Replacement of missing posterior teeth can be done in a healthy, functional and aesthetic manner. This case reviews principles and techniques to replace a mandibular first molar with an implant-retained crown. Planning for the final result before the time of the loss of the existing natural tooth gives the largest number of options to attain an excellent result.

Tooth #19 had a gold onlay placed 20 years ago; approximately one year ago, it became sensitive to biting pressure. Endodontic therapy was completed with the aid of a microscope and the distal buccal root showed a vertical fracture line that was also evident coronally (Figure 1). The symptoms were lessened but did not abate. After waiting for several months, the patient decided that he was ready to extract the tooth and place an implant-retained crown. The patient also expressed a desire to have a more natural looking replacement than the gold onlay.

Using local anesthesia, the tooth was atraumatically extracted by surgically separating the mesial and distal roots to preserve all of the remaining alveolar bone. The socket was curetted to remove any granulation tissue and the walls perforated in multiple sites to create bleeding points to aid in healing. A peptide enhanced synthetic bone graft material that is biomimetic of autogenous bone, was placed in the extraction site. This accelerates natural bone regeneration by enhancing the healing cascade that leads to cell proliferation, cell differentiation and the formation of new bone. A collagen membrane was placed over the extraction site to allow for primary healing (Figure 3). A decision was made not to do an immediate placement of the implant at the time of the extraction because of the granulation tissue that was present around the root fracture; due to the extraction voids, better implant positioning and angulation could be attained by placing the implant into a solid bone mass.

Six months healing time was allowed for the graft to mature into enough viable bone for implant placement (Figure 4). A decision was made to center the implant between the adjacent teeth with 3mm of clearance. A 2mm pilot hole was drilled 8mm deep, and the surface gingiva was punched with a 4.3mm soft tissue punch (Figure 6). After cutting down to the level of the bone with the punch, the soft tissue was easily removed with a surgical curette (Figure 7). A radiopaque alignment pin was placed (Figure 8) and radiographed (Figure 9), and the succeeding osteotomies were adjusted to create the preferred alignment to parallel the roots of the adjacent teeth. A 4.3mm × 10mm tapered Implant Direct Replant implant was placed and torqued to 35Ncm (Figure 10). Because of the initial high stability, a polyvinyl impression was taken with Kerr Take One at the time of placement using a closed tray impression coping (Figure 11). A distinct advantage of this technique was after the 4-month healing period, the next appointment for the patient was the delivery of the final restoration. A radiograph was taken to confirm proper positioning of the implant fixture and intimate mating of the coping and the fixture (Figure 12). The impression coping was then removed and matched with the implant analog, tightened to 20Ncm and seated in the impression with the exact orientation in which the impression was taken (Figure 13). This is an important step to gain maximum accuracy of the final impression. A 3mm healing collar was placed on the implant fixture and radiograph taken for the integrative phase of four months (Figures 14 and 15). A shade was taken and instructions sent to the dental laboratory for the fabrication of a porcelain fused to gold crown over a cast gold abutment. This design allowed for a very fine marginal interface between the crown and the abutment. A cement-retained crown was fabricated and the gingival margin of the crown was within 1mm of the gingival crest. Designing the margin placement within a 1mm depth facilitates cement removal after cementation.

A cast gold abutment was designed and fabricated along with a porcelain fused to gold crown. An acrylic verification matrix was made on the model that could be used to verify the orientation and position of the analog in the model (Figure 16) was the exact duplicate of the fixture in the mouth (Figure 17). The impression coping should fit exactly to place on the fixture when using the matrix. The cast gold abutment was placed and torqued to 35Ncm (a similar acrylic seating matrix can be used to aid in proper orientation) (Figure 18). A radiograph was taken as perpendicular to the abutment fixture interface as possible to verify complete seating (Figure 19). Retorquing the abutment screw one last time was done to assure the correct abutment torqued.

The final crown was adjusted and seated with 3M Relyx Luting Cement. Margin placement was just below the marginal...
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The final result in this case is aesthetic, replaces the full function of the missing natural tooth and will have predictable longevity. Implant retained restorations are an excellent option but requires attention to detail from start to finish.

01 Tooth #19 with a distal buccal vertical root fracture. 02 Atraumatic extraction with bone graft and collagen membrane. 03 Post extraction healing at two weeks. 04 Healing at 6 months. 05 Implant Guidance System pilot drill position. 06 4.3mm tissue punch. 07 Removal of punched tissue with a surgical curette. 08 Radiopaque metal guide pin. 09 Position of pilot hole too far mesially inclined. 10 Torquing fixture to 35Ncm. 11 Implant impression coping ready for final impression at time of implant placement. 12 Radiograph verifying coping fixture fit. 13 Placing implant impression coping and analog into impression. 14 Healing cap in place at implant placement. 15 Radiograph of implant at time of placement. 16 Acrylic verification matrix on model. 17 Acrylic verification matrix in the mouth. 18 Cast gold abutment in place. 19 Radiograph of seated cast abutment on fixture. 20 Occlusal view of porcelain fused to gold crown. 21 Buccal view of final crown. 22 Final radiograph of seated restoration exhibiting complete excess cement removal.

gingiva, so complete post cementation cement removal was easily accomplished. Because of the relatively narrow diameter of the implant compared to the natural root it replaced, the most coronal aspect of the fixture should be at the crest of the bone and approximately 3mm subgingival. In this particular case, the tissue thickness was only 2mm, so the emergence profile needed to be relatively flat to allow for broad interproximal contacts between the implant retained crown and the adjacent teeth (Figure 20). By reducing the size of the interproximal gingival embrasures, food impaction problems in the gingival embrasures that are common with many posterior implants retained crowns are reduced (Figure 21). A final radiograph was taken to confirm complete seating and complete cement removal (Figure 22).