بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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The Incidence of Dentinal Crack Formation During Root Canal Treatment by Three Different File Systems
In Vitro Study

Thesis Submitted to the Endodontic Department Faculty of Dentistry - Ain Shams University for Fulfillment of the Requirements of Master Degree in Endodontics

By

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B.D.Sc 2017

Faculty of Dentistry

Ain Shams University

2022

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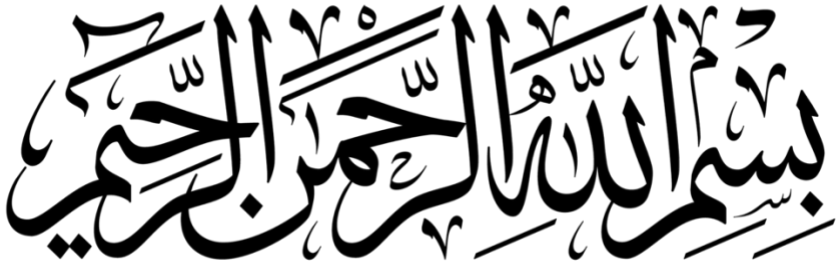
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Acknowledgement

I would like to express my deep appreciation to **Ass. Prof. Dr. Mohamed Mokhtar Nagy** Assistant Professor of Endodontics, Faculty of Dentistry - Ain Shams University, for his continuous encouragement, guidance and valuable advice, which were essential for completion of this work. Thank you Dr. Mohamed

I must extent my appreciation to **Dr. Sarah Hossam** Lecturer of Endodontics, Faculty of Dentistry – Ain Shams University, for her guidance and help during the work

Many thanks and appreciation to **Prof. Dr. Houry Baghdadi** and **Dr. Nermine Sami** Oral Pathology Department, Faculty of Dentistry – Ain Shams University, for their help and effort.

I would like also to thank **Medi-Tech** for their support in supplying the files used in this study.

Table of Contents

List of Tables

List of Figures

Figure No.	Title	Page No.

Figure No.	Title	Page No.

Introduction

Introduction

Effective root canal therapy is based on reaching an accurate diagnosis and establishing an appropriate treatment plan. In spite of the fact that successful treatment depends on numerous factors, one of the most important steps in root canal treatment is canal instrumentation. This is essential because instrumentation determines the efficacy of all subsequent procedures and includes mechanical debridement, creating space for medicament delivery, and optimized canal geometries for obturation.

Chemo-mechanical preparation is expected to clean, sanitize, and shape the root canal. This step is of most importance during endodontic therapy. since treatment result relies upon how successfully the clinician eliminates bacteria, their by-products, and necrotic tissue that would act as substrate for bacterial re-growth. In any case, curves**,** root canal complex and internal anatomical variations can represent a high degree of difficulty in reaching these goals.

For many years root canal instrumentation was performed using manual stainless steel endodontic files. This technique proved to be difficult and led to many errors, due to the use of rigid ended instruments in a push-pull filing motion. Because of the constraints of manual files NiTi rotary instruments were introduced.

Root canal preparation can damage the root dentin, that might result in dentinal crack formation that have the ability to develop to vertical root fracture.

The treatment of cracked teeth depends on the extent of the crack. A tooth with an extensive crack for long duration may be more likely to require root canal treatment.

Review of Literature

There are five generations of NiTi rotary instruments:
The First generation was firstly introduced to the market during the mid 1990s. The main Niti Files of this generation are LightSpeed, Profile-Dentsply, Quantec SybronEndo and GT system-Dentsply. All these NiTi instruments were centered in the middle of the canal also created smooth walls and caused minimum procedural errors. The main disadvantage of this generation was requiring large number of files to achieve these goals. **Hata et al., 2002[1] and Yun and Kim 2003[2]**

The second generation was introduced in 2001. The main Niti files of this generation were: I Race, I Race Plus, ProTaper Universal-Dentsply, Hero Shape, K3-SybronEndo and Mtwo. The main benefits of these NiTi instruments were greater cutting efficiency with active cutting edge, so the number of instruments required was less in comparison with the previous generation. The main disadvantages during shaping with these files were file breakage and canal transportation. **Schäfer and Vlassis 2004[3] and Kuzekanani et al., 2009[4]**

The third generation was introduced in 2007. The main NiTi files were : Profile GTX, HyFlex CM, Vortex Blue and K3 XF Files. **Peters et al., 2012[5]**. In this generation the manufactures focused mainly on the metallurgy of the files, so they applied the M-wire and R-phase technology, to increase the flexibility of files and decrease the incidence of file breakage. **Shen et al., 2013[6]**

The fourth generation focused mainly on reciprocation motion and the use of single file technique to achieve full cleaning and shaping of the canal. The main files of this category were Wave One and One Shape. **Haapasalo and Shen 2013[7] and Peters et al., 2012[5]**

The fifth generation focused on increasing the efficiency of the canal shaping and also improve the cutting and removing of debris. The main important examples of Niti files in this category were: Revo-S and ProTaper Next. **Peters et al., 2012[5]**

ProTaper Next is made by M- wire technology. This system has an off center rectangular cross section. It has a progressive and regressive taper. Off centered rectangular shape provides the file a swaggering motion (snake-like), which minimizes the contact between the file and the dentinal wall, thus reducing the screwing effect. **Çakici et al., 2019[8]**

ProTaper Gold has a convex triangular cross section with a progressive taper. According to the manufacturer ProTaper Gold is considered as a twin to ProTaper Universal as it has the same geometry, but high austenite finish temperature and thermal treatment provides greater flexibility and resistance to cyclic fatigue. **Kim et al., 2021[9]**

Recently, TruNatomy files has been developed. It is manufactured using special NiTi heat treated wire in order to increase flexibility. TruNatomy files are off-centred parallelogram cross-section. TruNatomy consist of four files: Gilder (size 017 .02 taper), Small (size 020 .04 taper)**,** Prime (size 026 .04 taper) and Medium (size 036 .03 taper). **Elnaghy et al., 2020[10]**

Studies has shown that distinctive root canal preparation systems damage the root canal wall to different degrees. Different types of dentinal wall defects may happen such as craze lines, micro-cracks or vertical root fracture. **Wilcox et al., 1997[11]**

Some authors define “crack tooth syndrome” as incomplete fracture of posterior teeth these teeth are vital, fracture extend to dentin and could reach the pulp. **Lynch and McConnell 2002[12]**