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Endodontic surgery in a lower molar affected by root resorption and fractured instrument

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***Abstract*—** *Endodontic treatment is responsible for cleaning and shaping the root canals after they have been affected by diseases in their pulp. However, some clinical complications that are inherent to the treatment may occur, such as fracture of instruments inside the conduit, perforations, and anatomical anomalies. When this occurs and it is not possible to carry out an endodontic intervention, opt for endodontic surgery. The aim of this study is to report a clinical case of endodontic surgery in a lower molar with a fractured file and resorption process. A patient was assisted who had a necrotic dental element, symptomatic, mesial root with fractured file and distal root with resorption process proven in the initial radiograph. In the first session, anesthesia, access surgery, absolute isolation, irrigation with 2.5% sodium hypochlorite were performed and an attempt was made to remove the fractured instrument with an operating microscope and an ultrasound insert, but this was unsuccessful. In this way, the dental element instrumented with rotary files logic 25/05, dried and filled with thermoplasty technique, using bioceramic cement. In the second session, endodontic surgery was performed with removal of the fractured instrument. A 2-month follow-up was performed, analyzing the pathology and symptomatology regression. The patient was asymptomatic and undergoing tissue repair in the mesial and distal root. It is possible to conclude with this clinical case that endodontic surgery is feasible in cases of fractured instrument and resorption process, thus allowing the remission of the pathological process, paralysis of the infectious process and permanence of the function and aesthetics of the dental element.*

I. INTRODUCTION

Endodontic treatment aims at chemical and mechanical preparation to remedy pulpal and periapical alterations, thus allowing the rehabilitation of the dental element. The procedure consists of promoting the cleaning, modeling and obturation of the root canal system to reduce the number of microorganisms present and consequently reduce the infection. However, conventional endodontic treatment may fail due to several clinical or accidental complications, including poorly installed intraradicular retainers, calcifications, and persistent infections (Cohen & Hargreaves, 2017).

It is known that during endodontic treatment, fracture of instruments is among the most reported accidents and may be caused because of torsion or flexion forces, as well as instrument fatigue. Canal obstruction can interfere

with canal cleaning and shaping, which compromises periradicular healing and negatively affects the outcome of endodontic treatment. However, fracturing an instrument during endodontic treatment is an unpleasant situation that can happen to any professional who practices endodontics daily (Leonardo, 2017).

External root resorption is a loss of tooth structure, initiated by a mineralized area due to infection by microorganisms, which can cause irreversible damage to the tooth structure, requiring adequate treatment and monitoring (CVEK, 1973; SJOGREN et al., 1997).

For resolution of complex cases, endodontic surgery can be used. This surgery proposes to remove the periapical lesion, apical curettage, apicectomy aiming at the posterior closure of the apical foramen with biocompatible material, capable of stimulating the formation of hard tissue (Bárbara et al., 2022).

The aim of this study is to report a clinical case of endodontic surgery in a lower molar with a fractured file and resorption process.

Clinical case report

The patient was approached in the triage sector of the multidisciplinary clinic of the specialization course in endodontics at IPE – Palmas – Brazil and was identified in the initial radiograph fracture of a manual file in the mesial root and process of resorption in the distal root (Figure 01).

The treatment was carried out in two sessions following the following protocol:

1st session

Anesthesia was applied with Lidocaine 1:200000 (Dentsply/Sirona, Ballaigues - Switzerland). Later, tooth prophylaxis was performed with a straight white CA brush (Microdont, Socorro - SP) and Herjos prophylaxis paste (Vigodent, Rio de Janeiro - RJ) and coronal opening with drills 1014 and 3082 (KG Sorensen, Barueri - SP).

Absolute isolation was performed with a rubber sheet (Madeitex, São José dos Campos - SP), Ostby isolation arch (Prisma, São Paulo - SP) and various isolation clamps (KSK, Rio de Janeiro - RJ) disinfection of the operative field with 0.2% chlorhexidine (A Formula compounding pharmacy, São Paulo - SP).

Initial exploration with a #10 K file (Dentsply/Sirona, Ballaigues - Switzerland) was carried out until the apical region of the tooth was perceived. Subsequently, the preparation of the cervical third will be carried out with a Logic file 25/05 and through the operating microscope and ultrasound insert, an attempt was made to remove the fractured instrument in the mesial root. However, it was not successful. It was decided to perform the chemical and mechanical preparation on the mesial root below the fractured instrument and on the distal root conventional procedure.

During the entire instrumentation, irrigation was performed with 2.5% sodium hypochlorite (Manipulation Pharmacy – Formula and Action – São Paulo – SP), using a 10 mL Lüer Slip plastic syringe (Advantive, Nanchanc Jangxi - China) and a needle. disposable 25 x 0.55 (BD, Curitiba - PR). 30 mL of irrigating solution were used.

The final irrigation was performed with 3 mL of EDTA (Ethylenediaminetetraacetic acid) 17% (Manipulation Pharmacy – Formula and Action – São Paulo – SP). First, 1 mL of 17% EDTA was introduced, followed by ultrasonic vibration with a 25 IRRI S insert (VDW; Endo Ultrasonic Files, Endodontic Synergy, Munich, Germany) at a frequency of 30 kHz. The ultrasound insert was connected to a piezoelectric ultrasound operating at 30 kHz (CVDent 1000; CVD Vale, São José dos Campos, SP, Brazil), set at power level 2, for a period of 20s. This process was repeated 2 more times. After this process, irrigation was performed with 5 mL of 2% chlorhexidine gel and saline solution (Farmácia Formula & Ação, São Paulo - SP. The canals were dried with capillary tips (Ultradent Products, Inc, South Jordan, Utah, USA) coupled to a high-power sucker and absorbent paper cones (Tanari, Manacapuru - AM).

The obturation of the root canal system was performed with a thermoplastified technique and bioceramic obturator cement was used. The definitive restoration with composite resin was performed after the treatment and the final radiograph was taken with a radiographic positioner (Indusbello, Londrina - PR) (Figure 02).

2nd Session (The second session will be held after 7 days)

With the aid of a 701 truncated conical drill (JET Carbide – Beavers Dental -Canada), at high speed and under abundant irrigation with saline solution (Laboratório Farmacêutico Arboreto Ltda. – Brazil), grinding was performed on the buccal cortical bone, in the region just below tooth #36 to join the points of disruption of the cortical bone affected by the lesion itself. Afterwards, a chisel was also used to continue removing the bone, now in a less invasive way in the sense of not breaking the cystic capsule. A bone pocket was opened to completely remove the lesion with the help of the back of curettes.

After removing the entire surgical specimen, an apicectomy was also performed in the mesiodistal direction to form a 90º angle with the long axis of the tooth (Figure 03).

During the entire removal of the apical portion of the mesial root and removal of the fractured instrument, intense irrigation with saline solution was maintained to wash the surgical pocket, to completely remove necrotic remains of the lesion, bone scrapings and the root apex that had ended. to be removed (Figure 04). The surgical site was cleaned and dried with sterile gauze. The suture was performed with simple interrupted stitches in the region of the relaxing incision on the sides and interdentally in the region of the gingival papillae with Vicryl 4.0 thread (Brasuture Ind. Com. Imp. Exp. Ltda. – Brazil). A periapical radiograph was taken right after the completion of the procedure (Figure 06) and anti-inflammatory medication was prescribed for six days (Nimesulide 100 mg) and antibiotics for seven days (Amoxicillin 500 mg). The suture was removed seven days after the surgery and 2 months after the procedure were allowed for follow-up.

A 2-month follow-up was performed, analyzing the pathology and symptomatology regression. The patient was asymptomatic and undergoing tissue repair in the mesial and distal root (Figure 05).

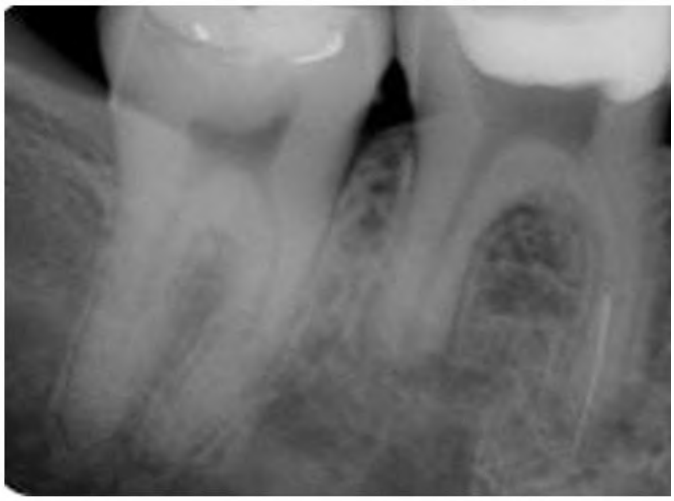

Fig.1 - Initial X-ray

Source: Own authorship

Fig.2 - Obturation of root canals with bioceramic cement.

Source: Own authorship

Fig.3 - Parendodontic Surgery

Source: Own authorship

Fig.4 - X-ray right after endodontic surgery

Source: Own authorship

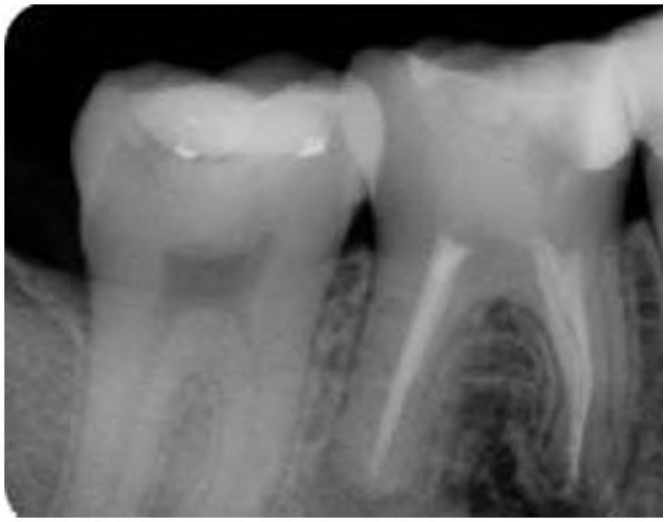

Fig.5 - Two-month follow-up X-ray

Source: Own authorship

II. DISCUSSION

Root resorptions are characterized by a non-bacterial destruction of cementum or mineralized dentin due to the interaction of clastic cells and dental hard and soft tissues. The resorption that occurs in the permanent dentition is considered pathological, that is, it is an unwanted resorption. The resorption that occurs in the deciduous dentition is considered favorable because it is through root resorption that exfoliation of the deciduous tooth occurs and subsequent eruption of the permanent successor. They are classified as internal, when they originate inside the root canals, related to the pulp, or external, when they originate externally in the tooth in contact with the periodontal surface of the dental root. In the case in question, it is a pathological resorption of the external type in the distal root, which was filled with bioceramic material (Nascimento et al., 2006).

The choice of Mineral Trioxide Aggregate (MTA) is justified by its physical-chemical properties and its biocompatibility/bioactivity. Its mechanism of action, like calcium hydroxide, promotes fundamental and targeted processes of alkalinity, calcification, mineralization, and tissue repair. It is a material widely indicated for clinical situations in Endodontics, such as in endodontic surgeries, intraradicular and furcation perforations, as a retrofilling material, pulpotomy, pulp capping, as a cervical cap in internal tooth whitening and as a stimulator of apicigenesis and apexification (Laranjeira, 2021).

Currently, the MTA bioceramic filling material has been increasingly used by professionals in special cases. This is due to its properties such as greater compatibility, greater sealing, good antimicrobial activity, induction of cementoblast and osteoblast formation and favoring periodontal regeneration, which is fundamental. Therefore, the physical, chemical, and biological properties of MTA added to its clinical applicability indicate a propitious performance of this material in dentistry. Several studies have shown us that MTA can indeed induce repair in periapical tissues and that it also has an excellent sealing capacity and mechanical properties, even in contact with moisture, characterizing itself as a good apical sealing material (Sarzeda et al., 2019).

In addition to root resorption, the dental element had a fragment of a file after a clinical accident, with greater difficulty in removing it conventionally due to its apical location. Thus, as it was not possible to remove it, we sought to solve it through endodontic surgery. This, in turn, was performed following the retrograde obturation technique, where a cavity is made in the root apex and its subsequent obturation (Khabiri et al., 2017).

Note, after surgery, the adequate filling of the conduits without the file fragment and with the two-month follow-up, it was already possible to observe the satisfactory result with evidence of paralysis/decrease of reabsorption.

A cirurgia parendodôntica é um procedimento que permite a entrada ao local afetado, retirar o tecido contaminado, analisar a raiz e o sistema de canais radiculares, aplicar um bom material selador biocompatível, favorecendo a regeneração do periodonto (MENDES et al., 2018). Então este procedimento tem como via de acesso a mucosa bucal e o alvéolo com a finalidade de resolver patologias resistentes ao tratamento endodôntico convencional.

Parendodontic surgery is indicated in cases where conventional treatment or retreatment is not possible or when no result has been achieved; in teeth with persistent periradicular pathological process; poorly performed endodontic treatment; in cases of root perforations or periapical tissue with abnormal bodies; prosthetic crowns and intraradicular posts that prevent endodontic retreatment or when the root canal is calcified or obstructed by fractured instruments. Generally, the indication is related to the presence of persistent periapical infections, observed on radiographs as a large radiolucent area. Another factor that may generate the need for this surgery is the presence of a dens in dente dental anomaly. The good result of this surgical procedure depends, initially, on a correct indication, good execution of the surgical technique, correct choice of

retro obturator material, successful periodontal treatment, and appropriate surgical cavity (Orso, 2006).

Contraindications can be of both general and local origin. Those of general origin are related to the patient's organic disorders such as: diabetes, kidney problems, cardiovascular problems, hematological problems (blood disorders), patients who use anticoagulants, patients who have recently undergone radiotherapy in the face region, allergies, etc.

Those of local origin are poor implantation of the tooth in the bone, presence of bone loss, short root, poorly filled canals that allow conventional endodontic retreatment, injury of anatomical structures, lack of periodontal support. It is also contraindicated in teeth with advanced periodontal lesions, marked anatomical proximity (maxillary sinus, nasal fossa, mandibular canal) and the presence of an acute infectious process.

Certainly, the experience and skills of the dentist are paramount factors. The applied technique, the systemic conditions of the patient, the location, number of teeth and dental classification, the amount and location of bone resorption, as well as the previous condition of the root canal treatment or retreatment, will directly influence its success (Basso, 2019). The choice of endodontic surgical technique will depend on the degree of complication, difficulty, and condition of the tooth to obtain good postoperative results.

III. FINAL CONSIDERATIONS

Removal of the fractured instrument through endodontic surgery and subsequent filling with bioceramic cement proved to be effective. Signs of new bone formation were observed during the two-month follow-up, confirming the solution to the problem and the success of the treatment, thus avoiding an early extraction. It should also be noted that extensive knowledge about therapeutic alternatives and clinical prognosis is of paramount importance for the dentist to be able to make the best treatment decision, seeking to preserve, whenever possible, the dental element and keep it in its function, even with low predictability. This surgery is quite invasive, so we should only perform it as a last resort, when the other procedures have not worked. Nowadays we have a greater predictability of favorable results thanks to the materials that are getting better, making possible an appropriate choice for each case and to the techniques that have evolved, causing less wear on the fabrics. In addition, the radiographic follow-up and follow-up of each case is extremely important.

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