Immediate restoration of single implants replacing central incisors compromised by internal resorption

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Central incisors with a history of past trauma are a common finding in dentistry today. Many of these teeth have been endodontically treated at the time of trauma or shortly post trauma. However, failure of these teeth can occur, often years later as a result of fracture, internal resorption, external resorption, decay and other factors. Sources of trauma often include sports or automobile related accidents.

Once it has been determined that an internally resorbed tooth is failing, typically the root canal treatment plan that is both functionally and esthetically acceptable must be determined and implemented. The following are case studies involving maxillary right central incisors that had sustained trauma, were endodontically treated and functioned for a number of years. Approximately 15 to 20 years later, the teeth in each case failed due to internal resorption.

Internal resorption

Dental root resorption involves the loss of hard tissues that compose the tooth (dentin, cementum and enamel) or results in reparatively by osteoclasts, large multinucleated cells that originate from the bone marrow.

Osteoclasts aid in the process of bone loss by releasing demineralizing agents and degrading enzymes that function in the breakdown of a tooth’s hard tissues. Resorption of the teeth is often difficult to prognosticate, diagnose and care for. In most cases, tooth resorption is the result of trauma or irritation to the periodontal ligament and/or tooth pulp. These conditions may occur because of injury, inflammation or chronic infection of the pulp, periodontal conditions, orthodontic tooth motility or tooth eruption.

Internal inflammatory resorption, the type of resorption identified in the following cases, is characterized by progressive loss of hard tissue in the tooth root. This degeneration is typically found in the cervical region, but has been observed in all areas of the root canal system. Internal resorption is generally asymptomatic and is discovered most frequently through radiographic examination. The loss of hard tissue is detected radiographically as uniform radiolucent expansion of the tooth. If internal resorption is left to progress untreated, it may result in expansion to the periodontal ligament through a crown or root perforation.

Immediately placed implants/ immediate provisionalization

The clinician faces a great esthetic challenge in the replacement of single anterior teeth. In the following cases of internally resorbed incisors with a poor prognosis, extraction followed by immediate placement of an implant is a desirable restorative option. The failing tooth is located in the esthetic zone, and therefore an immediate and esthetic replacement is necessary following extraction.

In the past, the non-restorable tooth was extracted and 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 results in a less than desirable gingival architecture surrounding the final restoration. There are also clear indications that partial removable dentures are an important causative factor in the alveolar bone resorption process.

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 internal resorption is predictable and predictable trends in the resorption process can be anticipated. The clinician can optimize the health of the bone and soft tissues around the implant by choosing a suitable diameter and length implant, as well as selecting a suitable abutment.

Implant evaluation

The right central incisor was removed and a Nobel Replace tapered Groovy (internal connection) 5.0 x 15 mm implant was placed. An osseous graft of demineralized freeze-dried bone and a collagen membrane were utilized to augment the surgical site. The fixture received an emergence profile-healing abutment. See the radiograph with implant in place (Fig. 2).

Provisionalization

The patient presented in our office after the implant placement with a healing abutment in place. The healing abutment was removed. A Nobel Biocare 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
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 insure 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 (Fig. 5).

**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 teeth. The provisional was then reinserted.

A Procera zirconia custom implant abutment was chosen. Zirconium implant abutments have not only been noted for their toothlike color and esthetic appeal, but for their tissue tolerability, high load strength and intrasulcular design enhancement.

The extraordinary load strength of the oxide ceramics 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 ceramic oxide abutments can be safely utilized in the incisor region of both the maxillary 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 Noritake CZR porcelain (Fig. 4).

At the time of insert, the provisional crown and immediate temporary abutment were removed. The Procera zirconia custom abutment was seated, the screw was hand tightened and the screw torqued to 55 Ncm with the manual torque wrench.

The access was filled with a small cotton pellet and topped with a thin layer of flowable composite. The Procera zirconia crown was then seated; margins, contacts and occlusion were confirmed; and the crown was cemented in place with 3M ESPE RelyX luting cement (Fig. 5).

**Case study No. 2**

This patient, a healthy male in his late 50s, was examined in my office for a fractured maxillary right central incisor. The patient had full arch porcelain restorations on his upper central and upper lateral incisors that were placed several years ago.

He had a history of trauma to the anterior teeth from a sports injury and subsequent endodontic treatment. Recent periapical radiographs showed internal resorption in the upper incisors (Fig. 6).

The patient sustained additional trauma to the maxillary right central incisor through a fall that resulted in complete fracture of the crown (Fig. 7). The tooth was non-restorable. After reviewing the different treatment options, the patient decided on an immediate implant restoration.

Although the maxillary left central incisor also exhibited signs of internal resorption, it was decided that treatment of that tooth would be performed later. Consideration was given to the poor gingival architecture. Internal resorption in the traumatized teeth approximately 15 years later.

Both of the patients’ careers and lifestyles demanded immediate replacements that were non-removable and esthetically pleasing. The failing teeth were extracted and implants were inserted immediately and restored the same day with a non-functional loaded provisional.

Immediate placement and restoration of a single implant offers a highly esthetic and timely treatment option in the case of internal resorption and tooth failure in the maxillary central incisors.

Furthermore, this treatment eliminates the need for a removable partial denture while maintaining the gingival architecture and preventing alveolar bone loss in the extraction site.

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A list of references is available from the publisher.

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