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EARLY AND LATE COMPLICATIONS OF NASAL FRACTURES IN THE PEDIATRIC POPULATION

Gabriela Kopacheva Barsova[1], Igor Kamshikoski[1], Marija Dokoska[1], Ana Pejkovska[1], Vesna Petreska Dukovska[2], Aleksandar Mitevski[2], Vlatko Cvetanovski[2], [3]Blagoj Kocev[3]
[1]Clinic for ear, nose and throat, University Campus "Ss Mother Theresa", Faculty of Medicine, "Ss.Cyril and Metodius" University in Skopje, North Macedonia, [2]Re-Medika General Hospital-Skopje, North Macedonia, [3]Public Health Institution ,,Health Center Radovish", North Macedonia

Abstract

This statistic reflects the high incidence of nasal trauma compared to other facial fractures. Nasal injuries can also be associated with head injuries, and can often lead to nasal obstruction as well as various nasal deformities. Post-traumatic early and late complications can occur. The aim was to show the importance of traumatic injuries to the nasal pyramid and analyze it with part of our experience

In this retrospective study, we present 100 patients with history of nasal fracture who required hospitalization. In all patient complete history and clinical examination were performed. External inspection and palpation as well as internal examination were requered. CBS analysis and Neurosurgical investigations on all patient have been done. CT scan of the nose and PNS were also performed.

More than 37 patients or 37% have fractures with dislocation that occurred around 7 days during which a closed reposition with an elevator was realized. The remain 63 patient had history of previous nasal injury that developed septal deviation. So most septal deviation happends in 53 patient or 88%, 16% or 10 patients in patient develop subluxation. Of these, 7 cases septal hematoma formation (5%) and 2 cases subperichondrial abscess (1%).

It is essential to know: the severity of the fracture, the direction of the impact and the physical type of the fracture line are of great importance for the predisposition to what kind of nose defect can develop. In order to ensure a better quality of life by improving the functionality and the aesthetic component of traumatic injuries to the nose, it is necessary to know the seriousness of the injury and its possible complications.

Keywords: complications, nasal fracture, treatment, development, side effects.

Introduction

The nose, as the most prominent part of the face, is very often exposed to injuries. They can be: isolated or combined, new and old, open and closed. The nasal bones and the lower jawbone are the bones of the face that are most often exposed to injuries. Nasal fractures occur more often than mandibular fractures, because they require less force to occur. Nasal injuries can also be associated with head injuries, and can often lead to nasal obstruction as well as various nasal deformities. Post-traumatic early and late complications can occur [1,2].

Based on World Health Organization Data nasal fractures are among the most common facial fractures, accounting for 40-50% of all facial injuries [3].

This statistic reflects the high incidence of nasal trauma compared to other facial fractures. In developed regions such as the United States and Europe, the incidence of nasal fractures is approximately 15-20 cases per 100,000 people per year. In developing countries, rates may be higher due to the increased incidence of trauma and accidents [4,5].

On the other hand, according to age, gender and overall distribution it can be mentioned that nasal fractures are more common in men with a male/female ratio of approximately 2:1. They occur most commonly in people aged 10-30 years, with a higher incidence in sports

injuries, physical assaults, and motor vehicle accidents. Injuries resulting from domestic violence are very common [5].

Before we start our research, it is essential to explain the development of the bony and cartilaginous skeleton of the midface, which will show us the weak points and the weakness of the supporting structures of the nasal pyramid. There are two significant periods of rapid growth.

The first is the first postnatal year in which in the anterior cranial fossa endochondral ossification occurs. And the second happens in the puberty where the nose develops more rapidly compared to other periods of life. Later, the lamina perpendiculars expand due to progressive ossification of the cartilage of the nasal septum. Due to this process, most of the cartilaginous part of the nasal septum loses contact with the sphenoid bone [6].

The cartilaginous part of the nasal septum has two thickenings with different mitotic activity and histological maturation.

These “growth zones” are extensions of the sphenoid. The first one is sphenodorsal zone that is located between the sphenoid sinus and the nasal dorsum. This zone is mainly responsible for the normal growth of the nasal dorsum in length and height.

And the second one is the sphenospinal zone and is located between the sphenoid and spina nasalis anterior, it is a leading force in the development of the premaxillary region. Cartilage and bone are directly related to growth.

Surgical interventions and procedures, incisions of the septal cartilage, fractures, late post traumatic complications could affect the normal growth and development of the middle third of the facial massif and can lead to disruption in the development of the supporting nasal structures [7,8].

And last but not least, vomer as a single unit, it is formation is the result of extracartilaginous ossification. Partial or complete injuries to the vomer can lead to disruption of the growth and development of the nose, especially if they occur in childhood and adolescence.

Material and methods

In a retrospective study conducted at the University Clinic for Ear, Nose and Throat, University Campus "St. Mother Teresa" in Skopje, N.Macedonia, By a 5 year period 100 patients raging from five years old to seventy five years old with nasal injuries were recorded.

In this retrospective study, we present patients with history of nasal fracture who required hospitalization.

Inclusion criteria: history of nasal fracture that happens during their lifetime. Exclusion criteria: autoimmune diseasese, drug addiction and no history of nasal trauma or previous nasal surgery. In each patient in the inclusion criteria, we contain a statement indicating patient permission for using their data information and clearance by the institute research or ethics committee.

In all patient complete history and clinical examination were preformed. External inspection and palpation of the nasal pyramid and the nasal septum for deviation, depresion or asymmetry. Internal examination include: anterior rhinoscopy with a nasal speculum to inspect for mucosal tears, bleeding (epistaxis), and septal deviation.

Detail complete history of the manner, place and awareness of the same injury. Neurosurgical assessment of coma status and whether the patient lost consciousness was also recorded in all patient. CBC test analyzes was also performed. Regarding imaging studies, CT scan of the nose and the Paranasal sinuses or X-ray were performed in each patient.

All patients underwent endoscopic evaluation through flexible nasoepipharyngoscopy looking for scarring, hematoma or septal abscess. From the medical detail records, we retrospectively tracked demographic, epidemiologic, clinical, and surgical information. The complete medical documentation in PHI UK for Ear, Nose and Throat is attached in ENT clinic.

Throw-out that period; it had been completely document of each stage of the condition from the patients. Regular checkups were also recorded in all of the patient.

Out of 100 patients, 10 were under 10 years old or 10%, 20 were between 10 and 30 years old or 20%, and 70 patients were over 30 years old or 70%.

More than 37 patients or 37% have fractures with dislocation that occurred around 7 days during which a closed reposition with an elevator was realized. The remain 63 patients had history of previous nasal injury that developed septal deviation. So mostly septal deviation happens in 53 patient or 88%, 16% or 10 patients in patient develop subluxation. Of these, 7 cases septal hematoma formation (5%) and 2 cases subperichondrial abscess (1%).

Table 1. Patients with history of nasal trauma.

Nasal trauma	Period of 7 days	Prolonged period
Nasal fracture with dislocation	37 patient (37%)	More than 1 year
Nasal deviation	/	53(88%)
Nasal subluxation	/	10(16%)

By severity of the fracture, the direction of the impact and the physical type of the fracture line in combinations are significant for the predisposition to what kind of nose defect can develop. The Rohrich and Adams classification of nasal fractures is a widely used anatomical system (introduced in 2000) that categorizes injuries into five types based on severity and anatomical disruption.

As a result of the frontal impact, nose can fracture and lead to displacement or depression of the nasal bones or septum. Because the nasal pyramid is predominantly cartilaginous during childhood, “greenstick” fractures as physical type fracture line mostly occur by frontal impact are more common. As a result of lateral force, impressive fractures can occur. (palpable on one side of the nose, while on the other side one fragment of the nasal bones overlaps the other and forms “scales”), [9,10,11].

Injuries to the nasal dorsum can later lead to the appearance of a nasal hump. On the other hand, injuries to the septum, as well as injuries to the triangular and alar cartilages, can lead to subluxations and deformities of the nasal pyramid and septum, as well as asymmetries and deformities of the nasal tip.

The Markowitz and Manson classification system categorizes Naso-Orbito-Ethmoid (NOE) fractures based on the integrity of the medial canthal tendon (MCT) and its bony attachment, crucial for managing traumatic tele canthus. It classifies injuries into three types (I–III) ranging from single-fragment fractures to severe comminution and tendon avulsion [11]. NOE complex involves: nasal bones, nasal process of the frontal bone, frontal processes of the maxilla, lacrimal bones, lamina papyracea of the ethmoid bones and sphenoid bones.

Resulting in severe cosmetic defects, functional defects such as collapse of the nasal structures, damage to the continuity of the attachment of the medial palpebral ligament (traumatic tele canthus). They can be “paths of least resistance” for the occurrence of post-traumatic inflammatory processes of the nose, ethmoids, orbit as well as the endocranium [12].

The risk of early complications is higher if left untreated. That’s why it’s recommended, according to Robinson's classification, that in the first 7 days to two weeks, the easier forms to undergo nasal bone repositioning with an elevator and mobilization.

Early complications of the nasal fractures are: epistaxis, CSF leaks, septal hematoma or abscess, nasal obstruction, lacrimal duct obstruction, triangular cartilage rupture, infections,

osteomyelitis, recurrent fractures, maxillary hypoplasia, toxic shock syndrome, naso-oral fistula. Septal hematoma is an accumulation of blood between the septal cartilage and the mucosa. The expansion of the hematoma separates the cartilage from the mucoperichondrial, obstructing blood flow to the nasal cartilage and causing avascular necrosis of the nasal cartilage. If not treated promptly, it can lead to abscess, cartilage necrosis, and significant nasal deformity. Symptoms that are mostly common are: pain, swelling, nasal congestion, and bleeding.

Signs of respiratory obstruction may also occur. If left untreated septal perforation and necrosis occur after three to four days due to ischemia. The accumulated blood and necrotic tissue provide a "good" site for infection to develop.

Treatment includes emergency drainage of the hematoma by incision, usually performed under local anesthesia. Bilateral asymmetrical incisions are made in the septal mucosa at the level of the Locus Kiesselbachi. Aspiration of the blood or purulent collection. Postoperative treatment is with firm nasal packing to prevent reaccumulation of blood and allow for structural stabilization.

Antibiotics and regular monitoring, follow ups of the drainage site for signs of infection or reaccumulation of blood. Long-term nasal obstruction can result from inflammation, tissue changes, or structural deformities (as a result of injury or incomplete healing).

Functional assessment as analysis with Rhinomanometry to objectively measure nasal airflow resistance. Treatment includes conservative therapy and surgery. In cases of persistent obstruction, additional surgery may be required to correct structural deformities, such as septoplasty or rhinoplasty. Postoperative infections can occur as a result of surgical procedures or inadequate postoperative care. Symptoms include: Redness, warmth, pain, and purulent contents. In severe cases, an abscess or osteomyelitis may develop.

Treatment is mostly with systemic antibiotic therapy with antibiotic adjustment based on antibiogram and if necessary, surgical intervention to drain abscesses and remove infected tissues. If osetomyelitis do occur than debridement/removal of infected bone tissue and possibly bone graft to reconstruct the damaged bone structure.

The possibility of a fracture reoccurring after initial treatment, often due to inadequate fixation or lack of adherence to recommendations and therapy. Symptoms that occur are: Recurrent pain, swelling, and visible changes in the nose.Treatment include: revision surgery to reposition and stabilize the nasal bones. Additional fixation or reconstruction may be required [13,14].

Permanent defects can cause long-term structural and functional problems of the nose. deviation of nasal septum, rhino kyphosis, rhino scoliosis, wide nasal pyramid, distortions of the nasal tip and columella, saddle nose with/or columella retraction, synechiae.

Persistent deformities can result from untimely intervention, improper treatment of fractures, or inadequate healing of the nose. Detailed planning of the surgical procedure using computed tomography (CT) scans for accurate positioning and correction of defects. Treatment involves reconstructive surgery such as rhinoplasty or septorhinoplasty may be necessary to correct structural and aesthetic deformities, often using cartilage grafts from the patient's own tissue or a donor.

Discussion

Certain statistics show that one in ten patients with postnasal trauma develop post-traumatic complications such as nasal deformities (10.4%), nasal pyramid deformity (10.0%), and nasal obstruction (11%). [15,16,17]. according to Jurcan M.

The main etiology of nasal bone fractures was interpersonal violence, which mainly affected men, aged 20–39 years, with a low level of education, living in urban areas.

Implementing laws to fight interpersonal aggression and increase the education level of the population would lead to a considerable reduction in the incidence of this pathology.

Based on Tiffrany T.Pham MS, the strongest associated injuries with nasal fracture included open wound of the nose (odds ratio [OR]: 8.71, 95% confidence interval [CI]: 8.49–8.94, $p < 0.001$), epistaxis (OR: 5.26, 95% CI: 4.59–6.02, $p < 0.001$), malar/maxillary fracture (OR: 4.38, 95% CI: 4.30–4.45, $p < 0.001$), and orbital fracture (OR: 3.99, 95% CI: 3.91–4.06, $p < 0.001$),[18,19].

By Ahmend K Alenare the Findings from his study of 122,222, people highlight the need for targeted prevention, efficient resource allocation, and risk screening to enhance the management of complex facial traumas in the national trauma system [20,21].

Conclusion

In order to ensure a better quality of life by improving the functionality and the aesthetic component of traumatic injuries to the nose, it is necessary to know the seriousness of the injury and its possible complications.

After reduction of the fracture, the nasal bones remain mobile for approximately two weeks and early fracture healing takes up to six weeks.

Therefore, people with nasal fractures are advised to refrain from all sports activities for two to three weeks and from contact sports (for example, American football, lacrosse or wrestling) for four to six weeks. The rest for up to six weeks.

It is not always possible to just provide the function of the nose to improve the basic function of the nose design. To preform septoplasty, it is necessary to improve the aesthetic part of the nose, including the pyramid, and the entire supporting points of the middle face massif.

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