The Effect of Margin Design and Selected Physical Properties of Waxes on the Accuracy of Full Coverage Crown

Thesis

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بسم اللّه الرحمن الـرحيم
وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيـلًا
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Dedication


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Introduction

A cast crown is considered satisfactory when it presents suitable retention and resistance form, correct polishing, and good cervical and internal adaptation. However, during the complete crown preparation, failure can occur in any of these steps. In attempt to improve the casting procedure, a wide range of materials and techniques have been reported in an effort to achieve better results.

The marginal fit of a full metal crown is a crucial factor claimed to affect the periodontal status of the tooth and longevity of the restoration. Although it is generally accepted that the marginal errors should be minimized, very little information is available, in the real sense of evidence-based medicine, with regard to the relationship between marginal inaccuracy and longevity of the restoration [89].

The accuracy of a crown depends mainly on the accuracy of the wax pattern and the type of the finish line used[51,27,26].

Many procedures in dentistry require the use of waxes [15]. They are used as patterns for inlays, crowns, pontics and partial and full dentures. Waxes are very useful for bite registration and can also be used to obtain impressions of edentulous areas. In the processing of restorative dentistry, waxes are very important for dentists and technicians

Wax is one of the materials that requires more knowledge and skill to manipulate accurately because it has a considerably higher coefficient of thermal expansion (and contraction) than any other dental material. It

often contributes considerably to the inaccuracies of cast dental restorations.

The restoration can survive in the biological environment of the oral cavity if the margins are closely adapted to the cavosurface finish line preparation[69,33]. There are different types of finish line configuration each have its advantages and disadvantages.

In this study we choose two types of finish lines which are chamfer finish line and bevel finish line to determine which one have better marginal accuracy and better internal surface adaptation in conjunction with other factors as the use of different types of dental waxes of different physical properties besides the use of different time elapsed between making the wax pattern and the investment.

Review of literature

Marginal adaptation is considered to be a primary and significant factor in the prevention of secondary caries and an important indicator for the overall acceptability of full coverage restoration[77, 83]. Marginal accuracy is significantly influenced by the preparation design[80,22]. Geometry of tooth preparation including type of finish line is an important factor in obtaining close marginal adaptation.

Margin design

Proper margin location, configuration and adequate fitness should be obtained for the success of fixed restoration [73,52, 6]. Crown margin is one of the components of cast restoration that most susceptible to failure. Numerous variations in margin design and finish line preparation of casted restorations have been studied to fulfill precise marginal adaptation, and prevention of microbial marginal leakage. The configuration of the finish line dictates the shape and bulk of the restorative material in the margin of the restoration **[37].** It also can affect both marginal adaptation and the degree of seating of the restoration. Different shapes of finish lines have been described and advocated. Margin designs used are featheredge, chisel, bevel, chamfer, shoulder, sloped shoulder and shoulder with bevel finish lines[63]. Finish line designs play a very important role in the marginal fit and fracture strength of fabricated casted crowns. Many studies

have been conducted to evaluate the role of finish line on the marginal fit. However most of them reported a conflicting data[21,84,57]

Fusayama et al. in 1964[32] cemented full cast metal crowns onto extracted teeth prepared with chamfer, shoulderless and 90-degree shoulder finish lines then sectioned buccolingually and the cement thickness was measured. An increase in the taper of the walls resulted in marked decrease in the thickness of cement on the margins. They observed that shoulderless margin provided the best sealing effect followed by the chamfer and the 90-degree shoulder finishing lines

El-Ebrashi et al in 1969[28] **and Dennison in 1978**[23] studied experimental stress analysis on photoelastic models and its relation to different marginal geometry. They found that shoulder with rounded internal line angle and chamfer showed the least stress concentration, and that shoulder with bevels and feather-edges showed the most stress concentration.

Shillingburg et al. in 1973[81] measured the change in marginal fit of the porcelain bonded to metal restoration with different marginal preparation, chamfer, shoulder and shoulder with bevel. They found the shoulder and the shoulder with bevel type of margin produced the best fit with no signification (5-10um).

Berman in 1973[9]**, Barnes in 1974**[7] **and Pascoe in 1978**[68] studied the effect of finish line design on the casted restoration by measuring the