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CASE REPORT
Craniofacial/Pediatric

Pediatric Mandibular Fracture Management: Intraoperative Thermoplastic Splint Fabrication and Circummandibular Wires, without Maxillomandibular Fixation

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Summary: Management of mandibular fractures often involves the use of maxillomandibular fixation (MMF) to attain immobility of the fractured segments. This can be used as a primary treatment modality or as an adjunct in fracture management. This technique, however, has its drawbacks due to the great burden of care imposed on patients. In the following case, fixation of a pediatric open mandibular body fracture was attained without the use of MMF, and bone union was achieved. Due to age, safety concerns, long-distance travel, and parent's preference, the routine management of this type of fracture with MMF using piriform aperture drop wires and circummandibular wires was not done. Instead, the fracture was reduced, and an intraoral mandibular impression was taken in the operating room, which was used to create a stone model. A 2-mm acrylic splint was designed and fabricated from the stone model, and two circummandibular wires were placed. The wires were tightened over the acrylic splint to achieve stabilization of the mandibular reduction. At 4 weeks postoperatively, the splint was removed, and the patient was maintained on a soft diet. At 6 weeks, bone union was appreciated clinically by immobility of the mandibular segments, and the patient was advanced to a regular diet. Occlusion was corrected to premorbid state by clinical findings and 6 months postoperative imaging. This technique represents an effective approach in managing pediatric mandibular fractures when MMF cannot be used. *(Plast Reconstr Surg Glob Open 2024; 12:e5883; doi: 10.1097/GOX.0000000000005883; Published online 7 June 2024.)*

The management of pediatric mandibular fractures is based on severity, and ranges from conservative treatment with liquid diet to open reduction internal fixation.[1] Conservative management is usually preferred during mixed dentition due to the high osteogenic potential of the pediatric mandible and to avoid growth impairment related to fibrosis and devascularization of the permanent tooth buds. Maxillomandibular fixation (MMF) is often used either as a primary treatment modality or as an adjunct in fracture management. Traditional MMF uses piriform aperture drop wires and circummandibular wires to achieve fixation. Nonetheless, the use of MMF in pediatric populations causes a relatively high burden for the patient and family, and is usually not easily tolerated. To alleviate the burden MMF imposes in a subgroup of displaced, noncomminuted fractures, alternative mandibular splinting modalities have been proposed.[2–5] Nevertheless, these splinting modalities are not part of the standardized pediatric mandibular fracture treatment algorithms, despite the fact that literature supporting splinting exists.[1,6,7]

In the following case, a custom-molded acrylic splint and circummandibular wiring was used successfully for the treatment of a displaced mandibular body fracture. The acrylic splint was done without MMF and allowed the patient to retain full mobility of the jaw while on a soft diet. This case affirms previous literature in demonstrating the usefulness of splinting in mandibular fracture

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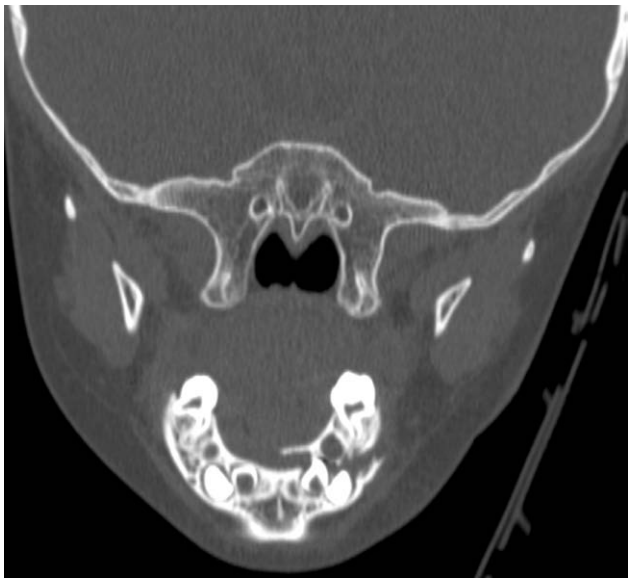

Fig. 1. CT scan demonstrating left displaced anterior mandibular body fracture and a nondisplaced fracture of the right mandibular ramus.

management. Description of refinements for ease and efficiency of splint fabrication is also presented.

METHODS

A 2-year-old male child was admitted with a left displaced anterior mandibular body fracture (Fig. 1) and a nondisplaced fracture of the right mandibular ramus. [**See figure, Supplemental Digital Content 1,** which displays a computed tomography (CT) scan demonstrating nondisplaced fracture of the right mandibular ramus. **http://links.lww.com/PRSGO/D272**.] The fracture pattern was diagnosed using CT scan. Due to age, safety concerns, long-distance travel, and parent's preference, MMF was not used. Instead, in the operating room, the patient was put under general anesthesia via nasotracheal intubation, and the fracture was manually reduced. A temporary circumdental wire was used to hold the reduction in place while an alginate impression was taken. (**See figure, Supplemental Digital Content 2**, which displays a temporary circumdental wire used during alginate impression, removed immediately afterward. **http://links.lww.com/PRSGO/D273**.) Adequate reduction of the fracture was confirmed through direct visualization of the anterior cortex through the gingival laceration and digital palpation of the posterior cortex. Normal occlusion was achieved. The impression was used to create a stone model using an immediate technique with the assistance of a pediatric orthodontist present during the case. During this time, a 2-mm thermoplastic splint was designed and fabricated from the stone model (Fig. 2). The total time from taking the impression to having the splint available for placement was approximately 30 minutes. The splint was secured to the lower dental arch using the previously placed circummandibular wires to maintain the mandibular fracture reduction (Fig. 3). Initially, the patient was

Fig. 2. The 2-mm thermoplastic splint that was custom designed and fabricated from a stone model.

Fig. 3. Intraoperative view showing the splint secured to the lower dental arch using circummandibular wires.

placed on a liquid diet for 2 weeks with the splint in place. At the 4-week follow-up, the splint was removed, and the patient was advanced to a soft diet for 2 additional weeks. There were no issues with patient compliance with the splint. Stable reduction with normalization of the occlusion could be appreciated clinically (Fig. 4).

It should be noted that informed consent was obtained for the procedure in addition to pre-, intra-, and postoperative photographs. The patient's guardians agreed to the use of the photographs for publication.

Fig. 4. Intraoperative view after removal of the thermoplastic splint showing stable reduction with normalization of the occlusion.

RESULTS

At a 6-week follow-up appointment, bone union was confirmed clinically by immobility of the mandibular segments, and the patient was advanced to a regular diet. Occlusion was corrected to premorbid state by clinical findings. This was maintained at 7 months follow-up and confirmed with postoperative radiographic imaging. No complaints were reported by the patient or parents at any of their follow-up visits.

DISCUSSION

Current literature regarding the use of acrylic splints for pediatric mandibular fractures is limited. However, several articles reported the use of open cap splints and lingual splints in a subset of mandibular fractures. These articles report good outcomes with the use of acrylic splints for mandibular fixation, noting them to be a cost-effective method for mandibular fractures requiring closed reduction.[2,3,8,9] The use of acrylic splints can reduce operative time. They are easy to apply and remove, provide good stability during the healing period, and are less invasive than traditional MMF.[10] Compared with traditional MMF, the use of an acrylic splint could impose less cost to the patient, though each is typically billed to the patient's insurance. Clear advantages over traditional MMF include maintenance of mouth mobility throughout the healing process. Limitations include the presence of comminution, inability to obtain adequate reduction, or unstable reduction once the splint has been applied.

Ideally, an onsite craniofacial orthodontist would fabricate the splint intraoperatively, but any trained personnel could potentially create this splint from a plaster or three-dimensional mold. Intraoral scanning combined with three-dimensional printing of the splint offers a promising future direction for splint design and application. This advancement could potentially eliminate the necessity for an onsite craniofacial dentist.

The application of this splint should be limited to simple symphyseal, parasymphyseal, and mandibular body fractures. This splint should be used with caution in comminuted fractures because it might not provide adequate stability of the reduction. Fractures involving the mandibular angle, ramus, or condyle would likely not be adequately managed by this method because the fixation mechanism does not overlap the fracture site.

In conclusion, the use of acrylic splints can be an effective method of simple symphyseal, parasymphyseal, or mandibular body fracture management, as it lessens the burden of care compared with traditional MMF. The use of acrylic splinting could be considered as a treatment option for these specific pediatric mandibular fractures.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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