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# ENDODONTIC TREATMENT IN A LOWER FIRST PREMOLAR WITH 3 ROOT CANALS: CLINICAL CASE STUDY

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**Abstract:** The dentist must be aware of anatomical diversities during endodontic treatment. Some dental elements may differ in the number of roots and root canals, so if a root canal is not formatted it may lead to failure of endodontic therapy. The objective of this study is to evaluate, through a case report, endodontic treatment in a lower first premolar with 3 root canals. A patient was treated who had a lower premolar in need of endodontic treatment due to a process of pulp necrosis. In the first session, anesthesia, access surgery, location of the 3 root canals, absolute isolation, irrigation with 2.5% sodium hypochlorite, odontometry, mechanized instrumentation, drying and insertion of intracanal medication (Calcium hydroxide) in all canals were performed.. In the second session (after 15 days), the intracanal medication was removed and the root canals were filled with the continuous wave technique. The patient appears asymptomatic. Case study alerts dental surgeons to the need to know the anatomical diversities in lower premolars and that endodontic treatment allows the remission of the pathological process and the maintenance of the function and aesthetics of the dental element.
**Keywords:** Endodontics. Periradicular abscess. Dental anomaly.

## INTRODUCTION

Knowledge of the anatomy of the root canal, especially the apical region, and the ability to correctly determine the length of the root canal can have an important effect on the prognosis of endodontic therapy (Morfis et al., 1994).

Bacterial contamination can reach the most apical part of the root canal and, occasionally, the periapex. The best prognosis for root canal treatment is homogeneous instrumentation and obturation of the apical constriction and the worst prognosis is instrumentation and obturation in addition to the apical constriction, followed by obturation more than 2 mm short of the apical constriction, combined with poor instrumentation. and filling. Instrumentation performed at the ideal limit will not only ensure the maintenance of the "minimum apical opening" of the ideal preparation, but will also limit the passage of harmful instruments and products from the interior of the root canal to the periapical tissues. There are those who recommend, in addition to achieving apical patency, cleaning the apical foramen, which implies instrumentation of the root canal along its entire length, but in more than 60% of root canals the main foramen is not located at the apex, and the distance between the main foramen and the radiographic apex varies from 0 to 3 mm (Wu et al., 2000).

Lower premolars and molars can present significant anatomical variations, such as extra roots and canals, which, when not located and treated, the success rate of the entire treatment tends to decrease (Vertucci, 1939). The root canal anatomy of each tooth has common characteristics as well as typical variations that require special attention during root canal treatment (Slowey, 1979). The relative simplicity and uniformity of external root surfaces often mask a complex internal morphology (Lee et al., 2009). Therefore, the exact details of the canal systems and their anatomical variations must be considered to achieve a successful outcome (Alenezi et al., 2020).

Periapical radiographs remain one of the most widely used aids in endodontic procedures, providing useful information to the clinician. Despite their widespread use, these images produce limited information, such as morphological changes, bone density around X-ray angles and contrast, which can influence radiographic interpretation. The lack of third-dimensional information and

areas of interest obscured by overlapping structures in the images can interfere with making an accurate diagnosis. To overcome these limitations and provide high-resolution images, computed tomography techniques have emerged that allow images to be obtained in three dimensions (3D), including cone beam computed tomography (CBCT) (Patel et al., 2015) .

Given the context, the objective of this study is to evaluate, through a case report, endodontic treatment in a lower first premolar with 3 root canals .

## METHODOLOGY

This work is a basic, qualitative and descriptive study of a clinical case report.

The patient was only treated after approval by the ethics committee (**Opinion Number:** 2,811,630) and signing of the informed consent form.

The sample for this work consisted of 01 patient, who was selected through the existing care records in the Diagnostic and Comprehensive Clinical disciplines of the Dentistry course at CEULP/ULBRA– Palmas– To .

Initially, anamnesis, tactile inspection and periapical radiography of element 44 (Figures 01 and 02) were carried out to confirm the diagnosis of pulp necrosis and radiographically observed the number of extra root canals. Clark's radiographic technique helped identify extra root canals.

Figure 01 – Element 44

Source: Own authorship

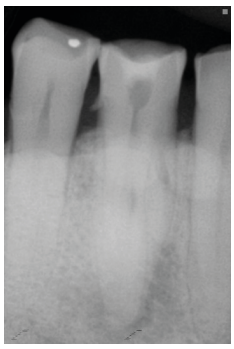

Figure 02 – Diagnostic radiography

Source: Own authorship

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) and access surgery with diamond tips 1014 and 3082 (KG Sorensen, Barueri-SP).

Absolute isolation was carried out with a rubber sheet (Madeitex, São José dos Campos-SP), an Ostby isolation arch (Prisma, São Paulo-SP) and a clamp for various isolation (KSK, Rio de Janeiro - RJ) disinfection of the operative field with 2% chlorhexidine (A Formula compounding pharmacy, São Paulo-SP).

Initial exploration with a #10 K file (Dentsply / Sirona, Ballaigues - Switzerland) was carried out until it was clear that it had reached the apical region of all root canals. Subsequently, the preparation of the cervical third was carried out with a 15/10 Prodesign $S_2$ rotary file, odontometry with a foraminal locator and preparation of the apical third with the 15/03 and 25/06 files.

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

The root canal, at the end of preparation, was dried with capillary tips tips (Ultradent Products, Inc, South Jordan, Utah, USA) coupled to a high-power sucker and with absorbent paper cones (Tanari, Manacapuru-AM). Immediately afterwards, intracanal medication, calcium hydroxide (Calen, SSWhite, Ballaigues – Switzerland), was inserted with the aid of a number 40 lens and the coronal sealing with glass ionomer.

**2ND SESSION (THE SECOND SESSION WAS HELD AFTER 15 DAYS)**

Anesthesia was applied with Lidocaine 1:200000 (Dentsply / Sirona, Ballaigues - Switzerland) and coronary opening with 1014 diamond tips (KG Sorensen, Barueri - SP), absolute isolation, irrigation with 2.5% sodium hypochlorite (Manipulation Pharmacy – Formula and Action – São Paulo – SP), using a Lüer plastic syringe Slip 10 mL (Advantive, Nanchanc Jangxi - China) and a 25 x 0.55 disposable needle (BD, Curitiba - PR) and Prodesign S $_2$ 25/06 rotary file to the apical third of the dental element in all root canals, to remove intracanal medication.

The root canals, after completion of preparation, were dried with capillary tips tips (Ultradent Products, Inc, South Jordan, Utah, USA) coupled to a high-power sucker and with absorbent paper cones (Tanari, Manacapuru - AM).

The final irrigation was performed with 3 mL of EDTA (ethylenediaminetetraacetic acid) 17% (Compounding 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 3, over a period of 20s. This process was repeated 2 more times. After this process, irrigation was carried out with 5 mL of 2.5% sodium hypochlorite (Farmácia Formula & Ação, São Paulo – SP). The canal was dried with capillary tips tips (Ultradent Products, Inc, South Jordan, Utah, USA) coupled to a high-power sucker and with absorbent paper cones (Tanari, Manacapuru - AM).

The filling was performed using the thermoplasticization technique along the entire length of the root canals (Figure 03). Provisional restoration with glass ionomer cement and final radiography were performed. (Indusbello, Londrina - PR).

Figure 02 – Final radiograph

Source: Own authorship

**SPEECH**

Costa et al., 2022 carried out a systematic review of the literature, evaluating national studies on the determining aspect in the execution of endodontic treatment due to the specific lower premolar anatomy. As a result of their study, they found that there was no significant association between the number of roots and the patient's sex. They concluded that the complex anatomy of the lower premolars is the reason for several cases of clinical frustration, considering the number of roots and the diversity of root canals

and the difficulty in identifying them. They highlighted that knowledge of dental anatomy and the use of diagnostic solutions are of enormous importance in terms of treatment efficiency. The present work corroborates this study, as it deals with a lower first premolar with 3 root canals.

Brenda, et al., 2011, analyzed the internal root anatomy of lower premolars using radiographic and tomographic examinations. The sample consisted of ten lower premolars, inserted into four human jaws, from the collection of the Anatomy discipline at the Federal University of Espírito Santo. The jaws were first photographed. The teeth were then submitted to radiographic examination using the periapical technique. The images obtained were digitized, stored in a computer file and analyzed by three examiners. Computed tomography scans of the specimens were performed using the Cone Beam technique. The results showed that the average evaluations by radiographic examination were 50%, 43% and 7% for one channel, two channels and three channels, respectively. And the tomographic examination found in 40% of the teeth evaluated a single root canal (type I) and in 60% of the teeth, type V canals, that is, canals that begin as units at the level of the pulp chamber and, before reaching the apex, undergo a bifurcation. They concluded that the three-dimensional image provided by Cone Beam computed tomography represents a major advance as an auxiliary method for establishing endodontic diagnosis. In the present study, the Clark radiographic technique was used to determine extra root canals.

Oliveira et al., 2016, carried out a study to evaluate the root anatomy of lower first premolars in a population from the Northeast of Brazil, through external analysis of the roots, digital radiography and clearing. One hundred extracted teeth were selected. Clinical analysis evaluated root characteristics and included number of roots, presence and type of root grooves on proximal surfaces, occurrence and type of root dilaceration, root size and shape. Two radiographic examinations (orthogonal and mesio -distal) were performed, followed by diaphanization. The results revealed a higher occurrence of single roots (96%), with a conical pyramidal shape (53%), presence of root grooves (71%) and apical laceration (46%). In the orthogonal position, 75% of the teeth presented a canal, while in the mesio -distal position this value was 57% ($p = 0.00$). In clearing, the most common branching was intercanal (38.9%) and, for the Vertucci type, type I was the most frequent (63%). When comparing the Vertucci classification on radiography and diaphanization, there was a statistically significant difference ($p= 0.00$). They concluded that the lower first premolars, in the studied population, presented great variation in root anatomy, which can generate difficulties during endodontic treatment.

With the intention of reinforcing the relationship between knowledge of internal anatomy and achieving success in endodontic treatment, Portela et al. (2011) carried out a literature review, reporting the characteristics of the internal anatomy present in the premolar dental group. They pointed out that morphological changes, when disregarded, can make endodontic therapy difficult and the resolution of clinical cases with unusual anatomy consequently requires changes in the diagnostic method, as well as in treatment. They concluded that the identification of anomalous anatomy provides satisfactory treatment of roots and canals, thus reducing the persistence of signs and symptoms and reducing the possible causes of retreatment.

Bürgel & Borba (2011) evaluated, using SEM, the average diameter of the main foramen of the root canal of lower premolars, the distance between the main foramen and

the vertex of the root apex, and determining the location of the main foramen. 45 extracted human lower premolars were used. Using a scanning electron microscope device, measurements were made of the diameter of the foramen and its distance from the apex of the root apex. The surface on which the foraminal openings appear was noted. The collected data were transferred to Excel® (Microsoft) spreadsheets and analyzed using tables, graphs and descriptive statistics. The result was that 56% and 75% of the first and second lower premolars analyzed had only one foraminal opening, with their average diameter being equivalent to 332.6 μm and 335.6 μm for these teeth, respectively. In 24.2% of cases, the main foramen was exteriorized distally and, in 21.2%, mesial. Only in 9.1% of cases did the main foramen end exactly at the apical vertex, with the average distance to this point in the lower premolars being 1.1 mm for the first and 1.0 mm for the second.

Ferreira et al., 2021, carried out a descriptive analysis of the internal dental anatomy of mandibular premolars and molars of a population, using cone beam computed tomography scans from the FMDUCP Clinic database. Tomographic images were selected in which the premolar and lower molar teeth were found in the mouth. The images included in the study were correlated according to Vertucci 's classification and the prevalence of extra roots and canals, molars with C-shaped canals, presence of Radix entomolaris and paramolaris. A descriptive analysis was carried out, of the types of teeth evaluated and the characteristics mentioned above for each group of teeth. They obtained as a result In a sample of 40 CBCTs, 151 teeth were analyzed. The majority of 1st and 2nd premolars had only one canal and mostly had a Vertucci type I morphology ; the 1st and 2nd molars mostly had 3 canals, type IV according to Vertucci 's classification in the mesial root and type I in the distal root; The majority of the 3rd molars had 3 canals with a Vertucci type II mesial root canal morphology and in the distal root all teeth were Vertucci type I. The incidence of C- Shaped teeth in the first and second premolars was equal, with the second mandibular molars showing the highest incidence of this variation. It was not possible to observe the presence of Radix Entomolaris and Paramolaris. They concluded that adequate knowledge of root canal anatomy is very important for the success of endodontic treatment and the dentist must be aware of the complexity of root canal anatomy using the most recent and reliable diagnostic means to achieve better treatment results. reliable and favorable.

Wolf et al., 2021, performed a systematic review to analyze root canal configuration (RCC) and mandibular second premolar (Mn2P) morphology. Of the 1,622 studies analyzed, 44 studies that investigated the internal morphology of 17,839 Mn2Ps were included. The majority of Mn2Ps examined were single-rooted (89.5–100%); two-root (0.1–8%) and three-root (0.1–3.5%) Mn2Ps at lower frequency. The most frequent CRCs reported were 1–1–1/1 (55.3–99.6%), followed by 1–1–2/2 (0.5–57%) and 2–2–2/2 (0.6–18%). The meta-analysis of seven studies demonstrated that a significantly greater number of CRC types 1–2–1/1 (OR [95%CI] =2.05 [1.27, 3.33]) and 2–2–2/ 2 (OR [95% CI] CI%] = 2.32 [0.65, 8.63]) were observed in male patients than in female patients. Different CCR research methods have been reported. While cleaning and x-rays were commonly used in the past, CBCT has been more prevalent in recent years. An overall high frequency of a 1–1–1/1 RCC in Mn2P has been reported. However, the probability that different and more complicated CCRs may appear in Mn2Ps should not be underestimated and should therefore be taken

into account when making decisions during endodontic treatment.

Lemos et al., 2022, investigated the anatomy of the internal root canal of maxillary and mandibular teeth. premolars in a Brazilian subpopulation in order to establish the prevalence of the different configurations proposed by Vertucci. Three hundred and ninety-eight cone beam computed tomography. The exams were collected from a database at a private imaging clinic in Rio de Janeiro, including 217 maxillary and 226 mandibular exams. A total of 1,316 premolars (594 upper and 722 lower) were evaluated using an image viewer and classified according to Vertucci. Two calibrated examiners determined the frequency of each morphological type. A third examiner reviewed discordant cases. The Kappa test was applied to verify agreement between evaluators and Fisher's Exact Test to verify differences related to gender. The most frequent configurations of the root canals of the maxillary first and second premolars were Type IV. (73.86%) and Type I (47.18%), respectively. Type I was the most prevalent in the first mandibular and second premolars (80.59% and 95.86%, respectively). Only Types I and VIII showed a significant difference between the sexes. Type I was more common in females and Type VIII in males. The highly significant frequency of Type I was found in mandibular first and second premolars, while the most frequent root canal configuration of maxillary premolars was Type IV for first premolars and Type I for second premolars.

## CONCLUSION

Case study alerts dental surgeons to the need to know the anatomical diversities in lower premolars and that endodontic treatment allows the remission of the pathological process and the maintenance of the function and aesthetics of the dental element.

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