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COMPARATIVE EVALUATION OF CLINICAL PERFORMANCE OF TWO DIFFERENT 3D PRINTED DEFINITIVE RESIN CROWNS WITH PRESSED LITHIUM DISILICATE CROWNS

By

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ABSTRACT

Background

3D printing technology is revolutionizing dentistry by replacing traditional metals and ceramics with nano-filled ceramic resin for dental restorations. This biomimetic restoration is expected to replace conventional crowns. However, clinical testing and performance evaluation are needed to determine the effectiveness of these new materials. The shift to biomimetic 3D printed resin crowns can help maintain balanced occlusal contacts post-wear.

Objectives

1. To evaluate the long-term durability and survival rate of 3D printed resin crowns.
2. To compare the clinical performance of 3D printed resin crowns with that of lithium disilicate crowns.

Method

The study involved 45 participants who were divided into three groups: one group received 3D printed crowns of a commercially available resin (Crowntec; Saremco Dental AG), another received 3D printed crowns of novel resin material (C&B - Permanent; Prevest DenPro), and the third group received pressed lithium disilicate crowns (IPS e.max Press MO; Ivoclar Vivadent AG). The procedure included pre-operative intraoral radiographs, diagnostic intraoral scans, and computer-aided design and manufacturing techniques. Crowns were prepared following standard operating procedures and bonded onto the prepared teeth using self-adhesive resin cement. Participants were recalled at intervals of 3, 6, and 9 months post-cementation for

evaluation. During these recall visits, all restorations were assessed by three clinicians using the modified United States Public Health Service (USPHS) criteria, examining anatomical form, restoration staining, marginal discoloration, colour match, surface roughness, and marginal adaptation. The collected data were methodically organized and analysed using descriptive statistics, Kruskal-Wallis tests, Mann-Whitney tests, Wilcoxon tests, and Friedman's test to evaluate changes within each group.

Results

Wilcoxon tests indicated statistical significance at different intervals (0-3m, 0-6m, 0-9m, 3-6m, 3-9m, 6-9m) with several values showing significant changes in Group 2. At 6 and 9 months, significant changes are noted in Group 1 and Group 2, with p-values of 0.049 in relation to anatomic form whereas Group 3 shows no change (mean remains 1.00). 9 months: Significant differences were also observed in marginal discolouration ($p = 0.037$) in Group 1 and Group 2, with Group 3 showing no discolouration.

Conclusion

Pressed lithium disilicate crowns consistently demonstrated stable performance across all evaluated variables and time points, suggesting it is a robust material for dental applications. However, the 3D printed materials exhibited changes, particularly in anatomic form and marginal discoloration, which may impact long-term clinical outcomes.

Keywords: 3D printed resin crowns, Definitive 3D printed crown, Lithium disilicate crowns, Clinical performance, Modified USPHS criteria

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