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COMPARATIVE STUDY OF MANUAL AND RECIPROCANTING FILES ON THE CAPACITY OF OBTAINING APICAL PATENCY IN TEETH WITH ENLARGEMENT OF THE APICAL FORAMEN

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ABSTRACT

The aim of this study was to evaluate the ability to obtain patency in enlarged foramina using manual files and Reciproc. For this, forty-five mesial and palatal roots of lower and upper molars, respectively, were sectioned, instrumented and filled with gutta percha and AH Plus cement. They were then divided into 3 groups: G1 - foraminal enlargement, obturation at 3 mm from the apex and desobturation with Reciproc R25; G2 - foraminal enlargement, obturation at 3 mm from the apex and unblocking with a K # 10 hand file; G3 - patency, obturation at 1mm from the apex and release with Reciproc R25. The time required to reach foraminal patency was set, and after 5 minutes without reaching it, eucalyptol was used. The results showed that groups 1 and 3 had very similar times ($p > 0.05$) and patency was achieved in all samples. In group 3, the time required was much longer, and in one of the specimens it did not complete its objective. It was concluded that foraminal enlargement did not significantly influence patency. With regard to manual instrumentation, it was significantly slower to provide foraminal patency when compared to the Reciproc system.

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INTRODUCTION

The dentist who practices endodontics faces three conditions that require endodontic treatment on a daily basis: live, necrotic pulps and cases of retreatment. For success to occur, it is essential to recognize the particularities of each case. In canals with necrotic pulp and periradicular lesion, the infectious problem requires different treatment of teeth with live pulp, where there is no infection.

In this situation, success depends on controlling the infection through chemical-mechanical preparation, intracanal medication and root canal filling (SIQUEIRA JR. *et al*., 2011). Even with the scientific, technological and biological evolution in endodontics, there are still many cases of failure. In these situations, if there are viable conditions, the root canal retreatment should always be indicated before conducting a surgical procedure. (GOMES *et al*., 2003). The causes of failure of endodontic treatment are related, among other

factors, to the presence of bacteria, inadequate filling and coronal infiltration. In endodontic retreatment, it is also necessary to be concerned with the permanence of filling material, which leads to compromising the seal and sheltering remaining bacteria (KAHLILAK *et al*., 2013).Gutta-percha is a filling material that is widely used and offers, among other advantages, that of being easily removed during endodontic retreatments (MADANI *et al*., 2015).Endodontic cement has been seen as very important in root canal treatment and is often considered more important than gutta-percha itself (GAURAV *et al*., 2014).Grossman (1958) described the requirements that an endodontic cement must meet, emphasizing that it must provide an airtight seal and be insoluble in oral fluids. Other characteristics that an ideal endodontic cement should have are: being biocompatible, well tolerated by periradicular tissues, filling in irregularities in the canal, bacterial control, assisting in the laying of gutta percha, having its adhesion increased when removing the smear layer and impermeable sealing (ANDINÓS *et al*., 2011).

To promote root canal clearance, including gutta percha and cement, mechanical instrumentation or filling material solvents can be used (FRIEDMAN; STABHOLZ; TAMSE, 1990).During disobturation, when retreating the root canals, gutta percha is easier to remove than cement, this is mainly due to the fact that it is a material that has a more favorable consistency to be removed, especially when allied the use of solvents. The foraminal patency is a maneuver used to prevent the apical foramen from blockages that can be formed by the constant deposition of pre-existing materials in the canal and also from the instrumentation. It is a procedure advocated by most schools. It consists of placing a narrow gauge file in the apical region between the working length and the actual length of the foramen in order to clean and inactivate the materials that are in that region (LOPREITE *et al*., 2014). The main objective of this study was to evaluate the ability to obtain patency in endodontically treated teeth that had their apexes enlarged using manual and reciprocating files.

MATERIALS AND METHODS

Selection of teeth: This 45 human teeth (22 upper and 23 lower molars) with fully formed apexes were selected, which were previously removed due to periodontal involvement. From the roots of the upper molars, only the palate was used and in the lower molars the distal roots. The roots were randomly divided into 3 experimental groups of 15 teeth each. All teeth were donated by signing the informed consent form signed by the patients (ICF) for voluntary delivery of the samples.

Procedures

Cutting teeth: All teeth were cut with 010 x 22 mm double-sided diamond flexible disks (Kg Sorensen, São Paulo, Brazil) for a straight piece, so that all specimens varied in size between 10 and 14 mm in length.

Instrumentation, filling, storage and release: After cutting the elements, files # 08 or # 10 were used for initial exploration of the canal. In group I, foraminal enlargement was performed with a K type flexofile # 25 hand file, and instrumentation with titanium nickel hand files up to 3 numbers higher than the initial apical instrument, irrigating with sodium hypochlorite until the CRT, using Navitip irrigation tips (Ultradent, Utah, USA). After instrumentation and cleaning of the root canals, the conduit was dried with absorbent paper cones (to check for interference inside the canal).The obturationprocedure was initiated with the selection of a Reciproc R25 gutta-percha cones (VDW, Munich, Germany) that was calibrated in order to lock at 3 mm before the apical foramen. The cone was wrapped with sealer and inserted into the canal using the single cone technique, pouring cement beyond the apical foramen. Thus, the 3 mm of the apical region was filled with AH Plus endodontic cement (Dentsply DeTrey GmbH, Konstanz, Germany). After completion of the filling process, the foramen was cleaned, removing mainly the extruded cement and each element was wrapped in gauze and stored in a greenhouse at 37º C for one month. The unblinding process was started with Gates Glidden (Maillefer - Dentsply) # 3 and # 2 drills and then with a C-PILOT # 10 hand file. An attempt was made to obtain foraminal patency for a period of 10 minutes, for 5 minutes using a manual file without using a solvent and the remaining 5 minutes using a manual file using a Eucaliptol solvent. In cases in which foraminal patency was achieved, the time taken to reach the apical foramen was recorded, as well as the cases in which it was not possible to reach the foramen. The obtaining of the patent was verified through the visualization of the file beyond the apex of the element.In group 2, foraminal enlargement was performed in the same way as in group 1. The remainder of the process also followed in the same way, changing only the disobturation process. In this group, only a Reciproc R25 rotary file was used to remove the filling material. As in the previous group, we tried to obtain foraminal patency for 5 minutes using only the solvent-free file and, in cases where the patency was not achieved, another 5 minutes were used, with the aid of solvent. In cases in which foraminal patency was achieved, the time taken to reach the apical foramen was recorded, as well as the cases in which it was not possible to reach the foramen.In group 3, the foramen was not enlarged, only the apical patency with a K type flexofile file # 20 and instrumentation in the same way as the other groups. The entire next process was carried out equally, changing only in the process of uncleaning. In this group, the instrument used was the R25 file.

Analysis of results: The data were analyzed in a descriptive manner with registration of the mean, median and standard deviation. Subsequently, they were analyzed using the Kruskal-Wallis non-parametric test using the Statistics Pakage Software System (SPSS®) version 22.0, with differences being considered statistically significant when p was less than 5% ($p < 0.05$).

RESULTS

It was observed that there was a statistically significant difference to obtain foraminal patency between the experimental groups, where manual files were less efficient than reciprocating files in carrying out the patency. However, it was also observed that group 1 had a mean time similar to group 3, with no statistically significant difference, while teeth in group 2 showed a statistically longer time to achieve foraminal patency. Thus, foraminal enlargement did not have a statistically significant influence to achieve patency. Manual instrumentation was significantly slower in promoting foraminal patency when compared to the Reciproc system (Table 1).

Table 1. Average, in seconds, of the times required to establish foraminal patency, according to the experimental group

Group	N	Mean (s)	Standard-deviation	P
I	15	40,06[a]	3,79	
II	15	333,06[b]	24,67	<0,05
III	15	18,26[a]	2,66	

Superscript letters (a and b) indicate the presence of statistically significant differences (p <0.05). Kruskall-Wallis test.

DISCUSSION

Obtaining foraminal patency is a constant search in cases of endodontic retreatments, as it may be one of the main factors responsible for disinfecting the entire length of the root canal, aiming at restoring health in the periapical region.In this study, the objective was to compare the performance of manual and Reciproc files in achieving apical patency in enlarged or not apexes and filled at different distances from the foramen, using AH Plus cement.The results showed that foraminal patency was achieved in all cases in which Reciproc files were used, both 1 mm and 3 mm from the foramen, using eucalyptol in the most resistant cases. In the group in which a k-file # 10 hand file was used, only 1 of the 15 samples did not reach patency. Similar results were found by Carpenter *et al*., (2014) in which the patency was achieved in 90% and 80% of the cases in which eucalyptol was used as an aid in the clearance of gutta percha and MTA Filapex cement in working length and 2 mm, respectively, also with manual file k-file # 10.Different results were found by Hess *et al*., (2011). In this work using bioceramic cement, foraminal patency was achieved in 80% of the teeth filled in the working length, but it was achieved in only 30% of those filled in 2mm of this length. Heat, chloroform and manual and rotary instrumentation were used in the process of desobturation.The study by Fariniuk*et al*., (2011) also compared rotary systems with manual instrumentation for removing gutta-percha and AH Plus cement and found better results in the groups in which the rotary systems were used, as well as what was verified in this work.Already Madani*et al*., (2015) showed in their work that the D-Race and Pro taper Retreatment rotary systems compared to manual files were equally efficient in removing filling material, however without highlighting the time required for the processes.

Conclusion

It was concluded that foraminal enlargement did not have a statistically significant influence to achieve foraminal patency. Manual instrumentation was significantly slower in promoting foraminal patency when compared to the reciprocantingsystem.

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