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MICRO-TENSILE BOND STRENGTH OF COMPOSITE RESIN SYSTEMS TO EROSIVE LESIONS VERSUS NORMAL DENTINE

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Abstract

Dentine is a vital, hydrated composite material with structural components and properties that vary with location, type and form. The structure-property relationships for normal and modified forms of dentine have their impact on dentine bonding. The wide deviation of tensile bond strength with surface area, has led to the development of micro-tensile bond testing with a surface area of one mm². This size provided minimum scatter in results. The purpose of the present investigation was to evaluate and to compare the micro-tensile bond strength of 2 composite resins dentine adhesive systems on eroded lesions versus normal sound dentine. The morphology of the resin tags and resin infiltrated-dentine layer for both systems was evaluated using SEM examination for each adhesive system. The mean micro-tensile bond strength to normal sound dentine was significantly higher than those to eroded dentine. Bonding to eroded dentine was found to be more difficult than to sound dentine. Moreover, in erosive lesions the use of self-etching primers after dentine conditioning is mandatory for better and more uniform bonding.

Introduction

Achieving a predictable bonding to dentin has long been a goal and challenge in restorative dentistry. Dentin microstructure and properties are principal determinants of nearly all restorative procedures. Although significant progress has occurred over the past several decades, based on an increased understanding of dentin, yet a key problem remains, which is the modifications occurred in dentin, by physiological, aging, carious and non-carious processes which created different forms of dentin. A number of these modifying factors, may have important implications for the ability to develop a long lasting adhesion or bonding to such a structure.

The etiology and characteristics of non-carious lesions including erosion, abrasion and stress lesions (abfractions), have been reviewed and showed to be complex and multi-factorial. Epidemiological data suggest variations in prevalence of these diseases from 5 to 85%.

Clinical reports showed a high number of failures of composite resin restorations to sclerotic and old dentin[1]. Clinical retention performance for dentin adhesives of sclerotic and old dentin is lower than that of normal young dentin[2]. Many researches[3-5] proved that adhesion of resins to sclerotic dentin was less strong than that to normal dentin. They attributed that, to the fact that, sclerotic dentin is thought to be less susceptible to acid demineralization. This is due to repeated cycles of demineralization and remineralization[6].

Bonding to hypermineralized dentin surfaces is more difficult than bonding to normal dentin[7]. Hypermineralized dentin occurs in several situations. For example, peritubular dentin is more mineralized than inter-tubular dentin[8]. Dentin in naturally desensitized areas is, also, highly mineralized and most of tubules are occluded with rhombohedral crystals[9]. Sidhu et al.[10], found that the composition of dentin substrate may affect the performance of the bonding. Duke and Lindemuth[7] stated that, increase in peritubular dentin and obliteration of tubular orifices may preclude the development of adequate micro-mechanical retention.

Yagi and Suga[11], demonstrated some sclerotic changes in dentinal tubules, associated with cervical abrasion lesions, in the form of deposition of, cuboidal or rhomboid, short rod-and droplet-like crystals, which were smaller than those found beneath carious lesions. The crystals were the same through the length of a tubule but different in shape and mode of deposition. These alterations are of great clinical significance and their influence on demineralization process requires clarification. Many researches[7,12,13], proved that, sclerotic and erosive lesions near cervical margin lead to varying responses to clinical treatment, that has been suggested to be a result of resistance to demineralization[14].

Van Meerbeek et al.[6], suggested that demineralization is more difficult in both the peritubular and intertubular regions of sclerotic dentin and they showed that, the hybrid resin layer

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