Effect of resin coating on the surface roughness and stain resistance of resin composite material

Thesis

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Dedicated to

- My Father and My Mother for their unlimited Love and Giving.

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بسم الله الرحمن الرحيم

" وَيَسْأَلُونَكَ عَنِ الْجِبَالِ فَقُلْ يَنْسِفُهَا رَبي نَسْفًا * فَيَذَرُهَا قَاعًا صَفْصَفًا * لَا تَرَى فِيهَا عِوَجًا وَلَا أَمْتًا "

صدق الله العظيم

آية (١٠٥- ١٠٧) سورة طه

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INTRODUCTION

Resin composites have been widely used esthetic materials because they are mercury free, thermally non-conductive and resist corrosion. These resin materials have progressed from macrofills to microfills and from hybrids to microhybrids. New materials such as packable and nanofilled composites have been introduced to the dental market [5,10]. Each type of resin composite has certain advantages and limitations [47].

Finishing and polishing of resin composite restorations are essential steps in restorative dentistry [64]. Finishing refers to the gross contouring or reduction of the restoration to obtain the desired anatomy [71]. Polishing refers to the reduction of the roughness and scratches created by the finishing instruments [63,80].

Proper finishing and polishing of restorations are desirable not only for esthetic considerations but also for oral health [80].

The marginal finish of a restoration, surface roughness and surface integrity as well as the physicochemical properties of the material itself can affect plaque retention. This, in turn, plays a significant role in periodontal disease and recurrent decay [15,54]. Therefore, maintaining the smooth surface of a restoration is important for its success [39].

Resin composites are finished and polished in order to establish a functional occlusal relationship and a contour physiologically in harmony with supporting tissues. In addition, proper contour and high gloss give the restoration the appearance of natural tooth structure. Thus, it is important to determine which finishing systems offer the best results for esthetic restorations [80].

However, it is difficult to obtain a smooth surface on tooth colored materials because they are not all the same [9] .The type of inorganic filler, the size of the particles and the extent of the filler loading vary widely among these materials. These factors influence their polishability [9,15]. The difference in hardness between the filler particle and the matrix contributes to a roughened surface in these materials. The advent of visible-light-polymerizing resin and the usage of finer filler particles permit tooth-colored restoratives to be polished to a higher degree [9].

The use of unfilled resins for covering resin composites was first suggested 20 years ago. These were autopolymerized resins with Bisphenol-A glycidyl dimethacrylate matrix (bis-GMA), called glazes and were primarily recommended to improve the optical properties of resin composite restorations [8,76].

Various surface defects can appear, such as microcracks and irregularities due to removal of some of the surface particles during finishing. With the purpose to fill in these microstructural defects and to improve the resistance to abrasion of posterior resin composites, application of liquid resin to the surface of the material after finishing has been recommended [65]. Also to seal restorations while leaving a smooth polished surface without leaving a sticky, air-inhibited layer [4].

Staining of resin composite surfaces is a complex phenomenon that can involve several mechanisms. Rough surfaces may be discolored by adsorption of stains, although there is not always a relation between surface roughness and staining [74].

Staining may result from a chemical interaction between the resin surface and the stain. Poorly polymerized resin composite surfaces may exhibit high surface reactivity enabling this type of reaction. Freshly polymerized resin composite surfaces may be more susceptible to stains than aged surfaces [49].

Coffee may stain both by adsorption and absorption of its colorants onto/into the organic phase of resin composites. Beverages and rinses containing alcohol may soften the resin matrix and contribute to staining in that manner [83].

Therefore this study will be conducted to investigate the effect of resin surface sealant and bonding agent on the surface roughness and stain resistance of nanohybrid resin composite .

REVIEW OF LITERATURE

I-Effect of finishing and polishing on the surface roughness and the color stability of resin composite:

The esthetics and life span of tooth-colored restorative materials are heavily dependent on the quality of surface finish. The presence of irregularities on the surface of restorative materials may influence appearance, plaque retention, surface discoloration and gingival irritation. The goal of finishing and polishing procedures is obtaining the desired anatomy, proper occlusion, the reduction of roughness and scratches that were produced by the contouring and finishing instruments **(Yap and Mok, 2002 and Anusavice, 2003)**[1,86].

Although a smooth surface can be obtained after polymerizing the material against a matrix, it is difficult to adjust the matrix correctly without removing excess material. Moreover, the surface layer is essentially composed of organic matrix and is thus, less dense than the underlying layer. Therefore removing the superficial layer increases surface resistance to roughness and staining **(Joniot et al, 2000)**[39].

Surface roughness can be assessed by optical or mechanical profilometry. Mechanical profilometry gives a two-dimensional representation of the surface. It is a tactile method using a diamond-tipped stylus. Whereas, optical profilometry is a three-dimensional analysis method that provides both a qualitative and quantitative representation of the surface. It is a method without mechanical contact and the measuring device is the optical beam **(Joniot et al, 2006)**[40]. Spectrophotometers and colorimeters have been used to measure color changes in the resin composites with different surface conditions **(Lee et al, 2002)**[46].

Chung, 1994[16], investigated the effects of finishing and polishing