EFFICACY OF ENDO ACTIVATOR OVER CONVENTIONALSYRINGE IRRIGATION IN TRADITIONALLY & MINIMALLY ACCESSED TEETH

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Abstract
Background: Adequate endodontic access is essential for effective delivery of therapeutic chemo mechanical measures into the root canals. In this regard, the access cavity may be considered the single most important phase in root canal treatment, as all of the steps that follow may be compromised if adequate access is lacking. The emerging concept of conservative endodontic access disregards the traditional requirements of a straight line access and complete de roofing of the pulp chamber& stresses on minimizing the tooth structure loss. This has raised doubts about canal cleanliness due to inadequate access cavity and possible inefficient root canal irrigation. Hence, it requires better mechanical means for cleaning and irrigation. This study compares the efficacy of irrigation methods by using conventional syringe and endoactivator in traditional and minimal access cavity.
Materials and Methods: 10 Single canal teeth and 5 premolars with two canals were selected which were further divided into two groups, i.e. Group I- single rooted single canal teeth with traditional access preparation. Group II- single rooted double canal premolars with minimal access preparation. In group I(10 teeth) five teeth were irrigated by syringe and remaining 5 by the endoactivator similarly for group II one canal of each premolars was irrigated by syringe whereas another canal with the endoactivator. After irrigation teeth were split into two halves and observed under Dental operating microscope and images were taken.
Results: The syringe group removed less amount of debris compared to that of endoactivator in both traditional and minimal access preparation.
Conclusion: The endoactivator enhances the removal of debris from root canal as compared to conventional syringe irrigation.
Key words: Endoactivator, Endodontic triad, Irrigation, Minimal access preparation, Traditional access

Introduction

The key to achieve successful endodontic treatment is to ensure complete eradication of the present infection and prevention of re-infection in future that can be achieved by completion of endodontic triad. The endodontic triad consist of biomechanical preparation, microbial control and three-dimensional obturation of the canalspace.[1] However, unless access to the canal orifices and the apical foramina are done properly, achieving the goals of the triad will be difficult and time consuming.[2]

In order to gain entry to the root canal system the endodontic access cavity cuts completely through the enamel and dentine in an apical direction which significantly reduces the rigidity of the tooth.[3] Although cleaning and shaping potentials are improved when instruments conveniently pass through the traditional endodontic access, tooth become more liable to fracture due to tooth structure loss by previous decay as well as access preparations and the tooth strength is reduced in proportion to coronal tissue lost.[4]

To overcome this condition the concept of minimal endodontic access comes into play. Minimal endodontic access(MEA) considered to be an alternative to traditional endodontic cavity (TEC).[5] No man made material or technique can compensate for tooth structure lost. Hence, dentin and enamel conservation is best and only proven method to buttress the endodontically treated teeth MEA emphasize on maintaining the structural integrity of pericervical area of tooth for long term survivability and optimum function.

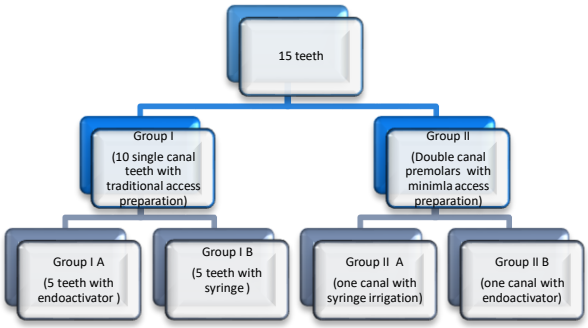
In series of endodontic treatment the next step after access preparation is cleaning and shaping of root canals that include instrumentation and irrigation of root canal for the removal of debris and smear layer by different techniques. Irrigation is considered to be the most important in chemo-mechanical preparation of the canal system. Irrigation is complementary to instrumentation in facilitating the removal of bacteria, debris and necrotic tissue[6], especially from areas that are routinely left uninstrumented following root canal preparation, e.g. isthmuses, oval extensions and apical deltas.[7]

Indeed, the flushing action to clean the canal is more important than the ability to dissolve the tissue. Several studies have been performed to evaluate the efficacy of different irrigation techniques used. It has been observed that the flushing action created by syringe irrigation is relatively weekend dependent not only on the anatomy of the root canal system but also on the depth of placement and the diameter of the needle.[8,9]but syringe irrigation is the most common method of irrigation used in day to day clinical practice. It has been demonstrated that the flushing action of syringe irrigation to remove debris from root canal irregularities is not sufficient as compared to agitation of irrigants with various methods including sonic/ultrasonicdevices.[10-13]Use of ultrasonics, sonics, ultrasound and laser for irrigation is also well documented that can well enhance the flushing action of irrigants.[9-13]

The dental literature referred so far has been in terms of traditional endodontic access preparation. No study yet has been performed to evaluate the efficacy of irrigation techniques in MEA. It is difficult to reduce the bio burden from root canal in case of MEA than TEC but with the advancements of irrigation systems as sonic, ultra sonic & lasers, the elimination of microorganisms has become less difficult. Endoactivator was introduced few years back as a sonic irrigation method which is easy to use in MEA. Unlike endodontic instruments, it consists of a polymer tip that eliminates the chances of separation of instrument into the canal space.
Hence, this study is a step towards evaluation of the effectiveness of endoactivator in minimally accessed endodontic cavity.

Materials and methods
Ten freshly extracted human teeth with single straight root canals, and five premolars with two root canals with mature apex and without any prior endodontic treatment were collected and stored in normal saline.

Figure 1: Materials used for the study



Grouping of sample

Access Preparations- Traditional endodontic access cavity were prepared in Group I & simultaneously minimal endodontic access were prepared in Group II from the fossa. After preparation of the access cavity, the length of the tooth was measured by inserting a standard 15 no. File into the root canal and verified by radiograph.

Cleaning & shaping- After access preparations, canals were shaped by using a step back technique with master apical file (MAF) size of #40. Throughout shaping of canal irrigation was performed by 26 gauge needle with every change of instrument.

Figure2: Traditional endodontic access

Figure 3: Minimal endodontic access

Endoactivator Agitation-After cleaning and shaping, the last irrigation was done by activation of the Endoactivator using 5ml of normal saline in group IB as well as in Group II B. Therefore, irrigation was achieved by overall use of 30ml normal saline in both the groups.

Evaluation: To evaluate the cleaning efficacy of both the groups, teeth were split longitudinally along the axis using a diamond disc &chisel instrument. Split parts were observed under 1x magnification of dental operating microscope.

Scoring Procedure: The amount of residual debris in the canal was scored under the microscope by one investigator unaware of irrigation technique performed using a scoring system.[14]

SCORE	DESCRIPTION
0	The entire canal is free of debris
1	Less than half of the canal is filled with debris
2	More than half of the canal is filled with debris
3	The entire canal is filled with debris

Table 1: Scoring Criteria for residual debris after irrigation

Figure 4:Syringe Irrigation for traditionally access prepared tooth

Figure 5- Endoactivator Irrigation for minimal access prepared tooth

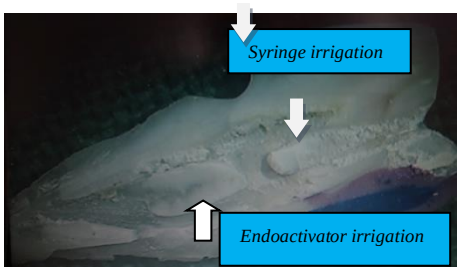


Figure 6- Syringe and Endoactivator Irrigation in Minimal Endodntic access prepared tooth

Result-The score for procedure are shown in table 1 & 2

	Traditional endodontic access	Conservative endodontic access
Endo-activator [Mean ± SD]	1±0.00	1.60±0.55

Table 2 -Score for teeth with Traditional Endodontic Access Cavity

	Syringe [Mean ± SD]	**Endo-activator [Mean ± SD]**	**Z#**	**P**
Minimal endodontic Access	**2.60±0.54**	**1.60±0.55**	**-2.236**	0.02*

Table 3 -Score for teeth with minimal endodontic access cavity

Statistical Analysis-Statistical analysis was done using Wilcoxon Sign rank test(Table 3-5). In traditional access cavity the endoactivator clean debris significantly better than conventional syringe. Similarly, in Minimal endodontic access also endoactivator was significantly better than conventional syringe. (<0.05). (Graph 1-3)

S.no.	**Syringe irrigation**	**Endo activator irrigation**
1	2	1
2	1	1
3	2	1
4	2	1
5	3	1

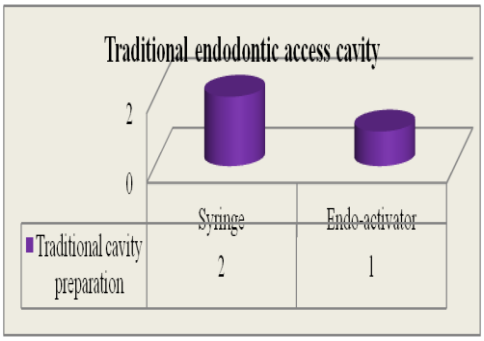
Table 4- Mean of syringe and endoactivator irrigation in traditional endodontic access

	Syringe [Mean ± SD]	**Endo-activator [Mean ± SD]**	**Z#**	**P**
Traditional endodontic Access	2.00±0.70	1±0.00	-1.890	0.04*

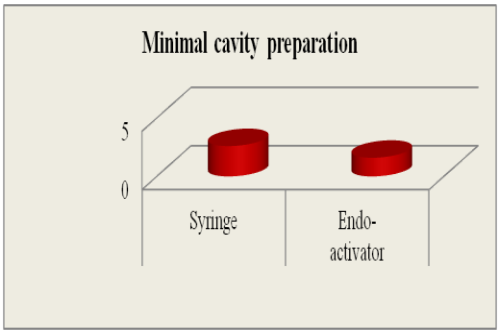
Table 5- Mean of syringe and endoactivator irrigation in minimal endodontic access

S.no.	**Syringe irrigation**	**Endoactivator irrigation**
1	2	1
2	3	2
3	3	2
4	2	1
5	3	2

Table 6- Mean of syringe and endoactivator irrigation in traditional endodontic access



Graph 1- syringe and endo activator in traditional endodontic access

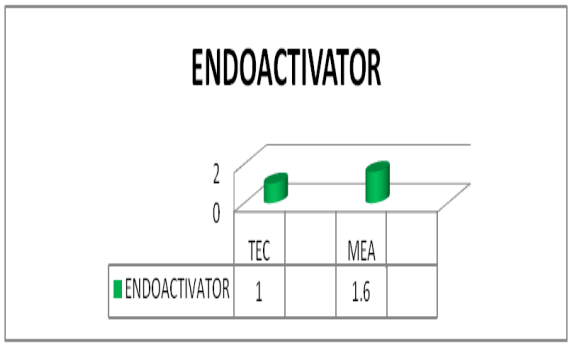


Graph 2- syringe and endo activator in minimal endodontic access

Discussion

During endodontic treatment the access to the root canal is considered as one of the most important steps. The access cavity makes the succeeding stages of the endodontic treatment easier, safer and offer the clinician complete control over the instruments.[15]In the current era of minimization the access cavity preparation is also minimized with minimal loss of tooth structure, leading to better fracture resistance. As a result, changes in

irrigation protocols are needed. During and after instrumentation, the irrigants facilitate removal of microorganisms, tissue remnants, and dentin chipsfrom



Graph 3- Effect of endoactivator in both traditional endodontic access and minimal endodontic

the root canal through a flushing mechanism. Irrigants also prevents packing of the hard and soft tissue in the apical root canal. Recently several sonic and ultrasonic methods for irrigations are available that claim for better removal of debris and necrotic tissue from the root canal. Endoactivator a sonically driven device, introduced few years back has been claimed to consider as an effective irrigating device[10]. Therefore, in this study endoactivator was used to compare its effectiveness over conventional syringe irrigation.

Very few studies are conducted where endoactivator is compared to conventional syringe irrigation, especially in MEA. In the study, premolars with two canals were particularly chosen for minimal endodontic access because cleaning efficacy can be well compared if the two canals of same tooth are used as they have same amount of bio burden and microorganisms distribution. The use of an antibacterial irrigant was omitted because this study was designed to assess only the mechanical effects of agitation[16]. A total of 30ml of irrigating solution was used for each tooth for appropriate removal of the debris from root canals.

To remain consistent in our comparison and to improve fracture resistance of the tooth, the tapered canals were prepared to ISO #40, which is the minimal size to allow efficient irrigation with either the needle irrigation as well as sonic irrigation.[15].In the present study, a scoring system was used to facilitate comparison among groups for better understanding and scoring[14]

Previously Endoactivator has been used to disinfect canal prepared by traditional access cavity. But no study has been performed in dental literature till now using endoactivator in the minimal endodontic access cavity preparation. Also none of the studies have compared canal cleanliness in one tooth with one root and two canals.

Conclusion

MEA are in the interest of the patient, and conservation of tooth structure. It requires optical magnification aids, ultrasonic-assisted preparation techniques, modern file systems, and in-depth knowledge of the tooth and root canal anatomy. However, as yet there is no clear evidence concerning the impact of MEA on the success rate of irrigation, more studies with larger sample size are required.

This pilot study demonstrates that Endoactivator irrigation is superior to syringe irrigation and equally effective in removing debris from traditional as well asMEA preparations.

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