Clinical Outcomes after Intentional Replantation of Periodontally Involved Teeth

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Abstract

Introduction: Periodontal involvement has been thought to be a contraindication for intentional replantation. This retrospective study aimed to assess clinical outcomes after intentional replantation of teeth with periodontal involvement and to explore potential predictors of outcomes. **Methods:** Teeth with a history of intentional replantation between March 2000 and December 2014 and with 1 or 2 preoperative periodontal pockets ≥6 mm among 6 sites evaluated per tooth were included. A total of 103 teeth were included, and 74 teeth were followed up for more than 6 months. Outcomes were assessed as improved (a decrease in the number and depths of periodontal pockets and the size of periapical radiolucency and no external root resorption or sign/symptoms) or failed. Data were analyzed with Kaplan-Meier survival analysis and a Cox proportional regression model. **Results:** Cumulative improved rates declined from 89% at 1 year to 68% at 4 years. A Cox proportional regression model identified the patient's age ($P = .049$; hazard ratio, 2.552) and the number of preoperative periodontal pockets with a depth ≥6 mm ($P = .041$; hazard ratio, 2.523) as predictors of outcomes in the replantation of periodontally involved teeth. **Conclusions:** Periodontal involvement is not an absolute contraindication to intentional replantation. The teeth with 1 preoperative periodontal pocket ≥6 mm and the subjects aged ≤40 years had 2.5 times and 2.6 times lower probability of failure, respectively, than the teeth with 2 pockets and the subjects aged >40 years. Therefore, these factors need to be carefully considered for intentional replantation. *(J Endod 2016;■:1–6)*

Key Words

Age, intentional replantation, number of periodontal pockets, outcome, periodontal involvement

Significance

This study showed the appropriate improved rates of intentional replantation for teeth with 1 pocket or 2 pockets with a depth ≥6 mm. Thus, intentional replantation deserves to be considered as a measure for saving periodontally involved teeth.

Dental implants have promoted the oral health of dental patients since they were incorporated into routine clinical dental practice several decades ago. The high survival rates of dental implants (1, 2) have accelerated their popularity. However, only natural teeth have proprioception (3) and exhibit adaptation (4) to masticatory forces mediated by the periodontal ligament, and satisfactory esthetics and gingival architecture are significantly more difficult to achieve with implants than natural teeth (5). In addition, the issue of peri-implantitis has been raised. The prevalence of peri-implantitis has been reported to be 19%–65% (6, 7).

For natural teeth, periodontal disease and apical periodontitis are prevalent diseases (8, 9) and often simultaneously affect a single tooth, forming endodontic-periodontal lesions. Treatment of endodontic-periodontal lesions is challenging because they are difficult to correctly diagnose (10), and their prognosis mostly depends on the degree of periodontal involvement (11, 12).

The success rate of endodontic surgery has dramatically improved since its procedure evolved from traditional root-end surgery to endodontic microsurgery (13). However, notwithstanding almost complete resolution of endodontic problems after endodontic microsurgery, outcomes in cases with endodontic-periodontal lesions are significantly worse than in isolated endodontic lesions (14, 15).

Intentional replantation was suggested as a last resort for the treatment of post-treatment apical periodontitis when nonsurgical root canal treatment and periapical surgery were infeasible or failed (16, 17). Incorporating contemporary guidelines for tooth replantation and apical microsurgery into intentional replantation procedures, recent clinical studies of intentional replantation report long-term survival rates of 73%–77% (18, 19). However, these studies included only cases without periodontal involvement. There are rare clinical studies of intentional replantation that included cases with periodontal involvement and analyzed them by objective standards of preoperative periodontal status.

Thus, the objectives of this study were to investigate the clinical outcomes of intentional replantation of periodontally involved teeth and to explore potential predictors of outcomes, focusing on preoperative periodontal status.

Materials and Methods

Subjects

The Institutional Review Board of Yonsei University Health System approved the study protocol. We searched for patients who received intentional replantation between

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0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2016.11.024

March 2000 and December 2014 by 2 operators (S.-J. Lee, E. Kim) at the Department of Conservative Dentistry, Yonsei University Dental Hospital, Seoul, Korea. Included were all types of teeth with apical periodontitis, nonsurgical retreatment, and for which apical surgery was considered infeasible or had failed. Root forms were confirmed on preoperative periapical radiographs and cone-beam computed tomography, and teeth with divergent roots were excluded because of fracture risk during extraction. The included teeth had 1 or 2 preoperative periodontal pockets ≥6 mm among 6 sites per tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual, and distolingual). Teeth with 3 or more pockets ≥6 mm, any vertical mobility or horizontal mobility ≥2 mm, developmental grooves, or root cracks were excluded. At the time of treatment, informed consent was obtained from each subject after the nature of the procedure and risks had been explained. A total of 103 teeth from 103 subjects were included in this study.

Surgical Procedure

Block or infiltration anesthesia was administered with 2% lidocaine with 1:80,000 epinephrine. Teeth were extracted with extraction forceps while being careful to not damage the root surface, and the patients were asked to bite gently on wet gauze while the teeth were being manipulated extraorally. Any granulation tissue and subgingival calculus attached to the root were carefully removed with tissue forceps and periodontal curette. The tooth was placed under an operating microscope (OPMI PICO; Carl Zeiss, Göttingen, Germany) for preparation. The root surface was examined closely for perforations or microcracks. The coronal two thirds of the root surface was wrapped with saline-soaked gauze, and the apical 3 mm of the root was resected perpendicular to the long axis with a high-speed diamond bur under copious water spray delivered from sterile reservoir on the dental unit. The resected surface was stained with methylene blue dye and inspected under high magnification (×20–×26) to examine the completeness of the root-end preparation and to identify other anatomic details.

The root end was prepared to a depth of 3 mm according to the long axis of the root. In roots with thick root dentin, a high-speed diamond bur (Komet 858 010; Komet, Rock Hill, SC) was used. In cases with especially thin root dentin, isthmus, or fins, ultrasonic tips (KiS; Obtura Spartan, Algonquin, IL) driven by a piezoelectric ultrasonic unit (Spartan MTS; Obtura Spartan) were used. Then, the resected root surface was inspected again at ×20–×26 magnification, and the cavity was air-dried and filled with 1 of the following materials, whichever was available in the clinic at the time of surgery: Intermediate Restorative Material (Caulk Dentsply, Milford, DE), Super EBA (Bosworth, Skokie, IL), ProRoot mineral trioxide aggregate (MTA) (Dentsply, Tulsa Dental Specialties, Tulsa, OK), or Endocem (Maruchi, Wonju, Korea). All the materials were mixed exactly as their instruction manuals suggested.

The socket was irrigated with sterile saline solution, and the tooth was replanted without undue force. When part of the material was suspected to be washed out during the replantation procedure, retrofilling was done over, and the tooth was replanted. When the tooth seemed stable, splint was not applied, and the patient was instructed to bite on gauze. Unstable teeth were splinted semi-rigidly with 1-mm-thick fishing line (Hae Kwang, Bucheon, Korea) bonded to the 1 or 2 adjacent teeth with flowable resin (Metafil Flo; Sun Medical, Shiga, Japan). The patient was instructed to have soft diet for 1–2 weeks, and the splint was removed in 1 month.

Outcome Assessment

Preoperative data described demographics (sex, age), tooth (jaw), and periodontal condition (probing depths on 6 sites per tooth, eg, mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual, and distolingual). Intraoperative data related to the treatment procedure (root-end filling material, extraoral time) were recorded.

Subjects were followed for post-treatment examinations at 1, 3, 6, and 12 months and annually thereafter. At every visit, teeth were subjected to clinical examination (subjective discomfort, sinus tract symptoms, swelling, tenderness to percussion or palpation, mobility, periodontal probing). Periapical radiographic examinations were performed at postoperative 6 and 12 months and annually thereafter. Subjects were informed about the findings at each follow-up session.

Outcomes in all retained teeth were assessed by combined clinical and radiographic criteria. Teeth were considered improved when they showed a decrease in the number and depths of periodontal pockets compared with preoperative status, had a decreased size of periapical radiolucency, had no evidence of external root resorption, and no signs/symptoms (Fig. 1*A*, *C*). Teeth with maintaining or worsening of number or depths of periodontal pockets compared with preoperative status, sustained or increased size of periapical radiolucency, evidence of external root resorption, or any signs/symptoms were recorded as failed (Fig. 1*B*, *D*). Two examiners (S.J.L., S.Y.C.) independently evaluated the radiographs by using standardized evaluation criteria for periapical healing and external root resorption. Inter-examiner reliability was determined with Cohen kappa statistics in accordance with Landis and Koch (20).

Analysis

All subjects with at least 6 months of follow-up were included in the analysis. Kaplan-Meier survival curves were plotted to chart improved and failed teeth during the duration of the follow-up period, and bivariate associations between outcomes and clinical variables were explored with the log-rank test, followed by multivariate analysis with the Cox proportional hazard model. All statistical analyses were performed with SPSS v21.0 software (IBM Corp, Somers, NY) and interpreted at the 5% level.

Results

Inter-examiner agreement regarding postoperative periapical lesions and external root resorption ranged from κ = 0.850 to 0.902, suggesting very good agreement (20).

Of 103 included subjects, 29 subjects failed to follow up during a period of 6 months (71.8% recall), and they were not included in this analysis. Among the 74 teeth analyzed, the majority of teeth were second molars (57 second molars, 10 first molars, and 7 others) (Table 1). Follow-up periods ranged from 6 months to 10 years (average, 2.6 years). Cumulative improved rates declined from 89% at 1 year to 68% at 4 years.

Bivariate associations between investigated variables and outcomes are presented in Table 2. The subjects aged ≤40 years had significantly fewer failures (7 of 41, 17.1%) than those aged >40 years (13 of 33, 39.4%) (P = .026) (Fig. 2*A*). The teeth with 1 preoperative periodontal pocket with a depth ≥6 mm failed less frequently (9 of 54, 16.7%) than the teeth with 2 pockets (11 of 20, 55.0%), and the difference was statistically significant (P = .021) (Fig. 2*B*).

The multivariate analysis (Cox regression, Table 3) identified the age (P = .049; hazard ratio, 2.552) and the number of preoperative periodontal pockets with a depth ≥6 mm (P = .041; hazard ratio, 2.523) as predictors of outcomes in the replantation of periodontally involved teeth.