A COMPARISON OF THERMAFIL AND LATERAL CONDENSATION TECHNIQUES IN OBTURATION OF ROOT CANAL SYSTEMS

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ABSTRACT

The aim of this study was to compare quality of thermafil obturation technique with cold Lateral Condensation technique in the management of root canal therapy. In this quasi experimental study, a total of 60 patients with symptomatic irreversible pulpitis were selected. They were randomly allocated to two groups, Group A and Group B, each comprising of 30 patients. In both groups chemomechanical preparation was done in first visit and in the second visit group A was obturated by thermafil technique and group B was obturated by cold lateral condensation technique. Post-operative evaluations of patients were based on peri-apical radiograph. Teeth obturated with Thermafil showed fewer voids and more radiodensity. Hence in terms of quality, obturation by thermafil technique was considered better.

Key Words: Radiodensity, Thermoplasticized Gutta percha, lateral condensation, Voids.

INTRODUCTION

The final objective of root canal therapy after thorough cleansing and shaping of the root canals is the three-dimensional obturation of the root canal system. The aim of obturating the root canal system is to perfectly seal the root canal space to prevent penetration of bacteria and their products into the peri-radicular tissues and create a favorable biological environment for healing of peri-apical tissues to take place.1,3

A hermetic three-dimensional obturation of the root canal system is one of the conditions under which long term successful root canal therapy can be achieved.1 Improper obturation of root canal system results in post-operative complication leading to failure of endodontic therapy.5 About 60% of endodontic failures are due to incomplete obturation of the canal space.6

To cope with such different obturation difficulties many root obturating techniques have been evaluated over the years and the filling materials from simple paste mixtures to silver points with sealing cements.7 To obturate root canal system the ideal obturating material chosen should be non-irritating, non-toxic, radiopaque, easily manipulated, insoluble in tissue fluids and able to adapt to canal walls.8 Gutta-percha is currently the material of choice due to its inertness, biocompatibility, dimensional stability and plasticity.9,10

Cold lateral condensation is most widely used method of obturating root canals. Advantages of this technique are its predictability, ease of use, conservative preparation and controlled placement of materials. However, the final filling lack homogeneity of gutta-percha mass, less adaptation to canal walls, irregularities and increased number of voids. So clinicians rely on sealers to fill the voids which may resorb with time. This might decrease the effectiveness of root canal obturation.11-13
There has been a continuous effort to identify and improve obturation techniques.\textsuperscript{14} Heated gutta-percha techniques have been shown to produce a significantly better quality root canal obturation than that produced by lateral condensation technique. Thermoplasticized gutta-percha technique on application of heat, flows and adapt well onto the walls of the root canal. The efficiency of thermo plasticized gutta-percha in c-shaped canals, internal resorption cavities, accessory canals and arborized foramina is well appreciated.\textsuperscript{15,16}

One of the thermo plasticized injectable techniques is Thermafil. Thermafil produces a homogenous threedimensional obturation. It allows simple, fast and predictable fillings of root canals especially useful for small curved canals.\textsuperscript{17}Thermafil technique requires minimal compaction only in coronal end so it produces few strains during compaction of gutta-percha. It easily flows around curves and canal irregularities providing a greater density of gutta-percha at the apical portion of the filling.\textsuperscript{18}

The quality of obturation is radiographically assessed in both techniques and is found to be better using thermafil technique. Thermafil results in a uniformed smooth surface and least observable space between gutta-percha and canal walls especially in middle and apical region of the root canal.\textsuperscript{19}The aim of this study was to compare the quality of thermafil technique with lateral condensation technique in the management of root canal therapy.

**METHODOLOGY**

This Quasi experimental clinical study was carried out at Department of Operative Dentistry, de, Montmorency College of Dentistry/Punjab Dental Hospital, Lahore, Pakistan. 60 patients from outpatient department of Operative dentistry with symptomatic irreversible pulpitis in mandibular premolar teeth were selected after informing and counseling the patients. Teeth without good apical constriction such as open apex, resorption and apical periodontitis were excluded from the study. Study spread over a period of six months.

The patients were randomly assigned into two groups. Group A received obturation by thermafil technique and group B by cold lateral condensation technique. Standard treatment protocol for both groups included history taking, clinical examination, preoperative peri-apical radiograph, local anesthesia, rubber dam isolation, caries excavation and standard access preparation. The root canals were cleaned and shaped by standardized apico-coronal preparation technique. Canal filing was followed by irrigation of the canal with sodium hypochlorite (2.5\%) and followed by normal saline and canals were dried with paper points.

In Group A (n=30) root canals were obturated using thermafil technique. A thermafil obturator of the same size as the size of verifier that fits passively at working length with adjustable rubber stop was selected. The obturator was heated in thermaprep oven for 17 seconds. Canals were coated with Topseal sealer, and then obturated with thermafil obturator. By using thermacut in a turbine (300,000 rpm) plastic carrier was separated. After obturation of canals, coronal cavity was filled with restorative material.

In Group B (n=30) canals were obturated by conventional lateral condensation technique in which stainless steel finger spreader was used to laterally condense gutta-percha.

Peri-apical radiograph was taken of both groups after obturation. All data was collected on specially designed proforma. Obturation by both techniques was assessed in terms of quality by taking post-operative radiographs.

The data was analyzed using the SPSS computer software. Frequency and percentage were calculated for patient’s gender, occupation, type of technique used for obturation and quality of obturation. Periapical radiographs were used to assess the outcome variable (quality of obturation). The Chi-square test was used for comparing the two techniques. P value of 0.05 or less was considered statistically significant.

**RESULTS**

In total, 60 patients received endodontic treatment (21 males and 39 females). Participants’ age ranged from 15 to 40 years old (Mean age=28±7.32 years).

Sixty mandibular premolars were included in the study (six left first premolars, 24 left second premolars, 12 right first premolars, and 18 left second premolars).
Following careful radiographic assessment, 40 cases showed no voids in the obturated canal while 20 (33.3%) cases were found to have voids. Using the Thermafil technique, only three cases were found to contain voids in the obturated canal. On the other hand, 17 cases obturated via the lateral condensation technique had voids in the obturated canal. Using Chi square test; there was a significant difference between the two techniques (p<0.001) as the thermafil technique was associated with significantly less voids than the lateral condensation technique (Table 1).

Furthermore, the radiographical assessment revealed that 20 (33.3%) obturations were less radiodense than the rest of the cases. All these less radiodense cases were obturated with the lateral condensation technique. Therefore, the lateral condensation obturation technique showed an association with significantly less radiodense obturations (p<0.001) (Table 2).

**DISCUSSION**

According to Schilder, the final objective of root canal therapy is three-dimensional filling of the root canal system. After proper cleansing and shaping, efforts should be directed to obtain a hermetic seal. An inadequate seal can allow bacteria, their byproducts and the breakdown products of unremoved pulp tissue to leach out from the tooth into the periapical tissues. This can lead to inflammatory response and clinical failure of root canal therapy. In order to avoid this, a dense, and well adapted root canal filling is required which is more radiodense, shows no apical leakage and is without voids.

We observed the presence of voids in both groups. Neither technique was free of voids or perfectly smooth, but in thermafil group, we observed fewer voids. Only 3 cases out of 30 showed voids in thermafil group while in lateral condensation group, voids were observed in 17 cases out of 30. Brayton et al and Eguchi et al reported that in lateral condensation technique, incomplete fusion of gutta-percha cones, lack of surface adaptations, voids and spreader tracks were seen. Voids in the core of gutta-percha were due to the accessory gutta-percha points not seating to the full length of the spreader penetration.

Root Canal Filling should seal the pulpal space both apically and laterally to prevent apical irritation which occurs from incomplete elimination of bacterial products. Due to thermo plasticized nature of gutta-percha in thermafil technique, gutta-percha easily flows into the lateral and accessory canals and in canal irregularities and in curved canals as compared to lateral condensation in which gutta-percha cannot fill the lateral canals and irregularities.

The maximum volume of core material should be required for dense, well adapted root canal filling. In this study, canals obturated with thermafil technique showed more readiodensity than canals obturated

| TABLE 1: DISTRIBUTION OF RADIOGRAPHIC VOIDS IN OBTURATED MANDIBULAR PREMOLARS ACCORDING THE OBTURATION TECHNIQUE (N=60) |
|---|---|---|---|
| Voids | Thermafil (n=30) | Lateral Condensation (n=30) |
| Frequency | Frequency | % | % | % |
| Yes | 3 | 10 | 17 | 56.67 | 43.33 |
| No | 27 | 90 | 13 | |
| P value using Chi Square test | < 0.001 | |

| TABLE 2: DISTRIBUTION OF RADIODENSITY IN OBTURATED MANDIBULAR PREMOLARS ACCORDING THE OBTURATION TECHNIQUE (N=60) |
|---|---|---|---|
| Radiodensity Level | Thermafil (n=30) | Lateral Condensation (n=30) |
| Frequency | Frequency | % | % | % |
| More | 30 | 100 | 10 | 33.33 | |
| Less | 0 | 0 | 20 | 66.67 | |
| P value using Chi Square test | < 0.001 | |
with lateral condensation technique. Only 10 cases out of 30 in lateral condensation technique showed more radiodensity. The success of root canal therapy depends on the more homogeneous mass of gutta-percha as obturation material and less amount of sealer in the canal. Cold condensation technique relied on sealer to fill defects not obturated with gutta-percha. So, in thermofil technique less sealer and more gutta-percha materials are used to obtain a more homogeneous mass. More density of filling material helps prevent apical and coronal micro leakage.

The results obtained in this study with the thermofil technique were clearly superior to those obtained by lateral condensation using the same preparation procedure. Thermafil has shown to be a better technique as it is less time consuming, resulted in filling of accessory canals with gutta-percha, more homogeneous mass, had fewer voids and replicated the surfaces of the roots better.

**CONCLUSION**

In conclusion, although lateral condensation technique is still the most widely used technique in the world but in terms of quality, obturation by thermafil technique is better as it produces less voids and more radiodense obturation.

**REFERENCES**


