The Effect of Dentinal Wall Ozone Treatment On Push-out Bond Strength and Adaptability of Resin Based Sealers.

(an in-vitro study)

Thesis

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Presented by:

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تاثير معالجة السطح العاجي بالاوزون علي قوة الرابطة ومطابقة الاسمنت الراتنجي .

(دراسة معملية)

رسالة مقدمة إلي

كلية طب الفم والأسنان

جامعة القاهرة

توطئه للحصول علي درجة الماجستير في طب الفم والاسنان

(علاج الجذور)

٢٠١١

مقدمة من الطبيبة / مروة محمد محمد سليمان

بكالوريوس طب الفم وجراحة الاسنان

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٢٠٠٥

Abstract:

Introduction: The present study was designed to evaluate the effect of dentinal wall ozone treatment on push-out bond strength and adaptability of resin based sealers.

Methods: A sample of forty sound human extracted teeth with single straight root canals was prepared and assigned to experimental groups, designated as group 1, ozone irrigation (n=20) and group 2, 2.5% NaOCl + 17% EDTA (n=20).

Further subgrouping is done according to obturating materials used into subgroup (A) (n=10) AH-plus sealer+ gutta-percha and subgroup (B) (n=10) RealSeal sealer+ Resilon.

After the filling procedures, each tooth was prepared for push-out assessment by using root slices of 2mm thickness, loading was performed on universal testing machine at a speed of 0.5mm/min.

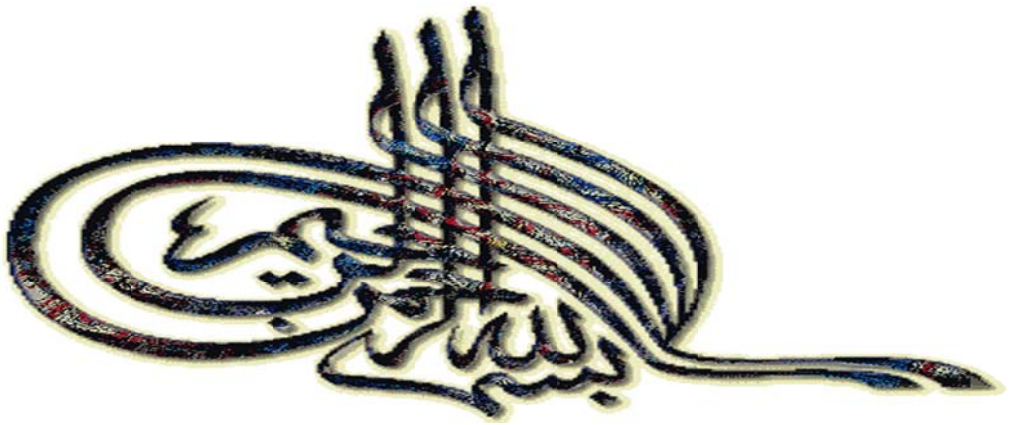
Mode of failure was determined using digital microscope.

Two-way ANOVA statistical analysis was performed.

Results: There was no significant difference between ozone and NaOCl groups regardless the level of slice cut and obturating materials used.

AH-plus showed significantly higher bond strength than RealSeal group regardless the level of slice cut and irrigating solutions used.

Conclusion: The bond strength of ozone group did not highly affect the bond strength of the tested sealers compared to NaOCl group. Bond strength of AH-plus is still better than that of RealSeal group which is manifested more in the NaOCl group.



"سَنُرِيهِمْ آيَاتِنَا فِي الآفَاقِ وَفِي أَنفُسِهِمْ حَتَّى يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَى كُلِّ شَيْءٍ شَهِيد".

صدق الله العظيم.

سورة فصلت- الآيه (٥٣).

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Dedication

To whom I refered any success
Throughout my life:

My parents, brothers and all my friends who assisted me and guided me through all my life.

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Introduction

Studies have demonstrated conclusively that mechanical instrumentation cannot sufficiently disinfect root canals, regardless of whether stainless steel or nickel titanium instruments are used. Irrigation solutions are required to eradicate micro-organisms, and overtime a variety of chemicals have been promoted for this purpose. The ideal irrigant kills bacteria, dissolves necrotic tissue, lubricates the canal, removes the smear layer, and does not irritate healthy tissues. Some formaldehyde-containing materials are no longer recommended for clinical use, but many irrigating solutions and varying concentrations of commonly used materials are described in the literature. Some solutions used in the past were sterile saline, NaOCl, and detergents (e.g., quaternary ammonium compounds, hydrogen peroxide, chlorohexidine and citric acid). Nowadays we still use NaOCl but with final flush of 17% EDTA or the recently introduced irrigant (MTAD) to remove smear layer. Ozonated water is the most recent irrigant used now. There is good evidence of its in vitro biocompatibility. It has an antibacterial effect on killing most of the microorganisms and washing off debri from root canals.

Ozone (also known as triatomic oxygen and tri-oxygen) is a naturally occurring compound consisting of three oxygen atoms. It is found in nature, in the form of a gas in the stratosphere in a concentration of 1–10 ppm, being continually created from and destroyed into molecular O2.Ozone, in the gaseous or aqueous phase, has been shown to be a powerful and reliable

antimicrobial agent against bacteria, fungi, protozoa, and viruses. It is generally accepted that the oxidant potential of ozone induces the destruction of cell walls and cytoplasmic membranes of bacteria and fungi. Medically, ozone gas was used for treating gaseous post-traumatic gangrene, infected wounds, mustard gas burns and fistulas. Its use has been investigated in treatment of ocular diseases acute and chronic bacterial, viral and fungal infections, ischemic diseases. It can react with blood components and positively affect oxygen metabolism, cell energy, antioxidant defence system, and microcirculation.

In dentistry, it was used in surgery to promote haemostasis, enhance local oxygen supply, and inhibit bacterial proliferation. Ozone can reduce the bacterial count in active carious lesions and therefore arrest the progression of caries. Also, it has been shown to encourage remineralization of incipient carious lesions. There are some Evidence that ozone is potentially effective disinfectant agent for removing biofilms and microorganisms from dental unit water system and from dentures. It also can be used as an antimicrobial agent inside the root canal. There is a conflicting evidence of its application as useful prophylactic antimicrobial treatment prior to the use of resin restoration.

Recently, in Endodontics resin-based restoration materials were introduced to produce a monoblock with the aim of 3D seal of root canal. So the antimicrobial treatment of ozone inside the root canal might affect such resin-based obturating materials.

Review of literature

I. Ozone in dentistry

Nagayoshi et al (2004)[1], examined the effect of ozonated water against Enterococcus faecalis and Streptococcus mutans infections in-vitro on bovine dentin. They also determined ozonated water cytotoxicity against mouse fibroblasts compared to NaOCl. Freshly extracted bovine incisors were decoronated and 5mm of root resected. Roots were cut into sliced blocks (4mm thick) with a diamond saw and canals were widened with round bur. Cementum and smear layer were removed. Dentin blocks were sterilized. Blocks were kept in brain heart infusion (BHI) inoculated with Enterococcus faecalis and Streptococcus mutans. The canal of each specimen was irrigated by flushing (flow rate 30ml/min) for 10 min with 4mg/L of ozonated water with ultrasonication, distilled water, one specimen was not irrigated (positive control) and the other was irrigated by 2.5% NaOCl (negative control). After each irrigation, samples of dentin chips were collected with sterile ISO 024 round bur at low speed and cultured in brain heart infusion (BHI). Bacteria was observed under fluorescence microscope. For cytotoxicity test, mouse fibroblasts were treated with distilled water, 4mg/L of ozonated water and 2.5% NaOCl.They found that the number of viable E.faecalis and S.mutans cells decreased in specimens treated by ozonated water and ozonated water with sonication was nearly the same as in those treated with NaOCl. They found that no significant difference in the metabolic acitivity of the fibroblasts among distilled water and 4mg/L of ozonated water, whereas it was significantly decreased when

the cells were treated with 2.5% NaOCl. They concluded that ozonated water had nearly the same antimicrobial activity as 2.5% NaOCl during irrigation, especially when combined with sonication, and showed a low level of toxicity against cultured cells.

Schmidlin et al (2005)[2], evaluated shear bond strength between composite restoration and ozone treated enamel and dentin with or without using an additional liquid reductant. Ten bovine enamel and dentin samples per group were pretreated as follows:(I) Ozone application for 60 seconds alone, or (II) with application of fluoride and xylitol containing antioxidant (liquid reductant), (III) light activated bleaching with 35% H2O2 for 5min (negative control), (IV) untreated enamel and dentin specimens (positive control). Specimens were bonded with 3-step adhesive system and restored with composite. Shear bond strength was measured using universal testing machine. Their results showed that un-treated enamel and enamel treated with ozone showed the highest shear bond strength values. No significant differences were observed in terms of shear bond strength values between ozone treated specimens and specimens that received an additional liquid reductant application. However, there was a tendency of liquid reductant to reduce the bond strength in comparison to untreated control groups. Bleached enamel specimens revealed the lowest shear bond strength values which were lower than untreated controls or ozone treated specimens. They concluded that despite possible retention of surface oxide related substances during high dose ozone application, shear bond strength was not impaired.