Complete reconstruction for a patient with chronic tooth decay

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When oral health is neglected for ex-
tensive periods of time, dental condi-
tions like tooth decay and periodon-
tal disease can advance to a point that, prior to the advent of implant therapy, was considered hopeless. If a patient presented with exten-
sive caries and a non-restorable set of dentition, practitioners had no choice but to extract the teeth and provide the patient with a complete denture. Although beneficial to pa-
tients as a fundamental replacement of their teeth, many patients have found the fit, comfort and retention of such appliances to be problem-
atic. Without any anchorage to hold it in place, the traditional denture has a tendency to move around in the patient’s mouth, compromis-
ing speech and chewing capabili-
ties. This problem is exacerbated by the recession of the edentulous arch that occurs following tooth loss or extraction. After decades of advance-
ments in implant design, restorative materials, and digital dentistry, we can today provide patients with a higher level of care. Root form den-
tal implants can be placed predict-
ably to hold a full-arch prosthesis in place, giving patients the most comfort, function, and quality of life compared to traditional com-
plete dentures.1 Further, osseointegrated implants serve to mitigate bone resorption2 This means that in long-term restorations and benef-
fits of natural dentition, implant-
supported restorations also help to preserve the edentulous ridge and the essential support it provides for the mouth and face. The positive im-
 pact this can have on personal confi-
dence, emotional health, and social interactions is substantial.

Thus, patients who present with the most acute dental conditions can now be brought back from the brink of total oral destruction via implant therapy. If the patient’s teeth have deteriorated to the point where they cannot be salvaged, they can be extracted, implants are placed, and a full-arch restoration is delivered that closely emulates the form and function of natural den-
tition. This alternative should be presented to all patients for whom implant therapy is indicated, as indi-
viduals who at first may not appear to have the means for high-quality treatment may in fact have the wherewithal after being apprised of their options. Additionally, all pa-
tients should be made fully aware of the long-term costs and benefits of traditional complete dentures vs implant-supported restorations before making a decision with such life-changing potential. The pres-
entation that follows documents a case in which a patient with severely decayed dentition undergoes a com-
plete oral reconstruction.

A treatment plan is developed that harnesses the classic principles of implant placement, the versatility of modern restorative materials, and the precision of digital diagnostics and CAD/CAM fabrication to achieve a predictable, aesthetic restoration for a case that would seem hopeless to many. The case illustrates how implant therapy can afford patients even in the most extreme of dental circumstances an excellent long-
term prognosis, restoring not just the teeth, but also the bone, soft tis-
sue, soft-esteem, and quality of life.

Case Report

A 66-year-old male patient presented for treatment with advanced, exten-
sive caries and localized periodontal disease (Figs. 1a–c) in addition to not having seen a dentist in more than 20 years. The patient was recover-
ing from an addiction to metham-
phetamine, which had caused ex-
cessive clenching and grinding that had substantially worn down the patient’s teeth. The many years of dental neglect combined with these parafunctional habits to render the patient’s severely decayed denti-
tion untenable (Fig. 2). Further, the deterioration of the patient’s teeth was accompanied by significant soft-
tissue recession and bone resorption.

Although the patient had been quite apprehensive about seeking treat-
ment, pain and discomfort eventual-
tly compelled him to take action. The patient had sought treatment from a practice where he could receive all of the necessary treatment from a sin-
gle provider in the fewest appoint-
ments possible. After locating my pel-
gular provider in the fewest appoint-
ts of similar cases were shown to the patient to assist his evaluation of the restorative options. The pa-
tient chose full-mouth reconstruc-
tion consisting of fixed prostheses delivered over dental implants. A treatment plan was developed that included extractions of the patient’s non-restorable dentition, the place-
ment of eight implants in each arch, delivery of Inclusive® Titanium Custom Abutments and BioTemp® res-
torations (Glidewell Europe GmbH; Frankfurt/Main, Germany), and final restoration with fixed PFM pros-
theses. The latest tools in digital dentist-
ry would be utilized to maximize the precision of both implant placement and prosthetic fabrication.

Because of the patient’s relatively youthful age and his continued brushing habits, eight implants were proposed for each arch in order to maximize the distribution of oc-
cuval load, the preservation of his ridges, and the long-term prognosis of the patient’s maxillary and man-
dibular ridges necessitated a grafting procedure. To provide the patient with the treatment needed for implant placement. Custom abutments would be used to position the prostheses for optimal aesthetics. Although BruxZir® Solid Zirconia Full-Arch Implant Possibil-
ites (Glidewell Europe GmbH, Frank-
tfurt/Main, Germany) would have been the ideal restorations given the need for long-term durability in this case, the product was not yet avail-
able at the time of treatment. Thus, PFM prostheses were chosen in order to avoid acrylic and its susceptibility to staining, wear and fracture. The proposed PFM restorations included layered pink porcelains to recreate the patient’s natural gingival con-
tours. All aspects of treatment were explained to and accepted by the pa-
tient. The first phase of treatment be-
gan by atraumatically extracting the six natural teeth and preparing the bone using Phys-
ics Forceps (Golden Dental Solutions Inc.; Detroit, USA), which allowed for removal of the teeth without caus-
ing any damage to the surrounding bone. The extraction sockets were filled with grafting material in order to preserve the sockets and rebuild the maxillary and mandibular ridges for ideal implant placement. The patient was provided with immediate dentures, which were prefabricated based on impressions that were tak-
en at a previous appointment (Fig. 3).

After approximately five months of healing, the implant was imaged in so-
cone-beam computed tomography (CBCT) scanning could be performed. The soft tissue of the patient’s non-
edentulous arches exhibited excel-
lent health (Figs. 4a & b). CBCT scan-
ing confirmed that the bone grafting procedure was successful in increas-
ing the bone volume available to ac-
commodate the planned implants. The CBCT scanning data was used to devise a custom intraoral scanning plan that would place the eight implants for each edentulous ridge in the maxi-
mum amount of bone adhering to the key implant positions as taught by Dr Carl Misch." Surgical
Carestream Dental makes it easy for you to elevate your practice above the rest with the CS 3600 intraoral scanner. High-speed continuous scanning captures dual arches quickly and easily, while full HD 3D scans simplify communication with patients, referrals and labs. With open system files and no hidden click fees, Carestream Dental has designed the CS 3600 to rise to the challenge of making digital impressions fast, accurate, easy and open.

guides were fabricated to ensure placement of the implants in the precise positions called for by the treatment plan (Figs. 5a & b).

At the next appointment, the tissue-supported surgical guides were tried in and found to be well-fitting. The fixation pins of each surgical guide were tightened with a surgical index to ensure complete, secure seating of the appliances (Fig. 6). A tissue punch was used to provide access to the implant sites, facilitating a flapless surgical procedure that would minimize gingival trauma. The osseotomies were created through metal inserts placed in the surgical guides, which precisely controlled drilling depth and orientation according to the digital treatment plan (Fig. 7).

Eight BioHorizons® Laser-Lok® dental implants (BioHorizons, Birmingham, USA) were placed in each ridge, including 7 mm implants in the two distalmost locations of each arch, and 4 mm implants in the remaining sites. After placing healing abutments in the implants, a soft re-line was performed on the patient’s temporary dentures so they could continue to serve as interim prostheses for the duration of healing and osseointegration. Four months after surgery, the patient returned to the office so impressions could be taken. Removal of the healing abutments revealed optimal tissue health surrounding the implant sites (Figs. 8a & b). Transfer posts were seated to capture the position of the implants (Fig. 9). Closed-tray impressions were taken of the upper and lower arches using Take® Advanced™ polyvinylsilicone material (Perm Corp, Orange, USA, Figs. 10a & b). At the same appointment, thermofomed sink-down impressions were made and a bite registration taken with the patient’s immediate dentures in place, providing the lab with a template for the definitive design of the PFM restorations (Fig. 11).

The lab poured working casts from the VPS impressions of the patient’s edentulous arches and produced wax occlusal rims (Fig. 12). After seating the wax rims in the patient’s mouth and tightening the temporary cylinder screws, the jaw relation was recorded with the wax rims in place. Measuring the distance between the patient’s nose and chin during maximum interocclusion, the lab was instructed to open the patient’s bite by 2 mm. Next, the lab used CAD/CAM software to design Inclusive® Titanium Custom Abutments (Glidewell Europe GmbH, Frankfurt/Main, Germany) for both arches based on the scanned working models. The CAD/CAM produced custom abutments were seated on the working models so their fit could be verified and they could be used in the development of the definitive prostheses (Figs. 13a & b). Based on the jaw relationship records and the impressions of the patient’s immediate dentures, the lab prepared a diagnostic wax-up to help determine the initial design for the PFM restorations (Fig. 13a). After finalizing the initial design, BioTemp prostheses were fabricated from polymethyl methacrylate (PMMA) material, which is versatile enough to easily accommodate adjustments at the try-in appointment, yet durable enough for provisionalization (Fig. 16). The working models were sent out along with the custom abutments and BioTemp interim restorations for patient evaluation (Fig. 17). After the patient approved the provisional restorations, the titanium custom abutments were transferred to the patient’s mouth using the acrylic delivery jig provided by the lab (Fig. 17). The custom abutments achieved a precise fit and were thus tightened to the appropriate torque, establishing ideal soft-tissue margins and support. Complete seating was verified radiographically, and the screw access holes were covered.

Next, the BioTemp prostheses were tried in and exhibited an accurate fit (Figs. 19a & b). The provisional restorations were attached to the abutments using temporary cement, and the phonetics, aesthetics, bite and function were evaluated (Fig. 19a). Minor modifications were made to the BioTemp prostheses, and the patient wore the BioTemp provisional for an interim of four weeks. This trial period was essential in verifying that the patient was happy with the look, comfort and function of the prosthetic designs before the final PFM restorations were fabricated and delivered. After patient approval was provided, alginate impressions were made of the BioTemp prostheses. Models of the final approved BioTemp restorations were fabricated from the impressions, and a new bite was taken so the definitive prosthetic designs could be adjusted accordingly. Crown & bridge impressions were taken of the final custom abutments in place and would be used by the lab to pour master models, upon which the final PFM restorations would be produced. The gingival areas for the final PFM were marked onto the models of the BioTemp restorations, and the case was returned to the lab along with final adjustments. The final PFM prostheses were fabricated by layering porcelain over a cast metal framework. Pink porcelain was layered on to form the gingival areas according to the markings indicated on the models of the BioTemp restorations, thus replacing portions of the soft tissue as well as the teeth per Dr. Mach’s FPDs (Fundamental Principles of Prosthesis Design) 5. Because the final prostheses were designed using the models fabricated from the final crown and bridge impressions, a precise fit over the patient’s custom abutments was ensured (Fig. 20).

At the delivery appointment, the PFM restorations were delivered over the custom abutments without any modifications to the provisional restorations, which ultimately served as the bases for the final restorations (Figs. 21 & 22).

The patient was ecstatic with the results, which reconstructed his teeth and gingiva, along with his confidence and quality of life. A nightguard was produced for the patient to mitigate the impact of his parafunctional habits (Fig. 23).

Conclusion

The predictability of implant treatment and the adaptability of restorative materials enable clinicians to provide patients in the most dire of dental circumstances a complete overhaul, reversing the damage that can result from many years of dental wear and neglect. This goes beyond the restoration of oral function by preserving the facial aesthetics that are so fundamental to the emotional state and social life of the patient. Providing a life-changing capacity, the fixed full-arch implant restoration should be offered to all patients who present with unremitting denture dependency, without prejudging a patient’s situation and the form of treatment that they will ultimately accept. As the precision, cost-effectiveness and prosthetic versatility of implant therapy expands ever further, so does the patient population that is able to receive high-quality treatment.

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