بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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التوثيق الإلكتروني والميكروفيلم

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قسم

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Evaluation of the Cyclic Fatigue Resistance of 2Shape, ProTaper Gold and Vortex Blue Rotary NiTi Files in curved Canals

(A Comparative In-Vitro Study)

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Introduction

In1988, Walia et al[1] introduced the use of a nickel-titanium (NiTi) alloy in the manufacturing of endodontic instruments. Such alloy is characterized by having superior mechanical properties as super elasticity and shape memory. Since then, nickel-titanium (NiTi) instruments have played an important role in the armamentarium of root canal treatment facilitating the procedure of cleaning and shaping, thus increasing their use by both generalists and endodontists. In spite of their superior mechanical properties, they still possess a risk of unexpected fracture[2,3].

Such fracture manifests itself in the form of either cyclic fatigue or torsional failure. Cyclic fatigue occurs when a file is rotating in a curved canal due to repeated compressive and tensile stresses falling on both the outer and inner curves of a file. These stresses finally exceed the maximum strength of the material resulting in fracture of the instrument. This type of fracture is usually aggravated by machining defects in the form of surface scratches and grooves that act as notches concentrating the stress and decreasing the file life span. Whereas, torsional failure is caused when the elastic limit of the file is surpassed by the torque of the hand piece, in a situation where the tip of the instrument is being locked while the shank continues to rotate[4,5].

Since, the fracture of NiTi instruments is unexpected and their removal is a challenging and time consuming procedure; which may sometimes be even impossible. Therefore, several attempts have been made to decrease such fracture and improve their flexibility. Among these attempts are the use of novel alloys, surface treatment of the instrument, changing of the instrument's cross section

design and taper and thermomechanical treatment of the alloy. The manufacturers have been recently working on developing different methods for such thermomechanical treatment claiming that it increases the resistance of the alloy to cyclic fatigue[6–8].

One of the oldest thermomechanical treatments is the blue treatment which is available in the Vortex Blue (VB) system. This blue color is due to a proprietary thermomechanical treatment which results in a blue titanium oxide layer that is responsible for an increase in the instrument's cutting efficiency, hardness, wear resistance, flexibility and cyclic fatigue resistance and a decrease in its shape memory[2,3].

There is also the gold treatment which is presented in the ProTaper Gold (PTG) system. This golden color is produced by an advanced proprietary metallurgy which provides it with a controlled memory effect and increases its flexibility and resistance to cyclic fatigue[9].

Recently, a novel proprietary heat treatment called T. wire technology has been introduced into the market in the form of the 2Shape (TS) system. This treatment is claimed to improve the system's flexibility and cyclic fatigue resistance, allowing better negotiation of curved canals[10].

Since these systems are new in the market, so there are only few studies performed on them. Besides, to our knowledge, there have been no studies comparing these three different methods of thermomechanical treatment. Therefore the aim of this study was to compare the cyclic fatigue resistance of these three systems.