



Rethinking Postoperative Pain After Nonsurgical Root Canal Treatment: Understanding, Prevention, and Management-Review

Mothanna Al Rahabi*

Associate Professor, College of Dentistry, Taibah University, Madinah Al Munawwarah, Saudi Arabia

***Corresponding Author:** Mothanna Al Rahabi, Associate Professor, College of Dentistry, Taibah University, Madinah Al Munawwarah, Saudi Arabia.

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Abstract

Background: Postoperative pain after root canal treatment is frustrating to practitioners and patients. The incidence of postoperative pain could be changed with recent advances in endodontic techniques and equipment. The aim of this review was to highlight key aspects of postoperative pain after nonsurgical root canal treatment, including causes, related factors, effects of recent advances, and management of postoperative pain.

Methods: Electronic databases were searched for publications on postoperative pain after nonsurgical root canal treatment. The search parameters were postoperative pain, nonsurgical treatment, single visit, recent advances in endodontics, and management of postoperative pain of endodontic treatment.

Results: The results of this review revealed that the incidence of postoperative pain after nonsurgical root canal treatment ranged from 3% to 58%. The main reason for postoperative pain was microorganisms, and there was no significant difference in postoperative pain between single-visit root canal treatment and multiple-visit treatment. The use of recent endodontic techniques and devices will reduce postoperative pain. To control and manage postoperative pain after root canal treatment, a so-called flexible plan for drug administration can be used based on the severity of pain.

Conclusions: Postoperative pain after root canal treatment ranged from mild to moderate, and it can happen even after high-standard root canal treatment. The management of postoperative pain with a correct approach is often considered a sign of clinical excellence.

Keywords: Root Canal Treatment; Postoperative Pain; Review; Acetaminophen; Analgesics; Ibuprofen; Narcotic Medications

Introduction

Pain can be considered one of the most important elements in dentistry because fear of pain is a major reason for dental apprehension [1]. Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage [2]. There is a common belief that root canal treatment is the most painful dental treatment [3-5]. Although root canal treatment alleviates pain, postoperative pain after root canal treatment unfortunately is still a common problem [6]. The incidence of this problem ranges from 3% to 58% [7-11]. The variance among these results can be explained by the use of different criteria in postoperative pain assessment, the use of different materials and techniques, and the failure to consider preoperative pain as a variable [12]. The severity of postoperative pain can range from mild to severe [13]. In one study, 12% of patients reported severe pain after finishing treatment using a visual analogue scale (VAS) [14]. The period of postoperative pain can last from one day to several weeks and can be a major cause of patient dissatisfaction [13]. The purpose of this review is to examine postoperative pain in nonsurgical root canal treatment, including related factors and management of postoperative pain.

Causative and related factors of pain after nonsurgical root canal treatment

The main reason for postoperative pain after nonsurgical root canal treatment is microorganisms; pain generally results from acute inflammation of peri-radicular tissues. Mechanical or chemical damage to peri-radicular tissues can be considered among other causes [15]. Mechanical factors, such as over instrumentation or extrusion of root canal obturation materials, have been related to postoperative pain after endodontic treatment [6,16]. Postoperative pain following nonsurgical root canal treatment is multifactorial and is related to several factors such as presence of periapical pathosis, missed canals, inadequate cleaning and shaping, apical extrusion of debris, apical patency during instrumentation, extrusion of irrigant and intracanal medications, overbite restorations [17], the type of tooth [18,19], and gender [5]. There is strong evidence of a correlation between preoperative and postoperative pain, and patients who have acute preoperative pain are likely to have more severe postoperative pain [19-22]. There is controversy regarding the correlation between pulpal status and postoperative pain, with some reports mentioning that pulpal status has an impact on postoperative pain [12,20,23], and others failing to dem-

onstrate an influence of pulpal status [18,21,24]. Several reports identified no relationship between age and postoperative pain after nonsurgical root canal treatment [23,25,26]. Various studies have concluded that women had more postoperative pain after nonsurgical root canal treatment than did men [9,12,14,21,22,27,28]. The biological differences between men and women that result from changes in serotonin and non-adrenalin hormones may be the cause of these differences [29,30]. Cortisol hormone organises the feeling of pain. This hormone is secreted more in males than in females [31,32]. Generally, men have been used as subjects in most clinical research, and women have been excluded [33]. Oestrogen and women’s menstrual cycle effects, as well as societal expectations, may contribute to differences between the genders in their physiological reaction to pain [34,35]. The incidence of postoperative pain after nonsurgical root canal treatment was higher in the mandibular arch and in molar teeth [19,28]. This difference may result from the dense trabecular pattern structure of the mandible, which decreases blood circulation and concentrates infection, delaying healing [21]. This difference results from the complex anatomy of the lower molars [5,36].

Number of visits and postoperative pain

Studies have shown that most clinicians complete root canal treatment in multiple visits [20,26,37]. However, in the last few decades, over 70% of schools in all geographic areas and various studies have advocated single-visit root canal treatment [9,38-40]. Single-visit root canal treatment is an efficient procedure, but the incidence of postoperative pain is still a source of concern [41]. Several studies mentioned found no significant difference in postoperative pain between single-visit and multiple-visit root canal treatment [9,13,20,27,38,42-46], whereas some researchers reported that postoperative pain was less in single-visit root canal treatment [47]. Table 1 summarises the relationship between number of visits and postoperative pain.

Recent advances in endodontics and postoperative pain after root canal treatment

In recent years, the practice of endodontics has benefitted from several new technologies that can improve its efficiency, safety, and quality [48]. The use of recent endodontic techniques and devices, such as operative microscopes, electronic apex locators, and rotary nickel titanium systems, will shorten the treatment time and increase the success rate of endodontic treatment [49]. Studies have shown that crown-down instrumentation that allows the practitioner to reach the apical terminus gradually, starting from the coronal aspect of the root canal, significantly reduces apically extruded debris, which is considered one of the important etiological factors of postoperative pain and flare-ups [50]. In addition, nickel–titanium engine-driven instrumentation extrudes less debris than do stain-

less steel K-files manipulated by hand, and use of this instrumentation will decrease postoperative pain [51-53]. Irrigant activation could be an effective method for minimising postoperative pain [54]. The use of a negative apical pressure irrigation device can reduce postoperative pain significantly [6].

Prevention and management of postendodontic treatment pain

Prevention and management of postoperative pain after nonsurgical root canal treatment is considered a complementary part of root canal treatment. Providing patients with information regarding expected postoperative pain, and managing pain by prescribing medications will improve patient confidence in their dentists, increase patients’ pain threshold, and improve their attitude regarding dental treatment in the future [55,56]. The synthesis of prostaglandin is prevented by nonsteroidal anti-inflammatory drugs (NSAIDs) through reducing the activity of the enzymes cyclooxygenase (Cox) 1 and 2. Several NSAIDs such as ibuprofen, aspirin [57], flurbiprofen [58], ketorolac [59,60], and etodolac [61] have been used to manage postoperative pain after root canal treatment. The best way to control moderate to severe pain is a combination of two or more drugs, so that a lower dose of each drug is used with fewer side effects [60]. The combination of an NSAID and acetaminophen can provide additional analgesia for management of dental pain. If this combination does not control pain, a narcotic analgesic will give additional relief [62,63]. To control and manage postoperative pain after root canal treatment, a so-called flexible plan for drug administration can be used based on the severity of pain [64]. Drugs are administered four times per day until pain subsides (Figure 1).

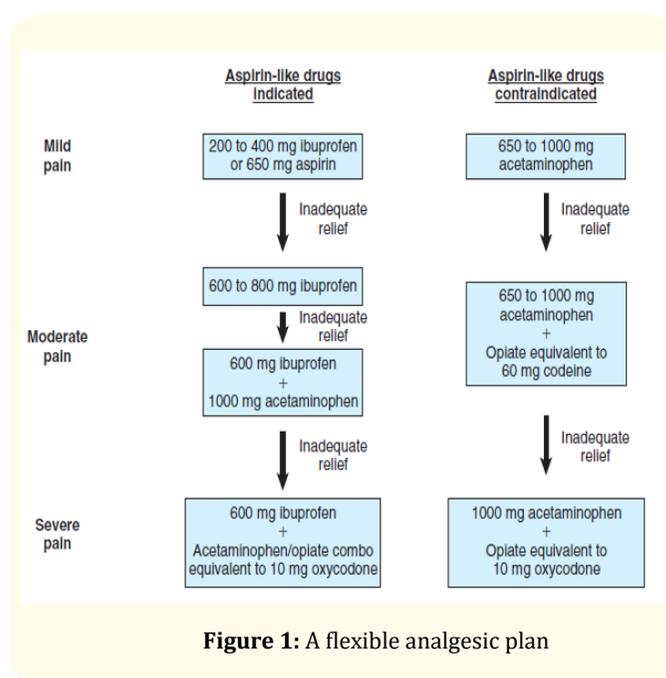


Figure 1: A flexible analgesic plan

Study and Reference No.	Type of Tooth	Pulp Status	No. of Cases	Percentage of Cases		Incidence of Postoperative Pain
				Single	Multiple	
Wong Amy Wai-Yee., et al. 2015 [13]	All types	Vital and nonvital	538 teeth	51%	49%	No significant difference was found in postoperative pain between single and multiple visits for root canal treatment.
Onay Emel O., et al. 2015 [47]	All types	Vital and nonvital	1819 teeth	31%	69%	The incidence of flare-up was minimal when teeth were treated in single visit. A peri-apical lesion in necrotic teeth is a significant risk factor for flare-ups.
Singh, Smita, and Aniket Garg. 2012 [45]	Single-rooted teeth	Vital and nonvital	200 teeth	50%	50%	No significant difference was found in postoperative pain between single and multiple visits for root canal treatment.
El Mubarak AH., et al. 2010 [20]	All types	Vital and nonvital	230	50%	50%	No significant difference was shown in postoperative pain between single and multiple visits for endodontic treatment.
Wang C., et al. 2010 [46]	Permanent anterior teeth	Vital	100 teeth	50%	50%	In teeth with vital pulp and a single canal, there was no significant difference in incidence and intensity of postoperative pain after one- or two-visit endodontic treatment.
Al-Negrish., et al. (2006) [27]	Central incisor teeth	Nonvital	120 teeth	50%	50%	There were no significant differences in the incidence and severity of postoperative pain between one- and two-visit root canal therapy.
Eleazer Paul D and Kristen R Eleazer (1998) [38]	Molar teeth	Nonvital	402 teeth	50%	50%	This study showed an advantage for one-visit treatment at a 95% confidence level.
Albashaireh ZSM and AS Alnegrish 1998 [9]	All types	Vital and nonvital	300 teeth	50%	50%	Pain was significantly higher in the multiple-visit group.

Table 1: Summary of several studies regarding the relationship between postoperative pain after root canal treatment and number of visits.

Conclusions

Postoperative pain after root canal treatment ranges from mild to moderate pain, and it can occur even after high-standard root canal treatment. New advances in endodontic treatment reduce postoperative pain. Proper management of postoperative pain is often considered a sign of clinical excellence; it requires a thorough understanding of the physiology of pain and the mechanisms by which drugs and therapies offer relief.

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