The Effect of Insertion Rate on The Adaptability of Gutta-Percha and The Apical Extrusion of Thermoplasticized Gutta Percha Obturation Techniques.

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ABSTRACT

Background: In the Thermafil as a root canal obturation, system little is known about the effect that varying rates of insertion have on the adaptability of thermoplasticized GP and the amount of apical extrusion.

Materials and methods: thirty simulated root canals were obturated with thermafil obturators and Apexit Plus sealer at three different insertion rates. The obturated canals were sectioned at three different levels, the sealer average film thickness for each section was calculated and the amount of apical extrusion for each canal was conducted.

Results: the higher adaptability was seen with the faster insertion rate while the slower insertion rate showed fewer tendencies to cause apical extrusion.

Conclusions: the intermediate insertion rate had the best results between the other two rates for both adaptability and apical extrusion.

Key words: insertion rate, adaptability, apical extrusion. **(J Bagh Coll Dentistry 2017; 29(4):33-36)**

INTRODUCTION

The poor adaptability and extrusion of root canal filling material into periapical tissues may increase the likelihood of treatment complications. Researchers have indicated that the complete homogenous three-dimensional filling of the root canal system to the working length is the ultimate goal of obturation [1]. A number of obturation techniques and filling materials have been used to meet these objectives. [1-4]

Dental Gutta-Percha which is composed of approximately 75% of zinc oxide, continue to be the material of choice because of its physical and chemical properties [5-7].

Many techniques have been developed for placing dental Gutta-Percha as an obturation material. Several methods using thermo-plasticized Gutta-Percha have gained popularity. These techniques provide increased adaptability of Gutta-Percha to the root canal walls. A perceived drawback to these techniques is an increased tendency for the extrusion of sealer and Gutta-Percha from the apex when using thermoplasticized Gutta-Percha.[8]

Johnson in 1987 reported the use of a gutta-percha-coated carrier to fill canal that was later produced as the Thermafil System, such systems consist of a flexible central carrier coated with a layer of α-phase gutta-percha. In the Thermafil system little is known about the effect that varying rates of insertion have on the adaptability of thermoplasticized Gutta-Percha to the root canal walls.

The purpose of this study was to compare variation in the rate of insertion, utilizing a thermo-plasticized Gutta-Percha obturation technique. The effect of altered insertion rates were compared by analyzing the differences in how well the Gutta-Percha adapted to the walls of the root canal system and the apical extrusion of the final obturation.

MATERIALS AND METHODS

A thirty resin blocks, each with a standardized, simulated, prepared main root canal of #40, 18mm length each and two apical lateral canals that provide a reservoir for apically extruded materials, they were obturated with Thermafil obturators after coating each canal wall with sealer (Apexit Plus), that introduced into the canal with protaper paper point of corresponding size (#40) to that of the canal by rotating the paper point two times counter clock wise to coat the canal walls with thin film with sealer.[10]

The thirty canals were obturated exactly according to manufacturer instructions differentiated by the rate of obturators insertion, the duration of insertion time for group A approximately 1.0s, group B approximately 3.0 and

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group C approximately 6.0s. A stopwatch was used to time the duration of insertion from the moment that the heated Thermafil obturator was inserted into the canal orifice to the instant the carrier was placed to working length. The obturated blocks were sectioned at three different distances from the apex (1mm, 3mm, and 5mm respectively). The obtained sections were highly polished to obtain highly reflective surfaces and stained with Alizarin red stain to make the calcium hydroxide sealer more distinguishable from the adjacent Gutta-Percha figure 1, these sections were digitally photographed and analyzed with AutoCAD program to trace the periphery of each area in these images to calculate sealer average film thickness. The amount of apical extrusion of sealer and Gutta-Percha of each resin block was calculated by taking digital radiograph for the apical lateral canals of each block figure 2, the periphery of the extruded material was traced and calculated with AutoCAD program.[11]

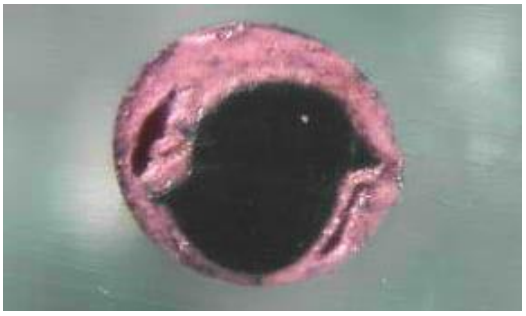

Figure. 2: cross section in obturated canal after staining.

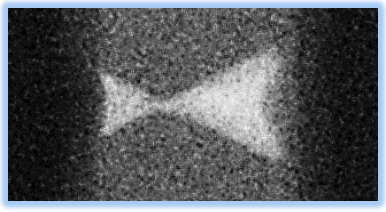

Figure 1: Radiographical image of sealer and gutta percha apical extrusion.

The collected data were analyzed using Sigma Scan Pro 13 (SPSS, Chicago, Illinois, and USA). Differences between groups were examined by ANOVA test (Analysis of variance of mean). The least significant difference test (LSD) was done to detect significance of difference between every two groups. P.value <0.05 was considered as statistically significant.

RESULTS

The mean sealer average film thickness (SAFT) and the standard deviation of the three insertion rates (IR) at the three sectioning levels are shown in table 1 and figure 2.

		One sec	Three sec	six sec
level1 1mm	Mean	0.0050	0.0049	0.0029
	SD	0.0042	0.0011	0.0046
level2 3mm	Mean	0.0055	0.0047	0.0036
	SD	0.0064	0.0051	0.0073
level3 5mm	Mean	0.0054	0.0046	0.0044
	SD	0.0055	0.0041	0.0065
Apical extrusion		0.306	0.257	0.198

Table 1: Descriptive data

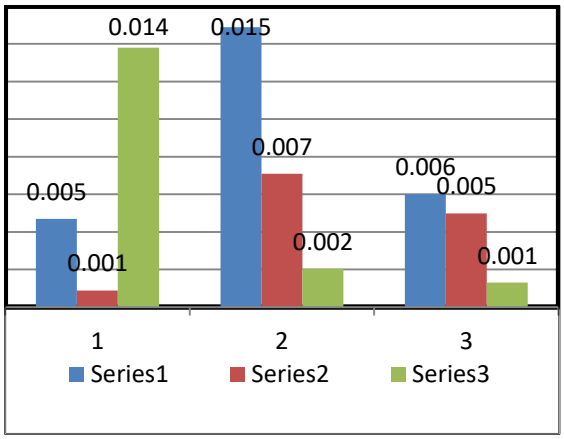

Figure3:mean values of SAFT for diffrent IRs.

When concerning the SAFT at the first level (1mm) the differences were statically significant between the highest IR (6sec) and the other two IRs with the lowest mean value of SAFT at the second IR (3sec) 0.001mm, while at the second level (3mm) the highest IR (6sec) showed the lowest mean value and highly significant difference with the other two IRs. At the third level (5mm) the highest IR (6sec) had the lowest mean value of SAFT with statically highly significant differences with the other two groups.

The amount of apical extrusion associated with the three insertion rates are revealed in table 1.and figure 4, which reveals that the amount of apical extrusion tends to decrease with the increase in the insertion rate. The differences between groups were statically significant only between the highest insertion rate and the other two groups.

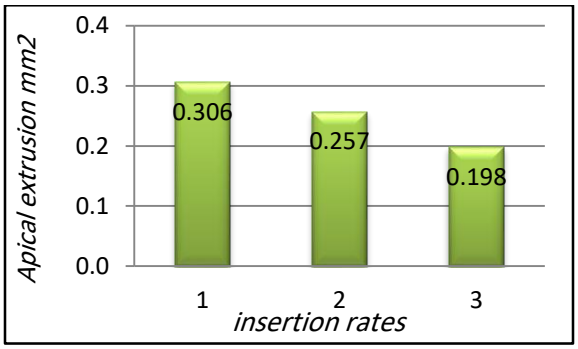

Figure 4:Amount of apical extrusion for each IR.

DISCUSSION

The hypothesis of this research was that a faster insertion rate would have a direct relationship with the apical extrusion and the ability of Gutta-Percha to adapt to the canal walls, the results of this research indicated that the rate did have an effect on the adaptability, these results can be explained in the slower insertion rate by both the decrease in the viscosity caused by cooling of Gutta-Percha and the apical pumping of sealer by the inserted cone with less tendency to cause apical extrusion while in the faster insertion rates the adaptability of Gutta-Percha to the canal walls were higher but with more tendency to cause apical extrusion. This may come in agreement with the findings of Levitan et al in 2003 how tested the effect of insertion rates on fill length and adaptation of a thermoplasticized Gutta-Percha technique.

CONCLUSION

From the above it seems that the intermediate insertion rate had the best results between the other two rates for both adaptability and apical extrusion.

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تاثير سرعة الايلاج على مقدار تقارب مادة الكوتابرشا و البروز القمي لحشوة الجذر المميعة حراريا.

في الجذور المحشاة بنظام (Thermafil) لا يعرف الا القليل عن مدى تاثير سرعة الايلاج على مقدار تقارب مادة الكوتابرشا المميعة حراريا ومقدار بروزها القمي . في هذه الدراسة تم تحشية ثلاثين قناة جذر صناعية بنظام (Thermafil) بثلاث سرع ايلاج مختلفة وباستعمال مادة ال(Apexit plus sealer). تم تقطيع القنوات المحشاة في ثلاث مستويات مختلفة لحساب مقدار تقارب مادة الكوتابرشا والبروزالقمي لكل سرعة ايلاج. بينت نتائج الدراسة بان مقدار تقارب مادة الكوتابرشا المميعة حراريا كان اعلى عند اتباع سرعة الايلاج الاسرع, بينما صاحب سرعة الايلاج الابطأ مقدار اقل من البروز القمي مما صاحب السرع الاعلى, وعليه نستنتج من ذلك ان اتباع سرعة ايلاج متوسطة قد يكون الافضل للحصول على معدل تقارب وبروز قمي جيد في حشوات الجذورالمعالجة بنظام (Thermafil). الكلمات الاساسية: سرعة الايلاج, تقارب, بروز قمي.