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# Comparative Study of Different Artificial Teeth Materials in Complete Dentures

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**KEYWORDS**

Complete dentures, artificial teeth materials, acrylic resin, composite resin, porcelain, denture wear, patient satisfaction

## ABSTRACT:

**Background:** Complete dentures aim to restore masticatory function, facial esthetics, and phonetics in edentulous patients. Selection of suitable artificial teeth materials is critical for long-term clinical success, patient satisfaction, and cost-effectiveness. Various artificial teeth—ranging from acrylic resin to composite and porcelain—offer different advantages regarding esthetics, wear resistance, and occlusal load distribution. However, the debate persists on which material provides the most favorable clinical outcome over time.

**Methods:** This is a comparative clinical study of 60 edentulous patients who require conventional complete dentures. Patients were divided into three groups by random sampling: Group A-conventional acrylic resin teeth; Group B-modified composite resin teeth; Group C-porcelain teeth. Standardized denture fabrication was carried out and evaluation was done at one, three, and six months after the prosthesis and retention period. Continuous variables were analyzed using one-way ANOVA and post-hoc tests, while categorical data were analyzed using Chi-square.

**Results:** Acrylic resin teeth showed maximum occlusal wear but provided excellent comfort and phonetics. Modified composite resin teeth showed an average resistance to wear with good esthetics. Porcelain teeth showed the least occlusal wear with excellent esthetics but required more occlusal adjustments due to their brittle nature. Statistically significant differences were found in the wear rates and some of the satisfaction parameters between the three groups ($p<0.05$).

**Conclusion:** The three materials, all of which may be used with success in complete denture rehabilitation, each possess certain advantages and disadvantages: acrylic resin offers ease of adjustment and a comfortable fit at the price of greater wear; porcelain ensures long life and the best esthetics but is more brittle; and modified composite resin teeth have a compromise between wear resistance and ease of adjustment. Clinicians must individualize material selection based on patient-specific needs and preferences.

## INTRODUCTION

The replacement of missing natural teeth with complete dentures remains a fundamental solution for restoring function, facial support, and speech in fully edentulous patients [1]. Over the decades, the market has offered an array of artificial teeth composed of diverse materials, each claiming superior aesthetics, better wear resistance, or improved ease of handling. Traditional porcelain teeth

Journal of Chemical Health Risks
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were once considered the gold standard owing to their hardness, esthetic qualities, and color stability [2]. Nonetheless, the rigidity of porcelain can amplify occlusal forces transferred to the supporting tissues, risking alveolar ridge resorption and occasional fracture of the denture base [3].

In contrast, the advent of acrylic resin teeth revolutionized denture fabrication. Acrylic teeth can chemically bond with the denture base resin, thus minimizing debonding incidents, facilitating simpler repairs, and offering improved comfort [4]. However, many studies have reported that acrylic teeth are more prone to wear, especially in patients with higher occlusal loads [5]. With time, significant wear can lead to occlusal discrepancies, requiring denture relines or replacements.

To address these challenges, modified composite resin teeth were introduced, incorporating highly cross-linked polymers and inorganic fillers to reinforce the structural matrix [6]. This hybrid composition aims to combine the best features of acrylic (bonding, ease of adjustment) and porcelain (superior wear resistance and esthetics) [7]. Several in vitro and in vivo trials have demonstrated promising results for these newer composite teeth; however, clinical data with sufficient follow-up remain relatively limited [8].

Since the geriatric population is increasing worldwide, it is vital for clinicians to choose artificial teeth that optimize durability and patient satisfaction [9]. The ideal denture tooth material should possess sufficient hardness to resist wear, reduce the stress in the supporting tissues, retain color stability, and at the same time, permit functional occlusion without causing undue wear on the opposing dentition. Patient-reported outcomes, including comfort, phonetics, and general acceptance, are also crucial in determining the long-term success of any prosthesis [10].

The present study compares the clinical performance of three commonly used denture teeth materials: conventional acrylic resin, modified composite resin, and porcelain, over a six-month period. By evaluating occlusal wear, patient satisfaction, and retention, the study will provide insight into the relative strengths and limitations of each material [11]. These results can help practitioners make evidence-based decisions that are appropriate for each patient's functional requirements, esthetic preferences, and economic considerations. In the context of an emphasis on patient-centered care, knowing how each material aligns with individualized needs is essential to successful complete denture therapy [12].

## MATERIALS AND METHODS

### Study Design and Ethical Considerations

A prospective, comparative clinical study was carried out on 60 edentulous patients at a tertiary care dental center. The Institutional Ethics Committee granted approval (Approval No. DENT/2023/08), and written informed consent was obtained from all participants. The study conformed to the ethical guidelines set out in the Declaration of Helsinki.

### Sample Size and Inclusion Criteria

Sixty participants (aged 50–75 years) were selected based on the following inclusion criteria:

1. Completely edentulous for at least one year.
2. Adequate maxillary and mandibular ridge morphology.
3. No history of severe temporomandibular joint disorders or debilitating systemic conditions.
4. Willingness to attend follow-up visits.

Exclusion criteria involved severe ridge resorption, parafunctional habits (e.g., bruxism), or inability to maintain scheduled appointments.

### Grouping of Participants

A randomized block design allocated participants into three equal groups (n = 20 each) according to the type of artificial denture teeth:

- **Group A**: Conventional acrylic resin (polymethyl methacrylate, PMMA) teeth
- **Group B**: Modified composite resin teeth (cross-linked polymer matrix + inorganic fillers)
- **Group C**: Porcelain teeth

### Denture Fabrication

A single experienced prosthodontist fabricated all dentures under standardized clinical and laboratory protocols [1,4]. Primary and final impressions were made using custom trays and an elastomeric impression material. Jaw relations were recorded, followed by tooth

Journal of Chemical Health Risks
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arrangement designed for balanced occlusion as feasible. Heat-cured PMMA resin was used for the denture bases. Acrylic teeth were chemically bonded to the base, while composite resin and porcelain teeth utilized mechanical retention as recommended by the manufacturers [6].

**Follow-Up Evaluations**

Patients were reviewed at one week for initial adjustments and then at one, three, and six months post-insertion. Each visit included:

- **Occlusal Wear**: Assessed using cast replicas and visual inspection. Vertical and morphological changes in cusp height were measured.
- **Patient Satisfaction**: A 5-point Likert scale questionnaire evaluated comfort, esthetics, phonetics, and overall acceptance.
- **Retention**: A single examiner rated denture stability (good, fair, poor) under standard testing conditions.

**Statistical Analysis**

Data were entered into SPSS (Version 25.0). Means and standard deviations were calculated, followed by one-way ANOVA for continuous variables. Post-hoc Tukey tests determined intergroup differences. The Chi-square test was used for categorical data. Statistical significance was set at $p<0.05$.

## RESULTS

A total of 60 patients (34 males, 26 females; mean age 62.4 ± 6.3 years) completed the study. No participants dropped out during the six-month follow-up. Overall, all groups demonstrated clinically satisfactory outcomes, but with measurable differences in wear patterns, satisfaction scores, and complications.

**Occlusal Wear and Retention**

**Occlusal wear** was assessed at six months by comparing cast replicas to baseline records. Table 1 shows mean wear values (in millimeters) for each group.

**Table 1. Mean Occlusal Wear (mm) at Six Months**

| Group | Mean Wear ± SD (mm) |
|---|---|
| Group A (Acrylic Resin) | 0.78 ± 0.10 |
| Group B (Modified Composite Resin) | 0.56 ± 0.08 |
| Group C (Porcelain) | 0.30 ± 0.07 |

ANOVA revealed a significant difference ($p<0.05$). Post-hoc analysis indicated porcelain teeth (Group C) had significantly lower wear than acrylic (Group A) and composite resin (Group B) teeth. Acrylic resin demonstrated the highest wear ($p<0.05$ when compared with B and C).

**Retention** was clinically graded at six months as shown in Table 2. While Group B and Group C dentures slightly outperformed Group A, differences were not statistically significant ($p>0.05$).

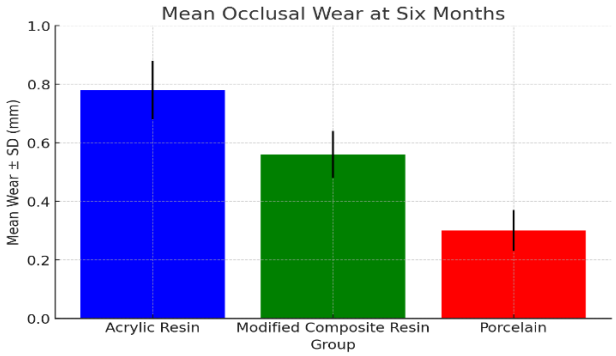


**Table 2. Retention Ratings at Six Months**

| Retention Rating | Group A (n=20) | Group B (n=20) | Group C (n=20) |
|---|---|---|---|
| Good | 14 | 16 | 17 |
| Fair | 5 | 3 | 3 |
| Poor | 1 | 1 | 0 |

**Patient Satisfaction**

Patient satisfaction was evaluated on a 5-point Likert scale across four domains: comfort, esthetics, phonetics, and overall acceptance. Acrylic resin (Group A) rated highest for comfort and phonetics, while porcelain (Group C) excelled in esthetics. Modified composite resin teeth (Group B) maintained relatively balanced scores across all domains.

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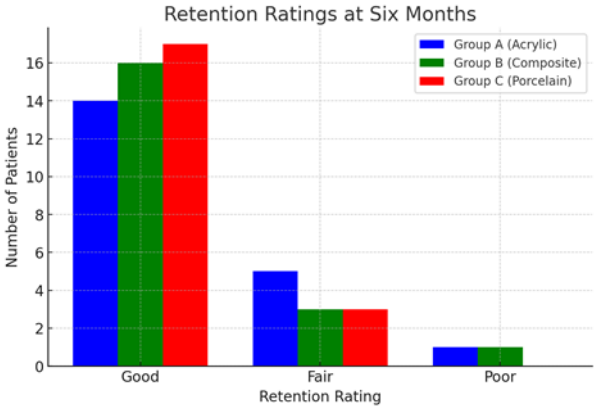
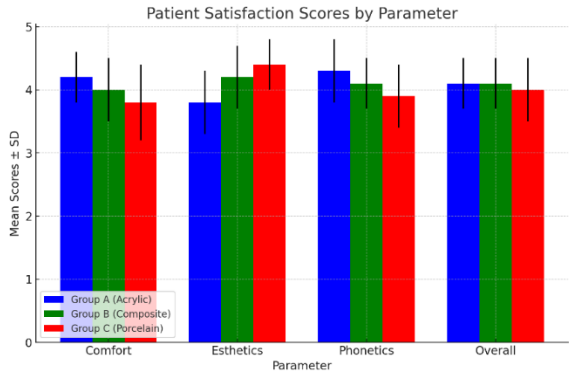



**Table 3. Mean Patient Satisfaction Scores by Parameter (Scale: 1–5)**

| Parameter | Group A (Acrylic) | Group B (Composite) | Group C (Porcelain) |
|---|---|---|---|
| Comfort | 4.2 ± 0.4 | 4.0 ± 0.5 | 3.8 ± 0.6 |
| Esthetics | 3.8 ± 0.5 | 4.2 ± 0.5 | 4.4 ± 0.4 |
| Phonetics | 4.3 ± 0.5 | 4.1 ± 0.4 | 3.9 ± 0.5 |
| Overall | 4.1 ± 0.4 | 4.1 ± 0.4 | 4.0 ± 0.5 |

Comfort scores were significantly higher in acrylic resin dentures compared to porcelain ($p<0.05$), and esthetic scores were significantly higher for porcelain ($p<0.05$). However, overall acceptance ratings did not differ significantly ($p>0.05$).




### Complications and Adjustments

Minor sore spots and occlusal discrepancies were more frequent in porcelain dentures (Group C), partly due to the material's brittleness and the need for careful occlusal equilibration. Seven patients in Group C reported small porcelain chip fractures requiring repair or adjustment. Groups A and B primarily needed occlusal refinements during the initial post-insertion visits.

## DISCUSSION

This study compared the clinical performance of acrylic resin, modified composite resin, and porcelain artificial teeth in complete dentures. The findings align with existing literature [13] emphasizing the interplay between material properties, patient comfort, and long-term wear resistance.

Acrylic resin (PMMA) teeth showed the highest occlusal wear, which was in accordance with other reports, as the material was known to have a lower hardness and greater abrasion susceptibility [14]. However, acrylic teeth show high patient comfort and ease of adjustment due to their ability to chemically bond with the denture base and lesser brittleness [15]. This attribute might help to decrease the traumatic forces transferred to the residual ridge, which promotes higher phonetics and comfort ratings [16].

Intermediately positioned modified composite resin teeth wore, indicating the possibility of obtaining enhanced mechanical properties with less reduction in adjustability due to inclusion of inorganic fillers and cross-linking [17]. This material exhibits balanced scores with regard to esthetics, comfort, and phonetics, supported by other investigations, which pointed to better long-term stability of color and duration than standard acrylic formulations [18].

Porcelain teeth wear out very slightly at the occlusal aspect, reflecting the better hardness [19]. High esthetic potential and excellent retention of color are the other convincing advantages. However, the brittleness of porcelain poses a challenge, as small chips and cracks can occur if the occlusal scheme is not meticulously adjusted [20]. These teeth can also amplify stress on the alveolar ridge, potentially necessitating more frequent follow-up adjustments or reline procedures [21].

Retention was similar across all groups, suggesting that denture base adaptation, anatomical ridge form, and overall prosthesis design play more decisive roles in retention than tooth material per se [22]. The slight but not statistically significant differences in retention might reflect minor variations in denture base fit or mechanical design specific to porcelain teeth, which cannot be

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bonded chemically to the denture base resin and thus rely more on mechanical retention [23].

A shortcoming of the current investigation is the six-month observation window, which may not fully capture long-term wear patterns and potential alveolar ridge remodeling. Future longitudinal studies incorporating a larger sample size and extended follow-up periods would provide more definitive insights into the durability and cost-effectiveness of each material. Moreover, evaluating patient-reported outcomes such as quality of life metrics could further delineate how different artificial teeth materials influence overall satisfaction in edentulous rehabilitation [24].

In conclusion, this study underlines the fact that each denture tooth material has unique merits. Acrylic resin offers superior comfort, porcelain boasts minimal wear and high esthetics, and modified composite resin strikes a good balance between the two. Tailoring the choice of artificial teeth to individual clinical and patient-specific needs remains paramount for optimal denture performance [25].

## CONCLUSION

All of these had acceptable clinical performance in the settings of complete denture therapy within the scope of a six-month evaluation: acrylic resin, modified composite resin, and porcelain teeth. Acrylic resin showed the highest wear but met well on comfort and phonetics. Porcelain scored highest in terms of resistance to wear and esthetics but tended towards chipping and hence time-consuming occlusal adjustments had to be entailed. The modified composite resin exhibited balanced properties with moderate resistance to wear as well as reasonable overall patient acceptability. Balanced material selection where each material can offer an optimal advantage in counterpoint to considerations for patient needs including functional necessity, esthetics, and financial cost must result in the optimal denture outcome.

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Journal of Chemical Health Risks

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