

THE EFFECT OF HERBALS AS INTRA-CANAL MEDICATION ON POST-OPERATIVE PAIN

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ABSTRACT

Aim of the study: This study was performed to compare the pain experienced after application of chitosan as an intracanal medication, in comparison with calcium hydroxide, and Chlorhexidine gel.

Materials and Methods: thirty patients with lower first molar diagnosed as necrotic pulp with chronic apical periodontitis were included in the study. post-operative pain experienced after placement of the intracanal medication was evaluated after 6,12,24 and 72 hours using numerical rating scale (NRS).

Results: Patients with chitosan (CHI) showed significantly the lowest post-operative pain scores in comparison with CH and CHX gel at 6,12 and 24 hours after treatment $P = 0.03$, while at 72 hours no significant difference was detected between the three tested medicaments $P = 0.16$.

Conclusions: chitosan could be considered as a promising intracanal medicament, owing to its comparable reduction in post-operative pain compared to the other medicaments.

KEYWORDS: Herbal medicine, Intracanal Medication, Root canal treatment, post-operative pain.

INTRODUCTION

Apical periodontitis is an infectious disease that is caused by bacterial invasion from infected root canals. The outcome of root canal treatment procedure depends on the degree of canal disinfection and avoiding reinfection of the root canal. The cleaning and shaping of the root canal process depends on a chemomechanical disinfection procedure, mechanically through canal shaping, and chemically using

chemical antibacterial irrigants aiming to disinfect the root canals from bacterial micro-organisms ⁽¹⁾.

Extra mean of canal disinfection using interappointment antimicrobial medication had been proposed to aid in elimination of the surviving bacteria from cleaning and shaping procedures. Calcium hydroxide (CH) and CHX gel are the most used intracanal medication ⁽²⁾.

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However Herbal alternative was introduced due to its biocompatibility and potential cytotoxicity when compared to CH & CHX gel regarding disinfection of root canal⁽³⁾. Previous trials of using several herbal extracts, like Propolis, Liquorice, Neem leaves, Morinda Citrifolia, and others. in Endodontics showed promising antibacterial and anti-inflammatory⁽⁴⁾.

So, in this study, the performance of chitosan in endodontics had been evaluated. A serious issue for both, clinicians, and patients, to be considered following the root canal treatment is postoperative pain (PP). The prevalence of PP ranges from 3%–58%. Apart from intraoperative factors, PP may be associated with various components, including microbial, inflammation, and/or immune-related factors as well as psychological elements. Studies have assessed the association between different intracanal medications on PP in patients undergoing root canal treatment.

MATERIALS AND METHODS

Sample Size

The sample size was 15 (n=15) for more statistical power and to be the same as sample size of microbiological analysis.

Participants

Thirty patients attending to the endodontic clinic at faculty of oral and dental medicine, Future University in Egypt diagnosed clinically and radiographically with pulp necrosis with asymptomatic chronic apical periodontitis were included in this study. All patients were informed with the procedures with a written consent ensuring that the patient fully understands the research procedures and its risks.

The selection of the teeth to be involved in the study was based upon strict inclusion/exclusion criteria.

▪ Inclusion criteria:

1. Mandibular first molar.
2. Teeth with necrotic pulps with asymptomatic apical periodontitis, confirmed by clinical and radiographic examination.
3. Teeth with intact pulp chamber walls
4. Teeth with no previous root canal treatment.

▪ Exclusion criteria:

1. Symptomatic teeth featuring pain, tenderness to percussion or swelling.
2. Teeth with crown root fracture.
3. Teeth with incompletely formed root.
4. Teeth with periodontal disease, having pocket depth more than 4 mm.
5. Involved teeth from patients that had taken antibiotics in the 2 weeks before the treatment.
6. Patients with chronic systemic disease.
7. Pregnant or lactating female patients

Intervention

Diagnosis After obtaining the medical and dental history from all patients, clinical and radiographic check was done. The chief complaint and history of the present illness were taken from patients own words. Clinical evaluation included detection of carious lesions, discoloration, or large restorations. Percussion and palpation were done to indicate the presence or absence of tenderness or swelling. Periodontal probing was done for the affected teeth to detect any periodontal problem. The necrotic pulps of the teeth were confirmed with electric pulp tester and cold sensibility tests and by the absence of bleeding after access cavity preparation. Pre-operative radiographs were taken before treatment to assess roots conditions and peri-apical status and measuring the size of apical radiolucency. The patients were divided into 3 groups with

10 patients in each group according to the intracanal medications CH, CHX gel and CHI.

Procedure: Apical patency and determination of working length was done with the aid of an electronic apex locator J Moritta Dentaport Root ZX. Confirmation using periapical radiograph. Canal shaping was done using Protaper Gold system up to F3, (30/0.09) F4, (40/0.06) or F5 (50/0.05), with aid of about 10 mL the tested irrigants NaOCl for lubrication, flushing of shaping debris and canal disinfection. Sterile 27 gauge side vent needle EndoTip was used for all irrigation procedures, and the needle was adjusted to be 2-3 mm shorter from the working length.

After cleaning and shaping procedures was completed, the root canals were filled with the tested intracanal medications. CH, CHX gel and chitosan were directly injected inside the root canal using their special tips. Confirmatory radiograph was taken to ensure adequate medication placement inside the canal (in case of CH group only). Teeth were then adequately sealed with cotton pellet and temporary restoration.

At the recall visit 7 days later, the canals were reaccessed and the canal medication was removed by flushing with sterile saline and EQS sonic activation to ensure complete removal of the medication, the canals were dried. Before obturation, all canals were irrigated with NaOCl with sonic activation, followed by saline flushing, then EDTA 17% solution and left inside the canals for 1 minute and final rinse with saline before canal dryness. Selection of the master cone was checked clinically and radiographically for fitting and reaching the full working length. Obturation was done with using continuous wave of compaction technique using iFill system. And composite restoration was done directly after canal filling.

Post-operative pain evaluation: pain experienced after treatment in the first visit after placement of the intracanal medication was evaluated using numeric rating scale (NRS), which is a

presented as 11-point scale starting with zero indicating no pain, and ending with 10 referring to severe unbearable pain. The patient was asked to mark the scale on a pain evaluation sheet starting from 0 "no pain" to 10 "worst imaginable pain" at 6, 12, 24, and 72 hours after treatment. And the patient returned with the pain evaluation sheet after one week for the obturation visit.

Blinding, the patients didn't know which intracanal medication was placed inside their cleaned and shaped root canals, which may affect their pain evaluation response. (Single blind)

Statistical analysis data from NRS, Kruskal-Wallis test was used to compare pain scores at different time intervals between the groups. If significance was found, Mann-Whitney was used for pair wise comparisons. Freidman test was used to compare pain scores at different time intervals within the same group, followed by Wilcoxon signed ranks test for pair wise comparisons. Statistical analysis was done using SPSS 22.0 (SPSS, Chicago, IL, US)

RESULTS

Post-operative pain evaluation: The post-operative pain experienced after placement of the intracanal medications included in the study; CH, CHX gel, and chitosan. All patients had no pain before the treatment and pain experienced after the treatment was recorded by the patient after 6, 12, 24, and 72 hours according to NRS. From the 30 patients, only 12 experienced pain (40% of patients), while 18 patient (60%) felt no pain in the following 72 hours after the first visit and placement of intracanal medication. And from the symptomatic patients, only one patient experienced flare-up in the form of severe pain and swelling from the CH group.

For CH group, 8 patients experienced pain after treatment, the pain scores in the symptomatic patients after 6 & 12 were high and close to each other and one patient experienced flare up in the form of severe unbearable pain and swelling.

DISCUSSION

The usage of herbal medicine is rising again in the last few decades for safety concerns and the increased antibiotic resistance. Several herbal extracts had been tested for endodontic use and showed promising results compared to the frequently used root canal irrigants and medications as, *Morinda Citrifolia*, *Liquorice*, *Propolis* and more⁽⁵⁻⁷⁾.

As intracanal medication, to calcium hydroxide and CHX gel, and post-operative pain experienced after placement of the three medications was evaluated using NRS. As root canal treatment induce more frequent and more severe postoperative pain than do other dental operative procedure, so prevention and management of post-operative pain is an integral part of endodontic treatment. Mechanical, chemical, host and microbiological factors have been described as important for inducing pain following root canal treatment⁽⁸⁾.

Postoperative pain was found to be significantly higher in the mandible compared to the maxilla because the mandible has a dense trabecular pattern, thus there is reduced blood flow and more localization of infection and inflammation, which might delay healing.

Necrotic teeth were selected since microorganisms have been identified as the major causative factor for flare-ups; It has been shown that occurrence of post-operative pain and flare-up in patients with pulpal necrosis are more common than in vital pulps Azim et al.,⁽⁹⁾.

In the present study, doses of anesthetic solutions selected were 3.6 mL (equivalent to 2 cartridges) of 2% mepivacaine with 1:100,000 epinephrine. A waiting period of 15 mins was allowed prior to initiation of endodontic treatment to allow for blockage of the nerve induction.

In the present study, patients with medical conditions or any medication (analgesic or antibiotics) in the past 12 hours prior to the endodontic visit and pregnant females were excluded. Moreover, teeth

associated with swelling and retreatment cases were not included so as not to be considered additional factors influencing the incidence and intensity of post-operative pain⁽¹⁰⁾.

The whole clinical procedures of the root canal treatment were done under strict rubber dam isolation which was placed before the access cavity preparation. This ensures no probable contamination of the pulp chamber and root canals with saliva, blood, or gingival fluids loaded with bacterial microorganisms⁽¹¹⁾.

Post-operative pain evaluation test, generally the intensity of pain is evaluated using three pain rating scales: Visual Analogue Scale (VAS), Numeric Rating Scale (NRS) and Verbal Rating Scale (VRS). VAS is presented as 100 mm line with the ends of the line representing no pain at the beginning and worst non bearable pain at the end of the line, the patient is asked to mark the line indicating the severity of pain experienced. While NRS is presented as 11-point scale and the patient choose one point scale indicating the severity of the pain.

In this study we used NRS rather than VAS, although the measurement of VAS is well documented, it's the least favorable method as it is more time consuming and patients especially elderly ones finds difficulties in understanding the scale^(12,13).

A survey was done in 2018 revealed that patients, clinicians, and researchers prefer the NRS over VAS⁽¹⁴⁾. In clinical studies, blinding is important to avoid bias.

Traditionally intracanal medication was of supreme importance as an extra aid in canal disinfection between visits, however in modern endodontics with the continuous development of instrumentation and irrigant activation tools and devices, single visit endodontics is being encouraged. Single visit endodontics treatment may have the benefit of time and convenience for both the dentist and the patient but with higher risk of increased post-operative pain as stated by Manfredi et al.⁽¹⁵⁾ in their systematic review that concluded that there is no added benefit

in multiple visit treatment. The previous conclusion was also agreed by the systematic review and meta-analysis made by Schwendicke and Göstemeyer⁽¹⁶⁾.

Comparing the outcome of single or multiple visits root canal treatment. In contrast, several studies found a significant added antibacterial effect after placement of intracanal medication after chemomechanical preparation. Rocas and Siqueira⁽¹⁷⁾, found that placing CH in either glycerin or camphorated para mono chloro phenol / glycerin further reduced the bacterial count after chemomechanical preparation. Sinha et al.⁽¹⁸⁾ tested in vivo the efficacy of CHX, CH and combination between both materials 1:1 as root canal medication. The test was carried out on 90 single rooted teeth having necrotic pulps and apical periodontitis. Samples were taken before & after preparation and after placement of the tested materials for about 7 days. The results showed that CFU significantly reduced after placement of intracanal medication in all groups.

Chitosan is a non-toxic cationic biopolymer obtained from chitin alkaline deacetylation, which is present in crustacean exoskeletons⁽¹⁹⁾.

It has been proposed that chitosan can form calcium phosphate layer when introduced on the exposed demineralized dentinal collagen, as its functional phosphate groups can bind to calcium ions to form a favorable surface for crystal nucleation. Chitosan also can increase the resistance of the dentin to degradation by collagenase^(20,21).

Post-operative pain of endodontic origin has been of major concern to the clinicians and patients for years. It has been noted that 50% of 2000 patients experienced pain at different levels during root canal treatment of teeth with necrotic pulp⁽²²⁾. And flare up rate could vary from 1.5-12 % of cases, experiencing severe pain and/or swelling^(9,23). The etiology of post-operative pain after cleaning and shaping of the root canal is complex and multifactorial. It could be related to iatrogenic and/or microbial causes. Pain could arise after injury of the periodontal ligament

by mechanical instrumentation, but extrusion of debris beyond the apical foramen loaded with bacterial microorganisms and their byproducts is the main cause of pain following instrumentation.

Therefore, to prevent such an unpleasant situation, there should be a potent antimicrobial strategy based on chemo-mechanical preparation to reduce the bacterial load within the canal, with placement of intracanal medicaments between the visits, especially in infected cases. Beside strong antibacterial effect, the ideal intracanal medication should prevent or relieve post-operative pain after placement.

In this study, the ability of chitosan as intracanal medication to reduce postoperative pain was evaluated in comparison with the most used medications, CH and CHX gel. The overall post-operative pain results showed that 43% of the patients experienced pain in the 72 hours following placement of intracanal medications, and there was a gradual decrease in the pain intensity as time passed. Our results showed patients of chitosan significantly experienced the lowest pain scores in comparison with CH and CHX gel according to the NRS in the intervals of 6, 12, and 24 hours. The ability of chitosan in the reduction of post-operative pain could be attributed to its potent anti-inflammatory effect.

CONCLUSIONS

Upon the results of our study chitosan as intracanal medicament displayed the least post-operative pain compared to other medicaments (CH, CHX).

REFERENCES

1. Roças IN, Siqueira Jr. JF. Comparison of the in vivo antimicrobial effectiveness of sodium hypochlorite and chlorhexidine used as root canal irrigants: a molecular microbiology study. *J Endod.* 2011;37(2):143–50.
2. Kawashima N, Wadachi R, Suda H, Yeng T, Parashos P. Root canal medicaments. Vol. 59, *International Dental Journal.* 2009;59(1):5–11.

3. Guimaraes-Pinto T, Roças IN. Effects of chemomechanical preparation with 2.5% sodium hypochlorite and intracanal medication with calcium hydroxide on cultivable bacteria in infected root canals. *J Endod.* 2007;33(7):800–5.
4. Almadi EM, Almohaimede AA. Natural products in endodontics. *Saudi medical journal* 2018 Feb;39(2):124–30.
5. Kandaswamy D, Venkateshbabu N, Gogulnath D, Kindo AJ. Dentinal tubule disinfection with 2% chlorhexidine gel, propolis, morinda citrifolia juice, 2% povidone iodine, and calcium hydroxide. *Int Endod J.* 2010;43(5):419–23.
6. Singh M, Singh S, Salgar AR, Prathibha N, Chandrahari N, Swapna LA. An In Vitro Comparative Evaluation of Antimicrobial Efficacy of Propolis, Morinda Citrifolia Juice, Sodium Hypochlorite and Chlorhexidine on *Enterococcus faecalis* and *Candida albicans*. *J Contemp Dent Pract.* 2019;20(1):40–5.
7. Jaiswal N, Sinha DJ, Singh UP, Singh K, Jandial UA, Goel S. Evaluation of antibacterial efficacy of Chitosan, Chlorhexidine, Propolis and Sodium hypochlorite on *Enterococcus faecalis* biofilm: An in vitro study. *J Clin Exp Dent.* 2017;9(9): e1066–74.
8. Anjaneyulu K, Nivedhitha MS. Influence of calcium hydroxide on the post-treatment pain in Endodontics: A systematic review. *J Conserv Dent.*;17(3):200-7, 2014.
9. Azim AA, Azim KA, Abbott P V. Prevalence of inter-appointment endodontic flare-ups and host-related factors. Vol. 21, *Clinical oral investigations.* 2017 Apr;21(3):889–94.
10. Erdem Hepsenoglu Y, Eyuboglu TF, Özcan M. Postoperative Pain Intensity after Single- versus Two-visit Nonsurgical Endodontic Retreatment: A Randomized Clinical Trial. *J Endod.* 2018.
11. Ng YL, Spratt D, Sriskantharajah S, Gulabivala K. Evaluation of protocols for field decontamination before bacterial sampling of root canals for contemporary microbiology techniques. *J Endod.* 2003;29(5):317–20.
12. Chiarotto A, Maxwell LJ, Ostelo RW, Boers M, Tugwell P, Terwee CB. Measurement Properties of Visual Analogue Scale, Numeric Rating Scale, and Pain Severity Subscale of the Brief Pain Inventory in Patients with Low Back Pain: A Systematic Review. Vol. 20, *J Pain.* 2019;20(3):245–63.
13. Elzaki WM, Abubakr NH, Ziada HM, Ibrahim YE. Double-blind Randomized Placebo-controlled Clinical Trial of Efficiency of Nonsteroidal Anti-inflammatory Drugs in the Control of Post-endodontic Pain. *J Endod.* 2016;42(6):835–42.
14. Chiarotto A, Deyo RA, Terwee CB, Boers M, Buchbinder R, Corbin TP, References 151 et al. Core outcome domains for clinical trials in non-specific low back pain. *Eur Spine J.* 2015;24(6):1127–42.
15. Manfredi M, Figini L, Gagliani M, Lodi G. Single versus multiple visits for endodontic treatment of permanent teeth. *Cochrane Database Syst Rev.* 2016;12(12):Cd005296.
16. Schwendicke F, Göstemeyer G. Single-visit or multiple-visit root canal treatment: systematic review, meta-analysis and trial sequential analysis. *BMJ Open.* 2017;7(2): e013115.
17. Roças IN, Siqueira JFJ. In vivo antimicrobial effects of endodontic treatment procedures as assessed by molecular microbiologic techniques. *Journal of endodontics.* 2011 Mar;37(3):304–10.
18. Sinha N, Patil S, Dodwad P, Patil A, Singh B. Evaluation of antimicrobial efficacy of calcium hydroxide paste, chlorhexidine gel, and a combination of both as intracanal medicament: An in vivo comparative study. Vol. 16, *Journal of Conservative Dentistry.* 2013;16(1):65–70.
19. Sinha V., Singla A., Wadhawan S, et al. Chitosan microspheres as a potential carrier for drugs. *Int J Pharm.* 2004;274(1-2):1-33.
20. Xu Z, Neoh KG, Lin CC, Kishen A. Biomimetic deposition of calcium phosphate minerals on the surface of partially demineralized dentine modified with phosphorylated chitosan. *J Biomed Mater Res Part B Appl Biomater.* 2011;98B(1):150-159.
21. Shrestha A, Friedman S, Kishen A. Photodynamically Crosslinked and Chitosan-incorporated Dentin Collagen. *J Dent Res.* 2011;90(11):1346-1351.
22. Torabinejad M, Kettering JD, McGraw JC, Cummings RR, Dwyer TG, Tobias TS. Factors associated with endodontic interappointment emergencies of teeth with necrotic pulps. Vol. 14, *Journal of Endodontics.* 1988;14(5):261–6.
23. Tsesis I, Faivishevsky V, Fuss Z, Zukerman O. Flare-ups after endodontic treatment: a meta-analysis of literature. Vol. 34, *Journal of endodontics.* 2008;34(10):1177–81.