The Effect Of Diode Laser Treatment For Root Canal Disinfection On Fracture Resistance And Micro-hardness Of The Tooth

THESIS

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Abstract

This study evaluated the effect of diode laser treatment for root canal disinfection on fracture resistance and micro-hardness of the tooth. Sixty freshly extracted mandibular and maxillary premolars were accessed under coolant then root canals were flared upto apical preparation size 40 MFA coupled with 5.25% NaOCl as an irrigant. Teeth were divided into two groups, control group (groupI) and lased group (groupII) that was lased by diode laser with average power 2w through fibrooptic into the canal 2mm shorter than the apex. Each tooth was embedded in acrylic block then subjected to the fracture resistance test .Each root was then sectioned transversely and polished to record dentin Vickers hardness. Data was analysed with student t-test then with linear regression test. The Lased samples presented a significantly higher resistance to fracture than unlased samples. There was no statistically significant differences found between Vickers hardness (HV) of lased and unlased samples and there was no relation between fracture resistance and hardness.

So it was concluded that:

1. Diode laser (980nm) treatment had no adverse effect on dentin microhardness
2. Diode laser (980nm) treatment increased the fracture resistance of dentine.
3. Diode laser (980nm) treatment could attain better functionability and maintenance of tooth after endodontic treatment.

Key words:

Diode laser, root canal disinfection, fracture resistance, microhardness.

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Dedication

To my dear parents.

To my beloved husband.

To my lovely kids.

To my all members of family.

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Introduction

Introduction

One of the most important reasons for endodontic treatment failure is the existence of microorganisms in the complex root canal system. These microorganisms may penetrate the deeper layers of root dentin and propagate in the peridontium with subsequent sequlae of pain, swelling and infection that may spread to other areas of the head and neck, bone loss around the tip of the root as well as drainage problems extending outward from the root leading to sinus formation through the side of the tooth with drainage into the gums or through the cheek with drainage into the skin.

Therefore, the success of endodontic treatment depends, to a great degree, on the elimination of microorganisms from the root canal system.

Application of antimicrobial agents into root canal system is an important step to decrease the number of microorganisms or eliminate them from the root canal system; therefore, the application of appropriate disinfecting agents should be evaluated and introduced.

Different kinds of antimicrobial agents have been introduced for disinfecting the root canal system; such as Sodium hypochlorite (NaOCl), Chlorhexidine gluconate (CHX), hydrogen peroxide,

Phenol and phenol derivatives, antiseptics with a chlorine or iodine base, and others. However all these solutions have

disadvantages such as limited antimicrobial activity, non-selectivity for host cells, inability to penetrate into dentinal tubules and a risk of allergy and toxicity. Therefore, no ideal intra-canal disinfectant is available

In recent years, various laser systems had assisted endodontists especially with regard to root canal system disinfection. In general, dental lasers provide high antibacterial effect, as well as greater accessibility of formerly unreachable parts of the tubular dentin network due to their better penetration into dentinal tissues so laser treatment helps to attain antibacterial effect, not only in the root canal walls, but also in the surrounding tissues, and guarantee one-step disinfection.

Fracture resistance and microhardness are very important physical properties of the tooth because they affect the functionability and maintenance of tooth after endodontic treatment. Therefore, it was aimed in this study to answer the question of whether laser treatment affects microhardness and fracture resistance of tooth or not?

Review of literature

Review of literature

I. History and Principle of Laser

A. Historical background of laser:

LASER' is an acronym for Light Amplification by Stimulated Emission of Radiation. Laser light is a man-made single photon wavelength**.** The process of lasing occurs when an excited atom is stimulated to emit a photon before the process occurs spontaneously [(1)].

As early as 1917, **Einstein** predicted that if a photon of the correct size struck a molecule already in an excited state, that molecule would fall back to the lower energy level and would emit a photon of exactly the same size, and move in the same direction as the entering photon. If the majority of molecules of a medium are already in an exited state (population inversion) the pr ocess speeds up and gets magnified resulting in a cascade reaching and the original photon becomes two, four, eight and the procedure proceeds on. This phenomenon was termed "MASER", which stands for Microwave Amplification by Stimulated Emission of Radiation. An American physicist **Charls Hard Towns**, in 1958 pointed out that the Maser principle can be applied to electromagnetic waves of any wave length, including light resulting in "light Amplification by stimulated emission of radiation" which is LASER. [(2)]