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## **Clinical Performance of Restorative Materials in Managing Bruxism: A Comparative Study**

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### **Introduction**

Teeth wear, fractures, and restoration failure are among the serious dental problems that can result from bruxism, the involuntary grinding or clenching of teeth (1). To ensure long-term durability and patient happiness, it is vital to select an appropriate dental restorative material for patients with bruxism. Glass ionomer cement (GIC), composite resins, amalgam, and cermet are some of the most typical dental materials utilized for restorations. There are distinct mechanical characteristics, wear resistance, and clinical lifetime exhibited by each of these materials (2,3). In this clinical trial, individuals with bruxism are tested for wear, fracture, and patient-reported results to determine how well these materials work.

## Methodology

**Study Design:** A prospective observational study was conducted over 12 months to evaluate the clinical performance of dental materials.

**Sample Size:** A total of 50 patients diagnosed with bruxism were included in the study based on specific inclusion and exclusion criteria.

### Inclusion Criteria:

- Adult patients (18-60 years).
- Diagnosed with bruxism through clinical examination and patient history.
- Presence of moderate to severe tooth wear requiring restorations.

### Exclusion Criteria:

- Patients with systemic conditions affecting oral health (e.g., uncontrolled diabetes).
- History of previous restorative failures unrelated to bruxism.

**Materials:** The study evaluated four dental materials:

1. Glass Ionomer Cement (GIC).
2. Composite resin.
3. Dental amalgam.
4. Cermet.

**Procedure:** Each of the four restorative materials was given to patients at random. Trained doctors followed the instructions provided by the manufacturers to perform standardized cavity preparations and put restorations. Occlusal guards were prescribed as part of the postoperative care plan to lessen the impact of bruxism. At 3, 6, and 12 months, patients were re-evaluated.

### Evaluation Parameters:

1. **Restoration Wear:** Assessed using digital calipers and visual examination.
2. **Fracture/Failure:** Monitored for partial or complete restoration loss.
3. **Marginal Integrity:** Evaluated based on discoloration, adaptation, and marginal gaps.
4. **Patient Satisfaction:** Measured using a Visual Analog Scale (VAS).

## Results

The results were analyzed to compare the performance of the four materials at the end of 12 months. Statistical analysis was conducted using ANOVA for continuous variables and chi-square tests for categorical data ( $p < 0.05$  considered significant).

### Table 1: Clinical Performance of Dental Materials in Bruxism Patients

Parameter	GIC (n=12)	Composite (n=12)	Amalgam (n=13)	Cermet (n=13)	p- value
<b>Restoration Wear (mm)</b>	0.80 ± 0.20	0.50 ± 0.15	0.30 ± 0.10	0.40 ± 0.12	0.01
<b>Fracture Rate (%)</b>	25% (3)	16.7% (2)	7.7% (1)	15.4% (2)	0.04
<b>Marginal Integrity (%)</b>	58.3% (7)	83.3% (10)	92.3% (12)	76.9% (10)	0.03
<b>VAS Satisfaction Score</b>	6.5 ± 1.2	8.0 ± 1.0	8.5 ± 0.8	7.8 ± 1.1	0.02

## Discussion

The findings of this study reveal significant differences in the performance of dental materials used in patients with bruxism, providing valuable insights for clinical practice:

1. **Restoration Wear:** Because of its great compressive strength and abrasion resistance, amalgam showed the least amount of wear compared to all the other materials. In keeping with its improved formulation for stress-bearing applications, composite resin also functioned admirably, displaying moderate wear resistance (4). In contrast, GIC exhibited the most wear, which is understandable given its comparatively weak mechanical strength and vulnerability to surface deterioration caused by the strong occlusal forces commonly experienced during bruxism (5). Cermet, a reinforced GIC, outperformed composite and amalgam in terms of wear resistance, but it was still behind conventional GIC.
2. **Fracture Rates:** The fact that amalgam restorations showed the least amount of fracture support is evidence of their capacity to endure high occlusal stresses. The fracture rate was somewhat greater for composite resin, despite its moderate strength and outstanding adhesive qualities. The highest fracture rate was observed with GIC restorations, which can be attributed to their brittleness and poor bonding capabilities (6). Although it outperformed GIC, Cermet's fracture resistance was still lower than that of amalgam or composite resin.
3. **Marginal Integrity:** There was less chance of microleakage and subsequent caries with amalgam restorations because of their excellent marginal integrity. Composite resins not only offered great marginal adaptability, but they also bonded well to dentin and enamel. Marginal discolouration and gap formation were more common in GIC because of its reduced bonding capacity, which also caused it to have poorer marginal integrity. Composite and amalgam restorations performed better than Cermet, which only slightly outperformed GIC (7).
4. **Patient Satisfaction:** As far as restorations go, patients were most satisfied with amalgam and composite options, praising their long-term durability and attractiveness. The lower satisfaction levels were mostly attributable to the increased wear rates and inferior aesthetics of GIC and cermet. The lack of permanence in individuals with bruxism eclipsed the fluoride-releasing capabilities of GIC, which were appreciated for caries prevention (8).

**Clinical Implications:** Findings from this study stress the significance of selecting materials with bruxism sufferers' unique needs in mind. Despite its lack of beauty, amalgam is still the go-to material due to its unmatched strength and endurance. If a patient values looks more than functionality, composite resins are a good option to consider. Additional research is needed to improve the wear resistance and durability of GIC and cermet in high-stress settings, while they do have their uses in specific clinical applications (9,10).

**Future Research Directions:** More research into bioactive materials, improved ceramics, and innovative composite formulations that can endure the harsh circumstances of bruxism is needed. To confirm the results and evaluate new restorative approaches, larger-scale, long-term clinical trials are required.

## Conclusion

Findings from this research highlight the significance of material choice in bruxism management. Although other materials performed better than amalgam and composite resins, GIC and cermet were not suitable for stress-bearing restorations. To maximize therapy results for bruxism patients, it is vital to have a thorough grasp of the advantages and disadvantages of each substance.

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