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Comparative evaluation of removal of root canal sealers namely AH + and Portland cement by using protaper universal retreatment files alone and in combination with H files: A stereomicroscopic *in vitro* study

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Abstract
The success of nonsurgical root canal retreatment depends on the complete removal of the filling material such as gutta-percha and sealers from root canals. Sixty freshly extracted teeth were single rooted maxillary incisors were selected for the study. The samples were divided into 4 groups after root canal treatment.
Group I: AH + sealer; Protaper universal retreatment files alone for retreatment – 15 teeth, Group II: Portland cement as sealer; Protaper universal retreatment files alone for retreatement – 15 teeth, Group III: AH + sealer; Protaper universal retreatment files followed by H file for retreatment – 15 teeth, Group IV: Portland cement as sealer; Protaper universal retreatemtn files followed by H file for retreatement – 15 teeth. The teeth were sectioned after the retreatment process and observaed under stereomicroscope for remaining filling material.
All the groups were compared and the results were not significant. Within the limitations of this study it can be concluded that Portland cement has the required retrievability property when used as a sealer, further research with regard to its property such as handling, wetting, dentinal tubule penetration and interaction with dentine need to be studied.

Keywords: Endodontic retreatment, Portland cement, retreatment files, root canal treatment

Introduction
The basis for successful endodontic therapy depends on proper diagnosis chemomechanical debridement and three-dimensional obturation of the root canal. Success rate root canal treatment is claimed to be 95% however root canal treatment fails because of many factors one of the major being under obturation of the root canal [1]. In such cases endodontic retreatment needs to be done. In the contemporary Endodontics retreatment of such cases is possible due to development of different nickel-titanium instruments systems. A new retreatment rotary system has been introduced which is The ProTaper R system consist of three flexible instruments [D1 (30/0.09), D2(25/0.08) and D3 (20/0.07) files] which are specially designed for root filling removal from the coronal, middle and apical portions of root canals, respectively [2]. Different root canal sealers have been used in endodontics, AH+ plus being the one of them. In the recent years Portland cement has shown to be a promising alternative as a root canal sealer which needs to be further investigated for its properties [3].
However success of any retreatment procedure will again depend upon total removal of root canal filling material along with sealer. Hence this study is proposed to comparatively evaluate removal of root canal sealers namely AH + and Portland cement by using protaper universal retreatment files alone and in combination with H files.

Materials and Method
Sixty freshly extracted teeth were single rooted maxillary incisors were selected for the study. Exclusion criteria: to minimize the variables associated with the study teeth with cries, crack and open apices were excluded along with teeth with resorbed roots, multirooted roots and teeth with curved roots. The teeth were verified radiographically for having patent and almost straight canal.

The selected teeth were stored in the containers containing normal isotonic saline at room temperature and were used within one month of extraction. The crowns of extracted teeth were removed with a diamond disk to leave 18mm root measured with a caliper. Cleaning and shaping was performed with stepback technique. In this procedure the apical constriction was identified using 15 no. K file and working length was determined. step back technique was done by increasing sizes of files using Master apical file no.40 and step back procedure was completed. The canals were irrigated between instrumentation using 17% ethylene di amine tetra acetic acid (EDTA) and 3% sodium hypochlorite.

30 samples were obturated using Portland cement as sealer with lateral condensation technique with Gutta percha no. 40 master cone and no. 35 spreader was used for accessory cones till canal was completely filled. 30 samples were obturated using AH+ as sealer with lateral condensation technique with Gutta percha no. 40 master cone and no. 35 spreader was used for accessory cones till canal was completely filledand confirmatory radiographs were taken. The teeth were left for 1 week for sealer to completely set.

The samples were divided into 4 groups

Group I: AH + sealer; Protaper universal retreatment files alone for retreatment – 15 teeth.

Group II: Portland cement as sealer; Protaper universal retreatment files alone for retreatement – 15 teeth

Group III: AH + sealer; Protaper universal retreatment files followed by H file for retreatment – 15 teeth.

Group IV: Portland cement as sealer; Protaper universal retreatemtn files followed by H file for retreatement – 15 teeth ProTaper Retreatment Files D1, D2 and D3 were used in the coronal, middle and apical thirds according to manufacturer's instructions and in group III and IV no. 25 H file was used in circumferential manner after the usage of rotary instruments.

The teeth were sectioned and observesd under stereomicroscope for any remaining debris and scored as follows.

None to slight presence 0%–25% of residual debris covering the dentinal surface, presence of 25% to 50% of residual debris on the surface, presence 50%–75% of residual debris, the entire or almost the entire surface (75%–100%) covered with residual debris [7].

Results

All the groups were compared (table 1) and the results were not significant. However When intergroup comparision was done between Group 1 and 2 showed significance and also group 1 and 4, group 2 and 4 and group 3 and 4. There was no significant difference of removal between group 1 and 3 and group 2 and 3.

Table 1: mean and standrd deviation (SD) and p value to compare all group by Anova

	Groups			
	I	II	III	IV
Mean	11.43	5.71	8.29	2.14
SD	6.16	0.83	2.19	1.23
P Value	<0.00001, Shows Significant Difference At p<0.05			

Discussion

The success of nonsurgical root canal retreatment depends on the complete removal of the filling material such as gutta-percha and sealers from root canals to allow effective cleaning, shaping and refilling of the reinfected root canal [4, 5].

Portland Cement differs from Mineral trioxide aggregate (MTA) by the absence of bismuth ions and the presence of potassium ions. Both materials have comparable antibacterial activity and almost identical properties macroscopically, microscopically and by X ray diffraction analysis. It has also been shown that Portland Cement and MTA have similar effects on pulpal cells when used for direct pulp capping in rat teeth Taking into account the low cost and apparently similar properties of Portland Cement in comparison to MTA, it is reasonable to consider Portland Cement as a possible substitute for MTA in endodontic applications [3].

When AH plus and Portland cement were compared with only protaper universal retreatment files to remove filling material AH plus remained in the canal more than portland cement which was statistically significant as was the case when H file was used. Use of H file along with protaper universal retreatment file was associated with increased removal of obturating material but results were not statistically significant which is in line with other studies [6, 8].

Several articles regarding experimental root canal sealers using Portland cement stated that the cement had the potential to be used as a root canal sealer so it becomes necessary to test the retrievability of the sealer which is one of its requirements [9, 11]. In this study when Portland cement was used as a sealer the teeth exhibited lesser amount of material however statistically insignificant but use of H file did not significantly enhance the retrievability. Further studies using scanning electron microscope to see dentinal tubule penetration are indicated.

Conclusion

Within the limitations of this study it can be concluded that Portland cement has the required retrievability property when used as a sealer, further research with regard to its property such as handling, wetting, dentinal tubule penetration and interaction with dentine need to be studied.

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