Case Report

Non-invasive management of maxillary labial undercuts in complete removable dentures using soft liners in a patient with maxillary labial undercut: a case report

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ABSTRACT

Introduction: Individuals who have lost all their teeth should promptly receive rehabilitative treatment with complete dentures to restore lost functions and structures. Bone protrusions or undercuts are factors that can interfere with prosthetic function. A common treatment for undercuts is their removal through alveolectomy surgery; however, the complexity of the procedure could lead to relatively long-time wound healing and post operative discomfort. This report aimed to discuss the management of a fully edentulous patient with complete dentures who presented with a maxillary labial undercut with alternative treatment beside surgery using soft liners in a patient who has maxillary labial undercut. **Case report**: A 54-year-old woman visited the Dental Hospital Universitas Muhammadiyah Yogyakarta, complaining of discomfort due to her dentures being loose, particularly in the lower jaw. She had experienced denture looseness since the first time she wore the complete denture. The patient initially used denture adhesive to prevent the denture from dislodging, but it was now used very rarely. A labial undercut was observed in the anterior region of the maxilla. The patient underwent complete removable denture treatment using soft liners to cover the area left by labial undercuts. **Conclusion**: The use of soft liners serves as an alternative to pre-prosthetics surgery in cases of labial undercut. This approach is considered more comfortable for patients, as it is elastic and does not put pressure on soft tissue.

KEYWORDS

Complete denture, denture liners, polyvinyl siloxane

INTRODUCTION

In Indonesia, the prevalence of tooth loss, according to the 2018 Basic Health Research (RISKESDAS) data, is 19%.[1] Tooth loss is a condition in which teeth become detached from their sockets, affecting aesthetic function, chewing function, speech function, and nutritional status.[2] Periodontal disease is usually the cause of tooth loss in the elderly, while caries is the leading cause of tooth loss in younger individuals.[3]

A complete denture is a removable denture that replaces all the missing teeth and tissue in the upper and lower jaw. Individuals who have lost all their teeth should promptly undergo rehabilitative treatment using complete dentures to restore the lost functions, structures, and maintain the patient's oral health. The most important factor in the creation of complete dentures is the condition of the alveolar bone, which must be adequate to support the retention of the dentures.

Complete dentures may feel loose in individuals with low alveolar bone, which can negatively impact the denture's retention and stability.[4,5]

The key factors determining the success of complete denture treatment are retention, stabilization, and support. Retention refers to the denture's ability to resist forces that try to displace it in an occlusal direction. Stabilization refers to the denture's resistance to movement under lateral (horizontal) forces. Common issues following the insertion of complete denture include mucosal irritation, loose dentures, food accumulation beneath the dentures, difficulty in speaking and chewing, unattractive appearance, and broken dentures.[6]

The alveolar ridge is where dentures are secured, so it must have an appropriate shape to ensure patient comfort. Bone protrusions or undercuts are factors that may interfere with prosthetic function.[7] Generally, labial undercut occurs more frequently in the maxilla than in the mandible which can complicate the insertion of dentures.[8,9]

Pre-prosthetic surgical treatment may be performed to ensure that dentures are stable and aesthetically pleasing.[10] One such procedure used to remove undercuts in hard tissue alveolectomy procedure.[7] However, alveolectomy has its disadvantages, such as the presence of large open wounds, relatively long wound healing times, and discomfort due to post-operative pain.[11]

Alternative treatments for labial undercuts in the patient's jawbone include flangeless dentures and using soft liners, which can help reduce occlusal pressure on the bone and distribute forces evenly.[12,13,14] Additionally, soft liners can reduce stress on the alveolar ridge mucosa and increase the pain threshold.[15] The aim of this case report is to discuss the management of a fully edentulous case with complete dentures in a patient who has maxillary labial undercut. The case report uniqueness relied on the usage of heavy bodied elastomer material as border moulding material, utilization of single step border moulding process, and management of gaps in the denture due to labial undercut using soft liner material.

Case Report

A 54-year-old woman visited Rumah Sakit Gigi dan Mulut Universitas Muhammadiyah Yogyakarta (RSGM UMY) with complaints of discomfort from her old complete dentures, particularly looseness in the lower jaw. She had experienced this issue since first wearing her complete dentures. The patient initially used denture adhesive to prevent the denture from dislodging, but now rarely uses it.

The objective examination revealed that the edentulous upper and lower jaws were pink in color. The palate was of medium size, and the mucosa of both the maxilla and mandible appeared normal. The arches of the upper and lower jaws were oval, with U-shaped contours. The upper jaw had a moderately sized ridge in the anterior-posterior direction, while the lower jaw had a low ridge in the same direction. A labial undercut was observed in the anterior region of the maxilla (Figure 1 and 2).

Based on subjective and objective examinations, the patient is suitable for complete denture treatment. The diagnosis is full edentulism, and the proposed treatment plan is the fabrication of complete dentures. The case had a good prognosis due to cooperative patient, a relatively proper residual ridge and the absence of a surgery procedure.

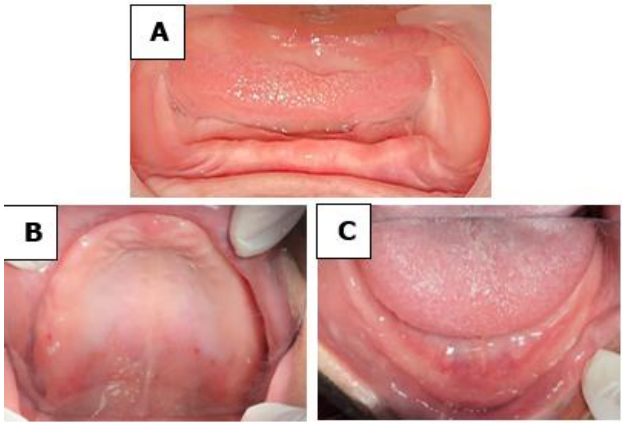

Figure 1. Intraoral Photo, (A) moderately height of maxilla residual ridge and low height of mandible residual ridge, (B) Oval shape of upper residual ridge (C) U shape of lower residual ridge

Figure 2. Labial undercut in the upper jaw

During the first visit, a study model was created using a perforated stock tray No. 2 with an edentulous impression tray and irreversible hydrocolloid material (alginate) (Aroma Fine Plus, GC Corp.) (Figure 3).

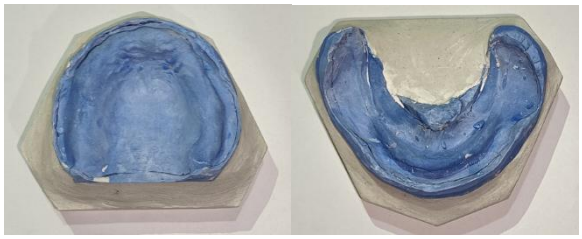

Figure 3. Results of the upper and lower jaw impressions

During the next visit, after the fabrication of the individual impression, the try-in was performed by placing the individual acrylic impression tray into the patient's mouth, while the operator maintained control of the tray. The patient was instructed to move their jaw, and stabilization was ensured by avoiding muscle attachments. The tray's edge was adjusted to be 2 mm short of the boundary between the movable and immovable mucosa. The mandibular impression tray was required to cover the retromolar pad, while the maxillary tray's posterior extension needed to cover the hamular notch and reach the vibrating line.

During the try-in of the lower impression tray, pressure areas were observed in the posterior region and were reduced until the patient felt comfortable. For the upper impression tray, pressure areas were present at both the front and back regions, which were adjusted until the patient no longer experienced pain (Figure 4).

Figure 4. Try-in the upper and lower impression tray

The border molding was created using heavy body type of vinyl polysiloxane (VPS) (Delikit Heavy Body, Happyden), which was applied using a gun. Before taking the impression with the heavy-body material, the custom impression tray was coated with VPS tray adhesive (DMG Tray Adhesive, DMG Dental) to ensure proper adhesion. The patient's cheek and lip mucosa were manipulated to accurately record the anatomical boundaries, by instructing the patient to pronounce the letters 'A', 'U', 'E', and 'O'. For the border molding of the upper arch, the patient was instructed to say 'AH', while for the lower arch, the patient was instructed to move their tongue to the right, left, forward, and backward (Figure 5, 6, and 7).

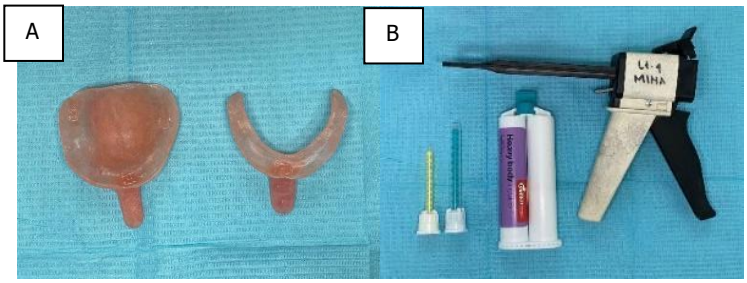

Figure 5. Preparation of tools and materials for border moulding, (A) Individual impression tray, (B) Heavy Body silicone material

Figure 6. Application of tray adhesive material

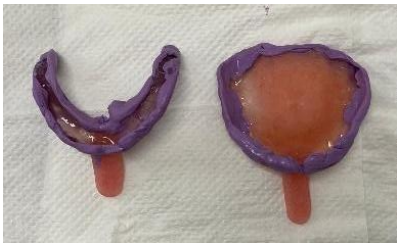

Figure 7. Border molding results

The final impressions were made using individual impression trays. The impression material used was a medium-body type of VPS (Vonflex S Medium, Vericom Co.Ltd). The mucosa was dried beforehand, as this elastomeric material is hydrophobic and requires a dry environment to ensure accurate recording of the patient's oral cavity (Figure 8).

Figure 8. Final impression for work model, (A) Preparation of tools and materials, (B) Coating with adhesive tray, (C) Result of the impression for work model

During the following visit, we performed an occlusal alignment procedure. The patient was instructed to sit in the dental chair, ensuring that the occlusal plane was parallel to the floor. Camper's line was determined using reference points located 4 mm from the external acoustic meatus of both the right and left ears, as well as the anterior nasal spine. These three points were then marked with thread and isolated (Figure 9).

The record block was placed with the upper jaw bite rim positioned 2 mm below the upper lip line in the resting position. When viewed from the front, the upper jaw bite rim appeared aligned with the pupillary line, using an occlusal guide plane for reference. From the lateral view, the upper jaw bite rim was aligned with Camper's line. When the lower jaw bite rim was positioned, both upper and lower bite rims closed perfectly, without gaps, forming a straight line.

Next, the vertical dimension was determined using the Willis method by measuring the distance between the pupil and the corner of the mouth, as well as the distance between the nose and chin in the rest position. The centric relation record was then established, with fixation achieved using a double V groove. Following that, the median line, caninus line, and smile line were identified. The median line was established by drawing a straight line from the center of the upper lip curvature to determine the midline that separated the right and left incisors. The caninus line was located precisely at the corner of the mouth in the resting position, while the smile line was determined by ensuring that the gums were not visible when smiling (Figure 10).

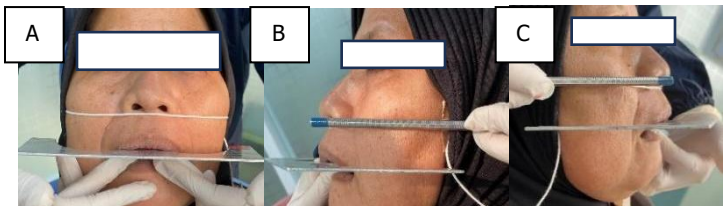

Figure 9. Occlusal alignment, (A) front view, (B) left side view, (C) right side view

Figure 10. Results of the double V groove fixation

An examination was conducted on the inclination and contour of the denture, occlusion, and the stabilization of forces on both the working and balancing sides during artificial teeth try-in. Aesthetic aspects were evaluated by observing the canine line and smile line. Phonetics were assessed by asking the patient to clearly pronounce the letters s, d, o, m, r, a, t, th, p, b, h, f, v, and others, ensuring there were no disturbances (Figure 11).

Figure 11. Try-in denture components

During the insertion visit, retention, stabilization, and occlusion were checked. The patient was educated and instructed on the proper use and maintenance of the prosthesis. Due to the labial undercut on the patient's upper jaw, the complete denture did not reach the fornix on the upper jaw (Figure 12). Therefore, a soft liner was needed to close the gap and prevent food impaction.

Figure 12. The upper jaw that does not reach the fornix.

The application of the soft liner began with roughening the edges of the denture at the areas where the soft liner would be applied using an Arkansas bur, followed by beveling. Afterward, the prosthesis was rinsed and dried. The primer was then applied and left to dry, and the soft liner paste (Sofreliner Tough Medium, Tokuyama Dental) was spread over the entire surface where the primer had been applied, with a wait time of about five minutes. Next, any excess material was removed using a scalpel and No. 11 sharp blade. The shape was then adjusted using a white shape adjustment point bur, followed by surface smoothing with a brown finishing point bur (Figure 13 and 14).

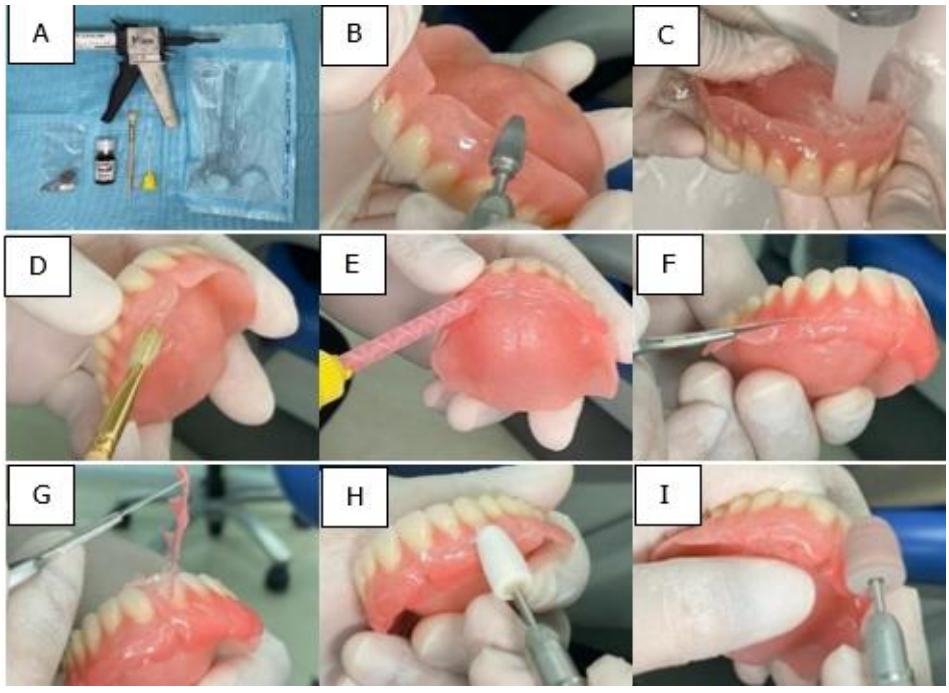

Figure 13. Steps for applying soft liner, (A) Soft liner material, (B) roughening the surface, (C) disinfecting the denture, (D) application of soft liner primer, (E) application of soft liner material, (F) cut the excess of soft liner, (G) remove the soft liner excess, (H) finish the soft liner surface using white stone, (I) polish the soft liner surface using brown stone

Figure 14. Results of using soft liner

A follow-up was conducted after one week to check retention, stabilization, occlusion, supporting tissues, masticatory function, and phonetics. Sharp areas were found on the denture surface of the upper and lower jaws, so adjustments were made using an Arkansas bur and polishing was performed using an acrylic polish bur (Figure 15).

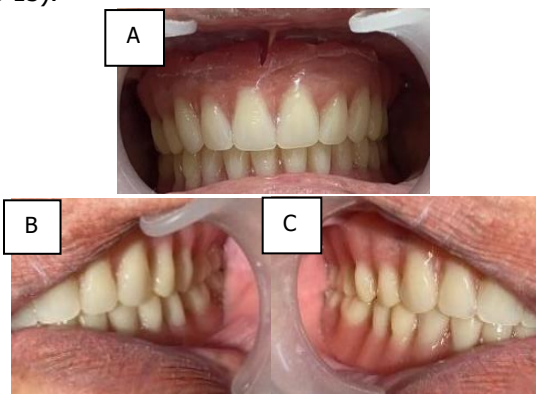

Figure 15. Intraoral photo during the follow-up, (A) Soft liner remain intact (B) left side view,(C) right side view

DISCUSSION

A labial undercut may result from both natural and pathological processes of jaw development and can be further exacerbated by minimal bone resorption.[9] Therefore, patients with such conditions require specific care to avoid pain during denture insertion. This pain arises due to trauma between the denture and the bone protrusion.[16]

A labial undercut on the alveolar ridge can make the border molding procedure more difficult. Therefore, it is necessary to use a material with elastic properties for border molding. The purpose of border molding is to create a peripheral seal to achieve retention. Vinylpolysiloxane (VPS) is an addition silicone impression material known for its elastic properties, ability to produce fine detail, and ideal dimensional stability.[17,18] In this case, heavy bodied VPS material was used as a substitute for green stick compound, which minimized distortion and increased the comfort during impression procedure, due to the elastic properties of VPS (Figure 8).

Border molding is the process of shaping the area around the edges of the impression tray by functionally or manually manipulating the soft tissues to replicate the contour and size of the vestibular area.[19] This step is crucial in the fabrication of complete dentures. Using heavy bodied VPS material for border molding, applied simultaneously with elastomeric impression material, can result in dentures with better retention compared to incremental use of green stick and zinc oxide-based impression material.[20,21] An advantage of the one-step border molding technique with heavy-body material is that it reduces the number of tray insertions during the impression procedure, thereby shortening the patient's treatment time and reducing errors during the heating process.[21, 22]

The reduction is made to the denture plate at the site of the bony protrusion, creating a gap. This gap needs to be relined with a soft liner (Figure 13 & 14). Relining with a soft liner plays a crucial role in enhancing chewing

efficiency and reducing trauma to the soft tissues caused by friction with the denture, making it more comfortable for the patient.[23] The soft liner helps distribute pressure evenly across the chewing surface of the denture. It has several properties, including being odorless, tasteless, biocompatible, elastic, wear-resistant, and maintaining stable color and dimensions. The elastic properties of the soft liner help reduce pressure on the protruding bone, making the insertion and removal of complete dentures easier.[24]

The limitations of soft liner as a relining material such as its long-term resiliency, easily to detach from the denture, color instability, porosity and abrasion resistance.[23] However, several modifications, such as material enhancements to improve long-term resiliency and the use of primers to increase the bonding strength were performed.[23] According to the manufacturer's specifications, Sofreliner Tough Medium is considered a long-term soft liner material that can remain for up to two years before requiring to another relining procedure.[25]

CONCLUSION

A soft liner can be used as a less invasive alternative to pre-prosthetic procedures in cases of labial undercut. It is considered more comfortable for patients due to its elastic properties and because it does not compress the soft tissues. Additionally, using heavy-bodied VPS material in the border molding procedure offers better retention compared to green stick compound. The implications of this case report suggest that the combined use of heavy-bodied VPS material as border moulding material and soft liner as an alternative to pre-prosthetic surgery could improve the comfort of patients without compromising the retention and stabilization of a complete removable denture.

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