The Lingual Splint: An Often Forgotten Method for Fixating Pediatric Mandibular Fractures

Abdulaziz Binahmed, *BDS, MDent, FRCD(C);* ***Claudio Sansalone,*** *DDS;*
Justin Garbedian, *DDS;* ***George K.B. Sándor,*** *MD, DDS, PhD, FRCD(C), FRCSC, FACS*

Auteur-ressource

Dr Sándor
Courriel : *george.sandor@utoronto.ca*

SOMMAIRE

Les fractures maxillofaciales sont peu fréquentes chez les enfants, et leur traitement est unique en raison des caractéristiques particulières des enfants sur le plan de la psychologie, de la physiologie, du développement et de l'anatomie. Nous présentons le cas d'un garçon qui a été traité dans une clinique dentaire externe, à l'aide d'un jumelage lingual utilisé pour la réduction, la stabilisation et la fixation d'une fracture du corps mandibulaire. Il s'agit d'une technique fiable et non invasive que les dentistes pourraient envisager dans certains cas, en dirigeant leur patient vers un spécialiste en chirurgie buccale et maxillofaciale. Qui plus est, cette technique limite l'inconfort et la morbidité pouvant être associées à la fixation maxillo-mandibulaire ou à la réduction ouverte avec fixation interne, chez les patients pédiatriques.

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Maxillofacial fractures are uncommon in the pediatric population. Although the etiological factors and clinical manifestations of these injuries are similar to those in adult patients, treatment in the pediatric patient is unique due to the psychological, physiological, developmental and anatomical characteristics of children. The mandible is one of the most common sites of facial bone fractures in adults and children.[1–4] In treating such fractures, the objective is to re-establish pretraumatic function and esthetics of the dentofacial complex with limited morbidity, without hindering future growth and development and without damaging the underlying developing dentition. This is achieved by reduction of the fracture site to its original anatomical alignment followed by stabilization with fixation. In this report, we present a case of a displaced mandibular body fracture in a pediatric patient who was treated in a dental clinic using a noninvasive method of reduction and fixation.

Case Report

An otherwise healthy, 11-year-old boy was referred to the oral and maxillofacial surgery service with a right mandibular body fracture. The patient reported that the injury was sustained 3 days earlier when he fell off a dirt bike while wearing a helmet. The patient denied any loss of consciousness. He had noticed a change in his occlusion, which had been assessed at another tertiary care hospital by surgical professionals without dental training. A closed reduction with maxillomandibular fixation had been recommended, but not carried out due to a shortage of inpatient beds at the institution. The patient was subsequently seen at 2 other hospitals, but was not treated because of a lack of hospital beds.

Figure 1: Preoperative occlusion with posterior open bite on the left side.

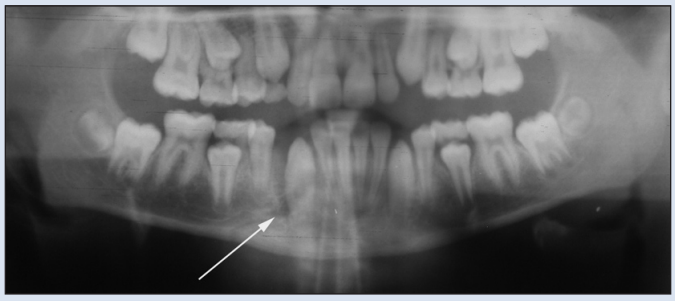

Figure 2: Panoramic radiograph with arrow indicating an oblique right mandibular body fracture.

Figure 3: Occlusal radiograph with arrow showing the fracture posterior to the right mandibular permanent canine and in front of the first premolar with lingual displacement of the posterior segment of the mandible.

Figure 4: Lingual splint positioned on the reduced fracture on the mandibular model.

Figure 5: Lingual splint in position after reduction of the mandible.

On examination, the patient had a normal facial profile with no swelling and no neurovascular deficits. He had mild trismus, sublingual ecchymosis in the right mandibular premolar region, a step deformity at the mesial aspect of the mandibular right first premolar and a mucosal laceration of the lingual gingiva caused by the sharp edge of the fractured mandibular bone. A malocclusion was observed, consisting of left posterior open bite and premature contact in the right first molar area (**Fig. 1**). Panoramic and occlusal films revealed an oblique fracture of the right mandibular body between the canine and first premolar (**Figs. 2** and **3**).

The clinical findings and diagnosis were explained to the patient and his parents with the recommendation that the fracture be treated with closed reduction and splint fixation, using a lingual acrylic splint applied in an outpatient setting. Nitrous oxide sedation was administered using a nasal mask and local anesthetic was infiltrated around the fracture site. A 2-step procedure was then followed.

First, maxillary and mandibular impressions were taken using alginate impression material. Casts were prepared immediately, and the mandibular cast was cut into 2 pieces at the fracture line and reassembled to articulate with the maxillary dentition in the best occlusion. The 2 pieces were luted together with sticky wax. A simple lingual splint was constructed in the laboratory using Duz-All acrylic material (Coralite Dental Products, Skokie, Ill.). Holes were drilled in the splint at each interdental space to facilitate the insertion of circumdental wires. The splint was polished and delivered to the patient (**Fig. 4**).

The fracture was reduced using a bimanual maneuver under nitrous oxide sedation. The splint was inserted on the lingual aspect of the mandible and secured using 25-gauge wires that passed from the splint holes to the corresponding interdental spaces, then around each erupted tooth. The wires were tightened, cut and turned down (**Fig. 5**). A postoperative radiograph was taken to confirm satisfactory reduction of the fractured mandible. The patient recovered from the procedure and postoperative antibiotics were continued. Analgesics and a soft diet of puréed food were also prescribed.

The splint was removed 4 weeks later as the patient's occlusion was stable (**Fig. 6**). At follow-up 3 months after the procedure, the patient had no complaints and examination revealed a satisfactory occlusion (**Fig. 7**).

Figure 6: View of patient's occlusion 4 weeks after splint removal.

Figure 7: Occlusal radiograph showing the well-aligned, healed mandible. The arrow indicates the site of the fracture.

Discussion

Mandibular fractures in children constitute the third most common facial bone injury in the maxillofacial region following dentoalveolar and nasal fractures.[1–4] These patients must be carefully assessed, as significant associations have been reported between pediatric mandibular fractures and other maxillofacial injuries, head injuries and systemic injuries. Jones and colleagues[5] reported other associated injuries in 76% of their patients; approximately 24% of the patients had intracranial injuries, 24% had fractures in the extremities, 16% had thoraco-abdominal trauma and 12% had concomitant skull fractures.[5] Assessment of these injuries requires a proper history of the injury and a thorough physical examination. On examination, the presence of facial swelling, trismus, hematoma, paresthesia, malocclusion, mobility of fragments and tenderness are all signs of mandibular fracture. In addition to the clinical examination, radiographs — including panoramic, occlusal, lateral oblique, Town's views and computed tomography scans — are important to confirm and delineate these fractures.[6]

The treatment of mandibular fractures in the pediatric population is challenging, and several factors play a role in treatment planning. In terms of psychological factors, treating a pediatric patient in the operating room under general anesthetic followed by admission to an intensive care unit would cause significantly more stress and anxiety to the patient and parents, compared with the treatment modality used in this case. The lack of hospital resources may increase the stress, if the patient's family must seek help for their child elsewhere. In addition, physiological differences between adult and pediatric patients mandate the timely treatment of mandible fractures as healing is very rapid in the pediatric patient. This case illustrates how the shortage of health care facilities and operating room time delayed the treatment of an injured child.

The use of open reduction and internal fixation of mandibular fractures in pediatric patients may not always be necessary. In the pediatric patient, open reduction may pose a risk by affecting dental development and facial growth. Developing tooth buds are easily injured by placement of screws required for rigid fixation. A significant volume of the soft bony structure of the mandible in a child is occupied by the developing tooth buds, which limits the placement of stable and rigid screws.[1]

Many different forms of splints are used in oral and maxillofacial surgery. Splints are regularly used in orthognathic surgery, temporomandibular joint surgery and dentoalveolar procedures, such as placing dental implants. Gunning splints or dentures that can occasionally function as gunning splints can be used in selected cases to treat edentulous mandibular fractures.

Hofer first described the mandibular lingual splint in 1939.[7,8] In 1973, Hardin[9] reported a case of a triple mandibular fracture that was treated with a lingual splint and maxillomandibular fixation. He reported that the lingual splint technique was not original, although he did not find it described in the literature. Irby[10] also described the lingual splint under the category "simple splints," and he recommended its use in reduction and stabilization of displaced dentoalveolar fractures in children. This technique is not new in the treatment of mandible fractures. Health care providers should be mindful of the possibilities of using a lingual splint, although some may have forgotten its applicability. Surgeons without a dental background may find this simple technique difficult, and a dental consultation would be helpful in this situation.

The lingual splint can be used in many cases without the need for maxillomandibular fixation or wiring of the jaws. The use of a lingual splint might also obviate the need for open reduction and the possibility of harming the developing dentition while drilling the holes in the mandible needed for the application of invasive hardware. The use of a splint may also allow treatment in an outpatient setting without the need for general anesthetic or hospital admission. In the setting of increasingly inadequate hospital resources, this technique may become more popular.

As a caveat, parasymphyseal and body fractures of the mandible can be challenging to reduce. Practitioners must follow up with close radiographic control to check on the maintenance of the reduction of the fracture by the lingual splint. Frequent follow-up visits are important to ensure compliance with soft-diet instructions. Referral to a more experienced practitioner is mandatory if the reduction does not continue to be satisfactory using this approach.

This case report demonstrates that the use of a lingual splint in the stabilization and fixation of a mandibular body fracture is a reliable and noninvasive procedure that dentists could consider in selected cases through referral to an oral and maxillofacial surgeon. A lingual splint limits the dis-

comfort and morbidity that may be associated with maxillomandibular fixation or open reduction and internal fixation in pediatric patients.

THE AUTHORS

Dr. Binahmed *is fellow, pediatric oral and maxillofacial surgery, The Hospital for Sick Children, University of Toronto, Toronto, Ontario.*

Dr. Sansalone *is chief resident, division of oral and maxillofacial surgery and anesthesia, University of Toronto, Toronto, Ontario.*

Dr. Garbedian *is resident, division of oral and maxillofacial surgery and anesthesia, University of Toronto, Toronto, Ontario.*

Dr. Sándor *is clinical director, graduate program in oral and maxillofacial surgery and anesthesia, Mount Sinai Hospital, coordinator, pediatric oral and maxillofacial surgery, The Hospital for Sick Children and Bloorview Kids Rehab, professor of oral and maxillofacial surgery, University of Toronto, Toronto, Ontario, and docent in oral and maxillofacial surgery, University of Oulu, Oulu, Finland.*

Correspondence to: *Dr. George K.B. Sándor, The Hospital for Sick Children, S-525, 555 University Ave., Toronto ON M5G 1X8.*

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