

**Review Article**

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Manipulation under Anaesthesia of Fractured Nasal Bone-A Review

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Nasal fractures are the single most common facial fracture and a very frequent presentation in the emergency otorhinolaryngology clinic. They present with epistaxis, nasal obstruction and cosmetic deformity. A focussed clinical history and examination should always be performed in the first instance to exclude any complex facial injuries and/or complications of nasal trauma that need urgent surgical intervention. Both local and general anaesthetic options exist in reducing nasal bone fractures but come with their risks and benefits. In the first instance local anaesthetic techniques should always be considered as it offers the most advantageous combination of safety, cost as well as outcome which would reduce the burden on otorhinolaryngology elective operations.

Background

Nasal fractures are the single most common facial fracture accounting for between 39 and 45% of all fractures sustained [1]. This is largely a result of its susceptibility to injury due to position and anterior projection [2]. It is an extremely frequent presentation to the acute otorhinolaryngology clinic. Although the majority require assessment and reassurance that the nasal bone is centrally aligned, some will have associated morbidity in terms of nasal obstruction and cosmesis [3]. There is a male predisposition with a male: female of 2:1 with a bimodal peak in patients aged 15-30 years and in the elderly [4]. These findings can be explained by increased likelihood of falls in elderly and increase likelihood of assault, sport and motor related accidents amongst young males [4].

On assessment, the clinician should find an external nasal deformity accompanied by crepitus and/or palpably mobile bony segments [5]. Epistaxis as well as pain are some common presenting complaints as well periorbital soft tissue ecchymosis and nasal

obstruction, a hall mark of associated septal deviation [5]. A lack of appropriate assessment at time of injury or delay in attempting reduction can be linked with chronic functional and/or aesthetic issues. Swelling and tenderness in the acute setting can make it difficult to assess the patient and therefore it should be seen in the clinic 7-10 days after the onset of injury.

Manipulation, often termed reduction, of nasal bone fractures is the process of repositioning the nasal bones. This can be done as a closed reduction (without making incisions) or open (operative procedure involving incisions and open manipulation of the nasal bones and septum) [6]. Each method of manipulation has its own benefits and risks.

Anatomy and Physiology

The structure of the nose consists of frameworks made from both bone and cartilage. The bony part of the nose, known as the nasal pyramid, is composed of paired nasal bones and the bilateral frontal processes of the maxillae. The cartilaginous elements

include upper lateral cartilages, which connect with the lower edges of the nasal bones, and lower lateral (or alar) cartilages that shape the nasal tip. Supporting the outer nose and extending beneath the centerline of the bony nasal vault is the septum, which consists of both bony and cartilaginous sections. Both the cartilage and bone that make up the outer nasal structure are susceptible to breaking.

Nasal fractures often result in epistaxis. The blood supply to the nose originates from branches of both the internal and external carotid arteries. From the internal carotid artery arises the ophthalmic artery, which in turn gives off the anterior and posterior ethmoidal arteries. These arteries run from the eye sockets toward the middle of the skull base and connect with the upper part of the nasal septum. The facial and internal maxillary arteries, which branch from the external carotid artery, also contribute to the blood supply. The facial artery further divides into the superior labial artery, as well as the sphenopalatine and greater palatine arteries. Trauma to the nose can lead to bleeding from Kiesselbach's plexus, an arterial network situated on the lower front part of the nasal septum. Key vessels that contribute to this network include:

- The anterior ethmoidal artery, a branch of the ophthalmic artery.
- The sphenopalatine artery, a branch of the maxillary artery.
- The greater palatine artery, also originating from the maxillary artery.
- The superior labial artery, arising from the facial artery.

This network of vessels is important in clinical terms, as the vast majority with epistaxis will experience bleeding from this area. Trauma to the nasal bones can also result in the shearing of the anterior ethmoidal artery, causing intense, intermittent bleeding. Although this situation is quite rare, it might necessitate the clipping of the artery. A strong blow to the face that leads to a nasal fracture might also result in fractures of the orbits, maxillary sinus, ethmoid sinus, and cribriform plate.

Nasal fractures can be classified by degree of severity as per the below [7].

Type I: Injury that is solely limited to the soft tissue of the nose

Type II: Simple and unilateral nondisplaced nasal bone fracture

Type IIb: Simple, bilateral nondisplaced fracture of nasal bone

Type III: Simple but displaced fracture

Type IV: Closed and comminuted fracture

Type V: Open and comminuted fracture or complicated fracture

Assessment

A comprehensive medical history should encompass details about the injury's mechanism and the direction of force applied, while also determining any prior nasal traumas or surgeries. It is equally important to ascertain whether the patient experiences any nasal obstruction following the injury. During the acute

phase, employing ice and analgesics can prove highly beneficial in minimizing any swelling and discomfort. More serious facial traumas may necessitate evaluating and stabilizing the airway using appropriate protocols from Advanced Trauma Life Support or Pediatric Advanced Life Support. This should be followed by examination which will involve inspection of nose and face for deformity, swelling, ecchymosis, epistaxis as well as analysing the shape of nose and eye movements. If there is a loss of frontal projection of the nose coupled with an increased intercanthal distance then this may suggest a possible naso-orbital-ethmoid fracture while fractures around the orbit may lead to extraocular muscle entrapment. Palpation should be performed to assess for tenderness as a broadened nose tip with nasal obstruction and tenderness could suggest a septal haematoma which would need urgent drainage. Palpation will also allow evaluation of mobility of the nasal bones whilst also detecting deformities, noting crepitus, identifying bony irregularities and examining for infraorbital paraesthesia. When examining the nasal cavities with a nasal speculum and headlight it is important to raise the tip of the nose to see the anterior aspect. Ecchymosis and oedema of the septum would indicate a possible septal haematoma. Clear nasal fluid observed may suggest an underlying cerebrospinal fluid leak from an associated basal skull fracture which can be further confirmed with beta-trace-protein testing and cross sectional imaging. A Le Fort fracture may be the diagnosis if there is associated mid-face instability and/or dental malocclusion.

Although imaging is seldom needed for nasal bone fractures and this should mostly be diagnosed clinically, computed tomography scans are indicated for suspected head injuries, basal skull fractures or complex facial injuries [8].

Management

Nasal wounds should initially be cleaned with the aim to remove any foreign bodies. Any small lacerations can be closed with either sutures, skin glue or surgical tape strips. Reduction is not always required and usually never in the acute setting so reassessment 7-10 days later is recommended. The aim is to reduce the displaced bone fragments within two weeks of the injury as the nasal bones will start to heal and fixate resulting in challenging mobilisation of the bones without performing osteotomies [9]. Contraindications to close reduction of nasal bone fractures include severely comminuted fractures of the nasal bones and septum, open septal fractures, a fracture that presents >2 weeks after onset of injury and complex facial injuries that require open reduction.

The topic of local anaesthetic versus general anaesthetic remains a consideration when planning for nasal bone fracture reduction. It is crucial to assess the patient's ability to comply with manipulation under local anaesthetic as this will of course impact outcomes. Most type IIa to type IV fractures in adults should be amenable to local anaesthetic reduction [10]. The anaesthetic solution commonly used contains 1% lidocaine with 1:100,000 epinephrine and can be infiltrated targeting specific nerve blockade. These areas include the sides of the nasal bones, the premaxilla, and the inner part of the nose along the septum. The key nerves to target

are the infraorbital nerves, as well as the infratrochlear and dorsal nasal nerves. Khwaja et al. were able to show that local anaesthetic closed reduction has comparable results when compared to general anaesthetic. Similar pain scores were experienced by both patient groups and patients equally tolerated the procedure [11]. Zhu, et al. [12] were able to demonstrate topical anaesthesia for closed reduction of nasal bone fractures had the same postoperative pain relief and the least adverse events as local and general anaesthetic procedures [12]. Closed reduction can give success rates as high as 90% with the main principle being to apply a force opposite to the vector of injury to reduce the nasal fracture. There may be a need to widen the fracture line initially. Walsham forceps can also be utilized by inserting into the nasal cavity and rotating laterally to press the nasal bones outward [10]. Following closed reduction it is essential that a dorsal splint should be worn for seven days to hold the bones in place but also to act as a reminder to the patient and others around them to be cautious.

Open reduction via septorhinoplasty is reserved for cases that cannot be reduced adequately by closed techniques. It comes with the risks of adverse events from general anaesthetic but allows greater exposure and direct visualisation to correct to nasal bone fracture deformity. It is however advised to wait at least 3-6 months after initial injury to allow adequate post traumatic resolution of oedema and inflammation [2]. Although Al-Moraissi and Ellis were able to show a trend towards better outcomes with general anaesthetic, there was no statistically significant difference between local and general anaesthetic when looking at patient's satisfaction with anaesthetic and function of the nose.

Conclusion

Nasal fractures are the single most common facial fracture and a very frequent presentation in the emergency otorhinolaryngology clinic. They present with epistaxis, nasal obstruction and cosmetic deformity. A focussed clinical history and examination should always be performed in the first instance to exclude any complex facial injuries and/or complications of nasal trauma that need urgent surgical intervention. Both local and general anaesthetic options exist in reducing nasal bone fractures but come with their risks and benefits. In the first instance local anaesthetic techniques should always be considered as it offers the most advantageous

combination of safety, cost as well as outcome which would reduce the burden on otorhinolaryngology elective operations.

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Conflict of Interest

No conflict of interest.

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