



ROOT PERFORATING INTERNAL REPLACEMENT RESORPTION: A CASE REPORT CLINICAL WITH 10-YEAR FOLLOW-UP

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ABSTRACT

This study aims to report a root perforating internal replacement resorption treated and followed up for ten years. A 19-years female showed in periapical tomography enlargement of the entire length of the root canal of tooth 11. The cone-beam computed tomography (CBCT) showed a hypodense area with jagged edges involving the pulp cavity space and communication with the periodontium. After being accessed and prepared, the canal and its resorption defect were obturated with mineral trioxide aggregate. The cervical third was sealed with glass ionomer, and the tooth was restored with composite resin. Ten years later, the tomography showed intact root canal filling and periapical and periodontal injury absence. The use of repair cement for root canal obturation with perforating internal replacement resorption is an alternative for these cases, being fundamental to have a clinical, radiographic and tomographic follow-up to evaluate the treatment success.

KEYWORDS: Endodontics. Internal Resorption. Calcium Hydroxide. Mineral Trioxide Aggregate.

INTRODUCTION

Root resorption is considered a physiological or pathological process in which the action of clastic cells over the hard dental tissues results in the loss of dentin, cement, and bone ¹. In the permanent tooth, the resorption is considered a pathologic event with inflammatory nature and might result in the premature loss of the affected teeth. According to the root surface, root resorption can be classified as internal or external resorption ².

The external is more prevalent than internal root resorption ². The internal root resorption leads to the loss of the inner walls of the root canal ¹. The inflamed pulp tissue does not

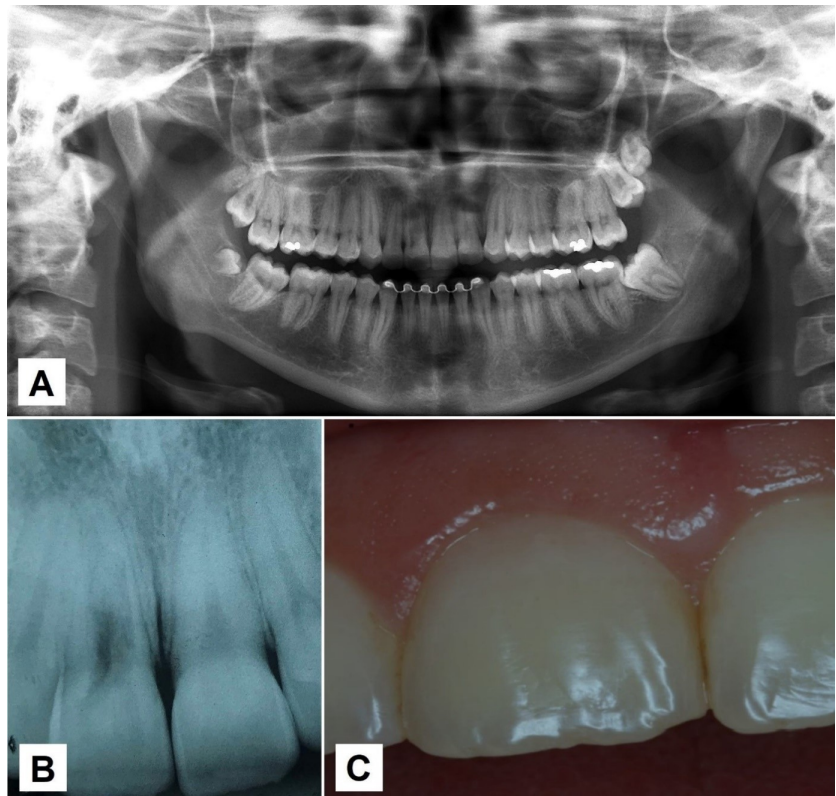
evolute to necrosis, remaining in a chronic state, and that sends stimulus for the loss of odontoblasts. Thus, the root dentin becomes exposed to the clastic cells, and the resorption process begins ³. Internal root resorption is a rare pathology, considered atypical pulp dystrophy, that destroys the hard tissue and changes its morphology ⁴. It is commonly asymptomatic, and the pain is a usual event when communication with the periodontal ligament occurs ⁵.

Internal root resorption is often diagnosed through routine periapical radiographs ⁶. Two types of internal resorption can be defined based on histological observations: internal inflammatory resorption (IIR) and internal replacement resorption (IRR). Radiographically, the IIR is an oval-shaped radiolucent area around the root canal or pulp chamber. In cases of IIR, a progressive loss of dentin occurs without adjunctive deposition of hard tissues ². This condition might go unnoticed to assume large dimensions and cause a perforation in the tooth structure or symptoms associated with pulp necrosis and an infection caused by the perforation.

The IRR consists of an irregular enlargement of the root canal or pulp chamber with the discontinuity of the typical canal space ⁷. The radiographic appearance of IRR is a fuzzy material resembling the bone tissue that might be observed. This form of resorption is asymptomatic, and the pulp tissue can normally respond to thermal and electric pulp testing. In those teeth where the resorption process achieves the cervical portion of the crown, a pink spot resulting from the growth of the granulation tissue can be clinically visualized ⁸. The internal replacement resorption (IRR) etiology is not entirely understood. It is usually caused by a low-grade inflammation of the pulp tissue or low-intensity trauma that disrupt the odontoblast and predentin layers. Some cases also present unknown causes that do not meet any of the categories and are called idiopathic root resorption. Histological images show the deposition of metaplastic hard tissue such as bone- and cementum-like tissue ⁹.

The treatment of IRR must be performed immediately after the diagnosis because its progression can be fast ¹⁰. The prognosis of the tooth might be considered for its maintenance. The root canal treatment

Figure 1(A) There can be noticed excessive enlargement of the root canal, together with jagged aspect and indefinite borders in the resorption zone. (B) Initial periapical radiography showing great resorption area. (C) Clinical aspects of the tooth before the endodontic treatment.



should remove vital or necrotic tissue that might be stimulating the resorptive process. Also, it aims to promote disinfection with the irrigant (sodium hypochlorite) and calcium hydroxide as root canal dressing. Finally, the obturation will fill the root canal system and the resorption defect. The follow-up is crucial and must be performed using radiographs and cone-beam computed tomography to evaluate the control of the resorption process ¹¹. This case report presents a root perforating internal replacement resorption with a clinical and tomographic 10-year follow-up.

CASE REPORT

The study was submitted and approved to the Ethics in Research Committee of the University of Santa Cruz do Sul (#3.502.568). This case report has been written according to Preferred Reporting Items for Case reports in Endodontics (PRICE) 2020 guidelines ¹².

A nineteen-year-old female took routine panoramic radiography in the Odontological Clinic of the University of Santa Cruz do Sul. The radiographic image showed a considerable enlargement of the root canal of the upper right central incisor (**Figure 1A**). Periapical radiography and a cone-beam tomography (CBCT) were performed to better assess the lesion (**Figure 1B**). The intraoral examination revealed a small pink spot in the cervical third of the vestibular surface of the crown, which also presented a fracture in the mesioincisal angle (**Figure 1C**).

Figure 2 (A-C) Coronal and sagittal planes of the cone beam computed tomography, in which hypodense and jagged area is observed. (D) Axial plane evidencing attachment to the lateral periodontium in the cervical third of the palatal face.



The CBCT showed the presence of a hypodense area, with jagged edges involving the whole pulp cavity space (**Figure 2A-C**) and communication with the periodontal attachment of insertion in the cervical third of the palatal surface of the root (**Figure 2D**). Based on the characteristics of the lesion, the diagnosis was an internal replacement root resorption.

The patient reported that she had suffered a concussion when she was nine and fractured the mesioincisal angle of the upper right central incisor. This history of trauma may be the cause of the IRR. The patient reported that no treatment was performed when the trauma occurred.

However, the tooth showed a positive answer to the pulp sensibility test with cold diminished compared to the adjacent teeth. Apical palpation and vertical percussion were negative. An infiltrative anesthesia with 2% lidocaine with 1:100,000 epinephrine (Alphacaine - DFL®, Indústria e Comércio S/A, Rio de Janeiro, Rio de Janeiro, Brazil) was performed. Next, the coronal access with spherical diamond bur 1014 (KG SORENSEN®, Cotia-SP, Brazil) was also performed. The partial pulp tissue extirpation was done with endodontic files (K-File; DENTSPLY®, Petrópolis, Rio de Janeiro, Brazil). A large volume of 1% sodium hypochlorite was used to

irrigate the root canal. Because of the intense bleeding, the chemomechanical preparation was not completed. The calcium hydroxide (Calen - SS WHITE®, Rio de Janeiro - RJ, Brazil) was used as root canal dressing. A cotton pellet was positioned at the canal entrance, and zinc phosphate cement (SS WHITE®,

Rio de Janeiro - RJ, Brazil) provisionally sealed the teeth.

After one week, the root canal dressing was removed. The working length was radiographically determined, and the chemomechanical preparation was performed up to a size #70 K-file. Passive ultrasonic irrigation (PUI) was performed to

Figure 3 (A) Periapical radiography to check the application of calcium hydroxide. (B) Picture of the fragments of remaining calcified metaplastic tissue removed from the resorption area. (C) Root canal obturation with MTA. (D-E) Cone beam computed tomography in coronal and sagittal planes evidencing filling of whole resorption. (F) Axial plane demonstrating the attachment area completely sealed and normality of the adjacent structures.

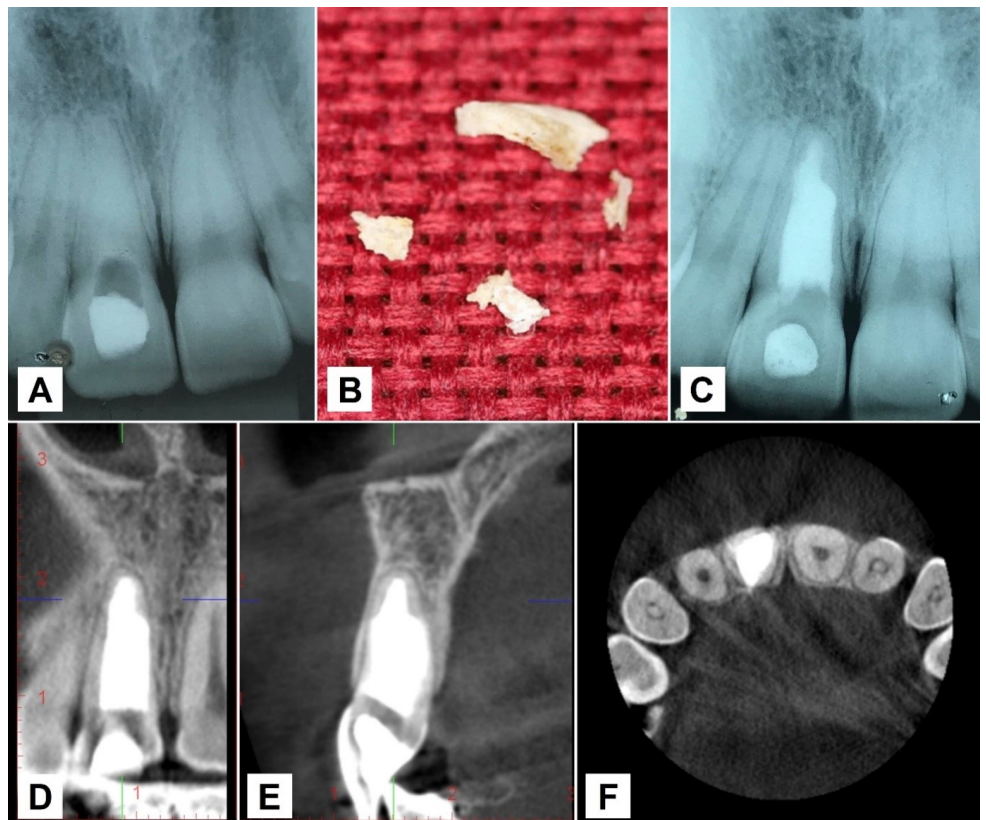
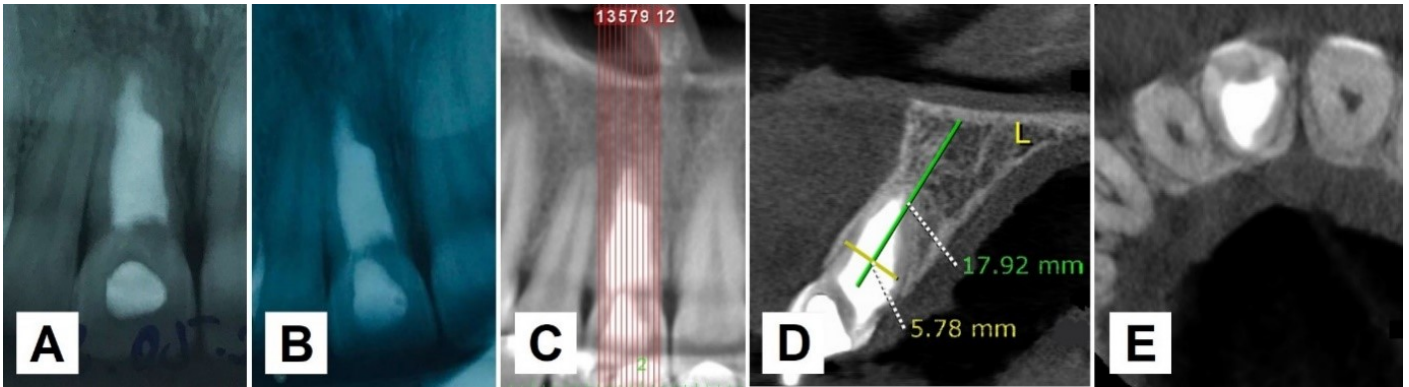


Figure 4 (A) periapical radiography of 2-years follow-up. (B) periapical radiography of 10-years follow-up. (C-D-E) Cone beam computed tomography in coronal, sagittal and axial planes with 10-years of follow-up. Note the complete healing of the periodontal structures and the paralization of the resorptive process.



improve the antibacterial activity and tissue dissolution promoted by NaOCl. Three activations of 20 seconds were carried out. Between each cycle, 10 mL of 1% NaOCl were used. The activation was made with MultiSonic S (SATELEC SYSTEM, GNATUS®, Ribeirão Preto, São Paulo, Brasil) powered at 30%. A smooth E1 tip (Irrisonic; Helse, Capelli e Fabris, São Paulo - SP Brazil) was positioned 1mm shorter than the working length. The canal was dried with #70 sterilized paper points (Dentsply), and calcium hydroxide root canal dressing filled the root canal, and a temporary restoration was placed as previously described.

In a third appointment, one week later, the metaplastic tissue was removed from the surrounding walls with an explorer probe and Gates-Glidden drills #1 and #2 (DENTSPLY®) (Figure 3B), and the root canal dressing and sealing procedures were carried out as described before. Fourteen days later, the disinfection protocol was repeated in the fourth appointment. PUI of 1% NaOCl and EDTA 17% (three cycles of twenty seconds). Once again, calcium hydroxide was used.

Finally, the root canal filling was made two months later without gutta-percha cones, only with mineral trioxide aggregate cement (White MTA - Angelus®, Londrina-PR, Brazil). The cervical third was provisionally restored with zinc phosphate (Figure

3C). After the obturation, the patient was submitted to a new CBCT that showed the complete filling of the root canal (Figure 3D-E), including in the periodontal attachment (Figure 3F). The coronal opening was filled with glass ionomer cement (Vitro Fill - Nova DFL, Taquara-RJ, Brazil) and restored with composite resin (Charisma Smart/CS, Kulzer, Hanau, Germany).

After two years, periapical radiography was taken (Figure 4A). The resorption remained stable, the hard layer contoured the periodontal ligament space, and no periapical alterations signals were observed. Clinically, the patient did not show any signal or symptoms of infection. In the cervical third of the palatal surface of the root, it was observed that the perforation area was healed.

The 10-years CBCT showed the root canal was filled with obturation without new root resorption or periapical bone

resorption. The periapical tissues and the hard layer are normal. The communication with the periodontal attachment at the cervical third of the palatal surface was healed (Figure 4C-E). The IRR remains controlled. Clinically, no signs or symptoms of infection were observed (Figure 5).

DISCUSSION

Dental trauma might affect hard, periodontal and pulp tissues, causing damage to the tooth and surrounding structures in the short, medium, and long term¹³. A concussion is defined as an injury in the dental support structures without excellent tooth mobility or displacement but with percussion pain. The root resorption is a pathology that may lead to the loss of the traumatized tooth, beginning right after the trauma or after some years¹⁴⁻¹⁵. The prevalence of root resorption is higher in males than females¹⁶.

Figure 5 Clinical aspect after 10-year follow-up.



Maxillary incisors are the most affected teeth ¹⁷.

The elimination of clastic cells and the removal of the granulomatous tissue are essential for the success of treating vital teeth with communicant internal root resorption. The inflamed tissue sends stimuli to maintain the resorption process ¹⁸.

So, as soon as the diagnosis was established, the pulp tissue was removed, and 1% NaOCl was used to stop the inflammatory process and eliminate the clastic cells of the inner walls of the root canal. Sodium hypochlorite presents two important chemical properties for this situation: tissue dissolution and antibacterial effect ¹⁹.

Different techniques can be used to activate the irrigant into the root canal to improve the adequate debridement of the resorption defect. PUI is one method that improves the tissue dissolution and antibacterial effect of NaOCl ²⁰.

The use of calcium hydroxide as a root canal dressing in these situations is to control the bleeding from the granulation tissue and enhance the process of tissue dissolution. Using calcium hydroxide as a temporary dressing is related to its antibacterial action, induction of formation of hard tissue provided by hydroxyl ions and calcium, and its highly alkaline pH ²¹.

If the resorption defect presents wide destruction of the pulp cavity, which involves the periodontium ligament, the canal obturation must be performed using MTA or bioceramic endodontic sealers. The filling material should present good mechanical and biological properties, induction of tissue regeneration, osteogenic capacity, biocompatibility, antibacterial effects, and adequate radiopacity ²²⁻²³. Furthermore, the presence of humidity should not interfere with the setting reaction and the material resistance. Because this case was performed ten

years ago, MTA was the material used for the root canal filling instead of the bioceramic endodontic sealers. MTA has superior bioactive properties compared to calcium hydroxide and other materials in forming a new dentin barrier ²⁴.

There is significant variability in the treatment approach in cases with a doubtful prognosis because of the extension of the root resorption and the questionable prognosis ²⁵. Although this decision can be controversial in some cases, the treatment must be based on the amount of the remaining tooth structure, the treatment cost-benefit, and the patient preference ²⁶. A systematic review compared the success rate of two treatment modalities of teeth with endodontic needs (with or without resorption), endodontic treatment or extraction, and implant installation. The success of the implant and endodontically treated teeth were essentially identical, but implants required more postoperative treatments ²⁷.

Another important fact is that, up to date, the endodontic treatment, even when the prognosis is questionable, must be the first treatment option because it can keep the tooth in the buccal cavity, with the presence of the periodontal attachment, maintaining function and aesthetics ²⁸. In this case, after ten years, the patient continued with the tooth in function and was satisfied with the aesthetics. It is important to emphasize that the patient was oriented and is aware of the need for follow-up on her case since the tooth presents fragility and specific risks because external resorption, root fracture, or lateral periodontal injury in continuity with the attachment zone may occur.

The diagnosis of resorptions can be underestimated and not entirely on periapical radiographs. CBCT may be indicated for accurate diagnosis and treatment planning. An in vivo study

found that CBCT imaging was significantly more accurate in internal medicine and solving internal resorption problems than periapical radiographs. This result indicates a greater likelihood of choosing the correct treatment option to manage the injury ²⁹.

CONCLUSION

It can be concluded that, up to this time, the resorption process is paralyzed without clinical, radiographic, and tomographic signs of periapical inflammatory alteration and that the treatment performed in this case of internal tooth resorption of replacement was successful.

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