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### Improving stability of mandibular complete denture in severely atrophied ridge using neutral zone technique: A case report

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#### Abstract

Complete denture fabrication is considered to be successful when retention, stability, support are obtained to the patient satisfaction. Mandibular ridge resorbs over time and challenges dentist clinical skills in complete denture fabrication. In this case, mandibular complete denture on severely resorbed ridge was managed using conventional neutral zone technique. Neutral zone technique helps in fabricating denture in a stable zone over severely resorbed ridge, which would improve the denture stability. This case report explains neutral zone technique using phonetic method in complete denture fabrication was followed, which satisfied both esthetics and functional demands.

**Keywords:** Denture stability, mandibular complete denture, maxillary Overdenture, neutral zone technique

#### Introduction

The overall Prevalence of edentulism in low income countries including India stated as 11.7%. In multivariate logistic analysis sociodemographic factors includes old age, low education, chronic conditions, health risk behaviours, malnutrition were found to be associated with complete edentulism<sup>[1]</sup>. Completely edentulous conditions could be manage by removable complete denture and implant retained prosthesis. An unstable mandibular complete denture is a commonly encountered situation that may occur due to various causes like incorrect extensions of buccal or lingual flanges, poorly adapted fitting surfaces, atrophic mandibular ridge and inappropriate contoured polished surface<sup>[2, 3]</sup>. The key determinant of stability of lower complete denture is the neuromuscular control, size and position of prosthetic teeth and the contours of polished surface<sup>[2]</sup>. There are various terms used to describe this potential area where the outward forces generated by the tongue are balanced or neutralized by the inward forces generated by lips and cheeks during functional activities. They are neutral zone, zone of minimal conflict, zone of equilibrium, potential denture space and the dead space. If the importance of tooth position, flange form and contour are not acknowledged, often results in unstable and unsatisfactory dentures<sup>[4-6]</sup>.

This case report sequentially explains the fabrication of mandibular denture against maxillary tooth supported complete denture using neutral zone technique which resulted in more stable and comfortable denture for patient.

#### Case report

A male patient of 43 years reported to Department of Prosthodontics with medical history of palmar plantar keratosis (Fig. 1, 2), and dental history of complete loss of lower teeth due to mobility 25 years back except maxillary first molars (Fig. 3). On intra oral examination presence of 16, 26 with tooth preparation, mild palatal gingival recession and no mobility observed. Patient is a complete denture wearer from his 18 years. At present he lost his denture and reported for new denture fabrication. As mandibular ridge was found to be severely atrophied (ACP Class IV)<sup>[7]</sup>, neutral zone technique of complete denture fabrication was planned.

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**Fig 1:** Palmar keratosis



**Fig 2:** Plantar keratosis.



**Fig 3:** Pre operative picture.

Primary impression made with alginate in maxillary arch and impression compound in lower edentulous arch. A conventional method of border moulding done with green stick compound (DPI Pinnacle Tracing Sticks, the Bombay Burmah Trading Corporation, Mumbai, India). Additional relief was given in the place of upper maxillary molar teeth in special tray with modeling wax. After border moulding final impression was made with light body polyvinyl siloxane material (Aquasil XLV- Aquasil light body [Addition Silicone Elastomeric Impression Material. Dentsply, Germany). Master cast was fabricated with type III Dental stone (Stone Plaster, Neelkanth Minechem, Rajasthan, India). Trial denture base was fabricated using self cure resin (DPI). Stainless steel Wire loops (24 gauge) were fabricated stabilised on the crest of mandibular trial denture base with self cure resin. This loops helps in supporting impression material while recording polished surface in neutral zone. Orientation jaw relation done using self centric arbitrary facebow (Hanau wide vue II semi adjustable articulator) (Fig. 4). Tentative jaw relation done in centric and cast transferred to articulator. After articulation, bite rim with modeling wax was softened and removed completely from the wire loops of trial denture base (Figure 5). Impression compound (DPI Pinnacle, The Bombay Burmah Trading) and green stick was mixed in 3:7 parts ratio

in 60 °C water bath to get admix compound. This compound has improved flow properties, easy to work and has sufficient working time [8, 9]. The compound was softened and made in to roll and positioned over the wire loops in lower trial denture base. Mandibular bite rim with softened admix compound placed in patient mouth and patient was instructed to perform functional movements like touching and moving the tongue over upper and lower lips, asking to pronounce DE, TE, PE, ME, SE verbally, pouting and extending lips by SO and SIS sounds for 5 times for recording neutral zone (Figure 6). Again jaws recorded in centric and checked again in articulator [10].



**Fig 4:** Face bow transfer.



**Fig 5:** Introduction of wire loops.



**Fig 6:** Neutral zone record with admix compound.



**Fig 7:** Putty index guide.

Putty index was made using polyvinyl siloxane putty material (Aquasil soft Putty [Addition Silicone Elastomeric Material] Dentsply, Germany) by adapting on buccal as well as in lingual aspect on mandibular master cast. (Figure 7). The Index was cut in distal aspect and separated in two pieces, one engaging buccal and other in lingual aspect. The admixed compound rim was softened and removed completely. The neutral zone space present in putty index was filled with molded modeling wax. Wax was allowed to set completely. Teeth setting were done using semianatomic 20° teeth (Acrylock, Ruthinium group, Badia Polesine). Maxillary teeth setting done following principals of teeth setting. Mandibular teeth setting done in neutral zone with guidance of putty index. Setting trail was done and polished surface was recorded using light body polyvinyl siloxane after scrapping of wax in polished surface in trial dentures by following same functional movements (Figure 8). Excess light body over the teeth were trimmed and exposed and trial dentures were processed using heat cure acrylic resin (Ivoclar). The recorded polished surface of mandibular denture were preserved while finishing and polishing.

Maxillary tooth supported overdenture and mandibular complete denture was delivered and evaluated for retention and stability (fig. 9). Maxillary overdenture denture fitted over maxillary first molars which had good retention. Mandibular denture fabricated using Neutral zone technique was found to more stable counteracting the force generated by opposing overdenture, patient was found be satisfied in aspects of esthetics, function and comfort. Patient was called for review and mild adjustments were done based on patient complaints. patient reported with satisfaction in subsequent visits.



**Fig 8:** Polished surface impression



**Fig 9:** Postoperative picture.

## Discussion

Papillon-Lefevre syndrome is an inherited autosomal recessive trait, an extremely rare condition of genodermatosis. The disease is caused most commonly by mutation of Cathepsin C gene leading to the deficiency of Cathepsin C enzymatic activity [11, 12]. Clinical characteristic of this condition includes diffuse palmoplantarkeratoderma,

premature loss of deciduous and permanent teeth and a tendency to recurrent pyogenic infections of the skin. Palmoplantar hyperkeratosis typically starts between 1-4 years of age [12].

Patient reported with keratosis in palms and soles, thickened digits and affected nails. Patient reveals past dental history of exfoliation of teeth from childhood which would reveal differential diagnosis of pappillonlefever syndrome. However his hair and other features were found to be normal. As patient prime demand was new denture diagnosis of his general condition was not focused. Patient has maxillary upper first maxillary molars on both sides which were root canal treated 18 years back and utilised for overdenture. Tooth was not covered with coping to prevent caries. As patient was maintaining the present oral condition for long time and he was not interested about coping on teeth. But patient was informed about the necessity of preventive measures against caries like fluoride application, regular visits to dentist for maintenance.

Modern approaches extends options of dental implant therapy as a means of improving the denture foundation which supplements the mechanics of prosthesis support, retention, and stability in better means than conventional denture. Regardless of implant availability, physiologically optimal denture contours and denture tooth arrangement also renders satisfactory prosthesis stability, comfort, and function for patients. Mandible atrophies at a greater rate than the maxilla and has less residualridge for retention and support (Atwood) [7] which always challenges denture stability. In this case patient was given options for implant retained denture in future. But as patient got used to this conventional dentures from his young age, he was not interested about it and got satisfied with newly fabricated complete dentures.

Neutral zone technique was proposed by Fish who emphasized the significance of recording polished surface to attain better denture stability. He classified denture surface as impression surface, occlusal surface and polished surface. He stated that polished surface is bounded by cheek and tongue muscles that involves in physiological movements like speech, swallowing, mastication, smiling and laughing. [10]. But it is a least selected technique in denture fabrication due to its multiple dental visits, complex series of steps that needed to be followed and evaluated for better results. He emphasized the significance of recording this neutral space in denture fabrication [13]. There are two methods followed to record polishing surface, that is swallowing and phonetic method. Makzoume *et al.* had done a comparative evaluation of swallowing and phonetic method in neutral zone technique. He concluded phonetic method was more effective than swallowing method in recording neutral zone [10]. This phonetic method was implemented along with movement of tongue to record neutral zone. In spite of elaborative clinical steps, Complete denture fabricated by neutral zone technique is cost effective than expensive implant therapy. As a result mandibular complete denture presented with satisfactory stability in function against the force of maxillary overdenture.

## Conclusion

Neutral zone technique can be considered as best alternative technique in complete denture fabrication as it records and reproduce individual potential space which allows the denture to function in harmony with tongue and cheek muscles. This is also a treatment option for patients with neuromuscular imbalance. Eventhough modern approaches take the field of



dentistry to incredible outcomes, there are situations where conventional methods needed to be chosen and executed to satisfy patient demands.

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