

CAD-CAM Ceramic Inlay Restorations: Evaluating Fracture Strength with Different Instrumental Cavity Preparation Methods

ABSTRACT

Objectives: The fracture strength of ceramic inlay restorations were evaluated after the use of different instrumental preparation methods.

Materials&Methods: 48 extracted human molar teeth were divided into four groups, and inlay cavity preparations were performed using different instruments for each group. The groups are as follows: Group 1: Expert inlay diamond bur set was used for preparation, followed by finishing with an ultrasonic instrument (Intensiv+Sonicflex (IS)), Group 2: Only the expert inlay diamond bur set was used (Intensiv (I)), Group 3: Standard fissure diamond burs were used for preparation, followed by correction with an ultrasonic instrument (Standard+Sonicflex (SS)), Group 4: Only standard diamond burs were used for preparations (Standard (S)). The digital impressions of the inlay cavities were obtained, and the design of inlay restorations was performed using CAD program. Inlay restorations were produced from feldspathic blocks and cemented with resin cement. Afterward, the inlays were subjected to a single-load failure test using a universal testing machine. All data were analyzed statistically.

Results: The highest fracture strength mean value was observed in the IS group, with a value of $1712.17N \pm 546.990$). This was followed by the I group ($1370.99N \pm 605.877$), the SS group ($1207.76N \pm 558.551$), and the S group ($941.73N \pm 372.361$). The lowest fracture strength was observed in the S group. The highest fracture strength was observed in the IS group. The IS group showed a statistically significant difference compared to the S group ($p < 0.05$).

Conclusion: The group utilizing both the intensive diamond bur set and ultrasonic instruments (IS group) demonstrated the highest fracture strength compared to other groups. On the other hand, the group that used only standard diamond burs (S group) exhibited the lowest fracture strength. These results highlight the superior performance of the expert inlay preparation instruments in terms of fracture strength, emphasizing the importance of utilizing advanced instruments for optimal outcomes in inlay restorations.

Keywords: Ceramic inlay restorations, CAD-CAM, fracture strength, inlay preparation, ultrasonic instruments