

The Mechanic Canal Treatment Using the Protaper Manual System

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ABSTRACT Modern endodontic treatment aims toward the modification and adjustment of the root canal shape according to the need to correctly debride and fill the endo-canalicular system. The preparation of root canals using the Ni-Ti needle system approaches perfection in accuracy as well as in respecting canal anatomy, at the same time reducing the risk of potential preparation errors. This article tries to show in detail the succession of steps in root canal preparation with the help of the manual ProTaper system.

KEY WORDS *Mechanical canal treatment, Ni-Ti needles, manual ProTaper system*

Introduction

Modern endodontic treatment allows patients to keep their natural teeth and, because endodontics represents the basis of restorative treatment, we can extend the lifespan of a tooth that was long meant to be extracted.

Endodontics is no longer “blind treatment”, based only on the touch and the experience of the clinician. The emergence of new canal preparation instruments, of means to electronically determining canal length, of the use of ultrasound in endodontics and, last but not least, of the endodontic surgical microscope have all led to an increase in treatment possibilities and indications and in success rates.

According to the fast evolution of science and technique, treatment methods are improving by the day, the technique and the instruments are perfecting, trying to closely mimic the internal root morphology, which represents the only stable element in this system. For this reason, the most difficult stage of endodontic treatment remains the method of making the root canals permeable up to the apex.

Typically, the requirements of an ideal endodontic preparation are:

1. Locate, make way and enlarge the canal without preparation errors;
2. Establish and maintain the proper working distance during the entire preparation;
3. Choose the enlargement degree of the canal in order to allow for disinfections and adequate filling.

The emergence of NiTi has revolutionized the method of preparing the canalicular system, bringing a series of advantages to the clinician. The used alloy allows an extreme flexibility, a quality that makes them relatively safe in canal instrumentation, especially the curved ones.

The ProTaper System:

Denstply Maillefer has recently introduced those ProTaper Ni-Ti Hand files, especially designed to instrument difficult root canals, with accentuated or calcified curves. The system was created in order to reduce the number of instruments for a large number of cases. The number of progressively conical needles has been reduced to 6: 3 file needles for configuring the canal shape through the crown-down procedure (the shaping needles) and 3 file needles for preparing the apical third and achieving a fine transition between the coronary and medium thirds, resulting in that “deep preparation” (the finishing needles). The needles have the following design characteristics:

- triangular shape with convex sides on transversal section;
- blunt head especially designed for guidance;
- variable helicoidal angle;
- multiple and progressive conicity.

The golden rules of this needle system are:

- access is granted in the long axis of the canal;
- the enlargement of the entry orifice with Gates-Glidden (XGates) drills;

- using instruments only in well lubricated and irrigated canals and only after the canal has been made permeable with ISO small number instruments;
- the frequent inspection of spires for possible signs of distortion;
- the use of instruments in the recommended movement.

Preparation needles (shaping files)

The first used needle is S_x , which is easily recognized because of its orange handle and smaller length than that of the other needles (14mm). All the needles are conical, increasing from the top to the handle (3,5-19%). Because of this thing, these needles are used to prepare the coronary portion of the canals, leading to the elimination of the dentinary triangle and of the constriction from the initial part of the canal, thus making the easier penetration of instruments and irrigation solutions possible on the distance of the root canal. The S_x needle becomes a substitute of Gates-Glidden drills.

The purple handled S_1 and white handled S_2 needles show a smaller progressive conicity than the S_x needle; the S_1 needle was designed to act especially in the coronary third of the canal, unlike S_2 that acts especially in the middle third. These instruments can reach working length after the initial instrumentation, thus preparing the apical region.

Finishing files

The finishing needles are F_1 (yellow), F_2 (red) and F_3 (blue); they represent a single conicity in the apical portion, being meant to prepare in the apical third, while the rest of the active part length presents reverse conicity in order not to excessively enlarge the coronary third and make a smooth transition between the coronary third and the medium third.

The manual ProTaper are used by making $\frac{3}{4}$ of a twist clockwise and a $\frac{1}{2}$ twist counter-clockwise, thus cutting off the dentine. The movements are repeated until reaching the desired work length.

Abundant irrigation with sodium hypochlorite has to be used along the entire prepared portion and the instruments regularly retreated in order to remove detrituses and check the spires.

The 010 and 015 ISO needles are introduced in the canal on the working length, in order to keep the area along the preparation permeable.

Once repaired, the canal is irrigated with 17% EDTA, in order to remove the smear-layer, then irrigated one last time with sodium hypochlorite.

The ProTaper system technique

The pulp camera is filled with EDTA or sodium hypochlorite in order to accomplish any negotiation procedure; the $\frac{2}{3}$ of the canal are explored with no. 010-015 ISO manual steel file needles using a forward-backward motion; these instruments are used passively and progressively until they move freely in the canal. (fig.1).



Fig.1 The aspect of the access cavity that allows the penetration of negotiation needles in the canal axis

The ProTaper sequence is begun with the S_x needle in the recommended motion, in order to achieve the enlargement in the coronary third of the canal; the purple S_1 is then used; the apical area of S_1 passively follows the region of canal that has been secured by the manual needles; S_1 is designed to cut the dentine in a crown-down manner; the canal is irrigated and recapitulated with a 010 ISO file needle to break the detrituses, then re-irrigated.

In the more difficult canals one, two or even three recapitulations with S_1 may be necessary in order to pre-enlarge the $\frac{2}{3}$ coronaries; once the pre-enlargement procedure is finished, a 010 ISO file needle is used in association with EDTA in order to negotiate the rest of the canal and establish permeability the work length is determined.(fig.2)

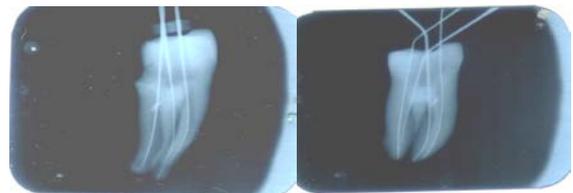


Fig.2 The radiological verification of the working length

Once the smooth reproducible slope to the apex has been established, S_1 then S_2 are successively used on the working length; irrigation, recapitulation and re-irrigation after using each ProTaper needle must be remembered.(fig.3)

The F_1 needle is used on the working length in one or more steps, in order to prepare the apical area; if F_1 stops advancing into the canal the needle is retracted, the spires cleaned and the

motion is continued until reaching the working length.(fig.4)



Fig.3 Preparing the coronary and medium thirds



Fig.4. Preparing the apical and measuring the apical diameter

The apical preparation is continued with the measuring of the apical diameter with corresponding steel Kerr file needles; the canal is thus ready for filling.(fig.5)



Fig.5. Canals filled with the monocon technique

The advantages of using this system and not the ISO steel instruments are easy to notice:

- increased flexibility;
- the use of a smaller number of instruments for canal preparation (usually three instruments are necessary to funnel-shape the preparation on the entire working length);
- less time for canal preparation;
- the cutting efficiency increases due to the triangular section shape, without a screw effect into the dentine (each instruments creates its own crown-down effect, the larger conicity creating space for the smaller one);
- complete tactile control;
- keeping the canal curvature, with a small risk of apical transportation;
- reaching a uniform conicity on the entire length of the canal;

- ability to use in high curvature canals, even if only a pre-permeabilization with steel hand needles;
- reduced needle stress;
- progressive conicity engages reduced dentine areas, thus reducing needle stress and fracture potential (clinically, this leads to a significant decrease in flexibility, cutting efficiency and number of recapitulations needed to reach the working length).

Conclusions:

The manually used ProTaper system represents an excellent teaching tool for students, a superior alternative to the preparation with manual steel instruments, an innovation in the case of difficult anatomy canals and an cheaper alternative than the rotating system.

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