CASE REPORT

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Piezo-graphic Recording of the Neutral Zone Using a Soft Liner for Improved Stability in a Completely Edentulous Patient: Clinical Reports

Sushmitha Mohan[1], Melvyn John R[1], Antony Leoney[1,*], R. Yavaneetha Reddy[2]

[1]Department of Prosthodontics, Crown and Bridge, Government Dental College, Cuddalore District, Tamil Nadu, India.
[2]Department of Prosthodontics, Crown and Bridge, Mamata Institute of Dental Sciences, Hyderabad, Telangana, India.

***Corresponding author:**
Dr Antony Leoney
Professor, Department of Prosthodontics, Crown and Bridge, Government Dental College, Cuddalore District, Tamil Nadu, India.
Email: antony.leoney@gmail.com

Abstract
Rehabilitation of completely edentulous patients with compromised denture stability remains a clinical challenge, particularly in cases with residual ridge resorption and increased neuromuscular activity. The neutral zone concept enhances denture stability by positioning teeth and polished surfaces within the zone of muscular equilibrium. The piezo-graphic technique using a resilient soft liner is a simple and physiologically driven approach for managing challenging edentulous cases. This case series describes the use of a piezo-graphic technique with a resilient soft liner for neutral zone recording during complete denture fabrication. Two edentulous patients presenting with unstable dentures and functional difficulties were treated using the neutral zone approach. In the first case, the technique was applied to the mandibular arch alone to improve mandibular denture stability. In the second case, the procedure was extended to both arches due to increased muscular influence and unfavourable maxillary anatomy. Following conventional impression procedures and jaw relation records, the neutral zone was recorded using a resilient soft liner. A silicone putty index was used to preserve the recorded contours and guide tooth arrangement. Both cases demonstrated improved denture retention, stability, phonetics, and patient comfort.

Keywords: Denture liners, Edentulous, Piezo-graphy.

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1. Introduction

Complete edentulism continues to represent a significant clinical challenge in prosthodontic practice, particularly among patients with long-standing tooth loss and progressive residual ridge resorption [1]. The mandibular arch is especially problematic because of its limited denture-bearing area, accelerated rate of bone resorption, and the presence of highly active surrounding musculature [2]. These factors collectively contribute to reduced denture retention, compromised stability, and impaired functional efficiency. Consequently, patients frequently report difficulties in mastication, speech, and comfort, which negatively affect overall satisfaction and oral health–related quality of life [3]. Conventional complete denture fabrication techniques are predominantly based on static anatomical landmarks and mechanical principles [4]. Although these approaches may yield acceptable outcomes in patients with favourable ridge morphology, they often fail to incorporate the dynamic influence of orofacial musculature [5].

The imbalance between the inward forces of the cheeks and lips and the outward forces of the tongue can lead to denture displacement during functional activities, particularly in severely resorbed mandibular ridges [6]. Recent clinical evidence suggests that such biomechanical

limitations are a major cause of dissatisfaction among complete denture wearers [7].

The neutral zone concept offers a physiologic approach to overcome these limitations by identifying the region within the oral cavity where muscular forces are in equilibrium [8]. Positioning denture teeth and polished surfaces within this zone enables the prosthesis to function in harmony with neuromuscular activity, thereby enhancing stability and minimizing dislodging forces [9]. Contemporary studies have demonstrated that dentures fabricated using neutral zone principles significantly improve patient-reported outcomes, including retention, stability, masticatory efficiency, and phonetics, compared to conventional dentures [3,10].

Various materials and techniques have been described for recording the neutral zone, including impression compound, tissue conditioners, and elastomeric materials [11,12]. Among these, piezography is a dynamic functional technique that records the denture space through phonetic and muscular movements. This method captures the continuous interaction of the tongue, lips, and cheeks, providing a more accurate representation of functional denture contours [13]. The use of a resilient soft liner as a recording medium further enhances this technique due to its ability to adapt under functional load and record subtle neuromuscular influences over time [14].

Although the neutral zone concept is conventionally applied to mandibular dentures, selected clinical situations may justify its use in the maxillary arch, particularly in patients with unfavourable palatal morphology or increased muscular influence affecting prosthesis stability [13,14]. This case series describes the application of a piezo-graphic neutral zone technique using a resilient soft liner in two edentulous patients, where the procedure was performed for the mandibular arch alone in one case and extended to both arches in the other case based on individual clinical requirements.

2. Case 1: Clinical Report

2.1 Patient history and clinical examination

A 52-year-old male patient reported to the Department of Prosthodontics with the chief complaint of difficulty in mastication and impaired speech due to ill-fitting dentures. The patient expressed dissatisfaction with his existing prosthesis and requested replacement of missing teeth in both arches. The patient had been completely edentulous for 15 years following extraction of all teeth due to mobility and had been wearing complete dentures for the same duration. The existing dentures were clinically worn out and exhibited poor retention and stability, particularly in the mandibular arch.

A comprehensive clinical examination was performed. Extraoral examination revealed a tapering facial form with a straight profile. No facial asymmetry or abnormality was noted (Figure 1). Intraoral examination showed a moderately resorbed maxillary ridge, while the mandibular ridge appeared well-rounded and U-shaped, corresponding to Cawood and Howell Class I. The ridges were bilaterally symmetrical. The arch form was ovoid in both maxilla and mandible. The hard palate was flat, corresponding to House Class III classification, and the soft palate was classified as Class I (Figure 2).

Functional examination revealed normal temporomandibular joint movements without deviation or clicking. The maximum mouth opening was approximately 55 mm, and mandibular movements were within normal limits. The muscles of mastication did not exhibit any tenderness upon palpation. Evaluation of the oral environment showed a tongue of medium size with normal posture and mobility. Salivary flow was adequate, and the post-mylohyoid space was greater than 10 mm, indicating favourable conditions for denture extension and stability.

Jaw relation assessment revealed a Class II ridge relationship with parallel ridge orientation. Based on the clinical findings, a treatment plan involving complete denture fabrication using the neutral zone concept with a piezo-graphic technique was formulated.

Figure 1. a) Preoperative extraoral frontal view; and b) Preoperative extraoral lateral (profile) view of the completely edentulous patient.

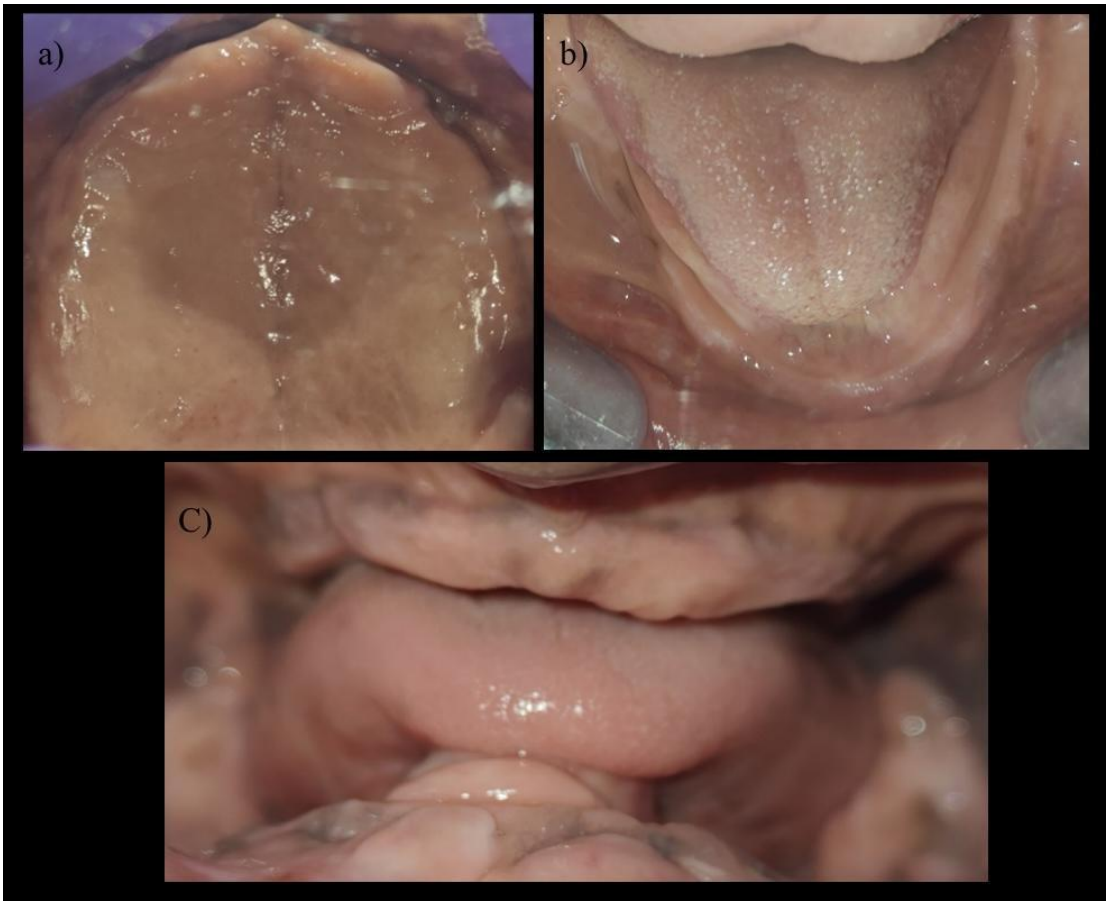

Figure 2. a) Intraoral view of maxillary arch; b) Intraoral view of mandibular arch showing ridge morphology and extent of residual ridge resorption; and c) Occlusal view of edentulous ridges.

Figure 3. Primary casts made by pouring into compound. a) maxillary arch; b) mandibular arch.

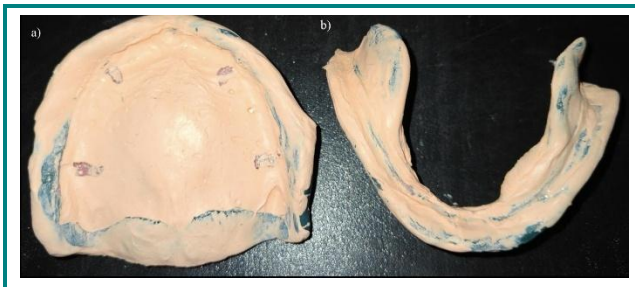

Figure 4. Final (secondary) impressions obtained using zinc oxide eugenol impression paste after border molding. a) maxillary arch; and b) mandibular arch.

2.2 Primary impression

The clinical procedure was initiated with primary impression making for both the maxillary and mandibular arches using impression compound (Impression Compound; Pyrax Polymars, Roorkee, India) in appropriately selected metal stock trays. The material was softened uniformly and adapted to ensure adequate coverage of all denture-bearing areas. Care was taken to record the anatomical landmarks essential for complete denture fabrication. The impressions were evaluated for accuracy, ensuring proper extension and absence of voids. And it was poured using Type II gypsum product (Plaster of Paris) (The Ramaraju Surgical Cotton Mills, Perumalpatti, Madurai, India) to obtain the primary casts (Figure 3).

2.3 Secondary impression

Primary casts were retrieved, and custom trays were fabricated for both arches using a full spacer design to provide uniform space for the impression material. Border molding was carried out using low-fusing impression compound (DPI Pinnacle Tracing Sticks, Dental Products of India, Mumbai, India) to

accurately record the functional depth and width of the vestibular sulcus. The patient was guided to perform functional movements during border molding to achieve proper extension.

Following this, the final wash impression (Figure 4) was made using zinc oxide eugenol impression paste (DPI Impression Paste, Dental Products of India, Mumbai, India), which allowed precise recording of the denture-bearing tissues under minimal pressure. The impressions were then poured using Type III gypsum product (dental stone) (Shruti Products, Gujarat, India) to obtain well-defined master casts.

2.4 Jaw relation

Occlusion rims were fabricated using the admixed technique for both the maxillary and mandibular arches and adjusted to establish the tentative vertical dimension of occlusion and centric relation (Figure 5). A facebow transfer was performed, and the casts were mounted on an articulator.

For neutral zone recording, the mandibular record base was incorporated with retentive wire loops to mechanically retain the admixed impression material during functional molding.

2.5 Neutral zone recording using soft liner (Piezo-graphy method)

For recording the neutral zone, the mandibular compound occlusal rim was retained and overlaid with a resilient soft-liner material, which served as the dynamic recording medium. The record base with the soft liner was inserted intraorally at the established vertical dimension (Figure 6).

The patient was instructed to perform a series of functional and phonetic movements, including swallowing, smiling, lip puckering, licking of lips, and phonation of syllables such as “ee,” “oo,” and “ma.” These movements were repeated continuously for approximately 5–10 minutes. During this period, the soft liner was molded by the coordinated activity of the tongue, lips, and cheeks.

This procedure, based on the principle of piezography, allowed the recording medium to be shaped under physiologic conditions. The interplay between the outward forces of the tongue and the inward forces of the cheeks and lips resulted in a zone of equilibrium known as the neutral zone. In this region, the denture is subjected to balanced forces, thereby enhancing its stability and retention. The molded soft liner thus accurately captured the patient-specific functional denture space.

2.6 Putty index in an articulator

The recorded neutral zone impression was carefully transferred onto the master cast without distortion. A silicone putty index (Photosil Soft Putty, Dental Products of India, Mumbai, India) was fabricated around the molded neutral zone on both the labial and lingual aspects while the cast was mounted on the articulator (Figure 7).

This putty index served as a guide to preserve the contours established during functional molding. It maintained the spatial orientation and dimensions of the neutral zone, ensuring accurate transfer of these contours during subsequent tooth arrangement.

2.7 Teeth arrangement

Following index fabrication, the soft-liner material was removed from the record base, and molten modeling wax was introduced into the space created within the putty index. This allowed precise replication of the recorded neutral zone contours.

Artificial acrylic teeth (Premadent Cross-linked Acrylic Teeth, Ashvin, India) were arranged within the confines of this neutral zone using the putty index as a guide. Special attention was given to ensure that the teeth were positioned in harmony with the surrounding musculature. A balanced occlusal scheme was established to minimize destabilizing forces during function and to enhance denture stability.

2.8 Wax try-in

The waxed trial dentures were inserted into the patient’s oral cavity for evaluation. Esthetics, including lip support, facial profile, and smile line, were carefully assessed. Phonetics was evaluated by asking the patient to pronounce specific sounds, ensuring proper tooth positioning. Occlusion was checked both intraorally (Figure 9) and on the articulator, to verify balanced contacts during functional movements. Necessary adjustments were made to achieve optimal harmony between the prosthesis and the patient’s neuromuscular system.

2.9 Denture insertion

After successful try-in, the dentures were processed using heat-cured acrylic resin following conventional laboratory procedures. The finished dentures were retrieved, finished, and polished meticulously. The prostheses were inserted into the patient’s oral cavity, and minor occlusal adjustments were performed to refine occlusal contacts and ensure balanced articulation (Figure

10). The patient was educated regarding denture hygiene, insertion and removal techniques, and adaptation period expectations. Post-insertion instructions were provided to enhance long-term success.

2.10 Post-operative evaluation

Post-operative evaluation demonstrated significant improvement in denture stability and retention, particularly in the mandibular arch. The patient reported enhanced masticatory efficiency, improved speech, and increased comfort compared to the previous dentures.

Clinical examination revealed that the dentures remained stable during functional movements such as speaking and swallowing, indicating successful integration with the patient's neuromuscular dynamics. Comparative assessment with the previous conventional dentures showed marked improvement both intraorally and extraorally, validating the effectiveness of neutral zone recording using the piezo-graphic method with a soft liner. The patient was followed up at 6 months and 1 year, during which the prosthesis continued to demonstrate satisfactory retention, stability, and functional efficiency, with no significant complications reported (Figure 11).

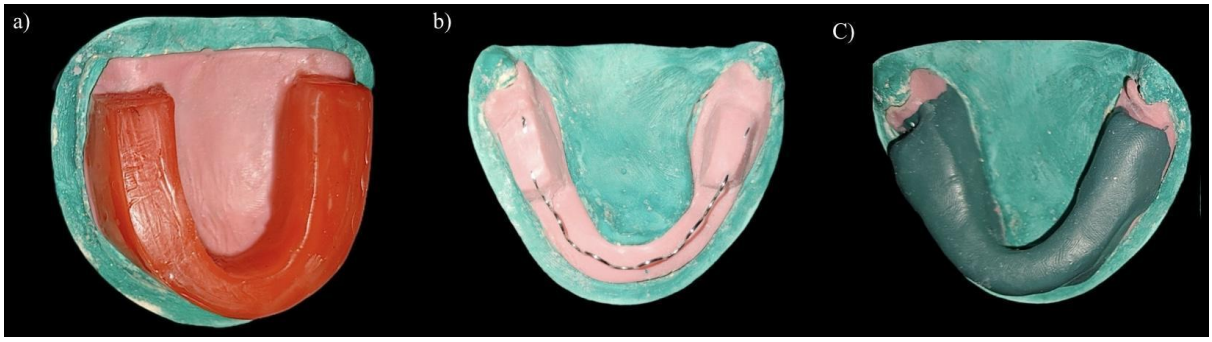

Figure 5. (a) Maxillary occlusal rim; (b) Mandibular denture base on master cast; and (c) Mandibular occlusal rim fabricated with impression compound.

Figure 6. Mandibular occlusal rim with soft liner used as a dynamic recording medium.

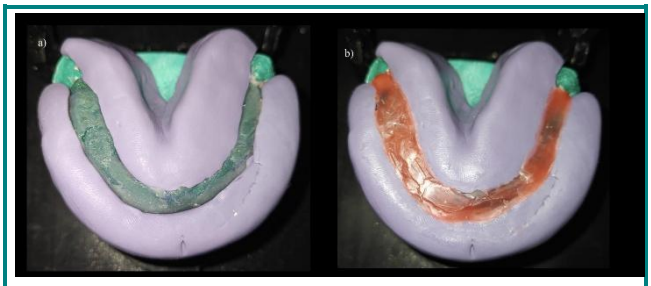

Figure 8. a) Silicone putty index fabricated around the recorded neutral zone to preserve functional contours; and b) wax is flowed in place of soft liners..

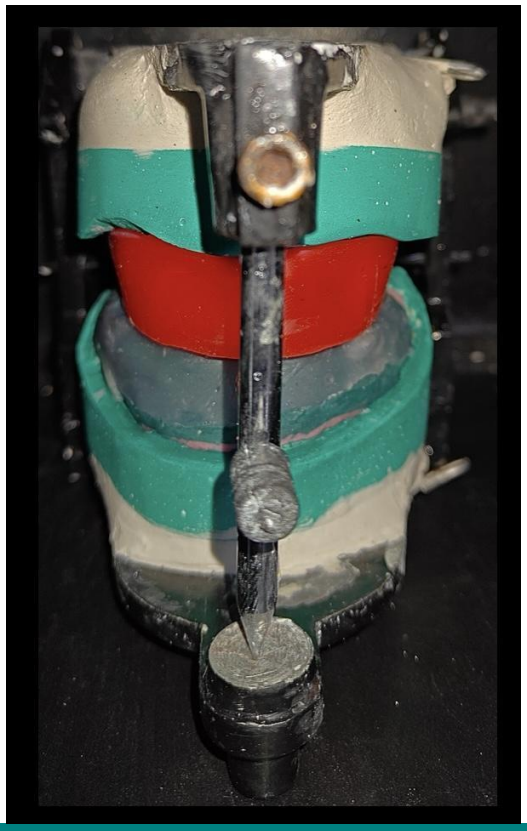

Figure 7. Maxillomandibular jaw relation records with occlusion rims mounted on a Mean Value articulator.

Figure 9. Intraoral view of wax trial dentures evaluating esthetics, phonetics, and occlusion.

Figure 10. Final processed complete dentures inserted intraorally after finishing and polishing.

Figure 11. a) Patient without dentures (extraoral view); and b) Post-insertion extraoral view.

3. Case 2: Clinical Report

3.1 Patient history and clinical examination

A 62-year-old male patient reported to the Department of Prosthodontics with the chief complaint of a fractured maxillary complete denture and difficulty during mastication. The patient had been completely edentulous for nearly 3 years and had been wearing complete dentures fabricated previously during this period. He expressed dissatisfaction with the existing prosthesis because of the fractured upper denture and reduced stability while eating and speaking.

Extraoral examination revealed an ovoid facial form with a straight profile and symmetrical facial appearance. A mild reduction in lower facial height was observed. The patient exhibited a short upper lip and low smile line. Temporomandibular joint examination showed no clicking, tenderness, or pain, and mandibular movements were within normal limits. Mouth opening was adequate, and no tenderness of the muscles of mastication was noted (Figure 12).

Intraoral examination demonstrated moderately resorbed edentulous ridges in both arches. The maxillary ridge was tapering in form with a shallow palatal vault, while the mandibular ridge exhibited an ovoid configuration with a well-rounded contour. The mucosa covering the denture-bearing areas appeared healthy, firm, and resilient with uniform thickness. Border tissue attachments were moderately high in the maxilla and favourable in the mandible, while frenum and muscle attachments did not interfere with the denture-bearing area (Figure 13).

The ridge relationship corresponded to Angle's Class I relation with relatively parallel ridge orientation. Tongue size and mobility were within normal limits, although increased circumoral muscular activity was evident during speech and swallowing. Salivary flow was adequate and of normal consistency.

Based on the clinical findings, a treatment plan was formulated to fabricate complete dentures using the neutral zone concept recorded through a piezo-graphic technique with a resilient soft liner in both arches.

3.2 Primary impression

Primary impressions of the maxillary and mandibular arches were obtained using impression compound (Pyrax Polymars, Roorkee, India) in suitably selected edentulous stock trays. The material was uniformly softened and carefully adapted to record the denture-bearing tissues and

peripheral anatomical landmarks. Adequate extension and surface detail of the impressions were verified clinically before pouring them in Type II gypsum product (Plaster of Paris; The Ramaraju Surgical Cotton Mills, Perumalpatti, Madurai, India) to obtain preliminary casts for custom tray fabrication (Figure 14).

3.3 Secondary impression

Custom trays were fabricated on the preliminary casts with uniform spacer adaptation to provide controlled relief for the impression material. Functional border molding was carried out using low-fusing impression compound (DPI Pinnacle Tracing Sticks; Dental Products of India, Mumbai, India) to accurately define the depth and width of the sulcus through patient-guided functional movements.

Following satisfactory peripheral tracing, definitive impressions were made using zinc oxide eugenol impression paste (DPI Impression Paste; Dental Products of India, Mumbai, India) to achieve detailed recording of the denture-bearing tissues under minimal pressure. The completed impressions (Figure 15) were inspected for accuracy and subsequently poured using Type III gypsum product (Dental Stone; Shruti Products, Gujarat, India) to obtain master casts.

3.4 Jaw relation

Record bases (Figures 16. a and d) were fabricated on the master casts using autopolymerizing acrylic resin (DPI RR Cold Cure; Dental Products of India, Mumbai, India). Occlusion rims were then constructed to establish the tentative vertical dimension of occlusion and maxillomandibular relationship. The vertical dimension was evaluated clinically using facial measurements, phonetics, and physiologic rest position. Centric relation was recorded and verified for consistency.

Figure 12. a) Preoperative extraoral frontal view; and b) Preoperative extraoral lateral (profile) view of the completely edentulous patient.

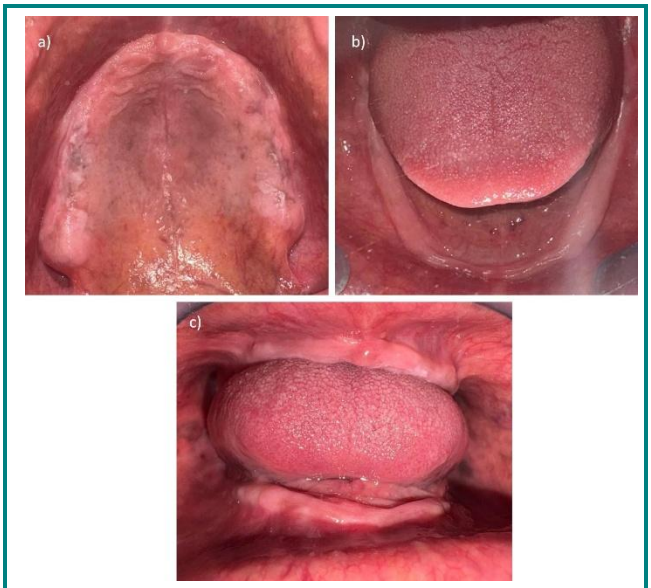

Figure 13. a) Intraoral view of maxillary arch; (b) Intraoral view of mandibular arch showing ridge morphology and extent of residual ridge resorption; and (c) Frontal view of edentulous ridges.

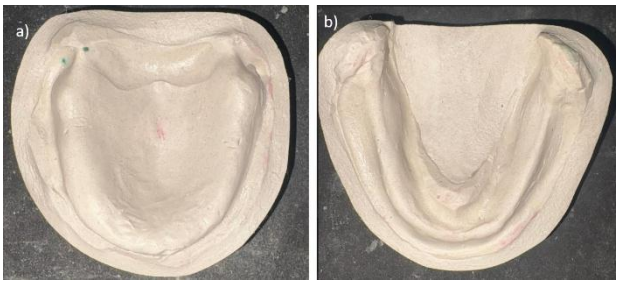

Figure 14. Primary casts made by pouring into compound. a) maxillary arch; and b) mandibular arch.

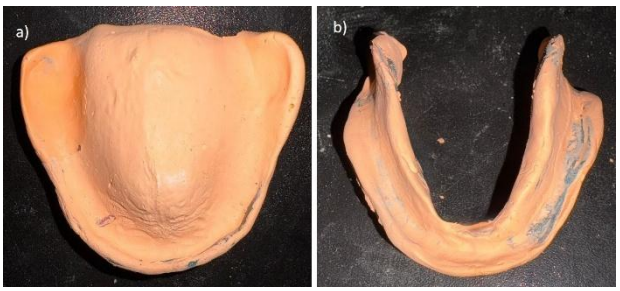

Figure 15. Final (secondary) impressions obtained using zinc oxide eugenol impression paste after border molding; a) maxillary arch; and b) mandibular arch.

A facebow transfer was performed to orient the maxillary cast on a semi-adjustable articulator, following which the mandibular cast was mounted using the recorded jaw relation. The established relations were re-evaluated intraorally to ensure stability and accuracy before proceeding to the functional neutral zone recording stage.

3.5 Neutral zone recording using Soft-liner (Piezography method)

For functional recording of the neutral zone, the conventional wax occlusion rims in both arches were replaced with rims made in admixed technique (impression compound with green stick compound) adapted over the record bases. The occlusal rims were inserted intraorally at a predetermined vertical dimension of occlusion. Then resilient soft-liner material (GC Soft Liner; GC Corporation, Tokyo, Japan) adapted over the modified occlusal rims to capture the neutral zone (Figure 16 C and F).

The patient was instructed to perform a sequence of physiologic movements including swallowing, sucking, smiling, lip puckering, and phonation of sounds such as "ee," "oo," and "ma." These movements were repeated continuously for several minutes, allowing the soft liner to be shaped dynamically by the coordinated activity of the tongue, lips, and cheeks.

The molded contours obtained through this piezo-graphic procedure represented the functional denture space where the surrounding muscular forces were in equilibrium (Figure 17). In the present case, the technique was extended to both arches due to the shallow palatal anatomy and increased perioral muscular activity, which were considered contributory factors to denture instability. Recording the neutral zone in the maxillary arch, in addition to the mandibular arch, aided in establishing tooth position and polished surface contours compatible with the patient's neuromuscular function, thereby enhancing overall denture stability and retention. For neutral zone recording, the maxillary and mandibular record bases were incorporated with retentive wire loops to mechanically retain the admixed impression material during functional molding (Figures 16. b and e).

3.6 Putty index in an articulator

After completion of the neutral zone recording, the contoured soft-liner rims were secured on the articulated casts. A silicone putty material (Photosil Soft Putty; Dental Products of India, Mumbai, India) was adapted around the recorded surfaces to create an index reproducing the functional contours obtained intraorally. The index provided a three-dimensional guide for maintaining the recorded denture space during laboratory procedures and assisted in reproducing the established muscular balance during tooth arrangement (Figure 18).

3.7 Teeth arrangement

After fabricating the putty index, the soft-liner material was removed from the record bases, and the indexed space was filled with modelling wax to reproduce the recorded contours. Artificial acrylic teeth (Premadent Cross-linked Acrylic Teeth; Ashvin, India) were arranged within the limits established by the neutral zone record. Tooth positioning and arch form were developed in accordance with the functional space created by the surrounding musculature. Occlusal contacts were refined on the articulator to achieve balanced articulation and minimize destabilizing forces during functional movements.

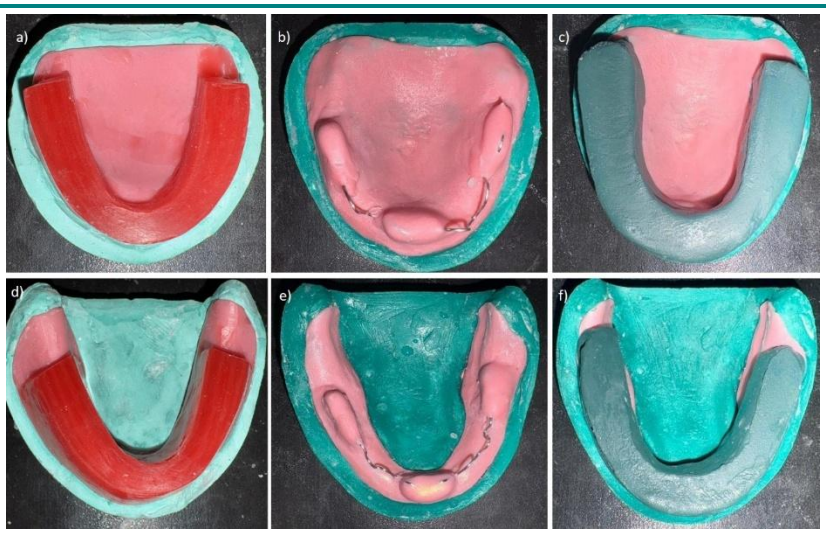

Figure 16. a) Wax occlusal rim; b) Maxillary denture base on master cast; c) Compound occlusal rim fabricated with impression compound; d) Wax occlusal rim; e) Mandibular denture base on master cast; and f) Compound occlusal rim fabricated with impression compound.

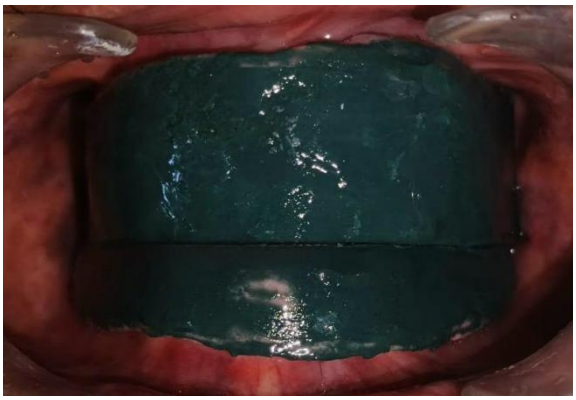

Figure 17. Maxillary and Mandibular occlusal rims with soft liner used as a dynamic recording medium.

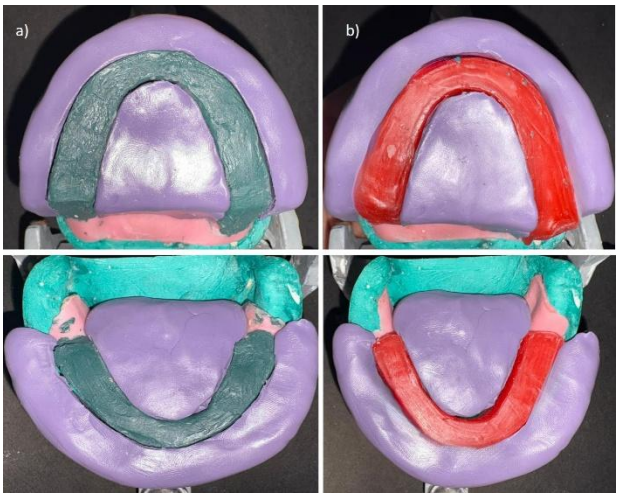

Figure 18. a) Silicone putty index fabricated around the recorded neutral zone to preserve functional contours; and b) Index used for wax rim fabrication at the recorded neutral zone.

Figure 19. Intraoral view of wax trial dentures.

3.8 Wax try-in

The trial dentures were evaluated intraorally to assess esthetics, facial support, phonetics, and occlusal harmony. Lip support, smile line, and overall facial appearance were examined, while speech was assessed using routine phonetic sounds. Functional movements were observed to verify denture stability and proper tooth positioning within the recorded neutral zone. Occlusion was rechecked both clinically and on the articulator, and necessary corrections were carried out before processing of the dentures.

3.9 Denture insertion

Following satisfactory clinical evaluation of the trial dentures (Figure 19), the definitive dentures were processed using conventional heat-cured polymethyl methacrylate (PMMA) acrylic resin. The finished prostheses were retrieved, finished, and polished before insertion (Figure 20). At the insertion appointment, pressure-indicating paste was used to identify and relieve any areas of excessive tissue contact. Occlusion was refined intraorally to obtain even centric contacts and smooth balanced articulation during eccentric movements. The patient was instructed regarding insertion and removal of the dentures, maintenance of oral and denture hygiene, and the expected adaptation period associated with the new prosthesis.

3.10 Post-operative evaluation

At post-insertion review appointments, the patient reported improved comfort and greater confidence while speaking and chewing compared to the previous dentures. Clinical examination demonstrated satisfactory retention and stability of both maxillary and mandibular prostheses during functional movements such as swallowing and phonation. Improved adaptation of the dentures to the surrounding musculature was observed, particularly in relation to denture stability during dynamic oral activity. Follow-up evaluations revealed satisfactory tissue response, functional efficiency, and patient acceptance of the prosthesis (Figure 21).

4. Discussion

The rehabilitation of completely edentulous patients, particularly those with compromised ridge morphology, remains a significant clinical challenge in prosthodontics [15]. Conventional complete denture fabrication techniques primarily rely on anatomical landmarks and static records, often neglecting the dynamic influence of surrounding musculature [16]. In such cases, instability, especially of the mandibular denture, is a common clinical finding. The present case series highlights the importance of incorporating the

neutral zone concept using a piezo-graphic approach with a soft liner to enhance denture stability and function.

As originally emphasized by Wilfred Fish, the polished surface of a denture plays a crucial role in stability, particularly when ridge support is compromised. With progressive alveolar ridge resorption, the denture-bearing area decreases, thereby reducing the contribution of the impression surface to retention [17]. Consequently, the role of tooth position and polished surface contour becomes more dominant. In such situations, positioning the denture teeth within the neutral zone allows muscular forces to contribute towards denture stabilization rather than dislodgement [18].

The neutral zone represents the region where the outward forces exerted by the tongue are balanced by the inward forces of the cheeks and lips [19]. This equilibrium is highly individualized and varies according to neuromuscular coordination. Failure to record and incorporate this functional zone during denture fabrication may result in instability, discomfort, compromised phonetics, and reduced masticatory efficiency [20].

Piezography offers a dynamic and physiologic method for recording the neutral zone through functional movements such as phonation, swallowing, and coordinated lip and tongue activity. Unlike conventional techniques that utilize static materials such as impression compound or wax, piezography records the functional denture space under physiologic conditions.21 In the present cases, phonetic sounds such as “ee,” “oo,” and “ma,” along with swallowing and facial movements, enabled accurate recording of the functional denture space.

A resilient soft liner was used as the recording medium instead of conventional materials such as zinc oxide eugenol or modeling compound [21,22]. Owing to its viscoelastic nature, superior adaptability, and prolonged working time, the soft liner responded effectively to dynamic muscular activity, thereby allowing more accurate molding of the neutral zone during functional movements [23,24].

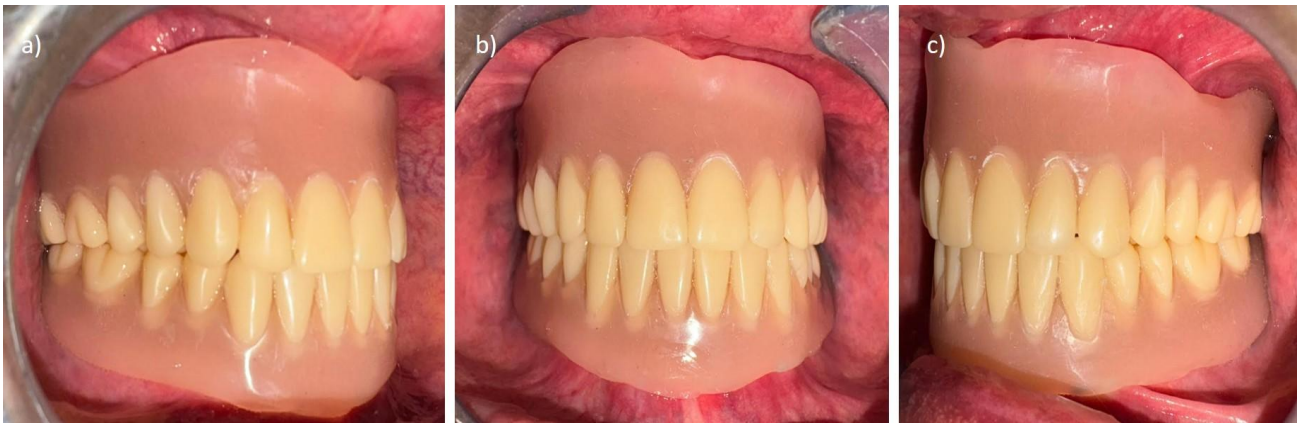

Figure 20. Final processed complete dentures inserted intraorally after finishing & polishing. a) Buccal view – Right; b) Frontal view; and c) Buccal view - Left.

Figure 21. a) Patient without dentures (extraoral view); and (b) Post-insertion extraoral view.

The use of a silicone putty index further ensured accurate transfer of the recorded neutral zone to the laboratory stage [25]. Preservation of the established contours is essential because distortion during wax replacement or tooth arrangement may compromise the functional benefits of the technique. The putty index enabled precise reproduction of the recorded contours and guided tooth arrangement within the functional denture space, thereby harmonizing the prosthesis with the patient’s neuromuscular dynamics [26].

The rationale for application of the neutral zone technique differed between the two cases. In Case 1,

the procedure was primarily utilized for the mandibular arch because mandibular dentures are generally more susceptible to instability owing to reduced denture-bearing area, accelerated ridge resorption, and greater muscular influence. Previous studies by Chandra SS emphasized the effectiveness of neutral zone recording in improving retention and stability in severely resorbed mandibular ridges [27]. Recording the functional denture space in such situations allows harmonious positioning of teeth and polished surfaces within the zone of muscular equilibrium, thereby minimizing destabilizing forces during speech and mastication.

In contrast, Case 2 warranted extension of the piezo-graphic technique to both arches. Although the neutral zone concept is conventionally associated with mandibular denture fabrication, certain clinical situations may justify its application in the maxillary arch as well. The patient exhibited a shallow palatal vault, increased circumoral muscular activity, and instability associated with the previous prosthesis. These conditions may alter the functional dynamics acting on the maxillary denture, particularly along the polished surfaces and anterior tooth region. Recording the neutral zone in the maxillary arch therefore facilitated placement of teeth and contouring of denture surfaces in harmony with muscular function. Studies involving functional impression and piezo-graphic techniques have also emphasized the importance of surrounding musculature in determining prosthesis stability and support the rationale for extending neutral zone recording beyond the mandibular arch in selected patients [28].

Clinically, both patients demonstrated improved denture stability, retention, phonetics, comfort, and masticatory efficiency following insertion of the prostheses. In Case 1, the procedure primarily addressed mandibular instability associated with muscular imbalance, whereas in Case 2, the technique was expanded to include the maxillary arch because muscular factors and palatal morphology significantly contributed to prosthetic instability. These findings indicate that the neutral zone concept should not be viewed solely as a mandibular procedure, but rather as a functional approach that can be selectively adapted according to individual patient requirements.

Although the technique requires additional chairside time and careful clinical execution, the present case series demonstrates that piezo-graphic recording with a soft liner is a practical, cost-effective, and biologically driven approach for enhancing complete denture stability in challenging edentulous situations.

5. Conclusion

The neutral zone concept remains a valuable approach in the prosthodontic rehabilitation of edentulous patients, particularly those with compromised ridge conditions. The piezo-graphic technique using a soft liner provides a simple, effective, and physiologically driven method for recording the neutral zone. This approach enhances denture stability, retention, and patient satisfaction by harmonizing prosthesis design with neuromuscular function.

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References

1. Emami E, de Souza RF, Kabawat M, Feine JS. The impact of edentulism on oral and general health. Int J Dent. 2013;2013:498305. https://doi.org/10.1155/2013/498305.
2. Jain P, Rathee M. Stability in mandibular denture. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2026. https://www.ncbi.nlm.nih.gov/books/NBK549861/. Accessed on 19.06.2026.
3. Limpuangthip N, Somkotra T, Arksornnukit M. Impacts of denture retention and stability on oral health-related quality of life, general health, and happiness in elderly Thais. Curr Gerontol Geriatr Res. 2019;2019:3830267. https://doi.org/10.1155/2019/3830267.
4. Feng Y, Feng Z, Li J, Chen J, Yu H, Jiang X, et al. Expert consensus on digital restoration of complete dentures. Int J Oral Sci. 2025;17:58.
5. El-Zawahry MM, El-Ragi AA, El-Anwar MI, Ibraheem EM. The biomechanical effect of different denture base materials on the articular disc in complete denture wearers: a finite element analysis. Open Access Maced J Med Sci. 2015;3:455-461. https://doi.org/10.3889/oamjms.2015.074.
6. Tallgren A, Tryde G. Relationships between facial morphology and activity of orofacial muscles in patients with a complete upper and a partial lower denture. J Oral Rehabil. 1995;22:643-651. https://doi.org/10.1111/j.1365-2842.1995.tb01062.x.
7. Chandra SS. Management of a severely resorbed mandibular ridge with the neutral zone technique. Contemp Clin Dent. 2010;1:36-39. https://doi.org/10.4103/0976-237X.62521.
8. Kraus BS, Jordan RL. The importance of the neutral zone in complete dentures. J Prosthet Dent. 1965;15:403-414.
9. Saravanakumar P, Thirumalai Thangarajan S, Mani U, Kumar VA. Improvised neutral zone technique in a completely edentulous patient with an atrophic mandibular ridge and neuromuscular incoordination: a clinical tip. Cureus. 2017;9:e1189. https://doi.org/10.7759/cureus.1189.
10. Cebi Gul B, Günel MD, Eyüboğlu TF, Özcan M. Neutral zone or conventional implant-retained overdentures? An assessment on quality of life, denture stability, patient satisfaction, and

maintenance requirements. BMC Oral Health. 2025;25:799. https://doi.org/10.1186/s12903-025-06207-8.
11. Agarwal S, Gangadhar P, Ahmad N, Bhardwaj A. A simplified approach for recording neutral zone. J Indian Prosthodont Soc. 2010;10:102-104. https://doi.org/10.1007/s13191-010-0019-8.
12. Baruah A, Leoney A. Utilization of neutral zone technique in complete denture fabrication for a class III sagittal jaw relation patient: a case report. J Clin Prosth Impl. 2024;6:16-19. https://doi.org/10.55995/j-cpi.2024004.
13. Awuti S, Wang TM, Ariani N, Naveau A, Somogyi-Ganss E, Hattori M, et al. Piezography approach to denture fabrication for a partial glossectomy patient: a clinical report. Int J Maxillofac Prosthetics. 2021;4:37-42. https://doi.org/10.26629/ijmp.2021.06.
14. Rodrigues S, Shenoy V, Shetty T. Resilient liners: a review. J Indian Prosthodont Soc. 2013;13:155-164. https://doi.org/10.1007/s13191-012-0143-8.
15. Akhtarkhavari M, Rajagopal P, Clovis Da Costa G, Aras M, Chitre V, Naik SG. Prosthodontic rehabilitation of a completely edentulous patient by salvaging ailing implants using a bar retained overdenture: a case report. Cureus. 2024;16:e63157. https://doi.org/10.7759/cureus.63157.
16. Rao S, Chowdhary R, Mahoorkar S. A systematic review of impression technique for conventional complete denture. J Indian Prosthodont Soc. 2010;10:105-111. https://doi.org/10.1007/s13191-010-0020-2.
17. Fish W. Using the muscles to stabilize dentures. J Prosthet Dent. 1964;14:670-681.
18. Beresin VE, Schiesser FJ. The neutral zone in complete dentures. J Prosthet Dent. 1976;36:356-367. https://doi.org/10.1016/0022-3913(76)90155-4.
19. Nanda A, Kaur H, Koli D, Verma M. A simplified technique to record neutral zone and cameo surface in complete denture. Indian J Dent Res. 2024;35:95-97. https://doi.org/10.4103/ijdr.ijdr_338_23.
20. Brill JJ, Tryde G, Cantor R. The dynamic nature of the neutral zone. J Prosthet Dent. 1965;15:419-433.
21. Frascaria M, Pietropaoli D, Casinelli M, Cattaneo R, Ortu E, Monaco A. Neutral zone recording in computer-guided implant prosthesis: a new digital neuromuscular approach. Clin Exp Dent Res. 2019;5:670-676. https://doi.org/10.1002/cre2.233.
22. Gupta R, Brizuela M. Dental impression materials. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2026. https://www.ncbi.nlm.nih.gov/books/NBK574496/ Accessed on 20.06.2026.
23. Zarb GA, Bolender CL. Prosthodontic treatment for edentulous patients. 12th ed. St Louis: Mosby; 2004.
24. Mierke CT. Viscoelasticity, like forces, plays a role in mechanotransduction. Front Cell Dev Biol. 2022;10:789841. https://doi.org/10.3389/fcell.2022.789841.
25. Sindi AS, Otudi HSA, Muslihi AAA, Althurwi RA, Sayed ME, Al-Makramani BMA, et al. Comparative evaluation of the dimensional accuracy of silicone-based putty reline impressions with different spacer acquisition techniques in fixed partial dentures. Med Sci Monit. 2025;31:e946537. https://doi.org/10.12659/MSM.946537.
26. Chaturvedi S, Gokhale ST, Bavabeedu SS, Reddy RN, Chaturvedi M. Establishing neutral zone to enhance stability: a case report. King Khalid Univ J Health Sci. 2016;1:31-34. https://doi.org/10.4103/1658-743X.291743.
27. Chandra SS. Management of a severely resorbed mandibular ridge with the neutral zone technique. Contemp Clin Dent. 2010;1(1):36–39. https://doi.org/10.4103/0976-237X.62521
28. Saravanakumar P, Thangarajan ST, Mani U. Improvised neutral zone technique in a completely edentulous patient with an atrophic mandibular ridge and neuromuscular incoordination: A clinical tip. Cureus. 2017 Apr 24;9(4):e1189. https://doi.org/10.7759/cureus.1189