

# Orthodontic Treatment and Implant-Prosthetic Rehabilitation of a Partially Edentulous Patient

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## Abstract

This article describes the treatment of a 61-year-old man who had a completely edentulous maxillary arch and partially edentulous mandibular arch. The patient was orthodontically treated to correct an anterior crossbite by distalization of the mandibular teeth using a removable prosthesis serving as an anchorage unit. Subsequently, the patient received two zygomatic implants, five conventional implants in the maxillary arch, and six conventional implants in the mandibular arch. By the end of treatment, the convexity of the facial profile improved, and esthetic and functional occlusion was established.

Orthodontic treatment is restricted or sometimes even impossible in the case of partially edentulous patients due to difficulty in obtaining anchorage for tooth movements,<sup>1</sup> reduced periodontal support,<sup>1</sup> and presence of a prosthesis, which can interfere or prevent tooth movements.<sup>2</sup> Dental implants, which can be inserted and serve as anchorage units after osseointegration, can be used as an alternative treatment for such patients.<sup>1-4</sup> However, the site of insertion of the implant should be precisely defined, but it becomes difficult for patients to be treated orthodontically based on the necessity of dental movement during treatment.<sup>2</sup>

Early loss of the entire maxillary dentition results in loss of height and width of the alveolar bone,<sup>5-8</sup> thereby preventing the use of conventional implants for supporting the prosthesis. Zygomatic implants can be used as an alternative to ordinary implants when the bone area available for implantation is not sufficient to provide support for implants.<sup>9,10</sup> Currently, the use of zygomatic implants together with conventional implants is one of the best options for replacing maxillary teeth in patients with completely edentulous maxillae.<sup>9,10</sup>

This study presents the case of a 61-year-old patient who wore a total prosthesis in the maxillary arch and partial prosthesis in the mandibular arch, and who was orthodontically treated using implants and a prosthesis to achieve adequate posterior rehabilitation.

## Clinical report

Facial analysis showed that the patient had a straight-to-concave facial profile while wearing the maxillary prosthesis due to the presence of an anterior crossbite and accentuated projection of the mandibular incisors. The patient wore a complete denture in the maxillary arch and a partial prosthesis in the mandibular arch. All the anterior teeth (maxillary canines of the prosthesis) were in a crossbite with a class III canine relationship (Figs 1-3). Radiographic examination showed high resorption in the maxillary and mandibular alveolar bones from the natural teeth (Fig 4). The chief complaints of the patient were prosthetic instability and poor facial and dental esthetics.

The treatment was aimed at retracting the mandibular anterior teeth to correct the anterior crossbite to allow rehabilitation with implants and prostheses without the formation of a crossbite, thereby improving the facial profile of the patient. Furthermore, the molars were to be made upright to allow the insertion of mandibular implants at an adequate inclination and position. The option for bone grafting and conventional implants in the maxilla was disregarded due to extensive bone loss and need for large amount of graft, which would have a lower probability of success compared to the zygomatic implants.

First, orthodontic alignment and leveling were performed using 0.012-inch to 0.020-inch stainless steel archwires. Subsequently, the mandibular removable prosthesis was cut in the



**Figure 1** Initial intraoral frontal view.



**Figure 2** Initial intraoral right view.



**Figure 3** Initial intraoral left view.

anterior region to allow distal movement of the anterior teeth. The posterior part of the prosthesis was used as an anchorage unit for keeping the molars in position. Initially, the canines were distalized using elastic chains connected to the molars. Subsequently, the incisors were retracted. After total distalization of the anterior teeth, the molars were made upright. The first step of the rehabilitation procedure was the insertion of six mandibular conventional implants (Straumann, Basel,



**Figure 4** Initial panoramic radiography.



**Figure 5** Initial facial profile.

Switzerland) measuring 4 × 18 mm (2 implants), 4 × 9 mm (2 implants), 3.75 × 11 mm (one implant) and 4 × 11 mm (one implant). Of the six implants, two were inserted close to the canines because of the availability of a large amount of bone area; another two were inserted between the molars and canines, and the remaining two were inserted closer to the molars. After 6 months, maxillary implants were surgically inserted using the original Brånemark technique for zygomatic implants. In this procedure, two implants (Straumann) measuring 4.0 × 5.0 × 50.0 mm were inserted in the



**Figure 6** Post-treatment facial profile.

zygoma, together with five conventional implants (Straumann) inserted anteriorly and measuring  $3.75 \times 13$  mm (two implants),  $3.75 \times 13$  mm (one implant),  $4 \times 18$  mm (one implant) and  $5 \times 13$  mm (one implant). After the surgery, a metalloplastic implant-supported temporary prosthesis was inserted and was worn until the metal-ceramic definitive prosthesis was delivered 6 months later. Occlusal contacts in maximum intercuspation matching the posterior centric occlusion were established in the temporary and definitive prostheses. Lateral canine guidance and incisal guidance were also established.

At the end of the treatment, the convexity of the facial profile improved, as shown in the lateral view (Figs 5 and 6) as a result of the lower anterior teeth retraction and new upper prosthesis with incisors positioned anteriorly and due to the correction of the habitual protrusive position and restoration of the occlusal vertical dimension. Functional occlusion was established with ideal intercuspation, good vertical and horizontal overlap, coincident midlines, and well-distributed posterior contacts (Fig 7). A fixed retainer made with 0.0195" twist-flex stainless steel wire was bonded on the lower six anterior teeth. The post-treatment panoramic radiograph showed good parallelism among teeth and implants and good tissue health (Fig 8). The analysis 8 years post-treatment revealed excellent stability of the results and optimal periodontal tissue health (Figs 9–11).



**Figure 7** Post-treatment intraoral frontal photograph.

## Discussion

Partially edentulous patients present a great challenge to orthodontists because anchorage is reduced or sometimes even absent in these patients.<sup>2,7,11</sup> Furthermore, loss of some teeth may cause inclination, rotation, and extrusion of the remaining teeth, thereby possibly jeopardizing the treatment and the reference for movements.<sup>3</sup> Moreover, the presence of a fixed and removable prosthesis might limit movements.<sup>4</sup> However, as in the present patient, the prosthesis may be used as an anchorage unit, thus facilitating the treatment.

For rehabilitation, mandibular implants were first inserted. Four of these implants were inserted near the canines and molars to take advantage of the larger amount of bone area available in these regions. After uprighting the molars, an osseous neoformation area was created because of the stretching of the fibers in the mesial region of these teeth.<sup>12</sup> This neoformation allowed the surrounding bone area to be used as an implantation site.<sup>8,12</sup> The mandibular right molar showed a slight inclination even after implant insertion. This was corrected using a combination of provisional crowns and by using the implants as anchorage units.<sup>3</sup> The region distal to the canines was another good site for implantation because the decrease in bone width and height was less in this region. Consequently, this region was also used as an implantation site. In the present patient, the implants were inserted very close to the canines. This implantation had to be performed very carefully to prevent contact with the canine roots.

Zygomatic implants are an alternative for patients with accentuated bone loss in the posterior region of the maxilla.<sup>10,13</sup> Normally, such patients are treated by reconstructing the large bones in the extraoral donor areas. This procedure always involves a certain degree of morbidity, high cost, and various biological risks beyond the control of the professional, which may lead to failure.<sup>10</sup> In contrast, zygomatic implants have a high success rate (approximately 97%).<sup>9</sup> Furthermore, using the zygoma as an implantation site reduces the need for conventional implants in the anterior region of the maxilla.

Correction of the crossbite and rehabilitation in the maxillary anterior region improved the convexity of the facial profile. The nasogenian sulcus, which was deep at the beginning of the treatment, flattened as a result of the rehabilitation. The upper lip was projected and vermilion border was more displayed. In contrast, the lower lip was retracted as a result of the retraction





**Figure 8** Post-treatment panoramic radiograph.



**Figure 9** Intraoral frontal view 8 years after treatment.



**Figure 10** Intraoral right side 8 years after treatment.



**Figure 11** Intraoral left side 8 years after treatment.

of the mandibular anterior teeth, thereby reducing the lower lip vermilion border displayed.

## References

1. Gallas MM, Abeleira MT, Fernandez JR, et al: Three-dimensional numerical simulation of dental implants as orthodontic anchorage. *Eur J Orthod* 2005;27:12-16
2. Maruo H, Maruo IT, Saga AY, et al: Orthodontic prosthetic treatment of an adult with a severe Class III malocclusion. *Am J Orthod Dentofacial Orthop* 2010;138:820-828
3. Drago CJ: Use of osseointegrated implants in adult orthodontic treatment: a clinical report. *J Prosthet Dent* 1999;82:504-509
4. Moslehifard E, Nikzad S, Geraminpanah F, et al: Full-mouth rehabilitation of a patient with severely worn dentition and uneven occlusal plane: a clinical report. *J Prosthodont* 2011;21:56-64
5. Salinas TJ, Sheridan PJ, Castellon P, et al: Treatment planning for multiunit restorations—the use of diagnostic planning to predict implant and esthetic results in patients with congenitally missing teeth. *J Oral Maxillofac Surg* 2005;63:45-58
6. Vitral RWF, da Silva Campos MJ, de Andrade Vitral JC, et al: Orthodontic distalization with rigid plate fixation for anchorage after bone grafting and maxillary sinus lifting. *Am J Orthod Dentofacial Orthop* 2009;136:109-114
7. Geckili O, Sakar O, Yurdakuloglu T, et al: Multidisciplinary management of limited interocclusal space: a clinical report. *J Prosthodont* 2011;20:329-332
8. Capri D: Augmentation of an anterior edentulous ridge for fixed prosthodontics with combined use of orthodontics and surgery: a clinical report. *J Prosthet Dent* 2003;90:111-115
9. Bedrossian E: Rehabilitation of the edentulous maxilla with the zygoma concept: a 7-year prospective study. *Int J Oral Maxillofac Implants* 2010;25:1213-1221
10. Sherry JS, Balshi TJ, Sims LO, et al: Treatment of a severely atrophic maxilla using an immediately loaded, implant-supported fixed prosthesis without the use of bone grafts: a clinical report. *J Prosthet Dent* 2010;103:133-138
11. Rose TP, Jivraj S, Chee W: The role of orthodontics in implant dentistry. *Br Dent J* 2006;201:753-764
12. Mantzikos T, Shamus I: Forced eruption and implant site development: soft tissue response. *Am J Orthod Dentofacial Orthop* 1997;112:596-606
13. Ferreira EJ, Kuabara MR, Gulinelli JL: “All-on-four” concept and immediate loading for simultaneous rehabilitation of the atrophic maxilla and mandible with conventional and zygomatic implants. *Br J Oral Maxillofac Surg* 2010;48:218-220