

## Obturation Technique Used for Open Apex Management - A Retrospective Analysis

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### KEYWORDS

Endodontics, Innovative technique, lateral condensation, Obturation technique, open apex.

### ABSTRACT

**Introduction:** Obturation technique is a method of filling of internal resorption and sealing a cleaned, shaped root canal using a root canal sealer with core filling material. Apexification and apexogenesis are two endodontic procedures that attempt to induce apical repair. The techniques employed for obturation for open apex includes warm vertical condensation, thermoplasticized injection technique, lateral condensation, and roll cone technique. The aim of this retrospective study is to analyze and assess the obturation technique employed for the management of open apex.

**Materials & Method:** The present study involved obtaining the records of 40 different patients from an electronic database of Saveetha dental college. The different obturation techniques undergone by the patients for non vital open apex management was recorded and documented.

**Results:** It was demonstrated that out of 40 dental patients, 25 of them had undergone lateral compaction obturation technique and 9 matched taper single cone technique. About 9 patients out of 40 had been subjected to rolled cone and warm vertical condensation techniques. The Pearson chi-square test indicated that p value was 0.008 (<0.05), which was proven to be statistically significant.

**Conclusion:** Within the limitations of the study, the obturation technique utilized for open apex management was analyzed and it was perceived that most of the patients had been subjected to lateral condensation obturation technique.

## 1. Introduction

Obturation is a technique employed to fill and seal a thoroughly cleaned and shaped root canal using a root canal sealer along with a core filling material<sup>[1]</sup>. For successful obturation, specific criteria must be met, including a reasonably dry canal with no fluid exudation, absence of sensitivity to percussion, and no periradicular radiolucency, following optimal cleaning and shaping. Open apices are classified into two types: blunderbuss and non-blunderbuss<sup>[2]</sup>. In the non-blunderbuss type, the canal walls are either parallel or slightly convergent as they approach the root apex, which may appear broad, cylindrical, or slightly tapered. In contrast, a blunderbuss apex is characterized by flaring, particularly in the buccolingual dimension, resulting in a funnel-shaped morphology where the apical opening is wider than the coronal aspect<sup>[3]</sup>.

Apexification and apexogenesis are endodontic procedures designed to stimulate apical repair by either promoting the formation of a hard tissue barrier across the open apex or encouraging further root development<sup>[4]</sup>. These procedures are particularly indicated in teeth with necrotic pulp and incomplete root formation. Apexification involves the placement of a biocompatible material to induce a calcific barrier at the apex, with calcium hydroxide being the material of choice due to its effectiveness in stimulating mineralization<sup>[5]</sup>. The selected material is delivered into the canal and compacted against the apical end using an endodontic plugger to ensure proper adaptation and sealing.

Various obturation techniques are employed for the management of open apices, including warm vertical condensation, thermoplasticized injection technique, lateral condensation, and the roll cone technique<sup>[6]</sup>. Warm vertical condensation, introduced in the 1960s, allows for a three-dimensional adaptation of gutta-percha by heating it to a thermoplastic state, making it moldable and facilitating its compaction into the irregular root canal system<sup>[7][8]</sup>. Lateral condensation is one of the most commonly

used techniques and involves the sequential placement and compaction of gutta-percha cones alongside a root canal sealer<sup>[9]</sup>.

The primary objective of this retrospective study is to analyze and assess the obturation techniques used for the management of open apex cases, evaluating their effectiveness in achieving apical closure and ensuring long-term clinical success.

## **2. Material & Methods**

This present retrospective study was conducted in Saveetha Dental College & Hospitals in the months of February - March 2021. The records of 40 different patients were collected from an electronic database of Saveetha dental college. The different obturation techniques undergone by the patients for non vital open apex management was recorded and documented. The exclusion criteria for this research comprised age and gender. The type of obturation techniques was categorized under inclusion criteria. The ethical clearance was obtained from the institution (IHEC/SDC/ENDO/151) before starting the experiment.

## **3. Results**

The results of this clinical retrospective study were analyzed and plotted in the form of bar charts. It was demonstrated that out of 40 dental patients, 25 of them had undergone lateral compaction obturation technique and 9 matched taper single cone technique. About 9 patients out of 40 had been subjected to rolled cone and warm vertical condensation techniques. Figure 1 represents the different obturation techniques that different dental patients had undergone during an endodontic treatment. It was observed that the technique of lateral compaction was used on the majority of them. Figure 2 depicts the most common tooth number on which obturation was practiced, and it was established that most of the patients had been subjected to treatment especially in the central incisor. Figure 3 indicates the association between obturation technique and the tooth number of dental patients who had undergone open apex management. The Pearson chi-square test showed that p value was 0.008 (<0.05), which is proven to be statistically significant.

## **4. Discussion**

According to the results obtained in this study, it was observed that the majority of dental patients who underwent non-vital open apex management were treated using the lateral compaction obturation technique. This method was predominantly performed on anterior teeth, particularly tooth numbers 11, 21, and 12, though it was also applied in a few cases involving posterior teeth, such as tooth number 46. The frequent use of lateral compaction in anterior teeth could be attributed to its ability to provide a dense and stable root canal filling while minimizing apical leakage<sup>[10]</sup>. However, previous research has indicated that lateral condensation exerts a comparatively higher influence on root strains, which may impact the long-term prognosis of treated teeth. Additionally, studies have reported that void formation within the obturated canal is significantly more prevalent in the lateral condensation technique compared to other obturation methods<sup>[11]</sup>.

Conversely, research has shown that the modified continuous wave compaction technique offers superior adaptation of gutta-percha to the canal walls at all cross-sections, with fewer voids and a shorter obturation time when compared to lateral compaction. This highlights the potential advantages of alternative obturation techniques that may enhance the overall quality of the root canal filling<sup>[12]</sup>. Despite the availability of various obturation techniques designed to achieve a three-dimensional, homogenous fill, cold lateral condensation remains the most widely used and commonly practiced method in clinical endodontics<sup>[13]</sup>. The preference for this technique may be due to its relative simplicity, cost-effectiveness, and familiarity among clinicians, even though more advanced techniques have demonstrated better adaptation and reduced void formation.

The matching-taper single-cone obturation technique, which emerged as an advancement in rotary instrumentation, was introduced as a simplified alternative to the traditional cold lateral compaction technique<sup>[14]</sup>. This technique allows for the use of larger cones with increased taper sizes, designed to match the geometry of rotary nickel-titanium (NiTi) systems. Unlike lateral compaction, the single-cone technique does not require the use of accessory cones, thereby reducing the time spent on endodontic obturation. Several studies conducted by different researchers have demonstrated that the single-cone technique provides superior sealing ability compared to lateral condensation, making it a promising alternative for root canal obturation<sup>[15]</sup>.

The usage of a very small sample size was considered to be the major hindrance of this study. A much larger sample size can be considered in the future for obtaining better results. The assessment of the obturation techniques that is chiefly used for non-vital open apex management can be contemplated as the future scope of this research.

## **5. Conclusion**

Within the limits of the study, the obturation technique utilized for open apex management was analyzed and it was perceived that most of the patients had been subjected to lateral condensation obturation technique, since it minimizes apical leakage and it has also witnessed to show an efficacious dimensional stability of the root canal filling.

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### **Author Contributions:**

All authors have equal contribution in conducting the survey and drafting the manuscript.

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### **Conflict Of Interest:**

The author has none to declare.

**Illustrations:**

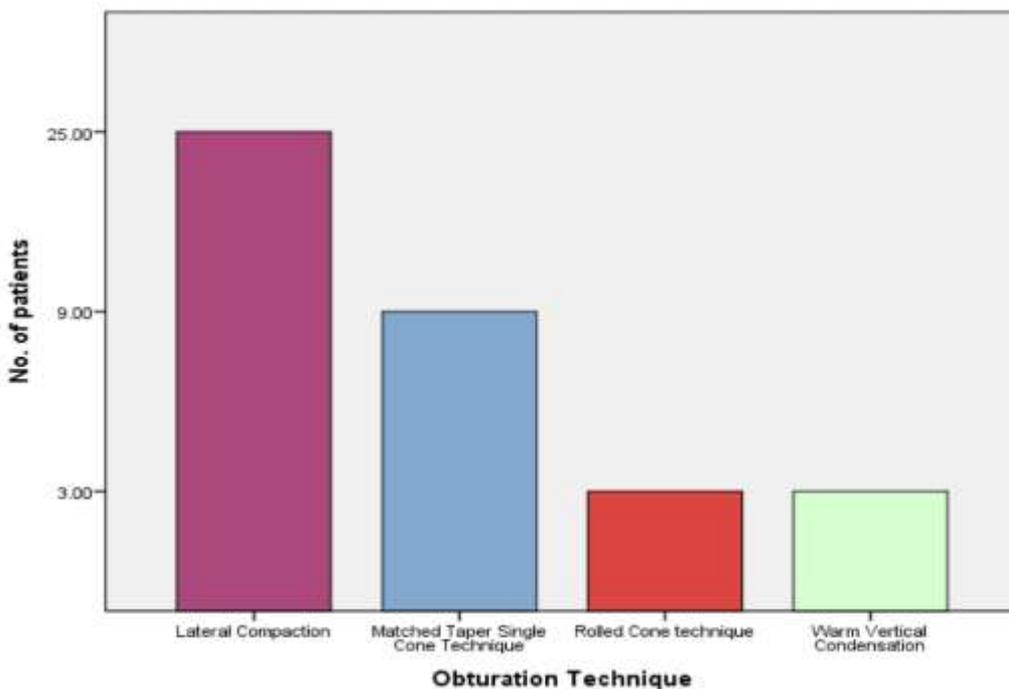


Figure 1: The bar chart represents the various obturation techniques that different dental patients had undertaken. The X - axis represents the different obturation techniques and Y - axis denotes the number of patients who have been subjected to that particular type of obturation technique. Pink colour represents lateral compaction; blue- matched taper single cone technique; red- rolled cone technique, and green indicates warm vertical condensation. Majority number of patients have been through obturation techniques of lateral compaction.

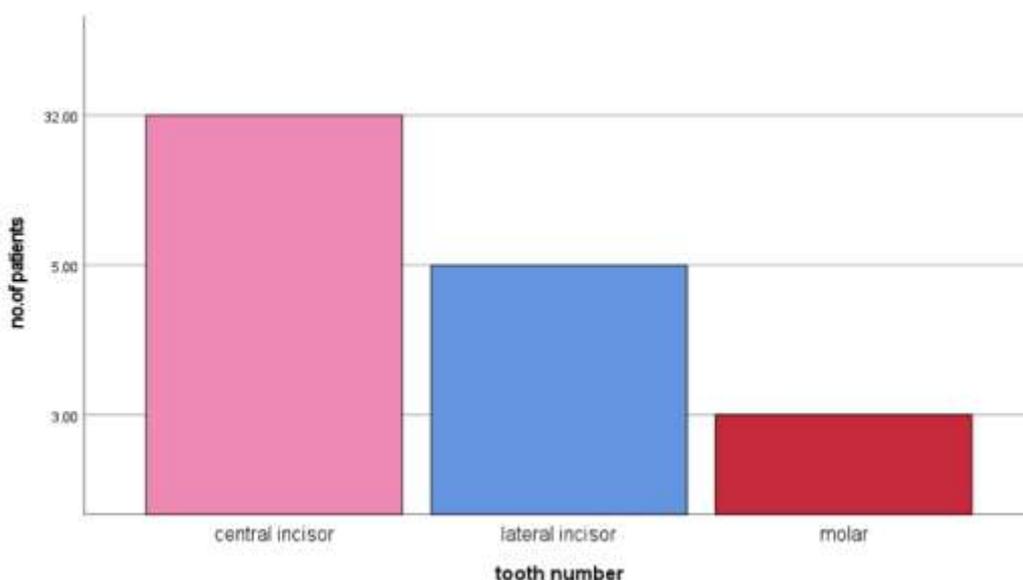


Figure 2: The bar chart illustrates the tooth number of each of the patients who had undergone open apex management. X - axis refers to the tooth number, and Y - axis represents the number of cases. Pink colour denotes central incisor, blue- lateral incisor, and red represents molar. Majority of the patients had been subjected to treatment especially in the central incisor, followed by lateral incisor and lastly, molar.

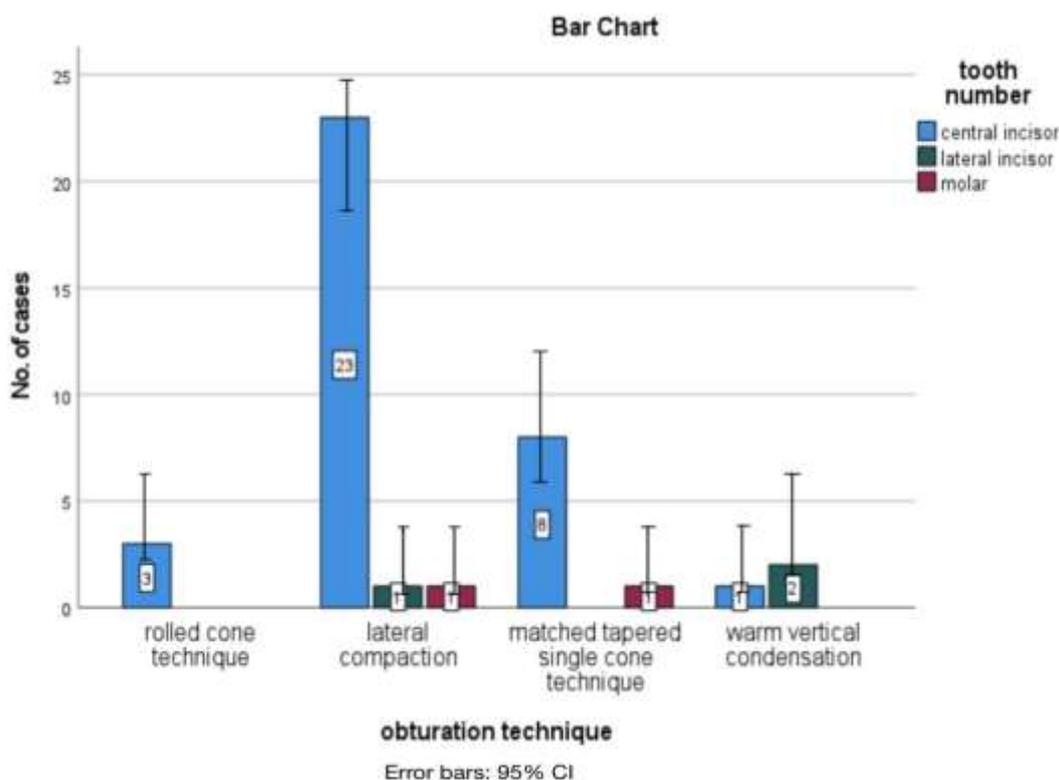


Figure 3: The bar graph depicts the association between obturation technique and the tooth number of dental patients who had undergone open apex management. The X-axis represents obturation technique and Y-axis represents the number of cases. The blue colour code denotes central incisor, green represents lateral incisor, and pink denotes molar. Majority of the patients had undergone obturation technique in central incisors. Pearson chi square test shows p value is 0.008 (<0.05), which is statistically significant.

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