Implant-Supported Prosthetic Rehabilitation of a Patient with Localized Severe Attrition: A Clinical Report

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Abstract

Patients usually adapt to their existing occlusal vertical dimension (OVD). It is essential to resolve each of the problems associated with decreased vertical dimension as a result of attrition. This report describes the multidisciplinary dental treatment of a 40-year-old male patient who had severe tooth wear, resulting in reduced vertical dimension. After clinical evaluations, extraoral examination showed a reduction of the lower facial height, drooping, and overclosed commissures. Ten dental implants were placed into the maxillary and mandibular alveolar processes. During the osseointegration period, an interim removable partial denture was made at increased OVD to use in the first stage of rehabilitation. It was used for 3 months as a guide for preparing the definitive restorations. The patient’s adaptation to the increased OVD was evaluated. During this period, he was asymptomatic. Following the evaluation period, the provisional fixed restoration was used for 3 months. Then, full-mouth definitive prostheses supported by a combination of implants and teeth were fabricated to upper and lower jaws. Osseointegration of the implants, peri-implant mucosa health, prosthesis function, and esthetics were assessed after 1 week and 1, 3, and 6 months. After 3 years of follow-up, no functional or esthetic difficulties with the implants and restorations were noted.

Dental wear could be a potential chronic problem for dentition since it is multifactorial and is generally a combination of abrasion, attrition, and erosion. Although several factors affect the type and rate of wear, attrition could be a physiologic process that occurs by the loss of tooth tissue due to friction between opposing teeth. In addition, pathologic wear occurs when the normal rate of physiologic process is accelerated by endogenous or exogenous factors. The etiology of wear should be diagnosed properly to prevent these pathological changes.

The tooth wear process might lead to destruction of the stomatognathic system with severe tooth surface loss and is associated with decreased occlusal vertical dimension (OVD). Since alterations in OVD could cause adaptable reactions in the temporomandibular joint (TMJ), periodontium, and tooth surfaces, some patients do not always need their stomatognathic system with decreased vertical dimension to be restored. However, in some severe cases, decreased vertical dimension with worn teeth could result in an unesthetic appearance, decreased masticatory efficiency, loss of muscle tone, dentin hypersensitivity, and pulpitis. Therefore, for managing a complete oral rehabilitation, a systematic approach should be followed by increasing the vertical dimension progressively. Thus, occlusal splints or fixed or removable partial dentures (RPDs) might be treatment options for situations where loss of OVD has occurred.

The use of dental implants integrated into the living tissues of the jaws to replace a single tooth or multiple adjacent missing teeth is a predictable procedure in consideration of optimal esthetic characteristics and long-lasting stability. Furthermore, the size of the edentulous space between existing teeth might be critical for the subsequent implant placement. To improve treatment success, a multidisciplinary approach with collaboration between the maxillofacial surgeon and prosthodontist for implant planning and placement should be considered.

The aim of this clinical report is to illustrate the restorative treatment of a patient with worn anterior dentition by a sequence of treatment, including surgical and prosthetic multidisciplinary approaches.

Clinical report

A 40-year-old man was referred to Gazi University, Department of Prosthodontics with a chief complaint concerning inability to chew and unpleasant esthetics, because of his worn anterior teeth and loss of posterior teeth. He reported that he had lost his posterior teeth 3 years ago because of periodontal disease. The patient’s general medical history was not significant, and he had no temporomandibular disorder or pain in the mastication muscles. Extraoral examination showed a reduction of the lower facial height, protuberant lips, wrinkles, drooping and overclosed commissures, and an unpleasant smile caused by collapsed OVD. The general standard of oral hygiene and gingival situation were not satisfactory. Additionally, periodontal...
condition and soft-tissue examination showed no pocket depth over 2 mm or mobility of any remaining teeth; however, there was loss of gingival papillae between the maxillary right and left central teeth (#11 and #21), possibly due to maxillary and mandibular incisor contact resulting in loss or cratering of the interdental alveolar crest. Radiographic evaluation demonstrated adequate bone support for the remaining teeth. Clinically, the patient demonstrated partial edentulism, and localized severe attrition was seen, especially in the right anterior teeth (Fig 1). In addition, the intraoral and radiographic examination verified that maxillary left and right first premolars, second premolars, first molar, maxillary left second molar, mandibular right and left first premolars, second premolar, and first and second molars were lost (#14–16, #24–27, #34–37, #44–47; Fig 1).

A treatment plan was formulated that required communication between the surgeon and the prosthodontist. To assist
the interdisciplinary consultation process, a diagnostic setup was prepared by the prosthodontist. The patient’s casts were mounted on a semiadjustable articulator (Stratos 200; Ivoclar Vivadent, Schaan, Liechtenstein) using a facebow record and an interocclusal record made with the aid of a Lucia jig and poly(vinyl siloxane) occlusal registration material (Exabite II; GC Corp., Tokyo, Japan). After careful assessment, it was determined that a 6-mm loss of OVD had occurred. To restore the lost OVD, the occlusion, function, and esthetics of the patient, increasing the OVD by interim removable partial prosthesis, interim fixed prosthesis, and full-mouth rehabilitation with implant-teeth-supported metal ceramic restorations were planned. Informed consent was obtained from the patient before beginning the treatment.

**Surgical procedure**

Decisions regarding implant length and width were based on an examination of periapical and panoramic radiographs of the maxillary and mandibular bone. In total, ten implants (five in the maxilla, five in mandible) were planned by the prosthodontist. Mounted diagnostic casts were used to fabricate a guide for implant placement by the surgeon. The implant surgery was undertaken under local anesthesia and following the guidelines determined by the manufacturer. The surgical procedure started with an intraoral crestal incision followed by subperiosteal dissection of the mucoperiosteum. Flattening of the alveolar crest was performed with a bur and under copious sterile saline irrigation. At the insertion stage, the implants were placed at a depth according to the guidelines given by the manufacturer (Standard Plus Implants; Straumann AG, Basel, Switzerland). Five implants were placed in both the maxilla and mandible (Table 1).

Postoperative treatment consisted of standard analgesics, chlorhexidine 0.2% mouthrinses, antibiotics, and nonsteroidal analgesics for 3 consecutive days. Sutures were removed 1 week after surgery. After a bone-healing period of 6 months, a second-stage surgery was undertaken; the healing abutments were connected and left in place for 3 weeks for peri-implant soft-tissue healing. Standard oral hygiene
instructions, including brushing of the healing abutments, were given to the patient.

**Prosthetic stage**

The new OVD was set to increase by approximately 6 mm in the incisal guidance pin of the articulator. Then, the maxillary right and left central incisor and right lateral incisor and canine (#11, #12, #13, #21) had root canal therapy and post-core restorations. An RPD was made at the increased OVD to use at the first stage of the rehabilitation (Fig 2). This interim removable denture was used for 3 months as a guide for the definitive oral rehabilitation. The patient’s adaptation to the increased OVD was evaluated. During this period, the patient’s functions, muscle sensitivity, mastication, TMJ discomfort, swallowing, speech, and anterior and posterior speaking space were assessed. No muscle tenderness or temporomandibular discomfort was found, and the patient was asymptomatic. Development in facial esthetics, speech, and mastication showed the patient’s tolerance capacity.

The proper OVD was determined using the physiologic rest position of the mandible as a guide and noting the existing interocclusal distance. It was decided that all of the teeth should be restored with full-mouth rehabilitation to restore lost vertical dimension. After preparation of the remaining teeth (Fig 3), the provisional crowns were fabricated (autopolymerizing acrylic resin, ALIKETM; GC America, Alsip, IL) using a vacuum-formed matrix (Drufofen H; Dreve Dentamid GmbH, Unna, Germany). The interim fixed restoration was cemented with temporary cement (Temp Bond NETM; Kerr, Salerno, Italy).
The previous interim removable denture made at increased OVD was adapted to the interim fixed prostheses. These interim prostheses were used for 3 months as a guide for the definitive oral rehabilitation. In addition, protrusive contact, canine guidance, esthetics, and phonetics of the interim prosthesis were assessed, and 1-, 2-, and 3-month check-ups were performed.

After 3 months, the impression copings were placed. Definitive impressions of the maxillary and mandibular teeth and abutments were made with a polyether impression material (Impregum; 3M ESPE, Seefeld, Germany). The impression copings were fixed onto the abutment analog. Then, cement-retained prostheses were completed on abutment level models from a base metal alloy (Master-Tec; Ivoclar Vivadent AG, Schaan, Liechtenstein) and porcelain (VITA VM 13, VITA Zahnfabrik, Bad Sackingen, Germany; Fig 4).

Centric occlusion, protrusive contacts, and canine guidance were assessed in the definitive anterior restoration. The scheme of occlusion was mutually protected articulation. The right lateral tooth (#12), which was below the plane of occlusion, created a reverse occlusal plane. To offset this reverse occlusal curve, the incisal guidance was increased. As a result, a flat mandibular plane of occlusion was established (Fig 4). The occlusal plane and esthetics were used as a guide to establish anterior guidance.

Phonetics was assessed using the closest speaking space technique. The technique, suggested by Silverman, was reported to give constant and reproducible results. The closest speaking space was considered to be between the lower centric occlusion line and the upper closest speaking line. Finally, the definitive restoration was cemented with temporary cement (Temp Bond NETM). Oral hygiene and regular check-up were emphasized. Following evaluation of the patient after 24 hours, 48 hours, and 1 week, occlusal corrections were made. Once the occlusal adjustments, speech, and esthetics seemed satisfactory, all restorations were cemented definitively with zinc polycarboxylate cement (Adhesor Carbofine, Kerr, Salerno, Italy; Fig 4). Compared with the pretreatment profile (Fig 5A), the post-treatment profile photographs (Fig 5B) showed a marked improvement in the facial profile (Fig 6). Following the definitive cementation of all restorations, a protective occlusal splint was manufactured to protect the restorations. Routine radiographs consisted of panoramic radiographs taken preoperatively, after placement of implants, at the time of prosthetic loading, and annually thereafter until the end of follow-up (Fig 7).

Follow-up period

Routine clinical assessments were made after 1 and 4 weeks, 3 and 6 months, and 1, 2, and 3 years with visual and radiographic examinations. Criteria for success included functional harmony, absence of pain, no tension or tiredness in facial and masticatory muscles, and phonetic and esthetic satisfaction. The patient acknowledged having improved function and esthetics and was pleased with the results.

Discussion

Loss of tooth substance or even severe tooth wear might be a contributing factor to dental occlusion problems. Patients with these problems often seek treatment because of an unpleas-
In this case, the attrition was severe in the right anterior region, and the patient had a concave profile (Figs 1 and 5A). Following the determination of 6 mm loss of OVD, the interim RPD was made to be used for about 3 months for restoring the lost OVD. Since provisional crowns had been prepared from autopolymerizing acrylic resin, they might demonstrate dimensional degeneration and marginal accuracy problems in long-term use. Additionally, use of a fixed interim prosthesis on prepared teeth might cause pulpitis or periodontal problems in the long term. Therefore, initially an RPD was chosen to restore loss of OVD. Then, a fixed interim prosthesis was used for 3 months. During the 3-month period, to evaluate temporomandibular discomfort, wear, and muscle fatigue, the restorations were cemented temporarily, and no complication occurred.

To restore lost OVD, the multidisciplinary team should be in close collaboration in terms of planning the immediate, transitory, and long-term phases of treatment. To rehabilitate these patients with esthetics and for functional success, prosthetic, orthodontic, and surgical collaboration might be required. The use of dental implants in supporting fixed prosthetic rehabilitations can provide high success when certain conditions are met during the manufacture of the implant, in its placement, in its eventual functional loading, and in its maintenance. In this report, because of the long treatment period and the difficulty of the treatment procedure, surgical/orthodontic/prosthodontic treatment was not preferred by the patient. Therefore, to restore the missing teeth, surgical/prosthodontic multidisciplinary rehabilitation was planned, and a total of ten implants were placed in the maxilla and mandible.

Mutually protected articulation is described as an occlusal scheme in which the posterior teeth prevent excessive contact of the anterior teeth in maximum intercusption, and the anterior teeth disengage the posterior teeth in all mandibular excursive movements. In this report, a mutually protected occlusal scheme was used to prevent the destruction of the provisional and definitive restorations. Furthermore, the patient had an end-to-end incisor relationship in right anterior maxilla and concave facial profile at the beginning of the treatment (Figs 5A and 6A). At the end of the prosthetic rehabilitation, both the facial appearance and the occlusion were improved (Figs 5B and 6B).

**Conclusion**

Restoring lost OVD by RPD and full-mouth rehabilitation should be done progressively and carefully for maintaining the health and structure of the masticatory system in the patient who has severely worn teeth. Additionally, these prosthetic rehabilitations play a major role in the patient’s physical attractiveness and social confidence.

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**References**


