" الْحَمْدُ لِلَّهِ الَّذِي هَدَانَا لِهَٰذَا وَمَا كُنَّا لِنَهْتَدِيَ لَوْلَا أَنْ هَدَانَا اللَّهُ "

سورة الأعراف – الأية 43

Efficiency of Two Nickel-Titanium Rotary Systems in removal of root canal filling material

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Dedication

This work is dedicated to….

My parents who have been a constant source of emotional and moral support in every aspect of life, this thesis would certainly not have existed without them.

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Introduction

Although root canal therapy has a high degree of success, it doesn't always lead to the desired response, and failure may occur.

Failure might occur in case of persistence of bacteria in the root canal system as a consequence of insufficient cleaning, inadequate obturation, or when there is coronal leakage[1]. If root canal therapy fails, treatment options include conventional retreatment (orthograde filling), apical surgery, or extraction. Whenever possible, the conventional retreatment is preferred as it is the most conservative method. Although conservative retreatment may pose a significant challenge to clinicians making it stressful and time-consuming procedure, especially in curved canals [2].

The main goal of retreatment is to regain access to the apical foramen by removing the root canal filling material completely, because remnants may shield and protect persistent bacteria involved in post-treatment disease maintaining inflammatory process and symptoms[3] . Most frequently *Enterococcus faecalis*, followed by *Streptococcus spp.* and *Tannerella forsythensis* was found in poorly root-filled teeth associated with periradicular lesions[4].

Introduction

Removal of much as possible of obturation material allows chemomechanical reinstrumentation and redisinfection of the root canal system[5].

Several techniques for the removal of the root canal gutta-percha and/or sealer have been tested, such as the use of manual, rotary, and reciprocating instruments and laser irradiation[6&7]. However, none of the techniques evaluated to date could completely remove remnants of gutta-percha and/or sealer from the root canal.

Several studies have evaluated the efficacy of different engine-driven nickel-titanium (Ni-Ti) file systems in the removal of root canal filling materials, whereby these systems promised reduced working time. Against this background, this study is aiming to further investigate the applicability of Ni- Ti rotary instruments in the removal conventional root canal filling material.

In the case of root endodontic failure, nonsurgical retreatment, peri-radicular surgery, and extraction are the options for treating the tooth. Nonsurgical retreatment should be the first choice because it is the most conservative method. In nonsurgical retreatment, efficient removal of the filling material from the root canal system is essential to ensure a favorable outcome. However, some studies have shown that it is almost impossible to remove the root canal filling completely.

Wilcox[8] compared the effectiveness of gutta-percha removal and time of retreatment between halothane and chloroform used as solvents. Thirty mandibular premolars were prepared, obturated, and stored in a humidity for 14 months, then teeth were divided into two groups using either halothane or chloroform as the solvent. The time of retreatment was measured to the nearest minute. Retreatment was deemed complete when there was no evidence of gutta-percha or sealer on the files or paper points. Teeth were split longitudinally and photographed. The results showed no significant difference in gutta-percha removal between the two groups. The chloroform group took significantly less time to retreat than halothane.

Sae-Lim et al .[9] compared the effectiveness of .04 profile rotary files in retreatment .Thirty extracted single-rooted anterior teeth were instrumented and obturated using lateral condensation. They were distributed into three groups according to method of retreatment. For group (A) retreatment was done using Profile alone, group (B) using Profile and chloroform, and group (C) using hand files with chloroform. The teeth were then split longitudinally into halves. The remaining gutta-percha on the root canal wall were visually scored with the aid of light microscopes. The mean scores in groups A and B were generally lower than group C.

Betti and Bramante[10] compared Quantec SC rotary instruments and hand files for removal of gutta-percha during retreatment. Twenty maxillary central incisors were selected. The canals were instrumented and obturated then they were divided into two groups of 10 specimens each. Group 1 using Quantec SC rotary instruments and Group 2 using hand files and solvent. Time taken to reach working length, time for gutta-percha removal and total time were measured, number of fractured instruments was recorded. Radiographs were taken and the teeth were split longitudinally. The canal walls of each half and the radiographs were evaluated visually for cleanliness. They were then digitized using a scanner and the residual debris assessed in the cervical, middle and apical thirds separately as well for the whole canal. The

time for root filling removal was significantly less when Quantec SC was used. Direct evaluation of the canal walls revealed that hand files and solvent demonstrated better cleanliness in the cervical third and in whole canal .Radiographic analysis demonstrated that hand files performed significantly better when viewed in a mesiodistal direction. Although Quantec SC instruments took less time, hand instruments and solvent cleaned canals more effectively.

Oyama et al .[11] assessed the effectiveness of five different solvents: xylol, eucalyptol, halothane, chloroform and orange oil on softening gutta-percha. Sixty simulated root canals were instrumented and filled with gutta-percha and N-Rickert sealer. The canals were distributed into 6 groups according to the solvent used: group 1: xylol, group 2: eucalyptol, group 3: orange oil, group 4: halothane in a one to one proportion to propylene glycol, group 5: chloroform, and group 6: negative control. One drop of solvent was placed into a reservoir made in each simulated canal. After five minutes, softening was evaluated by the penetration of a #30 digital spreader. Then the necessary force for the digital spreader, with a constant speed of 5 mm/min, to penetrate to a depth of 5 mm into the gutta-percha was measured. The results showed that xylol and orange oil were better in softening gutta-