

# Comparison of Pain Observed with Sodium Hypochlorite and Chlorhexidine Based Root Canal Irrigant 24 Hours Post Appointment

Sadaf Amjad<sup>1</sup>, Zarah Afreen<sup>2</sup>, Ammarah Afreen<sup>3</sup>, Eruj Shuja<sup>4</sup>, Hassan Rasheed<sup>5</sup>, Sundas Rashid<sup>6</sup>

<sup>1</sup>Senior Registrar,  
Watim Medical & Dental College, Rawalpindi  
<sup>2,3,4</sup> Associate Professor,  
Watim Medical & Dental College, Rawalpindi.

<sup>5,6</sup> Registrar, Watim Medical & Dental College,  
Rawalpindi.

## Author's Contribution

<sup>1</sup> Conception of study  
<sup>1,3,5</sup> Experimentation/Study conduction  
<sup>1</sup> Analysis/Interpretation/Discussion  
<sup>3,5</sup> Manuscript Writing  
<sup>2,4,6</sup> Critical Review  
<sup>2,4,6</sup> Facilitation and Material analysis

## Corresponding Author

Dr. Sadaf Amjad,  
Senior Registrar,  
Watim Medical & Dental College,  
Rawalpindi.  
Email: sadafamjad986@gmail.com

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## Abstract

**Objective:** To compare the effectiveness of 2.5% sodium hypochlorite and 2% chlorhexidine, in reduction of frequency in pain 24 hours after endodontic treatment of teeth with chronic apical periodontitis

**Study design and Setting:** Randomized Clinical Trial conducted –removed for blind review–from July 2018 to December 2018.

**Materials and Methods:** A total of 60 patients requiring management of chronic apical periodontitis and pulp necrosis were randomly allocated by lottery method to two groups of 30 each according to the irrigating solution employed: Group A (2.5% sodium hypochlorite) or Group B (2% chlorhexidine gluconate). To assess inter-appointment pain, a questionnaire with visual analogue scale was filled out by the patient at 24 hours after the procedure. The Chi-square test was used to compare the effectiveness between the two irrigation solutions.

**Results:** Group A (2.5% sodium hypochlorite) was effective in 83.3% cases that is no or mild pain compared to 76.7% in group B (2% chlorhexidine). In group A, 5(16.7%) patients suffered pain compared to 7(23.3%) in group B. This difference in pain was statistically insignificant. (p-value 0.519).

**Conclusion:** Both 2.5% sodium hypochlorite and 2% chlorhexidine were equally effective in minimizing pain 24 hours post endodontic treatment.

**Keywords:** Chlorhexidine gluconate, Sodium hypochlorite, Symptom Flare up.

## Introduction

The optimal cleaning in a shaped canal is a perfect setup for filling and ensures success in endodontics, our primary goal.<sup>1</sup> One characteristic of success in root canal therapy is the reduction of inter appointment pain; however, the recurrent incidence of such pain which requires emergency treatment is of much concern to the endodontists.<sup>2</sup> Knowledge of the causes and mechanism behind inter-appointment pain is crucial to effectively prevent and manage such emergencies.

The instrumental reasons of inter appointment pain include chemical, microbial and/or chemical trauma to the pulp or periradicular tissues.<sup>3</sup> Removing the microbes increases the chances of a favorable endodontic outcome.<sup>4</sup> The prime reasons for periapical inflammation include extrusion of the infectious debris through the root apex and insufficient cleaning. Hence, a thorough elimination of the infectious and necrotic debris from root canals is extremely vital.<sup>5</sup>

Irrigation plays a fundamental role in preventing the occurrence of such infective flare ups as it helps in the removal of dentin chips, tissue remnants and microorganisms, tissue from the root canal space which instrumentation alone cannot adequately remove.<sup>6</sup> Other benefits of irrigation include lubrication of the canal, prevention of extrusion of infected material into the periapical space, impaction of those areas of root canal not accessible by mechanical instrumentation, improved cutting efficiency of files and cooling of the instruments and the tooth.<sup>7</sup>

The standard irrigant for disinfection and cleaning and of the root canal system is Sodium Hypochlorite (NaOCl) solution due to its tissue dissolution ability, antimicrobial effect and satisfactory biologic compatibility in less concentrated solutions however it has particular cytotoxic effects on periapical tissue in high concentrations.<sup>8</sup> As an alternative, 2% Chlorhexidine (CLX) has been suggested for its antimicrobial action, high substantivity and low toxicity but allergic reactions have been reported.<sup>9</sup> Gustavo et al. found no significant differences in post-operative pain when using either NaOCl or CLX ( $P > 0.05$ ).<sup>1</sup> Contrary to this, a study carried out by Mohammad Badar and his colleagues shows CLX to decrease the frequency of inter appointment pain as compared to NaOCl ( $P = 0.0001$ ).<sup>10</sup>

Therefore, the aim of this study is to clear this ambiguity and to compare the influence of NaOCl and

CLX on the frequency of inter appointment pain in a local environment.

## Materials and Methods

It was a randomized clinical trial and ethical approval was obtained before study commencement from the institute. Inclusion criteria consisted of both female and male patients with age ranging from 18 to 60 years with a diagnosis of chronic apical periodontitis with periapical bone loss and apical patency. Patients must have taken no anti-inflammatories, antibiotics or analgesics for at least 1 week before the study treatment and had no preoperative pain to be eligible for inclusion in this study. Exclusion criteria consisted of patients with deep periodontal pockets, calcified teeth, persistent exudate, partial root formation, failure to achieve apical patency and those patients suffering from immunosuppression.

A total of 60 patients requiring treatment of apical periodontitis and pulp necrosis were selected for this study centered on the above mentioned criteria and randomly assigned by lottery method into two groups according to the selection used for irrigation: 2.5% sodium hypochlorite (Tehno Dent Antiseptic Liquid No.2) or 2% chlorhexidine (CHX-Plus™) (30 patients in each group). Root canal treatment was undertaken using standardized methods. Once caries affected tissue was removed and isolation achieved by a rubber dam, access to the root canal was established. The chosen irrigant was then used to flood the pulp chamber by means of a 5-ml disposable syringe making sure that the needle does not bind while delivering irrigants. Instrumentation was performed with a step back technique. A size 10 or size 15 K file was employed for establishing working length at 0.5-1.0mm of apical foramen on a periapical radiograph. Hand files were used for canal preparation. After removal of each file, the canal was irrigated with 1.5-2.0ml of the designated irrigant. Canals were dried with paper points and left empty. The pulp chamber was then closed with sterile cotton and Zinc Oxide Eugenol temporary restoration Cavit. Each patient received a questionnaire for assessment of pain (on a self-explanatory scale) to be filled out at 24 hours after the appointment and to be brought along at the time of next appointment.

To analyze the data statistical package for social science (SPSS version 17) was used. Age and VAS was measured as mean Standard Deviation. Frequency of the variables namely gender and effectiveness was also recorded. To compare the effectiveness between

the groups Chi-square test was applied. The significance level was set at  $p \leq 0.05$ .

## Results

In this study a total (n) of 60 patients were included for a period of 6 months from July 2018 to December 2018 diagnosed with chronic apical periodontitis. They were randomly assigned by lottery method into two groups i.e. Group A (2.5% sodium hypochlorite) n=30 and Group B (2% chlorhexidine) n=30. The gender distribution was comparable between the two groups. In both the groups there were 13(43.3%) males and 17(56.7%) females.

For the purpose of analysis we categorized age in decades of life. The most common age group, in both the groups was 18-30 years. In Group A, there were 13 (43.3%) patients between 18 to 30 years, 9 (30%) between 31 to 40 years, 4(13.3%) between 41 to 50 years and 4(13.3%) between 51 to 60 years. In Group B, there were 16(53.3%) patients between 18 to 30 years, 7(23.3%) between 31 to 40 years, 4(13.3%) between 41 to 50 years and 3 (10%) between 51 to 60 years. The mean age of the patients in Group A was  $34.30 \pm 11.8$  years and in Group B was  $32.8 \pm 12.4$  making it statistically insignificant (p value 0.633)

The mean VAS was equivalent between the two groups. The mean VAS of the patients in Group A was  $1.77 \pm 1.79$  and in Group B was  $1.93 \pm 2.02$ . This difference was statistically insignificant (p-value, 0.736). (Table 1)

As per study objective, we compared frequency of pain between the two groups. The main outcome variable was occurrence of pain at 24 hours after endodontic treatment. Group A (2.5% sodium hypochlorite) was effective in 83.3% cases i.e. no or mild pain compared to 76.7% in group B (2% chlorhexidine). In group A, 5(16.7%) patients suffered pain compared to 7(23.3%) in group B. This difference in pain was also statistically insignificant, p-value 0.519. (Table 2)

The percentage of patients who reported with pain in age category of 18 - 30 years was 15.4% in group A and 18.8% in group B (p-value=1.0). In 31-40 years category 22.2% of the patients in group A had pain compared to 42.9% in group B (p-value=0.59), in 41-50 years category 25% of the patients in group A versus 0% in group B (p-value=1.0) and in 51-60 years category 0% in group A and 33.3% in group B (p value=0.42) suffered with pain. Hence, the incidence of pain among the four age categories was statistically insignificant (Table 3).

The percentage of females complaining of pain in group A was 17.6% and in Group B was 29.4% with a p-value of 0.68 which is statistically insignificant. Likewise, the percentage of males with pain in both group A and group B was equal (15.4%) having a p-value of 1.0 making it a statistically insignificant result (Table 4).

**Table 1: Comparison of mean VAS in Study Groups**

Variable	Group A (2.5% sodium hypochlorite) n=30	Group B (2% chlorhexidine) n=30	p-value
Mean	1.77	1.93	0.736
Standard Deviation	1.79	2.02	

**Table 2: Comparison of effectiveness of Irrigant in Study Groups**

Variable	Group A (2.5% sodium hypochlorite) n=30	Group B (2% chlorhexidine) n=30	P-value
Effective	25(83.3%)	23(76.7%)	0.519
Not effective	5(16.7%)	7(23.3%)	

**Table 3: Stratification of gender according to effectiveness between the two groups**

		Not effective (n=12)	Effective (n=48)	p-value
Female	Group A	3 (17.6%)	14 (82.4%)	0.68
	Group B	5 (29.4%)	12 (70.6%)	
Male	Group A	2 (15.4%)	11 (84.6%)	1.0
	Group B	2 (15.4%)	11 (84.6%)	

**Table 4: Stratification of age according to effectiveness between the two groups**

		Not effective (n=12)	Effective (n=48)	p-value
18-	Group A	2 (15.4%)	11 (84.6%)	1.0
30	Group B	3 (18.8%)	13 (81.2%)	
31-	Group A	2 (22.2%)	7 (77.8%)	0.59
40	Group B	3 (42.9%)	4 (57.1%)	
41-	Group A	1 (25.0%)	3 (75.0%)	1.0
50	Group B	0 (0.0%)	4 (100.0%)	
51-	Group A	0 (0.0%)	4 (100.0%)	0.42
60	Group B	1 (33.3%)	2 (66.7%)	

## Discussion

The target of root canal treatment is to inhibit or eradicate infection within the root canal system.<sup>11</sup> Local wound debridement of the contaminated pulp space is the pivotal phase in root canal treatment to prevent the tooth from being a cause of infection. Irrigation of the canals is essential since mechanical cleaning on its own will not free the root canals of microbes, regardless of whether manual or rotary instruments are employed. To reach all mechanically inaccessible areas of the root canal system, for removal of the smear layer and the biofilm and even for penetration of the dentin, a rigorous antimicrobial irrigation regimen is crucial.<sup>12</sup>

Flare-up is an unpleasant experience for most patients, which brings doubt about their dentist skills as his ability is often mostly judged by the achievement or failure of pain control. Complications such as pain, swelling or both may occur despite cautious and vigilant treatment procedure. Inter-appointment pain is caused by a breach in the integrity of the periapical tissues. This can occur during root canal treatment owing to various mechanical, chemical and/or microbial causes.<sup>13</sup> Maximum cases of flare up occur due to acute periradicular inflammation (acute apical periodontitis or acute periradicular abscess), secondary to intracanal procedures. An influx of inflammatory cells and mediators is initiated which then eventually consequences in pain.<sup>14</sup>

A total of 60 patients diagnosed with chronic apical periodontitis from Rawal Institute of Health Sciences were included in this study and were randomly divided into two groups of 30 cases each. Group A received 2.5% sodium hypochlorite as the irrigation solution and Group B received 2% chlorhexidine as the irrigation solution. In this study both males and females were in equal distribution between the two groups hence there was no statistically noteworthy difference in gender distribution between them. The greatest number of patients was in the age range of 18 to 30 years in both the groups. The difference in age between the two groups was statistically insignificant. Parallel to our study, Zarei and Bidar also reported no statistically significant dissimilarity between different age groups in the incidence of flare-ups with a P-value of 0.609.<sup>15</sup> A similar result was seen in a study carried out by Onay et al. The statistical difference was insignificant between the various age categories (p value=0.394) and gender (p value=0.584).<sup>12</sup> ElMubarak et al show contrasting results, reporting that post-operative pain was a more frequent finding among

younger patients (18-33 years old).<sup>16</sup> The flare up rate was also found to be greater in younger groups 6% compared to older groups' 0% by Kalhoro and Mirza.<sup>17</sup> This can be theorized to the reduction of diameter size of the root canals with age therefore reducing the amount of debris that can be extruded through the root apex and decreasing the incidence of post-operative sensitivity and flare up in older patients.<sup>18</sup> A retrospective study by Torabinejad showed a significant positive correlation of flare-ups with patients' ages of between 40 and 59 years and female patients. In general, compared to male patients females have a higher sensitivity to pain after endodontic treatment. This greater incidence of flare ups observed in female patients may be attributed to the fact that women tend to remember and feel the discomfort after RCT even when they undertake the same treatment. This might have led to more female cases of flare-ups being reported by this prospective study. Pain toleration and threshold are dependent on sexual hormones (cortisol) and their amount during different stages of menstrual cycle which take part in mechanisms that are accountable for processing the pain.<sup>19</sup>

Depending on the various criteria used in different studies numerous incidences of postoperative pain and flare-ups have been reported. Our study had flare-up rate of 16.7%. However a study by Genet et al. in 1987 observed a 27% flare-up rate in all treated cases. He established a positive association between the occurrence of preoperative pain and the incidence of post-operative pain.<sup>20</sup> On VAS scores, neither of the irrigant was superior over the other in decreasing the frequency of pain in our study and this was parallel to a study carried out by Kusum Bshetty and Jayshree Hegde (p-value 0.659).<sup>21</sup> Qazi et al. compared NaOCl to saline as root canal irrigant with statistically insignificant difference between their mean VAS readings (p-value 0.62).<sup>22</sup>

As per the primary outcome of the study; to compare the effectiveness of irrigant in reduction of frequency in pain 24 hours after endodontic treatment, both irrigants were equally effective in our study. Gustavo et al. found a similar result in their study in which 78% patients irrigated with 5.25% NaOCl had no pain and 81% patients irrigated with 2% CLX reported absence of pain.<sup>23</sup> Zarei and Bidar came to the same conclusion since in their study 60% of patients with CLX as the irrigant were pain free and 65% of patients with NaOCl as the irrigant had no flare-up. The P-value was 0.8 making it statistically insignificant.<sup>24</sup> According to Onay and his colleagues, the occurrence of

flare up with sodium hypochlorite was 28% and with chlorhexidine was 4% but statistically the difference was insignificant with a p value of 0.113.<sup>25</sup> On the contrary, Mohammad Badar and his colleagues reported chlorhexidine decreased the frequency of inter-appointment pain as compared to sodium hypochlorite. 70% of the patients experienced moderate pain in the sodium hypochlorite group as opposed to no patient recording any pain in the chlorhexidine group after 24 hours (P-value of 0.0001). This could be because of the high concentration of cytotoxic sodium hypochlorite used (5.25%).<sup>10</sup>

There are many advantages of the present study as this is a randomized clinical trial which uses rigorous research method that eliminate or reduce the bias. Reasonable numbers of patients enroll in each study group. The follow up period of 24 hours is short and coincided with the patients' next appointment. The study carried out in a tertiary hospital in Islamabad allowed us to evaluate the results in our setting. There were certain limitations of this study as well. Flare-up has multifactorial causes and the number of variables used in our study was very limited. To further explore this topic studies are needed which evaluate a larger number of variables.

## Conclusion

Based on our results we conclude that there is no difference in effectiveness between the two irrigants i.e. 2.5% sodium hypochlorite and 2% chlorhexidine, in terms of reduction in frequency of pain 24 hours after root canal treatment of teeth with chronic periapical periodontitis.

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