Section A -Research paper
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An In-Vivo Study Comparing the Effectiveness of Single Sitting Endodontic Therapy in the Primary Mandibular Molars Using Rotary and Hand Instruments

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Abstract: To assess the timing of root canal preparation and the quality of obturation after a single sitting pulpectomy in primary mandibular molars using manual and rotary equipment in young children between the ages of 4 and 8 year.

Material and Method: In present study pulpectomy was performed on 40 primary mandibular. For half of them, hand K files were used, and for the other half, Pro AF baby gold rotary files were employed. The amount of time spent instrumenting, the quality of the obturation were documented.

Result: It was observed that Pro AF baby gold offered the quality obturation and required less instrumentation time than hand file.

Conclusion: In pulpectomies of primary teeth, pediatric rotary files are effective substitutes for hand instrumentation and can be regarded as the gold standard of therapy.

Keywords: Pulpectomy, Rotary file, Hand File, Pro AF baby gold rotary files

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Introduction: For the preservation of infected deciduous teeth with irreversible pulpitis or pulpal necrosis, pulpectomy is the preferable treatment option.[1] The architecture and shape of root canals in primary teeth make endodontic therapy difficult. A channel for irrigants is created by complete biomechanical preparation of the canals, which also helps to close the canals with biocompatible obturating material while conserving the radicular structure.[2,3]

Because of this, the effectiveness of pulpectomy is largely dependent on the biomechanical preparation of canals. It is typically advised to preserve the original shape of root canals in order to preserve healthy dentin while efficiently widening the canal to eliminate its contaminated contents.[4]

Traditionally, infected deciduous teeth's root canals were cleaned and prepared with hand K-files. Even though it is often employed, manual instrumentation can cause iatrogenic mistakes because of the forceful and indiscriminate cutting activity of stainless-steel files.[4]

The literature provides examples of how nickel-titanium (Ni-Ti) rotary files can be used to efficiently prepare primary teeth's root canals while producing fillings that are remarkably uniform and predictable. However, compared to permanent teeth, the dentin of primary teeth is less dense and more brittle, which makes the use of rotary problematic. Additionally, because the roots of deciduous teeth are more curved, narrower, and restricted, the resorption at the tip of the root is frequently not evident. Ni-Ti rotary tools are challenging to use on baby teeth because of all of these characteristics.[5]

The Pro AF Baby Gold file system (Kids-e-dental) was created specifically for primary teeth to improve patient and dentist safety and comfort. So, utilizing a hand and Pro AF baby gold rotary file system, this study was done to examine the root canal preparation time and obturation quality following single sitting pulpectomy in primary mandibular molars.

Material and Method: After receiving approval from the scientific and ethics council, the study was carried out in the department of pediatric and preventive dentistry. Following fulfillment of the eligibility requirements and receipt of written informed consent, forty patients who visited the department's OPD and were between the ages of 4 and 8 were chosen to take part in this clinical study.

Participants in the study were young children with primary mandibular molars that had carious pulpal exposure, were free of periapical and interradicular radiolucency, and had sufficient coronal tooth structure and root structure (greater than 2/3 root length) on radiographs

included for present study. Patients with extensive tooth mobility, internal and pathologic root resorption, and non-restorable tooth structure were eliminated.

Selected teeth were randomly placed into two groups:

- Group 1 - Manual instrumentation using K-files (Mani, Tochigi, Japan) (n = 20)
- Group 2 - Rotary instrumentation using Pro-AF Baby Gold files (Dentobizz, India) (n = 20).

One operator performed single-visit pulpectomies on all of the involved teeth. All individuals underwent pulpectomy under rubber dam isolation after receiving local anaesthesia. Access opening was carried out quickly with round and straight fissure burs (BR-41 and SF-41). The DG-16 tool was used to locate the canal after coronal pulp amputation. K-files were used to eradicate pulp. 3% sodium hypochlorite and ordinary saline were used to liberally irrigate the pulp chamber. The no. 10 K-file was placed in the canal after the pulp chamber had been irrigated. The radiographic working length, calculated using the standard Ingle's method, was 1 mm below the radiographic apex.

In Group 1: Root canal preparation was done using conventional step-back method using stainless steel K–files and quarter-turn pull technique from #15 to #35.

In group II: Instrumentation of root canals was done using Pro-AF files after enlarging the canals using K-file up to #15. Progressive filing of all the canals was carried out using the following files in the same sequence: B0 (#20/04), B1 (#25/04), B2 (#25/06). File B3 (#30/04) was used in wider canals. Absorbent, sterile paper points were then utilized to dry the canals, which were then obturated using Metapex. The tooth was then restored with Type IX GIC. Postoperative digital radiograph was taken for the assessment of the obturation quality.

The complete time duration for instrumentation was recorded using a stopwatch and two blinded examiners radiographically assessed the quality of theroot canal filling and documented whether it was at the optimal level, underfilled, or overfilled. based on criteria given by Coll and Sadrian.[6] The ideal obturation was defined as being at or lessthan 1 mm from the radiographic apex.

Result: The mean time required for the instrumentation of canals using K-files (Group 1) was 28.02 ± 3.03 min. The mean time required for instrumentation using Pro-AF files (Group 2) was 18.45 ± 2.11 min. *Post hoc* analysis revealed that a significant difference was observed between the three groups with $P < 0.05$. **(Table 1)**

Radiographic quality of obturation was assessed by assessing the length of obturation and presence or absence of voids. On analyzing the radiographic quality of obturation after instrumentation with K-files (Group 1), 55.0% canals were optimally filled without any voids. In rotary group, which was instrumented using Pro-AF files, 80.0% canals, which were optimally filled, were devoid of any voids. Thus, these results show that superior quality obturation was seen after the use of Pro-AF files compared to Hand K file. **(Table 2)**

Table 1: Mean instrumentation time between hand operated and rotary system

Method	Mean± SD	p-Value
Hand Operated	28.02 ± 3.03	< 0.001
Rotary	18.45 ± 2.11	

Table 2: Comparative evaluation of obturation quality

Group	Optimum		Overfilled		Underfilled	
	Number	%	Number	%	Number	% age
Hand (n=20)	11	55.0	4	20.0	5	25.0
Rotary (n=20)	16	80.0	3	15.0	1	5.0

Discussion: To achieve maximum effectiveness in cleaning and shaping the canals of deciduous teeth, endodontic devices and techniques have undergone a great deal of progress. Root canal therapy has improved thanks to nickel-titanium rotary files by cutting down on preparation and chair-side time.

The morphology and histology of deciduous molars are different from those of permanent molars. Their roots are smaller and go through physiologic resorption, and the interior anatomy of the canals is constantly changing. The use of rotary files on deciduous teeth has been the subject of numerous reports.[7-9]

The super-elasticity, shape memory, and strength of nickel-titanium (NiTi) rotary files help them preserve the original geometry of curved canals while also reducing procedural errors. Numerous systems have been built on the market since its introduction.[10]

Pro-AF Baby Gold has five files constructed of NiTi-CM wire, which makes it more flexible and cyclic fatigue resistant. It continuously tapers between 4% and 6%. These files are 17 mm long whereas the active length is just 13 mm. It is advised to utilise Pro-AF files in well-lubricated canals at 250–300 rpm and 2.0–2.2 N torque. These files should be brushed once or twice along the entire working length.[11]

The pulpectomy prognosis is influenced by a variety of factors. The length of the root canal filling is one of the crucial factors. The highest success rate of pulpectomy is ensured by the ideal canal filling. As a result, the present study examined the obturation's quality.

On analyzing the radiographic quality of obturation after instrumentation; results show that superior quality obturation was seen after the use of Pro-AF files compared to Hand K file. These results are in accordance to the study conducted by stated by Ochoa-Romero *et al*. in 2011,[12] Babaji *et al*. 2019,[13] and Lakshmanan *et al*. 2020.[14]

Rotary files can shape curved canals much more easily and with less canal transit thanks to the memory capacity function. This gives the dentist more assurance as they work with the rotary files in a curved primary canal. Better outcomes than when using hand files are obtained thanks to the easier and more accurate obturation made possible by the larger canal preparation.[3]

Due to their shorter attention spans, chair-side time is a very important aspect in determining whether endodontic therapy will be accepted by youngsters. As a result, the current study compares instrumentation times using the two different biomechanical preparation techniques. Result of present of study showed that the Pro AF baby gold files need significantly lesser time compared to manual K file which is accordance to study conducted by Makerem *et al*. in 2014,[15] Vieyra and Enriquez 2014,[16] Panchal *et al*. 2019.[17]

Conclusion: According to the findings of the current study, pulpectomy performed using the rotary technique results in better biomechanical preparation, which improves the quality of the obturation. When compared to hand instrumentation, rotary instrumentation takes less time to conduct a pulpectomy, which is highly advantageous in paediatric dentistry.

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