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Frequency of Post Obturation Pain after Single versus Multiple Visits Endodontic Therapy by using Hybrid Root Canal Preparation Technique

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ABSTRACT

Background/objective: *The hybrid root canal preparation technique is better in a single visit as compared to multiple visit endodontic therapy in reducing the incidence of post endodontic pain. Relationship of post obturation pain and canal preparation has been studied in the past for the better outcomes of the treatment and for the patient's belief in the treatment. The objective of this study was to compare the frequency of post obturation pain after single versus multiple visits endodontic therapy by using hybrid root canal preparation technique.* ***Materials and methods:*** *This randomized clinical trial (RCT) was carried out in the Department of Operative Dentistry, College of Dentistry, BAMDC, Multan, Pakistan, between 15th December 2017 and 14th June 2018. After approval from the Institutional Ethical Review Committee, a total of 140 patients with acute pulpitis and non-vital asymptomatic maxillary central incisor to first molar teeth were divided into 2 equal groups. In both groups, canal preparation was done by following hybrid canal preparation technique. Group A patients were treated in a single visit and Group B patients were treated in 2 visits. Patient's pain response was recorded after 24 hours of treatment, using a Visual Analogue Scale. Data were analyzed using SPSS version 20.0.* ***Results:*** *After 24 hours, when post-operative pain was compared in two groups, it was found that in one visit Group A post obturative pain was significantly less as compared to the 2 visit Group B. In one visit Group A, 18 (25.7%) patients reported pain as compared to the two visits Group B where 38 (54.3%) patients complained of pain. When both the groups were compared by Chi-square test p-value was found 0.001, which was highly significant.* ***Conclusion:*** *Single visit endodontic therapy is better than multiple visits endodontic, in relation to post obturation pain when hybrid root canal preparation technique was used.*

Keywords: Post obturation pain, Step back preparation technique, Step down preparation technique, Hybrid canal preparation technique, Visual analogue scale

INTRODUCTION

Root canal treatment consists of the preparation of the canals that include cleaning and shaping of the root canals followed by the obturation. Now the latest concept of preparation is changed from cleaning and shaping to shaping and cleaning. This process of shaping and cleaning allows the effective and efficient cleaning of the root canal system from the infected micro-organisms that make the environment aseptic and is needed to cure the diseased state. Copious amount of irrigation is required during the preparation of canals to get the maximum beneficial results. Obturation is to fill the canals with a biocompatible material. Obturation needs ideal funnel shaped preparation of the root canals that ease the placement of gutta-percha. Good obturation eliminates the chances of re-infection, by sealing the canal system both apically and coronally [1-3].

Different techniques are available for the canal preparation. These are manual, automated, sonic, ultra-sonic preparation, laser system, and NiTi. In manual root canal preparation, there are 2 most common techniques that are step back root canal preparation and step down root canal preparation techniques [2,4].

Step back root canal preparation is designed from the conventional root canal preparation. In this technique, the

preparation starts from the apical or root portion with the use of smaller instruments. The process continues towards the coronal portion with larger instruments successively. The problems of ledging, zipping, elbow formation, slight curve canals, perforation and loss of working length owing to compaction of dentine debris has been solved, but still got the disadvantages of inability of irrigants to reach the apical portion, blocking of the canals by debris and pushing the debris across the apex [2].

Step down technique is used to overcome the problems due to step back and conventional canal preparation techniques. In this preparation first, the coronal portion of the canal is prepared with the use of larger instruments, like Gate Glidden drills. Once the coronal portion is widened, the preparation continues towards the apical portion with the use of smaller instruments progressively. The advantages are less incidence of apical transmission, canal blockage and better irrigation ability of antiseptics [5].

The hybrid technique, using rotary and hand files, and the advantages of the combination of both instruments, are clearly described in this study. Used with this technique, the rotary Gate Glidden in coronal third of canal is a very safe system to use, and more controllable, for both inexperienced and experienced practitioners alike, than other systems. The mechanical objectives for endodontic canal preparation were brilliantly outlined almost 40 years ago. When properly performed, these mechanical objectives promote the biological objectives for shaping canals, 3-dimensional (3-D) cleaning, and filling root canal systems. During the following decades, there has been the emergence of a staggering number of file brands, sequences, and hybrid techniques advocated for shaping canals [6]. Relationship of post obturation pain and canal preparation has been studied in the past for the better outcomes of the treatment and for the patient's belief in the treatment. In our set up, the hybrid root canal preparation technique is used for root canal treatment [7].

The rationale of this study is to investigate the intensity of post-obturation pain in patients undergoing single and multiple visits to root canal treatment after using the hybrid root canal preparation technique. Pain is an important factor for patients after every dental procedure. If any procedure will result in a significant reduction of pain as compared to the other procedure then that procedure will be performed in future for better patient management.

MATERIALS AND METHODS

This randomized clinical trial (RCT) was carried out in the Department of Operative Dentistry, College of Dentistry, BAMDC, Multan, Pakistan, from 15 December 2017 to 14 June 2018. After approval from the Institutional Ethical Review Committee, a total of 140 patients with acute pulpitis and non-vital asymptomatic maxillary central incisor to first molar teeth were divided into 2 equal groups (70 in each group) following inclusion and exclusion criteria.

Inclusion Criteria

- Patients of both gender
- Aged 12-40 years having carious exposure of permanent teeth
- The teeth having no preoperative pain on percussion

Exclusion Criteria

- Teeth having extensive intra canal calcification
- Teeth with the incompletely formed apex
- Teeth had received any endodontic treatment previously
- Taking analgesics, anti-inflammatory, antibiotics, corticosteroids or tricyclic anti-depressants
- Pregnancy and lactation
- Allergic to endodontic medication
- Teeth with grade II or III mobility (>2 mm)
- Patients with systemic disease
- Immunocompromised patients

- Patients of age below 12 and above 40 years
- Patients with acute periodontitis and acute apical abscess
- Teeth with weeping canals
- Teeth with periapical radiolucencies of diameter greater than 0.5 cm (5 mm)

Data Collection Procedure

After taking permission from the Institutional Ethical Review Committee of the NID, the patients were selected from the Out Patients Department of Operative Dentistry, College of Dentistry, BAMDC, Multan. The patients, who were fulfilling the inclusion and exclusion criteria, were informed about the study and consent for the participation in the study was requested. Thorough patient's history and careful clinical examination were done before the treatment procedure. Preoperative radiographic examination and thermal pulp testing of the tooth was done before proceeding with the actual procedure. The diagnosis of the non-vital pulps was determined by the history, clinical examination, lack of response to thermal and electrical pulp tests and radiographs. Patients were randomly allocated into 2 groups, Group A and Group B, using double blind lottery method technique. The whole procedure was performed under the supervision of a consultant having more than 5 years of post-graduation experience. The standard procedure for both the A and B group at the first appointment was infiltration of local anaesthetics, rubber dam application, caries excavation if present and access preparation. A surgical length no 2 or 4 round bur and long tapering diamond burs were used for access cavity preparation. Occasionally no. 2 round bur was used laterally and incisally and occlusally to eliminate pulpal horn debris. After access cavity, preparation pulp chamber was flooded with 2.6% NaOCl solution. Pulp extirpation was done in vital cases.

Canal patency was checked with a size 15 K file and working length was achieved. Canals were prepared in coronal third with peso-reamers and gate-glidden drills after taking the working length. Remaining two third canals were prepared with k-files. In the remaining apical two third part of the canal, hand instrumentation was done by using 2.6% sodium hypochlorite as an irrigant while step back technique was followed.

After instrumentation was complete, canals were dried with paper points. Regardless of group assignment, the teeth were prepared to the same end points at the first appointment. Teeth in the Group B were sealed with a sterile dry cotton pellet and double seal with cavit and zinc phosphate cement. Group B patients were recalled after 7 days. In Group A the canal preparation and obturation was done in a single visit and in Group B the canal preparation and obturation was done in 2 visits. In both groups, the same root canal sealer was applied with the help of lentulospiral and canals were obturated using lateral condensation technique with gutta-percha cones.

The evaluation of postoperative pain experience by the patients was done after 24 hours with a Heft-Parker visual analogue scale. Patients were told they could place a mark anywhere on a horizontal visual analogue scale. Each patient's mark was assigned a value between 0 and 170. Patients recorded their preoperative pain levels in the presence of the clinician to ensure that they understood the instructions. These readings corresponded to post-operative periods of 24 hours. Each patient was given a prescription for 600 mg of Ibuprofen with instructions to avail the same only if needed for pain. They were instructed to call the clinic if adequate pain relief was not obtained with the prescription.

Data Analysis Procedure

Data were analyzed using SPSS version 20.0. Descriptive statistics were presented for both qualitative and quantitative variables. Mean ± S.D is calculated for age and VAS score. Frequency and percentages for gender and frequency of pain were calculated for both groups. Chi-square test was used to compare pain in both groups. The p-value ≤ 0.05 was considered as statistically significant. Confounding variables like age and gender were controlled by stratification and chi-square test was applied to see the effect of these on outcome variables.

RESULTS

In the present study, 140 teeth were treated for the root canal therapy in one visit and two visit groups. All patients were divided into 2 equal groups A and B. In one visit Group A, 70 patients participated with minimum age 12 years to maximum age 40 years. Mean age was 26.4714 and SD was 7.696. In two visits Group B, 70 patients participated with minimum age 12 years to maximum age 40 years. Mean age was 24.900 and SD was 7.6445. In both groups, CI was taken 95%.

Table 1 shows the gender distribution. In one visit Group A, 37 (52.9%) patients were male and 33 (47.1%) patients were female. In two visits Group B, 37 (52.9%) patients were male and 33 (47.1%) patients were female. Over all 74 (52.9%) patients were males and 66 (47.1%) patients were female in this study.

Table 1 Gender distribution and number of visits

Variables		Number of visits for the procedure		Total
		One visit group	Two visit group	
Gender	Male	37 (52.9%)	37 (52.9%)	74 (52.9%)
	Female	33 (47.1%)	33 (47.1%)	66 (47.1%)
Total		70 (100.0%)	70 (100.0%)	140 (100.0%)

After 24 hours, when post-operative pain was compared in 2 groups, it was found that in one visit Group A 52 (74.3%) patients showed no pain but 18 (25.7%) patients reported pain which was mild to moderate in intensity. In two visits Group B, 32 (45.7%) patients showed no pain but 38 (54.3%) patients showed mild to moderate pain. All these results were tabulated in Table 2. When both the groups were compared by chi-square test p-value was found 0.001, which was highly significant. Overall in both groups, 84 (60.0%) patients showed no pain and 56 (40%) patients showed pain.

Table 2 Post-op pain after 24 hours *number of visits for the procedure

Variables		Number of visits for the procedure		Total
		One visit group	Two visit group	
Post-Op pain after 24 hours	No	52 (74.3%)	32 (45.7%)	84 (60.0%)
	Yes	18 (25.7%)	38 (54.3%)	56 (40.0%)
Total		70 (100.0%)	70 (100.0%)	140 (100.0%)
*p=0.001				

When we compared both the one visit and two visit groups with age stratification, all the patients were divided into two groups (from 12-20 years and 21-40 years) as given in Table 3. In one visit group, 8 (34.8%) patients showed pain and 15 (65.2%) patients showed no pain in 12-20 years age group. In 21-40 years age group, 10 (21.3%) patients showed pain but 37 (78.7%) patients showed no pain. In this one visit group, the p-value was 0.225 which was non-significant.

Table 3 Comparison of age and post-op pain after 24 hours in one visit group

Variables		Post-Op pain after 24 hours		p-value
		Yes pain	No pain	
Age groups	12-20 years	8 (34.8%)	15 (65.2%)	0.225
	21-40 years	10 (21.3%)	37 (78.7%)	

In two visit group, 17 (53.1%) patients showed pain and 15 (46.9%) patients showed no pain in 12-20 years age group. In 21-40 years age group 21 (55.3%) patients showed pain and 17 (44.7%) patients showed no pain. In these two visit group, the p-value was 0.858 which was non-significant (Table 4).

Table 4 Comparison of age post-op pain after 24 hours in two visits group

Variables		Post-Op pain after 24 hours		p-value
		Yes pain	No pain	
Age groups	12-20 years	17 (53.1%)	15 (46.9%)	0.858
	21-40 years	21 (55.3%)	17 (44.7%)	

With respect to gender stratification in one visit group, 9 (24.3%) patients showed pain and 28 (75.7%) patients showed no pain in male patients group. In female patients group 9 (27.3%) patients showed pain and 24 (72.7%) patients showed no pain. The p-value for this one visit group was 0.778 which was non-significant (Table 5).

Table 5 Comparison of gender and post-op pain after 24 hours in one visit group

Variables	Post-op pain after 24 hours		p-value
	Yes pain	No pain	

Gender	Male	9 (24.3%)	28 (75.7%)	0.778
	Female	9 (27.3%)	24 (72.7%)	

In two visit group, 20 (54.1%) patients showed pain and 17 (45.9%) patients showed no pain in the male group. In female group 18 (54.5%) patients showed pain and 15 (45.5%) patients showed no pain. The p-value for this group was 0.967 which was non-significant (Table 6).

Table 6 Female and male nursing students mean scores and standard deviations on the 50 items of NPVS-R (n=233)

Variables		Post-op pain after 24 hours		p-value
		Yes pain	No pain	
Gender	Male	20 (54.10%)	17 (45.90%)	0.967
	Female	18 (54.50%)	15 (45.50%)	

DISCUSSION

Root canal treatment can be done either in multiple visits or one visit. Considerable controversy exists over the question regarding the difference in the quality of treatment, the incidence of post treatment complications or success rates between the single visit and multiple visit root canal treatment. Hence, to date, the evidence for recommending either one or multiple visit endodontics is not consistent [8,9].

One of the major advantages with the multiple visit root canal therapy is an opportunity to place an intracanal disinfectant. The fear that patients will properly develop post-operative pain and that the canal has been irretrievably sealed has probably been the greatest deterrent to single visit therapy [10,11].

The incidence of post-operative pain is the major concerns when evaluating endodontic treatment alternatives. Greater know-how regarding a technique for treatment modalities, better understanding of internal tooth anatomy, the evolution of instruments and materials have changed the way of treating routine cases to diminish post-operative pain. During cleaning and shaping procedures; dentin chips, micro-organisms, pulpal remnants, irrigating solution or necrotic debris may be pushed into the periapical region causing inflammation and post-operative pain. Since this extrusion is a problem common to all root canal preparation techniques, modern procedures have been advocated to minimize these situations. These problems can be minimized with the new cervical flaring techniques like crown down technique [12,13].

With the introduction of rotary instruments, a new generation of apex locators and evolution in the instrumentation techniques, irrigating solutions, today we could perceive a broader criterion for selection of cases for single visits endodontics. And hence, the purpose of this study was to evaluate the frequency of post-operative pain after one visit and two visit root canal therapy using the hybrid technique [14].

Salem-al-Negrish conducted a study on 120 patients with asymptomatic non-vital central incisor teeth. Five patients failed to report back, 115 patients were evaluated for post obturation pain after 2 days and 7 days. About 57 patients with step back technique and 58 patients with step down technique were treated. After 2 days, 94 patients felt no pain, while 10, 9, and 2 patients were reported with mild, moderate and severe pain. After 7 days, 3 patients were reported with moderate to severe pain. The incidence of post obturation pain is 9.5% after 2 days and 2.6% after 7 days. Percentage of post obturation pain of moderate to severe nature after 2 days with the step back preparation technique is 10.6%, and 8.6% for step down root canal preparation technique. After 7 days, the incidence of post obturation pain of moderate to severe nature is 3.5% for step back technique and 1.7% for step down technique. There is no statistically significant difference between incidence and degree of pain between step back and step down root canal preparation techniques. There is a significant difference of pain in teeth with periapical radiolucencies or those teeth which had no periapical radiolucencies [15].

In the study of Svec, relationship existed between post obturation pain and certain factors, namely,

- More incidence of pain within 24 hours of treatment
- More chances of post obturation pain, if pain existing during the treatment phase
- Less incidence of pain in teeth treated with sodium hypochlorite 5.25%, hydrogen peroxide 3% and formocresol [16,17]

Also, the healing process is impaired because of the extruded debris into the periapical area. This incidence is less in step down technique than step back technique [18].

Females are more sensitive to pain. There may be two possible explanations for this phenomenon. First, females experience more local and distinct hyperalgesia, and the second possible fact is, because of fluctuating hormonal levels, that results in changes of nor-adrenaline and serotonin, thus increased the prevalence of pain during menstrual periods and in women taking hormonal replacement therapy or oral contraceptives therapy. Stressful situations are also directly related to pain after dental treatment [15].

Aqrabawi studied the incidence of post obturation pain, by comparing the root canal preparation with a manual step back technique, and rotary NiTi system. He studied on 146 patients with 160 teeth. He divided the patients into two equal groups of 80 patients each. In group 1, root canal preparation was done with step back technique, and in group 2, root canal preparation was done with Pro Taper, NiTi. Post obturation pain was recorded, after 8 hr, 24 hr and 48 hr, as none, mild, moderate and severe. The results concluded that there was no statistical difference in post obturation pain between the two groups at any time interval (p=0.005) [19].

The study was conducted by Palmer, et al., in the Northwest of England in January 2006. About 702 primary care dentists were included to evaluate the training needs, 498 (70.9%), primary care dentists sent the results. According to these results, 58% of these dentists were following step down technique, while 35% of the dentists were following step back root canal preparation technique. The results showed that primary care dentists in the northwest of England, have the knowledge of modern techniques to follow the most aspects of accepted endodontic practice [20].

A study conducted by Goreva, et al., on 100 patients, to assess the post obturation pain of different origin. In 100 patients, 151 teeth were studied after endodontic treatment. About 34.4% of patients recorded pain in the follow up. The intensity and incidence of pain were recorded. The study results showed post obturation pain was the result of a number of treatment visits, the presence of infection and excessive material beyond the apical area. According to the study results, step down root canal preparation using, rotary principle instruments and GT rotary files, proved to be the most effective as regards to in prevention of post obturation pain [21].

Limitations of the Study

- It was a single blinded study and the bias of the operator recordings cannot be excluded
- Teeth from central incisor to the first molar were included in this study. Only some particular teeth are included in the study
- Some patients found it difficult to record their results on a visual analogue scale
- Control group was not used to rule out the placebo effect

CONCLUSION

Single visit endodontic therapy is better than multiple visits endodontic therapy in relation to post obturation pain when hybrid root canal preparation technique was used.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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