# **Comparison of Rotary and Manual Instrumentation Techniques on Cleaning Capacity and Instrumentation Time in Deciduous Molars**

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### ABSTRACT

Purpose: The aim of this study was to evaluate, in vitro, the cleaning capacity and time needed for instrumentation of root canals of deciduous molars by manual and rotary instrumentation.

Methods: Thirty-three deciduous molar root canals were injected with India ink and divided into 3 groups: group I-the root canal instrumented manually with K files; group II-the root canal instrumented with rotary Profile .04 instruments; group III-control group, (ie, root canals not instrumented). Instrumentation time was recorded. The teeth were cleared and the removal of India ink was measured in the cervical, middle, and apical thirds.

Results: There was no significant difference for cleaning capacity between manual and rotary techniques in the 3 root thirds (P>.05), but both techniques were different from the control group (P<.001). Significantly less time was needed for instrumentation with the rotary technique (3.46 minutes) than with the manual technique (9.06 minutes).

Conclusions: Although no differences were found for cleaning capacity, the reduction of instrumentation time by the rotary technique was a relevant clinical factor for endodontic treatment. (J Dent Child. 2004;71:45-47)

KEYWORDS: INSTRUMENTATION, ROOT CANAL, PULP THERAPY

iomechanical instrumentation removes pulp tissue and/ or necrotic residue, with consequent cleaning, shaping, and increase of dentin permeability of the root canal.<sup>1</sup> Between-session dressings, when necessary, and hermetic sealing are important steps for successful endodontic treatment and the reduction or elimination of bacterial infection.<sup>2,3</sup> Root canal instrumentation is performed with files, reamers, burs, sonic instruments or mechanical apparatus, and recently with rotary instruments.

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The development of nickel-titanium alloys and the possibility of changing the traditional design and taper have allowed use of rotary instruments in endodontic treatment. Their ability to rotate on their own axes in the root canal without any risk or damage to the original anatomy<sup>4,5</sup> is very important. Among other advantages, the nickel-titanium files do not need to be precurved due to elastic memory, and the root canal preparation is quicker because they are activated by a motor. The possibility of root canal deformation is reduced due to its elastic memory and radial land that maintain the file in the center of the root canal by wall support and inactive tips.5-7

The use of rotary instrumentation in permanent teeth has proven to be efficient<sup>8,9</sup> with decreased instrumentation time in atresic and curved molar root canals,<sup>10</sup> greater comfort for the patient compared to other techniques, and lower risk of flare-up. However, the operator needs training because of loss of tactile sensitivity.

Some systems currently available are: Quantec (Kerr), Profile .04/.06, Profile series 29 (Maillefer/Dentsply),

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Heros 634 (Micro Mega), Pow-R (Moyco Union Broach), GT, Pro-Taper (Maillefer/Dentsply), and K3 Endo (Kerr).

The same principles of cleaning and shaping of the root canal for rotary instrumentation in permanent teeth should be applied to deciduous teeth.<sup>11,12</sup> Curvatures and irregularities of root canal walls of deciduous teeth can be cleaned efficiently with nickel-titanium instruments with clockwise rotation, resulting in removal of pulp tissue, dentin, and necrotic residue from the root canal, similar to the action of manual files.<sup>11,12</sup>

The technique recommended for deciduous teeth uses Profile .04 instruments.<sup>11,12</sup> The nickel-titanium files with a conic predefined form should be used with a low-speed handpiece with continuous torque and 150 to 300 rpm rotation, obtaining a conical and smooth root canal that facilitates sealing of the root canal system.

Because the introduction of the rotary system with nickel-titanium files for the instrumentation of deciduous teeth root canals was recent, this in vitro study compared cleaning capacity and time necessary for the instrumentation of root canals of deciduous teeth by both manual and rotary instrumentation.

#### **METHODS**

Seventeen maxillary and mandibular extracted deciduous molars with at least two-thirds of intact root were washed in water and stored in 0.5% sodium hypochlorite for 1 week. Radiographs were then exposed and 33 mesial and distal roots were selected. Coronal access was performed with spherical diamond burs (KG Sorensen, São Paulo, SP, Brazil), followed by a #3082 inactive tip diamond bur (KG Sorensen).

After irrigation of the root canal with 1.0% sodium hypochlorite, a K file (Dentsply/Maillefer, Ballaigues, Switzerland), with a compatible diameter was introduced into the root canal and the canal length determined at 1 mm from the apex or root bevel. A #15 K file was introduced into the root canal and India ink was injected with an insulin syringe. The ink was reapplied after diffusion and drying.

The roots were then divided into 3 groups:

- 1. Group I (N=13): The root canal was instrumented manually with K files (Dentsply/Maillefer, Ballaigues, Switzerland) up to a #35 file and stepped back to a #50 file.
- Group II (N=13): The root canal was instrumented with rotary Profile .04 (Dentsply/Maillefer) instruments up to a #35 file and stepped back with #40, #45, and #50 files. The files were activated by an Endo Plus motor (VK Driller, São Paulo, SP, Brazil) at 250 rpm.
- 3. Group III (N=7): Control group root canals were not instrumented.

In groups I and II, the root canals were instrumented by only 1 operator, and 1.0%

sodium hypochlorite was used for irrigation. At each instrument change, the root canal was irrigated/aspirated with 3.6 mL of irrigating solution. The instrumentation time was measured by a chronometer during both techniques.

The teeth were cleared for analysis of the cleaning capacity. For the clearing process, the teeth were placed separately in jars with a lid containing 10% chloridric acid for 3 days and renewed every 24 hours until completely decalcified. The teeth were washed under running water for 8 hours and dehydrated in 70% alcohol (for 16 hours, changed after 8 hours), 90% alcohol (for 3 hours, changed every hour) and absolute alcohol (for 3 hours, changed every hour). After dehydration, the teeth were placed in methyl salicylate.

After clearing, the removal of India ink from the cervical, middle, and apical thirds was analyzed with a stereoscopic magnifying glass and scored: 0=total cleaning; 1=almost complete ink removal; 2=partial ink removal; and 3=no ink removal. The results were analyzed statistically with the Kruskal-Wallis test.

# RESULTS

There were no statistical differences (P>.05) between root thirds after manual (group I) and rotary instrumentation (group II) with a score of 1 predominating. Both techniques cleaned better than the control group (P<.001), where score 3 was observed in all specimens (Figure 1).

The time spent for rotary instrumentation was 3.46 minutes and for manual instrumentation 9.06 minutes (*P*<.05).

# DISCUSSION

Manual instrumentation of root canals of deciduous teeth has been recommended with subsequent sealing with resorbable pastes.<sup>13</sup> Rotary biomechanical preparation of deciduous teeth was first described by Barr et al.<sup>11, 12</sup> These authors prepared a central incisor and second mandibular molar with nickel-titanium instruments and emphasized how to avoid overinstrumentation and dentin wall perforation enlarging the apical foramen without causing over-obturation.





Instrumentation must be performed with the use of smaller diameter files, which should not be used in more than 5 teeth. This technique allows easier insertion of obturating paste and less over-obturation.<sup>11,12</sup>

In the present study, there were no statistical differences between thirds with the 2 techniques in terms of cleaning. When considering instrumentation time, this study agreed with Barr et al<sup>11,12</sup> who reported considerable reduction of time spent for instrumentation using the rotary technique in 2 clinical cases.

However, rotary instrumentation in deciduous teeth has several disadvantages, such as the higher cost of nickeltitanium instruments and the need for training of the operator.<sup>11,12</sup>

# **CONCLUSIONS**

Although no differences of cleaning capacity were observed, the reduction of instrumentation time with the rotary technique was a relevant clinical factor.

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