

RELATIONSHIP OF INTRACANAL IRRIGANTS TO INTER-APPOINTMENT PAIN IN ENDODONTICS

¹MUHAMMAD BADER MUNIR, BDS (Pb), MCPS, FCPS (Pak)

²SHAHZAD ALI SHAH, BDS (Pesh), FCPS-II (Pak)

³AMNA MASOOD, BDS (Pb)

ABSTRACT

The purpose of this study was to compare levels of postoperative pain after cleaning and shaping of root canals using three different root canal irrigants for debridement. Sixty patients with irreversible pulpitis and acute apical periodontitis requiring root canal treatment were included. They were divided into three study groups. Canals were cleaned and shaped with one of the following protocols. In group I, 17% EDTA was used as the root canal irrigant. In group II, canals were irrigated with 2% Chlorhexidine. In group III, 5.25% sodium hypochlorite was used as root canal irrigant. Access cavities were closed with a sterile cotton pellet and Cavit. The patients recorded degree of pain at various time intervals after conclusion of the first appointment on a visual analogue scale for 72 hours. A significant statistical difference was found in the degree of pain between the three groups ($p = 0.0001$).

INTRODUCTION

Knowledge on the causes of and the mechanisms behind inter-appointment pain in endodontics is of utmost importance for the clinicians to properly prevent or manage this undesirable condition. The causative factors of interappointment pain encompass mechanical, chemical, and/or microbial injury to the pulp or periradicular tissues, which are induced or exacerbated during root canal treatment.¹

Local wound debridement in the diseased pulp space is the main step in the root canal treatment to prevent the tooth from being a source of infection. Microorganisms can participate in causation of inter-appointment pain in the following situations, 1. Apical extrusion of debris, incomplete instrumentation leading to changes in the endodontic microbiota and secondary intra-radicular infections, 2. Overzealous instrumentation leading to mechanical trauma and 3. Injudicious use of intracanal irrigants during preparation causing chemical trauma to periapical region.

Interappointment pain is almost exclusively due to the development of acute inflammation at the periradicular tissues in response to an increase in the intensity of injury coming from the root canal system.²

When an interappointment emergency occurs, proper diagnosis and active treatment are required for the clinician to succeed in solving the problem. This study focuses on the occurrence of interappointment

pain, with special emphasis placed on the intracanal irrigants used during root canal treatment.

Through the years, different irrigating solutions have been recommended such as Physiologic Saline, 30% Urea, Urea per Oxide in Glycerin, Chloramine, Sodium hypochlorite, Hydrogen peroxide, Ethylenediamine tetra acetic acid (EDTA) & a mixture of Tetracycline isomer, an acid & a detergent (MTAD).³

The most commonly intracanal irrigant used in endodontics is sodium hypochlorite.^{4, 5} An effective irrigating solution in root canal preparation is essential for the sanitization process because it favors cleaning and shaping and neutralizes necrotic content which favors root canal enlargement for subsequent filling. Sodium hypochlorite is recommended and used by the majority of dentists because this solution presents several important properties, antimicrobial effect, tissue dissolution capacity, and acceptable biologic compatibility in less concentrated solutions.⁶

Sodium hypochlorite in higher concentrations is more aggressive while in lower concentrations (0.5% to 1%), it is biocompatible.⁷ NaOCl can be an extremely cytotoxic material; therefore, care must be taken with its use. In the literature reports a few cases of adverse reaction caused by NaOCl. They range from injection through the apical foramen to air emphysema and allergic reactions as complications during endodontic treatment.^{8, 9, 10}

¹ Assistant Professor, Operative Dentistry and Endodontics, de, Montmorency College of Dentistry, Lahore

² Post Graduate Resident, Department of Operative Dentistry and Endodontics, de, Montmorency College of Dentistry, Lahore

³ House Surgeon, de, Montmorency College of Dentistry, Lahore

Correspondence: Dr Shahzad Ali Shah, 80-C, Model Town, Lahore. Phone No: 042-58866-8, 03339115856, Shahzad971@gmail.com

Chlorhexidine was first developed in the late 1940s in the research laboratories of imperial chemical limited. It is a strong base and is most stable in the form of its salts. It is a potent antiseptic, which is widely used for chemical plaque control in the oral cavity. It displays affinity to dentine, forms depots, and has longer antimicrobial activity. Usually the 2% solution of chlorhexidine is used in endodontics. This concentration was used in our study as well.

EDTA (pH -7.3 ethylene diamine tetraacetic acid) is used as means of demineralization (chelators). The chelators have the ability to attach to themselves Cations from the dentine and thus to demineralize the surface layers of the root-canal dentine. Thus more effective use of medication becomes possible and better adhesion between the root-canal fillers and the dentine is achieved.¹¹

One major shortfall of EDTA is the significant erosion of intertubular and peritubular dentine. Should saliva enter the once opened dentine canals, it may cause re-infection.

Several studies have been undertaken to evaluate the effect of different Intra Canal Irrigants on inter-appointment pain in root canal treatment. Different methods were used to evaluate the pain like Visual Analogue Pain Scale (VAS).¹²⁻¹⁴

METHODOLOGY

Patients were selected from the OPD of the Punjab Dental Hospital. An informed consent was taken from all the patients. History and clinical examination was undertaken. A diagnostic periapical radiograph was taken. Patients were divided into three groups on the basis of irrigant used. Twenty cases irrespective of sex were taken for each irrigant used. Teeth with acute apical periodontitis, periapical radiolucency and discharging sinus were excluded from the study. Maxillary and mandibular premolars and permanent molars with irreversible pulpitis were included in the study. Root canal treatment was undertaken using standardized methods. Step back preparation performed following rubber dam isolation and by using specified irrigants from the group, according to manufacturer's instructions. Irrigants were delivered using conventional 5 cc syringe in to the canal making sure that it does not bind while delivering irrigants. A special type of proforma was given to each patient at the conclusion of the first appointment with instructions for recording his/her evaluation of the incidence and level of pain after 4 hours, 24 hours, 48 hours and 72 hours. Intensity of the pain experienced was recorded on a modified Visual Analogue Pain Scale (VAS 1-10).

The Intra canal irrigant used were,

1. 17% Ethylenediamine tetra acetic acid (EDTA)
2. 2% Chlorhexidine (CHX)
3. 5.25% Sodium Hypochlorite (NaOCL)

RESULTS

A total of sixty patients with mean age 1.875 and standard deviation 14.52, (Table 1) were divided into three groups of 20 each. Group I consists of patients in whom 17% EDTA was used, group II, 2% Chlorhexidine & group III, 5.25% sodium hypochlorite was used as intra canal irrigant. Gender wise distribution shows 35 (58.3%) male and 25 (41.7%) female patients. (Table 2) Data revealed that 6.7% of the total number of cases treated with all three irrigants showed absence of any level of pain at 2 hrs interval, 38.3% at 24 hrs, 61.7% at 48 hrs and 86.7% at 72 hrs respectively. The study showed high significance $P = 0.0001$

Visual analogue scale readings 2 hours after first appointment showed no pain only in group I, 13 patients reported with mild pain in group I and 13 in group II while 2 patients reported mild pain in group III. Moderate pain was recorded among 2 patients in group I, 7 patients in group II and 13 patients in group III, 3 patients with severe pain was recorded only in group III. P value is .0003 (Table 3)

Readings at 24 hours interval showed no pain group I & II with total of 23 patients. Mild pain was recorded in 10 patients of group I, 7 patients of group II and 10 patients of group III. Moderate pain was recorded among 10 patient of group III. (Table 4)

After 48 hours, pain analogue scale showed no pain in all groups having a total of 37. Mild pain was documented in 4 patients of group I, 3 patients of group II and 14 patients of group III respectively. Moderate pain was recorded in 2 patients of group III. P value is .0001. (Table 5)

72 hours post appointment follow up showed no pain in all groups having a total of 52. Mild pain was recorded only in 8 patients of group III. P value is 0.0004 (Table 6)

TABLE 1: DISTRIBUTION OF AGE WITH MEAN & STANDARD DEVIATION

n = 60

Age	Frequency	%age
16 – 20	5	8.33
21-30	23	38.3
31-40	11	18.3
41-50	7	11.6
51-60	9	15.0
61-70	4	6.66
70-80	1	1.66
Total	60	100

Mean \pm S.D = 1.875 \pm 14.522

TABLE 2: DISTRIBUTION OF SEX
n = 60

Gender	Frequency	%age
Male	35	58.3
Female	25	41.7
Total	60	100

TABLE 3: COMPARISON OF PAIN INTENSITY TO INTRACANL IRRIGANTS AFTER 2 HOURS
n = 60

Pain intensity at 2 hours	Intracanal canal irrigants			Total
	Group I n=20	Group II n=20	Group III n=20	
No Pain	4	0	0	4
Mild	13	13	2	28
Moderate	3	7	11	21
Severe	0	0	7	7
Total	20	20	20	60

Chi Square = 35.214
P Value = 0.0001
Degree of freedom = 6

TABLE 4: COMPARISON OF PAIN INTENSITY TO INTRACANL IRRIGANTS AFTER 24 HOURS
n = 60

Pain intensity at 24 hours	Intracanal canal irrigants			Total
	Group I n=20	Group II n=20	Group III n=20	
No Pain	8	5	0	13
Mild	11	15	6	32
Moderate	1	0	14	15
Total	20	20	20	60

Chi Square = 35.75
Degree of freedom = 4

TABLE 5: COMPARISON OF PAIN INTENSITY TO INTRACANL IRRIGANTS AFTER 48 HOURS
n = 60

Pain intensity at 48 hours	Intracanal canal irrigants			Total
	Group I n=20	Group II n=20	Group III n=20	
No Pain	12	13	4	29
Mild	8	7	6	21
Moderate	0	0	10	10
Total	20	20	20	60

Chi Square = 25.32
P Value = 0.0001
Degree of freedom = 4

TABLE 6: COMPARISON OF PAIN INTENSITY TO INTRACANL IRRIGANTS AFTER 72 HOURS
n = 60

Pain intensity at 72 hours	Intracanal canal irrigants			Total
	Group I n=20	Group II n=20	Group III n=20	
No Pain	18	13	5	36
Mild	2	7	12	21
Moderate	0	0	3	3
Total	20	20	20	60

Chi Square = 20.31
P Value = 0.0004
Degree of freedom = 4

DISCUSSION

There can be no doubt today that microorganisms, either remaining in the root canal space after treatment or re-colonizing the filled canal system, are main causes of endodontic failure. The primary endodontic treatment goal must thus be to optimize root canal disinfection and to prevent re-infection.⁷

The occurrence of mild pain following chemo-mechanical preparation is not a rare event and can develop in about 10–30% of the cases. In most instances, the patient can bear the discomfort or can make use of common analgesics, which are usually effective in relieving symptoms. On the other hand, the development of interappointment severe pain, accompanied or not by swelling, has been demonstrated to be an unusual occurrence. These cases have been referred to as “flare-ups” and usually constitute true emergencies that require unscheduled visits for treatment.

It is commonly held that CHX is less caustic than hypochlorite. However, that is not necessarily the case. Heating the CHX irrigant of lesser concentration could increase its local efficacy in the root canal system while keeping its systemic toxicity low. CHX seems to act by adsorbing onto the cell wall of the microorganism and causing the leakage of intracellular components.⁴

Results of our study showed an average of 48.35% patients having no pain at all after first appointment. Pain scale readings showed that after 2 hours, 13 (21.66%) patients in group I, 13 (21.66%) in group II and 2 (3.33%) in group III shows mild pain respectively. Moderate pain was recorded among 2 (3.33%) patients of group I, 13 (21.66%) patients of group II and 3 (5.0%) of group III respectively. Severe pain was recorded in group III patients only (5.00%). A p value of .0003 was recorded on comparison.

Postoperative pain is associated with inflammation in the periradicular tissues caused by irritants egressing from the root canal during treatment. Irritation can be of biological (microorganisms) or nonbiological (chemical or mechanical) origin.

According to the study conducted by Tulio GV et al¹⁵ using 2.5% sodium hypochlorite, 84% of patients showed absence of pain in between appointments while 5.8% showed some degree of pain. The concentration used was less compared to our study.

Most irrigants and medications are cytotoxic to the host tissues, and consequently there is virtually a universal consensus that their use should be restricted to the root canal. Clinical trials have shown that substances used for irrigation or intracanal medication may have no influence on the occurrence of postoperative symptoms. However, severe reactions have been reported after extrusion of some commonly used substances to the periradicular tissues.¹⁵

A study conducted by Torabinejad et al¹⁶ showed an insignificant relationship between intracanal irrigants with p value of 0.58, this is in contrast to our study which shows high significance.

A gradual decrease in the pain occurrence is easily noted in this study as after 72 hours all patients were devoid of severe pain, while only group III showed 3 (5%) patients with mild pain were recorded. Mild discomfort was present in a number of patients from all groups. This mild pain can be of instrumentation during procedure, debris extrusion in to periapical region and overzealous use of irrigation syringes used in this study.

Elimination of microbial contamination from the root canal system is a pre requisite to the successful outcome of root canal treatment as diagnosed clinically by the absence of pain. The evidence shows that mechanical instrumentation, irrigation and the use of inter appointment medication were all important in this regard. However, all the currently available antimicrobial materials for irrigation have some limitations and search continues for the ideal irrigant.

CONCLUSION AND RECOMENDATIONS

The concentration of sodium hypochlorite used in this study was high (5.25%), care must be taken to handle such irrigants and specially designed side port delivery system canuli should be used while irrigating canals. Length determination should precede intracanal irrigation so that to avoid passing instruments and irrigants beyond apical constriction. All the irrigants should be handled with care by inexperienced hands. Clinician should strictly follow the manufacturer's recommendations. Visual analogue scale for measuring pain intensity is an effective and common tech-

nique but due to difference in the level of pain threshold among different individuals, a bias in the study is one of the limitations due to which other methods should be used. Some patients complain of prick pain of anaesthetic needle after its effect wears off, further limiting the credibility of results. Complete explanation to the patient is necessary.

ACKNOWLEDGMENT

We are thankful to all the medical and paramedical staff of operative dentistry department, de, Montmorency College of Dentistry, Lahore for their co-operation and help.

REFERENCES

- 1 Siqueira JF, Barnett F. Inter appointment pain: mechanisms, diagnosis, and treatment. *Endod Topics* 2004; 7: 93-109
- 2 Zehner M. Root canal irrigants. *J endodon* 2006; 32: 389-98.
- 3 Richard E, Walton Isaac et al. Calcium Hydroxide as an Intra Canal Medication: effect on post treatment pain. *J Endodon* 2003; 29: 627-9.
- 4 Cohen S, Richard C. Orofacial Dental Pain Emergencies. Pathways of the Pulp. 8th ed; Mosby Inc; 2002: p36-37.
- 5 Ingle JI, Backland LK, Peters DL, Buchanan LS, Mullanay TP. Endodontic cavity Preparation. In: *Endodontics*. 4th ed. Ingle JI, Backland LK, eds, Baltimore, Williams & Wilkins, 1994: 180-4.
- 6 Spano JCE, Barbin EL, Santos TC, Guimaraes LF, Pecora JD. Solvent action of sodium hypochlorite on bovine pulp and physico-chemical properties of resulting liquid. *Braz Dent J* 2001; 12: 154-7.
- 7 Carlos E, Cyntia RA, Estrela E L, Barbin J CE, Spanó MA, Marchesan JD. Mechanism of Action of Sodium Hypochlorite. *Braz Dent J* 2002; 13: 113-11.
- 8 Pontes F, Pontes H, Adachi P, Rodini C, Almeida D, Pinto D. gingival and bone necrosis caused by accidental sodium hypochlorite injection instead of anaesthetic solution. *J endod* 2005; 31: 171-6.
- 9 Kleier DJ, Averbach RE, Mehdipour O. The Sodium hypochlorite Accident: Experience of Diplomates of the American Board of Endodontics. *J Endodon* 2008; 34: 521-3.
- 10 Serper A, Ozbek M, Calt S. Accidental sodium hypochlorite induced skin injury during endodontic treatment. *J Endod* 2004; 30: 180-1.
- 11 Tomov GS, Vladimirov DS. Chelators in Endodontics – Essence and Clinical Application *Zubolekarski pregled* 2004; 86: 150-157.
- 12 NG YL, Glenon JP, Setchell DJ et al. Prevalence of and factors affecting Post Obturation Pain in patients under going Root Canal Treatment. *Int J Endod* 2000; 33: 238.
- 13 Oncag O, Hosgor M, Hilmioglu S et al. Comparison of antibacterial and toxic effect of various root canal irrigants. *Int J Endod* 2004; 37: 178.
- 14 Weber DW, Scott B et al. The effect of passive ultra sonic activation of 2% Chlorhexidine or 5.25% Sodium hypochlorite irrigant on residual antimicrobial activity in root canals. *J Endod* 2003; 29: 562-4.
- 15 Tulio GV, Gama JC, Oliveira M, Ernani C, Isabela N, Siqueira JF. Postoperative pain following the use of two different intracanal medications. *Clin Oral Invest* 2008; 12: 325-30.
- 16 Torabinejad M, Shabahang S, Bahjri K. Effect of MTAD on post operative discomfort: a randomized clinical trial. *Int endod J* 2003; 36: 868-75.