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Comparative Wear Evaluation of Glazed and Non-Glazed Acrylic Denture Teeth Over 12 Months

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KEYWORDS

Acrylic denture teeth, Enamel glaze, Wear resistance, Profilometry, Complete dentures, In vivo study.

ABSTRACT:

Introduction: Tooth wear in complete dentures is an inevitable consequence of masticatory and parafunctional activity. Loss of vertical dimension, decreased chewing efficiency, and compromised aesthetics result over time, affecting patient satisfaction and prosthesis lifespan [1,2].

Objectives: This study aimed to evaluate and compare the wear resistance of artificial acrylic denture teeth with and without an enamel (glaze) layer over 6 and 12 months in vivo.

Methods: Fifty-two edentulous patients were rehabilitated with complete dentures fabricated with Ruthinium Acry Lux three-layered acrylic teeth. Each participant received a glazed and a non-glazed (sandblasted) prosthesis. Impressions were taken at baseline, 6 months, and 12 months. A 3D optical profilometer (MicroXAM-100) was used to measure vertical wear. Statistical analyses included paired t-tests and independent t-tests.

Results: Non-glazed teeth exhibited significantly higher wear compared with glazed teeth ($p = 0.001$). Mean wear for non-glazed teeth was 131.13 ± 20.68 µm at 6 months and 219.58 ± 20.09 µm at 12 months, while glazed teeth showed 96.87 ± 20.69 µm and 176.60 ± 17.06 µm at the same intervals.

Conclusions: Preservation of the glaze layer improves wear resistance of denture teeth, promoting better long-term prosthetic performance.

1. Introduction

Tooth wear in complete dentures is a common clinical problem. Over time, occlusal wear can lead to loss of vertical dimension, reduced masticatory efficiency, and aesthetic compromise [1,2]. Acrylic resin teeth are widely used because of their ease of adjustment and bonding compatibility, but they lack the wear resistance of porcelain teeth [3,4].

Manufacturers add an enamel-like glaze layer to acrylic denture teeth to increase wear resistance [3,5].

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Unfortunately, this layer is often reduced or removed during occlusal corrections and finishing. Although in vitro studies have investigated wear, in vivo evidence remains limited [5,6].

This study investigates the role of the glaze layer in enhancing wear resistance under intraoral functional conditions over 12 months.

2. **Objectives**: To evaluate and compare the amount of occlusal wear in glazed versus non-glazed acrylic denture teeth at 6 months and 12 months of clinical use.

3. **Methods:** This prospective in vivo study was conducted in the Department of Prosthodontics after obtaining ethical clearance and written informed consent.

Participants: Fifty-two completely edentulous patients (aged 45–70 years) were included. Inclusion criteria: well-formed ridges, absence of systemic illness affecting oral function, good neuromuscular control, no bruxism. Exclusion criteria: parafunctional habits, temporomandibular joint disorders, or prior denture wear.

Prosthesis Fabrication: Each participant received two sets of complete dentures with Ruthinium Acry Lux three-layered acrylic teeth. For the glazed group, the enamel layer was intact; in the non-glazed group, the glaze was removed using 50 µm aluminum oxide sandblasting [7]. Tooth 27 (maxillary left first molar) was selected for wear measurement.

Data Collection: Baseline impressions were made using polyvinyl siloxane and repeated at 6 and 12 months. Casts were analyzed with a MicroXAM-100 non-contact optical profilometer [8]. Wear was measured as the change in vertical height.

Statistical Analysis: Data were analyzed using SPSS software. Paired t-tests were used for intra-group comparison and independent t-tests for intergroup comparison. Significance was set at $p < 0.05$.

4. **Results:** Glazed teeth demonstrated significantly lower wear than non-glazed teeth across both time intervals.

- Glazed group: 96.87 ± 20.69 µm (6 months), 176.60 ± 17.06 µm (12 months)
- Non-glazed group: 131.13 ± 20.68 µm (6 months), 219.58 ± 20.09 µm (12 months)

The intergroup differences were 34.26 µm at 6 months and 42.98 µm at 12 months ($p = 0.001$). Intragroup wear progression was also significant: 79.30 µm in the glazed group and 88.44 µm in the non-glazed group ($p = 0.001$).

These results are consistent with earlier studies on artificial tooth wear [9,10].

5. **Discussion:** This study demonstrates that the enamel glaze layer plays a protective role in reducing wear of acrylic denture teeth. Glazed teeth consistently showed lower wear values compared to non-glazed teeth over 12 months.

These findings align with Hirano et al. [10] and Lambrechts et al. [11], who emphasized the importance of surface integrity on wear resistance. The glaze layer functions like enamel in natural teeth, acting as a hard protective barrier against occlusal stress.

The greater wear observed in non-glazed teeth can be attributed to increased two-body abrasion [12]. Early rapid wear within the first 6 months may be related to occlusal settling and adaptation, similar to observations by Abbasi et al. [5].

The use of non-contact profilometry provided precise and reproducible measurements without examiner bias [8]. Tooth 27 was chosen because it is a load-bearing posterior tooth frequently subjected to functional occlusal forces [13].

Clinically, the results highlight the importance of avoiding unnecessary removal of the glaze layer during adjustments. Loss of this protective coating may accelerate wear, reduce chewing efficiency, and compromise vertical dimension [14,15].

6. **Conclusion:** Retention of the enamel glaze layer on acrylic denture teeth significantly improves resistance to occlusal wear. Prosthodontists should

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minimize removal of this layer during finishing and occlusal adjustments to enhance prosthesis durability and patient satisfaction.

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