Comparison of postobturation flare ups between two apical limit of instrumentation and obturation in root canal treatment in vivo study

Talha Asad Khan[1], Zahid Iqbal[2]

ABSTRACT

Objective: To compare frequency of postobturation flare ups between two apical limit of instrumentation and obturation in root canal treatment

Study Design: Comparative Randomized clinical trial

Place and Duration: At Department of Operative Dentistry Isra Dental College from 19th Feb 2014 to 18th Feb 2015.

Methodology: Total hundred patients of either gender who were diagnosed for pulp necrosis of single rooted teeth and required root canal treatment were divided into two groups by randomization. In Group-A, instrumentation and obturations were done up to apical constriction and in Group-B, instrumentation and obturations were done up to apical terminus. The patients were instructed to record the pain severity in case of flare ups on performa by visual analogue scale and called for follow-up after three days. Pain was recorded as no pain, mild pain, moderate pain and severe pain accordingly.

Results: Frequency pain on 3rd post- operative day was recorded as 32% patients reported no pain, 58% mild pain, 6% moderate pain and 4% severe pain (flare-up) in Group A. In Group B, 2% patients reported no pain, 34% mild pain, 44% moderate pain and 20% severe pain (flare-up). There was a significant difference of flare-ups (P=0.028 <0.05) between Group A and Group B.

Conclusion: There is a difference in frequency of flare-ups between the two apical limit and frequency increased when the apical limit was kept at the terminus compared to the apical constriction.

Keywords: Apical constriction, Apical terminus, Endodontics, Flare ups, Instrumentation, Obturation, Pain

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INTRODUCTION

Apical limit of preparation and obturation in root canal treatment has various controversies in Endodontology[1]. For many years, the said issue has undergone tremendous research but is still a debatable topic for endodontists regarding apical limit of instrumentation and obturation[1]. Previous anatomical and histological research had debated much the topic as determination of exact apical termination of these procedures[2]. However, apical limit of instrumentation and obturation is a point where consensus is yet to be established in clinical endodontic research[3].

Traditionally, the canal preparation and obturation is achieved at the apical constriction (AC) which is the narrowest part of canal system[4]. The clinicians demarcate this focal point by radiography and electronic devices to find the histological location of AC with-in the root canal[5]. Electrical apex locators (EAL) of modern era, working on principle of impedance quotient measurements, are capable of determining the AC by measuring impedance between the file tip and the canal fluid using differences of their frequencies[6]. Instrumentation and obturation to the AC is reported to provide favorable prognosis in endodontic practice[7]. Anatomical details and variations of the apical region are central to the success of any endodontic procedure[4]. With the introduction of rotary instrumentation and advanced mechanisms of WL determination, another school of thought in Endodontology has arose that suggests to complete instrumentation of the canal till the apical terminus[8]. The general agreement is that the apical limit of instrumentation and obturation assumes a pivotal role in the

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prognosis of an endodontically treated tooth[9]. Recent trend, especially after improvement in the metallurgy of the shaping instruments, coincides with above advocacy of approaching till peri-apical lesions, but the apical limit of instrumentation and obturation still remains controversial[10].

A flare-up is construed as pain and the oral mucosa swelling along with exacerbation of symptoms in the area of tooth being treated endodontically that occurs in a couple of hours to days after RCT[11]. There are multiple causes and reasons for the flare-ups to occur but the mechanical factors are the ones relevant to this study. These include the extent of apical preparation and obturation and the technique of instrumentation used i.e. step back with hand S.S files or crown down with motor-driven Ni-Ti files[12].

Literature has reported varying incidence of flare-ups somewhere between 1.4% and 16%[13]. Studies show that the frequency of flare-ups and post-operative pain increases if the instrumentation and obturation is done beyond the apical constriction[14].

After extensive search of literature it was found that the comparison of postobturation flare ups between the two preparations and obturation limits in root canal treatment has not been extensively studied internationally and local data is close to none. Therefore the present study will help in developing a consensus for dental practitioner in selecting the choice of apical extension of instrumentation and obturation in routine RCT procedures in order to reduce the discomfort to the patient as well as increase the long term outcome of root canal procedure. There is need of a standardized research in this matter since the previous studies often leads to confusion and for clinicians searching for proper directions based on scientific facts and prognostic results rather than opinions. So the objective of this study was to compare frequency of postobturation flare ups between two apical limit of instrumentation and obturation in root canal treatment.

METHODOLOGY

This comparative randomized clinical study was conducted at the Department of Operative Dentistry/College of Dentistry Isra University; Hyderabad Pakistan from 19th February 2014 to 18th February 2015. The objective of this study was to compare frequency of postobturation flare ups between two apical limit of instrumentation and obturation in root canal treatment Local ethical committee approval was obtained before the study start from the local research ethical committee, Isra University Hyderabad.

Total hundred patients of either gender who were diagnosed for pulp necrosis of single rooted teeth and required root canal treatment were selected. The patients of aged 20 to 65 years were included. The patients that presented with perforation and/or internal resorption in teeth, resorbed and or open apices of teeth and previous root canal treated teeth were excluded. An informed consent was taken from every patient. Hundred patients were divided into two groups by randomization using odd and even patients' hospital ID number. Group-A, 50 patients in which apical limit of instrumentation and obturation was planed up to apical constriction and in Group-B, 50 patients in which apical limit of instrumentation and obturation was planed up to apical terminus.

In group A clinical examination, radiographic examination and sensibility testing were performed to fulfilling the inclusion criteria. Patients were given local anesthesia (2% Lignocaine with 1:100,000 Adrenaline, Septodont, UK), and isolation of teeth with rubber dam was done. Access cavity was prepared by a diamond round bur The access was refined and finished by an access cavity preparation carbide bur (Endo Z, Dentsply International) in a high-speed hand-piece. The working length was determined by a 4th generation electronic apex locator (Root ZX mini, J.Morita, Japan.) up-to the apical constriction and this was reconfirmed with a digital peri-apical radiograph (DIGORA Optime, Sorerdex, Finland). Following the manufacturer's instructions, canal instrumentation was performed with a rotary endo-motor (X-Smart, Dentsply International) using a Ni-Ti file system (Pro-taper Universal, Dentsply, Maillefer; Ballaigues, Switzerland). Between each file change, 2 ml. of 3% NaOCl (Clorox, Pakistan) were used for irrigation. The canal system was then dried by the corresponding sterile paper points (Pro-taper Universal Dentsply International). A try-in with the corresponding master gutta percha point (Pro-Taper, Dentsply International) was made to check for proper seal and tug-bag. A resin based sealer (AH-Plus, Dentsply Maillefer; Tulsa, OK, USA) was then applied by lentulo-spirals of the appropriate size and obturation were made by the cold single cone technique by the placement of the master gutta percha point (Pro-Taper, Dentsply International) After the obturation, an intra-oral digital imaging plate system (DIGORA Optime, Sorerdex, Finland) was used to develop a digital radiograph and check the obturation. The tooth was then restored with a composite restorative material (Z100, 3M ESPE) (Fig-1)

In group B All the standardized protocols followed for Group-I were repeated for this group as well except that the instrumentation and obturation was done till the terminus of the root located by the electronic apex locator (Root ZX mini, J. Morita, Japan) and reconfirmed and by a peri-apical radiograph developed through an intra-oral digital imaging plate system (DIGORA Optime, Sorerdex, Finland). (Fig-2)

The patients were instructed to record the pain severity in case of flare ups on performa by visual analogue scale and analgesics were prescribed to reduce pain in case of severe pain. Then patients were followed after three (03) days and perform was taken .Pain was recorded by visual analogue scale as No pain, mild pain, moderate pain and severe pain accordingly. Following scoring was used to marks the pain by patients.0-1=No pain, 2-4=Mild pain, 5-7=Moderate and 8-10=Severe pin

Data Analysis: Statistical package for social sciences (SPSS 20) was used to calculate the mean age, frequency of gender and teeth distribution. Frequency of flare-ups in each group was calculated. Chi-square test was used to compare flare-ups between groups with p-value (0.05) at 95% level of significance.

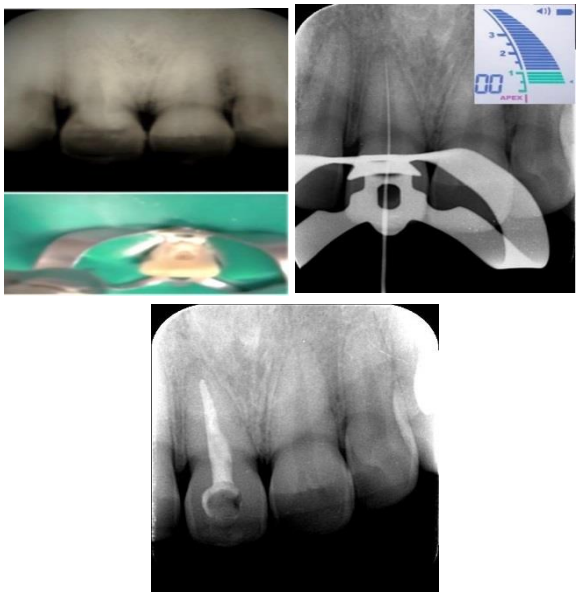

Fig-1: Instrumentation and obturation up to apical constriction

Fig-2: Instrumentation and obturation up to apical terminus

RESULTS

There were 100 patients selected for this study. There were 25 (50%) male and 25 (50%) female in Group A while there were 28 (56%) male and 22 (44%) female in Group B. (Fig-3) The mean age of the patients was 32.42 ± 9.9 in Group A and 31.42 ± 10.6 years in Group B. There was no significant difference of Age between the two groups (P=0.62 P > 0.05). A total of 100 single rooted teeth were included in the study. Out of the 100 teeth included in the study, thirty eight (38%) were incisors, twenty (20%) were canines and forty two (42%) were premolars.

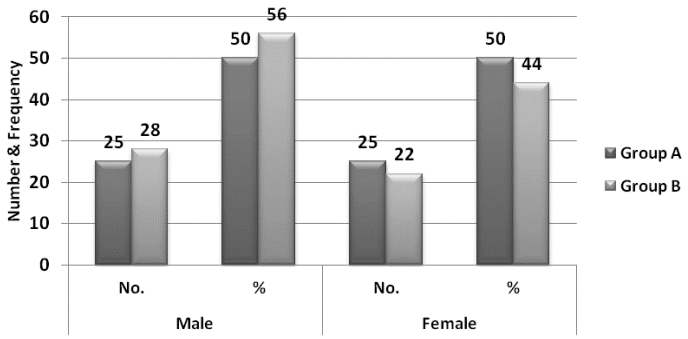

Fig-3: Gender distribution (N=100)

Frequency of No, mild, moderate and severe pain (Flare-up) on 3rd post- operative day was recorded in Group A and Group B. In Group A, 16 (32%) patients reported no pain, 29 (58%) mild pain, 3 (6%) moderate pain and 2 (4%) severe pain (flare-up). In Group B, 1 (2%) patients reported no pain, 17 (34%) mild pain, 22 (44%) moderate pain and 10 (20%) severe pain (flare-up). (Fig-4)

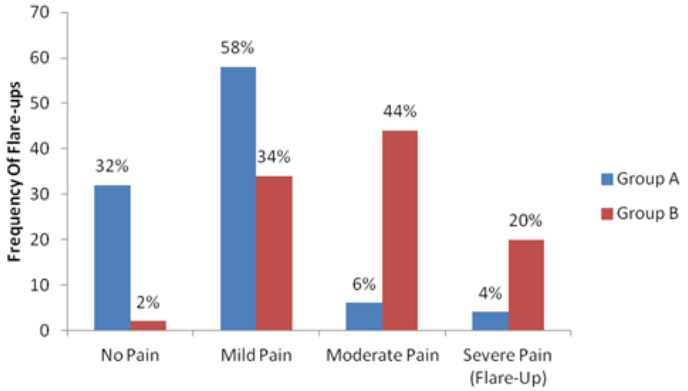

Fig-4: Frequency of flare-ups on 3rd Post-Operative day (N=100)

The frequency of Flare-ups on 3rd post-operative day in Group A was reported as 2 (4%) out of 50 (100%) patients and the frequency of Flare-ups on 3rd post-operative day in Group B was reported as 10 (20%) out of 50 (100%) patients. The Chi-Square test was applied and there was a significant difference of flare-ups (P=0.028 <0.05) between Group A and Group B. Group A was shown to have lesser frequency of flare-ups. (Table-I)

Table-I: Comparison of Flare-Ups between Group A and Group B on 3rd Post-Operative Day (N=100)

Flare-Ups	Group A (n=50)	Group B (n=50)	X^2-value	P-value
Yes	2 (4%)	10 (20%)	6.061	0.028
No	48 (96%)	40 (90%)		

DISCUSSION

Root canal therapies are one of the most common procedures to preserve teeth, that are intended to give a three dimensional seal with relief of patient's pain as well as to make favorable condition for healing of peri-apical tissues[15]. The quality of canal

preparation along with its filling followed ultimately by coronal seal with a definitive restoration are important factors to get high success rates. Many of previous studies have concluded the hypothesis that success of root canal therapy is dependent on the quality of obturation. General agreement is that the apical limit of instrumentation and obturation holds an important position in successful healing of an endodontically treated tooth[9].

Traditionally, the canal preparation and obturation is limited up to the apical constriction. Clinically demarcation of this focal point within the canal is determined by radiography and electronic devices[5]. Considering the AC as an apical endpoint has a few drawbacks as limiting canal preparation to this landmark risks leaving inflamed or necrotic pulp tissue beyond the AC[16]. Instrumentation and obturation to the AC is reported to provide favorable prognosis in endodontic practice. The concept of cleaning and shaping till terminus and then obturating has been also advocated in literature. Canal instrumentation and filling up to the AF has previously been advised. A flare-up is severe pain in the region of endo-treated tooth occurring within a couple of hours to days after RCT[11]. Although the rate of a flare-up is minute, it usually leaves a horrific impact on the patient as well as the attending endodontist.

After extensive search of literature it was found that the comparison of flare ups between the two preparations and obturation limits in root canal treatment has not been extensively studied internationally and local data is close to none. In this study, an overall incidence of flare-ups at 3rd post-operative day was 12% which is in accordance to previously reported varying incidence of flare-ups somewhere between 1.4% and 16%[9]. In this study frequency of no pain, mild pain, moderate pain and severe pain (flare-ups) in Group A subjects were noted as 32% no pain, 58% mild pain, 6% moderate pain and 4% flare ups. This finding is in contrast to the previous study by Siquera et al[17] on incidence of postoperative pain after instrumentation and obturation up to the apical constriction, in which they reported that a certain degree of post-operative pain occurred in 15.2% of patients, out of which mild pain was felt in 10% of the patients, moderate pain in 3.3% and severe (flare-up) in 1.9%. This low incidence of flare-up is in contrast to the findings of present study that reported 4% incidence of flare-ups in group A where the apical limit was at the apical constriction. The findings of 4% flare-ups in group A (instrumentation and obturation till AC) are also in contrast to another previous study by Arias et al[18] on relationship between post-endodontic pain after instrumentation till AC while maintaining the apical patency. Arias et al[18] reported the incidence of flare-up to be 0.16% which is in contrast to the present study that showed 4% flare-ups on instrumentation and obturation till AC. In another previous study by Risso et al[19] on post-operative pain and associated factors in adolescent patients undergoing RCT found out the incidence of flare-ups was 1.75% on 3rd day which again is in contrast to the findings of 4% flare-ups when instrumentation was kept limited to the AC. The results of this study are also in contrast to a previous local study by Ahmed et al[20] on post-operative pain after root canal treatment with rotary instruments. They reported 19.1 % frequency of severe pain (flare-up). This high incidence of flare-up is in contrast to the findings of present study that reported 4% occurrence of flare-ups in group A. The reason of contrast between findings of previous studies and current study are samples size, difference in instrumentation and obturation method, difference in assessment of flare-ups and difference in follow up time period. The findings of post obturation pain and 4% flare ups in group A of this study have some agreement with previous study by Mattscheck et al[21] as they reported 6% flare ups at 72 hours that is similar to this study.

The findings of post obturation pain and flare ups in group B (instrumentation and obturation till AF) of this study showed that 2% reported no pain, 34% mild pain, 44% moderate pain and 20% flare ups. We didn't find any previous study that determined frequency of flare-ups and post-operative pain when the instrumentation and obturation is done beyond the apical constriction or up to apical foramen. So the results of this study for group B should be interpreted with caution. We found previous study by Bourreau et al[22] who determined postoperative pain at 24 hours but related to apical over instrumentation and overfilling up to the apical terminus instead of up to apical foramen. The findings of 20% flare-ups in group B of this study are in contrast to study by Bourreau et al[22] that reported only 2.48% of the single rooted teeth presented with pain at 24 hours.

When comparing the two groups on 3rd post-operative day in this present study there was also statistically significant difference ($p=0.028$, $p<0.05$) in the occurrence of flare-ups on 3rd post-operative day between group A (instrumentation and obturation till AC) and group B (instrumentation and obturation till terminus).This result is in contrast to the previous study by Morse et al[23] as they found a 6.6% incidence of flare-up with no statistically significant difference between instrumentation to the apical terminus (7.5%) and instrumentation to the apical constriction (5.7%). We did not find further previous studies on comparison of flare ups in relation to the apical limit of instrumentation and obturation so further comparison can't be made.

The limitations of current study is less number of sample size because of a strict exclusion criteria and confounding factors that can affect frequency of flare ups could not be controlled .To further affirm the results of this study further large scale studies with controlled confounding factors and a longer follow-up are advised to validate the findings.

CONCLUSION

There is a difference in frequency of flare-ups between the two apical limit and frequency increased when the apical limit was kept at the terminus compared to the apical constriction.

CONTRIBUTION OF AUTHORS

Iqbal Z: Conceived idea, Designed methodology, Manuscript writing.

Khan TA: Data collection, Literature review, Data analysis, Critical analysis

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REFERENCES

1. Mohammed A, Sidhu SK, Chong BS. Root canal working length determination and apical limit of root canal instrumentation and obturation. Endo Prac T. 2015; 9:161–68.
2. Tang L, Sun TQ, Gao XJ, Zhou XD, Huang DM. Tooth anatomy risk factors influencing root canal working length accessibility. Intl J Oral Sci 2011; 3: 135 -40.
3. Johnson WT, Noblett WC. Cleaning and Shaping. In:Torbinejad M, Walton RE. Endodontics; Principles and Practice, 4th ed. Missouri: Saunders Elsevier. 2011: 258-86.
4. Peters OV, Peters CI. Cleaning and shaping of the root canal system. In: Hargreaves KM, Cohen S (ed). Pathways of the Pulp. 10th ed. Missouri: Mosby Elsevier 2011:283-48.
5. Gluskin AH. Anatomy of an overfill: A reflection on the process. Endod Top 2007; 16(1):64-81.
6. Orosco FA, Bernardinelli N, Garcia RB, Bramante CM, Duarte MAH, de Morales IG. In vivo accuracy of conventional and digital radiographic methods in confirming root canal working length determination by Root ZX. J Appl Oral Sci 2012; 20 (5): 522-25.
7. Mukhaimer R, Hussein E, Orafi I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. Saudi Dent J. 2012; 24(3-4):149–55.
8. Mounce R. Determination of True Working Length. Endod Practice 2007; 10(1):18–22.
9. Deonizio MDA, Sydney GB, Batista A, Pontarolo R, Guimaraes PRB, Gavini G. Influence of apical patency and cleaning of the apical foramen on periapical extrusion in retreatment. Braz Dent J. 2013; 24(5):482–86.
10. Souza RA. The Importance of Apical Patency and Cleaning of the Apical Foramen on Root Canal Preparation. Braz Dent J. 2006; 17(1):6-9.
11. Sipavičiūtė E, Manelienė R. Pain and flare-up after endodontic treatment procedures. Stomatologija. 2014; 16(1):25-30.
12. Kara Tuncer A, Gerek M. Effect of working length measurement by electronic apex locator or digital radiography on postoperative pain: A randomized clinical trial. J Endod. 2014; 40(1):38–41.
13. Iqbal M, Krutz E, Kohli M. Incidence and factors related to flare-ups in a graduate endodontic programme. Int Endod J 2009; 42(2):99-104.
14. Priyanka SR, Veronica. Flare-Ups in Endodontics – A Review. IOSR-JDMS. 2013; 9(4):26-31.
15. Udoye Cl, Jafarzadeh H, Aguwa EN, Habibi M. Flare-up incidence and related factors in Nigerian adults. J Contemp Dent Pract. 2011; 12(2):120-23.
16. Martinez-Lozano MA, Forner-Navarro L, Sánchéz-Cortes JL, Llena-Puy C. Methodological considerations in the determination of working length. Int Endod J 2001; 34(5):371-76.
17. Siqueira JF Jr, Rôças IN, Favieri A, Machado AG, Gahyva SM, Oliveira JC, et al. Incidence of postoperative pain after intracanal procedures based on an antimicrobial strategy. J Endod. 2002; 28(6):457–60.
18. Arias A, Azabal M, Hidalgo JJ, José C. Relationship between postendodontic pain, tooth diagnostic factors, and apical patency. J Endod 2009; 35(2):189–92.
19. Risso PA, Cunha AJ, Araujo MC, Luiz RR. Postobturation pain and associated factors in adolescent patients undergoing one- and two-visit root canal treatment. J Dent 2008; 36(11):928–34.
20. Ahmed S, Ahmed A, Sikander M. Comparison of postoperative pain frequency after single visit and multiple visits root canal treatment with rotary instruments on non-vital teeth. Pak Oral Dent J 2017; 37(1):158-60.
21. Mattscheck DJ, Law AS, Noblett WC. Retreatment versus initial root canal treatment: factors affecting posttreatment pain. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001; 92(3):321–24.
22. Bourreau MLS, Soares A deJ, Souza FFJde. Evaluation of postoperative pain after endodontic treatment with foraminal enlargement and obturation using two auxiliary chemical protocols. Rev. odontol. 2015; 44(3):157-62.
23. Pak JG, White SN. Pain prevalence and severity before, during and after root canal treatment: a systematic review. J Endod 2011; 37(4):429-38.