



Ministry of Higher Education
And Scientific Research
University of Baghdad
College of Dentistry



**MARGINAL ADAPTATION AND FRACTURE
STRENGTH OF MONOLITHIC ZIRCONIA CROWNS
WITH VERTICAL PREPARATION AND MODIFIED
VERTICAL PREPARATION
(A COMPARATIVE *IN VITRO* STUDY)**

This thesis is submitted to the Council of the College of Dentistry/University of Baghdad in partial fulfillment for the requirement of Master of Science in
Conservative Dentistry

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2021 A.D.

1443 A.H

ABSTRACT

Background: Tooth preparation design plays a key role in determining the marginal accuracy and fracture strength that are both critical for the longevity of all-ceramic restorations. This study was conducted to evaluate the influence of different preparation designs on the marginal adaptation and fracture strength of monolithic zirconia crowns.

Materials and methods: Thirty sound human maxillary first premolars were used in this study. The teeth were divided randomly into three groups according to the preparation design (n=10). Group A: chamfer margin; group B: vertical preparation, and group C: modified vertical preparation with a reverse shoulder. All samples received a standardised preparation with planer occlusal reduction, 4mm axial height, 0.8mm chamfer (group A), vertical margin (groups B&C), 1mm reverse shoulder at the buccal surface (group C). The prepared teeth were scanned using an intra-oral scanner, the crowns were designed using Sirona InLab CAD 20.0 and milled with a 5-axis milling machine. The marginal gap between the crown and tooth was measured in μm pre-and post-cementation at sixteen points for each sample using a digital microscope at a magnification of 230x. Each crown was then cemented on its respective tooth with self-adhesive resin cement. A single load to failure test was used to assess the fracture strength of the crowns using a computer-controlled universal testing machine that automatically recorded the fracture strength of each sample in Newton (N). The data were then analysed statistically using One-way ANOVA test, Bonferroni test, Paired t-test, and Pearson's Correlation test at a level of significance of 0.05.

Results: Regarding the marginal gap, the results showed that the least marginal gap was recorded by the modified vertical preparation while the highest

marginal gap was recorded by the chamfer group with a statistically significant difference ($p < 0.05$) pre-and post-cementation.

Concerning the fracture strength, the results revealed that the modified vertical preparation showed a statistically non-significant difference as compared to the chamfer and vertical groups ($p > 0.05$). While the chamfer group showed a higher fracture strength with a statistically significant difference as compared with the vertical group ($p < 0.05$).

Conclusion: The modification of the vertical preparation with a reverse shoulder improved the marginal fitness and fracture strength of monolithic zirconia crowns.



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التكيف الهامشي وقوة الكسر لتيجان الزركونيا الكاملة مع التحضير العمودي والتحضير العمودي المحور (دراسة مختبرية مقارنة)

تقدم هذه الرسالة إلى مجلس كلية طب الأسنان / جامعة بغداد كجزء من متطلبات نيل ماجستير العلوم
في معالجة و تجميل الأسنان

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