Implant Therapy: Then and Now

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Implant dentistry has come a long way since blade and subperiostal implants were widely used. Improvements in implant design and site preparation methodology have made surgical procedures simpler and more consistent. Modern grafting techniques have improved our ability to "grow bone," facilitating placement of implants in cases where such treatment would have previously been impossible. The use of CAD/CAM technology in abutment and crown fabrication allows the practitioner to examine and evaluate the final contours prior to laboratory production of the restoration.[1] Collectively, these advancements facilitate predictable restorative outcomes, lifelike esthetics and treatment protocols that are both clinically efficient and convenient for the patient.

The case presentation that follows demonstrates the stark contrast between the implant therapy available decades ago and the predictable, minimally invasive treatment of today. Modern implant dentistry and materials provide everything needed to replace outmoded implants that were successfully used to treat patients in the distant past, but have since reached the end of their useful function. The patient presented with a blade implant that was placed over 30 years prior. The implant, along with the restoration it retained, had become unstable and needed to be replaced. She did not want her other teeth to be disturbed in the process. In fact, the reason she elected to have the original implant placed, back when the procedure was relatively new, was because she did not want to have her other anterior teeth prepared.

The 30-year-old blade-type implant was a flat, rectangular piece of metal. The one-piece implant was affixed to an abutment, which penetrated the soft tissue and was used to retain a conventional porcelain-fused-to-metal crown. The implant was fabricated from Vitallium® (DENTSPLY Austenal; York, Pa.) and designed to integrate with the hard tissue through a fibro-osseous process, which means that rather than bone integrating directly onto the surface of the implant, fibers from the bone attach to the implant body, forming a layer of connective tissue that holds the implant in place. In the past, this implant design was frequently used when the edentulous ridge was rather thin.[2] Immediate loading of the implant was the norm. Obviously, the blade-form design of the implant and the subsequent final crown served the patient well for several decades. It was only after the implant and attached restoration became mobile that the patient sought consultation for another restoration.

CASE REPORT

The patient is a 65-year-old female with no significant medical compromises other than controlled high blood pressure. She presented with an implant-retained maxillary left central incisor crown that had become mobile. Oral and radiographic evaluation revealed that the crown was being retained by a blade implant that was, according to the patient's recollection, placed over 30 years ago. There were actually two blade implants in the site. The head of one implant had fractured, requiring placement of an additional blade implant positioned facial to the first.

After discussing treatment options with the patient, it was determined that the blade implants needed to be removed and replaced with a root-form dental implant. Following sufficient healing and osseointegration, a new custom abutment and crown would be placed, esthetically restoring function for the patient.

Modern implant dentistry, rather than being entirely surgically driven, is much more focused on the prosthetic outcome. When treatment planning implant placement and prosthetic reconstruction, it is crucial that the dental practitioner carefully plans the case to maximize the esthetics of the final result in order to meet patient expectations. Because this particular restoration was in the esthetic zone, it was especially important to create a natural-looking emergence. Proper contouring helps to ensure excellent gingival health and a beautiful final restoration.

Anatomic considerations, along with any potential complications, must be anticipated and addressed. In this case, two old blade implants were to be removed. The subsequent bone damage had to be treated and any granulation tissue had to be thoroughly removed. The final thickness and angulation of bone as well as the integrity of the facial and palatal plates were evaluated. There was some slight bone loss around the adjacent natural abutments.

The surgical removal of the blade implants was actually quite simple and atraumatic to the patient. The defect created by the loss of these blade implants was a trough shape. The residual site was prepared with vertical excisions flaring away from the crest of the ridge, maintaining the position of the attached gingiva. This allowed the flap to be easily controlled. Any granulation tissue at the site was vigorously curetted out. After thoroughly cleaning the bone site, it was determined that there was indeed enough palatal and apical bone to immediately accept a dental implant. The Inclusive® Tapered Implant (Glidewell Direct; Irvine, Calif.) was chosen because of its excellent initial stability and design.

Because the vertical incision made on the facial flap was maintained in the attached gingiva, it was a simple effort to place a bioresorbable barrier, engaging 2 mm onto the healthy facial plate of bone. The barrier was positioned after the osteotomy was created to accept a 3.7 mm x 13 mm implant.

Prior to placing the implant, the facial aspect of the defect was grafted with an allograft to allow for bone growth, and to provide increased width and tissue support. The implant needed to be situated into as much of the available bone as possible, and was thus placed approximately 3 mm subgingival to the crest of bone. A 3-mm-tall healing abutment was placed and the site was sutured closed. Four months were allowed for hard- and soft-tissue healing, as well as integration of the new dental implant. Some semblance of interdental papillae was maintained between tooth #9 and the adjacent teeth.

Following completion of the healing phase, an open-tray impression technique was used to ensure an accurate impression. An Inclusive® open-tray impression coping (Glidewell Direct) was used, which includes a long plastic sleeve that prevents impression material from impregnating the screw access hole. After taking the open-tray impression, a lab analog was threaded into the impression coping. The case was submitted to the laboratory for design and fabrication of the final custom abutment and crown.

Because this was a particularly demanding anterior case, it was crucial to maximize esthetics and create a natural-looking emergence profile out of the soft tissue. The patient was adamantly opposed to having the adjacent teeth prepared for any type of restoration like a veneer, so it was necessary to work within the existing edentulous space, presenting a challenge for the doctor and laboratory alike.

An all-zirconia custom implant abutment was selected, which would offer durability while accommodating patient expectations by eliminating the gray color that can otherwise show through the gingiva when a titanium abutment is used. After scanning the model, the lab technicians designed the final all-zirconia abutment utilizing CAD/CAM software, carefully controlling the contours of the abutment to adhere to the patient's gingival architecture captured in the final impression.[3] Instruction was provided to the lab for abutment margins that were slightly subgingival, yet, following proper physiologic construction, placed about 3 mm apical to the adjacent cemento-enamel junction. Adhering to this simple principle facilitated an ideal emergence profile.

After the final abutment design was approved, the lab prepared and sent the crown design for clinical review. The goal was to mirror the esthetics of the maxillary right central incisor, but because there was some tissue loss around that tooth, and the root structure was a bit deformed, the decision was made to widen the crown slightly. This would

minimize any dark triangles between the teeth and maximize the use of the remaining interdental papillae. The flexibility and precision offered by CAD software streamlined the implementation of these custom design parameters.[4] Although not perfectly symmetrical with the shape of the adjacent central incisor, the final crown was acceptable to the patient. Its monolithic zirconia construction promises long-lasting functionality.

With careful surgical and prosthetic planning, modern implants are effective at replacing implants of earlier designs in cases where their viability has become compromised. Clinical design innovations and restorative-driven treatment planning make the use of contemporary dental implants extremely predictable. CAD/CAM technology allows us to visualize the completed case prior to fabrication and delivery of the final prosthesis. Dental implantology has many quality practitioners who have brought implant dentistry into the mainstream. Patients are seeking out and demanding this choice of therapy and we are now able to provide them predictable, quality dentistry at a very reasonable fee.

Figure 1: *The patient presented with a 30-year-old maxillary left central incisor crown over a blade implant. After decades of function, the blade implant had become mobile.*

Figures 3a, 3b: *Using simple elevation, the implant-retained crown and blade implant were removed without complication.*

Figure 2: *Digital periapical radiograph of the blade implants. The second implant was placed alongside the first after the original fractured subgingivally.*

Figure 4: *Vertical incisions were made in the attached gingiva to expose the defect created by the removal of the blade implants.*

Figure 5: *A bioresorbable barrier was positioned so that 2 mm of healthy bone engaged with the facial and palatal aspects of the defect.*

Figure 8: *Following approximately four months of integration, the soft tissue and interdental papillae had healed well.*

Figure 6: *After creating the osteotomy for a 3.7 mm x 13 mm Inclusive Tapered Implant, bone grafting material was placed in the facial defect.*

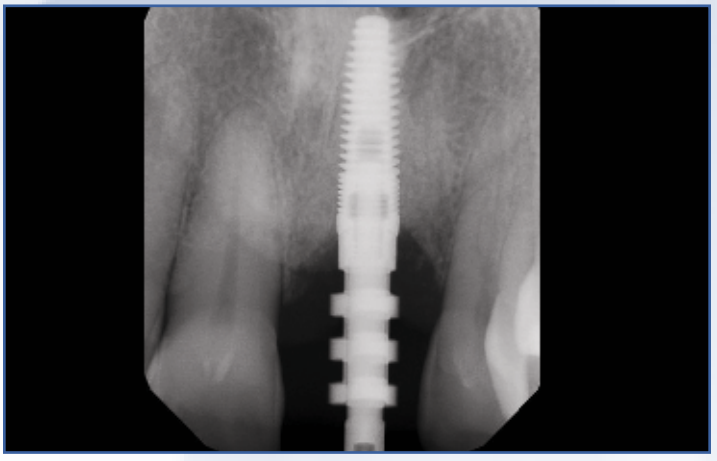


Figure 9: *An open-tray technique was used to take a final impression of the implant site. After placing the impression coping, a radiograph was taken to ensure complete seating.*

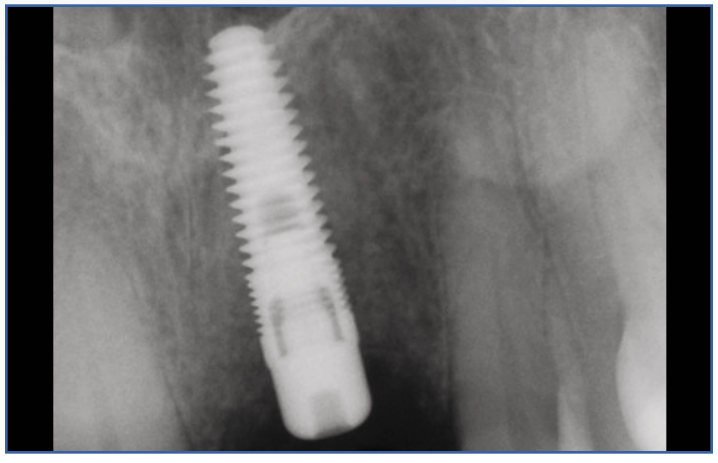
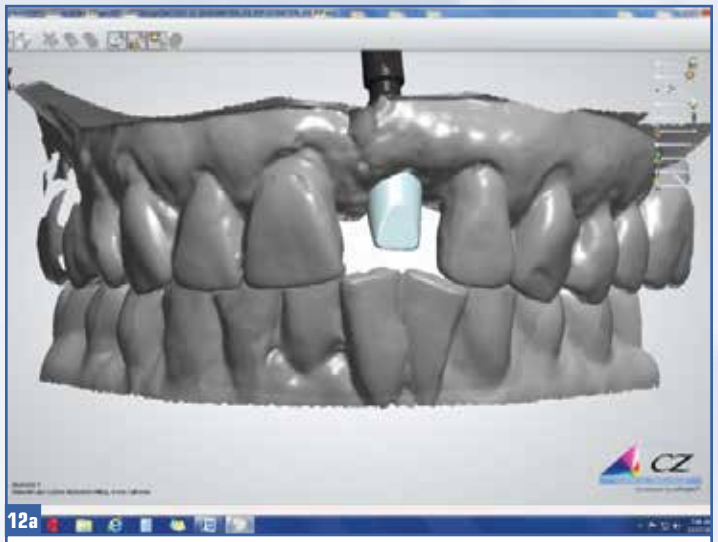


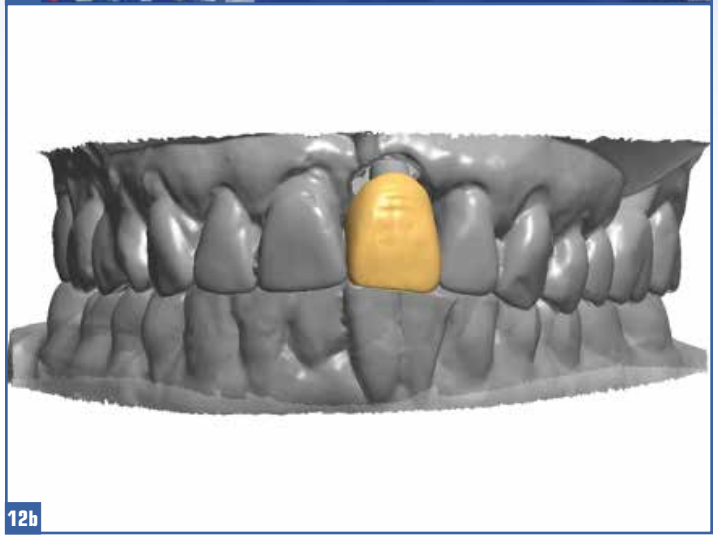
Figure 7: *After threading the implant into place and achieving initial stability at a torque of 35 Ncm, a 3-mm-tall healing abutment was placed.*

Figure 10: *The Inclusive® open-tray impression coping has a long plastic sleeve that protects the impression coping screw access hole from the impression material when making an open-tray impression.*

Figure 11: *Light- and heavy-body vinyl polysiloxane material was used to make an accurate final impression, and a lab analog was placed to represent the intraoral position of the implant.*

Figure 13: *An all-zirconia abutment was created with margins set 3 mm apical to the cemento-enamel junction of the adjacent teeth. This helped achieve an ideal emergence profile for the final implant-retained crown.*





Figures 12a, 12b: *The laboratory created a digital design of the abutment and final implant-retained crown for doctor review and approval prior to fabrication.*

Figures 14a, 14b: *The abutment was torqued into position, exhibiting a precise fit and esthetic margins.*

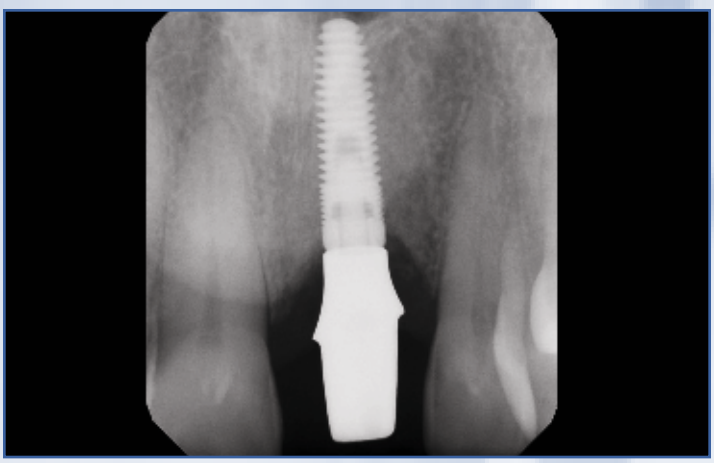


Figure 15: *A radiograph was taken to verify complete seating of the prepared abutment.*

Figures 16a–16c: *The final implant-retained crown was cemented into place, creating a nice smile line and a final restoration that was satisfying to the patient.* IM

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