

## **Study Protocol**

**Effect of MTAD as the final irrigation protocol on periapical healing after single-visit root canal treatment: a randomized controlled clinical trial**

NCT:.....

## **Materials and Methods**

This in vivo study was a prospective, single-center; single blinded, parallel, and randomized clinical trial. The study protocol was approved by the Ethics Committee of Cukurova University Faculty of Medicine, Adana, Turkey (2019/12197-91).

## **Patient Selection**

One hundred patients with a noncontributory medical history presented to the Department of Endodontics of the University of Cukurova Faculty of Dentistry between October 2019 and February 2020 were selected according to inclusion and exclusion criteria. All selected teeth were single-rooted, maxillary and mandibular incisors, canines or premolars that were asymptomatic (no preoperative pain, swelling or acute endodontic or periodontal abscess). All pulps were nonvital and did not respond to cold testing. All patients were aged between 18 and 65 years, had no systemic diseases or allergies to local anaesthetic agents, had not previously received any endodontic treatment and had no radiographic evidence of periapical bone loss. Pregnant and breast-feeding women and patients taking analgesic, anti-inflammatory or antibiotic medications during the 7 days prior to the beginning of treatment were also excluded. All patients were informed that they were to be included in a clinical trial and their consent was obtained.

Based on the study of Verma et al., a change in PAI score of 0.50 units and above is found to be clinically significant, and at least 42 patients per group should be included at 90%

power and 5% margin of error, assuming the standard deviation of the change is 1.0. Given the possibility of dropouts throughout the study, it was planned to take 20% more and to conduct the study on 50 patients per group.

### **Root Canal Procedure**

The initial periapical radiographs of the patients were taken with the digital imaging system Digora Optime (Soredex, Tuusula, Finland) by long-cone paralleling technique with a film holder (Endo Rh plus; Indusbello, Londrina, PR, Brazil), the vitality of the pulp was evaluated by an electronic vitalometer (Analytic Technology Corp., Redmond, WA, USA) and confirmed by the absence of bleeding from the endodontic access cavity.

For both maxillary and mandibular teeth, local infiltration anaesthesia was achieved using 2 mL articaine hydrochloride with 1:200 000 adrenaline (Maxicaine; VEM Ilac, Istanbul, Turkey). Endodontic access preparations were performed using diamond round burs. After the canals were visible, patency was checked with a K-file (VDW GmbH, Munich, Germany), and a dental dam was placed to isolate the tooth. The working length (WL) was determined with an electronic apex locator (Raypex 6, VDW) and accepted when all 3 green bars were reached. In addition, the canal length was confirmed by a periapical radiograph, and the apex locator was accepted as correct in situations where the two did not match. Root canal instrumentation was performed using the Reciproc Blue (VDW, Munich) #50/0.5 file. During instrumentation of the root canals, irrigation was applied with 10 mL 2.5% NaOCl using side-vented needles (NaviTips, 30 gauge; Ultradent, South Jordan, UT, USA). The final irrigation in Control group was applied with 5 ml of 17% EDTA solution and 5 ml of distilled water. In the MTAD group, final irrigation was done with 5 mL of MTAD and 5 mL of distilled water. Side-vented needles were placed 1 mm shorter than the working length, and 5 ml of solution was given in 2 minutes. The root canals were dried with sterile paper points and were filled with cold lateral condensation technique using AH Plus root canal sealer (Dentsply Maillefer,

Cologne, Germany) and gutta percha (President Dental, Duisburg, Germany). Then the cavity entry was restored with composite (Solarex, GC Corporation, Tokyo, Japan) and radiography was taken.

### **Radiographic and Clinical Evaluation**

Patients were invited to follow-up sessions at 6, 12, 18, and 24 months and were radiographically and clinically assessed. Many patients missed their follow-up appointments due to the covid 19 pandemic. The follow-up radiographs performed by long-cone paralleling technique with a film holder. The pre-treatment and 24-month follow-up radiographs of teeth, were prepared as a Power Point presentation (Microsoft ® Corporation, Redmond, WA) and the change in periapical radiolucency was assessed according to PAI scores of five categories; 1. Normal apical periodontium 2. Small changes in bone structures 3. Change in bone structure with mineral loss 4. Periodontitis with well-defined radiolucent area 5. Severe periodontitis with exacerbating features. Teeth with a  $PAI \leq 2$  score and clinically asymptomatic were considered 'healthy' in the radiographic evaluation, while teeth with a  $PAI \geq 3$  and/or clinically symptomatic were considered 'failure'.

**Informed Constant Form**

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NCT:.....

You have been included in the research by Assoc. Dr. Aysin Dumani and Dt. Berkcan Yildiz on ..../..../.... (Date)

In this research, because the pulp is irreversibly damaged, root canal treatment will be applied. After your tooth is anesthetized during root canal treatment, soft tissue called 'pulp' containing vessels and nerves in the center of the tooth was extirpated with instrumentation and irrigation. Then the root canal was filled with gutta-percha and sealer. Using various filling materials on the tooth (composite, amalgam if necessary, post and crown) is restored. In this study, MTAD or saline was used as a final irrigation solution during root canal treatment. Patients were invited to follow-up sessions at 6, 12, 18, and 24 months and were radiographically and clinically assessed for periapical lesion healing. If you want to participate in our study, which irrigation solution to be used will be chosen randomly. You will not know which irrigation solution is used.

You were asked whether they used drugs or not and if there is a problem about root canal treatment success, retreatment or extraction were planned at 6, 12, 18, and 24 months. Radiographic healing will be followed up with a periapical film. The results will be used primarily for scientific purposes, your personal information will be kept confidential.

If detected, you will be notified of the situation and detailed information on the measures to be taken notification will be made. A payment that does not require you to pay a monetary

price and if you want, you can withdraw after participating. If you request additional information, it will be explained.

If you agree to participate in our research, please write your name, surname and date and signature in the section below. We thank you.

Participant Name/Surname:

Adress:

Tlf:

Signature:

## **Statistical Analysis Plan**

### **Effect of MTAD as the final irrigation protocol on periapical healing after single-visit root canal treatment: a randomized controlled clinical trial**

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#### **Randomization of Groups**

Based on the study of Verma et al., a change in PAI score of 0.50 units and above is found to be clinically significant, and at least 42 patients per group should be included at 90% power and 5% margin of error, assuming the standard deviation of the change is 1.0. Given the possibility of dropouts throughout the study, it was planned to take 20% more and to conduct the study on 50 patients per group.

The teeth included in the study were divided into two treatment groups (Control and MTAD group) by using a randomized block design of 10 patients per block. These randomization blocks were prepared on the computer by a biostatistician. During treatment, the dental practitioner used the irrigation solution according to the order defined in the randomization block. The patients were uninformed of which solution was used; in this regard our study was a single-blind clinical trial.

04/09/2019

**Statistical Analysis Plan**

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**Randomization Blocks:**

2 1 1 1 2 2 1 2 1 2

1 2 2 2 1 2 1 1 2 1

2 2 2 1 2 1 1 2 1 1

2 1 2 1 2 2 1 1 2 1

1 1 1 1 2 2 2 2 1 2

2 2 1 1 1 1 2 2 2 1

1 1 2 1 1 2 2 2 2 1

2 1 2 1 2 1 2 2 1 1

2 2 1 2 2 1 2 1 1 1

2 2 1 1 2 1 1 2 2 1

2 2 1 1 1 2 1 1 2 2

1 1 1 2 1 2 2 1 2 2

2 2 1 2 1 1 2 1 1 2

1 2 2 2 2 1 1 1 2 1

**1: Control**

**2: MTAD**

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**Statistical Analysis**

The data were statistically analysed using the IBM SPSS Statistics Version 20.0 program (IBM, Armonk, NY, USA). Gender distribution according to groups was evaluated with Chi-square analysis and age distribution t-test. The Mann-Whitney U test was used to compare the differences (pre-treatment, post-treatment change) between the groups' pre-treatment and 24-month follow-up radiographs. The change in PAI scores for each group from baseline to the end of follow-up was evaluated with the Wilcoxon test. The Chi-Square test was used to compare bilateral variables (teeth with a PAI  $\leq 2$  scores 'healthy', teeth with a PAI  $\geq 3$  score 'failure') between two groups. In all tests, the statistical significance level was set at 0.05.

**Results:**

In the MTAD group, 2 patients were excluded from the study due to health problems and 1 patient was excluded because of pregnancy. A total of 97 patients, 64 females and 33 males (47 MTAD, 50 Control) with apical periodontitis, were included in this study. After a 24-month follow-up, 25 of the 97 patients (15 Control and 10 MTAD) were excluded from the study because of not to attend follow-up appointments. Pre-treatment and 24-month follow-up radiographs of a total of 72 teeth, 37 in the MTAD group and 35 in the Control group, were examined and evaluated according to the PAI score.

Age and gender distribution were compatible between the groups, and no statistically significant difference was found in terms of gender (Chi-Square Test) and age (t-test) ( $P > 0.05$ ). Initial PAI scores were consistent in the teeth with periapical lesions of the patients in

the two groups, but there was no statistically significant difference between them. There was no significant difference in baseline and follow-up scores between groups ( $p=0.744$ ,  $p=0.469$  respectively). No change was observed in the PAI score of 3 patients (8.6%) in the Control group and 4 patients (10.8%) in the MTAD group. There was no statistically significant difference between the groups' post follow-up PAI scores ( $p= .551$ ).