

# VISUAL MICROSCOPIC ANALYSIS OF THE CLEANING EFFICIENCY FROM THE EASYCLEAN AND IRRISONIC EQUIPMENT

## ANÁLISE MICROSCÓPICA VISUAL DA EFICIÊNCIA DE LIMPEZA DOS EQUIPAMENTOS EASYCLEAN E IRRISONIC

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### RESUMO

A eficiência do tratamento endodôntico está diretamente relacionada com a qualidade do preparo químico-mecânico e da obturação do sistema de canais radiculares. Neste caso, durante a limpeza e modelagem do canal, a eficácia da solução de irrigação é de grande importância, o que levou a muitos estudos ao longo das décadas com vários protocolos sendo criados de forma a potencializar a sua eficácia. O presente estudo busca avaliar as capacidades de limpeza de dois sistemas ativadores de irrigação, o sistema Easy Clean e o sistema Irrisonic.

**PALAVRAS-CHAVE:** Irrigante de canal radicular; preparo do canal radicular; cavidade pulpar dentária; terapia de canal radicular.

### ABSTRACT

The efficiency of the endodontic treatment is in direct correlation with the quality of the cleaning, shaping and the obturation of the root canal. In this case, during the cleaning and shaping of the canal, the effectiveness of the irrigation solution is of great importance, which has led to many studies over the decades with several protocols being created in order to potentialize its effectiveness. The present study seeks to evaluate the cleaning capabilities of two irrigation activator systems, the Easy Clean and the Irrisonic systems.

**KEYWORDS:** Root canal irrigant; root canal preparation; dental pulp cavity; root canal therapy.

### 1. INTRODUCTION

As Siqueira (2010)<sup>1</sup> states, during the shaping and cleaning of the root canal system the action of both mechanical instruments and the irrigant solution cannot be separated, as the main objective of the endodontic treatment is to clean and shape the canal to have a

satisfactory obturation. Therefore, to properly clean the canal is necessary to remove the maximal number of bacteria colonies, contaminated pulp tissue and smear layer as possible. In this scenario, it is fundamental to have a close relation between the manual instruments and the chemical solutions used during this process.

With the goal of improving endodontic treatments, much research focusing on the role of the irrigant solution have been done in the past decades, resulting in instruments known as irrigant activator and many protocols aiming to maximize the cleaning of the irrigant solution. Weller *et al.* (1980)<sup>2</sup> described the activation protocol of the sodium hypochlorite (NaCl) using Ultrasonic instruments, which became known as Passive Ultrasonic Irrigation or PUI.

This technique consists in the transmission of acoustic energy through the contact of ultrasonic vibrations, created by the instrument, and the irrigant solution in the canal. This interaction promotes a cavitation effect in the solution, forcing it through the canal walls and dentinal tubules. The passive term refers to the action of the instrument tip, that does not cut or remove any tissue, only activates the solution.

Other alternative present in the Brazilian market is the sonic protocol, which has been widely used by Brazilian professionals due to its low cost and the relative ease of removal in case of instrument fracture in the root canal. One product has been in the spotlight in the Brazilian market is the Easy Clean (Easy Dental Equipment, Belo Horizonte, MG, Brasil), made out of plastic, with an initial diameter of 0.25 mm and a taper of 0.04, operating with both reciprocating and rotatory movements.

The impact of these equipment is still unknown due to lack of comparative studies between them, however, the few studies already made suggests a very close performance between both instruments. This situation requires further experiments and research to provide more information for the dental professionals.

## 2. MATERIALS AND METHODS

This research was made with 20 human canine teeth, both superior and inferior, collected in the dental clinic of the University of Vassouras Hospital ceded to the research by the University of Vassouras. After the collection phase, the samples were cleaned with a 2% to 2,5% sodium hypochlorite solution and then sterilized.

After cleaning the samples, they were instrumented with traditional type K endo files with 15, 20 and 25 calibers, with specific working length to each tooth and with 1ml of NaCl being irrigated between each file. Thereafter, the samples had their crown sectioned in the Cemento-Enamel Junction (CEJ), using a diamond disc, so that each remaining root had a standard length of 15 millimeters and their apical foramen were sealed with red utility dental wax from the Lysanda® (Vila Prudente, SP, Brazil) brand.

Following the preparation phase, the samples were randomized into two groups, one for the EasyClean™ equipment and the other to the Irrisonic, where each tooth was subjected to 3 cycles of 1 ml of NaCl injection and 30 seconds of activation of the solution.

The samples were subsequently cleaved for analyses in the dental clinic of the Hospital of the University of Vassouras using a surgical microscopic from DF Vasconcellos, model MC-M1232, with two teeth, one for each group, being lost due to inappropriate cleaving. Therefore, two halves from the same tooth were created, with two images from each half being taken with the white and yellow filter from the microscopic. They were then divided by cervical, middle and apical thirds, so that each dental third of each half were judged based by the following chart:

Sheet 1. Cleaning criteria for each ponits given.

No cleaning at all	0
Insatisfactory cleaning	1
Low cleaning	2
Satisfactory cleaning	3

Source: Private archive.

Therefore, the capture images were such as the following exemples:

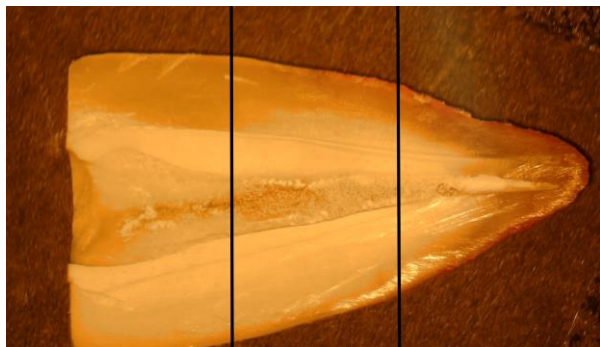


Figure 1. EasyClean equipment with yellow filter. Source: Private archive.

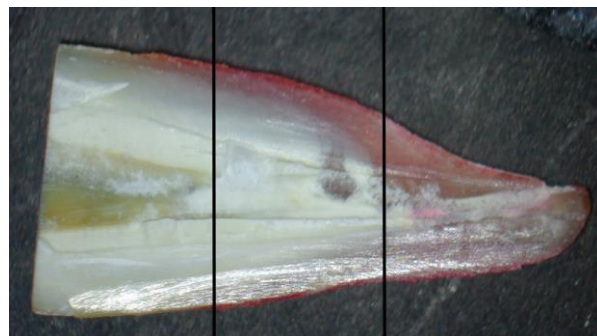


Figure 2. Irrisonic equipment with white filter. Source: Private archive.

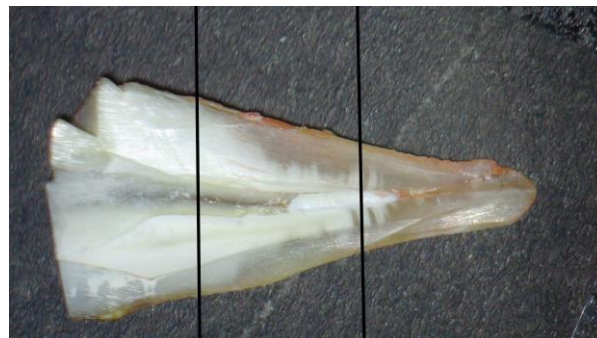


Figure 3. EasyClean equipment with white filter. Source: Private archive.

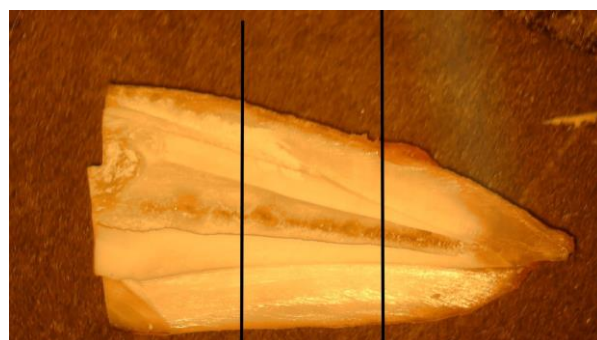


Figure 4. Irrisonic equipment with yellow filter. Source: Private archive.



Figure 5. Irrisonic equipment with white filter. Source: Private archive.

The points were given by two observers, with the grades given each tooth half being added and then divided by two, so that there was one grade for each tooth given third by third. After that process, the two grades given by both observers to each dental third were added and divided by two again, so that each tooth of each group had a grade for its each dental

third, as per the following chart below:

**Sheet 2.** Final mean of each third from each sample.

	E 1		I 1
Cervical	2,75	Cervical	3
Middle	2,25	Middle	3
Apical	2,75	Apical	3
	E 2		I 2
Cervical	2,5	Cervical	1,5
Middle	2,75	Middle	1
Apical	0,75	Apical	0,5
	E 3		I 3
Cervical	2,25	Cervical	2,5
Middle	2,5	Middle	2
Apical	2,5	Apical	2
	E 4		I 4
Cervical	1	Cervical	2,75
Middle	1,25	Middle	2,25
Apical	0,25	Apical	2,5
	E 5		I 5
Cervical	2,25	Cervical	2,75
Middle	1,5	Middle	2,75
Apical	1,5	Apical	1,5
	E 6		I 6
Cervical	2,5	Cervical	1,5
Middle	2,75	Middle	0,25
Apical	2,75	Apical	0,25
	E 7		I 7
Cervical	2	Cervical	2
Middle	1,25	Middle	2,5
Apical	1	Apical	1,75
	E 8		I 8
Cervical	1,25	Cervical	2,5
Middle	1,25	Middle	3
Apical	2,5	Apical	2,75
	E 9		I 9
Cervical	2,5	Cervical	1,75
Middle	1,5	Middle	2
Apical	0	Apical	1,25

Source: Private archive

Lastly, the results presented on the chart were used in the Biostat statistic program, where an analysis of variance using a one-way ANOVA test was performed.

### 3. RESULTS

The Biostat program provided a series of results

from different tests, as per the charts below:

**Sheet 3.** Descriptive Statistics.

Descriptive Statistics							
Groups	Sample size	Sum	Variance	Std Dev	Mean	95% Confidence Interval*	
Easy (A)	9	17,5	0,5122	0,7156	1,9444	1,3943	2,4945
Easy (C)	9	19	0,3611	0,6009	2,1111	1,6492	2,573
Easy (M)	9	17	0,4392	0,6627	1,8889	1,3795	2,3983
Irrisonic (A)	9	16,5	0,7188	0,8478	1,8333	1,1817	2,485
Irrisonic (C)	9	20,25	0,3281	0,5728	2,25	1,8097	2,6903
Irrisonic (M)	9	18,75	0,8594	0,927	2,0833	1,3708	2,7959
Total	54		0,5067	0,7118	2,0185		

Source: BioStat program.

**Sheet 4.** Neuman-Kleus.

Groups	Difference	Test Statistic	p-value	Significant
Easy (C) vs Irrisonic (C) (df=2)	-0,1389	0,5689	0,9986	No
Easy (M) vs Irrisonic (M) (df=3)	-0,1944	0,7964	0,9930	No
Easy (A) vs Irrisonic (A) (df=3)	-0,1111	0,4551	0,9996	No

Source: BioStat program.

**Sheet 5.** Fisher LSD

Group vs. Group (Contrast)	Difference	Test Statistic	p-value	Significant
Easy (C) vs Irrisonic (C)	-0,1389	0,4023	0,6892	No
Easy (M) vs Irrisonic (M)	-0,1944	0,5632	0,5758	No
Easy (A) vs Irrisonic (A)	0,1111	0,3218	0,7489	No

Source: BioStat program.

**Sheet 6.** Turkey HSD

Groups	Difference	Test Statistic	p-value	Significant
Easy (C) vs Irrisonic (C) (df=2)	-0,1389	0,5689	0,9986	No
Easy (M) vs Irrisonic (M) (df=3)	-0,1944	0,7964	0,9930	No
Easy (A) vs Irrisonic (A) (df=3)	-0,1111	0,4551	0,9996	No

Source: BioStat program.

Therefore, after the Biostat program ran a plethora of tests as presented in the results, both the EasyClean and Irrisonic equipment presented a very similar performance overall.

The Irrisonic had a slightly better performance in both the cervical and middle thirds, where the EasyClean had a small advantage in the apical third.

Another interest data was the variance of performance observed, where the Irrisonic presented a bigger variance in the apical and middle third when compared to the Easyclean.

### 4. DISCUSSION

For a successful endodontic treatment is necessary that certain goals have been met before the obturation phase, such as the maximal removal of pathogenic microorganisms, correct shaping of the canal and maximal removal of smear layer from the root canal



system. With these goals in mind, the irrigant solutions gain more significance in the endodontic practice, since they complement the action of the mechanical instruments.

Consequently, instruments aiming to increase the cleaning of the irrigant solutions were created and became known as irrigant solutions activators. Authors such as Hargreaves K<sup>3</sup> states that the injection of the solution into the canal is crucial for the irrigation, as demonstrated by Susila A. and Minu J.<sup>4</sup> in their systematic review.

Articles such as Brenda Gomes<sup>5</sup> and Riccardo Tonini<sup>6</sup> go further into irrigant solution activators in their systematic reviews of previous research, that also corroborates with *in vitro* studies of smear layer removal done by Priyantam Karade<sup>7</sup> and Matthias Widbiller<sup>8</sup>, that confirm the close performance of different irrigant solution activators.

With the work of the authors cited before in mind, this research was done to add a study into the academic community research done with equipment available in the Brazilian market, to assist the Brazilian dentists. In this scenario, canine teeth were chosen due to their ample canal that increase performance for the EasyClean and Irrisonic, since they lose performance when they touch the canal walls. This fact demonstrates that clinical results may differ slightly than those of this research.

After analyzing the results, it was clear that neither equipment was able to consistent clean all the dental thirds, which reiterates the importance of the traditional techniques in the endodontic treatment.

Therefore, the dentist must keep in mind that instruments such as irrigant solution activators are auxiliary equipment during the treatment. However, if the dentist wants to increase his spectrum of techniques, he will have two reliable options, with the cost of the instruments and the protocol of each one being the main differentiator between them.

## 5. CONCLUSION

Both equipment had similar performance, with the data presented in the results confirming that there were no significant statistic difference between the EasyClean and Irrisonic equipment.

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