

# Post-Operative Pain and Associated Factors in Patients Undergoing Single Visit Root Canal Treatment on Teeth with Vital Pulp

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## ABSTRACT

### Background

Pain after root canal therapy is unwanted yet common experience for the patient and unpleasant for the dentist so it is always desirable to predict such pain.

### Objective

To evaluate the frequency, intensity and associated factors of post-operative pain after single visit endodontic therapy on teeth with vital pulps.

### Method

A total of 418 single visit root canal treatments were performed on patients of age 18 years and above by two endodontists. Canals were shaped with rotary Pro-Taper files. After the canal preparation, the canals were obturated, using lateral compaction technique, with ProTaper universal gutta-percha and AH-Plus sealer. Independent factors were recorded during the treatment and characteristics of post-operative pain were later surveyed through questionnaires. The severity of pain was recorded on a visual analogue scale (VAS) of 0-5. The data were analyzed using logistic regression models.

### Result

The prevalence of post-operative pain within first six hours after treatment was high (79.2%) which decreased to 22% at the end of 72 hours however majority (70%) of the patients had mild to moderate pain (VAS 1-2). The factors that significantly influenced post-obturation pain experience were: gender (OR=0.55, 95%CI=0.32-0.93; p=0.03), tooth type (OR=0.67; 95% CI=10.56-0.81, p=0.00), history of pre-operative pain (OR=1.26; 95% CI= 1.04-1.51; p=0.02) and number of canals (OR=2.03; 95% CI=1.40-2.95; p=0.00).

### Conclusion

The prevalence of some level of post-operative pain after single visit root canal therapy was high and was significantly influenced by female gender, increased number of canals, posterior tooth type and positive history of pre-operative pain.

## KEY WORDS

*Pain, Post-operative pain, Root canal treatment, Single visit*

## INTRODUCTION

Pain after root canal treatment (RCT) is an undesirable yet a common experience for patients and is also unpleasant for the clinician. For patients, the post-operative pain (POP) might be a measure to judge the expertise of the clinician and result in poor patient- dentist relationship with decreased patient contentment.<sup>1</sup> Although the cause of POP cannot be determined specifically, the probable causes are mechanical, chemical or microbial injuries to the peri-apical tissue that result in acute inflammation.<sup>2</sup>

The goal of RCT is to remove the inflamed or necrotic pulp and eliminate bacteria from the root canal system and to prevent re-infection.<sup>3</sup> This can be performed either in single visit or multiple visits especially in tooth with vital pulp where the amount of micro-organism in the root canal is limited.<sup>4,5</sup> The severity of pain experienced by the patient in single visit root canal treatment has been studied by many but the results are contradictory. Furthermore, the factors associated with such pain have not been clearly investigated.<sup>4-11</sup>

Therefore, the aim of this study is to determine the incidence and intensity of post-operative pain after root canal treatment and evaluate its association with various clinical factors. The knowledge of these factors becomes important so as to either control such factors or prepare the patients for possibility of pain post operatively.

## METHODS

A descriptive longitudinal study was carried out at Department of Conservative Dentistry and Endodontics, Dhulikhel Hospital, Kathmandu University School of Medical Sciences, Dhulikhel from 1<sup>st</sup> February 2015 to 31<sup>st</sup> January 2016. A total of 418 patients visiting the department, fulfilling the inclusion criteria and who gave written consent to participate were included.

The research was conducted with approval of Kathmandu University School of Medical Sciences Institutional Review Committee (KUSMS/IRC).

The inclusion criteria were patients who were 18 years and above requiring RCT on single vital permanent tooth and who are literate and without any debilitating diseases. Teeth with periodontal diseases (confirmed clinically and with pre-operative radiographs) or having intra operative complications like canal calcification, or inability to achieve apical patency were excluded from the study. The procedures were carried out by two Endodontists (SR, SD).

The preoperative and intra-operative data were collected by the operators which included record of age, gender, tooth type, pre-operative pain, apical periodontitis and number of root canals.

After the confirmation of tooth being vital by thermal and electric pulp testing, all the patients were given local anesthesia (Lignocaine with adrenaline 1:200000; Neon Laboratories Ltd.). Access cavity was prepared with access opening bur set (Dentsply Maillefers) using an air turbine

hand-piece (NSK, Pana Air Fx) under water coolant. The affected tooth was isolated with a rubber dam.

Working length was determined with iPex II (NSK) which was reconfirmed by a radiograph. Canals were shaped with rotary Pro-Taper files (Dentsply Maillefers) with the final finishing file being F1 to F5 depending on the width of the canal. During the procedure Glyde (Dentsply Maillefers) was used as lubricant and copious amount of 3% sodium hypochlorite (NaOCl) (Hyposol, Prevest Den Pro) was used as irrigant.

After the canal preparation, the canals were obturated, using lateral compaction technique, with ProTaper universal gutta-percha (GP) and AH-Plus sealer (Dentsply Maillefers) and restored with temporary restorative material, Cavit (3M, ESPE).

After the treatment, the patients were informed that they could experience pain in the days immediately following treatment and were handed a questionnaire where they had to record presence and severity of pain over the first six hours (hrs), 24 hrs, 48 hrs and 72 hrs following the root canal obturation. The severity of pain was recorded on a visual analogue scale (VAS) of 0-5. The patients were also instructed to take analgesic (ibuprofen and paracetamol combination) only if they experienced pain. The patients were recalled after three days with the form for permanent restoration. A reminder phone call was made to all the patients to return with the filled form.

The VAS scoring of 0-5 was categorized as; 0 as no pain, 1 and 2 as mild pain (did not require intake of medication), 3 as moderate pain (required to take one tablet of analgesic), 4 and 5 as severe pain (required to take more than one tablet of analgesic).

The relationship between possible factors influencing the pain experienced by patients after root canal obturation was analyzed by bivariate logistic regression model using SPSS statistical software (version 16.0, SPSS Inc., Chicago, IL, USA).

## RESULTS

All the 418 patients who participated in this study returned the questionnaire (100% response rate). Some degree of POP occurred for majority of the patients (331/79.19%) at six hrs although the severity was low (VAS 1 and 2). Among those who had pain, only 4.22% had severe pain (VAS 4 and 5) during first six hours which reduced greatly in 24 hrs and none of the patients had severe pain after 24 hrs. Table 1 illustrates the incidence and severity of post-operative pain at six hrs, 24 hrs, 48 hrs and 72 hrs.

Results of incidence of POP at six hours and description of the characteristic of the patients based on pre-operative data are shown in Table 2.

The variables were individually analyzed using bivariate logistic regression model (Table 3). For the purpose of analysis the number of canals was broadly divided into single and multiple and tooth type into anterior and

**Table 1.** The prevalence and severity of post-operative pain reported by patients at 6 hrs, 24 hrs, 48 hrs and 72 hrs

Severity of pain	Six hrs		24 hrs		48 hrs		72 hrs	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
VAS 0	87	20.8	194	46.4	272	65.1	326	78.0
VAS 1	152	36.4	118	28.2	102	24.4	76	18.2
VAS 2	82	19.6	69	16.5	26	6.2	8	1.9
VAS 3	83	19.9	35	8.4	18	4.3	8	1.9
VAS 4	9	2.2	2	.5	0	0	0	0
VAS 5	5	1.2	0	0	0	0	0	0
Total	418	100.0	418	100.0	418	100.0	418	100.0

**Table 2.** Incidence of post-operative pain by preoperative data

Gender	Incidence of POP	
	No	Yes
Female	85	125
	109	99
Male	109	99
	109	99
Type of teeth	Anterior	
	Maxillary	25 0
	Mandibular	5 1
Premolar	Maxillary	33 84
	Mandibular	15 2
Molar	Maxillary	56 76
	Mandibular	60 61
Number of canals	One	44 8
	Two	34 88
	Three	76 70
	Four	40 58
Pre-operative pain	Yes	17 41
	No	70 290
Age group	18-30yrs	83 78
	31-50yrs	78 121
	>50yrs	33 25
Apical periodontitis	Yes	63 215
	No	24 116

posterior. In this study, gender (OR=0.55; CI=0.32-0.93; p=0.03), number of canals (OR=2.03; 95% CI=1.40-2.95; p=0.00), tooth type (OR=0.67; 95% CI=0.56-0.81; p=0.00) and preoperative pain (OR=1.26; 95% CI=1.04-1.51. p=0.02) were statistically associated with post-operative pain.

**DISCUSSION**

The 100% response in this study might have been because all the patients had to return for a permanent restoration after RCT and also may be because of a reminder phone call a day prior to the appointment.

In the present study, the POP was high (79.19%) especially at six hours post treatment. This is in agreement with the study by Calhoun and Lander, Levin et al, Marshal and Liesinger, Undoye and Jafarzadeh who found that POP is

**Table 3.** Relationship between clinical factors and post-operative pain: bivariate analysis

Variables	OR	95% C.I. for OR		P value
		Lower	Upper	
Gender	0.55	0.32	0.93	0.03
Age	1.01	0.99	1.03	0.45
Apical periodontitis	1.39	0.71	2.72	0.34
Number Of Canals	2.03	1.40	2.95	0.00
Tooth Type	0.67	0.56	0.81	0.00
Pre-operative pain	1.26	1.04	1.51	0.02

more common following treatment of teeth with vital pulp and in our study all the teeth were vital to start with.<sup>5,6,12,13</sup> Moreover, the higher frequency of POP in our study might be due to the fact that RCT was performed at a single visit and single visit treatment has also shown to result in higher frequency of POP.

Although other studies have shown lower frequency of pain even for single visit RCT, in such studies only the patients with moderate or severe pain (VAS 4 to 5) were included whereas the present study included all the patients who reported with any level of POP (VAS1 to 5).<sup>14,15</sup> Since we had included only those teeth with vital pulp, the comparison with other studies where condition of the pulp was highly varied should be perceived with caution. One hypothesis of higher incidence of POP in vital pulp is that the injury of peri-apical vital tissue during endodontic treatment in teeth with vital pulp promotes more intensive secretion of inflammatory mediator like prostaglandin, leukotrienes which are also pain mediators.<sup>16</sup> A smaller spectrum of VAS (0 to 5) was selected because the smaller categories have shown to provide greater clinical relevance for comparison than using its full spectrum.<sup>17</sup>

As concurrent with many other studies our current study also showed higher POP in female patients. The difference between the genders may be explained by difference in physiological reaction to pain by them.<sup>1,14,18</sup> Moreover it is stated that due to social expectation, men tend report less pain and tolerate pain more.<sup>19</sup>

The occurrence of POP was significantly associated with the presence of history of pre-operative pain in agreement with some studies and in disagreement with others.<sup>1,14,15,20-22</sup> Psychologically, patients arriving in dental clinic with pain

may be conditioned to expect pain during and after the treatment.<sup>15</sup> Besides, patients presenting with pain usually have inflamed peri-apical region which may become secondarily irritated during treatment causing more pain.<sup>21</sup>

Studies have shown that the teeth without apical periodontitis are more susceptible to POP.<sup>18,21,23</sup> This was justified by the fact that when peri-apical bone resorption is absent, there is lack of space for pressure release and thus more pain. This study found that the POP was more in cases with patients without apical periodontitis however significant association could not be found.

In the present study, it was found that posterior teeth were significantly more susceptible to POP, consistent with other studies.<sup>1,15,20</sup> The reason for this may be attributed to the complex morphology and greater number of root canals of posterior teeth which is more difficult to debride thoroughly and also increase the potential peri-apical pain foci.<sup>1,24</sup>

In this study, frequency and intensity of POP has been followed up only till 72 hrs. We do not know the maximum time the POP lasts. And, finally, pain is a subjective

perception, some patient might exaggerate the pain perception where as some patients understate it which creates bias during comparison between individuals.

## CONCLUSION

The prevalence of post-operative pain after single visit root canal therapy in vital teeth was high at first six hours. However, the intensity was low, and the post-operative pain was significantly influenced by female gender, increased number of canals, posterior tooth and positive history of pre-operative pain. The operator should be aware of such factors and the patients should be informed about the possibility of pain after endodontic treatment.

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