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# Prosthetic Treatment Using an Osseointegrated Implant After Secondary Bone Grafting of a Residual Alveolar Cleft: A Case Report

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Conventionally, for dental reconstruction after bone grafting of the congenital residual alveolar cleft, a fixed prosthesis or removable partial denture is used. In this paper, residual alveolar cleft reconstruction with an osseointegrated implant following secondary bone grafting is described. The patient underwent secondary bone grafting of the residual alveolar cleft at the age of 18 years. One osseointegrated implant was placed in the bone bridge 8 months after bone grafting. No problems up to 1 year after the fabrication and placement of the fixed prosthesis have been observed.

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**Key words:** oronasal fistula, osseointegrated implant, residual alveolar cleft, secondary bone grafting

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Secondary bone grafting of the residual alveolar cleft in patients with a congenital cleft lip and palate has become a well-established procedure.<sup>1-3</sup> If the gap in the dental arch must be closed orthodontically, the grafted bone improves bony support for adjacent teeth. In some patients, the canine can be allowed to erupt in the grafted bone. However, if the canine erupts in the region of the lateral incisor, esthetically the result is not complete. In addition, orthodontic closure of the arch is difficult if the width of the cleft, combined with missing teeth, is very large. In such cases, conventionally fixed prostheses or removable partial dentures have been used for dental reconstruction. If enough of a bone bridge

has formed after bone grafting, it is possible to place an endosseous implant. This paper describes treatment that uses an osseointegrated implant after secondary autogenous bone grafting of the residual alveolar cleft for the prosthetic reconstruction of the dental arch.

## Case Report

A closure of the congenital complete unilateral cleft lip was performed at 3 months of age, and the cleft palate was closed at 18 months of age in a male patient. The left lateral incisor was congenitally missing. Orthodontic treatment was started at the mixed dentition stage. When orthodontic treatment was finished at the age of 16 years, the width between the mesial incisor and the canine was 8.0 mm (Figs 1a and 1b). For secondary repair of the residual alveolar cleft and oronasal fistula, bone grafting using an iliac crest donor site was performed at the age of 18 years. The options for prosthetic treatment to replace the lateral incisor, including fixed prosthesis, removable partial denture, or single-tooth implant, were presented to the patient. Subsequently, the patient chose the single-tooth implant option, because there were no tooth lesions or restorations in the adjacent teeth.

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**Figs 1a and 1b** Intraoral view (*below*) and occlusal radiograph (*right*) of a patient who had a left residual alveolar cleft, and in whom the left lateral incisor was congenitally missing.



**Figs 2a and 2b** Occlusal radiographs taken immediately after bone grafting (*left*) and 8 months after bone grafting (*right*).

**Secondary Bone Grafting.** Secondary bone grafting was performed according to the manner described by Boyne and Sands.<sup>3</sup> The bony defect was packed to overcorrection with particulate cancellous bone and marrow (PCBM) harvested from the left iliac crest. The reconstructed maxilla was covered with a gingival mucoperiosteal flap, which provided a watertight seal and a tension-free closure. The post-operative course was uneventful (Figs 2a and 2b).

**Implant Placement.** The existence of a bone bridge was confirmed by radiographic survey, and an implant was placed 8 months after bone grafting. A

13-mm self-tapping Brånemark implant (Nobel Biocare AB, Göteborg, Sweden) was placed into the grafted region according to the manner described by Brånemark et al<sup>4</sup> and Albrektsson<sup>5</sup> (Fig 3). The resistance to drilling was almost the same as with normal maxillary bone, and the implant was fixed bicortically.

**Abutment Connection.** The implant was exposed, and a healing abutment (Nobel Biocare AB) was connected 11 months after implant placement. Vestibuloplasty was performed simultaneously with an autogenously cultured epithelial mucosal sheet in the manner described by Ueda.<sup>6</sup> Two months after

abutment connection, a completed conventional fixed prosthesis was placed (Figs 4a and 4b). One year after fabrication of the fixed prosthesis, there were no complications with the implant, and no excessive marginal bone loss was seen around the implant.

**Discussion**

Several investigators have demonstrated the advantages and long-term results of secondary bone grafting of congenital residual alveolar clefts.<sup>7-9</sup> Kortebein et al<sup>10</sup> reported that the average success rate of grafted PCBM obtained from the iliac crest was 89.8%. After bone grafting, orthodontic closure of the gap in the dental arch is difficult when the width of the cleft is too wide and is combined with congenitally missing teeth. To use conventional prostheses or

removable partial dentures requires sacrifice of adjacent healthy tooth substance, and the load on adjacent teeth is increased. In contrast, using osseointegrated implants for prosthetic restoration avoids this disadvantage, although there are other disadvantages in using implants as prosthetic support. The treatment requires surgical trauma and bony intervention. The treatment period is longer than in the case of using conventional fixed prostheses or removable partial dentures.

The healing period between bone grafting and implant placement is controversial. Generally, a long period between grafting and implant placement can result in resorption of the grafted bone. PCBM grafting is also used for sinus augmentation. For sinus augmentation, 3 to 4 months is recommended.<sup>11</sup> However, in the case of secondary bone grafting of a residual alveolar cleft, there have been no reports of recommended healing times.

With regard to implant placement, the development of a bone bridge of at least 13 mm in height and 6 mm in width was attempted. In the event that the bone bridge height and width had not been adequate for implant placement, onlay or veneer bone grafting, performed simultaneously with the implant placement, would have been considered.

Labial closure in cases of residual congenital alveolar cleft may cause narrowing of the vestibule. In some patients, vestibuloplasty carried out simultaneously with abutment connection is required; in this situation, the procedure of grafting cultured autogenic mucosal epithelial sheet was used. This procedure has the advantage of minimal morbidity of the donor site.

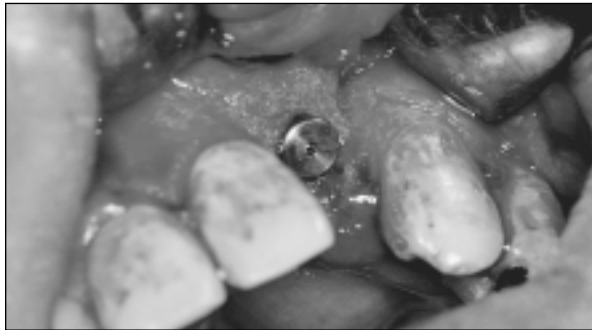


Fig 3 The self-tapping implant is placed into grafting area.



Figs 4a and 4b Intraoral view (above) and occlusal radiograph (right) of the completed fixed prosthesis.

## Summary

This case report describes prosthetic treatment that uses an osseointegrated implant after secondary bone grafting of a congenital maxillary residual alveolar cleft. Long-term successful results will be needed to confirm the reliability of the procedure.

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