10.5005/jp-journals-10024-1893

ORIGINAL RESEARCH

Effect of Different Obturation Techniques on the Prognosis of Endodontic Therapy: A Retrospective Comparative Analysis

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ABSTRACT

Introduction: Success of root canal therapy (RCT) is largely dependent upon the quality of biomechanical preparation and obturation of the pulp canal. Improperly cleaned or shaped root canal, regardless of the type of obturation method and obturating material, cannot lead to the success of endodontic therapy. Hence, we conducted a clinical comparative analysis of two obturating techniques.

Materials and methods: A total of 140 patients receiving RCT at the department of Endodontic were included in the present study. The average follow-up time for the patients was 29 months (18–38 months). Patients were grouped into two depending on the type of obturating technique used. Evaluation of the clinical and radiographic follow-up records of the patients was done and analysis was made. One-way analysis of variance (ANOVA) was used for assessing the level of significance.

Results: The average age of the patients undergoing obturation with carrier-based obturation (CO) technique and lateral compaction (LC) technique was 43 and 48 years respectively. While comparing failure and success of the teeth at the time of follow-up, nonsignificant results were obtained. Significant difference was seen, while comparing the presence of voids and type of teeth in which endodontic therapy was performed using different obturating techniques.

Conclusion: Endodontic therapy done with LC obturating technique or with CO technique shows prognostic difference on the outcome or quality of treatment therapy.

Clinical significance: Quality of obturation is more important rather than type while performing endodontic therapy for better prognosis.

Keywords: Endodontic, Obturation, Root canal.

How to cite this article: 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;17(7):582-586.

Source of support: Nil

Conflict of interest: None

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INTRODUCTION

Complete debridement of the root canal along with sterilization and obturation are the foremost steps that are required to be carefully done for the success of root canal therapy (RCT).[1] For attaining a good-quality obturation and a successful RCT, thorough cleaning and shaping of root canal should be done to provide ideal environment for the obturating material to fit and completely seal the pulp space.[2] A well-cleaned and -shaped root canal along with a three-dimensionally fitted pulpal space ensures the success of endodontic therapy.[3] If the root canal is not properly cleaned, shaped, or sterilized, regardless of the type of obturation method and obturating material, endodontic therapy cannot be successful.[4] To ensure the

complete adaptation of obturating material into the root canal space, various techniques have been introduced from time to time. Out of these, the most accepted technique involves the lateral compaction (LC) of obturating material.[5] Hence, we conducted a clinical comparative analysis of two obturating techniques and their effect on the prognosis of endodontic therapy.

MATERIALS AND METHODS

The present study included evaluation of all the patients who received RCT at the Department of Endodontic of the dental institution. A total of 140 patients were included, who were treated from June 2009 to July 2014. Selection criteria of ASA Relative Value Guide were used to select patients for the present study.[6] All the patients were preinformed about the study protocol and written consent was obtained from them. The average follow-up time for the patients was 29 months (18–38 months). The exclusion criteria for the present study were as follows:

- Pregnant patients
- Patients with any history of systemic illness
- Patients with history of any known drug allergy
- Patients with severe periodontal diseases
- Patients with history of any oral major or minor surgical procedure in the given area of the oral cavity 6 months before starting of the treatment.

All the patients were divided into two groups with 70 patients in each group, depending on the type of the obturating technique used: Group 1 unnderwent carrier-based obturation (CO) and group 2 underwent LC technique. All the RCT procedures were performed by a registered experienced endodontist with a minimum of 5 years' experience. While performing the RCT procedure, radiographic verification of the working length of the tooth was done. Apexit Plus (root canal sealer) was placed into the pulp canal walls of the teeth of both the groups with the help of paper points. Manufacturer's protocols were followed for performing the obturation. Intracoronal restoration, extracoronal restorations, and full-coverage crown were used for final restoration of the teeth after completion of RCT. Regular follow-up of the patients was done for postoperative clinical and radiographic analysis. Experienced independent radiologist and endodontist were given the task for clinical and radiographic examination of the RCT-treated teeth at follow-up time.

Follow-up Examination

For recording the patient's response, palpation and percussion tests were done and readings were noted. Adjacent soft and hard tissue examination was also done, which involved checking the mobility of the involved tooth, measuring of probing depth, and checking for presence or absence of any soft tissue pathology in relation to the treated tooth. Root canal therapy was considered to be successful clinically when no associated hard or soft tissue pathology was noted. Intraoral periapical radiographs were taken for assessment of any periapical or surrounding pathological changes associated with the treated tooth. Absence of any radiographic sign was considered to be success of RCT radiographically. All the results were analyzed by Statistical Package for the Social Sciences (SPSS) software. One-way analysis of variance (ANOVA) was used for assessing the level of significance.

RESULTS

Table 1 shows the distribution of various variables in different groups. Average age of the patients in patients undergoing obturation with CO technique and LC technique are 43 and 48 years respectively. Clinicoradiographic details of the treated teeth at the time of follow-up are

Table 1: Intergroup distribution of various variables

Parameter		*CO*	*LC*	*p-value*
Age of the patient		43 ± 10 years	48 ± 14 years	0.555 NS
Follow-up time		810 ± 140 days	900 ± 138 days	0.004 S
Time between two consecutive appointments		14 ± 18 days	25 ± 40 days	0.412 NS
Restoration time		60 ± 17 days	61 ± 22 days	0.153 NS
Type of tooth	Incisor + Canine	42	20	0.015 S
	Premolar	20	30	
	Molar	8	20	
Status of pulp tissue preoperative	Vital	52	50	0.183 NS
	Nonvital	18	20	
Presence of apical periodonitis preoperative	Yes	8	12	0.235 NS
	No	62	58	
Complete crown	Yes	38	60	0.024 S
	No	32	10	
Post required	Yes	22	42	0.004 S
	No	48	28	

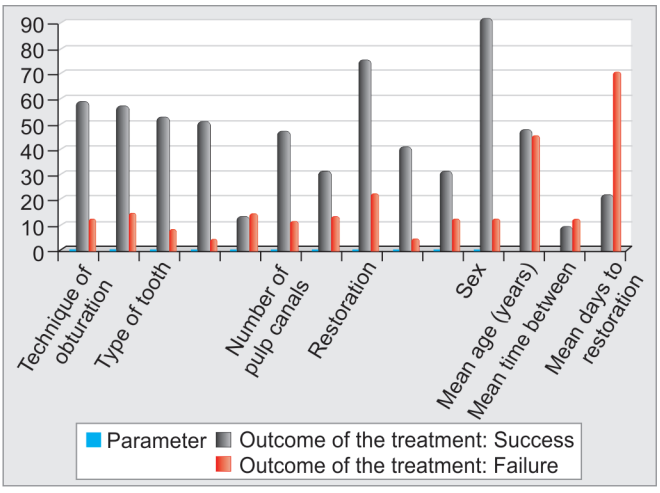
NS: Nonsignificant; S: Significant

Table 2: Clinical radiological details of treated teeth at follow-up time

Parameter		*CO*	*LC*	*p-value*
Success	Absence of clinical or radiographic symptoms	58	56	NS
Failure	Clinically	6	8	NS
	Radiographically	6	12	NS
	Both	0	2	NS

NS: Nonsignificant

shown in Table 2. Nonsignificant results were obtained while comparing failure and success of the teeth at the time of follow-up treated by different obturating techniques. Graph 1 highlights the effect of various variables on the outcome of the treatment. Percentage of success of the treatment cases of anterior (incisor, canine, and premolar) and posterior (molar) teeth are shown in Graph 2. Significant difference was observed while comparing the effect of various obturation techniques in different tooth types (anterior or posterior). Graph 3 shows the obturation length and presence of voids among groups. Although, variation in the length in the treated teeth in the two study groups was nonsignificant, significant alteration were noticed while comparing the presence of postoperative voids.

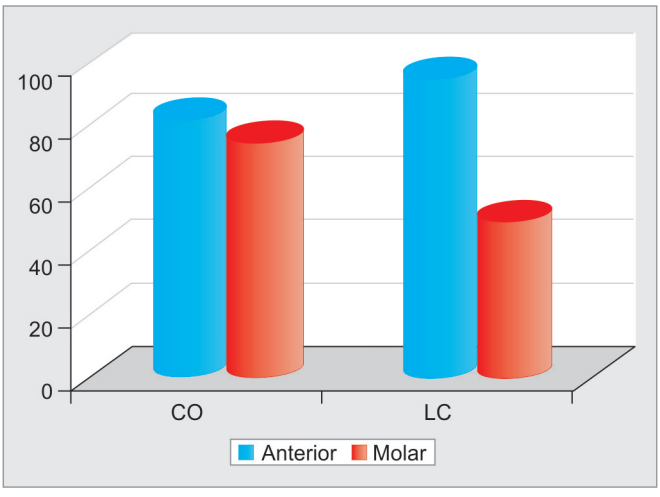


Graph 1: Effect of different variables on prognosis of the treatment

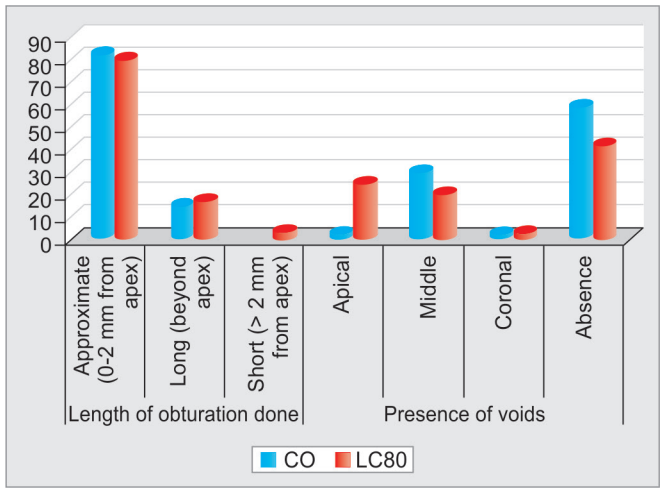
DISCUSSION

To completely fill the pulp space and block the entry of all the infectious agents form the preliminary function of obturation. Prognosis of the teeth after RCT depends on the quality of the seal. An obturation is said to be ideal if it seals all the foramina that exists from the root portion and the material used for obturating the root canal completely adapts to the canal wall ending in the apical seat.[7,8] Controls over the placement of the gutta-percha in the pulp canal along with cost-effectiveness are some of the advantages offered by the LC (cold) technique of obturation, which is commonly used worldwide by the dental practitioners for conducting endodontic therapy.[9-11] In case of poorly prepared root canals, or the presence of curved canals or improper obturating technique, voids can occur due to formation of spaces between the gutta-percha cones and pulp canal walls.[12,13] Hence, we compared the prognosis of various root canal obturating techniques.

No difference was observed in the success rate of the teeth treated with LC and CO obturation techniques (p-value < 0.05), as shown in Table 1. Our results were in correlation with the results of Chu et al,[14] who also observed a nonsignificant difference in the success rate of RCT done with different obturating techniques. Literature states that when RCT is done with proper shaping and cleaning of pulp canal and ideally obturated with biocompatible obturating material, the treated teeth show very good prognosis with minimal or negligible post-treatment symptoms.[11,14,15] A significant impact of type of



Graph 2: Percentage of success of the treatment cases of anterior (incisor, canine, and premolar) and posterior (molar) teeth



Graph 3: Obturation length and presence of voids among groups

tooth was seen on the clinical outcome of RCT. A higher failure rate was observed in molars as compared to incisors and canines. Previous studies done by Benenati and Khajotia,[16] Cheung[17] and Peak[18] also showed a high failure rate of RCT-treated molars due to difficulty in accessibility and variation in the anatomy of the root canal shape. No statistically significant differences were noted in the periodontal status, days of restoration, and status of the pulpal tissue at the initial preoperative and follow-up time (Table 2, Graph 1). Similar results were obtained by Hale et al[19] who reported nonsignificant findings in their study. Only tooth type was found to have statistically significant impact on the prognosis as shown in Graph 2. A significant difference was observed in the presence of voids in between LC and CO groups (Graph 3). Inadequate penetration of spreader after the placement of master cone, obturating material might be responsible for the higher number of apical voids in the RCT done in LC groups. Our results were in association with Allison et al,[20] who demonstrated a correlation of apical leakage with spreader penetration in RCT patients obturated with LC technique.

Hale et al[19] evaluated the prognosis of RCT in patients obturated with LC and CB techniques. From the results, they concluded that no difference exists in the prognosis of the teeth treated with RCT by different obturating techniques. Anna-Junior et al,[21] with the help of vertical compaction technique of obturation, evaluated the ability of gutta-percha and a thermoplastic synthetic polymer to completely obliterate the lateral root canals. They analyzed 45 human teeth with single roots by making artificial lateral canals at varying distance from the working length of the root. Depending on the type of filling material used, they categorized their samples into three main groups. They then obturated the root canals with vertical compaction technique without making the use of endodontic sealer. Resilon cones were found to be the best filling materials in their study in sealing the artificial canals. Concluding the results, they emphasized on the potential benefits offered by warm vertical compaction techniques for obturating the lateral canals of the root. Gencoglu et al[22] analyzed the obturation of artificially prepared lateral canals using various different obturating techniques. Analysis of 60 extracted teeth having single root was done and were obturated by lateral condensation, Microseal, JS Quick-Fill, Softcore, System B with Obtura II and Thermafil techniques using endodontic sealer. Thermafil group showed maximum filling of lateral canals. From the results, they concluded that best methods of filling the lateral root canal is by using Thermafil and Obtura techniques. Basavanna et al[23] compared the efficacy of various obturation techniques in treating artificial cases of internal resorption. They evaluated 40 freshly extracted maxillary central incisors and found that in comparison with other methods, group containing obtura II showed significantly more gutta-percha lesions of internal resorption. Gupta et al[24] compared the quality of various obturation techniques by using cone beam computed tomography (CBCT). They analyzed 30 central incisors and separated the teeth into three groups depending on the type of obturating technique. They observed that samples in the Calamus group showed the maximum amount of obturating material. From the results, they concluded that Calamus is a good obturating technique for achieving good prognosis of RCT cases. Mohan and Kaushik[25] prospectively compared and analyzed 100 patients visiting a tertiary care center for primary, nonsurgical conservative measures for managing teeth that required endodontic therapy. From the results, they concluded that thermoplasticized core carrier condensation technique can prove to be a useful alternative to conventional lateral condensation technique in terms of prognosis.

CONCLUSION

From the above results, it can be concluded that there is no difference in the prognosis and outcome of RCT when done with either LC or CO technique. Although, tooth type affects the prognosis to a greater extent, further studies are required in this field to improve the quality of endodontic therapy.

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