Case report

Prosthetic rehabilitation of a patient with a palatal fistula and an atrophic mandibular ridge using admix material to record the neutral zone: A case report

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Abstract

Objective: In this case report, we employed an admix material to record the neutral zone in a patient presenting with a palatal fistula and an atrophic mandibular ridge.

Case report: In this case report, we present a 67-year-old edentulous female with a history of oropharyngeal carcinoma affecting the soft palate. A circular palatal fistula, measuring approximately 8mm×8mm, was identified at the junction of the hard and soft palate. The mandibular residual ridge displayed significant atrophy. The neutral zone was recorded using admix material, comprising three parts by weight of impression compound and seven parts by weight of tracing compound. The fabricated dentures yielded favorable outcomes in terms of denture stability, and patient comfort. The patient reported the absence of nasal regurgitation and a notable improvement in speech production due to the obturator prosthesis.

Conclusion: The neutral zone impression technique with admix impression material provided successful results in constructing both a mandibular complete denture and a maxillary denture with an obturator. The retention and stability of the complete denture were desirable and the patient was satisfied with the outcome.

Keywords: Alveolar ridge, Atrophy, Complete denture, Dental prosthesis, Fistula, Obturator

Introduction

Treatment for head and neck cancer encompasses a combination of radiation therapy, surgery, and chemotherapy (1). Following the treatments, soft palate defects are frequently encountered, giving rise to issues like hypernasality, unclear speech, and difficulties in swallowing (2). Moreover, communication with the nasal cavities may result in bacterial superinfections, leading to the development of sinusitis. Oropharyngeal surgical repair may not be a viable option for some patients due to factors such as age, cost, high recurrence rates, and a substantial incidence of morbidity (3). Consequently, prosthetic rehabilitation utilizing an obturator emerges as a preferable alternative.

The stability of complete dentures is intricately related to the neuromuscular system surrounding the oral cavity. The neutral zone also referred to as the zone of minimal conflict, represents the potential space where the inward forces of the lips and cheeks balance harmoniously with the outward forces exerted by the tongue (4). The neutral zone approach is advantageous for patients with highly atrophic ridges, neuromuscular incoordination, and a history of denture instability. Several case reports suggested that the neutral zone technique is effective in achieving both stability and adaptability in severely resorbed ridges (5, 6). Other studies indicated that neutral zone dentures exhibit greater retention and stability, leading to higher levels of patient satisfaction in comparison to conventional dentures (7).

Various materials, including impression compounds, tissue conditioners, waxes, and impression plaster, have been employed for recording the neutral zone, each having its advantages and disadvantages (8). However, admixed materials have been rarely used for this purpose. In this case report, we employed an admix material to record the neutral zone in a patient presenting with a palatal fistula and an atrophic mandibular ridge.

Clinical Report

A 67-year-old female presented to the Department of Prosthodontics with the primary concern of missing

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teeth, coupled with nasal regurgitation of food and difficulty in speech clarity. A comprehensive medical and dental history was documented. The patient had a history of Stage IV oropharyngeal carcinoma (soft palate) and had undergone four doses of Neoadjuvant chemotherapy (NACT).

Upon clinical examination, complete edentulism in both the maxillary and mandibular arches was observed, accompanied by a palatal fistula located at the junction of the hard and soft palate (Figure 1A). This circular fistula measured approximately 8 mm × 8 mm. Additionally, the mandibular residual ridge exhibited unfavorable characteristics due to significant resorption (Figure 1B).

The treatment plan involved the fabrication of a maxillary denture to obturate the fistula, coupled with the application of a neutral zone technique to enhance the retention and stability of the mandibular denture.

Treatment Procedure

The primary impression was taken using an irreversible hydrocolloid (Zelgan, Dentsply, India) in a perforated edentulous tray. Then, the primary cast was poured using dental plaster, and custom trays were fabricated from cold-cure acrylic material (Dental Products of India Ltd., Mumbai, India). For the maxillary arch, a single-step border molding was executed with polyether material (Impregum, 3M ESPE Inc., Minnesota, USA) (Figure 2A), while for the mandibular arch, the all-green technique was used (Figure 2B). A secondary impression was taken with polyether material (Figure 2C and 2D). Afterwards, the master casts were fabricated.

A tentative jaw relation was recorded using occlusal rims made from modelling wax (Figure 2E). Then, the lower occlusal rim was removed, and acrylic pillars were created in the canine and first molar area using self-cure acrylic resin (Figure 2F).

The neutral zone was captured using an admixed material comprising three parts by weight of the Pinnacle Impression Compound (Dental Products of India Ltd.) and seven parts by weight of Tracing Sticks (Dental Products of India Ltd.) (Figure 3A). This approach records the physiological dynamics of oral and perioral muscle function. Moreover, it facilitates peripheral tissue molding and eliminates the soft tissue folds during the impression procedure with minimal time and effort. The

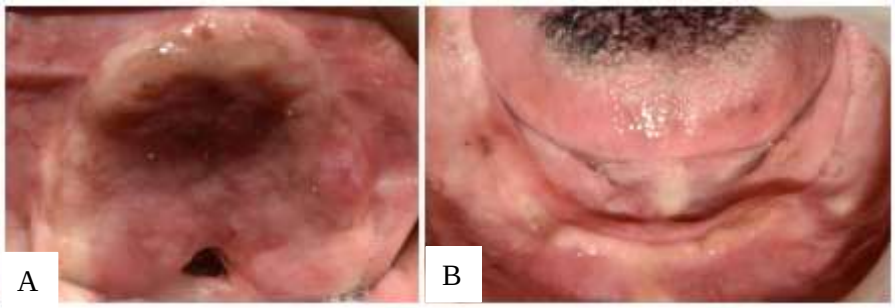

Figure 1. (A) Pre-rehabilitative maxillary occlusal view. (B) Pre-rehabilitative mandibular occlusal view.

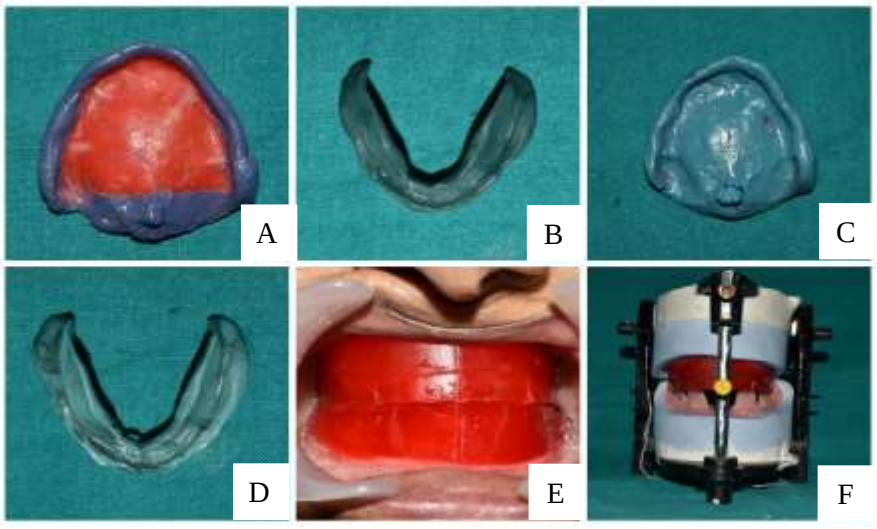

Figure 2. (A) Single-step border molding using polyether. (B) All green techniques to record atrophic mandibular ridge (C) and (D) Secondary impression. (E) Tentative jaw relation. (F) Self-cure acrylic pillars in canine and molar regions.

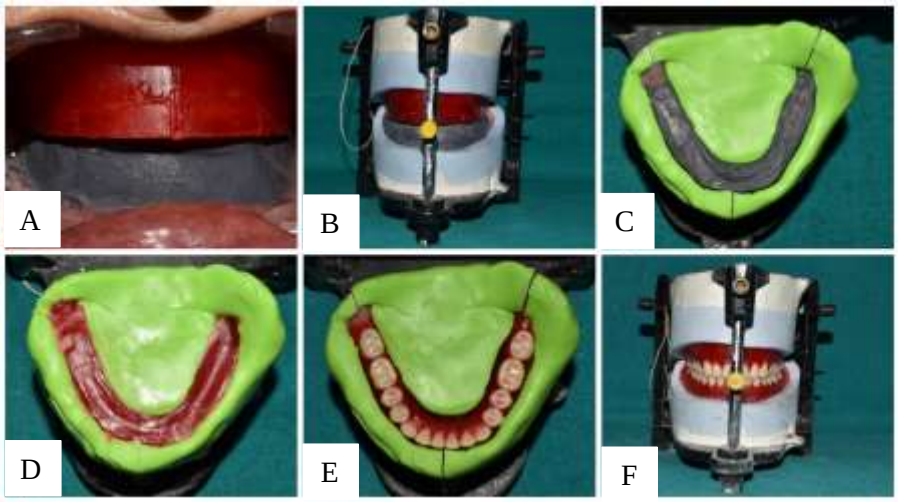

Figure 3. (A) Neutral zone recorded with admix material. (B) Articulated neutral zone record. (C) The silicone index. (D) Admix material was replaced with modelling wax. (E) Mandibular teeth arrangement in neutral zone. (F) Maxillary teeth arrangement is guided by mandibular teeth.

the patient actively engaged in regular mandibular movements, including swallowing, lip-sucking, and vowel pronunciation, aiding in the molding of the neutral zone.

After setting, the impression was removed from the mouth and placed back on the articulator (Figure 3B). Subsequently, a silicone index of the recorded neutral zone was prepared and sectioned into right and left facial indices and a lingual index to guide their removal and placement (Figure 3C). The neutral zone record was extracted, and acrylic stops were trimmed from the denture base. Using the silicone index, modelling wax was poured into the space representing the neutral zone, creating a new occlusal rim on the mandibular record base (Figure 3D). Mandibular teeth arrangement followed the index (Figure 3E), and maxillary teeth were arranged in alignment with the mandibular teeth (Figure 3F). To preserve the contours established by the silicone indices in the neutral zone, no additional wax was added to the denture flanges.

A wax try-in was conducted to assess mandibular record base stability, aesthetics, and intraoral occlusion (Figure 4A). The trial dentures were then conventionally processed in heat-cure acrylic resin. The extension of the maxillary denture in the defect was relined using a soft tissue liner to enhance retention. Upon insertion, the denture was examined for occlusion, retention, and stability (Figure 4B). The patient reported comfort with the prosthesis, noting the absence of nasal regurgitation and improved speech (Figure 4C).

Discussion

The prosthetic rehabilitation of patients with soft palate defects using obturator prostheses varies based on factors such as the location, size, and nature of the defect. Nevertheless, the primary goals of obturation remain consistent—to prevent inappropriate nasal resonance during speech and the escape of food into the nasal cavity during deglutition. Obturator prostheses play a crucial role in averting hypernasality and nasal regurgitation linked with velopharyngeal inadequacies (9). The case presented in this study revealed improvement in speech and a reduction in nasal regurgitation.

Figure 4. (A) Denture try-in. (B) Denture insertion. (C) Prosthesis in situ

Retention and stability challenges are more prominent in the mandibular arch, primarily because the covered surface area is roughly half that of the maxillary arch. Additionally, the palate enhances the maxillary denture bear area against tongue movement (10). This is particularly important when there's a loss of neuromuscular control or extensive resorption of the mandibular ridge has occurred. Effectively addressing such cases relies on the precise positioning of artificial teeth and establishing an optimal relationship between the polished surface of the denture and surrounding tissues (11).

The neutrocentric concept includes positioning mandibular posterior teeth as centrally as possible relative to the denture base without impeding necessary tongue function (12). A lingualized occlusion is recommended in these cases to reduce forces on denture-bearing areas while enhancing masticatory efficiency (13). The neutral zone technique aims to construct a denture in harmony with the surrounding musculature. This is accomplished by using various materials, including impression compounds, plaster, waxes, and tissue conditioners. However, these materials have some drawbacks. For instance, high-viscosity impression compounds limit dexterous oral functions. On the other hand, the impression plaster poses risks of swallowing fragments, and non-uniform softening of complete wax rims may impact adequate recording of functional movements. Tissue conditioners lack sufficient body, which makes them challenging to use (14). Materials for recording the neutral zone should offer sufficient flow and a reasonably slow setting to be properly molded by oral musculature (15). In our study, we utilized an admix material—a combination of impression compound and green stick compound in a 3:7 ratio—to mold the neutral zone. This low-viscosity material facilitated the manipulation of oral musculature, ensuring better flow and accuracy in impression (16).

Despite the positive outcomes in terms of patient satisfaction and function, it is important to acknowledge the limitations of this technique, including an increased chairside time and cost for recording the neutral zone.

Conclusions

The neutral zone impression technique with admix impression material provided successful results in constructing both a mandibular complete denture and a maxillary denture with an obturator. The results showed enhanced denture stability and improvement in patient speech and comfort.

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