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Original Article

Management of pediatric mandibular fractures using bioresorbable plating system – Efficacy, stability, and clinical outcomes: Our experiences and literature review

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ABSTRACT

Aims: The purpose of this study was to determine the efficacy and stability of the biodegradable fixation system for treatment of mandible fractures in pediatric patients by measuring the bite force.

Methods: Sixty pediatric patients with mandibular fractures (36 males, 24 females) were included in this study. The 2.5-mm resorbable plates were adapted along Champy's line of ideal osteosynthesis and secured with four 2.5 mm diameter monocortical resorbable screws, 8 mm in length. All patients were followed for 10 months. Clinical parameters, such as soft tissue infection, nonunion, malunion, implant exposure, malocclusion, nerve injury, and bite force for stability, were prospectively assessed.

Results: Adequate fixation and primary bone healing was achieved in 100% of the cases. Six minor complications (10%) were observed: 2 soft tissue infections (3%), 1 plate dehiscence (2%), 1 malocclusion (2%), and 2 paresthesia (3%).

Conclusion: 2.5-mm resorbable plating system along Champy's line of ideal osteosynthesis is a good treatment modality for mandible fractures in pediatric patients.

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1. Introduction

Successful treatment of mandible fractures signifies an anatomic bony union with restoration of normal occlusion and function. Mandibular fractures may be either treated conservatively or with open reduction and internal fixation. The principles of management of mandibular fractures differ in children. While in adults, absolute reduction and fixation of fractures is indicated, minimal manipulation of facial skeleton is mandated in children. The goal of fracture management is to restore the underlying bony architecture to preinjury position, in a stable fashion, as noninvasively as possible, with minimal residual esthetic and functional impairment.

Most fractures are treated conservatively by splints with circummandibular wires and maxillomandibular fixation; but in unstable fractures, internal fixation using miniplates is required. Titanium plates have been the gold standard for internal fixation of mandible fractures.[1] Resorbable plating systems have been used for midface, craniofacial, and pediatric fracture cases. The purpose of this study was to determine the efficacy and stability of the biodegradable fixation system in the treatment of pediatric mandible fractures by measuring the bite force.

2. Methodology

Sixty children with mandible fractures, who reported to our outpatient department over a period of one and half years, were included in the study, irrespective of age, sex, caste, religion, socioeconomic status, and nature of injury. Inclusion criteria include normal healthy individuals with no debilitating systemic and bony diseases, and single, noncomminuted mandibular fractures (symphysis, parasymphysis, body, angle) where open reduction was indicated (Fig. 1). An informed consent was obtained from their parents prior to their enrollment in the study. Exclusion criteria include infected fracture site, undergoing steroid therapy, pathological fracture, and concomitant condylar, coronoid fractures, and midface fractures.

Pediatric patients having mixed and permanent dentition in the age range of 8–15 years were included in the study. Preoperative detailed history was recorded. Careful examination of the soft tissues and underlying facial skeleton excluded any other associated injuries. Radiographs (Fig. 2) and routine blood investigations were advised and parents were informed of the treatment plan. Prophylactic antibiotic coverage and analgesics were prescribed. Mean duration between injury and surgery was 2 days.

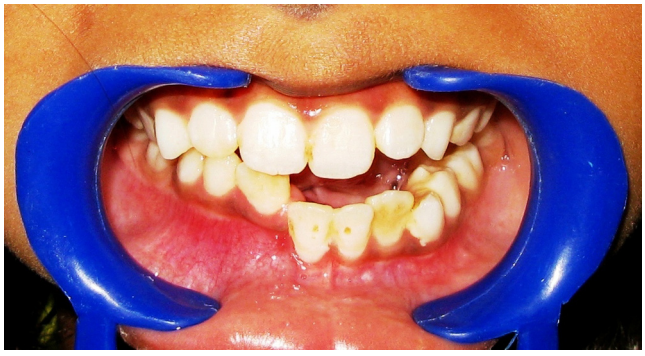

Fig. 1 – Intraoral view of fracture and deranged occlusion.

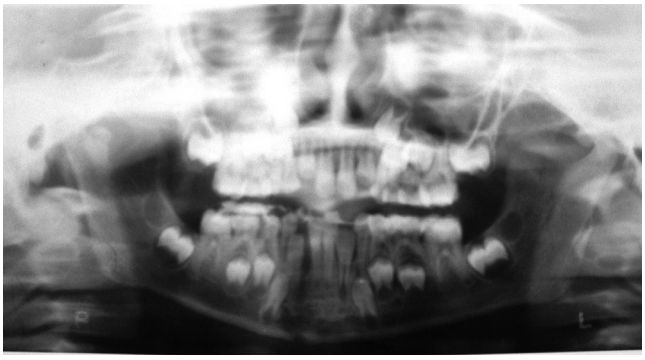

Fig. 2 – Preoperative O.P.G.

Nasotracheal intubation was done and all fractures were treated under general anesthesia. Fractures were treated either intraorally with vestibular/mucosal incision or extraorally through existing traumatic scar. Extraction of teeth in the line of fracture was performed if the tooth was fractured, periodontally involved, nonrestorable, grossly carious, or interfering with reduction of fracture, or occlusion. Either a splint was made after impression or interdental eyelet wiring was done prior to surgery.

Ideal occlusion was achieved using maxillomandibular fixation, and fractures were reduced. 2.5-mm INION – CPS plating kit was used for plating (Fig. 3 and 4). A four-hole resorbable plate was adapted along Champy's line of ideal osteosynthesis after being immersed in a sterile water bath at 55 °C for 15 s, and was secured with four 8 mm length, 2.5 mm diameter monocortical screws, using a drill–tap–screw sequence (Fig. 5). Care was taken to place the screws lateral to roots and superior to neurovascular bundle, with a minimum of two screws in the proximal and distal segments of the fracture. Interforaminal fracture involving symphysis and parasymphysis was fixed with 2 four-hole resorbable plates. The area was irrigated and closed with resorbable sutures. All patients received a postoperative course of intravenous antibiotics and chlorhexidine oral rinse upon discharge. A short-term postoperative IMF for 2 weeks was done. Patients were followed for bite force, temporo-mandibular joint function, esthetics, and complications if any.

2.1. *Bite force recording*

Bite force recordings were made using indigenous Bite Force Recorder, designed at Research Design and Standard Organization, Lucknow. The recorder consists of four strain gauges mounted on steel bar forming a wheatstone bridge. Load changes in steel bar produces measurable voltage changes across the strain gauges, which were converted into the kilogram force (kp). Bite forces were recorded at the bilateral molar region and incisor region.