Root Canal Treatment Postoperative Pain Assesment in Head and Neck Postirradiated Patients: A Controlled Clinical Trial

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Abstract

Objective: The aim of this controlled clinical trial was to assess whether radiotherapy interferes with pain levels in patients who have undergone endodontic treatment.

Materials and Methods: Sixty adult patients over the age of 18 years participated in this study, among these, 30 received radiotherapy to treat cancer in the region of the endodontically treated tooth. The patients were distributed two groups. Group SH2.5 (2.5% sodium hypoclorite) (n=30) e SH2.5AR (2.5% sodium hypoclorite after radiotherapy) (n=30). Only one tooth per participant was included in this trial. In order to shape the canals, it was used a Wave One Gold instrument, and canals were filled with AH Plus sealer. The canal preparation was accomplished with continuous canal irrigation using 2.5% sodium hypochlorite and a final rinse with EDTA 17% followed by sodium hypochlorite. The cavity was sealed using glass ionomer cement. Pain intensity was assessed using the visual analog scale (VAS).

Results: In the SH2.5 group, according to the visual analog scale, pain was mild at 6, 12, 24, 48, 72 hours and 7 days after endodontic treatment. In the SH2.5AR group, the pain was mild at 6 and 12 hours, and disappeared after that period, obtaining the shortest duration of pain ($p<0.05$).

Conclusion: Patients undergoing radiotherapy for the treatment of orofacial cancer had mild pain that disappeared 12 hours after treatment. Therefore, a null hypothesis was rejected.

Key Words: Radiotherapy, Postoperative pain, Sodium hypochlorite, Pulp necrosis

Introduction

Pain and swelling are common postoperative complications in an endodontic treatment, which can begin a few hours or days after treatment, resulting in an unkind situation for the patient and the Dental Surgeon. Because of this, preventing or predicting postoperative pain is still an ideal situation in the office [1,2].

Measuring pain is not an easy task, several methods are used for this purpose, one of which is the Visual Analogue Scale (VAS), which provides a one-dimensional measurement. The scale is simple and efficient in the perception of pain intensity and is widely used by clinicians when a fast pain index is needed. Postoperative pain has been considered a problem and VAS can help in search for a solution [3].

Painful symptoms after endodontic treatment can be related to the patient's general health status, so several strategies have been investigated for pain relief after treatment. Among them are pharmacological methods. Knowledge of the occurrence of postoperative pain associated with endodontic treatment is of great importance for the Dental Surgeon to carry out actions aimed at an effective treatment, through a correct diagnosis and drug prescription [4,5].

Many factors can influence postoperative pain [6,7], regardless of the technical procedure to be performed during root canal treatments, pain may be associated with the patient's systemic condition. Individuals with elevated anxiety or sensitivity are more likely to perceive somatic symptoms as postoperative pain [8].

However, no studies have been found in the literature that report the level of pain after endodontic treatment in patients who was had orofacial cancer and was were treated with radiotherapy.

Head and neck radiotherapy cause countless sequels in irradiated patients, affecting the stomatognathic system, with significant systemic implications. Sequels of an exposure to ionizing radiation may be extensive and sometimes permanent, particularly in the salivary glands and bone tissue. It is of utmost importance that the dental surgeon be aware of adverse reactions and appropriate forms of treatment to alleviate discomfort and improve the quality of life of the irradiated patient [9].

The aim of this study was to assess whether radiotherapy interferes with pain levels in patients who have undergone endodontic treatment. Null hypothesis tested is that there is no difference in pain levels.

Materials and Methods

This was controlled clinical trial conducted in patients who presented for routine endodontic therapy at the endodontics clinic, Pontifical Catholic University of Paraná, Paraná, Brazil. This study followed the standards of the Consolidated Standards of Reporting Trials (CONSORT) and was approved by the Ethics Committee of the Pontifical Catholic University of Paraná, #3056118. It was registered under the International Standard Randomized Controlled Trial.

Patient selection

Sixty adult patients aged between 18 and 60 years old participated in this study, among these, 30 received radiotherapy to treat cancer in the region of the Endodontically treated tooth. The patients were distributed into two groups. Group SH2.5 (2.5% sodium hypoclorite) (n=30) e SH2.5AR (2.5% sodium hypoclorite after radiotherapy) (n=30). Only one tooth per participant was included in the trial. The sample size was calculated using a method used by Walters (2004), with the assumption of relative normal distribution [10].

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Inclusion and exclusion criteria

Patients aged 18 years or above, who needed endodontic treatment, of uniradicular teeth, with asymptomatic necrotic pulp and apical periodontitis, as verified radiographically, were consecutively enrolled in the study, beyond these requirements the group SH2,5AR only patients exposed to previous radiation therapy at the treated tooth area were included. For the exclusion criteria, patients who presented cute apical pain and/or abscesses, Teeth already endodontically treated vital pulp, pregnancy, use of antibiotics, corticosteroids, or analgesics and complications from systemic diseases.

The diagnosis of necrotic pulp was confirmed through the collection of dental history and periapical digital radiography, periodontal evaluation, percussion and cold test (Endo Ice; Coltene/Whaledent Inc, Cuyahoga Falls, OH). The diagnostic findings were verified by comparing the response of the tooth with that of an adjacent tooth with a vital pulp.

Treatment protocol

Endodontic treatments were performed by a single endodontic specialist. For local anestesia, it was administered 2% lidocaine with epinephrine (DFL, Rio de Janeiro, Brazil). Teeth were isolated using a rubber dam (Madeitex, São José dos Campos, Brazil). The carious lesions were removed using a spherical diamond burr 101 (KG Sorensen, Sao Paulo, Brazil) on a high-speed handpiece, which was cooled with water, and manual instruments. After gaining access, the canals were explored with #10, and #15 K-type hand files (Dentsply Maillefer, Ballaigues, Switzerland) according to the initial diameter of the foramen, its degree of flattening, and its canal curvature using a watch-winding motion.

The Working length was established by introducing a K#10 file into the canal and then determined by determined by a Root ZX II apex locator (J Morita Corp, Kyoto, Japan) and then removing the file and subtracting 0.5 mm in length, which was measured with the aid of an endodontic ruler. The work limit was confirmed radiographically.

Instrumentation was performed with a X-Smart Plus motor (Dentsply Maillefer, Ballaigues, Switzerland). The protocol used for selecting the initial file in the WaveOne group was as follows. If #010 K-file was very resistant to movement in the root canal, the small file was used. If #020 K-file would easily go to the working length, the large file was used. The file was used in a reciprocating, slow in and out pecking motion according to the manufacturer's instructions. The instrument was cleaned after three pecks. No glide path was created prior to instrumentation with the WaveOne file.

The canal preparation was accomplished with continuous canal irrigation using a 2.5% solution of sodium hypochlorite and a final rinse with EDTA 17% followed by sodium hypochlorite.The canals were dried using sterile paper tips (Dentsply Maillefer, Ballaigues, Switzerland). Filling was performed with the endodontic sealer AH Plus (Dentsply Maillefer, Ballaigues, Switzerland) and a gutta-percha cone (Dentsply Maillefer, Ballaigues, Switzerland) Previously calibrated (Dentsply Maillefer, Ballaigues, Switzerland) using Shielder's lateral condensation technique. The access cavity was sealed temporarily with glass ionomer cement (FGM, Joinvile, SC, Brazil).

Pain assessment

After treatment, all participants received a questionnaire based on a visual analog scale (VAS) to record their assessment of pain after 6 hours, 12 hours, 24 hours, 48 hours, 72 hours, and 7 days, from 0 to 10, where 0, 1-2, 3-7, and 8-10 meant complete absence of pain, mild pain, moderate pain, and severe pain, respectively. This scale has already been validated in other studies [3].

Statistical analysis

Statistical analyses were performed using SPSS 25.0 (IBM Brazil, São Paulo, Brazil). The data were then analyzed with repeated-measures ANOVA; the Mann-Whitney U test was used for two-by-two comparisons. Statistical significance was set at 0.05.

Results

No patient received analgesic, antibiotic or anti-inflammatory drugs nor did they decide to abandon the study. There were no serious adverse effects and need for additional or unscheduled visit due to postoperative pain by any of the participants during the assessed period.

Table 1. *Dependence among sex and age range among groups.*

			SH2,5	SH2,5AR
Sex	Female	Count	14_a	17_a
		% in group	46.7%	56.6%
	Male	Count	16_a	13_a
		% in group	53.3%	43.3%
Total		Count	30	30
		% in group	100.0%	100.0%
Age (Years)	18-33	Count	7_a	8_a
		% in group	23.40%	26.70%
	34-49	Count	8_a	6_a
		% in group	26.60%	20.00%
	50-65	Count	9_a	7_a
		% in group	30.00%	23.30%
	66-81	Count	6_a	8_a
		% in group	20.00%	26.70%
Total		Count	30	30
		% in group	100.00%	100.00%

Each subscript letter indicates a subset of group categories whose column proportions do not differ significantly from each other at the 0.05 level

Legends: SH2.5 (2.5% sodium hypochlorite) and SH2.5AR (2.5% sodium hypoclorite after radiotherapy)

The teeth included in this study were 46.4% incisors and 53.6% canines. The mean age of the patients was 40.4 years

for the female sex and 40.7 years for the male sex, with no difference between the groups.

There was no statistically significant dependence between sex and middle ages group in relation to groups. These variables are not confusing, being properly balanced (*Table 1*) ($p>0.05$).

In the SH2.5 group, according to the visual analog scale, pain was mild at 6, 12, 24, 48, 72 hours and 7 days after endodontic treatment. In the SH2.5PR group, the pain was mild at 6 and 12 hours, and disappeared after that period, obtaining the shortest duration of pain (*Figure 1*) ($p<0.05$).

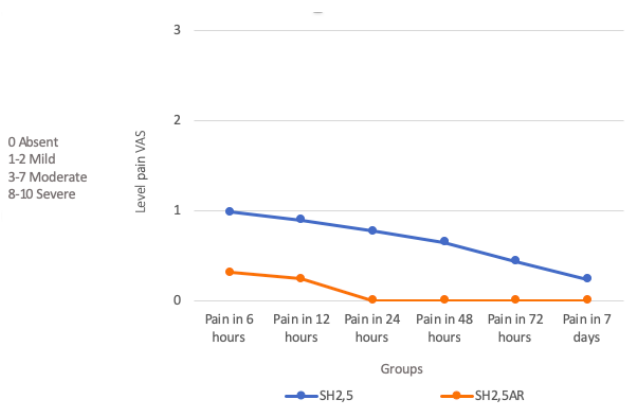

Figure 1. *Duration and intensity of pain at 6, 12, 24, 48, 72 hours and at 7 postoperative days, comparing groups SH2.5 and SH2.5AR. SH2.5 (2.5% sodium hypochlorite) and SH2.5AR (2.5% sodium hypoclorite after radiotherapy).*

Discussion

All the patients involved in the present study were informed about the irrigation solutions and systems prior to the treatment.

In the methodology, two groups were included, one group was considered the treatment group, where patients with a history of radiotherapy were allocated and a control group where, patients with no history of radiotherapy at the location of the tooth to be endodontically treated. This project determines that any deviation in the results of the treatment group is really a direct result of the variable.

One of the main obstacles to assess postoperative pain found in clinical studies performed for this purpose is the subjective nature of this assessment and the inherent difficulty in measuring pain [11].

In the SH2.5AR group, the pain was mild for 12 postoperative hours and disappeared after this period, showing a shorter duration compared to SH2.5 group. The high doses of radiotherapy, which produced significant changes in the mucosa, salivary glands, dental structures, and teeth of these patients, could be an influencing factor [12]. Another factor to be considered is the fact that most of these patients had experienced severe and disabling pain during orofacial cancer treatment, this exposure may have increased the pain threshold of these individuals, making pain after endodontic treatment more difficult to detect [13]. There is a scarcity of studies on the subject and, therefore, little scientific evidence available on this pertinent issue. Due to the risk of osteoradionecrosis after dental extractions, endodontic treatment ends up being the best preventive and therapeutic method [14].

Patients with malignant neoplasms of the head and neck who will pass through radiotherapy treatment should preferably receive dental and endodontic treatment before radiation sessions, in order to eliminate any form of disease presented in the teeth and mucous membranes. During or after radiotherapy, infections evolve more aggressively, however in most cases the very damaging effect of radiotherapy on the teeth causes the need for endodontic treatment [15,16].

Studies report that from three weeks to one year after radiotherapy, caries lesions may develop, usually around the cervical margins. The absence of the salivary buffering action that regulates the oral cavity pH leads to alteration of organic and inorganic components of the teeth so as they may become more susceptible to decalcification [17,18]. We observed in our study that teeth that suffer radiotherapy become fragile and more susceptible to endodontic treatment.

In patients diagnosed with necrosis and apical periodontitis, greater foraminal contamination is expected and the recommended treatment is to remove the cause of the disease. The reduction of microbial load and the interruption of biofilms are achieved by a combination of irrigation with a tissue-dissolving microbicide solution and mechanical instrumentation. There is a common belief among the authors that greater apical preparation not only allows for a greater reduction of remaining bacteria and infected dentin debris, but also results in a more effective action of the irrigation solution [19,20].

During endodontic treatment, instrumentation should be performed with precision and without penetration of materials in the periapical tissues in patients who have undergone radiotherapy, as it may induce the development of osteoradionecrosis [18]. Therefore, we did not create a group with these patients using the foraminal enlargement technique. The apical foramen must be kept as small as possible during chemical-mechanical preparation [21].

One of the main concerns in the study of pain is that pain assessment is subjective and each person's pain threshold is unique. The measurement of subjective variables is a great challenge. The visual analog scale is a simple and efficient model, easy to understand and reliable. All data are obtained without the interference of an interviewer who can influence the results, for this reason most of the studies found use this scale [22,23].

Endodontic treatment aims to reverse the disease process and thereby eliminate the associated signs and symptoms [5]. When the treatment itself appears to initiate the onset of pain and/or swelling, the result can be very distressing to both the patient and the operator. Patients might even consider postoperative pain and flare-up as a benchmark against which the clinician ' s skills are measured. Prevalence of postoperative pain or flare-up is, therefore, one of the influencing factors when making a clinical decision [24].

The postoperative pain after root canal treatment negatively affects the patient's quality of life after the treatment, and this problem needs to be immediately resolved, for both patients and clinicians [25].

Conclusion

Patients undergoing radiotherapy for the treatment of orofacial cancer had mild pain that disappeared 12 hours after treatment. Therefore, a null hypothesis was rejected.

Conflict of Interests

The authors declare that they have no conflict of interests.

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