

## Restoring Lost Vertical Dimension of Occlusion Using Dental Implants: A Clinical Report

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The successful rehabilitation of a patient with severe vertical overlap resulting from the loss of posterior occlusal support and excessive wear of the mandibular incisors is described. The treatment plan necessitated extraction of the remaining periodontally compromised mandibular teeth and placement of eight implants. Lost occlusal vertical dimension and morphologic facial height were restored using a fixed detachable implant-supported mandibular prosthesis, and the maxillomandibular relationship was transformed from Class II to Class I. *Int J Prosthodont* 1996;9:473-478.

Severe vertical overlap is characterized by an increased vertical difference between the incisal edges of the opposing central incisors in maximum intercuspation. This condition is recognized clinically as the loss of occlusal vertical dimension and morphologic facial height. It is believed that this condition predisposes the patient to abnormal function, improper mastication, excessive stress, and functional problems such as bruxing, clenching, and craniomandibular disorders.<sup>1,2</sup>

The etiology of excessive vertical overlap of the anterior teeth may include: (1) an abnormality in dentoalveolar or skeletal development; (2) a loss of posterior occlusal support; (3) wear of the anterior teeth; and (4) iatrogenic factors.<sup>3</sup>

Akerly<sup>4</sup> classified excessive vertical overlap according to severity and illustrated different possibilities for treatment. Treatment may include:

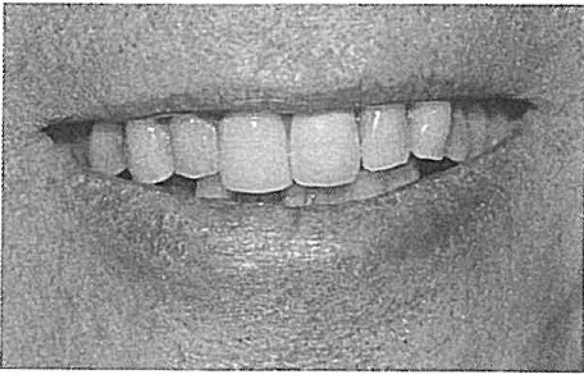
1. Reduction in the length of the mandibular incisors and restoration of the maxillary incisors to provide stable intercuspal position contact and prevent re-eruption of the mandibular anterior teeth.
2. Orthodontic correction to reduce the vertical overlap and realign the labial segments to obtain a stable occlusal relationship.<sup>5</sup>
3. Placement of an anterior occlusal device to intrude the anterior teeth and permit posterior tooth extrusion.<sup>6</sup>
4. Orthognathic surgery, often preceded by orthodontic correction of anterior teeth angulation to ensure a stable posttreatment occlusal relationship.
5. Complete mouth rehabilitation to increase vertical dimension and decrease anterior vertical overlap.

All treatment should include reduction of anterior vertical overlap and provide a stable occlusal relationship with correct anterior guidance.<sup>3</sup>

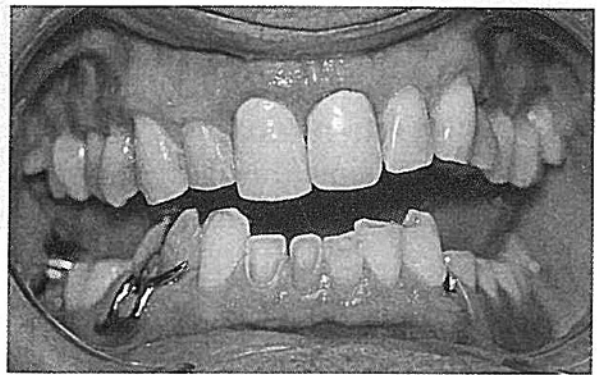
This article describes a method to restore lost vertical dimension of occlusion and decrease anterior vertical overlap through complete mouth rehabilitation using osseointegrated dental implants.

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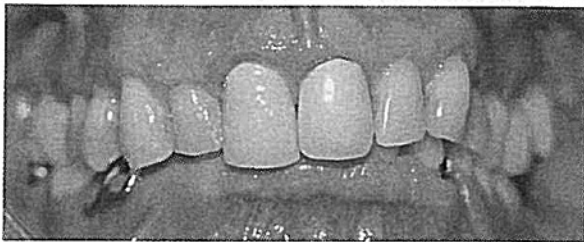
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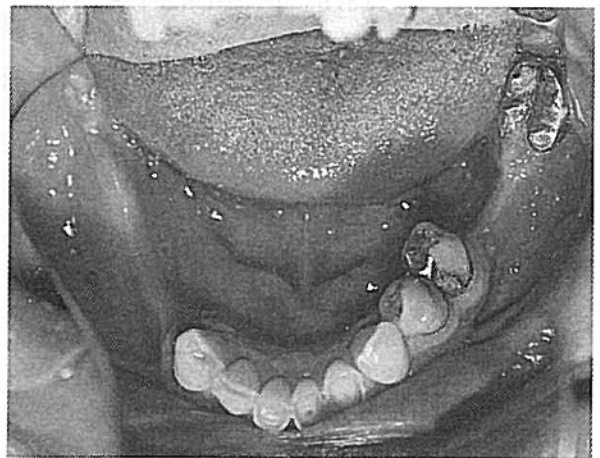
**Fig 1** Preoperative facial view of patient's smile.



**Fig 2** Facial view showing slanted maxillary plane of occlusion and advanced wear of mandibular incisors and collapsed posterior support.



**Fig 3 (Above)** Preoperative facial view showing severe vertical overlap in which mandibular anterior teeth are not visible.



**Fig 4 (Right)** Occlusal view of mandibular arch. Note loss of posterior teeth and advanced wear of mandibular anterior teeth.

### Patient Evaluation

A 67-year-old man presented with the chief complaints of loose teeth, facial collapse, and "not showing any lower teeth." The patient's medical history was noncontributory.

Extraoral examination revealed a retrognathic profile. Intraorally, the smile analysis showed poor anterior esthetics (Fig 1). The crowded, lingually inclined, mandibular anterior teeth impinged on the palatal mucosa, and the patient was edentulous posteriorly. The mandibular anterior teeth were also severely worn (Fig 2).

The missing mandibular posterior teeth had been replaced by a 25-year-old, ill-fitting removable partial denture that accommodated the collapsed occlusal plane (Fig 3). Because of advanced attrition, gingival recession, and advanced periodontal de-

struction, the mandibular teeth had a poor long-term prognosis (Fig 4). The maxillary arch was malaligned with a compromised occlusal plane. The maxillary central incisors were esthetically unsatisfactory.

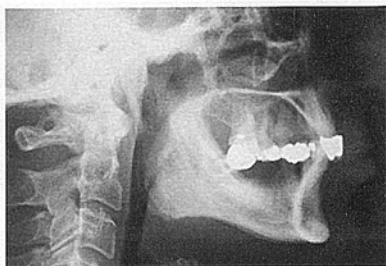
Radiographic examination revealed generalized horizontal bone loss with advanced bone loss in the mandibular arch (Fig 5).

The periodontal diagnosis was generalized moderate to severe periodontitis, gingival inflammation, localized severe periodontitis involving the mandibular right third molar, and generalized moderate gingival recession.

The occlusal relationship was an Angle's Class II malocclusion with excessive vertical overlap and extreme wear of the mandibular anterior teeth (Fig 6). The occlusal plane was uneven with unstable occlusal contacts, lateral excursive interferences, and poor anterior guidance.



**Fig 5 (Above)** Preoperative radiograph. Note advanced bone loss around the mandibular right third molar.



**Fig 6 (Right)** Preoperative lateral cephalometric view showing severe vertical overlap.

### Treatment Plan

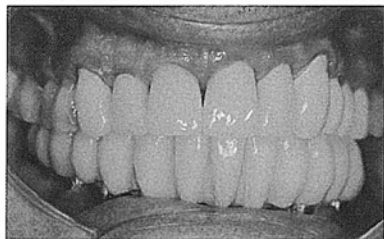
The main objectives of the treatment plan were to: (1) create an ideal occlusal plane for both the maxillae and mandible; (2) restore lost occlusal vertical dimension; (3) provide stable occlusal contacts in centric occlusion; (4) create a functionally acceptable anterior guidance; and, (5) improve the anterior esthetics.

All mandibular teeth were scheduled for extraction followed by immediate placement of eight implants (Nobel Biocare USA, Chicago, IL). Provisional crowns were planned for the maxillae with placement of a provisional complete mandibular denture. The final restorations would consist of metal ceramic restorations in combination with selective maxillary occlusal recontouring. A metal ceramic fixed detachable restoration supported by

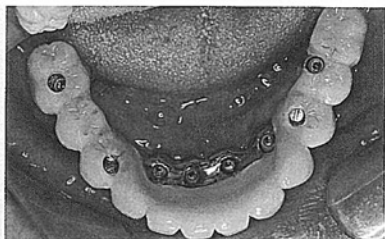
eight osseointegrated implants was planned for the mandible.

The diagnostic waxing was completed in the laboratory and converted to fixed and removable provisional restorations. Treatment for both arches was initiated simultaneously. The remaining mandibular teeth were extracted and eight implants were immediately placed. Ten days after stage 1 surgery the mandibular teeth were provisionally replaced with a complete removable denture with the corrected occlusal plane that restored the occlusal vertical dimension. Maxillary teeth from the right canine to the left first molar were prepared, and a heat-processed acrylic resin provisional restoration was placed. Enameloplasty was then performed on the remaining natural teeth to correct the occlusal plane.

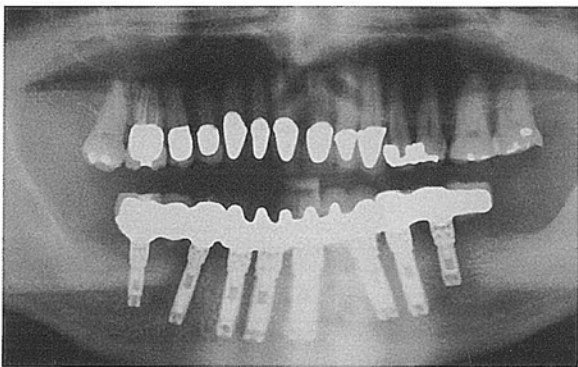
Esthetics and function of the provisional restorations were evaluated over the 3-month healing and



**Fig 7** Postoperative facial view showing restored vertical dimension of occlusion using metal ceramic crowns in the maxillae, and an implant-supported metal ceramic restoration in the mandible.



**Fig 8** Occlusal view of mandibular arch. Note the cantilevered mandibular anterior teeth.



**Fig 9** Postoperative radiograph of the final restoration showing implant-supported metal ceramic restorations on eight implants in the mandible, and metal ceramic maxillary restorations.

implant integration phase. The patient functioned well without any complications at the restored vertical dimension and new occlusal plane. The provisional restorations served as templates for the final prosthesis.

Three months following successful integration of the eight mandibular implants, stage 2 surgery was completed. The patient's provisional removable denture was modified and converted to an implant-retained fixed provisional restoration.<sup>7-9</sup> Final impressions of both arches were made and related to the articulator using face-bow and interocclusal registrations. Individual metal ceramic crowns were fabricated for the prepared maxillary teeth,

and an implant-supported metal ceramic mandibular prosthesis was fabricated. The screw-retained design of the fixed detachable prosthesis allowed retrievability.

### Results of Treatment

The vertical dimension of occlusion was reestablished, transforming the Class II malocclusion with a steep vertical overlap to a Class I occlusion (Fig 7). The mandibular incisors were cantilevered facially to compensate for the maxillomandibular discrepancy at the newly established vertical dimension of occlusion (Figs 8 and 9).

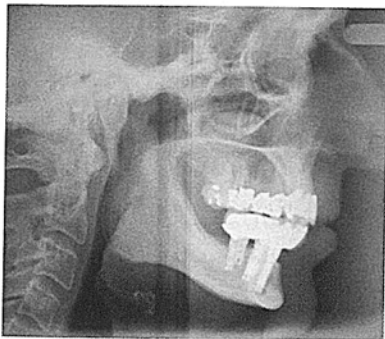


Fig 10 Postoperative lateral cephalometric view showing final restoration at re-established vertical dimension of occlusion.

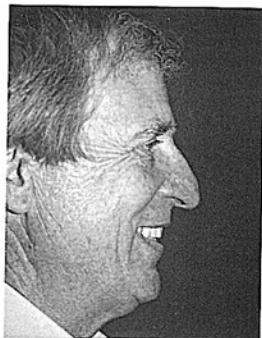


Fig 11 Postoperative profile view.

The preoperative and postoperative lateral cephalometric radiographs were compared to determine the increase in vertical dimension of occlusion, which approximated 5 mm (Fig 10).

The implants provided the necessary support to predictably correct the mandibular anterior deficiencies, replace the missing posterior teeth, and eliminate the need for a removable partial denture. Opposing porcelain occlusal surfaces were used to resist occlusal wear (Figs 11 and 12).

### Discussion

The decision to sacrifice the remaining mandibular anterior teeth and place osseointegrated dental implants may be considered radical treatment. However, if some of the mandibular anterior teeth had been preserved, fixed partial denture restorations would have been necessary to restore proper form, reduce the vertical overlap, and increase the occlusal vertical dimension. The patient may still have required a bilateral distal extension removable partial denture to replace the missing mandibular posterior teeth. Bone quantity in the posterior mandible was too limited to consider bilateral posterior free-standing implant-supported fixed restorations. Connecting the remaining natural teeth to the osseointegrated dental implants was rejected as an alternative because of the unpredictability and potential for complications.<sup>10</sup>

Extraction of the mandibular anterior teeth permitted use of the anterior mandibular bone for placement of the majority of the implants.

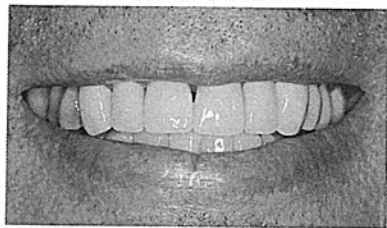


Fig 12 Postoperative facial view of smile.

Implant integration has been shown to be most successful in the anterior mandible,<sup>11</sup> primarily because of the quality and quantity of bone available and the ability to engage both cortices in implant placement.

A free-standing fixed implant restoration with a porcelain occlusal surface supported by eight implants provided the strength and wear resistance necessary to preserve the re-established occlusal vertical dimension over the 5-year period of observation.

### Summary

A method to restore morphologic facial height and vertical dimension of occlusion and reduce vertical overlap using implant-supported restorations, conventional fixed restorative therapy, and selective enameloplasty has been described. The occlusion

was transformed from severe Class II to Class I. The morphologic facial height and vertical dimension of occlusion were increased 5 mm, resulting in improved esthetics and function. The patient has been functioning symptom free for over 5 years without any changes in vertical dimension of occlusion.

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### Literature Abstract

#### Clinical aspects of a multicenter clinical trial of implant-retained mandibular overdentures in patients with severely resorbed mandibles

This randomized clinical trial compared the treatment effects of different implant systems used for retaining mandibular overdentures. The three different implant systems were the transmandibular implant (TMI), the IMZ (IMZ), and the Brånemark (BRA) systems. Eighty-eight patients with severe mandibular bone loss (8 to 15 mm mandibular symphyseal bone height) were randomly assigned to the different treatment groups. In all treatment groups, the overdentures were fabricated with an optimal fit and balanced occlusion after a 3-month healing period. Evaluation included peri-implant and radiographic parameters immediately after implant placement and 1 year after placement of the new implant-retained overdentures. A clinical implant performance scale (CIP) was also developed for comparative assessments of the different implant systems and included all the complications that occurred. The results did not reveal significant differences among the three implant systems at 1 year after placement of the implant-retained overdentures. The TMI group, however, displayed more complications than the other implant groups. A long-term evaluation is necessary to assess the clinical differences between the three implant systems.

Geertman ME, Boerrigter EM, VanWaas MAJ, van Oort RP. *J Prosthet Dent* 1996;75:194-204. References: 26. Reprints: M.E. Geertman, Department of Oral Function and Prosthetic Dentistry, PO Box 9101, 6500 HB Nijmegen, The Netherlands.—Haini Wang, DDS, VA Medical Center, Dental Service, Department of Prosthodontics, New York, New York