EFFECT OF DIFFERENT LABIAL MARGIN DESIGNS, LUTING AGENTS ON THE VERTICAL MARGINAL ADAPTATION AND MICROLEAKAGE OF CERAMOMETALIC RESTORATION

A

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تأثير اختلاف تصميم الحافة الشفاوية والمادة اللاصقة على التطابق الحافى العمودى والتسريب للتركيبات المعدنية الخزفية

بحث مقدم كجزء من مقومات الحصول على درجة الماجستير فى التيجان والجسور

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Summary

The principal aim of this investigation was to evaluate the effect of different labial margin designs (Knife Edge, Collarless and Butt Joint) together with different luting agents (Zinc Phosphate, Ketac Cem and Rely X Unicem) on the vertical marginal gap before and after cementation and coronal microleakage of ceramometalic restoration.

45 intact caries free recently extracted human molars were selected with approximate similarity in size and shape. They were machined cut stimulating the prepared molar of 6mm length, 6.5 mm cervical diameter and 6º Cervico-occlusal angle.

The wax pattern was fabricated by the aid of specially designed copper counter die

Wax pattern were built up on the working die according to labial margin design into three different coping designs;

1- 15 Copings with wide cervical knife edge

2- 15 Collarless Copings

3- 15 Butted margin Copings.

After spruing, investing, casting and finishing, porcelain was applied, condensed and fired according to manufacturer's instructions. Porcelain application technique is the same for knife edge and butt margin while with collarless crowns direct lift up technique was used.

The vertical marginal gap of samples was measured using (High resolution digital microscope with a fixed magnification of 65X

Restoration were cemented to their corresponding prepared teeth using three different luting agents as follow

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Dedication

I dedicate this thesis to those who made great contributions in my life; to my Father who is the greatest support I got and my role model. I wish I make him proud.

To my Mother, her constant love and care made me the person I am now, I owe her everything.

To my husband, who made life pleasant because I am sharing it with him.

Finally I also dedicate this to my kids, the love of my life Abdel Hamid and Omar. They are giving me smiles and they are forcing me to be a better person, a better mom and a better dentist

Mai Nabil

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Introduction

Esthetic dentistry is currently a main theme of dentistry and patients are interested in restorative materials which look and feel like natural teeth.

The search for ideal materials to restore missing tooth structure has resulted in the availability of esthetically acceptable restorative material such as glass filled, resin based composite resin, metal ceramic crown and other types of improved porcelain crowns.[100]

Porcelain Fused To Metal restorations still commonly used due to its cosmetic appearance, durability and versatility of use for both single restoration and fixed partial denture. [42]

The success of dental cast restoration depends basically on good retention and accurate marginal fitness

Defective margins develop a gap at the tooth restoration interface which allow for microorganisms, chemicals and fluids to percolate through. [83]

In spite of recent development in dental materials and improvement in technical procedures regarding impression making alloys, marginal leakage is still involved in crown and bridge failure

Marginal integrity of cast restoration is a function of three main factors which are the margin of the preparation, the margin of the restoration and the sealing ability of cementing medium

The type of finishing line as well as the type of casting alloy is important factors which contribute to the integrity of the cast restoration. [54]

Many Researches had tried to establish a relationship between different margin designs and luting agents and their effect on the vertical marginal adaptation and microleakage of ceramometalic restoration. This relation is still doubtful and there is a conflict between different results.

Review of Literature

Metal Ceramic exactly means a metal casting or coping which fits over the tooth preparation and ceramic that is fused to the coping.

When the porcelain was developed with co-efficient of thermal expansion similar to the existing dental casting alloys, porcelain restorations were introduced in the market as porcelain fused to gold and Porcelain Fused to Metal (PFM), The term Metal Ceramic Restoration (MCR) commonly used in the dental literature during 1970's and 1980's.

Advantages of Porcelain-Fused-to-Metal Restorations

- Clinically-proven longevity and fracture resistance: fracture rate of porcelain-fused-to-metal crowns and bridges were reported to be as low as 2.3% after 7.5 years. [(52)] Combines the esthetics of porcelain with the strength, marginal adaptation, and accuracy of cast metal restorations. [(41)]
- More resistant to fracture than conventional all-ceramic crowns. The slight difference in the coefficient of thermal expansion between the metal and ceramic causes the ceramic to undergo residual compressive stresses following the cooling process during crown fabrication. This constant residual compressive stresses resists the tensile stresses the crown is subjected to rendering the crown stronger and more fracture resistant. [(51)]
- A more conservative preparation provides adequate thickness for porcelain-fused-to-metal crowns when compared to all-ceramic crowns.
- No wear of ceramic by abrasion or attrition.

- No change of color due to no microleakage between the veneer and the metal. [52]
- More cervical adaptation than all ceramics

Limitations of Porcelain-Fused-to-Metal Restorations

- Non-ideal esthetics since:
    - The metal at the gingival margin may cause gingival discoloration [111]
    - The dark metal core may show through in areas with minimal porcelain thickness especially at the gingival third
    - The metal margin may become visible if gingival recession occurs
- Metal hypersensitivity

Cervical Marginal Adaptation

Cervical marginal adaptation is a very important aspect for fixed restoration because a large marginal opening allows more plaque accumulation, gingival sulcular fluid flow, and bone loss, resulting in microleakage, recurrent caries, and periodontal disease [88, 89]

Variation exists regarding what constitutes a clinically acceptable margin. [52] **Machlen and Von Fraunhofer, [66] 1971** proposed that restoration would be successful if marginal gaps and cement thicknesses of less than 120 μ could be achieved.

The longevity of fixed restoration is critically linked to the retention and marginal fit, which are affected by many factors, but all are related to the properties of the luting cement. [78]