Clinical Realities

Immediate One-Stage Implant Placement and CAD/CAM Abutments for Posterior Restorations

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Implant-supported restorations have assumed a position of prominence in the restorative armamentarium, often providing dental professionals with a conservative, predictable means of restoring edentulous spaces or replacing failing teeth. Further, the viability of implant placement and provisionalization at the initial surgical visit has increased in recent years due to advances in the associated materials and techniques, both of which enable the delivery of natural aesthetics to implant patients. Immediate one-stage implant placement, while depending on the clinician's adherence to established protocols, several treatment parameters, and case selection, can establish a gingival contour that is harmonious within the oral environment. It can also significantly reduce the duration of treatment, decrease the involved expenses, and eliminate the second surgical invasion altogether.

Innovations in technology also contribute to the growing success and predictability of aesthetic implant treatment, whether in the form of grafting materials, devices measuring implant stability, the shape and surface of the fixtures themselves, or the associated components. The computer-aided design/computer-assisted machining (CAD/CAM) process now enables not only the fabrication of high-strength and high-density copings but implant abutments as well. Since it evaluates the position of an implant in relation to the surrounding clinical environment (eg, soft tissues, adjacent teeth, occlusal schemes), abutments created via the CAD/CAM software are individually customized for the specific site requiring reconstruction. When used in conjunction with contemporary implant techniques, this technology affords the clinician several benefits that were unavailable even a decade ago.

Clinical Presentation

A 46-year-old female patient was referred for the treatment of the mandibular left posterior quadrant, which had been previously restored with three full-coverage porcelain crowns. The patient experienced a degree of mobility with the affected teeth and failing endodontic lesions, and the prognosis had to be determined. Once all related diagnostics were completed, a treatment plan involving immediate implant placement, healing abutment placement, and CAD/CAM abutments was developed and presented to the patient for approval. The patient provided informed consent, and therapy was initiated.

Figure 1A. Preoperative panoramic radiograph of patient requiring restoration of the mandibular left posterior quadrant.

Figure 1B. Postoperative panoramic radiograph demonstrates successful treatment of the quadrant with implant-supported, full-coverage crown restorations.

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**Figures 2A, B.** Upon completion of the clinical and radiographic examination, tooth #19(36) was judged as failing. #18(37) had failing endodontic treatment, and #20(35) exhibited a residual periapical lesion. In preparation for the surgical procedure, the patient was placed on a preoperative regimen of Augmentin (875 mg, GlaxoSmithKline, Philadelphia, PA) b.i.d. one day prior to treatment. 20 cc of whole blood was also drawn from the patient and centrifuged in order to harvest platelet-rich plasma (PRP) that would promote healing in the extraction sites. In the first stage of treatment, teeth #18 and #19 were carefully extracted, and tooth #20 received an apicoectomy. Each extraction site was debrided, and all granulated tissue was removed. The PRP mixture was placed in the ostectomy sites and on the tapered implants themselves prior to insertion.

**Figures 3A, B, C, D.** A 5.7-mm-diameter implant (Tapered ScrewVent, CenterPulse, Carlsbad, CA) was placed in site #18 (length of 10 mm) and #19 (length of 13 mm), respectively. A fixture-level impression was made at the time of surgery, after which the transfer copings were removed from their implants and placed on analogs. These were reinserted into the impression with the flat side oriented buccally. Prior to the delivery of a PRP-derived graft complex, healing abutments were placed on both of the implants. The impression was forwarded to the laboratory with all accompanying clinical data.

**Figures 4A, B, C.** To promote healing and integration for the tapered dental implants and the apicoectomy, a combination graft of PRP and a mineralized bone allograft (Filloros, Tulogen Medical Inc, Alachua, FL) was delivered at the posterior treatment site. Closure was then accomplished with 4.0 Vicryl Rapide sutures (Ethicon, Somerville, NJ) in a continuous sling/horizontal mattress design. A bioactive wound dressing consisting of PRP and plateletpoor plasma (PPP) was placed over the site, forming a thick, gelatinous mixture that lasted approximately 8 hours.

**Figures 5A, B.** Radiographs were taken immediately following the one-stage implant placement to facilitate evaluation of the grafting material as well as the positioning of the seated fixtures. The panoramic radiograph verified the insertion of the implants and the presence of the radiolucent regenerative material surrounding the tapered implants and the site of tooth #20; the periapical radiograph showed the placement of the two healing abutments, the extent of the PRP-allograft complex, and the bases of the implants, which were seated in cortical bone. This would provide some measure of stability during the preliminary healing period.
Figures 6A, B, C, D. At one month postsurgery, the patient was recalled to permit evaluation of the initial soft tissue response. The healing caps were removed and demonstrated the favorable condition of the tissues, which had begun to form natural emergence profiles around the abutments. Two titanium abutments (Atlantic Abutments, CenterPulse, Carlsbad, CA), fabricated via CAD/CAM software according to the impressions obtained at the initial surgery, were subsequently seated and connected to the implants. At this visit, the restorative clinician torqued the abutments into place at 30 Ncm.

Figures 7A, B, C, D, E. The acrylic provisional restorations provided in conjunction with the CAD/CAM abutments were tried in to permit evaluation of marginal integrity, contact points, and related quality measures. Marking ribbons were used to evaluate the patient’s occlusion on the provisional restorations, which would not be fully loaded at this stage. The restorations (and thus the patient’s occlusion) were then adjusted — first to permit canine function but also to eliminate any group function. Performed extraorally, the provisional restorations were contoured in a manner that would essentially “flatten” them for the two months they would be in service and to continue to place load on the implants and surrounding forming bone. Any necessary adjustments in the aesthetics, shape, and fit of the provisional restorations was conveyed to the laboratory for inclusion in the definitive full-crown restoration.

Figures 8A, B. The patient was recalled again at three months postsurgery for further evaluation. Periapical radiographs recorded at this visit verified the seating of the custom-fabricated abutments and demonstrated the continued regeneration of the peri-implant graft along the mesial and distal aspects of the implants (Tapered Screw-Vent, CenterPulse, Carlsbad, CA). The radiographs were closely monitored to ensure that no periapical radiolucencies were present. Healing was judged to be commensurate with the expectations of the patient and the practitioner.

Figures 9A, B. Four months following the implant placement surgery, the definitive porcelain-fused-to-metal restorations were delivered and cemented. The panoramic and periapical radiographs confirmed the total obliteration of the previous tooth sites and their associated periodontal ligaments, which were now filled with regenerated bone. The final clinical evaluation verified the health and integrity of the soft tissues, which demonstrated good contact points and soft tissues. These implant-supported, full-coverage crowns exhibited natural aesthetics and harmony with the gingival architecture, thus confirming the viability of the immediate one-stage approach to implant placement and provisionalization.

Acknowledgment
The author mentions his gratitude to Dr. Ned Nippoldt, Woodbury, Minnesota, for his excellence in restorative dentistry. The author also declares that he serves as a paid consultant for CenterPulse, though he has no financial interest in the sale of any product cited herein.

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