بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم"

صدق الله العظيم

"الآية٣٢ من سورة البقرة"

Effect of Atmospheric Pressure Changes on Bond Strength and Microleakage of Different Aesthetic Restorative Materials

Thesis
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Dedication

This work is dedicated to....

Soul of my father,

My mother for her endless love and support,

My wife for her encouragement and understanding,

And last but not least my beloved daughter Karma

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Abstract:

The aim of this study was to determine the effect of different atmospheric pressure values on the shear bond strength and microleakage of low-shrinkage composite, nano-composite, conventional glass ionomer cement and nano resin-modified glass-ionomer cement. 120 intact human molar teeth were used for shear bond strength testing using universal testing machine, while 60 teeth were used for microleakage assessment using stereomicroscope to identify the scoring levels of dye penetration. Both parameters were tested for enamel and dentin substrates. The results revealed that increasing the atmospheric pressures reduced the shear bond strength while increased the microleakage for all investigated materials.

Keywords: low-shrinkage composite, nano-filled composite, conventional glass ionomer cement and nano resin-modified glass-ionomer cement, shear bond strength, microleakage, atmospheric pressure.

Introduction

Increased people's desire in invading the underwater world creates a new era of medical specialty due to physiological and pathological conditions caused by the great variant between the sea level and underwater level during diving.

Clinically, environmental pressure cycling has been found to be associated with barotraumas and barodontalgia. Barotrauma is the mechanical damage occurs due to disruption of gas filled spaces. Meanwhile, barodontalgia is the pain experienced in the teeth initiated by changes in barometric pressure. This symptom was originally used to describe the dental pain developed by pilots in unpressurized cockpits during the early 1940 [(30)].

This form of dental pain is generally marked by a predisposing dental pathology such as acute or chronic periapical infection, caries, deep or failing restorations, residual dental cysts, sinusitis or a history of recent dental surgery. Meticulous oral health is advised for divers to avoid barodontalgia. All carious lesions should be restored, ill-fitting crowns replaced, active periodontal lesions treated and all endodontic therapy completed [(60)].

There was little available literature focusing on the effect of pressure variations on the properties of the restorative materials and their marginal integrity, as well. Therefore, it is a concern that needs to be addressed to overcome all dental problems related to divers exposed to pressure changes.

Review of literature

I- Development and advancement of direct aesthetic restorative materials

I.1- Resin composites

Generally, composites consist of fillers embedded in a chemically-reactive organic resin matrix. Fillers are typically inorganic materials like glass or quartz which are functionalized by surface treatment (silanization), enabling chemical linkage to the resin matrix.

The composite resins were firstly introduced in the 1960s, they were chemically cured and their use was limited for class III, IV and V cavity preparations. The filler particles were large (mean diameter 0.8 to 100 micrometers [μm]). High wear rates and marginal leakage made such composites unacceptable for long-term restorations. In the 1970s, a major step in composite technology occurred with the introduction of light-cured composite resins. Studies have demonstrated that light-cured composite resins are more wear-resistant and more color-stable than the self-cured composite resins. The improved wear resistance was the result of using smaller filler particles (mean diameter 0.5 to 8 micrometers [μm]) and less air incorporation during placement of the restoration. Increased air causes inhibition of the polymerization process and creates voids that accelerate wear ***(Leinfelder, 1997)*** [(36)].

In the early 1980s, resins specifically for posterior use appeared in the market. They were relatively high wear resistant because of reduced particle size and increased filler loading. In the mid-1980s, significant