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Correspondence and Communications

Alveolar cleft closure using a triangular flap with an M-shaped incision

Dear Sir,

Alveolar bone grafting (ABG) has become an accepted means of uniting and stabilizing maxillary segments prior to definitive orthodontic and restorative dental treatment for patients with cleft lip.[1] However, the timing of surgery, donor site, and whether the use of allogenic materials improves the outcome are still controversial. Adequate soft tissue coverage of the grafted bone in all three dimensions is imperative for successful secondary ABG.[2] To create gingivoperiosteal flaps for coverage of the alveolar cleft, the incision is placed near the teeth, adjacent to the cleft, and fans out over the more lateral and mesial teeth to leave a 2- to 3 mm gingival cuff. In other words, it creates a reverse U-shaped incision along the alveolar cleft. However, in some cases, such as those with wide clefts, closure over the anterior wall using the labial gingivoperiosteal flap is poor. Deficient soft tissue coverage carries the risk of high bone resorption and infection. Thus, to achieve stable soft tissue coverage over the anterior wall, we modified the reverse U-shaped incision to an M-shape by designing a superiorly based triangular mucosal flap.

The operation was performed during the mixed dentition period when the permanent canine root had formed to be approximately one-fourth to two-thirds of its actual length. When required, orthodontic preparation was employed pregrafting to correct severe rotations of the maxillary incisors and segmental displacement.

First, the incision to create the flaps for coverage is designed along the alveolar cleft and extended medially and laterally. The limits of the medial and lateral flaps are the midline and the mesial aspect of the first molar, respectively. Then, the triangular mucosal flap is designed into the cleft that was reconstructed during cheiloplasty (Figure 1, extra).

The incision starts from the anterior wall. Once the anterior wall of the alveolus has been opened, the cleft cavity can be incised more efficiently using the triangular mucosal flap. Then, gingivoperiosteal flaps are elevated by turning out the soft tissue covering the lateral walls of the cleft. The nasal floor and roof of the cleft oral cavity are closed by suturing the flaps.

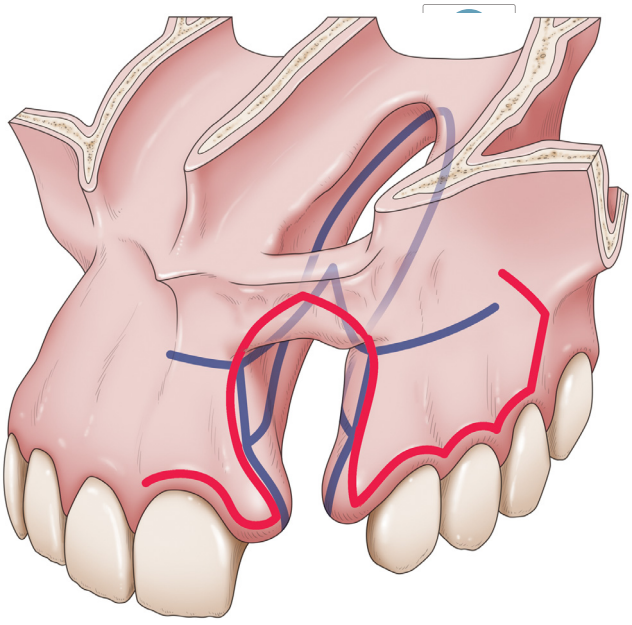

Figure 1 Schematic of the conventional U-shaped incisions (red line) and M-shaped incision (blue line). The incision used to create the triangular flap was created into the cleft for coverage of the alveolar cleft. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

A segment of the cortical bone harvested from the iliac bone is wedged into the roof and floor of the cleft to reinforce the nasal floor and roof of the cleft. The remaining space between the cortical bone is packed with cancellous bone. Finally, the triangular mucosal flaps are closed over the anterior wall and sutured to the palatal flaps (Figure 2, extra). The bone volume that survived 1 year after ABG was measured using computer-aided engineering on computed tomography scans before and at 1 month and 1 year after ABG.

Sixteen patients (mean age: 98 ± 7.2 months; range, 89 to 113 months) underwent this technique. During 18.6 ± 2.8 months' follow-up duration (range, 15 to 23 months), there were no complications, including sequestrum or wound dehiscence, especially at the anterior wall. No patient required extension of the incision on the lesser segment. The survival ratio ranged from 57.2 to 85.4% (mean: $72.0 \pm 10.0\%$). The bone survival ratio without using this flap was $59.6 \pm 10.7\%$,[3] while that with this flap had improved. A representative case is shown in the Figure.

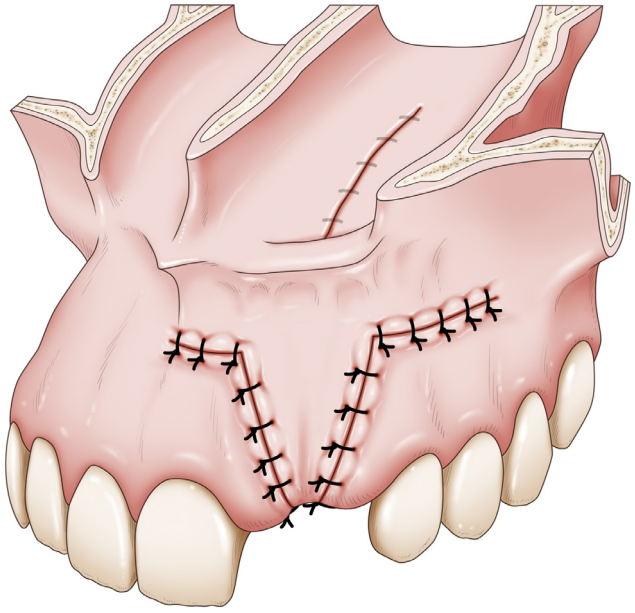

Figure 2 Schematic representing closure of the flaps. Note that the anterior wall of the alveolar cleft was covered by the triangular flap.

The outcome of ABG is assessed based on the survival of bone volume. Wound dehiscence can lead to infection or exposure of the graft, or both, and may be caused by tension in the soft tissue after wound closure.[4] To cover the bone graft completely without resulting in any tension and obtain mobilization of the lateral flaps, periosteal relaxing incisions and a relaxing mucoperiosteal incision toward the buccal fold are frequently used.[5] Nevertheless, wound dehiscence at the anterior wall still occurs in some cases. Previous reports state that if stable soft tissue coverage has not been achieved, bone grafting should be delayed by 3 to 4 months until stable soft tissue coverage develops.[2] Wound dehiscence at the anterior wall is an important risk. To our knowledge, there is no report describing a new method to prevent wounds above the alveolar cleft. Our treatment approach creates a suture line away from the alveolar cleft and covering the bone graft using one flap. This procedure is associated with the risk of a shallow vestibule and poor periodontal health of the erupting canine. However, we have not experienced cases wherein orthodontic treatment and acceptable appearance were hindered by a shallow vestibule. To reconstruct the area of the attached gingiva, we use the oral non-keratinized mucosa. Although, the triangular flap augments the anterior wall, there is a risk of gingival recessions and inflammation; thus, long-term follow up is recommended.

In conclusion, our new approach for alveolar cleft closure using a triangular flap with an M-shaped incision is useful for bone graft survival and preventing wound dehiscence above the alveolar cleft.

Declaration of Competing Interest

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2019.09.001.

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