

CASE REPORT

Prosthetic rehabilitation of a severely resorbed mandibular ridge using the effective suction method

Novita Gabriela Andreas,^{1*} Taufik Sumarsongko,² Rasmi Rikmasari²

ABSTRACT

Keywords: Closed-mouth impression, Complete dentures, Edentulism, Effective suction impression, Mandibular ridge resorption

Mandibular ridge resorption commonly occurs after tooth loss and progressively reduces ridge height and contour, often resulting in a flat ridge. Severe resorption in edentulous patients creates challenges in complete denture fabrication, particularly in achieving adequate retention and stability. The mandibular suction effective denture technique was developed to improve retention by establishing a complete border seal and negative pressure beneath the denture base. This case report aims to describe prosthetic rehabilitation of a patient with a flat mandibular ridge using the effective suction impression technique. A 67-year-old female with complete edentulism and a flat mandibular ridge complained of difficulty in mastication and speech due to a loose, fractured denture. Rehabilitation was performed using the effective suction impression technique with a frame cut-back (FCB) tray and a closed-mouth impression method. Procedures included final impression making, jaw relation recording, artificial teeth arrangement, and insertion of complete dentures for both arches. Post-insertion evaluation showed good retention and stability, with improved comfort and masticatory function. The effective suction technique can provide improved retention, stability, and patient comfort in patients with flat mandibular ridges. Further clinical studies are needed to confirm its long-term success. (IJP 2025;7(1):48-54)

Introduction

Edentulousness results from the cumulative effects of oral diseases and is considered a state of poor oral health. Nearly one in ten elderly Indonesians (50 years and older) is edentulous.¹ Missing teeth can result in multifactorial changes in the mouth, including alveolar bone resorption, tongue enlargement, and facial muscle weakness.² This can lead to decreased masticatory function, phonetics, and aesthetics, thereby impacting the patient's quality of life.³

Residual ridge resorption is a complex and common biophysical process following tooth extraction. Ridge resorption occurs most rapidly in the first year after tooth loss, characterized by a series of changes in shape and height. This process is followed by a slower but more progressive rate of resorption.^{4,5} The rate and direction of alveolar bone resorption vary in the upper and lower jaws. The rate of resorption in the mandible is approximately twice that of the maxilla. More rapid and dramatic changes occur in the mandible. In the mandible, resorption occurs more in the labiolingual and vertical directions.^{4,6}

Mandibular ridge resorption can cause loss of sulcus depth, decreased vertical dimension, and reduced lower facial height. Dentures become passive due to complex neuromuscular control and create difficulties in impression making, mastication, and swallowing, ultimately leading to loss of retention and stability in complete dentures.^{7,8}

Retention and stability are critical factors in the success of

complete dentures. Retention provides psychological comfort, stability provides physiological comfort, and support provides long-term denture wear. These factors must complement each other to achieve a successful denture.^{2,9} Retention and stability of mandibular dentures are relatively more difficult to achieve due to the much smaller surface area of the mandible compared to the maxilla and the active muscle movements caused by the presence of the tongue and floor of the mouth. Consequently, achieving a border seal in the lower jaw becomes more difficult.^{10,11}

Insertion of complete dentures in patients with flat ridges can cause problems for the patient, such as unstable, non-retentive dentures, pain, and discomfort.^{12,13} This is due to muscle insertions near the apex or edge of the ridge, which may lead to muscle-induced displacement of the denture. Another problem is the difficulty in achieving retention and stabilization of the mandibular denture because the base only covers approximately half the mucosal surface compared to the maxillary denture. Therefore, modifications to the impression procedure are necessary to prevent excessive pressure and distortion of the abnormal tissue. One technique that can be applied is the mandibular suction-effective denture, developed by Dr. Jiro Abe in 1999.⁶

The effective suction impression technique can ensure the formation of a border seal according to the patient's anatomical conditions.¹⁴ The concept of this treatment is to create negative

¹Specialist Program, Department of Prosthodontics, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia
²Department of Prosthodontics, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

*Corresponding author: novita15001@mail.unpad.ac.id



Figure 1. Extraoral profile of the patient.



Figure 2. Intraoral findings of the patient: A. Maxillary occlusal view, B. Mandibular occlusal view, C. Left lateral view, D. Frontal view, E. Right lateral view.

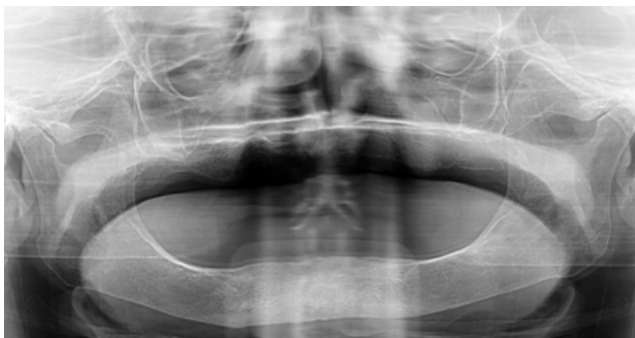


Figure 3. Panoramic radiograph of the patient.

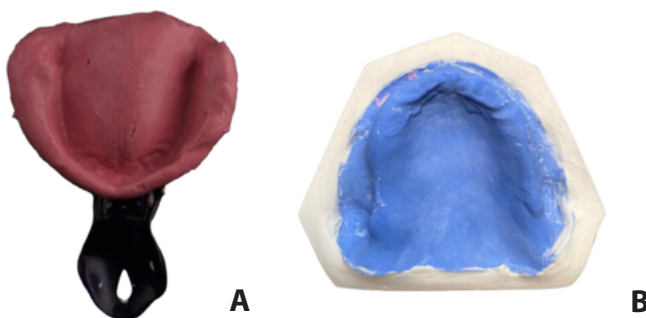


Figure 4. Preliminary maxillary impression: A. Result of the preliminary maxillary impression, B. Study model.

pressure between the denture and the alveolar mucosa, resulting in a strong and effective seal around the border of the denture and the mobile mucosa. Suction-effective dentures are a type of retentive and stable denture because they are able to withstand occlusal forces and

are held in place by the buccal mucosa and lips.¹⁵ This method has high predictability, thereby improving the patient's quality of life because it can restore function and aesthetics.¹⁶ This case report describes the effective suction technique in a case of severely resorbed mandibular ridge of a 67-year-old female patient.

Case Report

A 67-year-old female patient presented to the Prosthodontics Clinic of Oral and Dental Hospital (RSGM) Universitas Padjadjaran with a chief complaint of difficulty chewing and speaking due to the loss of all teeth in the upper and lower arches. The patient had been wearing complete dentures for 11 years; however, the dentures had fractured, become loose, and caused pain, especially during chewing. The patient desired new, more comfortable dentures. Extraoral examination revealed an elongated face, a concave profile, hypotonic lips, and no glandular enlargement [figure 1](#).

Intraoral examination revealed that the patient had lost all teeth in the mandible and maxilla. The alveolar ridge in the mandible appeared flat [figure 2](#). The examination also revealed low anterior and posterior vestibules, accompanied by a low frenulum. The patient's retromylohyoid space was moderately deep. The patient was then referred for a radiographic examination [figure 3](#). The diagnosis in this case was complete tooth loss accompanied by a flat mandibular ridge. The treatment plan was complete dentures, with a good prognosis for success.

After the patient agreed to the treatment plan and signed the informed consent, an initial impression of the maxilla was taken using irreversible hydrocolloid (alginate) to obtain a study model. The resulting maxillary impression was then cast in stone plaster [figure 4](#).

Initial impressions of the mandible were taken using the effective suction method with a cut-back impression tray and impression materials of two consistencies. The materials used included a liquid-consistency irreversible hydrocolloid placed in a syringe and a thick-consistency irreversible hydrocolloid placed in a tray. The procedure began with the application of the syringe material to the lingual area, retromolar pad, mucobuccal fold, and ridge crest, followed by the insertion of the tray filled with the thick material. The impression was taken using a closed-mouth technique, in which the patient was instructed to close her mouth throughout the procedure until the material hardened. The mandibular impression was then cast in stone plaster [figure 5](#).

On the study model, a custom impression tray with a spacer was fabricated using light-cured resin. The custom impression tray was extended to cover the labial, buccal, and sublingual areas. The excess edges of the custom impression tray were carefully reduced. The custom impression trays for the upper and lower jaws



Figure 5. Preliminary mandibular impression: A. Frame cut-back impression tray, B. Result of the impression, C. Study model.



Figure 6. Mandibular custom impression tray.

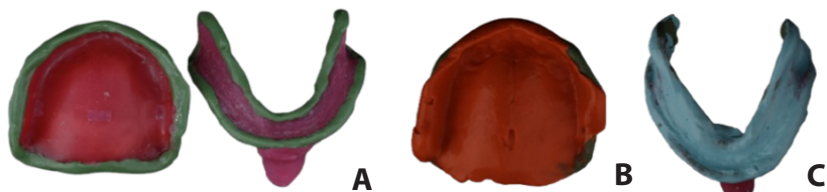


Figure 7. Final impression results: A. Muscle trimming/border molding, B. Final impression of the maxilla using PVS, C. Final impression of the mandible using ZnOE.



Figure 8. Assessment of maxillary bite rim parallelism: A. Left lateral view, B. Frontal view, C. Right lateral view.

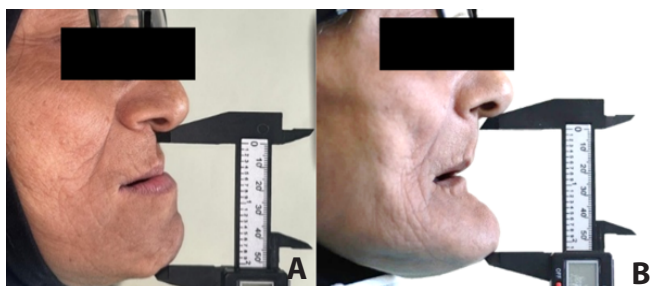


Figure 9. Establishment of vertical dimension: A. Centric relation, B. Rest position.

were positioned 2 mm above the mucobuccal fold to allow for muscle activation during border molding. The lips, cheeks, and tongue were evaluated during the trial insertion of the custom impression tray into the patient's mouth [figure 6](#).

A thin layer of tray adhesive was applied to the inner surface and edges of the upper and lower impression trays. Muscle trimming was performed on the patient's upper and lower jaws using greenstick compound along the edges of the impression trays [figure 7A](#). Excess compound from muscle trimming was then reduced. The wax spacer on the impression tray was carefully removed without damaging the greenstick compound. An escape hole was then created in the impression tray. Final impressions were made using polyvinyl siloxane (PVS) light body for the upper jaw and ZnOE paste for the lower jaw [figure 7B](#) and [figure 7C](#). Beading and boxing were performed on the impressions, which were then cast in stone plaster to obtain the working models.

The denture base and bite rim were fabricated on the working model. The upper and lower bite rims were tried in the patient's mouth. First, the alignment of the upper bite rim was assessed using a fox plane [figure 8](#). The lower bite rim was then tried in, followed by the determination of the patient's vertical dimension and centric relation. The patient's vertical dimension at rest was measured at 55 mm, and the vertical dimension of occlusion was determined to be 52 mm [figure 9](#). At this stage, the orientation lines, namely the high lip line, low lip line, midline, and canine line, were also marked on the bite rim. The bite rim was then fixed using bite registration paste and removed from the patient's mouth [figure 10](#). A facebow transfer was performed to transfer the jaw relationship to the cranial base from the patient to the articulator. The working model with the bite rim was mounted on a semi-adjustable articulator. During this visit, the color and shape of the teeth were selected to suit the patient's skin tone, facial shape, age, and gender, followed by the arrangement of the upper and lower artificial teeth [figure 11](#).

During this visit, the patient underwent a wax denture try-in. The patient was evaluated for aesthetics, midline, low lip line, smile line, and centric and eccentric occlusion. Once the dentures were deemed satisfactory, laboratory procedures for the complete dentures were performed, including packing, finishing, polishing [figure 12](#).

The laboratory-processed complete dentures were evaluated for sharp, unpolished, or rough areas [figure 13](#). The complete dentures were then inserted into the patient. During insertion, retention, stability, adaptation, base extension, centric and eccentric occlusion, and aesthetics were evaluated [figure 14](#). The patient was also re-instructed on how to remove and clean the dentures.

The patient returned for a checkup one week

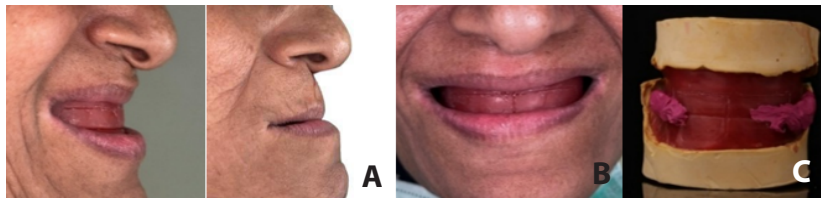


Figure 10. Bite rim evaluation: A. Assessment of labial support, B. Orientation lines, C. Stabilized bite rim.



Figure 11. Arrangement of artificial teeth for the maxilla and mandible.



Figure 12. Wax denture try-in evaluation: A. Low lip line, B. Occlusion, C. Smile line.



Figure 13. Complete dentures of the maxilla and mandible.

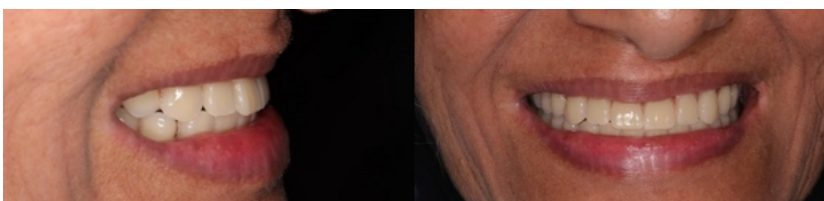


Figure 14. Insertion of the complete dentures of the maxilla and mandible.



Figure 15. Clinical appearance at the one-week follow-up.

after insertion to evaluate her oral condition and monitor her adaptation to the new dentures [figure 15](#). During this visit, a subjective assessment of the patient's complaints and an objective assessment of her oral soft tissues were performed. The patient stated that the new dentures were more comfortable and did not cause pain or pressure on her gums.

Discussion

Alveolar ridge resorption is the process of reduction in the quantity and quality of residual ridges after tooth extraction. Changes in the anatomical structure of the alveolar process inevitably occur after tooth extraction.¹⁷ Alveolar ridge resorption is most evident in the first year after tooth loss, followed by a slower but continuous resorption process. Severely resorbed ridges are more common in the mandible than in the maxilla. This is because resorption in the mandible occurs at a higher rate than in the maxilla.¹⁸

Many factors contribute to alveolar bone resorption. Parafunctional habits, as well as misuse of dentures such as intensive denture wear, unstable occlusion, and inappropriate denture design, can accelerate bone resorption.¹⁹ Metabolic and systemic factors also significantly influence the rate of bone resorption, including age, race, the presence of systemic diseases such as osteoporosis, nutritional status, especially calcium and vitamin D intake, and the length of time the patient has been edentulous. Chronic and progressive bacterial infections of the gingival tissue can cause alveolar bone destruction and loss of tooth attachment. The rate of bone resorption is much higher in postmenopausal women due to inadequate new bone formation resulting from estrogen deficiency.^{17,20,21}

While teeth are still in the mouth, pressure from masticatory muscle contractions is transmitted as tensile forces to the bone through the periodontal membrane. This pressure is absorbed by the alveolar bone and can even stimulate bone remodeling. However, after tooth extraction, the force distribution pattern changes completely. The load is no longer distributed throughout the bone but is concentrated only on the bone surface. The alveolar bone can withstand this compressive force only to a certain extent. Over the long term, denture use can cause changes in the form of flattening of the residual ridge.¹⁷

After tooth extraction, sharp bone edges are flattened by osteoclastic resorption, resulting in a high, rounded residual ridge. Resorption continues labially and lingually, narrowing the ridge apex until it becomes knife-edge, then shortening, and finally transforming into a low, flat ridge.²² The initial resorption phase lasts approximately 8–10 days, consistent with the life cycle of osteoclasts. The rate of resorption is most rapid in the first three months, and then gradually slows. The rate of resorption varies between individuals, varies at specific locations within the same individual, and affects denture

function, which depends on the quality of the jawbone.^{21,23}

The main difficulty in achieving retention, stabilization, and support is often found in complete dentures with flat ridges.²⁴ Retention and stability of dentures can be achieved effectively if the denture has an adequate border seal.²⁵ According to *The Glossary of Prosthodontic Terms*, 9th Edition, a border seal is the contact between the denture and the underlying tissue that prevents air or other materials from entering beneath the denture. Therefore, the impression technique is a key factor in the success of a flat ridge denture, utilizing as much surrounding tissue as possible to achieve an adequate border seal.^{24,26}

The purpose of denture impressions is to capture the supporting tissue structure and establish a peripheral border, resulting in a tight border seal.²⁴ The impression is expected to accommodate normal muscle function and ensure peripheral adaptation, preventing air penetration between the denture base and the mucous membrane. This can provide maximum retention and stability for the denture.²⁷

In this case of a flat mandibular ridge, the initial impression was taken using the effective suction impression technique. This aligns with a study by Joewana and Kusdhany,²⁸ which stated that effective suction impressions were developed specifically for cases of severely resorbed mandibles that struggle to achieve stabilization and retention. Dogra et al.¹⁵ stated that conventional dentures have limitations in treating edentulous patients with severe ridge resorption. To address this, it is recommended to use the effective suction method for mandibular complete dentures.

The effective suction impression technique is performed using a frame cut-back tray (FCB) and alginate impression material. A frame cut-back tray is a specially designed prefabricated impression tray used for flat ridge cases. The design difference lies in the retromolar pad and buccal shelf areas of the tray being cut, allowing the operator to record the retromolar pad in a resting, undeformed position and to record the retromylohyoid depth due to the extension of its wings.^{15,28} In addition, the frame cut-back impression tray used in the effective suction technique is reduced by approximately two-thirds in the vestibular shelf area to avoid excessive buccal extension. This is because the mucosa may be overstretched buccally and tends to lose its ability to seal against the mandibular denture base in the area around the retromolar pad.¹⁵

The most challenging part is achieving a seal in the posterior part of the mouth by ensuring tight contact between the denture and the tissue in the retromolar pad area. The retromolar pad area is easily deformed. To overcome this, the use of an FCB tray is recommended for the initial impression. Alginate is chosen because it can produce good impressions with adequate anatomical detail and is inexpensive. Howev-

er, alginate can exert excessive pressure on the patient's vestibule.^{29,30}

Making a personalized impression tray using the effective suction method requires consideration of eight key points: identify and mark the retromolar pad; avoid the sinew string; draw a line at the most inferior point of the buccal shelf; draw a line from the retromylohyoid fossa extending 2–3 mm beyond the mylohyoid muscle line; avoid the buccal frenulum; avoid the mentalis muscle attachment; avoid the midpoint of the inferior labial frenulum; draw a line along the convexity and avoid the lingual frenulum.²⁸

Sinew strings appear when pressure is applied and are formed in the buccal retromolar pad area toward the second molar. They are present in 10–20% of edentulous patients. Their function is to pull the buccal mucosa inward during swallowing and to close the space posterior to the second molar. This area is usually the site of the BTC.¹⁴

A thin layer of tray adhesive was applied to the inner surface and edge of the personalized impression tray in this case. Elastomeric impression materials require a tray adhesive to provide an effective bond between the tray and the impression material.^{4,31} The final impression material used for the maxillary impression in this case was a light-body PVS impression material. This aligns with Mehra's research,³² which stated that light-body PVS impression material is very suitable for complete denture impressions. The low pressure applied by this material provides an accurate impression of the mucosa. The complete denture will have adequate retention, stabilization, and support. The advantages of this material include better results, shorter working time, easy application, and increased patient comfort.^{33,34}

The impression material used to create the mandibular impression in this case was zinc oxide eugenol paste. A survey by Vohra et al.³⁵ indicated that ZnOE impression material is one of the most frequently used final impression materials in complete denture cases. ZnOE is mucostatic and easily adapts to soft tissue due to its water-based system. Therefore, this material is capable of producing detailed impressions of soft tissue anatomical surfaces without causing tissue displacement. This impression material is easy to apply, affordable, and has good flow consistency.⁸

Closed-mouth impressions were performed in this case. A closed-mouth impression is a method in which the patient's mouth is closed and relies on functional movement. This method allows the impression to be taken during functional patient movement, creating negative pressure that encloses the denture perimeter. Saliva is released under the denture base during biting, creating negative pressure by covering the perimeter of the denture.³⁶ Patients are instructed to move their tongue left and right, swallow, and perform movements while the mouth is closed.²⁸

Conventional dentures aim to expand the denture-bearing surface area by emphasizing muscle attachment. Effective suction dentures, on the other hand, focus on complete border coverage.³⁷ For successful denture placement, the BTC point must be formed. Ichikawa³⁸ explained that two-thirds of the retromolar pad area must be covered to ensure strong and stable denture retention. Another crucial area is the spongy tissue found in the sublingual fold. This area is crucial because the mucosa there stretches during secondary impressions, resulting in a thick groove at the periphery of the denture. This contact remains virtually unchanged during tongue function and contributes to stable border closure.¹⁵

Conventional complete dentures primarily rely on expanding the denture-bearing area and emphasizing muscle attachment to achieve retention and stabilization.³⁷ However, in cases of severely resorbed mandibular ridges, the limited supporting surface area and unfavorable muscle dynamics often lead to retention failure.¹⁵ In contrast, effective suction techniques focus on achieving complete border closure and establishing a BTC point to create negative pressure within the denture. Functionally, this improves denture retention in cases of severe ridge resorption.³⁷ Furthermore, Ichikawa³⁸ explained the importance of covering two-thirds of the retromolar pad area with the effective suction technique to ensure strong and stable denture retention. Retention with the effective suction technique also utilizes the sublingual fold, as the mucosa in this area stretches during secondary impressions, creating a thick groove at the periphery of the denture. This contact remains virtually unchanged during tongue function and contributes to stable border closure.¹⁵

After applying the effective suction impression technique in this case, the patient was satisfied and comfortable with the newly inserted denture. The patient reported that the denture did not loosen when chewing or speaking. The maxillary complete denture also did not cause excessive pressure or pain when worn. Compared to her previous denture, the patient found the new denture much more comfortable and reported increased self-confidence. This demonstrates that the effective suction impression technique is an effective technique for fabricating complete dentures in flat ridge cases.

This case report has several limitations that should be considered. First, this report involved only one patient, so the findings may not be representative of the entire population of edentulous patients. Second, the follow-up period was relatively short, so the long-term stability of denture retention and function could not be fully evaluated. Furthermore, the evaluation of treatment outcomes was largely based on the patient's subjective perception of comfort and masticatory function, without objective measurements such as retentive force or

masticatory efficiency. In addition, this technique is highly dependent on operator skill, so clinical outcomes may vary between clinicians. Therefore, further research with a larger sample size and a longer-term study design is needed to evaluate the effectiveness and predictability of this technique in cases of severe mandibular ridge resorption.

Conclusion

Mandibular complete denture fabrication using the mandibular suction-effective denture technique in edentulous patients with a flat mandibular ridge yields good results in terms of retention, stability, and patient comfort. The effective suction impression technique produces optimal base adaptation and an adequate border seal, thereby improving masticatory function and comfort. This technique can be considered as an alternative in cases of severely resorbed mandibular ridges. However, further clinical research is needed to confirm the long-term efficacy of this suction-effective denture technique.

References

1. Pengpid S, Peltzer K. The prevalence of edentulism and their related factors in Indonesia. *BMC Oral Health*. 2018;18(1):1–9.
2. Nuriyanto AF, Rostiny R, Agustono B. Neutral zone: concept and technique application for managing severely resorbed mandibular ridges – a case report. *e-GiGi*. 2022;10(1):32–7.
3. Ari MDA, Laksono H, Laksono V, Sanjaya RAA, Pramesti TR, Sitalaksmi RM. Management of a complete denture in the flat mandibular ridge using a semi-adjustable articulator along with an effective suction method. *Dent J*. 2022;55(3):179–85.
4. Kresnoadi U, Theodora M. Closed mouth impression method for immediate complete denture fabrication on maxillary and mandibular flat ridges in medically compromised patient: A case report. *World J Adv Res Rev*. 2022;13(3):348–53.
5. Abdelbagi NF, Ismail IA, Awadalkreem F, Alhaji MN. Comprehensive prosthodontic treatment of an elderly patient with compromised ridges: A clinical case report. *J Oral Res*. 2021;10(5):1–11.
6. Chihargo, Nasution ID, Chairunnisa R. Modifications on impression procedure and occlusal scheme for complex oral conditions in complete edentulous patient. *World J Dent*. 2018;9(2):126–31.
7. Saravanakumar P, Thangarajan S, Mani U, Kumar V. Improvised neutral zone technique in a completely edentulous patient with an atrophic mandibular ridge and neuromuscular incoordination: a clinical tip. *Cureus J Med Sci*. 2017;9(4):1189–1200.
8. Radke UM, Rajlakshmi S. An in vitro study to evaluate and compare the flow property of different commercially available zinc oxide eugenol impression materials. *Contemp Clin Dent*. 2018;9(1):137–41.
9. Mistry R, Pisulkar S, Bhoyar A, Surekha B, Mandhane R. Stability in complete dentures: an overview. *J Dent Med Sci*. 2018;17(11):36–41.
10. Dimas M, Ari A, Laksono H, Laksono V, Akbar R, Sanjaya A, et al. Management of a complete denture in the flat mandibular ridge using a semi-adjustable articulator along with an effective suction method. *Dent J*. 2022;55(158):179–85.
11. Jain P, Rathee M. *Stability in mandibular denture*. Treasure Island (FL): StatPearls Publishing LLC; 2022. 1–6 p.
12. Hiroki L. A retrospective study of risk factors for suction-effective mandibular complete dentures. *J Acad Clin Dent*. 2016;36(1):184–91.
13. Herdianti NC, Soekobagiono S, Dahlan A. Complete denture treatment with a flat ridge using semi-ad-

- justable articulator. *Indones J Dent Med.* 2018;1(1):40-44.
14. Abe J, Kokubo K, Sato K. *Mandibular Suction-effective Denture and BPS: A Complete Guide.* Tokyo: Quintessence Publishing; 2012. 291 p.
 15. Dogra S, Dhawan P, Tandan P, Tomar SS, Mehta D, Nautiyal M. Mandibular suction effective denture for severely resorbed ridges-A review. *J Prosthodont Dent.* 2020;15(2):17-23.
 16. García E, Jaramillo S. Enhanced retention of mandibular digital complete dentures using an intraoral scanner: A case report. *Prosthesis.* 2025;7(2):29-37.
 17. Kaur R, Kumar M, Jindal N, Badalia I. Residual ridge resorption - revisited. *Dent J Adv Stud.* 2017;5(2321):76-80.
 18. Prasad DK, Divya M, Prasad DA. Prosthodontic management of compromised ridges and situations. *Nitte Univ J Heal Sci.* 2020;4(1):141-8.
 19. Sikri A, Sikri J, Kalra T, Sharda R, Bathla N, Thakur S. Customized preliminary impression: a novel impression technique for severely resorbed edentulous ridges. *Sudan J Med Sci.* 2023;18(3):325-37.
 20. Feng X, McDonald JM. Disorders of bone remodeling. *Annu Rev Pathol.* 2013;6(3):121-45.
 21. Vasudeva D. Prosthodontic management in residual ridge resorption: Article review. *Int J Heal Sci.* 2021;5(2):198-204.
 22. Gupta A, Tiwari B. Residual ridge resorption: a review. *J India Dent Sci.* 2010;2(2):7-11.
 23. Teitelbaum SL. Osteoclasts: what do they do and how do they do it? *Am J Pathol.* 2007;170(2):427-35.
 24. Rahmat A, Nina P, Jubhari EH. Comprehensive approach for highly resorbed mandibular ridge with complete denture. *Indones J Prosthodont.* 2023;3(2):126-31.
 25. Patel J, Jablonski R, Morrow L. Complete dentures: an update on clinical assessment and management: part 1. *Br Dent J.* 2018;225(8):707-14.
 26. Driscoll C, Freilich M, Guckes A, Knoernschild K, McGarry T, Goldstein G, et al. *The Glossary of Prosthodontic Terms: Ninth Edition.* *J Prosthet Dent.* 2017;117(5S):e1-105-13.
 27. Malachias A, Paranhos H, Silva C da, Muglia V, Moreto C. Modified functional impression technique for complete dentures. *Braz Dent J.* 2005;16(2):135-9.
 28. Joewana CST, Kusdhany LS. Modified suction-effective denture technique for mandibular flat ridge. *Indones J Prosthodont.* 2025;6(1):6-10.
 29. Solomon E. A critical analysis of complete denture impression procedures: contribution of early prosthodontists in India — Part I. *J Indian Prosthodont Soc.* 2011;11(3):172-82.
 30. Kresnoadi U, Putri CR, Kuntjoro M, Pratiwi WAS. Complete denture treatment in a resorbed mandibular ridge with suction effective method and neutral zone technique using a semi-adjustable articulator: A case report. *World J Adv Res Rev.* 2024;23(1):1265-71.
 31. Sahay S, Reddy V, Chandrasekharan Nair K. A Study on tray adhesives used with elastomeric impression materials and different types of trays. *Acta Sci Dent Scien.* 2022;6(3):81-7.
 32. Mehra M, Vahidi F, Berg R. A complete denture impression technique survey of postdoctoral prosthodontic programs in the United States. *J Prosthodont.* 2014;23(4):7.
 33. Dogan S, Schwedhelm ER, Heindl H, Mandl L, Raigrodski AJ. Clinical efficacy of polyvinyl siloxane impression materials using the one-step two-viscosity impression technique. *J Prosthet Dent.* 2015;114(2):217-22.
 34. Ho W, Seow LL, Musawi A. Viscosity effects of polyvinyl siloxane impression materials on the accuracy of the stone die produced. *J Clin Transl Res.* 2018;4(1):70-4.
 35. Vohra F, Rashid H, Hanif A, Mariam S, Ghani A, Najeeb S. Trends in complete denture impressions in Pakistan. *J Ayub Med Coll Abbottabad.* 2015;27(1):108-12.
 36. Djuarsa I, Sitalaksmi RM. Complete denture treatment with closed mouth impression method for medically compromised elderly patients with flat ridge. *World J Adv Res Rev.* 2022;13(3):401-4.
 37. Abe J. Difference of preliminary impression takings between conventional mandibular complete denture and the mandibular complete denture intended with effective suction - Recommended impression system, frame cut back tray representative of Japan Denture Association. *Japan Denture Assoc.* 2010;43(5):3-22.
 38. Ichikawa M. Report on establishing the base outline of mandibular complete denture obtained from measurements of denture base dislodging and retraction force (1st report): Discussion on retentive force from coverage difference with a denture base over the retromolar. *J Acad Clin Dent.* 2012;32:57-64.