

## Methods To Improve Stability In A Highly Resorbed Mandibular Ridge - A Review Article

### Abstract

Obtaining stability in resorbed mandibular ridge has long been a challenge for the prosthodontist. Stability of mandibular denture is usually the distinguishing factor between success and failure. This article intends to acquaint the various conservative techniques which can be employed to improve mandibular denture stability in case of a resorbed mandibular ridge.

### Key Words

Resorbed mandibular ridge, stability.

### Introduction

Stability is defined as resistance to horizontal displacement of prosthesis. Providing a stable mandibular denture has been challenging for prosthodontists. In particular it is more difficult to provide a stable denture in flat resorbed mandibular ridge. A stable mandibular denture provides physiological comfort to the patient. This article first of all evaluates the factors necessary to develop stability in lower denture and then discusses the various techniques to improve mandibular denture stability in a resorbed mandibular ridge.

### Evaluation of factors necessary to improve stability

Wright C R describes the following factors which are necessary to create and maintain stability in mandibular dentures.

1. Retention
2. Diagnosis
3. Functions of mouth
4. Denture base outline
5. Occlusal plane
6. Arch arrangement
7. Patient education and motivation

### 1) Retention

Defined as the quality inherent in prosthesis acting to resist forces of dislodgement along the path of insertion. Retention resists adhesiveness of food, the forces of gravity, and the forces associated with opening of the jaws. Retention in turn depends upon a) adhesion b) cohesion c) interfacial

surface tension, d) mechanical interlocking into under cuts d) intimate adaptation, e) peripheral seal, f) gravity, g) atmospheric pressure, h) neuromuscular control

### 2) Diagnosis

A thorough examination of edentulous mouth will provide information to make a diagnosis that will relate directly to the retention and stability of mandibular denture. Patients who have a normal tongue position possess a set of conditions that are conducive to retention of lower denture. Patients with a class 1 n 2 tongue position lack the ability to develop retention without some degree of training.

### Normal tongue position

Tongue fills the floor of the mouth and is confined by the mandibular teeth. The lateral borders rest on the occlusal surfaces of the posterior teeth and apex rests on the incisal edges of the anterior teeth.

### Class 1 tongue position

Retracted. floor of the mouth is pulled downward is exposed back to the molar area. The lateral borders are raised above the occlusal plane and the apex is pulled down into the floor of the mouth.

### Class 2 tongue position

Retracted and tongue is very tense and pulled backward and upward. The apex is pulled back into the body of tongue and almost disappears. the lateral borders rest above the mandibular occlusal plane. The

<sup>1</sup> Laxman Singh Kaira

<sup>2</sup> Vishal Katna

<sup>3</sup> Himanshu Kapoor

<sup>4</sup> Ramit Verma

<sup>5</sup> Manoj Rawat

<sup>1</sup> Assistant Professor

VCSG Govt. medical College, Garhwal, Uttaranchal

<sup>2,4</sup> Senior Lecturer

<sup>3,5</sup> PG Student

Deptt. Of Prosthodontics, Himachal Dental College, Sundernagar (H.P.)

### Address For Correspondence:

Dr. Laxman Singh Kaira

47 A Vijay Colony New Cantt Road Dehradun

Uttarakhand, Pin - 248001

GSM : 91-8755902525

Email Id : laxmansingh6@gmail.com

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floor of mouth is raised and tense.

### 3) Functions of mouth

The three important structures that are important to understand the functions of mouth are tongue, teeth, and medial roll of buccinators.

### Tongue

The tongue is the most accurate muscular organ of the body. It performs the functions of sucking, swallowing, receiving food in the mouth, mastication, vocalization and speech.

### Teeth

The primary functions of teeth is to deal with food. Incisors incise the food, canines tear the food and molars and 2nd premolars chew food. The 1st premolar neither tears nor chews the food. The buccal surface of first premolar forms a point of fixation for the medial roll of buccinators and other muscles at the corner of mouth.

### Medial roll of buccinators

The medial roll of buccinator is a band of muscle fibers within the large buccinator muscle. Main function of the medial roll is to form the buccal wall of food trough and to retrieve food that is forced into the buccal pouch. This mechanism is known as "shunting effect".

#### **Food trough**

The food is received by the tongue and placed on the molars to be chewed. The medial roll of buccinator moved inward towards the teeth to form the buccal wall of food trough, while the tip of tongue forms the lingual wall of the food trough.

#### **4) Denture base outline**

A properly formed denture base outline develops a seal that can be maintained during most oral functions. The labial flange extends from one buccal frenum to other. The buccal flange extends from buccal frenum to retromolar pad. The posterior border extends to completely cover the retromolar pad. The lingual vestibule is divided into three areas: the anterior vestibule, called the sublingual crescent area or anterior sublingual fold; 2) the middle vestibule, called the mylohyoid area; and 3) the distolingual vestibule, called the lateral throat form or retromylohyoid fossa.

#### **5) Occlusal Plane**

The superior - inferior position of occlusal plane is an important factor which affects stability. An occlusal plane that is too high creates unnecessary trouble, while an occlusal plane that is slightly low causes no problem. An elevated plane not only prevents the tongue from reaching over the food table into buccal vestibule but also makes the control of food bolus and denture difficult.

#### **6) Arch arrangement**

Means the buccolingual relationship of teeth to the crest of ridge. The anterior teeth are set on the anterior part of the crest of the ridge with an incisal tilt of 20 degrees and the posterior teeth are set over the crest of stress bearing area of the basal seat.

#### **7) Patient education and motivation**

Patients with retracted tongue position should be trained and given the following exercises.

Step 1 - tongue is thrust in and out rapidly.  
Step 2 - tongue is moved rapidly from side

to side.

Step 3 - tongue is extended fully and quickly retracted.

Step 4 - tongue is raised to its highest position well forward in the mouth as the sound "ee" is articulated and dropped down as sound "yup" is articulated. These exercises should be practiced thrice daily for a period of 15 minutes.

#### **Now the treatment procedures to enhance lower denture stability**

- (1) Overdentures
- (2) Neutral zone
- (3) Dynamic impression method
- (4) Metal denture bases
- (5) Neutrocentric concept
- (6) Linear occlusion concept
- (7) Implants

#### **(1) Overdentures**

The anterior mandibular ridge can be preserved by maintaining one or more endodontically treated roots and fabrication of overdenture. Preservation of ridge can be attributed to the following factors (1) Masticatory force is transmitted to the root and periodontal ligament thus stimulating normal physiological function, (2) retained roots substantially increase lateral stability of denture thereby reducing trauma to the edentulous ridge, (3) better occlusal awareness, biting forces and neuromuscular control, (4) increased horizontal stability.

#### **(2) Neutral zone**

The potential space between lips and cheeks on one side and tongue on other; that area where the forces between tongue and cheeks are equal. The aim of neutral zone is to construct a denture which is in harmony with its surroundings to provide optimum stability, retention and support. Sir W. Fish described a denture as having three surfaces: the impression surface, the occlusal surface and the polished surface. In case of highly resorbed ridge the area of impression surface decreases and the area of polished surface increases. Denture retention and stability are more dependent on accurate positioning of teeth and the contour of external surface of denture.

#### **The Neutral Zone Technique**

The usual sequence for complete denture is to make primary impressions, construct special trays, make final impressions, and then fabricate stabilized

bases. Occlusion rims are used to establish the occlusal vertical dimensions and centric relation. With the neutral zone approach the procedure is reversed individual trays are made first. These are adjusted in the mouth to be sure that they are not overextended and remains stable during functional movements. Next tissue conditioner is used to fabricate occlusal rims. These rims, which are molded by muscle function, locate the patient's neutral zone. The mandibular neutral zone rim is indexed with putty placed on the buccal and lingual surfaces. Teeth are set up exactly following the index.

#### **3) Dynamic impression methods**

In case of advanced mandibular residual ridge resorption, muscle attachments are located near the crest of residual ridge, and dislocating effect of the muscles is great. The range of muscle actions as well as the space into which denture can extend, can be recorded by dynamic impression method.

#### **Dynamic impression method**

A perforated individual tray is made on diagnostic cast. To obtain correct thickness of impression materials against denture bearing tissues, stops are made using green stick compound (3 stops, 2 mm high, one each in region of molars and one in incisors). Mandibular rests are placed in the region of molars on the occlusal surface of the tray. These rests are made using impression compound at a height corresponding to mandibular rest position. Sufficient irreversible hydrocolloid is mixed and placed directly into the mouth to cover the mandibular ridge. A small amount is placed in the tray and the tray is placed in the patient's mouth. The tray is pressed with digital pressure until stops are firmly seated on the residual ridge. Next, the patient is asked to close his mouth firmly until the rests have obtained firm contact with the maxillae. The patient is asked to perform the tongue movements. The procedure develops a proper registration of the denture space. The tray is removed from the mouth after the impression material is set and the cast is poured immediately.

#### **4) Metal denture bases**

In 1957, Faber advocated using metal denture bases. However, in a patient with atrophic residual ridge the metal base may shift frequently and irritate the underlying tissues. A metal denture base

with soft liner often meets the needs of these patients. The denture base provides the weight necessary to facilitate stability while maintaining strength, and the soft liner accommodates the ridge irregularities.

### 5) Neurocentric occlusion

Devan has suggested the two objectives of his occlusal scheme (1) neutralization of inclines, (2) centralization of forces. The neutralization of inclines and centralization of forces aids in stability without interfering with speech, appearance and chewing capacity. The 5 elements of this scheme are

- (a) Position - position of posterior teeth should be centralized so that the forces are perpendicular to the support areas.
- (b) Proportion - reduced the teeth width by 40% and this reduced the vertical stress on the ridge.
- (c) Pitch - this is the inclination of the occlusal plane. It is oriented parallel to the underlying ridge and midway between them. This directs the forces perpendicular to the mean osseous foundation plane.
- (d) Form - flat teeth with no deflective inclines were used so that there is no interference with mandibular movements.
- (d) Number - the number of posterior teeth was reduced from 8 to 6. This reduced the magnitude of occlusal forces.

### 6) Linear occlusion-

William Goddard introduced the concept of linear occlusion. Frush described occlusion in geometric terms as one dimensional (linear), two dimensional (flat) and three dimensional (cusped). Linear occlusal scheme has the potential for creating the smallest lateral force component. It consists of following basic parameters.

- a) Zero degree teeth are opposed by bladed (line contact) teeth in which the blade is a straight line over the crest of ridge.
- b) Mandibular teeth are set to flat occlusal plane.
- c) The arch which requires the greatest stability receives the bladed teeth
- d) There is no anterior interference to protrusive or lateral movements.
- e) This non interceptive occlusion provides a consistent vertical seating force in both centric and eccentric hence transe vectors are eliminated.

### 7) Implants -

A dental implant is a prosthetic device made of an inert alloplastic material implanted into the oral tissues beneath the mucosa or/and periosteal layer, and support for fixed or removable dental prosthesis. The treatment options available for restoration of extremely resorbed mandible with implants can be categorized as:

- 1) Endosseous implants in combination with fixed or removable prosthesis.
- 2) Augmentation of mandible by distraction osteogenesis, followed by placement of endosseous implants in combination with fixed or removable prosthesis.

The choice between a mandibular implant supported overdentures and a mandibular full arch implant fixed prosthesis is dependent on

- (a) Anatomic factors (inter foramina space, inter maxillary relationship).
- (b) Oral hygiene
- (c) Speech related factors
- (d) Patient preference
- (e) Cost

### Conclusion

Stability of complete mandibular dentures has challenging dentists and patients alike. In particular, a "resorbed mandibular ridge" is associated with difficulties in providing successful stable dentures. A lower denture which covers the entire supporting area available to it with its flange extensions in harmony with the surrounding musculature will certainly show improved stability.

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