A Method for Direct Fabrication of a Lingual Splint for Management of Pediatric Mandibular Fractures

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Summary: Pediatric mandibular fractures have successfully been managed in various ways. The use of a lingual splint is one such option. The typical indirect method for acrylic lingual splint fabrication involves obtaining dental impressions. Dental models are produced from those impressions so that model surgery may be performed. The splint is then made on those models using resin powder and liquid monomer in a wet laboratory and transferred to the patient. Obvious limitations to this technique exist for both patient and operator. We present a technique for direct, intraoperative, fabrication of a splint using commercially available light-cured material that avoids some of the shortcomings of the indirect method. Recommendations are made based on available material safety information. (Plast Reconstr Surg Glob Open 2013;1:e51; doi:10.1097/GOX.0b013e3182aa876e; Published online 18 October 2013.)

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Techniques using arch bars, orthodontic appliances, and acrylic splints have previously been described and shown to be effective in treating pediatric mandibular fractures.1–4 The usual (indirect) “powder and liquid” method for acrylic lingual splint fabrication involves taking impressions to produce dental models. Model surgery is performed on the casts to treat posttraumatic malocclusion. A splint is then made using acrylic resin powder and liquid monomer on the surgerized casts and transferred to the patient. The splint is wired into place to maintain the reduced segments and preserve occlusion during healing.

We present a technique for direct fabrication of a splint using light-cured material, commercially available as Triad TranSheet VLC (Denstply International, York, Pa.). Recommendations are made having reviewed available material safety information.

Two cases are presented as online-only supplemental material (Supplemental Digital Content 1, http://links.lww.com/PRSGO/A11).

TECHNIQUE

The patient receives a general anesthetic via nasal endotracheal intubation. After preparation and draping, fracture segments are manipulated and mandibular and maxillary teeth are held in proper occlusion while under direct visualization. The mouth is opened while the operator maintains segment position and a piece of Triad Tru Tray acrylic is sized and folded to double thickness, for strength, by a second operator. Approximately one-third the

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width of acrylic is placed over the occlusal surfaces, whereas the remaining two-thirds hang lingual to the dentition. The mandibular and maxillary teeth are then reoccluded under direct visualization. The uncured resin between maxillary and mandibular teeth is polymerized with a handheld dental curing light for 30–60 seconds or until rigid and then moved to the next section of uncured material. Once the acrylic has been cured between upper and lower teeth, it functions as a semirigid occlusal splint and allows for the mouth to be opened while aiding in maintaining reduced segment position. The penetration of light is insufficient to cure material lingual of the dentition with teeth closed and remains pliable. A lingual flange is fashioned with a finger and polymerized with the curing light (Figs. 1A, B). The splint that is rigid now is removed and polymerized as per manufacturer’s instructions in a light-curing carousel. During this time, the mouth is irrigated and mucosa inspected for signs of contact sensitization. Once fully polymerized, the splint is trimmed, washed, inserted, and wired into position with an awl (Figs. 2A, B).

DISCUSSION

Although most pediatric facial trauma involves soft tissue and dental structures, 6,7 facial bone fractures are common. The most commonly fractured facial bone in children is frequently reported as the mandible.7–11 The presence of the developing tooth buds within the mandible influences occurrence, location, characteristics, and management of pediatric mandibular fractures.

Various methods have been described for managing pediatric mandibular fractures. For minimally or nondisplaced fractures without significant malocclusion, diet modification and close observation can be highly effective.9,12,13 With significant displacement, mobility of segments and/or malocclusion, reduction of segments, and retention of reduced segments in position become necessary.

Arch bars are typically avoided due to unfavorable tooth shape for interdental wire placement and retention of the bar with primary teeth. Skeletal fixation wires have been successfully used for maxillomandibular fixation; however, prolonged immobilization of a fractured mandibular condyle increases the risk of ankylosis.14

Open reduction with placement of internal plate and screw fixation is useful and may allow for avoidance of mandibular immobilization9,12,15,16; however, damage to developing tooth buds within the mandible is a concern. Additionally, use of nonresorbable materials may require removal in growing children. Use of a lingual splint avoids many of the associated pitfalls of plate and screw fixation and is useful both with and without mandibular immobilization.

The “powder and liquid” method for lingual splint fabrication has drawbacks. Most obviously, one must have access to a wet laboratory and multiple dental materials. Second, the technique demands obtaining preoperative dental impressions to fabricate casts. In the pediatric population, obtaining impressions is sometimes difficult due to discomfort from casts or simple lack of cooperation. Obtaining impressions for cast fabrication with the patient under a general anesthetic at the time of fracture treatment or as a separate procedure is an option but results in an addition-

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Fig. 1. Dry skull model illustrating technique: A, After the ability to establish stable and reproducible occlusion while reducing fracture segments is confirmed, an appropriately sized piece of material is placed along the occlusal surface and jaws are manipulated into occlusion while maintaining fracture reduction. B, Visible material is then light-cured until rigid, which allows for the mouth to be opened while segment positions are maintained.
al procedure under anesthesia or increased time under anesthesia for the patient while the laboratory work is completed outside the operating suite, both of which increase cost and patient risk. Our technique allows for treatment without a laboratory procedure and without access to a wet laboratory and multiple materials.

The Triad VLC acrylic resin system was introduced by Dentsply (now Denstply International, York, Pa.) in 1983. Advantages of light cure resin over powder and liquid monomer formulation include complete curing without residual compounds, absence of free monomer, and ease of use. In addition, there is possibly decreased adherence of microorganisms due to decreased porosity of light-cured acrylic as seen under electron microscopy.\(^{17}\)

Use of this technique came after thorough review of the material safety information\(^{18}\) and a discussion with the chemistry division of the manufacturer. To the best of our knowledge, this application seems unlikely to result in any significant untoward events in the live patient. The person handling uncured material should wear gloves due to the potential for contact hypersensitivity. The material should not be ingested or inhaled. It contains no known carcinogens. The curing process does not result in any significant alteration of components nor is it known to produce any harmful by-products. Once the material is cured using the manufacturer’s protocol, it is Food and Drug Administration–approved for prolonged intraoral use. The company does not provide instructions or endorsement of direct use in live patients, and so by definition, our application constitutes off-label use. The substitution of other light-cured materials is not recommended without a review of the material safety data as some other available materials contain known carcinogens and hazardous components.

**CONCLUSIONS**

In summary, our technique is simple, seemingly safe, and effective. Because of lack of need for wet laboratory access, no need for dental impressions, and avoidance of unnecessary anesthetic procedures, it has proven useful in select cases.

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![Image of splint following completion of light curing and contouring to desired dimensions with an “egg-shaped” carbide bur away from operative field (A). Intraoperative image of splint retained with circummandibular wires placed with an awl (B). Note occlusal acrylic was removed entirely before placement.](image-url)
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