Case Report

Fabrication of complete dentures with aluminum foil spacer for torus palatinus: a case report

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ABSTRACT

Introduction: The success of denture fabrication depends on retention and stabilization. The condition known as torus palatinus manifests as a nodular exophytic proliferation of compact bone along the central axis of the hard palate. The large size of the torus palatinus compromises retention and stabilization of dentures. This article describes the prosthodontic treatment for an edentulous patient with a big palatal torus palatinus, utilizing an aluminum foil spacer for the fabrication of a complete denture. **Case report**: A 69-year-old woman presented to RSGM UMY, reporting difficulty chewing and having all her teeth missing in the arch with a torus palatinus. A maxillary prosthesis was constructed utilizing a spacer that incorporated aluminum foil specifically within the region of the palatine torus. The presence of this bony growth in the palatine region can make the process of creating a complete denture for a patient with a torus palatinus more difficult. The modifications made to ensure patient comfort, functional stability, and optimal denture retention while accommodating the torus are what make the treatment process special. Furthermore, the aluminum foil spacer was designed to provide retention support for the complete denture. **Conclusion**: To ensure the stability and retention of the complete denture in a patient with a torus palatinus, the impression must generate a vacuum space. In cases of torus palatinus, in addition to employing a window design on the maxillary base plate, an aluminum foil spacer can be utilized over the relief of the torus, with the maxillary base plate covering the torus completely.

KEYWORDS

Complete dentures, aluminum foil, spacer, torus palatinus

INTRODUCTION

Tooth loss represents a condition that is commonly encountered by adults, with its prevalence increasing as individuals age.[1] The etiologies of tooth loss are diverse, including tooth extraction necessitated by extensive carious lesions that are beyond restorative capabilities, teeth lost because of periodontal pathology, or trauma inflicted upon the dental structures.[2] Lengthy spans of tooth loss, if unremedied, cause resorption of the alveolar bone in toothless areas, which detrimentally impacts the functions of mastication and phonation and may lead to dysfunction of the temporomandibular joint.[3]

Furthermore, alterations in soft tissue and osseous dimensions can significantly modify the configuration of facial musculature. The role of teeth is pivotal in providing necessary support to the facial muscles, and their loss can precipitate an elderly appearance defined by enhanced wrinkling, distinct nasolabial folds, downturned mouth corners, decreased buccal fullness, an elongated upper lip, and a more pronounced nasal appearance resulting from the absence of upper lip

support.[4] The buccal structures and surrounding soft tissues around the oral cavity are integral to the perception of an individual's aesthetic appeal.[4,5]

Prosthodontic rehabilitation through the application of complete dentures (CD) serves to not only restore absent dentition but also fulfill an aesthetic role while bolstering the confidence of the patient.[5] This dental prosthesis is paramount in reinstating the compromised support of facial musculature that results from tooth loss and alveolar bone resorption. In addition, the fundamental purpose of the creation of complete dentures is to compensate for all lost teeth in association with their neighboring soft tissues, thereby facilitating the improvement or restoration of chewing function, speech, visual appeal, and mental health, while also tackling the discrepancies, impairments, and diseases connected to edentulism.[6]

The efficacy of denture fabrication is contingent upon numerous factors, including retention and stabilization.[7] Retention pertains to the prosthesis's capacity to withstand gravitational forces, the adhesive characteristics of alimentary substances, and forces associated with the jaw's surface, ensuring that the denture remains securely positioned within the oral cavity.[8] Stability, on the other hand, implies the denture's ability to maintain a consistent position during functional use. Stability contributes to the physiological comfort experienced by the patient, while retention is associated with psychological reassurance. A deficiency in stability often renders retention and support inadequate.[9] To attain optimal retention and stabilization, the impression technique must encompass all supporting tissues.[10]

Torus palatinus is characterized as a nodular exophytic growth comprised of dense cortical bone situated along the midline of the hard palate. The typical thickness of the torus palatinus measures approximately 2 mm; however, it has the potential to increase in size, occasionally occupying the entire palatal region.[11] Such substantial enlargement can impede the functionality of dentures by compromising their retention and stability.[12]

In instances where torus palatinus is significantly enlarged, surgical intervention may be warranted if it adversely impacts denture construction, oral functionality, induces irritation, results in mucosal pathology, hampers the maintenance of oral hygiene, poses a risk of malignancy, or inflicts psychological distress.[13] Should the patient decline surgical options, it is imperative to select a suitable complete denture design that circumvents disturbance to the torus palatinus.[10,13]

The components of a complete denture encompass both the artificial teeth and the foundational base. The base represents the segment of the denture that engages with the oral mucosa, operating to restore the tissue contours to their anatomical configuration.[14] Furthermore, it functions as a support structure for the prosthetic teeth and derives its stability from the residual alveolar bone.[15] The base material may consist of acrylic or metal, with acrylic resin being predominantly favored due to its cost-effectiveness, resemblance to gingival tissue color, manipulability, resistance to solubility in saliva, reparability, and minimal dimensional alterations.[16]

This clinical case elucidates a hard torus palatinus observed in a female patient necessitating a complete denture owing to the complete edentulous state. The patient conveyed challenges in mastication, which occasionally hindered her routine activities. The therapeutic approach involves modifying the design to incorporate an aluminum foil relief chamber (approximately 0.25 mm) for the torus. This creates an excellent vacuum area, facilitating retention and stabilization of the maxillary complete denture baseplate while avoiding the torus. Because aluminum foil can create a barrier with precise thickness for printing materials, this process is unique. The positioning of the aluminum foil is also ideal since it can still form in accordance with the relief torus because it is not easily distorted. When creating prostheses for specific clinical conditions, the process is thought to be straightforward, efficient, and effective.

While other materials, such as plastic or wax, can be used as spacers, their processing can be time-consuming. Additionally, there is a risk that the thickness of the material may not be suitable or sufficient for the space to achieve the retention of the dentures. The purpose of this case report is to describe a modified therapeutic approach incorporating an aluminum layer as a torus release chamber, facilitating retention and stabilization of the maxillary complete denture baseplate while adhering to a design that does not surround the torus.

Case Report

A 69-year-old female patient presented to the Dental and Oral Hospital affiliated with Muhammadiyah University of Yogyakarta, seeking the provision of new dentures attributed to diminished self-confidence. Intraoral examination showed that both the maxillary and mandibular arches were entirely edentulous, accompanied by an irregularly shaped torus palatinus with a diameter measuring approximately 3 mm. The patient's posterior alveolar ridge of the lower jaw was found to have diminished and become nearly flat upon intraoral examination.

The patient presented with a systemic disorder characterized by uncontrolled hypertension. This suspicion was substantiated by the consistent elevation of blood pressure observed during each evaluative assessment. This condition was further corroborated by the oral examination, which revealed the presence of thick, frothy saliva accompanied by a diminished salivary flow rate. Furthermore, the patient's sibling has a documented history of the same ailment.

An unstimulated sialometric examination of the patient during the first visit showed hyposalivation, with a saliva rate of 0.05 ml/minute (normal > 0.1 ml/minute). Periodic blood pressure tests showed high results, averaging 189/100 mmHg over three measurements. However, further supporting examinations were not conducted. Following the execution of both subjective and objective evaluations, the diagnosis established for both maxillary and mandibular arches was complete edentulism with systemic condition.

The suggested therapeutic regimen entailed the creation of comprehensive dentures employing acrylic resin as the primary material. To circumvent any surgical intervention related to the torus while maintaining manageability, aluminum foil was used as a spacer during the processing of these dentures. Following the completion of the denture fabrication process, the aluminum foil will be extricated from the dentures, and patients will be instructed not to use this material intraorally. The prognosis of this treatment is poor due to a large torus palatinus, intraoral conditions, and the patient's relative indifference to treatment instructions. However, improvement is anticipated with a modified treatment plan and better communication with the patient and their family.

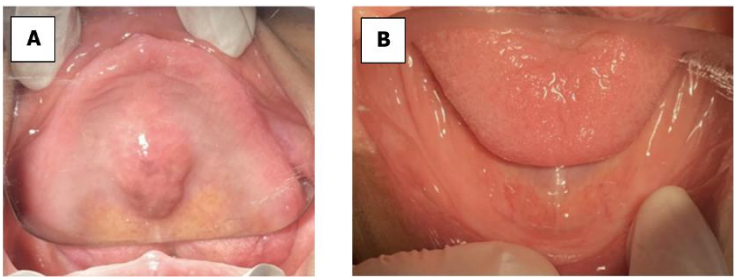

Figure 1. Oral Condition; A. maxillary; B. mandibular.

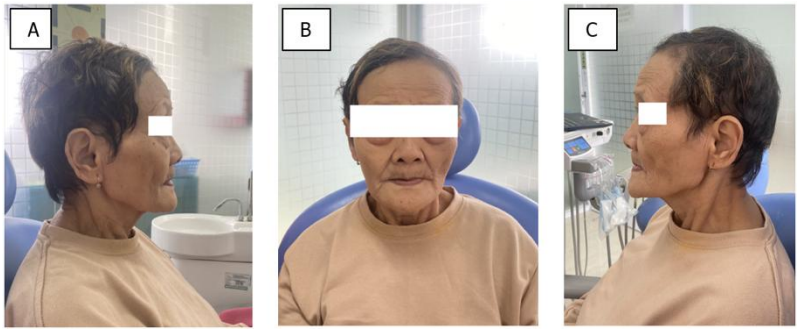

Figure 2. Facial profile; A. right side view; B. front view; C. left side view

The treatment proceeded with the explicit consent of the patient. In the initial meeting, a complete assessment was conducted, during which the patient was briefed on the projected treatment timeline and the materials that would be utilized. Impressions of the patient's oral structures were acquired to facilitate the creation of study models utilizing alginate. Following the acquisition of the study model, an individualized impression tray was constructed using self-cured acrylic, incorporating a stopper measuring approximately 2 mm for the maxillary arch, while aluminum foil was strategically placed over the torus region.[17,18]

Figure 3. Maxillary denture included aluminum foil spacer

In the subsequent visit, a trial fitting of the upper individualized impression tray was conducted, demonstrating adequate retention and stabilization; however, certain areas that induced trauma to the mucosal tissue were subsequently refined. Furthermore, border molding was executed on the upper tray. An impression was obtained utilizing monophase/medium body silicone, which was then dispatched to the laboratory for the fabrication of a base plate and bite rim.

During the fourth visit, the base plate was subjected to a trial fitting in both the maxillary and mandibular arches to evaluate retention and stability. The maxillary base plate exhibited satisfactory retention and stability, whereas the mandibular base plate yielded minimal retention due to a flattened posterior ridge, necessitating the relining of the lower base plate.

In the fifth visit, maxillomandibular relations (MMR) were established by delineating the chamfer line from three reference points (4 mm from the external auditory meatus on both the right and left sides, along with the anterior nasal spine). The alignment of the upper bite rim was executed in accordance with the chamfer line for the posterior region and the pupil line for the anterior region. After alignment, the vertical dimension (VD) was ascertained through the Willis method, measuring the distance between the pupil and the corner of the mouth (PM), which should correspond to the distance from the base of the nose to the base of the chin (HD). The patient was instructed to rest until PM and HD were equal. If a discrepancy was observed, adjustments were made by reducing the lower bite rim.

During the subsequent consultation, centric relation was meticulously recorded by instructing the patient to tilt their head posteriorly and to perform a series of swallowing motions until a stable centric relation was attained, which was subsequently delineated on the bite rim. Once the centric relation was definitively established, fixation was achieved by creating a double V-groove on

both the right and left posterior sections of the upper bite rim (designated as P1 and M1 of the maxillary arch). Additional wax was meticulously applied beneath the double V-groove of the lower bite rim to correspond with the upper grooves, and the patient was directed to occlude again in centric occlusion. Then, the organization of the front teeth in the maxillary and mandibular arches was completed.

During the seventh appointment, the arrangement of the anterior teeth was assessed intraorally in the patient. In the process of the try-in, considerable attention was devoted to the smile line, the alignment of the canines, the overjet, the overbite, the midline, and the patient's phonetics to ensure the precise articulation of the phonemes S and F. Subsequently, the arrangement of the posterior teeth was undertaken.

At the subsequent visit, a posterior try-in was performed. At this juncture, the parameters of retention, stabilization, occlusion, the smile line, the canine line, and the patient's phonetics were thoroughly evaluated to guarantee the unimpeded pronunciation of the letters S, D, O, M, R, A, and T. Following the try-in, the dentures were forwarded to the laboratory for fabrication utilizing acrylic materials.

During the eighth visit, the dentures were inserted into the patient's oral cavity, where articulation, retention, stabilization, and occlusion were systematically assessed. At this appointment, the lower dentures had yet to achieve adequate stabilization; therefore, a soft liner was incorporated into the lower dentures. The patient was provided with comprehensive instructions on the utilization and maintenance of the complete dentures.

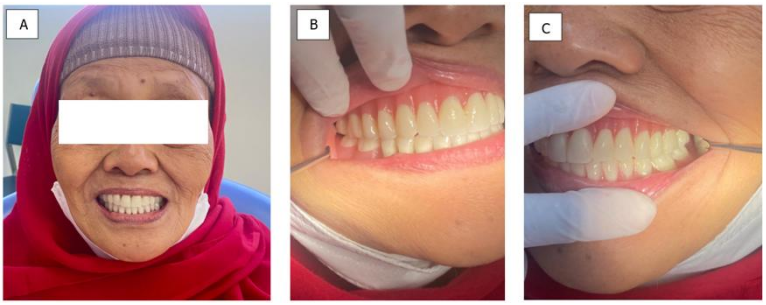

Figure 4. Patient appearance with complete dentures; A. front view; B. right side view; C. left side view

DISCUSSION

Anatomical characteristics constitute an essential component for dental practitioners to guarantee optimal retention of dentures, particularly in the case of complete dentures. Several factors can complicate denture fabrication, such as flabby areas, sharp ridges, flattened posterior ridges, and medium- to large-sized torus palatinus.[1] The presence of torus palatinus in patients requiring complete dentures necessitates meticulous attention to prevent enlargement that may compromise functionality and denture placement and to avert the development of traumatic ulcerations on its surface.[19] The existence of a torus palatinus can hinder prosthetic treatment, particularly in the positioning of posterior teeth, if surgical intervention is not undertaken.

Nevertheless, the excision of the torus is not invariably warranted. Several indications for the removal of the torus encompass disturbances in speech, limitations in masticatory movements, sensitivity attributable to thin mucosal layers, traumatic inflammation, ulcers within the affected region, food retention, aesthetic considerations, and denture instability.[20] Surgical intervention may be contemplated when one or several of these criteria are satisfied, such as compromised oral functionality, mucosal irritation or pathology, challenges in maintaining oral hygiene, risks of malignancy, or psychological distress.[21]

The development of removable complete dentures without necessitating surgical intervention can be accomplished through the implementation of a "window" or "horseshoe" design within the base plate to preclude the torus from making contact with the base plate, thereby mitigating the risk of enlargement or the onset of traumatic ulcers.[22] However, in this case, the window design failed to sustain base plate retention due to difficulties in aligning the torus relief with the window margins, culminating in the absence of vacuum space and suboptimal retention of the base plate. In the design of dental prosthetics, the aperture situated above the torus inhibits the complete engagement of the denture base with the palatal tissues in that specific region. This interference disrupts the vacuum integrity, particularly if air infiltrates through the exposed window, thereby compromising retention. The presence of the open window also undermines the peripheral seal, as there exists a discontinuity in contact between the denture base and the palatal tissues within the torus region. The absence of an effective seal facilitates the ingress of air and fluids beneath the denture, which further diminishes suction and overall stability.[23] To alleviate these adverse effects in a window configuration, the focus of the peripheral seal must be directed towards establishing a robust seal in regions not compromised by the window, such as the posterior palatal seal (post-dam) and along the alveolar ridges.[24] In addition, it is imperative to minimize the dimensions of the window while ensuring adequate relief over the torus, as a smaller window mitigates the loss of vacuum and enhances retention.[24,25] Furthermore, it is essential to ensure an even distribution of occlusal forces on the remaining palatal tissues and alveolar ridges to reinforce the stability of the denture.[26]

The retention of complete dentures is contingent upon the establishment of a vacuum effect that engenders a seal between the denture base and the supporting mucosal tissues. Air is expelled from beneath the base plate, generating negative pressure that aids in retaining the dentures in position through the forces of adhesion, cohesion, and surface tension. A vacuum optimizes the contact between the denture and the tissues, which is imperative for the comfort and stability of the prosthesis.[18] The retention mechanism achieved in complete dentures is predicated upon a confluence of physical forces, which encompass atmospheric pressure, adhesion, cohesion, and surface tension. These physical forces engender an airtight seal between the base of the denture and the mucosal tissue beneath it, a process that is augmented by the presence of a thin layer of saliva. Several critical elements come into play, including the surface tension of saliva that facilitates the binding of the denture base to the underlying tissue through cohesive forces, atmospheric pressure that obstructs the ingress of air, thereby preserving the vacuum and optimizing retention, as well as the integrity of the fit along the border seal.[27]

The architectural configuration of the base plate incorporating a relief for torus palatinus, which incorporates a layer of aluminum foil (Figure 3.), can promote the establishment of a substantial vacuum region, subsequently enhancing the stabilization and retention of complete dentures.[17] In scenarios involving torus palatinus, the base plate for complete dentures may incorporate a window-denture design or materials such as aluminum foil to accommodate the torus. Aluminum foil functions as a spacer to diminish friction between the torus and the denture base plate.[23] In this particular case, the examination of the vacuum area during the gradual attempts to position the maxillary base plate within the oral cavity revealed challenges in removing the plate from the oral cavity. This observation suggests that the utilization of aluminum foil effectively established a vacuum area while simultaneously accommodating the torus without inducing pressure, as evidenced by the subjective feedback provided by the patient. Two weeks after complete denture insertion, the patient reported feeling comfortable with no pressure on the palate. The dentures were easy to use and remove, and their daily use during eating and talking did not cause any

disruptions. However, the patient was still in the process of adapting, as this was their first experience with dentures.

This spacer also acts as a supplementary method of retention. It is advisable to position a sheet of metal foil over the incisive papilla and palatine raphe, while other regions, including the maxillary rugae, prominent tuberosities, and buccal surfaces, should be relieved. Typically, no additional relief is necessary in these regions for complete dentures. The spacer provides enhanced support to the underlying oral tissues, particularly in ridge areas or undercuts, by filling these voids and preventing the movement of the denture during functional activities.[6] The spacer serves as a seal between the base plate and the tissues, thereby improving suction and diminishing the potential for denture displacement. Furthermore, the spacer effectively shares the forces placed upon the dentures among the underlying tissues, which decreases pressure and discomfort for the patient while also fortifying the overall stability of the denture.[18]

The effectiveness of complete denture retention can be augmented by the strategic implementation of the posterior palatal seal along with the use of spacers.[25] Upon donning the dentures, the posterior palatal seal establishes a vacuum region between the denture base and the underlying soft tissue structures. This phenomenon of suction is a significant factor in the stability and retention of dentures during critical functional activities like phonation and mastication (Figure 4.).[28]

The salivary conditions, such as hyposalivation and frothy saliva, can significantly impede the retention of complete dentures through various mechanisms. An insufficient quantity of saliva compromises the peripheral seal of the denture, which is critical for establishing a vacuum that facilitates retention. In the absence of adequate lubrication, the denture may not adhere effectively to the oral tissues, resulting in discomfort and instability during mastication or verbal communication.[29,30] Hypertension itself, along with its associated treatment modalities, can aggravate these oral conditions by disrupting the equilibrium of electrolytes and the functionality of salivary glands. This further reduces the protective and supportive roles of saliva concerning denture retention and mucosal integrity. Individualizing the denture base to enhance peripheral sealing in patients exhibiting altered salivary flow is imperative for optimizing retention and comfort.[30,31]

One of the most critical determinants for the successful implementation of prosthodontic interventions utilizing complete dentures pertains to the patient's psychological disposition and mental state. According to Milus M. House's classification from 1937, patients' psychological attitudes were categorized into four distinct types: philosophical, exacting, hysterical, and indifferent.[32] Utilizing these classifications, one can conduct a thorough analysis of a patient's motivation, levels of anxiety, and propensity to engage in learning. Systemic health conditions exert a substantial influence on the efficacy of complete denture interventions. Ailments such as diabetes mellitus, cardiovascular disorders, and osteoporosis may adversely affect the health of oral tissues, the capacity for healing, and the flow of saliva, consequently impacting the retention and stability of dentures. Pharmacological agents, including antihypertensives and diuretics, frequently induce xerostomia, which further diminishes denture adhesion. Optimal management necessitates the customization of prosthetic designs to align with individual patient requirements and the incorporation of systemic health considerations through a collaborative interdisciplinary approach.[33]

These attributes necessitate meticulous evaluation.[9] In this instance, the patient was identified as belonging to the 'exacting' category, thereby necessitating extraordinary diligence, effort, and patience from the dental practitioner. While the patient expressed interest in the treatment, they exhibited difficulty maintaining focus and frequently requested clarification of the treatment plan, which could be time-consuming.[34]

It is anticipated that dental professionals, equipped with fundamental psychological insights, will assess and comprehend patient attitudes and responses throughout the treatment process, subsequently modifying these attitudes and responses for the mutual advantage of both the patient and the practitioner.[35] In this scenario, despite the operator's directives appearing to be comprehended, the patient exhibited a lack of adherence to the prescribed guidance. This failure could be linked to the patient's advanced age and restricted educational background, which complicated effective communication between the dentist and the patient.[36] The patient's failure to comply was also associated with discomfort arising from the adaptation process to complete dentures, which necessitated adjustment.[37] Having become used to undertaking activities such as eating and speaking without teeth, the patient faced challenges in being motivated to embrace their new dentures. A multitude of factors, encompassing emotional, psychological, and physical dimensions, significantly influenced the patient's capacity to adapt. These factors included sensations of inability to chew, challenges in discerning flavors, apprehension regarding the potential dislodgment of the dentures, excessive salivation pooling in the buccal cavities, and difficulties associated with the cleaning of the dentures.[38]

A notable limitation in this case is the use of aluminum foil, which remains relatively unexplored and requires further research to evaluate its long-term effects on the retention and stability of dentures. The approach is based on a single patient, which limits its broader applicability. Additionally, in cases of a sizable torus palatinus during the fabrication of complete dentures, performing a torus resection (torectomy) is ideally recommended to ensure optimal denture results and comfort and to prevent future complaints or injuries caused by friction from the denture base plate.

CONCLUSION

For the purpose of securing the stability and retention of the complete denture for a patient with a medium torus, the implementation of a vacuum space might be viewed as an acceptable alternative in cases where the patient is reluctant to choose surgical intervention. In instances concerning torus palatinus, the ramifications of such cases, in addition to implementing a window design on the maxillary base plate, suggest that an aluminum foil spacer may be employed atop the relief of the torus. The comprehensive coverage of the torus by the maxillary base plate is expected to yield favorable outcomes in denture treatment. Other aspects of patients, such as mental attitude, psychology, and physical aspects of their background, also affect the success of the treatment. The implication of exposure to this case is that it is expected to provide insights for modifying the treatment of dentures complete with large palatal tori requiring surgery. Additionally, successful prosthetic treatment can be achieved with effective communication between the dentist and the patient, coupled with the dentist's experience and skill.

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