Short Communication

Surgical and Prosthodontic Treatment Using Alveolar Distraction Osteogenesis and Implant Placement for a Patient with Mandibular Prognathism: A Clinical Report

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A 49-year-old patient presented with an Angle Class III malocclusion with a partially edentulous mandible, as diagnosed by orofacial examination and radiographic and cephalometric analyses. The patient refused orthognathic surgery; therefore, the treatment plan included the preparation of all teeth and fabrication of provisional restorations to reestablish optimal occlusion. To allow for the placement of 3 implants, the edentulous posterior mandibular ridge was improved via alveolar distraction. The patient was recalled 3, 6, 12, and 24 months after prosthodontic treatment. The oral situation was stable and patient satisfaction was reported as high. *Int J Prosthodont 2007;20:256–258.*

A maxillary skeletal deficiency either alone or in combination with mandibular prognathism can be an etiologic factor in the development of Angle Class III malocclusion. Reestablishment of an acceptable vertical dimension should be based on the ability of the stomatognathic system to tolerate maxillomandibular spatial changes. The patient's ability to withstand any alterations of the vertical dimension of occlusion should be determined before a definitive prosthodontic treatment plan is made.[1]

Orthognathic surgery, orthodontic therapy, and maxillary and mandibular overlay removable and fixed partial dentures can be treatment alternatives for patients with mixed dental and skeletal malocclusions.[1–3] Distraction osteogenesis is the process of generating new bone in the bone gap.[4] This process has shown good success rates for the alveolar augmentation of quantitatively compromised proposed implant sites, and it has been used as an alternative to bone grafting for alveolar reconstructions.[4]

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This case history presents a treatment strategy for a patient with mixed dental and skeletal malocclusion and severe residual ridge reduction in the posterior mandible. Clinical management included restoration of posterior occlusal support with preliminary vertical alveolar distraction osteogenesis, combined with implant placement and extensive crown restoration therapy.

Clinical Report

A healthy 49-year-old partially edentulous male patient was referred to Marmara University Faculty of Dentistry, Istanbul, Turkey, for evaluation. His chief complaints were esthetic and functional deficiencies. Cephalometric, panoramic, and periapical radiographs were taken and Ricketts cephalometric analysis was performed. The patient showed a mixed dental and skeletal malocclusion with severe vertical bone resorption in the right posterior mandible. The habitual occlusion of the patient was diagnosed as an Angle Class III malocclusion with a significant loss of teeth at the right side of the mandible.

The patient's mandibular guidance in the centric relation position revealed excessive contact of the anterior teeth and a posterior interocclusal distance of under 2 mm, as measured in the molar region both intraorally and on mounted diagnostic casts. Figure 1 shows the teeth in centric occlusion and is a dramatic reflection of the resulting protrusive "slide in centric" associated with inadequate posterior occlusal support.

Informed consent was obtained after the prosthetic and surgical treatments were explained in detail. All maxillary and mandibular teeth were prepared for full

Fig 1 Pretreatment intraoral view demonstrating the patient's anterior protrusive slide from centric relation to centric occlusion.

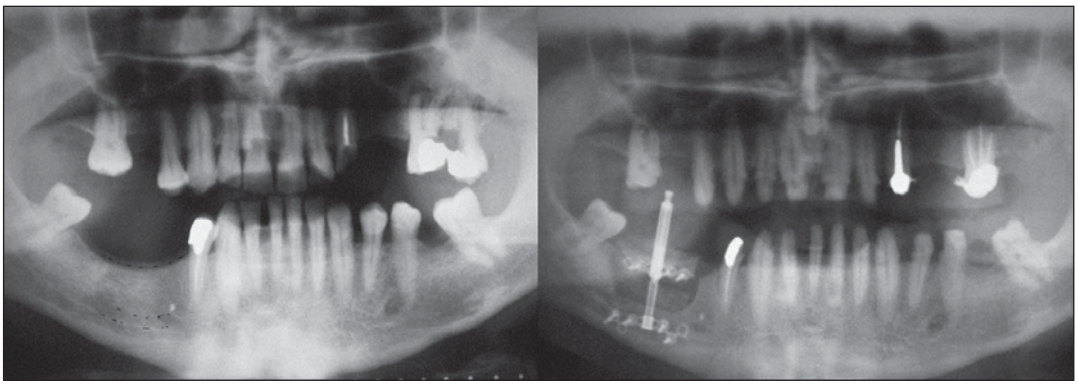

Fig 2 Initial panoramic radiographs following completion of the right-sided mandibular vertical alveolar distraction.

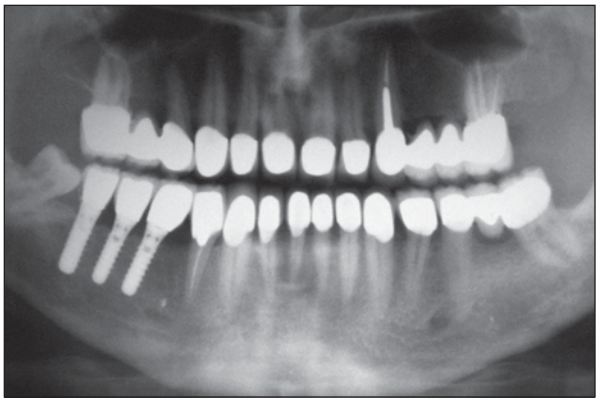

Fig 3 Panoramic radiograph 2 years after definitive treatment.

Fig 4 Intraoral view 2 years after definitive treatment.

crown coverage with a chamfer finishing line. Provisional restorations were fabricated at the predetermined vertical dimension of occlusion and left in situ for 3 months to allow proper adaptation. The distraction osteogenesis procedure was planned to increase residual alveolar height at the edentulous mandibular ridge, thus allowing the compromised site to be restored with a fixed prosthesis.

Placement of the alveolar distractor (Modus Distractor, Medartis) was performed under general anesthesia. The alveolar distractor was fixed, and lengthening was initiated after 1 week at a rate of 1 mm/day until the planned height of 8 mm was reached (Fig 2). The active phase of distraction osteogenesis was followed by a consolidation phase of 4 months. Next, the distractor was removed, 2 weeks were allowed for soft tissue healing, and 3 implants (Straumann, Straumann) were placed under local anesthesia in the distracted region.

All teeth and implants were restored with metal-ceramic restorations (VMK-95 Metal Keramik, Vita Zahnfabrik) (Fig 3). After prosthodontic treatment, the patient was recalled at 3, 6, 12, and 24 months. The implants were evaluated using traditional clinical and radiographic parameters (Fig 4). Standardized periapical radiographs using the parallel cone technique were obtained at each recall to monitor peri-implant bone loss.

Results

An evaluation of routine clinical parameters 2 years after definitive prosthodontic treatment demonstrated stable attached gingiva around the implants and no signs of inflammation. Implant stability was checked manually and with resonance frequency analysis (Osstell, Integration Diagnostics). All implants demonstrated excellent stability. The patient's vertical dimension of occlusion, esthetics, phonetics, and overall function were evaluated. Radiographs revealed 0.4 mm of peri-implant bone loss, which was regarded as acceptable. The patient reported a comfortable and satisfactory adjustment to the treatment. While no persistent sensory nerve complications were noted, temporary hypoesthesia of the right inferior alveolar nerve was recorded for 6 weeks postsurgery. After removal of the distractor, the bone gain remained constant during the observation period.

Discussion

Conventional treatment of mandibular prognathism often includes orthodontic treatment and mandibular osteotomy.[3] However, older patients may refuse such a surgical strategy, and alternative options must be considered. Frequently, occlusal problems similar to those presented in this case history can be managed with prosthodontic and surgical approaches.[5]

Furthermore, in cases where bone reduction in the mandible precludes ideal implant support, an augmentation procedure may become mandatory.[5] The distraction osteogenesis protocol offers excellent results when more bone is needed to allow for implant therapy. The disadvantage of distraction osteogenesis is the need for additional surgery to remove the device. However, it is an effective technique when properly planned and performed.[5]

Skeletal deformities with malocclusion can be treated successfully with a multidisciplinary approach in selected situations. Meticulous preoperative planning and assessment of each patient's requirements will ultimately define the methods of rehabilitation.

References

1. Fayz F, Eslami A. Determination of occlusal vertical dimension: A literature review. J Prosthet Dent 1988;59:321–323.
2. Turner KA, Missirlian DM. Restoration of the extremely worn dentition. J Prosthet Dent 1984;52:467–474.
3. de Villa GH, Huang CS, Chen PK, Chen YR. Bilateral sagittal split osteotomy for correction of mandibular prognathism: Long-term results. J Oral Maxillofac Surg 2005;63:1584–1592.
4. Enislidis G, Fock N, Millesi-Schobel G, et al. Analysis of complications following alveolar distraction osteogenesis and implant placement in the partially edentulous mandible. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;100:25–30.
5. Mays KA. Reestablishing occlusal vertical dimension using a diagnostic treatment prosthesis in the edentulous patient: A clinical report. J Prosthodont 2003;12:30–36.

Literature Abstract

Nine- to 14-year follow-up of implant treatment. Part III: Factors associated with peri-implant lesions

This study aimed to analyze, on a patient and implant basis, associated factors related to peri-implant lesions. A total of 218 patients with 1,057 implants (Brånemark)—524 in the maxilla and 533 in the mandible—placed from 1988 to 1992, were provided with implant-supported fixed or removable restorations. New sets of intraoral radiographs were taken at 1- and 5-year (after placement of the suprastructure) recall examinations. At the final examination, performed 9 to 14 years after suprastructure placement (from 2000 to 2002), 999 implants were available for examination The following recordings were included: age at final examination, gender, years of education, total number of dental visits since placement of suprastructure, smoking habits, medical history, keratinized mucosa, probing depth measured at 4 sites, bleeding on probing (BOP), suppuration, plaque score, percent of remaining teeth before implant placement with bone loss ≥ 4 mm, number of implant threads not supported by bone. Mucositis was defined as probing depth ≥ 4 mm and BOP, and peri-implantitis was defined as bone loss ≥ 3 threads when comparing the radiographs taken at the final examination with the radiographs taken 1 year after placement of the suprastructure, combined with BOP and/or pus. The results showed that in both univariate and multivariate analyses, on the implant level, the amount of keratinized mucosa and the presence of pus were explanatory for mucositis as well as a bone level at ≥ 3 threads. On the patient level, smoking was significantly associated with mucositis, bone level at ≥ 3 threads, and peri-implantitis. Another factor associated with peri-implantitis was bone loss at teeth at the time of implant placement. Loss of bone around existing teeth is an obvious sign of current or past periodontal disease. As a result, it was concluded that individuals with a history of periodontitis and individuals who smoke are more likely to develop peri-implant lesions.

Jansaker AMR, Renvert H, Lindahl C, Renvert S. *J Clin Periodontol* 2006;33:296–301. **References:** 27. **Reprints:** Stefan Renvert, Department of Health Sciences, Kristianstad University, 291 88 Kristianstad, Sweden. E-mail: stefan.renvert@hv.hkr.se—*Huong Nguyen, Singapore*