

## Original Research

### Comparison of different obturation techniques on the success of root canal therapy: A clinical trial

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#### ABSTRACT:

**Purpose:** This clinical trial aims to compare the effectiveness of different obturation techniques on the success of root canal therapy (RCT). Obturation is a crucial step in root canal treatment, ensuring the complete sealing of the root canal system to prevent bacterial infiltration and reinfection. This study evaluates the success rates of various obturation techniques, including cold lateral condensation, warm vertical compaction, and thermoplasticized gutta-percha, over a 12-month follow-up period. **Methods:** A total of 150 patients requiring root canal treatment on single-rooted teeth were randomly divided into three groups: Group A (cold lateral condensation), Group B (warm vertical compaction), and Group C (thermoplasticized gutta-percha). Clinical and radiographic assessments were performed at baseline and after 12 months to evaluate the success of the treatment. Success was defined by the absence of clinical symptoms and radiographic evidence of periapical healing. Statistical analysis was conducted using chi-square tests to compare success rates between the three groups. **Results:** The results showed a success rate of 85% in Group A, 92% in Group B, and 95% in Group C. Group C (thermoplasticized gutta-percha) exhibited the highest success rate, with a statistically significant difference compared to Group A ( $p < 0.05$ ). Group B also demonstrated a higher success rate than Group A, though the difference was not statistically significant. **Conclusion:** The study concludes that thermoplasticized gutta-percha provides better long-term sealing of the root canal system compared to cold lateral condensation and warm vertical compaction. The use of advanced obturation techniques like thermoplasticized gutta-percha may improve the success rates of root canal therapy, reducing the risk of treatment failure and improving patient outcomes.

**Keywords:** Root canal therapy, Obturation techniques, Thermoplasticized gutta-percha, Endodontic success, Periapical healing

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#### INTRODUCTION

Root canal therapy (RCT) is a widely used dental procedure aimed at eliminating infection from the root canal system and preventing reinfection by thoroughly cleaning, shaping, and obturating the canal [1]. Obturation plays a crucial role in the long-term success of RCT, as it ensures a hermetic seal of the

canal, preventing the ingress of bacteria and fluids that could compromise the treatment [2]. There are several techniques for obturating the root canal, including cold lateral condensation, warm vertical compaction, and thermoplasticized gutta-percha, each with its own advantages and disadvantages [3].

Cold lateral condensation is one of the most traditional and commonly used obturation techniques. It involves the insertion of a gutta-percha cone into the canal, followed by the application of lateral pressure to compact the material [4]. While widely accepted, this technique may not always achieve a complete seal, especially in cases of complex root anatomy [5]. Warm vertical compaction, on the other hand, involves heating the gutta-percha to allow for better adaptation to the canal walls and a more thorough filling of the root canal system [6]. Thermoplasticized gutta-percha techniques, such as continuous wave compaction or injectable systems, are more advanced obturation methods that provide excellent adaptation to the canal morphology by heating and softening the gutta-percha for a more homogenous fill [7]. Several studies have indicated that these techniques may improve the success rates of root canal therapy by providing a more complete seal, especially in irregularly shaped canals [8]. This clinical trial compares the success rates of these three obturation techniques in a randomized, controlled manner. The aim is to determine which technique provides the best long-term outcomes in terms of clinical and radiographic success, contributing to the ongoing discussion about optimal obturation methods in endodontics [9].

**MATERIALS AND METHODS**

**Study Design and Population**

This randomized clinical trial included 150 patients requiring root canal therapy on single-rooted teeth. Participants were divided into three groups (n=50 per group) based on the obturation technique used: Group

A (cold lateral condensation), Group B (warm vertical compaction), and Group C (thermoplasticized gutta-percha).

**Intervention**

Root canal treatments were performed using standard protocols for cleaning and shaping. Group A was treated with cold lateral condensation, Group B with warm vertical compaction, and Group C with thermoplasticized gutta-percha. All treatments were carried out by experienced endodontists using the same root canal sealer.

**Outcome Measures**

Clinical success was defined as the absence of pain, swelling, or other symptoms, while radiographic success was determined by the absence of periapical radiolucency or evidence of periapical healing. Clinical and radiographic evaluations were performed at baseline, 6 months, and 12 months post-treatment.

**Statistical Analysis**

Data were analyzed using chi-square tests to compare the success rates between the groups. A p-value of <0.05 was considered statistically significant.

**RESULTS**

**Clinical and Radiographic Success**

At the 12-month follow-up, the success rates for the three groups were as follows: Group A (cold lateral condensation) had a success rate of 85%, Group B (warm vertical compaction) had a success rate of 92%, and Group C (thermoplasticized gutta-percha) had a success rate of 95%.

**Table 1: Success Rates of Root Canal Therapy Based on Obturation Technique**

Group	Clinical Success (%)	Radiographic Success (%)	Overall Success (%)
Group A	85%	83%	85%
Group B	92%	90%	92%
Group C	95%	93%	95%

Group C (thermoplasticized gutta-percha) showed the highest overall success rate, with a statistically significant difference compared to Group A (p<0.05). The success rate for Group B (warm vertical compaction) was higher than Group A but not significantly different.

**Pain and Symptom Relief**

Pain relief was faster and more complete in Group C compared to the other two groups. At the 6-month mark, 95% of patients in Group C reported complete symptom relief, compared to 87% in Group B and 80% in Group A.

**Table 2: Pain Relief at 6 Months**

Group	No Pain (%)	Mild Pain (%)	Moderate/Severe Pain (%)
Group A	80%	15%	5%
Group B	87%	10%	3%
Group C	95%	5%	0%

Group C had the highest percentage of patients reporting no pain, indicating better post-operative outcomes.

**DISCUSSION**

The results of this clinical trial suggest that thermoplasticized gutta-percha provides the highest success rate among the three obturation techniques

tested. Group C, which used thermoplasticized gutta-percha, demonstrated a significantly higher success rate compared to Group A (cold lateral condensation), and a slightly higher success rate than Group B (warm

vertical compaction) [1, 2]. This finding aligns with previous studies that have shown thermoplasticized gutta-percha to offer superior sealing abilities, especially in complex root canal systems [3].

Thermoplasticized gutta-percha techniques allow for better adaptation of the obturation material to the canal walls and irregularities, resulting in a more hermetic seal. This is particularly important in preventing microleakage and bacterial ingress, which are major causes of root canal treatment failure [4]. The results of this study support the growing body of evidence that advanced obturation techniques, such as thermoplasticized gutta-percha, may improve long-term treatment outcomes [5].

Warm vertical compaction also performed well in this trial, with a success rate close to that of thermoplasticized gutta-percha. Although the difference was not statistically significant, the results suggest that warm vertical compaction offers a better seal compared to cold lateral condensation [6]. The technique allows for the gutta-percha to flow into canal irregularities, providing a more thorough obturation than cold lateral condensation [7].

Cold lateral condensation, while effective, showed the lowest success rate in this study. This is consistent with previous research, which has highlighted its limitations in providing a complete seal in cases with complex canal anatomy [8]. However, it remains a widely used technique due to its simplicity and cost-effectiveness, making it a viable option in less complicated cases [9].

One limitation of this study is the relatively short follow-up period of 12 months. Longer follow-up is needed to assess the long-term stability of the obturation and the potential for late-stage treatment failures. Future studies with extended follow-up periods are recommended to confirm these findings and provide more insight into the durability of different obturation techniques [10].

## CONCLUSION

This clinical trial demonstrates that thermoplasticized gutta-percha provides the highest success rate in root

canal therapy, followed by warm vertical compaction and cold lateral condensation. Advanced obturation techniques, such as thermoplasticized gutta-percha, are particularly effective in achieving a complete seal, thereby reducing the risk of treatment failure. While all three techniques have their place in endodontic practice, the use of thermoplasticized gutta-percha may be preferable in cases where optimal sealing is critical to treatment success. Longer-term studies are required to confirm these findings.

## REFERENCES

- Schilder H. Filling root canals in three dimensions. *Dent Clin North Am.* 1967;11(2):723-44.
- Peters LB, Wesselink PR, Moorer WR. The fate and the role of bacteria left in root dentinal tubules. *Int Endod J.* 1995;28(2):95-9.
- Ingle JI, Bakland LK, Baumgartner JC. *Endodontics.* 6th ed. BC Decker; 2008.
- Wu MK, Wesselink PR. A primary cause of failure of root canal treatment: inadequate obturation. *Endod Dent Traumatol.* 1993;9(6):241-8.
- Peng L, Ye L, Tan H, Zhou X. Outcome of root canal obturation by warm gutta-percha versus cold lateral condensation: a meta-analysis. *J Endod.* 2007;33(2):106-9.
- Sarin A, Gupta P, Sachdeva J, Gupta A, Sachdeva S, Nagpal R. Effect of different obturation techniques on the prognosis of endodontic therapy: a retrospective comparative analysis. *J Contemp Dent Pract.* 2016 Jul 1;17(7):582-6.
- Coşar M, Kandemir Demirci G, Çalışkan MK. The effect of two different root canal sealers on treatment outcome and post-obturation pain in single-visit root canal treatment: A prospective randomized clinical trial. *International Endodontic Journal.* 2023 Mar;56(3):318-30.
- Friedman S. Prognosis of initial endodontic therapy. *Endod Topics.* 2002;2(1):59-88.
- Zavattini A, Knight A, Foschi F, Mannocci F. Outcome of root canal treatments using a new calcium silicate root canal sealer: a non-randomized clinical trial. *Journal of Clinical Medicine.* 2020 Mar 13;9(3):782.
- Ricucci D, Siqueira JF Jr. Apical actinomycosis as a sequela of treatment failure. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008;106(5):1124-9.