Comparison Between Rotary and Manual Instrumentation in Primary Teeth

Crespo S* / Cortes O** / Garcia C*** / Perez L*****

The aim of this study was to compare the efficiency in both, preparation time and root canal shape, when using the Nickel Titanium (Ni-Ti) rotary and K-Files hand instrumentation on root canal preparation of single rooted primary teeth. ***Material and methods:*** *Sixty single rooted primary teeth were selected and divided into two equal groups: Group (I) 30 teeth instrumented with manual K- files and group (II) 30 teeth instrumented with Ni-Ti rotary files (ProFile 0.04). Instrumentation times were calculated and root canal impressions were taken with light bodied silicone in order to evaluate the shape. The data was analyzed with SPSS program using the t-test and the Chi-square test to compare their means.* ***Results:*** *The preparation time with group (I) K- files was significantly higher than in group (II) rotary files (ProFile 0.04), with a p= .005. The ProFile system showed a significantly more favorable canal taper when compared to the K-files system (P= .002).* ***Conclusions:*** *The use of rotary files in primary teeth has several advantages when compared with manual K files: the efficiency in both, preparation time and root canal shape. 1. A decreased working time, that helps maintain patient cooperation by diminishing the potential for tiredness. 2. The shape of the root canal is more conical, favoring a higher quality of the root canal filling, and increasing clinical success.*
Keywords: *Rotary files, Primary teeth, K-files, Profile.*
J Clin Pediatr Dent 32(4): 295–298, 2008

INTRODUCTION

Dentistry has had great developments in previous years. In the field of pulp therapy not only have the materials been improved but also the techniques and the instrumentation, reaching a better quality of work.

The files for pulp therapy treatment have had changes in both, the shape and the content materials. In the early 60's the files were made of Nickel Titanium (Ni-Ti) alloys.

Later in the 80's rotary instrumentation with Ni-Ti files proved to be efficient and effective and became a well accepted system to prepare root canals for pulp therapy treatment in permanent teeth.

It was until the mid 90's when research started regarding the use of rotary files in primary teeth pulpectomy[1-3] Barr *et al*.[2-3] first described this technique for primary teeth using the Profile system. There are several kinds of files made of Ni-Ti, some are manual while others are used with rotary systems such as the GT, K3, Protaper or Profile.

The Ni-Ti alloys files used in rotary systems are composed of 56% Ni and 44% Ti which present a low elasticity modulus, high resilience, corrosion resistance, super elasticity and shape's thermal memory.[4] The flexibility is 2 or 3 times higher than stainless steel files and promote the maintenance of the root canal shape by avoiding canal transportations,[5-8] an important factor when negotiating the primary molars curved root canals.

The Profile system chosen for this study display a constant 4% conicity in the body, an inactive point and a cut zone with the shape of triple "U" [9-11] with three smooth areas in contact with the root canal walls, design to brush but not cut the dentin, thus, making the Profile system less aggressive than other differently shaped files.

The specific characteristics of this rotary technique in pediatric dentistry for primary teeth preclude the requirement of using a crown down technique typical of rotary systems since the primary teeth dentin is softer and can be cut easily.[2,3] Profile is an appropriate system, because it is not aggressive and it cuts less than other systems.[2,3]

Even though the system includes 0.04, 0.06 and 0.08 taper files, a higher conicity than 0.04 is not needed.[2,3] When using the Profile system, it is recommended to use a torque between 150 and 300 rpm and a slow, constant speed.

Care must be taken not to over work or perforate the canal

* Crespo, S. DDS. Doctorate student. Department of Pediatric Dentistry, University of Murcia. Spain.
** Cortes, O. DDS. Associate professor. Department of Pediatric Dentistry, University of Murcia. Spain.
*** Garcia, C. MD, DDS. Assistant professor. Department of Pediatric Dentistry, University of Murcia. Spain.
**** Perez, L. MD, DDS. Assistant professor. Department of Community Oral Health, University of Murcia. Spain.

Send all correspondence to: Susana Crespo Jimenez, C/Nadadora Carmen Soto, nº8, Esc.7, 3º N. , C.P.03009.Alicante (España)

Phone: +619316490.

E-mail: susanacrespoj@hotmail.com

and avoid a dry or aggressive instrumentation.

It is recommended to discard files after instrumenting approximately five root canals and inspect the file under a magnifying glass to detect alterations. Similarly, the files must be measured at the end of the procedure to identify possible fractures.

Silva *et al.*[1] compared rotary (Profile) and manual instrumentation techniques in primary molars and found no differences between the two techniques in their cleaning capacity, however, the instrumentation time with the rotary system was decreased when compared to the manual system.

The introduction of the rotary system with nickel-titanium files for the instrumentation of primary root canals is recent and there is only a small number of studies regarding this issue. For this reason, the present study aims to compare *in vitro:* 1) the shape of root canals instrumented with Profile 0.04 and stainless steel K-files in primary teeth and 2) the mean procedure time of each method.

MATERIAL AND METHODS

Sixty single rooted extracted teeth with a minimum root length of 8mm. were stored in 0,5% sodium hypochlorite. The sample was divided into two equal groups of 30 teeth.

Group I was prepared using the conventional method with stainless steel K files and group II using the rotary method with Ni-Ti files.

The access opening was performed and the canal length was determined by placing nº 10 files into each canal until the file was just visible at the apical foramen; the working length was determined at 1 mm short of this initial length. The canal was then shaped and cleansed. The conventional method used stainless steel K-files (Dentsply,Maillefer), with the quarter turn-pull technique. In the Ni-Ti rotary group (Dentsply, Maillefer), teeth were instrumented with Profile 0.04 taper rotary instruments starting with the one that better approximated the canal size up to the working length and using 4 sequentially larger taper files. The rotary files were used with a motor X-smart (Demo Maillefer A 1005) at 250 rpm and slow torque. The files were advanced while rotating slowly towards the apex, and withdrawn as soon as the working length was reached, rotating until the file appeared outside the canal.

The time taken for preparation of the canal was recorded. Copious irrigation with sodium hypochlorite solution was used after each file use. Approximately 10 ml. of sodium hypochlorite were used *per* root canal. The files were lubricated with EDTA gel each time they were used.

The root canal internal 3D shape was determined by intracanal impressions made using light (Reprosil, Dentsply Caulk) and heavy bodied vinyl siloxane (3M Express STD), impression materials. Materials were pressed over the floor of the pulp chamber. The putty material was kneaded by hand to facilitate the light bodied material entrance into the canal. This putty material also acted as support for the coronal part of the impression facilitating its removal.

The impression was observed within 24 hrs. under the stereomicroscope Olympus SZ11 with a reductor objective to assess taper: Acceptable Good taper, defined as a conical canal, and unacceptable taper defined as poorly conical or cylindrical. The data was recorded directly on coding sheets and analyzed statistically with the SPSS program version 14.0 using the t-test and the Chi-square test to compare the means.

RESULTS

The comparison between the two methods in terms of preparation time, showed a mean of 214 seconds (I) for rotary files and 270 seconds (II) for the conventional method with a p= .004, that was statistically significant (Graph 1).

The canal taper prepared with Profile was significantly more conical compared with the canals instrumented with K-files (Figure 1) according with the chi- square test (p= .002).

DISCUSSION

On one hand, instrumentation time was significantly reduced with the rotary system when compared to the conventional system; this finding is in agreement with studies previously

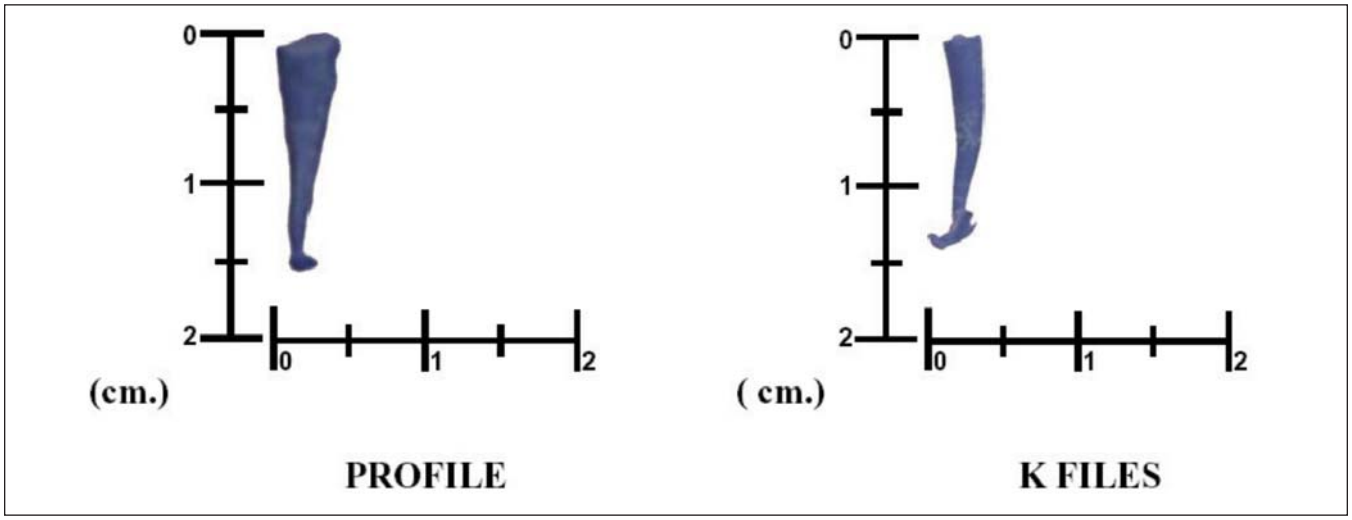
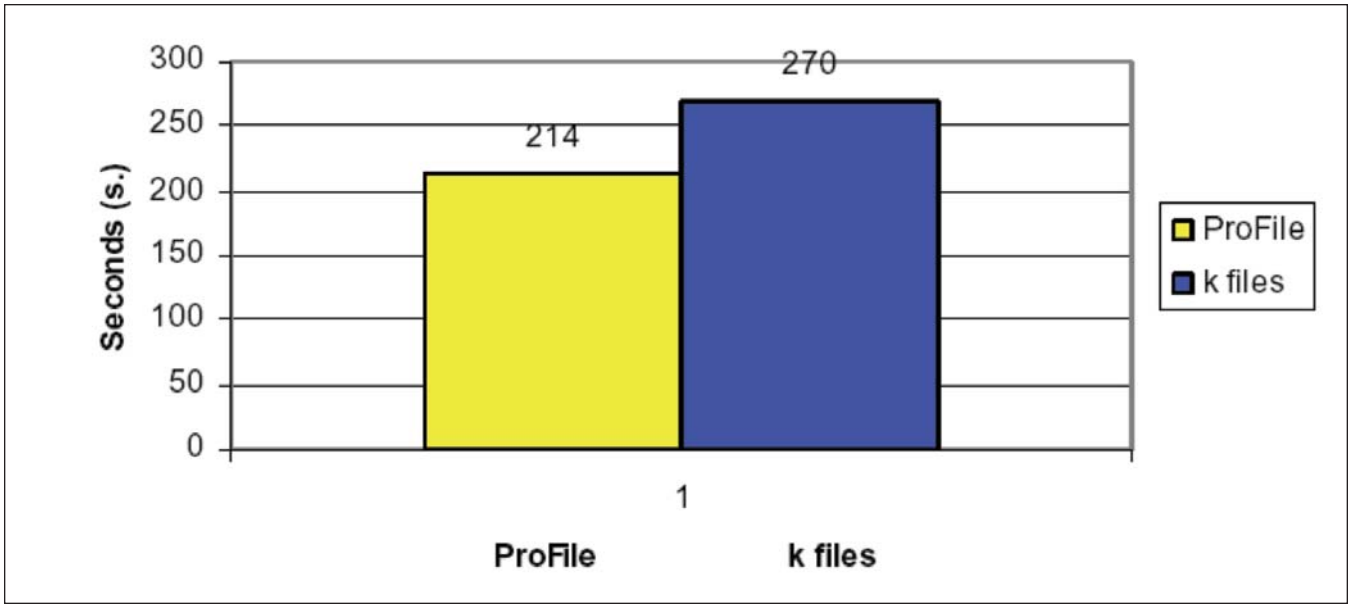


Figure 1. Example of intracanal impressions: ProFile versus k files.



Graph 1. Instrumentation mean time: ProFile versus K files.

published.[1-3,12] The reduction in preparation time is due to the fact that less number of files are used with the rotary system as well as rotary files are engine powered and therefore, faster. It is the authors belief that the reduced working time compensates for the higher expense of the rotary files.

The aforementioned can positively influence treatment because patient cooperation is not lost due to tiredness. However, contrary to this belief, the rotary system can generate more anxiety in the child as it is noisier and generates more vibration, potentially hindering cooperation.

On the other hand, although the rotary files used had a 0.04 taper, similar to the 0.02 taper of the conventional files, rotary files have twice the taper than k files and this predetermined shape is marked in the root canal during instrumentation resulting in more conical canals than those prepared with conventional files.

The higher conicity allows for an easier insertion of the material and facilitates condensation. This shape retains better the material inside the canal than a cylindrical shape, preventing apical extrusion of the filling material. This is important since clinical research reports analyzing filling quality in pulpectomies, regardless of the material used, showed high success rates with flush and under filled canals. The success rate dropped significantly when overfilling occurred, in spite of the material use.[14-17] Other factors such as previous pulp pathology and resorption can also influence the treatment's success.[15] Another crucial consideration when working with rotary files is that, due to their conicity, passing the working length must be avoided. Passing this length will enlarge the apical orifice, more so than when using manual files leading to an overfill; nevertheless, it has been shown, with statistical significance, that a higher success rate was achieved with optimally filled and overfilled primary root canals when compared to underfilled canals.[18]

CONCLUSIONS

The use of Profile 0.04 systems in primary teeth provides certain advantages when compared to conventional K files:

1. A decreased working time, which helps maintain patient cooperation.
2. The shape of the root canal is more conical, favoring a higher quality of the root canal filling, and increasing clinical success.

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