

**“COMPARATIVE EVALUATION OF HOMOGENEITY
AND QUALITY OF OBTURATION BY DIFFERENT
OBTURATION TECHNIQUES USING CONE BEAM
COMPUTED TOMOGRAPHY-AN IN VITRO STUDY”**

Dissertation submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

**In partial fulfillment for the Degree of
MASTER OF DENTAL SURGERY**



RAJAS DENTAL COLLEGE AND HOSPITAL

THIRURAJAPURAM, KAVALKINARU JN – 627 105, TIRUNELVELI

DCI Recognition No. DE-3 (44) – 93/2246, dated 09/11/1993.

Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai

CERTIFICATE BY THE GUIDE

This is to certify that this dissertation entitled "Comparative evaluation of homogeneity and quality of obturation by different obturation techniques using Cone Beam Computed Tomography-an in vitro study" is a bonafide research work done by Dr. S.Sherin Menaka under my guidance during her postgraduate study period between 2013 – 2016.

This Dissertation is submitted to THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, in partial fulfillment for the degree of MASTER OF DENTAL SURGERY in CONSERVATIVE DENTISTRY AND ENDODONTICS -BRANCH IV. It has not been submitted partially or fully for the award of any other degree or diploma.

Signature of the Guide


Dr. A. Arvind Kumar MDS(Professor)

Date: 12/11/2015

Place: Kavalkinaru

Signature of HOD

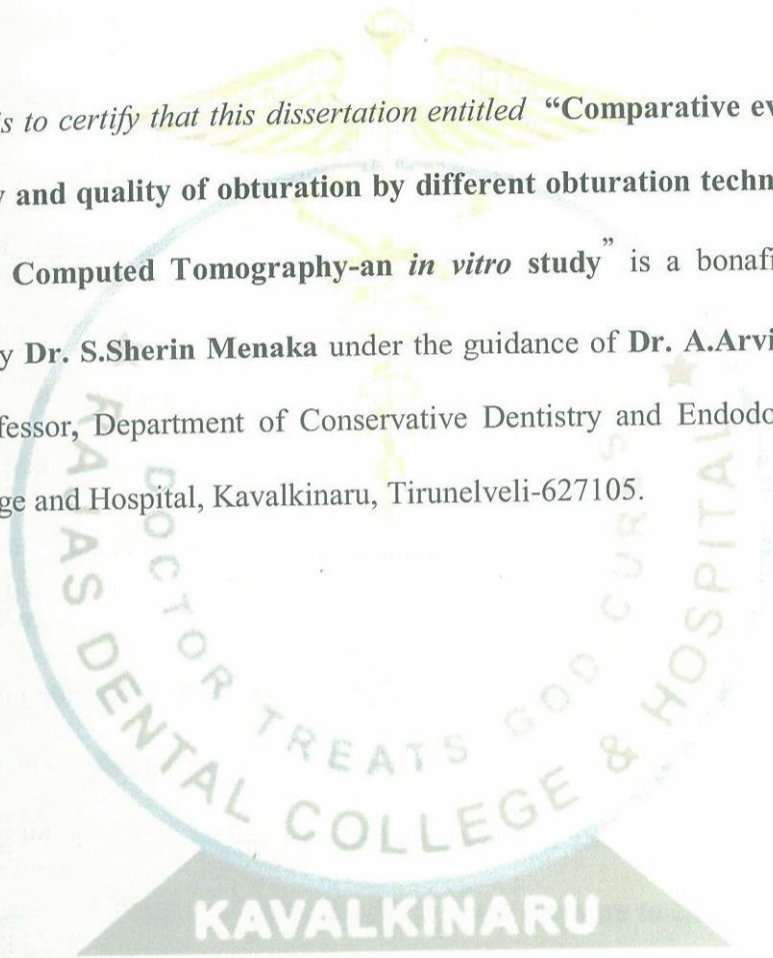

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*This is to certify that this dissertation entitled "Comparative evaluation of homogeneity and quality of obturation by different obturation techniques using Cone Beam Computed Tomography-an *in vitro* study" is a bonafide research work done by Dr. S.Sherin Menaka under the guidance of Dr. A.Arvind Kumar, M.D.S., Professor, Department of Conservative Dentistry and Endodontics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli-627105.*



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This ethical committee has undergone the research protocol submitted by **Dr.S.Sherin Menaka**, Post Graduate Student, Dept of Conservative Dentistry and Endodontics under the title "COMPARATIVE EVALUATION OF HOMOGENEITY AND QUALITY OF OBTURATION BY DIFFERENT OBTURATION TECHNIQUES USING CONE BEAM COMPUTED TOMOGRAPHY-AN IN VITRO STUDY" under the guidance of **Dr.A.Arvind Kumar** for consideration of approval to proceed with the study.

This committee has discussed about the material being involved with the study, the qualification of the investigator, the present norms and recommendation from the Clinical Research scientific body and comes to a conclusion that this research protocol fulfills the specific requirements and the committee authorizes the proposal.

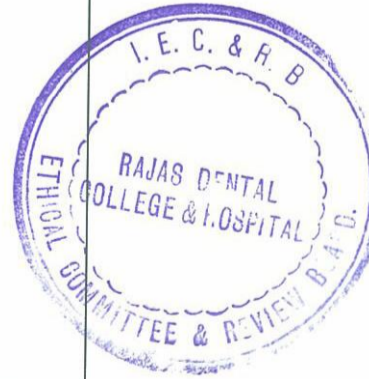
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Background

Newer materials are emerging in the field of endodontics which can be used as root canal filling materials. Most of them are able to provide an adequate coronal and apical seal which is one of the prime requisites for successful endodontic therapy. This *in vitro* study was done in order to evaluate the homogeneity and quality of four obturating techniques namely, Lateral Compaction, Guttaflow, Beefill and Thermafill using Cone Beam Computed Tomography.

Materials and methods

One hundred twenty (120) lower first premolars extracted for orthodontic purposes were used for this study. For the standardization of samples, teeth with single canals and straight roots were selected. The selected teeth were then stored in 5.25% sodium hypochlorite solution for two hours in order to dissolve the attached periodontal ligament fibers. After, which the teeth were made free of calculus and debris by using an ultrasonic scaler and the samples were washed under normal tap water and stored in normal saline solution at 37°C and 100% humidity. The access cavities were prepared by using an endo access bur and the working length was estimated with the help of routine radiographs.

The canal shaping was done by using the Protaper rotary file system up to size 30 by following the crown down technique. 2.5ml of 2.5% Sodium hypochlorite solution was used as the irrigant in between the filing sequences followed by 5ml of 17% EDTA solution and then 2.5 ml of saline was as the final flush. Then a preoperative CBCT analysis was done in order to evaluate the volume of the root canal after standardizing the working length at 15mm. This 15mm is further divided into coronal, middle and apical segments of 5mm each. These 5mm segments were

further divided into 0.5mm slices. The prepared root canals were then dried with appropriately sized paper points. AH plus sealer was coated along the walls of the prepared canals by using a lentulospiral at a speed of 300 rpm. Before obturation, the samples were randomly divided into four groups where group I was obturated by Lateral Compaction technique (LC), group II was obturated with Guttaflow (GF), group III was obturated with Thermafill (TF) and group IV was with Beefill (BF) by following the manufacturer's instructions.

Then, the postoperative CBCT analysis was performed by using the CBCT scanner (ORTHOPHOS XG 3D, Sirona Dental systems, Bensheim, Germany). The volume of each segment was then calculated from the linear measurements obtained by the CBCT analysis. The volume of the root canal in each slice was then calculated by multiplying the root canal area with the slice thickness (0.5mm). The Volume Percentage of the voids in the obturated root canal (VP) was calculated by using the formula, $(R-V) \times 100/R$ where, R is the volume of the root canal space and V is the volume of the void space. From this formula the volume percentage of the obturated material was calculated. The homogeneity of obturation was then evaluated by estimating the prevalence of voids at the coronal, middle and apical segments of the obturated root canals.

Statistical analysis

The obtained data was then analyzed statistically by using the Statistical Package for Social Sciences, (SPSS) version – 17 Software for Windows. Data entry was done by using the Microsoft office Excel spreadsheet where the data was expressed in its mean and standard deviation and were then analyzed by using ANOVA and multiple comparisons by Post Hoc Bonferroni test.

Results

Voids were present in all the groups (LC, GF, TF and BF) but the results were not statistically significant. In the intergroup comparison of the overall total volume percentage between the four groups, the mean overall total volume percentage of the Lateral Compaction group (LC) was the lowest at 88.9407% and Beefill (BF) at 97.9273 % was the highest, which was statistically significant. The overall volume percentage of the obturated material was the highest in the Beefill (BF) group followed by Thermafill (TF), Guttaflow (GF) and the Lateral Compaction techniques (LC). For the presence of extrusion among the four groups, the mean value for Lateral Compaction was 3.07 and for Beefill it was 1.033 which was statistically significant.

Conclusion

Within the limitations of the present study, it can be concluded that

1. Voids were present in all the four groups (LC,GF,TF,BF).
2. The maximum volume percentage of obturated material was found in the Beefill group (97.9273%) and the least volume percentage was found in the Lateral Compaction technique (88.9407%)
3. Extrusion was present in the Lateral Compaction group (3.07 %)
4. The homogeneity and quality of obturation was better in Beefill followed by Thermafill, Guttaflow and finally by Lateral Compaction.

Keywords:

Cone Beam Computed Tomography, Guttaflow, Lateral Compaction, Obturation Technique, Volumetric Analysis.