Intentional Replantation Techniques: A Critical Review

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Abstract

Introduction: Techniques and armamentarium for intentional replantation have varied throughout the years with no universally accepted clinical treatment guidelines. A wide range of success rates has been reported, and accordingly, this treatment method has often been regarded as a treatment of last resort. However, recent studies have shown more consistent success rates as high as 88% to 95%. In light of these new studies, intentional replantation may now be considered a more commonly accepted treatment modality. The purpose of this review was to critically examine reported techniques for intentional replantation. **Methods:** A search of the literature on intentional replantation techniques was performed using electronic databases including PubMed, Medline, and Scopus. A total of 3183 articles were generated and screened for relevance based on defined inclusion and exclusion criteria. Subsequently, 27 studies were included for critical review of technique. **Results:** There has been an evolution in technique for intentional replantation over the decades. **Conclusions:** Numerous aspects of the procedure exhibit variations, whereas other aspects exhibit considerable consistency. Few studies reported techniques consistent with modern endodontic surgical principles. *(J Endod 2018;44:14–21)*

Key Words

Intentional, reimplant, replant, replantation, review, techniques

Significance

Intentional replantation is a clinical technique used by endodontists routinely throughout the world to treat disease of endodontic origin. This article provides a critical review of the reported and suggested techniques, highlighting differences and consistencies.

Post-treatment endodontic disease, defined as the persistence or development of an inflammatory periapical or periradicular lesion in a previously root-filled tooth, is a significant issue for oral health care providers, especially for endodontic specialists. The prevalence, according to cross-sectional epidemiological studies, ranges from 16% to 65%, depending on the study population (1). The primary cause has been attributed to the presence of microorganisms in the root canal system and/or the periapical tissue, although additional etiologies, including the presence of cysts, cholesterol crystals, and foreign bodies, have also been implicated (2). Several treatment options with varying levels of success have been suggested, including nonsurgical endodontic retreatment and apical surgery (3). Because of improved operational efficiency, difficulty with surgical access, and the desire to avoid delicate anatomic structures, intentional replantation has been proposed as an additional method to resolve post-treatment endodontic disease in select cases.

Intentional replantation has been defined as the deliberate extraction of a tooth and after evaluation of root surfaces, endodontic manipulation, and repair, placement of the tooth back in into its original socket (4). It is one of the oldest known methods for the treatment of disease of endodontic origin, dating as far back as the 11th century when Albulcasis described a replantation (5). In addition, from the 16th to 18th centuries, multiple accounts of replantation were reported, including incorporation of a root resection and root-end filling before reinsertion of the tooth (6). The evolution of the procedure in more recent times has involved modification of techniques surrounding tooth extraction, root-end resection and preparation, handling of the tooth during surgical manipulation, and materials used for root-end filling.

The procedure now involves multiple surgical steps that must be executed with precision for the best outcome. First, the selected tooth is carefully extracted so as not to induce fracture, thereby rendering the tooth nonrestorable, and also to minimize damage to the periodontal ligament (PDL). Survival of PDL cells has been noted to be a critical factor influencing successful healing (7). Several authors have recommended avoiding the use of dental elevators and limiting the application of dental forceps to the crown of the tooth as a means to minimize trauma to the PDL cells (8–11). This step has been considered by some as the most technique-sensitive portion of the procedure (11).

After extraction of the tooth, the roots are examined for fractures, additional canals or portals of exit, isthmi, and any additional anatomic features requiring attention (12). Root inspection is best accomplished with the aid of a dental operating microscope

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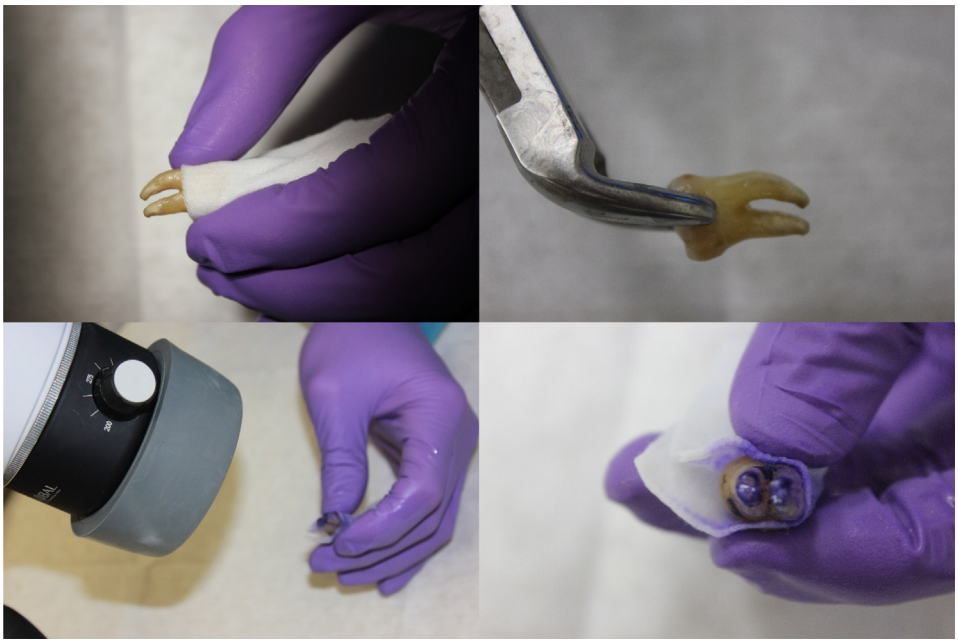

Figure 1. Handling and inspection of the extracted tooth.

(DOM) to properly magnify and illuminate the areas being evaluated (11) (Figure 1). Following root inspection, root resections are made using a high-speed handpiece, ideally of at least 3 mm, which has been shown to eliminate 98% of apical ramifications and 93% of lateral canals (13) (Figure 2). In the event that granulomatous tissue remains attached to the root ends on extraction, it is carefully curetted or is removed when the root is resected.

The root canals are then prepared to receive a root-end filling using either a high-speed handpiece or ultrasonic instrumentation (Figure 3). The ideal root-end preparation has been described as a class I cavity, at least 3 mm in depth, with parallel walls and consistent with the natural anatomic outline of the root canal space (14). The best method to accomplish these goals is thought to be with ultrasonic instrumentation, rather than high-speed surgical burs (11). The use of ultrasonic instrumentation for root-end preparations has been associated with the creation of fractures in the unsupported root-end and thus must be performed with caution to avoid excessive force (15). A root-end filling material is then placed and condensed into the preparation (Figure 4). Historically, amalgam was the material of choice for root-end filling; however, newer materials, such as Super ethoxybenzoic acid (SuperEBA), mineral trioxide aggregate (MTA), and calcium silicate cements, have shown superior ability to seal the root canal

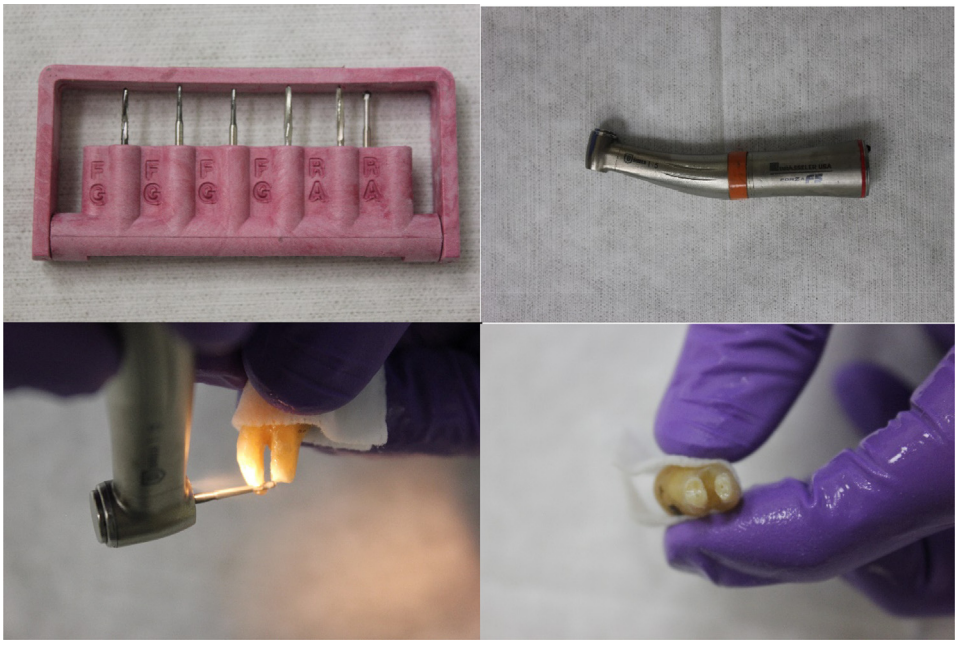

Figure 2. Root-end resection.