

Management of Compound Mandibular Fractures with Miniplate and Monocortical Screws in 8-Year-Old Male Child: A Case Presentation

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Abstract: *The main differentiating feature of the paediatric mandible is its decreased size, which affects both the open reduction and internal fixation (ORIF). The cervically bulbous short stature primary teeth in the dental segment could pose a challenge for the traditional maxillomandibular fixation. The damaged area is more likely to consolidate and remodel quickly due to greater osteogenic potential of the bones. While stabilising the damaged segments, the mixed dentition of the ugly duckling stage increases the burden. Fracture management depends on the patient age, site, severity, and comorbidity. The main goal of the clinician is to achieve and restore the facial appearance and function. Hereby we present a 8-year-old male child with compound mandibular fractures with haematoma floor of mouth, right lower lip and chin laceration and he is managed by miniplate and monocortical screws fixation.*

Keywords: Mandibular fractures, Open reduction and internal fixation, Maxillomandibular, Miniplate, Monocortical

1. Introduction

Mandibular fractures in children are relatively rare, not only by their anatomical and physiological aspects, but also by their social factor, which makes this group less exposed to high-impact trauma [1]. Approximately half of all pediatric facial fractures involve the mandible [2] and boys are more commonly affected than girls by a ratio of 2: 1 and the majority of injuries occur in teenagers [3]. However, the mandible fractures in particular the condyle are commonest fractures in children requiring hospitalization and/or surgery. Fractures in the condylar region are followed in number by symphysis, angle, and body fractures, respectively [4, 5]. Moreover, the fractures of the body and angle are initially infrequent but increase with age [6].

Although much of the relevant technology is shared, the management of mandibular body fractures in children differs from that of adults due to concern for mandible growth and dentition development [7, 8]. Whereas absolute reduction and fixation of fractures is indicated in adults, concern for minimal manipulation of the facial skeleton is mandated in children. The small size of the jaw, existing active bony growth centers and the contained, overwhelmingly crowded deciduous teeth with permanent tooth buds located in great proximity to the mandibular and mental nerves, all significantly increase the therapy-related risks of pediatric mandibular fractures and their growth-related abnormalities [9]. Thus, the understanding of the surgical or treatment options is essential for making informed choices to best manage these injuries. Hereby, we present a clinical scenario of a 8-year-old male with right compound mandibular fracture, managed with miniplate and monocortical screws for ORIF.

2. Case Presentation

A8-year-old male child of weight 20kgs presented with compound mandibular fractures, admitted in the Department of Orthopaedics, at Owaisi Hospital and Research Centre, Hyderabad, Telangana. He experienced difficulty, and pain during mouth opening. The case history revealed that the

patient had a fall from the vehicle in which he travelled. On extraoral examination, haematoma floor of mouth, right lower lip laceration and chin laceration was seen. Intraoral examination revealed that his occlusion was deranged and also reduced mouth opening, in the mixed dentition phase. The patient was conscious, coherent, oriented, a febrile, cooperative, and with absence of vomiting or seizures (Figure 1a). There was no history of any co-morbidities, pre-hospitalisation and no history of any allergies. Child vaccinated only upto one and a half years of age, thereafter, not given vaccinations. He had normal S1 and S2 heart sound. Airway assessment could not assess due to hematoma and reduced mouth opening. Before fall no history of broken or loose teeth. Investigations include-Hb was 11.4g/l, WBC was 18600 per microliter, platelets were 3.9L, general random blood sugar (GRBS) was 155mg/dl, blood group was O+ve and viral markers were negative. Vital parameters were pulse rate-152bpm, bp-120/80mmhg, respiratory rate-18/min, Spo2-99% with fio2-0.3. Bronchial artery embolization (BAE) was done which was normal.

Three-dimensional facial computerized tomography (3D facial CT) revealed horizontally favourable fracture of right mandibular angle region (Figure 2). Clinical findings, 3D facial CT, and treatment plan were explained to the parents and informed consent was obtained. He was advised NPO for 6 hours before surgery. Urinary catheterisation was not done. Patient was pre medicated with inj glycopyrolate 0.2mg, inj ondansetron 2 mg, inj fentanyl 20mcg. After pre oxygenation patient was induced with general anaesthesia with inj propofol 40mg and sevoflurane and nasal intubation was attempted (Figure 1b). On direct laryngoscopy: Blood collected in the posterior nares was pushed along with the endotracheal tube into the epiglottic region blocking the vocal cords. More than 3 attempts were done but failed to intubate the patient. Suctioning was done with an anchor suction and the clot was removed. We then continued with face mask ventilation until saturations picked up and patient was given inj succinylcholine 25mg and intubated nasally under direct vision. Intraoral approach was done via retromolar incision in the right side. The fracture site was exposed in relation to right angle of mandible, reduced, and kept in occlusion. The fractured site was fixed with titanium

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miniplates of 2 mm, 4-hole straight plate with gap, and 2 × 8 mm four monocortical screws were used. Flap closure was approximated with 4-0 Vicryl. Hemostasis was achieved. Surgery was uneventful. Patient transferred from OT, after reversal of neuromuscular blockade for elective extubationi/v/o tongue fixation. Right nasopharyngeal ET Tube in situ, patient connected to MV-Pressure control mode with Fio2 0.3, PEEP 5 RR 16, PCAP 8cm H20. After observation for 24 hours and complete recovery and confirmation of no active bleeding, patient was extubated in

the CCU. Plan of care and prognosis were monitoring of vitals, I/O hourly 30-degree head end elevation, IVF-NS-60ml/hr, Foleys catheterisation, inj pan 20mg IV OD, injzofer 2mg IV TID, injpcm 300mg IV TID, ing tramadol 50mg IV Stat and BD, injpiptaz 2.25gm IV TID in 50ml NS, inj amikacin 250mg IV BD and injhydrocort 50mg IV TID was given. Intraoral wound healing was good followed by stable occlusion and improved mouth opening.



Figure 1: a) Preoperative clinical view; b) Nasal intubation



Figure 2: Three-dimensional facial computerized tomography (3D facial CT)

3. Discussion

Facial fractures in the pediatric age group generally account for about 5% of all facial fractures and this percentage drops considerably in those less than the age of 5 [10, 11]. Their incidence rises as children begin school and peaks during puberty and adolescence. A male dominance exists in all age groups [12, 13]. Haug and Foss 2000 report that less than 1% of all fractures occur inpatients younger than 5 years and 1-14.7% in patients younger than 16 years [14].

After the age of 5-7 years, rapid progression of neuromotor development results in a general desire for independent activity, more frequent social interactions with other children, and a wider range of activities outside of the house, with less stringent parental and adult supervision. These factors result in increased opportunity for direct facial trauma [1]. Thus, a protective social environment and supervision by parents play an important role in the pediatric facial bone injuries. The most common etiologies for facial trauma in the pediatric category are road traffic accidents, fall, sports injury, and interpersonal altercation. In the study of Atilgan et al (2010) falls were the most common cause of maxillofacial injuries in young patients, and the second most common cause was road traffic accidents [15]. However, studies from other parts of the world have reported that road traffic accidents were the leading cause of facial fractures in young adult patients [16]. In our case, the reason for the pediatric trauma was a fall from the vehicle in which he travelled.

For treatment of these accidents, Davison et al (2001) said that the risks of facial growth disturbance in the ORIF has not been supported [16]. In contrast, no treatment in unrecognized mandibular fractures leads to a high incidence of orthognathic surgery and craniofacial treatment. The potential damage to tooth roots and follicles can be minimized with a careful technique, which places bicortical screws in the lower mandibular border with monocortical screws placed in the more superior plates. Zimmerman et al. (2006) said that open reduction internal fixation (ORIF) provides stable three dimensional reconstruction, promotes primary bone healing, shortens treatment time and eliminates the need for or permits early release of maxilla mandibular fixation (MMF) [13].

Moreover, displaced mandibular fractures witnessed in the pediatric category are managed by ORIF. Modification of the miniplate protocol was developed by Champy and Lodde, [17] which was earlier presented by Michelet in 1973. Stable fixation is required in this stage in order to avoid further injury to the developing dentition and growth. The fractured segments of the bone undergo gradual consolidation and remodeling due to slow, gradual, and increased masticatory forces. The main advantages of ORIF are reduced treatment span, 3D reconstruction, and primary bone healing [18]. The fracture repair is controlled by age of the patient, site of fracture, severity of the condition, and the approach used [19]. The major advantage of intraoral approach is the absence of visible scar formation [20]. The ORIF plays an important role in restoration of the lost dental hygiene and dietary habits. Absence of intermaxillary fixation despite ORIF aids in reduced immobilization time, decreased

muscular atrophy in conjunction with improved oral hygiene measures, thereby leading to favorable healing period [21]. The handling nature of the metallic plates helps in the ORIF of displaced fractures [22]. Follow-up was done along with counselling of parents regarding futuristic growth-related disturbances, if any.

The treatment of pediatric fractures is perhaps one of the themes explored by the oral and maxillofacial surgery and one of the most contradictory. We believe that regardless of the methodology, minimized injuries should always be the choice. In our case, we chose a conservative treatment in compound mandibular fractures, a surgical treatment by anatomic reduction and minimally invasive rigid internal fixation, restoring occlusion with a maximum of fixation while preserving the tooth germs by means of smaller functional monocortical screws.

4. Conclusion

This case report describes an intra-oral approach to open reduction and internal fixation with titanium miniplates and monocortical screws of mandibular fractures in an 8-year-old male child. Open reduction internal fixation was chosen to allow for an earlier return to function and an intra-oral approach augmented by trans-buccal trocar. Care was taken during dissection to isolate the inferior alveolar nerve, and plates were shaped around it to protect it with the patient recovering without deficit. While not typically used for compound mandible fractures, an open reduction with miniplates was successful in this case.

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