

Functional and esthetic reconstruction using implant systems and maxillary sinus grafting: A clinical report

Ikuya Watanabe, DDS, PhD,^a Catherine Pham, BDS, BSc, MS,^b and Uwe Froberg, MD, DMD^c

^aDepartment of Biomaterials Science, ^bPost-Graduate Prosthodontics, and ^cDepartment of Oral & Maxillofacial Surgery/Pharmacology, Baylor College of Dentistry, Texas A&M University System Health Science Center, Dallas, Texas, USA

This clinical report describes a functional and esthetic reconstruction using the Brånemark Novum system for the mandible and ITI implants for the maxilla after maxillary sinus grafting. After the extraction of mandibular teeth, the Novum system and a prosthesis were placed in the patient's mouth. Autologous bone transplantation from the mandible was also performed in the maxillary sinus at the same time. After the implant placement subsequent to the maxillary sinus grafting, the maxillary teeth and implants were restored with ceramic prostheses. These functional and esthetic prostheses have performed favorably without any problems for two years. (Int Chin J Dent 2004; 4: 93-96.)

Key Words: esthetics, function, implant, maxillary sinus graft.

Introduction

Implant-supported prostheses are frequently applied restorations for patients with functional and esthetic demands. A unique alternative in the realm of immediate loading of osseointegrated implants is the Brånemark Novum system for the edentulous mandible. Experience to date with over 200 Novum patients treated indicates a success rate of fixtures and fixed prostheses comparable to that of conventional fixed partial dentures.¹⁻³ In addition, bone loss patterns seem to indicate that the same kind of steady-state bone resolution occurs with the Novum that has been the benchmark of the original Brånemark fixed implant bridgework in the anterior mandible.

Maxillary sinus grafting is occasionally necessary to complement insufficient bone volume to support maxillary implants, especially for posterior regions. There are several techniques to increase the bone volume such as guided bone regeneration (GBR) with autogenous bone graft,^{4,5} and sinus floor elevation.⁶ This clinical report describes the functional and esthetic reconstruction using the Novum system for the mandible and ITI implants for the maxilla after maxillary sinus autologous bone transplantation from the mandible.

Clinical Report

A 56-year-old female patient had multiple missing and stump teeth, fracture and attrition of porcelain in PFM restorations (Figs. 1-3). All of the mandibular teeth, left molars and the first right premolar in the maxilla had type 2-3 mobility and resorption of alveolar bone, as evident in the radiographs (Fig. 4). Anterior mandibular teeth also indicated an apical lesion. The patient was classified as having bone quality of 2-3 and bone type of B-C (Lekholm and Zarb)⁷ after examination of the lateral radiographic cephalogram and occlusal radiograph, and was considered appropriate for treatment in the Novum system (Nobel Biocare USA Inc., Yorba Linda, CA, USA). After several possible treatment plans were outlined to the patient, the definitive plan that the patient accepted was the application of the Novum system with a fixed detachable prosthesis after the extraction of all mandibular teeth. For the maxilla, the selected plan was the grafting of maxillary sinus (left posterior and right



Fig. 1



Fig. 2



Fig. 3

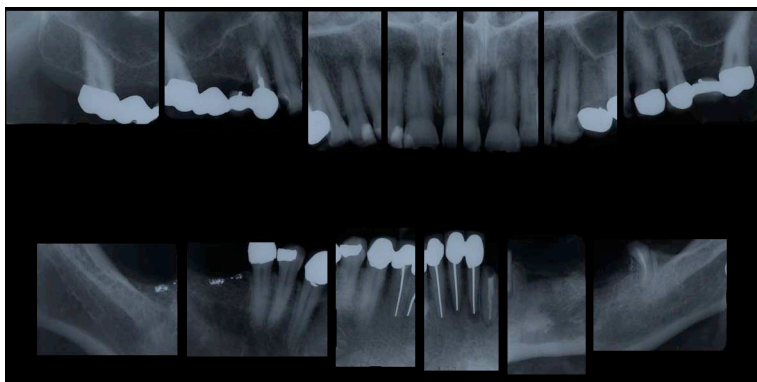


Fig. 4



Fig. 5



Fig. 6

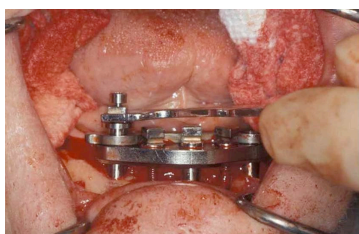


Fig. 7



Fig. 8



Fig. 9

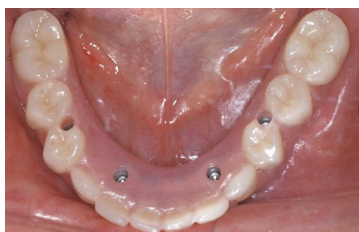


Fig. 10

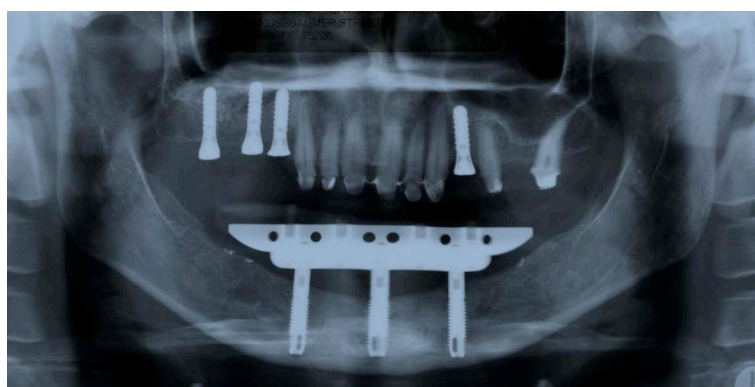


Fig. 11

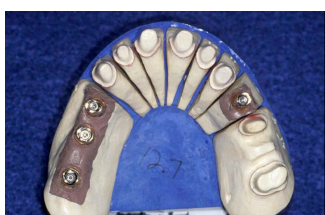


Fig. 12



Fig. 13



Fig. 14

Fig. 1. Frontal view of the patient referred for prosthetic evaluation.

Fig. 2. Occlusal view (maxillary) of the patient referred for prosthetic evaluation.

Fig. 3. Occlusal view (mandibular) of the patient referred for prosthetic evaluation.

- Fig. 4.** Dental X-ray radiograph of the patient before treatment.
Fig. 5. Surgical splint: anterior residual ridge of the mandible was ground flat.
Fig. 6. Titanium (lower and upper) bars placed on mandible to confirm adequate space.
Fig. 7. Placement of two lateral implant fixtures using V-template.
Fig. 8. Titanium (upper and lower) bars installed on the Novum implants.
Fig. 9. Autologous bone (from mandible) transplantation in maxillary sinus.
Fig. 10. Definitive mandibular prosthesis installed on the Novum system.
Fig. 11. Panoramic radiograph after placement of maxillary implants.
Fig. 12. Master cast for fabrication of Procera and custom copings.
Fig. 13. All-ceramic crowns (top) with Procera copings for anterior and PFM prostheses (bottom) for posterior.
Fig. 14. Frontal view of the patient after final restorations.

premolar regions) from the mandible and the placement of four implants and ceramic restorations. Although the Novum system and a definitive prosthesis can be installed in the same day as the tooth extraction, the system installation was conducted after the tooth sockets of the extracted teeth had healed. The vertical dimension of occlusion (VDO) was maintained using a mandibular temporary complete denture and maxillary provisional restorations. Before the installation of the Novum system, a surgical guide was fabricated on the master cast mounted on the semi-adjustable articulator (Fig. 5). The alveolar ridge of the mandibular cast was ground flat by removing amounts equivalent to actual surgical bone reduction. There was enough space to place two titanium (lower and upper) bars and artificial teeth between the maxillary teeth and mandibular residual ridge (Fig. 6).

According to the instructions, the Novum system (4 mm diameter) was installed using four templates after the reduction of the mandibular alveolar bone crest. Fig. 7 presents the final template (V-template) for the placement of two lateral implant fixtures positioned in relation to a central fixture. After the titanium bars were placed in position (Fig. 8), the interocclusal record was registered with a polyvinylsiloxane putty to fabricate the definitive prosthesis. The maxillary sinus grafting was performed during the fabrication of the mandibular prosthesis (Fig. 9). The alveolar bones removed from the mandible were transplanted beneath the maxillary sinus mucous membrane. After the wax denture was tried in the patient's mouth to confirm the occlusion and esthetics, the denture resin was finally polymerized according to conventional methods. The definitive fixed detachable prosthesis was then installed in the patient's mouth on the same day (Fig. 10).

Four ITI solid screw implants (4.1 mm diameter, 12.0 mm long, Institut Straumann AG, Waldenburg, Switzerland) were placed in the grafting area 6 months after the maxillary sinus grafting (Fig. 11). Five months after implant placement, custom gold alloy copings for implants and Procera alumina copings (Nobel Biocare, Fair Lawn, NJ, USA) for the anterior teeth were made from the master cast (Fig. 12). The final maxillary restorations were all-ceramic crowns with Procera copings for the anterior teeth, and PFM single crowns and fixed partial dentures for the posterior implants and teeth (Fig. 13). The maxillary prostheses were finally cemented with a resin luting cement (Rely X; 3M ESPE, St. Paul, MN, USA). The definitive prostheses had the group function occlusal scheme (Fig. 14). The patient was satisfied with these functional and esthetic prostheses, which have performed favorably without any fracture or bone resorption for two years.

Discussion

It is sometime difficult to place implants establishing functional and esthetic superstructures due to insufficient bone volume or bone loss (resorption) of the implant placement area. In the present clinical case, the patient's maxillary sinus floor in the posterior area was low, and the level of the sinus floor had to be elevated to place the

implants. Since the number of patients having difficulty with implant placement is increasing, the collaboration of prosthodontists, periodontists and oral surgeons is very important to achieve satisfactory results for these patients. With the appropriate informed consent from the patient, the mandibular teeth suffering from periodontal and endodontic disease were extracted, and the Novum system was installed to produce good functional and esthetic results. Another reason for choosing this treatment plan was that the appropriate function may not be achieved even if the fixed anterior teeth are reserved on the anterior residual ridge that is much higher than that of the posterior residual ridge due to severe bone resorption (Fig. 1). The bone debris removed from the mandible for the Novum installation was used as autologous bone for the maxillary sinus floor elevation to increase the support for the maxillary implant placement. As a result, sufficient bone support was achieved for the functional superstructures on the implants. The all-ceramic restorations with Procera copings used for the maxillary anterior teeth are also likely to contribute to the achievement of good esthetic results. Follow-up appointments to monitor the prostheses' function will continue.

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Reprint request to:

Dr. Ikuya Watanabe
Department of Biomaterials Science, Baylor College of Dentistry
Texas A&M University System Health Science Center
3302 Gaston Ave., Dallas, TX 75246, USA
Fax: +1-214-828-8458 E-mail: iwatanabe@bcd.tamhsc.edu

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