Intentional Replantation of a Mandibular Canine with Multiple Iatrogenic Endodontic Complications

Sübay RK1, Sübay MO2, Balkaya CM3

1Department of Endodontics, School of Dentistry, Istanbul University, Turkey. 2Department of Maxillofacial Surgery, School of Dentistry, Istanbul University, Turkey. 3Department of Prosthodontics, School of Dentistry, Istanbul University, Turkey.

Abstract
Teeth being exposed to multiple iatrogenic complications during root canal treatment are usually extracted and replaced with a dental implant. This case report presents the treatment of a mandibular canine that had multiple endodontic complications using an intentional replantation technique. The case was showing swelling and pain, unusual canal anatomy, periapical lesion, broken instruments, and root perforation in association with overfilling. After extraction of the root, the resected root end and perforation were sealed using mineral trioxide aggregate. The root was replanted extrusively, fixed and restored with a crown. Appearances of slowly progressing replacement resorption were detected radio graphically at 6-, 12- and 24-month recalls. The tooth was functioning successfully without showing clinical symptoms at 6-, 12-and 24-month recalls.

Key Words: Perforation, Overfilling, Intentional replantation, Extrusion, Root-end filling, Mineral trioxide aggregate

Introduction
Although most endodontic complications can be adequately treated by endodontists using modern techniques and materials, there are still some unmanageable cases that are indicated for extraction and replaced with a dental implant in daily clinical practice.

In endodontics, Intentional Replantation (IR) is an accepted and reliable technique. IR could be indicated when conventional treatments have failed or could not be performed properly and when endodontic surgery is contraindicated or could be very difficult [1-3]. The technique involves extraction of the tooth and its re-insertion into the socket after sealing the resected root end or root perforation with a root-end filling material [1,2]. Vertical root fractures of endodontically treated teeth, teeth with crown-root fracture, periodontally involved hopeless teeth and teeth showing replacement resorption have also been managed using this technique [4-6].

The principle point of the technique is preservation of the periodontal membrane and the cementum cells’ vitality [1,2]. The clinical studies reported that the success rate of IR based on periapical healing was between 72% and 89.5% [1,3,7]. The main causes of failures following IR were reported as root resorption, the persistence of apical lesion or pain, periodontal pocket formation, and mobility [1,3]. Root cracks or fractures occurring during the extraction of teeth are complications that require termination of the procedure [1].

Amalgam, zinc-oxide eugenol, glass-ionomer resin, and Mineral Trioxide Aggregate (MTA) have been used as root-end filling materials in reported IR cases [3,7-9].

This case report presents management of a mandibular canine that had multiple endodontic complications using the intentional replantation technique with MTA root-end filling.

Case Report
A 45 year-old woman was referred to the clinic of the Department of Endodontics, Istanbul University by a local dentist for endodontic evaluation of her mandibular left canine after a failed root canal treatment. The preoperative digital radiography showed that the tooth had an adequate root canal treatment and apical radiolucency (Figure 1). The tooth was demonstrating no signs of external resorption and was showing 25 mm length, radio graphically (8 mm crown length and 17 mm root length). Clinically, the tooth was having a composite restoration and was showing no carious. A painful facial swelling was visible around the tooth. An endodontic access cavity was prepared to remove the root canal filling for the retreatment and to initiate drainage through the root canal, but further radiography revealed that the mandibular canine had a complex canal anatomy, two broken instrument pieces in the middle-third root canal and root perforation associated with overfilling (Figure 2).

Following careful consideration of possible treatment alternatives and strategies by the authors, the patient was informed that either the IR technique could be applied for the treatment of the tooth or a dental implant could be done following the extraction of tooth. The patient was also informed about the treatment procedures, the costs, the success outcomes, and the complications of both treatments.

Corresponding author: Sübay RK, Department of Endodontics, School of Dentistry, Istanbul University, Capa, Fatih, 34093, Turkey, Tel: +90-5326171969; Fax: +90-2125250075; e-mail: ctsubay@yahoo.com

Figure 1. Preoperative radiography of the case.
The recorded medical history was noncontributory for the patient. The patient preferred IR treatment. An antibiotic [amoxicillin/clavulanic acid 2 g/day for a week], an analgesic [naproxen sodium when necessary], and a mouth wash [0.2% chlorhexidine two times/day for 10 days] were prescribed for the swelling. The patient was scheduled for a visit at the end of antibiotic treatment on the seventh day. No signs of acute periapical inflammation were seen clinically, and it was decided that the treatment could be done at this visit.

A 3X magnifying loupe (Keeler, Windsor, UK) was utilized during the operation. Following the mandibular block anesthesia, the tooth crown was filled with a composite resin before the extraction. However, a complete crown fracture occurred subgingivally during the extraction with forceps. The root was then removed using an elevator. The patient was informed about possible complication of elevation on the tooth but she wanted to complete the treatment plan due to the financial constraints.

The root was held in sterile gauze and washed with sterile saline. All root surfaces were inspected for possible crack formation using the loupe. Extruded gutta-percha from the perforation was removed using a diamond round bur [ISO size 012] on a high-speed hand piece under saline irrigation, and a cavity was prepared into the canal through the perforation. Following the root resection of almost 3 mm, a 3 mm root-end cavity was prepared using the same bur under saline irrigation. The remaining tooth length was 13 mm. Both cavities were sealed using a Mineral Trioxide Aggregate [MTA Angelus, Brazil]. Maximum care was given to perform good root-end filling. The apical lesion was not curetted to avoid any injury to the ligament in the socket. The most coronal part of the root was sealed with temporary cement. After final irrigation of the root surfaces with saline, the root was replanted into its socket with finger pressure, left in a slightly extrusive position [2-3 mm]. During the extraoral period, the root and its socket were rinsed with saline every 4-5 minutes. The length of the extraoral period was recorded as 14 minutes. Mesial and distal interdental sutures were applied for stabilization of the root in place. The use of antibiotics was extended for three days.

After a week, the sutures were removed, and the patient reported only slight pain lasting two days after the surgery (Figure 3). Uncertain apical healing was seen radiographically at one-month follow-up visit (Figure 4). Clinically, the soft tissues around the root showed a normal appearance, and mobility was within normal limits at one month. One week after a gingivectomy around the root, the canal was prepared using #2 and #3 drills [GF Precision drill; Polydentia SA, Mezzovico, Switzerland] at low speed with water cooling. The entire root canal filling (9-10 mm) was removed using the preparation drills of the post system to the point of MTA filling. The root canal was irrigated with 10 ml of 5% sodium hypochlorite and 2 ml of sterile saline and dried with the paper points. A self-etch adhesive bonding [All-Bond Universal; Bisco Inc., IL, US] was applied to the root canal surface and light-polymerized for 40 seconds. A glass fiber post [Polydentia GF posts; Polydentia SA] 1.5 mm in diameter was painted with the bonding agent, light-polymerized, and then cemented into the root canal with a self-polymerized adhesive resin cement [C&B Cement; Bisco Inc., IL, US] using the endodontic tips. A light-polymerized composite resin [Reflexions; Bisco, Inc., IL, US] was applied to the fiber post for core build-up. The tooth was prepared by a rounded shoulder finish line using diamond rotary cutting instruments.
Providing maximum care to the ligament during tooth extraction, washing the extracted tooth with suitable liquids such as sterile saline, Hank’s balanced salt solution or ViaSpan® during the extraoral period, and completing the procedure in as short a period as possible are the significant operative factors leading to the success in IR cases. Moreover, placement of a root-end filling with superior sealing ability and high biocompatibility, avoiding the splinting and curetting of the lesion through the socket, and preventing the contamination of the root surface and coagulation in the socket could also facilitate successful periodontal healing [10].

Discussion

Endodontic and dental implant surgeries have been considered common treatments in most infected endodontic cases having procedural complications such as unmanageable broken instruments or root perforations. On the other hand, most of these complicated cases may be treated using the IR technique. The case presented herein had broken instruments in the root canal, unmanageable complex root canal morphology, root perforation, extruded filling through the perforation, and an apical lesion with clinical manifestations. Fracturing of the tooth crown during the extraction was an additional complication.

At the six-month follow-up, periapical radiography demonstrated replacement root resorption appearances on the mesial side of the root surface (Figure 7). Slow progression of replacement resorption was also observed on the mesial side of the root surface at 12- and 24-month follow-ups (Figures 8 and 9). Almost complete healing was present around the periapex at 6-month follow-up (Figure 7). The tooth was functioning with a desirable aesthetic and showing no clinical symptoms at 6, 12, and 24-month follow-ups. The patient was informed about status of the tooth. She preferred to use the tooth since there was no clinical complication.
Figure 9. 24-month follow-up radiograph of the case. Note progression of replacement resorption on the cervical root area.

The extraction could be done using an elevator in this case since the crown fracture occurred during the extraction with forceps. Elevation may damage severely periodontal ligament both and cementum on the root and the remaining periodontal ligament on the alveolar bone sides, allowing bone regeneration to the injured root surface. During re-implantation, the root was re-positioned extrusively in its socket to eliminate marginal root surface that was damaged due to elevation of the root and to facilitate the crown restoration. But, replacement resorption on mesial cervical portion of the tooth was present in this case. Radio graphical appearances of slowly progressing replacement resorption were seen on mesial root surface at 6-, 12- and 24-month follow-ups. It has been reported that ankylosed cases following avulsions could generally be diagnosed within two years [11].

For elevated cases, rotational plus extrusive replantation may reduce the risk of ankloysis if elevation was applied from only one side. A number of chemicals were used topically to slow down the replacement root resorption such as tetracyclines, alendronate, calcitonin, enamel matrix protein (Emdogain®) and sodium fluoride [11]. The topical application of tetracycline (minocycline) and 2.4% sodium fluoride on the traumatized root surface during the elevation might be beneficial to reduce the progression of ankloysis [11].

The extrusive re-positioning of the root did not cause an increase in mobility of the root. Surgically extruded roots have been demonstrated to heal successfully in most cases without showing complications such as mobility and root resorption [12].

MTA was selected as the root-end filling material since there was a wide root surface area that had to be sealed in this case. MTA has been shown to allow regeneration of the cementum and ligament cells over itself when used as a root-end filling in animal studies [13]. In the case, the periapical healing was satisfactory around MTA after six months.

The present case re-emphasizes that intentional replantation modality is a sensitive clinical technique and requires preservation of periodontal ligament on both socket and root surface during clinical procedure.

References


