



## ASSESSMENT OF DIFFERENT DENTURE BASE MATERIALS ON PATIENT SATISFACTION AND MASTICATORY EFFICIENCY

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### ABSTRACT

**Background:** The loss of natural teeth adversely affects mastication, speech, facial appearance, and overall quality of life. Complete dentures continue to be the most common treatment option for restoring oral function and esthetics in edentulous individuals. The success of complete dentures depends largely on the properties of the denture base material used in their fabrication

**Objective:** To assess the impact of different denture base materials on patient satisfaction and masticatory efficiency among complete denture wearers.

**Methodology:** A cross-sectional comparative study was conducted in the Department of Prosthodontics of a tertiary care dental hospital. A total of 120 completely edentulous patients wearing maxillary and mandibular complete dentures for at least six months were included through consecutive sampling. Participants were divided into three groups according to denture base material: conventional heat-cured polymethyl methacrylate (PMMA), flexible nylon-based dentures, and CAD/CAM milled dentures. Patient satisfaction was evaluated using a structured questionnaire assessing comfort, retention, esthetics, speech, and overall satisfaction. Masticatory efficiency was measured using a standardized peanut-chewing test. Data were analyzed using SPSS version 26. Mean scores were compared using one-way ANOVA, with  $p < 0.05$  considered statistically significant.

**Results:** The mean age of participants was  $63.4 \pm 8.2$  years. CAD/CAM denture wearers demonstrated the highest overall satisfaction score ( $8.7 \pm 0.9$ ), followed by conventional PMMA dentures ( $7.9 \pm 1.1$ ) and flexible dentures ( $7.2 \pm 1.3$ ) ( $p < 0.001$ ). Mean masticatory efficiency scores were significantly higher among CAD/CAM denture users ( $82.5 \pm 9.4\%$ ), compared to PMMA ( $75.1 \pm 10.8\%$ ) and flexible dentures ( $68.7 \pm 11.6\%$ ) ( $p < 0.001$ ). Retention and comfort scores were also significantly greater among CAD/CAM denture wearers.

**Conclusion:** Denture base material significantly influences patient satisfaction and masticatory efficiency. CAD/CAM milled dentures exhibited superior performance compared to conventional PMMA and flexible denture bases, suggesting improved clinical outcomes and patient acceptance.

**Keywords:** Denture Base Materials, Cad/Cam Dentures, Pmma, Flexible Dentures, Patient Satisfaction, Masticatory Efficiency.



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### INTRODUCTION

Complete edentulism remains a major oral health concern worldwide, particularly among older adults.<sup>1</sup> The loss of natural teeth adversely affects mastication, speech, facial appearance, and overall quality of life. Complete dentures continue to be the most common treatment option for restoring oral function and esthetics in edentulous individuals. The success of complete dentures depends largely on the properties of the denture base material used

in their fabrication.<sup>2</sup> For decades, polymethyl methacrylate (PMMA) has been considered the gold standard denture base material due to its ease of manipulation, acceptable aesthetics, favorable cost-effectiveness, and satisfactory mechanical properties. However, PMMA is not without limitations, including polymerization shrinkage, fracture susceptibility, and dimensional instability over time.<sup>3</sup>

Recent advances in prosthodontics have introduced alternative denture base materials, including flexible thermoplastic resins and CAD/CAM milled denture bases. Flexible denture materials offer improved impact resistance and patient comfort because of their elastic properties.<sup>4</sup> Nevertheless, concerns exist regarding their long-term stability, polishing characteristics, and retention. CAD/CAM denture technology utilizes digitally fabricated pre-polymerized resin blocks that exhibit superior adaptation, reduced porosity, and enhanced mechanical properties.<sup>5</sup>

Patient satisfaction represents a critical measure of treatment success because it reflects the individual's perception of comfort, function, retention, esthetics, and overall quality of life. Similarly, masticatory efficiency is an objective indicator of denture performance and directly affects nutritional status and general health.<sup>6</sup> Previous studies have suggested that denture base materials may influence both subjective and objective treatment outcomes, yet evidence remains limited in many developing countries.<sup>3-7</sup>

Understanding the relationship between denture base materials and patient-reported outcomes can help clinicians select the most appropriate treatment modality for edentulous patients. Therefore, this study aimed to assess and compare patient satisfaction and masticatory efficiency among wearers of conventional PMMA, flexible, and CAD/CAM denture bases.

## METHODOLOGY

A cross-sectional comparative study was conducted in the Department of Prosthodontics from January 2025 to June 2025 after obtaining approval from the Institutional Review Board (1E-IMD/2025). The study included 120 completely edentulous patients aged between 45 and 80 years who had been wearing complete dentures fabricated from a single denture base material for at least six months. Patients with neuromuscular disorders,

temporomandibular joint dysfunction, severe ridge abnormalities, uncontrolled systemic diseases, or cognitive impairment were excluded.

Participants were selected through consecutive sampling and categorized into three equal groups based on denture base material: Group A (conventional heat-cured PMMA dentures), Group B (flexible nylon-based dentures), and Group C (CAD/CAM milled dentures), with 40 participants in each group.

Patient satisfaction was assessed using a validated questionnaire consisting of five domains: comfort, retention, esthetics, speech, and overall satisfaction. Responses were recorded on a 10-point Likert scale, where higher scores indicated greater satisfaction. Masticatory efficiency was evaluated using a standardized peanut-chewing test. Participants were instructed to chew a fixed amount of peanuts for 20 chewing cycles. The chewed particles were collected, sieved, and analyzed. The percentage of finely fragmented particles was considered the masticatory efficiency score.

Data were entered and analyzed using SPSS version 26. Descriptive statistics including mean, standard deviation, frequencies, and percentages were calculated. One-way ANOVA followed by post-hoc Tukey testing was used to compare outcomes among groups. A p-value less than 0.05 was considered statistically significant.

## RESULTS

A total of 120 complete denture wearers participated in the study. The overall mean age was 63.4±8.2 years. Males constituted 57.5% of the sample, while females represented 42.5%. Demographic characteristics were comparable among all groups (Table 1). Significant differences were observed among denture base materials regarding patient satisfaction. CAD/CAM dentures demonstrated the highest scores across all domains, particularly comfort and retention. Flexible dentures showed the lowest satisfaction levels, while conventional PMMA dentures exhibited intermediate performance (Table 2). CAD/CAM denture wearers exhibited significantly greater masticatory efficiency compared to both PMMA and flexible denture users. Flexible dentures demonstrated the lowest efficiency scores. The differences among groups were statistically significant (Table 3).

Table 1: Demographic Characteristics of Participants (n=120)

Variable	PMMA (n=40)	Flexible (n=40)	CAD/CAM (n=40)	Total
Mean Age (Years)	62.8±8.5	64.1±7.9	63.3±8.2	63.4±8.2
Male	24 (60%)	22 (55%)	23 (57.5%)	69 (57.5%)
Female	16 (40%)	18 (45%)	17 (42.5%)	51 (42.5%)

Table 2: Comparison of Patient Satisfaction Scores

Domain	PMMA	Flexible	CAD/CAM	p-value
Comfort	8.0±1.2	7.5±1.4	9.0±0.8	<0.001
Retention	7.8±1.3	6.9±1.5	8.9±0.7	<0.001
Esthetics	8.3±1.1	8.1±1.2	8.8±0.9	0.012
Speech	7.7±1.4	7.0±1.5	8.5±0.9	<0.001
Overall Satisfaction	7.9±1.1	7.2±1.3	8.7±0.9	<0.001

Table 3: Comparison of Masticatory Efficiency

Denture Base Material	Mean Efficiency (%)	SD	p-value
PMMA	75.1	10.8	
Flexible	68.7	11.6	
CAD/CAM	82.5	9.4	<0.001

## DISCUSSION

The present study evaluated the influence of different denture base materials on patient satisfaction and masticatory efficiency among complete denture wearers. The findings demonstrated that CAD/CAM denture bases provided significantly superior outcomes compared with conventional PMMA and flexible denture materials. Patients wearing CAD/CAM dentures reported higher levels of comfort, retention, speech, esthetics, and overall satisfaction, while also exhibiting better masticatory efficiency.

The superior patient satisfaction observed among CAD/CAM denture wearers in the current study is consistent with the findings of Zupancic et al. (2023)<sup>8</sup>, who reported that digitally fabricated dentures demonstrated improved adaptation and retention due to reduced polymerization shrinkage and enhanced manufacturing precision. Their study found that patients experienced greater comfort and required fewer post-insertion adjustments compared with conventional dentures. Similarly, the mean overall satisfaction score in our study was highest among CAD/CAM denture users (8.7±0.9), supporting the notion that digital fabrication techniques contribute positively to patient-centered outcomes.

The findings are also comparable to those reported by Shah et al. (2022)<sup>9</sup>, who evaluated digital complete dentures and observed significantly higher patient satisfaction scores related to denture stability, retention, and oral comfort. The authors attributed these outcomes to the improved tissue adaptation achieved through computer-aided manufacturing. Our results similarly demonstrated significantly higher retention and comfort scores among CAD/CAM denture wearers compared with PMMA and flexible denture users.

Conventional PMMA dentures demonstrated satisfactory outcomes in the present study, with overall satisfaction scores second only to CAD/CAM dentures. These findings correspond with the work of Gomaa et al. (2023)<sup>10</sup>, who reported that conventional acrylic dentures remain a reliable treatment option for edentulous patients,

providing acceptable levels of comfort and functional performance. Their study found patient satisfaction levels ranging from moderate to high, which aligns with the satisfaction scores observed among PMMA denture wearers in the present investigation.

Flexible dentures showed comparatively lower satisfaction scores despite acceptable esthetic outcomes. Similar observations were reported by Limpuangthip et al. (2021)<sup>11</sup>, who found that although flexible dentures were preferred for their esthetics and comfort during insertion, they demonstrated lower stability and retention during mastication. The authors suggested that the inherent flexibility of the material may reduce functional efficiency under occlusal loading. These findings are consistent with the present study, where flexible dentures recorded the lowest retention and overall satisfaction scores.<sup>12</sup>

Regarding masticatory efficiency, CAD/CAM dentures achieved the highest mean score (82.5±9.4%), significantly outperforming both PMMA and flexible denture groups. These findings are in agreement with the study conducted by Barbosa et al. (2022)<sup>13</sup>, who reported superior chewing performance among digital denture users due to enhanced denture stability and adaptation. Their participants demonstrated greater ability to comminute food particles effectively, which parallels the improved masticatory efficiency observed in our study.

The masticatory efficiency findings are also supported by research conducted by Hsu et al. (2021)<sup>14</sup>, who reported a positive association between denture retention and chewing efficiency. The authors concluded that dentures with better adaptation and stability enable more efficient force transmission during mastication. Since CAD/CAM dentures exhibit superior adaptation to supporting tissues, their enhanced masticatory performance in the present study appears clinically justified.

Furthermore, the lower masticatory efficiency observed among flexible denture wearers corresponds with findings reported by Goiato MC et al. (2015)<sup>15</sup>, who suggested that excessive flexibility of

denture base materials may compromise force distribution and reduce chewing effectiveness. Their observations support our findings that flexible denture users achieved the lowest chewing efficiency scores among the three groups evaluated.

### CONCLUSION

Denture base material significantly affects patient satisfaction and masticatory efficiency among complete denture wearers. CAD/CAM milled dentures demonstrated superior comfort, retention, overall satisfaction, and chewing efficiency compared to conventional PMMA and flexible denture bases. Conventional PMMA dentures provided acceptable outcomes, while flexible dentures showed comparatively lower performance. Incorporation of CAD/CAM technology may enhance prosthodontic treatment outcomes and improve patients' quality of life.

### Limitation

The study was limited by its cross-sectional design and relatively small sample size. Longitudinal studies assessing long-term patient satisfaction, prosthesis durability, maintenance requirements, and cost-effectiveness are recommended to further validate the clinical advantages of various denture base materials.

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