

ORIGINAL ARTICLE**COMPARISON OF APICAL EXTRUSION OF CHLORHEXIDINE USING 2 DIFFERENT ROOT CANAL IRRIGATION TECHNIQUES**Manoj Chandak¹, Rasika Kashikar², Prithwish Mukherjee³, Rakhi Chandak⁴¹Professor and Head, Department of Conservative Dentistry and Endodontics,²Post graduate student, ³ Post graduate student, Department of Conservative Dentistry and Endodontics, Sharad Pawar Dental College, Sawangi Meghe Wardha Maharashtra, ⁴Associate professor, Department of Oral Medicine and Radiology, Swargiya Dadasaheb Kalmegh Smruti Dental College, Nagpur Maharashtra**ABSTRACT:**

Introduction: We compared the apical extrusion of Chlorhexidine delivered with a 27-G needle, and the EndoVac system (SybronEndo, Orange, CA) during the instrumentation and final irrigation of root canals. **Methods:** Matched paired single-canal teeth were divided into 2 groups. The experimental groups were needle irrigation size #30 (NI30), and EndoVac size #30 (EV30). Teeth were embedded in 0.2% agarose gel (pH = 7.4) containing 1 mL 0.1% m-Cresol purple (titan media), which changes color at a pH level of 9.0. Root canals were irrigated with Chlorhexidine using 2 different techniques, and the amount of irrigant was controlled. Standardized digital photographs were taken 20 minutes after the first irrigant was used and were analyzed to determine the amount of extrusion (expressed as a percentage of total pixels). **Results:** The amounts of apical extrusion obtained in the NI30 and EV30, were 50% (10/20), and 10% (2/20), respectively. The EndoVac group showed significantly lower extrusion values than the needle irrigation techniques in terms of the number of teeth and pixels. **Conclusion:** The risk of apical extrusion is significantly lower with the EndoVac in comparison with the needle irrigation techniques.

Key Words: Apical extrusion, EndoVac, needle irrigation

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INTRODUCTION:

Bacteria play a primary role in the development of pulp necrosis, periapical pathosis and post-treatment disease. Careful removal of vital and necrotic remnants of pulp tissue, debris, microorganisms, and microbial toxins from a root canal system is essential in endodontic treatment. However, debris is difficult to remove effectively using mechanical instrumentation alone. Because the root canal system has a complex and irregular

structure. Thus, root canal irrigation needs to be incorporated to enhance debridement.¹

Various studies have proven the effectiveness of chlorhexidine for bacterial reduction in addition to mechanical cleaning and shaping but it must be confined to the root. The apical extrusion of chlorhexidine and other irrigants should be minimized during endodontic treatment so as to reduce the possibility of iatrogenic harm to patients.² Irrigation solutions are often delivered with a 30- or 27-G

endodontic slot-tipped needle placed into the canal until just short of the apex. But the depth of needle penetration is dependent on the size and morphology of each canal. The EndoVac negative pressure irrigation system was developed to address the procedural challenge of delivering irrigants safely to the Working length. A delivery/evacuation tip is attached to a syringe of irrigant and the high speed suction of the dental chair. A small tube attaches either a macro- or microcannula to the suction. The delivery/evacuation tip places irrigant in the chamber and siphons off the excess to prevent overflow.⁴ An EndoVac placed to the Working length resulted in significantly better debridement at 1 mm from the working length compared with needle irrigation in teeth prepared to an ISO size #36 or larger. The purpose of this study was to compare apical extrusion of chlorhexidine delivered with a 27-gauge irrigation needle, the EndoVac, during both instrumentation and the final irrigation of single-canal teeth.³

MATERIAL AND METHODS:

A Total hundred freshly extracted human permanent anteriors with straight root canal was selected for the study. Freshly extracted, intact, unrestored human anteriors having working length ranging from 18-20 mm was selected for the study. Extracted tooth with root resorption, cracks, and previous history of root canal were excluded from the study. Immediately after extraction, the teeth were stored at room temperature in phosphate-buffered saline (Titanmedia) till use. OSHO guide lines were followed for storage of extracted teeth.

Preparation of sample:

A flat occlusal surface was made as a reference on incisal edge for determining the working Length. Standardized access cavity was prepared with a #2 round bur. The Working Length was determined as the point in which a size 15K file (Dentsply) was just visible at the root end with x20 magnification. Working length was confirm by radiographic method. Biomechanical preparation was done with crown down technique using rotary protaper (Dentsply Malliefer) system till #30 master apical file.

The teeth were fixed rigidly and secured to a modified flat-sided clear plastic container using self-curing resin(DPI) and will be embedded in a Agarose

gel(titan media)A size15K file (Dentsply) Was placed at the Working length in each canal to prevent the 0.2% Agarose gel (titanmedia) containing 1mL 0.1% Cresol purple (titamedia) from getting into the canals. Cresol purple (titan media) has a pH-sensitive color change (from yellow at pH = 7.4 to purple at pH = 9). A color change to purple will indicate the extrusion of NaOCl (pH = 11.4) into the gel.

Apical patency was maintained by passing a #15 file to the Working length after each rotary instrument in all groups. To standardize the time for diffusion of the dye, the gel was photographed at precisely 20 minutes after the initial irrigation with chlorhexidine. The gel was photographed digitally using a camera at a fixed distance. The standardized photographs were analyzed using Adobe Photoshop 7 to determine the area of the color change (expressed in pixels)

Specimen grouping:

Hundred anterior teeth were randomly divided into three groups i.e.:

Sr. No.	Group	Sample	Method of Irrigation
1.	Group A	Twenty	Needle irrigation
2.	Group B	Twenty	Pressure alteration irrigation
3.	Group C	Twenty	Control group

Root canals were irrigated using 2 mL 5.25% NaOCl between all instrument changes. The final irrigation was performed with 2 ml 5.25% NaOCl and then 2 mL 17% EDTA followed by 2 mL 5.25% NaOCl. Twenty teeth were used as positive and negative controls to assist color changes in the gel. Positive control group were irrigated by 0.5 ml NaOCl and negative control teeth were irrigated by 0.5 ml saline over 30 seconds. The data was then analyzed using the Kruskal-Wallis, Mann-Whitney U test with the P value set at <0.05.

STATISTICAL ANALYSIS

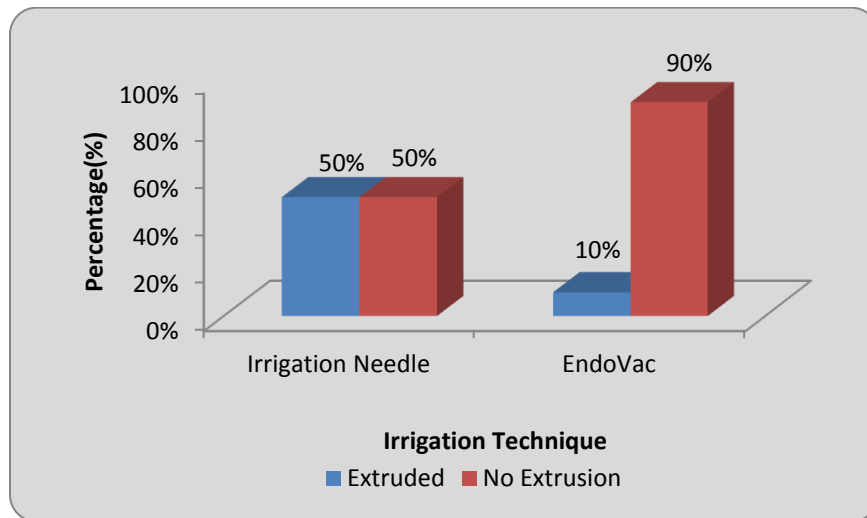
Statistical analysis was done by using descriptive and inferential statistics using Chisquare test and Mann Whitney U test and software used in the analysis were SPSS 17.0 version and GraphPad Prism 5.0 version and p<0.05 is considered as level of significance.

RESULTS

Table 1: Number of teeth showing Apical Extrusion according to Irrigation Technique

Number of teeth	Irrigation Needle	EndoVac	χ^2 -value	p-value
Extruded	10(50%)	2(10%)	38.10	0.0001,S
No Extrusion	10(50%)	18(90%)		

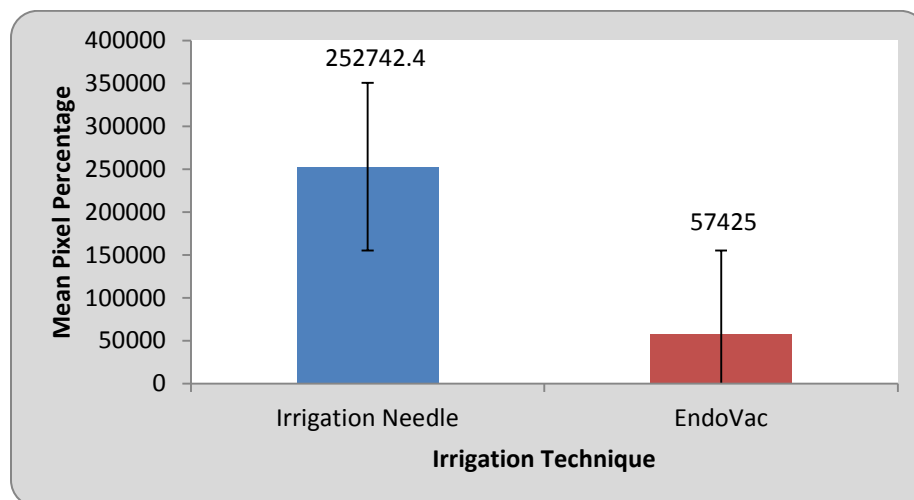
Graph 1: Number of teeth showing Apical Extrusion according to irrigation technique



Mann Whitney U Test

Irrigation Technique	N	Mean	Std. Deviation	Std. Error Mean	z-value
Irrigation Needle	10	252742.40	25966.32	8211.27	10.18
EndoVac	2	57425.00	7672.10	5425.00	p=0.0001,S

Graph 2: Pixel percentage according to irrigation technique



DISCUSSION

A sufficient volume of irrigant should be supplied to a mechanically instrumented space. However, it is difficult to irrigate the apical portion of the root canal system sufficiently to achieve satisfactory root canal debridement⁵

In this study, the needle was not placed closer than 2 mm from the WL. In contrast, the EndoVac was used at the WL as recommended by the manufacturer. The results of this study reflect extrusion using the apical extent of “safe” endodontic needle placement and the manufacturer’s recommended location for the EndoVac at the WL.⁶

Thorough cleaning of the root canal depends on effective irrigant delivery, solution agitation, and its direct contact with the entire canal wall, particularly in the apical third. Brunson et al and de Gregorio et al showed that an increase in the apical size resulted in a gain of irrigant volume.⁷

Our study presents 2 data variables: the frequency of apical extrusion and the number of pixels. The number of pixels directly corresponds to the amount of the extruded irrigant, which is more important than the number of teeth showing extrusion because the greater the amount of extrusion the greater the damage to the periapical tissues.⁹ Apical extrusion may occur in any irrigation procedure as shown in our results, but if the amount of extrusion is small, the periapical tissues would not be harmed, and the patients would show no clinical symptoms.¹⁴

CONCLUSION

Our results showed that needle irrigation should be our last choice among these techniques because our pixel percentage data showed that it extruded the most amount of irrigant. Our data suggested a significantly lower frequency of extrusion of chlorhexidine using the EndoVac compared with needle irrigation techniques. Further research should investigate the actual volume of irrigant reaching the apex with the EndoVac.

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