

# Evaluation of Pain in Relation to Root Canal Treated Teeth Having Instrument Separation-A Retrospective Analysis

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## Abstract

One of the most common mishaps during root canal treatments is the separation of an endodontic instrument during cleaning and shaping. The main problem to this is the improper debridement of the apical portion of canal and directly compromises the success of the treatment. The aim of this study was to evaluate the association of pain in root canal treated teeth having instrument separation. A total of 29 patients who have undergone root canal treatment and reported with a separated instrument were evaluated. Each of the patient's age, gender, tooth number, the association of pain, nature and the duration of pain was obtained from the patient records of the institution from June 2019 to March 2020. In this study, out of the total sample size, 15 (51.7%) of patients were females while the remaining 14 (48.3%) patients were males. It was shown that 72.4% of the patients did not experience pain with the presence of instrument separation in their root canal treated teeth, while 29.6% experienced pain. Position of the tooth in the arch did not influence the experience of pain among the patients (Chi - Square test, P- 0.35, >0.05). Within the limits of the study, an association between pain and root canal treated teeth with instrument separation was not established. Though gender and tooth did not influence the experience of pain, many female patients in the present study experienced pain. The pain was more often associated with lower posteriors.

**Keywords:** *instrument separation, root canal treated, pain, gender*

## Introduction

An endodontic procedure is known to be a fairly predictable type of procedure that has been known to have a high success rate within the range of 86-98%.<sup>1</sup> In order to obtain success during an endodontic treatment, the root canal system should be thoroughly cleaned and debrided of any necrotic tissues as well as microorganisms.<sup>2</sup> As the carious lesion have progressed

from the enamel and dentin, these microorganisms have been accepted as being the sole entity that initiates both pulpal as well as periapical pathologies.<sup>3,4</sup> Diseases of the pulp are both of infectious as well as inflammatory in nature.<sup>5,6</sup> When treatment failure has occurred; the majority of such cases have shown basic clinical signs and symptoms including radiographic findings.<sup>7,8,9</sup> Such lesions often originate from various etiologies and common presents as a diagnostic challenge for dental clinicians.<sup>10</sup>

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Specifically, during an ongoing root canal procedure, there are several unwanted procedural errors that a clinician may encounter. The process of cleaning and shaping of the root canal system is considered to be one of the most fundamental aspects of a root canal treatment.<sup>11</sup> With the help of irrigation solutions, the number of microorganisms in the root canal system

can also be reduced.<sup>12</sup> Chlorhexidine has become an appropriate adjunctive final irrigant in such cases.<sup>13</sup> When left untreated, further bone destruction and remodelling will contribute to more severe periapical lesions in the teeth with deep caries.<sup>14</sup> However, such clinical errors during cleaning and shaping particularly includes perforations, ledging as well as the separation of endodontic instruments are commonly encountered.<sup>15,16</sup>

The separation of an endodontic instrument inside the root canal system is one of the many mishaps that can hinder the success of an endodontic procedure. The reason behind this is because the fracture of an instrument within a root canal can result in both interference and delay for a successful root canal treatment.<sup>17</sup> Fractures of endodontic instrument origin are the effect of various factors which includes root canal curvatures, instrument design, dynamics of instrument usage, instrumentation techniques as well as the operator's skill set.<sup>18,19,20</sup> From the patient's point of view, continuous pain and discomfort that they experience is far worst if the broken instrument is not removed or bypassed from the involved tooth<sup>(21)</sup> As of now, such cases are treated through non-surgical measures but if the symptoms persist, then a surgical approach should be considered.<sup>22</sup>

In this study, the aim was to evaluate the association of pain in a root canal treated tooth with the presence of instrument separation. The purpose of it being that by determining the frequency of instrument separation and the factors associated with it, a better insight on the importance of proper instrument retrieval for the success in an endodontic treatment can be highlighted and the quality of the treatment can be improved.<sup>23,24</sup> It should always be of prime importance that a dentist should have the necessary knowledge as well as clinical experience to deal with such cases and especially as students, it can be understood through a variety of methods not only in practice but also in awareness.<sup>25</sup>

## Materials and Methods

### Study Setting

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

### Study Design

The study was designed to include all dental patients who have undergone root canal treatment with the presence of instrument separation. The patients who did not fall into this inclusion criteria were excluded.

### Sampling Technique

The study was based on a non probability consecutive sampling. To minimise sampling bias, all cases sheets of patients who had a history of root canal treatment were reviewed and included.

### Data Collection and Tabulation

Data collection was done using the patient database with the timeframe work of 01 June 2019 to 31 March 2020. About 86,000 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification was done with the help of photographs and radiographic evidence. To minimise sampling bias, all data were included. The exclusion criteria was patients with systemic illness. Data was downloaded from DIAS and imported to Excel, tabulation was done. The values were tabulated and analysed.

### Statistical Analysis

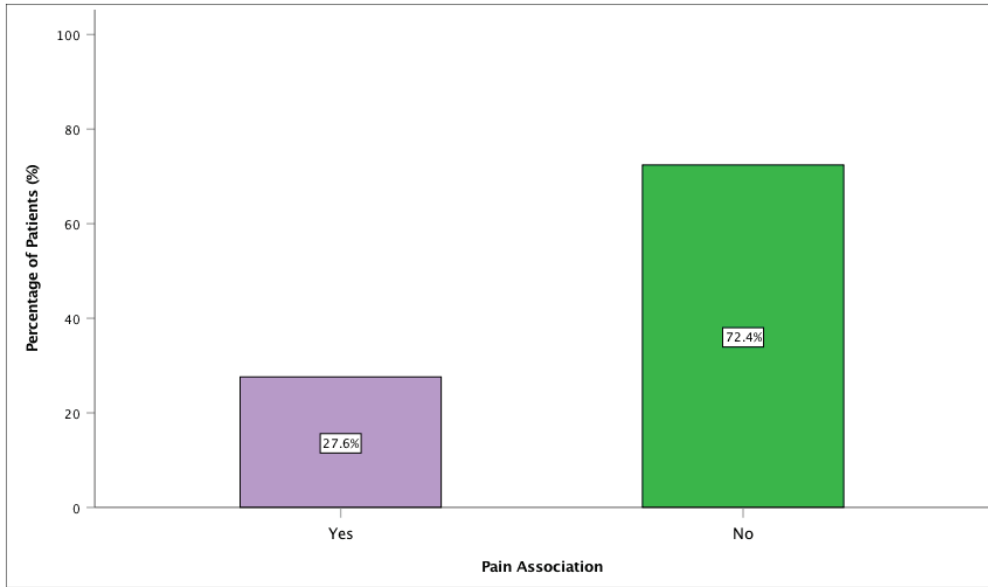
Descriptive statistics were performed using SPSS Statistical Analyzer (23.0 Version) by IBM on the tabulated values. Both the frequency distribution and the Chi-square tests were done.

### Results and Discussion

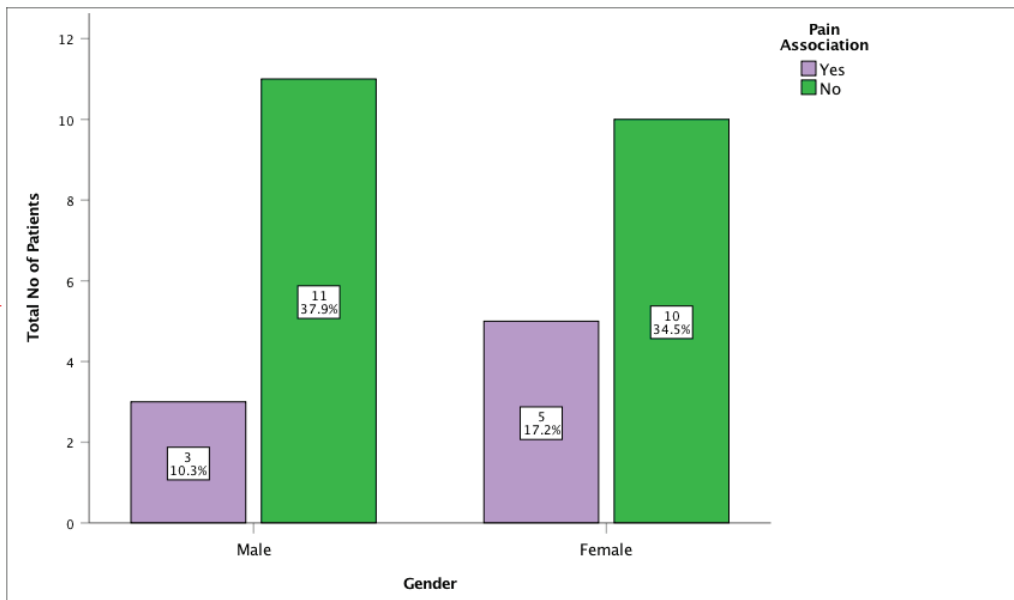
Analysis of the presence or absence of pain in relation to root canal treated teeth with instrument separation showed that 21 (72.4%) patients reported with no history of pain in relation to the affected tooth while only 8 (27.6%) patients had a history of pain (Figure 1). Considering the gender, 66.7% of the female patients did not experience pain while 33.33% patients experienced pain. Similarly among male patients 78.6% did not experience pain, while the remaining 21.4% of the patients had pain (Figure 2).

Analysis of the duration of pain showed that the majority of the patients experienced pain for a duration of 1 - 15 days (17.2%). An equal distribution of 3.4% of the patients experienced pain for a duration of either 15-

30 days or 30 - 45 days or 45-60 days. The remaining 72.4 % did not experience pain (Figure 3). In regard to the nature of pain, the most common type of pain encountered was intermittent pain (17.2%) while 3.4 % experienced either nocturnal pain or spontaneous pain. (Figure 4). In terms of the tooth region, pain was more commonly associated with the lower posteriors (50.0%) followed by upper posteriors (37.5%) and upper anteriors (12.5%) (Figure 5)



**Figure 1:** This bar graph represents the percentage of patients with and without pain in relation to root canal treated teeth having instrument separation. X-axis represents the presence of pain (Yes-purple) and absence of pain (No - green); Y-axis represents the percentage of patients having instrument separation in their root canal treated tooth. Majority of the patients did not experience pain in relation to root canal treated teeth having instrument separation.



**Figure 2:** This bar graph represents the association between gender and presence/absence of pain in relation to root canal treated teeth having instrument separation. X-axis represents gender. Y-axis represents the number of patients with instrument separation in their root canal treated tooth. Purple bars - presence of pain (Yes); Green bars - the absence of pain (No). More number of female patients experienced pain compared to male patients. However gender did not influence the presence and absence of pain (Chi-square test; p-value=0.47, P>0.05, not significant).

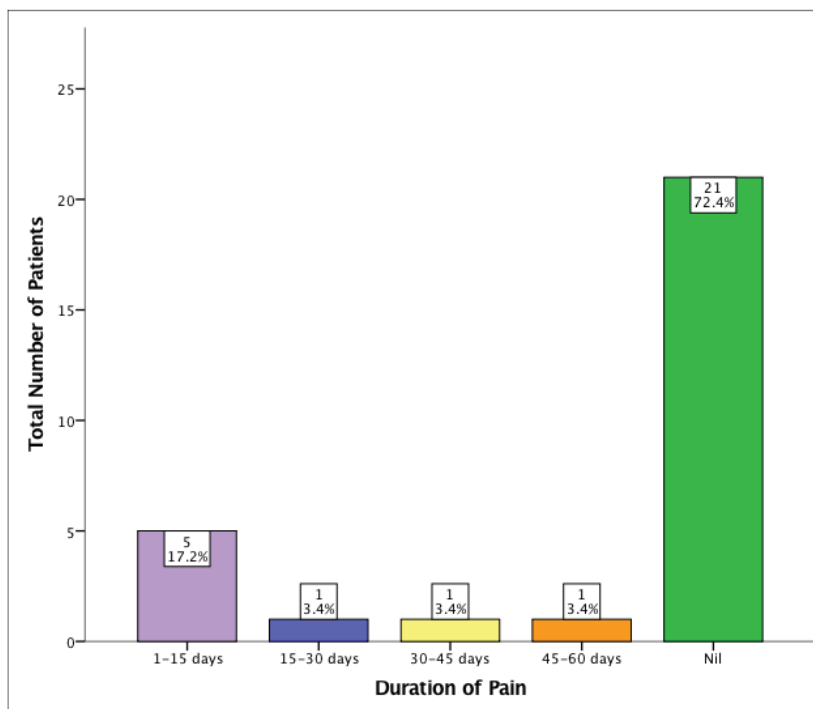


Figure 3: This bar graph represents the duration of pain experienced by the patients in relation to root canal treated teeth having instrument separation. X-axis represents the duration of pain experienced. Y-axis represents the total number of patients with instrument separation in their root canal treated tooth. Among the patients who reported pain, the majority of them experienced it for a duration of 1 to 15 days (Purple).

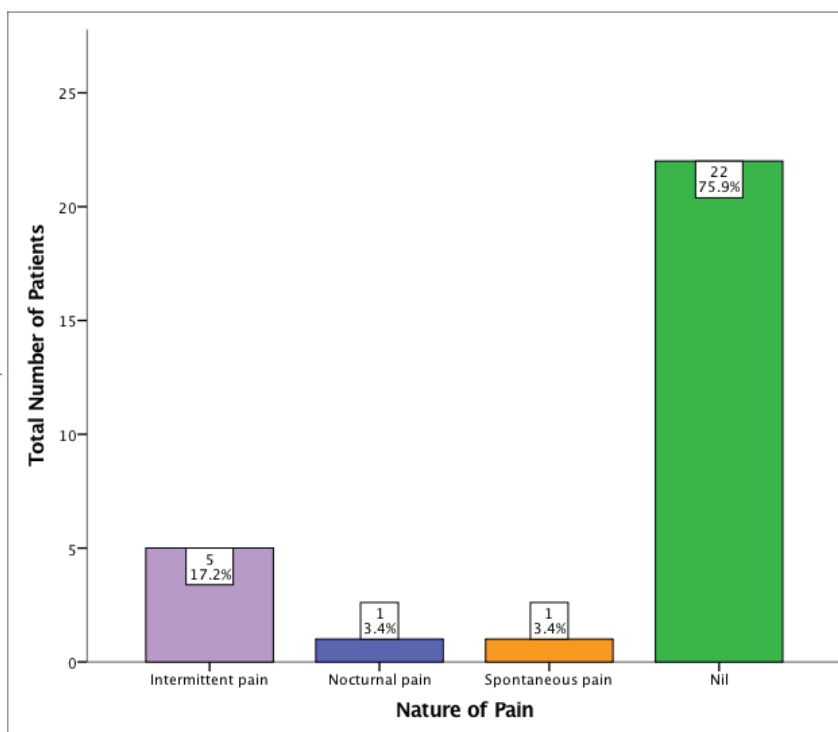
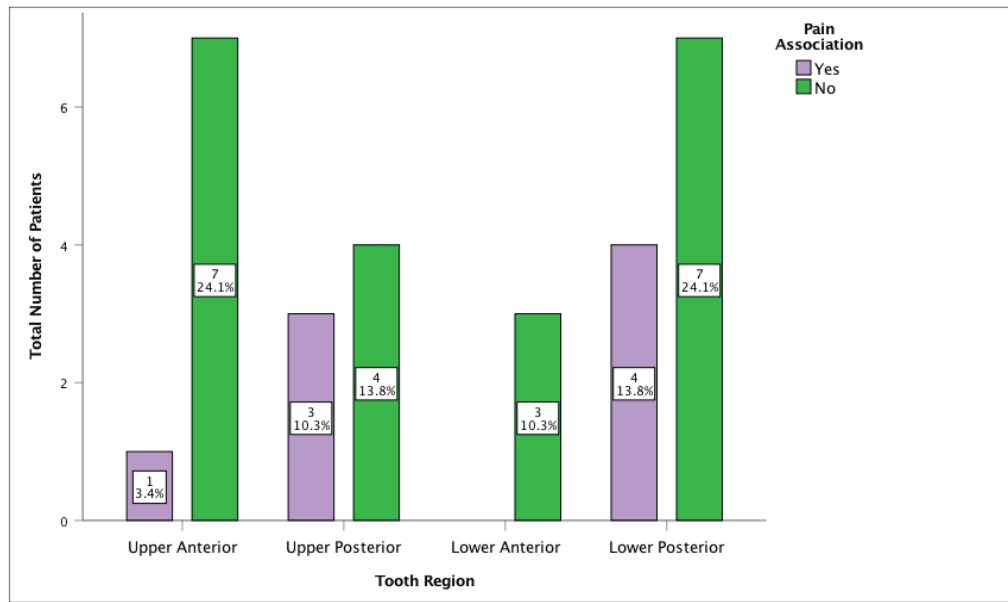


Figure 4: This bar graph represents the nature of pain experienced by the patients in relation to root canal treated teeth having instrument separation in a root canal treated tooth. X-axis represents the nature of pain. Y-axis represents the total number of patients with instrument separation in their root canal treated tooth. Among the patients who reported pain, the majority of them experienced intermittent pain (Purple).



**Figure 5: The graph represents the association between the tooth and presence / absence of pain in relation to root canal treated tooth having instrument separation. X axis represents the tooth region. Y-axis represents the total number of patients. Purple denotes presence of pain - Yes; and green denotes absence of pain - No. Among the teeth associated with pain, the majority of them were lower posterior teeth. However tooth involved did not influence the presence and absence of pain (Chi-square test; p-value=0.35, P>0.05, not significant)**

The presence of instrument breakage in a root canal treated tooth was seen to be higher in the male population compared to females. However, when it comes to pain association, females showed a higher prevalence compared to males. Based on a study done by Lipton et al, with similar findings to our study, he found that women experienced each symptom more often than men with only two exceptions- “toothache and oral sores” and “oral sores and burning mouth”.<sup>26</sup>

In the present study, intermittent pain was the most common type of pain experienced compared to nocturnal and spontaneous pain. Similar findings were reported by Arya et al, where they found that the patient had a history of episodic pain before reporting for the treatment. The reason behind this could possibly be because at different times, the nerve fibres can be stimulated either through mastication or even the type of food being consumed.<sup>27,28</sup>

Based on our study, patients experienced pain commonly at a duration of 1-15 days. A contrasting report by Arya et al showed that the patient had a history of pain for 1 month together with a history of incomplete root canal treatment. The reason behind the results of our

study could be explained through the limited sample size available as well as the ability of the patient to tolerate pain.<sup>27</sup>

The lower posteriors were the most common tooth in which pain was associated. Shenoy et al also stated that lower posteriors were found to be the most common site for pain. However, factors other than the anatomy of the tooth that can influence the incident of an instrument separation, includes the usage of Stainless steel / NiTi File, cyclic fatigue, number of instrument usage, rotational motions/reciprocating motion, presence of apical enlargement and the sequence of filing.<sup>21</sup>

During the course of this study, some limitations were encountered which included the limited time frame in which the study was conducted that was only for 10 months. The study demographic was also only limited to the city population. Further multicentric studies with larger sample size must be carried out to establish the association of pain with tooth having instrument separation.

## Conclusion

In the present study, pain in the root canal treated teeth with instrument separation was recorded in 27.6% of the cases, with higher predilection in the female population. The pain was more often associated with lower posteriors. However, gender and tooth did not influence the experience of pain.

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**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** It is taken from “Saveetha Institute Human Ethical Committee” (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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