Effect of a New Glass-Ionomer Restorative Material on the Elemental Composition and Micro-Hardness of Hard Tooth Structures

Thesis

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بسم الله الرحمن الرحيم

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

صدق الله العظيم

(البقرة – الآية ٣٢)

This work is dedicated to… my encouraging father and mother … my wife …. My little stars Mariam, Ruqaya and Hafsa… …and supportive brothers and sisters.

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Introduction

Glass-ionomer cements are mainly composed of fluoride-containing silicate glass and polyalkenoic acids which are set by an acid–base reaction between the components. During the setting reaction a variety of ionic constituents is released from the glass, including fluoride. Fluoride may be released from glass-ionomers into an aqueous environment by the means of one of two mechanisms, one mechanism is a short-term reaction, during the first 24 hours, that involves rapid dissolution from outer surface into solution (process I) due to reaction of the glass particles with the polyalkenoate acid during setting, whereas the second is more gradual and resulted in the sustained diffusion of ions through the bulk cement (process II) which occurs due to the dissolution of the glass in the acidified water of the hydrogel matrix(1-7).

Resin-modified glass-ionomers have been developed to overcome the problems of moisture sensitivity and low initial mechanical strengths typical for conventional glass-ionomers. They were basically formed by adding methacrylate components to the polyacrylic acid, which are polymerizable by light-curing that is followed by the fundamental acid–base reaction that arises from sorption of water (8). It has been found that resin-modified glass-ionomers have a potential for releasing fluoride in equivalent amounts as conventional cements(9), but may be affected not only by the formation of complex fluoride compounds and their interaction with polyacrylic acid, but also by the type and amount of resin used for the photochemical polymerization reaction(10-12).

The ability of a restorative to act as a fluoride reservoir is mainly dependent on the type and permeability of filling material, on the frequency of fluoride exposure and on the kind and concentration of the