

COMPARISON OF POSTOPERATIVE PAIN WITH AND WITHOUT APICAL PATENCY TECHNIQUE IN ASYMPTOMATIC IRREVERSIBLE PULPITIS TEETH: A RANDOMIZED CONTROL TRIAL

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ABSTRACT

Objective: To compare postoperative pain in asymptomatic irreversible pulpitis teeth with and without apical patency application during root canal treatment.

Materials and Methods: A randomized control trial was carried at Armed Forces Institute of Dentistry, Rawalpindi started July 2013 to Jan 2014. A total of 150 teeth (75 in each group) were randomly divided in two groups. In group A apical patency was applied with smallest file (8 or 10 number K file) in between instrumentation up to the whole working length. In group B no apical patency file was used in between instrumentation to check for post operative pain. SPSS version 22 was used for analysis.

Results: Postoperative pain was significantly less in group-A when compared with group-B, 26 (34.7%) versus 42 (56.0%) with p value 0.009. Moderate pain was observed in 17 teeth (22.7%) of group-A and 21 teeth (28.0%) of group-B. Severe postoperative pain was seen in 3 teeth (4.0%) of group-A and 7 teeth (9.3%) of group-B. Unbearable pain was present in 6 teeth (8.0%) of group-A and 14 teeth (18.7%) of group-B.

Conclusion: There was less postoperative pain in asymptomatic irreversible pulpitis teeth with apical patency application during root canal treatment.

Keywords: irreversible pulpitis, apical patency, working length

INTRODUCTION

The apical endpoint for root canal preparation and obturation is still a topic of controversy and debate in endodontics.¹ To determine the true termination of the root canal a number of studies have been done.^{2,3} A newer concept regarding apical endpoint for cleaning and obturation is of apical patency.⁴ Pulpal remnants and dentinal chips get clogged in the apical region during instrumentation which is responsible for blockage of root canal, mainly in its apical third. This blockage can be prevented if we maintain patency of the canal before and during instrumentation.⁵ Apical patency is a technique in

which apical portion of the canal is maintained free of debris by passing a small number file through the apical foramen.⁶ Buchanan first discussing the concept of apical patency stated that patency files can be defined as “small flexible K-file(s), which passively moves through the apical constriction without widening the apical constriction”. In this technique, the smallest diameter file is set 1mm longer than working length and recapitulated after each instrument to prevent packing of debris in the apical portion.⁷ This technique ensures complete debridement of root canals and is associated with less postoperative pain.⁸ In addition it prevents procedural accidents like ledges, apical transportation, and apical perforation, maintains the anatomy of apical portion of the canal, minimizes the risk of loss of length, and eases irrigation in the apical third of

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the canal.⁹ Some authors do not recommend patency concept as Patency files may be responsible for debris extrusion into periapical area leading to tissue irritation and postoperative pain.¹⁰

The benefits of maintaining apical patency exceed the possible injury; it might cause because its main purpose is to prevent clogging of dentinal debris mainly in apical region of the canal which hinders the determination of WL.¹¹

Apical patency technique is thought to ensure complete debridement of the root canal therefore the purpose of this study is to assess if maintenance of apical patency during root canal treatment causes no postoperative pain therefore an improved form of root canal treatment can be offered to patients.

MATERIALS AND METHODS

A randomized control trial was performed at Operative Dentistry department of Armed Forces Institute of Dentistry, Rawalpindi, Pakistan. Started from July 2013 to Jan 2014. Data were collected using Non-probability purposive sampling technique. Both male and female patients aged between 20 and 50 years reporting to Dental OPD and diagnosed with asymptomatic irreversible pulpitis were included. A total of 150 patients having teeth with immature apices, internal or external root resorption, blocked or sclerosed canals, periapical radiolucency, acute apical periodontitis, grade 3 mobility, root fracture, or teeth in which patency cannot be maintained because of one or other reason were excluded, all of these conditions were diagnosed by clinical, radiological and diagnostic test assessment.

Teeth showing symptomatic irreversible pulpitis and non-restorable teeth were not included. Approval was taken from ethical committee of Armed Forces Institute of Dentistry. Informed consent was taken from each patient.

Data were entered and analyzed by using SPSS version 22. Descriptive statistics was calculated for quantitative and qualitative variables. For Quantitative variables like age mean \pm SD was used. For qualitative variables i.e. gender and presence of pain, frequency and percentage was calculated. Qualitative variables were presented as tables. Chi square test was used for comparing proportion of outcome of the treatment groups. P value less than ≤ 0.05 was considered significant. Root canal treatment was

initiated under LA (2% lidocaine with 1 in 80,000 epinephrine). Rubber dam was applied and access cavity was prepared. Pulpotomy was performed, working length was determined. Canal was prepared with crown down technique preparation. Patients were divided into two groups by lottery method. In group-A apical patency was applied with smallest file (8 or 10 number K file) in between instrumentation upto the whole length. In group-B no apical patency file was used in between instrumentation. Irrigation was performed with 3% sodium hypochlorite (paccan). Teeth were sealed with temporary dressing. Postoperative pain was assessed at 24 hours. Patient presenting with pain was treated accordingly. Pain was rated on numerical rating scale (10 point scale) by the patient itself (Annexure-B) Patient having mild to moderate pain was given analgesics only while patient having severe pain was operated again by readjustment of working length and calcium hydroxide was packed in canal. Tooth was disoccluded as well.

RESULTS

Mean age of the patients was 36.55 ± 7.62 and 34.84 ± 7.58 years in group-A and B, respectively (Table-1).

In group-A, 41 patients (54.7%) and in group-B, 35 patients (46.7%) were males while 34 patients (45.3%) in group-A and 40 patients (53.3%) in group-B were females (Table-2). Postoperative pain was significantly less in group-A when compared with group-B, 26 (34.7%) versus 42 (56.0%) with p value 0.009 (Table-3). Moderate pain was observed in 17 teeth (22.7%) of group-A and 21 teeth (28.0%) of group-B. Severe postoperative pain was seen in 3 teeth (4.0%) of group-A and 7 teeth (9.3%) of group-B. Unbearable pain was in 6 teeth (8.0%) of group-A and 14 teeth (18.7%) of group-B. Distribution of patients by tooth number presented in Table-5.

Table: 1 Distribution of cases by age

Age (Year)	Group-A (with apical patency)		Group-B (without apical patency)	
	No.	%	No.	%
20-30	20	26.7	23	30.7
31-40	32	42.7	35	46.7
41-50	23	30.6	17	22.6
Total	75	100.0	75	100.0
Mean±SD	36.55±7.62		34.84±7.58	

Table: 2 Distribution of patients by gender

Gender	Group-A (with apical patency)		Group-B (without apical patency)	
	No.	%	No.	%
Male	41	54.7	35	46.7
Female	34	45.3	40	53.3
Total	75	100.0	75	100.0

Table: 3 Distribution of teeth by postoperative pain

Postoperative Pain	Group-A (with apical patency)		Group-B (without apical patency)		P value
	No.	%	No.	%	
Yes	26	34.7	42	56.0	0.009
No	49	65.7	33	44.0	
Total	75	100.0	75	100.0	

Table: 4 Distribution of teeth by severity of pain

Severity of pain	Group-A (with apical patency)		Group-B (without apical patency)		P value
	No.	%	No.	%	
No	49	65.3	33	44.0	0.039
Moderate	17	22.7	21	28.0	
Severe	03	04.0	07	09.3	
Unbearable	06	08.0	14	18.7	
Total	75	100.0	75	100.0	

DISCUSSION

Pain is an unwanted yet unfortunately common sensation after root canal treatment (RCT) which commences a few hours or days after treatment and is always an unpleasant experience for both patients and clinicians.¹² The incidence of postoperative pain after RCT, mainly mild discomfort, was reported to

range from 3% to 58%^{13, 14} but less than 12% of patients experienced severe pain.¹⁵ In a clinical investigation, it is difficult to determine if a single or multiple factors elicit pain. The reasons for post-operative pain can be many including chemical, mechanical, or microbial injuries to the periapical tissues that result in acute inflammation.¹⁶

Table: 5 Distribution of teeth by number

Severity of pain	Group-A (with apical patency)		Group-B (without apical patency)		P value
	No.	%	No.	%	
Mandibular 1st pre-molar	12	16.0	16	21.3	0.11
Mandibular 2nd pre-molar	21	28.0	27	36.0	
Maxillary 1st premolar	16	21.3	19	25.3	
Maxillary 2nd premolar	26	34.7	13	17.4	
Total	75	100.0	75	100.0	

Vital and necrotic tissue, microorganisms, and dentinal debris may be extruded through the apical foramen into the periapical tissues during root canal preparation resulting in post-operative pain.¹⁷ A mechanical reason may be over instrumentation; chemical factors include the extrusion of medications, filling materials, or irrigants.¹⁸

Postoperative pain is common after endodontic treatment, so it is very important for the dentist to control this pain.¹⁹ Root canal treatment must be carried out taking into account that instrumentation and obturation techniques can provoke periapical damage. Furthermore, several reports associate the extrusion of filling material to the presence of post-operative pain.²⁰

Forcing of endodontic instruments beyond the apical foramen can extrude a variety of irritants to the peri apical tissue, which can increase incidence and degree of pain.²¹ One study showed a significantly higher incidence of pain if during the shaping procedure, instruments were forced beyond the apical foramen instead of maintaining them 1.5 or 2 mm short from the radiographic apex.²²

Our cases show less postoperative pain in patients of with apical patency group as compared to without apical patency group (65.7% vs 44.0%) with p value 0.009, probably because debris or microorganisms in the apex irritate more periapical tissue than a small file that passively moves through apical foramen. Our findings are comparable with the results of a study carried out by Arias et al.²³

In a study done by Arora M, a size 10 K-file was used as a patency file and carried 1 mm beyond the working length (WL) between each instrument change in the patency group, while it was carried

up to WL in the non patency group. Maintenance of apical patency during chemo mechanical preparation had no significant influence on post-operative pain in posterior teeth with necrotic pulps and apical periodontitis.²⁴ Moreover, Torabinejad et al 25 found that unintentional overextension of files, which can happen while determining working length, does not affect the incidence of postoperative pain. Probably they used only fine files to determine the working length. This supports the idea that these are the only files that should invade the periapex. Periapical overextension does not necessarily cause postoperative pain. However, it differs from our study in that the authors did not try to maintain apical patency during all the shaping procedure, but overextension of files through apical foramen was limited to working length determination.

CONCLUSION

There was less postoperative pain in asymptomatic irreversible pulpitis with apical patency application in comparison without apical patency application during root canal treatment.

REFERENCES

1. Michael Hülsmann and Edgar Schäfer Apical patency: fact and fiction—a myth or a must? A contribution to the discussion ENDO (Lond Engl) 2009;3(4):285–307
2. Ricucci D. Apical limit of root canal instrumentation and obturation, part 1. Literature review. International Endodontic Journal. 1998;31, 384-393.
3. Ricucci D, Langeland K. Apical limit of root canal instrumentation and obturation, part 2. A histological study. International Endodontic Journal. 1998;31, 394-409
4. Khatavkar. Roheet A. Hegde. Vivek S. Importance of patency in endodontics

5. Arias A, Azabal M, Hidalgo JJ, de la Macorra JC. Relationship between postendodontic pain, tooth diagnostic factors, and apical patency. *J Endod* 2009;35:189-92.
6. Garg N, Sharma S, Chhabra A, Dogra A, Bhatia R, Thakur S. Clinical evaluation of maintenance of apical patency in post endodontic pain: An in vivo study. *Endodontology* 2017;29:115-9
7. Buchanan LS. Management of the curved root canal. *J Calif Dent Assoc.* 1989; 17:18-25.
8. Sadaf D , Ahmad ZM. apical patency or apical plug: a literature review . *Saudi Endodontic Journal – Vol. 1(1):6-11, October 2011*
9. Flanders DH. Endodontic patency. How to get it. How to keep it. Why it is so important. *N Y State Dent J* 2002; 68:30-2.
10. Buchanan LS. Cleaning and shaping of the root canal system. In: Cohen S, Burns RC, editors. *Pathways of the Pulp*. 5th ed. St. Louis, MO: Mosby; 1991.
11. Souza RA. The importance of apical patency and cleaning of the apical foramen on root canal preparation. *Braz Dent J* 2006;17:6-9
12. Alves VO. Endodontic flare-ups: a prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010;110:e68-72
13. Sathorn C, Parashos P, Messer H. The prevalence of postoperative pain and flare-up in single- and multiple-visit endodontic treatment: a systematic review. *Int Endod J* 2008;41:91-9.
14. Gondim E Jr, Setzer FC, Dos Carmo CB, Kim S. Post-operative pain after the application of two different irrigation devices in a prospective randomized clinical trial. *J Endod* 2010;36:1295-301.
15. Ersan et al. Postoperative pain intensity after using different instrumentation techniques: a randomized clinical study. *J. Appl. Oral Sci.* vol.25 no.1 Bauru Jan./Feb. 2017
16. Ng YL, Glennon JP, Setchell DJ, Gulabivala K. Prevalence of and factors affecting post-obturation pain in patients undergoing root canal treatment. *Int Endod J* 2004;37:381-91.
17. Ozsu D, Karatas E, Arslan H, Topcu MC. Quantitative evaluation of apically extruded debris during root canal instrumentation with ProTaper Universal, ProTaper Next, WaveOne, and self-adjusting file systems. *Eur J Dent* 2014;8:504-8
18. Dalopoulou A, Economides N, Evangelidis V. Extrusion of Root Canal Sealer in Periapical Tissues - Report of Two Cases with Different Treatment Management and Literature Review. *Balk J Dent Med*, 2017; 21:12-18
19. Vanotti A, Osio M, Mailland E, Nascimbene C, Capi-luppi E, Mariani C. Overview on pathophysiology and newer approaches to treatment of peripheral neuropathies. *CNS Drugs* 2007;21:3-12.
20. Seltzer S. Pain in endodontics. *J Endod* 2004; 30: 501–3.
21. Nobuhara W, Carnes D, Gilles J. Anti-inflammatory effects of dexamethasone on periapical tissues following endodontic overinstrumentation. *J Endod* 1993;19:501–7.
22. Georgepoulou M, Anastassiadis P, Sykaras S. Pain after chemomechanical preparation. *Int End J* 1986;19:309–14.
23. Glossary of Endodontics terms. 7th ed. Chicago, IL: American Association of Endodontist; 2003
24. Arora M, Sangwan P, Tewari S, Duhan J. Effect of maintaining apical patency on endodontic pain in posterior teeth with pulp necrosis and apical periodontitis: a randomized controlled trial. *Int Endod J.* 2016 Apr;49(4):317-24
25. Torabinejad M, Kettering JD, McGraw JC, Cummings RR, Dwyer TG, Tobias TS. Factors associated with Endodontic interappointment emergencies of teeth with necrotic pulps. *J Endod* 1988;14:261-6.