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Evaluation of post-operative pain and flare-ups in endodontic treatments using a type of rotary instruments- a cross-sectional study

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Abstract

Aim: The purpose was to evaluate the general incidence of post-operative pain and flare-ups in patients who were endodontically treated by two endodontics specialists using rotary instruments with the same treatment protocol.

Methods: Records of 382 teeth belonging to 268 patients treated by two endodontics specialists during a 6-month period were kept and evaluated. Post-operative pain between treatment visits was categorized using a pre-established scoring system. Ninety-five patients were males, whereas 173 were females.

Results: Pulpal necrosis without periapical pathosis was determined as the most common indication for endodontic treatment (21.7%) followed by irreversible pulpitis and re-treatment without periapical lesions (18.3%, 18.3%, respectively). The general prevalence of postoperative pain and flare-ups was determined as 8.1%, whereas cases that could be classified as real flare-ups which were severe and required an unscheduled visit (scores 2 and 3) comprised 3.4% of the cases. No statistically significant correlation was determined between gender and post-operative pain and flare-up ($p = 0.05$).

Conclusion: Teeth with pre-operative pain were more prone to developing post-operative pain and discomfort with a statistically significant difference ($p = 0.02$). While no significant correlation was determined between tooth vitality and pain and flare-ups ($p = 0.5$), a statistically significant relationship existed between the presence of a periapicalpathosis and postoperative pain and flare-ups. Cases with a periapical lesion had a higher risk of developing pain and flare-upscompared to those with no periapical involvement ($p = 0.0001$). Future studies may focus on the influence of rotary instrumentation systems in more specific groups of cases. Meanwhile; microbiological as well as psychological aspects of flare-ups are topics that warrant further investigation.

Keywords: endodontic treatment, flare-ups, post-operative pain, rotary instruments

Introduction

Post-operative pain following endodontic treatment has been defined as pain of any degree that occurs after the commencement of root canal therapy [1]. A flare-up, defined as a sub-set of post-operative pain, is characterized by the development of pain, swelling or both, which commences within a few hours or days after root canal procedures and is often of sufficient severity to require an unscheduled visit for emergency treatment [2]. It is an undesirable and distressing situation since it not only causes serious discomfort but may also disrupt the patient's confidence in the outcome of the treatment [3]. Various researches have been undertaken so far that examine the prevalence of post-operative pain, yielding different results [4, 12]. It is difficult to draw a general conclusion relying on the varying results obtained from these researches. These conflicting results may be due to the differences in treatment protocols, as well as the days that patient records are taken. There are various factors that have been reported as responsible for the occurrence of pain and endodontic flare-ups such as the number of appointments before the completion of the treatment, inter-appointment medication type, gender, age, the type of the tooth, presence of pre-operative pain, pulpal and periradicular diagnosis, treatment protocol, irritants within the root canal space, apical debris extrusion and preservation of apical patency during root canal preparation [10]. Furthermore; patients' attitudes towards endodontic treatment may vary and these may constitute the impact of psychological factors on post-operative pain incidence. Fear of dentists, anxiety and apprehension were reported as factors that may affect patients' reaction thresholds and endurance [13]. In the meantime; there may be differences in patients' approaches towards endodontic treatment depending on the population investigated.

The science of endodontology has witnessed quite a number of innovations in recent years, one of which is the utilization of nickel-titanium rotary instruments. With the help of the rotary nickel titanium instrumentation, excessive time consumption is prevented and endodontic procedures are completed more efficiently. The incidence of post-operative pain and flare-ups with rotary instrumentation systems engaging a crown-down technique isn't a topic that has been extensively studied. The purpose of the present study was to evaluate the general incidence of pain and endodontic flare-ups in cases treated by two endodontics specialists using rotary instruments with the same treatment protocol.

Materials and Methods

In this study, records of 382 teeth belonging to 268 patients treated by two endodontics specialists during a 6-month

period were evaluated at the GDC (Srinagar). Data were obtained by recording information belonging to patients whose endodontic treatments were completed by these specialists. The main focus of the study was the evaluation of the incidence of post-operative pain and flare-ups. A special chart was designed for the recording of the data. The following scorings were assigned to the treated teeth in terms of pain and flare-ups based on a system similar to that developed by Fava [6]:

1. No symptoms between visits.
2. Mild-to-moderate pain which could be alleviated by regular medication.
3. Severe signs of pain that required an unscheduled visit.
4. Severe pain accompanied by intra-oral or extraoral swelling.

During the study, variables such as patients' ages, gender, tooth numbers, initial diagnosis, number of appointments and the duration of the overall treatment were recorded. While evaluating post-operative pain, information regarding the initiation of the flare-up (the day of onset), its duration and type were also included. Initial diagnosis of the treated teeth was classified and described as follows:

1. Deep carious lesions
2. Irreversible pulpitis
3. Pulpal necrosis
4. Acute apical abscess
5. Chronic apical periodontitis (Granuloma)
6. Chronic apical abscess
7. Retreatment
8. Prosthetic purposes

The endodontics specialists who participated in the study followed a very similar treatment protocol during the performance of their endodontic treatments. Meticulous care was taken to follow contemporary principles of endodontic care. Confirmation of the working lengths was determined by combining radiographic findings with those obtained by apex locators. Apex locators were used until 1 mm short of the working length. During the preparation of the root canals, irrigation was performed with sufficient amounts of 2.5% sodium hypochlorite. Pulpdent (Pulpdent Corporation, Watertown, MA, USA) was utilized for intra-canal medication. Root canal obturation was accomplished by using a cold lateral condensation technique that combined gutta-percha points with sealer using finger spreaders. Confirmation of the adequacy of root fillings was done by periapical radiographs.

The patients were instructed to call the practitioners in case they experienced painful episodes between appointments or after root canal obturation. They were questioned about the type of pain or discomfort they experienced between appointments. In cases where the patients suffered from mild-tomoderate pain, analgesics such as NSAIDs or acetaminophen were prescribed for the alleviation of symptoms. When severe cases were encountered, the patients were called to the clinic for emergency interventions. Root canals were not completed unless the patients were completely free of symptoms. Patient follow-ups were continued from the initiation of root canal treatment until 1 week after obturation.

The relationship of different parameters with interappointment flare-ups was evaluated by the chi-square test. A confidence level was set at 0.05.

Results

Records of 382 teeth belonging to 268 patients were included in the study. Ninety-five (35.4%) patients were males, whereas 173 (64.6%) were females. Table I presents the distribution of teeth according to tooth types. Mandibular first molars comprised the highest proportion of teeth to be treated in the study.

In Table II, the initial diagnosis of the treated teeth is presented. Pulp necrosis (without periapical pathosis) was the most common indication (21.7%) for endodontic treatment, followed by irreversible pulpitis (18.3%) and re-treatment (without periapical pathosis) (18.3%). The majority of the endodontic treatments (55.8%) were completed in two appointments; 42.1% of the cases were completed in a single visit. Only eight cases (2.1%) necessitated three appointments for the final completion of endodontic treatments.

Table III presents the general incidence, day of onset and type of inter-appointment pain. Thirtyone (8.1%) of the examined teeth developed postoperative pain and flare-ups in general. The majority of pain and flare-ups commenced during the first day following endodontic treatment (5.2%). When the type of inter-appointment pain and flare-up was evaluated, the majority of the symptomatic teeth were identified as having mild-to-moderate symptoms classified as 0 or 1 (4.7% of the overall painful cases). Nine teeth (2.4%) were associated with severe flare-ups classified as 3 and four teeth (1%) were associated with pain accompanied by extra-oral swelling classified as 4. Overall; cases with severe pain which required an unscheduled visit that could be characterized as real flare-ups comprised 3.4%.

Table 1: Distribution of teeth according to their types.

Tooth type	n	%
Maxillary	213	55.76
Central incisor	26	12.21
Lateral incisor	26	12.21
Canine	26	12.21
First premolar	32	15.02
Second premolar	33	15.49
First molar	38	17.84
Second molar	28	13.15
Third molar	04	1.88
Mandibular	169	44.24
Central incisor	05	2.96
Lateral incisor	04	2.37
Canine	17	10.06
First premolar	20	11.83
Second premolar	27	15.98
First molar	65	38.46
Second molar	30	17.75
Third molar	01	0.59

Table 2: Distribution of teeth according to initial diagnosis.

Initial diagnosis	N	%
Deep carious lesions with pulpal exposure	45	11.8
Irreversible pulpitis	70	18.3
Necrosis without periapical pathosis	83	21.7
Acute apical abscess	06	1.6
Chronic apical periodontitis	47	12.3
Chronic apical abscess	22	5.8
Re-treatment without apical pathosis	70	18.3
Prosthetic purposes (vital teeth treated for prosthetic reasons)	39	10.2

Table 3: Distribution of teeth according to the presence of interappointment pain and flare up, pain and flare-up onset time and flare-up type.

		n	%
Presence of inter-appointment pain and flare-up	Present	351	91.9
	Absent	31	8.1
Flare-up time (day of onset)	0	351	91.9
	1	22	5.8
	2	08	2.1
	3	01	0.3
Flare-up type	No pain	351	91.9
	Mild-moderate pain	18	4.7
	Severe pain	09	2.4
	Severe pain and swelling	04	1

Discussion

Although contemporary endodontic treatment can be pain free during the procedure, patients may still experience some pain and discomfort after the appointment. Hargreaves *et al*. [14] drew attention to the significance of pain in endodontic therapy indicating that the terms root canal and pain are considered synonymous even in the 21st century. The authors further indicated that every clinician who provides endodontic therapy had to deal with this misconception and the clinician's skill is often primarily judged by the success or failure of pain control. A survey of the literature reveals different rates reported in terms of flare-up cases and it has been indicated that the rates reported in the literature range between1.4–16% [10]. Alves [10] evaluated the incidence of flare-ups (requiring emergency intervention) in 408 cases seen by students attending a specialization course and determined the overall rate of flareups (requiring unscheduled visit) as 1.71%, which is slightly lower than the 3.4% obtained in the present study. The differences may be attributed to the variabilities between the two studies, such as the rotary instrumentation techniques used. Their results were similar to those of the present study in the sense that teeth with periapical radiolucencies were more prone to developing inter-appointment flare-ups. This issue has been confirmed by a number of other researches as well [7, 8, 11, 15].

In the present study, special care was taken to follow a similar treatment approach. However, it is practically impossible to standardize treatments performed by two different practitioners. Furthermore, there is no means by which the impact of individual differences can be calculated. On the other hand, a definite consensus was made both in armamentarium to be utilized as well as the techniques chosen during root canal preparation and obturation. In multiplevisit cases, root canals were not obturated until the patients were completely free of symptoms, therefore, no severe post-obturation pain was reported that could be characterized as flare-up. Although the majority of multiple-visit cases were completed in two appointments with a 1-week time interval, some cases required a longer time elapse either due to the persistence of symptoms or the delay in patients' attendances due to personal reasons. Different researchers attempted to determine the incidence of pain and flare-ups. Fox *et al*. [16] controlled 247 endodontically treated teeth in terms of pain 1, 2 and 7 days following endodontic treatment. The authors recorded a pain incidence of 62%, 45% and 11% 1 day, 2 days and 7 days following endodontic treatment, respectively. They also added that there was a positive correlation between gender and the presence of a periapical lesion and interappointment pain. The results of the present investigation found no result in favor of a specific gender. Genet *et al*. [17] found the incidence of 'flare-ups' as 30% in a study they performed on 1204 patients.

Post-operative pain and discomfort were more frequently reported in re-treatment cases performed in teeth with periradicular lesions. In the present study, re-treatment cases with a periapical lesion were categorized under the group of periapical pathologies to which they belonged, rather than classifying them as those of Genet *et al*. [17].

The psychological factors associated with flare-ups were not taken as a primary criterion in the present investigation. However; it is true that fear and anxiety towards dental procedures are among factors that trigger patients' pain thresholds and reactions. Moreover, pain and discomfort thresholds may exhibit individual differences. Previous painful experiences may also have influence on the severity of post-operative responses. Also, mutual communication between the patient and the practitioner may have influence on patients' reactions towards endodontic procedures, which again is debatable in the present study where the treatments were performed by two practitioners whose behavioral approaches may somehow differ. The present investigation gives a general overview of inter-appointment pain incidence when rotary instruments engaging crown-down instrumentation are utilized. Detailed research on a more specific group of cases will certainly help enlighten our knowledge on this clinical dilemma.

Within the limitations of this study, it can be concluded that post-operative pain using rotary systems is definitely a topic that warrants further investigation with the inclusion and comparison of different methodologies to suggest strategies for the prevention for this undesirable and distressful condition, both for the patient and the dental practitioner.

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