

Original Research

Evaluation Of The Postoperative Pain At Various Temperatures Of The Sodium Hypochlorite Irrigation: An Original Research

¹Amit Chhapparwal, ²Hirdepal Singh Brar, ³Disha Desai, ⁴Ashish Choudhary, ⁵Bhupendra Singh Rathore, ⁶Heena Dixit

¹Senior Resident, Department of Dental Surgery, Sardar Patel Medical College, Bikaner, Rajasthan, India;

²Consultant OMFS, Faridkot, Punjab, India;

³Final year BDS, Drs. Sudha and Nageswara Rao Siddhartha Institute of Dental Sciences, Andhra Pradesh, India;

⁴Senior Research Associate, Department of Dentistry, AIIMS, Jodhpur, Rajasthan, India;

⁵Senior Resident doctor at UCTH & RC Ujjain, M.P, India;

⁶Government Dental Surgeon, CHC Makdi, Kondagaon, Chhatisgarh, India

ABSTRACT:

Introduction: Sodium hypochlorite-NaOCl antimicrobial effectiveness, such as passive ultrasonic irrigation as a supplementary disinfecting step and using NaOCl with a higher concentration, volume or temperature may increase its effectiveness. To evaluate the postoperative pain at various temperatures of the sodium hypochlorite irrigation. **Material and Methodology:** Ninety subjects were selected and made to three groups who were treated with NaOCl 2°C, NaOCl 25°C, NaOCl 45°C irrigant. The root canal treatments were completed and the participants were given instructions to record postoperative pain levels at 24, 48 and 72 hours, 5 days and 1 week after treatment using a visual analog scale (VAS). Bacterial loads were studied before- S1 and after the therapy - S2. **Results:** The reduction in the number of total bacterial cell equivalents from S1 to S2 was statistically significant in all groups ($p < 0.001$). The NaOCl 2°C group reported significantly less postoperative pain than the NaOCl 45°C group ($p < 0.05$). Postoperative analgesic intake was significantly higher in the NaOCl 45°C group than in the NaOCl 2°C group ($p < 0.05$). **Conclusion:** It can be concluded that final irrigation with NaOCl at different temperatures results in similar antibacterial effectiveness. Final irrigation with cold NaOCl (2°C) is better than NaOCl 45°C when comparing postoperative pain levels.

Keywords: Antibacterial activity, Sodium hypochlorite, efficiency, temperatures.

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Corresponding author: Amit Chhapparwal, Senior Resident, Department of Dental Surgery, Sardar Patel Medical College, Bikaner, Rajasthan, India

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INTRODUCTION

Several attempts have been made to increase Sodium hypochlorite-NaOCl antimicrobial effectiveness, such as passive ultrasonic irrigation as a supplementary disinfecting step and using NaOCl with a higher concentration, volume or temperature.¹⁻³ Due to the ability of NaOCl to kill microorganisms in seconds, and the lack of information about the clinical antibacterial efficacy of preheated NaOCl, it is important to investigate if preheated NaOCl exerts an additional antibacterial effect and affects the postoperative pain level clinically, since the temperature of the irrigation

solution is known to affect postoperative pain.⁴⁻⁶ Consequently, there are no clinical studies to support the use of preheated NaOCl for root canal irrigation. Our randomized controlled clinical study aimed to evaluate the effect of final irrigation of root canals with NaOCl solution at different temperatures on postoperative pain level and antimicrobial activity. The null hypothesis was that the solution temperature does not change the solution antibacterial effectiveness or the postoperative pain level in patients presenting teeth with asymptomatic apical periodontitis.

MATERIAL AND METHODOLOGY

We selected 100 subjects with equal gender distribution for the study. After the patient consent and the ethical clearance the study was conducted. Only single canal teeth were selected that were to be restored with root canal therapy. Only the teeth with no other periodontal conditions were selected for the study. Periodontitis and any health conditions were excluded for the study. The routine root canal therapy was performed. The bacterial levels in the canal were collected and then were measured with the PCR test before (S1) the irrigation with the NaOCl, and after the finish of the irrigation with NaOCl (S2). Then the paper points were transferred to a tube containing a Tris-EDTA buffer. Any contact between the paper points and the cavity walls was avoided to prevent contamination during transfer of the paper points into the tubes. The irrigation was done for three different temperatures- NaOCl 2°C, NaOCl 25°C, NaOCl 45°C. After that, 2 mL of 0.5% sodium thiosulfate was used to inactivate the NaOCl and then the root canals were finally irrigated with distilled water. Later the obturation was completed. The pain levels

at 24, 48 and 72 hours, 5 days and 1 week after treatment using a visual analog scale (VAS) were recorded. Appropriate statistical tools were applied to the findings keeping the significance level of $p=0.05$.

RESULTS

In the NaOCl 2°C, 25°C and 45°C groups, a mean number of 6.47×10^6 , 5.18×10^6 and 5.76×10^6 bacterial counts in S1 was decreased to a mean of 3.66×10^5 , 2.7×10^5 and 3.31×10^5 bacterial counts in S2, respectively. The reduction in the number of total bacterial cell equivalents from S1 to S2 was statistically significant in all groups ($p < 0.001$). The percentage of reduction was 94.7, 95 and 93.9 for the NaOCl 2°C, 25°C and 45°C groups, respectively. There was no statistically significant difference among the groups in terms of percentage of reduction of total bacterial counts ($p > 0.05$). Table 1. The mean postoperative pain level was 6.67 ± 10.722 , 16.87 ± 27.604 and 40.0 ± 50.709 for the NaOCl 2°C, 25°C and 45°C groups, respectively. (Table 2). Statistical analysis showed that the NaOCl 2°C group reported significantly less postoperative.

Table 1- Changes in Total Bacterial Counts during Treatment

	S1	S2	Reduction (%)	p-value
NaOCl 2°C				
Mean	6.47×10^6	3.66×10^5	94.7	0.001
Median	6.78×10^6	3.94×10^5		
Range	$1.35 \times 10^5 - 8.21 \times 10^6$	$0 - 6.21 \times 10^5$		
NaOCl 25°C				
Mean	5.18×10^6	2.7×10^5	95.0	0.001
Median	5.55×10^6	3.01×10^5		
Range	$3.22 \times 10^6 - 6.69 \times 10^6$	$0 - 5.11 \times 10^5$		
NaOCl 45°C				
Mean	5.76×10^6	3.31×10^5	93.9	0.001
Median	5.89×10^6	3.81×10^5		
Range	$3.22 \times 10^6 - 7.47 \times 10^6$	$0 - 5.58 \times 10^4$		
p value	0.072	0.384	0.418	

Table 2- Postoperative pain levels according to the groups

	NaOCl 2°C	NaOCl 25°C	NaOCl 45°C	P value
1st Day	6.67 ± 10.722	16.87 ± 27.604	40.0 ± 50.709	0,03
2nd Day	8.13 ± 10.176	14.13 ± 27.118	25.0 ± 35.355	0,219
3rd Day	4.13 ± 7.726	10.13 ± 17.221	18.33 ± 19.97	0,059
5th Day	15.40 ± 18.715	18.07 ± 29.173	11.67 ± 26.502	0.784
7th Day	0	0	3.33 ± 8.797	0,129

DISCUSSION

We observed that the effect of NaOCl with different temperatures on elimination of bacteria from root canals and postoperative pain level. According to the results of our study, chemo-mechanical preparation and final irrigation with EDTA + NaOCl was highly effective in significantly reducing the intracanal bacterial counts, irrespective of the NaOCl temperature. This is in accordance with previous studies, which reported statistically significant

reduction of bacterial counts by chemo-mechanical preparation.^{4, 10, 18} However, there was no statistically significant difference among the groups, when comparing NaOCl with different temperatures, in the removal of bacteria from root canals. Several studies investigated the antibacterial effect of NaOCl with different temperatures and contradictory results have been reported.⁴⁻¹² Giardino, et al.¹⁰ (2016) demonstrated better NaOCl antibacterial efficacy at 45°C than at 20°C. The methodological differences

mentioned above could explain the difference in the findings of our study and the previous ones.¹³⁻¹⁸ Our findings could be explained by the strong antibacterial effect and the NaOCl concentration (1%) used in our study was efficient for killing sufficient bacteria in the root canal system. NaOCl can kill bacteria even at concentrations lower than 0.1%. Additionally, and consistent with our results, Carpio-Perochena, et al.⁹ (2015) compared NaOCl solutions with a concentration of 1% at different temperatures (22°C and 37°C) in terms of antibacterial efficacy and concluded that the temperature variation of the NaOCl is not relevant in killing or dissolving bacterial biofilms. Our study also evaluated the effect of the NaOCl at different temperatures on the level of postoperative pain. Cryotherapy leads to reduced cellular metabolism by dropping local temperature, which causes reduced blood flow.¹⁶ This means that using preheated NaOCl for root canal irrigation results in a higher postoperative pain value. One of the limitations of our study is that the temperature of the solution in the root canal was not constant during the irrigation procedure.

CONCLUSION

From our study it can be concluded that preheating NaOCl does not provide any extra antibacterial effect and results in a higher postoperative pain value than the cold NaOCl when used for final irrigation of root canals of teeth with asymptomatic apical periodontitis.

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