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Pre-Sealing of Endodontic Access Cavities for the Preservation of Anterior Teeth Fracture Resistance

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ABSTRACT

Objective: Sodium hypochlorite solution (NaOCl) is an effective canal irrigant but interferes with the mechanical features of dentin and the bonding capability of adhesives when restoring endodontically treated teeth. This study evaluated whether access cavity resin sealing before using canal irrigant would augment the resistance of endodontically treated anterior teeth against fracture.

Methods: Sixty maxillary incisors underwent endodontic treatment in five groups ($n = 12$). Irrigation with 5.25% NaOCl and 17% ethylenediaminetetraacetic acid (EDTA) was performed in all groups except for Group 5. After root canal obturation, in Group 1, the access cavity was kept unrestored. In Group 2, immediate restoration after obturation was achieved. For Group 3, delayed restoration after 1 week was provided. In Group 4 (pre-sealed), before canal irrigation, the dentin surface of access cavities was sealed using self-adhesive composite resin (Vertise Flow) and then restored after obturation. In Group 5, which was saline irrigated, immediate restoration was performed. After storage and thermal cycling for 5000 cycles at 5°C–55°C with a dwell time of 15 s and a transfer time of 5 s, teeth were statically loaded by a universal testing machine until a fracture occurred. Data were collected as the fracture resistance (FR) and analyzed using the one-way analysis of variance and Tukey's tests.

Results: FR significantly differed between all groups ($p < 0.001$). The lowest FR was recorded in the unrestored group (284 ± 86 N), which was not statistically different from the immediately restored group ($p = 0.065$). The pre-sealed group exhibited the highest FR value (810 ± 127 N, $p \leq 0.02$ vs. other groups). The FR of the saline-irrigated and delayed restored groups was almost similar ($p = 0.13$).

Conclusions: NaOCl/EDTA irrigation resulted in an adverse effect on FR. Delayed restoration could reduce this adverse effect. Access cavity pre-sealing with flowable composites led to a higher FR than conventional methods and may be considered an effective step during treatment procedures.

1 | Introduction

Restorative materials can seal endodontically treated teeth to avert premature coronal leakage and achieve a successful endodontic treatment (De Rose, Krejci, and Bortolotto 2015; Ebert et al. 2009; Uranga et al. 1999). The dentin of endodontically treated teeth undergoes some structural alterations, such as water loss and collagen cross-linking weakening (Comba et al. 2021). Consequently, the weakened biomechanical behavior of tooth structure

of endodontically treated teeth makes their restoration challenging for dental clinicians (Comba et al. 2021). Compared to non-adhesives, adhesive restoration, such as composite resin, presents greater fracture resistance (FR) by reinforcing the remaining tooth structures (Soares et al. 2008). Lacking an adhesive bond, nonadhesive restorations achieve less FR and more treatment failures (Soares et al. 2008). In addition, when nonadhesive restorations such as amalgam were used in combination with adhesive resins, the FR of teeth after endodontic treatment would

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dentin surface using a self-adhesive flowable composite may be considered an effective step during treatment procedures to increase the FR of the composite resin-restored anterior teeth compared to conventional methods. However, future clinical investigations are needed to confirm this finding in daily clinical practice.

Author Contributions

Both authors contributed equally to all aspects of the research.

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Ethics Statement

The protocol of the present research was approved by the university ethics committee with Ethical Approval Number IR.SUMS.DENTAL.REC.-1398.023.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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