

# Management of Naso-orbito-ethmoidal Fractures with Modification of the Conventional closed Technique

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## ABSTRACT

The management of naso-orbito-ethmoidal (NOE) fractures is often challenging due to the complex anatomy of the region. Trauma to the bones that make up the area often result in fractures which occur in a comminuted fashion and are usually compounded into the related sinuses.

We report a case of a 25-year-old male iron bender who sustained NOE fractures and had reduction and immobilization using per cutaneous tubed stents supported by intra nasal endotracheal tubes (ETT) for both nostrils. The fixation acquired enough strength and stability which permitted removal of splints at the end of three weeks.

Modification of the conventional closed reduction technique with the use of percutaneous tubed stents provides an acceptable pre-traumatic facial appearance including facial width, projection and height at a relatively low cost and technique sensitivity.

**Keywords:** Naso-orbito-ethmoidal fractures, conventional closed techniques, management.

## Introduction

Naso-orbito-ethmoidal (NOE) fractures are fairly common accounting for about 5% and 15% of adult and paediatric facial fractures respectively (Kelly *et al*, 2005; Chapman *et al*, 2009; Nguyen *et al*, 2010).

Reduction and fixation of the fractured bony segments are often carried out by an open or close technique. Open reduction of

NOE involves surgical exposure with reconstitution using osteosynthetic plates

and screws while conventional close technique involves reduction with appropriate forceps and immobilization using plaster of Paris stents. While open reduction is challenging

because of the difficulty encountered in reducing the fractured segments and the possibility of losing or devitalizing the constituent bones by stripping of the adjoining periosteum. Close reduction is not usually acceptable by patients because of the unsightly appearance of the plaster of Paris or other stents used for immobilization and the difficulty in maintaining consistent results following treatment.

A modification of the conventional closed reduction technique without immobilization with plaster of Paris was carried out in our centre.

## Case Report

A 25-year-old iron bender who was constructing the metal frame work of a decking of a high-rise building but was said to have felt dizzy while gazing down from the top of the roof.

He fell down with his face impacting unto the iron metal frame work before falling to the ground. He was said to have lost consciousness for about an hour but recovered on his way to the hospital. He was said to have bled from both nostril and from bruises he sustained around the glabella as well as fore

**Citation:** Omeje KU (2018): Management of naso-orbito-ethmoidal fractures with modification of the conventional closed technique. *Nigerian Journal of Dental and Maxillofacial Traumatology*; 1(1&2):23-26.

head regions. He also reported a history of discharge of clear fluid from the nostril for about 3 days.

There was a complain of difficulty in breathing when the mouth is closed. He had no other injury at any other part of his body. He had no medical history of note.

He has been working as an iron bender for about 6years. Smokes as well as consumes moderate volumes of alcohol occasionally.

### Management

He was transferred from the scene of the accident to a private hospital where he was resuscitated and transferred to our facility on the second day. The obvious clinical features were increased inter canthal distance, buckling of the frontonasal statures as well as blood clot which obliterated both nares. An impression of NOE was made and a neurosurgical review was also sought (figure).

Following the institution of supportive care, base line laboratory parameters were assessed and were found to be optimal for surgery under general anaesthesia (Haemoglobin concentration 12.2g/dl, platelet count  $220 \times 10^9/L$ , white blood cells  $6.1 \times 10^9/L$  urea 4.6mmol/L,  $Na^+$  130mmol/L,  $K^+$  3.8mmol/L,  $HCO_3^-$  22mmol/L,  $Cl^-$  90mmol/L, creatinine 92 mmol/L, RBG 5.5mmol/L). Computerized tomographic scan was done which confirmed NOE fractures. Patient was placed on Rocephin 1g daily for 5days) for cover against cerebrospinal meningitis, re-assessed and booked for surgery.

At surgery, orotracheal intubation was carried out, following which routine scrubbing and draping was done. The comminuted bones of the naso-orbito ethmoidal region was reduced using a combination of Walsham and Ashe's septal forceps. Size 12 nasogastric tubes (NG) was sectioned to obtain two 1.5cm tubings to assist the immobilization of the left and right sides

A 0.5mm soft stainless-steel wire was stretched and passed through one the NG tubes, one end of the projecting wire was then secured unto a maxillary awl and carefully passed through the posterior part of the nasal bone so to exit from the contralateral side. This same wire was then threaded through the second 1.5 cm NG tube and returned to the initial side like a horizontal mattress suture. The wire was then twisted to the initial wire at the entry point and tucked into the NG tube. This wire helps to compress the bone fragments against appropriately sized endotracheal tubes (ETT) which have been placed inside both nostrils and secured to length, while the NG tubes helps to create a wide surface contact area for the tension from the wires to exact its effect on maintaining

the reduction as well as preventing the wires from cutting through the skin (figure 2).

Following surgery, patients was monitored in accordance to the standard hospital policy for managing patients who had surgery under general anaesthesia. The implants were removed at the end of three weeks (figure 3). A post-operative CT was requested for but was not done as patient could not afford it. The post-operative result was acceptable to the patient and costed only about 10% of what it takes to have open reduction and internal fixation in our center.



Figure 1a



Figure 1b

Figure 1: (a) Pre-operative picture of a 25-year old man with naso-orbito-ethmoid fracture and (b) a 3D Computer tomographic image



Figure 2a



Figure 2b

Figure 2 (a and b): Immediate post-operative and 3-days post-operative photograph of patient in figure 1



Figure 3: Three weeks' post-operative photograph of patient in figure 1

## Discussion

High energy blunt or penetrating trauma is the most common aetiologic factor responsible for these injuries (Baril and Yoon, 2013; Rosenberger *et al*, 2013). These forces are commonly generated from motor vehicles or industrial accidents, assaults as well as falls from height. Other potential causes of NOE fractures which may be rare include neoplasms of the NOE region such as fibrous dysplasia or congenital deformities such as facial clefts (Milad *et al*, 2017).

The combination of clinical examination and CT scans have proven consistent as the best method to confirm diagnosis of NOE fractures (Sargent, 2007). Three-dimensional reconstruction CT is often very useful when combined with the traditional two-dimensional views since it offers increased accuracy especially in detecting these fractures as well as fractures of the piriform aperture (Remmler *et al*, 2005).

Patient with NOE fractures may complain of swelling around the region, double vision, inability to perceive smell as well as nasal obstruction. Clinically widening of the nasal bridge and the medial canthus may be obvious. Loss of nasal projection is often considered as the most consistent clinical finding (Milad *et al*, 2017).

Treatments is often delayed for 3-7 days to allow recession of oedema and the goal of treatment is the re-establishment of the nasal projection and the narrowing of the intercanthal distance (Milad *et al*, 2017).

There is a need for neurosurgical consultations for patients with NOE fractures, especially in cases where there is cerebrospinal fluid rhinorrhea (Ziu *et al*, 2012; Hasheminia *et al*, 2015). Neurosurgical review becomes even most important in cases where the cerebrospinal fluid rhinorrhea fails to stop after 7-10 days. This is often as a result of an extensive dura tear that may necessitate neurosurgical repairs.

Treatment with external plates and splints were once employed, however the discomfort complained by the patients as well as the unsightly appearance made the use of these appliances essentially historical. Most authorities advocate open reduction and internal fixation. Incisions used to access these fractures are mostly dictated by the concomitant injuries. The principle of treatment of NOE fractures remains essentially reduction and fixation using mini plate osteosynthesis. Closed management of NOE is not very common anymore especially following the advent of implants for midface rigid fixation. Cases with severe comminution of bone in which open reduction may lead to loss of bony fragments, devitalization of loosely attached fragments or

even infection have justified the need to master techniques for closed reduction of NOE fractures.

Although open reduction is noted to be superior to the closed reduction techniques, comminution of fractures as in the index case justifies the need for surgeons to also master the techniques of closed reduction of NOE fractures. The modification of the closed reduction as employed in the present case is not technique sensitive and obviates the use of POP splints which patients are often reluctant to tolerate.

To achieve expected results, two aspects of the technique presented must be aptly done; the passing of the awl through the glabella region from one side to the other must be careful carried out so as to navigate the awl through the comminuted bony segments ensuring that the tip is not directed cranial wards. This is aimed to prevent any form of intracranial injury as the passage of the wires is essentially by blind means. Another aspect is ensuring that the tubed wires are carefully adjusted to compress against the ETT which should be placed as high up to the glabella region as permissible. This compression will help to bring the bony fragments in favorable position for uneventful bony union.

### Conclusion

The modification of conventional technique of treatment of NOE with support from tubed wires are not only easy to perform but also produces an acceptable result as seen in the present case.

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