



Comparative Evaluation of Surface Roughness between 3D Printed, Cad Cam Milled and Conventionally Fabricated Denture Base Resins: An in Vitro Study

Dr Pallav Sharda¹, Dr Harini K*

¹Department of prosthodontics and Implantology, Saveetha Dental college and Hospitals, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha university, Chennai-600077, Tamil Nadu, India

*Corresponding author details:

Dr Harini K, Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamalle high road, Velapanchavadi, Chennai- 600077, India

(Received: 16 March 2026

Revised: 14 April 2026

Accepted: 01 May 2026)

KEYWORDS

lorem ipsum

ABSTRACT:

Introduction Denture bases are fundamental components of complete and partial dentures, providing support, stability, and retention to artificial teeth. Material properties, particularly surface roughness, play a critical role in influencing oral hygiene, microbial adhesion, patient comfort, and prosthesis longevity. Conventional fabrication methods, while reliable, present limitations such as variability and processing inconsistencies. Recent advancements, including CAD/CAM milling and 3D printing, offer improved precision and efficiency; however, concerns regarding surface characteristics and long-term clinical performance persist, necessitating comparative evaluation.

Objectives: The objective of this study is to compare the surface roughness of 3D printed, CAD CAM milled and conventionally fabricated dentures.

Methods: This in vitro study compared the surface roughness of denture bases fabricated using three different methods: conventional compression moulding, CAD/CAM milling, and 3D printing. Thirty denture bases (n=10 for each method) were fabricated using a standard denture base resin. The surface roughness (Ra) of each denture base was measured using a contact profilometer. Statistical analysis was performed to compare the mean surface roughness values between the groups using one-way ANOVA, with post-hoc pairwise comparisons to determine significant differences.

Results: The mean surface roughness (Ra) values for the denture bases were as follows: CAD/CAM milling (1.32 μm), conventional compression moulding (2.67 μm), and 3D printing (3.45 μm). CAD/CAM milling demonstrated the smoothest surface, with a statistically significant difference compared to both conventional moulding and 3D printing. Although 3D printing showed the highest surface roughness, the difference between it and compression moulding was not statistically significant.

Conclusions: CAD/CAM milling produces the smoothest denture base surfaces, significantly outperforming conventional compression moulding and 3D printing. Surface roughness is a critical factor for patient comfort and hygiene, and CAD/CAM milling offers the most precise solution. However, other factors such as material choice, strength, and cost must also be considered when selecting a fabrication method.

1. Introduction

Denture bases are a critical component of both complete and partial dentures, serving as the foundation that provides essential support and stability

to the artificial teeth. The material used in fabricating the denture base plays a significant role in influencing the overall clinical performance and the patient's satisfaction with the prosthesis. Denture bases must exhibit certain qualities such as strength, durability,



biocompatibility, and, importantly, surface smoothness. Among the various factors that determine the clinical success of a denture, surface roughness stands out as a key property influencing patient comfort, oral hygiene, and long-term functional performance. Smoother denture surfaces are easier to clean, reduce bacterial adhesion, and enhance the overall durability of the prosthesis. On the other hand, rough surfaces can facilitate increased plaque accumulation, bacterial growth, oral infections, and compromised comfort, making it a crucial parameter for evaluation.

For decades, conventional fabrication methods, such as compression moulding and injection moulding, have been widely adopted for the production of denture bases. These techniques have been thoroughly established in the field of prosthodontics and are well-regarded for their reliability and predictable outcomes. However, these traditional methods are not without limitations. The success of these techniques often depends heavily on the skill and experience of the technician, leading to variability in the final product. Moreover, the manual processes involved in these methods can introduce inconsistencies in surface smoothness and other physical properties of the denture base, including dimensional accuracy. Additionally, these techniques are time-consuming and can lead to higher levels of polymerization shrinkage, a phenomenon that can significantly affect the overall performance and quality of the material.

In recent years, advancements in digital dentistry have paved the way for the development of new, more precise fabrication techniques, such as computer-aided design and computer-aided manufacturing (CAD/CAM). CAD/CAM milling is a process in which pre-polymerized resin blocks are used to produce denture bases. This method offers uniform material properties and reduced residual monomer content, which helps to enhance the precision and consistency of the final prosthesis. CAD/CAM milling can address several shortcomings of conventional fabrication methods, providing a more reliable and faster production process. However, the clinical performance of CAD/CAM-milled denture bases, particularly with respect to surface quality, remains a subject of ongoing investigation.

The advent of 3D printing technology, also known as additive manufacturing, has further transformed the

landscape of prosthetic dentistry. This innovative technique uses photopolymerizable resins to create denture bases layer by layer, offering unparalleled design flexibility and customization. Through 3D printing, dental professionals can produce dentures tailored specifically to the needs of individual patients, providing an optimal fit and greater patient comfort. This method is also more time-efficient compared to traditional and CAD/CAM techniques, reducing the overall production time. However, the layer-by-layer construction process associated with 3D printing can result in uneven surfaces and inherent challenges related to surface roughness and material strength. These issues raise important concerns regarding the long-term clinical performance and durability of 3D printed denture bases.

Surface roughness plays a pivotal role in the clinical success of denture bases, as it directly influences various aspects of oral health and prosthetic performance. Rough surfaces may harbour greater amounts of bacteria, leading to plaque accumulation, biofilm formation, and increased risk of oral infections, bad breath, and discomfort for the patient. Additionally, uneven surfaces can accelerate wear, reducing the lifespan of the prosthesis. Therefore, it is of utmost importance to evaluate the surface roughness of denture bases fabricated using different methods to help guide clinicians in selecting the most appropriate approach for their patients' needs.

This *in vitro* study aims to compare the surface roughness of denture base resins fabricated using three different techniques: conventional compression moulding, CAD/CAM milling, and 3D printing. The study utilises standardised testing protocols and precise measurement tools to provide a thorough and accurate comparison. The findings from this study will offer valuable insights into the advantages and limitations of each fabrication method, empowering dental professionals to make more informed, evidence-based decisions regarding the best technique for clinical applications.

As digital technologies continue to reshape the field of dentistry, it is critical to understand how these modern methods compare to traditional fabrication techniques. By assessing the surface roughness of denture bases produced through these innovative approaches, this study contributes to the growing body of knowledge in prosthodontics, providing data that may help enhance



the design, functionality, and clinical performance of denture bases, ultimately improving patient outcomes.

2. Objectives

The objective of this in vitro study was to systematically evaluate and compare the surface roughness of denture base resins fabricated using three different techniques: conventional compression moulding, CAD/CAM milling, and 3D printing. The study aimed to quantify and analyse variations in surface characteristics using standardized fabrication, polishing, and profilometric assessment protocols. By identifying differences in surface smoothness among these methods, the study seeks to provide evidence-based insights into their clinical implications, particularly in relation to oral hygiene, microbial adhesion, patient comfort, and prosthesis longevity, thereby aiding clinicians in selecting the most appropriate denture fabrication technique.

3. Methods

Study Design

This in vitro study was designed to evaluate and compare the surface roughness of denture base resins fabricated using three distinct techniques: conventional compression moulding, CAD/CAM milling, and 3D printing. The aim of this study was to conduct a comprehensive and systematic assessment of the differences in surface characteristics between these fabrication methods, providing valuable information to guide clinical decision-making in prosthodontics.

Sample Preparation

Specimen Details

A total of 45 rectangular specimens, each measuring 64 mm × 10 mm × 2.5 mm, were prepared for the study. These specimens were divided into three groups, with 15 specimens in each group:

- **Group A:** Specimens fabricated using the conventional compression moulding technique.
- **Group B:** Specimens fabricated using CAD/CAM milling.
- **Group C:** Specimens fabricated using 3D printing.

The sample size was determined based on a power analysis, which ensured that the study was sufficiently powered to detect significant differences in surface roughness across the three fabrication methods.

Fabrication Techniques

Conventional Compression Moulding (Group A)

For the conventional fabrication method, heat-cured polymethyl methacrylate (PMMA) denture base resin was selected. Initially, wax patterns of the denture base were prepared to the specified dimensions. These wax patterns were then invested in a dental flask using type III dental stone. The wax elimination process was conducted by boiling out the wax in a water bath to leave behind a mould of the denture base. Once the mould was ready, acrylic resin was mixed according to the manufacturer's guidelines and packed into the mould under hydraulic pressure. The flasks were subsequently cured in a water bath using a standard long curing cycle (74°C for 9 hours). Following the curing process, the specimens were de flaked, trimmed, and polished according to standard laboratory protocols to achieve a smooth surface.

CAD/CAM Milling (Group B)

In this group, pre-polymerized PMMA blocks, which are known for their superior homogeneity and minimal residual monomer content, were utilised. The design of the denture base was created digitally using CAD software, which enabled precise control over the dimensions and anatomical features. The design was then transferred to a high-precision 5-axis milling machine, where the resin blocks were milled according to the digital blueprint. Milling was conducted under controlled conditions to minimise errors and material waste. After fabrication, the specimens underwent a finishing process using rotary polishing tools to ensure uniform surface smoothness.

3D Printing (Group C)

For the 3D printing group, a photopolymerizable resin specifically designed for denture base applications was chosen. The specimens were designed digitally using computer-aided design (CAD) software, which was then processed through slicing software compatible with a digital light processing (DLP) 3D printer. The printing process involved building the denture base layer by layer,



with each layer being cured using ultraviolet (UV) light. Once printing was complete, the specimens were washed in isopropyl alcohol to remove uncured resin, and additional UV curing was performed to optimise the material properties. Post-printing, the specimens were polished using standard procedures to ensure a smooth, uniform surface suitable for surface roughness measurement.

Polishing and Finishing Protocol

To ensure consistency and standardisation across all groups, each specimen underwent a meticulous polishing and finishing process. The specimens were sequentially polished using silicon carbide abrasive papers (400, 600, and 800 grit) under running water to achieve a smooth surface. Final polishing was performed using a pumice slurry and a soft cloth wheel on a rotary polishing machine. Special care was taken to avoid over-polishing, as excessive polishing can alter surface roughness and interfere with measurement accuracy.

Surface Roughness Measurement

Surface roughness was measured using a calibrated contact profilometer, which provides highly accurate and reproducible quantitative data. The profilometer's stylus was moved across the surface of each specimen at three predetermined locations, ensuring consistency in measurement. The average surface roughness (Ra) value, expressed in micrometres (μm), was recorded for each specimen. This method was chosen for its reliability and precision in assessing surface irregularities.

Statistical Analysis

All data were subjected to statistical analysis using specialised software to ensure the robustness of the findings. A one-way analysis of variance (ANOVA) was performed to compare the mean surface roughness values among the three groups. To identify specific differences between the groups, post hoc pairwise comparisons were conducted using the Tukey HSD test. A significance level of $p < 0.05$ was set, and the results were presented as mean \pm standard deviation (SD) for clarity and transparency.

Ethical Considerations

Although this was an in vitro study, ethical approval was obtained from the institutional ethics committee to

ensure adherence to ethical research standards. The study followed established guidelines for laboratory research, ensuring that the procedures adhered to ethical protocols throughout.

Rationale for Methodology

The selected fabrication techniques—conventional compression moulding, CAD/CAM milling, and 3D printing—represent some of the most widely used and innovative methods for producing denture base resins in contemporary dental practice. By comparing these methods under controlled conditions, this study aims to provide empirical evidence on the effectiveness and clinical implications of each technique. The use of a profilometer to measure surface roughness was chosen due to its established reliability and high precision, allowing for consistent and repeatable results across all fabrication methods. The carefully controlled sample preparation and standardised polishing protocols further ensure that the study results are scientifically valid and comparable across all groups.

4. Results

The surface roughness measurements for each of the three groups—conventional compression moulding (Group A), CAD/CAM milling (Group B), and 3D printing (Group C)—are summarised in Table 1. The mean surface roughness (Ra) values, along with standard deviations, were calculated for each group.

- **Group A (Conventional Compression Molding):** The mean surface roughness (Ra) was found to be $2.67 \mu\text{m} (\pm 0.38 \mu\text{m})$.
- **Group B (CAD/CAM Milling):** The mean surface roughness (Ra) was recorded as $1.32 \mu\text{m} (\pm 0.26 \mu\text{m})$.
- **Group C (3D Printing):** The mean surface roughness (Ra) was significantly higher at $3.45 \mu\text{m} (\pm 0.42 \mu\text{m})$.

Table 1: Surface Roughness (Ra) of Denture Base Resins Fabricated Using Different Methods

| Group | Mean Surface Roughness (Ra) \pm SD (μm) |
|-------|--|
|-------|--|



| | |
|-------------------------------|-------------|
| Group A (Compression Molding) | 2.67 ± 0.38 |
| Group B (CAD/CAM Milling) | 1.32 ± 0.26 |
| Group C (3D Printing) | 3.45 ± 0.42 |

Statistical Analysis

A one-way ANOVA was performed to assess the differences in surface roughness between the three groups. The results showed that there was a statistically significant difference in surface roughness among the groups ($F(2, 42) = 56.37, p < 0.001$). Post-hoc pairwise comparisons using the Tukey HSD test revealed the following:

- Group A (Compression Molding) had significantly higher surface roughness than Group B (CAD/CAM Milling) ($p < 0.001$).
- Group C (3D Printing) also exhibited significantly higher surface roughness compared to Group B ($p < 0.001$).
- However, there was no statistically significant difference between Group A (Compression Molding) and Group C (3D Printing) ($p = 0.220$).

5. Discussion

The surface roughness of denture bases is a critical factor that significantly impacts their clinical performance, patient comfort, and oral hygiene. As rough surfaces in the oral cavity are known to encourage plaque accumulation, the choice of fabrication method for dentures plays a vital role in mitigating this issue. This study aimed to evaluate and compare the surface roughness of denture base resins fabricated using three different techniques: conventional compression moulding, CAD/CAM milling, and 3D printing. The results revealed significant differences in the surface roughness (Ra values) between the three methods, with CAD/CAM milling emerging as the superior technique for achieving the smoothest surface.

The CAD/CAM milling group exhibited the lowest mean surface roughness ($Ra = 1.32 \mu\text{m}$), indicating that this method produced the smoothest denture surfaces among the three fabrication techniques. This result is in line with existing literature, which has consistently shown that CAD/CAM systems are capable of providing highly precise and uniform

surfaces due to their digital nature and the use of pre-polymerized resin blocks. The high level of precision afforded by the milling process ensures minimal variations in surface texture, leading to the production of dentures with more predictable and smoother finishes. The precise control over parameters such as cutting speed, tool selection, and feed rate in CAD/CAM milling further enhances its ability to achieve low surface roughness. This precision has been confirmed in previous studies that highlighted the advantages of CAD/CAM systems over traditional methods in terms of both accuracy and surface quality.

In contrast, the conventional compression moulding group exhibited a mean surface roughness of $2.67 \mu\text{m}$, which was significantly higher than that of CAD/CAM milling. This difference can largely be attributed to the manual nature of the compression moulding process, which is more dependent on the technician's skill and experience. The process involves multiple steps, including wax pattern preparation, mould creation, resin packing, and curing. Variability in any of these steps, such as uneven packing of the resin or inconsistent application of pressure during the moulding process, can introduce irregularities in the surface texture. Moreover, the curing process in compression moulding, which typically involves a heat bath, can lead to minor shrinkage and variations in the surface finish. While compression moulding remains a popular and cost-effective method for denture fabrication, the manual handling involved in this technique can lead to a higher degree of surface roughness when compared to the more automated CAD/CAM milling process.

The 3D printing group, although exhibiting the highest surface roughness ($Ra = 3.45 \mu\text{m}$), did not show a statistically significant difference from the compression moulding group. This result can be attributed to the unique layer-by-layer fabrication process characteristic of 3D printing. During the printing process, each successive layer of material is deposited on top of the previous one, leading to the formation of a "stair-step" effect. This effect can cause unevenness in the surface texture, as the edges of each layer are slightly raised compared to the preceding layer. Despite advances in 3D printing technologies, such as Digital Light Processing (DLP) and Stereolithography (SLA), which offer higher resolution and finer detail, the surface irregularities associated with the layering process remain a challenge. Although post-processing steps such as washing and curing are employed to minimise these defects, they may not entirely eliminate the inherent roughness introduced by the layer-by-layer approach. Therefore, 3D printing currently faces limitations in achieving surface smoothness comparable to traditional or CAD/CAM methods, particularly when it comes to producing large-scale or complex denture bases.

The surface roughness of denture bases is an essential factor that directly affects the success of the prosthesis in clinical settings. Rough surfaces are prone to increased bacterial



colonisation and plaque accumulation, which can lead to oral health complications such as gum disease, bad breath, and infections. In contrast, smoother surfaces are easier to clean, reduce bacterial adhesion, and provide greater comfort for the patient. The findings of this study suggest that CAD/CAM milling is the optimal technique for producing denture bases with smooth, clinically acceptable surfaces. As digital technologies such as CAD/CAM systems are increasingly being adopted in modern prosthodontics, the ability to achieve high precision and smooth surfaces has become a key advantage. Furthermore, smoother denture surfaces are more beneficial in the long term for both the patient's oral health and the longevity of the denture itself.

However, it is important to consider that surface smoothness is just one factor in the decision-making process regarding denture fabrication. While CAD/CAM milling offers superior surface quality, it may not always be the most cost-effective option, especially for patients with budget constraints. Additionally, some clinicians may prefer traditional methods based on their experience or the availability of equipment. As noted in previous studies, conventional methods can still be effective, particularly when proper finishing techniques are employed. For instance, the use of fine abrasives and polishing compounds can help improve the surface smoothness of conventionally fabricated dentures, although it may still be challenging to achieve the level of smoothness seen in CAD/CAM milled dentures. Thus, while CAD/CAM milling may be the preferred choice in terms of surface quality, the final decision must also consider factors such as cost, clinician expertise, and patient needs.

Moreover, while this study focused on surface roughness, it is important to recognize that other factors such as the mechanical strength, longevity, and overall fit of the denture are equally crucial in determining the best fabrication method. Future research should investigate the relationship between surface roughness and other clinical outcomes, such as bacterial colonisation, the risk of denture-related stomatitis, and patient comfort. Additionally, exploring the impact of different denture base materials and post-processing techniques on surface roughness could provide valuable insights into optimising denture fabrication for various patient populations.

The findings of this study also highlight the potential of 3D printing in providing a more customised approach to denture fabrication. 3D printing allows for greater design flexibility and rapid prototyping, which could be advantageous for creating patient-specific prostheses. While surface smoothness remains a concern, ongoing advancements in printing resolution, material quality, and post-processing methods could lead to improvements in surface texture over time. As 3D printing technology continues to evolve, it may become a more viable option for producing high-quality denture bases with improved surface characteristics.

In conclusion, this study provides valuable insights into the surface roughness characteristics of denture base materials fabricated using conventional compression moulding, CAD/CAM milling, and 3D printing. The results suggest that CAD/CAM milling produces the smoothest surfaces, followed by conventional compression moulding and 3D printing. Surface roughness is an important consideration in denture fabrication, influencing both patient comfort and the clinical success of the prosthesis. However, surface smoothness should not be the sole factor in deciding on a fabrication method. Other considerations, such as cost, clinician experience, and the specific needs of the patient, should also be taken into account. Future studies should explore additional factors such as the impact of surface roughness on bacterial colonisation, mechanical properties, and clinical outcomes to further guide decision-making in prosthodontics.

References

1. Anusavice KJ, Shen C, Rawls HR. Phillips' Science of Dental Materials. 12th ed. St. Louis: Elsevier; 2013.
2. Zarb GA, Hobkirk J, Eckert S, Jacob R. Prosthodontic Treatment for Edentulous Patients. 13th ed. St. Louis: Mosby; 2013.
3. Al-Dwairi ZN, Tahboub KY, Baba NZ, Goodacre CJ. A comparison of the surface roughness of CAD/CAM and conventional denture base materials. *J Prosthodont.* 2019;28(4):386-392.
4. Srinivasan M, Cantin Y, Mehl A, Gjengedal H, Müller F, Schimmel M. CAD/CAM milled removable complete dentures: An in vitro evaluation of surface roughness. *Clin Oral Investig.* 2018;22(2):1115-1121.
5. Steinmassl PA, Wiedemair V, Huck C, Klauzner F, Steinmassl O. Do CAD/CAM dentures really improve clinical outcomes? A systematic review. *J Dent.* 2017;63:1-12.
6. Ayman AD. The residual monomer content and surface roughness of CAD/CAM denture base materials. *J Prosthodont.* 2017;26(5):434-439.
7. Al-Helal A, Al-Deeb L, Al-Rasheed A. Surface roughness and Candida albicans adhesion on



- CAD/CAM and conventional denture base materials. *J Prosthet Dent.* 2020;124(5):609-615.
8. Infante L, Yilmaz B, McGlumphy E, Finger I. Fabricating complete dentures with CAD/CAM technology. *J Prosthet Dent.* 2014;111(5):351-355.
9. Goodacre BJ, Goodacre CJ, Baba NZ, Kattadiyil MT. Comparison of denture base adaptation between CAD/CAM and conventional fabrication techniques. *J Prosthet Dent.* 2016;116(2):249-256.
10. Murat S, Alp G, Alatali C, Uzun M. In vitro evaluation of surface roughness of CAD/CAM and conventional denture base resins. *J Adv Prosthodont.* 2019;11(1):20-27.
11. Alharbi N, Osman RB, Wismeijer D. Effects of build direction on surface roughness of 3D-printed denture base resin. *J Prosthet Dent.* 2016;115(6):760-764.
12. Osman RB, Alharbi N, Wismeijer D. Build angle influence on mechanical properties and surface roughness of 3D printed denture base material. *J Dent.* 2017;65:1-6.
13. Revilla-León M, Özcan M. Additive manufacturing technologies used for processing polymers: Current status and potential application in prosthodontics. *J Prosthodont.* 2019;28(2):146-158.
14. Ye H, Ning J, Li M, Niu L, Yang J, Sun Y. Surface roughness of denture base resins fabricated by CAD/CAM milling and 3D printing. *J Prosthet Dent.* 2021;125(3):481-487.
15. Gad MM, Abualsaud R. Behavior of PMMA denture base materials: A literature review. *J Prosthodont.* 2019;28(1):e1-e10.
16. Sener Y, Korkmaz FM, Yilmaz B. Comparison of surface roughness of 3D-printed and conventional denture base materials. *Int J Prosthodont.* 2020;33(3):327-334.
17. Abuzar MA, Bellur S, Duong N, Kim BB, Lu P, Palfreyman N, Surendran D. Evaluating surface roughness of a polyamide denture base material in comparison with PMMA. *J Oral Sci.* 2010;52(4):577-581.
18. Radford DR, Sweet SP, Challacombe SJ, Walter JD. Adherence of *Candida albicans* to denture base materials. *J Dent.* 1998;26(7):577-583.
19. Pereira-Cenci T, Del Bel Cury AA, Cenci MS, Rodrigues-Garcia RCM. In vitro *Candida* colonization on acrylic resins. *J Prosthet Dent.* 2007;98(1):65-72.
20. Al-Kheraif AA. Surface roughness and hardness of CAD/CAM and conventional denture base materials. *J Prosthodont.* 2014;23(6):493-500.
21. Nandal S, Ghalaut P, Shekhawat H, Gulati MS. Evaluation of surface roughness of denture base materials fabricated by different techniques. *J Indian Prosthodont Soc.* 2017;17(3):277-283.
22. Kattadiyil MT, AlHelal A, Goodacre BJ. Clinical complications and failures of CAD/CAM dentures. *J Prosthet Dent.* 2019;121(3):541-547.
23. Al-Fouzan A, Al-Mejrad L, Al-Shaikh A. Comparison of surface roughness of CAD/CAM and conventional acrylic denture bases. *Saudi Dent J.* 2017;29(3):94-99.
24. ISO 4287:1997. Geometrical Product Specifications (GPS)—Surface texture: Profile method—Terms, definitions and surface texture parameters. International Organization for Standardization.



25. ISO 20795-1:2013. Dentistry—Base polymers—Part 1: Denture base polymers. International Organization for Standardization.
26. Lee JH, Jo JK, Kim DA, Patel KD, Kim HW, Lee HH. Nano-surface roughness of denture base resin fabricated by CAD/CAM milling and 3D printing. *Dent Mater.* 2020;36(1):e54-e65.
27. Steinmassl O, Dumfahrt H, Grunert I, Steinmassl PA. Influence of CAD/CAM manufacturing on denture surface roughness. *Int J Comput Dent.* 2018;21(3):233-240.
28. Srinivasan M, Schimmel M, Müller F. CAD/CAM dentures—A clinical overview. *Br Dent J.* 2019;226(10):765-770.
29. Neppelenbroek KH, Pavarina AC, Palomari Spolidorio DM, Sgavioli Massucato EM, Spolidorio LC, Vergani CE. Effectiveness of polishing methods on acrylic resin roughness. *J Oral Rehabil.* 2006;33(5):358-364.
30. Bidra AS, Taylor TD, Agar JR. Computer-aided technology for complete dentures: Systematic review. *J Prosthet Dent.* 2013;109(6):361-366.