OBJECTIVE: To compare the apical sealing ability of injectable thermoplasticized gutta percha and solid core obturation technique.

STUDY DESIGN: In vitro comparative study

Place and Duration: At Department of Operative Dentistry Isra Dental College and Mehran University from 8th October 2015 to 8th April 2016.

METHODOLOGY: Sixty samples of extracted permanent teeth were selected and divided into two groups. Endodontic access opening, working length and preparation were performed. Then group I obturated with injectable thermoplasticized gutta percha and group II solid core using Thermafil. All samples were kept in methylene dye blue for 3 weeks and all were sliced horizontally in three levels and dye presence and penetration was checked under stereomicroscope.

RESULTS: The results showed no dye presence at Level-2 and 3. At Level-1, six (20%) samples showed presence of dye in Group I and there were five (16.66%) samples showed presence of dye in Group II. The study found insignificant difference between Obtura-III and Thermafil with p-value 0.741 (p>0.05). The mean and standard deviation of dye penetration at level I in Group I and Group II were 0.026 ± 0.069 and 0.020 ± 0.048. The mean difference was 0.006±0.868 with p-value 0.677(p>0.05) and 95% CI which indicates insignificant difference of dye penetration between two groups.

CONCLUSION: The study showed insignificant difference of apical sealing ability between two obturation techniques.

KEYWORDS: Obturation, Sealing ability, Dye leakage, Thermafil, Solid core

INTRODUCTION

The root canal system must be adequately sealed apically for successful endodontic treatment. The apical seal is the principal barrier to leakage. The inadequate obturation is the most important factor in failure of endodontic treatment. The apical leakage was common factor in 59% endodontic failure cases as reported in previous research. Microleakage among root canal filling and root canal walls may adversely affect the result of root canal treatment. Therefore, complete obturation of the root canal with an inert filling material and creation of an apical seal have been proposed as goals for successful endodontic treatment by Nguyen in 1994.

Gutta-percha is most commonly used material in root canal obturation. Many gutta-percha obturating systems are available as recent advances in dental technology. However, there is no single generally accepted method for root canal obturation to obturate the root canal with gutta-percha. Lateral condensation of gutta-percha is one of the most popular and well documented techniques of root canal obturation. But the researcher has questioned the ability of this technique to conform to the internal surface of the root canal system. The new techniques based on thermoplasticized injectable obturation were introduced to improve the surface adaptation and homogeneity of gutta-percha. The continuous wave of condensation technique, developed by Buchanan, serve as a combination of the cold lateral and warm vertical techniques. The continuous wave of condensation is less time consuming, provides less microbial coronal leakage and better adaptation to grooves and depression of the canal walls and lateral canal than lateral compaction.

Thermafil obturation is a solid core obturation technique in which patented endodontic obturator consisting of flexible central carrier uniformly coated with a layer of α-phase gutta-percha is used. Short time required to obturate and property of α-phase gutta-percha to replicate the canal wall are included in advantages of this technique. Overfilling and shrinkage when gutta-percha cools are the major disadvantages of this technique.

Previously researcher compared the apical sealing ability of
lateral condensation, obtura II and thermafil and found statistically significant difference (p<0.001) between obtura II and thermafil. They found minimum apical dye penetration in thermafil obturation technique. Previous study also showed that thermafil obturation techniques produced good apical seal compared to injectable thermoplasticized obtura-II technique. On contrary, another study assessed five different obturation techniques and found acceptable and well sealed root canal filling in all thermoplastic obturation techniques with no statistically significant difference between them. Many in vitro methods have been used to evaluate the sealing ability of root canal filling materials and many previous clinical studies have indicated that the success of root canal treatment is adversely affected due to apical or coronal microleakage. Therefore the evaluation of apical leakage of different obturation techniques using a variety of leakage tests to some degree is relevant concept. In this study we used Endopilot, obtura-III for injectable thermoplasticized obturation as Endopilot for down pack was not used in previous studies and dye presence and penetration was checked under stereomicroscope at 30X magnification that was documented in few previous studies. This study was designed to find which obturation method having least amount of apical leakage and reliable method to reduce the failures and increase the success rate of root canal procedures. So the aim of this study was to compare the sealing ability of injectable thermoplasticized gutta-percha and solid core obturation technique between two groups.

**METHODOLOGY**

This In-vitro comparative study was carried out at Department of Operative Dentistry Isra Dental College and Mehran University from 8th October 2015 to 8th April 2016. Sixty single-rooted extracted permanent teeth were selected for the study. The teeth that presented calcified root canal system, evidence of root resorption and previously root canal treated teeth were not included in the study. All teeth were sterilized in autoclave (Glowpak, Pak) at 121°C for 45minutes. Ultrasonic scaler (Dentsply, USA) was used to remove both calculus deposits and residual periodontal tissues. The teeth were stored in normal saline solution. Routinely endodontic access opening were performed with round diamond point (2 no,MANI, UK) in high speed hand piece. The working length was established with #10 or # 15 K-file (MANI, UK) and when the file tip was visible the length recorded by deducting 1mm. The root canal was prepared with hand and rotary files using endomotor (Morita,USA) at 250 rpm with torque 1Ncm ,17% EDTA and 5.25% sodium hypochlorite (Clorox) as irrigant solution .SX protaper rotary file (Dentsply Switzerland) was used for coronal enlargement of middle 1/3, then # 10,15 and 20 K-files were used upto working length to create glide path, then S1,S2 protaper rotary were used to clean and shape the canal and in the last F1, F2 protaper rotary were used upto working length for final shaping of canal. Apical patency was established throughout the preparation by passing a size 10 K-file, 1.0 mm beyond the apical foramen. After root canal preparation of total samples,60 single-rooted teeth with only one canals (n=60) were randomly divided into two groups of 30 (n=30 teeth) for obturation . In Group I teeth were obturated with endopilots (Schlumbohm, USA) (down pack) + Obtura-III (Max Spartan, USA) (back fill) and AH Plus sealer. In Group II teeth were obturated with Thermafil GP points and AH Plus sealer (Dentsply, USA). Canal obturation was verified radiographically. In the last the access cavities were filled with GIC (3M ESPE, US). All obturated teeth were coated with two layers off different color nail varnish (Cosmic GIRL, Pakistan) on all the external surfaces of tooth except 2mm of apical foramen then all teeth were placed into 2% Methylene blue (dye) for 3 weeks. Afterwards, each tooth was rinsed in distilled water for one minutes and sectioned at 3 levels with diamond bur by using slow speed motor. Level one was at 3 mm above at the apical end of the working length and other two levels were at 5 and 7 mm. By using X 30 Stereomicroscope (Leica, UK), the presence and penetration of dye (calibrated measurement by scale (mm) of Stereomicroscope) was assessed in group-I and II at Level- I, II & III under stereomicroscope. Statistical package for social sciences (SPSS-20) was used to analyze data.

**RESULTS**

No dye presence found at Level-2 and 3, so statistically measurement can’t be analyzed.

In Group-I at Level-1(n=30), there were 6 (20%) samples showed presence of dye and there was no presence of dye in 24(80%) samples. Similarly in Group-II at Level-1, there were 5 (16.66%) samples showed presence of dye and there was no presence of dye in 25(83.34%) samples (Fig 1). The Chi-square test shows insignificant difference result (0.741) greater than p-value (0.05) as shown in (Table-I).

In Group-I at level-1, the mean and standard deviation of dye penetration were 0.026 ± 0.069 (X±SD) and in Group-II at Level-1 the mean and standard deviation were 0.020 ± 0.048 (X±SD) (Table-II) The mean difference of dye penetration between two groups was 0.006 ± 0.868 with p-value 0.677(P>0.05) and 95% confidence of interval which indicates insignificant difference (0.741) greater than p-value (0.05) as shown in (Table-I).

The mean difference of dye penetration between two groups was statistically significant difference (p<0.001) between obtura II and thermafil as found in previous studies. Therefore the evaluation of apical leakage of different obturation techniques using a variety of leakage tests to some degree is relevant concept. In this study we used Endopilot, obtura-III for injectable thermoplasticized obturation as Endopilot for down pack was not used in previous studies and dye presence and penetration was checked under stereomicroscope at 30X magnification that was documented in few previous studies. This study was designed to find which obturation method having least amount of apical leakage and reliable method to reduce the failures and increase the success rate of root canal procedures. So the aim of this study was to compare the sealing ability of injectable thermoplasticized gutta-percha and solid core obturation technique between two groups.

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![Frequency of Dye presence at Level-1 in both groups](image-url)
present study supported by similar results carried out by Lanja AA et al., they checked the effect of canal preparation on apical microleakage by hand files and rotary files between obtura-II and thermafil obturation. The mean of dye leakage in rotary instrumentation were 2.00 in obtura-II and 1.92 in Thermafil, which showed higher mean value as compared with this study, but they also found no significant difference in dye leakage (p-value 0.477) as consistent to present study.

Ideally an irrigant should provide a mechanical flushing action, be microbiocidal and dissolve remnants of organic tissues. In current study, NaOCl 5.25% and EDTA were used for irrigations. The mean value of dye penetration in both groups of current study are similar to results of previous study by Emmanuel Samson, and his colleagues in 2013 who compared the apical sealing ability of obtura-II and thermafil obturation technique and they used NaOCl 5.25% and EDTA for irrigation. They checked apical sealing ability by using methylene blue dye in vertical tooth sectioning. They found dye penetration as mean value 0.0239 in Obtura-II and 0.0239 in Thermafil that are similar with current study but p-value (0.001) of previous study indicates significant difference of dye penetration between two groups that is contrast to present study due to different methodology of tooth sectioning.

In current study, canals were obturated with Obtura-III and Thermafil and all teeth were placed in 2% of methylene blue dye for three weeks and samples were analyzed by Stereomicroscopic. The result of present study agreed with previous study by researcher in 2013. They checked apical dye penetration in Obtura-II and Thermafil by using Indian ink under stereomicroscope in vertical sectioning of teeth they found dye penetration with mean value 18.36 in Obtura-II and 12.65 in Thermafil. The result showed higher value than our study, but they found no significant difference in dye penetration with p-value 0.327 (p>0.05) that is consistent with present study.

Another local study carried out by Khurram Pervez and his...
colleagues in 2010 compared apical sealing ability between single cone and lateral condensation obturation in vertical sectioning under stereomicroscope. The mean value in single cone obturation 6.42±3.18 which is higher value then current study. The p-value 0.245 shows statistically no significant difference between two groups. That is consistent with this study.

There are various methods for evaluation of sealing ability which includes dye, radiographs, fluid filtration, radioisotopes etc. Previous study 25 showed that methylene blue dye penetrates further than radioisotopes, thereby giving a more accurate assessment of marginal leakage. On the other side, methylene blue is inexpensive, easy to manipulate and shows a high degree of staining. Methylene blue dye has been used in numerous studies and is a reliable method in leakage studies. Shilpa H Bhandi 26 et al in 2013 evaluated the apical sealing ability in Obtura-II and Thermafil by using silver nitrate dye in horizontal tooth sectioning under stereomicroscope. They determined the apical dye leakage and found mean and standard deviation of dye penetration 0.1+0.5 in obtura II and 1.0±0.5 in Thermafil. Mean value of dye penetration of Obtura-II group was similar to current study but values of thermafil group were higher than current study. p-value (0.001) of previous study indicates a significant difference between both groups that is also in contrast to current study and showed more dye leakage in thermafil group.

Current study showed that injectable thermoplastic obturation and solid core obturation techniques demonstrate acceptable root canal filling and sealed well apically with no statistically significant difference between them.

CONCLUSION

It is concluded that there is insignificant difference in apical sealing ability between both obturation techniques.

Contribution of authors:
Soomro M: Data Collection, Literature Review, Data Analysis. Critical analysis
Iqbal Z: Conceived Idea, Designed Methodology, Manuscript Writing.

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REFERENCES


