



EFFICACY, CLEANING ABILITY OF PASSIVE ULTRASONIC IRRIGATION IN NON-SURGICAL ENDODONTIC RETREATMENT WITH AND WITHOUT SOLVENT USING STEREO MICROSCOPE – AN IN-VITRO STUDY

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ABSTRACT **AIM:** This in-vitro study aims to evaluate the effectiveness of passive ultrasonic irrigation in endodontic retreatment with and without solvent using a stereomicroscope. **MATERIAL AND METHODS:** A total of 50 extracted maxillary lateral incisors were obturated with gutta-percha and AH plus sealer. Retreatment was done with or without using solvent and either with syringe irrigation or passive ultrasonic irrigation. The roots were split longitudinally and were observed under a stereomicroscope. All the specimens were evaluated for the presence of residual filling material. The data were analyzed by One way ANOVA followed by Tukey's post hoc was used for intergroup comparison. **RESULTS:** Passive ultrasonic irrigation subgroup without using Xylene as a solvent group showed better, cleaner canals than with Xylene as a solvent group, and similarly syringe irrigation group without solvent showed better cleaner canals than with Xylene as a solvent group. **CONCLUSION:** Both ultrasonic and syringe irrigation showed cleaner canals when Xylene was not used. Hence, Xylene should be utilized only when mechanical methods fail to achieve retrieval of Guttapercha in retreatment cases.

KEYWORDS : Passive ultrasonic irrigation, Retreatment, Xylene, Stereomicroscope.

INTRODUCTION:

The system of root canals features complex anatomy that has got to be chemically and mechanically prepared before obturation. Endodontic pathologies include inflammatory and infectious processes related to bacteria, fungi, and viruses.

During endodontic treatment, various clinical factors influence the success or failure of endodontic therapy.¹ The persistence of bacteria in the root canal system is the consequence of insufficient biomechanical preparation, inadequate obturation, re-infection of the root canal or coronal leakage are the main cause of endodontic failure making retreatment necessary.

A growing interest in endodontic retreatment has been seen as a result of an increasing demand to preserve teeth. Non-surgical endodontic retreatment should be preferred over endodontic surgery.²

Conventional root canal retreatment is one of the greatest technical difficulties since filling materials represent a mechanical barrier and their removal can be time and energy-consuming. Endodontic retreatment requires regaining access to the root canal system, by removal of Guttapercha using various methods like endodontic hand files, heated instruments, ultrasonic instruments, and engine-driven rotary files followed by proper biomechanical preparation, and obturation of root canal system.³

Ultrasonics are applied in endodontic retreatment procedures mainly as an adjunct to assist with the removal of filling materials. The technique is based on a combination of irrigation and ultrasonic vibration to loosen the root canal filling material. Passive ultrasonic activation involves ultrasonic activation of a size 15 file or smooth wire freely in the root canal to induce acoustic micro streaming.⁴ The use of solvents is necessary for all techniques for the removal of Guttapercha. The most common solvents used are Chloroform, Eucalyptol, and Xylol.⁵ The present study aims to evaluate the effectiveness of passive ultrasonic irrigation in endodontic retreatment with and without solvent using a stereomicroscope.

AIM:

This in-vitro study aims to evaluate the effectiveness of passive ultrasonic irrigation in endodontic retreatment with and without solvent using a stereo-microscope

MATERIALS AND METHODS:

A total of 50 freshly extracted human maxillary lateral incisors were selected and cleaned for removing calculus and debris. The selected teeth were decoronated and standardized to a length of 19mm. A 10-K file was inserted into all the canals until it could be seen at the apical foramen. The working length was established 1mm short of apical

foramen the canals were instrumented up to size 40-K file followed by stepback instrumentation up to 55-K file size, under copious irrigation using 3% NaOCl (2ml). Saline solution (1ml) was used as a final rinse to terminate the action of the irrigants. The roots were dried with paper points and were obturated with 2% Gutta-percha with AH plus as a sealer using the lateral compaction method. The access cavities were restored with Cavit-G and all the specimens were stored at 37°C at 100% humidity for one day.

Grouping:

The 50 root samples were randomly divided into 3 groups which include a control group in which roots remained unobturated. In Group 2 and Group 3 the roots were obturated by using the lateral compaction method.

Group 1:- Control group (Unobturated)

Group 2:- Retreatment is done by M two retreatment files and with solvent

Group 3:- Retreatment is done by M two retreatment files and without solvent

Group 2 and Group 3 were further divided into subgroups based on irrigation protocol

Subgroup 1:- Irrigation done with side vented needle.

Subgroup 2:- Irrigation done with Passive ultrasonics.

Endodontic retreatment protocol:

In group 2 samples, Mtwo rotary retreatment files were used after the application of 0.4ml of Xylene solvent. In group 3 samples, Solvent was not used before the retreatment procedure. Teeth were divided into 2 subgroups. In Subgroup 1 irrigation was done with 1 ml of 3% NaOCl using a disposable syringe with a side vented needle. In Subgroup 2, Passive ultrasonic irrigation with the intermittent flow was used. A 15-K hand file was placed in the root canal, 1 mm short of working length, and the irrigant was ultrasonically activated.

Stereo microscope evaluation:

The root samples from each group were split longitudinally into two halves and were washed with 0.5ml of saline solution to remove any cutting debris during splitting and were subjected to Stereomicroscopic evaluation.

STATISTICAL ANALYSIS:

The data was checked using the Kolmogorov-Smirnov normality test, and it was found to be normal. Hence, the data were analyzed by One way ANOVA followed by a Post hoc Tukey test.

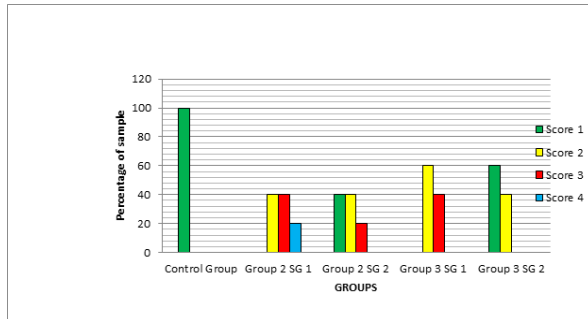
RESULTS:

The grading system was developed for obturation material and debris

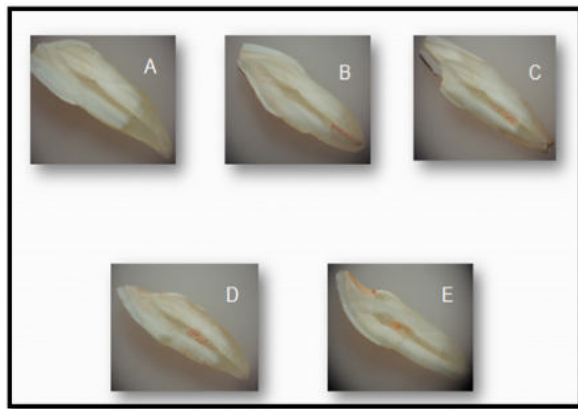
in each canal according to the following criteria:

1. No to the slight presence (0-25%) of obturation debris on the dentin surface
2. Some presence (25-50%) of obturation debris on dentinal surface
3. Moderate presence (50-75%) of obturation debris on dentinal surface
4. Heavy presence (>75%) of obturation debris on dentinal surface

Graph-1



Graph 1 shows, better results were obtained with Group 3 when compared to Group 2 in terms of elimination of obturation material, and on the other hand, there is no significant difference was found between Subgroups 1 and 2 in the amount of residual filling material.



- A – Group 1 (Control group)
 B – Group 2 Sub group 1
 C – Group 2 Sub group 2
 D – Group 3 Sub group 1
 E – Group 3 Sub group 2

DISCUSSION:

The retreatment of a previously obturated root canal is indicated when there is a persistent periradicular lesion resulting from coronal microleakage, incomplete biomechanical preparation, and teeth with sophisticated anatomy. Procedures for removal of root fillings include the utilization of heated stainless steel hand files, Ultrasonic, Lasers, Rotary systems, and solvents.⁶ In this study 50 maxillary lateral incisors were chosen because of their oval anatomic shape, which would facilitate the removal of obturated material.

When non-surgical retreatment is indicated, efficient removal of the obturated material from the root canal system is essential to ensure a favorable outcome. In curved root canals, the removal of obturated materials and further biomechanical preparation is difficult when compared with straight canals. Furthermore, it may lead to instrument distortion or instrument separation. In roots obturated with resin sealer, there's a better adhesion to the dentinal walls which makes its removal from the canal wall difficult.⁷

The retreatment procedure was considered complete when the working length was reached, no obturating materials were observed between the flutes of the files, and irrigating solution appears to be clear of debris.⁸ Cameron, postulated that there is a synergistic effect between NaOCl and ultrasonic irrigation and NaOCl being the most commonly used irrigant, so it was used in the present study.⁹

Of all the known irrigants, irrigation with NaOCl combined with ultrasound has the greatest antibacterial effect. Testing the efficacy of

retreatment procedures by assessing the cleanliness of root canal walls. It has been established that NaOCl in combination with passive ultrasonic irrigation is more effective than conventional hand irrigation in removing dentine debris from the root canal.³

The Mtwo rotary system which is used in the study has two specifically designed files with cutting tips for retreatment. The blade is designed in such a way that the depth of the space behind the blades provides a place for increased dentin removal and leads to efficient Guttapercha sealer removal. The Mtwo R instruments with positive rake angles act more like Hedstrom files and tend to remove bulks of obturated material.¹⁰

In the present study, endodontic retreatment without using any solvent that is (Group 3) showed more cleanliness of dentinal tubules when compared with groups using Xylene solvent (Group 2). Chloroform was the solvent of choice for removal of Guttapercha previously, it is no longer in clinical use owing to its cytotoxicity, carcinogenic potential, and toxicity to the tissues. So, Xylene is used here as it is a less toxic alternative to chloroform.

CONCLUSION:

Both ultrasonic and syringe irrigation showed cleaner canals when Xylene was not used. Hence, Xylene should be utilized only when mechanical methods fail to achieve retrieval of Guttapercha in retreatment cases. Irrigation, when done with ultrasonics, leads to cleaner canals than syringe irrigation. Hence, mechanical methods of retrieval in conjunction with the use of Passive ultrasonic irrigations should be a part of retreatment protocol.

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