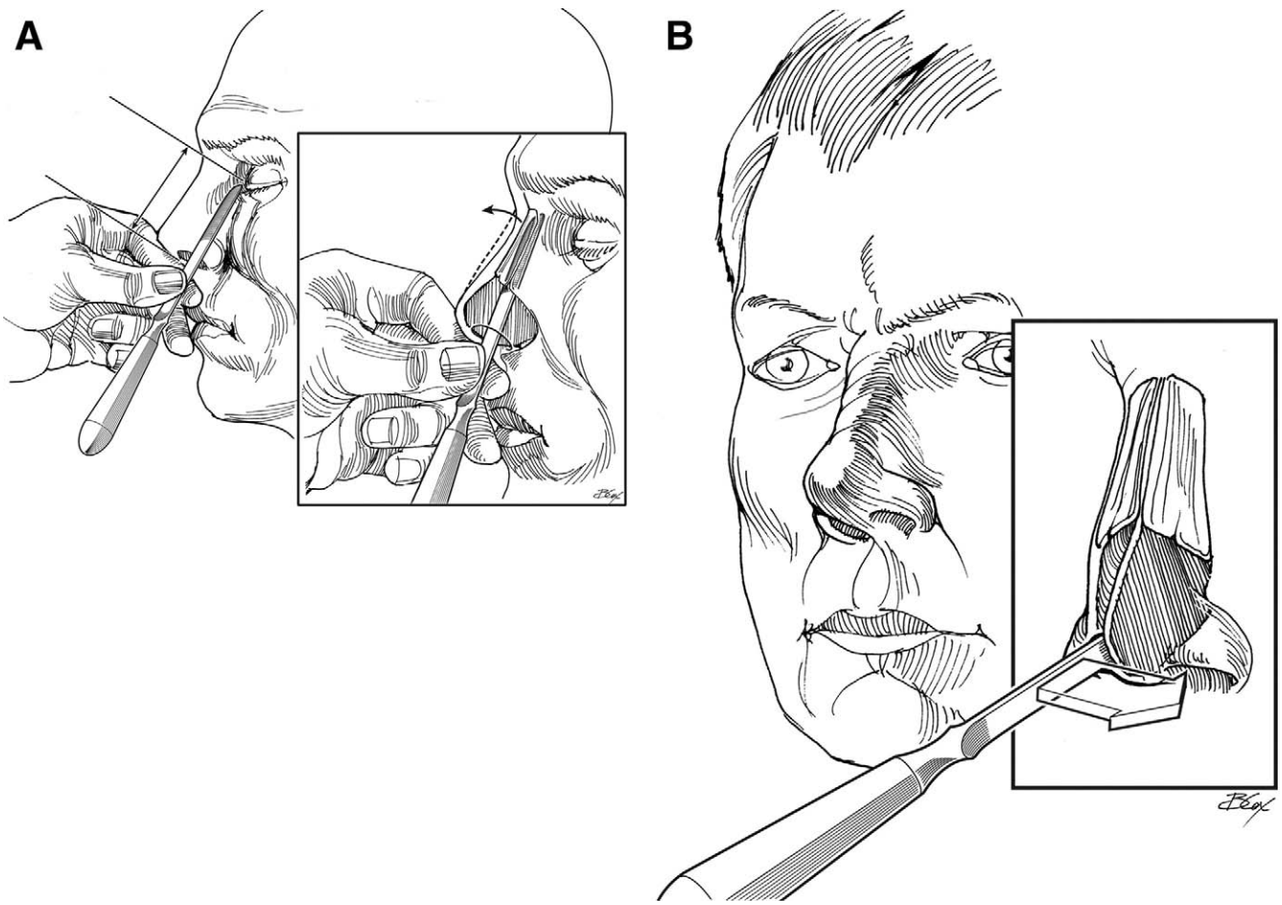

Figure 3 (A) Boies elevator placed intranasally can be used to gently elevate depressed nasal bones. (B) Septums that are displaced off the maxillary crest can be reduced with the use of a Boies elevator.

is inserted into the nasal cavity and placed against the nasal bones. The skull base is protected before insertion of the instrument by placing the distal tip of the instrument at the medial canthus and placing the thumb and/or forefinger at the level of the external nares. Once held this way, the instrument grip is not changed. In cases of lateral deviation of the nasal pyramid, the elevator is placed in the nares corresponding to the concave side. The pyramid is elevated anteriorly and toward the concavity. The opposite hand is used to palpate the fracture lines and place gentle medial pressure on the opposite (convex) side. Protruding segments, or laterally displaced pyramids, can be reduced with this digital manipulation by the opposite hand. Septal dislocations can be reduced with Ash forceps by the surgeon gently placing the forceps intranasally against the septum and reducing the fracture. The nose is examined externally, and improved contour is confirmed by palpation and direct visualization. If the patient is awake, s/he may do the same with a mirror.

All closed reductions receive a dorsal splint for 7 days (malleable metal or thermoplastic polymer). Intranasal splints are placed for 7 to 10 days if there is significant nasal bone comminution, segments do not remain reduced, the septum is severely dislocated, or there are significant intranasal mucosal lacerations. Doyle splints placed upside down into the nasal cavity can help maintain nasal bones in their appropriately reduced position. Silastic splints can hold the septum in place and prevent synechiae formation.

Complications

Patients should be made aware that even with closed reduction treatment, a formal septorhinoplasty might still be indicated if persistent nasal obstruction or deformity exists. A formal septorhinoplasty can be performed 6-9 months after injury to allow for adequate nasal bone healing. Epistaxis, septal hematomas, and cerebrospinal fluid leaks after acute nasal trauma can occur. The occurrence of epistaxis after closed reduction is rare and usually self-limited. Septal hematomas should be drained immediately to prevent permanent septal deformities. Antibiotic coverage should be initiated if intranasal packing or splints are used.

Conclusion

Nasal fractures occur commonly in both children and adults. Closed reduction with local anesthesia in the office setting is an appropriate method for treating uncomplicated nasal fractures in the cooperative patient. Closed reduction provides an acceptable result in 60-90% of patients. Some patients will request open septorhinoplasty to address persistent nasal deformity or airway obstruction.

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