

Comparative Study on Root Canal therapy Preparation with Rotating Tools Protaper Gold And Hyflex cm

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Summary

Aim: In the case of teeth clinically diagnosed with acute pulp irritation or complicated gangrene with periradicular lesions, endodontic treatment is the choice used by practitioners. The purpose of this in vitro study is to compare the ability of the rotary instruments, ProTaperGold and HyFlex CM, to prepare canals with medium and severe curves on extracted teeth.

Materials and methods: This experimental study was performed on 24 extracted permanent teeth, maxillary and mandibular molars without root resorption. Chemo-mechanical treatment was performed only at the mesio-vestibular and distal-vestibular canals of the upper molars, but also at the mesio-lingual and mesio-vestibular canals of the lower molars. The canals were divided into two groups (n = 28 each) and prepared with ProTaper Gold or HyFlex CM nickel titanium instrumentation, with the VDW Gold Reciproc Endodontic Engine. The fracture of the instruments during use, the reduction of the working length, and time needed for preparation were evaluated. The reduction of the working length was evaluated by making the difference between the initial working length and the final working length with pre-and post-instrumentation with rotary files on X-rays and Kodak Dental Imaging Software. The preparation time was measured in seconds using the Eurochron Timer EDT 9000 Schwarz timer.

Results: Teeth prepared with the HyFlex CM rotary tools achieved a lower reduction in working length (average = 0.15mm) compared to those prepared with Protaper Gold (0.22mm), statistically insignificant differences.

During the preparation of the 56 canals, a ProTaper instrument and one Hyflex CM were broken. The fracturing occurred at the second and third use respectively.

Regarding the preparation time, the shortest time was obtained with the HyFlex CM system (960 s), compared to the ProTaper system (1123s), again, the differences being statistically insignificant.

Conclusions: Canal preparation using the two Ni-Ti rotation systems did not lead to a major alteration of root system anatomy or working length. Therefore, we can conclude that ProTaper Gold and HyFlex CM are comparable in efficiency in preparing medium and severe curves.

I. Introduction

The preparation of root canals with moderate and severe curves remains a challenge, even for experienced endodontics. Since 1990, new and new titanium-nickel rotary tools have continued to appear on the market and develop in order to achieve a safer, more accurate and easy treatment, compared with stainless steel tools. (1.2). The success of a canal treatment consists of conserving the original root canal anatomy while avoiding fracture of the instruments during preparation or other iatrogenic processes such as reduction of working length, threshold formation, transport of the apex.)

So, in order to achieve these goals, we have chosen the use of ProTaper Gold and HyFlex CMT rotary tools. The HyFlex CM rotary file system is manufactured using a unique process that performs crystal-phase transitions from austenite to martensite at room temperature, unlike those of conventional NiTi, making them highly flexible and fracture resistant, according to producer ColteneWhaledent. Due to controlled memory,

those follow the canal anatomy, thus significantly reducing the risk of deviations, movement or perforation. Like stainless steel files, HyFlex system can be precurved. This is an advantage for extremely curved root canals to avoid creating thresholds. They have a shape memory integrated. They prevent stress during preparation by changing the shape of their spirals. They recover their form after heat treatment. A normal autoclaving process is enough to bring those to their original shape and regenerate crystalline structures and fatigue resistance. If the needle fails to regain shape after heat treatment, it is deformed plastic and thus increases the risk of fracture. After visual inspection, these needles are not used. The number of reusability, which can be determined by the user through visual inspection, is higher than that of conventional NiTi, according to the manufacturer. The ProTaper Gold system, compared to Universal, according to Dentsply Tulsa Dental Specialties, has increased flexibility, greater resistance to cyclic wear, a 11mm shorter handle, but a geometry and technique similar to that offered by ProTaper Universal. Therefore, in this in vitro study on extracted human molars, it was desired to compare the performance of the two file systems in conditions closest to clinical ones, assessing the degree of reduction in working length, the number of fractured instruments during preparation and the time required for the preparation of root canals.

II. Materials And Methods

For this study, a total of 24 extracted teeth were selected, both maxillary and mandibular, without root resorption (Figure 1.2). After extraction, the teeth were kept in saline (9% NaCl). The preparation was performed on the vestibular canals of the upper molars (mesio-vestibular 1/2, disto-vestibular) and on the mesio canals of the lower molars (mesio-lingual, mesio-vestibular). Each molar was incorporated into a parallelepiped of Zetaplus Putty for better stability (Figure 3). To limit the errors in determining the working length, the occlusal surface of the molars was planted smoothly. The molars were drilled with a D801L long diamond rounded endodontic burr, 1.6mm diam. In total, 56 canals of medium and severe curves were prepared.



Fig. 1,2: Teeth Lot 1, ProTaper Gold; 2, HyFlex CM



Fig. 3: Molar embedded in a parallelepiped of Zetaplus Putty for better stability

The teeth were randomly assigned to two groups of 12 molars and 28 canals respectively, each group being prepared with either ProTaper Gold or HyFlex CM. The pulp chamber was irrigated with 1 ml of 5,25% sodium hypochlorite solution. Subsequently, the third coronary root canal was enlarged with the Sx Pro Taper

Gold, Dentsply, 19mm rotation file, and the second group with the needle HyFlex EDM 25 / .12 Orifice Opener 15mm, with brushing motion. A glidepath was then established using the Kerr files 08,10,15 for both groups of teeth. The apex of the teeth was immersed in an water solution and, using the apex locator Raypex 6, VDW connected to a Kerr 10 inserted into the canal, the working length was determined. Then, radiographs of the teeth from both groups were performed with K-files 10 in the canals. The root canal length was measured in Kodak Dental Imaging's special software from the plane of the occlusal surface to the apex, corresponding to the tip of the Kerr file (Figure 4,5,6,7,8). This is the initial measurement of the working length, which will be compared to the final measurement, made after the preparation with the two systems.

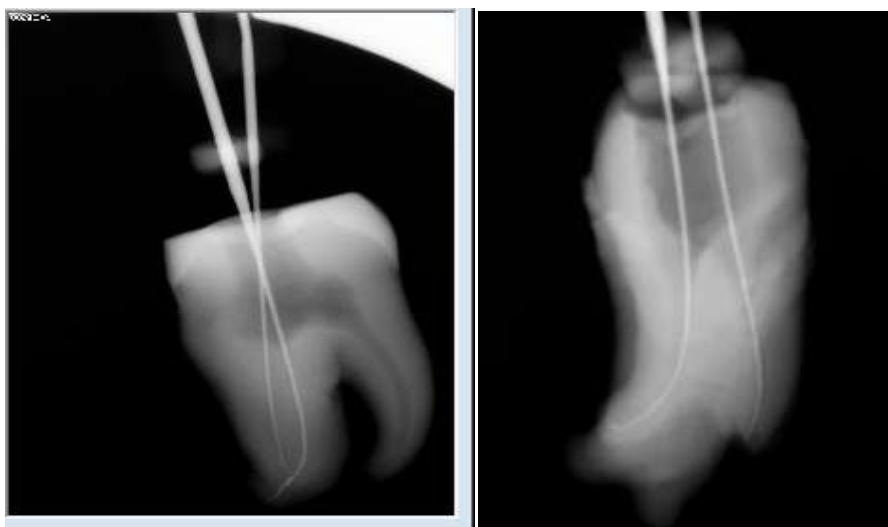


Fig. 4.5: Initial radiographs prior to rotary preparation with Kerr 10 files (ProTaper Gold and HyFlex CM)

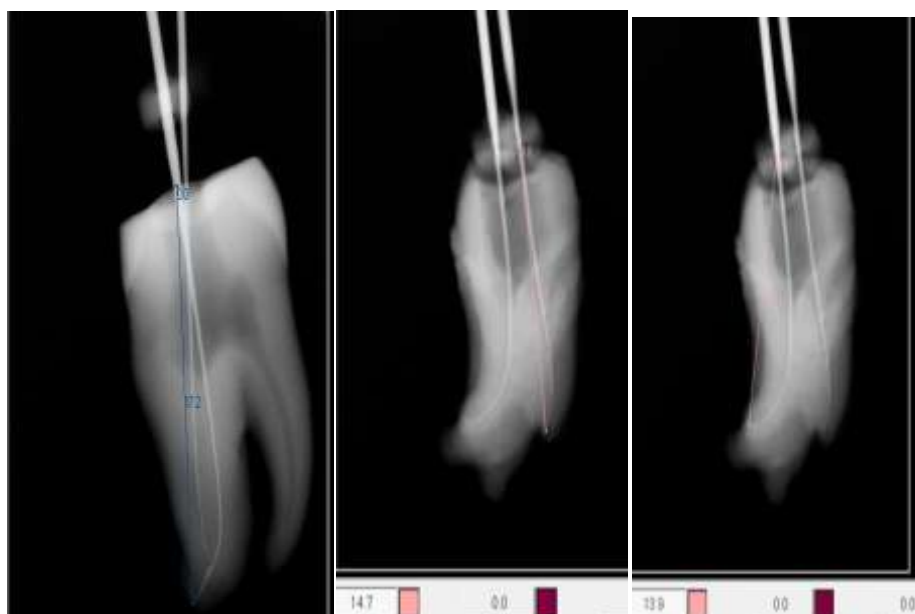


Fig. 6.: Initial radiography prior to HyFlex CM preparation with Kerr 10 files on the ML canal: 17.2 mm, measured using Kodak Dental Imaging

Fig. 7.8.: Initial radiographs prior to preparation with ProTaper Gold with Kerr 10 files on mesial canals:13.9mm; 14.7mm, measured lengths with Kodak Dental Imaging

For the first group of teeth, the root canal preparation was continued using the Ni-Ti ProTaper Gold file sequence: S1, S2, the finishing being done with the help of F1, F2. Between each file, was irrigated with 1 ml of 5% sodium hypochlorite solution using a 28 Ga irrigation needle and recapitulated with a Kerr file no. 10, then irrigated again. The rotating files are used at a rotational speed and a torque recommended by the manufacturer - the speed is the same, 300rpm, the torque being different: Sx, S1-5.1 N / cm; S2, F1-1.50 N / cm; F2-3.10 N / cm (Figure 9.10).

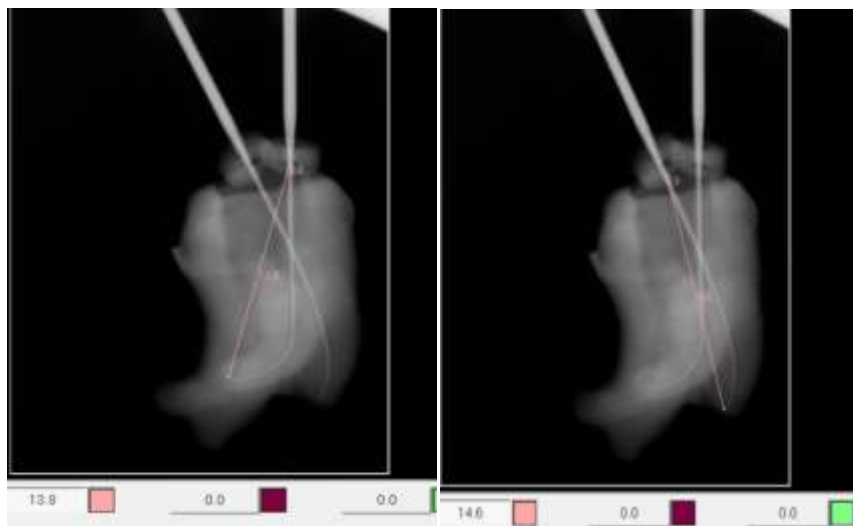


Fig. 9, 10: Radiographs made after preparation with ProTaper Gold, with Kerr files 10 inserted at the level of the mesial systems, measured using the Kodak Dental Imaging software: 13.8mm; 14.6 mm For the second group, root canal preparation continued with the HyFlex CM file system in the following sequence: 10/05, 15/04, 20/04, 25/04, 30/04. The rotation speed is between 300-500 rpm and the torque of 2.5-3.0 N / cm. Both types of rotating systems were used in the same VDW GoldReciprocatory Endodontic Micro Motor (Figure 11).



Fig. 11: Radiography performed after rotary preparation with HyFlexCM ; measurement was made with Kodak Dental Imaging: 17.1 mm.

After completion of the rotary preparation, a Kerr file was inserted into the canal and a second set of radiographs was made, the working length being quantified as the first time.

III. Results

Regarding WL, the teeth prepared using the HyFlex CM rotary files made a smaller reduction of the WL, the average difference between the initial WL and the final WL being of 0.15 mm. Canals prepared with Protaper Gold had a difference of 0.22. So between the two systems there is a difference of 0.07mm, but the value is too small to be statistically significant. Regarding instrument fracture during the preparation of the 56 channels, a ProTaper Gold S1 instrument was separated in the first group, in the apical third, after a severe curvature, this being at it's second use. In the second group, a HyflexCM 15/04 instrument was fractured under the same conditions as the other, only for a third use. Regarding the preparation time, the shortest time was obtained with the HyFlex CM system (960 s), compared to the ProTaper system (1123 s), again, the differences being statistically insignificant. The time was quantified in seconds using the Eurochron Timer EDT 9000 Schwarz Timer (Figure 12).



Fig. 12: Eurochron Timer EDT 9000 Schwarz Timer.

Discussions

Until now, no such study has been found, putting the effectiveness of these two systems together to compare the results. The literature suggests a number of factors that lead to the occurrence of preparation errors such as the complex root canal anatomy (9), the impossibility of obtaining a linear access (10), the design of the instrument (5,11), the sequence used in the instrumentation (12), the operator experience (13,14), the rotation speed (14) and the inappropriate use of the irrigant (3). Operator experience is a worthy variable to discuss. Even if the teeth instrumentation in the study was done by a single practitioner, experience is a factor that can not be controlled. Moreover, when we think about the clinical development of these maneuvers, we need to consider other factors that we can not control, such as patient movements, limiting mouth opening, etc.

In this study, upper and lower molars were used. In order to be able to standardize the material, only teeth were selected without root resorption, fractures, cracks or other abnormalities. Since the physiological age of individuals is not always correlated with dental age, no age limit has been set for this study. To reduce the risk of errors, the occlusal surface of the molars was planar, so the working length of their teeth, in vivo, would have been different than that obtained for this study. The fact that in both systems, or in both tooth groups, one instrument has been fractured in more than one endodontic system, makes it obvious that the safest method of using these rotating needles is to limit their use to one treatment session. Of course, there are variables: the practitioner's experience, the anatomy of the root canals, etc. From the point of view of the time allocated for canal preparation with each of the two systems, we can conclude that there are no significant differences. Since the same method was used, the number of files was the same, having the same ISO size, the ideal conditions were met to compare the time required for instrumentation.

IV. Conclusions

Based on the results of this in vitro study, it can be concluded that the preparation of root systems with the two types of instruments did not lead to significant alteration of the initial root canal anatomy or working length. Therefore, those rotating ProTaper Gold and HyFlex CM are comparable as the efficiency and utility in the preparation of medium and severe curves.

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Contribution Note

All authors made equal contributions to the study and the publication.

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