NASAL BONE FRACTURE MANAGEMENT- OUR EXPERIENCE
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ABSTRACT
BACKGROUND
Nasal bone fractures are distinctive due to their anatomical complexity area and associated psychological effects. An understanding of the epidemiology of these fractures is important to develop preventive measures, increase the efficiency and delivery of health services, improve the skills of healthcare providers and better distribute resources. The aim of the paper is to evaluate the approach towards management and outcomes of nasal bone fractures in tertiary care centre at Jammu.

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MATERIALS AND METHODS
Patients of maxillofacial injuries presenting to the hospital who had nasal bone fractures only were included in the study. The study period was from November 2009 to October 2010.

Statistical Analysis- The data was tabulated and analysed in Microsoft Excel spreadsheet (version 2007).

Setting- Shri Maharaja Gulab Singh Hospital, Government Medical College, Jammu.

Design- Prospective cross-sectional study.

RESULTS
In our study, majority cases were more common in urban areas and in males (80%). Younger age group (21-30) was most commonly affected. The fractures were most commonly associated with Road Traffic Accidents (RTAs) in 23 cases, assault in 7 cases and falls in 3 cases. Common clinical presentations were epistaxis, swelling and tenderness, nasal obstruction, external deformity and crepitus seen in all the cases of nasal fractures. Class II fractures were seen most commonly (51.42%) followed by class I fractures (42.85%). X-rays of the nasal bone demonstrated (88.57%) of the cases. Closed reduction was made of treatment in 19 cases, 6 cases needed open reduction while 10 patients with undisplaced fractures were treated conservatively.

CONCLUSION
Even though the current protocols in the management of nasal bone fracture are quite efficient a uniform protocol is still missing. Several techniques are used in individual fracture depending on the course of fracture, surgeon’s experience and patient’s preference. So, we conclude that long-term and multicentre collection of data about nasal trauma is important to develop standard protocols and consensus.

KEYWORDS
Nasal Bone Fracture, Protocol.

Complex facial injuries include the restoration of bony form (dental occlusion) as well as facial form (appearance). Controversy exists concerning the correct timing for repair required to achieve these goals. The timing of intervention for any nasal injury also greatly influences the approach and the outcome.

Despite a multitude of options available in managing a case of nasal bone trauma, a uniform protocol in approach and treatment for nasal bone fracture is not present. The aim of our paper is to evaluate the current practices towards management of nasal bone fractures and their outcomes in a tertiary care centre at Jammu.

**MATERIALS AND METHODS**

35 patients with nasal bone fracture at the Department of Otorhinolaryngology, Shri Maharaja Gulab Singh Hospital and Government Medical College, Jammu, for a period of one year from November 2009 to October 2010 were included in the study. Patients who had history of any other maxillofacial injury, life-threatening injury, which required immediate attention were excluded from the study. All cases were subjected to a detailed history and examination followed by x-ray nasal bones and computerised tomography (if required). Cases were analysed with respect to demography, cause of injury, presentation, type of fracture, management undertaken, anaesthesia used and outcomes.

**RESULTS**

Majority of the fractures occurred in urban areas (24 cases) and the least from rural areas (11 cases).

In our study, nasal bone fractures were more common in males, 28 cases (80%) compared to females, 7 cases (20%).

Nasal bone fracture was most commonly seen in the age range of 21-30 years (20 cases). Patients aged between 31-40 years were the second most vulnerable group (5 cases) followed by those between 11-20 years (3 cases). Patients aged more than 60 years had the least incidence (2 cases) (Figure 1).

Common clinical presentations were epistaxis, swelling and tenderness, nasal obstruction, external deformity and crepitus seen in all the cases of nasal fractures. Ecchymosis was seen in 26 cases (74.2%) and telecanthus in 4 cases (11.4%) (Figure 2).

Class II fractures were seen most commonly in 18 cases (51.42%) followed by class I fractures found in 15 (42.85%). Only 2 cases of class III fractures were seen.

X-rays of the nasal bone could demonstrate 31 (88.57%) of the nasal fractures while remainder 4 cases (11.43%) required computerised tomography of the face.

Out of the 35 fractured cases, 33 (94.2%) presented within 24 hours of the trauma and 2 (5.75%) presented after 7 days.

32 of the patients were treated within 2 weeks of presentation and 2 cases of persistent septal deformity were operated within 3 weeks. Only 1 case of saddle nose was operated after 3 weeks because he presented after 7 days of injury.

Intervention was needed in 28 patients. Out of these, 10 patients were administered general anaesthesia, while 18 patients were given local anaesthesia.

10 patients had undisplaced nasal bone fractures treated conservatively with anti-inflammatory agents alone. 15 patients had class I fracture with only 6 requiring intervention in the form of closed reduction with immobilisation by application of external nasal splint. 18 patients had class II fracture, one patient requiring no treatment, 13 needing closed reduction and 4 requiring open reduction and septal deformity correction. The 2 cases of class III fractures underwent open reduction and internal fixation (Figure 3).

The fractures were most commonly associated with Road Traffic Accidents (RTAs) in 23 cases, assault in 7 cases and falls in 3 cases.

**Figure 1. Age Distribution of Nasal Bone Fracture**

**Figure 2. Bar Chart Showing Different Signs/Symptoms in Nasal Bone Fractures**

**Figure 3. Chart Showing the Modality of Treatment Used for Different Classes of Fracture**
In the 6 patients of class I fracture treated with closed reduction, only one developed saddle nose deformity, postoperatively. Two patients of class II fracture treated by closed reduction developed persistent septal deviation while one patient treated by open reduction developed septal haematoma. Patients of class III had no postoperative complications.

DISCUSSION
An extensive bibliographical search revealed that very few studies were done on nasal bone fractures. Most of the reported data was in conjunction with other maxillofacial traumas that altered the approach to the patient markedly.\textsuperscript{5,10,11} Face because of its conspicuous position is the most frequently traumatised site of the body. Numbers of studies have been conducted from different countries about the pattern of maxillofacial injuries, but the demographical data are difficult to evaluate because of many variables.\textsuperscript{10}

In our study, 80% of the cases were males while 20% were females. Younger age group of 21-30 (20 cases) was most commonly affected. Males are known to be more prone to nasal bone fractures.\textsuperscript{2} Latifi et al in their study on maxillofacial fractures on 637 patients, males outnumbered women (2.5:1), younger age group (20-30 years) was most prone and falls and RTA were the commonest aetiologies have also reported that males particularly in the younger age group were more liable to sustain a nasal bone fracture.\textsuperscript{3} The peak incidence was in the 15-30 years age group when assaults, contact sports and adventurous leisure activities were more common.\textsuperscript{2}

In our study, the fractures were most commonly associated with RTAs accounting for 66% cases. Road traffic accidents are now considered a public health hazard that is likely to escalate in severity owing to rapid rise in automobile users.\textsuperscript{10} This alarming trend has often been reported in numerous national as well as international journals. RTA has been reported to cause maxillofacial fractures including nasal bone fractures in 60-70% cases in various studies similar to what we have observed. Physical assault (20% cases) and falls (8%) were the other aetiologies observed in our study. Interpersonal Violence (IPV) and assault has been reported in many studies to be the next leading cause of maxillofacial fractures as was found in our study. Further, in many nations, stringent laws have seen a reduction in fractures due to RTA, but those due to IPV continue to rise.\textsuperscript{11,12}

Examination of nasal trauma is often made in a subjective manner. Therefore, a gold standard for the evaluation of the nasal trauma and its outcomes, a gold standard is missing.\textsuperscript{12,13} We observed that all cases presented with epistaxis, swelling and tenderness, nasal obstruction, external deformity and crepitus. 26 (74.2%) cases had ecchymosis and 4 (11.4%) cases had telecanthus. Marco et al recommend that a history of epistaxis and nasal deformity in a nasal trauma case must always arouse suspicion of nasal bone fracture.\textsuperscript{13} Maran observed that nasal fractures usually present with history of blow, epistaxis and external deformity of nasal pyramid, nasal obstruction and tenderness over bridge of nose and crepitus. The type and extent of fractures of nasoethmoid complex determines the principal features found on clinical examination, usual features being frontal depression, nasal deformity and traumatic telecanthus. Cerebrospinal Fluid (CSF), rhinorrhea and diplopia maybe present. Haemorrhage can be severe due to rupture of either anterior or posterior ethmoidal artery. He further recommended that physical examination should incorporate both internal and external components. External examination must focus on obvious nasal defects, malposition and other apparent soft tissue injuries including lacerations, haemorrhage or oedema. Palpation of the nose is critical with findings of crepitus, tenderness, depression, step-offs, nasal shortening or widening of the nasal base indicative of fracture. However, any injury without some degree of bleeding is unlikely to be a severe fracture. Intercanthal measurements are useful in ruling out associated nasoorbitoethmoid fractures, especially in high-velocity frontal or inferior injuries.\textsuperscript{15} The finding of significant rhinorrhea should be evaluated for Cerebrospinal Fluid (CSF) leak by testing fluid levels of either glucose or β-transferrin, a suspicion of CSF leak necessitating a neurological consultation.\textsuperscript{5}

Maran classified nasal fractures into class I, II and III fractures. Class II fractures were seen most commonly in 18 cases (51.42%) followed by class I fractures found in 15 (42.85%). Only 2 cases of class III fractures were seen. Class I fractures are the result of low-moderate degrees of force and hence the extent of deformity is usually not marked. Class 2 fractures are the result of greater force and are often associated with significant cosmetic deformity. In addition to fracturing, the nasal bones, the frontal process of the maxilla and septal structures are also involved. Class 3 fractures are the most severe nasal injuries encountered and usually result from high velocity trauma. They are also termed nasoorbitoethmoid fractures and often have associated fractures of the maxillae.\textsuperscript{2}

Out of the 35 fractured cases, 33 (94.2%) presented within 24 hours of the trauma while only 2 (5.75%) presented after 7 days. 32 of the patients were treated within two weeks of presentation, while two cases were operated within three weeks. Only one case was operated after three weeks because he presented after 7 days of injury.

We observed that earlier the patient presents after sustaining maxillofacial trauma, the better the results a maxillofacial surgeon can offer. The reason for delay can be non-availability of proper medical facilities or patients may consider the injury as trivial or the facial deformity is camouflaged by the post injury swelling. According to Murray and Maran, timing of closed reduction of nasal fracture after sustaining trauma influences the final outcome of operation. Rate of unsuccessful manipulation increases, longer the gap between trauma and day of operation.\textsuperscript{15} Weing reports that it is desirable to provide definitive fracture treatment as soon as possible. He postulates that an early reduction of fracture dislocation facilitates direct...
occlusal positioning and reconstruction of facial configuration.\textsuperscript{6}

Facial pain and oedema subside rapidly following early rigid internal fixation and repair. Although, a delay of two weeks in definitive repair could increase the difficulty in obtaining adequate reduction of fracture dislocations, a period of 7-10 days prior to intervention to permit oedema to subside appears reasonable.\textsuperscript{6}

X-rays of the nasal bone could demonstrate 31 (88.57\%) of the nasal fractures while rest required computerised tomography of the face 4 (11.43\%). We believe that radiographic examination apart from its medicolegal aspects has not been found to be very helpful in the diagnosis of nasal bone fractures, however, it is quite useful for documentation, litigation and for confirming the clinical diagnosis.

Mayell found that radiography in nasal fractures have little value by because negative x-rays would not alter the management of a clinically fractured nose.\textsuperscript{16} Schultz observed that if the x-rays show displacement while nose looks straight, nose should be manipulated otherwise cosmetic deformity ensues.\textsuperscript{17} Manson said that while roentgenographic evaluation is indispensable in the evaluation of a patient with head and face injuries, it does not replace clinical examination, that is the most sensitive indicator of facial injuries. Even though, the clinical evaluation may demonstrate obvious fracture and suggest a standard type of management, a thorough roentgenographic evaluation should be made. Because of the high incidence of litigation arising from the injuries, it is of prime importance to have a thorough documentation of all bone injuries even if treatment is not required.\textsuperscript{18} Finkle et al observed that while clinical examination was most accurate for nasal fractures, CT scan was most accurate for diagnosing fractures of the lateral wall, orbital roof and floor and infraorbital rim for ethmoid and sphenoid sinus injuries.\textsuperscript{19}

Recent trends are of using ultrasonography in the diagnosis of nasal bone fractures, especially in pregnant women and children and also in intraoperative evaluation of repositioning of the nasal bones. In cases of suspected complex facial bone trauma, a CT examination should be performed.\textsuperscript{20}

We observed that out of the 28 patients needing intervention, 10 were administered general anaesthesia, while 18 were given local anaesthesia. Although, Schultz found local anaesthesia quite satisfactory in 76\% of his cases of facial fractures, Mayell carried out all the nasal fracture reductions under general anaesthesia. Local versus general anaesthetic as the preferred means for reduction of nasal fracture is a contentious issue and the literature is divided over the influence on outcomes.\textsuperscript{16,17} Ridder et al found that there was no significant difference in overall success rate between nasal fractures reduced with local and general anaesthesia.\textsuperscript{21} Al Morain observed that the incidence of postoperative adverse effects and severity of postoperative pain were similar between the two groups of general and local anaesthesia; therefore, concluded that both anaesthetic techniques can be used during the reduction of nasal bone fractures based on a patient’s preference and medical condition.\textsuperscript{22}

In our study, we observed that 10 patients (30\%) had undisplaced nasal bone fractures treated conservatively with anti-inflammatory agents alone.\textsuperscript{15} Patients had class I fracture with only 6 requiring intervention in the form of closed reduction with immobilisation by application of external nasal splint.\textsuperscript{19} Patients had class II fracture with one patient requiring no treatment, 13 needing closed reduction and 4 requiring open reduction and septal deformity correction. 2 cases of class III fractures were managed by open reduction and internal fixation by transnasal wires.

All class I and most class II fractures can be reduced with closed reduction techniques.\textsuperscript{2} For many class 2 fractures, closed reduction alone rarely achieves a satisfactory result as the final position of the nasal dorsum reflects the deformity of the underlying septum.\textsuperscript{23}

Open reduction techniques may lead to improved results, despite the increased time and effort involved. Mayell et al found satisfactory results in only a third of cases reduced by closed techniques, whereas Illum found 71-90 percent of patients had good results after closed techniques.\textsuperscript{16,24}

Although, place of closed manipulation of nasal fractures has been questioned as regards the final outcome of procedure (Mayell; Stell; Harrison), there have been advocates of closed reduction (Manglia; Schultz; McCollough).\textsuperscript{16,17,25,26,27,28} According to Bowerman, nasoethmoid injuries or class III fractures should be treated by open reduction. Weerda and Siegert observed that most class III fractures should be treated with open reduction and internal fixation.\textsuperscript{29} In the past, the reduced fronto-nasal complex would be supported by transnasal wires tied externally over either silicon or lead plates and the comminuted medial orbital wall left to reattach and reorganise itself. The recent development of miniplate systems has had a huge impact on the management of these fractures.

White observed that correction of nasal deformity is usually postponed for 3-5 days as swelling subsides. Nasal fracture reduction is optimally performed within 2 weeks of injury.\textsuperscript{20} McCollough et al observed that if nasal fractures are seen prior to significant swelling, they can easily be reduced then only, but if these present when oedema has already set in or if there are open wounds, these should be meticulously stitched and actual management of fracture may require postponement for 5-7 days. They also reported that most of the simple fractures of nose can be treated by closed reduction by manipulation, but if by manipulation septum cannot be restored in central position, then one should proceed to open.\textsuperscript{28}

Murray and Maran also said that time of reduction after sustaining fracture has relation with final outcome. In patients who were manipulated seven days after sustaining fracture, the rate of unsuccessful manipulation was 30\% and those undergoing manipulation within 9-14 days, it was 41\%. There was a group in which manipulation was delayed to more than two weeks. Although, the failure rate was smaller, viz., 22\% yet according to them, this could not be
relied upon as number of patients in this group was small. Class I fractures need simple manipulation and packing. In case, Class II replacement of nasal bones maybe successful in >40% cases, there is redisplacement of the nasal bones due to overlapping of the fractured ends of the perpendicular plate of ethmoid and quadrilateral cartilage. The manipulation of the nasal bone here should be accompanied by open reduction of the septal deformity. Class III fractures require open reduction.23

Harrison reviewed 40 cases in which closed manipulation was done and found that only 13 cases had a perfect result defined as a nose that is straight throughout its bony and cartilaginous bridge line with clear Airways.26

In the 6 patients of class I fracture treated with closed reduction, only 1 developed saddle nose deformity, postoperatively. Two patients of class II fracture treated by closed reduction developed persistent septal deviation while one patient treated by open reduction developed septal haematoma. Patients of class III had no postoperative complications.

We observed that only one patient developed saddle nose, which was due to late presentation and subsequently late management. Residual deformity has been recorded in 14-50 percent after closed reduction.21 Closed reduction is the treatment of choice in nasal bone fracture unless a severe nasal septum fracture is observed.32

Illum reported that closed reduction is adequate for most fractured nasal bone, but if reduction is not maintained, then open reduction can be carried out months later by traditional septorhinoplasty.24 In our study, we recorded a failure rate of 23% after closed reduction and all of them were adult. Murray et al reported a failure rate after closed reduction of up to 30-40% and attributed their failure to interlocking of fracture septal segment, which drag the mobile fracture nasal bone segment toward their initial displaced position.22 Stucker et al pointed out the difficulties in determining when complete reduction has been achieved after closed reduction in children.33

CONCLUSION

Even though, the current protocols in the management of nasal bone fracture are quite efficient, a uniform protocol is still missing. Several techniques are used in individual fracture depending on the course of fracture, surgeons experience and patients' preference. So, we conclude that long-term and multicentre collection of data about nasal trauma is important to develop standard protocols and consensus.

REFERENCES


