

의도적 재식술이 시행되었던 치아의 재 의도적 재식술; 증례보고

윤지영, 최용훈, 배지현, 박지훈
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Intentional replantation of an intentionally replanted tooth: A case report

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Abstract

Intentional replantation(IR) is a reliable treatment option for maintaining the natural tooth in cases in which conventional endodontic treatment, non-surgical retreatment, and periradicular surgery have failed. However, clinicians may be dissuaded from trying IR because of its reported failures. Among the various causes for IR failure, root resorption and ankylosis are commonly reported. In this report, we introduce a clinical case in which a symptomatic tooth, even after a prior IR, was successfully treated with a second IR. The second IR itself was an opportunity to prove that the first IR had not caused any root resorption or ankylosis, about which most authors have raised concerns. The patient, a 54-year-old man, presented with recurrence of clinical symptoms such as discomfort and a sinus tract 16 months after the first IR. Instead of extraction of the tooth, a second attempt at IR was decided with the patient's consent. Unlike in the first IR, orthodontic extrusion and the use of the Physics Forceps[®] were crucial in the second IR, for the safe extraction of the tooth. Apart from the extraction, the other procedures, including the use of mineral trioxide aggregate (MTA), were similar to those employed in the first surgery. In the first IR, poor adaptation of the MTA at the mesial root-end resulted in a recurrence of a fistula. Although the first IR failed because of MTA leakage, the well-preserved periodontal ligament, through which the delicate extraction was conducted, made the second IR possible. About 2 years after the second IR, the patient showed no clinical problems, and the radiographs revealed significant healing.

I. Introduction

Intentional replantation (IR) is a series of procedures in which a tooth is intentionally and carefully extracted, the root canal is treated extra-orally by using retrograde filling materials such as mineral trioxide aggregate(MTA), and the tooth is reinserted into the socket in order to correct the failures of conventional root canal treatments¹. Although IR is a classical concept that was introduced in the eleventh century², most clinicians are still wary of the risks and failures associated with it and consider it to be the last option¹. The success rates of IR vary between 72 and 85%³⁻⁵; nevertheless, various articles focus more on its complications such as root resorption, ankylosis, formation of sinus tract, tenderness to percussion, and tooth fracture during the procedure¹. It appears that the reported failures of IR make clinicians reluctant to try it. Most authors express concern over root resorption and ankylosis, which are common causes for failure of IR, but there are very few studies that clarify the actual occurrence of root resorption and ankylosis after performing an IR. The aim of this report is to introduce a clinical case, in which a symptomatic tooth was successfully treated with a second IR, even after a prior IR. The second IR itself was an opportunity to prove that the first IR had not caused any root resorption or ankylosis about which most authors have raised concerns.

II. Case Report

1. The first intentional replantation

The patient, a 54-year-old man, presented with a recurrent fistula in the lower left first molar and was

referred to the Department of Conservative Dentistry, Seoul National University Bundang Hospital on July 7, 2009. The root canal treatment (RCT) of this tooth had been completed several years ago, yet the first molar was tender to percussion and had a fistula accompanied by discomfort. The periapical radiograph showed radiolucent lesions along the mesial and distal roots of the first molar and widened periodontal ligament spaces (Fig. 1A). The first molar was diagnosed as a prior RCT with chronic symptomatic periapical periodontitis. An intentional replantation was planned instead of a periradicular surgery, because of the dense distobuccal cortical bone and limited intra-oral accessibility of the distal root.

On July 17, 2009, the tooth was extracted using conventional forceps with a slow, weak, and continuous buccolingual force. The extraction time was about 7 min (not recorded to the second). The patient was instructed to bite on saline-soaked gauze during the extraoral procedure. No cracks or perforations were observed on the tooth during examination under the operating microscope (OPMI Pico, Carl Zeiss, Oberkochen, Germany). The extracted tooth was wrapped in physiological saline-soaked gauze. A root tip resection with a 3-mm length was performed using a high-speed diamond bur, and retrograde cavity preparation was performed with a #330 high-speed bur for a 3-mm depth. MTA (ProRoot MTA, Dentsply, Tulsa Dental, Tulsa, OK) was used as the material for retrograde filling.

The extraction socket was examined, the root tip area was lightly curetted, and the blood clot was removed by saline irrigation. The tooth was repositioned into the socket. The extraoral time was 12 min. The patient was instructed to bite on a roll of gauze for 2 h; no resin/wire



Fig. 1. (A) A periapical radiograph shows radiolucent lesions on the mesial and distal root of the first molar, and widened periodontal ligament spaces. (B) Three months after the first IR, the final restoration was fabricated, and no fistula or clinical symptom was present. (C) There were no specific clinical symptoms or problems, and the periapical radiograph showed decreased apical radiolucency at the 6-month recall appointment.

splint was applied. The patient was given a prescription for amoxicillin and non-steroidal anti-inflammatory drugs (NSAIDs).

Two months after the surgery, the clinical symptoms disappeared, the buccal fistula had resolved, and the periodontal pocket depth and mobility were normal. Three months after the IR, a gold crown was fabricated and cemented (Fig. 1B). There were no specific clinical symptoms or problems, and the patient was satisfied with the treatment results at the 6-month recall appointment (Fig. 1C).

2. The second intentional replantation

The patient returned after 10 months, on November 16, 2010, complaining of a swelling near the first molar, which also showed sensitivity to percussion and a recurrent fistula. The periapical radiograph showed recurrent apical radiolucency along the mesial root of the first molar (Fig. 2A). Instead of extracting the tooth, a second attempt at IR was planned with the patient's consent. As this was the second attempt at IR, there were more considerations for safe extraction, such as

orthodontic extrusion and use of the Physics Forceps[®]. Before the second IR, orthodontic appliances were placed on the lower left premolar and molars, and a .014-inch nickel titanium (Ni-Ti) wire was engaged for extrusion of the first molar for 3 weeks to increase tooth mobility and the volume of the periodontal ligament. Under local anesthesia, the Physics Forceps[®] was used as an extraction instrument to minimize the risk of tooth fracture. The extraction was successful with no root fracture and occurred within 4 min and 21 s. By examining the extracted tooth, it could be physically verified that there was no external root resorption or ankylosis (Fig. 2B). The extraction socket and soft tissue were clean, and no alveolar bone fracture was observed (Fig. 2C). It appeared that a microleakage, resulting from the washing out of the MTA, had caused contamination and a dark discoloration at the mesial root (Fig. 2D). The extraoral procedure and the materials and instruments were the same as in the first IR. The retrograde root canal preparation and filling with MTA took 9 min and 30 s (Fig. 2E). Thereafter, the tooth was replanted into the socket, and a no resin/wire splint was applied. As in the first IR, amoxicillin and NSAIDs were prescribed for 5 days.

The patient returned about 7 weeks after the second

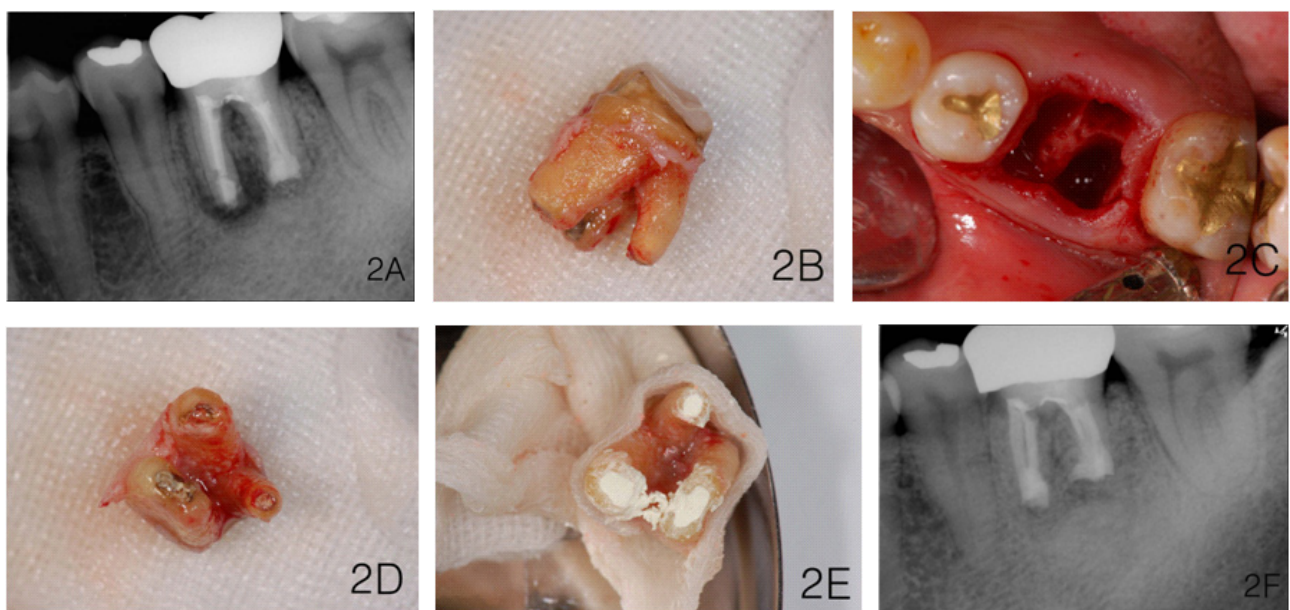


Fig. 2. (A) A periapical radiograph shows recurrent apical radiolucency on the mesial root of the first molar. (B) Through the extracted teeth, it could be verified that there was no external root resorption or ankylosis (C) The extraction socket and soft tissue were clean, and no alveolar bone fracture was observed. (D) Contamination of the retrograde filling material, MTA, had been caused by a microleakage, which was the main cause of the failed first IR. (E) The retrograde preparation and filling with MTA. (F) About 2 years after the second IR, the tooth was still asymptomatic and showed normal pocket depth and periodontal ligament space.

IR and had no specific clinical symptoms or discomfort. Tooth mobility was normal, and the probing depths were no greater than 3 mm. The periapical radiograph showed that the radiopacity around the first molar had improved, and the periodontal ligament (PDL) space was intact (Fig. 2F). A new gold crown was fabricated and cemented; even about 2 years after the second IR, the tooth remained asymptomatic and showed good healing with a normal pocket depth.

III. Discussion

The success of an IR is normally evaluated clinically and radiographically³. Discomfort, tenderness to percussion, presence of a sinus tract, and poor periodontal conditions are considered to be the clinical evidence of a failed IR. Radiographically, features such as the absence of root resorption, an intact lamina dura, and decreased apical lucency suggest a successful IR³. However, it is sometimes difficult to detect the presence of root resorption and ankylosis through two-dimensional (2D) periapical radiographs because of the superimposition of the buccal and lingual aspects⁷. To overcome the limitations of 2D imaging, cone-beam computed tomography (CBCT) has been recently introduced and facilitates evaluation of root resorption and ankylosis⁷. As CBCT is generally required for an accurate evaluation, this case was a significant opportunity, in that we could directly verify the absence of root resorption and ankylosis after the IR, without necessitating a CBCT. If root ankylosis had happened after the first IR, the orthodontic extrusion before the second IR would not have been possible, and the alveolar bone or roots would have broken during the extraction procedure. Furthermore, the absence of root resorption was confirmed through a microscope immediately after the extraction.

Despite the absence of root resorption and ankylosis, the first IR was likely to fail because of the leakage of MTA. It is well known that the setting time of MTA with sterile saline is as long as 3 h and that MTA itself, with its sandy nature, is not easy to handle. If MTA is not compactly inserted into the preparation, it can eventually be rinsed out⁸. It appears that in the first IR,

these properties of MTA resulted in poor adaptation at the mesial root-end that resulted in the recurrence of the fistula.

Although the first IR failed because of the leakage of MTA, the well-preserved periodontal ligament, through delicate extraction, made the second IR possible. For favorable results in IR, the extraction procedures should be carried out with the utmost care. It is evident that the protection of the periodontal ligament around the roots is closely related to the success of IR, with no ankylosis or resorption⁹⁻¹¹. It is also known that the loss of cementum causes resorption of the root¹². Furthermore, extra-socket time of less than 20 min is one of the most important factors for maintaining the vitality of the periodontal ligament: the shorter the extra-socket time, the higher the success rate of the IR¹³⁻¹⁵. In the first IR, there was an attempt to carefully extract the tooth with conventional forceps. The forceps were placed on the enamel instead of the cementum, and no elevators were used, thus preventing damage to the periodontal ligament and the cementum.

The extraoral time was as short as 12 min, and during the extra-socket manipulation, the moisture in the periodontal ligament was preserved by wrapping the tooth in saline-soaked aseptic gauze. Hank' s Balanced Salt Solution (HBSS) is usually mentioned as the ideal medium for preserving a periodontal ligament¹⁶. However, in actual IR cases, sterile saline is normally used to moisten the periodontal ligament^{17,18}. In this case, sterile saline was used during both IRs and did not cause any specific problem with regard to the preservation of the periodontal ligament cells.

Based on the criteria for declaring an IR to be successful, such as normal function, no tooth mobility, no root resorption, normal probing pocket depth, and no apical radiolucency^{19,20}, this case can be considered a success after an event-free, 28-month follow-up period. In this case, the careful and atraumatic management of the periodontal ligament allowed a successful IR. Root resorption and ankylosis can be accurately evaluated by a three-dimensional CBCT or the Periotest M[®], but this case was significant in that we could physically confirm that the first IR had not resulted in root resorption and ankylosis. As seen in this case, because there was no root resorption or ankylosis after the first IR, the second IR of the symptomatic tooth was possible

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