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The fibular free flap (FFF) approach is the preferred option for reconstruction of segmental mandibular deficiencies. Fixed dental prostheses are recommended for patients who have undergone FFF jaw surgery to improve quality of life, but treatment of these patients with an implant-supported prosthesis is challenging because of the thin bone and thick soft tissue in the fibula. This case history reports the use of a bone-level implant guide fabricated with a computer-aided system and milled customized long abutments for implant placement and prosthodontic procedures. Advanced digital technologies can facilitate jaw rehabilitation in patients with bone flap. Int J Prosthodont 2018;31:573–576. doi: 10.11607/ijp.5658

The fibular free flap (FFF) approach has been used to restore mandibular function in cancer patients who have undergone a mandibulectomy to remove tumors.¹ The fibula is suitable for mandibular reconstruction because the bone is long enough to shape the mandible—unlike the scapula or ilium—and the periosteum provides sufficient blood supply. Although an FFF is a favorable autograft biologically, it is challenging to apply implant-supported fixed dental prostheses to patients treated with an FFF approach. Because the fibula is thin, special care should be taken when placing dental implants. Additionally, thick soft tissue on the fibula could make it difficult to connect the implants and the prosthesis superstructure. This case history report describes fixed prosthesis treatment in an FFF patient using digitized mandibular reconstruction procedures—computer-guided implant surgery and customized long abutments for a fixed prosthesis.

Case History Report

A 44-year-old female patient diagnosed with osteosarcoma in the right mandibular posterior area underwent mandibular body resection and reconstruction with an FFF. Ten months after the surgery, the patient came in for rehabilitation of the edentulous area (Fig 1). Several treatment options, including partial dentures and an implant-supported prosthesis, were provided. Considering the thick soft tissue on the graft and the opposing dentate arch, an implant-supported fixed prosthesis was chosen as the treatment modality.

Implant placement was planned at the surgery for removing the fixation plates placed during the reconstruction surgery. To increase the accuracy of implant placement, a guide with a bone-level design was fabricated before surgery as follows. Cone beam computed tomography (CBCT) images of the mandible were acquired, and the images were segmented and saved in surface tessellation language (STL) format using image control software (Mimics, Materialise). The STL images and a scanned image of the temporary denture were merged (Fig 2a), and the resulting image was used to determine implant position. The bone-level guide was designed using dental design software (DDS-Pro 0.9.75, Digital Dental Service) (Fig 2b), and an acrylic resin guide was fabricated using an additive manufacturing process (Eden 260VS, Stratasys) (Fig 2c).

On the day of surgery, fixation plates were first removed with flap elevation, after which six implants were placed using the implant guide (Fig 2d). Four months later, a final impression was created using the open-tray technique with pick-up impression copings. The

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vertical space for the prosthesis was considerably large, so a computer-milled method was selected to generate prosthetic abutments. The master cast was digitized as a virtual model, on which customized abutments were designed in optical shapes (MyD, RaphaBio) (Fig 3a). Because the designed abutments were long, specially ordered titanium blocks with a diameter of 12 mm and a height of 29 mm (Ti6Al-4V ELI, Perryman Company) were used to fabricate the abutments (Fig 3b). The customized abutments were tried in in the oral cavity to evaluate passive fit using a positioning jig (Fig 4a). A hybrid monolithic zirconia prosthesis was then fabricated and delivered (Fig 4b). The tightening torque of the abutment screws was 25 N/cm². Oral hygiene instructions were provided for the patient, and regular recalls were observed for maintenance.
Discussion and Conclusions

Guided implant surgery is considered to be a reliable and accurate method, as it reduces the probability of damage to critical anatomical structures and facilitates transfer of the treatment plan to the oral cavity. Contemporary implant guide systems are based on CBCT, digital scanning, and computer-aided design and computer-assisted manufacturing (CAD/CAM) technologies. CBCT supplies the images of the underlying bone, and digital scanning visualizes the surface of the oral cavity. By superimposing and merging the two image datasets, virtual three-dimensional (3D) operation fields can be generated. CAD software facilitates virtual planning of implant positions and designing the implant guide, and 3D printing technology is used to convert the guide design into the stereolithographic guide template. Consequently, these digital advancements have optimized implant treatment, making the procedures more predictable, accurate, and convenient from both clinicians’ and patients’ points of view.

Implant guide design is categorized as a bone- or tissue-level guidance system according to the contact between the sleeve part of the guide and the bone. Bone-level guides provide better visualization of the surgical field than tissue-level guides, allowing for superior control of drilling depth. Nonetheless, the prerequisite for using this type of guide is the elevation of a flap to access the underlying bone, which could lead to alveolar bone resorption due to reduced blood supply, as well as increased patient discomfort. In this case, considering the thick soft tissue, the bone-level guide design was selected to increase the accuracy of implant placement and to reduce decision-making during surgery by definitively restricting the drilling motion. Moreover, flap elevation was planned during the implant surgery to remove the fixation plates inserted during the preceding surgery for FFF reconstruction. Therefore, the condition for using a bone-level guide was fulfilled.

Computer-milled solid abutments can serve as abutments with a favorable form, morphology, and
emergence profile. The fabrication sequence begins with the introduction of the scan information to dental design software. The abutment shape is designed to adapt to the opposing arch and emergency profile and can be modified according to clinicians’ instructions. The virtually designed abutment is sent to a computer-controlled milling machine that fabricates the abutment from a solid block of the selected material. In the present case, the vertical space between the grafted bone and the antagonist teeth was markedly large, thereby not allowing the use of stock abutments. With the advantages of CAD/CAM technology, the length and shape of abutments were customized specifically for the patient.

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References


Immediate Versus Early Loading of Single Dental Implants: A Systematic Review and Meta-Analysis

Patients prefer to be rehabilitated as soon as possible if the risk of implant failure is not increased; however, whether immediate loading of single implants is riskier than early loading is not clear. This systematic review and meta-analysis investigated whether the immediate loading protocol has more clinical disadvantages than the early loading protocol for single dental implants in terms of marginal bone loss and survival rate of single-implant crowns. Two reviewers conducted an advanced electronic database search, with no language or date restrictions, in Medline/PubMed, Embase, and the Cochrane Library up to May 2016. Studies were chosen by title and abstract for screening in accordance with the following inclusion criteria: dental implant studies; cohort studies (prospective and retrospective) and randomized controlled trials; samples involving partially edentulous patients; immediate loading implants; early loading implants; and ≥ 10 participants. Of the 5,710 studies initially identified, 5 fulfilled the inclusion criteria. A meta-analysis yielding risk differences (RD) and mean differences (MD) with a 95% confidence interval (CI) was performed. The trials included showed no significant differences between early and immediate loading protocols in single-implant crowns with regard to survival rate at 1 and 3 years (RD –0.00; 95% CI –0.04 to 0.04; P = .990 for 1 year and P = .980 for 3 years) or marginal bone loss at 1 year (MD 0.09; 95% CI –0.02 to 0.19; P = .110) and 3 years (MD –0.23; 95% CI –0.47 to 0.01; P = .060). This systematic review showed no significant differences between early and immediate loading protocols in single-implant crowns with regard to survival rate or marginal bone loss at 1 or 3 years.

Pigozzo MN, Rebelo da Costa T, Sesma N, Laganá DC. J Prosthet Dent 2018;120:25–34. References: 37. Reprints: Monica Pigozzo, mpigozzo@usp.br — Steven Sadowsky, USA