EVALUATION OF REMOVAL OF GUTTA PERCHA POINTS AND SEALER WITH HEDSTROM FILES ALONE AND AUGMENTED BY CHLOROFORM

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ABSTRACT

Objectives: *To compare time dependent value and potential for effectiveness of Hedstrom files alone and facilitated with chloroform to retrieve the obturated material from root canals.*

Materials and Methods: *First premolars, single rooted teeth (n=20) were used. Root canals of specimen teeth obturated following standard protocol, specimens incubated at 37° C for one month in humid conditions in an incubator. Re-treatment was performed with H files alone (group A) and facilitated with chloroform (group B). Time spent for removal of material for both groups was recorded. To inspect the remaining material in the root canals specimens were splitted longitudinally. Photographs of the splitted specimens were taken for confirmation and record.*

Results: *Mean values showed a marked difference in two protocols which were confirmed by independent t test which provided highly significant value.*

Conclusion: *Hedstrom files alone (not aided by chloroform) are efficient for removal of materials from obturated root canals in terms of efficacy and time.*

Key words: *Re-treatment, Retrieval of obturated material, Chloroform facilitated removal, Hedstrom files.*

INTRODUCTION

Modern techniques and instruments have made root canal treatment (RCT) easy and reliable but failure chances are inevitable. Problems associated with treatment failure are lack of cleanliness of canals, inappropriate hermetic seal, and percolation of materials from crown of the tooth.[1] Inattentiveness to these factors can leads to treatment failure. To save a tooth through retreatment (re-RCT) includes extraction of gutta percha point (GPP) along with sealer and debridement of canals. Files with solvent facilitate retrieval of GPP along with sealer from the root canals of the tooth in dental care facility clinics and hospitals.

Chloroform used as solvent in dentistry for recovery of root canal obturation material. Since1833 chloroform was used in dentistry. Due to its rapid action, usage as solvent for removal of GPP in retreatment cases in dentistry, however it is also reported as cytotoxic and carcinogenic in literature.[2-6] International Agency for Research on Cancer (IARC) declared it as Group 2 B carcinogen.[7] Alternative techniques and materials for removal of GPP and sealer were considered and evaluated in different studies to resolve this issue.[8-10]

Hedstrom (H) file is common, cost effective, non-technique sensitive manual instrument effective in removal of root filling materials. Rotary systems are reported to be associated with high procedural

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error rate.[11] Hedstrom files were used as a standard in comparative studies for determination of cleaning ability of new techniques and devices.[12]

This study was conducted for removing GPP and sealer with Hedstrom (H) files from root canals of teeth having straight roots and comparing it with chloroform augmented technique, by verifying removal of GPP and sealer from canals. Time dependent complete removal of material was evaluated through this in vitro experiment. Null hypothesis for this study was, no difference found in time intervals for removing root canal filling materials with H files alone and chloroform augmented.

MATERIALS AND METHODS

Seventy-six extracted mandibular premolars were collected from different dental surgery departments including own practice from Peshawar, Pakistan. Plastic containers having 2.5% NaOCl used for specimen collection. Specimens properly cleaned and stored in NaOCl solution for the period of one week, saline washed then sterilized through autoclave for a period of 30 minutes at 121 c.

Teeth radio graphically evaluated for single, straight canals and forty specimens were selected. Confounders of anomalies of crowns were eliminated through decoronation.

Each tooth was held in hand vice, RCT performed by crown down technique starting from 15# reamer and working length determined through radiographs (Figure 1) master apical file used was 30# reamer. Step back was performed through 35# reamer, 1mm shorter than master apical file and 40# reamer, 2mm shorter than master apical file. Irrigation performed with NaOCl (2.5%) and EDTA solution. Canals dried by using paper points. For obturation of canals GPP was used along with sealer of zinc oxide eugenol type cement. Lateral condensation was performed and temporarily filled. Specimens were incubated for a month in 100% humidity at 37°C and distributed randomly in to group A and group B.

Specimens of group A fixed in hand vice (Figure 2) after removal of temporary filling chloroform, through a disposable 5 ml syringe was filled in the cavity drop wise. A 30 # H file was inserted in to the canal and operated through up and down motions till the resistance faced. Then more chloroform was added and H file manipulated to remove the GP points and time was recorded. Working length of all the teeth was kept about 15 mm through decoronation when reached at about 13 mm, H file of 35# was introduced to not to cross the apical foramen. The amount of chloroform used was 2ml for each tooth. Removal was considered to be complete when no chunks of GPP came out and a sharp sound of H file drawing it along the walls of root canal was heard.

Each tooth was sealed with sticky wax at both ends, longitudinal grooves with a diamond cutting disk were made and each tooth was split apart with a chisel to see the remaining GP points. Photographs of split teeth along with a ruler (Figure 3-5) were taken and material present in different thirds of the root canals recorded for group A.

In group B, GP points and sealer were removed with the help of 30 No H file by the same method and except the addition of chloroform, the remaining procedure was same (Figure 6). Data obtained was recorded in respective tables.

Mean minimum, maximum, frequencies and standard deviations were calculated by processing the data. Differences between the two populations were calculated through application of independent T test, p value of 0.05 for significance was selected. Data were analyzed through SPSS 16.0 (SPSS Inc., Chicago, IL) for Windows.

RESULT

Mean values differed markedly for both groups for time consumption during removal, value obtained for group A was 9.19 minutes and 5.82 minutes for group B (Table 1). Time obtained for experimentation in group B was much shorter than group A on the basis of mean values. Difference in the frequency was noted, there was no repetition in group A, while frequent values repeated up to three times for group B as shown by table 1 indicative of ease of time dependent manipulation.

Mean values obtained for remaining material after root canal treatment with H files augmented with chloroform showed an increasing order of remaining material in different thirds when going from coronal third to apical third. Coronal third illustrated minimum mean values of remaining material after re-treatment protocol followed by middle third with maximum material in apical third for group A (Ta-

ble 2). Mean values for the remaining material in specimens of group B provides a different etiquette value for coronal and apical thirds but were far less were same than encountered in group A followed by a slight deviation of 0.1mm for middle third (Table 3). Independent T test was employed for testing hypothesis which confirmed a significant difference by providing a highly significant value of 0.00 for both the groups which indicated that there was a difference in both populations thus rejecting the null hypothesis (Table 4).

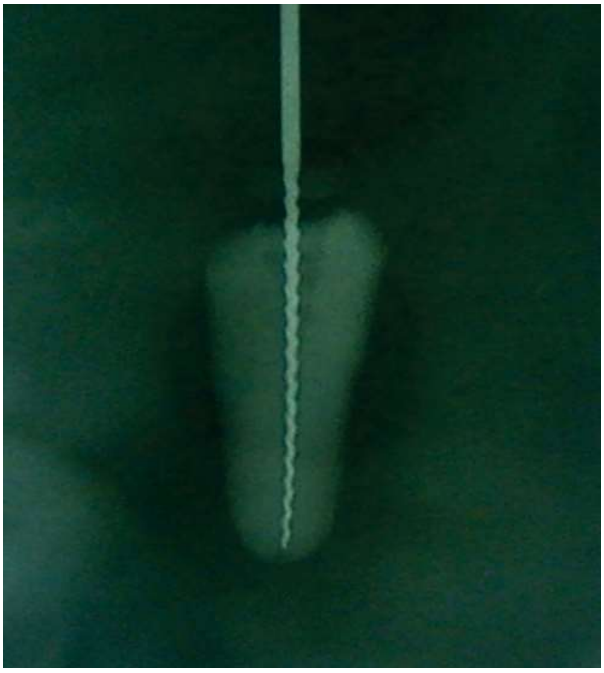

Fig 1: Radiograph with master apical file

Fig 2: Specimen was fixed in a hand vice during removal of material

DISCUSSION

Main aim of retreatment in a tooth in which previously root canal treatment was performed is to debride the root canal system. This debridement

Fig 3: Specimen treated with chloroform

Fig 4: Grooves by diamond disc for splitting the specimen

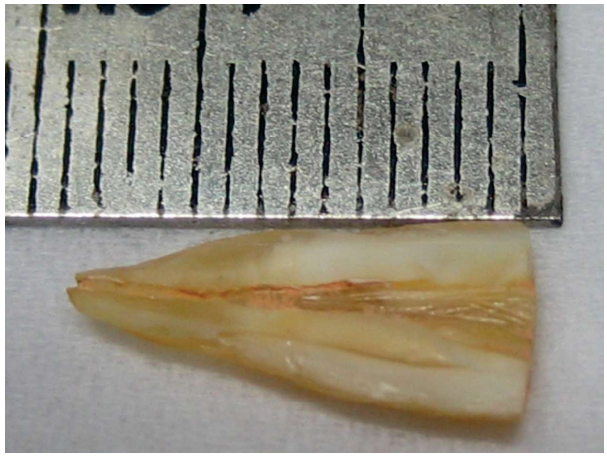

Fig 5: Split specimen which was treated with chloroform placed with ruler

includes total removal of existing root canal filling materials along with other infected materials. This criterion was defined and accepted by all researchers in this regard since long.[13] Success rate of about 90 % of retreatment cases was reported by the researchers.[14] Survival rate of about 94% reported after retreatment procedure in the literature.[15] Failure of endodontic treatment requires initially nonsurgical re-treatment of the tooth with a greater skill and knowledge.[16] Root canal treatment failure was reported in about 43% cases during January 2010 and November 2015 only in King Abdul-Aziz medical city only for instrument separation.[17] A foreign body reaction is reported since long as a consequence of introduction of root canal filling material in peri-

Fig 6: Split specimen which was treated with chloroform placed with ruler

Table 1: Mean, standard deviation, maximum and minimum values of time taken for retrieval of material from both groups in minutes

	Time taken to remove material from group A	Time taken to remove material from group B
Valid	20	20
Missing	0	0
Mean	9.19	5.82
Std. Deviation	0.39	0.23
Minimum	8.23	5.55
Maximum	10.00	6.08

Table 2: Mean, standard deviation, minimum, maximum values of group A for presence of material in different parts after treatment

	Filling material in coronal part of specimens treated with H files augmented with chloroform	Filling material in middle part of specimens treated with H files augmented with chloroform	Filling material in apical part of specimens treated with H files augmented with chloroform
Valid	20	20	20
Missing	0	0	0
Mean	0.70	2.65	3.15
Std. Deviation	1.08	0.74	0.74
Minimum	0.00	0.00	2.00
Maximum	3.00	3.00	4.00

Table 3: Mean, standard deviation, minimum, maximum values for material present in different parts after treatment in group B

	Filling material in coronal part of specimens treated with H files alone in mm	Filling material in middle part of specimens treated with H files alone in mm	Filling material in apical part of specimens treated with H files alone in mm
Valid	20	20	20
Missing	0	0	0
Mean	0.1000	0.2000	0.1000
Std. Deviation	0.30779	0.41039	0.30779
Minimum	0.00	0.00	0.00
Maximum	1.00	1.00	1.00

Table 4: Result after application of independent T test for group A and Group B

	T	Df	P value	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Time taken to remove material with H files augmented with chloroform (Group A)	103.924	19	0.01	9.19750	9.0123	9.3827
Time taken to remove material with H files alone (Group B)	110.138	19	0.01	5.82600	5.7153	5.9367

apical area.[18] In local setup manual instruments are used for endodontic procedures. Hedstrom files were used in previous studies as a standard tool. Removal of root canal obturation materials was evaluated for H files with other systems for their efficacy in a recent study.[1] This study intended to compare the employment and effectiveness of H files alone and augmented with chloroform to remove obturated root canal materials. Safe and less time consuming procedures for retrieval of root canal filling material are still under investigation. Lack of material and deficiency in confirmed protocol for removal of obturated material is still an explorable area of the subject.[12]

Hedstrom files perform better than other instruments for the removal of GP points was conclusion of a previous research work.[19]

The H files without solvent reported the best when compared with other techniques reported in a previous study. These files considered for comparison between modern and manual procedures. The H files provide comparable results even in severely curved canals was concluded by researchers.[20] The H files were compared with other systems by researchers for the evaluation of same parameters.[21]

Unswerving results acquired for current study which were in accordance with a recent study. Study demonstrated material removal with manual and rotary systems. Difference on the basis of time of removal was marked i.e. mean value for manual instruments was 5.62 minutes. Mean time recorded for removal was 5.99 minutes for the present study which is comparable.[1]

Another study also confirms the results of the current study. Time taken for obturated material removed without chloroform was recorded 5.37minutes with standard deviation of ± 0.525 minutes. This mean value was recorded 5.99 minutes for extraction of materials from the root canals. No difference was chronicled for removal of obturated material in terms of consumed time.[10]

These studies equally validated a need for complete removal of obturated material from root canals. Significant amount of obturated material found in apical thirds of specimens in both studies. Performance of manual instruments reported as comparable in confiscating obturated materials predominantly for GPP.

Smaller quantity of obturated materials remnants were documented in the apical, middle and coronal area of the specimens in comparison of chloroform vs non chloroform aided regime. Scanning electron microscope when used to confirm the presence of remnants in root canals confirmed the same results which were in accordance to current study. Modern rotary instruments were found less effective in removal of obturated materials when evaluated through scanning electron microscopy. It also revealed that chloroform aided procedure was not effective in removal of obturated material than H files. Sample size of both the studies was the same which confirms deliberation of procedures and techniques employed for the current study. The procedures employed for specimen's evaluation were also same. Splitted specimens were and assessed through photographic analysis as were done in the current study.[22] Less amount of material was found in group of specimens which were used for removal of material through non aided regime. Solvent on the other hand increased the amount of remnants. This study concluded that remnants of obturated materials were frequent in solvent aided technique.[23]

Reciprocating and rotary technologies which drives through K files or NiTi files were reported as deficient in removing obturated material. This parameter was assessed for completeness of removal during re-treatment. The computed tomography (CT) employed for the evaluation of this factor was reported in a previous study which was in accordance to current study.[24]

CONCLUSION

Within the limitations of this study, the H files performed comparable when assessed through non chloroform regime to remove the obturated materials.

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