Possibilities of Achieving an Efficient Endodontic Treatment

OANA DIACONU, MARILENA BĂTĂIOSU, IREN MORARU, MIHAELA ȚUCULINĂ, LELIA GHEORGHIȚĂ, VICTORIA ANDREI

Odontotherapy-Endodontics Department, Faculty of Dental Medicine, University of Medicine and Farmacy of Craiova

ABSTRACT

Aims: The study aims to emphasize the possibility of realizing a superior and yet not expensive, very accessible mechanical root canal treatment using ProTaper Manual needles. Materials and methods: The study was realized on 56 extracted teeth, most of them multi-rooted and curved and some single-rooted. The access path was created using Kerr Ni-Ti flexible needles under permanent irrigation with 2% sodium hypochlorite (NaOCl), until ISO 15 or 20 dimensions were reached; effective preparation of root canals was realized by techniques of crown-down and compensated forces when using the ProTaper Manual system. Discussions and conclusions: Preparation of root canals should confer an appropriate form to them and facilitate adequate action of irrigation and disinfection solutions in order to deeply penetrate the root canal system and to determine its efficient filling. The design of these needles allows ideal preparation of root canals with diverse anatomical configurations. The manual use of the ProTaper system provides more predictability, high tactile control, and guarantees the achievement of a more appropriate anatomical form than any other manual steel endodontic instrument.

KEY WORDS mechanical root canal treatment, Ni-Ti files, ProTaper manual system

Introduction

Modern endodontic treatment methods allow for more and more natural teeth to be preserved; ensuring a solid base for possible prosthetic restoration. Although the preparation and complete live or dead pulp tissue evisceration of the root canal was considered the most important stage of the endodontic triad (Grossman 1988), the other two stages are equally important: the shape of the canal determines the ability of irrigation and disinfection solutions to reach the depth of the endo-canalicular system, on it depending the quality of the filling. The use of Ni-Ti needles has revolutionized the endo-canalicular mechanical treatment and offered multiple advantages to the clinician.

The Purpose of the Study:

The main purpose of the study was the emphasis of the possibilities of realizing a modern mechanic canal treatment that is not very expensive, using the manual ProTaper needles. Manual use offers an increased tactile control, more predictability and provides a vastly superior anatomic radicular canal shape when compared to any other manual steel endodontic instruments.

Materials and method:

Our study has encompassed 56 teeth, mostly with curved roots, multi-rooted, but some single rooted as well. The teeth were extracted due to various clinical reasons (dental afflictions of the marginal and apical periodontium, teeth that erupted in vicious positions leading to local or general complications or included teeth that had no chance to erupt). They have been collected for a year by the O.M.F. surgery clinic of the Emergency Clinic Hospital and by private dental medicine clinics from Craiova. After extraction, the teeth were immediately washed and kept in distilled water until the lot was completed when they were again washed under a continuous jet of water and cleaned with a periodontal scoop in order to remove tophus and soft tissue traces, then placed in a 2.5% sodium hypochlorite solution to remove the remaining soft adherent tissue.

After cleaning, access cavities were performed, using the known rules with spherical and cylindrical extra hard diamond drills at high revolution (Cavity access set- Dentsply Maillefer). The access cavities need to be large enough to allow the instrument to penetrate in a straight line toward the root canal. The canals were identified with the help of 08 and 010 ISO file needles, then the canal orifices were enlarged with X Gates drills through a brushing motion on the wall of the canal opposite of the forking, thus removing the dentinal triangle and the constriction in the initial
portion of the canal, leading to an easier penetration of instruments such as irrigation solutions on the root canal tract even in the early stages of treatment. The permeabilization and preparation of the canal with hand needles (preferably Kerr files) to the 015-020 ISO sizes and the creation of an access route to the apical third (manual pre-flaring) before the beginning of the instrumentation with manual ProTaper needles, lead to a decrease in instrument fracture risk by reducing their torsion. The use of Kerr pile needles is a forward-backward motion, progressing from the coronary third to the medium third. These instruments are used passively and progressively until free movement is achieved, using large quantities of gel EDTA to lubricate the canal and emulsify any remaining pulp tissue. The dentinal dust formed after the instrumentation might reach the apex forming an apical dentinal plug that would prevent the debridement and filling of this extremely important area. In order to avoid this, during the entire treatment a strict and efficient anti-microbe protocol must be adhered to. Endodontic washing during the entire preparation with sodium hypochlorite and EDTA; the verification of permeability and re-irrigation after using each instrument are very important in order to have a clean canal.

The determination of the working length was accomplished by introducing 010 or 015 ISO needles on the entire length of the canals and verifying electronically and radiologically. The lengths were measured with the endodontic ruler, noted for each canal and transferred to the manual ProTaper needles by fixing the stopper at the corresponding mark, then the preparation of the canals began.

The enlargement of the coronary portion of the canal is performed with the purple S₁ ProTaper needle operating in one third, then the remaining two thirds of the canal, using the recommended motion; the needle is rotated clockwise ¼ of the way, then counterclockwise to unblock it, then clockwise again to cut the dentine, then it is withdrawn, cleared of spiral detrituses and the motion is repeated until the working length is reached. The 010 and 015 ISO needles are reintroduced on the working length in order to maintain permeability all along the preparation.

The preparation of the coronary and medium thirds was achieved with the use of the manual S₁ (purple) and S₂ (white) needles, in the same reaming motion along the working length, resulting in that characteristic “deep shape” of the canal, needed to ease apical preparation. In some difficult canals one, two or even three recapitulations with the S₁ needle were needed to pre-enlarge the two out of three coronaries. The irrigation of the canal after each ProTaper needle use was not forgotten.

The apical preparation was performed with the use of the manual F₁ (yellow) instruments for the narrow canals and F₂ (red) / F₃ (blue) for the wide canals, in the same motion, on the entire working length. The apical preparation was continued with the measuring of the apical diameter with corresponding Kerr steel file needles (needle 020 ISO→F₁, needle 025 →ISO ₂, needle 030 ISO→F₃) in order to fill the canal.

The canal filling. The shape of the canals thus prepared is adequate for filling with a variety of techniques (cold / hot lateral condensation, vertical condensation or thermoplastic techniques). We opted for the monocon technique with an apex calibrated cone and for the cold lateral condensation.

Results and Debates:

We will now present a few relevant cases to our study.

Case #1:

A 4 canal inferior molar 2; the sufficiently enlarged access cavity and the post-filling canal radiological aspect are noticeable.

Case #2:

A 4 canal superior molar 1, two on the middle-mouth root; the access cavity with the 4 orifices of the root canal, the radiological control for determining working length and the radiological aspect of the canal filling are noticeable.
Case #3:

Superior canine with a curved root; the trajectory of the canal on the X-ray while determining the working length is noticeable.

Case #4:

Inferior molar 3 with curved roots; the radiological aspect of the determination of the working length and the canal filling are noticeable.

Case #5:

Inferior molar: the aspect of the access cavity with root canal orifices and the radiological aspect of the determination of the working length and the canal filling are noticeable.

Case #6:

Inferior molar 1 that showed a previously incomplete and incorrect endodontic treatment on the clinical (the change in color of the treated root) and the radiological aspects. The incorrectly filled root was emptied then a manual ProTaper mechanical treatment was applied on all canals.

Conclusions

On the whole, the manual ProTaper system has totally proved its usefulness in spite of the existence of a low percent of failures or accidents that will be discussed in a later article.

The use of this needle system has pleased us both from a result point of view and from the reduced cost of the rotating system, being a superior alternative to the preparation with manual steel instruments and an excellent teaching tool.

References