



## POST-ENDODONTIC PAIN VERSUS FLARE-UP: DIFFERENCES IN MEAN PAIN SCORES ACROSS THE VARIOUS TIME POINTS

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### ABSTRACT

The aim of this study was to observe the evolution of post-endodontic pain over time, noting differences between cases with and without flare-ups.

**Material and Methods:** 375 patients received conventional radicular treatment in a single-visit. Pre-treatment and postoperative pain was recorded using a visual analogue scale (VAS). Statistical analysis applied ANOVA testing. Significance was set at  $p \leq 0.05$ .

**Results:** In cases without flare-ups, the most intense pain occurred after 4 hours, thereafter decreasing to almost zero at 72 hours, with significant differences ( $p \leq 0.05$ ). Flare-up cases developed the highest pain levels 24 hours after root canal treatment, with pain still present at the 72-hour, but without significant differences between all study times ( $p \geq 0.05$ ).

**Conclusions:** The most painful post-treatment time in conventional endodontic treatment occurs between 4 and 24 hours after intervention. In cases of flare-up, patients may experience a delayed pain that may still be after 72 hours.

**KEYWORDS:** Endodontic Pain, Root Canal Treatment, Flare-up, Post-obturation Pain.

### INTRODUCTION

Root canal therapy is considered to be a routine dental procedure and it is in variance with the belief of many patients that it is painful. The etiological factors of pain have not been determined yet, although it is hypothesized that mechanical, chemical, and/or microbial injuries to the pulp or the periradicular tissues could be involved [1,2].

Postoperative pain – even in previous asymptomatic teeth – may occur as a result of cleaning, shaping, and obturation of root canals. Root canal treatment eliminates the irritants that cause the inflammation, but not immediately, which explains why the pain may persist for several days [3].

Although post-endodontic pain is frequent, at times exacerbations or flare-ups can occur, characterized by the development of severe pain and/or swelling [4,5].

There is no evidence on whether a flare-up appears and persists over time; despite many studies have evaluated numerous factors related with preoperative pain, pulp and periapical conditions, patient's age, gender, tooth position, systemic medications, number of appointments on postoperative pain [6].

The aim of this study was to assess pain levels and the evolution of pain over time following conventional root canal treatment, recording differences between cases with and without flare-ups.

### MATERIAL AND METHOD

This study was approved by the International University of Catalonia Ethics Committee for Research. At initial appointment, subjects gave their informed consent to take part. Five hundred consecutive patients aged over 18 years were recruited, who received single-visit conventional root canal treatment, performed by the same experienced endodontist (NV) at her practice during a three-year period.

After anamnesis, periapical and bitewing radiographs were captured, and pulp vitality was determined. All teeth were anesthetized with articaine hydrochloride 40mg/mL and epinephrine 1:100,000 (Artinibsa, Inibsa, Spain). Standard access opening was performed using round burs and Endo-Z® burs (Dentsply Maillefer, Ballaigues, Switzerland). Occlusion was relieved in cases with pain on percussion prior to absolute isolation.

The working length was determined with an electronic apex locator Root Zx® (J. Morita Corporation, Tustin, California, USA) and 10 K-

file (Dentsply Maillefer) and confirmed radiographically. All canals were instrumented up to a 20 K-file (Dentsply Maillefer) using the Roane technique. Root canal preparation was performed using Protaper Universal (Dentsply Maillefer) up to an F3 file, in accordance with the manufacturer's sequence, using a torque control endodontic motor (TCM ENDO III; Nouvag AG, Goldach, Switzerland). When the diameter of the apical third, was above 0.30 mm, Profile® rotary files system (Dentsply Maillefer) were used following the manufacturer's instructions.

During mechanical instrumentation, root canals were irrigated with 5.25% sodium hypochlorite (NaOCl) solution through a 30-gauge Max-i-Probe needle (Dentsply Maillefer). Apical patency was maintained throughout the procedure. Final irrigation was performed with 10 ml. of 10% citric acid, neutralizing with 10 ml of 2% chlorhexidine.

Root canals were obturated with Top Seal® cement (Dentsply Maillefer) and System B® (SybronEndo, Glendora, California) obturation technique. Canals were sealed with flow composite awaiting the final restoration.

Huskinson visual analogue scale (VAS) was used to evaluate the incidence and severity of pain, which obtained a numerical score of 0 to 10. Patients were given written instructions explaining possible complications, and were asked to take analgesics on demand if they experienced severe post-obturation pain. The recommended medication was ibuprofen 600mg tablets every 6 hours. Patients were asked to note the time and evolution of pain. Pain duration was recorded at pre-treatment, immediately after completing obturation, and after 4h, 8h, 16h, 24h, 48 and 72 hours.

Flare-up was defined as a VAS value higher than 7, with or without swelling, during the first 72 hours after root canal obturation.

A total of 375 patients returned complete questionnaires and were included in the study. Raw data were entered into Excel® (Microsoft Corporation, Redmond, WA, USA).

The ANOVA test was used to analyze data, with significance set at  $p < 0.05$ . All analyses were performed using the Statgraphics 5.0® statistical software package (Statpoint Technologies, Inc. Warrenton, Virginia, USA).

### RESULTS

Pre-treatment pain and post-operative pain during the follow-up period after root canal treatment was assessed by means of patients'

VAS scores, which identified slight differences.

Taking the entire sample (n=375), maximum pain occurred at the 4-hour study time and had decreased by the 72-hour mark (Table 1). When the sample was divided into two groups –patients who experienced flare-ups and patients who did not – pain evolution was found to be different between the groups.

In the 358 cases without flare-up, pre-treatment pain values were generally low. Post-treatment pain values were lower than pre-treatment VAS values. In all cases, pain decreased substantially over the days immediately after root canal treatment with statistically significant differences between study times (p<0.01). The highest mean pain scores occurred at 4 hours, and thereafter decreased, mainly during the first 2 days. By 72 hours, values had generally dropped to levels from 1,9 to 0.528 (Figure 1).

Overall incidence of flare-up was 4.58%. However, in this group pre-treatment pain was more than double that of cases without flare-up. Pain was found to increase at 4 hours, peaking at 24 hours after treatment with no significant differences between periods studied (p=0.40). At 72 hours, pain decreased from 4,4 to 3,6 but was still present. (Figure 2)

**DISCUSSION**

Post-operative pain after root canal treatment is usually due to acute inflammatory responses of the periradicular tissues. Research has shown that it commences within a few hours or days after the endodontic treatment and is limited to the first 7 days after intervention [7,8]. As our results shown a pain evolution different between the groups the sample was divided into two groups: flare-up cases or non flare-up cases.

All cases were treated in a single visit, as literature has provided evidence of reliability of single-visit endodontic treatment [9]. Several showed that instrumentation techniques produce an amount of debris extrusion into the periapical tissues and these detritus could cause postoperative pain. ProTaper techniques appear to be the most conventional used, studies show that this technique produces less apical extrusion of debris when compared with reciprocating systems [10].

In cases where patient didn't experimented a flare-up, our results showed that the highest level of pain occurred 4 hours post-treatment, and then gradually decreased to three days after intervention. So root canal treatment was able to reduce pre-operative pain. The highest mean of postoperative pain observed in patients of this study was at 4 hours, which corresponds to previous investigations [11,12,13].

In contrast, our results do not agree with other authors, who found the highest pain values registered at 6 hours after treatment [2,14,15,16,17]. However, these authors did not record the intensity of pain 4 hours after endodontic treatment.

The overall prevalence of flare-up in this study was 4.58%, this result is in agreement with previous studies showing a low prevalence of flare-up [1,18]. Based on the results of this study, the average practitioner should observe few flare-ups. General dentists should experience fewer flares-up than the endodontist who generally manages more difficult cases.

The reasons for the occurrence of flare-ups are still not well understood. According to the literature, flare-ups commence within a few hours or a few days after root canal treatment. The patient will suffer either pain or swelling or a combination of the two. In cases of severe pain it may disrupts patient's habitual routine and lifestyle [1,4,6].

The present findings showed a high mean pre-operative pain value (4.48) for the flare-up group. These cases presented the highest pain levels and longest lasting post-operative pain. Furthermore

literature reports that preoperative pain determines postoperative pain [4,5]. Moreover it would appear that preoperative pain could be indicative of possible post-operative flare-up.

In the current study, the most intense pain in the flare-up group occurred within 24 hours, with a VAS value of 6.21, and thereafter decreased until the 72-hour study time, when it still persisted.

These results are consistent with previous studies, which registered a high incidence of postoperative pain 24 hours after root canal treatment [5,19,20].

The present results differ from other studies, which have registered higher and earlier post-treatment pain levels. [18,21].

Following endodontic treatment, the present study found that the highest levels of pain occurred during the time from 4 hours to 24 hours after the intervention. In most cases, slight post-endodontic pain can be expected at the 4 hours. However, when a flare-up developed the most intense pain occurred at 24 hours and lasted 72 hours. Taking these results into account clinicians should be aware of the possibility of flare-up in cases of pre-treatment symptoms, pre-analgesic medication or delayed pain are present. If properly identified these signs can help better managing patients post-operatively.

Future research should be aimed at evaluate preoperative pain as an indicator of post-endodontic flare-ups.

**CONCLUSIONS**

In cases of flare-up, the pain is experienced delayed after 24 hours and may still be present after 72 hours with significant differences in comparison with non-flare-up cases.

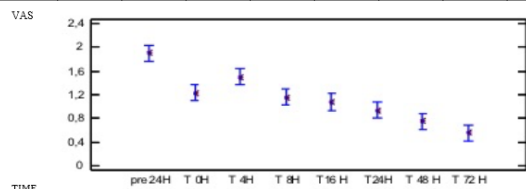
Nevertheless, all cases of root canal treatment presented reduced pain after 72-hours.

**Conflict of interest:**

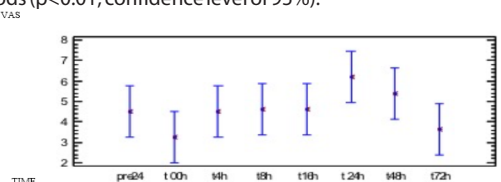
This study received no institutional financial support.

**Table 1. Mean of VAS pain measurements at all study times.**

Hours	Pre 24h	0h	4h	8h	16h	24h	48h	72h
<b>Total Sample</b>	2.025	1.372	1.634	1.296	1.201	1.117	0.921	0.670
<b>No flare-up</b>	1.908	1.282	1.496	1.139	1.038	0.875	0.710	0,528
<b>Flare-up</b>	4.488	3.258	4.529	4.611	4.635	6.211	5.376	3.658



**Figure 1.** Mean value plot excluding flare-up cases at all study times, with statistically significant differences between post-operative periods (p<0.01; confidence level of 95%).



**Figure 2.** Mean value plot of flare-up cases at all post-operative study times, with no significant differences between study times (p=0.40).

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