Immediate Loading of Dental Implants in the Esthetic Region Using Computer-Guided Implant Treatment Software and Stereolithographic Models for a Patient with Eating Disorders

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Keywords
Immediate loading; dental implants; implant-supported prosthesis; eating disorders; computer-guided implant treatment software; stereolithographic model.

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Abstract

This manuscript describes the reconstruction of a maxillary anterior segment using immediate implant placement and immediate implant loading techniques, aided by computer-guided implant treatment software and stereolithographic models and surgical templates, in a patient with a history of eating disorder. Her medical and dental histories did not make her a candidate for the use of conventional 2-stage implant surgery and restorative procedures along with an interim removable prosthesis.

Eating disorders are characterized by patterns of disturbances in eating behavior. Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Eating Disorders Not Otherwise Specified (ED-NOS), which includes the provisional Binge-Eating Disorder (BED), are three formal diagnostic categories described by the American Psychiatric Association.1 Eating disorders have been associated with increased suicide and mortality rates2-3 and affect up to 24 million people of all ages and genders in the United States.4 Several psychological and pharmacological treatment modalities have been described, such as family-based therapy, cognitive-behavior therapy, along with use of antidepressants, both in primary care settings and outpatient facilities.5 Physical and psychosocial health consequences include, but are not limited to, limb and joint pain, headache, gastrointestinal problems, menstrual problems, shortness of breath, chest pain, anxiety, depression, and substance abuse.6 Common oral and dental signs and symptoms include hypersensitivity, erythema, chemical erosion of the lingual surfaces of maxillary teeth, xerostomia, loss of enamel, gingival bleeding, caries, loss of occlusal vertical dimension, and angular chelitis.7-10 Few patients with eating disorders seek medical treatment,11 and often the dentist is the first healthcare professional to detect the signs of eating disorders in an otherwise undiagnosed patient.12 Several reports in the dental literature address the challenges of treating the consequences of this disease due to the complexity of the medical and dental clinical conditions. Most authors recommend that restorative therapy should begin once the patient’s eating disorder is under control.13,14 Treatment modalities vary depending on the extent of damage to the remaining dentition and supporting structures. Composite resin restorations have been recommended for the management of limited erosive lesions and caries along with the use of fluoride rinses and gels.15 Lesions extending subgingivally or those where tooth foundation is compromised require the use of partial or full coverage restorations such as veneers, inlays, or crowns.16 Dental implants have been used successfully in the restoration of partially and fully edentulous patients for the past 30 years.17-19 Methods and technologies have evolved to deliver highly functional and esthetic implant-supported restorations, especially in the maxillary anterior region20 incorporating concepts such as immediate implant loading. Previously, dental implant treatment consisted of a two-stage surgical protocol where patients were asked to wear an interim removable prosthesis or remain partially edentulous during the healing phase.21,22 At times, this was an inconvenience for the patient and forced clinicians to find a solution to this challenge. The concept of loading of implants immediately after surgical placement was introduced and defined as a restoration.
placed in occlusion with the opposing dentition within 48 hours of implant placement. Multiple studies have reported successful outcomes when implants are immediately loaded through interim prostheses in edentulous arches and later, in partially dentate arches. The concept of immediate loading is based on three important principles: (1) micromotion of approximately 100 µm (with a range of 50 to 150 µm) may be the threshold value for implants to osseointegrate properly; (2) implants need to be joined together through a rigid interim prosthesis to reduce micromotion and favor healing.
Temporary abutments were customized to develop proper emergence profile and esthetics. Two four-unit interim FPDs were fabricated; the restorations were cemented over the abutments in the central incisor and canine positions, while the first premolar was screw-retained directly on the implant. Ovate pontics were developed for the lateral incisors.

Figure 4

Figure 5

Intraoral labial view of interim prostheses after 1 week of healing.

Figure 6

Zirconia abutments fabricated using CAD/CAM technology seated on implants.

Figure 7

Two four-unit zirconia FPDs were cemented.

during immediate loading, and (3) micromotion between the implant and its osteotomy needs to be minimized through insertional torque values of at least 30 Ncm at the time of implant placement.

The original protocol for implant surgery required raising a flap to expose underlying bone, probably leading to a compromised esthetic result. Several techniques were developed to minimize the impact of altering tissue attachment and position with modified flaps, mini flaps, and microflaps as well as with enhanced suturing methods. Digital technologies have been developed to aid in the flapless surgical procedure, allowing for proper management of hard and soft tissues. These technologies include computer-guided implant treatment software and stereolithographic models and surgical templates.
Immediate Loading of Dental Implants in a Patient with Eating Disorders

Computer-guided implant treatment software uses cone beam computed tomography (CBCT) files to create a 3D image of the patient’s jaws. The software allows for the desired implants to be planned and positioned on the patient’s image. Once the position has been finalized, stereolithographic models and surgical templates can be fabricated. This allows for the fabrication of interim prostheses that will allow for adequate implant splinting with ideal esthetics and function.

Few reports describe the prognosis for dental implants and surrounding soft tissues in patients with eating disorders. To our knowledge, no report in the literature addresses the use of immediately loaded dental implants in the management of a patient affected by eating disorders, incorporating the use of software for digital diagnostics and treatment planning along with virtual surgery and stereolithographic models.

Clinical report

This clinical report presents a 29-year-old female patient with a 10+ year history of being diagnosed with an eating disorder. She received comprehensive medical and psychological treatment and was considered to be under remission. At the time of treatment, she continued to attend support meetings two times per week with her physicians and therapists. Prior to treatment, the patient underwent a thorough medical evaluation in conjunction with her attending physician. A full panel of laboratory values and a 12-lead electrocardiogram were obtained to determine her ability to undergo the surgical procedure. In light of the past longstanding eating disorder, her liver enzymes were elevated, thus precluding the use of general anesthesia. Her ECG was interpreted as normal. Based on this information, her physician cleared her for the procedure under local anesthesia.

The treating physicians also deemed her fit for treatment, as she had not had any recurrences in the previous 18 months and had attended all scheduled support sessions. The patient had been unsuccessfully restored several times in the anterior maxilla with full coverage restorations, which over time had to be replaced with more extensive restorations replacing extracted teeth. At the time of her examination, she presented with an eight-unit porcelain-fused-to-metal fixed partial denture (FPD) retained by maxillary canines and first premolars, which were failing due to recurrent decay (Fig 1). Her main concern had to do with her inability to tolerate a removable prosthesis due to her sensitive gag reflex and the emotional and psychological effects of it on her overall condition. She was also unwilling to transition during the healing phase without teeth. After clinical and radiographic evaluation it was determined that the retaining teeth for her FPD had a questionable prognosis. The existing fixed restoration was removed to evaluate the condition of the canines and first premolars. The extent of decay compromised these teeth to the extent that endodontic treatment along with crown lengthening procedures, cast post and cores, and full coverage crowns were required. Past experiences with similar procedures on the now missing maxillary central and lateral incisors made her unwilling to proceed with such an alternative, and the option of dental implants was presented. To address the patient’s chief complaint, the treatment plan included extraction of failing maxillary left and right canines and first premolars, immediate placement of dental implants on the sites of central incisors, canines, and first premolars, bilaterally, and two fixed four-unit implant-supported interim FPDs. After proper healing, the plan was to restore the patient with ceramic abutments and two four-unit ceramic FPDs.

CBCT was performed, and digital images reconstructed using computer-guided implant treatment software. Removal of teeth was done on the software, and buccolingual slides were evaluated for selected implant placement. The anterior and sagittal views ensured that the roots of adjacent teeth would not be compromised (Fig 2). Both a stereolithographic surgical guide and model were fabricated.

Simulated surgery was completed on the model using Nobel-Guide instrumentation (NobelBiocare, Yorba Linda, CA). The surgical guide was secured on the stereolithographic model, and implant placement was completed in the planned position (Fig 3). The stereolithographic model was duplicated using implant replicas, vinylpolydimethylsiloxane (VPS) (Gingifast Rigid; Zhermack, Rovigo, Italy), and Type IV stone (GC Fujirock EP, GC Corporation, Tokyo, Japan). The cast with the implant replicas in the selected implant position was used for the design and fabrication of custom temporary abutments (NobelBiocare) with the goal of providing proper guidance and support for the healing of the soft tissues. Four-unit cement- and screw-retained prostheses were fabricated.

Figure 8 Periapical radiographs illustrating bone levels after 18 months in function in definitive prostheses.
interim FPDs were fabricated using bis-acrylic temporization material (Protemp Plus, 3M ESPE, St. Paul, MN) to meet the esthetic and functional demands of the patient (Fig 4). Actual surgery followed the same NobelGuide protocol. Falling teeth were removed, the surgical guide was seated, and site development was completed. Selected implants (Nobel Replace) were placed through the surgical template at a 35 Ncm torque value. Temporary abutments were seated on the implants in the positions of central incisors and canines and torqued to 20 Ncm. Screw access holes were sealed with Teflon tape and Fermit. Interim prostheses were modified as needed to develop the desired emergence profile and soft tissue contours. The four-unit interim FPDs were cemented over these abutments using RelyX luting cement (3M ESPE) while at the same time, screwed directly on to the implants in the first premolar position. The screw access holes were sealed in the previously described fashion. The occlusion on the interim FPD was adjusted to prevent loading during eccentric movements, while allowing maximum intercuspation loading in centric occlusion only on the first premolars. Radiographs were taken to verify implant, abutment, and prosthesis position. The patient was given postoperative instructions and recall appointments after 1 week, 1 month, and 2 months. At each of these visits, implant and abutment stability, soft tissue health, and prosthesis appearance and function were evaluated (Fig 5). At 5 months, tissue health was considered optimal, and with no signs of prosthesis, abutment, or implant mobility, final restorative procedures were completed. The interim prostheses and abutments were removed, and impression copings connected to the implants. An open tray implant level impression was made using VPS impression material, making sure the healed soft tissue contour was adequately detailed. The soft tissue was reproduced in the impression using a VPS gingival mask (Gingifast Rigid), and the master cast was poured in Type IV stone (GC Fujirock EP). Abutment design and fabrication were completed with computer-aided design/computer aided manufacture (CAD/CAM) technology in zirconia (Procera, Nobel Biocare). Two four-unit zirconia frameworks were fabricated for the FPDs (Wieland ZENO, Pforzheim, Germany) (Figs 6, 7). Both FPDs were cemented using temporary cement (Zone Temporary Cement, Dux Dental, Oxnard, CA). The fit of the abutments on the implants and of the FPDs on the abutments was verified with periapical radiographs, and the marginal bone height was recorded. During the course of treatment and a follow-up period of 18 months, the patient has not presented with any complications (Fig 8).

Summary

This clinical report describes rehabilitation using implant-supported FPDs on immediately placed and immediately loaded dental implants, aided by computer-guided implant treatment software, stereolithographic models, and surgical templates, of a partially dentate patient affected by eating disorders. The patient’s anatomy was evaluated on CBCT scans to determine the ideal recipient sites for implant placement, as well as angulation and depth. Virtual surgery was done with the aid of computer-guided implant treatment software, and stereolithographic models, and surgical templates were obtained once the digital process was completed. Temporary abutments and interim prostheses were designed on the stereolithographic models to aid in soft tissue healing and enhance the final esthetic and functional result. Treatment for this patient with immediate implant placement and immediate implant loading kept her from having to use a removable prosthesis during the healing phase, thus avoiding the undesirable gag reflex.

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References


