

Clinical Evaluation of Rotary System over Manual System in Deciduous Molars: A Clinical Trial

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Abstract

Background: Primary teeth need special attention since they differ from permanent teeth in canal morphology and tendency for root resorption. The present study was conducted to compare manual and rotary instrumentation techniques in deciduous teeth. **Materials and Methods:** The present study was conducted on 120 patients (boys – 60, girls – 60) in the age range of 5–12 years. Patients were divided into two groups of sixty each. Group I patients were treated with rotary files and Group II patients with manual technique. Time taken for instrumentation and obturating the canals in both groups was recorded. The quality of filling was labeled as optimal, underfilled, and overfilled. **Results:** The mean instrumentation time in Group I was 12.4 min and in Group II was 18.2 min. Chi-square test showed highly statistically significant difference ($P < 0.05$). The mean filling time in Group I was 1.4 min and in Group II was 2.6 min. In Group I, in 92%, filling was optimal, whereas in Group II, 76% had optimal filling, 5% in Group I and 14% in Group II had overfilling, and 3% in Group I and 10% in Group II had underfilling. **Conclusion:** In the present study, we found lesser instrumentation time and filling time with rotary system compared to manual endodontic method.

Keywords: Deciduous, manual, rotary

INTRODUCTION

Deciduous teeth play an important role in the oral cavity. The primary function is mastication, whereas it also serves to maintain the distance for the eruption of permanent teeth. Preshedding of deciduous teeth leads to difficulty in eating as well as space closure. The causes of early loss of deciduous teeth are dental caries, trauma, and peri-apical infection.^[1] Children are more prone to develop dental caries due to excessive intake of sugar, carbohydrates, and candies. The restoration as well as endodontic treatment is the management for these teeth. The function of pediatric dentistry thus becomes essential in order to maintain esthetics, function, arch length etc.^[2]

The endodontic treatment is necessary once the infection crosses the coronal portion of deciduous teeth. Pulpectomy is performed to preserve the deciduous tooth and to ensure normal eruption of the permanent tooth. Endodontic treatment of deciduous teeth demands extra concern. It should be shorter, effective in controlling infection, and permit healing of peri-radicular tissue. The complete removal of bacteria, pulp

tissues, and toxins from root canals is the key to successful endodontic therapy.^[3]

Stainless steel hand files have been used since many years for cleaning and shaping the canals. These have their limitations such as limited flexibility and difficulty in accessing narrow and constricted canals. Rotary endodontics has been widely used in permanent teeth. Rotary endodontics in pediatrics is a new concept. It uses nickel-titanium file (Ni-Ti) system.^[4] The present study was conducted to compare manual and rotary instrumentation techniques in deciduous teeth.

MATERIALS AND METHODS

The present study was conducted in the department of pediatric dentistry. It comprised 120 patients (boys – 60, girls – 60) in

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the age range of 5–12 years. All were informed regarding the study, and written consent was obtained from the parents. The study protocol was approved by the Institutional Ethical Committee. Inclusion criteria were patients with one or two teeth with necrotic pulp, teeth with the presence of 2/3rd of root portion, and teeth with the presence of periapical radiolucency. Patients having mobile teeth, perforation in pulpal floor, teeth with resorbed roots, and uncooperative patients were excluded.

General information such as name, age, gender, systemic condition, and dental history was recorded. Patients were divided into two groups of sixty each. Group I patients were treated with rotary endodontic technique and Group II patients with manual technique.

In all patients, deciduous first molar was selected. Tooth was isolated using rubber dam. Local anesthesia was administered following standardized technique. Once anesthesia was achieved, access opening was started using round carbide bur (No. 4). Working length was determined with no. 10 file. In Group I, tooth was prepared using K3 Ni-Ti files and in Group II with stainless steel K files. Crown-down technique was used by using tapered files. Simultaneously, irrigation with 1% NaOCl was done. After completion of the procedure, the canals were filled with iodoform paste. Coronal portion was restored with glass ionomer cement. The time taken for instrumentation and obturating the canals in both groups was recorded. The quality of filling was labeled as optimal, underfilled, and overfilled.

Results thus obtained were subjected to statistical analysis. Data were expressed in mean and standard deviation. Chi-square test was used to compare both groups using SPSS software for Windows, Version 18.0. Chicago: SPSS Inc.

RESULTS

Table 1 indicates the distribution of patients that in Group I, rotary technique and in Group II, manual technique was used. The number of patients in each group was 60.

Table 2 and Graph 1 show that mean instrumentation time in Group I was 12.4 min and in Group II was 18.2 min. Chi-square test showed highly statistically significant difference ($P < 0.05$).

Table 3 and Graph 2 show that mean filling time in Group I was 1.4 min and in Group II it was 2.6 min. Chi-square test showed highly statistically significant difference ($P < 0.05$).

Graph 1 indicates mean instrumentation timing in both the groups. Instrumentation timing was more in manual group (II) compared to rotary one. Graph 2 indicates mean filling time in minutes. It was highest in Group II over Group I. Graph 3 shows that, in Group I, in 92%, filling was optimal, whereas in Group II, 76% had optimal filling; 5% in Group I and 14% in Group II had overfilling; and 3% in Group I and 10% in Group II had underfilling. The difference was statistically significant ($P < 0.05$).

Table 1: Distribution of patients

Group	Group I	Group II
Technique	Rotary	Manual
Number of patients	60	60
Total	120	

Table 2: Instrumentation time in both groups (min)

Groups	Mean ± SD	P
Group I	12.4 ± 2.6	0.001
Group II	18.2 ± 2.4	

Test used: Chi-square test. $P < 0.05$. SD: Standard deviation

Table 3: Comparison of filling time in both groups (min)

Groups	Mean ± SD	P
Group I	1.4 ± 0.6	0.004
Group II	2.6 ± 0.4	

Significance: $P < 0.05$. SD: Standard deviation

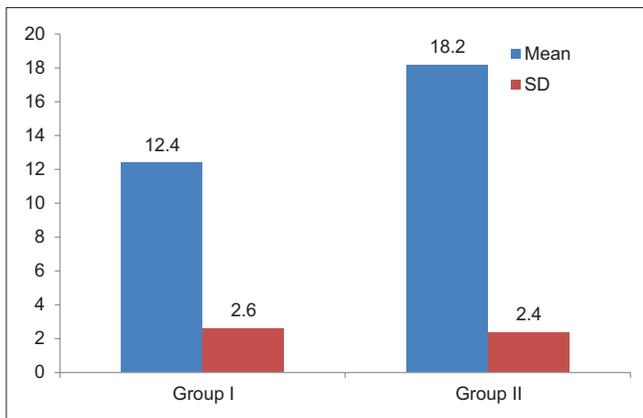
DISCUSSION

The basic principles of endodontic therapy are the removal of irritants of root canal, root canal system obturation, and maintenance of natural dentition. In accessible canals and in the presence of normal supporting bone, the process of endodontic therapy in primary teeth with necrotic pulps is indicated. Barr *et al.*^[5] first described rotary biomechanical preparation in case of deciduous teeth. Studies have revealed less instrumentation time and accurate filling using this technique. It has been observed that there is effective debridement of the uneven walls of primary teeth. In the present study, we compared rotary system with manual system.^[6,7] We included 120 patients of both genders. We divided teeth into Group I and Group II.

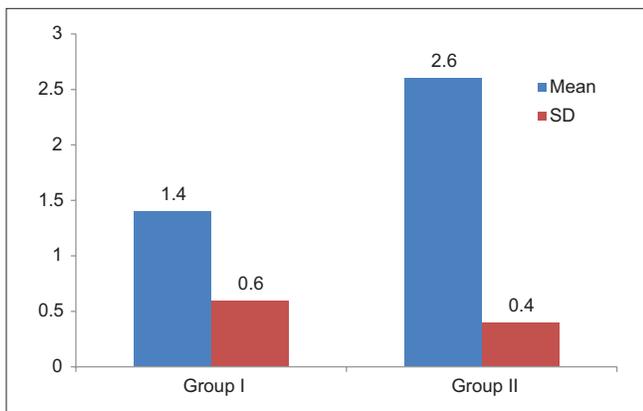
We observed that mean instrumentation time in Group I was 12.4 min and in Group II it was 18.2 min. We can comment that rotary system is superior in terms of instrumentation time. Our results are in agreement with those of Ochoa-Romero *et al.*^[8] They included forty necrotic teeth which were treated with rotary system and manual technique. The authors found rotary system better than manual system. There was optimal filling of canals and less instrumentation time.

We observed that mean filling time in Group I was 1.4 min and in Group II, it was 2.6 min. Katge *et al.*^[9] in their study compared instrumentation time and cleaning efficiency between manual and rotary systems. Ninety primary molars were divided into three groups. In Group I, H-files were used for instrumentation; in Group II, Mtwo files were used; the authors found Mtwo files better than H-files.

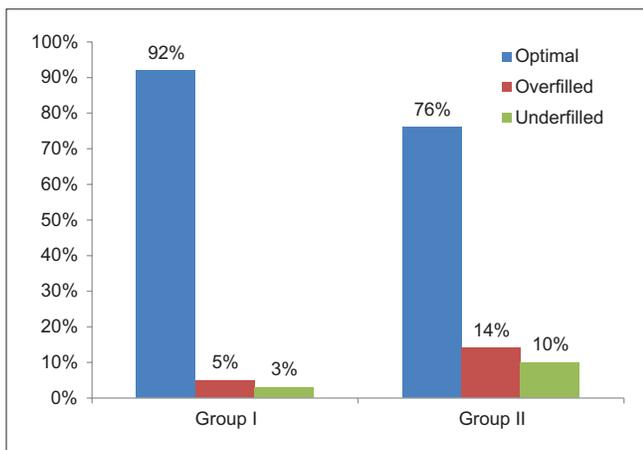
Jeevanandan^[10] in his study suggested that, though Ni-Ti instruments are widely used for root canal preparation in permanent tooth than primary teeth, there is effective and accurate filling with rotary system. The time taken for root



Graph 1: Mean instrumentation timing in minutes. Significance: $P < 0.05$.



Graph 2: Mean filling time in minutes. Test used: Chi-square test significance: $P < 0.05$.



Graph 3: Comparison of root canal filling quality in both groups. Significance: $P < 0.05$.

canal preparation with the rotary method is less compared to conventional manual method.

We observed 92% optimal filling in Group I as compared to 76% in Group II. Vieyra and Enriquez^[11] compared instrumentation time efficiency of rotary and hand instrumentation on vital and necrotic primary teeth. They included 45 primary molars

in both arches. The mean time of root canal preparation in rotary system was found to be less as compared to protaper and manual method groups. It was 20.10 ± 7.86 , 9.37 ± 2.19 , and 10.45 ± 4.77 min, respectively. Rotary system had less underfilled and overfilled canals than that of other groups.

It has been suggested that, with rotary, there is increased efficiency in both preparation time and root canal shaping which helps in maintaining patient cooperation by reducing fatigue, thus increasing clinical success.

Elnagar *et al.*^[12] in their study evaluated and compared the cleaning efficacy of rotary and manual systems for root canal preparation in primary teeth. It comprised thirty single-rooted human primary teeth. Teeth were divided into two groups. In Group I, teeth were manually instrumented with Ni-Ti K files. In Group II, Revo-S™ rotary instruments were used. There was better cleanliness with Revo-S rotary system than that obtained by manual system.

Govindaraju *et al.*^[13] in their study compared hand files, Protaper, and Mtwo files for canal instrumentation. The authors observed less canal instrumentation time with rotary files. There was no significant difference in the quality of obturation among the three groups.

Govindaraju *et al.*^[14] in another study found that there was a decrease in the instrumentation time with Protaper files followed by K3 rotary files. There was no statistically significant difference in the quality of obturation between rotary and hand instrumentation.

There are few advantages of rotary systems for canal instrumentation in deciduous teeth such as less chairside time, better debris and tissue removal, increased patient cooperation, and effective cleaning and shaping of canals. It has advantage of being efficient for the preparation of funnel-shaped canals which in turn produce uniform fill of the obturation paste. Apart from advantages, it has disadvantages also such as overfilling of canals due to overextension of instrument beyond apical end, risk of separation of the instrument within the canal, high cost, and increased risk for perforation.^[15] The limitation of the present study was small sample size. Only deciduous molars were selected for the study. The inclusion of multiple deciduous teeth could give different results.

CONCLUSION

Rotary system is widely used in permanent teeth. Their use in deciduous teeth has provided better results. In the present study, we found lesser instrumentation time and filling time with rotary system compared to manual endodontic method.

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Conflicts of interest

There are no conflicts of interest.

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