

References

- Lopes HP, Siqueira JF. *Endodontia: Biologia e Técnica*. 4ª ed. Rio de Janeiro: Elsevier; 2015.
- Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. *Endod Topics*. 2005 Mar;10(1):3-29.
- Vera J, Siqueira JF Jr, Ricucci D, Loghin S, Fernández N, Flores B, et al. One-versus two-visit endodontic treatment of teeth with apical periodontitis: a histobacteriologic study. *J Endod*. 2012 Aug;38(8):1040-52.
- Mannocci F, Peru M, Sherriff M, Cook R, Pitt Ford TR. The isthmuses of the mesial root of mandibular molars: a micro-computed tomographic study. *Int Endod J*. 2005 Aug;38(8):558-63.
- Villas-Bôas MH, Bernardineli N, Cavenago BC, Marciano M, Del Carpio-Perochena A, Moraes IG, et al. Micro-computed tomography study of the internal anatomy of mesial root canals of mandibular molars. *J Endod*. 2011 Dec;37(12):1682-6.
- Melton DC, Krell KV, Fuller MW. Anatomical and histological features of C-shaped canals in mandibular second molars. *J Endod*. 1991 Aug;17(8):384-8.
- Zheng Q, Zhang L, Zhou X, Wang Q, Wang Y, Tang L, et al. C-shaped root canal system in mandibular second molars in a Chinese population evaluated by cone-beam computed tomography. *Int Endod J*. 2011 Sept;44(9):857-62.
- Amoroso-Silva PA, Ordinola-Zapata R, Duarte MA, Gutmann JL, del Carpio-Perochena A, Bramante CM, et al. Micro-computed tomographic analysis of mandibular second molars with C-shaped root canals. *J Endod*. 2015 June;41(6):890-5.
- Yin X, Cheung GS, Zhang C, Masuda YM, Kimura Y, Matsumoto K. Micro-computed tomographic comparison of nickel-titanium rotary versus traditional instruments in C-shaped root canal system. *J Endod*. 2010 Apr;36(4):708-12.
- Solomonov M, Paqué F, Fan B, Eilat Y, Berman LH. The challenge of C-shaped canal systems: a comparative study of the self-adjusting file and ProTaper. *J Endod*. 2012 Feb;38(2):209-14.
- Amoroso-Silva P, Alcalde MP, Duarte MAH, De-Deus G, Ordinola-Zapata R, Freire LG, et al. Effect of finishing instrumentation using NiTi hand files on volume, surface area and uninstrumented surfaces in C-shaped root canal systems. *Int Endod J*. 2017 June;50(6):604-11.
- Plotino G, Pameijer CH, Grande NM, Somma F. Ultrasonics in endodontics: a review of the literature. *J Endod*. 2007 Feb;33(2):81-95.
- Vivan RR, Duque JA, Alcalde MP, Só MV, Bramante CM, Duarte MA. Evaluation of different passive ultrasonic irrigation protocols on the removal of dentinal debris from artificial grooves. *Braz Dent J*. 2016 Sept-Oct;27(5):568-72.
- Gutarts R, Nusstein J, Reader A, Beck M. In vivo debridement efficacy of ultrasonic irrigation following hand-rotary instrumentation in human mandibular molars. *J Endod*. 2005 Mar;31(3):166-70.
- Burleson A, Nusstein J, Reader A, Beck M. The in vivo evaluation of hand/rotary/ultrasound instrumentation in necrotic, human mandibular molars. *J Endod*. 2007 July;33(7):782-7.
- Castro FP, Pinheiro SL, Duarte MA, Duque JA, Fernandes SL, Anchieta RB, et al. Effect of time and ultrasonic activation on ethylenediaminetetraacetic acid on smear layer removal of the root canal. *Microsc Res Tech*. 2016 Nov;79(11):1062-8.
- Koçak S, Bağcı N, Çiçek E, Türker SA, Can Sağlam B, Koçak MM. Influence of passive ultrasonic irrigation on the efficiency of various irrigation solutions in removing smear layer: a scanning electron microscope study. *Microsc Res Tech*. 2017 May;80(5):537-42.
- Duarte MA, Balan NV, Zeferino MA, Vivan RR, Morais CA, Tanomaru-Filho M, et al. Effect of ultrasonic activation on pH and calcium released by calcium hydroxide pastes in simulated external root resorption. *J Endod*. 2012 June;38(6):834-7.
- Arias MP, Maliza AG, Midená RZ, Graeff MS, Duarte MA, Andrade FB. Effect of ultrasonic streaming on intra-dental disinfection and penetration of calcium hydroxide paste in endodontic treatment. *J Appl Oral Sci*. 2016 Nov-Dec;24(6):575-581.
- Guimarães BM, Amoroso-Silva PA, Alcalde MP, Marciano MA, Andrade FB, Duarte MA. Influence of ultrasonic activation of 4 root canal sealers on the filling quality. *J Endod*. 2014 July;40(7):964-8.
- Nikhil V, Bansal P, Sawani S. Effect of technique of sealer agitation on percentage and depth of MTA Fillapex sealer penetration: a comparative in-vitro study. *J Conserv Dent*. 2015 Mar-Apr;18(2):119-23.
- Alcalde MP, Bramante CM, Vivan RR, Amoroso-Silva PA, Andrade FB, Duarte MAH. Intradental antimicrobial action and filling quality promoted by ultrasonic agitation of epoxy resin-based sealer in endodontic obturation. *J Appl Oral Sci*. 2017 Nov-Dec;25(6):641-9.
- van der Sluis LW, Vogels MP, Verhaagen B, Macedo R, Wesselink PR. Study on the influence of refreshment/activation cycles and irrigants on mechanical cleaning efficiency during ultrasonic activation of the irrigant. *J Endod*. 2010 Apr;36(4):737-40.
- Paqué F, Balmer M, Attin T, Peters OA. Preparation of oval-shaped root canals in mandibular molars using nickel-titanium rotary instruments: a micro-computed tomography study. *J Endod*. 2010 Apr;36(4):703-7.
- Rodrigues RCV, Zandi H, Kristoffersen AK, Enersen M, Mdala I, Ørstavik D, et al. Influence of the apical preparation size and the irrigant type on bacterial reduction in root canal-treated teeth with apical periodontitis. *J Endod*. 2017 July;43(7):1058-63.
- De-Deus G, Marins J, Silva EJ, Souza E, Belladonna FG, Reis C, et al. Accumulated hard tissue debris produced during reciprocating and rotary nickel-titanium canal preparation. *J Endod*. 2015 May;41(5):676-81.
- Brunson M, Heilborn C, Johnson DJ, Cohenca N. Effect of apical preparation size and preparation taper on irrigant volume delivered by using negative pressure irrigation system. *J Endod*. 2010 Apr;36(4):721-4.
- Ziafias D, Alraeesi D, Al Hormoodi R, Ataya M, Fezai H, Aga N. Preparation prerequisites for effective irrigation of apical root canal: a critical review. *J Clin Exp Dent*. 2017 Oct 1;9(10):1256-63.
- Holland R, Gomes Filho JE, Cintra LTA, Queiroz ÍOA, Estrela C. Factors affecting the periapical healing process of endodontically treated teeth. *J Appl Oral Sci*. 2017 Sept-Oct;25(5):465-76.
- Sharma G, Ahmed HMA, Zilm PS, Rossi-Fedeles G. Antimicrobial properties of calcium hydroxide dressing when used for long-term application: a systematic review. *Aust Endod J*. 2018 Apr;44(1):60-5.
- Lloyd A, Navarrete G, Marchesan MA, Clement D. Removal of calcium hydroxide from Weine Type II systems using photon-induced photoacoustic streaming, passive ultrasonic, and needle irrigation: a microcomputed tomography study. *J Appl Oral Sci*. 2016 Nov-Dec;24(6):543-8.
- Marciano MA, Ordinola-Zapata R, Cunha TV, Duarte MA, Cavenago BC, Garcia RB, et al. Analysis of four gutta-percha techniques used to fill mesial root canals of mandibular molars. *Int Endod J*. 2011 Apr;44(4):321-9.
- Pedro FM, Marques A, Pereira TM, Bandeca MC, Lima S, Kuga MC, et al. Status of endodontic treatment and the correlations to the quality of root canal filling and coronal restoration. *J Contemp Dent Pract*. 2016 Oct 1;17(10):830-6.

Intentional replantation as an alternative to dental implant: a 10-years follow-up case report

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ABSTRACT

Objective: This case report shows a successful viable treatment for an endodontically treated permanent mandibular molar which presented clinical symptoms 6 months after the endodontic treatment. Since endodontic retreatment or paraendodontic surgery were not indicated, the chosen technique was intentional replantation. **Case Report:** One hour before the procedure, the patient rinsed his mouth with chlorhexidine gluconate 0.12%. The patient was prepared for surgery and profound inferior alveolar and lingual nerve block anesthesia was achieved with 2% mepivacaine containing 1/100,000 adrenaline. The procedure started with the least traumatic extraction as possible and immediately wrapping the extracted tooth in physiological saline-moistened gauze, while the roots were evaluated for vertical fractures, followed by apicoectomy. The cavities were retro-prepared

with high-speed bur under irrigation with physiological saline and white mineral trioxide aggregate (MTA) was used for retrofilling. Immediately, the tooth was repositioned in the alveolus. Two 4-0 silk sutures were used to suture and stabilize the tooth. After one year, the patient returned for radiographic and clinical control, which revealed no more response to vertical percussion. After 10 years, the images show radiographic apical repair, without evidence of root resorption or periapical lesion. **Conclusion:** Clinical examination associated with the reported absence of pain and normal mobility confirmed the procedure's success, indicating this treatment as a valid alternative when an implant is not viable. This technique may help restore an original tooth to function instead of replacing it with a prosthetic or a dental implant.

Keywords: Apicoectomy. Tooth Apex. Endodontics. Tooth Replantation.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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Introduction

Failures in conventional endodontic therapy lead to non-surgical retreatment and apical microsurgery, considered as the first and second choices. In the non-surgical retreatment, the presence of prosthetic materials is always a concern, once the removal may pose risks greater than the potential benefits.¹ In apical microsurgery, the bone thickness is an important factor to be considered, since it may hinder the surgical access, increasing the failure possibility, once the apex or isthmus would not be appropriately retro-prepared and filled.^{2,3}

The possibility of such difficulties may indicate a technique known as intentional replantation (IR), defined by Grossman as the “removal of a tooth and its almost immediate replacement, with the objective of filling the canals apically while the tooth is out of the socket”.⁴ Therefore, it is a procedure with specific indications that intends to correct endodontic failures that cannot be corrected by other treatments, starting with the least traumatic extraction as possible, followed by extra-oral apicoectomy, retro-preparation, retro-filling and reinsertion of the extracted tooth.⁵ It is considered a last effort to preserve a tooth when extraction is indicated,⁶ and it is a valuable treatment modality, once the procedure is easy to perform and provides a chance to detect root fracture, besides the high cost-benefit.⁷

According to previous authors, the intentional replantation is indicated when: there is difficulty in endodontic retreatment or inaccessibility to perform apical microsurgery especially in lower second and first molars; when the mental foramen is superimposed over the apex of premolars; when molar apex is near the mandibular canal; when patients decline apical microsurgery; when failures occur after apical microsurgery; when surgery would create a periodontal pocket; when the indicated teeth are of prime importance to the existence and development of stomatognathic system.^{5,8}

This case report describes the combined endodontic and surgical treatment of intentional replantation in mandibular second molar with a successful follow-up after 10 years.

Case report

A 45-year-old white woman was referred to the Department of Endodontics at São Paulo State University (UNESP) School of Dentistry, Araçatuba, Brazil, complaining of pain after 6 months of endodontic treatment in the mandibular left second molar. After her medical history was reviewed, a periapical radiographic was taken, showing the mandibular left second molar endodontically treated, with extruded material on the distal root, restored with a crown and a fiber post (Fig 1A, B).

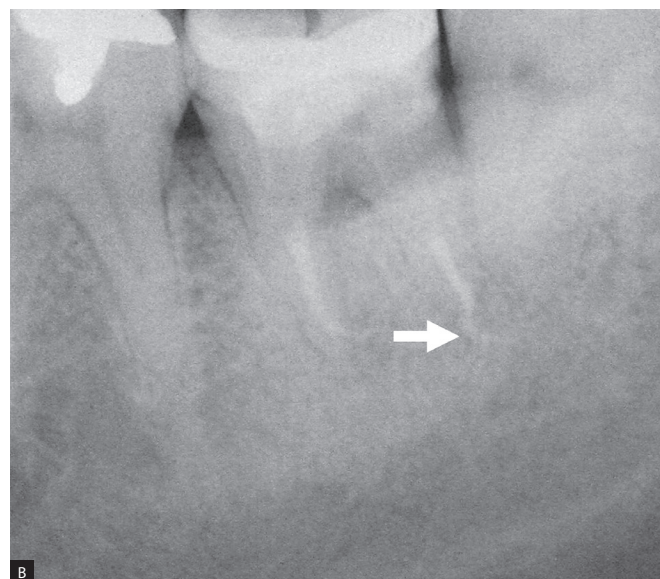


Figure 1. Initial appearance of the mandibular second molar: (A) intraoral; (B) periapical radiograph illustrating extruded material on the distal root (white arrow).

The risk of radicular crack or perforation during post removal, associated with possible failure to remove the extruded filling material from periapical tissue, discarded conventional endodontic retreatment. The apical microsurgery wasn't considered due to the difficulty to access the area of the second mandibular molar and proximity with mandibular nerve.

The patient was presented with treatment options of extraction and a dental implant, extraction and a prosthetic or extraction with no replacement. The extraction and an implant placement or prosthetic were declined by the patient, opting to have the tooth removed. Upon this decision, it was offered the choice of intentional replantation.

After all the associated risks and benefits were explained, the patient consented to the treatment.

Procedure

One hour before the procedure, the patient rinsed the mouth with chlorhexidine gluconate 0.12%. The patient was prepared for surgery and profound inferior alveolar and lingual nerve block anesthesia was achieved with 2% mepivacaine containing 1:100,000 adrenaline.

Four professionals (a surgeon, an endodontist and two assistants) were present for the clinical procedure, which started with the least traumatic extraction as possible of the tooth by the surgeon. A syndesmotomy was performed in order to enhance access to the crown, preventing additional structure damage and alveolar fracture.

The molar was extracted using extraction forceps as carefully as possible, without curettage of the root or the alveolar socket, and immediately wrapped in physiological saline-moistened gauze, while roots

were evaluated for vertical fractures and the extruded material was evidenced (Fig 2AB). After confirmation of fractures absence, the endodontic procedure was performed.

The apicoectomy was conducted by the endodontist. From the apical root, 2 mm was cut perpendicular to the long axis of the root (Fig 3A), and root-end cavities were retro-prepared with a high-speed carbide bur 169 (Beavers Jet Burs, Kerr, California, USA) irrigated with physiological saline (Fig 3B). The entire root surface was kept moistened with saline while the White MTA (Angelus, Londrina, Brazil) was manipulated with distilled water, inserted with the aid of a dental curette back and irrigated with saline (Fig 4A, B).

Simultaneously the endodontic retrofilling, the alveolus was slightly curetted and irrigated with saline by the surgeon. Immediately after root canal retrofilling, the tooth was repositioned in the alveolus. The entire extra-alveolar endodontic procedure did not exceed 5 minutes. Two silk sutures 4-0 (Johnson & Johnson Produtos Profissionais Ltda, São José dos Campos, Brazil) were used to suture and stabilize the tooth (Fig 5) and an immediate postoperative radiograph was taken. Analgesic was prescribed as well as local cleaning with chlorhexidine digluconate 0.12%. After 7 days, the suture was removed.

After one, three, six months and one year, the patient returned for clinical examination and radiograph control, revealing no more pain response to vertical percussion or complaint of pain. After 10 years, the image shows radiographic apical repair, without evidence of root resorption or periapical lesion (Fig 6AB). The clinical examination associated with the reported absence of pain and normal mobility confirmed the treatment success.



Figure 2. Surgical procedure: (A) extraction with forceps; (B) extracted molar wrapped in moistened gauze, evidencing the extruded material (white arrow).



Figure 3. Apical procedure: (A) apicoectomy and (B) retrocavities performed with high-speed bur.



Figure 4. Retrograde root filling: (A) insertion of white MTA with the aid of a curette; (B) retrofilling molar ready for replantation. Notice the moistened gauze around the roots during all procedure.



Figure 5. Two 4-0 silk sutures stabilizing the reimplanted tooth.

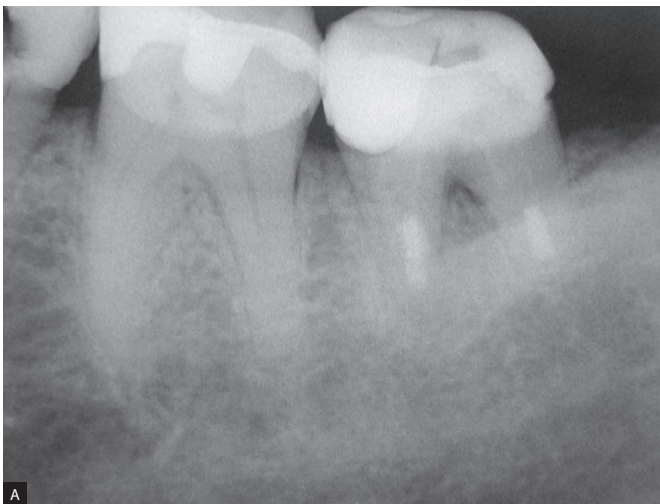


Figure 6. After 10 years, an periapical radiograph (A) reveals no sign of resorption or lesion and clinical examination confirms the success (B).

Discussion

Traditional root canal therapy is the first choice and it has always been the mainstay of endodontic therapy. The intentional replantation has been used for many years to intervene on endodontically treated teeth, considered as an effective strategy when traditional root canal therapy fails and retreatment or paraendodontic surgery has a poor prognosis.⁹

In the present case, it was considered fiber post removal, but occasionally it may pose greater risks compared with other options including extraction.³ The other important hindrance and doubtful success factor to be considered was the uncertain removal of extruded root-end material. All these conditions associated with a favorable clinical situation (absence of both periapical lesion and periodontal disease), contributed to choosing the IR technique. Even with the possibility of resorption or ankylosis that may affect replanted teeth,¹⁰ previous case reports with long-term follow-ups showed success of 73-88% with IR technique, evidencing the importance of an atraumatic extraction to maintain the alveolar ridge, besides conservation of periodontal ligament viability.^{3,11-16}

Another major difficulty that influenced the choice of IR was bone thickness. A systematic review found that second maxillary and mandibular molars are more common candidates for intentional replantation likely because access is limited by their position and bone thickness,^{11,14} corroborating with previous reports with the IR indications.^{5,8} In a computed tomography study conducted by Jin et al, the buccal bone plate thickness in mandibular second molars were found to be approximately 8,51 mm.² To perform apical surgery, a large portion of the buccal bone plate must be sacrificed and the healing process would be compromised. Even if the apex is reached, the extreme difficulty of adequate retro instrumentation and retrograde filling compromises surgery success.^{3,7,12}

The root resorption after reimplantation is always a matter of concern and the most frequent cause is vitality loss of periodontal ligament cells, emphasizing the importance of maintaining its aspect feasible and intact over the radicular surface, as the major factor to induce periodontal ligament healing without resorption.^{12,17} Factors like extra-oral time, preserva-

tion and tooth handling technique were probably of crucial importance for preserving periodontal ligament vitality.^{18,19} According to Andreasen et al.²⁰, the root surface can be preserved by immersion in sterile saline solution and gauze soaked in saline, with meticulous instrumentation.

Once the blood supply is interrupted, dehydration of periodontal ligament cells compromises healing after replantation. Therefore, to reduce extra-oral time, a high-speed handpiece was used, conforming previously reported techniques,^{16,21,22} to produce security and effective retro-cavity.^{3,7,11,23} In the present case, extra-oral time was 5 minutes, in accordance with previous reports which states the ideal extra-oral time for IR as 5 minutes²⁴ and it should not exceed 10 minutes.²⁵

The choice of white MTA as the material used for retrofilling is due to its biocompatibility, healing ability, good apical sealing, and fast setting property, reducing the washout factor.²⁶⁻²⁹ Once reimplanted tooth may present a minor mobility at initial stages, causing a pumping action under mastication, which could partially wash out unset MTA, reinforcing the choice of white MTA instead of gray MTA, which presents a longer setting time.¹⁵

The suture splint technique used in the present case was performed in order to maintain the reimplanted tooth in the alveolar socket. Earlier reports suggest that posterior teeth are well retained and dismiss rigid splinting which may accumulate bacteria, hinder healing and induce replacement resorption, once the physiological mobility is contained.^{3,24} Nowadays, the high success rate of dental implants reduces the choice of the IR as treatment. However, a study concerning the quality of life of patients with an root canal or dental implant, reported the satisfaction with both treatments, although the interviewed patients reinforced the effort to save natural dentition whenever possible.³⁰

Conclusion

In cases which there is no possibility of retreatment, paraendodontic surgery or the high cost of dental implant is unfeasible, IR should be considered. With adequate case selection and proper root-end filling material, IR is a viable option and it may present a high success rate, providing long-term results and a less expensive treatment.