Immediate implantation and provisionalization: Single-tooth restoration in the esthetic zone

By Susan McMahon, DMD and Karrah Petruska

Anterior tooth loss and restoration in the esthetic zone as a common challenge in dentistry today. The prominent visibility of the area can be especially distressing to the patient and requires a timely and esthetically pleasing solution.

Immediate single-tooth implantation followed by immediate provisionalization is becoming an increasingly desirable treatment modality. Several advantages exist in comparison to conventional delayed loading.

In the past, the non-restorable tooth was extracted and possibly grafted for site preservation. A removable partial denture (or flipper) was fabricated and placed for use during healing. After an adequate healing period, an implant was placed and buried under the gingiva, and the patient continued to wear the flipper until the implant had osseointegrated and was ready to be uncovered and restored. The patient would therefore wear the removable partial denture for upwards of six to eight months.

This course of treatment often resolves with undesirable esthetic and functional results due to uncontrolled bone resorption in the alveolar ridge. The creation of the provisional restoration for use during healing results in a less than desirable gingival emergence and may compromise future restoration possible outcomes. Studies have shown that “early loading of dental implants does not appear to interfere with osseous modeling of a developing tooth.”

Immediate implantation into the fresh extraction socket allows the clinician to maintain the gingival tissue and create a more esthetically pleasing restoration.

Minimum criteria for implant placement have been established for successful immediate loading. Rough quantitative values for insertion torque and implant stability quotient (ISQ) as well as surgical assessment play a role. Values as low as 15 Ncm for insertion torque and 50 ISQ both resulted in successful provisionalization.

Additionally, the surgeon must assess where there is adequate bone support at the apex, at least 5 mm of circumferential bone, and primary stability of the implant. Research has shown that “early loading of dental implants does not appear to interfere with osseous remodeling of a developing tooth.”

Immediate provisionalization following implant placement allows for greater clinical control over the regeneration of tissue surrounding the site of extraction. Unfavorable alterations to the alveolar bone structure must be avoided using ridge preservation techniques and precautions in terms of osseous exposure.

Immediate placement of the implant into fresh extraction sockets prevents the post-extraction resorption that occurs commonly with alternative forms of treatment, preserving the integrity of the alveolar ridge. A compromised implant site can also be a concern when tooth loss. Bone resorption may leave insufficient bone for implantation. Furthermore, a deteriorated periodontal ligament architecture produces an inferior interior. Immediate implantation into the fresh extraction socket allows the clinician to maintain the gingival tissue and create a more esthetically pleasing restoration.

Immediate implantation and same-day provisional replacement of single anterior teeth minimizes treatment time and cost while enhancing esthetic quality. In addition to alleviating patient trauma, this technique decreases resorption of hard and soft tissue and results in better function. Overall, this leads to greater patient satisfaction.

In this process, the implant is placed and provisionalized quickly and loaded. A nonfunctioning, also known as non-occluding provisional is used in a protected occlusal scheme. The placement of the non-occluding restoration must occur within 48 hours to be considered immediate loading. Both of the following cases received same day provisionalization.

The clinician faces several challenges when restoring teeth in the esthetic zone. Major cosmetic concerns in the fabrication of the immediately placed provisional are the retention of the interdental papilla and prevention of alveolar bone collapse. Research has suggested that immediate provisionalization following implantation allows for greater clinical control over the regeneration of tissue surrounding the site of extraction.

In both cases, the maxillary right central incisors had sustained trauma, were endodontically treated and functioned for a number of years. Approximately 15-20 years later, the teeth in each case failed due to internal resorption. The failing teeth were extracted and implants were inserted immediately and restored the same day with a non-functional provisional. Dental root resorption involves the loss of hard tissue that composes the tooth (dentin, cementum and enamel). In most cases, tooth resorption is the result of trauma or irritation to the periodontal ligament and/or tooth pulp. These conditions may occur as a result of injury, inflammation or chronic infection of the pulp, periodontal disease, orthodontic movement, or tooth eruption. In most cases, the root resorption is generally asymptomatic and is discovered most frequently through radiographic examination.

Internal resorption is generally asymptomatic and is discovered most frequently through radiographic examination.

Case study 1: failing maxillary right central incisor

The patient is a 50-year-old healthy male who was examined in our office for a failing maxillary right central incisor. His history involves a soccer accident in 1993 that resulted in an elbow to the face with trauma to the right maxillary central incisor. Approximately one week subsequent to the accident, the patient’s tooth was treated endodontically. It eventually became discolored and grew increasingly out of alignment (Fig. 1). Radiographic examination revealed internal resorption. Clinically, all other maxillary and mandibular teeth were in good condition. Periodontal examination revealed healthy gingival tissue. The patient was concerned that his anterior tooth would fracture unexpectedly and desired an immediate replacement.

Treatment options

Several treatment options were considered. The first was extraction of the maxillary right central incisor and fabrication and placement of a conventional fixed bridge of porcelain fused to metal or all-ceramic system. The second option was extraction of the tooth followed by placement of a removable partial denture. The next option was extraction, provisionalization with a removable partial denture (flipper) followed by implant placement, healing while wearing the flipper and, finally, restoration of the implant. The best alternative was extraction and immediate replacement of the extracted tooth with an implant, followed by immediate loading with a nonfunctioning provisional. After adequate osseointegration, a final restoration would be fabricated. Advantages and disadvantages of all options were explained to the patient. He decided to continue treatment with an immediate implant restoration. The patient was then referred to a periodontist for further evaluation and implant consultation.

Implant examination

Implant examination revealed adequate bone height and width for implant placement immediately following extraction of the failing tooth. A surgical date was scheduled with the periodontist for extraction of the tooth and placement of the implant. An appointment was coordinated with our office for the patient directly following the surgical procedure for provisionalization of the implant.

Surgical protocol

The right central incisor was removed and a NobelReplace Ta-pered Groovy (internal conec- tion) 5.0 mm x 13 mm implant was placed. An osseous graft of demineralized freeze-dried bone and a collagen membrane were utilized to augment the surgically treated site. The fixture received an emergence profile, healing abutment.

Provisionalization

The patient presented in our office after the implant placement with a healing abutment in place. The healing abutment was removed. A Nobel BioCure immediate temporary abutment was placed and a provisional was fabricated. Care was taken to contour the emergence of the provisional as to best support the gingival architecture. The plastic coping for the immediate temporary abutment was roughened with a 56 carbide bur to enhance adherence of the integrity provisional material used.

The provisional was polished and placed on the immediate temporary abutment with a small amount of flowable composite to enhance retention. The provisional crown was fabricated to be completely out of occlusion and non-functional to ensure the implant adequate osseointegration time undisturbed by occlusal forces. The provisional restoration was observed periodically during the six-month healing process to monitor gingival adaptation.

Final restoration

Six months post surgery, the patient was scheduled for placement of the final restoration. After removing the provisional crown and the immediate temporary abutment, an implant impression post was placed, radiographic verification was made to assure complete seating and a final impression was taken with a polyether system. Complex shade-mapping was carefully performed to match the existing contralateral natural tooth.
teeth. The provisional was then reinserted. A Procera zirconia custom implant abutment was chosen. Zirconium implant abutments have not only been noted for their tooth-like color and esthetic appeal but have exhibited high load strength and intrasulcular design enhancement. The extraordinary load strength of the zirconium is not compromised by high bending and tensile strength, and fracture and chemical resistance. Zirconium abutments are mechanically equivalent to their metal counterparts but boast greater biological compatibility. Results of a recent study provide evidence that the ceramic oxide abutments can be safely utilized in the incisor region of both the maxilla and mandible as determined by maximal bite forces in the esthetic zone. Due to excellent restorative properties in terms of strength and color conformity, the zirconium implant-abutment is becoming increasingly favored by clinicians for esthetically pleasing anterior implant restorations. A Procera zirconia crown was fabricated for this patient with Nortake CZR porcelain (Fig. 5). At the time of the insert, the provisional crown and immediate temporary abutment were removed. The provisional crown and immediate abutment was seated, the screw was hand tightened and the screw was torqued to 55 Ncm with the manufacturers torque wrench. The abutment was utilized to augment the surgical placement of the immediate implant for the maxillary right central incisor. The patient’s treatment was similar to that of the patient in the

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Final restoration
After the six-month healing period the final restoration was fabricated. In this case, a one-piece screw-through abutment made from a Nobel Bioscand Goldalgot Eng-

Fig. 8

Final restoration
The right central incisor was re-

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13