

Evaluation of obturation techniques used for single visit root canal treatment and Multi visit root canal treatment of anterior teeth - a retrospective study

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Abstract:

In recent years, one appointment endodontic treatment has gained increased acceptance for most of the cases. Studies on post-operative pain, healing rates show that the treatment outcomes have been similar even though the treatment takes place in one visit or in multiple visits. Including these benefits, there are also additional advantages like increased patient acceptance and limiting duplicate procedures.

Materials and Methods : The study sample was 15,600 where 6472 were single visit root canal treatment and 8862 were multi visit root canal treatment. The various obturation techniques used in the study were lateral compaction, matched taper single cone technique, thermoplasticized technique and warm vertical condensation technique. The obtained data were put into graphs and pie charts using the SPSS software. Correlation analysis and chi square test was done using SPSS.

Results : 1,926 cases were done by lateral compaction technique, 4,484 cases were done by matched taper single cone technique, 241 cases were done by thermoplasticized technique and 91 cases were done by the technique warm vertical condensation method . In multi visit root canal treatment, 4,655 cases were done by lateral compaction technique, 3,938 cases were done by matched taper single cone technique, 174 cases were done by thermoplasticized technique and 91 cases were done by warm vertical condensation technique.

Conclusion : From the study, it is evident that the most frequently used obturation technique was matched taper single cone technique in single visit root canal treatment and lateral compaction technique in multi visit root canal treatment.

Keywords : Eco friendly ; innovative technology ; lateral compaction ; matched taper single cone technique ; obturation technique ; root canal treatment

Introduction :

The main goal of root canal treatment is to prevent and treat apical periodontitis. Apical periodontitis is due to the bacterial contamination of the root canal system and the subsequent immune response of the

surrounding periapical tissues. During the root canal treatment, the root canal system is ingrown and the canals are shaped using endodontic files to remove the vital or the necrotic debris and to facilitate irrigation and disinfection. After rigorous disinfection, the canal system is obturated. The main purpose of obturation in root canal treatment is to prevent the communication of bacteria from the oral cavity through the root canal system and into the periapical tissues (1). Also, obturation prevents the entry of apical fluids and prevents the growth of any bacteria present in the canal system (2). In recent years, one appointment endodontic treatment has gained increased acceptance for most of the cases. Studies on post-operative pain healing rates show that the treatment outcomes have been similar even though the treatment takes place in one visit or in multiple visits (3). Including these benefits, there are also additional advantages like increased patient acceptance and limiting duplicate procedures. Single visit treatments also decrease the operating procedures like anaesthesia, rubber and placement leading to gingival trauma and also eliminating the risk of inter-appointment leakage through temporary restoration (4).

Several studies have stated various advantages of single visit root canal treatment like there is no risk of flare up induced by leakage of temporary seal between appointments and materials needed for separate visits are saved. Usually a proper clinic outcome is due to absence of signs and symptoms and no radiological evidence of periapical pathology (5). But then there are various studies which have evaluated the success rate of postoperative pain of single visit and multi visit treatment and show that there is no significant difference (6). The time consumed for single visit treatment was less than multi-visit treatment (7). The main steps in the sequence of root canal operation are choosing a technique and canal drying, sealer application filling the apical portion, completing the filling and assessing the quality of fill. Outcomes of each population can defer, for example primary endodontic treatment using a standardised cleaning and shaping technique and operation with either lateral compaction or carrier-based operation (8).

A prospective clinical study compared lateral compaction and warm vertical obturation technique and found that the warm vertical obturation technique had a higher degree of success rate only in teeth with preoperative periapical lesions(9). Various studies have been conducted to compare the obturation methods in vitro but very few have been conducted in a supervised clinical setting (10,11). Thus it is important to obtain more long-term clinical evidence comparing the outcomes of various obturation systems. Our team has extensive knowledge and research experience that has translate into high quality publications(12–21),(22–25),(26–30),(31). Therefore the aim of this study is to evaluate the various obturation techniques used for single visit root canal treatment and multi visit root canal treatment of anterior teeth.

Materials and Methods :

This is a retrospective clinical study which involves the evaluation of patients who received treatment at Saveetha dental College and Hospital in Chennai. All patients who had root canal treatment were under direct supervision of an endodontist in a predoctoral clinic.

The study sample was 15,600 where 6472 were single visit root canal treatment and 8862 were multi visit root canal treatment. The various obturation techniques used in the study were lateral compaction, matched taper single cone technique, thermoplasticized technique and warm vertical condensation technique. Patients' contact information was obtained from an electronic database containing all names of patients. The study protocol was approved by the ethical research committee of Saveetha dental College. The obtained data were put into graphs and pie charts using the SPSS software. Correlation analysis and chi square test was done using SPSS. Level of significance was set at $p < 0.05$. Dependent variables included anterior teeth and independent variables included age and gender.

Results :

In the present study, various obturation techniques in single and multi visit root canal treatment was analysed. In single visit root canal treatment, 1,926 cases were done by lateral compaction technique, 4,484 cases were done by matched taper single cone technique, 241 cases were done by thermoplasticized technique and 91 cases were done by the technique warm vertical condensation method (Figure 1). In multi visit root canal treatment, 4,655 cases were done by lateral compaction technique, 3,938 cases were done by matched taper single cone technique, 174 cases were done by thermoplasticized technique and 91 cases were done by warm vertical condensation technique (Figure 2).

Correlation analysis was assessed between the obturation techniques in single visit and multi visit root canal treatment. Matched paper single cone technique was widely used in single visit (4,521) while lateral compaction technique was widely used in multi visit root canal treatment (4,631). Pearson chi square test was done and p value was found to be 0.001 which is statistically significant ($p < 0.05$) (Figure 3).

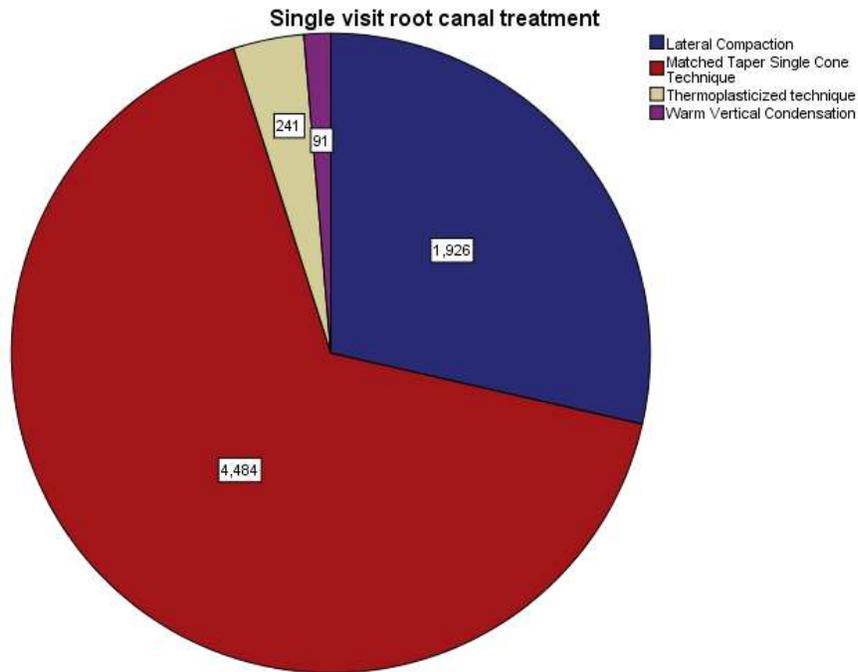


Figure 1 : The graph represents the frequency distribution of the obturation techniques of single visit root canal treatment where lateral compaction technique was used in 1,926 cases (blue), matched taper single cone technique was used in 4,484 cases (red), thermoplasticized technique was used in 241 cases (sandal) and 91 cases were done by the technique warm vertical condensation method (violet).

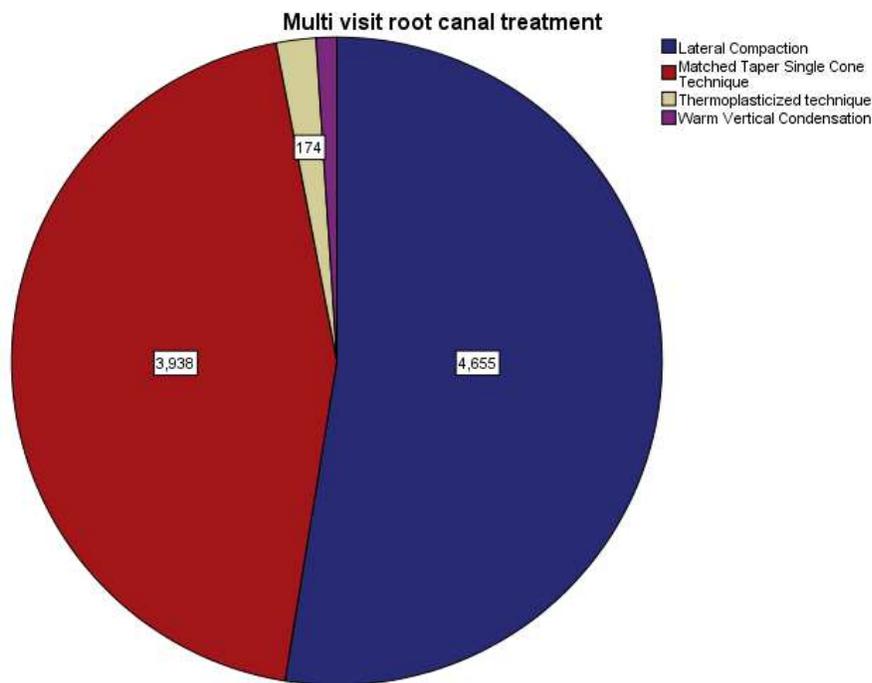


Figure 2 : The graph represents the frequency distribution of the obturation techniques of multi visit root canal treatment where lateral compaction technique was used in 4,655 treatments (blue), matched taper single cone technique was used in 3,938 cases (red), thermoplasticized technique was used in 174 cases (sandal) and 91 cases were done by warm vertical condensation technique (violet).

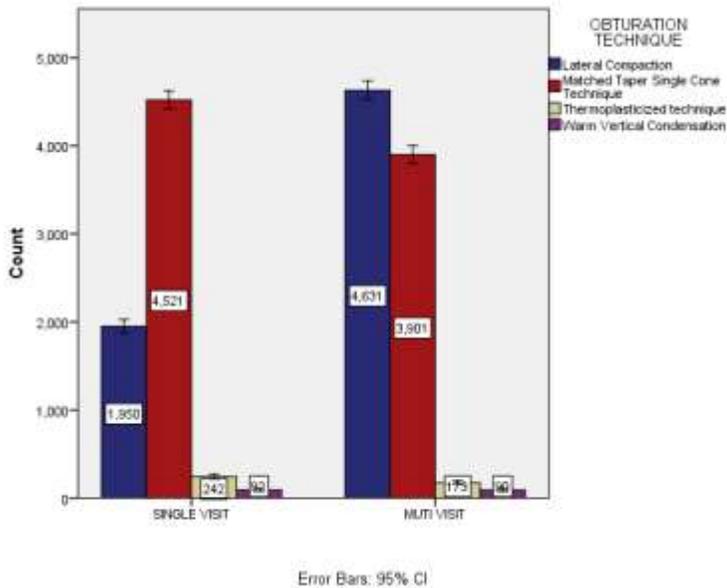


Figure 3 : The graph represents the correlation between the obturation techniques used in single visit and multi visit root canal treatment. X axis represents the number of patients in a single visit and multi visit root canal treatment. Y axis represents the obturation technique. Blue colour denotes lateral compaction technique, red colour denotes matched taper single cone technique, sandal colour denotes thermoplasticized technique and violet colour denotes warm vertical condensation technique. Single cone technique was widely used in single visit while lateral compaction technique was widely used in multi visit root canal treatment. This difference was statistically significant (Chi square test ; p value = 0.001 - significant).

Discussion :

In the present study, the majority of root canal treatment in both single visit and multi visit took place by the single cone technique. The single-cone technique usually uses a single principal or master cone with different tapers. Over the years, it has become popular among endodontists because of its high adaptability to the characteristics of nickel-titanium (NiTi) rotary systems without the requirement for accessory cones, which reduces the working time and allows for a faster and easier filling. Due to this, it causes less fatigue for both the patient and the operator. This technique in terms of quality of the obturation, apical microleakage, and bacterial penetration, provides a similar result to those achieved using other techniques (32,33). The single-cone technique also helps in saving time during root canal filling and it is more comfortable for the patient and the dentist .

The preceding technique which was used for the maximum number of times in root canal treatment for both single visit and multi visit was lateral compaction technique. Lateral compaction technique is the most commonly used and studied technique. Lateral compaction has been proved to be a successful technique due to its simplicity and does not require specific and expensive instruments and low cost. Also has the advantage of excellent length control and any acceptable fillers. However this technique may not fill canal irregularities (34) (35) . Thermoplasticized technique was the following obturation technique which was used for a maximum number of times. The main advantages of thermoplasticized techniques include better adaptation to root canal complexities, lower risk of void formation and creating a dense filling. Warm vertical technique was to be the least used treatment in both single visit and multi visit root canal treatment (36). Warm vertical condensation technique involves the movement of plasticised gutta percha and filling of canal irregularities and accessory canals. But it is usually difficult to obturate curved canals with this technique. Also it has a risk of vertical root fracture and extrusion of material into the periradicular tissues (37).

Root canal procedures are commonly believed to be the most painful dental treatment. The incidence of postoperative pain after RCT, mainly mild discomfort, was reported to range from 3% to 58% (38). Studies have shown that there is no significant difference in postoperative pain in one-visit RCT compared with two-visit treatment (39). The factors that influence postoperative pain after root canal treatment are not completely understood. A previous study evaluated postoperative pain using three obturation techniques where lateral compaction technique's maximum postoperative pain level was "light" (6) . Another study evaluated the post operative pain in lateral compaction technique where a majority of the patients reported with no pain or only minimal pain within 24 to 48 hours of treatment (40). Studies have shown that root canals must be completely filled to prevent the entry of oral microorganisms (41). However, none of the fully established techniques for root canal treatment provides a definitive coronal, lateral and apical seal. The present study was done on a limited sample size. A larger sample size would give a better understanding. The success of an endodontic treatment would majorly depend upon the quality and type of obturation technique used. Thus it is important to evaluate the best obturation technique in order to achieve a successful outcome.

Conclusion :

From the study, it is evident that the most frequently used obturation technique was matched taper single cone technique in single visit root canal treatment and lateral compaction technique in multi visit root canal treatment. These two techniques are being widely used as it is time saving and more comfortable for the patient and the dentist. Also, lateral compaction has been proved to be a successful technique due to its simplicity and does not require expensive instruments.

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