Management of Symphysis Fracture in a 3-year-old Child With Prefabricated Acrylic Splint and Circum-mandibular Wiring

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ABSTRACT

Pediatric mandibular fractures are often the sequelae of facial skeletal injuries in patients with trauma and frequently require hospitalization. Due to the retrusive midface position relative to the calvarial prominence, facial fractures are rare in children younger than 5 years of age. Although rare, they most often occur as a result of motor vehicle accidents. The purpose of this report is to describe the management of a mandibular symphysis fracture in a 3-year-old boy with displacement between the primary mandibular left central and lateral incisors. The fracture was reduced and the fractured segment was stabilized under general anesthesia with a prefabricated acrylic splint with circum-mandibular wiring. Children have greater osteogenic potential and faster healing rates than adults; therefore, anatomic reduction in children is best accomplished earlier. (J Dent Child 2013;80(1):36-40)
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Children younger than 5 years of age have a lower incidence of facial bone injuries. This may be attributed to a retrusive midface positioning in relation to the calvarial prominence. Pediatric mandibular fractures are estimated to be approximately 5% of all facial fractures, and this percentage is decreased in children younger than 5 years.[1]

Parental supervision, child-friendly environments, and protective social situations do not predispose pediatric patients to serious injury.[2] The incidence and etiology of pediatric facial trauma, however, is affected to a great extent by age-related activity and social, cultural, and environmental factors.[3] The following factors contribute largely to mandibular stability and elasticity: the high elasticity of young bones, a thicker layer of adipose tissue covering them, a higher ratio of the cancellous bone compared to cortical bone, flexible suture lines during mixed dentition, and the lack of pnuematization of facial sinuses.[4] The most frequently occurring fractures in children necessitating surgical intervention and/or hospitalization are those involving the mandible, particularly the condylar region, followed by symphysis, angle, and body fractures, respectively.[5]

Facial trauma in children results most frequently from motor vehicle accidents (MVA), followed by falls, sports injuries, and interpersonal altercations. The management objective is to reestablish pretraumatic function and esthetics of the dentofacial complex with morbidity limitations without hampering future growth and development, and to minimize damage to the developing dentition.[6] Early treatment of the trauma is needed to facilitate reestablishment of the anatomic skeleton prior

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to injury in terms of form and function. Early reduction and fixation of the fractured fragments is mandatory to allow rapid healing and restoration of the normal function.[7]

Management techniques should be modified according to the child's particular stage of anatomical, physiological, or psychological development.[8] Technical advances in craniofacial surgical instrumentation and open reduction internal fixation have revolutionized management of midface injuries in children. Such treatment modalities, however, are not always applicable in all pediatric patients. Modifications are called for to suit individual needs.

The purpose of this case report is to describe a case of symphysis fracture in a 3-year-old boy who suffered an MVA causing displacement between the primary mandibular left central and lateral incisors. The fracture was treated by placing a prefabricated acrylic splint with circum-mandibular wiring under general anesthesia (GA).

CLINICAL REPORT

A 3-year-old boy reported to the Department of Pedodontics and Preventive Dentistry, M.R. Ambedkar Dental College and Hospital, Bangalore, Karnataka, India, with a history of a recent MVA. The patient was conscious and well oriented to time, place, and person, and had no history of convulsions or vomiting. Asymmetry of the lower third of his face was noted due to a shift of the mandible to the left side. An intraoral examination revealed an obvious mandibular fracture at the symphysis region involving the primary mandibular left central and lateral incisors, with the permanent central incisor tooth bud visible (Figure 1).

The fractured segment was mobile and tender on palpation. Thorough clinical and radiological examinations confirmed the fracture line traversing the primary mandibular left central and lateral incisors exposing the permanent mandibular left central incisor and the fractured line extending to the inferior border of the mandible. The presence of other fractures in the facial skeleton was ruled out (Figure 2).

After obtaining informed consent from parents, the child was admitted to the hospital for closed fracture reduction under GA with analgesics (ibuprofen 100 mg thrice daily, calculated based on child's age and kg body weight) and prophylactic antibiotic coverage to rule out any infection to the exposed bone and permanent tooth germ at the fracture site. Antibiotics used were cephalexin 125 mg thrice daily and metronidazole 200 mg thrice daily both for 5 days, calculated based on child's age and kg body weight. Intravenous propofol sedation was administered by the anesthesiologist in the operating room and an oral prophylaxis and alginate impressions of the upper and lower arches were obtained. The impressions were poured with stone plaster, and the casts made were sectioned along the fracture line. The sectioned mandibular cast was oriented

Figure 1. Fracture line with permanent central incisor seen.

Figure 2. Preoperative radiographs showing an antero-posterior view and lateral oblique view.

Figure 3. Fractured nonreduced casts.

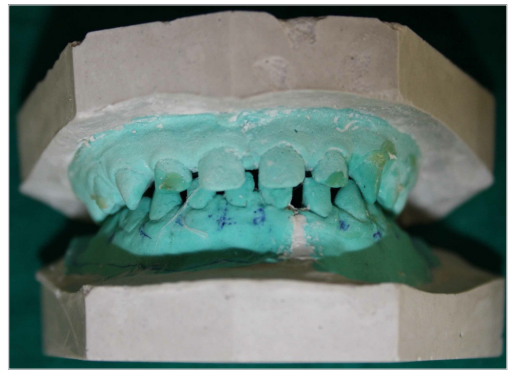

Figure 4. Reduced casts in occlusion.

to the maxillary cast to reestablish the pre-trauma occlusion and was refixed (Figures 3 and 4).

An acrylic splint was fabricated using the sprinkle-on technique with a 0.9-mm stainless steel wire (Dentaurum, Germany) incorporated into it for better stabilization and strength. The splint was trimmed and polished. Holes were incorporated in the acrylic splint for the circum-mandibular wiring. Under GA, the splint was secured in place and circum-mandibular wiring was placed using a bone awl with 26 gauge stainless steel wire (Figures 5 and 6). Postoperative occlusion and healing were found to be satisfactory (Figures 7 and 8). The splint was to stay for 3 weeks. Recovery was uneventful, and the patient was discharged after a 24-hour follow-up, with home care instructions provided for soft diet and maintenance of oral hygiene. Postoperative antibiotics and analgesics were prescribed as previously mentioned. The patient was recalled after 3 days following the fracture reduction, and the occlusion was rechecked and found to be satisfactory (Figure 9). The child was recalled on a weekly basis until the time of splint removal.

At the beginning of the fourth post-operative week, the splint was removed and satisfactory healing and occlusion were observed clinically (Figures 10 and 11). The consolidation of the fracture was also radiographically confirmed (Figure 12). The child's parents were reminded about the importance of recall visits to assess the normal growth and eruption of the permanent successors.

DISCUSSION

Treatment principles of pediatric mandibular fractures differ from treatment of the adult population in that the high osteogenic potential of the pediatric mandible allows nonsurgical management to be successful in younger patients when a conservative approach is advocated.[9] Management is also greatly dependent on the fracture type and the stage of skeletal and dental development.[10] If displaced, closed reduction and immobilization are performed. Immobilization methods depend on the child's chronological age and stage of dental development. Alternatively, new treatment modalities were tried using nickel titanium staples that were inserted, not osseointegrated. These staples were noninvasively placed in a relatively pain-free manner, and their eventual removal was quick. Due to their superficial location, there is little risk for inhibiting and deforming facial bone development or harming any proximal strategic structures such as nerves and developing dentition.[11]

Other studies have recommended that facial fractures be treated by using:

1. modified orthodontic brackets in maxillofacial mandibular fixation,[12,13]
2. an orthodontic resin for mandibular fixation in children,[14]
3. orthodontic rubber elastics in combination with fixed orthodontic brackets to create compressive horizontal force over the mandibular fracture site, from one site to the other,[15]

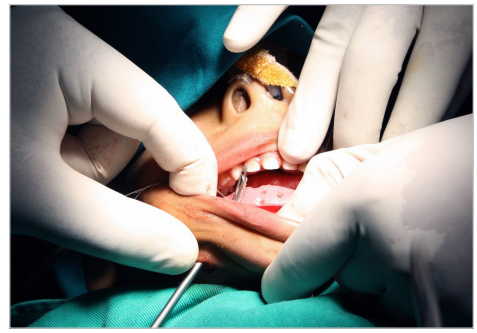

Figure 5. Circum-mandibular wiring using a bone awl.

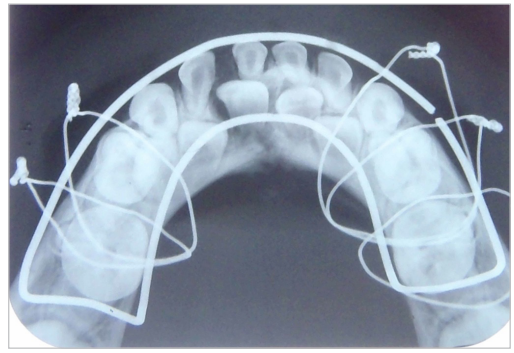

Figure 6. Immediate postsurgical occlusion with acrylic splint in place.

Figure 7. Occlusal radiograph taken 3 days postoperatively.

Figure 8. Radiograph taken 3 days post-operatively showing splint in place.

4. a modified orthodontic splint, where 2 orthodontic bands were fit on the primary second molars with rounded stainless steel wires soldered on the buccal and lingual side.[16]

The use of a custom-fabricated acrylic splint in this case was advocated because it was more reliable than open reduction and the intermaxillary fixation technique regarding its cost effectiveness, ease of application and removal, reduced operation time, maximum stability during the healing period, minimal trauma for anatomic structures, and comfort for young patients.[1] The acrylic cap splint provides support from the adjacent teeth and bone, and is easy and cheap to fabricate. These splints help stabilize mandibular fractures when used with circum-mandibular wires, as evidenced in this particular case. Furthermore, early reestablishment of pre-injury skeletal anatomy was essential to facilitate normal growth of the craniofacial complex.[7] This procedure was done mainly to minimize any ill effects, such as poor healing, malocclusion, and impending dentofacial deformity. A delay in the treatment would have rendered the fracture less amenable for adequate reduction.

Following splint placement, a strict dietary protocol and maintenance of oral hygiene were recommended. The child was advised to use a 0.2 % chlorhexidine mouthrinse; with the splint in place, it was difficult to brush the teeth for the first few days. Hard foods were to be completely avoided for the period of the splint placement. Long-term follow-up will be imperative to monitor the future eruption of the permanent dentition and assess any deviations in the normal growth of the mandible.

Figure 9. Photograph taken 3 days post-operatively showing occlusion with splint in place.

Figures 10 and 11. 4 weeks postoperatively.

Figure 12. Radiograph taken 4 week postoperatively showing healing after placing splint.

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