



Comparision of volume of irrigant extruded beyond apex by two instrumentation systems

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ABSTRACT

The prime aim of any root canal treatment is to reduce the microbial load within the root canal system. This is achieved by proper chemomechanical treatment of the root canal. During such procedure there may be some inadvertent extrusion of irrigant and debris beyond the apex. Sixty mandibular first premolar teeth were divided into two groups of thirty each. The first group was instrumented with stainless steel hand K-files whereas the second group was instrumented with nickel-titanium rotary Protaper files. 2.5% sodium hypochlorite and saline were used as irrigant. The irrigant thus extruded from each group of teeth were collected and subjected to volumetric comparison. The data obtained were analyzed using Tukey test. In both the groups, irrigants extruded beyond the apex and there was no statistically significant difference between the groups. However, there was less extrusion of irrigant in the group in which Protaper had been used.

KEYWORDS : irrigants, extrusion, root canal treatment

Introduction

A well cleaned root canal space is of prime importance during an endodontic treatment. Irrigants which are used during the root canal treatment may extrude inadvertently beyond the apex.[1] During cleaning and shaping irrigants which go beyond the apex may carry debris and microorganisms to the periapex which may cause inflammation in the periapical region.[3] Engine-driven nickel-titanium instruments have been shown to prepare the root canal rapidly, and maintain the canal shape and working length with few aberrations during root canal preparation. They are available in various designs that differ in tip and taper design, rake angles, helical angles, pitch, and presence of radial lands.[8] All preparation techniques and instruments have been reported to be associated with extrusion of infected debris, even when preparation is maintained short of the apical terminus.[4]

Tissue reactions following instrumentation short of the apex are milder than those reactions that follow instrumentation beyond the apex.[2] It is also known that inflammatory reactions can cause bone resorption, edema, and pain.[3] Therefore, it is logical to assume that minimizing the amount of apically extruded material should minimize postoperative reactions.

Materials and Methods

A total of forty maxillary central incisors were taken for this in-vitro study. Teeth were selected such that they had single root with single canal as found radiographically. Any teeth with blunderbuss apices were excluded from the study. Pulp was extirpated from the root canals by preparing the access cavity in each teeth and using broaches.

Holes were made in the rubber stopper of glass vials such that the teeth could be suspended from them. A tooth was inserted under pressure into a rubber stopper up to the cemento-enamel junction. The apical part of the root was suspended within the vial; which acted as a collecting container for apical material evacuated through the apical foramen. A bent 19-gauge needle was forced alongside the rubber stopper to use as a drainage cannula and balance between the air pressure inside and outside the vials. Two coats of nail varnish were applied to the external surface of all roots. A hole was created in the nail varnish that covered the apical foramen using a size 15 K-file. During this procedure, only 1 mm of instrument was extruded. The rubber stopper with the tooth was then fitted into the mouth of the vial.

Group 1: In the first group K-files were used as the instrument to clean and shape the canals. The apical portion was prepared till a

master apical file size of 50 K-file taking the total length of the tooth and subtracting one as the working length.

Group 2: In the second group, Protaper rotary files were used to clean and shape the canals.

All the canals after instrumentation were irrigated with a volume of 5ml and a concentration of 2.5% sodium hypochlorite. The extruded irrigant was collected with the help of a syringe and the volume collected was noted with respect to the marking present on the syringe.

Statistical analysis of the data was performed using Kruskal-Wallis one-way analysis of variance and Mann-Whitney U tests.

RESULTS

Irrespective of the instruments used to prepare the root canals, irrigants did extrude beyond the apex although in varying amounts. No statistically significant difference was observed among all groups in terms of debris extrusion ($P > 0.05$). Volume of irrigant extruded in the first group which were instrumented with K-files was more than the volume of irrigant extruded in the second group in which Protaper rotary nickel-titanium files were used.

Table 1. Mean volume of extruded irrigant

Group	Instrument Type	Mean volume of extruded irrigant (mL)
1	K-files	0.8
2	Protaper Files	1.9

DISCUSSION

There are a wide array of instruments which can be used to clean and shape root canals. Each instrument system has its own advantages and disadvantages. Although any dentition could be used for the study, here we chose to take maxillary central incisors as we could obtain a more uniformity in the samples. As most of the maxillary central incisors have straight roots, the chances of variation is very less. The working length for the instrumentation of the root canals was kept 1 mm short of the apex.

In the instrument group in which Protaper files were used, less irrigant was extruded beyond the apex. This could be as a result of early preflaring in the coronal root canal area. Thus, there would be more space for the irrigant to escape out of the canal from the coronal direction. On the contrary, due to the absence of coronal preflaring in case of K-files, a piston-like effect is created and thus the chances of extrusion of the irrigant through the apex relatively increases.

Conclusion

The results of this study show that all instrumentation systems extrude irrigant beyond the apex. However, in group instrumented with ProTaper files, less debris was extruded beyond the apex as compared with the group instrumented with K-files.

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