

CASE REPORT

Management of mandibular flat ridge using modified suction-effective method in geriatric patient

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ABSTRACT

Keywords: Closed-mouth impression, Complete denture, Geriatric patient, Modified suction-effective method, Semi-adjustable articulator

Geriatric patient has compromised medical conditions, physical disability, and cognitive impairment, thus the treatment plan must consider many factors both local and systemic condition of the patient. The main problem that often arises when treating edentulous patients, especially in elderly patients, is severe mandibular ridge resorption. This makes it difficult to achieve retention and stabilization of the mandibular complete denture. One technique to overcome this problem is using suction effective mandibular complete denture introduced by Dr. Jiro Abe. This method can provide sealing of the entire denture border including the retromolar pad area. This report aimed to elaborate the management of flat mandibular ridge using modified suction-effective method in geriatric patient. A 71-year-old male geriatric patient with fully edentulous teeth came with history of hypertension and high risk of falling. The patient had never used any denture before and wanted to be able to eat properly and seek improvement in appearance. The mandibular showed highly resorbed ridge along with spongy tissue. Modification of this technique carried out by utilizing semi-adjustable articulator and the use of bite rim mounted on custom tray which facilitated closed-mouth impression that is in accordance with patient's functional movement in occlusion state. Rehabilitation of complete denture in elderly patients must consider efficient and appropriate method according to the patient's systemic and local conditions. Flat ridge management in geriatric patient using semi-adjustable articulator and modified suction-effective method can provide retention and stability in mandibular complete denture. (IJP 2025;6(1):44-49)

Introduction

Geriatrics is a branch of medical discipline that studies aspects of health and medicine for the elderly, including health services for the elderly by studying all aspects of health in the form of promotion, prevention, diagnosis, treatment, and rehabilitation. Geriatric patients are elderly patients who have more than one physical and/or psychological disease; or have one disease and experience disorders due to decreased organ function, psychology, social, economic, and environmental conditions that require integrated health services with a multidisciplinary approach that works in an interdisciplinary manner.¹

Generally, geriatric patient has compromised medical conditions, physical disability, cognitive impairment, thus treatment plan must consider many factors both local and systemic condition and best treatment plan for patient.² Degenerative condition in elderly might affect treatment plan, design of prostheses, and modification in making a denture may be needed to restore the function of teeth.³ In treating geriatric patient, prosthodontist must have knowledge not only about aging in general, pathologic, and oral manifestation of systemic condition, but also special communication with elderly.^{4,5}

Local intraoral condition which frequently found in elderly is missing all the tooth. Edentulous ridge that has been left for a long time resulted in significant alveolar bone resorption. The mandible is more difficult

to achieve stability, retention and support compared to the maxilla due to limited denture bearing area of the residual ridge, tongue mobility in the mouth, and extensively mobile mucobuccal fold during mouth opening and closing.^{6,7}

The main problem that often arises when treating edentulous patients, especially in elderly patients, is severe mandibular ridge resorption.⁸ This makes it difficult to achieve retention and stability of the mandibular complete denture.⁹ One technique to overcome this problem is using suction-effective mandibular complete denture introduced by Dr. Jiro Abe.⁸ This method can provide sealing of the entire denture border including the retromolar pad area with the aid of oral soft tissue which located in buccal mucosa, sublingual tissue, and the tongue sidewall.¹⁰

Good prognosis may be achieved due to optimal impression method which determine retention, stability, and support of soft and hard tissue in denture.⁴ The preliminary impression play an important role in the making of suction-effective complete denture because it needs to record mandibular at physiological and rest position. it will affect the custom tray and final impression can imprint muscle attachment movement and minimal deformation in retromolar pad area thus creating suction effect.⁷

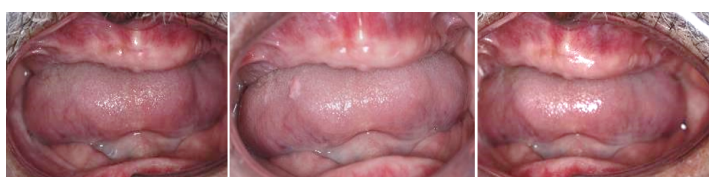
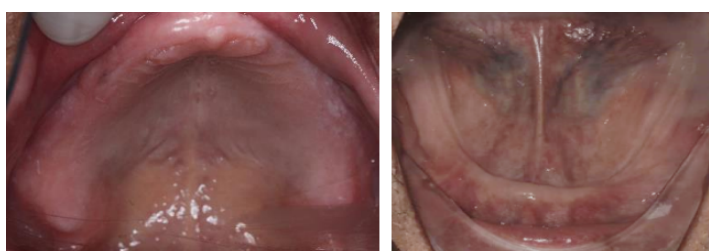
Suction-effective denture has the concept of creating

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Table 1. Result of P3G assessment form

Assessment	Result
Activity of Daily Living (ADL) with Barthel modification index	Score 19 Category B: mild dependent
Instrumental Activities of Daily Living (IADL) Lawton	Score 8 Independent
Risk of falling in elderly	Score 8: High risk of falling
Geriatric Depression Scale (GDS)	Score 3: No depression possibility
Mini Cog dan Clock Drawing Test (CDT4)	Score 2: Decreased cognitive function (Remember 4 words but couldn't draw a clock of 11.10)
Mini Nutritional Assessment (MNA)	Score 19 : Risk of malnutrition

**Figure 1. Clinical intraoral photograph of right side, frontal, and left side****Figure 2. Intraoral photograph in occlusal view****Figure 3. Panoramic X-ray**

negative pressure between inner surface of the denture border and mobile mucosa during swallowing or occlusion located in 4 areas which are labiobuccal, sublingual fold, retromylohyoid fossa and lateral of the tongue and buccal mucosa in retromolar pad area.^{11,12} Modification of this technique carried out by utilizing semi-adjustable articulator and the use of bite rim mounted on custom tray which facilitated closed-mouth impression that is in accordance with patient's functional movement in occlusion state.

This report aimed to elaborate the management of complete denture in flat mandibular ridge using modified suction-effective method in geriatric patient.

Case Report

A 71-year-old male geriatric patient with fully edentulous teeth came to RSKGM FKG UI with history of hypertension and high risk of falling. There's no history of spontaneous bleeding in patient, last tooth extraction was conducted around 2 years ago at the front left upper tooth due to mobile tooth. There's also no history of making a denture before. This may ease the making of denture since patient didn't have any experience in using a denture. The patient wanted to be able to eat properly and seek improvement in appearance.

There's no abnormality found on extraoral clinical condition. The patient profile is concave. Intraoral examination showed missing all mandibular and maxillary teeth [figure 1](#) and [figure 2](#). The ridge is oval with medium in height, in maxilla. In mandibular, the ridge is flat in posterior left and right and oval in anterior with low tissue resistance. There's also present sufficient mobile oral mucosa in retro mylohyoid fossa and in anterior. The retro mylohyoid space is short, there's no tori or exostosis. The jaw relation is orthognathic.

At the first visit, the patient is also instructed to take a radiograph [figure 3](#). Dental radiography, especially panoramic, has been used to predict lack of bone mineral density in patients. The mandibular cortical index (MCI) and panoramic mandibular index (PMI) have been developed to assess and quantify the quality and quantity of mandibular bone mass to observe signs of resorption in identifying osteopenia.¹³ Radiographic examination showed missing in all mandibular and maxillary teeth. Cortical index is 3 mm. There's decreasing in bone density. Mandibular Cortical Index (MCI) is measured on the appearance of the lower border cortex of mandible, distal to mental foramen. MCI classified as C2 based on thickness and patterns of intra-cortical resorption of mandibular cortex. Meanwhile Panoramic Mandibular Index (PMI) is measured as ratio of superior margin of inferior mandibular cortex and bottom of the mandible at the middle of mental foramen.¹³ Normal value is >0,3 while this patient has 0,3.

Geriatric patients have different characteristics and syndromes so they require a special approach oriented to bio-psycho-social aspects so that patient management can be complete.¹⁴ By filling in the P3G form or known as Complete Geriatric Patient



Figure 4. A. Preliminary cast using FCB tray, B. Centric tray record, C. Centric tray mounted on articulator and custom tray were made with bite rim mount

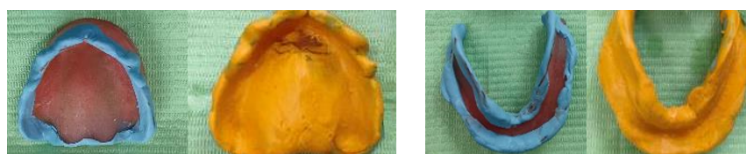


Figure 5. Functional and final impression in maxilla and mandible



Figure 6. Facebow transfer using BioArt



Figure 7. Mounting on semi-adjustable articulator

Assessment, geriatric patients can be treated comprehensively, and their management becomes more effective and efficient. Components that need to be evaluated include assessing the patient's physical, functional status, mental and cognitive status, and nutritional status. It is hoped that this multidimensional assessment can enable operators to understand the condition of geriatric patients whole fully, thus supporting the success of the treatment that will be carried out on the patient.^{14,15}

Based on the result of P3G assessment form [table 1](#), the patient has a high fall risk score. The follow-up to this patient includes by identifying with yellow bracelets/ribbons while the patient in the hospital area. In addition, it is necessary to provide fall prevention education to patients and families. Treatment includes addressing risk factors for falls such as eye health, vision, hearing, and muscle health.¹⁵ Therefore, prevention needs to be carried out by assessing the risk of falls in elderly patients with P3G form instruments.

The patient also has decreased cognitive function. Cognitive function is one of the complex functions in human body which located in brain. Cognitive is related to all mental activities associated with thinking, finding out and remembering.¹⁶ Further evaluation needed to examine decreased cognitive function but communication with the care giver about cognitive function stimulation can be done. Cognitive function stimulation is an activity in the form of providing stimulation or incentives to elderly people to improve and optimize their cognitive function, such as physical and non-physical activity.¹⁶ The patient also has risk of malnutrition. Recommendations for balanced nutrition for the elderly is needed. The care giver must be provided the information about setting dietary pattern for cognitive impairment.¹⁷

Management of this patient carried out with modified suction-effective method in mandibular complete denture. Started with preliminary impression of the maxilla with a stock tray, and the mandible with a Frame Cut Back (FCB) tray (J. Morita Corp., Tokyo, Japan). To obtain a seal in the posterior part of the oral cavity, contact between the denture and the soft tissue in the retro molar pad area is required.¹⁸ This was helped by using FCB tray which has removed posterior lateral ridge wall and the retromolar pad area so that deformation at retromolar pad can be minimized.^{7,12}

The initial impression is carried out with alginate irreversible hydrocolloid (Aromafine, GC, Japan) with two different consistencies. The patient is asked to rest his tongue on the tray, then the tray is pressed for 7-10 seconds, then the patient is asked to close his mouth until the material sets.¹² Do not press on the tray so that the situation in the oral cavity can be reproduced in real time. While waiting for setting, the patient's cheeks are gently massaged upwards to prevent the accumulation of impression material in the cheeks. The closed-mouth impression technique formed negative pressure on the inferior surface of the denture base when the denture sits on the alveolar



Figure 8. Try in complete denture wax



Figure 9. Polished acrylic complete denture intraorally



Figure 10. Modified suction-effective complete denture inserted in patient, A. Extra oral profile before insertion, B. Extra oral profile after insertion

ridge.^{11,12} The retromolar pad must be imprinted well assuming that when the mouth is closed, the mandible is at rest position.^{12,19} The impression then followed by type III gypsum for casting [figure 4A](#).

At the same visit, the jaw relationship is recorded using a centric tray. Previously, the patient's vertical dimensions had been measured using the Niswonger method. Initial bite record measurements used heavy body material (Flexceed, GC, Japan) on the Centric Tray (Ivovlar Cicadent, AG, Schaan, Liechtenstein) [figure 4B](#). The patient is asked to practice closing the mouth in a relaxed condition, then insert the centric tray slowly and the patient is instructed to close the oral cavity until the initial occlusion vertical dimension (OVD) size matches that before inserting the centric tray.²⁰ With this centric tray, initial VD is obtained 2-3 mm above the patient's original OVD.^{12,18}

In this modified suction method, the study model was mounted on non-adjustable articulator. With the aid of the centric tray, individual custom trays were manufactured with bite rim mounts [figure 4C](#).^{11,12} The bite rim mounted in a custom tray helped in doing closed-mouth impression because the denture will sink slightly when teeth are brought into the occlusion from the mandibular resting position so that negative

pressure will form, and a suction effect occurred. It is important to imprint the appropriate denture border that is in accordance with the patient's functional movement when the teeth are in occlusion.¹²

The custom trays were checked, the outline was different from the conventional custom tray which was based on muscle attachment.^{11,18} The custom tray needs to cover the entire area required for the suction mechanism so that the denture border is completely sealed by the mobile oral mucosa. The custom tray must avoid buccal frenulum, mentalis muscle attachment, median inferior labial frenum, and sinew string. The sinew string mucosa forms in the area of buccal root of the retromolar pad, posterior to second molar when in tension. This will pull the buccal mucosa firmly inward when swallowing and closes the space posterior to M2 which affect the formation of the Buccal Tongue Contact (BTC) point. The posterior border seal is supported by contact of the buccal mucosa with the side of the tongue on the retromolar pad when closing the mouth which called as BTC point.^{10,11,18,19}

At the second visit, final impression was acquired. Border molding was performed by functional movement to obtain a complete seal at the denture border and imprint the shape of the denture border which is in harmony with patient's functional movement when in occlusion. During the closed-mouth impression, the patient was instructed to move the lips forward, saying 'woo', then asked the patient to retract the corner of the mouth, saying 'eeh', to record the movement of the lips and buccal mucosa. After that, move the tongue to one side or another to record the movement of the tongue. The patient then asked to push the tray with the tongue to record the floor of the mouth in tension condition and the mylohyoid muscle during contraction. Asked the patient to swallow 2-3 times to record the mentalis muscle in active condition and records all movements of the oral cavity.^{10-12,19}

The border molding firstly performed on maxilla by applying adhesive tray material at the edge and intaglio of maxillary individual tray. Inject PVS double impression (Flexceed Kit Putty and Light Body, GC, Japan) heavy body material on all its edges. The maxillary individual tray was inserted followed by mandibular individual tray. The patient was instructed to close the mouth and performed 5 functional movements which mentioned previously. The individual trays were removed subsequently, then evaluated and eliminated the excess of the material, especially the inner surface of the tray by using scalpel.¹¹ The procedure was continued by injecting light body material on the intaglio of individual tray to obtain final impression. The maxillary individual tray was inserted initially followed by mandibular tray, and the patient was instructed to do the same movement as in border molding. Wait for the material to set then remove the tray and cut the excess material. The next step was to acquire border molding of the mandible, the final impression then continued with the same procedure as in maxilla [figure 5](#).¹¹ The final impression was performed beading and boxing then poured with gypsum type IV

material to obtain a working cast.

The 3rd visit, the definite OVD was measured using Niswonger method. The correct OVD and closest speaking space were confirmed by counting down, checking the proper pronunciation space.⁷ The bite rims fixated and patient's median, canine and smile line were marked. The facebow transfer then performed on patient using BioArt facebow transfer (Elite Facebow Transfer) [figure 6](#). It resulted from plane orientations and angles according to the anatomical and physiology conditions of the patient's maxilla and horizontal axis.²¹ The bite rims were mounted on working cast using BioArt semi-adjustable articulator [figure 7](#). This provided the denture that had occlusion and articulation similar with that of the patient.⁷ The tooth elements were then arranged based on centric occlusion, protrusive and lateral movement. The lingualized form of balanced occlusion was recommended for flat mandibular ridge which was done on the patient. Lingualized occlusion is indicated in patients with severe ridge resorption because it is more stable while chewing and can produce less occlusal force compared to bilateral balance occlusion so there is less pain.⁷

At the 4th visit, the complete denture wax was tried in for the patient [figure 8](#). When trying it, listen to the patient's opinion and preferences in aesthetic aspect. Check tooth color, shape, and alignment to see if they match the patient's face.¹² The profile, retention, stability, and occlusion were checked by the operator. Then the gum cuff was performed then the complete denture wax was subjected to packing. The following visit was the insertion of modified mandibular suction-effective complete denture [figure 9](#) and [figure 10](#). The adaptation of denture bases with the mucosa were checked along with occlusion and articulation. The patient was given advice and instructions in using and cleaning the denture. The control visits were conducted to evaluate the adaptation of the denture.

Discussion

Rehabilitation of complete denture in elderly patients must consider efficient and appropriate method according to the patient's systemic and local conditions. The Complete Geriatric Patient Assessment or called as P3G form was provided by Indonesian Ministry of Health, which facilitated geriatric patients be treated comprehensively, and their management becomes more effective and efficient. Components that need to be evaluated include assessing the patient's physical, functional status, mental and cognitive status, and nutritional status.^{14,15}

Dentures that sit on a resorbed residual ridge are more likely to be unstable. Therefore, it is more susceptible to air leaks at the edges and seals of the denture which can reduce the success rate of prosthodontic treatment. A study conducted by Hiroki Li stated that mandibular suction-effective denture had a success rate of up to 86.9%.^{8,20} The treatment stages are based on the concept of creating negative pressure between the denture and the alveolar mucosa by forming an effective and strong seal around the edges of the denture with the moving oral mucosa.¹⁸

Zarb stated that the aim of the denture impression

technique is to expand the area that is resistant to pressure to achieve retentive and stable dentures.²² This was obtained by initial impression of the oral cavity under static conditions. Dr. Jiro Abe developed the Frame Cut Back (FCB) Tray to support this. Modification of this technique carried out by utilizing semi-adjustable articulator and the use of bite rim mounted on custom tray which facilitated closed-mouth impression that is in accordance with patient's functional movement in occlusion state.¹²

Anatomical markings are factors that help in fabricating dentures so that they have maximum surface area without being affected by muscles.²⁰ The most important anatomical signs include retromolar pad, distobuccal border of denture, mylohyoid muscle, and Someya's sinew string.²⁰

A study about masticatory movement in suction-effective denture showed efficient result. The masticatory patterns of right-side chewing, left-side chewing, free mastication showed reduction in mouth opening-closing time, an increase in the amount of mouth opening, an increase in speed of mastication and stable chewing rhythm.⁶

Conclusion

It can be concluded that flat ridge management in geriatric patient using modified suction-effective method can provide retention and stability in mandibular complete denture. Rehabilitation of complete denture in elderly patients must consider efficient and appropriate method according to the patient's systemic and local conditions. The patient had improved in appearance and masticatory function. It is hoped that the patient's malnutrition condition can also be improved by utilization of mandibular suction-effective denture and education regarding good nutrition.

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