

Mandible fracture in children: a case report

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Abstract

The type of maxillofacial fractures in children and young adults varies with evolving skeletal anatomy and social and environmental factors. The general principles of treating mandibular fractures are the same for children and adults: Anatomic reduction along with rigid skeletal stabilization is mandatory until bone union has occurred. Here we present a female child with a fall trauma accident, presenting with fractures of the symphysis, horizontally and vertically unfavourable, with significant displacement. Open reduction and internal fixation with miniplates and screws was done, with good post-operative recovery and outcome.

Keywords: maxillofacial fracture, paediatric trauma, skeletal stabilization

Introduction

Only 5 to 15 % of all facial fractures occur in children and 1% in under five-year olds.^[1] The impact of facial trauma is minimized in children because their light weight, underdeveloped sinuses and small size. The force of impact is absorbed by the forehead and the skull rather than the face since the ratio of cranial volume to facial volume is greater in children than adults. Paediatric facial bones are more resistant to fractures due to their higher elasticity, poor pneumatization of sinuses, and stabilization of the mandible and maxilla by the unerupted teeth. Reported incidence rates of mandibular fractures in children have been fairly consistent in stating how infrequent these cases are. In several reports, motor vehicle accidents and falls were the most common causes of paediatric mandibular fractures.^[2]

Case Report

A 2-year-old girl and her mother reported to the Department of Maxillofacial Surgery in Katutura State Hospital with an ecchymosis on the lower lip, and abnormal movement on the symphysis area, haematoma on the vestibule sulcus of the mandible symphysis with displaced teeth after a fall (Figure 1).

On examination there was malocclusion and a step deformity in relation to the anterior part of the mandible. The child had no pain and the mother complained of the displaced anterior part of the lower jaw. The rest of the maxillofacial examination was normal. A simple postero-anterior view of the mandible was taken (Figure 2).

A CT scan was not ordered because of the patient's age and the amount of radiation that she would receive. Katutura hospital treats approximately 300 mandible fractures annually, which are the most common facial fractures in Namibia. So, we have accumulated experience in diagnosing them with simple resources using clinical examinations and X-rays, unless we face a very complicated fracture, as occurs in some motor vehicles accidents.

Treatment

Under general anaesthesia with nasotracheal intubation, the airway was secured. Local anaesthetic was injected into the vestibule sulcus of the lower jaw in order to reduce bleeding, and incision was made with mucoperiosteum dissection to expose the fracture

Care was taken to reduce the fracture and bring the teeth into occlusion. The



Figure 1. Clinical examination showing abnormal alignment of the anterior lower teeth and hematoma of the vestibule sulcus.



Figure 2. Posterior anterior view of the mandible, showing line of fracture in the symphysis area.



Figure 3. Reduced bone fracture and osteosynthesis.



Figure 4. Closure of the wound. Occlusion maintained with a wire and composite resin splint.

fracture was plated intraorally with a 4-holes steel plate (1.5 mm x 6 mm length) and 4 screws. (Figure 3).

Intra oral occlusion was maintained with the help of a temporary composite bonding splint on the vestibular surface of the teeth. Post wound closure, there was no mobility of the segments in the symphysis region (Figure 4).

Post-operative clinical examination confirmed healing of the wound and fracture, with no displacement of teeth or mandible fragments. The patient was regularly followed up and, after 6 months, the plates and screws were removed under general anaesthesia, to prevent any growing disorders. (Figure 5).

Post-operative X-rays were not ordered because the clinical progression of the patient was favourable, so in our opinion and experience this is not always needed, unless, after the surgical procedure, the patient feels discomfort, deformity or malocclusion due to malposition of teeth after reduction, osteosynthesis and immobilization. If the

patient progresses well postoperatively more radiation is not required.

Discussion

Paediatric mandible fracture is a rare compared with the number that occur among adults. Although the clinician who manages facial fractures may rarely encounter a paediatric mandible fracture, it is an injury that warrants a comprehensive discussion.^[3, 4] Because of the anatomy, dentition, and growth of a child, the management of a paediatric mandible fracture requires treatment ranging from a soft diet to open reduction and internal fixation.^[5]

Various factors need to be taken into consideration when treating a child, including age, compliance, anatomy of the fracture site, stage of growth, development of the teeth and bone and its potential to change, and complexity, complications and time elapsed since the injury.^[6]

Children heal faster with fewer complications because of the increased vascularity of the facial tissues. Also, growth

potential and increased adaptability favour repair of damaged orofacial tissues and restoration of function. But the presence of multiple tooth buds is a concern when treating paediatric patients.^[7]

A loose anchorage system due to attrition of deciduous teeth with physiological resorption of roots, unstable partially erupted secondary teeth and precarious dental stability in the mixed dentition stage further complicate treatment.^[8] Thus our aim for this patient was, within our limited resources, to restore the underlying bony structure to its pre-injury position as non-invasively as possible with minimal impairment.

Several treatment options have been described, such as: occlusal splints, orthodontic functional apparatus, and intermaxillary fixation when possible, acrylic splints, soft diet and physiotherapy, composite splints, craniofacial bandages, and maxillary screws for intermaxillary fixation. Any treatment should cause the least trauma and discomfort to the patient, always taking into consideration the age, dentition, and the classification of the fracture and its location.^[8, 9]

Clinical features of a fractured mandible in a child and adult are similar: pain, swelling, trismus, derangement of occlusion, sublingual ecchymosis, step deformity, midline shift, bleeding, temporo-mandibular joint problems, loss of sensation and movement restriction. Airway compromise is not frequent, because usually the degree of injury does not cause a huge displacement and the tissues are more elastic.

In the case of airway compromise, the patient should be assessed in coordination with general surgery, neurosurgery, and orthopaedics, to rule out other causes. We examine the mouth carefully, remove foreign bodies if present, and loose teeth which can be inhaled, aspirate secretions, suture the tearing of the soft tissues which causes bleeding, identify the fracture clinically by intraoral examination, and reduce it with local anaesthesia if possible. Sometimes there is no choice but to intubate the patient and once the patient is stable, order X-ray to confirm the diagnosis and bring the patient to theatre to do open reduction internal fixation, which is the best way to achieve stability of these fractures.^[6-8]

Imaging studies are not of much value in children. A panoramic radiograph may not be sufficiently conclusive due to poorly developed sinuses, presence of tooth buds and an underdeveloped cortex obscuring fracture lines. A computed tomography (CT) scan can be considered as gold standard as it improves diagnostic accuracy, but it is not always needed; experience in the field, pattern of fractures, classification of the fracture, age of the patient, cooperation, are factors to be taken in account to avoid unnecessary radiations and manoeuvres. Sometimes it is not necessary or possible to order a CT scan for a simple



Figure 5. Follow-up after 6 months Complete healing of the wound. Mandible fragments stable on clinical examination.

mandible fracture that can be diagnosed and treated with minimum resources.^[9, 10]

In children, depending on the type of fracture and stage of skeletal and dental development, the treatment modalities range from conservative, non-invasive through closed reduction and immobilization, to open reduction internal fixation. Usually conservative treatments are preferred, functional splints and other techniques can be used with very good results in coordination with orthodontics. Unfortunately, this could not be considered in this case for several reasons:

1. It was a very displaced fracture, unstable and very difficult to treat only with a splint, or functional orthodontic apparatus.
2. No prosthodontics or orthodontic specialist was available.
3. Circummandibular wiring it is a very traumatic technique for children with milk teeth.
4. Titanium micro plates or even absorbable micro plates could have been a good option but these were not available.

The developing tooth buds should not be damaged if the plate is correctly placed.

Normally all patients with fractures are followed up to determine if there were any discomfort or functional problems.

The calcification of the central permanent incisors takes from 3 to 12 months, the crown of the central and lateral incisor is completed at 5 years old, and the canine at 7 years old, so that at the time of the surgery were not even formed, and therefore very unlikely to be damaged with the plate and small screws.

So, the general principles of the management of maxillofacial trauma are similar in both children and adults, but the ongoing developmental changes in the

growing face of a child must be taken into consideration.^[11]

Adequate treatment of mandibular fractures should restore occlusion, function, and facial balance, and prevent complications such as growth disturbance and infection.

Mandibular fractures without displacement are managed by close observation, soft diet, and avoidance of physical activity. A dental splint can be made to immobilize the fracture in some cases, according to age.^[12] In case of displaced mandibular fractures, the best course of treatment is surgical exposure, reduction and bone osteosynthesis with plate and screws which guarantees accuracy concerning three dimensions, besides there is no need for intermaxillary fixation.^[13, 14]

A high metabolic rate and high osteogenic potential of the periosteum speeds up the reparative process resulting in early union of fractured segments. Slight occlusal discrepancies resolve spontaneously with bone remodelling and teeth eruption.^[15]

In some cases, it is not possible to use absorbable plates because they are expensive and difficult to manage, especially in very young patients. Titanium micro plates or miniplates are very useful but sometimes are not available in state hospitals. Stainless steel plates or titanium, should be removed a year after surgery to avoid restriction of the growing mandible.

Conclusion

The majority of paediatric facial fractures can be managed conservatively and this should be the goal considering the anatomical complexity of the developing mandible.

The controversy of open treatment versus closed treatment remains. In this case, the fracture was unfavourable displaced, so we used open reduction and internal fixation as the preferred option, with a composite resin splint in order to keep the teeth aligned on the upper border of the mandible.

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