The Effect of Bleaching on Color, Surface Roughness and Shear Bond Strength of Two Different Ceramic Materials.

Thesis submitted for the partial fulfillment of the

Master Degree Requirements in Crown and Bridge

Faculty of Dentistry

Ain Shams University

By

ANDY KARAM NASSIF

B.D.S, Faculty of Dentistry

Ain Shams University, 2006

Teaching assistant, Faculty of Dentistry

Ain Shams University

Faculty of Dentistry,
Ain Shams University
(2012)

Supervisors:

Dr. Amina Mohamed Hamdy

Assistant Professor of Fixed Prosthodontics
Head of Crown and Bridge Department
Faculty of Dentistry, Ain Shams University

Dr. Tarek Salah Morsi

Assistant Professor of Fixed Prosthodontics
Crown and Bridge Department
Faculty of Dentistry, Ain Shams University

Dr. Marwa Mohamed Wahsh

Lecturer of Fixed Prosthodontics
Crown and Bridge Department
Faculty of Dentistry, Ain Shams University

Acknowledgement

I would like to express my deepest gratitude ***to Dr. Amina Hamdy****, Assistant Professor and Head of Department of Crown and Bridge, Faculty of Dentistry, Ain Shams University for her constant support, advice and valuable comments.*

Deep thanks and appreciation to ***Dr.Tarek Salah Morsi****, Assistant Professor of fixed Prosthodontics for his great help and guidance, and valuable advices throughout the accomplishment of this work.*

I would like to thank ***Dr. Marwa Mohamed Wahsh****, Lecturer of fixed Prosthodontics, Ain Shams University for her great guidance, and continuous help throughout the accomplishment of this work.*

I would like to express my deep thanks to ***Dr.Ayman Galal eldimeery****, Lecturer of fixed Prosthodontic, Ain Shams University and* ***Dr. Maged Zohdy,*** *Lecturer of fixed Prosthodontic, Ain Shams University, for their great help and support.*

Personal appreciation and thanks to ***Dr.Ahmed Sabet,*** *Assistant lecturer of fixed Prosthodontic, Ain Shams University for his great help and stimulating guidance in laboratory work of this study.*

I would like to thank ***Dr.Mahmoud Yehia*** *and* ***Dr.Doaa Taha*** *for their help in collecting extracted teeth from the department of surgery. Deep appreciation to* ***Dr. Fady Bassily*** *for his help in photographing my samples.*

Finally, I would like to thank all the staff members of the crown and bridge department, Faculty of Dentistry, Ain Shams University for their help and encouragement during the course of this study.

Dedication

This work is dedicated to my family
for their continuous love, support
and great care.

My Father and Mother have been
the source of encouragement
and guidance.

My beloved fiancée for her
Understanding, great
help and support.

Contents

Page

List of Figure

Page

List of tables

Page

INTRODUCTION

Patients often seek dental treatment for esthetic problems such as discolored teeth through various methods, All-ceramic restorations and bleaching remains the major interest in patients concerned with esthetics.

Dental ceramic materials have demonstrated extremely desirable properties, including biocompatibility, esthetics & chemical resistance. [1,2] The popularity of all ceramic dental restorations has increased in recent years due to their superior esthetic appearance and metal-free structure. [3] Currently a wide variety of all-ceramic dental restorations are provided using various ceramics systems.[4]

Since carbamide peroxide home bleaching was introduced in the 1980s, this treatment has become a popular and conservative alternative for patients seeking improved esthetics in a relatively short period of time.[5,6] During crown cementation, a microscopic, cement-filled gap is formed between the prepared tooth and the restoration margin. If a fixed restoration is subjected to vital tooth bleaching, any exposed cement margin will be exposed to the bleaching agent as well. [5,6] The possibility exists that the bleach could deteriorate or dissolve the cement, creating a void where bacteria could proliferate. [5] As a result of this void, bond strength could be deteriorated between the ceramics and tooth structure. Vital tooth bleaching could affect the surface texture of the ceramic used.

Given the fact that over 40% of the populations have at least one dental restoration, the effects of different bleaching treatments on dental materials have received much attention. However, the effects of bleaching agents on restorative materials remain controversial. [7]

If cement dissolution exposes the prepared tooth surface, penetration of peroxide into the abutment tooth could result in pulpal reactions and patient discomfort. (5)

It remains a major concern if bleaching would affect some important characteristics of ceramics including color, surface roughness and shear bond strength.

REVIEW OF LITRATURE

In recent years, trends for esthetic dentistry surprisingly increased. The demands of patients for tooth-colored restorations and the availability of new types of dental ceramics have driven increased use of ceramic materials in a variety of restorative situations. [8,9]

Full veneers restoration treatment is potentially invasive and requires considerable reduction of tooth structure, and hence laminates and metal-free restorations have been introduced. Porcelain veneers are thin ceramic laminates that are bonded to the labial surface of the anterior teeth. [10] also esthetics, strength, biocompatibility and easy-processing are important issues regarding these types of restorations, recognizing the bond strength of each material has been of great importance for dental practitioners. [11]. Different types of material have been utilized to fabricate these restorations; Low-fused feldspathic ceramics, reinforced ceramics and laboratory composites are some of the most prominent. [12] The primary advantage of a ceramic restoration is the increase in depth of translucency and light transmission, either deeper into or across the entire restoration. This allows the ceramist and restorative dentist to provide the patient with a natural and vital-looking restoration. [13]

Historical Background of Ceramics:

At the end of the 19th century, all-ceramic restorations, called Jacket crowns were fabricated by firing a feldspathic ceramic material on a die prepared with platinum foil. As the only esthetic restorative modality found at that time, [14] Jacket crowns failed to gain popularity due to its low strength and high probability of fracture as well as its poor marginal seal. Porcelain

jacket crowns later on were replaced by metal-ceramic restorations which gained wide spread.

In the early 1930 porcelain veneers were first introduced by **Dr. Charles Pincus** using denture adhesive to retain the veneers. In 1937 acrylics were introduced which had a large impact and replaced porcelain veneers. Soon the disadvantages of acrylic resins were realized which are increased wear, high permeability leading to discoloration and leakage. By the time the adhesion techniques and enamel bonding was introduced, composite pioneered the use of Veneers. [15,16]

In the early 1950s, the first attempts were made to add leucite to porcelain formulations to elevate the coefficient of thermal expansion and allow their fusion with gold alloys. Following the introduction of feldspathic porcelain crown by **Land**, the demand for nonmetallic and biocompatible restorative materials increased for clinicians and patients. [17] In the 1960s, fusion of ceramics to gold alloys was introduced to dentistry successfully.

Using metal-ceramic restoration may lead to compromised esthetics especially in anterior teeth because of limited translucency of opaque metal substructure. In laminates the absence of metal is essential to allow the light transmission through the restoration and permit a perfect match with natural teeth. [18] The metal substructure may also show through the thin gingival areas which may compromise esthetics in the anterior teeth. Demand for more esthetically pleasing dental restoration and public fears about the adverse effects of dental metals and alloys have lead to the increased use of ceramics. [19]

In 1965, **McLean** pioneered the concept of adding Alumina to feldspathic porcelain to improve mechanical and physical properties. [20] In

1968, **MacCulloch**, in conjunction with the **Pilkington Glass Company**, was the first to use glass ceramic veneers to replace porcelain pin teeth. [21]

Acid etching of enamel to bond metal-ceramic fixed partial dentures to lower teeth was conceived by **Rochette** [22] in 1973. The concept of bonding composite resin to acid-etched porcelain was first reported by **Simonsen and Calamia** [23] in 1983, and the fabrication of porcelain veneers with this system was reported by **Horn** [24] in the same year. The direct bonding of porcelain to tooth structure remains one of the most significant advances of the 20th century in restorative dentistry.

Specialized porcelains have since been developed for porcelain laminate veneers. The use of ceramic etching and silane coupling agent in addition to phosphoric acid etching to enamel surface improved the micromechanical retention and bonding of laminates to the tooth surface using resin based composites. [25] This enabled practitioners to adopt a much more conservative approach to tooth restoration.

It is no exaggeration to state that the last century saw a revolution in dental esthetics. In the 21st century, the challenge of producing high-strength ceramics without sacrificing translucency may be solved. [26]

Porcelain Laminate Veneers:

Porcelain laminate veneers (PLVs) can be used in a broad range of esthetic restorative situations, and countless patients have benefited from their advantages over traditional crowns. [27,28] All ceramic porcelain laminate veneers can provide some of the most esthetically pleasing restoration currently available, they promote the conservation of natural tooth structure and eliminate the risk of a negative periodontal response whenever the finish line is supragingival.