



The Effect of Non-Thermal Plasma Treatment on the Shear Bond Strength of Monolithic Zirconia

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requirements of Master's Degree in fixed prosthodontics,
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Dedication

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List of Contents

<i>Item</i>	<i>Page</i>
<i>List of figures</i>	<i>IV</i>
<i>List of tables</i>	<i>V</i>
<i>Introduction</i>	<i>1</i>
<i>Review of literature</i>	<i>3</i>
<i>Statement of the problem</i>	<i>32</i>
<i>Aim of the study</i>	<i>33</i>
<i>Materials and methods</i>	<i>34</i>
<i>Results</i>	<i>54</i>
<i>Discussion</i>	<i>66</i>
<i>Summary</i>	<i>75</i>
<i>Conclusion</i>	<i>77</i>
<i>References</i>	<i>78</i>
<i>Arabic summary</i>	<i>.....</i>

List of Figures

Figure	Item	Page
(1)	<i>Katana Zirconia STML Disc</i>	36
(2)	<i>Panavia SA cement plus</i>	38
(3)	<i>Ultra etch 35% phosphoric acid gel</i>	38
(4)	<i>50 μm alumina oxide particles for air abrasion</i>	38
(5)	<i>98% Hexamethoxydisioxane for NTP treatment</i>	38
(6)	<i>Isomet saw used for cutting of zirconia discs</i>	39
(7)	<i>Milling of zirconia into cylindrical block</i>	40
(8)	<i>cylindrical specimen of 5 mm diameter before sintering process</i>	40
(9)	<i>cutting disc shaped specimens of 2.5mm thickness before sintering</i>	40
(10)	<i>5 mm diameter before sintering</i>	41
(11)	<i>2.5mm thickness after sintering</i>	41
(12)	<i>4mm diameter after sintering</i>	41
(13)	<i>2mm thickness after sintering</i>	41
(14)	<i>Air abrasion of zirconia disc</i>	45
(15)	<i>Suction tip was sectioned to standardize the distance of 10mm between the disc and the nozzle</i>	45
(16)	<i>Ultrasonic cleansing of zirconia disc after sandblasting</i>	45
(17)	<i>Placement of specimens in cylindrical chamber</i>	46
(18)	<i>The glow discharge of plasma inside the cylindrical chamber</i>	46
(19)	<i>Plasma equipment</i>	47
(20)	<i>Schematic drawing showing the equipment component</i>	47
(21)	<i>Quanta scanning electron microscope</i>	48
(22)	<i>Gold spattered zirconia sample</i>	48

(23)	<i>Teeth embedded in acrylic resin blocks exposing the experimental surface</i>	49
(24)	<i>Plastic mounting template</i>	49
(25)	<i>Application of 35% phosphoric acid etchant on the exposed enamel surface of the specimen</i>	50
(26)	<i>Leaving the phosphoric acid etchant for 15 seconds</i>	50
(27)	<i>Application of SA cement plus on the treated surface of the disc</i>	50
(28)	<i>Placement of the treated disc surface covered with the resin cement above the tooth specimen</i>	50
(29)	<i>Constant load of 1Kg was placed above the specimen</i>	51
(30)	<i>Light curing of the specimen</i>	51
(31)	<i>Thermo-cycling machine</i>	52
(32)	<i>universal testing machine</i>	53
(33)	<i>A mono-beveled chisel shaped metallic rod parallel to the interface of the bonding surface.</i>	53
(34)	<i>Bar chart representing mean and standard deviation values for shear bond strength of surface treatments regardless of thermocycling</i>	56
(35)	<i>a Bar chart representing mean and standard deviation values for shear bond strength before and after thermocycling regardless of surface treatment</i>	57
(36)	<i>Bar chart representing mean and standard deviation values for shear bond strength with different interactions of variables</i>	59

(37)	<i>Scanning electron microscope image of control group 3000X</i>	60
(38)	<i>Scanning electron microscope image of air abrasion group 3000X</i>	61
(39)	<i>Scanning electron microscope image of non-thermal plasma group 3000x</i>	62
(40)	<i>Energy dispersive spectroscopy of control group</i>	63
(41)	<i>Energy dispersive spectroscopy of air abrasion group</i>	64
(42)	<i>Energy dispersive spectroscopy of non-thermal plasma group</i>	65

List of Tables

<i>table</i>	<i>Item</i>	<i>Page</i>
(1)	<i>Materials used in this study</i>	35
(2)	<i>Chemical composition of the super translucent multilayered Zirconia (STML)</i>	36
(3)	<i>Technical data of katana Zirconia STML ceramic discs</i>	37
(4)	<i>Chemical composition of Panavia SA cement plus</i>	37
(5)	<i>Sintering cycle</i>	42
(6)	<i>Samples grouping</i>	44
(7)	<i>Two-way ANOVA results for the effect of different variables on mean shear bond strength</i>	55
(8)	<i>The mean, standard deviation (SD) values and results of two-way ANOVA test for comparison between shear bond strength of surface treatments regardless of thermocycling</i>	55
(9)	<i>The mean, standard deviation (SD) values and results of two-way ANOVA test for comparison between shear bond strength before and after thermocycling regardless of surface treatment</i>	56
(10)	<i>The mean, standard deviation (SD) values and results of two-way ANOVA test for comparison between shear bond strength values with different interactions</i>	58

Introduction

Introduction

For many years, it was known that metal ceramic restorations used in dentistry combine both the esthetic properties of ceramic material and mechanical properties of metals. But with the use of metals either as a full metal restoration or in combination with ceramics, some drawbacks have been showed that lead to patient dentist un-satisfaction.

All ceramic restorations are metal free alternatives from the metal ceramic restorations. Zirconium oxide (ZrO_2) ceramics is considered the strongest ceramic material that has been used in the recent years. It is characterized by high fracture resistance and durable viability in comparison to porcelain or metallic substrates ⁽¹⁾.

High strength ceramic restorations have been popularly used in dentistry due to increasing patient's demands for a more esthetic restoration with the new era of dental technology and research. They are biocompatible materials, highly esthetic, and fulfill highly mechanical properties.

With the evolution of zirconia materials, zirconia-based restorations have been more frequently used. Until even a few years ago it was challenging to produce a zirconia restoration that accurately replicates the natural translucency and opalescence of real teeth. Now, the newest generation of materials can provide patients with even better treatment outcomes due to increased translucency, better wear characteristics, and strength with significantly improved translucency, the technician can fabricate restorations that more closely replicate natural teeth. ⁽²⁾

This ceramic restorative material by the help of computer aided design and computer aided manufacturer(CAD/CAM) innovation has been widely used in dentistry, zirconia can be used in so many clinical aspects as orthodontic brackets, post and cores, implants, and fixed partial dentures ⁽³⁾.

Adhesive cementation of dental restorations is highly requested, since it enhances retention, marginal adaptation, fracture resistance, and decreases the possibility of recurrent decay and require more conservative tooth preparation. Different surface treatments are launched to improve the adhesion and retention to the tooth structure.

The conventional way of cementation which includes H-F acid and salinization treatment for the surface of zirconia before adhesive cementation is not effective to achieve proper adhesion due to the lack of silica and glass phase in the microstructure. Due to the difficulty in achieving chemical and mechanical bonding with zirconia, alternative methods have been performed.

The most commonly used micromechanical surface treatment method is air abrasion using alumina oxide particles to improve mechanical bonding with abrasive particle size ranging from 50 to 250 μm . ⁽¹⁾ Another form of surface treatment to zirconia ceramics is the use of non-thermal plasma treatment (NTP) to improve the surface chemistry of zirconia for bonding/cementation mechanism. Non thermal plasma is a partially ionized gas containing mixture of ions, electrons, free radicals in non-equilibrium state to be applied to the ceramic surface. This treatment produces a thin silica layer that chemically changes the surface of ceramics improving its wettability and enhancing the bond strength by creating chemical active sites. ⁽⁴⁾

Review of Literature