Aesthetic replacement of maxillary premolar with immediate implant placement and metal ceramic crown over CAD/CAM abutment

**Introduction**

This article describes treatment to solve a common dental complication (loss of tooth due to vertical root fracture). Contemporary implant therapy and subsequent CAD/CAM laboratory procedures provide an elegant solution to this patient’s dental emergency. Treatment was accomplished during a period of approximately six months.

**Case presentation**

The patient was a healthy, 52-year-old female with an unremarkable medical history. Her dental history and general dental health were excellent. Unfortunately, she suffered a vertical fracture of tooth #5, which necessitated its extraction (Fig. 1).

The treatment plan was for extraction and immediate implant placement with concurrent bone grafting as required. A temporary partial denture was planned to provide aesthetic replacement and to support and shape tissue during the healing process. The final restoration was to be a cemented PFM crown supported by an Atlantis (DENTSPLY Implants) gold hue abutment.

Material selection was based on the patient’s cross bite occlusion that transitioned from normal to cross bite across this particular tooth’s occlusal table. Crown and abutment could potentially be subject to occlusal stress due to this transitional relationship. A restoration that provides maximum strength was desirable for long-term stability of the restoration. The patient had a thin biotype and the gold hue abutment provides both strength and a more natural tissue colour. The gold colour provides ‘warmth’ of colour in the critical transmucosal region. Titanium abutments provide strength but can telegraph a greying effect on thin tissues.
Treatment began with a preoperative appointment to take the necessary records (impressions of both arches, facebow transfer, shade taking, bite registration and clinical photography). The prescription that was sent to the lab ordered a partial denture fabricated from duracetyl resin and to develop a tooth born surgical guide. The lab was instructed to simulate the extraction site by removing the tooth from the study cast provided. This model was duplicated for fabrication of the two appliances.

Laboratory product was provided to surgeon. Atraumatic extraction was accomplished and the temporary partial denture was immediately implanted (Legacy Three, Implant Direct), placed with facial bone grafting (Figs. 2 & 3).

There was a healing screw placed and the site was closed with appropriate membrane and suturing techniques. The unilateral partial denture was not delivered at time of surgery. The patient was seen in the restorative office and the temporary partial denture (Duratek, Drake Precision Laboratories) was modified to provide tissue support and begin development of an ovate tissue site. The partial denture was placed uneventfully. These appliances are extremely retentive and not subject to dislodgement or pressure over the implant site during function. The patient was seen one week later for a postoperative check and adjustment of the temporary appliance (Fig. 4). The patient was instructed to return to surgical clinic in approximately four months for a final evaluation prior to restorative procedures.

Four months after surgery, the patient was seen by the surgeon to uncover the implant, remove the healing screw and place a temporary abutment. The temporary partial was adjusted to accommodate the added height of the healing abutment (Fig. 5). The patient was instructed to return to the restorative office for definitive restoration of the implant in approximately three weeks.

---

**Fig. 4:** Temporary Duratek partial.
**Fig. 5:** Healed implant site with healing abutment.
**Fig. 6:** Well-healed mucosa.
**Fig. 7:** Placement of impression coping.

---

**Fig. 8:** Final PVS impression.
**Fig. 9:** Crown and abutment on analogue model.
The patient returned to the restorative office for evaluation and to develop necessary records for the laboratory fabrication of the definitive restoration. The implant site was evaluated and deemed adequately healed to proceed with restorative procedures (Fig. 6).

The healing abutment was removed and a closed tray impression coping was fitted onto the implant (Fig. 7). A radiograph was taken to confirm complete seating of the impression coping. A full-arch impression was taken with heavy body PVS impression material (Panasil Tray Soft, Heavy Body Regular Set, Kettenbach) (Fig. 8). The healing abutment was replaced once impression was taken. A bite registration (Futar D Fast Set Kettenbach), new opposing impression (Silginate plus Panasil Light Body Fast Set, Kettenbach) and shade map were taken. All clinical products were sent to the laboratory along with shade photography and a complete written prescription.

A PFM high noble crown and Atlantis gold hue custom abutment were prescribed. The abutment was ordered as tissue contouring with 1 mm deep margin placement circumferentially (Atlantis, DENTSPLY Implants). The use of a custom abutment allows modification of the transmucosal tissue profile and to ideally position margins. Tissues were previously shaped with the ovate pontic of the temporary partial. The final crown was planned to be chairside custom stained. The lab was cautioned that occlusion on this restoration was in the path of the patient’s cross bite transition from normal to cross bite.

The laboratory (Drake Precision Dental Laboratories) partnered with Atlantis for the abutment design and milling and then fabricated the PFM crown (Figs. 9 & 10). An appointment was made for the patient to come and have the definitive restoration placed.

The appointment was uneventful. The healing abutment was removed and the Atlantis abutment was placed (Fig. 11). Due to positive tissue pressure from the tissue contouring, the abutment was slowly placed with incremental turns of the retention screw. Tissue blanching was carefully observed. The abutment was fully seated and within five minutes, tissue blanching had disappeared. The Atlantis abutment was torqued to the manufacturer’s specifications (30 Ncm). A radiograph was taken to confirm the final seating of the abutment.

The PFM crown was tried on and interproximal contacts adjusted to allow complete seating of the crown. Occlusion was marked with appropriate articulation ribbon and adjustments were accomplished, with particular attention to functional path and centric contacts. The final occlusion respected the cross bite while providing a light occlusal contact that became normal in intensity upon biting. All functional contact was adjusted to be in minimal contact during excursions. Adjacent teeth provided partial group function.

Once all clinical adjustments were done, a laboratory technician was consulted for the final shade matching. The initial shade was very close to ideal. The tech-
nician accomplished minor modifications (minimal characterisation staining and reduction in final surface gloss). Proximal contacts and the occlusal table were polished after final glazing. The crown was lined with silicone tape and then the bite registration material was injected into the crown to fabricate a cementation jig (Fig. 12). This step is very important to avoid excess cement extrusion during final seating of the restoration.

All pre-cementation procedures were completed, including approval by patient of both aesthetics and bite comfort. The abutment screw access hole was sealed with silicone tape, respecting the external contours of the abutment to allow complete seating of the restoration. This is a critical step to maintain patency for future access to retention screw.

The crown was steam cleaned and thoroughly dried. Intraorally, the abutment was thoroughly cleaned and dried in preparation for cementation procedures. The attending dental assistant maintained cheek retraction and a dry field.

The walls of the crown were lined with implant cement (Dental Implant Cement, radiopaque, Premier). The crown was then seated on the previously fabricated cementation jig to extrude excess cement. Cement adaptation to the internal walls of the crown was confirmed and the crown was seated over the custom abutment. Excess cement was removed by a combination of hand instrumentation and dental floss after initial cement setting.

The crown was left under biting pressure with cotton roll over the occlusal table for five more minutes to allow for the cement to fully set. Meticulous inspection of sulcus was accomplished to remove any vestige of implant cement. A postoperative radiograph was taken to evaluate complete seating of crown and to confirm removal of any excess radiopaque cement. The occlusion was confirmed and patient was dismissed. One-week recall was accomplished to confirm occlusion and to re-evaluate soft-tissue response to the restoration.

Conclusion

This case study reveals the potential for implant-supported tooth replacement. The aesthetic result was excellent and final gingival contours were consistent with adjacent dentition. The tissue colour was natural and did not reveal any hint of the underlying implant or abutment. Restoration margins were concealed within the gingival sulcus. This treatment provided an elegant solution for this all-too-common dental emergency. The patient was extremely pleased with the result (Figs. 13–15).

Editorial note: The author would like to express gratitude to Drake Precision Dental Laboratories (Charlotte, NC) for all services provided for this treatment. In addition, Dr Todd Engle, DDS, (Charlotte, NC) provided extraordinary care during extraction and immediate placement of implant.

References


about

Dr Larry R. Holt, DDS, FICD, graduated from the UNC School of Dentistry in 1978. He was in private practice from 1978–2008. Since 2008, he has been the director of clinical education and research at Drake Precision Dental Laboratories in Charlotte, NC