

# A Custom Stabilizing Splint for the Management of BLCF with Protruding Premaxilla

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**Summary:** A severely protruding premaxilla in a patient with bilateral cleft lip and palate prevents functional closure of the orbicularis oris muscle and acceptable reconstruction of the nasolabial components during primary cheiloplasty. This is typically corrected with vomerine osteotomy and premaxillary setback, followed by cheiloplasty and rhinoplasty. Due to the risk of vascular compromise to the prolabium and premaxillary segment, the lip and nose repair is often staged after the vomerine osteotomy and premaxillary setback has healed. Stabilizing the premaxillary segment to allow adequate healing has been a topic of interest. Several methods have been described, but each is associated with varying degrees of compromise of the blood supply to the premaxilla. To combat this, the authors created a custom oral splint that effectively maintained the position of the premaxilla with minimal impingement of the blood supply. The authors present two cases in which a two-stage premaxillary setback with a custom-stabilizing oral splint was performed, followed by primary cheiloplasty and rhinoplasty in an age-appropriate and delayed presentation of bilateral cleft lip and palate and protruding premaxilla. (*Plast Reconstr Surg Glob Open* 2022;10:e4653; doi: [10.1097/GOX.0000000000004653](https://doi.org/10.1097/GOX.0000000000004653); Published online 7 November 2022.)

## INTRODUCTION

A severely protruding premaxilla in a patient with bilateral cleft lip prevents functional closure of the orbicularis oris muscle and acceptable reconstruction of the nasolabial components during primary cheiloplasty. Multiple presurgical dentofacial appliances apply external force to retract the protruding segment, including nasoalveolar molding and Latham devices. These devices are typically used early in the child's life and lose efficacy by 8–10 months as the bony skeleton matures.<sup>1</sup> When these interventions are unavailable or unsuccessful, vomerine osteotomy and premaxillary setback (VOPS) may be necessary before cheiloplasty to allow for successful approximation of the orbicularis oris muscle and tension-free closure of the prolabium to the lateral lip elements.

Vomerine osteotomy involves making an osteotomy adjacent to the vomero-premaxillary suture, removal of redundant bone and soft tissue, and repositioning the

protruding premaxillary segment. This procedure risks compromising the blood supply to the premaxilla, mainly if performed in conjunction with procedures that manipulate the soft tissues anterior to the vomero-premaxillary suture, including the premaxillary periosteum and nasal septum, as in primary cheiloplasty and cleft rhinoplasty. Primary nasal correction may be avoided or limited to avoid vascular compromise, necessitating later surgery.<sup>2</sup>

A topic of interest in bilateral cleft lip and palate repair that requires premaxillary repositioning is the method of premaxillary segment fixation after osteotomy. In the following cases, the authors created a custom-stabilizing oral splint that allowed the premaxillary segment to maintain its position without significantly impairing the blood supply.

## METHODS

Two patients with bilateral cleft lip and palate and protruding premaxilla presented to cleft clinic for treatment. One known patient from birth presented when he was 5 months old for his formal cleft lip repair after unsuccessful lip taping and nasoalveolar molding (Fig. 1). The other patient was a 17-month-old girl adopted from India and had no previous cleft care. (See figure, **Supplemental Digital Content 1**, which shows a preoperative photograph of a 17-month-old girl demonstrating a protruding premaxillary segment, <http://links.lww.com/PRSGO/C260>.)

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Received for publication August 5, 2022; accepted September 20, 2022.

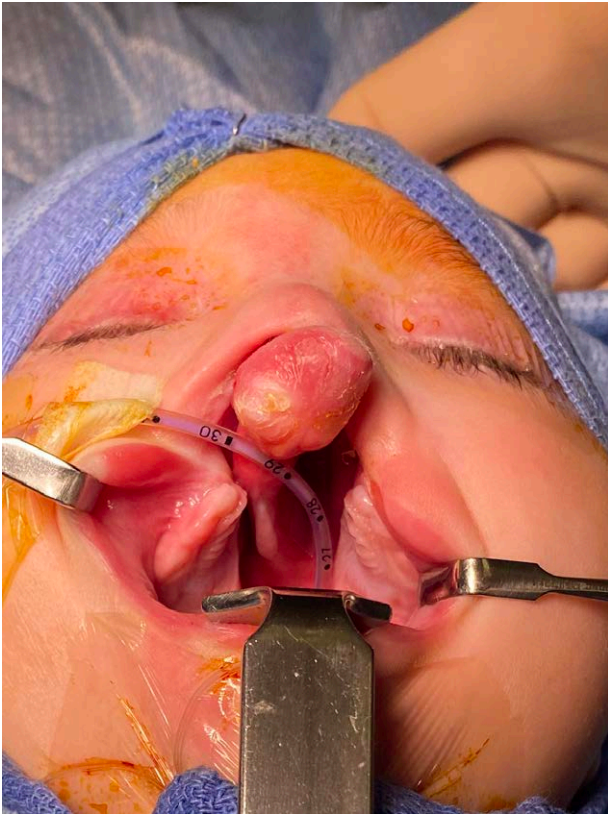
Presented as poster at the Mountain West Society of Plastic Surgery, February 24–27, 2022, Snowbird, Utah, and at Cleft 2022, July 11–15, 2022, Edinburgh, Scotland, UK.

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DOI: [10.1097/GOX.0000000000004653](https://doi.org/10.1097/GOX.0000000000004653)

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

Related Digital Media are available in the full-text version of the article on [www.PRSGlobalOpen.com](http://www.PRSGlobalOpen.com).



**Fig. 1.** Preoperative photograph of a 5-month-old infant demonstrating a protruding premaxillary segment.

Both patients had a severely protruding, ossified premaxilla and required VOPS for repositioning. Both underwent successful repositioning (Fig. 2). At the end of the repositioning, minimal periosteal elevation with bony drilling and interosseous suturing with 3-0 polyglactin (Vicryl, Ethicon Inc., Raritan, N.J.) sutures were done for stabilization, followed by mucoperiosteal closure. Custom acrylic splints were fabricated and fitted with denture adhesive to stabilize the reduction further. These were kept in position for 3 months (Fig. 3). Once complete healing was appreciated with stable ossification of the premaxilla in the new position, the patients underwent staged primary cheiloplasty and extensive rhinoplasty.

## RESULTS

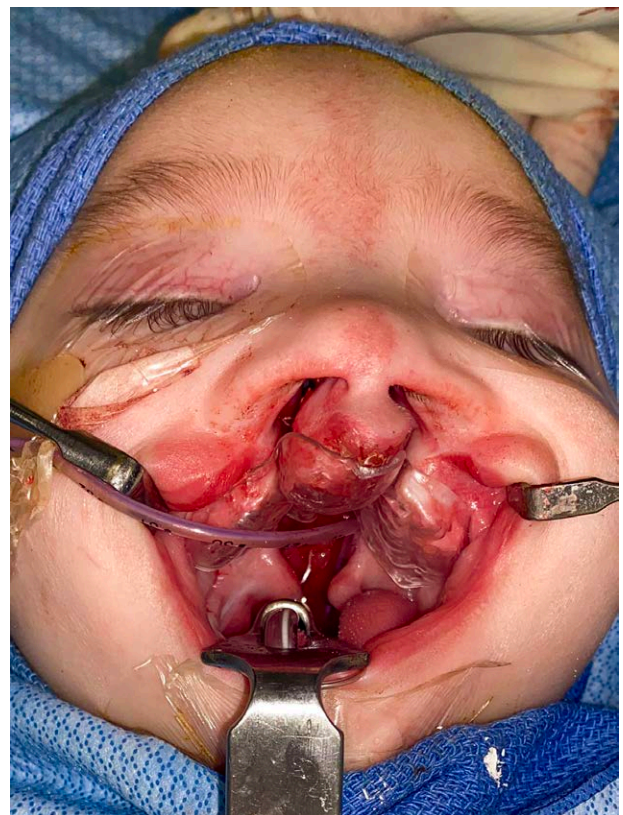
The staging of VOPS before the primary cheiloplasty and rhinoplasty reduced the risk of devascularization during healing by preserving the vascular supply to the prolabium and premaxillary segment. The custom acrylic splint stabilized the premaxilla without further impingement of the blood supply and aided in the bony healing at the vomerine osteotomy site. The premaxilla was successfully revascularized and ossified to the vomer, which allowed safe, extensive subsequent cleft lip repair and rhinoplasty with satisfactory functional and aesthetic outcomes (Fig. 4). (See figure, Supplemental Digital Content 2, which shows a photograph demonstrating 7-month postoperative status after VOPS followed by primary

## Takeaways

**Question:** Will a custom oral splint be sufficient to stabilize the premaxillary segment in bilateral cleft lip and palate following vomerine osteotomy and premaxillary setback?

**Findings:** A custom oral splint in combination with interosseous sutures successfully maintained the position of the premaxillary segment following vomerine osteotomy and premaxillary setback.

**Meaning:** A custom oral splint can be an effective stabilizer and facilitate bony healing of the premaxilla in a two-stage premaxillary setback and primary cheiloplasty for patients with bilateral cleft lip and palate without the added risk of devascularization.



**Fig. 2.** Postoperative photograph of a 5-month-old infant following VOPS with custom oral splint in place.

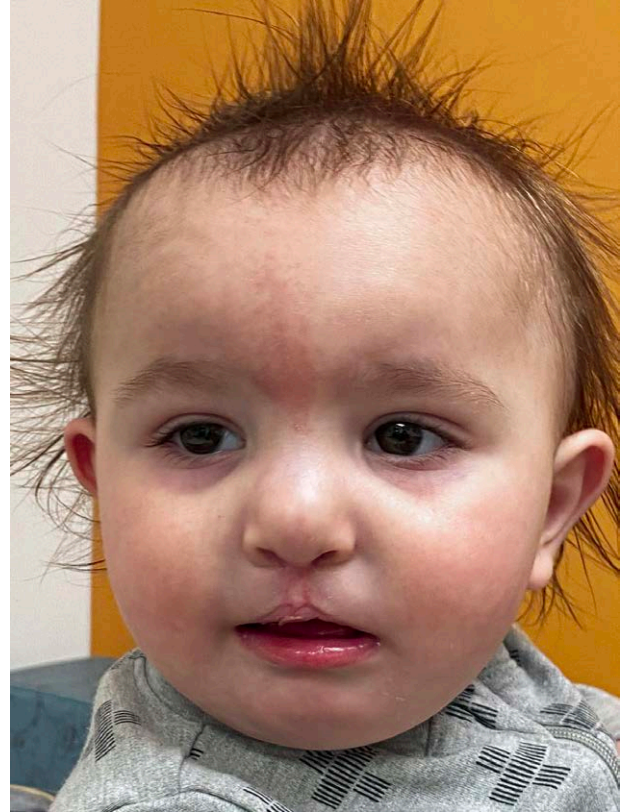
cheiloplasty and rhinoplasty, <http://links.lww.com/PRSGO/C261>.)

## DISCUSSION

Bilateral cleft lip and palate patients often have a mobile premaxilla, only apically fixed to the vomer. The unopposed action of the tongue on the mobile premaxilla leads to protrusion due to the lack of orbicularis oris sphincter function. In most cases, gradual molding to the optimal position before the operative correction can be achieved. Occasionally, due to noncompliance with the molding protocol or delayed presentation, the premaxilla ossifies and becomes rigid.



**Fig. 3.** Photograph of the custom acrylic oral splint that was used to maintain the position of the premaxilla for 3 months.



**Fig. 4.** Photograph demonstrating 7-month postoperative status after VOPS followed by primary cheiloplasty and rhinoplasty.

Various surgical approaches to the bilateral cleft lip and palate with a rigid, protruding premaxilla have been described in the literature. Fakh-Gomez et al<sup>2</sup> described a single-stage premaxillary setback with bilateral cleft lip repair with or without gingivoperiosteoplasty (GPP). Farhadi and Wallace<sup>3</sup> reported on a two-stage premaxillary setback with bilateral cleft lip repair and primary rhinoplasty. Narayanan et al<sup>4</sup> examined premaxillary repositioning with alveolar cleft repair and bone grafting in older patients. In this case, the patients underwent a two-stage procedure, similar to Farhadi, with VOPS followed by primary cheiloplasty and rhinoplasty.<sup>3</sup>

Limiting movement at the osteotomy site is paramount to achieving bony healing after premaxillary repositioning. Immobility can be achieved by fixation or splinting. Using mucoperiosteal sutures exclusively after repositioning is likely not sufficient to restrict excessive movement at the osteotomy site. Rahpeyma et al. utilized miniplates with screws to maintain the position of the premaxilla, whereas Chauhan et al. fixated the premaxilla with a singular lag screw.<sup>5,6</sup> Park and Kim fixed the premaxilla with interosseous suturing in one patient and titanium plates and screws in another patient.<sup>7</sup> All the internal fixation methods risk damaging the tenuous blood supply to the premaxilla and injuring the underlying tooth buds. It is also a concern that it could potentially inhibit maxillary

growth, but a few studies have demonstrated the long-term effect of VOPS on maxillary growth.<sup>8</sup> Miyasaka et al described successful healing of the repositioned premaxilla after VOPS and external stabilization with a custom oral splint in one patient.<sup>9</sup> Considering this, we developed a custom oral splint that maintained the position of the premaxilla in combination with interosseous sutures. This method allowed for external fixation of the segment until bony healing occurred without invasive hardware or the threat of vascular compromise.

Fabricating this splint is ideally performed by an onsite orthodontist using traditional impression molding. However, the splint can also be created using an intraoral scanner and 3D printer without an orthodontist. The combination of this custom oral splint and interosseous suturing has shown to be an effective stabilizer that allows bony healing of the premaxilla following VOPS in two patients. Of note, neither patient has demonstrated any hindrance to midface growth; however, they are far from reaching facial maturity, and therefore a firm conclusion cannot be drawn at this time. Even so, we always consider this technique when presented with this unique challenge because of their success. While larger studies are needed to determine the generalizability of this splint, it is an option that can be considered in bilateral cleft lip and palate patients presenting with an ossified, protruding premaxilla.

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