Surgical Repositioning of the Premaxilla With Bone Graft in 50 Bilateral Cleft Lip and Palate Patients

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Purpose: The aim of this study was to evaluate a modified surgical technique for premaxilla repositioning with concomitant autogenous bone grafting in bilateral trans-foramen cleft lip and palate patients.

Patients and Methods: The study included 50 bilateral trans-foramen cleft lip and palate patients. Bone graft was harvested from the mandibular symphysis in 24 patients. Whenever more grafting was necessary, the iliac crest bone was used as the donor site (26 patients). The premaxilla was displaced by rupturing the bone and the palatine mucosa, and repositioned in a more adequate position using a surgical guide. The premaxilla and the grafts were fixed with miniplates and screws or screws only. The surgical guide was kept in place for 2 months, whereas the miniplates and screws were removed after 6 months, together with the complete bilateral lip and nose repair. Follow-up examinations were performed at 3, 6, and 12 months by means of periapical and occlusal radiographs, and by clinical examination. Thereafter, the patients were referred for completion of the orthodontic treatment.

Results: Overall, in 48 cases (96%) the treatment achieved total graft integration, with complete closure of the bucconasal and palatal fistulas, and premaxilla stability (either at first surgery or after reoperation). In the remaining 2 patients (4%), the treatment failed, due to necrosis of the premaxilla.

Conclusions: The procedure is complex and involves risk. However, the patient’s social inclusion, especially at the addressed age group, is the best benefit achieved.

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The benefits of secondary bone grafting for treatment of cleft lip and palate patients have been well-described by several authors,1-6 especially for unilateral cleft cases. Regarding bilateral cleft lip and palate (BCLP) patients, there have been difficulties in achieving similar results. This is mainly due to a significant lack of bone and soft tissue in the cleft area, overlarge protrusion of the premaxilla, frequent diversion of the median line malocclusion due to maxillary segments atresia, and excessive premaxilla mobility.

Moreover, large bucconasal fistulas compromise the esthetic aspect. All these situations limit orthodontic rehabilitation, especially for repositioning of the premaxilla and for future prosthetic rehabilitations.

The ideal age for reconstruction of alveolar process defects by secondary bone grafting in BCLP patients varies between 8 and 12 years, before eruption of the permanent upper canines and when two thirds of the root is already formed.2,5,6,7 With a secondary bone graft, the maxilla’s growth deficit is minimized, because most of the anterior maxilla growth is already completed. The canine is expected to erupt in the grafted bone to induce bone deposit on the alveolar crest and increase the maxilla’s vertical height. Possible donor areas for bone grafting in cleft and palate patients include the iliac crest, costal arch, cranial dome, mandibular symphysis, and retromolar region.8-10 Whenever feasible, the mandible is the preferred donor area for bone grafting surgery in cleft palate patients.8 The advantages include easy access, less morbidity, the same embryonic origin, and faster return of the blood supply, which tends to provide a larger amount of bone and less postoperative resorp-

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tion when compared with endochondral bone graft (iliac crest).

Regarding treatment options for the premaxilla in BCLP patients, different treatment modalities have been suggested. Some authors have proposed amputation of the premaxilla, to promote easier lip closure. Aburezq et al have suggested surgical reposi-
tioning of the premaxilla and bone grafting, with 4 successful cases in BCLP patients during an 8-year period. In this study, we evaluated a modified surgical technique for premaxilla repositioning with concomitant bone grafting in 50 BCLP patients.

**Patients and Methods**

**PATIENTS**

The present study involved a sample of 50 bilateral trans-foramen cleft lip and palate patients, according to the classification proposed by Spina (Figs 1-6). The patients were operated on in the period from January 2003 to July 2005 at the CAIF’s Maxillofacial Surgery Service, in Curitiba, Brazil. Patient age was determined by upper canine position and in relation to lower canine position. Thirty-four patients were between 8 to 12 years of age, whereas the remaining 16 patients were above the ideal age. Whenever possible, bone graft was harvested from the mandibular symphysis area (24 patients). The second area of choice was the iliac crest (26 patients), when the cleft defect was too large.

**METHODS**

The patients were submitted to an initial orthodontic intervention according to CAIF’s protocol. The

**FIGURE 1.** Preoperative frontal view (case 1).

**FIGURE 2.** Preoperative intraoral view (case 1).

**FIGURE 3.** Preoperative panoramic radiography (case 1).
protocol included patient evaluation by all dental professionals, as well as speech therapy, psychology, nursing, plastic surgery, and pediatrics professionals. Disjunctive devices were placed in the maxilla to correct atresia and to improve premaxilla position. As soon as the patient was considered fit for surgery, arch impressions were taken and premaxilla repositioning was performed in the cast to produce the surgical template in self-curing acrylic. Orthodontic brackets were placed on the maxillary incisors and molars for future fixation of the surgical template.

SURGICAL PROCEDURE

After induction of general anesthesia and orotracheal intubation, lidocaine at 2% with adrenaline at a 1:100,000 dilution was locally infiltrated. A number 15 scalpel blade was used to make a vertical incision on the cleft’s rims, extending laterally with an intrasulcus incision after 1 or 2 teeth away from the cleft area, at which point a relaxing incision was made toward the buccal fold. The procedure was repeated on the opposite side, followed by the detachment of a mucoperiosteal flap. Vertical incisions were made on the premaxilla, and the periosteum was detached at the lateral and palatine portions on both sides. Using an osteotomy blade (reciprocating saw), the bone at the portion posterior to the premaxilla was sectioned, and an incision on the palatine mucosa at the cleft palate height was made, keeping approximately 1.5 cm of the palatine mucosa attached to the premaxilla (Fig 7). The premaxilla was displaced forward so the nasal mucosa could be separated from the oral mucosa. The bilateral nasal floor was then closed using reabsorbing sutures. Once the nasal floor was sealed, the palatine mucosa was sutured as premaxilla remained, using reabsorbing sutures. With the surgical template in place, the premaxilla was repositioned, using the brackets for fixation, with a number 0 steel wire.

At the donor area (symphysis), an incision 1.5 cm below the lower lip vermilion line was performed,
cutting through the mucosa and the muscles, directing the blade toward the mandibular bone. After detachment of the periosteum, a cone-shaped low rotation 701 bur was used to perform the osteotomy properly shaped to adapt to the cleft defects.

The grafts and the premaxilla were fixed with titanium miniplates and screws (1.5 mm) (Signo Vinci, Campo Largo, Brazil) (Fig 8). The grafts were covered with a mucoperiostal flap and moved through relaxing incisions at the periosteum at the base of the flap. The cleft was closed with a tension-free flap and a 4-0 nylon suture (Fig 9). On the mental area, reabsorbing sutures were placed through anatomical planes.

External compression dressings were kept on the area for 3 days postoperatively, to avoid lip ptosis, reduce edema and bleeding, and make the patient more comfortable. Cefalosporin was administered parenterally for 24 hours (until the patient was discharged) and completed orally to a 10-day treatment. Paracetamol and mouth wash with chlorhexidine gluconate (0.12%) were prescribed in the postoperative period. Postoperative care included meticulous oral hygiene and soft diet to avoid suture dehiscence, and the sutures were removed after 2 weeks. The template was removed 2 months after the surgical repositioning of the premaxilla. The removal of the miniplates and screws, as well as the complete bilateral lip and nose repair, was performed 6 months postoperatively. Thereafter, the patients were referred for completion of the orthodontic treatment.

The parameters used to consider the treatment as successful were based on the complete closure of the bucconasal fistulas and absence of premaxilla mobility by clinical examination, as well as the observation of bone deposition in the cleft area by periapical and occlusal radiographs taken 3 and 6 months postoperatively (Figs 10-15). New radiographic examination was performed at 12 months postoperatively to observe canine eruption and orthodontic movement of the teeth adjacent to the cleft.

This surgical technique is shown in the following cases.

Results

Among the 50 BCLP patients included in the present study, in 48 cases (96%) the treatment was considered successful, either at first surgery or after reoperation. The bone grafts were integrated; improved phonation was achieved, with complete closure of the bucconasal and palatal fistulas. Furthermore, no premaxilla mobility could be observed. In 45 of the 48 successful cases, this was achieved at first
In the 3 remaining cases, graft loss was observed at first surgery (1 patient with bilateral graft loss, 2 patients with unilateral graft loss). These patients underwent a new surgery, with successful integration of the grafts and subsequent premaxilla stability. The treatment failed in 2 cases, due to premaxilla necrosis. The 2 patients were reoperated on and received new grafts to replace the premaxilla, with satisfactory results.

The present study presented a modified technique for surgical repositioning of the premaxilla with concomitant bone grafting in BCLP patients. The overall surgical outcome was satisfactory, with 96% success among the treated cases. Unfortunately, we had 2 cases with major complications (premaxilla necrosis). According to Mul liken, this risk is real when premaxillary setback is performed with labial repair. However, in all patients included in the present study, complete lip repair was only performed 6 months after surgical repositioning of the premaxilla. We hypothesised that lack of local hygiene and blood irrigation, combined with a subsequent contamination of the operated area, may be attributed as possible causes of the failures.

The results of the present study confirmed previous findings that the bone quality in the grafted area does not depend on the origin of the graft. Normal gingival contour of the adjacent teeth and maxilla stability was observed postoperatively among the successful cases. Moreover, normal teeth eruption was observed in the grafted area among patients between 8 to 12 years old. Canine retention was only observed in 1 occasion in our series, in a 17-year-old patient. Previously, the incidence of canine retention after...
bone grafting in cleft and lip palate patients has been reported to occur in 15% to 20% of the cases.\textsuperscript{15}

Although early surgical premaxillary repositioning is not a new issue, the question of its influence on facial growth has been a matter of paramount concern.\textsuperscript{16} Regardless of the premaxilla projection, even if it occurs in a postsurgical premaxilla retroposition, these patients are potential candidates for orthognatic surgery. Therefore, it is not advantageous to wait for the maxilla to grow completely or to expect that orthodontic treatment may partially improve the problem, because there is no bone in the cleft area.

Mandibular symphysis grafts provide smaller bone volume than the iliac crest, and therefore, symphysis grafts may not be enough to repair large clefts, especially in BCLP patients.\textsuperscript{7} Prior to surgical repositioning, the premaxilla of these patients usually is extremely projected toward the buccal area. In a posterior osteotomy of the premaxilla, a bone segment is removed to anchor the new position of the premaxilla. As a result, there is considerable reduction of the size of the clefts, and consequently, the size of the graft, which enable us to use mandibular symphysis bone. When the graft is stabilized with miniplates it is advisable to fixate the graft on the 2 stumps, that is, the premaxilla and the distal segment of the maxilla, increasing the stability of both the premaxilla and the graft itself.

In our proposed surgical technique, and also in the technique described by Aburezq et al,\textsuperscript{12} the palatine mucosa is ruptured, leaving part of the mucosa attached to the premaxilla, beyond the resected bone that provides anchorage to the premaxilla. Because the palatine mucosa is invaginated, by keeping the premaxilla and the maxilla apart, this procedure im-
proves the access to the nasal fossa, enabling better suture of the nasal mucosa.

Finally, the esthetic factor is important for the social inclusion of BCLP patients. At their age, these patients frequent school and are relating to people other than their families. Because of their appearance, they usually are excluded from groups of friends and kept away in school, which may hinder their intellectual development. From this standpoint, we justify the surgical repositioning of the premaxilla, because it improves the esthetic aspect. Though in the future some of the cases may require orthognatic surgery, this treatment provides a chance for healthy development for these patients between 8 and 17 years old.

In conclusion, a refined surgical technique for repositioning of the premaxilla with concomitant bone grafting was shown to be useful in BCLP patients, whose premaxilla is extremely displaced forward and laterally. By minimizing the cleft, mandibular symphysis graft may be enough to fill the defect. The treatment provides a better forecast of orthodontic treatment, canine eruption, and future prosthetic rehabilitation. The procedure is complex and involves risk. Nevertheless, the patient’s social inclusion, especially at the addressed age group, when the personality is being formed, is the best benefit achieved.

References