

Incidence of Endodontic Flare-ups and Its Related Factors: A Retrospective Study

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ABSTRACT

Aims and Objectives: The aim and objective of the study were to determine the incidence of flare-ups during endodontic treatment and to identify the risk factors associated with flare-ups.

Subjects and Methods: A total of 1725 patients who were treated during the time period of 2009–2014 by the same endodontist were reviewed. Incidence of flare-up, patients' age, gender, status of pulp, tooth position, number of roots, and treatment provided were taken from their dental records. Relationship between these factors and flare-ups was examined. Statistical analysis was done using Pearson Chi-square test and Fisher's exact test.

Results: A total of 2% incidence of endodontic flare-ups was seen out of 1725 cases. Patient's age, gender, and diagnosis had a significant effect on the development of flare-ups ($P < 0.05$). Tooth type, position of tooth, number of root canals, number of visits, and treatment modality had no significant effect on flare-up incidence.

Conclusions: Diagnosis plays an important role in predicting the incidence of flare-ups. Patients in the age group of 40–60 years had a higher risk of developing flare-ups. Women compared to men are more prone to flare-ups.

KEYWORDS: Endodontic treatment, flare-up, incidence, pain, risk factors

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INTRODUCTION

Flare-up is swelling and/or pain, within a few days following an endodontic appointment, which requires an unscheduled emergency visit by patients to relieve the symptoms.^[1] Flare-ups are undesirable, as it requires an unscheduled visit and causes great discomfort to patient due to pain and swelling. Although the exact reasons for flare-up are not clearly understood, it is most definitely multifactorial.^[2,3] The prevalence of flare-ups has been examined with respect to patients' age, gender, tooth position, pulp and periapical conditions, preoperative signs and symptoms, operator skills, number of appointments and treatment protocol, and a positive correlation has been found.^[4,5]

Studies have shown a correlation between the pulpal status of the tooth and flare-up following endodontic treatment.^[6] Teeth with normal or inflamed pulp usually do not develop flare-ups if thorough debridement has been done and aseptic conditions are strictly observed.^[6,7]

Previously initiated or previously endodontically treated teeth are also more prone to flare-ups.^[6] Age is also a strong predictor for flare-ups, especially in the age group of 50 and above.^[6] Incidence of flare-ups and associated risk factors reported in studies vary widely. Risk factors may differ depending on the population, treatment modalities, and protocol followed. Hence, it is desirable for an institution to do its own study to identify risk factors in its population and thus be prepared to avoid flare-ups.

This study aims to evaluate the incidence of flare-ups following an endodontic appointment and identify its associated risk factors.

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SUBJECTS AND METHODS

This retrospective study was carried out at Department of Conservative Dentistry and Endodontics, Pushpagiri College of Dental Sciences with approval (RN.PCDS/426/2016) from the institution, and ethical clearance was waived as it is a retrospective study based entirely on data abstraction from existing dental records available in college with no interaction with human subjects and with no collection of identifiable private information. Dental records of patients who had undergone endodontic treatment from 2009 to 2014 were retrospectively examined, and only those patients who had their root canal treatments completed by the same endodontist in the endodontic specialty clinic and had full dental records were included in this study. Data were collected from 1725 patients. Following data were collected from each of the patients' record: age and gender [Table 1], type of tooth and its position [Table 2], number of root canals [Table 3], treatment modality [Table 4], number of visits for completion of root canal treatment [Table 5] and pulpal and periradicular diagnosis of the tooth [Table 6].

Access opening and complete chemomechanical instrumentation were done under rubber dam isolation using hand and rotary instruments during the first appointment itself so that the canal is ready for obturation in the following visit. Hand instrument K-file 10 and 15 was used to establish glide path followed by rotary files using 2.5%–5.25% sodium hypochlorite in standard needle irrigation. Following instrumentation, calcium hydroxide was placed as an intracanal medicament and tooth was temporized, and the patient was rescheduled for completion of the root canal procedure at a later appointment. In single visit treatment, obturation and permanent access restoration were done in the same first visit. For retreatment cases, previous root canal filling material was removed using Gates Glidden Drills, xylene, and hand files after which root canal preparations were completed as mentioned above.

Diagnosis of normal pulp and periradicular status [Table 6] was categorized as:^[8] normal pulp is symptom free with normal response to pulp testing. Lesions that extend to the pulp but show no symptoms of pulpitis still requires endodontic treatment due to extensive pulpal exposure and intentional endodontic treatment done for prosthodontic reasons.

Symptomatic and asymptomatic irreversible pulpitis diagnosed based on subjective symptoms and objective findings. Acute apical abscess, chronic apical abscess, and chronic apical periodontitis cases were categorized as teeth with periapical pathology, and remaining cases with necrotic pulp were considered as acute apical

Table 1: Flare-ups according to age and gender

Prognostic factor	Total number of teeth	Number of flare-ups (%)	P
Age			
<20	205	1 (0.4)	0.001
20-29	359	1 (0.3)	
30-39	326	5 (1.5)	
40-49	222	5 (2.3)	
50-59	293	16 (5.4)	
>60	320	6 (1.9)	
Gender			
Male	607	3 (0.5)	0.001
Female	1118	31 (2.8)	

$P < 0.001$ highly statistically significant using Chi-square test

Table 2: Flare-ups according to tooth position and type

Tooth	Total number of teeth	Number of flare-ups (%)	P
Maxillary			0.531
Anterior	209	4 (2)	
Premolar	390	4 (1)	
Molar	412	8 (2)	
Mandibular			
Anterior	125	3 (2.4)	
Premolar	170	2 (1.2)	
Molar	419	13 (3.1)	

$P > 0.05$ statistically not significant using Chi-square test

Table 3: Flare-ups according to number of root canals

Number of root canals	Total number of teeth	Number of flare-ups (%)	P
Single rooted	505	9 (1.8)	0.850
Multi-rooted	1220	25 (2)	

$P > 0.05$ statistically not significant using Chi-square test

Table 4: Flare-ups according to treatment modality

Treatment modality	Total number of teeth	Number of flare-ups (%)	P
Initial treatment	1601	30 (1.9)	0.302
Retreatment	124	4 (3.2)	

$P > 0.05$ statistically not significant using Chi-square tests

Table 5: Flare-ups depending on number of appointment

Number of visits	Total number of teeth	Number of flare-ups (%)	P
Single	410	5 (1.2)	0.307
Multiple	1315	29 (2.2)	

$P > 0.05$ statistically not significant using Chi-square tests

periodontitis categorized under teeth without periapical pathology.^[8]

Patients who had pain and/or swelling within 1–3 days following an endodontic appointment which required an emergency visit by the patient for relief of symptoms was

considered as flare-up in this study. Such patients were identified and categorized as having flare-up. Patients who were not considered as flare-up cases were patients who were simply reassured without prescribing any medication or any treatment, patients who reported with pain and/or swelling but refused an unscheduled visit for relief of symptoms, and patients who reported with pain on their second appointment. Statistical analysis was done using Pearson Chi-square test and Fisher's exact test.

RESULTS

A total number of flare-ups reported among 1725 cases were 34 (2%). Tooth type or its position had no statistically significant influence on flare-up development [Table 2] ($P > 0.05$). Furthermore, a number of root canals, single-rooted teeth (1.8%), and multirooted teeth (2%) showed no statistically significant difference [Table 3] ($P > 0.05$). Depending on the treatment modality, initial treatment cases showed 1.9% flare-ups and retreatment cases showed 3.2% flare-ups which was not statistically significant [Table 4] ($P > 0.05$). Endodontic treatment carried out in single visit had 1.2% flare-ups and those done in multiple visits had 2.2% flare-ups which is statistically not significant [Table 5] ($P > 0.05$). Asymptomatic irreversible pulpitis (10%) showed the highest risk of developing flare-ups followed by necrosed pulp with periapical lesion (2.7) and without periapical lesion (2.1%) as summarized in Table 6 ($P < 0.01$). Patients in the age group of 50–59 years (5.4%) followed by 40–49 (23%) year age group showed a higher tendency to develop flare-ups [Table 1] ($P < 0.01$). Flare-ups were more common in women (2.8%) compared to men (0.5%) as shown in Table 1 ($P < 0.01$).

DISCUSSION

Despite meticulous treatment procedures, flare-ups can occur increasing patients' skepticism as often a dentist's

skill is judged by his ability to relieve the symptoms such as pain and swelling. Flare-ups are multifactorial, and hence it is important to identify correctly the factors that can cause flare-ups. Flare-ups are undesirable, but they can be predicted if risk factors can be identified in a patient.^[9] Furthermore, retrospective study eliminates the bias from the operator and investigator side as compared to a prospective study. Although there are limitations in retrospective studies as investigator has to rely on secondary data, still random selection of cases and larger sample size can be easily achieved with minimum expense, both of which are important in clinical studies.^[5]

In the current study, flare-up was measured as the singular outcome variable. Tooth type or its position, number of root canals, treatment modality, and number of visits had no statistically significant influence on flare-up development. A maximum number of flare-ups were seen in asymptomatic irreversible pulpitis followed by necrosed pulp with periapical lesion and without periapical lesion. Patients in the age group of 50–59 years followed by 40–49-year age group and particularly women recorded more number of flare-ups.

Patients were divided into multiple decades of age groups, increase in flare-ups in the age group of 40–60-year patients was seen which is in agreement with a previous study,^[5] which found a higher prevalence of flare-up in patients between the ages of 40 and 60. This could be related to the changes in both humoral and cell-mediated immunity that occur naturally due aging.^[10] It was reported in a study that action of sodium hypochlorite is affected with increasing age of patient and they found it to be less effective in decreasing the count of *Enterococcus faecalis* in aged teeth.^[11] There was a definite correlation between flare-ups and the patients' gender in the current study, which is similar to some previous studies^[5,6] and disagree with others.^[1,7,12] Although there is no evidence in literature that female patients are more prone to postoperative complications following an endodontic treatment, female patients have a tendency to develop postoperative pain as they are more prone to psychosomatic disorders and their symptoms are governed by these emotional turbulences.^[13,14] Changes in female hormonal levels during menstruation, hormone replacement therapy, and oral contraceptives can alter the levels of serotonin and noradrenaline levels, thus contributing to decreased pain threshold.^[13,15-17]

There was no significant differences in the incidence of flare-ups depending on tooth types (anterior, premolars, or molars) or its location (maxillary or mandibular) and number of root canals, which is in agreement with some studies^[1,6,7,12] but disagree with a study where they have found molars and mandibular teeth have higher risk of

Table 6: Flare-ups according to pulpal and periradicular diagnosis

Diagnosis	Total number of teeth	Number of flare-ups (%)	P
Normal pulp	94	0	0.002
Symptomatic irreversible pulpitis	730	1 (0.1)	
Asymptomatic irreversible pulpitis	129	13 (10)	
Pulp necrosis without periapical lesion	92	2 (2.1)	
Pulp necrosis with periapical lesion	680	18 (2.7)	

$P < 0.05$ statistically significant using Chi-square tests

developing flare-up.^[5] Single visit endodontics have greater patient acceptance due to reduced number of appointments. However, a correlation between single visit and flare-ups has been shown in the past.^[18-20] Hence, in the present study, we compared single visit and multiple visit endodontics and found no significant difference in flare-up rates between them which is in agreement with the majority of studies.^[1,4,12,21]

There was a statistically significant difference in the flare-up rates depending on the diagnosis. Previous studies have shown a low prevalence of flare-up which is directly related to the preoperative status of the tooth.^[1,22,23] Results in these study show the complete absence of interappointment flare-up in cases with healthy pulp which is in partial agreement with one of the studies where they found no flare-ups in vital and inflamed pulp.^[6] In the present study, we found that in normal pulp case, there was no flare-up reported, thus further providing the evidence that thorough debridement of canals during initial visit will prevent flare-ups. Asymptomatic irreversible pulpitis showed maximum flare-ups of 10%. Reason may be that, in these chronic cases, peripheral anatomy of the pain system may be altered due to the sprouting of nociceptor terminals caused by the chronicity of pulpal inflammation.^[24] This may contribute to increased pain perception after initial appointment. Incomplete cleaning and shaping may disturb equilibrium of the microbial community by leaving behind some inhibited species, which can then overgrow and if these microbes are virulent, then it can lead to increased damage to the periradicular tissues, thus resulting in flare-up.^[25] Environmental disturbances brought about by incomplete cleaning and shaping may activate virulence genes which may result in increased microbial virulence, thus resulting in a previously asymptomatic case to become symptomatic.^[25]

Further studies are required to identify other risk factors such as the patient's medical condition, role of microorganisms, irrigants, and medicaments used during the treatment which can affect the occurrence of flare-ups after initiating endodontic treatment.^[26,27] Randomized controlled trials are considered most reliable to establish the relationship between contributing factors and the outcome and it also minimize confounders. Such randomized controlled trials are required to validate the effect of contributing factors on the occurrence of flare-ups in endodontic treatment.

CONCLUSIONS

Within the limitations of this study, it can be concluded that flare-up is most commonly seen in patients with asymptomatic irreversible pulpitis. Incidence of flare-up

is more in the age group of 40–60. Female patients are at higher risk of developing flare-ups.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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