

# An Contemporary Techniques for Recording Severely Resorbed Mandibular Ridge: A Case Report

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## Abstract

Resorption of mandibular ridges is a multifactorial and biomechanical disease that is chronic, progressive, irreversible, and cumulative leading to loss of sulcular depth, vertical dimension loss, and decreased lower facial height. Some common neurological, hormonal, and metabolic disorders affect the adaptability of dentures, and this can be diagnosed by a trained prosthodontist with proper history-taking and clinical examination. The denture becomes passive due to complex neuromuscular control and causes difficulties in impression-making, mastication, and swallowing, which in turn leads to loss of retention and stability in complete dentures. The loose and unstable lower complete denture is one of the most common problems faced by denture patients. One of the methods used to solve this problem is the neutral zone technique. Neutral zone technique is long being used for the management of severely resorbed mandibular ridges. The piezography technique, a special functional approach is described in order to overcome the difficulties of the mandibular denture. Piezography, prosthetic space recorded by pronunciation, can be used as a reference for arrangement of artificial teeth and polishing surface of a denture.

**Key Words :** Neutral Zone , Piezography, functional method, speech method , flabby ridge,

## Introduction

The “neutral zone” was first described by Dr. Wilfred Fish, who indicated that the denture’s polished surface should be contoured so that it approximates the moveable muscles of the lips, cheek, and tongue [1, 2]. To define the neutral zone, the potential space between the lips and cheeks on the one side and the tongue on the other; that area or position where the force between the tongue and cheek or lips are equal. [3] The neutral zone resides is that region where forces imposed by the tongue directed outward are neutralized by inwardly directed forces originating from the cheeks and lips during normal neuromuscular function [4]. In general, boundary conditions that define the neutral zone are developed through muscular contraction and relaxation during the various functions of mastication, phonation, deglutition, and facial expression. Historically, different terminology has been loosely associated with this concepts includes dead zone, stable zone, zone of minimum conflict, zone of equilibrium , zone of list

interference, biometric denture space, denture space and potential denture space<sup>[5]</sup> Directives provided for optimal facial- lingual arrangement of posterior denture teeth have varied dramatically over the profession’s long history of complete denture therapy. The posterior denture teeth should be arranged directly over the crest of the edentulous ridge.

In addition, Weinberg, Pound , Halperi , Devan , Gheriani , Lammie , Wright , Martone and Campbell have published subtly varying concepts and philosophies for optimal faciolingual arrangement of posterior denture teeth. [6]

Failure to recognize the cardinal importance of tooth position and flange form and contour often results in dentures which are unstable and unsatisfactory, even though they were skillfully designed and expertly constructed. The coordination of complete dentures with the neuromuscular function is the foundation of successful, stable dentures<sup>[7]</sup> Unstability in mandibular complete dentures may be present due to a number of

reasons. The common ones, as described by Jagger & Harrison are:

- a) Inappropriate extensions of buccal and lingual flanges of a denture;
- b) Poorly adapting denture fitting surface;
- c) Severely atrophic mandibular alveolar ridge;
- d) Poorly contoured polished surfaces of a denture;
- e) Abnormal denture teeth positions, inappropriate orientation and high level of the occlusal plane and presence of occlusal errors.<sup>[8]</sup> Many techniques have also been suggested using the materials in conjunction with movements including sucking, grinning and whistling, and pursing the lips. The swallowing/ modeling plastic impression compound technique located the neutral zone, using swallowing as the principle modeling function

The term piezograph was coined by Klein in 1974 from the Greek term meaning ‘a shape formed by pressure’. Piezography records the mandibular denture space by means of pressure developed during oral functions, mainly speech<sup>[10]</sup>. Considering that a person swallows up to 2,400 times per day and that during the entire swallowing sequence, teeth come into contact for less than a second, it may be concluded that less than 40 minutes of tooth-to-tooth contact occurs per day during function. Since a person speaks much more than he involves in swallowing, we should follow phonation method more often to fabricate dentures for more stable denture prosthesis.<sup>[11]</sup>

Various materials are used in recording neutral zone like tissue conditioners, Impression compound, Waxes, Impression plaster and polyether have been advocated to record neutral zone which has their own advantages as well as disadvantages.<sup>[12]</sup>

#### **Indication of Piezography :-**

- long period of edentulousness
- Having a severely resorbed lower ridge (most benefited by this technique.)
- Concave foundation of lower bones, - compromised earlier denture

#### **Advantages of Piezography –**

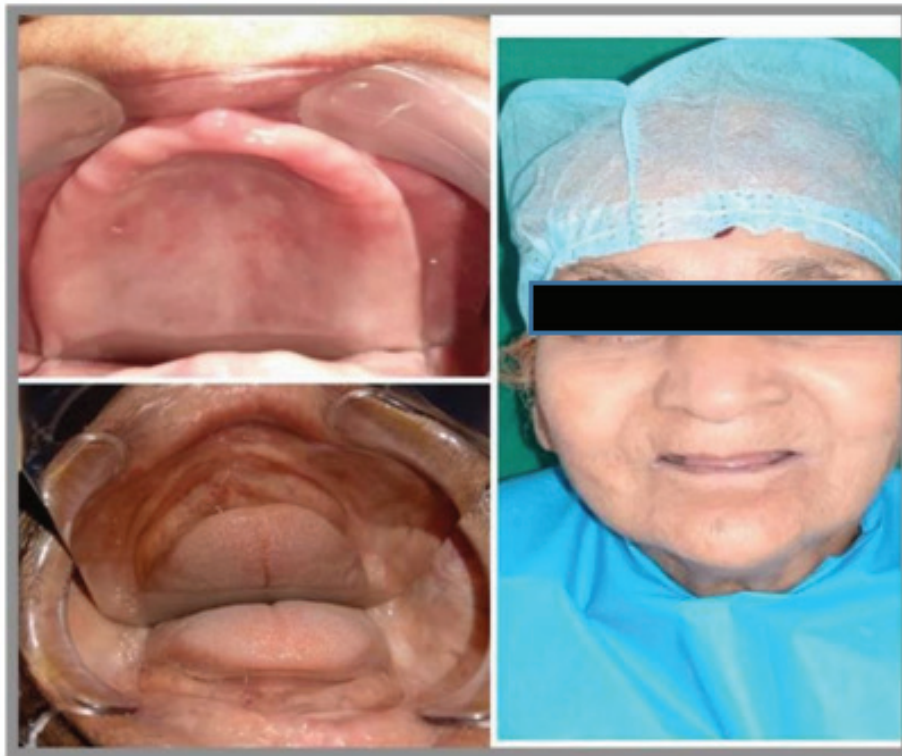
- As speech is employed for recording the denture space, the patients can practice before the impression is taken.
- The procedure is easy to understand, especially for the elderly.
- It is easy to inspect for proper oral function while the patients pronounce the phonemes - allows precise placement of artificial teeth.<sup>[11]</sup>

#### **Case Presentation-**

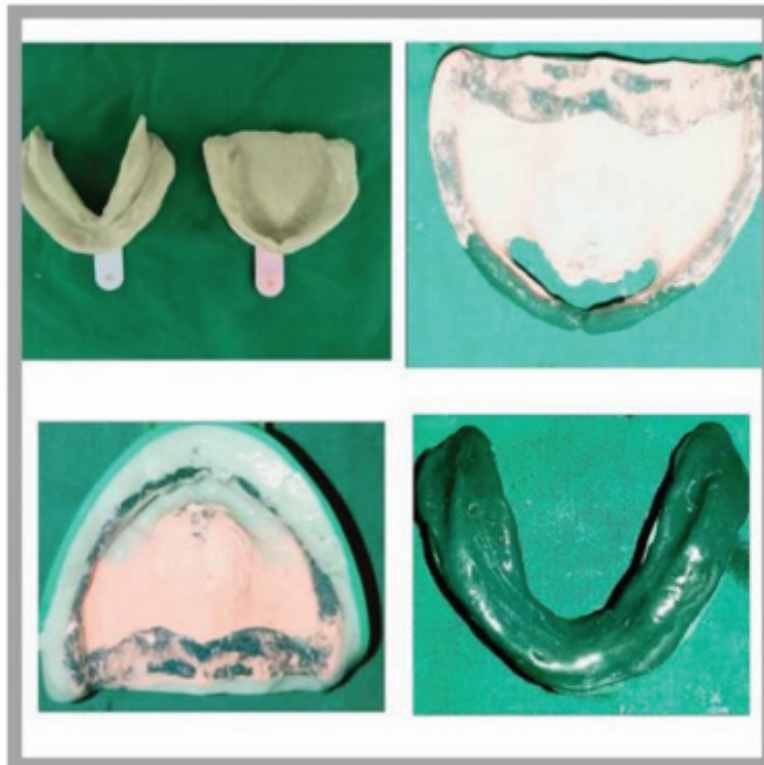
A 65 year old female patient referred to the department of prosthodontics, crown and bridge & implantology at CSMSS dental college Aurangabad, Maharashtra for fabrication of upper and lower complete dentures. The patient had been edentulous for the past 15 years and had worn 2 sets of complete dentures previously. Her chief complaint was fractured mandibular denture and wanted a new denture for above mention reason. On clinical examination loss vertical height was seen and on intraoral examination severely resorbed concave mandibular ridge and anteriorly mobile flabby tissue were seen maxillary ridge (fig.1).

#### **dentulous maxillary and mandibular ridges**

Preliminary impression was recorded with irreversible hydrocolloid impression materials. Zafarullah Khan impression techniques was planned for recording the impression of maxillary arch. The preliminary impression was made using irreversible hydrocolloid in perforated edentulous tray and primary cast was poured in impression plaster. Spacer was adapted over the primary cast except in the region of flabby tissue. Special tray was fabricated providing a window in the region of flabby tissue. Border molding was done using green stick compound. Spacer wax was removed and impression was made with zinc oxide eugenol impression material. With the zinc oxide eugenol impression (DPI Impression Paste) in the mouth and over impression of the flabby tissues was made with irreversible hydrocolloid. Final impression of mandibular arch was recorded with all green techniques using low fusing impression compound and zinc oxide eugenol impression paste (fig.2).



**Fig. 1:** Extra oral and intraoral photographs of completely edentulous maxillary and mandibular ridges



**Fig.2:** Primary alginate impression and final zafrulkhan impression of maxillary arch and all green impression of mandibular arch

Jaw relation records are then recorded using conventional occlusal rims made of modelling hard wax, the upper rim was adjusted parallel to the Camper's line and 2 mm visibility was established. The vertical dimension both at occlusion and at rest was recorded. A freeway space of 2 mm was maintained and occlusal blocks are mounted on semiadjustable articulator using facebow record (fig.3).

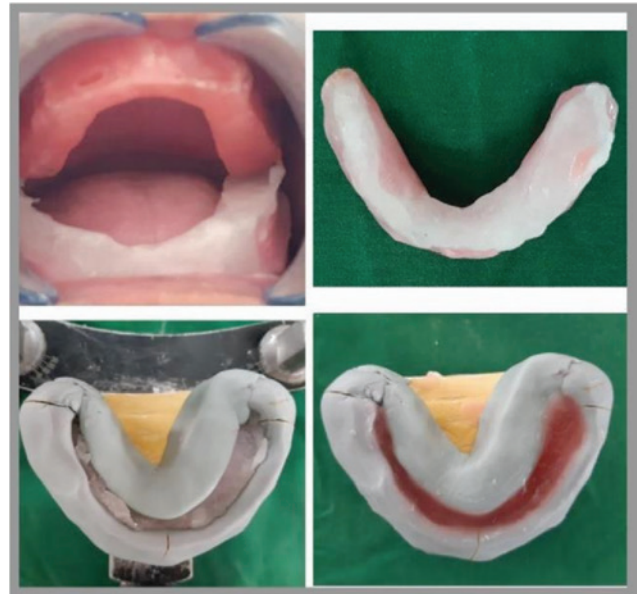


**Fig.3. facebow record**

The piezographic method was carried out from this position onwards. Since the technique was based on phonetics, the patient was made to practice pronouncing certain phonemes before it was actually implemented. The patient was asked to say 'SIS' four times followed by a strong 'TO' in order to obtain the posterior molding. Anterior piezography was obtained by asking the patient to pronounce T, D, M, P five times in a sequence clearly and vigorously.

An additional autopolymerizing resin mandibular denture base is fabricated and grooves were made on the external surface so that the moldable material can adhere to the acrylic. A silicon-based self-polymerizing soft liner was used. The maxillary rim was placed in the mouth. Initially, the soft liner was first placed on the right side and the patient was instructed to pronounce the phonemes. Once the material set, the piezographic record was checked and the same was done for the left side. After the posterior dam was obtained, moldable material

was placed anteriorly and the patient was asked to say 'TDMP'. The final dam was kept on the mandibular cast and inspected. Excess was removed with a knife and adjusted to the required height. Analyzing piezography, it was noted that the lateral border of the tongue had created its impression on the dam. A similar observation was recorded for the apex of the tongue, which indicated its excursion and occupied space. a silicon index was fabricated over the mandibular cast. After the dam was removed, the void was filled with molten wax to obtain a new wax rim ( fig.4 ).



**Fig.4: neutral zone recorded with Piezography techniques using silicon-based self-polymerizing soft liner**

The wax rim was adjusted to the predetermined vertical dimension and placed in the articulator. The posterior teeth were now arranged in the newly obtained space. Monoplane posterior was used. The waxed up teeth arrangement was tried in and esthetics and speech was adjusted and corrected. Dentures were finally fabricated and inserted after correcting processing errors occlusion was satisfactory. Facial profile improved drastically and the denture was stable functionally (fig.5)



**Fig.5. processing of denture and denture insertion**

## Discussion

The ultimate goal of prosthodontic treatment is to restore the function, form, and esthetics of the patient. There are economic, clinical, and medical contraindications when providing dental implants to a patient.

In 1972, Kelly and his colleagues first described 'combination syndrome' caused by the presence of opposing natural teeth to an edentulous area. His observations included alveolar bone resorption in the anterior maxilla, enlargement of the tuberosities and bone resorption underneath the mandibular denture bases<sup>[13]</sup> Liddlelow<sup>[14]</sup> in 1964 described a technique whereby two separate impression materials were used in a custom tray (using 'plaster of Paris' over the flabby tissues and zinc oxide eugenol over the normal tissues). In 1964, Osborne<sup>[14]</sup> described a technique where two separate impression trays and materials were used to separately record the 'flabby' and 'normal' tissues and then related intra-orally. Watt and McGregor<sup>[14]</sup> in 1986 described a technique where impression compound was applied to a modified custom tray and a wash impression with zinc-oxide and eugenol is made.

Provision of a denture using neutral zone technique may help in overcoming these difficulties. Firstly, it will be ensured that the oral musculature aids in the retention and stabilization of the denture rather than dislodging

the denture during function. The dentures made using the NZ technique will have other advantages such as reduced food entrapment, good esthetics due to facial support and proper positioning of the posterior teeth which will allow for sufficient tongue space.<sup>[8]</sup> Several studies have compared complete dentures fabricated using conventional and neutral zone (NZ) techniques. Concluded that at the final appointment showed that swallowing neutral zone (SNZ) dentures were preferred by the patients with regards to esthetics, stability, comfort and ability to chew.<sup>[15]</sup>

Another study was conducted where the piezographic space was scanned, a virtual tooth arrangement and festooning were performed within the space using computer-aided design software. The denture bases were milled from a polymethylmethacrylate resin block using computer-aided manufacturing, and commercially available denture teeth were bonded with resin adhesive. Using the piezography technique described, physiologically appropriate complete dentures were fabricated based on the neutral zone concept<sup>[16]</sup>

## Conclusion

Functional and aesthetic dental treatments for patients with atrophic ridges are an inestimable service provided by a prosthodontist. Piezographic method for complete mandibular denture construction provides the patient with a great degree of comfort and confidence. With meticulous attention to the polished surface of the prosthesis, optimal stability, retention, and comfort of the definitive complete dentures is possible.

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