Long-term Outcome of the Cases Classified as Successes Based on Short-term Follow-up in Endodontic Microsurgery

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Abstract

Introduction: In a previous study, we evaluated the outcomes of endodontic microsurgery by comparing the healing success of cases involving a lesion of endodontic origin with cases involving a lesion of combined endodontic-periodontal origin. Of the 188 teeth over the 5-year period, 172 (91.5%) were considered to be successes. The purpose of this study was to evaluate the outcomes, up to 10 years, of the cases that were classified as successes in the previous study. **Methods:** The 172 cases that were considered to have successful outcomes in the previous study were included. Patients were followed up every 6 months for 2 years and every year up to 10 years. On every follow-up visit, clinical and radiographic evaluations were performed according to the same criteria as in the original study by the same 2 examiners. **Results:** A follow-up rate of 60.5% (104/172 cases) was obtained. Of the 104 followed-up cases, 97 cases were included in the successful group, 91 with complete healing and 6 with incomplete healing. The overall maintained success rate was 93.3%. The failure group, which meant a reversal to disease, included 7 cases with unsatisfactory healing. **Conclusions:** In this study, 93.3% of endodontic microsurgery cases that were considered healed in a prior 5-year study remained healed after more than 6 years. *(J Endod 2012;38:1192–1196)*

Key Words

Clinical outcome, endodontic microsurgery, long-term follow up, success rate

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Surgical endodontics is often a last resort when nonsurgical retreatment is impractical or unlikely to improve on a previous result (1). In particular, only surgical intervention might resolve cases involving a persistent lesion that is related to a periapical cyst or complex canal anatomy (2, 3). In recent years, modern techniques that include the use of magnification tools, microinstruments, ultrasonic instruments, and more biocompatible filling materials have been introduced (2, 4). These technical advances have increased the success rate compared with traditional root-end surgery; this success rate has varied considerably from 74% to 92% (5–8).

Endodontic microsurgery represents an evolutionary advance in periradicular surgery, applying not only modern ultrasonic preparation and filling materials but also incorporating microsurgical instruments, high-power magnification, and illumination (2). In addition, Setzer et al (9, 10) specified endodontic microsurgery as root-end surgery using ultrasonic root-end preparation, biocompatible root-end filling materials (intermediate restorative material [IRM; Caulk Dentsply, Milford, DE], Super ethoxybenzoic acid [Super EBA; Harry J. Bosworth, Skokie, IL], mineral trioxide aggregate [MTA]), and high-power illumination and magnification (10× and higher). Among the many studies on the clinical outcomes of surgical endodontics, there are only few reports related to endodontic microsurgery. In addition, most endodontic microsurgery studies have investigated short-term postoperative successes. Therefore, long-term follow up studies are needed to produce valuable scientific evidence.

In a previous study (11), we evaluated the outcomes of endodontic microsurgery by comparing the healing successes of cases involving a lesion of endodontic origin compared with cases involving a lesion of combined endodontic-periodontal origin. Of the 188 teeth followed up for up to 5 years, 172 teeth (91.5%) were considered to be successes. However, 65% of the included cases were observed for only 1 to 2 years. Friedman (12) noted that such a short term follow-up period is not sufficient for confirmation of the treatment outcomes. Long-term predictability of treated teeth is important for deciding between root retention versus extraction and other alternative treatments. Therefore, the purpose of this study was to evaluate the outcomes over a period of 6 to 10 years of the cases that were classified as successes in the previous study.

Materials and Methods

Data were collected from patients in the Department of Conservative Dentistry, Dental College, Yonsei University, Seoul, Korea, between 2001 and June 2005. A total number of 263 teeth from 227 patients requiring periradicular surgery were included in the previous study (11). Teeth with mobility class II or greater, horizontal and vertical fracture, and perforation were excluded from the study.

In this study, 172 cases that were observed to have successful outcomes in the previous study were included; 141 cases involved a lesion of endodontic origin, and 31 cases involved a lesion of combined endodontic-periodontal origin. The distribution of the included cases is shown in Table 1.

All clinical procedures were performed by a single operator (E.K.). With the exception of incisions, flap elevation, and suturing, all surgical procedures were performed using an operating microscope (OPMI Pico; Carl Zeiss, Göttingen, Germany). Briefly, the flap was reflected after deep anesthesia, and an osteotomy was performed. After removing the soft-tissue debris, an additional 2 to 3 mm of the root tip with a 0° to 10° bevel angle was sectioned with a no.170 tapered fissure bur under copious sterile distilled water irrigation. The resected root surfaces were then stained with methylene

TABLE 1. Case Distribution

Variables	No. of teeth
Age (y)	
11–20	8
21–30	55
31–40	32
41–50	34
51–60	30
61–70	11
>71	2
Sex	
Male	49
Female	123
Tooth type	
Anterior	102
Premolar	37
Molar	33
Tooth location	
Maxilla	121
Mandible	51
Lesion type*	
A	28
B	52
C	61
D	10
E	7
F	14

*Lesion type A, the absence of a periapical lesion and mobility with a normal pocket depth but has unresolved symptoms after nonsurgical therapies have been exhausted; B, the presence of a small periapical lesion in the apical quarter and by clinical symptoms such as discomfort or sensitivity to percussion (the tooth has normal periodontal probing depth and no mobility); C, large periapical lesions progressing coronally but without periodontal pockets and/or mobility; D, clinically similar to those in class C but have periodontal pockets more than 4 mm, and there is no communication with the pocket and the periapical lesion; E, deep periapical lesions with endodontic-periodontal communication to the apex but no obvious fracture; and F, apical lesion and complete denudement of the buccal plate but no mobility.

blue and inspected with micromirrors (Obtura Spartan, Fenton, MO) under 20 to 26× magnification to examine the cleanness of the root-end preparation and search for other overlooked anatomic details. The root-end preparation extending to 3 mm into the canal space along the long axis of the root was made using KIS ultrasonic tips (Obtura Spartan) driven by a piezoelectric ultrasonic unit (Spartan MTS, Obtura Spartan). One of 3 root-end filling materials was chosen and randomly selected: IRM, Super EBA, and ProRoot MTA (Dentsply, Tulsa, OK). For teeth with a lesion type F, calcium sulfate was placed into the periradicular bone defect, and the denuded buccal surface was covered with CollaTape (Integra NeuroSciences, Plainsboro, NJ). The wound site was closed and sutured with 5 × 0 monofilament sutures, and a postoperative radiograph was taken.

After surgery, an operative record form was completed and updated with the postoperative data whenever the patients were followed up periodically to assess the clinical and radiographic signs of healing. The patients were contact by telephone for their follow-up every 6 months for 2 years and every year after 2 years up to 10 years. On every follow-up visit, the clinical and radiographic evaluation was performed according to the same criteria as in the original study by the same 2 examiners. Cohen kappa statistical analysis was conducted to measure the interexaminer variability. Disagreement on clinical outcome was resolved by discussion until an agreement between the 2 examiners was reached. The radiographic healing classification was as follows: I, complete healing; II, incomplete healing (scar tissue); III, uncertain healing; and IV, unsatisfactory healing. The criteria for successful outcomes included the absence of clinical signs and/or symptoms and radiographic evidence of complete or incomplete healing (13). The criteria for failure included any clinical signs and/or symptoms or radiographic evidence of uncertain or unsatisfactory healing (14). In cases in which a tooth proved to be a failure, the appropriate treatment of either surgical retreatment or extraction was performed.

Results

Of the 172 cases observed to have successful outcomes based on the short-term follow-up, 104 cases with 81 cases involving a lesion of endodontic origin and 23 cases involving a lesion of combined endodontic-periodontal origin were followed up for a period of 6 to 10 years. A follow-up rate of 60.5% (104/172 cases) was obtained. The distribution of the cases in relation to the follow-up period is shown in Table 2.

Of the 104 followed-up cases, 97 cases were included in the successful group, 91 with complete healing and 6 with incomplete healing. The overall maintained success rate was 93.3%. The kappa value was 0.73, which shows that the agreement between the 2 examiners was good. The failure group in which reversal to disease occurred included 7 cases with unsatisfactory healing. The treatment outcome related to the lesion type is shown in Table 3.

The 7 cases in the failure group consisted of 6 cases that involved a lesion of endodontic origin and 1 case that involved a lesion of combined endodontic-periodontal origin. The distribution of the failed cases, defined as (a) to (g), is shown in Table 4. Among these 7 cases, 5 had undergone resurgery and were examined for the cause of the failure. There was a crack on 1 tooth, and a lateral canal was found on another tooth. In 3 other teeth, leakage around the root-end filling was observed, and the filling material in these cases was Super EBA according to the dental records. All retreated cases except the 1 tooth with the crack showed successful outcome after resurgery. There was a sinus tract formation in case (f) and a larger lesion based on radiologic findings in case (g), which was not associated with any subjective symptoms. The patients declined further treatment including resurgery. Therefore, additional treatment was not administered.

Discussion

In cases that may warrant surgical intervention, healing tends to occur more quickly with surgical retreatment compared with nonsurgical retreatment (15). The most significant information about healing was obtained 1 year after surgery (16). Jesslen et al (17) reported that the result of a 1-year follow-up was valid in more than 95% of the cases. Moreover, Grung et al (18), who investigated healing 1 year after surgery and at the final follow-up (up to 8 years), reported that the cases of incomplete and uncertain healing had progressed to complete or unsatisfactory healing over time, and the overall success rate for the long-term period was 87.2%, which is higher than the 80.9% associated with the 1-year follow-up. Because of these studies, many other studies on the clinical outcomes of surgical endodontics reported outcomes after follow-up periods of approximately 1 year (16, 19–21).

However, there is a concern that the short follow-up period does not capture the recurrence of apical periodontitis in teeth that appear to be completely healed 1 to 2 years after surgery (3). One report stated that success associated with surgical endodontic treatment declined

TABLE 2. Distribution of Cases Related to the Recall Period

Recall period	No. of teeth
6 years	37
7 years	24
8 years	27
9 years	14
10 years	2