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Evaluation of Gutta-percha and Resilon Dissolving Properties: An In Vitro Study

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ABSTRACT

Aim: The aim of this study was to evaluate the Gutta-percha and resilon dissolving properties

Materials and Methods: Ten standardized samples each of Resilon and Gutta percha were tested in 5 ml volumes of Chloroform, Halothane, Eucalyptol oil and Xylene for upto 45 minutes at room temperature to investigate their potential for clinical use in dissolving Resilon and Gutta Percha.

Results: Mean time taken by GP to dissolve in Chloroform, Halothane, and Xylene was 4.06, 12.09, and 33.87 minutes respectively. Whereas, mean time taken by Resilon to dissolve in Chloroform, Halothane, and Xylene was 2.09, 3.71, and 11.03 Minutes respectively.

Conclusion: the present study suggests that Chloroform, Halothane, and Xylene can be used for softening Gutta percha/ Resilon during retreatment with various techniques.

Keywords: Endodontic sealer, gutta-percha, resilon.

INTRODUCTION

Endodontics re-establishes healthy periapical tissues after inefficient treatment or reinfection of an obturated root canal system. It removes defective root canal filling and further clean and shapes the canal. Success rate of endodontic treatment ranges from 86% to 95% [1] and the retreatment are done for the remaining cases. Gutta-percha (GP) is the most commonly used material in endodontics since a century. It fulfils many of the characteristics indicated by Grossman in 1940[2]. The biggest disadvantage of GP is the lack of formation of effective seal[3] hence, contamination by saliva may cause dissolution of sealer thus providing a passage to bacterial penetration which may contribute to endodontic failure[4]. The teeth are also weakened by the removal of additional dentin in retreatment cases and it leads to increase in susceptibility to fracture[5,6]. Obturation by GP do not compensate for the dentinal structure lost during retreatment therefore, it becomes prone to fracture[7]. To overcome with this difficulty, recently, a new root canal filling material, Resilon is introduced which is a thermoplastic synthetic polymer based root canal filling material containing bioactive glass and radiopaque fillers[8]. It is said that Resilon fulfils all the demerits of GP including the solvent properties. The significant improvement of Resilon when compared to Gutta percha is claimed to be its bonding to the dentin walls when used in conjunction with its sealer, and forms a "monoblock" within the canal[8]. Initial studies have stressed that Resilon in more effective than GP. Resilon has less microleakage than GP[8,9]. Similarly, a study by Tay et al. showed that both Resilon with

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Epiphany and GP with AH plus sealer were unable to obtain complete seal. Still Resilon with Epiphany was preferred because it attained an immediate seal because of dual cure characteristics. Canals obturated with Resilon have also been shown to be more resistant to fracture when compared to Gutta percha[8].

The acclaimed superior characteristics will help Resilon emerge as an alternative to gutta percha. Day by day there will be an increase in the number of teeth obturated. Hence long-term evaluation is necessary for a successful treatment.

MATERIALS AND METHODS

This study was conducted to evaluate Gutta-percha and resilon dissolving properties. Ten samples of resilon and GP were tested in 5 ml of Chloroform, Halothane, Eucalyptol oil, and Xylene for approximately 45 minutes. All the test set up was done at room temperature. Ten samples of each test solutions were prepared in below mentioned manner. Ten ml capacity scintillation vial was taken and 5 ml of each solvents were poured in. Immediately after Resilon/GP was immersed in the solvents. Time was noted till the GP and Resilon was dissolved completely. Minishakers were used to prevent clumping of the test materials. The different groups are mentioned below.

Group 1: Chloroform plus GP

Group 2: Chloroform plus Resilon

Group 3: Halothane plus GP

Group 4: Halothane plus Resilon

Group 5: Xylene plus GP

Group 6: Xylene plus Resilon

Group 7: Eucalyptol oil plus GP

Group 8: Eucalyptol oil plus GP

Time was recorded till entire sample was dissolved. The rate of solubility was recorded in minutes and seconds. The samples which took no more than 45 minutes were analyzed statically. If the samples did not dissolve completely at 45 minutes then it was taken out and kept on blotting paper to absorb the excess solvents.

RESULTS

The data obtained after dissolving the samples in different solvents were obtained and analyzed. All the timings were recorded in minutes and seconds. Kruskal wallis test was used to evaluate the significance of difference in values of the mean time taken for dissolution within the groups. Mean time taken by GP to dissolve in Chloroform, Halothane, and Xylene was 4.06, 12.09, and 33.87 minutes respectively. Whereas, mean time taken by Resilon to dissolve in Chloroform, Halothane, and Xylene was 2.09, 3.71, and 11.03 Minutes respectively. Eucalyptol was excluded as it was unable to dissolve in 45 minutes (Table 1).

Table 1: Comparison of time take to dissolve the samples.

Material	Group	N	Mean	Std Dev	P Value
Gutta-Percha	Chloroform	10	4.06	.49	0.001
	Halothane	10	12.09	1.01	
	Xylene	10	33.87	2.11	
Resilon	Chloroform	10	2.09	.15	0.001
	Halothane	10	3.71	.42	
	Xylene	10	11.03	.71	

DISCUSSION

Endodontics is a non traumatic way of retreatment in an attempt to reestablish healthy periapical tissue. It requires reassess to entire infected root canal system because of coronal and apical leak[10]. Few of the previous studies have suggested that the success rate of normal root canal treatment is in the range of 53% to 95%. This can be related to different reasons such as case selection, case evaluation, patient compliance with treatment, method of determining failures etc. Many other factors such as presence of periapical lesion, procedural errors and length determination error also results in the failure of root canal therapy.

At present times it is firmly believed that the most important cause of failure is inadequate coronal seal. This inadequacy allows the bacteria to enter the canal and infect it leading to a failed root canal treatment. Removing as much sealer and filling material as possible from inadequately prepared and filled root canal is critical to uncover the

remnants of necrotic tissue or bacteria that may be responsible for preapical inflammation and subsequently failure[11].

There are several ways to remove the gutta percha during the treatment. The easiest way to do is to pull put the gutta percha. This is done when the gutta percha is not condensed well in the canal. It can be pulled out by engaging H file in the canal. In case where the gutta percha is condensed well than it becomes difficult for the operator to remove it. Coronal portion of gutta percha can be removed by heating it with heat carriers or Gates Glidden burs. Recently it has been showed that removal of gutta percha can be done by the use of nickel titanium rotary files as well. In the past solvents have been used to facilitate the removal of gutta percha. Solvents that are available for dissolution of gutta percha are Chloroform, Xylene, and Halothane[4,12].

When small, underprepared and curved canals need negotiation, solvents and small K-type files are best suited. The sequential technique involves refilling the created reservoir in the canal orifice with drops of solvent and picking into the dissolving gutta-percha while filing with a size 10,15 and 20 stainless steel files. This is continued until the terminals is negotiated after which all the solvents should be discontinued. Sequentially larger K-type files are then inserted into the canal until all the Gutta-percha mass is removed. In many cases combined use of different techniques may be the most efficient and time saving method[13].

Presently a new root canal filling material have been introduced which is a thermoplastic synthetic polymer. It contains bio active glass and radiopaque fillers[8]. When GP is compared with resilon then resilon proved to be more superior. It claimed to be bonding to the dentinal wall when used as sealer. So, we conducted this study in our department to evaluate the dissolving capacity of the sealers.

A few study have suggested that chloroform was the most effective solvent for all brands of gutta percha tested[14,15]. They stated a different solubility between various brands of gutta percha. On the other hand Morse et al. highlighted the possible carcinogenicity of choloroform[16]. As a result of this study US council on dental therapeutics deleted chloroform from the accepted dental practice.

Chloroform dissolved the gutta percha more than the xylene. Due to this reason xylene was less preferred than other. Chloroform tends to be very inconvenient in such procedures as it dissolves instead of softening the gutta percha, leaving residues on the walls of the pulp chamber. Xylene on the other hand dissolves gutta percha very slowly thus allowing better manipulation.

In our study there is significant difference between Guttapercha and Resilon, in Chloroform, Halothane and Xylene. The reason might be difference in chemical composition of gutta-percha which contains 17% of Gutta-percha, with zinc oxide, zinc silicate forms most of its weight[14] whereas Resilon has thermoplastic synthetic polymer based (polyester) root canal core material containing bioactive glass, bismuthoxy chlorides and barium sulphate. The filler content in approximately 65% by weight Trope et al4. May be polyester is rapidly dissolved by solvents because studies have been shown it undergoes biodegradation by bacterial / salivary enzymes[17].

CONCLUSION

The present study suggests that chloroform, halothane, and xylene can be used for softening gutta percha/resilon during the endodontic treatment with various techniques. Eucalyptol oil can be used for softening the gutta percha but takes longer time hence cannot be used for softening resilon.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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