SOLUBILITY OF BIODENTINE AND ITS BOND STRENGTH TO RESIN COMPOSITE AFTER DIFFERENT STORAGE PERIODS

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Dedication

I dedicate this work to:

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Introduction

The popularity of Tricalcium silicate cements in dental procedures is growing [1] owing to their bioactivity and biocompatability.[2] These cements were first introduced into dentistry in the 1990's by Torabinejad, who developed a formula based on Ordinary Portland Cement (OPC) to produce the mineral trioxide aggregate, or the gray MTA. Later on, a white MTA version was developed. Since their introduction, MTAs have been mainly indicated for endodontic purposes, as repairing root perforations, apexification and pulp capping. [3]

The use of calcium silicate based cements as dentin substitutes beneath resin composite restorations has provided the advantage of calcium hydroxide release from the set material, which could react in the presence of physiological fluids forming hydroxyapatite, therefore acting as liners, while the rigid calcium silicate matrix replaces the dentin in bulk. However, the difficult manipulation and long setting time of MTA have restricted its use as dentin substitute in open sandwich restorations. Therefore, the introduction of Biodentine, with its short setting time allowed its use in coronal restorations, which is a novel clinical application of the calcium silicate family of cements. [2-5]

Biodentine™ (Septodont, Saint Maur des Fossés, France) was launched in 2011 as a quick setting calcium silicate cement, to overcome the long setting time of MTA. Biodentine is mainly composed of a highly purified tri-calcium silicate powder which is synthetically prepared in the lab de novo. Additionally, di-calcium silicate, calcium carbonate and zirconium dioxide are present in the powder. The tri-calcium and di-calcium silicate phases form around 70% of the powder's weight, which is close to that of white MTA and white Portland cement. (3)

Unlike MTA, Biodentine does not contain calcium sulphate, aluminate, or alumino-ferrate. The powder is dispensed in a two part capsule to which a liquid is added for hydration. This liquid is composed of water, calcium chloride, and a water reducing agent. (3)

Using bioactive cements beneath resin composite would be clinically more advantageous than using glass ionomer cement (GIC) bases, as they are biologically well tolerated by the pulp tissue and have comparatively higher remineralizing ability. The success of these cements in laminate restorations does not only depend on its bond strength to dentin but also on the quality of bond between it and the overlying resin composite. (6)

Moreover, to provide a long-term seal, avoid leakage from the oral cavity and maintain pulp protective effect, the lining and base materials have to be resistant to dissolution in water, organic solvents as well as in acid-etching solutions. According to Tam et al., base and lining materials should have high strength and low solubility. (2,7) However, partial or total dissolution of the GIC and fracture of the resin composite were main reasons for failure. (8)