A multidisciplinary approach for the rehabilitation of a patient with an excessively worn dentition: A clinical report

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This clinical report describes a multidisciplinary approach to the diagnosis and treatment of a patient with a severely worn dentition. The treatment included osteotomy and immediate implant placement and loading in the mandible. The definitive restorations were implant- and tooth-supported metal ceramic restorations. These restorations were fabricated with metal occlusal surfaces at an increased occlusal vertical dimension, which provided acceptable esthetics and function. (J Prosthet Dent 2014;111:259-263)

Dental wear occurs in patients of all ages across the globe. Studies have provided important information about the anatomy and origin of dental wear. Occlusal wear has mostly been attributed to attrition, which is defined as the loss of tooth structure by mechanical wear from another tooth surface. However, several other etiologic factors, such as erosion, abrasion, and parafunctional habits (bruxism), have been reported to have a significant role in the process of excessive occlusal wear. Diet and diseases, such as gastric reflux, congenital abnormalities, and eating disorders, are important contributors to excessive occlusal wear. A differential diagnosis is not always possible because a combination of these conditions may be present. Nevertheless, identifying the etiology of the excessive wear and evaluating the diagnostic data, especially the occlusal vertical dimension, are important. An estimation of the presenting occlusal vertical dimension, together with the extent of noncarious tooth loss, is essential before deciding upon a treatment plan.

Loss of the occlusal vertical dimension caused by physiologic tooth wear does not occur when compensated for by continuous tooth eruption, together with the development of the associated alveolar bone. When the rate of tooth wear exceeds the compensatory mechanisms, a loss of occlusal vertical dimension is observed. Occlusal vertical dimension can be estimated with several methods, for example, phonetics, interocclusal distance, and swallowing.

The management of severely worn dentition is challenging for clinicians, both from a preventive aspect and a restorative aspect. Turner and Missirilian classified patients with extensively worn dentitions into 3 categories. Patients in category I exhibit excessive wear, with loss of the occlusal vertical dimension. Patients in category II exhibit excessive wear, without loss of the occlusal vertical dimension but with space available for the placement of restorations. Patients in category III present with excessive wear and no loss of occlusal vertical dimension but differ from category II in having limited space available. Providing sufficient space for restorative materials is challenging, and, with any increase in the occlusal vertical dimension, the patient is committed to having all the occluding surfaces of at least 1 arch restored. When there is an occlusal plane discrepancy. This is further complicated because an uneven amount of restorative space across the arch may be required. This clinical report describes a multidisciplinary approach to the diagnosis and treatment of a patient with excessively worn dentition of overerupted mandibular anterior teeth.

CLINICAL REPORT

A 64-year-old white man was referred by his previous dental provider to the Advanced Prosthodontics Department, Ostrow School of Dentistry, University of Southern California, for treatment. His stated chief complaint

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was, “I grind my teeth and all of them are worn out; I would like to have good looking teeth again” (Fig. 1). The patient reported that he lost his teeth because of fracture and recurrent caries. Upon examination, the patient was found to have worn and supraerupted mandibular anterior teeth (Fig. 1). Sharp enamel edges with dentinal craters were observed on the anterior mandibular teeth, which indicated active wear and an erosive component that caused loss of tooth structure. Abrasive wear facets also presented on the maxillary anterior sextant. An occlusal plane discrepancy where the mandibular anterior teeth were supraerupted and the porcelain had fractured also was observed in the intraoral examination. Noncarious cervical lesions were noted on teeth in the maxillary arch. However, the patient had no tooth sensitivity or pain.

Results of clinical and radiographic examinations revealed the presence of carious lesions. Also, the previous dental provider had placed 6 implants for the patient, 3 Mk III RP (Nobel Biocare) in the mandibular posterior, 2 Osseospeed TX (Dentsply Implants) in the maxillary left posterior, and 1 regular neck Straumann implant (Standard Plus RN; Straumann USA LLC) in the mandibular right posterior (Fig. 2). The 2 implants on the left mandible exhibited periimplant bone loss (Fig. 3). Both of the implants were mobile, and the patient experienced moderate levels of pain upon loading. A diagnosis of periimplant bone loss associated with malplaced implants was made. Extraoral examination revealed no facial asymmetry or muscle tenderness. The patient did not have any symptoms of temporomandibular joint dysfunction. The dental disease diagnosis of the patient included dental caries, periapical periodontitis, generalized moderate with localized severe chronic periodontitis, partial edentulism, and nocturnal bruxism. He was also diagnosed with loss of tooth structure due to abrasion. The patient was classified as class III, according to the prosthodontic diagnostic index (PDI) classification.

The treatment objectives were to improve oral hygiene and restore function by providing implant-supported partial fixed dental prostheses to replace teeth in the mandible, together with a combination of implant-supported fixed restorations (single units and fixed dental prostheses) and metal ceramic restorations for the remaining teeth in the maxilla. The available treatment options were presented and discussed with the patient, as was the need to increase the occlusal vertical dimension to obtain restorative space, especially in the anterior region of the maxilla and mandible. At this point, an esthetic intraoral interim acrylic resin (Jet Acrylic; Lang Dental Manufacturing Co Inc) restoration was fabricated to establish parameters of esthetics to include the incisal edge position of the maxillary anterior teeth and to display the teeth when smiling.

To provide space for the components and develop proper contours for the implant-supported restorations, 10 mm of space from the implant platform to the opposing occlusal surface has been recommended. Therefore, an occlusal device was provided at an increased occlusal vertical dimension (4 mm at the incisal pin) with instructions that the patient wear the device constantly except for hygiene and eating. After a 4-week period, the patient did not report any muscle tenderness or temporomandibular joint discomfort. A diagnostic waxing was completed at this occlusal
vertical dimension, which satisfied the esthetic parameters for the maxilla.

In spite of the increased occlusal vertical dimension, the supraeruption of the mandibular anterior teeth demanded additional restorative space. A variety of procedures were considered, including orthodontic intrusion, crown lengthening surgery together with reduction of clinical crown height, elective endodontic therapy with reduction of clinical crown height, extraction of the supraerupted teeth, and an increase in the occlusal vertical dimension. These options also were considered in combination. After considering the severity of the malposition of the mandibular anterior teeth, their remaining tooth structure, and the length of treatment time, the restoration with the best long-term outcome was determined to be an implant-supported restoration. Apart from the 2 failing implants of the mandibular left side, this patient had a history of success with implant integration and presented with no systemic risk factors; moreover, the anterior mandible was anatomically conducive to implant placement. A space analysis indicated that an ostectomy would also be required after the removal of the mandibular anterior teeth to allow for appropriate contours of the implant-supported restoration. If the implants were deemed to have adequate primary stability, then they were to be loaded at the time of placement.

In accordance with the diagnostic waxing (Fig. 4), a surgical template was fabricated to guide both the ostectomy and implant placement after the extraction of the mandibular anterior teeth. The posterior mandibular implants were used to index the surgical template. This procedure was carried out by attaching three 6-mm-long healing abutments (4-mm-diameter Healing cap; 3i Biomet) to the implant analogs on a cast in positions of the existing posterior mandibular implants, then replicating the diagnostic waxing in polymethyl methacrylate (Jet Acrylic; Lang Dental Manufacturing Co Inc) on this cast. Similar healing caps were placed on the implants intraorally to allow accurate placement of the surgical guide (Fig. 5). With this surgical guide, 5 implants (Osseotite; 3i Biomet) were placed in the mandibular anterior region. All the procedures were

![Image](image_url)

**4** Diagnostic waxing.

![Image](image_url)

**5** A, B, Six-mm-long healing abutments on implants as indices for surgical template. C, D, Extraction of remaining teeth followed by ostectomy and immediate loading of implants.
completed at the same appointment. Similar to the surgical guide, the diagnostic waxing was duplicated with polymethyl methacrylate (Ena Temp; Micerium) to form an interim restoration, which was inserted immediately after placing the implants. At another appointment, 2 implants (Osseotite; 3i Biomet) were placed in the maxilla, and the fixed interim restorations (Ena Temp; Micerium) were fabricated and cemented with TempBond (Kerr Dental).

After confirming that the patient was satisfied with the form, color, shape, and function of the interim restorations (Fig. 6), the tooth preparations were completed and impressions were made with polyvinyl siloxane impression material (Extrude; Kerr Corp). The framework (Au-Pd alloy, Argdent30; Argen Corp) was fabricated with posterior teeth with metal occlusal surfaces because of the self-reported parafunction. In the maxillary arch, single-unit tooth-supported metal ceramic restorations were inserted and cemented with resin-modified glass ionomer cement (FujiCEM; GC America). Splinted screw-retained metal ceramic restorations were inserted for the maxillary left posterior implants, whereas single-unit screw-retained implant-supported restorations were placed in the anterior maxilla. In addition, screw-retained implant-supported splinted metal ceramic restorations were inserted in the mandible in 2 segments. The restorations were satisfactory in terms of form, color, phonetics, and function (Figs. 7-9).

DISCUSSION

The management of excessively worn dentition is a major challenge for dental professionals. One of the most important considerations before diagnosis and treatment planning is to identify, eliminate, or reduce the factors that caused the excessive wear. Failure to eliminate the cause may compromise the long-term survival of restorations and lead to further deterioration of the dentition.18-21 Attribition has been assumed to be a physiologically normal process that is necessary for function.18 Xhonga19 found the rate of normal attrition for nonbruxers to be 35 to 65 μm in 6 months. In another study, Lambrechts et al20 reported that the normal amount of tooth wear is 68 μm per year.

The patient in this clinical report presented with excessive wear with limited space available for restorations.
and excessive wear in existing restorations, attributed to nocturnal bruxism. A sufficient amount of restorative space was gained by combining surgical osteotomy in the anterior region of the mandible, with an increase in the occlusal vertical dimension. Approximately 5 mm of restorative space was obtained with the surgical procedure in addition to a 5-mm increase in the occlusal vertical dimension. Maxillary and mandibular metal restorations were inserted at the new occlusal vertical dimension, which resulted in acceptable esthetics and function. In addition, the patient presented with 3 different types of implant systems, which complicated procedures for the restorative dentist because 3 different sets of screws, drivers, and wrenches were required. This further illustrates the benefit of having a comprehensive treatment plan before implant placement and mutual understanding among different specialists of interdisciplinary treatment planning.

SUMMARY

In this clinical report, the patient presented with excessive wear without loss of the occlusal vertical dimension, with limited restorative space together, and with overerupted mandibular anterior teeth. The treatment plan used osteotomy, immediate implant placement, and loading in the mandible, and delivery of implant and tooth-supported metal ceramic restorations in the maxilla and mandible. These restorations used metal for the posterior occluding surfaces at an increased occlusal vertical dimension, which provided acceptable esthetics and function.

REFERENCES


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