An Alternative Method of Intermaxillary Fixation for Simple Pediatric Mandible Fractures

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Purpose: Mandibular fractures represent a substantial portion of facial fractures in the pediatric population. Pediatric mandibles differ from their adult counterparts in the presence of mixed dentition. Avoidance of injury to developing tooth follicles is critical. Simple mandibular fractures can be treated with intermaxillary fixation (IMF) using arch bars or bone screws. This report describes an alternative to these methods using silk sutures and an algorithm to assist in treating simple mandibular fractures in the pediatric population.

Patients and Methods: A retrospective chart review was performed and the records of 1 surgeon were examined. Pediatric patients who underwent treatment for a mandibular fracture in the operating room from 2011 to 2015 were identified using *Common Procedural Terminology* codes. Data collected included age, gender, type of fracture, type of treatment used, duration of fixation, and presence of complications.

Results: Five patients with a mean age of 6.8 years at presentation were identified. Fracture types were unilateral fractures of the condylar neck (n = 3), bilateral fractures of the condylar head (n = 1), and a unilateral fracture of the condylar head with an associated parasymphyseal fracture (n = 1). IMF was performed in 4 patients using silk sutures, and bone screw fixation was performed in the other patient. No post-treatment complications or malocclusion were reported. Average duration of IMF was 18.5 days.

Conclusions: An algorithm is presented to assist in the treatment of pediatric mandibular fractures. Silk suture fixation is a viable and safe alternative to arch bars or bone screws for routine mandibular fractures.

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Facial fractures are less common in the pediatric population for different reasons, including less mineralized and more malleable bone, larger fat pads, and open, compliant sutures.[1] The mandible and maxilla are further stabilized by the presence of unerupted dentition. In addition, there are more safeguards in place, such as parental supervision and less risky activity.[2] Pediatric facial fractures account for approximately 15% of all facial fractures; however, there appears to be an increased incidence in the older

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pediatric population (12 to 18 yr of age) from interpersonal violence, sports, and recreational vehicle use.[1-3]

The incidence of pediatric mandibular fractures varies widely in the literature, with published studies reporting 20 to 50% of all pediatric facial fractures.[1,4] Data show that most mandibular fractures occur in patients older than 6 years. One explanation is the higher cranial-to-facial ratio in the younger group, providing anatomic protection.[4,5] Management of mandibular fractures in pediatric patients with primary or mixed dentition provides a unique challenge. In addition to restoring preinjury function, care must be taken to choose a treatment technique that minimizes morbidity for future skeletal growth and dental development. Conservative treatment should be chosen whenever possible, and open reduction and internal fixation (ORIF) should be used only when necessary. Respectable outcomes can be achieved by any technique providing return of preinjury occlusion and short-term immobilization with intermaxillary fixation (IMF).

Surgeon preference plays the main role in the determination of which method is ultimately used. Guidelines regarding indications for each method of IMF do not exist. An algorithm for the management of mandibular fractures in pediatric patients during primary or mixed dentition is proposed in addition to a small case series. In addition, a simple alternative method of IMF using silk suture ligatures is described.

Patients and Methods

After institutional review board approval, a retrospective chart review was conducted through the records of 1 surgeon (K.B.P.) in the Division of Plastic and Reconstructive Surgery at the Washington University School of Medicine (St Louis, MO). All patients with primary and mixed dentition who underwent treatment for a mandibular fracture in the operating room from 2011 to 2015 were identified using *Common Procedural Terminology* codes. Data collected included age, gender, type of fracture, type of treatment used, time to return to the operating room for device removal, preoperative radiography used, and complications. All follow-up examinations included assessment of occlusion and incisal opening.

IMF Surgical Technique Using Suture or Bone Screws

Ability to obtain preinjury occlusion is examined under general anesthesia. If obtained, then 0 silk sutures (Ethicon, Inc, Somerville, NJ) are tied around individual erupted molars and canines in the mandible and maxilla. Centric occlusion is obtained and the silk sutures are tied tightly to each other (Fig 1). Suture removal is performed in the operating room after the fracture has healed clinically.

For fixation with IMF bone screws, preoperative imaging is used to identify positions of permanent and deciduous dentition; appropriate screw locations are chosen to avoid injury to dental structures. Self-drilling, self-tapping bone screws are placed, 2 within the mandible and 2 within the maxilla. Pre-stretched 25-gauge wires are used to fix the patient into centric occlusion.

Results

Five patients with primary or mixed dentition who underwent treatment of an uncomplicated mandibular fracture with silk sutures or bone screws were identified. The mean age of these patients was 6.8 years (range, 4 to 10 yr). Three patients were boys. Three patients had unilateral fractures of the condylar neck, 1 patient had bilateral fractures of the condylar head, and 1 patient had a unilateral fracture of the condylar head with an associated parasymphyseal fracture (Table 1).

IMF was performed using silk sutures (n = 4) and bone fixation screws (n = 1). One patient required silk sutures and ORIF using a resorbable plating system (Delta, Stryker Craniomaxillofacial, Kalamazoo, MI) because of a displaced parasymphyseal fracture. Total immobilization time with IMF ranged from 11 to 21 days (mean, 17 days). There were no postoperative complications reported. Preinjury occlusion was obtained in all patients with eventual return to normal preinjury incisal opening.

Report of Cases

CASE 1

A 9-year-old girl had a right comminuted mandibular condyle fracture from a motor vehicle collision (Fig 1). The patient underwent IMF using 0 silk ties to the canines, premolars, and molars bilaterally on the maxilla and mandible. Centric occlusion was obtained. The silk sutures were removed after 2 weeks and the patient remained on a soft, non-chew diet. At 2-month follow-up, the patient continued to report preinjury occlusion.

CASE 2

A 5-year-old boy sustained a left parasymphyseal fracture and a right condylar fracture as an