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# ORIGINAL ARTICLE

## Assessment of comparison of the percentage of voids in root canal obturation using different techniques of sealer placement

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***ABSTRACT:***

**Background:** Approximately 60% of endodontic failures are due to insufficient obturation of the root canal system. The present study was conducted to compare the percentage of voids in root canal obturation using different techniques of sealer placement. **Materials & Methods:** 60 mandibular second premolars were prepared using the step-back technique. The teeth were assigned to two groups of 30 each. In group I, use of K file and in group II, Lentulo spiral sealer placement technique was used. After sealer application and canal obturation with lateral condensation technique, specimens were horizontally cut into 3 mm slices. Sections were evaluated under a digital microscope at 150X magnification for void detection in apical, middle and coronal thirds. **Results:** Percentage of voids in group I and group II at apical sections were 2% and 1%, at middle sections were 2% and 1% and at coronal sections were 1% and 0% respectively. The difference was significant (P< 0.05). **Conclusion:** Percentage of voids was max maximally seen with K file technique ofsealerplacement.

**Key words:** Gutta percha, Root canal obturation, voids

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## INTRODUCTION

Root canal obturation is a critical phase in success of root canal treatments. Gutta percha is the most commonly used root canal filling material but it cannot seal the entire root canal space alone because it does not have the ability to adhere to dentinal canal walls. Thus, sealers are used to fill up the gap between the gutta percha and canal walls.[1]

Approximately 60% of endodontic failures are due to insufficient obturation of the root canal system.[2] Inadequate obturation has been reported to result in voids within the canal filling and in the interface between filling and dentin, which permits bacterial movement in the coronal-apical direction or vice versa, potentially leading to reinfection or persistent apical periodontitis.[3]

The isthmuses remain one of the most difficult clinical challenges during root canal treatment, owing to accumulation of hard and/or soft tissue debris which can contain biofilms and intracanal microorganisms, after canal preparation within these areas leading to treatment failure.[4] Therefore, the choice of root canal filling materials and obturation technique is very important in order to achieve a high- quality seal in isthmus areas.Most root canal filling techniques employ a core material, which is most commonly gutta-percha, and a sealer used to seal the space between gutta-percha (GP) and the canal wall.[5]The present study was conducted to compare the percentage of voids in root canal obturation using different techniques of sealer placement.

## MATERIALS & METHODS

The present study comprised of root canals of 60 mandibular second premolars and they were prepared using the step-back technique. The teeth were assigned to two groups of 30 each based on sealer placement technique. In group I, use of K file and in group II, Lentulo spiral sealer placement technique was used. After sealer application and canal obturation with lateral condensation technique, specimens were horizontally cut into 3 mm slices. Sections were evaluated under a digital microscope at 150X magnification for void detection in apical, middle and coronal thirds. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Distribution of patients**

| Groups | Group I | Group II |
|---|---|---|
| Method | K file | Lentulo spiral |

Table I shows thatin group I, K file and in group II, Lentulo spiral sealer placement technique was used.

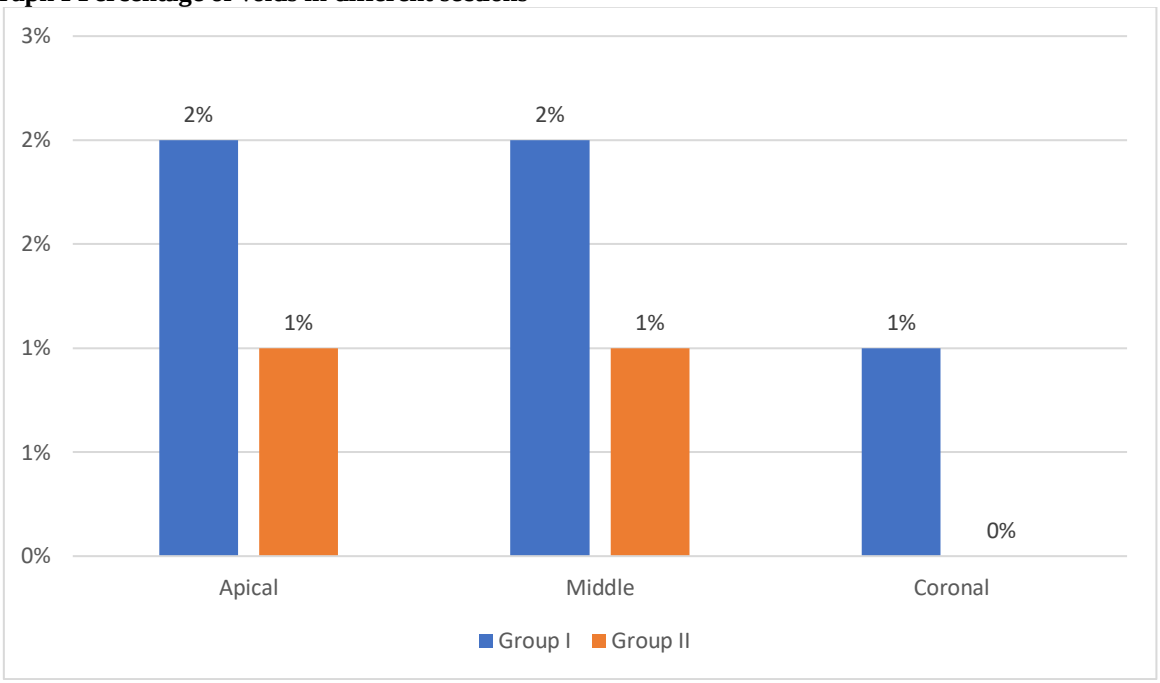
**Table II Percentage of voids in different sections**

| Sections | Group I | Group II | P value |
|---|---|---|---|
| Apical | 2% | 1% | 0.05 |

| | | | |
|---|---|---|---|
| Middle | 2% | 1% | 0.05 |
| Coronal | 1% | 0% | 0.02 |

Table II shows that percentage of voids in group I and group II at apical sections were 2% and 1%, at middle sections were 2% and 1% and at coronal sections were 1% and 0% respectively. The difference was significant (P< 0.05).

**Graph I Percentage of voids in different sections**




## DISCUSSION

Most root canal filling techniques employ a core material, which is most commonly gutta-percha, and a sealer used to seal the space between gutta-percha (GP) and the canal wall. The traditional technique of lateral condensation (LC), is the most classic method of clinical root canal obturation and has been used for many years in numerous studies.[6,7] Meanwhile, thermoplastic sealing techniques, such as continuous wave of condensation (CWC), have been reported to be advantageous for the management of irregular root canals.[8]The single cone (SC) technique has become increasingly popular due to its easier implementation, better adaptation in three-dimensional preparation, low cost and short operation time when applied with a bioceramic sealer.[9]The present study was conducted to compare the percentage of voids in root canal obturation using different techniques of sealer placement.

We found that in group I, K file and in group II, Lentulo spiral sealer placement technique was used.Zhang et al[10]assessed the presence of voids in band-shaped isthmuses obturated using three different filling techniques. Twenty-four artificial molar teeth with a band-shaped isthmus were allocated to three groups (n=8) for obturation, according to the filling technique: single-cone (SC), continuous wave of condensation (CWC) or lateral condensation (LC). Obturation was performed with gutta-percha (GP) cones and iRoot SP (Innovative Bioceramix, Vancouver, Canada). Post-filling micro-CT scanning was performed. The percentage of filling materials and void volumes were calculated in the isthmus areas. The mean percentage of void volumes and corresponding filling percentages in the isthmus areas after obturation in the SC groups was 22.98% ± 1.19%, 77.02% ± 1.19%; in the CWC groups 10.46% ± 2.28%, 89.54% ± 2.28%; and in the LC groups was 13.14% ± 1.85%, 86.86% ± 1.85%, respectively.

We observed that percentage of voids in group I and group II at apical sections were 2% and 1%, at middle sections were 2% and 1% and at coronal sections were 1% and 0% respectively. Kim et al[11]evaluated the root-filling quality of a calcium silicate-based sealer and gutta percha (GP) cones by measuring the percentage of voids. Twenty artificial molar teeth were divided into two groups: one obturated using the single-cone (SC) technique, and the other using the continuous wave (CW) technique. Obturation was performed with GP cones and Endoseal MTA. Obturated teeth were scanned using microcomputed tomography, and the percentage of void volume was calculated in the apical and coronal areas. A linear mixed model was used to determine the differences between the two techniques ($p < 0.05$). The percentage of voids between the filling materials and root canal walls was not significantly different between the two obturation methods ($p > 0.05$), except for the CW group, which demonstrated

a significantly higher void volume in the coronal area of the distal canal ($p < 0.05$). The percentage of voids inside the filling material was significantly higher in the CW groups for all of the comparisons ($p < 0.05$), except in the apical area of the distal canal ($p > 0.05$). The voids between the filling material and canal wall in the apical area were not significantly different between the two techniques.Nabavizadeh et al[12]compared the percentage of voids following root canal obturation with gutta percha and AH26 sealer using four different sealer placement techniques. In this laboratory experimental study, root canals of 50 mandibular second premolars were prepared using the step-back technique. The teeth were assigned to 4 experimental groups of 10 and one control group based on sealer placement technique. Sections were evaluated under a digital microscope at 150X magnification for void detection in apical, middle and coronal thirds. No significant difference was found in void percentage in one-thirds or total sections between the four methods.

## CONCLUSION

Authors found that percentage of voids was max maximally seen with K file technique of sealer placement.

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