Postoperative Pain Intensity after Single- versus 2-visit Nonsurgical Endodontic Retreatment: A Randomized Clinical Trial

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Abstract

Introduction: The aim of this study was to evaluate postoperative pain after single-visit and 2-visit non-surgical endodontic retreatments with 2 different intracanal medicaments. **Methods:** A total of 150 patients with asymptomatic root canal–treated teeth in need of nonsurgical endodontic retreatment were randomly divided into 3 groups (n = 50). Patients were selected randomly from among those without preoperative pain. Patients in group 1 (single visit) were treated in a single visit. Patients in group 2 and group 3 were treated in different visits with calcium hydroxide and chlorhexidine (CHX) as intracanal medicaments. The presence of postoperative pain was assessed 1, 2, 3, and 7 days and 1 month after treatment. All 2-visit treatments were completed 1 week after the initial visit. Data were analyzed using the Mann-Whitney U, Kruskal-Wallis, and Pearson chi-square tests ($\alpha = 0.01, 0.05$). **Results:** Postoperative pain was significantly higher in the CHX group in comparison with the single-visit group ($P \leq .05$) on the first day of assessment. On the second day, postoperative pain was significantly less in the single-visit group ($P < .05$) than in the other 2 groups. There were no significant differences among the groups on the third and seventh days of assessment. At the 1-month assessment, postoperative pain was significantly higher in both the calcium hydroxide group ($P < .05$) and the CHX group ($P < .05$) in comparison with the single-visit group. **Conclusions:** Single-visit nonsurgical endodontic retreatment presented fewer incidences of postoperative pain in comparison with 2-visit nonsurgical endodontic retreatment based on assessments ranging from 1 day to 1 month. *(J Endod 2018;■:1–8)*

Key Words

Intracanal medicament, multiple-visit root canal treatment, postoperative pain, retreatment, single-visit root canal treatment

Significance

The present study helps to better understand the effects of single-visit and multiple-visit retreatment methods on postoperative pain.

Root canal treatment (RCT) is a dental procedure that consists of the removal of infectious tissue followed by cleaning and shaping of the remaining tooth structure based on the original root canal. With novel techniques and materials, RCT can be completed safely in a single visit instead of multiple visits. Retreatment is a type of procedure that is applied when previous RCTs have failed. Postoperative pain after endodontic retreatment is an undesirable occurrence for patients and clinicians (1).

Postoperative pain is the result of acute inflammation in the periradicular tissue caused by the penetration of microorganisms from the root canal during endodontic retreatment (2). Postoperative pain is associated with the number of visits as well as preoperative factors, preoperative complications, the periapical index (PAI) score, the size of the radiolucency, the quality of the coronary restoration, intraoperative factors, the intracanal medications, tooth localization, inadequate instrumentation, extrusion of intracanal medicament, age, sex, periapical pathosis, and apical debris extrusion and irrigant extrusion (3, 4).

Calcium hydroxide ($Ca[OH]_2$) has been recommended as a very effective intracanal medicament to control infection. It reduced the incidence of interappointment symptoms more effectively than traditional medications, such as camphorated paramonochlorophenol iodine, potassium iodide, and formocresol. The exact mechanism of action of $Ca(OH)_2$ is not clearly understood. Most of its favorable properties have been correlated with its high alkalinity (5, 6). However, $Ca(OH)_2$ is not effective against all microorganisms found in the root canal system (7). It has been reported that *Enterococcus faecalis* shows a resistance to elevated pH; it has the ability to penetrate dentinal tubules and to adapt to different environmental conditions (8). Therefore, different intracanal medicaments have been used inside the root canal to overcome the disadvantages of $Ca(OH)_2$.

Chlorhexidine (CHX) is another commonly used intracanal material in endodontic therapy that has significant antibacterial effects on intracanal microorganisms (9). The gel form of CHX was introduced as a root canal medicament because of its wide ranging antimicrobial activity and low toxicity, which makes it an ideal medicament for endodontic purposes (2).

Over the past several years, there has been a growing concern about the urgency of multiple appointments in endodontic treatments because no significant differences in antimicrobial efficacies have been reported between single-visit and multiple-visit

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treatments (9). The recent novelty of rotary nickel-titanium systems and developments in the understanding of irrigation dynamics have simplified the mechanical instrumentation and disinfection of the root canal, which makes a single-appointment treatment a more practical and acceptable treatment regimen than multiple appointments.

Single-visit RCT has been recommended for use in cases with purulent inflammation, traumatic pulpal exposure, or necrotic pulp with a present sinus tract (10). Single-visit RCT is more advantageous than multiple-visit RCT in terms of time and cost. Thus, it is a treatment plan that is more amenable to the needs of busy patients (11, 12).

In addition, RCT performed over the course of multiple visits has negative clinical consequences, such as the inability of the intracanal medicament to come into contact with the residual microorganisms within the dentinal tubules, isthmus, or lateral canals because of the complicated anatomic structure of the root canal or the ineffectiveness of the medicament to fight these microorganisms even if the medicament comes into contact with them (6). Moreover, dentin resistance is reduced in multiple-visit RCT because of the fragile state of the crown with a temporary filling and the caustic effect of some intracanal medicaments, such as $Ca(OH)_2$. This can result in a high risk of fractures during or after the treatment procedure (13).

Therefore, the present study aimed to compare the incidence of postoperative pain for single-visit and multiple-visit primary nonsurgical endodontic retreatments with 2 different intracanal medicaments, $Ca(OH)_2$ and CHX, in asymptomatic teeth. The hypothesis is that the intensity of postoperative pain is lower in single-visit retreatments than in multiple-visit retreatments.

A number of confounding factors were evaluated, including sex, age, number of visits, dental arch (upper or lower), tooth position (anterior or posterior), PAI score, preoperative periapical radiolucency, preoperative coroner restoration quality, preoperative root canal filling density and length, and sealer and gutta-percha extrusion, with different intracanal medicaments in asymptomatic teeth.

Materials and Methods

This clinical study was approved (10840098-604.01.01-E.14947) by the Research Ethics Committee at the Medipol University of Science and Technology, Istanbul, Turkey. The study population was selected from those patients requiring conventional endodontic retreatment who presented at the Medipol University Endodontics Clinic from January 21, 2015, through November 11, 2015. All the patients read and signed forms giving their consent to participate before they were included in the study.

A patient was excluded from the study if 1 or more of the following conditions were observed: complicating systemic disease, severe pain and/or acute apical abscess, under 18 years of age, antibiotic or corticosteroid use, and multiple teeth that required pretreatment to eliminate the possibility of pain referral. In total, this study included 150 teeth from 150 patients between the ages of 18 and 75 years. The patients were consecutively distributed into 3 different groups as follows:

1. Group 1: single-visit retreatment ($n = 50$)
2. Group 2: multiple-visit retreatment with the interappointment application of $Ca(OH)_2$ ($n = 50$)
3. Group 3: multiple-visit retreatment with the interappointment application of CHX gel ($n = 50$)

Radiographic Evaluation

The diagnoses of the relevant teeth were made using panoramic radiographs (Kodak 9000; Carestream Health, Inc, Rochester, NY) and periapical radiographs (Kodak RVG 5100, Carestream Health, Inc) with a paralleling technique, an exposure time of 0.16 seconds, and an exposure dose of 1.22 mGy. A periapical radiograph of the relevant tooth was taken immediately after the retreatment using a paralleling technique with the same digital radiograph. The postoperative and control film data were recorded in the database.

PAI

The PAI is a basic radiographic method of interpretation consisting of a scale from 1 to 5. It was first described by Ørstavik et al in 1986 (14). For each subject, the periapical tissue was assessed radiographically using the PAI as follows:

1. PAI 1: normal periapical structure
2. PAI 2: small changes in the bone structure not pathognomonic of apical periodontitis
3. PAI 3: changes in the bone structure with mineral loss characteristic of apical periodontitis
4. PAI 4: well-defined apical radiolucency characteristic of apical periodontitis
5. PAI 5: severe periodontitis with exacerbating features and bone expansion

The quality of the existing root canal fillings and the status of the periapical tissues were determined according to the PAI by 1 author using the periapical radiographs. The measurements were taken using the paralleling technique. The PAI scores were dichotomized to reflect the absence (PAI ≤ 2) or presence (PAI >2) of apical periodontitis (15). Those teeth with multiple root canals were scored based on the root canal with the highest PAI score.

Retreatment

Endodontic retreatment was conducted according to the contemporary standards of endodontic therapy. Each patient was anesthetized with 40 mg articaine hydrochloride + 0.006 mg/mL epinephrine hydrochloride (Ultracaine DS Forte; Aventis Pharma, Istanbul, Turkey). All the patients were anesthetized to provide maximum comfort. The standard procedure for each group at the first appointment included rubber dam isolation and the removal of the previous coronal restorations and root canal filling materials. We achieved patency in all the canals. After gaining access to the previously obturated root canals, #1, #2, and #3 Gates Glidden burs (Mani Inc, Tochigi, Japan) were used on the coronal two thirds of the canal, whereas a #15 Kerr file (Dentsply Maillefer, Ballaigues, Switzerland) was used to gain access to the apical third of the root canal. During the removal of the root canal filling material, a copious amount of a 2.5% sodium hypochlorite (NaOCl) solution was used as irrigation. No chemical solvents were used to remove the gutta-percha or the sealer. Apical patency was achieved in all root canals before cleaning and shaping, which were performed by using a crown-down technique using hand files and nickel-titanium rotary instruments (Revo-S; Micro-Mega, Besançon, France). After measuring the root lengths with an apex locater (Apex Pointer, Micro-Mega), each tooth was prepared up to an AS 40 file 0.5 mm short of the apex. Irrigation was performed with 2.5% NaOCl (Wizard; Rehber Chemistry, Istanbul, Turkey) after the use of each instrument in all cases. At the end of instrumentation, the final irrigation was performed using 2.5 mL 5% EDTA (Wizard, Rehber Chemistry), 2.5 mL 2.5% NaOCl, and 5 mL distilled water, respectively, and the root canals were dried with paper points.

In the $Ca(OH)_2$ group, after removing the excess irrigant with paper points, $Ca(OH)_2$ (Vision Calcium Hydroxide; USP, Darmstadt, Germany) medication was introduced into the root canal using a Lentulo spiral as the 7-day interappointment medication. In the third group, the root canals were medicated with a 2% CHX gel (GLUCO-CHeX 2%

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