

A Clinical Study to Evaluate Debridement Efficacy of Ultrasonic Irrigation Followed By Hand Rotary Instrumentation in Anterior Teeth

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ABSTRACT

Introduction: Success of any endodontic treatment depends on proper preparation of the root canal space. Various factors responsible for achieving this success, such as reduction in the microbes and proper obturation of the root canal system, are dependent on thorough root canal debridement. The aim of cleaning and shaping is the removal of all vital or necrotic tissue, microorganisms, and their respective by-products. The complex nature of root canal anatomy has made cleaning and shaping procedure a lot challenging.

Materials and Methods: A study analysis was conducted in our dental collage and hospital by the department of endodontic. A prior approval for the study was taken by the ethics board of our collage. A total of 70 patients were included in the study analysis over the period of 10 months, and a total of 155 anterior teeth were treated during this time period. A follow-up period of 4 months was kept to evaluate the results. All 70 patients were randomly divided into two groups; group A included patients who underwent ultrasonic irrigation along with manual rotary canal debridement. Whereas, group B included patients who underwent manual irrigation of the root canals with side vented needles followed by manual hand rotary instrumentation.

Results: It was interesting to know that both groups, i.e. group

A and group B showed considerable reversal of symptoms after the endodontic treatment of the tooth. Interestingly, group A patients had more post-obturation discomfort (57%) i.e. even after 1 week of endodontic treatment when compared to group B patients (26%).

Conclusion: The longer ultrasonic times do increase the time of endodontic treatment and might be inconvenient for the treatment demonstrated that the operator is more important than the technique in the thoroughness of canal debridement.

Keywords: Ultrasonic, Debridement, Irrigation.

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INTRODUCTION

Success of any endodontic treatment depends on proper preparation of the root canal space.¹⁻³ Various factors responsible for achieving this success, such as reduction in the microbes and proper obturation of the root canal system, are dependent on thorough root canal debridement.^{4,5} The aim of cleaning and shaping is the removal of all vital or necrotic tissue, microorganisms, and their respective by-products. The complex nature of root canal anatomy has made cleaning and shaping procedure a lot challenging.⁶⁻¹² Various isthmuses and irregularities within the root canal system help the microbes and their by-products to habitat in the complex root canal system. These areas are inaccessible to conventional hand and rotary instruments.¹²⁻²³ The use of ultrasonic irrigation system as a primary cleaning and shaping technique has not been shown to result in better canal debridement when compared to hand instrumentation alone. An attempt has been made to study the effectiveness of an ultrasonically activated file followed by hand instrumentation. The results showed a greater canal and isthmus

cleanliness values. The practitioners were apprehensive to adopt ultrasonic irrigation as an addition to endodontic cleaning and shaping. The main reason behind this is the need for three additional minutes per canal for adequate debridement, and file breakage at high levels of ultrasonic activation. The present study was conducted with the aim to determine the efficacy of ultrasonic after root canal preparation.

MATERIALS AND METHODS

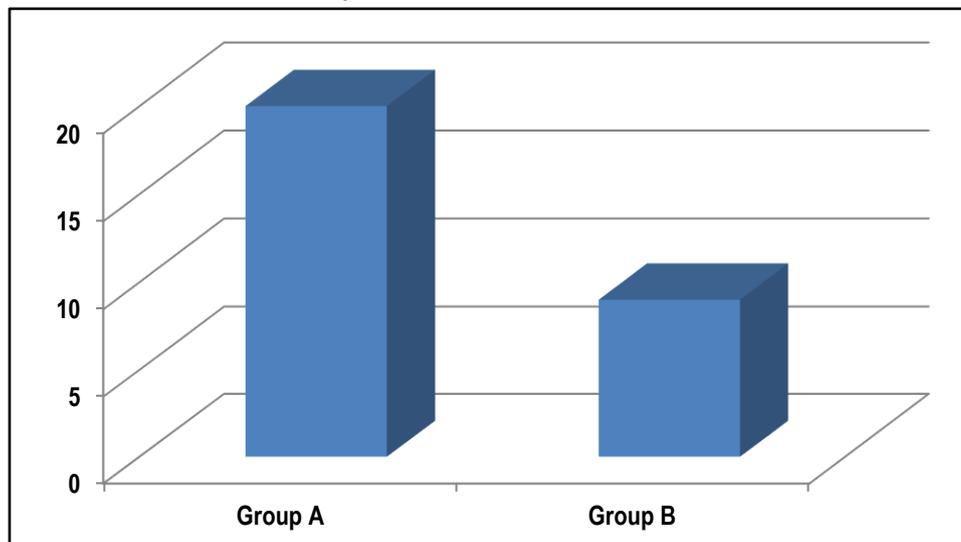
A study analysis was conducted in our dental collage and hospital by the department of endodontic. A prior approval for the study was taken by the ethics board of our collage. A total of 70 patients were included in the study analysis over the period of 10 months, and a total of 155 anterior teeth were treated during this time period. A follow-up period of 4 months was kept to evaluate the results. All 70 patients were randomly divided into two groups; group A included patients who underwent ultrasonic irrigation along with manual rotary canal debridement. Whereas, group B

included patients who underwent manual irrigation of the root canals with side vented needles followed by manual hand rotary instrumentation. All the patients were given prophylactic amoxicillin before the treatment. The painkiller of choice was ibugesic and paracetamol combination in all cases. Any case which required surgical intervention was completely discarded from the analysis. The irrigating solution of choice was 2% w/v sodium hypo-chloride. The rotary system of choice was hero shapers, with master cone G.P. with size 30, 4% taper. The sealer

of choice was AH+ in all cases. The group A canals were ultrasonically activated with 17 size 4% taper ultrasonic tips for endodontic use. The duration of activation was 3 minutes per canal.

All the results were manually recorded and later on interpreted electronically. All the patients were followed up, radiographs were made after every 1 month and post-obturation discomfort was recorded. All the data was recorded in a tabulated form and analysed statistically using Spss software.

Graph 1: Post obturation discomfort



Graph 2: Radiographic evaluation of lesion healing

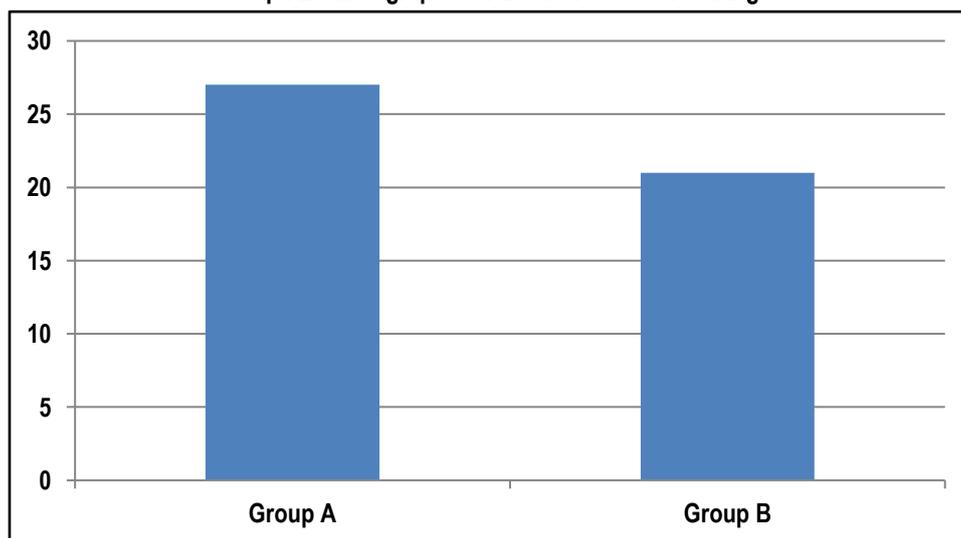


Table 1: comparative evaluation between Two groups

	Treatment Failure	Post-Treatment Pain	Lesion Healing
Group A	3	20	27
Group B	5	9	21

RESULTS

It was interesting to know that both groups, i.e. group A and group B showed considerable reversal of symptoms after the endodontic treatment of the tooth. Interestingly, group A patients had more post-obturation discomfort (57%) i.e. even after 1 week of endodontic treatment when compared to group B patients (26%).

(Graph 1) While comparing radiographs, group A patients lesions tend to heal faster than patients of group B. (Graph 2) All the patients were evaluated after 4 months, post-endodontic treatment. From group A, 3 patients (8.5%) recorded treatment failure whereas from group B, 5 patients (14%) recorded treatment failure. (Table1)

DISCUSSION

The effectiveness of irrigation depends on both the mechanical flushing action and the chemical ability of irrigating solution to dissolve the tissue.^{24,25}

Moreover, the flushing action of irrigating solutions aid to remove organic and dentinal shavings and microorganisms from the canal.²⁶ The flushing action from side-vented irrigation needle is comparatively weak and dependent not only on the anatomy of the root canal complex but also on the depth of placement and the diameter of the irrigating needle.^{27,28} It has been established that irrigating solution can only progress 1 mm beyond the tip of the side vented needle.²⁹ Any increase in volume does not significantly improve their debridement action and efficacy of debris removal.^{30,31}

In wider apical canals, the debridement and disinfection of canals did improve to a certain extent. Deep cleaning of the most apical part of any type of canal preparation remains difficult. Use of fine needles such as 30 gauge, might facilitate reaching the apical area more conveniently. Even though any conclusive evidence are still not conclusive, the introduction of finer irrigating needles with a safety tip placed to working length or 1 mm short of the apex to improve irrigating solution efficacy. The only effective way to debride the root canal complex and isthmus is only by the movement of the irrigation solution, as they cannot be mechanically cleaned or shaped. Ultra-sonic system is a useful adjunct in cleaning and shaping of these difficult anatomical features. It has also been demonstrated that an irrigating solution along with ultrasonic vibration, which generates a continuous movement of the irrigating solution, is directly associated with the effectiveness of the cleaning of the root canal space. The flushing action of irrigating solution is enhanced by the help of ultrasonic. This improves the efficacy of irrigation solutions in removing organic and inorganic debris from root canal walls. A possible scientific explanation for the improved action is that a much higher velocity and volume of irrigating solution flow is created in the canal during ultrasonic irrigation. The tissue-dissolving capability of solutions with a good wetting ability can be increased by ultrasonic systems if the pulp tissue remnants or smear layer are wetted completely by the solution and become subject to the ultrasonic agitation.

Ultrasonic systems create both cavitation and acoustic streaming within the canal complex. The cavitation is minimal and is restricted to the apex of the canals only. The acoustic streaming effect is significant, the irrigating solution activated by the ultrasonic system imparted from the energized instruments. Ultrasonic systems can also improve disinfection of root canals, because organic tissues entering the streaming field that are generated are disturbed. It is interesting to note that a combination of low-power ultrasonic system with sodium hypo-chloride was not more effective than sodium hypo-chloride alone. Ultrasonic vibrations are also effective when touching the shank of a hand file inserted inside the canal. The hand file will transmit certain vibrations to the irrigating solutions inside the canal, but a greater risk for touching dentinal walls exists.

CONCLUSION

The longer ultrasonic times do increase the time of endodontic treatment and might be inconvenient for the treatment demonstrated that the operator is more important than the

technique in the thoroughness of canal debridement. Therefore, the success of the treatment may have affected the canal cleanliness values in this study.

REFERENCES

- Schilder H. Cleaning and shaping of the root canal. *Dent Clin North Am* 1974;18:269–96
- West J, Roane J, Goerig A. Cleaning and shaping the root canal system. In Cohen S, Burns RC, eds: *Pathways of the pulp*, 6th ed. St. Louis: CV Mosby Co., 1994;179–81.
- Weine FS. *Endodontic therapy*, 5th ed. St. Louis: CV Mosby Co., 1996;305.
- Heuer MA. The biomechanics of endodontic therapy. *Dent Clin North Am* 1963.
- Ingle JI. Standardized endodontic technique utilizing newly designed instruments and filling materials. *Oral Surg* 1961;14:83–91.
- Green D. Stereomicroscopic study of 700 root apices of maxillary and mandibular posterior teeth. *Oral Surg* 1960;13:728–33.
- Kuttler Y. Microscopic investigation of root apices. *J Am Dent Assoc* 1955;50:544–52.
- Skidmore AE, Bjorndal AM. Root canal morphology of the human mandibular first molar. *Oral Surg* 1971; 32:778–84.
- Hess W. The Anatomy of the root-canals of the teeth of the permanent dentition: part I. London: John Bale, Sons, and Danielsson, 1925;3–49.
- Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg* 1984;58:589–99.
- Manning SA. Root canal anatomy of mandibular second molars. Part I. *Int Endod J* 1990;23:34–9.
- Yesilsoy C, Gordon W, Porras O, Hoch B. Observation of depth and incidence of the mesial groove between the mesiobuccal and mesiolingual orifices in mandibular molars. *J Endod* 2002;28:507–9.
- Weller RN, Brady JM, Bernier WE. Efficacy of ultrasonic cleaning *J Endod* 1980;6:740-3.
- Goodman A, Reader A, Beck F, Melfi R, Meyers W. An in vitro comparison of the efficacy of the step-back technique versus a step-back ultrasonic technique in human mandibular molars. *J Endod* 1985;11:249–56.
- Lev R, Reader A, Beck M, Meyers W. An in vitro comparison of the step-back technique versus a step-back/ultrasound technique for one and three minutes. *J Endod* 1987;13:523–30.
- Haidet J, Reader A, Beck M, Meyers W. An in vivo comparison of the step-back technique versus a step-back/ultrasonic technique in human mandibular molars. *J Endod* 1989;15:195–9.
- Metzler RS, Montgomery S. The effectiveness of ultrasonics and calcium hydroxide for the debridement of human mandibular molars. *J Endod* 1989;15:373–8.
- Mayer BE, Peters OA, Barbakow F. Effects of rotary instruments and ultrasonic irrigation on debris and smear layer scores: a scanning electron microscopic study. *Int Endod J* 2002;35:582–9.
- Schafer E, Zapke K. A comparative scanning electron microscopic investigation of the efficacy of manual and automated instrumentation of root canals. *J Endod* 2000;26:660–4.
- Hulsmann M, Schade M, Schafers F. A comparative study of root canal preparation with HERO 642 and Quantec SC rotary Ni-Ti instruments. *Int Endod J* 2001;34:538–46.

21. Versumer J, Hulsmann M, Schafers F. A comparative study of root canal preparation using Profile.04 and Lightspeed rotary Ni-Ti instruments. *Int Endod J* 2002;35:37–46.
22. Tan BT, Messer HH. The quality of apical canal preparation using hand and rotary instruments with specific criteria for enlargement based on initial apical file size. *J Endod* 2002; 28: 658 – 64.
23. Archer R, Reader A, Nist R, Beck M, Meyers WJ. An in vivo evaluation of the efficacy of ultrasound after step-back preparation in mandibular molars. *J Endod* 1992;18:549 –52.
24. ChowTW. Mechanical effectiveness of root canal irrigation. *J Endod* 1983; 9: 475–9.
25. Teplitsky PE, Chenail BL, Mack B, Machnee CH. Endodontic irrigation: a comparison of endosonic and syringe delivery systems. *Int Endod J* 1987;20:233–41.
26. Ram Z. Effectiveness of root canal irrigation. *Oral Surg Oral Med Oral Pathol* 1977;44:306–12.
27. Walters MJ, Baumgartner JC, Marshall JG. Efficacy of irrigation with rotary instrumentation. *J Endod* 2002;28:837–9.
28. Vander Sluis LW, Gambarini G et al. The influence of volume, type of irrigant and flushing method on removing artificially placed dentine debris from the apical root canal during passive ultrasonic irrigation. *Int Endod J* 2006;39:472–6.
29. Wu MK, Wesselink PR. Efficacy of three techniques cleaning the apical portion of curved root canals. *Oral Surg Oral Med Oral Pathol* 1995;79:492–6.
30. BaumgartnerJC, Cuenin PR. Efficacy of several concentrations of sodium hypochlorite for root canal irrigation. *J Endod* 1992;18:605–12.
31. Gutarts R, Nusstein J, Reader A, Beck M. In vivo debridement efficacy of ultrasonic irrigation following hand-rotary instrumentation in human mandibular molars. *J Endod* 2005;31:166–70.

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