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**Purpose:** To evaluate the fracture resistance of computer-aided design/computer-assisted manufactured (CAD/CAM) glass-ceramic incisor crowns fabricated on reverse-tapered preparations. **Materials and Methods:** Resin abutments with known total occlusal convergence angles (−8, 0, and 12 degrees; n = 20) were scanned with the TRIOS scanner, and glass-ceramic crowns were fabricated with KaVo Arctica, stored in water for either 1 or 30 days, and submitted to fracture test. **Results:** The fracture resistance of crowns made on reverse-tapered preparations was not significantly different (P = .471) from crowns fabricated over abutments with 0- or 12-degree tapers, irrespective of the water storage period. **Conclusion:** The fracture resistance of anterior glass-ceramic crowns fabricated over reverse-tapered preparations was similar to that of crowns made on abutments with 0- or 12-degree tapers.

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eplacing missing teeth with fixed dental prostheses requires the preparation of abutment teeth. These abutments will have a total occlusal convergence (TOC) angle that fluctuates within the 10- to 22-degree range with no apparent correlation with the operator’s level of education or experience.¹ Although having preparations with low TOC angles (< 10 degrees) would be advantageous in terms of tooth structure preservation and increased retention of restorations, achieving such low TOC angles is, unfortunately, a clinically challenging task prone to preparation undercuts. In fact, the reported frequency of preparation undercuts in prepared teeth goes from 59.1% (final year students, in vitro) to 30.7% (experienced general dental practitioners, in vivo).¹,²

However, it has been demonstrated that reverse-tapered preparations (negative TOC angles or undercuts) neither restrict the making of intraoral digital impressions nor are detrimental to their accuracy,³ and that well-fitting dental crowns can be fabricated from those intraoral impressions.² Therefore, this study evaluated the fracture resistance of computer-aided design/computer-assisted manufactured (CAD/CAM) glass-ceramic incisor crowns fabricated over conventional and reverse-tapered preparations with or without 1 month of water storage. The null hypothesis was that no significant differences would be found among the tooth preparations tested.

**Materials and Methods**

A total of 60 resin (polymethylmethacrylate) abutments with a TOC angle of −8, 0, or 12 degrees (n = 20; Fig 1) were scanned with the TRIOS intraoral scanner, and crowns were designed with KaVo multiCAD software version 2.8.0 with default parameters (50-µm cement space) for 0- and 12-degree abutments, whereas −8-degree abutments were digitally blocked out² at 0 degrees and had an extra mediodistal gap set to 0.05 mm. Crowns were then machined from Vita Mark II blocks (Vita Zahnfabrik), tried onto their respective dies, glassed, cemented with a self-adhesive resin cement (RelyX Unicem 2, 3M ESPE) in accordance with the manufacturers’ instructions, stored in water for either 1 or 30 days, and finally submitted to fracture test in a universal testing machine at a crosshead speed of 0.5 mm/minute (Fig 2). Collected data were analyzed with repeated measures analysis of variance (ANOVA) and post hoc Tukey test (α = .05).
Results

Mean loads to fracture for specimens with 1 day/30 days of water storage were: 205.6/190.1 N (–8 degrees); 233.8/223.6 N (0 degrees); and 218.2/229.8 N (12 degrees). There was no statistically significant difference between the water storage conditions. Also, the interactions between water storage and the TOC angle within subgroups were not statistically significant ($P = .471$), nor was the multiple comparisons test (Table 1, Fig 3).

Discussion

The null hypothesis was accepted ($P > .07$), as none of the TOC angles tested showed a significant impact on the load-to-fracture values of glass-ceramic crowns after water storage for 1 or 30 days. The fabrication of dental restorations over reverse-tapered preparations or preparations with minor undercuts is possible as...
long as the CAD software has undercut-blocking algorithms that could successfully manage these preparations at the design stage of a fully digital workflow. On the other hand, the main concern when fabricating dental crowns over reverse-tapered preparations would be the long-term mechanical stability of such restorations, as the virtual space generated after digitally “blocking out” those abutments will be filled with a nonuniform cement film. Such virtual space has been reported to be within the 128.8- to 172.6-µm range, and research about the influence of this internal gap width on the fracture resistance of crowns is material dependent and still not conclusive.\(^1\)–\(^7\)

**Conclusions**

Within the intrinsic limitations of this laboratory-based study, the fracture resistance of crowns made on reverse-tapered preparations was not significantly different from crowns fabricated over abutments with either 0- or 12-degree tapers.

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**References**


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**Literature Abstract**

**A Systematic Review of the Survival of Teeth Intentionally Replanted with a Modern Technique and Cost-Effectiveness Compared with Single-Tooth Implants**

The aim of this study was to investigate the survival rate of teeth intentionally replanted with a modern technique and to compare the cost-effectiveness of this procedure with that of single-tooth implants. Four databases were systematically searched for articles that met the inclusion criteria published between January 1966 and February 2017. The overall survival rate of intentionally replanted implants was determined through a meta-analysis using a random-effects model. Costs of different procedures were determined from the 2016 American Dental Association Dental Fees Survey, and cost-effectiveness analysis was performed for the different treatment modalities. Six studies met the inclusion criteria. The meta-analysis resulted in a survival rate of 89.1% (95% confidence interval [CI] 83.8% to 94.4%). Compared with a single-tooth implant, intentional replantation was more cost-effective even when custom post/core and crown were also needed. The meta-analysis revealed a high survival rate for intentional replantation. Although the survival rate of implants is higher, intentional replantation is a more cost-effective treatment modality. Intentional replantation should be a treatment option discussed with patients, especially because an implant can still be placed if intentional replantation is unsuccessful.