Case Report

A clinical innovation in complete denture fabrication using a modified impression technique for a flat ridge with flabby tissue: A case report

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Received: 8 May 2026
Revised: 21 June 2026
Accepted: 20 July 2026
Published: 31 July 2026
DOI: 10.24198/pjd.vol38no2.66890

p-ISSN 1979-0201
e-ISSN 2549-6212

Citation:
Fahira, J, Kusumadewi, AN, Sumarsongko, T, Damayanti, L. A clinical innovation in complete denture fabrication using a modified impression technique for a flat ridge with flabby tissue: A case report. Padjadjaran J Dent. 2026 Jul;38(2):367-377

ABSTRACT

Background: Alveolar ridge resorption is a common complication in edentulous patients, often resulting in flat ridges with flabby tissue, especially in long-term denture wearers. These soft tissues are mobile and easily displaced, compromising denture retention, stability, and support. Conventional impression techniques may lead to distorted impressions and ill-fitting dentures. This case report aims to demonstrate the effectiveness of a modified impression technique combining selective pressure and closed-mouth approaches to manage flat ridges with flabby tissue. **Case Report:** A 59-year-old male presented with difficulty chewing due to ill-fitting complete dentures. Clinical examination revealed completely edentulous arches with flat ridges and flabby tissue in the anterior regions of both jaws. A modified selective pressure technique was employed. For the maxilla, a custom tray with a window was used to record the flabby area using light-body polyvinyl siloxane (PVS), while medium-body PVS was applied to the stress-bearing areas. For the mandible, a closed-mouth technique was used during the preliminary impression to accurately record the retromolar pad and retromylohyoid area. A double-spacer tray with escape holes was then used during the final impression with light-body PVS to minimize tissue displacement. **Conclusion:** The modified selective pressure and closed-mouth techniques may effectively minimize soft-tissue distortion in flat ridges with flabby tissue. Proper tray design and material selection may enhance denture retention and stability, while accurate recording of mandibular extension, especially the retromylohyoid area, may further improve the performance of mandibular denture.

KEYWORDS

Complete denture, flabby ridge, flat ridge, window tray, double spacer tray

INTRODUCTION

Alveolar ridge resorption is a common problem experienced by edentulous patients, affecting both the upper and lower jaws. Alveolar ridge resorption is usually found in patients who have been edentulous for a long time, causing the alveolar ridge to become flat and the surrounding soft tissue to become flabby (soft and unstable).

Alveolar ridge resorption is a multifactorial process influenced by anatomical, metabolic, mechanical, and prosthetic factors, with the highest rate of resorption occurring in the first few months after tooth extraction and continuing progressively throughout life. Tooth loss, especially in the mandibular arch, often leads to a rapid decrease in alveolar bone height. The mandible shows a significantly higher resorption rate, approximately four times that of the maxilla.[1–5]

A flabby ridge is an area of soft tissue that is easily displaced and found on the alveolar ridge of edentulous patients. It usually consists of fibrous tissue and often appears due to the loss of alveolar bone, which is then replaced by

hyperplastic soft tissue, particularly in long-term denture wearers. A flabby ridge is typically caused by mechanical trauma from ill-fitting denture bases. A flabby ridge often causes poor retention, support, and stability of dentures.

According to several studies, flabby ridges are found in about 5% of mandibles and 24% of maxillae.[6–9] A flabby ridge usually appears when the edentulous ridge opposes natural teeth, where direct occlusal pressure causes trauma to the tissue. A flabby ridge is very often found in the anterior maxillary region and is therefore commonly referred to as combination syndrome. However, in fully edentulous patients, it is more frequently found in the anterior region of both jaws.[6,7,10]

Special techniques are required to obtain an accurate impression for flat alveolar ridges with flabby tissue. The basic objective of the impression is to record the maximum possible denture-bearing area. Unlike the maxilla, the mandibular ridge is smaller and muscle attachments together with tongue movement can easily destabilize the denture.

Therefore, careful impression making and extension design are particularly important for flat alveolar ridges to compensate for reduced bone support and to maximize denture retention. The mandibular denture base relies on the functional depth and accurate recording of the retromolar pad, buccal shelf, and retromylohyoid area to obtain adequate retention and stability.[11,12]

Several impression techniques have been developed to avoid distortion caused by pressure during the impression of flabby areas. These techniques include the mucocompressive technique, in which all the supporting tissues are compressed during the impression; the mucostatic technique, which records the tissue in a resting state without pressure; and the selective pressure technique, which combines both by applying pressure only to the stress-bearing areas while leaving the non-stress-bearing areas uncompressed. Taking impressions of flabby tissue in a resting state (mucostatic) has been widely accepted by clinicians because it is considered more accurate in maintaining the natural shape of the soft tissue.[7,10,13–16]

The most appropriate technique for flabby ridge cases remains a subject of debate. Controversies persist regarding the amount of pressure that can be applied without displacing flabby tissue and regarding the reliability of various materials and tray designs in capturing flabby areas without distortion.[17] These issues remain clinically relevant today because improper impression techniques are related to complete denture failure, contributing to poor stability, compromised retention, and patient dissatisfaction.[18–20] Additionally, surgical treatment can be performed to repair the supporting area of dentures, but in elderly patients, surgical procedures are often not recommended; therefore, denture treatment using a modified impression technique is generally preferred.[10,21]

Existing impression techniques also present limitations. The window technique has been previously described in the literature and is generally considered effective for eliminating pressure on flabby areas, with reports indicating favorable clinical outcomes such as reduced distortion and improved denture stability.[14]

However, its application is limited to single-arch modifications and evidence regarding its effectiveness cases in both jaws or when combined with other techniques remains sparse. Although the window technique can accurately record flabby tissue under minimal pressure, it often lacks adequate support for capturing the rest of the arch, which may compromise the overall accuracy of the impression.[22]

The double spacer method, meanwhile, is a commonly adopted modification in selective-pressure techniques, providing additional relief over mobile tissue and helping minimize displacement during the final impression. One study has reported favorable outcomes with this technique, including improved soft-tissue reproduction and red.uced distortion, indicating a good clinical success rate.[23]

Combining the window technique with the double spacer approach may enhance impression accuracy because each method compensates for the limitations of the other. In the maxilla, the larger denture-bearing area and broad residual ridge provide sufficient space and structural support to use the window technique. However, in the mandible where the denture bearing area is restricted, it is more challenging to control material flow when the window technique is applied.

This case is unique because it involves a combination of clinical conditions that are rarely found together in edentulous patients, including a very flat ridge, extensive flabby tissue in the anterior region of both jaws, and the necessity to accurately record expanded retentive areas such as the retromolar pad and retromylohyoid area. This clinical challenge often leads to tissue distortion and denture retention failure when using conventional techniques.

The procedural uniqueness of this case report lies in the modification of the impression technique that integrates two approaches that are usually used separately, namely the selective pressure technique and the closed-mouth technique, which are specifically adapted for each jaw. For the maxilla, a custom tray with a window technique was used to record flabby tissue with light-body PVS without pressure, while stress-bearing areas were recorded using medium-body PVS. For the mandible, the closed-mouth technique was used in the initial impression to ensure accurate recording of the posterior structures, and a double-spacer custom tray with escape holes was used in the final impression to minimize displacing forces on the flabby tissue.

This combined and modified approach contributes novelty to the literature by demonstrating that the strategic combination of selective pressure and the closed-mouth approach can overcome soft tissue distortion in patients with flat ridges and extensive flabby tissue, while improving the retention, stability, and comfort of complete dentures. This case report describes the fabrication of complete dentures for a patient with flat ridges and flabby tissue using the selective pressure impression technique with a window method for the maxilla and a double spacer method for the mandible. This case report aims to demonstrate the effectiveness of a modified impression technique combining selective pressure and closed-mouth approaches to manage flat ridges and flabby tissue.

Case Report

A 59-year-old man presented to the Prosthodontics Department of Rumah Sakit Gigi dan Mulut (RSGM) FKG UNPAD with complaints of difficulty chewing due to the loss of all teeth in the upper and lower jaws. The patient had previously used complete dentures for both arches but found them loose and uncomfortable when eating and speaking over the past year. The patient requested fabrication of new complete dentures. The patient had no history of systemic disease.

Extraoral examination showed a convex facial profile, with normal pupils in both eyes (Figure 1A, 1B). Intraoral examination revealed complete edentulism of both maxillary and mandibular arches with flat ridges and flabby tissue in the regions of teeth 13-23 and 33-43. The shape of the upper and lower jaw arches is oval, with a Class I jaw relation (Figure 2).

The patient was diagnosed with complete edentulism of the maxilla and mandible, classified as American College of Prosthodontists (ACP) Prosthodontic Diagnostic Index (PDI) Class IV, based on the presence of a severely flat alveolar ridge offering no resistance to horizontal or vertical denture base movement, accompanied by extensive flabby tissue in the bilateral anterior region. The prognosis was considered guarded to fair, because of the severely compromised residual ridge and soft-tissue condition, but was expected to improve through the use of a modified impression technique to manage the flabby tissue and to compensate for the minimal ridge support. The treatment plan was established

as the fabrication of new maxillary and mandibular complete dentures using a modified selective pressure technique. For the maxilla, a window tray technique with light-body PVS was used for the flabby anterior area, whereas for the mandible, a closed-mouth technique with a double-spacer tray was employed. After the patient approved the treatment plan and signed an informed consent form, preliminary impressions of the upper and lower jaws were made using irreversible hydrocolloid material (CAVEX CA37, Cavex, Netherlands) to obtain diagnostic casts (Figure 3A, 3B). The impressions were cast using dental stone (Pro Model Super 11, Formula Saint Gobain, USA).

On the diagnostic casts, custom impression trays were fabricated with a wax spacer, and an additional spacer was applied to the flabby area of the lower jaw. For the upper jaw, a custom impression tray was made with a spacer and a window was created in the flabby area. The custom trays for the upper and lower jaws were made from light-curing synthetic resin (LC Dental Tray, Cavex, Netherlands) with a 1.5 mm spacer made of baseplate wax (Cavex, Netherlands) and stoppers were created. The custom trays were fabricated 2 mm short of the mucobuccal fold on the diagnostic casts (Figure 4). The lips, cheeks, and tongue were evaluated during the trial fitting of the custom impression trays in the patient's mouth.



Figure 1. Extraoral profile A. Front view and B. Lateral view

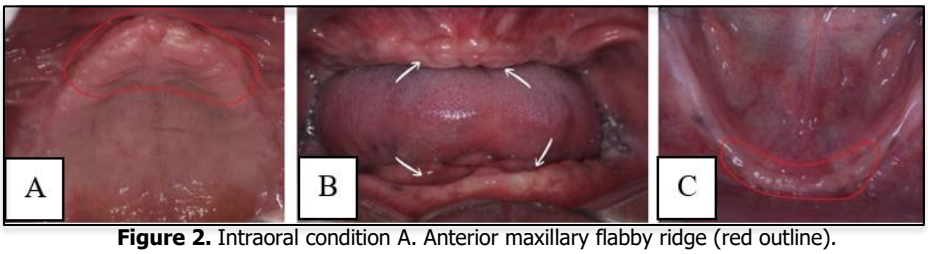


Figure 2. Intraoral condition A. Anterior maxillary flabby ridge (red outline). B. Anterior mandibular flabby ridge (white arrows). C. Severely resorbed flat mandibular residual ridge (red outline)

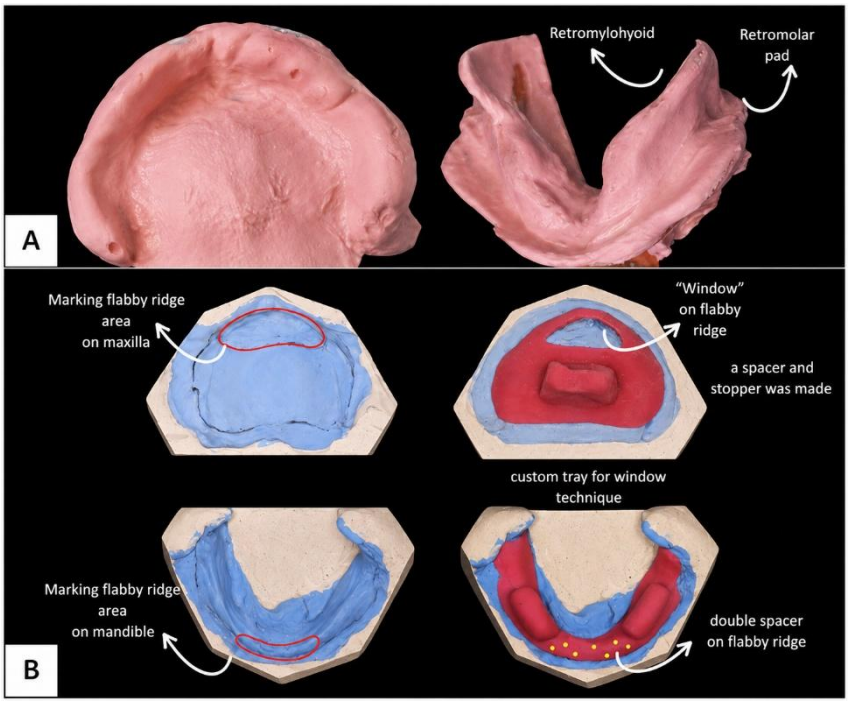


Figure 3. A. Primary impressions made with alginate. B. Diagnostic casts and custom impression trays

On the second visit, a trial fitting of the custom impression trays was performed. The tray extensions were confirmed to be adequate, and border molding was carried out using green stick compound (Peri Compound, GC, Japan). Border molding was performed by manual manipulation, moving the patient's muscles using the open-mouth technique, extending the border up to the retromylohyoid area.

The wax spacer was removed, and the custom tray was coated with tray adhesive (Chemi Dental, Poland) before application of the final impression material. The final impression on the upper jaw was made using two types of materials, medium-body polyvinyl siloxane (PEAKOSIL Monophase Regular Set, Neosil, Korea) and light body polyvinyl siloxane (PEAKOSIL Light Body Regular Set, Neosil, Korea) to capture the flabby area.

The final impression on the lower jaw was made using light-body polyvinyl siloxane (PEAKOSIL Light Body Regular Set, Neosil, Korea). Escape holes were created in the flat and flabby ridge areas as well as the retromolar pad. The final impression results are then beaded and boxed, followed by casting with type IV dental stone to obtain the master casts. After obtaining the master casts, an acrylic baseplate and occlusion rims were fabricated with baseplate wax (Figure 4).

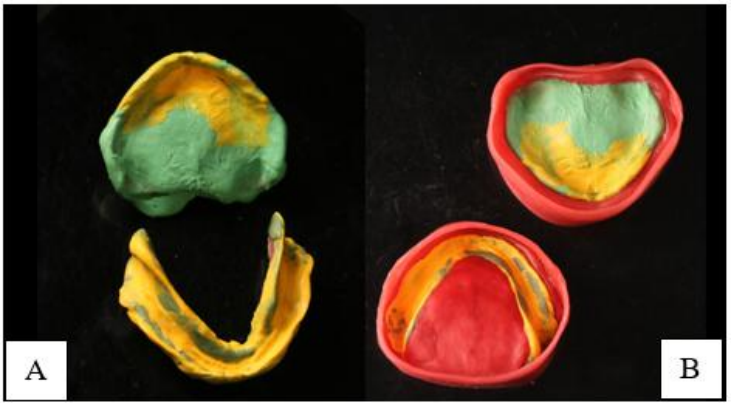


Figure 4. A. Final impression, B. Beading and boxing

On the third visit, adjustments of the occlusion rims were performed to establish occlusal plane parallelism, labial plane orientation, determination of vertical dimension, and centric relation. Occlusal parallelism was verified using a fox plane, an instrument designed to assess the parallelism of occlusal rims to facial reference lines (Figure 5). Orientation lines such as the high lip line, low lip line, midline, and canine lines were marked on the bite rim. Notches were then made on the maxillary and mandibular rims in the premolar and molar areas, and bite registrations were recorded using bite registration material (PEAKOSIL Bite Regular Set, Neosil, Korea).

A face-bow transfer was performed on the patient, and the recorded bite fork was placed on a semi-adjustable articulator ready for mounting. Mounting was first carried out on the maxillary cast. The bite registration was subsequently positioned and verified according to the patient's centric relation and vertical dimension, fixed, and the mandibular cast was then fixed and mounted on the articulator (Figure 5). During this visit, the tooth shade and mould were selected based on the patient's skin tone, facial appearance, age, and gender, followed by the arrangement of the artificial teeth.

On the fourth visit, the trial insertion was performed, followed by an evaluation of esthetics, facial support, and phonetics. Occluding vertical dimension, occlusal scheme, and centric occlusal position were also verified. After the evaluation of the wax try-in, laboratory procedures for denture processing were carried out, including packing, finishing, and polishing.

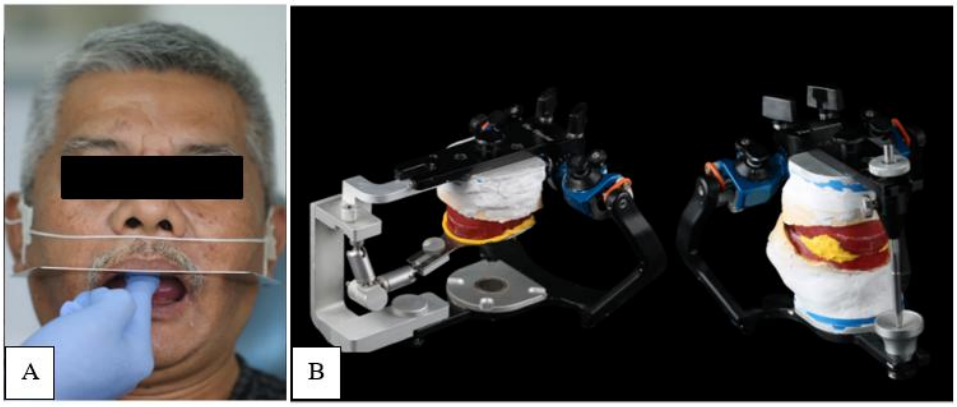


Figure 5. A. Occlusal parallelism, B. Mounting of the maxillary and mandibular casts on a semi-adjustable articulator

On the fifth visit, the insertion of acrylic complete dentures was carried out, followed by a systematic clinical protocol (Figure 6). Treatment outcomes were assessed using clinical evaluation and patient feedback. Clinically, denture adaptation to the mucosal surface, peripheral extension, absence of pain, and centric and eccentric occlusion were evaluated. Conventional clinical tests of retention and stability were performed by applying dislodging forces to the dentures; the presence of resistance during removal indicated adequate retention and that the dentures did not dislodge easily.

Functional assessment was also conducted by asking the patient to chew soft food (bread) to evaluate comfort and functional stability, during which no discomfort or difficulty was reported. The patient was instructed on proper insertion and removal techniques as well as oral and denture hygiene. During follow-up visits, insertion direction, adaptation, retention, occlusion, stability, and aesthetics of the dentures were re-evaluated. The patient consistently reported no complaints and expressed satisfaction with both the maxillary and mandibular dentures.

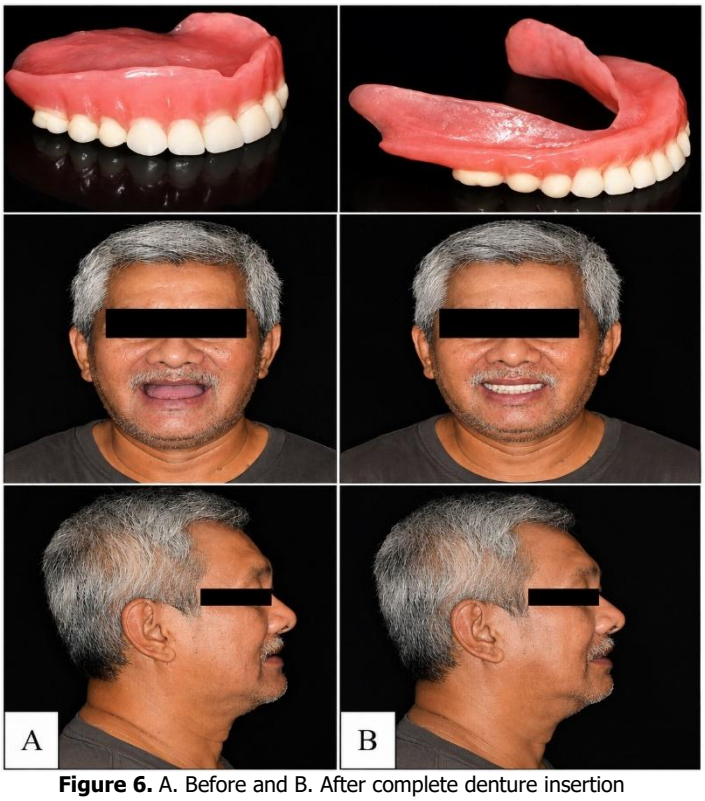


Figure 6. A. Before and B. After complete denture insertion

DISCUSSION

The success of complete denture treatment is determined by three basic principles: retention, stability, and support. The fabrication of mandibular complete dentures generally poses greater challenges in meeting these three aspects than the fabrication of maxillary complete dentures. This is due to the smaller residual ridge of the mandible, which provides less area for retention and support, as well as a higher rate of bone resorption compared to the maxilla.[24–26]

In this case, the patient presented with a flat residual ridges and flabby tissue in both the maxilla and mandible, accompanied by a lack of retention and stability of the existing dentures. These findings are consistent with previous studies reporting that flabby tissue undermines peripheral seal and base adaptation, making conventional impression techniques prone to producing ill-fitting denture bases with compromised retention and stability.[6–9] The poor performance of the previous dentures was likely related to insufficient denture-base extension and inadequate adaptation to the supporting tissues. In managing cases with a flat ridge on the mandible, retention can be obtained by extending the base posteriorly into the alveolingual sulcus (retromylohyoid fossa) with appropriate thickness and length to achieve an adequate peripheral border seal.

The area located at the distal end of the alveolingual sulcus is known as the retromylohyoid fossa or lateral throat form. This area is bounded anteriorly by the mylohyoid muscle and laterally by a pear-shaped pad, posterolaterally by the superior constrictor muscle, posteromedially by the palatoglossus muscle, and medially by the tongue. The retromylohyoid fossa has varying depths. Neil classified the retromylohyoid fossa into Class I deep, Class II moderate, and Class III shallow. Class I and II configurations are favorable for denture retention. Extension of the denture flange in this area provides stability effects (resisting horizontal forces) for the mandible complete denture, helps maintain proper tongue position, and improves neuromuscular control**.** [24,27–31]

An accurate impression has a significant impact on the extension and adaptation of the denture base to ensure proper adaptation. It is widely recognized that no single impression technique is suitable for all clinical situations. Various techniques have been used for complete denture impressions, including mucostatic, mucocompressive, selective pressure, functional, and neutral zone impressions. Final impression materials for complete dentures include zinc oxide eugenol (ZOE) paste, resinous wax, alginate, and elastomeric impression materials.[31]

Polyvinyl siloxane (PVS) is an elastomeric impression material available in various viscosities: light-bodied (more fluid), medium-bodied, heavy-bodied (with a much thicker consistency), or putty (dough-like and non-fluid). The selection of viscosity is based on the consistency of the tissue being recorded: the less supported and more movable the tissue, the more fluid impression material should be to minimize distortion of the mobile tissue.[32,33]

In this case, the primary impression of the mandible was taken in a static condition with the mouth closed, in order to capture the physiological anatomy of the soft tissues at rest and to obtain an optimal impression border (seal area), especially in areas such as the retromylohyoid fossa. When the mouth is open, the retromolar pad stretches posteriorly and becomes thinner, whereas it shortens and becomes rounded when the mouth is closed. If the impression is taken with the mouth open, it will create space under the denture base once the mouth is closed, thereby compromising the peripheral seal. Djuarsa et al., reported that the closed-mouth impression technique improved denture retention and stability in an elderly patient with a flat mandibular ridge by accurately capturing the resting position of the peripheral tissues. An accurate preliminary impression will result in a well-fitting custom tray and facilitates an accurate final impression.[34,35]

Flabby tissue in the denture-bearing area may cause pain during denture use and denture displacement. The main challenge in making impressions of flabby tissue is minimizing tissue movement and distortion caused by pressure applied during the impression procedure, which can result in an unstable prosthesis. Tissue displacement can be minimized by controlling the pressure applied during the impression making through modifications in impression tray design and the selection of impression material.

Tray design may be modified by using spacers, perforated trays, window trays, or detachable trays.[36] If conventional impression methods are used in cases with flabby tissue and flat ridges, impression distortion may occur. Tan et al. reported that impression distortion in severely resorbed ridges can be controlled by selecting the appropriate impression material. Therefore, modifications to the impression technique are required.[37]

The final impression of the maxilla was made using the selective pressure technique with a modified custom impression tray featuring a window over the flabby (non-stress-bearing) area. This approach is supported by Shin et al., who found significant differences in flabby-tissue displacement between tray designs, with an open-window tray design reducing displacement compared to trays with conventional or additional relief alone.[38] With this technique, a mucocompressive impression is first obtained of the stress-bearing tissues using medium-body PVS material. Once the material has set, the flabby tissue (non-stress-bearing area) is recorded using light-body PVS material applied through the tray window. The window technique minimizes displacement of the flabby tissue, and the viscosity of the impression material is directly related to the amount of pressure exerted.[38,39]

A clinical challenge of this technique is the difficulty in handling low-viscosity impression material, particularly in the maxilla because of gravity. To retain the light-body impression material within the window area, gauze may be used.[40] In the mandible, the impression is made using a selective pressure technique with a modified tray incorporating a double spacer and escape holes in the flabby area,

using light-body PVS material. The use of a tray with a double spacer has been shown to minimize displacement of flabby tissue more effectively than a tray with only one spacer. This difference is due to greater flowability of impression material in that area, indicating that adding a spacer is more effective in reducing lateral displacement of the flabby tissue.[38]

The success of complete denture rehabilitation is largely determined by achieving the three fundamental principles of denture function: retention, stability, and support. These factors are more challenging to achieve in the mandible due to the smaller denture-bearing area, greater muscle activity, and the higher rate of residual ridge resorption. In cases of flat ridges and flabby tissue, an appropriate impression strategy becomes essential to minimize soft-tissue distortion and to optimize denture performance.

In this case, the modified selective pressure impression technique effectively improved denture retention by selectively compressing the stress-bearing areas while avoiding pressure on the flabby tissues through the use of the window technique and light-body PVS. These findings are consistent with those reported by Wang et al., who found that dentures fabricated using a window impression technique with light-body PVS were stable and retentive, with reduced chewing difficulty and improved patient satisfaction compared to dentures made using conventional impression methods.[7] This approach allowed the flabby mucosa to be recorded with minimal displacement, resulting in a more accurate tissue reproduction and a better seal during function. For the mandible, the double-spacer tray combined with closed-mouth technique helped capture the functional depth of the retromylohyoid space and ensured proper extension of the denture borders, contributing to improved overall stability.

The favorable outcomes of this technique were demonstrated through several clinical indicators, including enhanced denture retention during the pull-test, improved stability during mastication and speech, proper border seal on functional movements, and the patient's subjective satisfaction regarding comfort and chewing ability. These outcomes collectively confirm that the modified approach produced a more functional prosthesis compared to the previous dentures worn by the patient.

This report is limited to only a single case; therefore, the findings cannot be directly generalized to all edentulous cases with flabby ridges. The absence of a control group and lack of comparison with other impression techniques may also introduce interpretation bias. Future follow-up is planned at regular intervals, such as one month, three months, and six months to evaluate long term denture performance, tissue adaptation, patient comfort, and potential adjustments that may be required over time.

CONCLUSION

The application of the selective pressure technique with modified impression tray designs incorporating a window and double spacer improved impression accuracy, denture stability, and patient comfort. Furthermore, the selection of elastomeric impression materials such as PVS with appropriate viscosity played a critical role in minimizing tissue displacement, particularly in flat ridges with flabby tissue.

The implication of this case report is that appropriate tray selection, its modification, and the impression material viscosity may contribute to improved clinical outcomes in complete denture fabrication for patients with flat ridges and flabby tissue. It also highlights the need for further research to compare this technique with conventional or digital impression methods.

Acknowledgement: Declared none.

Author Contributions: Conceptualization, J.F. and A.K.; methodology, J.F.; software, J.F.; validation, J.F., A.K. and T.S.; formal analysis,J.F.; investigation, A.K.; resources, J.F.; data curation, J.F.; writing original draft preparation,J.F.; writing review and editing, A.K., T.S.; visualization, J.F.;

supervision, T.S.; project administration,J.F.; funding acquisition, J.F. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no funding.

Institutional Review Board Statement: Not applicable

Informed Consent Statement: Written informed consent has been obtained from the patient and their legal guardian to publish this case report and accompanying images

Data Availability Statement: The data are available upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest, financial or otherwise.

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