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CASE REPORT

Fabrication of a complete denture using a modified custom tray with a closed-mouth impression on a fully edentulous compromised mandibular flat ridge

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Keywords: Flat ridge, Full edentulism, geriatric, Modified closed-mouth impression, Muscle trimming

ABSTRACT

Severe mandibular alveolar ridge atrophy, common in geriatric patients, compromises the functional success of complete dentures due to a reduced denture-bearing area and the proximity of muscle attachments to the ridge crest. This condition increases denture displacement during function in both horizontal and vertical movements, leading to poor retention and stability of the denture. Accurate impression techniques are critical to overcoming these challenges. The closed-mouth functional impression technique allows for the recording of denture-bearing areas and peripheral seal under functional pressure, potentially enhancing retention. This case report aims to describe the procedure for fabricating a complete denture using a modified custom tray with a closed-mouth impression on a fully edentulous, compromised mandibular flat ridge. A 52-year-old woman presented with a loose and poorly fitting lower denture. Clinical examination revealed complete edentulism with a severely resorbed mandibular ridge. A custom tray was fabricated with a detachable handle to support the closed-mouth impression technique without interfering with occlusion during border molding and impression-making. The closed-mouth approach allowed for better muscle molding, recording of functional borders, and a more accurate reflection of the patient's oral dynamics. As a result, the final denture exhibited significantly improved retention and comfort during function. This case highlights the clinical advantage of the closed-mouth impression technique in managing challenging ridge conditions and emphasizes the practical benefit of modifying tray design to ease the procedure for both clinician and patient. Such adaptation is especially relevant in geriatric care, where functional and anatomical limitations are common. The use of a modified custom tray with the closed-mouth functional impression technique proved effective in managing a severely resorbed mandibular ridge. It resulted in a stable, retentive, and comfortable complete denture, contributing to enhanced patient satisfaction. (IJP 2025;7(1):87-89)

Introduction

Full edentulism is a condition characterized by the loss of all natural teeth or the absence of teeth in both the upper and lower jaws within the oral cavity. Tooth loss can result from dental caries, periodontitis, or trauma. Full edentulism can also be found even in younger elderly individuals. Early tooth loss can occur due to several factors such as low socioeconomic status, nutrition, level of oral health knowledge, systemic disease risk factors , and access to healthcare. Edentulism has a negative impact on quality of life, encompassing masticatory function, appearance, speech ability, and self-confidence.[1]

Complete dentures are a treatment option for patients with complete edentulism to replace all missing teeth in the upper and lower jaws, supported by the mucosa, connective tissue, and bone. The success of dentures is assessed based on retention, stabilization, occlusion, and aesthetics, which are prerequisites in denture fabrication to restore masticatory, phonetic, and aesthetic functions.[1,2]

A challenge for clinicians in providing full denture care to geriatric patients is when a flat mandibular alveolar ridge is encountered. Atrophy of the alveolar ridge initially occurs due to tooth loss, which then progresses as a result of a long period of inactivity and is accelerated by risk factors for systemic diseases. Čelebić et al. evaluated alveolar ridge resorption and found that the degree of mandibular resorption was 2.5 times greater than that of the maxilla. In cases of a flat alveolar ridge, the smaller surface area affects the retention factors of complete dentures, namely adhesion, cohesion, surface tension, atmospheric pressure, and gravity acting on the base surface of the complete denture. Consequently, the denture shifts both horizontally and vertically during function. Complete denture treatment in cases of a flat margin can be addressed through accurate closed-mouth impression techniques to obtain support and denture margin boundaries in the patient's functional state. This case will discuss complete denture treatment with modifications to the closed-mouth impression technique in cases of a flat margin accompanied by a pterygomandibular raphe.[3]

Case Report

A 52-year-old woman presented to the University of North Sumatra Dental and Oral Hospital complaining of loose dentures accompanied by chewing difficulties. Clinical examination revealed edentulism with a flat marginal ridge on the mandible.

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Figure 1. **Intraoral examination; A. Maxilla, B. Mandible.**

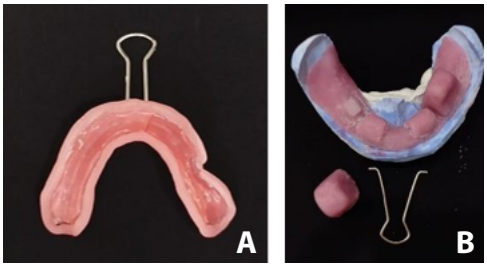

Figure 2. **A. Modified physiological mandibular impression tray, B. Removable handle and removable abutment.**

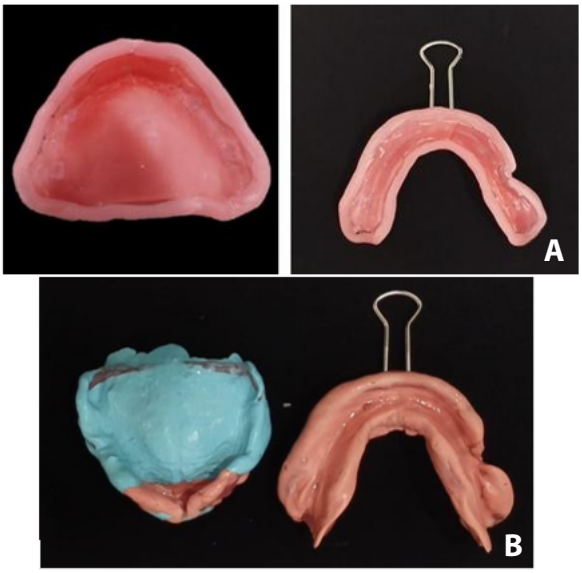

Figure 3. **A. Maxillary and Mandibular Border Molding, B. Physiological Impression.**

Anatomical impressions were taken using a manufacturer's impression tray and irreversible hydrocolloid to obtain a diagnostic model. Tentative vertical dimensions were established to determine the patient's jaw relationship as a prerequisite for the treatment plan. A physiological impression tray with removable handles and pillars was fabricated to support closed-mouth impressions without obstructing occlusion during border molding and impression-taking procedures. The anterior handle facilitates the operator when positioning the physiological impression tray into the mouth, and two posterior pillars assist the patient in closing the mouth.

The border molding procedure was performed using light-curing resin and polymerized both intraorally and extraorally. The physiological impression was taken using the closed-mouth impression technique on the lower jaw. During the impression process, the patient is instructed to close their mouth until the mandibular pillar rests against the occlusal rim of the maxilla, and the patient is directed to move their tongue to the left, right, and up, protrude the tongue, and suck in the cheeks to record the functional state of the oral structures until the impression material hardens. Facebow transfer, determination of the definitive jaw relationship, and neutral zone impression-taking are performed after this process.

Tooth arrangement was performed using a lingualized occlusion scheme in which the palatal cusp of the maxillary posterior teeth contacts the central fossa of the mandibular posterior teeth. Semi-anatomical tooth elements were used in the maxilla and non-anatomical ones in the mandible.

Complete dentures were fabricated using conventional techniques, with the mandibular prosthesis reinforced by a metal framework. Following the laboratory process, the dentures were fitted during the subsequent appointment. Instructions regarding maintenance and care were provided after placement, followed by periodic follow-up visits. The patient is satisfied with the results of the dentures in terms of function and aesthetics.

Discussion

The success of complete dentures is based on the ability to meet the basic principles related to support, stability, and retention. Proper impression-taking is key to successful treatment in cases of mandibular marginal resorption. This case highlights the clinical advantages of the Closed-Mouth Impression technique in managing complex mandibular flat ridges and the practical benefits of modifying the design of the physiological impression tray during the fabrication of dentures with compromised margins.[1,5]

The advantage of the custom tray modification for the closed-mouth functional impression technique is that it facilitates the operator's handling through the inclusion of removable handle and post components during the border molding and physiological impression-taking processes, thereby achieving maximum support and extension of the denture base in accordance with the patient's function. This modified physiological impression tray design is suitable for novice operators.[6]

Shaping the impression material along the tray's edge area through functional or manual manipulation of the soft tissues around the margin to mimic the contours and dimensions of the vestibule—a process known as border molding—is necessary to achieve a peripheral seal and ensure denture retention. Although green stick compound remains the gold standard for

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border molding procedures, this material has several drawbacks, such as a short manipulation time to perform movements and accurately record the vestibular tissue margins, varying pressure along the mucobuccal folds due to sectional molding, a long duration, and the risk of thermal injury, which may not be suitable for less experienced practitioners.[7,8]

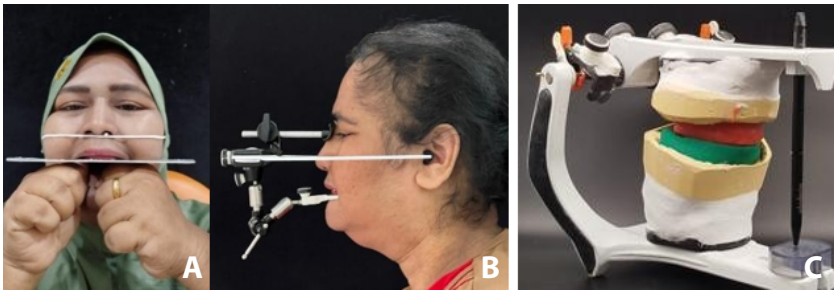

Figure 4. A. Determination of definitive jaw relationship, B. Facebow transfer, C. Impression of the neutral zone.

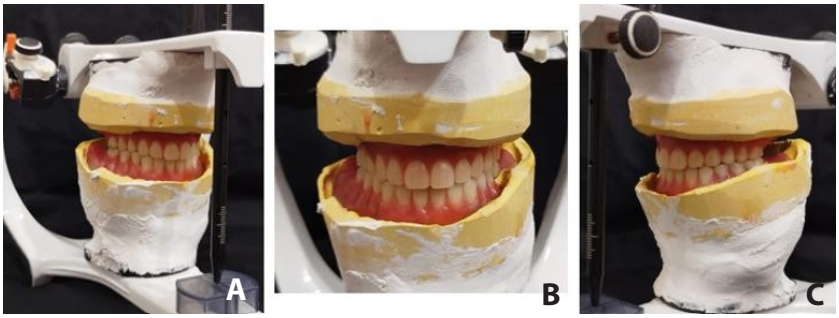

Figure 5. Dental arrangement with a modified lingualized occlusion scheme; A. Right lateral view, B. Frontal view, C. Left lateral view.

Figure 6. Complete dentures, A. Maxillary denture, B. Mandibular denture reinforced with a metal framework, C. Placement of complete dentures.

Alternative materials such as light-cure resin allow the operator to perform border molding in a single step, achieve uniform pressure across the entire marginal area, and provide ease of control over the material's working time. Additionally, high muscle attachment at the pterygomandibular raphe can be recorded, and marginal contour correction is also possible through the addition of new material. A limitation of light-cure resin border molding is its unsuitability for cases with severe tissue undercuts, which may not be indicated due to the material's rigidity.[8]

The closed-mouth impression technique has the advantage of minimizing the risk of over- and under-extension because the patient shapes the impression margins and the impression is taken in the occlusal position. This ensures that the denture base extends into both movable and immovable tissues during function and records the margins under functional pressure. Consequently, this approach enables the creation of impressions that more accurately reflect the patient's oral dynamics. This approach is highly relevant in geriatric care, where functional and anatomical limitations are frequently observed in geriatric patients. In conclusion, the final dentures demonstrate significantly better retention and comfort during function.[8]

Conclusion

The use of a modified impression tray with the closed-mouth impression technique has proven effective in managing severe alveolar ridge resorption of the mandible, and demonstrates the practical benefits of modifying the impression tray design for procedural ease for clinicians and patient comfort, resulting in a stable, retentive, and comfortable denture for the patient.

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