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Influence of preoperative pain intensity on postoperative pain after root canal treatment: A prospective clinical study

Akram Alí, Juan Gonzalo Olivieri, Fernando Duran-Sindreu, Francesc Abella, Miguel Roig, Marc García-Font*

Department of Restorative Dentistry and Endodontics, Universitat Internacional de Catalunya, Barcelona, Spain

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ABSTRACT

Objectives: The aim of this prospective study was to investigate the correlation between the intensity of preoperative pain and the presence of postoperative pain, taking into account the variables sex, tooth type, arch, and tooth vitality.
Methods: Two hundred and seventy patients with pulpal pathology who were scheduled for routine endodontic treatment were enrolled in this study. Conventional endodontic treatment was carried out in a single visit. The chemomechanical preparation of root canals was performed with ProTaper instruments, and canals were obturated with a warm gutta-percha obturation technique. A structured questionnaire was used to record data on sex, age, type of tooth, location and pulp diagnosis. Patients were asked to record their preoperative and postoperative pain using a 10-cm visual analogue scale (VAS). Postoperative pain and the need for analgesic consumption were assessed at 4, 8, 16, 24, 48 and 72 h post-treatment. The data were analyzed using the Mann–Whitney *U* and chi-square test, and the significance was set at $P < .05$.
Results: The mean level of pain after root canal treatment was 2.58 ± 2.80 on a VAS between 0 and 10. Variables that were associated with a higher preoperative pain intensity (female, mandible and molar) also had a higher value of postoperative pain ($P > .05$).
Conclusions: Within the limitations of this study, it can be concluded that the presence of preoperative pain is the variable that most influences the prevalence of postoperative pain.
Clinical significance: Pain management should be an integral part of dental treatment. The present study analyses the incidence of postoperative pain that should be expected by patients with different intensity of pain before root canal treatment.

1. Introduction

Pain control, both during and after root canal treatment, is a key aspect of endodontic practice [1]. Postoperative pain following root canal treatment can be embarrassing for the dentist and annoying for the patient, especially if the tooth was symptom-free before the treatment began.

Postoperative pain of low and mild intensity is common, even when the endodontist has followed acceptable standards of treatment [2]. According to a recently published systematic review, between 3% and 58% of patients reported pain after root canal treatment [3]. The discrepancies among studies may be partly explained by the fact that most of the authors assessed and defined postoperative pain according to different criteria, used different endodontic materials and techniques, or did not take preoperative pain intensity into account as a variable [4].

Postendodontic pain is multifactorial [5]: it is linked to a periapical inflammatory response secondary to mechanical, chemical and/or microbial injury to the periradicular tissues [3,6–9].

Postoperative pain most often occurs during the first 24–48 h after obturation, and generally recedes in a few hours [10–12], although it occasionally persists for several days [5,13,14].

The strong evidence of a correlation between preoperative and postoperative pain demonstrates that patients experiencing preoperative pain tend to have a higher intensity of postoperative pain when compared with patients who had no preoperative symptoms [6,11,15–17].

There is some disagreement in the literature on the correlation between pulpal status and postoperative pain. Some authors

* Corresponding author at: Dentistry Faculty, Universitat Internacional de Catalunya, C/Josep Trueta s/n. 08195, Sant Cugat del Vallès, Spain. Fax: +34 504 2031.
E-mail address: marcgarcia@uic.es (M. García-Font).

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suggest that pulpal status has an influence on postoperative pain [4,6,18], while others [11,19,20] found no evidence of any influence between these two factors.

Some authors [4,11,15,16,18] investigated the correlation between specific variables (patient age, sex, arch, tooth vitality, and the presence of preoperative pain) on the prevalence of postoperative pain. However, in these studies, the investigators recorded the presence or absence of preoperative pain regardless of its intensity. To our knowledge, only two studies [21,22] have quantified preoperative pain before root canal treatment. Therefore the aim of this study was to investigate the correlation between preoperative pain intensity with a view to measuring its influence on the prevalence of postoperative pain by taking into account the variables sex, tooth type, arch, and tooth vitality.

2. Materials and methods

This prospective study was conducted in patients with pulpal pathology who were scheduled for routine endodontic treatment at the Restorative Dentistry and Endodontics Department of Universitat Internacional de Catalunya (Sant Cugat del Vallés, Barcelona, Spain). The study was approved by the Institutional Ethics in Research Committee.

2.1. Patient selection

Two hundred and seventy consecutive adult patients took part in the study. Prior to treatment, demographic and clinical characteristics of the patients were recorded, including their sex, age, tooth type and location in the arch. In addition, the preoperative pain intensity and pulpal diagnosis (vital pulp or necrosis) were also recorded. The exclusion criteria included root canal retreatment, pregnancy, teeth with open apices, a history of intolerance to nonsteroidal anti-inflammatory drugs, immunosuppressed patients, those under 18 years old, patients requiring antibiotic prophylaxis, or patients with pacemakers.

2.2. Treatment procedure and analysis of preoperative pain

Endodontic treatment was performed on all the patients in a single visit. The Huskinsson [23] visual analogue scale (VAS) was used to evaluate pain levels. The patients were shown how to use a 10-cm visual analogue scale (VAS) to record their pre- and postoperative pain. Before administration of local anesthesia, the patients were asked to mark their preoperative pain on the scale. This was undertaken in the presence of the clinician to ensure that they understood the instructions. Pulp vitality was assessed by thermal stimulation with Endo-Frost spray (Coltène/Whaledent GmbH & Co., KG), and verified by the presence or absence of bleeding from the root canals during endodontic access preparation. Accordingly, the teeth were classified as either vital (V) or necrotic (N).

After applying local anesthesia (4% articaine and epinephrine 1:100,000; Ultracain, Normon, Madrid, Spain) an endodontic access cavity was prepared with sterile round diamond burs and Endo-Z burs (Dentsply Maillefer, Ballaigues, Switzerland) with rubber dam isolation (Hygenic Dental Dam, ColténeWhaledent, Langenau, Germany).

The working length was established with a #10 K-file and an apex locator (RootZX; J. Morita, Tokyo, Japan), and confirmed with a periapical radiograph. All canals were instrumented up to a #20 K-file (Zipperer, Munich, Germany) to obtain a manual glide path. Root canal preparation was performed using ProTaper (Dentsply Maillefer, Ballaigues, Switzerland) nickel–titanium rotary instruments up to an F2 file, in accordance with the manufacturer's suggested sequence, using a torque control endodontic motor (X-Smart; Dentsply, Maillefer, Ballaigues, Switzerland). Profiles #35/04, #40/04 or #45/04 were used in cases where additional apical enlargement was needed. Apical patency was maintained throughout the shaping procedure using a #10 K-file between each instrument. During instrumentation, the canals were irrigated with a 4.2% sodium hypochlorite solution using a plastic syringe with a closed-end needle (Max-I-probe; Kerr-Hawe, Bioggio, Switzerland). After instrumentation, the smear layer was removed using 1 ml of 10% citric acid for 1 min, followed by a final flush with 4.2% sodium hypochlorite. The canals were obturated with a warm gutta-percha obturation technique. AH-Plus cement (Dentsply, DeTrey GmbH, Konstanz, Germany) was used as root canal sealer. Upon completion of root canal treatment, each canal access was sealed with a flowable composite (Tetric; IvoclarVivadent AG, SchaanFurstentum, Liechtenstein), and the access opening was temporarily filled with a Cavit restoration (ESPE dental, Seefeld, Alemania).

Table 1
Mean values and SD of postoperative pain, and clinical variables.

		Mean and SD of preoperative pain	*P* value
Sex	Men	2.91 ± 3.18	0.03*
	Women	3.73 ± 3.27	
Type of tooth	Molar	3.94 ± 3.21	0.003*
	Premolar	3.23 ± 3.27	
	Anterior	2.21 ± 3.03	
Arch	Maxillary	2.82 ± 3.21	0.04*
	Mandibular	3.97 ± 3.94	
Pulp diagnosis	Vital	3.30 ± 3.18	0.84
	No-vital	3.46 ± 3.36	

* Statistically significant difference ($P < .05$).

2.3. Analysis of postoperative pain

At the end of the visit, all patients were given a VAS form to take home, on which they were requested to rate their pain at 4, 8, 16, 24, 48 and 72 h post-treatment. When the completed forms were returned, the scores for pre and postoperative pain were recorded as numerical values between 0 and 10, and converted to a verbal scale: "no pain", "slight pain", "moderate pain", and "severe pain". Pain intensity was defined as follows: no pain (0); slight pain (0.1–3.9): mild discomfort that did not require analgesics; moderate pain (4–6.9), which was relieved with analgesics; and severe pain (7–10), pain that was not relieved by analgesics.

Although none of the patients was prescribed medication after treatment, each was provided with written information about the possible development of pain. The recommended medication for pain control, if required, was ibuprofen 600 mg every 8–12 h.

Table 2
Mean values and SD of postoperative pain, and clinical variables.

		Mean and SD of postoperative pain	*P* value
Sex	Men	2.02 ± 2.50	0.04*
	Women	2.81 ± 2.83	
Type of tooth	Molar	2.88 ± 2.87	0.006*
	Premolar	2.16 ± 2.70	
	Anterior	1.58 ± 1.92	
Arch	Maxillary	1.76 ± 2.22	0.04*
	Mandibular	2.32 ± 2.58	
Pulp diagnosis	Vital	2.43 ± 2.78	0.71
	No-vital	2.33 ± 2.57	

* Statistically significant difference ($P < .05$).