Repair of a root perforation with a resin-ionomer using an intentional replantation technique

Endodontics

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Abstract
The repair of a root perforation can be accomplished using different materials and techniques. When the defect is surgically inaccessible, the tooth can be carefully extracted, repaired extraorally, and placed back into the socket. This procedure, known as intentional replantation, is often a measure of last resort in an heroic effort to save a hopeless tooth.
This case report describes the treatment of a tooth with an iatrogenic root perforation and the subsequent healing of the surrounding periodontium using an intentional replantation technique and resin-ionomer to repair the root defect.

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Root perforation is an uncommon occurrence during the endodontic treatment of teeth. It can occur during endodontic therapy or during restorative procedures. If the perforation occurs below the level of the periodontal attachment, in-fection with resultant loss of attachment and pocketing can be a sequelae. In the past, iatrogenic root perforations were treated by filling the defect with a variety of different materials including gutta percha, calcium hydroxide products, amalgam, Cavit® (Espe Co., Norristown, PA; 800/344-8235),IRM®(Caulk/Dentsply, Milford, DE; 800/532-2855), Super EBA® cement (Harry J. Bosworth, Skokie, IL; 800/323-4352), and glass ionomer cement.[1-7]

Recently, a new class of restorative material, resin-ionomer, has been used successfully to treat a variety of subgingival root defects including iatrogenic perforations and resorptive lesions.[8-10] Resin-ionomer can be characterized as being a dual cure (both self- and light-curing) high fluoride-releasing composite resin. Resin-ionomer is a small particle, hydrophilic, non-aqueous resin combined with a photoinitiator and glass filler containing fluoride. The setting reaction may be considered to be one of a free radical curing mechanism, hence the identification as a resin-ionomer.[11]

Resin-ionomer restorative materials are self-adhesive, although they can be used in conjuction with an acid-etch dental adhesive. Other fluoride-releasing restorative materials have different setting reactions and are classified as such. Compomers are composite resin-like materials with an acidic hydrophilic monomer replacing a portion of conventional Bis-GMA resin polymer.[12] Most compomers must be used with an acid-etch dental adhesive technique. Resin modified glass ionomers are self-adhesive, with a setting reaction similar to conventional self-curing acid-base reaction glass ionomers with the addition of approximately 10% resin to permit a dual cure (both light- and self-cure). Of all classes of resin containing fluoride-releasing materials, resin modified glass ionomer cements have the highest fluoride release.

The management of the subgingival root defect typically is treated by either a surgical approach, exposing the defect and filling it with the restorative material, or a combination of intracanal and extracoronal access. Dragoo has reported comparing resin-ionomer, Geristore (Den-Mat, Santa Maria, CA; 8001433-6628), compomer, Dyract (CaulklDentsply), and resin modified glass ionomer, Pho-tac-Fil (Espe Co.), restoratives in the treatment of subgingival root lesions.[9] He concluded that none of the materials tested exhibited all the necessary characteristics of an ideal subgingival restorative; however, the Geristore restorative material provided the most favorable results.

Dragoo also described the histologic evidence of healing and connective tissue adherence of Geristore in these cases. He concluded that Geristore was closest to the ideal restorative material for subgingival lesions because it is biocompatible with osseous and gingival tissues, insoluble in the oral environment, self-adhering, radiopaque, has a low coefficient of thermal expansion and contrac- tion, is both light- and self-curing, and has fluoride release.

Resillez-Urisote and others reported the use of Geristore in the treatment of a mechanical root perforation. Sixteen months after the perforation repair, the tooth was healthy and functioning with-out problems.[13] Roth described the successful management of two cases that involved iatrogenic perforations of the pulpless tooth using Geristore.[10]

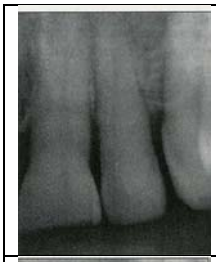

Fig. 1. Preoperative radioraph of root perforation of maxillary left lateral incisor.

Fig. 2. Immediate postoperative radiographic view of repaired perforation using a resin-ionomer restorative material. Note the radiopacity of the restoration.

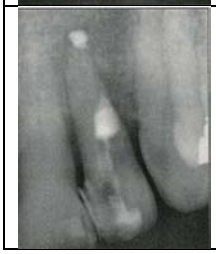

Fig. 3. Three month recall radiograph of perforation repair demonstrates healing.

Fig. 4. One year recall radiograph of perforation repair demonstrates healing.

In some instances, the subgingival lesion may not allow access for a conventional surgical and/or intracanal approach. In the past, these inaccessible lesions were deemed hopeless and the teeth were extracted. For the case being presented, the patient would not accept the extraction of a maxillary lateral incisor with a mechanical perforation of the root at a subosseous level. A novel approach of intentional replantation with treatment of the subgingival lesion extraorally with a resin-ionomer is presented.

Case report

The patient, a 60-year-old man, complained of a throbbing and swelling of the maxillary left lateral incisor. The tooth had received endodontic therapy from his pre- vious dentist three months earlier. Clinical and radiographic examination revealed an incompletely filled root canal with mechanical perforation on the distal surface of the root and suppuration exuding from the periodontal sulcus.

Periodontal probing at the distolingual line angle was 9.0 mm and the tooth had mobility of grade 2. A fistula was noted on the facial attached gingiva between the lateral incisor and canine. Radiographically the perforation was below the level of the supporting bone with extrusion of the endodontic filling material into the periodontal ligament and adjacent structures (Fig. 1).

The patient was told of the poor prognosis of the tooth and a strong recommendation was made that the tooth be extracted and replaced with either a fixed partial denture or an implant-supported prosthesis. The patient requested that heroic measures be taken to save the tooth. The treatment option of endodontic retreatment with surgical repair of the perforation was presented. However, after reevaluating the distolingual position of the perforation and the difficulty in surgically accessing the area for repair, it was decided that a replantation procedure was the only method that would improve the treatment outcome prognosis to maintain the tooth.

Clinical procedure

The upper left lateral incisor was anesthetized as for an extraction. To minimize mobility during healing, it was decided to place an adhesive composite splint joining the lateral incisor and adjacent central incisor.

Prior to extraction, Class III proximal preparations were made into the mesiolingual surface of the lateral incisor and distolingual surface of the central incisor. In addition, the root canal was accessed through the previous endodontic access opening. All accessible gutta percha was removed. The root canal was irrigated to remove all debris and dried. Then, the left maxillary lateral incisor was extracted, taking care to avoid damage to the root, gingival tissues, and alveolus.

During all phases of postextraction treatment, the tooth was handled with a saline-soaked sterile gauze. The tooth was then thoroughly inspected for all root defects. At the time of extraction, the root surfaces

adjacent to the perforation exhibited the classic signs of an external resorptive lesion.[8] The inflammation in the area of perforation contributed to a bowl-shaped, softened cemental surface.

The area of perforation as well as the root apex was prepared with a diamond and copious water spray. The preparations were rinsed, gently dried, and then restored by syringing self-adhering Geristore in an Accudose Needle Tube (Centrix, Shelton, CT; 8001 235-5862). Excess resin-ionomer was removed with a plastic filling instrument. The restorative material was light-cured for 30 seconds and then allowed to complete polymerization within the canal by self-curing. The restorations were finished with ultrafine diamonds (Brasseler USA, Savannah, GA; 800/841-4522) with water spray. The extraoral restorative phase was completed in less than ten minutes.

The tooth socket was gently irrigated with sterile saline to dislodge the developing clot and the tooth replanted into the socket with gentle but firm finger pressure. The Class III preparations of the replanted lateral incisor and adjacent central incisor were splinted together through an acid etch technique with composite resin. Occlusion was adjusted so that the lateral incisor had minimal function in centric occlusion and in all excursions. Fig. 2 is the radiograph of the replanted lateral incisor immediately after treatment. After one week, the tooth was healing well with no evidence of a fistula or suppuration from the gingival sulcus. On three month and one year recall, the lateral incisor had healed satisfactorily (Fig. and 4).

Discussion

Subgingival root lesions are difficult to treat. In many cases the prognosis of these teeth, even with surgical and restorative treatment, is guarded. An innovative approach to treating a mechanical perforation of a root (where clinical access was not possible with a surgical flap) is described, featuring intentional replantation.

Grossman describes intentional replantation as the removing of a tooth, performing endodontic manipulation and/or obturation, and then reinserting it back into the socket. This requires careful removal of the tooth from the mouth without damaging the tooth, soft tissues, and alveolus. He includes a perforation of the root that cannot easily be walled off as an indication for replantation.[14] After removal, the tooth must be handled gently, kept moist with saline solution, and replanted within as short a time as possible. Koerner describes the ideal time out of the socket as being not longer than 30 minutes, although 10-15 minutes is preferred.[15]

It must be understood that intentional replantation is a technique that offers a last chance for success. Grossman and Deeb, two early proponents of the technique, emphasize that intentional replantation is to be done only when no other procedure offers hope of retaining the tooth.[16] Grossman and Ship reported that after five years there was only a 50% chance for success.[17] Of course in the cases they described, all teeth treated had hopeless prognoses and were to be extracted. Knowing this, 50% success after five years is excellent.

The choice of material to restore and seal root lesions should be based upon past history with clinical success. The use of Geristore, a resin-ionomer, is based upon the clinical reports of biocompatibility with healing by Dragoo, Scherer, Roth, and Resillez-Urisote.[10,11,13] Geristore also has been described as being used for the routine restoration of anterior teeth, for the restoration of deciduous teeth, as core foundations for teeth prior to crown preparation, for root resorptive lesions, to repair root fractures, and for bonding amalgam restorations.[11]

Conclusion

This case report presents the successful treatment of a mechanical root perforation using an intentional replantation procedure and a resin-ionomer restorative. Further investigation is needed to provide more long term data on the use of these techniques.

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