Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 10, pp.40369-40372, October, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

IMPORTANCE OF PASSIVE ULTRASONIC IRRIGATION IN CLEANING THE ROOT CANAL

[1]Lucas Gonzaga de Carvalho Sousa, [1]Letícia Marini, [1]Suelen Reis Teixeira, [1,2]Taylane Soffener Berlanga de Araújo, [1]PatríciaGarani Fernandes, [1]Andreia Borges Scriboni, [1]Simone Andreia Gubolin, [1]Carlos Alberto Costa Neves Buchala, [1,2]Elias Naim Kassis and *[,2]Idiberto José Zotarelli Filho

[1]University Center North Paulista (Unorp) - São José do Rio Preto – SP, Brazil
[2]Post Graduate and Continuing Education (Unipos), Street Ipiranga, 3460, São José do Rio Preto SP, Brazil 15020-040

ARTICLE INFO

Article History:
Received 07th July, 2016
Received in revised form
11th August, 2016
Accepted 26th September, 2016
Published online 30th October, 2016

Key words:

Dentin Remnants,
Endodontics,
Irrigation Systems,
Passive Ultrasonic Irrigation,
Root Canal Irrigation.

ABSTRACT

Background: The smear layer is formed by the rest of dentin and organic material, such as cellular waste vital or necrotic, bacteria and byproducts. It prevents the penetration of medicines intracanais and endodontic sealer in the Dentinal tubules and ramifications of the root canal system. Several techniques have been proposed and rinsing delivery devices to improve the distribution of the solution within the root canal system.

The objective of this work was to compare the conventional irrigation technique the technique of passive ultrasonic irrigation for removal of debris tubules and smear layer. It was concluded that ultrasound enhances passive irrigation solution irrigating action decreasing the amount of dirt from the root canal system.

Conclusion: The passive ultrasonic irrigation is more effective than the conventional ultrasonic irrigation and irrigation in the removal of debris and smear layer from root canals. Passive ultrasonic irrigation is not able to remove all the "debris" from the root canal but when used, significantly enhances cleaning of the root canal system.

Citation: Lucas Gonzaga de Carvalho Sousa, Letícia Marini, Suelen Reis Teixeira *et al.* 2016. "Importance of passive ultrasonic irrigation in cleaning the root canal", *International Journal of Current Research*, 8, (10), 40369-40372.

INTRODUCTION

The main goals of endodontic treatment are cleaning and shaping of root canals and then obtain a three-dimensional obturation, thus preventing reinfection by microorganisms (Ivana Toljan *et al*., 2016). These objectives are achieved thanks to the preparation done by hand files or roundabouts and irrigating solutions during their action of chemical mechanical preparation by the walls of the root canal, these release scrapings of dentin, which unite the pulp and microorganisms remains, forming the smear layer (Kamalak Aliye *et al*., 2016; Castelo-Baz *et al*., 2016). Thus, the disinfection of the root canal with use of antimicrobial substances which dissolve organic tissues is considered essential part of the microsurgical preparation (Al-Jada *et al*., 2009). Irrigation-aspiration complements the mechanical instrumentation facilitating the removal of microorganisms, debris and necrotic debris, areas not reached by the instruments during the preparation of root canals, such as communications between channels (isthmus) and accessory canals and flattening (Alkahtani *et al*., 2014; Roding *et al*., 2010; Young *et al*., 2007). Disinfection of root canals, irrigating solutions are used, the best known of them is sodium hypochlorite (NaOCl), for its low surface tension, deodorizing, ability to disaggregate organic fabrics and antimicrobial properties (Ivana Toljan *et al*., 2016). To remove the smear layer and microorganisms of root canals, NaOCl and ethylene diamine tetraacetic acid (EDTA) was more effective than just the use of NaOCl to have an effect must be in direct connection with the dentin surface (Alkahtani *et al*., 2014; Andrade, 2012; Baugh and Wallace, 2005). Because of small diameter of the root canal and its branches becomes dificultoso the irrigant fills apical and lateral channels thus various studies have suggested the use of PIII (Passive Ultrasonic Irrigation) to assist the arrival of irrigants these areas (Ivana Toljan *et al*., 2016; Weber *et al*., 2003). Thus, PUI consists in the use of ultrasound is widely used in endodontics, and its more expanded use in removing calculations of the pulp chamber and assist in the search for calcified canals or even to complement

Corresponding author: Idiberto José Zotarelli Filho
Post Graduate and Continuing Education (Unipos), Street Ipiranga, 3460, São José do Rio Preto SP, Brazil 15020-040

the action of irrigating solutions (Ivana Toljan *et al*., 2016; KamalakAliye *et al*., 2016; Castelo-Baz *et al*., 2016). The PUI strengthens the action of the chemical agent, for its ability cavitation and movement, which eventually result in the displacement of these "debris" that would hinder the action of irrigating solutions within the tubules (Plotino *et al*., 2007). Therefore, the objective of this study was to evaluate through literature review the importance of passive ultrasonic irrigation in cleaning the root canals. Hypothesized to be an increase of successful endodontic treatment.

MATERIALS AND METHODS

For the identification of studies in this review study, carried outa detailed search strategy for Medline, Pubmed, Embase, Ovid and Cochrane Library in the years 1957 - 2016, as well as books and magazines related to the topic, with 159 correlationated works. They Were used the descriptors: "Dentin Remnants"; "Endodontics"; "Irrigation Systems"; "Passive Ultrasonic Irrigation"; "Root Canal Irrigation." Analyzed studies systematic review, meta-analysis, randomized controlled cases, nonrandomized clinical cases and opinion articles que Addressed the term atraumatic surgery. The date Were Analyzed, correlated to the discussion of the results highlighted in the literature.

Continuous Predictors

The continuous predictors Were Passive Ultrasonic Irrigation.

Response Predictor

The response was predictor Root Canal Irrigation.

Literature review

According to the bibliographic findings, a number of results showed the importance of irrigation in endodontic treatment. According Ricucci and Bergenholtz, 2013, in endodontic procedures, it is impossible to mold and thoroughly clean the root canal due to the complex anatomy of the root canal system, such as irregularity of the root including isthmus and apical deltas. Only 40% of the root canals can be reached by instruments used in the technique, and therefore the irrigation an essential part of endodontic therapy which allows a cleaning of the instruments beyond (Ivana Toljan *et al*., 2016; KamalakAliye *et al*., 2016). Thus, the goal of irrigation is to remove the pulp tissue and also the smear layer and layer of rest dentin that occurs after instrumentation (Baugh and Wallace, 2005). The effectiveness irrigation depends on the operating mechanism. Sodium hypochlorite (NaOCl) is widely used as an effective disinfectant in endodontics, for it to dissolve organic tissue and kill microorganisms and moreover act as a lubricant and is non-toxic (Haapasalo *et al*., 2005). Richman (1957) (Richman, 1957) introduced ultrasonic devices in endodontics, activated by means of ultrasound has the potential to prepare and perform debridement of the root. Frequent Oscillation is 25-30 kHz, which are beyond human limits. It has been demonstrated that ultrasonic irrigation are effective for irrigation canals, two types of ultrasonic irrigation are described in the literature, one is the simultaneous combined irrigation ultrasonic (UI), and the other without the simultaneous instrumentation called passive ultrasonic irrigation (PUI). Thus IU was shown to be less effective in removing the pulpal tissue smear or layer of the wall of the root canal of the PUI. This can be explained by a reduction of transmission of acoustic and cavitation. Moreover, Rodig *et al*, 2010 compared the removal of dental debris irregularities simulated root canals, between the conventional manual instrumentation (BMI) and the PUI. The PUI showed better results in the removal of debris compared to BMI. The study of Gregory *et al*. 2010 evaluated the effect of penetration of NaOCl in side channels, including the PUI compared with IMC needle 30G on the surgical microscope verified that all the specimens were filled with a solution of contrasts. The results showed that the PUI was more concrete to penetrate the side channels. Even in this context, Andrade 2012 found 75 human teeth uni root, right, has been divided into 5 groups, group I and II the irrigating solution was activated with the tip ultrasonically and group III and IV irrigation was performed with BMI and the V group was control. Group I and III was used saline, and Group II and IV 1% NaOCl, and V without .Conclui irrigation PUI and BMI associated with 1% NaOCl contributed to the reduction of contamination, however not completely eliminated E. faecalis. However the PUI promoted greater cleaning in the simulated lateral canals in the apical third compared to BMI.

Sabins *et al*, 2003 have conducted studies to determine if passive ultrasonic irrigation could reduce the debris in the root canal. Were used 100 molars instrumented hand, they were given 5 groups: group 1 was control and received no treatment, only final irrigation with NaOCl 5.25%. Group 2 received for 30 seconds sonic irrigation, group 3 for 60 seconds and Groups 4 and 5 received by the PUI 30 and 60 seconds respectively. The results were that the passive ultrasonic activation is more effective than conventional irrigation and the ultrasonic activation to the removal of dentin debris in relation to the time used no significant difference. Spoleti *et al*. (2003) used 60 teeth (incisors, upper canines and the disto-buccal root of maxillary molars) to evaluate the disinfecting root canals by PUI. The channels were infected with three types of microorganisms. They were divided into two groups: group 1 received saline solution, group 2 also received the same solution more was ultrasonically activated. The teeth were analyzed consecutively with culture medium, where surviving colonies were found on all teeth of the sample in cases that were not used in PUI colonies were greater. Jadaan *et al*. (2009) compared the different activations ultrasonic, sonic and conventional irrigation in curved canals cleaning using NaOCl 2.5% were manufactured 50 models with the curvature of 20 degrees between the long axis and the apex in transparent resin. Were divided into four groups, three of activation was done with ultrasound, the first of which was used stainless steel K file, the second file K of pre curved stainless steel and nickel-titanium file was used in the third, fourth group used a sonic device with plastic uncertain, and in the control group there was no activation. The file with curvature was the one that caused discrete apical transport. Concluded that the first three groups (PUI) there were different statistics, however, the sonic device and conventional irrigation removed less necrotic tissue.

Muller *et al*. (2003) investigated a final washing with solvent and ultrasound Endosolv R® result in cleaner walls of root canals during endodontic retreatment. A total of 56 teeth, bicuspids extracted was instrumented manually using a step-back extension technique and filled with gutta-percha and AH Plus. After nine months, the channels were portrayed by removing the gutta-percha and sealer with ProTaper Universal.

All groups fill with debris in the three thirds of the root canal after retreatment. There were no significant differences between groups or between thirds of the root canal in each group ($p > 0.05$). Cohença *et al*. 2003 performed in vivo study to assess the effectiveness of the apical irrigation negative pressure (ANP), passive ultrasonic irrigation (PUI) and irrigation positive pressure (PP) in the reduction of intracanal bacterial dog teeth with pulp necrosis and periodontitis apical. Eighty channels were randomly distributed in three experimental groups and two control according to the irrigation delivery system: ANP group (n = 20), PUI (n = 20) group, PP (n = 20) CP group (positive control - irrigation with sterile saline, n = 10) group and NC (negative control - vital pulp not subjected to bacterial inoculation, n = 10). All experimental groups were effective in the reduction of Gram-positive bacteria compared with the PC ($p < 0.05$). As regards the reduction of Gram-negative bacteria, ANP group was significantly better than PP ($p < 0.05$). No statistically significant difference was found between PP and PUI ($p > 0.05$).

According Alkahtani *et al*. (2004) evaluated the efficacy of debridement of the root canal after irrigation EndoVac compared with conventional irrigation systems. The Endovac system was more efficient in removing debris from the apical third of the root canal as compared to conventional irrigation systems. Munoz and Camacho-Cuandra (2012) conducted a study in vivo in order to evaluate the efficiency of different irrigation protocols to take the irrigating substance to the working length. All tooth preparation followed the same protocol, and then were divided into three groups: group 1 conventional irrigation was performed, group 2 received PUI and the third group was irrigated with negative pressure (EndoVac® system). After analysis, the authors concluded that the PUI and irrigation EndoVac® were more effective than conventional irrigation to bring the irrigating substance to the working length. Castle-Baz *et al*. (2012) conducted a study to compare the effect of two ultrasonic irrigation techniques penetration of NaOCl in the main channel and accessory canals of extracted teeth. The teeth were divided into three groups, with the group 1 irrigation was made with positive pressure in group 2 was held PUI and group 3 was made continuous ultrasonic irrigation. The results showed that group 1 had lower NaOCl penetration rate in the side channels and principal than the other experimental groups. Malki *et al*. (2012) conducted a study in order to evaluate the influence of the depth of insertion of an instrument ultrasonically oscillating in removing debris dentinal irregularities simulated upper canines with straight roots. Once prepared, the specimens were divided into groups: group 1 the ultrasonic device was placed 1 mm from the working length, in group 2 to 2 mm in group 3 to 3 mm in group 4 to 4mm in group 5-5 mm and group 6 to 1 mm but no ultrasonic activation. After the analysis concluded that an ultrasonic tip activated in a root canal is capable of removing greater amounts of debris, especially if it is between 1 to 3 mm of working length.

Conclusion

It was concluded that the passive ultrasonic irrigation is more effective than the conventional ultrasonic irrigation and irrigation in the removal of debris and smear layer from root canals. Passive ultrasonic irrigation is not able to remove all the "debris" from the root canal but when used, significantly enhances cleaning of the root canal system.

Competing Interests

The authors declare que they have no competing interests.

REFERENCES

Al-Jada A. *et al*. 2009. Acoustic Hypoclorite Activation in Simulated Curved Canals. *Journal of Endodontics, Baltmore*, V. 35, n. 10, p. 1408-1411.

Alkahtani A, Khudhairi, TDA, Anil S. 2014. A comparative study of the debridement efficacy and apical extrusion of dynamic and passive root canal irrigation systems. Alkahtani *et al*. *BMC Oral Health*, 14:12.

Andrade GMC. 2012. Eficácia da irrigação ultrassônica passiva na limpeza e eliminação de *EnterococcusFaecalis* dos canais radiculares. 79f. Tese (Especialização em Endodontia) – Faculdade de Odontologia de Araraquara – UNESP, Araraquara.

Baugh D, Wallace J. 2005. The role of apical instrumentation in root canal treatment: a review of the literature. *Journal of Endodontics*, 31, 333–40.

Castelo-Baz P, Varela-Patiño P, Cantatore G, Domínguez-Perez A, Ruíz- Piñón M, Miguéns-Vila R, Martín-Biedma B. 2016. In vitro comparison of passive and continuous ultrasonic irrigation in curved root canals. *J ClinExp Dent*., 8(4):e437-41.

Castelo-Baz P. *et al*. 2012. In Vitro Comparison of Passive and Continuous Ultrasonic Irrigation in Simulated Lateral Canals of Extracted Teeth. *Journal of Endodontics*, Baltmore, 38, 5: 688- 691.

Cohenca N *et al*. 2013. Microbilogical Evaluation of different irrigation protocols on root canal disisfection in theeth with Apical Periodontitis: An In Vivo Study. *Brazilian Dental Journal*, 24(5): 467-473

Gregorio C, Estevez R, Cisneros R, Paranjpe A, Cohenca N. 2010. Efficacy of different irrigation and activation systems on the penetration of sodium vitro study. *J Endod*., 36: 1216-21.

Haapasalo M, Endal U, Zandi H, Coil JM. 2005. Eradication of endodontic infection by instrumentation and irrigation solutions. *Endodontic Topics*., 10, 77–102.

Ivana Toljan1, Ivona Bago Jurič2, Ivica Anić. 2016. Eradication of Intracanal Enterococcus Faecalis Biofilm by Passive Ultrasonic Irrigation and RinsEndo System. Actastomatol Croat., 50(1):14-22.

KamalakAliye, Uzun Ismail, ArslanHakan, Keleş Ali, DoğanayEzgi, KeskinCangül, and AkçayMerve. 2016. *Photomedicine and Laser Surgery*, 34(10): 467-472.

Malki M. *et al*. 2012. Irrigant flow beyond the insertion depth of an ultrasonically oscillating file in straight and curved root canals: visualization and cleaning efficacy. *Journal of Endodontics, Baltmore*, 38,5: 657- 661.

Muller GG, Schönhofen AP, Kopper M, Grecca FS, SÓ MVR, Bodanezi A. 2013. Efficacy of an Organic Solvent and Ultrasound for Filling Material Removal. *Brazilian Dental Journal*, 24(6): 585-590.

Munoz HR, Camacho-Cuandra K. 2012. In vivo efficaccy of three different endodontic irrigation systems for irrigant delivery to working length of mesial canals of mandibular molars. *Journal of Endodontics, Baltmore*, 38, 4:445- 448.

Plotino G. *et al*. 2007. Ultrasonics in Endodontics: a Review of the Literature. *Journal of Endodontics, Baltmore*, 33, 2: 81-95.

Richman MJ. 1957. The use of ultrasonics in root canal therapy and root resection. *Journal of Medicine*, 12: 12–8.

Ricucci D, Bergenholtz G. 2003. Bacterial status in root-filled teeth exposed to the oral environment by loss of restoration and fracture or caries – a histobacteriological study of treated cases. *International Endodontic Journal*, 36: 787–97.

Roding T, Sedghi M, Konietschke F, Lange K, Ziebolz D, Hulsmann M. 2010. Efficacy of syringe irrigation, RinsEndo and passive ultrasonic irrigation in removing debris from irregularities in root canals with different apical sizes. *IntEndod J*., 43: 581-9.

Sabins RA, Johnson JD, Hellstein JW. 2003. A Comparison of the Cleaning Efficacy of Short-Term Sonic and Ultrasonic Passive Irrigation After Hand Instrumentation in Molar Root Canals. *Journal of Endodontics, Baltmore*, 29, 10: 674-678.

Spoleti P, Siragusa M, Spoleti MJ. 2003. Bacteriological Evaluation of Passive Ultrasonic Activation. *Journal of Endodontics, Baltmore*. 29, 1:12-14.

Torabinejad M. *et al*. 2003. A New Solution for the Removal of the Smear Layer. *Journal of Endodontics, Baltmore*. 29, 3:170-175.

Weber CD. *et al*. 2003. The Effect of Passive Ultrassonic Activation of 2 % Chlorhexidine or 5,25 % Sodium HypocloriteIrrigant on Residual Antimicrobial Activity in Root Canals. *Journal of Endodontics, Baltmore*. 29, 9:562-564.

Young GR, Parashos P. Messer, H. H. 2007. The Principles of techniques for Cleaning Root Canals. *Australian Dental Journal, Sydney*, 52: 52-63.

****