BONDING OF ADHESIVE RESIN TO MACHINABLE AND CONVENTIONAL CERAMICS

THESIS

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Dedicated to…

My wife, my daughter, my mother and my family.

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INTRODUCTION

Ceramic materials have been used for over 200 years. They are the most compatible of dental restorative materials, because of their outstanding esthetics and chemical stability. Essentially they are metallic oxides, which are in the lowest energy state.

The earliest successful porcelain system used conventional feldspathic porcelain derived from the natural mineral feldspar. Porcelain fused to metal systems was used in the 1950s, and a development in 1962 greatly improved the porcelain systems; that is the incorporation of a high proportion of leucite crystals in the feldspathic porcelain composition. The leucite crystals served to increase the thermal expansion of porcelain to bring it closer to that of the metal. Although the porcelain fused to metal systems have high strengths, the opacity of the metal substructure has encouraged the development of all ceramic materials containing crystalline composition, which are stronger than the traditional feldspathic porcelain. The introduction of CAD/CAM

(Computer-aided design combined with computer-aided machining) has brought a new approach to esthetic dentistry. Laser mapping of a preparation can be fed to a computer-controlled milling machine. A second generation of fine particle feldspathic ceramic blocks, called Cerec Vita blocs Mark II have been available since 1991; they are considered to be one of the most abrasion resistant dental ceramics, the abrasion properties are highly similar to those of natural enamel. This is attributable to the industrial sintering process, as well as to the small particle size (an average of 4 µm) of the ceramic system. The Cerec system has proved its clinical suitability for production of ceramic restorations in millions of cases.

Ceramic surface treatment is crucial for bonding to resin. Surface treatment includes acid etching and air abrasion with silica or alumina. This creates micro-irregularities through which resin interlocks to form a durable resin-ceramic bond. The hypothesis of this study was to test the assumption that machinable ceramics exhibit superior bond strength with resin cement compared with conventional feldspathic porcelain.

So, this study aimed to elucidate the effect of surface treatment on resin bond to conventional sintered, as well as machined feldspathic porcelain.

REVIEW OF LITERATURE

Porcelains are steadily increasing in popularity among today's dental practitioners for conservative restoration of unaesthetic anterior teeth. As with any new procedure, in vitro and vivo investigations are required to assess the ultimate clinical efficacy of these restorations [1-4]. The ceramic reconstruction (Cerec) system, originally developed by Brains AG (Zollikan, Switzerland), was the first fully operational CAD/CAM system marketed for use in clinical dentistry. The Cerec technique consists of 3-dimensional scanning of the preparation, immediate data transformation, and 3-axial milling, which is integrated into the mobile unit. Many articles have discussed surface-treating of the Cerec restorations i.e. VMKII with silane coupling agents and their cementation with resin luting agents[5-7].

Several investigations have been conducted to evaluate the effect of ceramic treatment on resin-ceramic bond and various methods have been introduced to enhance the bond between porcelain and composite resin cement, as mechanical roughening of porcelain surfaces with a coarse diamond rotary instrument [8,9]. A strong resin bond relies on micromechanical interlocking and chemical bonding to the ceramic surface i.e. common treatment options advocated with various researches are Al_2O_3 sandblasting[10-12] which increases the surface area available for bonding.