

Resolving the Mystery of Lower Denture: A Case Report

Harshita Narang^{1*} Urvashi Sukhija² Manisha³ Arpit Sikri⁴ Priyanka Vats⁵

¹PG Student, Department of Prosthodontics, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, Haryana, India.

²Professor, Department of Prosthodontics, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, Haryana, India.

³Professor, Department of Prosthodontics, Sudha Rustagi College of Dental Sciences & Research, Faridabad, Haryana, India.

⁴Senior Lecturer, Department of Prosthodontics, Santosh Dental College & Hospital, Santosh Deemed to be University, Ghaziabad (Delhi NCR), India.

⁵Assistant Professor, Department of Prosthodontics, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, Haryana, India

ABSTRACT

Background: Residual ridge resorption is a complex biophysical process, which is bound to occur. Prosthodontic management of the resorbed ridges is an uphill task. Not only the general dental practitioners, but also many prosthodontists find it difficult to provide stability in patients with highly resorbed mandibular ridge. In addition, such patients repeatedly complain of lower dentures to be ill-fitting and repeated post-insertion appointments with their dental surgeon. This clinical case report describes a technique rehabilitation procedure of a patient with resorbed mandibular ridge using sublingual crescent area providing maximal areas of coverage to improve support and stability of the denture. A complete maxillary denture combined with a mandibular denture placed in the stable neutral zone was selected as the treatment of choice. A simple method of recording the sublingual crescent area is presented.

Keywords: Neutral zone, resorbed mandibular ridge, complete denture, edentulism, sublingual crescent.

INTRODUCTION

Although with the ever-emerging science and techniques for recording impressions, prosthodontists still feel strained whenever it comes to provide retention and stability in resorbed mandibular arch. There is a huge difference between the surface area of mandibular ridge and that of the maxillary ridge, in terms of size, shape, form of the basal seat. The nature of the supporting bone of the mandibular arch is further reduced due to the continuous resorption.¹

Residual ridge resorption is accelerated by a variety of vertical, horizontal and diagonal forces in small areas, which tend to result in resorption of the residual ridge. The direction of resorption for mandibular ridge is centrifugal [inferior (downward) and prognathic (forward)]. Depending on the metabolic factors and the nature of the resorption, alveolar ridge resorbs to form the basal

seat, which is wider than the original shape of the ridge but has reduced height to support the denture.²

As, resorption is an on-going, life-long process, patients find it difficult to adjust to the new ridge contours and forms. In addition, complete dentures tend to move over the mucosa under function. This instability of the dentures and parafunctional movements may cause trauma to the underneath tissues leading to residual ridge reduction, and unsuccessful treatment provided.²

Physical factors which are needed to be incorporated to enhance the denture retention and stability are:

- Denture borders extensions within physiological limits

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*Correspondence Dr. Harshita Narang.

Department of Prosthodontics, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, Haryana, India.

Email: h.narang.india@gmail.com

- Intimacy of the mucosa and the denture base
- Placement of artificial teeth in neutral zone
- Maintaining the contour of the denture flanges to that of the adjacent muscles' actions



Fig 1: Showing the mandibular ridge (flat).



Fig 2: Border moulding using green stick was done except for premolar-to-premolar region, where impression compound was used to record the sublingual area.



Fig 3: ZOE impression made over the green stick and compound border moulded tray with exposed stoppers.



Fig 4: Neutral zone of the patient recorded.



Fig 5: Pre-insertion pictures: Front and lateral view.



Fig 6: Post-insertion pictures: Front and lateral view.

Intrinsic and extrinsic muscles of tongue also play an important role in denture stability, retention and function. Inadequate muscular control is seen in the patients who are the new denture wearers, which in turn affects the retention and psychological aspect of denture wearing.¹ This problem is enhanced in cases with resorbed ridges, where dentures fabricated with conventional techniques majorly fail to provide the required treatment outcome. The facial musculature significantly sags over the ridges and most importantly tongue has a wide seat covering maximum area of oral cavity. These musculature changes make it important for the clinician to record the “neutral zone”.

Most of the dental practitioners fail to record the anterior lingual borders of the lower denture as the tongue movements greatly displace the impression material on the lingual surface. Anterior retention and stability of the lower dentures is hampered significantly due to insufficient border seal in this region, hence maximum number of the unsatisfied edentulous patients report to the clinics repeatedly with loose lower dentures.

CASE REPORT

A 70-year-old male patient reported to the Department of Prosthodontics, Maharishi Markandeshwar College of Dental Sciences and Research, Ambala, with chief complaint of loose dentures since 3 yrs. There was no relevant medical history associated with the patient. Past dental history revealed extraction of all teeth 12 years back. He was an old denture wearer for 11 years and had changed three set of dentures. His chief complaint was ill-fitting lower denture. On intraoral examination, mandibular ridge was found to be flat [Fig. 1].

Patient was kept on recall appointments for 1 week, 1 month, & 3 months and was satisfied with the new pair of dentures. The procedure for fabricating lower denture with successful results in relation to retention and stability in highly resorbed lower ridges is as follows:

1. Primary impression of the ridge was made using impression compound in close-fitting tray for peripheral tracing with all the labial and lingual functional movements.
2. Cast of the made impression was poured, onto which full spacer was made of 2 mm thickness and tissue stops were made of 2x2 mm dimension over the area between canines and pre-molars. Special tray was fabricated using self-cure acrylic (DPI-RR Cold Cure) and trimmed 2-3 mm short of the periphery.
3. Border moulding with green stick compound (DPI Pinnacle tracing sticks) was done, beginning from the lateral throat form. All the areas were border moulded, but the lingual sulcus from pre-molar to premolar kept clean and was last to be recorded.^[3]

4. Red impression compound (Y-DENTS Red Impression Compound cake) was softened in hot water, kneaded and was placed from pre-molar to pre-molar, in a shelf form shape. The tray was then placed in the mouth of the patient, and a light pressure was applied by the index fingers over the sublingual crescent region, and simultaneously the patient was asked to make functional tongue movements simultaneously.

For the tongue to achieve adequate freedom of movements and reflection of the tissues border moulding procedures play an important role in denture border positioning, denture flange designs, which in return influence the stability of the mandibular denture. In addition, the borders thus recorded should extend accurately over the resting tissues of *sublingual crescent area* and should exert minimal of the pressure over these tissues. Apex of the tongue should passively touch the lingual surface of the mandibular anterior teeth, and lateral surface touching the mandibular posterior teeth when in rest position.

- **Method to Develop the Border Seal-** after the low fusing compound has been placed over the tray in anterior region, the patient is:^[4]
 - ➔ Asked to protrude the tongue, which will activate the posterior fibres of genioglossus muscle. In addition, the anterior surface of the floor is raised, determining the length of the lingual flange in anterior lingual sulcus.
 - ➔ Asked to retract the tongue, which will activate the anterior fibres of the genioglossus muscle. This will cause the compression of the material between ventral surface of the tongue and lingual wall of the mandible. This movement determines the width of the denture borders in anterior lingual sulcus.

A bulge was created on both sides of the tray representing the sublingual crescent area, which extended upwards from the tray borders than normal. It was shaped in half-spindle or a crescent on either sides of the midline. [Fig. 2]

The relief for lingual frenum was made by adequate moulding to expose the opening of sublingual duct.

5. For making the final impression of the ridge and borders, 1 mm of the material was scrapped from all the impression surfaces. Zinc Oxide Impression material (DPI impression paste; Zinc Oxide Eugenol) was used to make the final impression. It was made sure that the occlusal stops were exposed in the impression, to remark that the impression was not excess. [Fig. 3]
6. After recording the jaw relation with balancing technique, neutral zone [Fig. 4] was recorded on the next appointment using admix material (3 parts of red compound and 7 parts of green stick compound).

Recording neutral zone of the patient allows the balancing of the actions of buccal, labial and lingual musculature on the teeth arranged. As, in highly resorbed or flat lower ridge, the tongue gets a wide area to rest upon along with deteriorated action of cheek and lip muscles.

7. Putty (Coltene Speedex Putty) index was made over the recorded neutral zone rim, after which admix material was removed from the denture base. Wax was then heated to flowable consistency, and poured into the putty index to replicate the neutral zone recorded.
8. Teeth arrangement procedure was carried out in the lower ridge first, starting from placement of 1st molar, 2nd molar, with gradual proceeding to anteriors. After the lower teeth arrangement, upper teeth arrangement was done in accordance to lower teeth.
9. During the trial stage, the lower denture stability was checked; occlusion, vertical and horizontal variants were evaluated.

Conventional procedure for fabricating the dentures was used, but while trimming the denture, bulges of sublingual crescent were kept intact, and were not flattened. Post insertion picture of the patient was taken. [Fig. 5]

DISCUSSION

In case of a severely resorbed mandibular ridge, the factors affecting retention are highly compromised. Hence, the problem of achieving satisfactory retention during impression making, exist for these

types of ridges. Adequate extension of the sublingual borders make it possible for the lower dentures to be stable and more retentive, as compared to the lower dentures fabricated without recording the sublingual borders.⁵

The anatomy of lingual border is least known to a large number of dentists, and hereby will be discussed in detail. Sublingual crescent area (anterior region of the floor of the mouth) influences the anterior borders of denture and hence, affecting the retention and stability.¹

Definition: *It is the crescent shaped area on the floor of the mouth formed by the lingual walls of mandible and adjacent sublingual folds. It is the region of the anterior alveolingual sulcus.*¹ (GPT-9)

Beneath the mucous membrane of floor of the mouth, genioglossus muscle is the most superior muscle to be seen originating from the superior genial tubercle. The fibres of these muscles run in fan-shaped postero-superiorly and insert into the tongue on ventral surface. From inferior genial tubercle, originates the geniohyoid muscle, fibres of which run in posterior and inferior directions to be inserted into the hyoid bone. It's one of the roles is to lift the hyoid bone upward and forward or downward and backward movement of mandible according the functions of surrounding muscles.¹

Beneath the genioglossus and the geniohyoid muscle, lies mylohyoid muscle, which arises from the inner surface of the mandible and posterior fibres originate at the level of third molar from alveolus. Ventrally, on the floor of the mouth, two mucosal folds are seen, which are known as sublingual folds, carrying the openings of Wharton's ducts. Medial to the sublingual folds, in the midline, is a strong fibrous tendon extending from the alveolingual sulcus to ventral surface of the tongue. This tendon is known as lingual frenum.

Other structures contained in the sublingual region are sublingual salivary glands, hypoglossus nerve, lingual nerve, lingual vein, and lingual artery. Pradeep et al concluded that mandibular complete dentures frequently lack retention and stability and offer less denture-supporting area than maxillary dentures. In case of severely resorbed ridges, retention is highly compromised. Extending the

anterior lingual flange of the lower denture sublingually makes it possible to achieve satisfactory retention in severely resorbed ridges.⁵

Hlaing et al said that the mandibular complete dentures with sublingual crescent extension significantly enhance in retention, stability and patient satisfaction. Therefore, the impression should be made to record this area routinely in resorbed mandibular ridge.⁶

During fabrication of the lower dentures, along with keeping in mind the proper border moulding technique, it should also be considered that the position in which the teeth are to be arranged in such way that they should not bite over the cheek or lips or tongue of the patient. Teeth arrangement should be in such a manner that their contact with adjacent mucosa does not displace the denture from its seat. Keeping this in mind, the idea for recording the neutral zone was discovered, which significantly increases the stability of the lower dentures even over the resorbed ridges.

CONCLUSION

The movements of the tongue should be guided through proper border moulding methods in anterior lingual sulcus, and it should be shaped as it is intended in final denture. Whenever the tip of the tongue touches the upper or lower lip borders, the denture should not be dislodged. The border placement is always different for different patients, so it should not be generalized to all of the edentulous population seeking complete denture treatment. The harmony of the anatomy of the floor of the mouth should be kept as intact as possible during rest and in function. The mandibular complete dentures fabricated with sublingual crescent extension enhance the retention, stability and hence the patient satisfaction.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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