

## Management of the Prominent Premaxilla in Bilateral Cleft Lip and Palate

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**Design and Objective:** This study was designed to present our philosophy in managing the prominent premaxilla in patients with bilateral cleft lip and palate. Indications, contraindications, and the pre- and postoperative orthodontic role are defined.

**Setting:** Tertiary care, cleft palate and craniofacial center—academic institution.

**Patients:** Under review were four cases of bilateral cleft lip and palate presenting with prominent premaxilla and operated on by a single surgeon between 1996 and 2004.

**Conclusion:** With appropriate patient selection, bilateral alveolar bone grafting with premaxillary repositioning is a safe procedure and can produce good aesthetic and functional results.

KEY WORDS: *bilateral cleft lip and palate, bone grafting, contraindications, indications, orthodontics, osteotomy, premaxilla*

It is widely accepted that the ideal timing of alveolar bone grafting is when the canine root reaches one half to one third of its length, and while its crown is still covered with bone (Hall and Posnick, 1983; Bergland et al., 1986). Grafting at that time allows the canine to erupt into bone, thereby solidifying the bone graft. However, in some bilateral cleft lip and palate (BCLP) patients who exhibit severe sagittal and/or vertical overdevelopment of the premaxilla, conservative alveolar bone grafting may not be possible. This not-uncommon scenario presents a dilemma for the treating orthodontist and surgeon.

Management of the protrusive premaxilla in patients with bilateral cleft lip and palate is a controversial issue in the literature (Lino et al., 1998). On the one hand, amputation of the premaxilla has been described as a means to facilitate lip closure (Motohashi and Pruzansky, 1981). On the other hand, early premaxillary setback was advocated many years ago. The question of its influence on facial growth, however, was a matter of concern. Monroe et al. (1970) suggested that osteotomy should be performed behind the "epiphyseal line" believed to join the vomer to the premaxilla, to avoid this effect.

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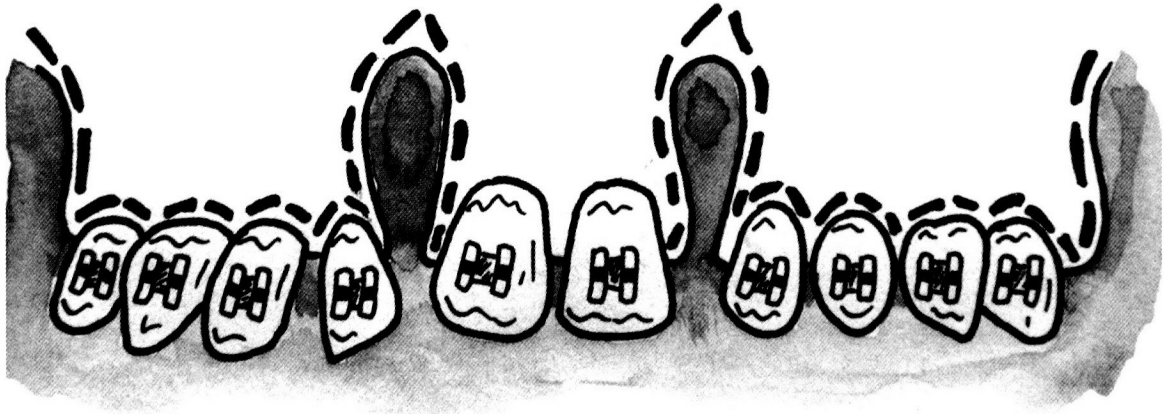
The purpose of this paper is to introduce our philosophy for treating BCLP patients with prominent premaxilla, by presenting four cases where premaxillary osteotomy and bilateral alveolar bone grafting were completed in one stage. Indications, contraindications, and the pre- and postoperative orthodontic roles are discussed.

### SUBJECTS AND METHODS

From a series of 237 cleft lip and palate patients who underwent iliac bone grafting to their alveolar clefts at The Hospital for Sick Children in the past 8 years (191 unilateral and 46 bilateral), four patients (3 boys and 1 girl, ages 9 to 11 years) required premaxillary osteotomy and bilateral alveolar bone grafting as a one-stage procedure. Surgical indications included vertical overdevelopment of the premaxilla in two patients, lateral displacement of the premaxilla, and severely protrusive premaxilla. The follow-up ranged from 10 months to 5 years. Viability and stability of the premaxilla, status of the maxillary incisors, recurrence of oronasal fistula, and the radiological height of bone grafts using the Oslo classification (Abyholm et al., 1981) were retrospectively examined in all four patients.

### Surgical Method

Under general anesthesia and preoperative prophylactic antibiotics, a pericoronary incision was used along the lateral segments and was extended vertically into the region of the alveolar fistula (Fig. 1). Incisions were made along the premaxillary component of the fistula with almost no undermining (Fig. 2). The incision was extended posteriorly on one side, to



**FIGURE 1** Anterior view showing the pericoronal incision designed along the lateral segments and extending vertically into the region of the alveolar fistula. Incisions made along the premaxillary component of the fistula should be done with almost no undermining.

the region of the maxillary crest, which represents the bony attachment of the premaxilla. A high-speed bur was used to create an osteotomy across the maxillary crest and the premaxilla was mobilized and was swung superiorly, giving excellent access to the palate. Flaps were elevated off the palate for nasal and oral closure. Nasal closure may have been difficult, given the quality and availability of tissue. A dental splint, constructed preoperatively after model surgery, was tested to ensure that bony interferences did not impede the planned position of the premaxilla. Bone for the graft was harvested from the iliac crest. Flaps of the mucoperiosteum were elevated from the palatal side of the premaxilla and delayed suture repair was performed on the fistula. The dental splint was wired onto the orthodontic appliances in the lateral segments, and the premaxilla was seated and was held into the splint with #28-gauge wire. Bone was packed into the region

of the alveolus and palate, and a buccal-layer closure of the fistula was performed.

#### Postoperative Management

All patients were maintained on a soft "no-chew diet" for 8 weeks. Oral hygiene was maintained by frequent mouth-washes (0.12% Peridex) and gentle brushing. The splint was maintained for 8 weeks postoperatively, at which time it was removed and was replaced by a continuous orthodontic arch wire.

#### RESULTS

All four patients in this series tolerated the procedure well and there were no perioperative complications. No patient sustained vascular impairment or loss of the premaxilla. Consolidation of the premaxilla was seen in three cases. Two patients had bilateral grade I (Oslo classification) bone grafts and one had bilateral grade II, without compromising the premaxillary stability. Minor instability was noted in one patient with a recurrence of the oronasal fistula unilaterally, after a direct trauma to the area 10 days postoperatively, complicated by infection. The bone support was rated as grade III on the fistula side and grade I on the intact side. No teeth were lost in any of these patients as a result of the procedure. All patients had a satisfactory dental arch alignment.

#### DISCUSSION

Protrusion of the premaxilla in BCLP can be seen as early as 10 weeks of gestation (Latham, 1973). Unrestrained anterior nasal septal and vomero-premaxillary suture growth, combined with lack of bony and soft tissue continuity, and disruption of balance between the circum-oral musculature and the tongue are thought to produce the classic bilateral premaxillary deformity (Ross and Johnston, 1972; Latham et al., 1975; Eppley et al., 1986). This premaxillary relationship may result in significant functional problems such as absence of proper anterior



**FIGURE 2** Maxillary occlusal view illustrating incisions needed to raise the palatal flap to achieve a two-layer closure.

occlusion, lateral mobility of the premaxillary segment and labial or palatal oronasal fistulae with consequent problems in speech and oral hygiene. Prominence or vertical overdevelopment of the premaxilla also may result in significant psychological harm during a child's formative years. This represents a challenging situation for the treating surgeon and orthodontist.

To address these concerns, many European centers advocated primary osteotomy and setback of the premaxilla as an adjunct during lip repair. However, severe maxillary retrusion due to subsequent growth retardation was frequently observed (Robertson and Jolleys, 1968; Bishara and Olin, 1972; Vargervik, 1983; Friede and Pruzansky, 1985). Delayed osteotomy of the premaxilla, in combination with secondary alveolar bone grafting, has been reportedly successful in selected cases (Eldeeb et al., 1986; Freihofer et al., 1991; Heidbuchel et al., 1993). This procedure enables closure of large fistulae (possibly increasing the chances of success of alveolar bone grafting), facilitates overjet and overbite correction, and may have psychosocial advantages for the child.

### Orthodontic Role

Alveolar segment manipulation has an important role in restoration and preservation of normal maxillary alignment before and after surgery. A premaxillary osteotomy should be considered only after achieving a satisfactory maxillary arch expansion and alignment. This restores the ideal position of the alveolar segments prior to their being fused together by grafted bone (Ross and Johnston, 1972). Additionally, expansion is easily achieved at this stage through bending of the bony segments outward, in contrast to the sutural expansion performed during a typical rapid midpalatal expansion procedure.

This type of expansion can be performed readily using a quad-helix or tri-helix appliance, or a V-type ("fan") expander with an expansion screw. This type of appliance allows expansion where it is needed, which is usually at the mesial aspects of the posterior alveolar segments. Care should be taken not to overexpand, but to stop once the desired width is achieved anteriorly to accommodate the premaxilla.

Once the expansion has been achieved, any supernumerary or primary teeth at the cleft sites that are located in the line of the future flap are extracted, preferably 6 to 8 weeks prior to the surgery. This is done to facilitate wound healing in the areas where excess tissue is necessary for coverage of the bone graft. The expansion appliance is removed on the day of the surgery, and an occlusal splint is constructed. Typically, because the maxillary incisors of BCLP patients commonly exhibit an increased crown-to-root bend (*dilaceration*) in the labiolingual plane of space, *torquing* of the premaxilla (placement of the roots of the maxillary incisors in a more palatal position) during the surgery greatly facilitates subsequent orthodontic treatment. This type of repositioning also facilitates bone-to-bone approximation, reducing the width of the alveolar cleft.

### Indications

Appropriate patient selection is the key to satisfactory aesthetic and functional results. Bilateral alveolar bone grafting with surgical premaxillary repositioning is indicated in:

- Extreme protrusion of the premaxilla. In such cases repositioning the premaxilla will facilitate watertight closure of the oral and nasal mucosa, and in theory should increase the chances of a successful bone graft.
- Extreme vertical overdevelopment, or more rarely, underdevelopment, of the premaxilla. In the latter, patients' relapse of the premaxillary correction would be the obvious concern, as downgrafting of the anterior maxilla is reported to have a high relapse potential (Macmillan and Tideman, 1994). However, we feel that the objective of restoring the maxillary alveolar continuity and achieving a unified maxilla is markedly facilitated through the procedure.
- Severe lateral displacement of premaxilla, especially when combined with I or II.
- Closure of large oronasal fistulae, again based on the assumption that bone approximation through premaxillary osteotomy will facilitate the graft and will improve its prognosis.

### Contraindications

Contraindications include the following:

- Timing. Premaxillary osteotomy should be timed to coincide with a secondary (mixed dentition) bone graft, based on the stage of root development of the permanent maxillary canines.
- Cases where adequate orthodontic expansion of the lateral segments could not be achieved (e.g., in the case of patients living in remote locations where no access to orthodontic care is available). In these situations, isolated premaxillary osteotomy will not re-create the dental and alveolar alignment. A three-segment Le Fort I osteotomy with bilateral alveolar bone grafting would be indicated in such cases, after skeletal maturity.
- Previous scarring of the anterior mucosal lining, which may threaten the viability of the premaxilla when surgically mobilized (Lahti et al., 1972).
- Inadequate dental eruption or inadequate dental crown height, which can prevent proper fixation of the splint.
- Postoperative splinting of a significantly underdeveloped premaxilla can be technically challenging. Inadequate stabilization may prevent bony union; therefore, preoperative orthodontic assessment is essential.
- The compliance of the patient and the parents. The patient has to maintain the splint for about 5 to 6 weeks postoperatively. Our only patient who developed unilateral recurrence of his fistula was involved in a contact sport and received a direct trauma to the face.

## CONCLUSION

With appropriate patient selection and after achieving a satisfactory maxillary arch expansion and alignment, bilateral alveolar bone grafting with premaxillary repositioning, although technically challenging, can be a safe procedure that may result in a good aesthetic and functional result. In addition, it unifies the maxillary segments, so that if a significant skeletal problem persists at skeletal maturity, it can be corrected through a one-segment Le Fort I osteotomy.

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