Nasal Fractures

EPIDEMIOLOGY AND AETIOLOGY

- M:F = 2:1
- Peak at 15 to 30 yrs of age
- Compound and comminuted fractures are more common in the elderly who are prone to falls.

PATHOPHYSIOLOGY

1. Nasal bones and underlying cartilage are susceptible for fracture because of their more prominent and central position in the face.
2. These structures are also pretty brittle and poorly withstands force of impact.
3. The ease with which the nose is broken may help protect the integrity of the neck, eyes, and brain. Thus it acts as a protective mechanism.

PARTS

- The nasal bone is composed of two parts:
  - A thick superior portion and a thin inferior portion. The intercanthal line demarcates these two portions. Fractures commonly occur below this line.

NATURE OF INJURY

- Nasal fractures occur in one of two main patterns:
  - Lateral impact or Head on impact. In lateral trauma, the nose is displaced away from the midline on the side of the injury, in head-on trauma, the nasal bones are pushed up and splayed so that the upper nose (bridge) appears broad, but the height of the nose is collapsed (saddle-nose deformity). In both cases, the septum is often fractured and displaced.

EXTENT OF DEFORMITY

- A five point grading system developed for the extent of lateral deviation of the nasal pyramid:
  - Grade 0: bones perfectly straight
  - Grade 1: bones deviated less than half of the width of the bridge of the nose
  - Grade 2: bones deviated half to one full width of the bridge of the nose
  - Grade 3: bones deviated greater than one full width of the bridge of the nose
  - Grade 4: bones almost touching the cheek

TYPES OF NASAL BONE FRACTURES

- 3 classes depending on degree of damage and management

CLASS I FRACTURES

- Chevallet fractures
- Very little force is sufficient to cause a fracture of nasal bone.
- It has been estimated to be as little as **25-75 pounds / sq inch**.
- Class I fractures are mostly depressed fractures of nasal bones.
- The fracture line runs parallel to the dorsum of the nose and naso maxillary suture and joins at a point where the nasal bone becomes thicker. This point is about 2/3 of the way along its length.
- The fractured segment usually regains its position because of its attachment along its lower border to the upper lateral cartilage.
- The nasal septum is not involved in this particular injury.
- Class I fractures do not cause gross lateral displacement of nasal bones, though a persistent depressed fragment may give it the appearance.
- In children these fractures could be of **Green stick** variety and a significant nasal deformity may develop subsequently during puberty when nasal growth accelerates.
- Clinically this fracture will present as a depression over the nasal bone area. There may be tenderness and crepitus over the affected nasal bone. Radiological evidence may or may not be present. In fact class I fracture of nasal bone is **purely a clinical diagnosis**.

**CLASS II FRACTURES**

- These fractures cause a significant amount of cosmetic deformity.
- In this group not only the **nasal bones** are fractured, the underlying **frononasal process of the maxilla** is also fractured. The fracture line also involves the **nasal septum**.
- This condition must be recognized clinically because for a successful result both the nasal bones as well as the septum will have to be reduced. Since both the nasal bones and the fronto nasal process of maxilla would have absorbed a considerable amount of force, the ethmoidal labyrinth and the adjacent orbit should be intact.
- The precise nature of the deformity depends on the direction of the blow sustained. A **frontal impact may cause comminuted fracture** of nasal bones causing gross flattening and widening of the dorsum of the nose.
- A lateral blow of similar magnitude is likely to produce a high deviation of the nasal skeleton. The perpendicular plate of ethmoid is invariably involved in these fractures, and is characteristically C shaped (Jarjaway fracture of nasal septum).

**CLASS III FRACTURES**

- Are the most severe nasal injuries encountered. This is caused by high velocity trauma. It is also known as naso orbital fracture / naso ethmoidal fracture. **(Naso orbito ethmoid fracture)**
- These fractures are always associated with **Le Fort fracture** of the upper face involving the maxilla also. In these fractures the nasal bone along with the buttressing fronto nasal process of maxilla fractures, telescoping into the ethmoidal labyrinth.
- Two types of naso ethmoidal fractures have been recognized by **RAVEH**:
- **Type I**: In this group the **anterior skull base, posterior wall of the frontal sinus and optic canal remain intact**. The perpendicular plate of ethmoid is rotated and the quadrilateral cartilage is rotated backwards causing a **Pig Snout Deformity of the nose**. The nose appears foreshortened with anterior facing nostrils. The space between the eyes increase (Telecanthus), **the medial canthal ligament may be disrupted from the lacrimal crest**.
- **Type II**: Here the posterior wall of the frontal sinus is disrupted with multiple fractures involving the roof of ethmoid and orbit. Sphenoid and parasellar regions may sometimes be involved. Since the dura is adherent to the roof of ethmoid, fractures in this region causes tear in the dura causing CSF rhinorrhoea. **Pneumocranium** and **cerebral herniation** may complicate this type of injury.

![Classification of naso-orbito-ethmoid complex](image)

**MARKOWITZ et al CLASSIFICATION**

**MANAGEMENT**

- An untreated nose might have a unfavorable look and function
- Key issues to consider when determining history include:
  - Details of how the injury was sustained
    1. Nasal obstruction
    2. Change in appearance
    3. Epistaxis
    4. Hyposmia
    5. Watery rhinorrhoea
    6. Visual disturbance
    7. Diplopia
    8. Epiphora
    9. Altered bite
    10. Loose teeth
    11. Trismus.
- Examination
  - Key issues to consider when examining a patient include:
    1. Deviation, depression, step deformities
    2. Mobility, crepitus, specific areas of point tenderness
    3. Generalized swelling
    4. Skin lacerations
    5. Septal fracture/haematoma/ abscess/perforation
    6. Mucosal lacerations
These patients also have considerable amount of swelling involving the dorsum of the nose, making assessment difficult.

These patients must be **conservatively managed for atleast 3 weeks for the oedema to subside** to enable precise assessment of bony injury.

According to **CUMMINS** Fracture reduction should be accomplished when accurate evaluation and manipulation of the mobile nasal bones can be performed; this is usually within 5-10 days in adults and 3-7 days in children (i.e. earlier in children).

**INVESTIGATIONS**

- The need for nasal x-rays is controversial and in many places it is actively discouraged.
- CT scan should be obtained
- Any watery rhinorrhoea must be collected in those with suspected cerebrospinal fluid (CSF) leak and tested for β2 transferrin.

**TREATMENT**

- The indications for surgical intervention in the acute phase are significant cosmetic deformity and nasal obstruction caused by a septal haematoma.

**ANAESTHESIA**

- GA or LA
- In LA – Lignocaine is injected along the nasomaxillary groove, infraorbital nerve in its foramen and around the infratrochlear nerve.
- Recently **EMLA (prilocaine and lignocaine) cream or AMETOP (amethocaine) gel to the external nose instead of infiltration have been tried**. They found less discomfort when the manipulation was carried out using the topical, local anaesthetic preparation compared with local infiltration.

**METHODS OF REDUCTION**

- The general principle of fracture reduction is to mobilize the fragments **first by increasing and then decreasing the degree of deformity**
- Most Class I fractures can be managed by closed reduction by digital pressure alone and immobilization by application of POP. Digital pressure alone commonly does the job.
- If the fractured fragments are impacted then a Welsham's forceps will have to be used to disimpact and reduce the fractured nasal bone
- Occasionally, the bones are fixed, especially if the fracture is old, and osteotomies are necessary to release the fragments before manipulation.
- Splints or packs used as per surgeons choice
- Splints are usually kept in place for about seven days.

Following indications for open reduction :

- Bilateral fractures with dislocation of the nasal dorsum and significant septal deformity
- Infracion of the nasal dorsum
Fractures of the cartilaginous pyramid, with or without dislocation of the upper laterals
For depressed tip or flail lateral fractures that are unstable despite closed reduction techniques, Kirschner (K) wires can be used.

Management of the nasal septum

- If a septal fracture is present, it is wise to reduce this at the same time as the nasal bones.
- Septoplasty may be required.
- So CLASS I → closed reduction suffices
- CLASS II → Closed reduction of bones with open reduction of cartilage.
- CLASS III → ORIF (open reduction and internal fixation). The problem here is even though the nasal bones can be reduced the adjacent supporting bones (components of the ethmoidal labyrinth) don’t support the nasal bones because of their brittleness. It is always better to reconstruct and stabilize the anterior table of the frontal bone so that other parts of nasal skeleton can derive support from it. Formerly transnasal wires were used to fix the nasal bones, but with the advent of plates and screws the whole scenario has undergone a dramatic change.
- **ELLIS PROCEDURE** of management of Class III fractures:

  Aims of the procedure include:

  1. Provision of **adequate surgical exposure** to provide an unobstructed view of all components of the fracture.
  2. The **medial canthal ligament** should be identified. This is rarely avulsed and is usually attached to a large fragment of bone. Once identified the ligament should be reattached and secured to the lacrimal crest. This step will avoid the future development of Telecanthus.
  3. Reduction and reconstruction of **medial orbital rim**. This can be achieved by use of **transnasal 26 gauge wires**. If plates are used they should be very thin otherwise they will become conspicuous once the wound has healed.
  4. Reconstruction of **medial orbital wall and floor with bone grafts**
  5. **Realignment of nasal septum**
  6. **Augmentation** of dorsum of the nose by the use of bone grafts
  7. Accurate **soft tissue readaptation** should be encouraged by placing splints.

**Complications of nasal bone fracture:**

1. Cosmetic deformity (saddle nose, pig snout deformity)
2. Persistent septal deviation, Septal perforations, haematoma
3. CSF leak
4. Orbital oedema / complications
5. Nasal block / compromise of nasal functions