

Extrusion of Endodontic Material to the Maxillary Sinus: Avoidable Intercurrence?

Extrusión de Material Endodóntico al Seno Maxilar: ¿Intercurrencia Evitable?

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ABSTRACT: The objective of this study is to discuss and analyze whether extrusion of endodontic material constitutes avoidable intercurrence, discussing the clinical, ethical and legal implications. Patient LSR, 31 years old, female, attended a dental consultation complaining of pain in the second left maxillary premolar (tooth 25). Radiographically, a single root canal and thickening of the periodontal ligament associated with extravasation of 8 mm of gutta percha to the maxillary sinus were observed. The first endodontic session aimed to performing the desobturation, root canal preparation and intracanal medication placement. The root canal obturation was performed in the second session. Was carried out an apical surgery that removed 2 mm from the root apex and also performed the covered with a collagen membrane. A 22 months follow-up revealed a tooth function, absence of painful symptomatology or infection, and radiographically normal periodontal ligament and bone neoformation. The second single-root premolar is the type of premolar with less distance with the floor of the maxillary sinus. In this case, the extrusion of the obturator material occurred due to the superinstrumentation of the root canal associated with the proximity of the root with the membrane of the maxillary sinus. From the ethical and legal point of view, the patient has the right to be informed about any intercurrences that may arise during or after the treatment, and the informed consent form is essential. This document will allow the patient to make a decision about performing an endodontic treatment in which the risk of an accident or complication is imminent or that treatment failure is already expected. It is important that professionals make appropriate diagnosis and treatment plan for each case, since this conduct may avoid clinical intercurrences. In addition, if the intercurrences occur, the patient should be advised of how to proceed.

KEY WORDS: endodontics, extravasation of therapeutic materials, tooth apex, apicoectomy, oral surgery.

INTRODUCTION

Endodontics, as well as other dental specialties, is not free of intercurrences that may compromise the success of root canal treatment such as instrument fracture (Asgary *et al.*, 2018), dental perforation (Pedullà *et al.*, 2018), extrusion of root canal irrigants (Guivarc'h *et al.*, 2017) or of filling material in the periapical region (González-Martín *et al.*, 2010) or for the maxillary sinus (Brooks & Kleinman, 2013).

In many of these circumstances, accidents and complications can be fully predictable, but it is the diagnostic and planning steps that can tell the

professional whether or not these intercurrences are preventable.

The extrusion of endodontic material beyond the apical foramen, specifically, constitutes a fully predictable intercurrence, that is, it is a circumstance that should be present in the planning of all root canal treatment (Caputo *et al.*, 2014). However, despite being predictable, this intercurrence is not always preventable by factors related to the patient or to professional performance. Root resorption with incomplete rhizogenesis or with an atypical anatomy in the region

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of the root foramen are factors related to the patient that can lead to extrusion, even when performing the best and safest technique (Al-Tammami & Al-Nazhan, 2017). On the other hand, failures in case selection, instrumentation and/or canal filling execution (Lin *et al.*, 2005), associated with low professional experience (Lee *et al.*, 2012), are the factors inherent in the professional that usually refer to endodontic overreaching.

Once overfilling is set up, the success of root canal treatment is not always compromised, since the case may be accompanied or a more invasive approach, and usually of a surgical nature, may be indicated (Brkic *et al.*, 2009). It is known that material extrusion for the periapical region, as well as other avoidable endodontic intercurrentences, may have consequences that go beyond clinical aspects, leading to ethical and legal disagreements (Givol *et al.*, 2010; Zanin *et al.*, 2016). The objective of this study is to discuss and analyze whether extrusion of endodontic material constitutes avoidable intercurrentence, discussing the clinical, ethical and legal implications.

CASE REPORT

Patient LSR, 31 years old, female, attended a dental consultation complaining of pain in the second left maxillary premolar (tooth 25). Patient reported that the tooth was endodontically treated 2 years ago. However, 5 months ago it started to feel uncomfortable in the periapical region, associated with otalgia on the left side and severe headache, compatible with sinusitis. In intraoral examination, there was no edema and fistula, with normal tissue coloration in the tooth region, which showed restoration of composite resin with signs of marginal leakage and painful symptomatology at vertical percussion.

Radiographically, a single root canal and thickening of the periodontal ligament associated with extravasation of 8 mm of gutta percha to the maxillary sinus were observed (Fig. 1). The information obtained from the clinical and complementary examination confirmed the diagnosis of infectious symptomatic apical periodontitis associated with extrusion of obturator material.

In the pre-surgical period, Clavulin® BD 875 mg, 12/12 h, was prescribed for 15 days. The first endodontic session aimed to performing the



Fig. 1. Periapical radiograph of tooth 25 presenting extrusion of filling material to the maxillary sinus.

desobturation, root canal preparation and intracanal medication placement (Calcium Hydroxide and physiological solution) for 15 days. The root canal obturation was performed in the second session by the lateral condensation technique, and direct restoration in composite resin (Fig. 2).

An apical surgery was also performed in a single procedure using the Caldwell-Luc technique, under local anesthesia in the third session. A Newman type incision was chosen and, subsequently, the soft tissues were divulsed for osteotomy of the buccal bone cortical osteotomy with spherical diamond bur in the region of the apex of the tooth root. The maxillary sinus membrane was ruptured and curetted of fibrous tissue was performed on the periapical region of the tooth (Fig. 3).



Fig. 2. Periapical radiograph of tooth 25 after endodontic retreatment.



Fig. 3. Membrane of ruptured maxillary sinus and apex of tooth 25 curetted.

For apicectomy, Zecrya 151 drill (Dentsply Maillefer®) was used being removed 2 mm from the root apex. It was then covered with a collagen membrane (Bio-Gide® 25x25 mm, Geistlich) and the flap repositioned with silk suture 4.0.

The postoperative period was uneventful (Fig. 4), and it was prescribed Nisulid® 100 mg, 12/12 h, for 3 days and Lisador® 500 mg, 6/6 h, for 2 days or in case of pain.

A 22 months follow-up revealed a tooth function, absence of painful symptomatology or infection, and radiographically normal periodontal ligament and bone neof ormation in the periapical region of tooth 25 (Fig. 5).



Fig. 4. Periapical radiography after 1 week of apical surgery.



Fig. 5. Radiographic follow-up after 22 months of apical surgery.

DISCUSSION

A better prognosis of root canal treatment is achieved when the filling material does not extend beyond the apical foramen, remaining 1 mm below the radiographic apex (Estrela *et al.*, 2014). Overfilling is one of the most common causes of periapical pain after root canal treatment (Nair, 2006). Due to the endodontic infection, the extrusion of the obturator material can transport bacteria beyond the apex and cause an apical periodontitis and/or foreign body type reaction (Nair).

According to Brook (2006), 10 to 12 % of maxillary sinusitis are odontogenic. In the present study, sinusitis caused by extrusion of filling material established a diffuse otalgia. Similar cases in the literature also describe spontaneous symptomatology in orbital region, headache and other places (Pasqualini *et al.*, 2012). Since the floor of the maxillary sinus and the postero-superior teeth share the same nerve branches, differential diagnosis of diffuse pain in this region is complex (Maillet *et al.*, 2011).

During root canal treatment in postero-superior teeth, attention is needed to avoid extrusion of the filling material due to the proximity between the root apices and the maxillary sinus (Nunes *et al.*, 2016). The literature presents studies that observed this anatomical relationship using concomitant computed tomography, showing that the second single-root pre-molar is the type of premolar with less distance with the maxillary sinus floor (Estrela *et al.*, 2016). In the present case, the extrusion of filling material in tooth 25 occurred due to the overinstrumentation of the root canal associated to the proximity of the root to the maxillary sinus membrane, due to the inherent factor of the failure of the technique performed during root filling, without evidence of a patient-related risk factor that would increase the occurrence of overfilling. Therefore, for the present case, extrusion was predictable and avoidable.

According to the American Dental Association, extrusion of filling material greater than 2 mm presents a technical error attributable to overinstrumentation, inadequate odontometry and lack of apical stop (Santoro *et al.*, 2009). This intercurrence will not always lead to endodontic failure, but may require a new intervention, such as endodontic retreatment, apical surgery or dental extraction (Givol *et al.*; Caputo

et al.). In addition, in cases with no postoperative pain, it is necessary that the dentist perform periodic follow-up of the patient, to evaluate the possible appearance of signs and symptoms that can identify the treatment failure (Santoro *et al.*).

In the present study, the initial root canal treatment was unsatisfactory, requiring a better preparation of the root canal and sealing of voids. Endodontic retreatment stage was indicated prior to surgery, since periapical curettage or apicoectomy performed alone would not eliminate the endodontic infection, only the periapical lesion and the extravasated material to the apex, which could lead to recurrence (Friedman, 2011).

In a traditional study, Gilheany *et al.* (1994), evaluated the angulation of apicectomy and the relation with dentinal permeability and apical microleakage (Gilheany *et al.*). As a result, the authors concluded that apical infiltration may be decreased when apicectomy is performed perpendicularly along the axis of the tooth (Gilheany *et al.*). Associated with this, Kim *et al.* (2001) studied the length of the apicectomy and concluded that removal of 3 mm from the root reduced 98 % of apical ramification and 93 % of accessory root canals (Kim *et al.*). Despite what has been described in the literature, in this study apicectomy performed in 2 mm of the root, with small angulation along the axis of the tooth, did not interfere in the success of the case.

In a systematic review by Tsesis *et al.* (2011), the authors concluded that guided tissue regeneration in apical surgery improves the prognosis of the treatment, promoting bone repair in the region (Tsesis *et al.*). In the present case, the use of absorbable collagen membrane was used to close the bone shop and promote a better tissue repair, which is in agreement with the literature since this technique has a better success rate when it is made in bone defects of 4 walls (Sánchez-Torres *et al.*, 2014).

From an ethical and legal point of view, patient has the right to be informed about any intercurrences that may arise during or after root canal treatment, and the informed consent form is essential. This is the document that will enable the patient to make a decision about performing a root canal treatment in which the risk of an accident or complication is imminent, or that treatment failure is already expected, in view of previously identified local or systemic anatomical factors.

In this sense, the importance of diagnosis and planning of the cases to be treated is highlighted, where local risk factors such as incomplete rhizogenesis and root resorption may contribute to increase the risk of extravasation. Once the patient has been diagnosed, the professional must notify the patient of the occurrence and try to solve the case by himself or with the appointment of another professional, in one or more operative times, in order to protect patient's integrity and health.

Failure to observe these conducts may lead to lawsuits in which the operator can be held liable for material, moral and aesthetic damages, since the expert literature reports that Endodontics is one of the dental specialties frequently cited in prevalence judicial process research in Dentistry (Pinchi *et al.*, 2013; Caputo *et al.*; Zanin *et al.*; Vehkalahti & Swanljung, 2017).

In case of legal proceedings, the operator may be held liable for the compensation and financial expenses for the treatment of the resulting harm, as well as for the temporary incapacity of the patient and the prolongation of the treatment (Santoro *et al.*).

CONCLUSION

The diagnosis and endodontic planning are fundamental steps for the professional to avoid the extrusion of filling material to the maxillary sinus during root canal treatment. Associated to this, it is of great value the previous information to the patient on the main factors that can cause it and the therapeutic alternatives after configured this intercurrentence.

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RESUMEN: El objetivo de este estudio fue discutir y analizar si la extrusión de material endodóntico constituye una intercurrentencia evitable, discutiendo las implicaciones clínicas, éticas y legales. Paciente LSR, de 31 años de edad, mujer, asistió a una consulta dental quejándose de dolor en el segundo premolar maxilar izquierdo (diente 25). Radiográficamente, se observó un solo conducto radicular y engrosamiento del ligamento periodontal asociado con la extravasación de 8 mm de gutapercha al seno maxilar. La

primera sesión de endodoncia tuvo como objetivo realizar la desobturación, la preparación del conducto radicular y la colocación de medicación intracanal. La obturación del conducto radicular se realizó en la segunda sesión. Se llevó a cabo una cirugía apical que extrajo 2 mm del ápice de la raíz y también se realizó el recubrimiento con una membrana de colágeno. Un seguimiento de 22 meses reveló función dental, ausencia de sintomatología dolorosa o infección y ligamento periodontal radiográficamente normal y neoformación ósea. El segundo premolar de una sola raíz es el tipo de premolar con menos distancia con el piso del seno maxilar. En este caso, la extrusión del material obturador se produjo debido a la superinstrumentación del conducto radicular asociada con la proximidad de la raíz con la membrana del seno maxilar. Desde el punto de vista ético y legal, el paciente tiene derecho a ser informado acerca de cualquier inter-ocurrencia que pueda surgir durante o después del tratamiento, y el formulario de consentimiento informado es esencial. Este documento le permitirá al paciente tomar una decisión sobre la realización de un tratamiento de endodoncia en el que el riesgo de un accidente o complicación sea inminente o de que ya se espera un fracaso del tratamiento. Es importante que los profesionales realicen un diagnóstico y un plan de tratamiento adecuados para cada caso, ya que esta conducta puede evitar las intercurrentencias clínicas. Además, si se producen intercurrentencias, se debe informar al paciente sobre cómo proceder.

PALABRAS CLAVE: endodoncia, extravasación de materiales terapéuticos, ápice del diente, apicectomía, cirugía oral.

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