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

By Dr. Larry R. Holt, USA

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.

The patient is a healthy, 32-year-old female with an unremarkable medical history. Her dental history and general dental health are excellent. Unfortunately, she suffered a vertical fracture of tooth No. 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 was planned to provide esthetic replacement and to support and shape tissue during the healing process. Final restoration was to be a cemented PFM crown supported by an Atlantis gold hinge abutment.

Material selection was based on patient’s cross bite occlusion that transitions 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 has a thin biotype, and the gold hinge abutment provides both strength and the gold color that provides a more natural tissue color. The gold color provides “warmth” of color in the critical transmucosal region. Titanium abutments provide strength but can telegraph a grayish affect on thin tissues.

Treatment began with a presurgical impression to take necessary records (impressions of both arches, facebow transfer, shade taking, bite registration, and clinical photography).

Prescriptions to lab was provided ordering a partial denture fabricated from duracryl resin and to develop a tooth born surgical guide. Lab was instructed to periodontist the extracting site by removing the tooth from the socket using a surgical guide. This guide was duplicated for fabrication of the two appliances.

Laboratory product was provided to surgeon. Atraumatic extraction was accomplished and immediate implant (Legacy Three, Implant Direct) placed with facial bone grafting (Figs. 2–3).

There was a healing screw placed at the time of surgery. Patient was seen in restorative office, and the partial (Duratek, Drake Precision Laboratories) was modified to provide tissue support and begin development of an ovate tissue site. Partial was delivered uneventfully. These appliances are extremely retentive and not subject to dislodgement or pressure over the implant site during function. Patient was seen at one week for postoperative check and adjustment of temporary appliance (Fig. 4).

Patient was instructed to return to surgical clinic in approximately four months for final evaluation prior to restorative procedures.

Four months after surgery, the patient was seen by 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). Patient was instructed to return to restorative office for definitive restoration of the implant in approximately three weeks.

Patient was appointed with restorative office for evaluation and to develop necessary records for laboratory fabrication of the definitive restoration. Implant site was evaluated and deemed adequately healed to proceed with restorative procedures (Fig. 6).

Healing abutment was removed and a closed tray impression coping was fitted onto the implant (Fig. 7). Radiograph was taken to confirm complete seating of the impression coping. A full arch impression was taken with heavy body PVS impression material (Panafil Tray Soft, Heavy Body Regular Set, Kettenbach GmbH) (Fig. 8).

Healing abutment was replaced once impression was taken. A bite registration (Futar D Fast Set Kettenbach GmbH, new opposing impressions (Siligraze plus Panafil Light Body Fast Set, Kettenbach GmbH)) and shade map were taken. All clinical product was sent to laboratory along with shade photography and a complete written prescription. A PFM high noble crown and Atlantis gold hinge custom abutment were prescribed. The abutment was ordered as tissue contouring with mm deep margin placement circumferentially (Atlantis, Denstply Implants).

The use of a custom abutment allows modification of 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 on chairside custom stained. Lab was cautioned that occlusion on this restoration was in the path of potential nuisance transition from normal to crossbite.

Once all clinical 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 force. All functional contact was adjusted to be in minimal contact during excursions.

Once all clinical adjustments were done, a laboratory technician was consulted for final shade matching. The initial shade was very close to ideal.

The technician accomplished minor modifications (minimal characterization staining and reduction in final surface gloss). Proximal contacts and occlusal table were polished.

The abutment was fully seated and, within five minutes, tissue blanching had disappeared. The Atlantis abutment was torqued to manufacturer’s specifications (15 Ncm). A radiograph was taken to confirm 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 articulating paper 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 force. All functional contact was adjusted to be in minimal contact during excursions. Adjacent teeth provided partial group function.

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Fig. 1. Fractured tooth. (Photos/Provided by Dr. Larry R. Holt)
Fig. 2. Immediate implant placement.
Fig. 3. Bone grafting and membrane placement.
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.
The crown was lined with silicone tape and then 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 esthetics and bite comfort. 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. Intracoronally, the abutment was thoroughly cleaned and dried in preparation for cementation procedures. Attending dental assistant maintained cheek retraction and dry field.

The walls of the crown were lined with implant cement (Dental Implant Cement, opaque, Premier). The crown was then seated on the previously fabricated cementation jig to extrude excess cement.

Cement adaptation to internal walls of crown was confirmed and the crown was seated over the custom abutment. Excess cement was removed by combination of hand instrumentation and dental floss after initial cement setting.

The crown was left under biting pressure with cotton roll over occlusal table for five more minutes to allow for cement to fully set. Medical inspection of sulcus was accomplished to remove any vestige of implant cement. Postoperative radiograph was taken to evaluate complete seating of crown and to confirm removal of any excess radiopaque cement. Occlusion was confirmed and patient was dismissed.


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Chen, Duncan, Afshar, Moshav-Zion, Fabrication of 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).

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

References

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