Effect of Autoclave Sterilization on Cutting Efficiency of Two Different Single Rotary File Systems (An In Vitro Study)

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

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Dedication

I would like to dedicate my Master thesis to my family, and my dear husband, who helped me a lot and without them I couldn't have achieved anything.

I dedicate it also to my friends who have given me day by day support and haven't saved effort to help me

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Introduction

The main objective of root canal instrumentation is to shape and clean the root canal system effectively while maintain the original configuration of the canal [1]. Nikel-titanium (NiTi) endodontic files are particularly helpful for successful shaping of curved root canals, due to their greater flexibility and superior resistance in bending and torsion, their safe use, when used in accordance with the recommendations of their manufacturers, enabling the canal to be prepared more quickly compared with stainless steel instruments.

The cutting ability of the root canal instruments is attributed to different factors such as: the sectional design of the instrument, radial lands or active cutting blades, metallurgical properties, and treatment of instrument surfaces with the incorporation of ions. And affected by the working environment including: chemical inertness and the effects of repeated clinical instrumentation and sterilization.

Sterilization of endodontic instruments is important for two reasons: the elimination of patient cross-contamination and the increase in the success of the endodontic therapy, the most accessible method is autoclave sterilization. The effect of sterilization procedures on physical and mechanical properties of the NiTi files was controversy for long time. Some researchers

found that sterilization leads to reduction of cutting efficiency of the NiTi files [2, 3].

Recently "One shape "endodontic file has been introduced, it is a single file shaping system and it claimed to be able to completely prepare and clean root canals with only one instrument. The Use of single file rotary systems is considered cost effective and time saving.

Up to date there is no knowledge about sterilization effect on the cutting efficiency of One shape file. So it's of value to evaluate this parameter.

Review of literature

Nickel–titanium (NiTi) is an alloy with increased flexibility and shape memory capabilities, many researches were made to improve the physical and mechanical properties of the NiTi rotary endodontic file. In recent years, nickel-titanium (NiTi) alloy has been successfully used in the manufacture of endodontic instruments. It was more suitable for preparing curved root canals owing to having three times elasticity and flexibility in bending and torsion than stainless steel (Walia et al)[(4)].

1- Cutting efficiency of NiTi instrument:

The basic functional property of endodontic instrument is the cutting of dentine, which contributes to the removal of infected tissues, debris and provides an adequate funnel-shaped preparation. This mechanical procedure is quantitatively termed" cutting efficiency". It was defined as the number of rotations and applied torque to remove a specific amount of material or as the rate by which an instrument can cut through a given material.

The cutting efficiency of the root canal instruments is affected by a complex interaction of different parameters such as: cross-section, tip design, surface treatment of the instruments and helical angle. Depending on the relationship between the cutting efficiency of endodontic instruments and their cross-section design, it was found that, instruments with triangular cross-section

and those with rhomboidal cross-section, showed greater cutting efficiency than instruments with square cross-section are generally efficient cutting instruments.

Variable helical angled files are more efficient in removing debris. These files are therefore less likely to become "clogged" or blocked, and in turn less likely to cause transportation, may be because of this feature [more efficient debris removal] canal patency is better. Ni-Ti instruments that are different in cross-sectional designs and tapers so Many studies have shown to find softer and more efficient instruments which also deliver consistent and reproducible shaping results.

Khalefa et al (1999)[5] evaluated three NiTi file systems (Greater taper , Onyx-R file and light speed) regarding their cutting efficiency and also the change in root canal angles after instrumentation of Mesiobuccal root canals of extracted mandibular molars. Cutting efficiency was determined by radiographs which were taken before and after instrumentation. They found that, the light speed technique showed the least changes in root canal angles and the best conservative results, followed by the Greater taper files then Onyx-R files.

Schaffer (1999) et al [6] studied the relationship between design features of endodontic instruments and their cutting efficiency. five different prototype were used made of one