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Management of upper central incisor with large periapical inflammatory cyst and persistent fistula: Case report

Tratamento de incisivo central superior com cisto periapical inflamatório extenso e fístula persistente: Relato de caso

Tratamiento de incisivo central superior con quiste periapical inflamatorio extenso y fístula persistente: Reporte de caso

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Abstract
The objective of this case report was to describe the retreatment of an immature upper right central incisor in a 20-year-old female patient after unsuccessful endodontic treatment, who had probable clinical-radiographic diagnosis of a large periapical inflammatory cyst and persistent fistula. After removing the root canal filling material, disinfection of the root canal system, and successive intracanal medication changes over 60 days, the fistula remained active. Therefore, parendodontic surgery was performed. The root canal system was obturated, the periapical cyst was surgically enucleated, and retro-obturation with mineral trioxide aggregate was performed. We used the guided tissue regeneration technique with a xenograft and resorbable membrane. On histopathological examination, we observed bacterial colonies present in the lumen of the cystic lesion. Clinical evaluation, periapical radiograph, and cone-beam tomography confirmed complete healing of the periapical area of the affected tooth. The treatment success was verified by periapical healing over a follow-up period of 21 months.
Keywords: Tooth injuries; Infection control, dental; Radicular cyst.

Resumo
O objetivo deste relato de caso foi descrever o retratamento de um incisivo central superior direito imaturo em uma paciente de 20 anos, após insucesso do tratamento endodôntico, com provável diagnóstico clínico-radiográfico de

extenso cisto inflamatório periapical e fístula persistente. Após a remoção do material obturador do canal radicular, desinfecção do sistema de canal radicular e sucessivas trocas de medicação intracanal ao longo de 60 dias, a fístula permaneceu ativa. Portanto, a cirurgia parendodôntica foi realizada. O sistema de canais radiculares foi obturado, o cisto periapical foi enucleado cirurgicamente e realizada retro-obturação com agregado de trióxido mineral. Utilizamos a técnica de regeneração tecidual guiada com xenoenxerto e membrana reabsorvível. No exame histopatológico, observamos colônias bacterianas presentes na luz da lesão cística. Avaliação clínica, radiografia periapical e tomografia computadorizada de feixe cônico confirmaram a cicatrização completa da área periapical do dente afetado. O sucesso do tratamento foi verificado pela cicatrização periapical ao longo de um período de acompanhamento de 21 meses.
Palavras-chave: Traumatismos dentários; Controle de infecções dentárias; Cisto radicular.

Resumen
El propósito de este caso clínico fue describir el retratamiento de un incisivo central superior derecho inmaduro en un paciente de 20 años, tras tratamiento endodóntico fallido, con probable diagnóstico clínico-radiográfico de quiste inflamatorio periapical extenso y fístula persistente. Después de retirar el material de obturación, desinfectar el sistema del conducto radicular y sucesivos cambios de medicación intracanal durante 60 días, la fístula permaneció activa. Por tanto, se realizó una cirugía de endodoncia. Se rellenó el sistema de conductos radiculares, se enucleó quirúrgicamente el quiste periapical y se rellenó de nuevo con agregado de trióxido mineral. Utilizamos la técnica de regeneración tisular guiada con xenoinjerto y membrana reabsorbible. En el examen histopatológico observamos la presencia de colonias bacterianas en la luz de la lesión quística. La evaluación clínica, la radiografía periapical y la tomografía computarizada de haz cónico confirmaron la curación completa del área periapical del diente afectado. El éxito del tratamiento se verificó mediante la curación periapical durante un período de seguimiento de 21 meses.
Palabras clave: Traumatismos de los dientes; Control de infección dental; Radicular quiste.

1. Introduction

Immature permanent anterior teeth are frequently affected by traumatic injuries. One of the most common types of trauma is a coronary fracture with pulp exposure, with a prevalence of 8.5%-34.5% (Ekanayake & Perera, 2008; Hecova et al., 2010; Ritwik et al., 2015). Although preserving pulp vitality is essential for the physiological formation of the root apex (Güngör, 2014), when factors such as the time elapsed between trauma and dental care or the choice of inappropriate emergency therapy, the pulp will eventually become infected, leading to pulp necrosis (Atabek et al., 2017; Lin et al., 2016; Viduskalne & Care, 2010).

Endodontic treatment of immature teeth with pulp necrosis is a challenge for endodontists owing to the divergence of the root canal walls (Mohammadi, 2011). When root canal filling is unsatisfactory in these cases, root canal infection may persist, resulting a long-term periapical inflammatory cysts formation (Nair, 2004).

Thus, the objective of this case report was to describe the management of a right upper central incisor with unsuccessful endodontic treatment associated a large periapical inflammatory cyst and persistent fistula.

2. Methodology

This is a descriptive case report study (Sayre et al., 2017). All the information presented in this case report was authorized for publication by means of a Free and Informed Consent Form signed by the patient. Although research ethics committee approval is not required for this study, the authors declare that it is following the national research committee ethical standards and the 1964 Helsinki Declaration and its subsequent amendments.

We followed the recommendations of the *PRICE 2020 Guidelines* for the describing this case (Nagendrababu et al., 2019).

3. Case Report

A 20-year-old female patient reported a history of dental trauma at the age of 10 years in teeth 11 and 21. On clinical examination, the patient experienced pain at apical palpation and vertical percussion tests of teeth 11 and 12. Tooth 12 did not

respond to the cold pulpal sensitivity test performed with refrigerant gas (Endo Frost, Langenau, Germany). On visual inspection, a fistula was observed at periapical region of tooth 12. The figure 1a shows a periapical radiograph taken with gutta-percha cone to mapping the fistula and identify its origin in tooth 11. The root canal retreatment plan was proposed and accepted by the patient.

After performing anesthesia and rubber dam isolation, access to the pulp chamber was made. The gutta-percha was removed from the root canal using Gates-Glidden burs and K-files. The cleaning of the root canal in all its extension (18.5 mm; figure 1b) was performed with K-file #130 (Dentsply Maillefer, Ballaigues, Switzerland). Copious irrigation with 2.5% sodium hypochlorite was performed. The root canal was dried and dressed with calcium hydroxide paste (Calen PMCC®, SS White Artigos Dentários Ltda, Rio de Janeiro, RJ, Brazil). Temporary coronal sealing with Coltosol® (Dentalville, Joinville, SC, Brazil) was used between appointments. After 15 days, the patient returned, reporting discomfort and spontaneous drainage of pus through the fistula. The intracanal dressing was replacement and maintained for another 30 days.

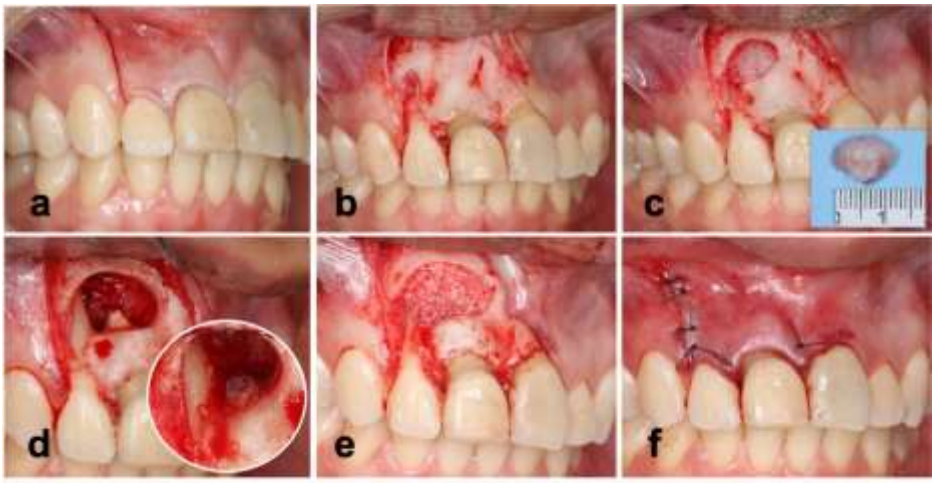
After this, it was observed that the tooth was asymptomatic, but the fistula was still active as observed in figure 1c. Therefore, it was decided to execute paraendodontic surgery. A cone-beam computed tomography (CBCT) (Prexion 3D XP68, PreXion Inc., San Mateo, CA, USA) was achieved to evaluate the extension of the lesion (Figures 1e-1g). The frontal section viewed in figure 1e shows the large periapical inflammatory cyst associated with teeth 11 and 12; sagittal section viewed in figure 1f shows the extension of the lesion compromising the vestibular and palatal bone cortices; and the axial section viewed in figure 1g shows the apical portion of the lesion.

In the fourth appointment, the region *was anesthetized*. Under rubber dam isolation, the root canal filling with a customized gutta-percha main cone, accessory cones (Dentisply Maillefer, Ballaigues, Switzerland), and resin-based root canal sealer (Sealer 26®, Dentisply Maillefer, Ballaigues, Switzerland) using the active lateral condensation technique was done (Figure 1d). Next, a relaxing oblique incision inclined to the distal (Figure 2a) and an intra-sulcular incision that extended from the mesial of element 21 to the distal of element 12 were made (Figure 2b). A fenestration-type bone defect was observed in the cervical of element 12 (Figure 2b). The figure 2c shows a vestibular bone plate ostectomy exposing part of the lesion; in detail, the lesion with the whole fibrous capsule. After periapical cyst enucleation, the surgical cavity showing the root apex could be observed in figure 2d; in detail, the removal of the 2.0 mm root apical third were cut and an apical cavity was made, dried with air jets and filled with white mineral trioxide aggregate (MTA) cement (Angelus, Londrina, Paraná, Brazil). Bone cavity filling was performed with a biomaterial (Geistlich Bio-Oss® Spongious Bone Replacement Granules 0.25 mm-1 mm/0.5 g, Wolhusen, Switzerland) (Figure 2e), and isolated with a resorbable collagen membrane (Geistlich Bio-Guide® Membrane 16 mm × 22 mm, Wolhusen, Switzerland). The flap was repositioned and sutured with 5-0 nylon thread (Ethicon Mononylon 5-0 w/ 24 1.7 cm Johnson & Johnson, São Paulo, Brazil) (Figure 2f).

Figure 1. Endodontic retreatment and mapping of the persistent fistula after disinfection of root canal system. Large periapical cyst observed in periapical radiography and cone-beam computed tomography.

Source: Authors.

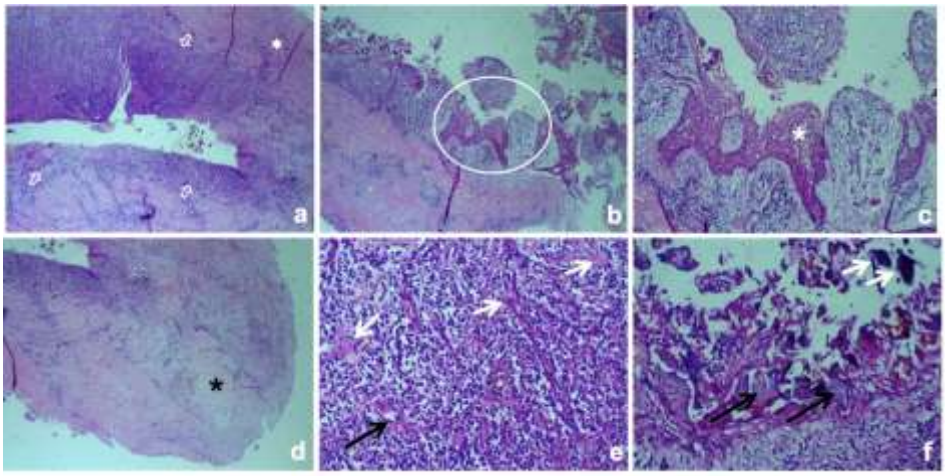
Figure 2. Paraendodontic surgery.



Source: Authors.

Figure 3 shows histopathological sections (report No B17-736) of cystic cavity. In the most central part of the virtual cystic cavity, figure 3a (4× magnification) shows stratified paved epithelium (white arrows) and area of the fibrous cystic capsule underlying the epithelium (white star). Areas with acanthosis and arciform projections could be viewed in figure 3b (white ellipse; 5× magnification) and in detail in figure 3c (white asterisk; 10× magnification). Underneath, a fibrous capsule comprising dense connective tissue (black asterisk; figure 3d) presented with intense inflammatory infiltration, predominantly by diffuse mononuclear cells. Figure 3e (20× magnification of the cystic capsule area) shows diffuse inflammatory infiltrate, blood vessels (black arrow), and bundles of collagen fibers (white arrows). Fragments of calcified tissue (white arrows), and bacterial colonies (black arrows) were also observed (Figure 3f). The conclusive histopathological diagnosis was a large periapical inflammatory cyst (2F1C-TM).

Figure 3. Histopathological image analysis.



Source: Authors.

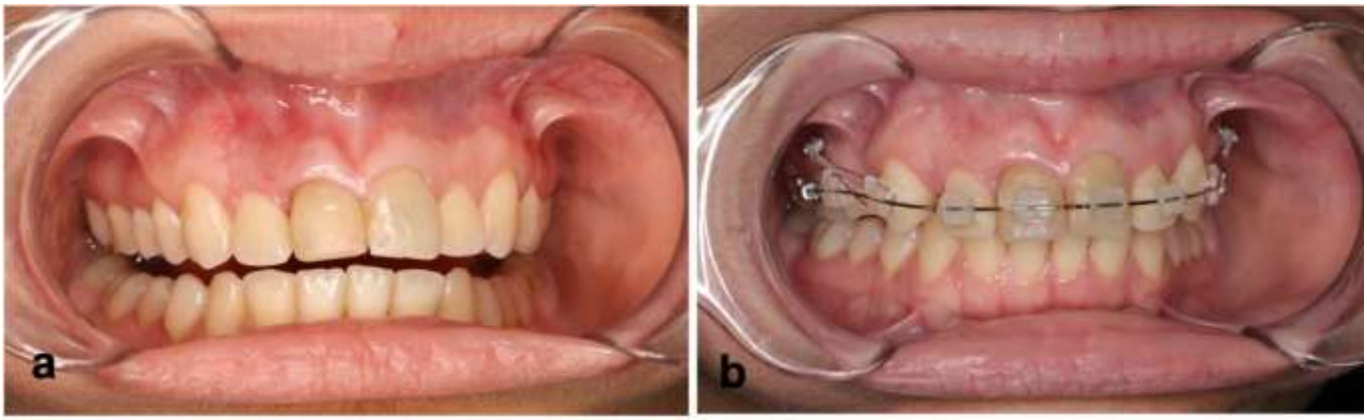
Postoperative radiographies were carried out immediately after paraendodontic surgery (Figure 4a) and, at 6 (Figure 4b), 14 (Figure 4c), and 21 months (Figure 4d) showing repair of the periapical tissues of teeth 12 and 11. In figure 4d, we observed a reduction in the pulp chamber of tooth 12, which continued to not respond to the cold pulp sensitivity test at all time-points. Radiographic aspect of tooth 12 with intact crown and pulp chamber reduction suggests calcic metamorphosis of the pulp probably owing to the involvement of the vascular and nervous bundles without total interruption of the blood flow of this tooth during the dental trauma that affected teeth 11 and 21 (concussion or subluxation). The success of the treatment was also confirmed by CBCT performed 21-months after the paraendodontic surgery (Figures 4e-4g). The figure 4e shows the frontal section of cystic cavity totally filled with Bio-Oss®. The sagittal section in figure 4f shows biomaterial contact with the bone cortices and, the axial section in figure 4g shows the filling with the biomaterial in the apical region of the cystic cavity.

Clinically, teeth 11 and 12 showed alveolar mucosa and marginal gingiva inserted with normal aspects at 30-days as observed in Figure 5a and, at 21-months after paraendodontic surgery as observed in Figure 5b.

Figure 4. Post-paraendodontic surgery control: periapical radiographies immediately and, at 6, 14 and 21-months and cone-beam computed tomography at 21-months.

Source: Authors.

Figure 5. Clinical control at 30-days and 21-months after paraendodontic surgery.



Source: Authors.

4. Discussion

In this case report, we describe the therapeutic management of an immature upper right central incisor in a 20-year-old patient with unsuccessful endodontic treatment and a probable clinical-radiographic diagnosis of a large periapical inflammatory cyst and persistent fistula.

The large diameter of the root canal and divergent walls of immature teeth prevent proper debridement of infected root canal and make it difficult to contain the root canal filling materials, which makes endodontic (re)treatment of these teeth a challenge for clinicians and specialists (Mohammadi, 2011; Trope, 2006). This may justify the unsatisfactory endodontic treatment in this case, what allowed percolation of tissue fluids into the root canal (Silvestrin et al., 2016). The treatment success can be significantly influenced by customized master gutta-percha cone and resin-based root canal sealer, as this could three-dimensionally fill the root canal space. Thus, an inadequate root canal filling and a lack of periodic patient follow-up (Andreasen et al., 2012), explains the development and maintenance of a periapical infectious-inflammatory process, evolving into an apical inflammatory cyst a the long-term.

Although non-surgical treatment is the most recommended therapeutic approaches because it is less invasive method (Siqueira, 2001), afterwards our unsuccessful attempt at control root canal infection, the lesion had to be surgically removed after root canal filling. This approach was employed because over a period of 60 days, with intracanal medication changes, the fistula did not heal and continued draining pus into the oral cavity. Previous studies have reported the occurrence of a complex extraradicular microbiota that did not favorably respond to non-surgical root canal treatment (Ricucci et al., 2015; Saoud et al., 2015; Signoretti et al., 2011). Bacterial species such as Actinomyces and P. propionicum can survive in apical tissues, despite the host's immune response to microbial aggression (Nair, 2006; Signoretti et al., 2011). In the histopathological analysis of the present case, we observed the presence of bacterial colonies in the cyst lumen. Hence, the persistence of pus drainage via fistula in this case can be explained by the viability of bacteria in the periapical region (Ricucci et al., 2015; Saoud et al., 2015; Signoretti et al., 2011). Such cases have been successfully treated with parendodontic surgery (Ricucci et al., 2015; Signoretti et al., 2011).

To select the surgical technique used for our case, we considered the size and location of the lesion, the integrity of cystic wall, and the proximity of the lesion to vital structures (L. M. Lin et al., 1996; Natkin et al., 1984). Considering this, we opted for enucleation and apicectomy with retrograde filling using MTA. It is a viable alternative for removing the extraradicular biofilm in the apical third roots (Signoretti et al., 2011) and because the apical sealing capacity of the MTA (von Arx et al., 2019). Besides that, this material has biocompatibility, low cytotoxicity and, antimicrobial properties (Torabinejad

et al., 2018).

The use of the guided tissue regeneration technique (GTR) has been indicated for the treatment of extensive apical lesions (>10 mm) and through-and-through type lesions, by promoting healing and improving the outcome of surgical endodontic therapy (Tsesis et al., 2011). Taschieri et al. (2008) showed that the defects treated with GTR (Bio-oss® combined with BioGuide® membrane) presented an 88% success rate compared with the control group (without GTR), in which the success rate was only 57%. Thus, owing to the extension of the periapical inflammatory cyst, in which the destruction of the vestibular and palatal bone cortices was observed on cone-beam tomography, we selected GTR using biomaterial as a bone substitute and resorbable membrane to fill the bone cavity. The use of a membrane at the surgical site improves the process of self-regenerative healing by preventing unwanted proliferation of gingival connective tissue or migration of oral epithelium into such defects, which could impair the formation of normal trabecular bone (L. Lin et al., 2010; Susan Chi et al., 2015; Taschieri et al., 2008). We believe that without the use of GTR, the surgical site would be filled with fibrous tissue, resulting in false diagnosis of recurrence of the lesion, besides not maintaining the tissue esthetic after healing. Therefore, in this case, the use of GTR with filling as a bone substitute and application of a resorbable membrane are essential to protect the remaining bone and to increase the capacity of bone and connective tissue regeneration.

5. Conclusion

In conclusion, the therapeutic approach employed was successful in the removal of the large periapical inflammatory cyst and complete apical bone regeneration at 21-month follow-up. Future studies are encouraged to carry out bacteriological examinations of the material to identify bacteria related to persistency of perirradicular infection.

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