

## Original Research

### Comparison of Efficacy of Different Obturation Techniques used in Root Canal Treatment

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#### ABSTRACT:

**Aim:** This study set out to compare the percentage of a root canal filled with gutta-percha (PGFA) between canals filled using the Thermafil method, canals filled using Warm Vertical Condensation (WVC), and canals filled using Cold Lateral Condensation (CLC), all of which omitted the use of sealers. In order to accomplish this, microscopical inspection of root canal cross-section was performed. **Materials and methods:** When the treatment was over, we were left with 90 permanent teeth, each of which only had one root. After having the crowns of the teeth removed, the samples were randomly divided into three groups, each containing a total of thirty specimens. This research found that there are three unique clusters based on the obturation techniques used. The Thermafilobturation group, the warm vertical condensation group, and the cold lateral condensation group all performed their respective obturation techniques. **Results:** Table 1 summarizes the average percentage of gutta-percha filled area in the apical third of root canals for each of the three methods (Thermafil, WVC, and CLC). The respective methods yielded these findings. Group A specimens treated with Thermafil technology showed the highest mean PGFA (Periapical Gutta-Percha Filling Area), as determined by the study. Group B (WVC) used the second highest average PGFA and had the second highest PGFA of the groups. Group C, on the other hand, followed the CLC method and had the smallest percentage of PGFA. **Conclusion:** The results of the current study demonstrate that both the warm vertical condensation technique and the cold lateral condensation strategy result in significantly lower PGFA compared to the ThermafilObturation method.

**Keywords:** obturation, root canal, thermafil

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#### INTRODUCTION

A three-dimensional seal of the root canal system is achieved by proper root canal obturation to prevent the recurrence of bacterial infection. The microleakage between the root canal and the periapical tissues is hindered leading to death of any surviving microorganisms. This prevents the entry of nutrients and toxic bacterial products into the periapical tissues.<sup>1</sup> Various techniques have been developed to achieve the proper obturation of root canal system including the vertical compaction, lateral compaction and carrier based obturation.<sup>2,3</sup> Over the years, pitfalls with one technique have often led to the development of newer methods of obturation. Lateral compaction of GP is the gold standard technique.<sup>4</sup>Thermafil provides a void free obturation

along with minimal sealer thickness and a higher degree of homogeneity. Hence, this study was conducted to assess the Comparison of Efficacy of Different Obturation Techniques used in Root Canal Treatment.

Several techniques have been used for the removal of filling material from root canals; these include stainless steel (SS) hand files, nickel-titanium (Ni-Ti) rotary instruments, and ultrasonic tips.<sup>5,6</sup> Rotary instruments are widely used and reportedly remove filling material in a safe and efficient manner, with high success rates.<sup>7,8</sup> Nevertheless, studies have shown that none of these retreatment procedures can completely clean the root canal wall, particularly in the apical third.<sup>9,10</sup>

Hence, this study was conducted to assess the Comparison of Efficacy of Different Obturation Techniques used in Root Canal Treatment.

## MATERIAL AND METHODS

In this study, we employed 90 extracted and manipulated permanent teeth, all of which had a single root and canal. After collecting and sterilizing dental samples, the samples were stored in a solution containing 3% sodium hypochlorite for fourteen days. Each tooth's pulp chamber was accessed, and then the canal's patency was determined by inserting a K-file of size 15 into the tooth's access cavity. The length of the healthy section of each tooth was measured using radiovisiography. The biomechanical preparation was executed using a step-back strategy. The teeth were instrumented at their respective working lengths using a K-file of size 50. Teeth were divided into three groups, one for each filling method: CLC (conventional), WLC (white light curing), and Thermafil (thermal). Thirty people made up the study's sample size. The obturation was performed with great care and precision, and no sealants were used at any point. After the obturation process was finished, a horizontal cross-section of the teeth was taken between 2 and 3 mm from the tooth's tip using a double-sided diamond disc. The color analysis was performed by looking at the pieces using a stereomicroscope magnified 50 times. After the slides were scanned, they were converted to pictures using the Tagged Image File Format (TIFFA). The gutta-percha fill area (PGFA) was determined by measuring the canal diameters and gutta-percha diameters with a

KS 100 imaging instrument. For each group, the researchers took measurements in at least two different locations at random. This was done to ensure that the results were reliable by checking their accuracy.

Analysis of variance (ANOVA) was then used to assess the results of the succeeding observations. Post hoc analysis with Student's t-tests allowed the researchers to evaluate the effect of each variable and determine its level of statistical significance. The investigation's ultimate goal was to establish a 95 percent level of certainty. When the p-values were less than 0.05, it was determined that there was a significant correlation between the two variables. Significant values are calculated using p-values. In addition, p-values with a value of 0.01 or higher are regarded as extremely significant, while those with a value of 0.001 or below are regarded as unusually significant.

## RESULTS

Table 1 summarizes the average percentage of gutta-percha filled area in the apical third of root canals for each of the three methods (Thermafil, WVC, and CLC). The respective methods yielded these findings. Group A specimens treated with Thermafil technology showed the highest mean PGFA (Periapical Gutta-Percha Filling Area), as determined by the study. Group B (WVC) used the second highest average PGFA and had the second highest PGFA of the groups. Group C, on the other hand, followed the CLC method and had the smallest percentage of PGFA.

**Table 1: Mean percentage of gutta-percha filled area in different study groups**

Group	Number of samples	Mean
Group A	30	93.54
Group B	30	85.77
Group C	30	79.62

**Table 2: Between group comparisons of percentage of gutta-percha filled area in different groups**

Comparison	Mean difference	P-value
Group A vs Group B	3.451	<0.001
Group A vs Group C	8.614	
Group B vs Group C	5.411	

There was a statistically significant difference between the means of Group A (which used the Thermafil technology) and the other two research groups (Groups II and III). Group B, which employed the WVC method, was also found to have a much higher mean value than Group C, which employed the CLC method. Since group B used the WVC method, this was the result. Therefore, the observed differences across all groups were demonstrated to be statistically significant.

## DISCUSSION

Successful endodontic therapy is critically dependent on the thorough removal of microorganisms and their

by-products through mechanical root canal instrumentation, antibacterial irrigation and adequate filling of the root canal space.<sup>11</sup> The goal of root canal filling is to completely obliterate the canal space with a stable, nontoxic material and at the same time creating a hermetic seal to prevent the movement of tissue fluids, bacteria or bacterial by-products through the filled canal.<sup>12</sup> Obturation provides a seal that prevents reinfection of the canal and subsequent leakage into the peri-radicular tissues.<sup>13</sup>

Although there are many techniques for obturation of root canals, but still search is on for better techniques, as cold lateral condensation (CLC) technique, the most frequently used technique and the standard with

which all other techniques are compared, results in creation of voids, spreader tracts and lack of surface adaptation to canal walls.<sup>14</sup>

Group A (Thermafil) appears to have had a much greater mean value than groups II and III, as shown by this study's findings. Also, the average for group B (the WVC) was much greater than that for group C (the CLC). The statistical significance of the differences observed between the groups was therefore confirmed.

Canakci et al<sup>15</sup> evaluated the amount of apically extruded debris removed from a root canal filled with cold lateral condensation (CLC), and warm vertical compaction (WVC) techniques, using b or a phase gutta-percha with AH-Plus (DentsplyDeTrey, Konstanz, Germany) or Resilon (Resilon Research LLC, Madison, WI) with RealSeal SE (SybronEndo, Amersfoort, The Netherlands). About 100 human incisor teeth were prepared with a #25.06 NiTi rotary system and divided into five groups according to the filling material used: Group 1: CLC (gutta-percha, AH-Plus); Group 2: WVC (b phase gutta-percha, AH-Plus); Group 3: WVC (a phase gutta-percha, AH-Plus); Group 4: CLC (Resilon, RealSeal SE); and Group 5: WVC (Resilon, RealSeal SE). Extruded debris during the retreatment procedure was collected in preweighed Eppendorf tubes. The times required for retreatment were recorded. The amount of debris extrusion was significantly greater with WVC than CLC in the gutta-percha and Resilon groups ( $P < 0.001$ ). Using a phase gutta-percha resulted in significantly more debris extrusion than b phase gutta-percha ( $P < 0.001$ ). In the WVC groups, Resilon caused significantly more debris extrusion than gutta-percha ( $P < 0.05$ ). Retreatment was faster for CLC than WVC ( $P < 0.05$ ).

## CONCLUSION

When using the cold lateral obturation technique in the apical third of root canals, the investigation and subsequent statistical analysis showed that voids and spaces were clearly obvious at the interface of the gutta-percha and the canal. This is what happened every time this method was employed. A more uniform and cohesive mass of gutta-percha is produced by heated vertical condensation as opposed to cold lateral obturation. This mass is denser and more capable of taking on the morphology of the root canal. The Thermafil obturation approach has the fewest occurrences of gaps and voids when compared to the other processes. Root canals filled with alpha-phase gutta-percha on a plastic core-carrier, specifically Thermafil, were found to be denser and better-fitting in the apical third when compared to fills created using the cold lateral obturation technique and the WVC approach. It turned out that this was the case.

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