Revista de Medicină de Urgență, Vol. 3, Nr. 1: 12-16

Nasal fractures diagnosis and treatment

Constanța Mîrșu*, Cătălin Floriță†

Abstract

Nasal fractures are very common. Nasal pyramid has an important role in facial cosmetic and in normal breathing. Therefore correct recognition and treatment of nasal fractures is very important, not only for esthetic reasons, but also for functional considerations.

This work will try to illustrate how nasal fractures are best diagnosticated on clinical considerations and the way they are resolved.

I will expose both closed and open surgical methods of reconstitution of nasal and septal fractures. Also here I'll present some clinical and treatment particularities of nasal fractures in children. (Revista de Medicină de Urgență, Vol. 3, Nr. 1: 12-16)

Key Words
nasal fractures, septal dislocations and septal fractures, closed reduction, open reduction, compound nasal fractures, nasal fractures in children.

Introduction

Nasal fractures are the most common type of facial fractures, because of nasal anterior projection and central position of nasal components. These fractures can be obvious with clear deformity of nose and mediofacial anatomy modification or can be often unrecognized and untreated at the time of the injury. These fractures can involve not only nasal bones, but also the nasal septum.

It is very important to proper diagnose and treat these nasal fractures and, after that to treat them in a appropriate surgical way, if needed.

Frequency

Nasal fractures are most common type of facial fracture, accounting for about a half of all facial fractures in most of clinical studies. After them are zygomatic (22 %), mandible (20 %) and maxillary bone (9 %) fractures [1].

* ENT specialist Clinical Emergengy Hospital, Calea Floreasca, no. 8 th, sector 1, Bucharest, email : constanta_m@hotmail.com

† ENT specialist, Ilfov County Hospital.

Corresponding author: Constanța Mîrșu email: constanta_m@hotmail.com

Recived in 20 may, accepted in 10 june

Etiology

Fights (34 %), accidents (28 %), sports (23 %) are causing nasal injuries and Fractures [1].

Accidental falls are the most common presentations in children.

Anatomical considerations

The external nose, supported by a framework of bone and cartilage, is covered externally by skin, subcutaneous tissue and muscles. It has an inner lining of mucous membrane and glandular structures. The entire nose is good innervated and has an extremely good blood supply.

Because of the rich blood supply, most lacerations and wounds heal very well and rapidly.

Also because of the extremely rich blood supply beneath the skin of the nasal region, any trauma to the external nose will probably result in considerable bleeding. Hematoma may appear with a swelling of over the dorsum of the nose, or a nasal septal hematoma can obstruct both nostrils.

The upper supporting framework of the nose is rigid and bony; the lower part is cartilaginous and semimobile. The nasal septum, which provides the support for the external nose, is bony and solid in its posterior part, but cartilaginous and partial mobile in its anterior side.

The bony opening of the mediofacial opening of the nose, called piriform aperture, is made by the maxillary bones in its base and lower part, and by inferior border of nasal bones in its upper parts.

The bony framework of the external nose is formed by the nasal bones, the frontal process of the maxillary bones and the nasal process of the frontal bone.

The nasal bones are attached to one another by a suture. They are very resistant to the fractures in their upper part, being extremely thick and heavy. In their lower part they are extremely thin and easy to be fractured.

The maxilla and the frontal bone compose the remainder of the lateral part of the nose.

Some severe fractures of the nose usually involve the nasal process of the maxilla and also the nasal process of the frontal bone.

The upper lateral and lower lateral cartilages constitute the cartilaginous support of the the external bone.

The upper lateral cartilages are attached to the inferior border of the nasal bones, providing the framework for

the middle third of the external nose. Approaching each other in the midline, they are usually attached to the septal cartilage.

The lower cartilages are both composed by a lateral and a medial *crus*.The lateral *crura* provide the support for the lower part of the nose, and the medial crura constitute the support for columella.

Lacerations and injuries can penetrate or disrupt the cartilages and nasal fractures can determine their displacement. But, the replacement of the nasal fractures can determine normal replacement of the cartilaginous structures, because of their bony attachments.

Nasal septum is the internal support of the nasal pyramid. It is covered by an extremely well vascularizated mucosa. Practically all fractures and other significant trauma of the nose will be accompanied by nasal bleeding.

The septal (quadrilateral) cartilage, the perpendicular plate of the ethmoid and the vomer compose the main supporting structures of the nasal septum. The maxilla crest, the palatine bone and the nasal spine of the frontal bone also contribute in septum formation.

The perpendicular plate of the ethmoid, extremely thin, with multiple dehiscences forms the superioposterior part of nasal septum. The vomer makes up the inferoposterior portion of the nasal septum.The septal cartilage makes up the anterior part of the supporting structure of the nasal septum. It articulates posterior with the perpendicular plate of the ethmoid and vomer and inferior it articulates with the crest of maxilla. All these conexions are very important in maintaining the proper position of the septum and also of the external nose.There are cases in which the septal cartilage is displaced from its normal position on the maxilla crest, with or without nasal bone fractures, cases in which nasal septum must be repositionated in order to repermeabilizate both nasal fosae.

Types of fractures

Fractures can be classified as open or closed, depending on the integrity of skin and mocosa. It is therefore necessary a imediat recognition and treatment of the lesions in order to avoid the potential complications of nasal and septal fractures[1]. Longer terms follow-up can allow the surgeons to evaluate early and late sequelae of nasal injuries.

Surgical reposition may be appropriate in the early postfracture period, or later, after fracture healing.

The direction of the blow and the intensity of its force will determine the type of nasal fracture [2]. The nose is more resistant to the fracture from direct frontal blows than it is from lateral injuries.

Direct frontal blows can determine the fracture of the lower portion of the nasal bones, separating them from the upper part, or separating them from at the midline, flattening or broadening the nasal bridge.

A more powerfull trauma can cause comminution of the entire bony pyramid or disengaged it from the frontal portion of the bone. There can result injuries of the cribriform plate and orbital plate of the frontal bone. The result can be the injury of the nasolacrimal system and of the orbital content. In some cases dura can be also torn, leading to a leakage of the cerebrospinal fluid. The medial canthal ligament can be also torn, detached, leading to a wide and flattened dorsum nasi and widespread medial canthi between the eyes.

The fractures caused by lateral forces are seen more commonly. Some patients can present with fracture dislocations of some bone fragments, but some patients, older ones, usually, show comminution.

Lateral blows, moderate in intensity, can determine fractures that can involve only one lateral nasal bone displacement into the nasal cavity. When the intensity of the blow is greater, the entire nasal pyramid can be displaced, moved over, the nasal bones and the nasal process of the maxilla can be pushed inward, or outward.

A fracture of the nasal bones can be accompanied by a nasal septum displacement from the crest of the maxilla.

It may buckle and may tear in a horizontal or vertical direction. In the case of a fractured perpendicular plate of the ethmoid, there will be of course a septal cartilage displacement.

Usually the caudal border of the nasal septum will be dislocated in an opposite direction, at the junction of the bony and cartilaginous septum.

Because the septum has an important role in determining the normal position of the entire nasal pyramid, if the septal trauma is not well recognized and not corrected immediately, the reduction of the nasal bones may not be adequate.

Of course, septal fractures and dislocations may also occur without obvious fractures of the nasal bones, usually in cases of lateral blows to the lower half of the nose.

In some cases, the cartilage fragments can be telescoped posteriorly, determining a duplication of the septum. This will cause a shortening of the nose and retraction of the columella.

So, these nasal septum dislocations and fractures are very important, because they will often determine later deformities and asymmetries of the upper lateral cartilages and also the lower cartilages, leading to nasal asymmetry .

Bleeding of the soft tissues can determine formations of hematomas of the septum or of the external nose. It is very important to recognize these septal hematomas, especially in children and elderly, because in case of not draining them, they can cause abcess formation and distruction of nasal and septal cartilages, with very severe deformities.

Diagnosis

Often, patients with nasal and septal fractures are underdiagnosed and in his daily practice every otolaryngologist

encounters patients with nasal and septal deformities that warrant surgical reconstruction. Almost all these deformities are results of improper medical attention at the time of the injury.

Diagnosis is made on the basis of history and the examination of the external nasal structure, nasal passage and septum [3].

The history of the traumatic event, the intensity and strenght of the traumatic force are important in determining the type of the fracture.

There will also be important: the amount of external hemorrhage, the possibility of a cerebrospinal fluid leakage and patients ability to breath through his/ her both nostrils.

Very important is to ask about past nasal and septal deformities and better, to compare past patients face photographs with his present face aspect.

Of course, immediately after fracture, there will be a considerable facial/nasal edema and ecchymosis that complicate the diagnosis. It is believed that there is no harm in waiting several days before any definitive correction is made, it is not necessary to make a final diagnosis and decision if the overlying edema and ecchymosis make the judgement difficult. It is important to instruct the patient to come back for a second evaluation in 4-7 days.

Inspection of the nose can reveal a considerably flattened or broadened nose or an external deviation of the nasal bones. Gentle palpation can reveal displacements and crepitation.

The internal nose will be carefully inspected: nasal septum presence of mucosal tears, septal hematoma, septal dislocations. For this is necessary a proper lighting and nasal suction.

The otolaryngologist will also evaluate the root of the nose and the distance between outer and inner canthus of both eyes. These can be modified in cases of lacrimal bone and ethmoid labyrinth involvement, that will require open surgical reduction.

The evaluation of the patency of the nasolacrimal system is also very usefull.

Radiographs of the skull and nasal bones can be often misinterpreted by the radiologist.

Sometimes a grossly displaced nose may be read on X-ray as not fractured or, in some cases, some sutures lines can be misinterpreted as fractures.

Therefore, the radiographs are always complementary to a complete, clinical approach and will not influence surgeons final decision.

Treatment

The treatment is surgical in fractures with obvious displacements of the nasal bones or/ and septum [4].

Nasofrontal and ethmoid fractures must be ruled out, as they may require other types of surgery. Some lesions must be preoperatively recognized also: those of the nasofrontal duct, cribriform plate , medial canthal ligaments [5].

The desired objectives are to:

- Re-establish cosmetic appearance and
- Re-establish respiratory function on both nasal sides.

Accurate diagnosis is very important in proper management of nasal fractures.

Therefore, if edema or ecchymosis are important, the surgeon will not be able to make a proper evaluation and is much better to wait until they are gone, even up to 2 weeks, before a definitive surgery will be carried out [6].

Some very simple nasal fractures can be treated in an outpatient basis in the emergency room. Often this is done immediately without any or partial local anesthesia, with great discomfort to the patient and surgeon, that will have only one attempt to correct the nose.

Therefore is much better to reduce these fractures in the operating room under proper anesthesia and a properly scheduled time [7].

It is important to have all instruments necessary to perform a septoplasty, a good lightening and suction system.

In children, good results can be obtained only under general anesthesia. Endotracheal intubation is mandatory because the blood can obstruct the airway.

In adults, local anesthesy is necessary , with proper premedication. topical anesthesia of the nasal mucosa can be made with lidocaine (Xylocaine)with the addition of a small amount of epinephrine . The external nose also will be infiltrated with 1 % lidocaine with 1: 100 000 epinephrine. For a good effect is indicated that the surgeon wait 10- 15 minutes.

The reduction can be closed or open [8].

Closed reduction is indicated in

- Simple fractures of nasal bones
- Simple fractures of nasal-septal bones.

Open reduction, which require a deeper sedation or a general anesthesy is made in

- Extensive fracture – with complex dislocation of nasal septum and bones;
- Dislocation with fracture of the nasal septum;
- Open septal fractures;
- Persistent deformity after closed reduction.

Closed reduction

In a unilaterally fractured nose with a depressed nasal bone or the nasal septum, a blunt ended heavy instrument (Ballanger, Boies, Sayer or other elevator) is inserted under the nasal bone and pressure is exerted to elevate it back to its proper position.

In bilateral fractures this reduction can be attempted by inserting the blunt ended instrument under the fractured nasal bone, elevating it and applying external pressure on the displaced opposite nasal bone.

So, the entire pyramid moves back to its position and the septum comes in its midline position.

If the nasal or septal reduction is less than ideal, there must be no hesitation in tempting an open nasal and septal reduction.

Open reduction

It can be an open reduction of nasal septum and an open reduction of the nasal pyramid [9].

a) Open reduction of the septum

A unilateral hemittransfixiation incision must be made and the mucoperichondrium and periosteum should be elevated off one side of the septum.

So, the surgeon can see the nature of the septal injury. A hematoma, if present, must be evacuated. Small, loose fragments of cartilages should be removed. Larger ones can be removed, but they will have to be reinserted at the end of surgery.

The important thing is to remove as little as possible and better to reposition the fragments of septum, than to remove them, as in a septoplasty.

If there are overriding fragments of cartilage, the surgeon may attempt to realign them and secure their position with through and through sutures.

As in septoplasty, the mucous membrane on the opposite side should be left intact as much is possible.

At the end of the procedure, the septum should be in a proper midline position.

After this septum reposition, another closed reduction of the nasal bones must be attempted. In most cases, this will be possible. Only if this is still not possible and there is a severe nasal cominution, another techniques are used.

b) Open reduction of the nasal pyramid

It is made by the same principles and techniques of the rhinoplasty. An intercartilaginous incision between the upper and lower lateral cartilages is done on both sides. Then the soft tissues over the *dorsum nasi* are elevated to the level of nasal bones. The surgeon will observe and palpate the nasal fragments. The main fragments are mobilized and brought in proper position.

Sometimes a lateral osteotomy may be necessary. The nasal bone fragments will be desimpacted and properly positioned. Once the nasal bone will be properly positioned, the nasal cartilages will usually return to their normal positions. If they are lost the contact with the bones, they should be repositioned and their position must be maintained by sutures or packing.

Packing and splinting

After reduction , the position must be maintained with internal nasal packing – as an internal splint and an external splint.

Their purpose is only to help to maintain the position and to prevent postoperative edema, bleeding and injury.

The packing must be enough to give support to the nose, but it must be not voluminous as to distort the external appearance of the nose.

The external splint prevents the formation of hematoma over the nasal dorsum, reduces the swelling and stabiles the fragments.

It can be of metal lined with some sponge rubber, of dental compound or plaster.

The splint will be left in position for 4-7 days [10].

The patient should be instructed to avoid trauma of the nose for several weeks.

Treatment of comminuted nasal fractures

In the case of the severe comminuted nose, there are many bony fragments without soft tissue attachment. In this case the open reduction is prohibited, being impossible to reposition those fragments[10].

In these cases a small lead plate will be placed over some adhesive tape, sponge rubber or gauze on either side of the nasal pyramid. A through and through suture of nonabsorbable material is passed through the plates, the skin of the external nose between the comminuted fragments, through the septum and through the opposite side and back again [11].

Then the suture is tied up to maintain support.. The nose is then packed inside in order to help maintain the position. The packing and spints will be left in for longer time, enough to allow fibrosis to occur [12].

It is necessary to expose the bony fragments and proper reduct them in cases of associated fractures of lacrimal bone and ethmoid labyrinth, when medial canthal ligament is disrupted and the lacrimal parts are affected.

Treatment of compound nasal fractures

If there are extensive lacerations of the skin, first nasal bones are to be reduced and, only after that external lacerations must be sutured in anatomical layers. The subcutaneous tissue will be closed with disrupted catgut sutures.

In cases of mucosal lacerations, they must be sutured as much as possible and internal nasal splinting must be done in order to avoid adhesions between turbinates and septum.

Special aspect of nasal fractures in children

In children, nasal fractures are more frecquently accompanied by hematoma, ecchymosis and edema. These made the diagnosis and treatment more difficult.

Many of nasal trauma at this age are the cause of nasal and septal deformities that appear later in life [13].

Therefore a proper treatment is indicated with evacuation of hematomas of the septum and *dorsum nasi*. All septal dislocations and deviations must be properly corrected, using as conservative a technique is possible, with the full correction of the nasal airway. If this is not well done the child will have nasal obstruction and a possible nasal deformity [14].

Follow up

The patient must be followed by the surgeon for at least 1 year after the surgery. Only in this way the surgeon can diagnose later complications and deformities that may require further correction. Scar formation will determine late complications that may not appear in the first months after trauma.

A common complication is the formation of nasal adhesion between the septum and the turbinates. If the synechia is small, it could be cut from the septum and the turbinate and the nose should be kept shrunk down for several days until healed. Larger synechiae must be sectioned and a piece of silicone sheeting or similar material must be placed between the opposite raw surfaces, until healing of mucosal surfaces.

Conclusions:

- The diagnosis of nasal and septal fractures is made mainly on clinical inspection and palpation. X-Ray can be often misleading, especially in children.
- The septal reduction is a main part of nasal bone reposition.
- The reduction of nasal bones can be done in closed or open manners, depending on the complexity of the nasal fracture.
- Comminuted nasal fractures, as well as fractures of lacrimal bone or ethmoidal labyrinth require special surgical approach.
- Nasal trauma in children is very often encountered and requires special clinical and surgical approach, in order to prevent the interfering with the growth centers of nasal bones and septum.

References

1 Bailey BJ, Tan LK: Nasal and frontal sinus fractures in Head and neck surgery – Otolaryngology , 2 nd ed Lippincot & Wilkins; 1998: 1007-31;
2 Holt Gr : Biomechanics of nasal septal trauma . Otolaringol Clin North Am 1999Aug; 32 : 615-9;
3 Bartkiw T, Pynn BR, Brown DH: Diagnosis and management of nasal fractures, International Journal trauma Nurs, 1995; 1; 11-8;
4 Toyota N., Nishimota T, Katah Y, Ohne e. at al : Early repair of nasal bone fracture. Journal of Japanese association for acute medicine 1995; 6; 233-239;
5 Rohrich RJ, Adams WP: Nasal fracture management : minimizing secondary nasal deformities. Plastic Reconstructive Surgery, 2000, 106: 266-73;
6 Gilpin T , Cohley S: Toward evidence based emergency medicine: best BETs from the Manchester Royal Infirmary, Early management of displaced nasal fractures, Journal of Emergency Medicine 2000,17-286;
7 Renner GJ. Management of nasal fractures. Otolaryngology Clinic of North America 1991 February 24 (1): 195-213.
8 Frodel JL : Management of the nasal dorsum in central facial injuries. Head and neck surgery 1995 March ; 121: 307-12 ;
9 Kane AP, Kane LA: Open reduction of nasal fractures. Jounal of Otolaryngology, 1976; 7; 183-6;
10 Burn J. S Oh: Indirect open reduction through intercartilaginous incision and intranasal kirschner wire spliting of comminuted nasal fracture. Plastic and Reconstructive Surgery 1998; 102; 342-349;
11 Nishihira S, Jamanuchi H, Masaki M, Edo M Correction of nasal bone fracture using Kirschner wire fixation technique Jihi-Rinsho 1992, 57: 8490;
12 Yabe T, Mucoaka M: Treatment of saddle type nasal fracture using kitchner wire fixation of nasal septum. Annals of Plastic surgery 2004; 53: 89-92;
13 Stuker FJ, Bryarly WW: Management of nasal trauma in children . Archives of Otolaryngology 1984 March, 190-194;
14 County PA, Berkowitz RG: Hematoma and abscess of the nasal septum in children. Archives of Otolaryngology Head and neck Surgery, 1996; 122, 1373- 6.