

## Original Research

### Evaluation of ultrasonic irrigation and syringe irrigation- A comparative study

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#### ABSTRACT:

**Background:** Disinfection of the root canal system is a specific requirement for endodontic treatment success. The present study was conducted to compare ultrasonic irrigation and syringe irrigation in clinical and laboratories study. **Materials & Methods:** 2 groups of 30 teeth each was made. In group I, ultrasonic irrigation and in group II, syringe irrigation was performed. The incidence of pain, quality of root canal filling and the number of obturated lateral canals were recorded. **Results:** The mean irrigation time in group I was 130.4 seconds and in group II was 216.2 seconds. There were 6 cases in group I and 3 cases of incidence of pain in group II. The difference was significant ( $P < 0.05$ ). In group I, appropriate filling was seen in 24 and under filling in 6 cases and in group II, appropriate filling was seen in 23, over filling in 3 and under filling in 4 cases. The difference was significant ( $P < 0.05$ ). **Conclusion:** Ultrasonic irrigation was effective in cleaning instrumented root canals than syringe irrigation.

**Key words:** Syringe irrigation, Root canal treatment, Ultrasonic irrigation

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#### INTRODUCTION

Disinfection of the root canal system is a specific requirement for endodontic treatment success. Irrigant penetration in the canal system depends on the root canal anatomy, irrigant application techniques, solution volume, root canal instrumentation and irrigant's physico-chemical characteristics.<sup>1</sup> Sodium hypochlorite (NaOCl) and chlorhexidine (CHX) are the most commonly used irrigants, and they are sometimes combined with ethylenediaminetetraacetic acid (EDTA) or other chelating agents. Different studies showed that the use of NaOCl between 2.5% and 5%, combined with 10 - 17% EDTA solutions, is particularly effective in the elimination of organic and inorganic debris.<sup>2</sup>

Ultrasonically activated files usually oscillate at frequencies exceeding human hearing. There are two types of ultrasonic irrigation, with or without simultaneous ultrasonic instrumentation: ultrasonic

instrumentation (UI) and passive ultrasonic irrigation (PUI). Syringe irrigation has been used for decades in clinical practice. In comparison, however, ultrasonic irrigation achieves better removal of artificially created dentinal debris from simulated canal irregularities in the root canal following preparation.<sup>3</sup>

Passive ultrasonic irrigation (PUI) has showed to be more effective than conventional irrigation in cleaning and disinfecting root canals. PUI-activated irrigation produces acoustic microwaves, cavitation and heat generation, that helps the irrigant to access to the difficult-to-reach places, favouring the elimination of dentinal debris, opening tubules and maximizing the irrigant antibacterial effect, because it can spread better along the root canal system. There are some variants in this technique. Ultrasonic intermittent activation, used with three 20 seconds sequences, removed more dentinal debris than conventional syringe

irrigation.<sup>4</sup>The present study compared ultrasonic irrigation and syringe irrigation.

**MATERIALS & METHODS**

The present study was conducted among 60 single rooted mandibular premolars. The study was approved from institutional ethical committee.

2 groups of 30 each was made. In group I, ultrasonic irrigation and in group II, syringe irrigation was performed. After instrumentation with a K-file using the step-back technique, the two groups received irrigation using 40 mL of 2.5% NaOCl respectively, followed by conventional lateral compaction. All teeth were evaluated histologically by light microscopy. The incidence of pain, quality of root canal filling and the number of obturated lateral canals were recorded. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of teeth**

Groups	Group I	Group II
Method	Ultrasonic irrigation	Syringe irrigation
Number	30	30

Table I shows distribution of teeth based on method of irrigation used.

**Table II Comparison of irrigation time in both groups**

Groups	Mean time (Seconds)	P value
Group I	130.4	0.001
Group II	216.2	

Table II, graph I shows that mean irrigation time in group I was 130.4 seconds and in group II was 216.2 seconds. The difference was significant (P< 0.05).

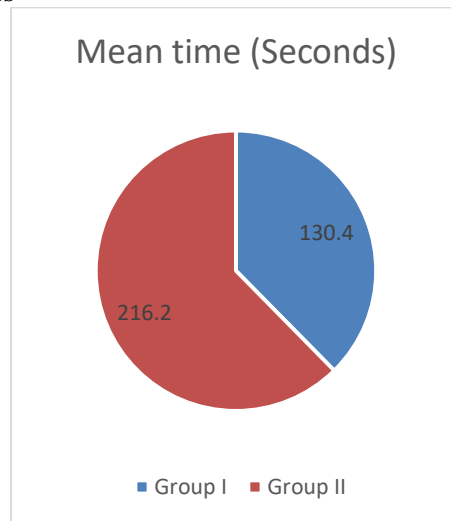
**Table III Comparison of pain in both groups**

Groups	Number	P value
Group I	6	0.001
Group II	3	

Table III shows that there were 6 cases in group I and 3 cases of incidence of pain in group II. The difference was significant (P< 0.05).

Table IV, graph II shows that in group I, appropriate filling was seen in 24 and under filling in 6 cases and in group II, appropriate filling was seen in 23, over filling in 3 and under filling in 4 cases. The difference was significant (P< 0.05).

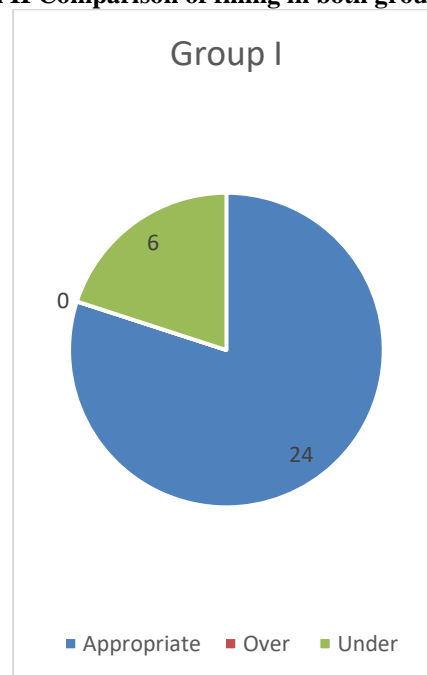
**Graph I Comparison of irrigation time in both groups**



**Table IV Comparison of filling in both groups**

Filling	Group I	Group II	P value
Appropriate	24	23	0.001
Over	0	3	
Under	6	4	

**Graph II Comparison of filling in both groups**



**DISCUSSION**

Endodontic therapy, also termed root canal therapy, involves removal of infected tissue and protection of decontaminated teeth. The root canal system has a complicated anatomical structure, comprising several

irregular structures in the root canal wall. Therefore, root canal irrigation is of great importance for eliminating infected pulp tissue, and removing the smear layer and dentinal debris resulting from root canal filing. Currently, an ultrasound oscillation frequency of 30 KHz, with displacement amplitude of 20 - 30  $\mu\text{m}$ , is recommended. It seems that a volume increase does not significantly improve washing action and effectiveness in debris removal. The efficacy of irrigation relies on both the flushing action of the irrigant and its capacity to dissolve infected tissue.<sup>5</sup> The present study compared ultrasonic irrigation and syringe irrigation in clinical and laboratories study.

In present study, in group I, ultrasonic irrigation and in group II, syringe irrigation was performed. A number of investigations have shown that removal of the smear layer exacerbates the penetration of bacteria into the dentinal tubules, suggesting that the smear layer might serve as a barrier against bacterial infection.<sup>6</sup> Nonetheless, others argue that the smear layer might compromise the therapeutic effect of intra-canal medications by impeding the penetration of medications into the dentinal tubules, thus protecting bacteria already present there. Besides, the smear layer itself may also be infected by bacteria located within dentinal tubules. Therefore, it is considered prudent to eliminate the smear layer covering the infected root canals.<sup>7</sup>

We found that mean irrigation time in group I was 130.4 seconds and in group II was 216.2 seconds. There were 6 cases in group I and 3 cases of incidence of pain in group II. Llana et al<sup>8</sup> included thirty extracted human teeth which were divided into three groups. According to final irrigation regimen, 5.25% sodium hypochlorite (Group A, NaOCl), 2% chlorhexidine (Group B, CHX) and saline solution (Group C, control group) were applied with Irrisafe 20 tips (Acteon) and PUI. Irrigant was mixed with 0.1% rhodamine B. Sections at 2 mm, 5 mm, and 8 mm from the apex were examined with confocal laser scanning microscopy (CLSM). The percentage and maximum depth of irrigant penetration were measured. In all groups, highest penetration depth and percentage of penetration were observed at the 8 mm level. At 2 mm level, Groups A and B had significantly greater depths and percentages in penetration than Group C ( $p < 0.05$ ), but there were no significant differences between Groups A and B. At 5 mm level, penetration depths and percentage of penetration was not significantly different among the groups.

We found that in group I, appropriate filling was seen in 24 and under filling in 6 cases and in group II, appropriate filling was seen in 23, over filling in 3 and under filling in 4 cases. Syringe irrigation has been used for decades in clinical practice.<sup>9</sup> In comparison, however, ultrasonic irrigation achieves better removal of artificially created dentinal debris from simulated

canal irregularities in the root canal following preparation.<sup>10</sup> Results from scanning electron microscopy (SEM) observations support the superiority of PUI over syringe irrigation for elimination of debris from the root canal, even with a lower concentration of sodium hypochlorite (NaOCl) solution.<sup>11,12</sup>

## CONCLUSION

Authors found that ultrasonic irrigation was effective in cleaning instrumented root canals than syringe irrigation.

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