

Use of Reciproc in mandibular premolar with double-curved root canals: a case report

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ABSTRACT

Introduction: Chemical-mechanical preparation enables antiseptics of the root canal system through the action of chemical substances, being crucial for a favorable prognosis of endodontic treatment. In 2010, two new systems were introduced to the market, aiming at instrumentation by means of the single-file reciprocating technique. **Objective:** To report a clinical case of endodontic intervention carried out by means of Reciproc R25 instrument. **Case report:** A Caucasian female patient was referred for endodontic evaluation. Clinical examination showed Class I composite resin restoration and fixed, supported prosthesis between teeth #44 and #45, active fistula, absence of both periodontal pocket and dental mobility. Thermal and electrical pulp sensitivity tests yielded negative results. Radiographic examination

revealed both double-curved root canal and diffuse rarefying osteitis. Diagnosis of pulp necrosis and chronic periapical abscess of tooth #44 was established, and endodontic therapy was then instituted. In the first visit, the root canal was biomechanically prepared by means of asymmetric reciprocation with Reciproc R25 files, intracanal dressing with Ca(OH)₂ PA and propylene glycol, and double coronal sealing with coltosol and glass ionomer for 30 days. In the second visit, the root canal system was filled. The patient has been asymptomatic for two years, exhibiting clinical and radiographic evaluations within normality. **Conclusions:** The Reciproc system contributed decisively to chemical-mechanical preparation, thereby contributing to the success of the proposed clinical case.

Keywords: Pulp cavity. Endodontics. Root canal filling.

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Introduction

Infiltration of bacteria as a result of caries and/or crown-root fractures is the most frequent cause of apical periodontitis. These microorganisms can invade the root canal system (RCS) and dentinal tubules. Therefore, the emergence and/or maintenance of a periapical inflammatory process result from the action of microorganisms and their by-products.¹ In this scenario, one can highlight facultative anaerobic bacteria, as they can deeply penetrate the dentinal tubules, which favors the emergence or maintenance of endodontic infection inside dentinal tubules.²⁻⁵

Thus, chemical-mechanical preparation is one of the main objectives of endodontic therapy, being crucial for a successful treatment⁶ while promoting antisepsis through the action of chemical substances. In this sense, sodium hypochlorite has been highlighted due to its bactericidal action, in addition to removing debris and organic remnants, as well as reducing the levels of microorganisms, thus favouring periapical repair process.⁷

Anatomical variation still represents a major challenge, given the complexity of root canal systems, with isthmuses, irregularities, ramifications, presence of angles and sharpened curvature, which can often lead to accidents and complications, such as perforations, deviations, undulations, and even fractures by endodontic instruments; thus, compromising sterilization during chemical-mechanical preparation and contributing negatively to treatment planning and prognosis.⁸

Rotary nickel-titanium instruments have been introduced into the market in order to enhance endodontic treatment, since they have advantages compared to stainless steel instruments, namely: flexibility, shape-memory effect, cutting efficacy⁹ and super-elastic behavior.¹⁰ However, these instruments are submitted to repetitive cycles, which can result in fracture mainly in curved root canals. There are also other factors (e.g. sharpened angle and radius of the root curvature, fatigue to flexion and torsion) which can damage the instrument and eventually lead to fracture.¹¹

Based on Roane's alternate movements and aiming to reduce the cyclic fatigue of instruments as well as obtain faster instrumentation, two new instrumentation systems using the single-file reciprocating technique were launched, namely: Reciproc™ (VDW, Munich, Germany) and WaveOne™ (Dentsply

Maillefer, Ballaigues, Switzerland),¹² which contributed decisively to the success of mechanical chemical preparation of root canals with complex anatomy.

Studies have shown that the use of reciprocating movement can extend the lifetime of endodontic instruments, since it is associated with a reduced cyclic fatigue compared to conventional rotary movement.¹³ Additionally, Reciproc™ R25 instrument has shown the ability to reach narrow and reasonably curved apices of mandibular molars without deviating from the trajectory in the majority of cases, which enables faster preparation compared to conventional rotary systems with several files.¹⁴

In cases of complex anomaly, the tridimensional filling of endodontic cavities also becomes a difficult task. As filling of root canal systems should act on anatomical irregularities, curvatures, isthmuses and ramifications, this process is dependent on an efficient chemical-mechanical preparation during endodontic therapy.¹⁵

In view of the above-mentioned considerations, it seems relevant to report a clinical case of endodontic intervention by means of Reciproc™ R25 asymmetric instrument for preparing the root canal of a mandibular premolar with double-curved roots.

Clinical case report

A caucasian female patient was referred to the graduate endodontic clinic of Associação Brasileira de Odontologia (ABO), in the city of Vitória da Conquista, Bahia, Brazil, for endodontic evaluation of her right first mandibular premolar. The main complaints reported by the patient were mild sensitivity to palpation and the presence of a little bubble draining a bitter substance. Clinical examination showed Class I composite resin restoration and fixed-supported prosthesis between teeth #44 and #45, including an active fistula located at the region of the bottom of the buccal sac. Neither periodontal pockets nor tooth mobility were found. Thermal and electrical pulp sensitivity tests were performed, all of them yielding negative responses. Radiographic examination revealed double-curved root canal and diffuse rarefying osteitis at the apical region with considerable bone loss (Fig 1). Diagnosis of pulp necrosis and chronic periapical abscess of tooth #44 was established. Endodontic therapy was then instituted.

In the first visit, endodontic access was obtained by means of a high-speed drill (KG 1558, Medical Burs, Cotia, Brazil). Pre-enlargement, odontometry (Fig 2) and reciprocating asymmetric instrumentation (Reciproc™ R25, VDW, Munich, Germany) were also performed following the manufacturer's instructions. Initially, pre-enlargement of cervical and middle thirds was performed with the instrument itself, followed by odontometry with Endex apex locator (Osada, Tokyo, Japan) and foraminal patency with manual K-file #10

(Maillefer, Ballaigues, Switzerland). Subsequently, the R25 instrument advanced up to the working length, 1 mm short from the apical foramen.

Substance used throughout chemical/mechanical preparation was 5.25% sodium hypochlorite (Lenza Farmacêutica, Belo Horizonte, Brazil). Thereafter, an ultrasonic tip (Enac ST 08, Osada, Tokyo, Japan) was activated in association with 17% EDTA (Fórmula & Ação, São Paulo, Brazil) and final irrigation with 5.25% sodium hypochlorite (Lenza Farmacêutica, Belo Horizonte, Brazil).

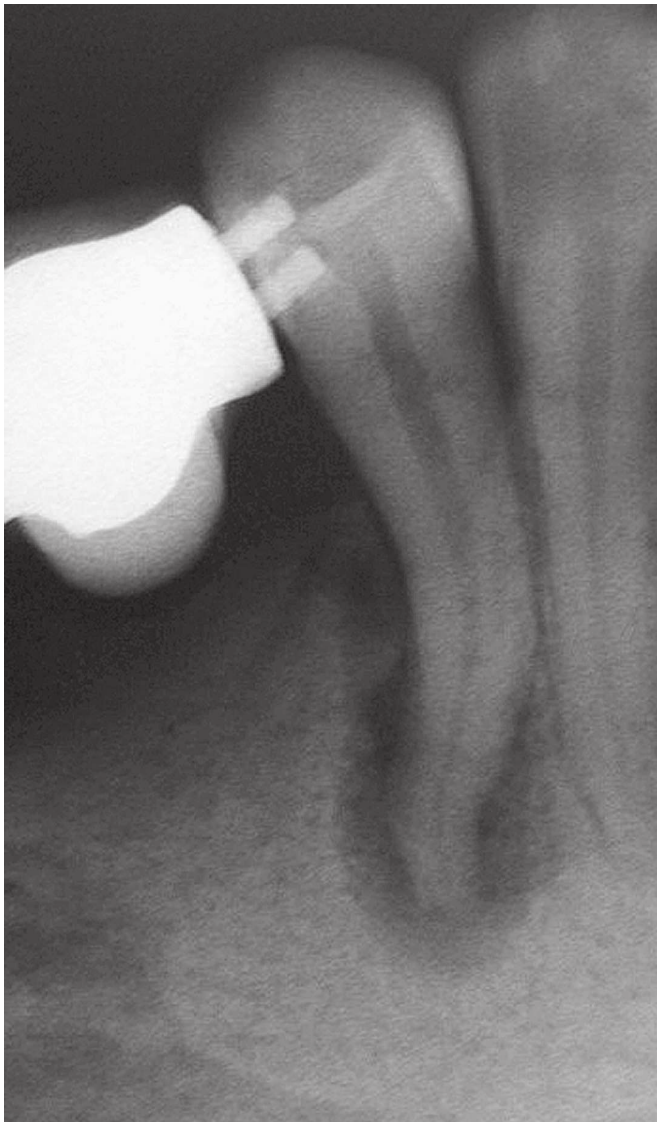


Figure 1. Preoperative periapical radiograph.

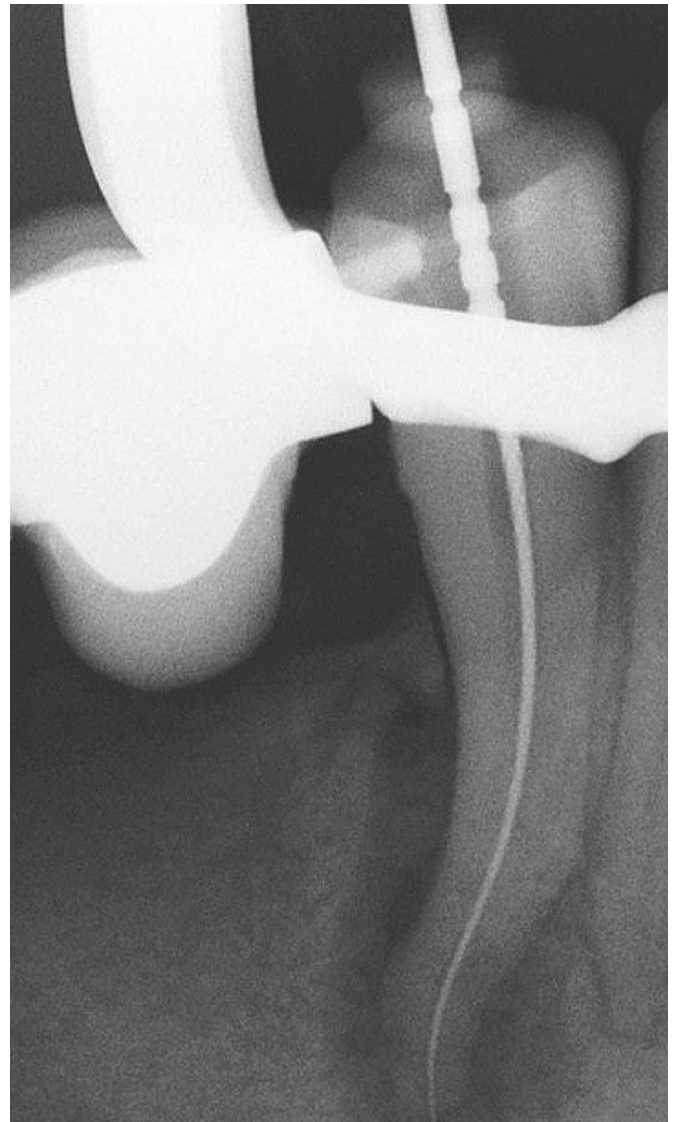


Figure 2. Odontometry.

The root canals were dried with absorbent paper points (R25, VDW, Munich, Germany) before the application of intracanal dressing (Fig 3) with calcium hydroxide PA (Lenza Farmacêutica, Belo Horizonte, Brazil) and propylene glycol (Lenza Farmacêutica, Belo Horizonte, Brazil). Subsequently, double sealing was carried out with coltosol (Vigodent, Bonsucesso, Brazil) and Ionoseal glass ionomer cement (Voco, Cuxhaven, Germany) for 30 days.

In the second visit, the patient was asymptomatic, and fistula healing was observed. Natural gutta-percha cones (Odous Medium, Belo Horizonte/MG, Brazil) were used (Fig 4) for try-in before filling the root canal (Fig 5) by means of vertical hydraulic

compression of accessory cones (advocated by De Deus¹⁶), with R25 gutta-percha (VDW, Munich, Germany) and Pulp Canal Sealer (Kerr Sybron Dental Specialites, California, USA). Temporary sealing with Ionoseal glass ionomer cement (Voco, Cuxhaven, Germany) was performed, and the patient was referred for restorative treatment. The case was documented by means of an operating microscope (Alliance, São Paulo/SP, Brazil). Follow-up clinical and radiographic examinations (Fig 6), after two years, showed re-establishment and repair of the periapical region, including masticatory and esthetic functions, by means of the restorative procedure.



Figure 3. Intracanal dressing.

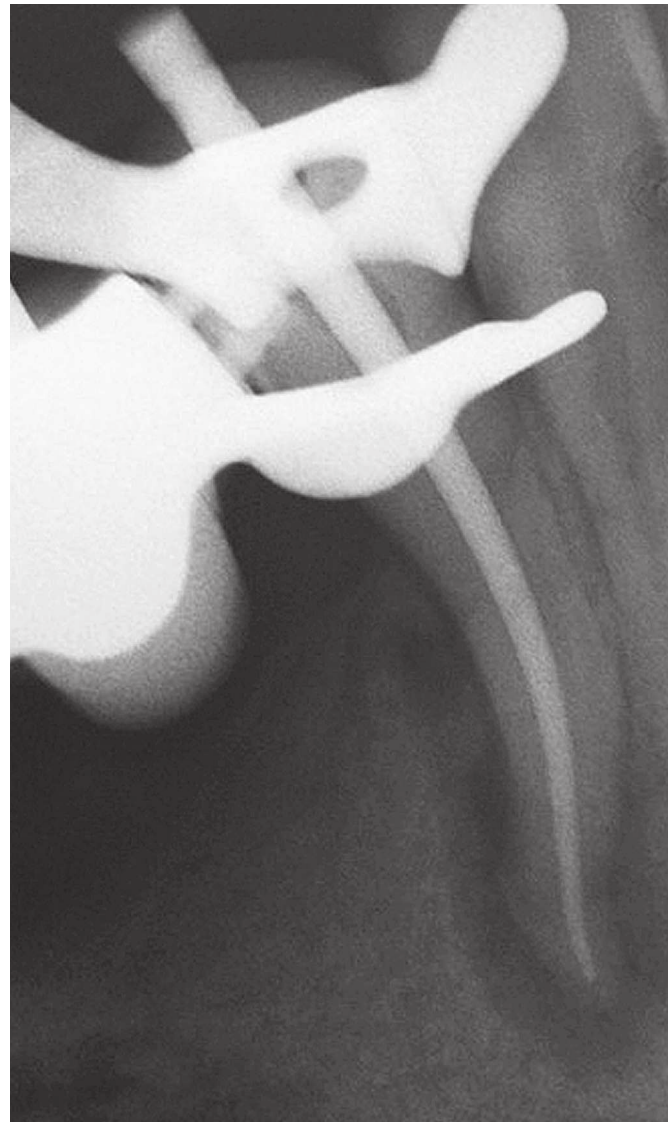


Figure 4. Cone try-in.

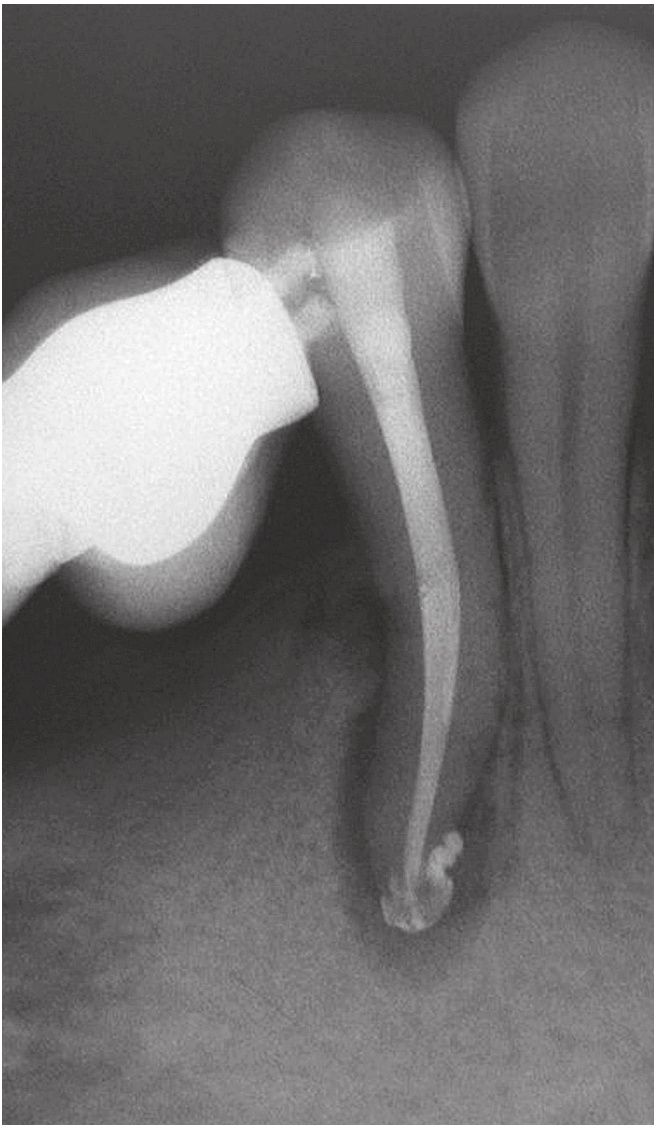


Figure 5. Root canal filling.

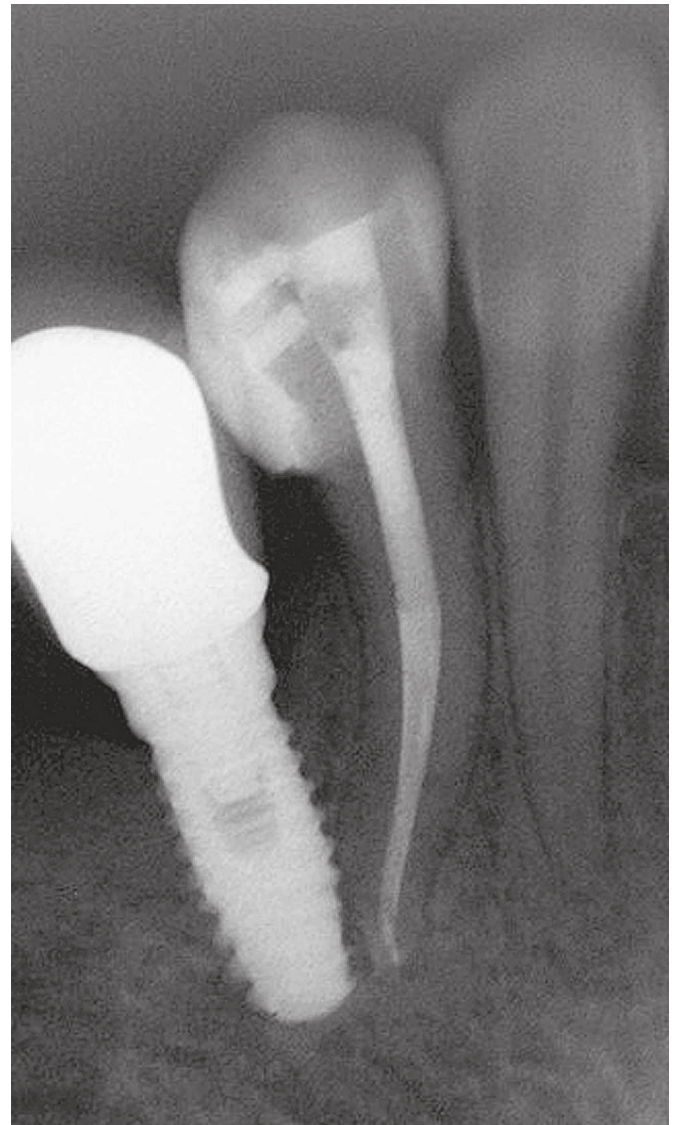


Figure 6. Two-year follow-up.

Discussion

The occurrence of accidents increases during shaping and cleaning of the root canal system by means of chemical-mechanical preparation, mainly in curved root canals. Therefore, in order to improve their performance, endodontic instruments had their physical and mechanical properties enhanced.¹⁷ The Reciproc™ single-file reciprocating system comprises files made of NiTi alloy (M-wire). It was launched in 2010 and has shown better mechanical properties and higher resistance to cyclic fatigue,¹⁸ which reinforced the safer use of this instrument in the present case report.

The cutting efficacy of instruments made of the new NiTi alloys is not affected, as they were thermally treated (M-wire), which rendered them more flexible and resistant to flexural fatigue, thereby providing greater efficiency in the mechanical preparation of root canals.¹⁹ A previous study compared the cutting efficacy of Reciproc™ R25 instruments to that of WaveOne™ Primary, showing that the former had a significantly better cutting performance.²⁰ This property was of crucial importance to choose Reciproc™ instruments for the treatment planning of the present clinical case.

The ability of cleaning and shaping root canals is also a relevant factor to be considered in the selection of such instruments. Two single-file reciprocating systems (Reciproc™ and WaveOne™) were evaluated by comparing them to two conventional rotary systems (Mtwo™ and ProTaper™), particularly in terms of performance in curved root canals of extracted teeth. Under the experimental conditions, all systems followed the curvature of root canals, thus demonstrating to be safe instruments. Reciproc™ and Mtwo™ systems, when compared to WaveOne™ and ProTaper™, provided better cleaning of the apical portion of the root canal.²¹ This advantage was crucial for the success of the case reported herein, which presented with diffuse rarefying osteitis in the apical third.

Two studies analyzed the fatigue resistance of Reciproc™ R25 nickel-titanium file. In the first study,²² the instrument was used both on continuous and alternate rotation, the basis for assessment of resistance to flexion fatigue. A significantly greater amount of cycles was achieved by rotary instruments operating on alternate movement mode, meaning that Reciproc™ R25 files have better resistance to flexural fatigue when used under alternate rotary movement compared to continuous movement mode. In the second study,²³ resistance to cyclic fatigue of Reciproc™ (VDW) and WaveOne™ (Dentsply) instruments was compared during treatment of artificial root canals

with a curvature angle of 60° and a radius of 5 mm. Both systems had the same diameter (0.25 mm), with each instrument being used until fracture. Reciproc™ R25 files took longer to fracture; thus, showing to be more resistant to cyclic fatigue.

Some advantages are present in Reciproc™ system, namely: safety – the amplitude of movement is determined by the rotation angles of the instrument in both clockwise and counter-clockwise senses, which is below necessary for file fracture; less chair time due to a smaller number of instruments necessary to achieve mechanical and biological objectives; quicker learning compared to continuous rotary systems; few procedural mistakes regarding debris extrusion and canal blockage; and elimination of patient cross contamination, as the instrument is immediately disposed after usage, thus requiring no manipulation to clean it, which also minimizes cross contamination involving the staff.²⁴

Conclusion

Reciprocating instrumentation has advantages and benefits over continuous and manual rotary instrumentation. Reciproc™ system contributed decisively to chemical-mechanical preparation, thereby contributing to the success of the proposed clinical case, with healing of the fistula, regression of lesion (radiographically) and restructuring of periapical tissues being observed.

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