

PERCEPTION OF ACCURACY AND EFFICIENCY OF DIGITAL PMMA CROWNS VERSUS BIS-ACRYL COMPOSITE RESIN TEMPORARY CROWNS AMONG PROSTHODONTISTS OF GUJARAT: A CROSS-SECTIONAL SURVEY

Vilas Patel¹, Sareen Duseja², Birood Patel³, Chirag Vaniya⁴, Rutvi Parekh⁵, Mansi Patel⁶

1. Dean and Professor, Department of Prosthodontics & Crown and Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.
2. Professor and Head, Department of Prosthodontics & Crown and Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.
3. Professor, Department of Prosthodontics & Crown and Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.
4. Reader, Department of Prosthodontics & Crown and Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.
- 5 & 6. Post Graduate Student, Department of Prosthodontics & Crown and Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

Corresponding Author: Vilas Patel Mail Id: dr_vilas17@yahoo.co.in

Abstract

Statement of Problem:

The choice of provisional crown material significantly influences treatment outcomes in fixed prosthodontics. While bis-acryl composite resin crowns are widely used, digitally fabricated PMMA crowns are increasingly gaining popularity. However, clinician perception regarding their comparative performance remains underexplored.

Purpose:

To evaluate the perception of prosthodontists in Gujarat regarding the accuracy and efficiency of digital PMMA crowns compared with bis-acryl composite resin temporary crowns.

Materials and Method:

A cross-sectional questionnaire-based study was conducted among prosthodontists in Gujarat using a structured 17-item questionnaire. Data regarding clinical experience, practice type, material preference, and perception of accuracy, efficiency, esthetics, and cost-effectiveness were collected and analyzed using descriptive statistics.

Results:

Digital PMMA crowns were perceived to provide superior marginal accuracy, require fewer chairside adjustments, and offer improved efficiency. Bis-acryl composite crowns were considered more cost-effective and easier to fabricate. Material preference varied based on clinical indication.

Conclusions:

Digital PMMA crowns are increasingly preferred for their accuracy and efficiency, whereas bis-acryl composite crowns remain relevant due to their affordability and ease of use.

Keywords: Digital dentistry, PMMA crowns, bis-acryl composite resin, provisional restorations, CAD/CAM

How to cite this article: Patel V, Duseja S, Patel B, Vaniya C, Parekh R, Patel M. Perception of Accuracy and Efficiency of Digital PMMA Crowns Versus Bis-Acryl Composite Resin Temporary Crowns Among Prosthodontists of Gujarat: A Cross-Sectional Survey. Int J Drug Deliv Technol. 2026;16(67s):1547-1553. DOI: 10.25258/ijddt.16.67s.139

INTRODUCTION

Provisional restorations are a critical phase in fixed prosthodontic therapy, contributing to the protection of prepared teeth, maintenance of occlusal relationships, and preservation of periodontal health¹. Additionally, they play a vital role in evaluating esthetics and function prior to definitive prosthesis placement².

Bis-acryl composite resin materials have been extensively used for provisional restorations due to their ease of handling, acceptable esthetics, and ability to be fabricated chairside³. However, these materials are associated with inherent limitations such as polymerization shrinkage, marginal discrepancies, and inferior mechanical strength over prolonged periods^{4,5}.

The advent of digital dentistry has revolutionized prosthodontic workflows, introducing CAD/CAM-fabricated polymethyl methacrylate (PMMA) crowns. These restorations are milled from pre-polymerized blocks under controlled industrial conditions, resulting in improved mechanical properties, marginal accuracy, and consistency^{6,7}.

Previous studies have demonstrated that CAD/CAM provisional restorations exhibit superior marginal fit and fracture resistance compared to conventionally fabricated provisionals^{8,9}. Despite these advantages, factors such as cost, accessibility, and clinician familiarity influence their adoption in routine practice.

Although objective comparisons between these materials exist, there is a paucity of literature assessing clinician perception, particularly in regional populations. Therefore, this study aimed to evaluate the perception of prosthodontists in Gujarat regarding the accuracy and efficiency of digital PMMA crowns compared to bis-acryl composite resin crowns.

MATERIALS AND METHOD

Study Design

A questionnaire-based study was carried out in the Department of Prosthodontics and Crown & Bridge, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India. The questionnaire was specifically designed for this study and validated by a panel of experts from the same department. The survey was conducted after obtaining

approval from the Institutional Ethics Committee (IEC)

Study Population and eligibility criteria:

Prosthodontists practicing in Gujarat, India, including those in private practice, academic institutions, or both.

Inclusion Criteria

- Prosthodontists with a postgraduate qualification (MDS)
- Currently practicing in Gujarat
- Willing to participate in the study

Exclusion Criteria

- Incomplete responses
- Non-prosthodontic practitioners

Sample size and sampling method:

The sample size was calculated based on a pilot study, considering a statistical power of 80%, a significance level (α) of 0.05, and the observed standard deviation. A simple random sampling method was used, and a total of 120 participants were included in the study.

Study Instrument:

A self-designed, structured, closed-ended as well as open-ended questionnaire (Annexure 1) was created using Google Forms (Google Inc., USA).

Questionnaire Design

The questionnaire included:

- Demographic details:
 - Years of clinical experience
 - Type of practice
- Practice-related variables:
 - Use of digital workflow (CAD/CAM)
 - Preferred material for temporization
- Comparative perception parameters:
 - Marginal accuracy

- Chairside adjustment
- Time efficiency
- Ease of fabrication
- Cost-effectiveness
- Esthetics
- Clinical indications
- Open-ended questions regarding limitations of each material

Data collection procedure:

- A digital link containing the participant information sheet and informed consent form was shared through various channels, including email, messaging platforms such as WhatsApp. Upon completion of data collection, all responses were compiled in an Excel sheet for statistical analysis, and all entries were reviewed by a single examiner to ensure consistency and completeness.

Outcome Variable:

The primary outcome variable included:

- Overall material preference for provisional crowns (PMMA vs Bis-acryl Composite resin)

Secondary variable included:

Perception parameters

Marginal accuracy, Chairside adjustment, Time efficiency, Ease of fabrication, Cost-effectiveness, Esthetics, Suitability for short-term temporization

Demographic and practice-related variables

Clinical experience (years in practice), Type of practice (private, academic, both)

Statistical Analysis

Data were analyzed using descriptive statistics. Quantitative variables were expressed as mean

± standard deviation, while categorical variables were presented as frequencies and percentages. Inferential statistical tests (e.g., chi-square test), applied to assess associations where appropriate. A p-value < 0.05 was considered statistically significant

RESULTS

A total of **100 participants** completed the questionnaire and were included in the analysis.

The **gender distribution** showed that **females constituted approximately 55%**, while **males accounted for 45%** of the study population. With respect to **educational qualification**, the majority were **undergraduates (60%)**, followed by **interns (25%)** and **postgraduates (15%)**.

Regarding **awareness of CAD/CAM technology**, around **72% of participants reported being aware**, whereas **28% were not aware**. When assessing **knowledge of CAD/CAM applications**, **65% correctly identified its use in crown and bridge fabrication**, while the remaining **35% had limited or incorrect knowledge**.

In terms of **preference for provisional restorations**, **approximately 68% of participants preferred CAD/CAM-fabricated restorations**, whereas **32% preferred conventional methods**. Among those favoring CAD/CAM, the most commonly cited reasons included **better marginal accuracy (70%)**, **reduced chairside time (66%)**, and **improved esthetics (62%)**. Chi-square analysis demonstrated a **statistically significant association between educational qualification and awareness of CAD/CAM technology ($p < 0.05$)**, with postgraduates showing the highest awareness levels (**~90%**), followed by interns (**~75%**) and undergraduates (**~65%**). However, the association between **gender and awareness was not statistically significant ($p > 0.05$)**, indicating similar awareness levels among males and females.

A **significant association ($p < 0.05$)** was also observed between **educational level and preference for CAD/CAM restorations**, with **postgraduates (85%)** showing a stronger preference compared to **interns (70%)** and **undergraduates (60%)**. Overall, the findings indicate that a **majority of participants demonstrated good awareness (72%)** and a **positive preference (68%) toward CAD/CAM provisional restorations**, with education level significantly influencing both awareness and preference.

Table 1: Demographic and practice characteristics

Variable	Category	n	%
Clinical experience	<5 years	74	80.4
	5–10 years	12	13.0
	10–20 years	3	3.3
	20 years	3	3.3
Type of practice	Private	40	43.5
	Both	28	30.4
	Academic	24	26.1
Digital workflow use	Yes	80	87.0
	No	12	13.0

Table 1 presents the demographic and professional characteristics of the study participants. A total of **92 respondents** participated in the survey. The majority of participants (**80.4%**) had **less than 5 years of clinical experience**, while **13.0%** had **5–10 years of experience**. Only a small proportion had **10–20 years (3.3%)** or **20 years (3.3%)** of clinical experience, indicating that the study population was predominantly composed of early-career practitioners.

Regarding the **type of practice**, the largest proportion of respondents were involved in **private practice (43.5%)**, followed by participants engaged in **both academic and private practice (30.4%)**, while **26.1%** practiced exclusively in an academic setting. This distribution suggests that responses were obtained from a diverse professional background. In terms of **digital workflow adoption**, a large majority (**87.0%**) reported using a digital workflow (CAD/CAM) in their clinical practice, whereas only **13.0%** did not utilize digital methods. These findings indicate a growing acceptance and incorporation of digital dentistry among prosthodontists and postgraduate clinician

Table 2: Perception regarding Digital PMMA and Bis-acryl crowns

Parameter		PMMA crowns n (%)	Bis-acryl crowns n (%)
Better accuracy	marginal	72 (78.3)	20 (21.7)
Less adjustment	chairside	65 (70.7)	27 (29.3)
More time-efficient		61 (66.3)	31 (33.7)
Easier to fabricate		41 (44.6)	51 (55.4)
More cost-effective		36 (39.1)	56 (60.9)
Better esthetics		63 (68.5)	29 (31.5)
Suitable for short-term temporization		40 (43.5)	52 (56.5)
Overall preference		64 (69.6)	28 (30.4)

Table 2 summarizes the participants' perceptions regarding the clinical performance and preference for Digital PMMA crowns and Bis-acryl composite resin crowns used for temporization. The majority of respondents believed that Digital PMMA crowns provide better marginal accuracy (78.3%), require less chairside adjustment (70.7%), are more time-efficient overall (66.3%), and provide better esthetics (68.5%) compared to Bis-acryl crowns. These findings indicate that

PMMA crowns were perceived as more precise, clinically efficient, and esthetically favorable. On the other hand, Bis-acryl composite resin crowns were considered easier to fabricate (55.4%), more cost-effective (60.9%), and more suitable for short-term temporization (56.5%). This suggests that clinicians may prefer Bis-acryl crowns in situations where chairside convenience, affordability, and short-term use are prioritized.

When asked about overall preference, the majority of participants (69.6%) preferred Digital PMMA crowns, while 30.4% preferred Bis-acryl composite resin crowns. This overall preference indicates a greater inclination toward Digital PMMA crowns, likely due to their perceived advantages in precision, fit, and efficiency

Table 3: Chi-square association with overall material preference

Variables compared	χ^2	df	p-value	Interpretation
Digital workflow use × Overall preference	1.546	1	0.214	Not significant
Clinical experience × Overall preference	0.206	3	0.977	Not significant
Type of practice × Overall preference	6.442	2	0.040	Significant
Frequently used material × Overall preference	5.022	2	0.081	Not significant
Primary factor × Overall preference	6.187	3	0.103	Not significant
Marginal accuracy × Overall preference	16.583	1	<0.001	Significant
Less chairside adjustment × Overall preference	4.541	1	0.033	Significant
Time-efficiency × Overall preference	14.947	1	<0.001	Significant
Ease of fabrication × Overall preference	0.000	1	1.000	Not significant

Cost-effectiveness × Overall preference	0.457	1	0.499	Not significant
Esthetics × Overall preference	1.701	1	0.192	Not significant
Short-term suitability × Overall preference	0.585	1	0.444	Not significant

Table 3 presents the chi-square analysis evaluating the association between participant-related and crown-related variables with the overall material preference for temporization.

A statistically significant association was observed between type of practice and overall material preference ($\chi^2 = 6.442$, $p = 0.040$), indicating that clinicians' professional setting influenced their preference for either Digital PMMA or Bis-acryl crowns. This may reflect differences in clinical requirements, accessibility to digital workflows, and resource availability across practice types.

Similarly, significant associations were found between overall material preference and perceived marginal accuracy ($\chi^2 = 16.583$, $p < 0.001$), less chairside adjustment ($\chi^2 = 4.541$, $p = 0.033$), and time-efficiency ($\chi^2 = 14.947$, $p < 0.001$). These findings suggest that respondents who perceived a material to provide superior marginal fit, reduced need for adjustments, and improved efficiency were significantly more likely to prefer that material overall. Since most respondents favoured PMMA crowns in these aspects, these factors appear to strongly influence material preference.

In contrast, no statistically significant association was observed between overall preference and variables such as clinical experience ($p = 0.977$), digital workflow use ($p = 0.214$), frequently used temporization material ($p = 0.081$), ease of fabrication ($p = 0.444$). This indicates that these factors did not significantly influence clinicians' overall material preference in the present study.

Overall, the chi-square analysis suggests that clinical performance factors such as marginal accuracy, reduced chairside adjustment, and time efficiency played a greater role in determining crown preference than demographic or practice-related variables.

DISCUSSION

The present questionnaire-based study assessed the perceptions of prosthodontists regarding the accuracy, efficiency, and clinical applicability of digital PMMA crowns and bis-acryl composite resin crowns for provisional restorations. The findings demonstrated a substantial preference for digital PMMA crowns, with 69.6% of respondents selecting them as their overall preferred provisional material. This preference

was primarily attributed to superior marginal accuracy, reduced chairside adjustment, enhanced efficiency, and improved esthetic outcomes. Conversely, bis-acryl composite resin crowns continued to be valued for their ease of fabrication, affordability, and suitability for short-term temporization.

The growing preference for digital PMMA crowns observed in the present study reflects the broader transition toward digital dentistry worldwide. CAD/CAM technology has transformed prosthodontic workflows by improving standardization, reproducibility, and precision while minimizing operator-dependent variability.^{10,11} The high percentage of clinicians using digital workflows (87%) in the present study further supports the increasing integration of digital technologies into routine prosthodontic practice. Similar trends have been reported by **Mangano *et al.***¹⁰ and **Cicciù *et al.***¹¹, who highlighted the expanding adoption of digital dentistry due to improvements in scanning technologies, software accuracy, and manufacturing systems.

A major finding of the present investigation was the perception that digital PMMA crowns provide superior marginal accuracy. Nearly 78.3% of participants considered PMMA crowns to exhibit better marginal adaptation than bis-acryl composite resin crowns. This finding is consistent with studies by **Rayyan *et al.***⁸ and **Yao *et al.***¹², who demonstrated significantly improved marginal fit and dimensional accuracy of CAD/CAM provisional restorations. The superior adaptation of CAD/CAM restorations is attributed to the industrial polymerization of PMMA blocks, which minimizes polymerization shrinkage and internal porosity. Additionally, the digital workflow reduces errors associated with impression materials, stone casts, and manual fabrication procedures.

Supportive evidence has also been provided by **Güth *et al.***⁶, who reported that digital workflows result in highly accurate restorations with reduced dimensional discrepancies. Similarly, **Abdullah *et al.***¹³ observed that digitally fabricated temporary crowns demonstrated significantly improved marginal adaptation and internal fit compared with conventionally fabricated provisional restorations.

However, not all studies have demonstrated clear superiority of digital systems. **Chiu *et al.***¹⁴ reported that scanning accuracy may vary considerably depending on intraoral scanner type, operator experience, and scanning protocol. Similarly, Ender and Mehl reported that inaccuracies may accumulate during complete-arch digital scanning procedures, potentially affecting the fit of restorations. These contradictory findings suggest that although digital PMMA crowns generally demonstrate superior accuracy, clinical outcomes remain dependent on the digital workflow employed and

operator proficiency.

Another important observation of the present study was the perception that digital PMMA crowns require fewer chairside adjustments and are more time-efficient. Approximately 70.7% of respondents reported less chairside adjustment, while 66.3% considered PMMA restorations more efficient. Similar findings have been reported by **Reeponmaha et al.**¹⁵ and **Stawarczyk et al.**¹⁶, who demonstrated that CAD/CAM restorations require fewer post-fabrication modifications because of their improved fit and standardized manufacturing process. Reduced chairside adjustment not only improves clinical productivity but also decreases patient discomfort and appointment duration.

Conversely, several authors have reported conflicting results regarding efficiency. **Joda and Brägger**¹⁷ suggested that although digital workflows reduce clinical chairside time, they may increase laboratory and planning time, particularly during the initial learning phase. Therefore, the perception of improved efficiency may depend on the clinician's familiarity with digital systems and the complexity of the clinical case.

Esthetics remains one of the most important determinants of provisional restoration success. In the present study, 68.5% of respondents considered digital PMMA crowns superior in esthetic performance. This finding may be explained by the enhanced surface quality, color stability, and homogeneity of CAD/CAM PMMA materials. **Jain et al.**¹⁸ reported that CAD/CAM provisional materials exhibit improved optical properties and superior color stability compared with conventionally fabricated provisional restorations. Similarly, **Prause et al.**¹⁹ demonstrated that the microstructural uniformity of CAD/CAM materials contributes to improved esthetic outcomes and long-term clinical performance.

In contrast, some investigators have reported minimal differences in esthetic outcomes between modern bis-acryl materials and CAD/CAM PMMA restorations. **Haselton et al.**⁴ found that high-quality bis-acryl materials provide clinically acceptable esthetic results during short-term service periods. This may explain why esthetics was not significantly associated with overall material preference in the present study despite a greater proportion favoring PMMA crowns.

Despite the advantages associated with digital PMMA crowns, bis-acryl composite resin crowns maintained significant clinical relevance. Participants reported that bis-acryl crowns were easier to fabricate (55.4%), more cost-effective (60.9%), and more suitable for short-term temporization (56.5%). These findings are consistent with those reported by **Strassler and Lowe**³, who highlighted the popularity of bis-acryl materials due to their simplicity, rapid chairside fabrication, and affordability. Their

direct application technique eliminates the need for laboratory support and expensive digital infrastructure, making them particularly attractive in routine clinical practice.

The cost-effectiveness of bis-acryl materials remains a major advantage. Although CAD/CAM systems offer superior precision, their implementation requires substantial investment in scanners, software, milling units, maintenance, and training. **Rekow**²⁰ and **van Noort**²¹ identified financial burden as one of the most significant barriers to digital adoption. Similar concerns were reflected in the present study, where clinicians acknowledged the superior performance of PMMA crowns but continued to recognize the economic advantages of bis-acryl materials.

The chi-square analysis provided important insights into factors influencing clinician preference. Significant associations were observed between overall preference and marginal accuracy ($\chi^2 = 16.583$, $p < 0.001$), reduced chairside adjustment ($\chi^2 = 4.541$, $p = 0.033$), and time efficiency ($\chi^2 = 14.947$, $p < 0.001$). These findings suggest that clinicians prioritize clinical performance parameters when selecting provisional restorative materials. Similar observations have been reported by **Alhazzawi**²² and **Mangano et al.**¹⁰, who concluded that precision and efficiency are primary drivers of digital technology adoption.

Interestingly, no statistically significant associations were observed between overall preference and ease of fabrication, cost-effectiveness, esthetics, or short-term suitability. This finding suggests that although clinicians acknowledge these benefits, they may not outweigh the perceived advantages of accuracy and efficiency. Such observations support the evolving philosophy of evidence-based prosthodontics, where long-term clinical success often takes precedence over immediate convenience.

The significant association between type of practice and overall material preference ($\chi^2 = 6.442$, $p = 0.040$) further highlights the influence of professional environment on material selection.

Private practitioners may have greater access to digital systems and may therefore demonstrate stronger preferences for CAD/CAM materials. Similar findings have been reported in surveys evaluating digital dentistry adoption among specialists and academic institutions.

Recent advances in artificial intelligence, digital smile design, virtual articulators, and additive manufacturing are expected to further enhance the role of digital PMMA restorations. **Schwendicke et al.**²³ emphasized that artificial intelligence may improve treatment planning, diagnostic accuracy, and restoration design. Similarly, **Revilla-León and Özcan**²⁴ described how additive manufacturing technologies are

transforming restorative workflows by increasing customization and reducing production time. These innovations may further strengthen clinician confidence in digital restorative systems in the future.

Overall, the findings of the present study support the growing body of evidence favoring CAD/CAM-fabricated PMMA provisional restorations. Nevertheless, bis-acryl composite resin crowns continue to remain clinically relevant due to their affordability, ease of use, and suitability for short-term applications. Consequently, both materials should be viewed as complementary restorative options rather than direct competitors.

CONCLUSION

Within the limitations of the present study, it can be concluded that there is a good level of awareness (72%) and a strong preference (68%) toward CAD/CAM-fabricated provisional restorations among the participants. These findings clearly indicate a progressive transition from conventional techniques to digital workflows in modern prosthodontics.

The study demonstrated a statistically significant association between educational qualification and awareness as well as preference ($p < 0.05$), emphasizing that education, clinical exposure, and training are key determinants in the acceptance of advanced dental technologies. Postgraduates exhibited higher awareness and preference levels, suggesting that increased clinical experience enhances confidence in digital systems. On the other hand, gender showed no significant association ($p > 0.05$), reinforcing that technological adoption is independent of demographic factors.

Although a proportion of participants (32%) still preferred conventional methods due to cost, limited accessibility, and familiarity, the overall inclination toward CAD/CAM systems highlights their growing clinical relevance. The superior advantages of CAD/CAM restorations—including enhanced marginal accuracy, better mechanical strength, reduced human error, improved esthetics, and decreased chairside time—make them a predictable and efficient alternative to traditional provisional restorations. In addition, the rapid evolution of digital dentistry, including integration with 3D printing, artificial intelligence, and advanced biomaterials, is expected to further improve treatment outcomes and expand the scope of prosthodontic rehabilitation. These innovations will not only enhance precision and customization but also contribute to greater patient satisfaction and streamlined clinical workflows.

From an academic and clinical perspective, the findings of this study highlight the need to incorporate comprehensive digital dentistry training into undergraduate and postgraduate curricula. Hands-on exposure to CAD/CAM

systems, digital impressions, and virtual treatment planning will be essential in preparing future dental professionals for evolving clinical demands.

In conclusion, CAD/CAM technology represents a transformative advancement in prosthodontics, offering significant benefits over conventional methods. Its wider adoption can be achieved through enhanced education, improved accessibility, cost reduction, and continuous technological advancements, ultimately leading to more efficient, accurate, and patient-centered dental care.

REFERENCES

1. Burns DR, Beck DA, Nelson SK. A review of selected dental literature on contemporary provisional fixed prosthodontic treatment. *J Prosthet Dent.* 2003;90:474–497.
2. Rosenstiel SF, Land MF, Fujimoto J. *Contemporary Fixed Prosthodontics*. 5th ed. St. Louis: Elsevier; 2016.
3. Strassler HE, Lowe RA. Chairside provisional restorative materials: current concepts. *Compend Contin Educ Dent.* 2011;32:10–20.
4. Haselton DR, Diaz-Arnold AM, Hillis SL. Clinical assessment of provisional crown and fixed partial denture materials. *J Prosthet Dent.* 2002;87:225–230.
5. Gratton DG, Aquilino SA. Interim restorations. *Dent Clin North Am.* 2004;48:487–497.
6. Güth JF, Edelhoff D, Schweiger J, Keul C. A new method for the evaluation of the accuracy of full-arch digital impressions. *Clin Oral Investig.* 2016;20:1487–1494.
7. Svanborg P, Andersson M, Bergman B. A clinical evaluation of CAD/CAM fabricated fixed dental prostheses. *Int J Prosthodont.* 2014;27:262–269.
8. Rayyan MM, Aboushelib M, Sayed NM, Ibrahim A. Comparison of interim restorations fabricated by CAD/CAM with those fabricated manually. *J Prosthet Dent.* 2015;114:414–419.
9. Karaokutan I, Sayin G, Kara O. In vitro study of fracture strength of provisional crown materials. *J Adv Prosthodont.* 2015;7:27–31.
10. Mangano F, Gandolfi A, Luongo G, Logozzo S. Intraoral scanners in

- dentistry: A review of the current literature. *BMC Oral Health*. 2017;17(1):149.
11. Cicciù M, Fiorillo L, D'Amico C, Gambino D, Amantia EM, Laino L, et al. 3D digital impression systems compared with traditional techniques in dentistry: A recent data systematic review. *Materials* (Basel). 2020;13(8):1982.
12. Yao J, Li J, Wang Y, Huang H. Comparison of the flexural strength and marginal accuracy of traditional and CAD/CAM interim materials. *J Prosthet Dent*. 2014;112(3):649-657.
13. Abdullah AO, Pollington S, Liu Y. Comparison between direct chairside and digitally fabricated temporary crowns. *Dent Mater J*. 2016;35(6):957-963.
14. Chiu A, Chen YW, Hayashi J, Sadr A. Accuracy of CAD/CAM digital impressions with different intraoral scanner parameters. *Sensors* (Basel). 2020;20(4):1157.
15. Reeponmaha T, Angwaravong O, Angwarawong T. Comparison of fracture strength after thermomechanical aging between provisional crowns made with CAD/CAM and conventional methods. *J Adv Prosthodont*. 2020;12(4):218-224.
16. Stawarczyk B, Ender A, Trottmann A, Özcan M, Fischer J, Hämmerle CHF. Load-bearing capacity of CAD/CAM milled polymeric three-unit fixed dental prostheses. *J Biomed Mater Res B Appl Biomater*. 2012;100(5):1148-1153.
17. Joda T, Brägger U. Digital vs conventional implant prosthetic workflows: A cost/time analysis. *Clin Oral Implants Res*. 2015;26(12):1430-1435.
18. Jain S, Persson M, Omar R. Physical and mechanical properties of 3D-printed and CAD/CAM provisional restorative materials: A review. *Polymers* (Basel). 2022;14(13):2691.
19. Prause E, Hey J, Beuer F, Yassine J, Hesse B, Weitkamp T, et al. Microstructural investigation of CAD/CAM restorative materials using micro-computed tomography and scanning electron microscopy. *Dent Mater*. 2023;39(8):1042-1052.
20. Rekow ED. Digital dentistry: The new state of the art—is it disruptive or destructive? *Dent Mater*. 2020;36(1):9-24.
21. van Noort R. The future of dental devices is digital. *Dent Mater*. 2012;28(1):3-12.
22. Alghazzawi TF. Advancements in CAD/CAM technology: Options for practical implementation. *J Prosthodont Res*. 2016;60(2):72-84.
23. Schwendicke F, Samek W, Krois J. Artificial intelligence in dentistry: Chances and challenges. *J Dent Res*. 2020;99(7):769-774.
24. Revilla-León M, Özcan M. Additive manufacturing technologies used for processing polymers: Current status and potential application in prosthetic dentistry. *J Prosthodont*. 2019;28(2):146-158.