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Complete denture treatment in a resorbed mandibular ridge with suction effective method and neutral zone technique using a semi-adjustable articulator: A case report

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Abstract

Background: The function of mastication, phonetic, and aesthetic of fully edentulous patient can be restored by complete denture treatment. The use of semi-adjustable articulator, suction effective impression method and neutral zone technique are important to enhanced a stable and retentive complete denture with good occlusion. Semi-adjustable articulator and suction effective method ensures the dentures constructed according to patient's physiological movements and denture's border seal captured according to patient's anatomy. Neutral zone technique ensures the teeth arrangement in the space where the displacing forces of the lips tongue and cheeks are balanced. Those three approaches are expected to provide optimal prosthetic integration.

Purpose: This case report aimed to describe the management of complete denture treatment in a resorbed mandibular with suction effective method and neutral zone technique using a semi-adjustable articulator.

Case: A 67-year-old female patient wanted dentures because of all the mandibular teeth already extracted five months prior to the patient's arrival. The mandibular posterior alveolar ridge showed dextral and sinistral tapering.

Case Management: A complete denture with an acrylic base was fabricated with suction effective method and neutral zone technique using a semi-adjustable articulator.

Conclusion: Resorbed mandibular ridge case management using a semi-adjustable articulator with suction effective method and neutral zone technique can improve complete denture retention and stability.

Keywords: Complete denture; Suction effective method; Neutral zone technique; Semi-adjustable articulator; Medicine

1. Introduction

The current prevalence of complete edentulism have been estimated between 7 and 69 percent of the adult population internationally, especially 26 percent in elderly patients between the ages of 65 and 74 years. The ageing population continued to growth and edentulism rates will increase over the next few decades (1). Edentulism in elderly has been associated with poor health status, poor nutrition, oral frailty that leads to physical frailty and many chronic diseases. Therefore, complete denture is needed to restore edentulism and improve patient's quality of life. The success of a complete dentures treatment with good stability, retention and comfort strongly suggested to improve the nutrition intake and avoid oral frailty (2).

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The loss of teeth and periodontal membrane in the long time occur resorption of the ridges, resulting sharp and tapering ridge and if the resorption continues to occur, it could be making the ridge flat. The main challenge of complete denture on resorbed ridge is unstable and non-retentive denture associated with pain and discomfort(3). An accurate impression is a very crucial step to ensures adequate border seal obtained. Suction effective method allows the impression taken by the functional movement of the patients, creating negative pressure that seals the border of denture (4) . Retention in mandibular dentures is relatively difficult because of muscle's active movement, cheeks, lip and tongue. Neutral zone technique can be used to ensure the teeth are arranged in the zero intra oral muscular forces area(5). Semi-adjustable articulator is using in this case in order to ensures the dentures fabrication closely resembles patient's physiological movement(6). This case report aims to describe the management of complete denture treatment in a resorbed mandibular with suction effective method and neutral zone technique using a semi-adjustable articulator.

2. Case

A 67-year-old female patient arrived at the Prosthodontist Specialis Universitas Airlangga Dental Hospital to get a complete denture. Patient want to get a complete denture to improve her masticatory functions and appearance due to the extraction of one upper and five lower remaining teeth 5 months ago. Patient has no history of systemic disease, patient used to wear partial denture only in maxilla but already taken off 7 months ago.

No abnormalities were found on extraoral clinical examination, the patient profile is shown in Figure 1.

Figure 1 Patient profile: (a) front view, (b) side

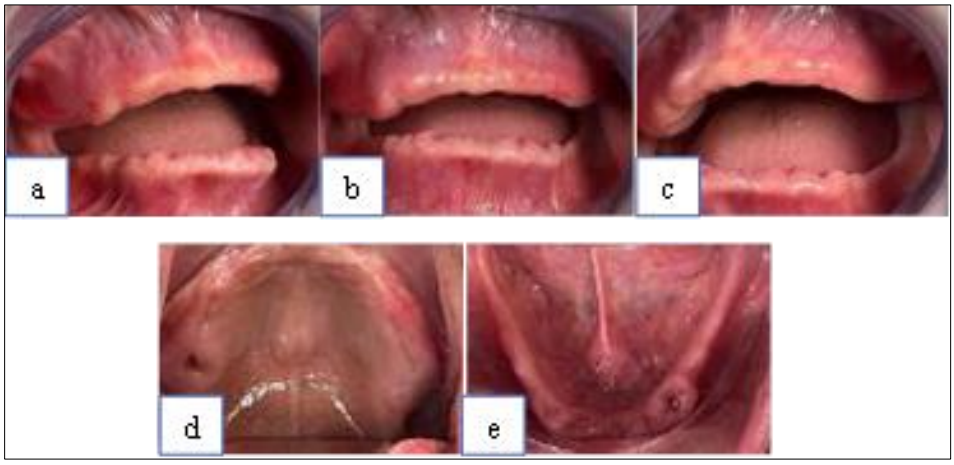

Figure 2 Clinical intraoral examination of the patient: (a) right side, (b) frontal, (c) left side, (d) maxillary occlusal and (e) mandibular occlusal

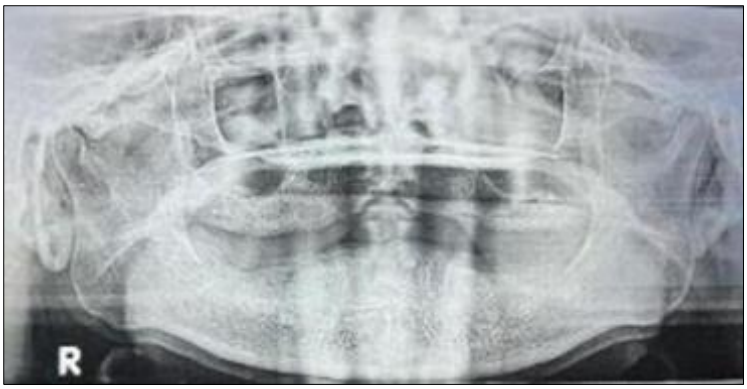

Figure 3 Panoramic Radiograph

Intraoral clinical examination (Figure 2) is shown the maxilla ridge is ovoid, and the posterior mandibular ridge is tapering (Prosthodontic Diagnostic Index Classification Class II). A normal ridge relation was seen, and no exostosis and torus mandible was found. Radiographic examination showed maxillary and mandibular edentulous ridges. The diagnosis obtained from all examinations performed was edentulous ridge of the maxilla and mandible.

3. Case management

The initial step was taking preliminary impression using Accu-tray (Accu-Dent®) edentulous stock tray (Ivoclar, USA) for the upper jaw and using free cut back tray (Morita, Japan) for the lower jaw. An ireversible hydrocolloid (alginate) impression material was used and followed by gypsum type III to obtain study models. Determine the interocclusal space using a centric tray with putty material, then facebow transfer was attached to the patient using Universal Transferbow System (UTS) and mounted on a semi-adjustable articulator (Stratos 300®). The individual tray with light tray (lumamat) was made by dental laboratory. Lumamat was tried on the patient and applied adhesive material.

Border molding was then performed by injecting polyvinyl siloxane medium body material on all its maxillary tray edges. Maxillary lumamat was inserted intraorally, then followed mandibular lumamat the patient was instructed to close her mandibula. The patient was instructed to do functional muscle movement like “woo” and “eee”, swallowing and thumb sucking motion until material set. Then, lumamat was removing and eliminated all excess border molding. The same procedure was repeated for the mandibula tray. The final impression was performed by injecting polyvinyl siloxane light body material. The patient was instructed the same movement as done for border molding.

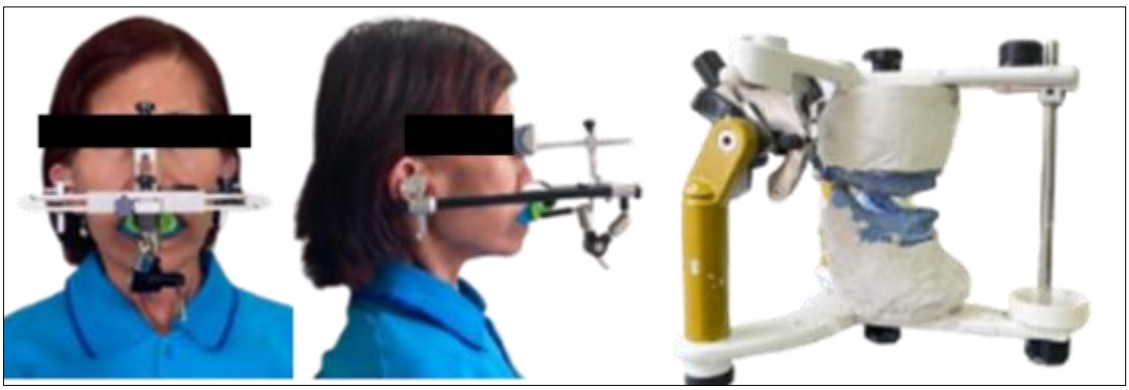

Figure 4 Determine the interocclusal space using a centric tray and Universal Transferbow System (UTS) Stratos® (a). Mounting the study cast on the semi-adjustable articulator (b)

The bite position of patient was determined using Gnathometer M. (Figure 5). The patient VDO was determined using Niswonger method and then patient guided to do protrusive movement, lateral and retrusive movement. Do a bite registration in each movement to measure bennet angle and condyle angle (Figure 5). That movement will results the shape of reverse arrow which is called “gothic arch” on the Gnathometer M (Figure 6). The three lines in the arrow shape is a centric relation position. The plastic fixation was inserted with the holes located at the starting point, so that the

stylus was locked in the correct starting point position. After that, do a bite registration using polyvinyl siloxane medium body in the gap between maxillary and mandibular registration plates.

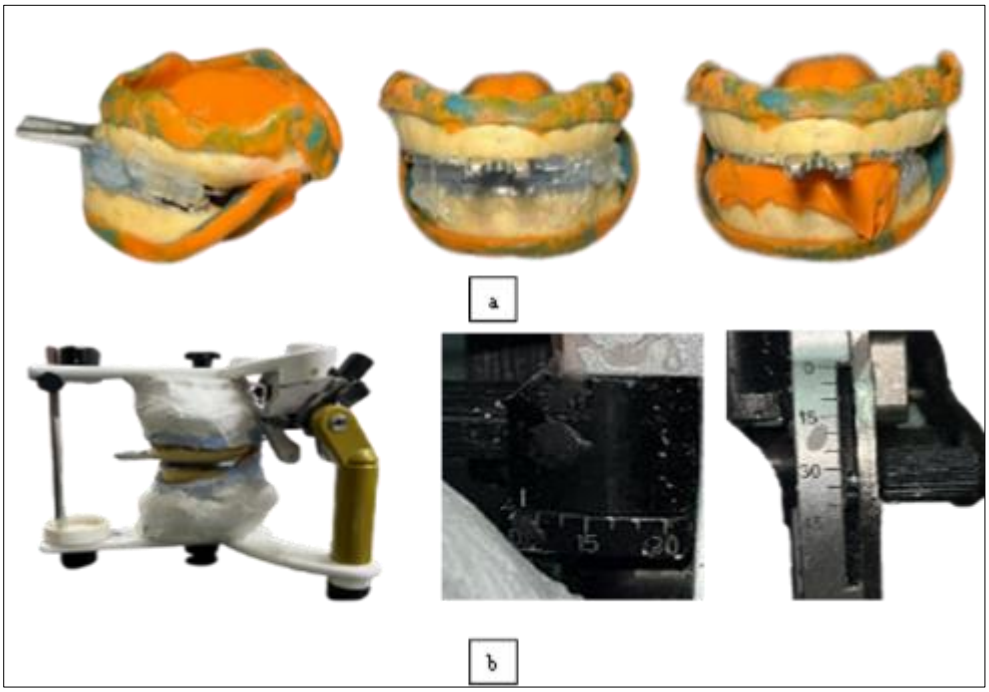

Figure 5 Bite registration in lateral and protrusive movement (a). Mounting the working cast on the semi-adjustable articulator using bite registration to determine bennet angle and condyle angle (b)

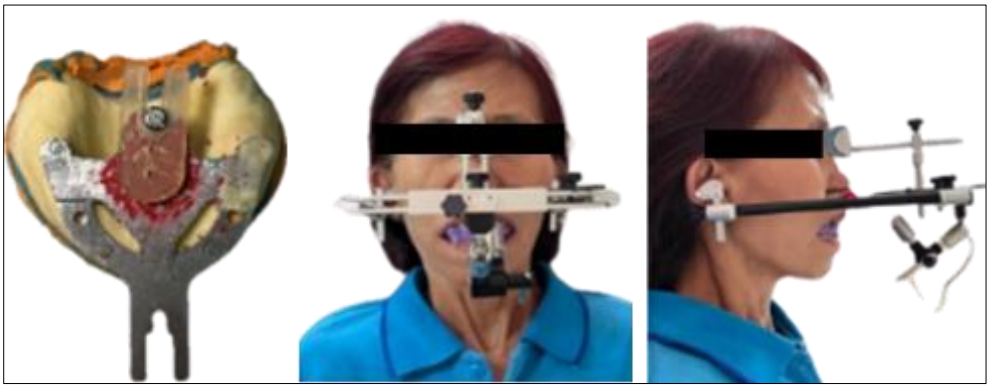

Figure 6 Result of gothic arch tracing on the maxillary registration plate (a). Bite registration and facebow transfer performed as guide to mounting working cast (b)

The neutral zone technique procedure made by using impression compound for lower jaw. The aim of neutral zone procedure is to determined detail informations that provide contours and position of denture teeth. Compound was softened in a water bath, then properly kneaded and rolled over the lower acrylic base. Patient asked to sipping warm water with straw, slightly protruding the tongue, swallowing, and sucking (Figure 7). Repeat these physiological movement and wait 5 minutes until the impression set and taken out from the mouth. The neutral zone impression adjusted to the master cast.

Figure 7 Patient asked to sipping warm water to achieve physiological movement. (a). Result of neutral zone compound impression (b)

The final impression was boxed and poured with gypsum type III (dental stone) to get a master cast. The master cast was mounted on semi-adjustable Stratos 300® articulator using a facebow transfer guide and bite registration guide. The arrangement of denture elements using a two-dimensional template based on the centric occlusion, protrusive movement and lateral movement. Complete denture wax was used for a trial denture for the patient. The patient's profile, retention, stability and occlusion were checked (Figure 8).

The complete denture wax was subjected to contouring, flasking, packing, and initial polishing. The denture was tried in for the patient and the patient's profile, retention, stability and occlusion were checked. Subsequently, an insertion of the denture was performed (Figure 9). This was followed by a session of information and advice for the patient.

Figure 8 The complete denture wax was tried to check patient's profile, retention, stability and occlusion

Figure 9 The final denture was tried to ensure the patient's profile, retention, stability and occlusion

4. Discussion

The initial patient's visit, the preliminary impression was made using the Accu-tray (Accu-Dent®) stock tray for maxilla and frame cut back (FCB) tray for mandibula with alginate material. The Accu-tray has advantages the extra flange that duplicates the depth of the vestibule and the extended distal part. Meanwhile for mandibula area using FCB tray. The difference of Accu-tray and FCB tray is the retromolar pad and buccal shelf areas of an Accu-Tray was cut back, so that the tray allows for a good preliminary impression. (7) The most difficult part is to achieve a seal in the posterior part of the mouth by ensuring intimate contact between the denture and the tissue in the area of the retromolar pad. The retromolar pad area is easily deformed. In order to overcome this problem, the use of FCB tray is recommended for preliminary impressions(8). Alginate material was chosen because it can produce a good impression with detailed

anatomical landmarks and has a lower cost. However, this material often results excessive pressure on the patient's vestibule and overextended study model.

The Vertical Dimension of Occlusion (VDO) for the patient was established using a centric tray. The centric tray minimizes adjustments during the occlusion determination stage and accurately mounting the study cast on the articulator in a centric relation. In this case, a semi-adjustable articulator (Stratos 300®) was used due to its ability to adjust plane orientation and angles based on the patient's anatomical and physiological conditions.(4) Achieving balanced occlusion is crucial for successful complete dentures as it promotes better distribution and enhances denture stability. This semi-adjustable articulator seems effective tools to achieved balanced occlusion similar to individual characteristic of each patient, so the patient's comfort will increase.(6)

The facebow transfer on the patient aimed to align the maxillary model's axis of rotation on the articulator closely with the patient's temporomandibular joint (TMJ). The facebow records the maxillary relation during mandibular rotation, allowing precise placement of the maxillary cast on the semi-adjustable articulator. The semi-adjustable articulator is an efficient tool for fabricating full dentures as it reduces the need for adjustments in artificial tooth alignment and occlusal contacts. A crucial factor for successful denture prosthesis is an adequate border seal, which requires an accurate final impression of the boundaries between movable and immovable mucosa.(9) Under extension of the mucosal margin reduces the denture-bearing area, while overextension disrupts the border seal due to muscle movement. Individual trays and border molding are essential for achieving precise denture borders. If the individual tray is displaced, the occlusal position cannot be accurately reproduced. An effective suction method involves the patient performing a suction movement during the impression process, enhancing the denture border seal and resulting in a more stable and retentive complete denture. (6)

The individual tray in this case was equipped with an M-gnathometer, an instrument used for intraoral gothic arch tracing. Gothic arch tracing records the full range of mandibular movement on a registration plate to determine the horizontal jaw relation. This method helps the operator to achieve a stable tapping point at the correct occlusal position and ensures an accurate horizontal relationship. Using gothic arch tracing minimizes occlusal discrepancies that might need correction after inserting the acrylic dentures. (10)This procedure facilitates the fabrication of complete dentures with optimal aesthetics, function, and phonetics. This case report concludes that managing a mandibular resorbed ridge using a semi-adjustable articulator and an effective suction method can successfully produce individualized complete dentures.

5. Conclusion

Resorbed mandibula ridge case management using a semi-adjustable articulator with suction effective method and neutral zone technique can improve complete denture retention and stability.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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