Effect of different pattern construction techniques on the marginal adaptation, internal fit and fracture resistance of IPS-emax press crowns

Mostafa Eldessouky ,Osama Saleh, Rania A. Amin, Mostafa A. Abdellatif

Abstract

Purpose: The purpose of this study was to evaluate the effect of pattern construction technique on the marginal accuracy, internal fitness and fracture resistance of E-max crowns.
Materials and methods: Thirty caries-free human maxillary first premolars were selected, cleaned by scaling, and stored in 0.9% standardized saline solution at room temperature. Using an industrial lathe machine, the teeth were prepared to receive all ceramic crowns with standardized dimensions of 6 degrees angle of convergence. The preparation had 5mm occluso-cervical height, 6mm cervical diameter and 1 mm deep chamfer finish line. The prepared teeth were divided into three groups (n=10) according to the pattern fabrication techniques used: Group1: Conventional wax patterns. Group2: CAD/CAM wax patterns. Group3: 3D Printing of resin patterns. All patterns were invested to construct E-max crowns. The ceramic crowns were seated on their corresponding prepared teeth and the vertical marginal gap was measured with a binocular microscope (90X). Then internal gap of each ceramic crown was measured using the silicone replica technique. Aftercementation, each ceramic crown was statically, compressively and axially loaded until fracture at a cross head speed of 1 mm/min using a steel rod placed centrally at the occlusal surface of the crowns to evaluate the fracture resistance of the crowns.
Results: Group 1 showed the largest marginal gap mean (85.74Ñ2.58εm) followed by group 2; (74.06Ñ3.27εm) and then group3 (69.35Ñ 3.44εm). These differences were statistically significant among the groups. The results of internal gap distances in group 1 (112Ñ7.66εm) followed by group 2 (100Ñ5.76εm) and then group3 (82Ñ 7.2εm), the differences between the groups were statistically significant. The mean fracture resistance values of groups 1, 2 and 3 were 850.67Ñ25.30N, 1080.01Ñ47.06N and 1412.18Ñ28.92N respectively. Post hoc test revealed that the differences between groups 1 and 2 as well as between groups 2 and 3 were statistically insignificant; however, the difference between groups 1 and 3 was statistically significant. Spearmanôs rank correlation coefficient showed value of -0.781. The negative sign indicates that the fracture resistance of the samples decreased as the internal gaps increased
Conclusions: The 3D printed pattern resulted in an E-max crown with better marginal adaptation and internal fitness. The fracture resistance of E-max crown was improved as its internal adaptation was enhanced.

Egyptian Dental Journal 2016, January