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Complete Mucostatic Impression: A New Attempt

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Abstract

Hypermobile ridges or flabby edentulous ridges are a common occurrence in edentulous patients. The literature reveals that the mucostatic impression technique is one of the treatment options in this scenario. Conventional mucostatic methods like employing a window tray technique, multiple relief holes, or double spacers can be employed when the flabby tissue is localized. But in cases of generalized flabbiness of the residual ridge, even the manual placement and manipulation of a custom tray may distort the tissues, violating the principle of mucostatics. This presentation is a clinical report of a patient with a generalized flabby maxillary edentulous ridge opposing a partially edentulous mandibular arch. A split two-part special tray using the principle of magnetic attraction for self retention was fabricated. This self retention ruled out finger pressure during impression making, helping to achieve mucostatics.

Constructing a stable prosthesis to restore missing dental and alveolar structures is the objective of complete denture prosthodontics. Jacobson and Krol clearly outlined retention, stability, and support as factors determining the success of a complete denture prosthesis.[1] A denture foundation composed of both hard and soft tissue structures plays an important role in determining these factors. Ideally the masticatory mucosa overlying the residual ridge must be 1.5 to 2 mm thick.[2] Excessive mucosa is a perplexing problem in terms of complete denture construction.

The Glossary of Prosthodontic Terms defines flabby ridge as excessive movable tissue.[3] This excess mobility offers poor stability and support for the complete denture. MacEntee states that concerns about support for the denture should be noted if the residual ridge moves more than 2 mm under light pressure.[4] Massad and Lobel have graded the displaceability of flabby tissues as low displaceability, average clinically acceptable displaceability, and high displaceability. They indicated that the last condition is very difficult to treat.[5]

Atrophy, bone resorption, nutritional deficiencies, pressure, and functional forces are various etiological agents proposed by Desjardin and Tolman for flabby ridge development. Excessive detrimental pressure on the residual ridge occurs in patients with parafunctional habits. On the other hand, normal functional forces become harmful in clinical situations like malrelation of the maxilla to the mandible and when a complete denture opposes the natural dentition, as in combination syndrome. Lammie[6] and Kelly[7] conceded that in cases of combination syndrome, a single maxillary complete denture plays its part in the development of an anterior maxillary flabby ridge. They explained the mechanism behind this by stating that the compressive and rotational forces generated by the standing mandibular teeth are transmitted to the maxilla via the maxillary denture, causing resorption of underlying alveolar bone. As a result, the overlying mucosal layer loses its bony support and exhibits excessive displaceability.[2]

The different surgical treatment options available for managing flabby ridges are excision, ridge augmentation, and injection of sclerosing solutions.[2] The prosthodontic management of these cases can be done to a certain extent by proper recording of these hypermobile tissues and by providing stable occlusal contacts. Since the 1900s there has been controversy in flabby ridge impression making. The issue of compressive versus static philosophy of impression recording prevailed. After the 1930s clinicians supported this latter concept of recording tissues at rest. The various static methods used over the years include employing spacers or perforations in impression trays, scraping of impression trays, window technique, and using detachable trays.[8-20] All these methods can be effectively employed in cases of localized areas of hypermobile ridge tissue. The problem is when the flabby ridge is generalized. This presentation deals with the prosthodontic management of a generalized flabby edentulous ridge with the aid of a novel mucostatic impression technique.

Clinical report

A 73-year-old male patient reported to the Department of Prosthodontics, Sri Ramakrishna Dental College and Hospital, Coimbatore, India, seeking a new maxillary complete denture due to the fracture of the existing denture. The previous denture was made 10 years previously, and the patient had a history of continuous denture wear without allowing tissue rest. He is under treatment for hypertension and diabetes.

Clinical examination

Intraoral examination revealed a maxillary edentulous ridge, classified as class IV according to the American College of Prosthodontists Prosthodontic Diagnostic Index (ACP PDI) for complete edentulism,[21] and a partially edentulous mandibular ridge with missing central incisors corresponding to ACP PDI class III for partial edentulism.[22] The maxillary ridge mucosa was hyperplastic and showed varying degrees of displaceability (Fig 1A).

Treatment plan

The patient required the following treatments:

(1) Scaling and root planing of the remaining mandibular teeth;
(2) Management of flabby ridge,
    (i) surgical or
    (ii) prosthodontic;
(3) Maxillary removable complete denture and mandibular removable partial denture (RPD).

The main hurdle in managing the situation at hand was a generalized flabby maxillary edentulous ridge. Management of this in terms of surgery required ridge augmentation, along with vestibuloplasty as suggested by the oral surgeon. As the patient's general health and motivation level did not favor a surgical option, prosthodontic management in the form of mucostatic impression and stable occlusal contacts were planned.

Treatment procedure

A diagnostic impression of the maxillary arch was made with irreversible hydrocolloid (Tulip, Cavex, RW Harlem, The Netherlands), and the diagnostic cast was prepared with type II gypsum product. The mere introduction and placement of the stock impression tray with finger pressure caused excess tissue displacement of maxillary residual ridge. Due to the lack of stable area on the ridge, the mode of stabilization of the custom tray during impression making needed to be addressed. A new method, a magnetically retained custom tray, was planned.

Construction of magnetically retained custom tray

On the diagnostic cast of the maxillary edentulous ridge, the denture-bearing area was divided based on displaceability of tissues as the palatal vault region (Region A—relatively stable) and residual ridge region (Region B with generalized tissue displacement) (Fig 1B). Corresponding to the same division, the custom trays were made in two parts. They were designed as palatal and ridge sections, which will be referred to hereafter as tray A and tray B, respectively.

Fabrication of tray A.

A single thickness of modeling wax (Surana, Mangalore Dental Corporation, Mangalore, India) was adapted on region A, and tray A was prepared with autopolmerizing resin (DPI–RR Cold Cure, The Bombay Burma Trading Corporation, Mumbai, India). Tray A covered all of region A and extended around the hamular notch region of the cast. Three depressions (denoted as D1, D2, and D3 hereafter) were developed in tray A; one anteriorly (D1) and two posterolaterally (D2, D3) (Fig 2A). Ferrite magnetic discs (6-mm diameter) (denoted as M) (M/S Sidhi enterprises, New Delhi, India) of 0.35 tesla magnetic field were placed in each of the three depressions (magnets in the three depressions will be denoted as MD1, MD2, and MD3 hereafter) (Fig 2B).

Fabrication of tray B.

Tray B was fabricated with autopolymerizing resin after covering the hyperplastic ridge in region B with two layers of modeling wax. The wax was placed 4 mm short of the sulcus, and the tray was fabricated 2 mm short of the sulcus. Three horizontal resin extensions (denoted as H1, H2, and H3 hereafter) were constructed in tray B to engage the depressions D1, D2, and D3 in tray A (Fig 3A). Another set of three ferrite magnets (denoted as M) were placed in these horizontal resin extensions (magnets in each of the three horizontal extensions will be denoted as MH1, MH2, and MH3 hereafter) (Fig 3B). The magnets were secured in place with autopolymerizing acrylic resin.

Tray assembly

Trays A and B were placed in their respective areas on the diagnostic cast. When assembled, the depressions in tray A were engaged by the horizontal resin extensions of tray B. The custom tray remained stable due to the attraction between the unlike magnetic poles of tray A (MD1, MD2, and MD3) and tray B (MH1, MH2, and MH3). There was a uniform clearance of 1 to 2 mm between trays A and B all around, except in the areas where the magnets engaged each other (Fig 4).

Impression making with self-retaining custom tray

The assembled tray was placed intraorally to develop a functional border seal. The very heavy body elastomer (Express, 3M ESPE, Seefeld, Germany) was used on the borders of tray B and on the posterior palatal seal region of tray A for functional border molding. During this step the tray was stabilized with finger support over the tray A region. The patient was asked to perform functional movement to develop labial and buccal borders. At the completion of this step, the trays were detached for final impression making. The placement and orientation of trays A and B in stages were rehearsed many times so the tissues would be recorded at rest without disturbance from the operator's finger pressure.

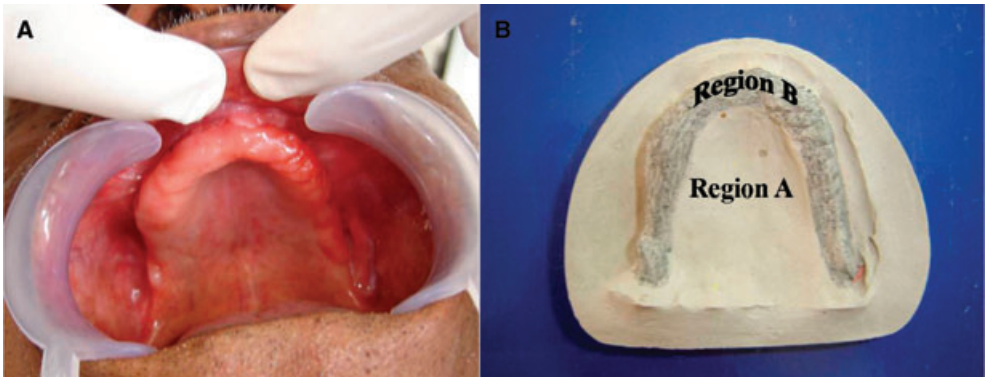

Figure 1 (A) Completely edentulous maxillary arch with generalized ridge hyperplasia; (B) Diagnostic cast with the regions marked: region A—palatal vault, region B—ridge portion.

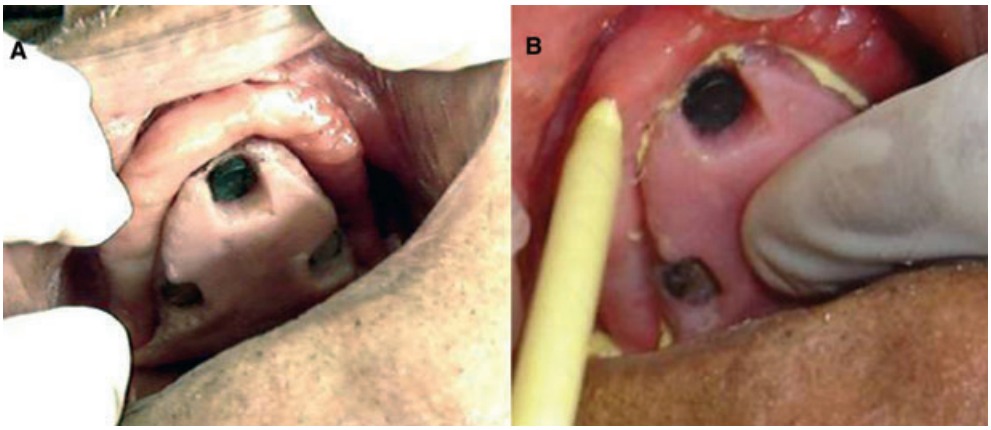

Figure 5 Two stages of impression making. (A) First stage—Impression making of region A with tray A; (B) Application of impression material for second-stage impression making of region B with Tray B.

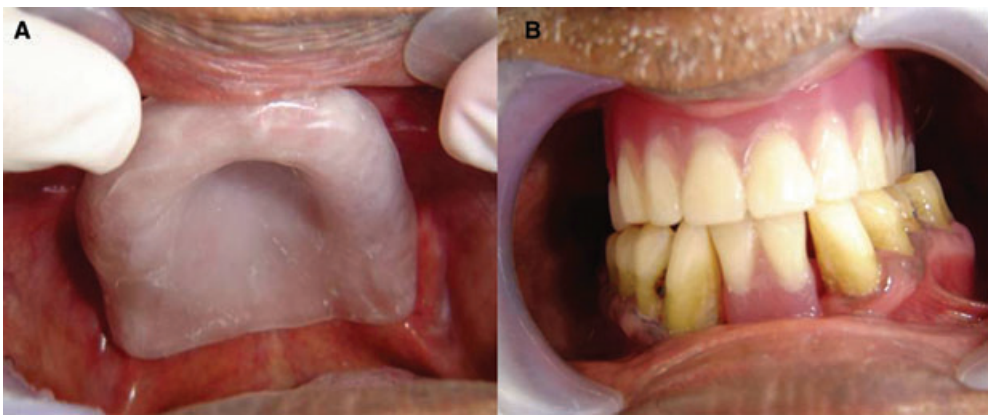

Figure 7 (A) Clear acrylic denture base showing close adaptation to tissues; (B) Insertion of removable maxillary complete denture and mandibular partial denture.

The light-body elastomer (Express XT Ultra-Light, 3M ESPE) was injected over region A, and the impression of this portion was completed first with tray A stabilized with finger pressure (Fig 5A). Maintaining tray A in place on the palate, the low-viscosity elastomer was gently syringed over the displaceable tissues of the ridge only to the extent required (Fig 5B). The partially filled tray B was gently oriented in correct relation to tray A so the magnets were aligned in line (i.e., MH1-MD1, MH2-MD2, and MH3-MD3). Now when the power of magnetic attraction was felt, the hold on tray B was released. The tray was self-retained due to the pull of magnetic force. Finger pressure was totally removed. Excess material escaped through the

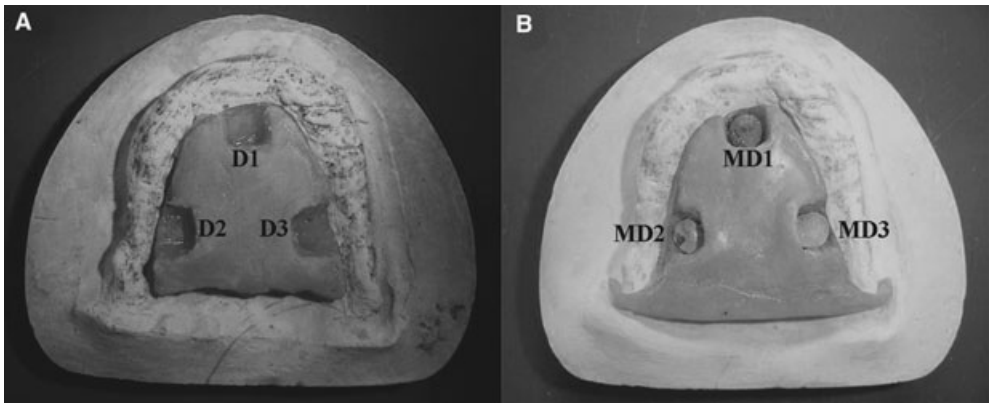

Figure 2 Fabrication of tray A. (A) Depressions in tray A (D1, D2, D3); (B) Magnets in the depressions (MD1, MD2, MD3).

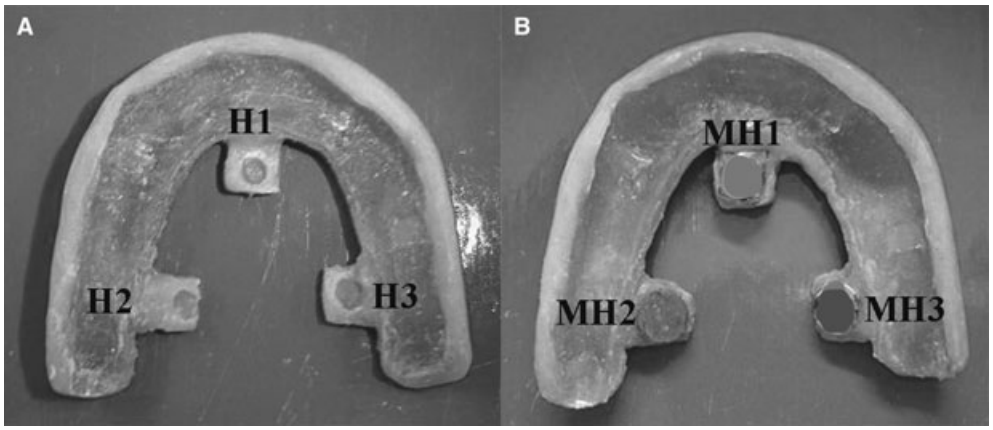

Figure 3 Fabrication of tray B. (A) Horizontal resin extensions of tray B (H1, H2, H3); (B) Magnets in place on the horizontal resin extensions (MH1, MH2, MH3).

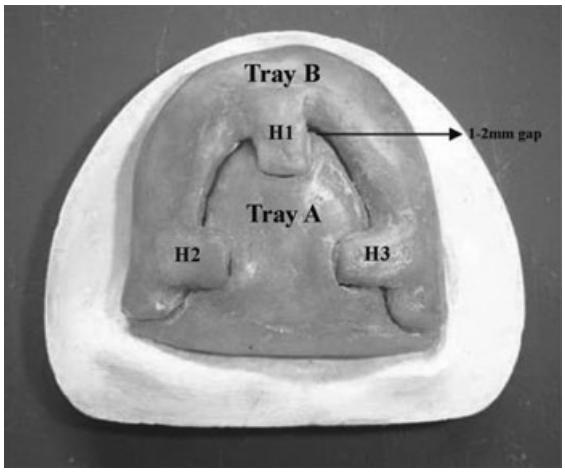

Figure 4 Two portions of the tray assembled.

spacing between the two portions of the tray. The tray was stabilized with magnetic attraction alone. After allowing sufficient time for the material to polymerize, the tray was removed in one section.

The amount of close adaptation to the tissues was appreciable in the details recorded (Fig 6A). The master cast was prepared with type III gypsum product (Fig 6B), and the denture base was fabricated with clear autopolymerizing acrylic resin (Veracril, Mangalore Dental Corporation, Karnataka, India). The denture base showed uniform adaptation to the tissues, and there was no evidence of tissue blanching or tissue rebound (Fig 7A). The static method of jaw relation using bite registration material (Virtual, Ivoclar Vivadent, Bendererstrasse, Liechtenstein) was used to further eliminate tissue compression due to unequal occlusal contacts. An occlusal scheme with very minimal incisal guidance was used. The acrylic teeth (Cosmo HXL, Dentsply India, Patparganj Industrial Area, Delhi, India) were modified to have minimal to almost zero cusp degree to decrease the lateral forces. Wax try-in for the maxillary complete denture and mandibular RPD was carried out, and the dentures were processed with heat-polymerizing denture base resin (Triplex Hot, Ivoclar Vivadent).

Denture insertion

On the day of denture insertion, the mandibular RPD was inserted first. Utmost care was taken during the insertion of the maxillary complete denture. The denture was inserted, and

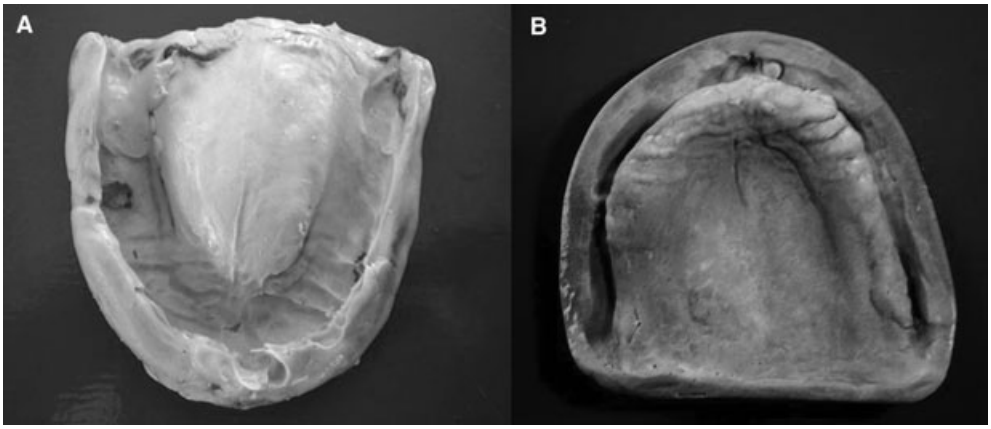

Figure 6 (A) Final impression with magnetically retained custom tray; (B) Master cast of maxillary arch.

signs of tissue rebound were assessed. Disclosing paste was used to further check for localized areas of tissue loading. Occlusal discrepancies were eliminated (Fig 7B). The denture exhibited satisfactory retention and stability.

The necessity of the patient's role in denture care and its implications in the progression of the existing soft tissue hyperplasia was clearly explained to the patient. The patient was recalled initially after 24 hours to check for postinsertion complaints. The patient did not report any appreciable discomfort and was satisfied with the denture fit and function. The patient was put on a recall schedule first after 1 month, and then 3 months, followed by every 6 months. Occlusion, tissue health, and progression of soft tissue condition are to be assessed during every recall appointment.

Discussion

Flabby ridges can be managed by prosthodontic management alone or in combination with surgical treatment depending on the degree of displaceability.[2-20] Surgical excision is favorable if there is sufficient bone height, but most of the time it decreases the sulcus depth requiring vestibuloplasty. Ridge augmentation by grafting is an invasive treatment option, as it carries with it the risk of resorption or rejection of graft material along with the need for additional surgery for graft harvesting. The idea of injecting scelorosing solution to make the tissues firm was popularized by Desjardins and Tolman.[2] The demerits reported with this concept are anaphylactic reactions, patient discomfort, loss of firmness in some cases, and technique sensitivity. Factors deciding the suitability of a patient for these surgical treatment options are age, general health, dental history, motivation, and personality.[2]

Ideas on impression making of hypermobile tissues have been presented over the years in relation to just one consideration—pressure. Pressure on hyperplastic mucosa alters normal tissue balance as per the law of hydrostatics. A denture constructed from a pressure-type impression can exhibit excellent fit during function. This is because compression displaces the vascular contents of blood vessels of the tissues into the interstitial spaces, and tissues conform to the shape of the denture. But when unloaded, the denture loosens because blood re-entering the tissue alters its contours. This viscoelastic behavior of hyperplastic mucosa affects the retention and stability of a denture.[8-20]

Although disagreements exist with the original concept of mucostatics, they are still employed after careful modifications because the crux of mucostatics cannot be denied. The concept says that the soft tissues, especially flabby tissue, should be registered in an impression in an unstrained position for the reason that any other position will compel the tissues to regain their rest position, dislodging the denture.[20] But a close scrutiny will show that it is not possible to record tissues at complete rest for several reasons, as mere introduction of trays and the direction and amount of force applied by the finger can result in varying degrees of tissue displaceability.[13] Numerous mucostatic impression techniques for recording localized areas of hyperplasia have been published.[5,14,20,23] Most techniques are applicable in the anterior maxillary edentulous ridge.

In this case, the described mucostatic technique enabled a satisfactory recording of generalized ridge hyperplasia. The magnetic retention ruled out finger pressure and provided an easy and stable orientation of special trays. The magnets also acted as tissue stops, avoiding overcompression of displaceable tissues of crest.

Although tissue displacement will occur on loading in the above-stated technique, the displacement is limited to only 2 to 3 hours during mastication. In the remaining hours of the day, the tissues are in their natural rest position, and the mucostatic denture base will show uniform tissue adaptation. This passive denture adaptation will not interfere with the viscoelasticity or the vascularity of the hyperplastic tissue, thereby maintaining the tissue health.

Conclusion

A self-retained tray technique aims to record the tissues in their complete passive form, as finger pressure is ruled out. It is a simpler and less-extensive prosthodontic alternative for

patients with hyperplastic edentulous ridges, where surgical management is not an option.

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