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Compare the Effectiveness of Manual Technique and Rinsendo System in the Irrigation of $Ca(OH)_2$ from Root Canals

Amini Kamal, Ghodsian Behnaz, Hosseini Marjan,
Morsali Ahari Ali and Mosavi Zahed Sharare
Department of Endodontic Khorasgan, University of Medical Science, Isfahan, Iran

Abstract: Different techniques have been introduced to improve removing the intra canal dressing like calcium hydroxide $Ca(OH)_2$. The purpose of this study is to compare the effectiveness of manual technique and Rinsendo System in the irrigation of $Ca(OH)_2$ from root canals. About 40 single-rooted teeth were divided in to 2 groups of 20 teeth each. The teeth were prepared using the flex master system size up to 30 and 0/04 taper. After instrumentation was completed, the canals were dressed with $Ca(OH)_2$ then teeth were radiographed in bucco-lingual direction. After 7 days canals were irrigated with Rinsendo in group 1 and through manual technique in group 2. After irrigation was completed canals were filled by methylene blue for 48 h and were splitted into 2 sections bucco-lingually. Then, canals evaluated under steriomicoscope. Data were analysed by Kruskal-Walis and Man-Withney test. There was significantly difference between Rinsendo and manual technique in the removal of $Ca(OH)_2$ from root canal in apical, middle and cervical third of the canal Rinsendo was more effective in $Ca(OH)_2$ removal. Neither manual nor Rinsendo System completely removed calcium hydroxide from the root canal but Rinsendo was more effective.

Key words: Irrigation system, Rinsendo, calcium hydroxide, manual technique, Man-Withney test

INTRODUCTION

In root canal therapy, the use of intra canal dressing is important between sessions for increase the success of endodontic treatment (Bottcher *et al*., 2012). $Ca(OH)_2$ has been employed as the most frequently accepted intra canal medicament (Rodig *et al*., 2011). All inter appointment dressing have to be irrigated from the root canal prior to filling (Rodig *et al*., 2011). The elimination may achieve by the mechanical action of instruments on the root canal walls and the chemical and physical action of irrigants (Lee *et al*., 2004).

Several studies have been evaluated to assess the efficacy of various devices on the removal of intra canal dressing from the root canal, e.g., using ultrasonic and manual technic (Bottcher *et al*., 2012). Cunningham evaluated comparatively, *in vitro*, the effectiveness of root canal irrigation by ultrasonic instrumentation and by manual instrumentation. They observed that root canals irrigated by ultrasound were cleaner than canals irrigated manually (Vansan *et al*., 1990).

Recently, a new technology for root canal irrigation which produces hydrodynamic activation based on the pressure suction technology has been presented to the market called Rinsendo System (Rodig *et al*., 2011; Vivan *et al*., 2010). It showed an enhanced penetration depth of a dye marked irrigant into root canal dentine and a superior efficacy in terms of tissue removal compare to manual irrigation (Balvedi *et al*., 2010; Hauser *et al*., 2007). Hauler in a study examined the efficacy of the Rinsendo System and the conventional method for root canal irrigation for debris removed (Yucel *et al*., 2011). They determined that the Rinsendo System was more effective than conventional method especially for capacity of penetration in the dentin tubules (Yucel *et al*., 2011). Present study compared the efficacy of the Rinsendo device and manual tehnique for $Ca(OH)_2$ removal from root canal during root canal therapy by sterio microscope.

MATERIALS AND METHODS

The study was examined on 50 single rooted tooth with completely formed roots and a single rooted canal. Access cavity preparation was down in a standardized manner using diamond burs 114 HL and 3082 at high-speed under refrigeration. After openings, a 15≠k file (Deutsply/maillefer, Ballaiguss, Switzerland) with a rubber stop was entered into the canal until its tip could be observed through the apical foramen then the working length was measured. Then, root canal of tooth Niti instrument (30 size, 0/04 taper) at WL using as crown down sequence. Between each file of root canals were

Corresponding Author: Amini Kamal, Department of Endodontic Khorasgan, University of Medical Science, Isfahan, Iran

rinsed with 5 mL sodium hypochlorite (3%) delivered by a syringe and a 30-gauge needle (NaviTip: ultra-dent, South Jordan UT. USA). After completion of preparation, root canals were irrigated with a find sequence of 5 mL EPTA (20%) and 5 mL NAOCL (3%) and then dried with study points. Then, $Ca(OH)_2$ injected to canals (calcipex II, water-based paste calcium hydroxide) and access cavity temporary were sealed with a cotton pellet and cavit (Espe sefeled, Germany), subsequently the specimens were stored in incubator at 37°C with 100% humidity for 7 days. In second section teeth divided into 2 groups randomly according to the irrigation method. Tempering restoration were removed from access cavity and $Ca(OH)_2$ in canals irrigated by two system.

Irrigation methods: In first group (N = 20), the root canals were irrigated with Rinsendo System (Durr Dental GmbH and Co., KG, Bietig heim-Bissingen, Germany) connected to a 30G needle (Durr Dental GmbH and Co., KG). In this method device worked base on pressure suction with hydrodynamic activation along with plastic cover that is attached to the irrigation needles to avoid reflex of irrigant solution on the patient or operator (Vivan *et al*., 2010).

In second group (N = 20) irrigation were performed with manual technique. The control group was included 5 tooth that were prepared with the same canal preparation and after completion of instrumentation, canals were injected by $Ca(OH)_2$. Subsequently access cavity was sealed by cotton pellet and cavit. In second section, no irrigation technique was performed and they were selected as positive control group. Negative group was consisted 5 tooth that after instrumentation no $Ca(OH)_2$ were injected into canals and these teeth were selected as negative control group. After irrigation completed, teeth were stored into solution of 2% methylene blue for 48 h until solution penetrate into dentinal tubules. Then, the teeth were spiltted longitudinally into two halves using a diamond disk.

Scoring procedure: The amount of remaining debris was evaluated by using a 4 grade scoring system: O = the groove is full with $Ca(OH)_2$, 1 = 2/3 of the groove is filled with $Ca(OH)_2$, 2 = 2/3 of the groove is filled with $Ca(OH)_2$, 3 = there is no $Ca(OH)_2$ in the groove. Subsequently the groves were covered under microscope with 30x magnification.

RESULTS AND DISCUSSION

There was significant differences between Rinsendo and manual technique. Calcium removal efficacy forms any third of canal (p<%5). Table 1 shows comparison between two irrigation technique in calcium hydroxide removal and percentage of tubule coloration by methylen blue.

Table 1: Comparison between two irrigation technique in calcium hydroxide removal

Zoon	Coloring average (Manual technique)	Average percentage (Rinsendo)	p-value
Apical	43.3	83.3	0.00
Middle	38.3	83.3	0.00
Cervical	71.3	96.7	0.00

Kruskal-Wallis test shows that percentage of tubule coloration by methylen blue was different in 4 groups (p<0/001). Also, comparison each two group using Mann-Whitney test and it shows that percentage of coloration in two irrigation technique was significantly more than positive control group and significantly less than negative control group. Figure 1 shows the distribution of scores for the tubule coloration by methylen blue in apical and middle of canal experimental groups.

One of the most important aims during root canal instrumentation is removal of debris or inters-appointment $Ca(OH)_2$ from the root canal system (Vivan *et al*., 2010) so that root canal filling materials can penetrate in to root tubules in order to achieve a good seal (Gorduysus *et al*., 2012) this aim requires new devises with high effectiveness and easy handling for clinical applications. This study is evaluating the effectiveness of the Rinsendo as a new irrigation technique in $Ca(OH)_2$ removal. In earlier studies different irrigation methods have been introduced to improve the irrigation efficacy of $Ca(OH)_2$ removal or remained debris from root canal such as canal brush, ultrasonic, manual technique or using rotary instrument (Wiseman *et al*., 2011; Bottcher *et al*., 2012; Rodig *et al*., 2011; Vivan *et al*., 2010; Gorduysus *et al*., 2012). Nevertheless, canal irregularities may be inaccessible for conventional irrigation procedure and $Ca(OH)_2$ may remain in these extension (Bottcher *et al*., 2012).

In this study, researchers compare the effectiveness of Rinsendo with manual irrigation technique. So, far several studies evaluated the effectiveness of Rinsendo in comparison with ultrasonic and manual irrigation (Vivan *et al*., 2010; Hauser *et al*., 2007; Caron *et al*., 2010; Kim and Kim, 2002). The comparison of Rinsendo System with static and conventional manual irrigation revealed better ability of penetration of the irrigant in the dentinal tubules, therefore this system is introduce as a more effective method for irrigation root canal walls compared to the conventional irrigation. However, the finding showed significant difference between two irrigation techniques in any canal tired. MC Gill showed that

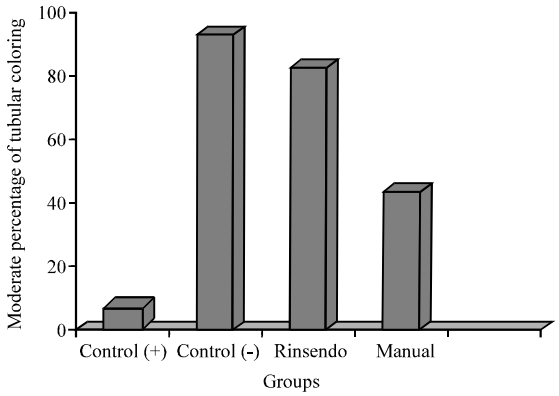

Fig. 1: Moderate percentage of tubular coloring by metylen blue in apical third

automated-dynamic irrigation with the Rinsendo was significantly less effective than conventional manual-dynamic irrigation on removal of the collagen biomolecular film in an *ex vivo* (Caron *et al*., 2010). These finding are diffrent from the study. Vivan *et al*. (2010) in a SEM analysis compared the efficacy of Rinsendo System and conventional irrigation for debris of removal and they found there was no difference in the cleaning ability of the Rinsendo System and conventional irrigation (Vivan *et al*., 2010) but in the study Rinsendo was more effective and percentage of colored tubules in Rinsendo group was similar to negative control where none of the canals were filled by $Ca(OH)_2$. In present study researchers try to equalize type, volume and temperature of irrigant solution in all groups (10 mL of NaOCl, 2.25%, 14C) up to delete any interfering factor. Also, all of the teeth were single rooted without any carve in apical and prepared with one Rotary System (flex master) 30#0.04 in all 2 groups due to delete effect of size and shape of canal on effectiveness of technique. The efficacy of Rinsendo in calcium removal from root canal showed significant difference from manual irrigation in any tired of canal.

Rodig *et al*. (2011) in a study compared the effectiveness of Rinsendo and ultrasonic irrigation for removal of calcium hydroxide from root canal (Rodig *et al*., 2011) they split the tooth longitudinally and prepare a groove in the apical part of one segment then all root halves were reassembled. Rinsendo and ultrasonic showed no significant difference in intra canal dressing removal. In present study researchers didn't use standardized groove because the major disadrantage of this model is that the standardized grooves do not represent the complexity of root canal anatom (Rodig *et al*., 2011).

In another study, Melahat in a SEM study evaluated the effectiveness of canal Brush technique as a new device for $Ca(OH)_2$ removal from the root canal system (Wiseman *et al*., 2011). The canal brush was used with a contra-angle hand piece running a 600 rpm. The results showed that Endo brush was significantly better than instrumentation alone in irrigation the root canal but canal brush technique shows the packing effect of the $Ca(OH)_2$ through to the apex.

CONCLUSION

There was difference between the Rinsendo System and manual irrigation in the cleaning ability of root canal walls. Because many devices are introduced to the clinicians for canal irrigation during root canal therapy further researches is necessary to optimized irrigation protocols for the removal of intracanal medication.

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