



RESTORING ORAL FUNCTION IN AN EDENTULOUS PATIENT WITH ORAL SUBMUCOUS FIBROSIS: A COMPREHENSIVE CASE STUDY

Prosthodontics

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ABSTRACT

Aim and Background: Oral submucous fibrosis is the most predominant premalignant condition, where the development of fibrous bands in the oral cavity leads to reduced mouth opening and tongue movement. Limited mouth opening, mucosal rigidity, and reduced salivary flow make prosthodontic procedures difficult in these patients and compromise the stability, retention, and support of any removable prostheses. These patients have poor tolerance to any removable prostheses owing to the burning sensation in the mouth and mucosal rigidity. **Case description:** A 54-year-old patient presented with the chief complaint of difficulty in chewing due to an ill-fitting denture and reduced mouth opening. Oral Submucous Fibrosis was determined to be the diagnosis after a comprehensive clinical examination that included history-taking and diagnostic procedures. The treatment involved a multidisciplinary approach. Initially, the patient underwent medical management to control the disease progression and improve mouth opening. Subsequently, the patient received complete dentures for the rehabilitation of missing teeth with certain modifications to the conventional fabrication technique. Regular follow-up visits were conducted to evaluate the patient's progress. **Conclusion:** The comprehensive treatment approach employed in this case study successfully restored oral function in an edentulous patient with OSMF. The prosthodontic rehabilitation resulted in improved mouth opening, enhanced chewing ability, and overall improved quality of life for the patient. The modifications in the neutral zone technique played a pivotal role in achieving optimal outcomes. **Clinical significance:** This case study highlights the modifications made in recording the neutral zone for fabricating complete dentures in an edentulous patient with OSMF. Dentists can greatly enhance the quality of life for people who suffer from this condition by treating both the underlying disease and the functional consequences. This study contributes to the existing body of knowledge regarding restoration of oral function in OSMF patients and comprehensive treatment planning in achieving favorable outcomes.

KEYWORDS

Complete denture, mucosal rigidity, Prosthodontic rehabilitation of oral submucous fibrosis, neutral zone.

INTRODUCTION

Oral Submucous Fibrosis is defined as 'a debilitating, progressive, irreversible collagen metabolic disorder induced by chronic chewing of areca nut and its commercial preparations; affecting the oral mucosa and occasionally the pharynx and esophagus; leading to mucosal stiffness and functional morbidity; and has a potential risk of malignant transformation.'^[1]

This premalignant condition primarily affects South-East Asians, particularly in India, Bangladesh, Nepal, Burma, Vietnam, and South Africa.^[2] In India, OSMF occurs more often in women than men but the opposite is true for other regions. The patient's age ranges from 20 to 40 years.^[3] There are many contributing factors to the etiopathogenesis of OSMF, but areca nut-chewing in any form is thought to be the main cause. Chewing smokeless tobacco, consuming large amounts of chilies (capsaicin), betel nut alkaloids, chronic iron deficiency, vitamin B-complex deficiency, toxic levels of copper in foods and masticatories, malnutrition resulting in low serum protein levels, anaemia, hypersensitivity, autoimmunity, and genetic predisposition are all suggested as contributing risk factors.^[4,5,6,7,8,9]

The main symptoms of these individuals are intolerance to spicy food and rigidity of the lip, tongue, and palate, which results in restricted mouth opening and tongue movement.^[10] When patients with partial or complete edentulism are affected by OSMF, the task of restoring function becomes more challenging.^[11]

Treatment options for OSMF include conservative treatment including restriction or avoidance of high-risk habits, nutritional or supportive therapy, and oral physiotherapy; medical treatment includes intralesional injection of steroids, Placentex®, and fibrinolytic agents. Medical treatment is symptomatic and intended at improving the mobility of tissues.^[12]

Limited mouth opening, mucosal rigidity, and altered salivary flow make prosthodontic procedures difficult in these patients, from the

primary impression to insertion. The symptoms of OSMF adversely affect the stability, retention, and support of removable prostheses, and, in addition, the burning sensation in the mouth that these patients characteristically experience reduces the tolerance to the prosthesis.

Case Description:

A 54-year-old female presented with the chief complaint of difficulty in chewing food due to an ill-fitting denture for 5 years and wanted to get it replaced. The patient also complained of a burning sensation on having spicy food and restricted mouth opening for a few months (Figure 1). The patient had a habit of chewing betel nuts for about 20 years. She stopped the habit 7 years ago since she lost her teeth.

The intraoral examination (Figure 2) revealed:

- Maxillary ovoid edentulous arch representing Atwood's order IV and resorbed mandibular edentulous arch.
- A mouth opening of 25 mm.
- Palpable vertical white fibrous bands on buccal mucosa on both sides.

Based on these findings a clinical diagnosis of Stage 2 OSMF^[25] was made. Obtaining the peripheral seal was difficult due to fibrosis and stiffness. There was a reduction in the potential cubicle space of the mouth. The fibrous bands had resulted in a shallow as well as narrow vestibule affecting the stability of the denture.

In the pre-prosthetic phase, multivitamin tablets (Becosule-Z, SM fibro) were prescribed to the patient, and physiotherapy exercise i.e., opening and ballooning of mouth for 15-20 minutes at least 3 times a day was advised.

Local topical corticosteroid, (Tenovate, Apex) application along with Chlorhexidine mouthwash was administered. Fabrication of complete dentures using the neutral zone technique with some modifications was planned later on.



Figure 1: Pretreatment extraoral photograph



Figure 2: Intraoral view showing reduced mouth opening

Technique

After evaluation of the intraoral findings, it was decided to use the mucostatic impression technique and for that pre-existing maxillary and mandibular denture were selected. Impression was made in irreversible hydrocolloid impression material (Zhermack Tropicalgin), (Figure 3). Impression was disinfected with 2% glutaraldehyde solution and washed under tap water. The impression was poured using dental stone (Zhermack Elite Model Stone, Zhermack SpA, Badia Polesine [RO], Italy), and the base was made with dental plaster (Bombay Burmah Trading Corporation, Ltd., Mumbai, India). The custom tray was fabricated using autopolymerizing acrylic resin. (Figure 4)



Figure 3: Preliminary impression



Figure 4: Preliminary cast

A step-by-step procedure was carried out for making the final impression. The final border molding was done conventionally, using a low-fusing impression compound (DPI - Pinnacle Tracing Sticks, The Bombay Burmah Trading Corporation, Ltd., Mumbai, India), and the final impression was made with Condensation silicone light body impression material (Zhermack Zetaplus Light Body). The posterior palatal seal was established at the final impression stage, using a low-fusing impression compound (DPI - Pinnacle Tracing Sticks, The Bombay Burmah Trading Corporation, Ltd., Mumbai, India). (Figure 5)

The master casts were poured in dental stone (Zhermack Elite Model Stone, Zhermack SpA, Badia Polesine [RO], Italy) (Figure 6) and record bases were fabricated with self-cure acrylic resin for the maxillary cast and heat-cure acrylic resin for the mandibular cast to improve record base stability followed by the fabrication of wax rims.

Maxillary occlusal rim was adjusted for

1. Lip support to establish the normal contour of lips
2. Phonetics
3. Aesthetics, and
4. Occlusal plane was established.



Figure 5: Final impression



Figure 6: Final cast

On the mandibular trial denture base impression compound and tracing sticks were mixed to make it a bit softer to record the neutral zone. (DPI - Pinnacle Impression Compound and Tracing Sticks, The Bombay Burmah Trading Corporation, Ltd., Mumbai, India) It was adapted in the shape of the mandibular residual alveolar ridge. It was softened uniformly in a warm water bath and inserted into the mouth. The patient was given a cup of warm water to sip and instructed to sip and swallow several times. Apart from sipping and swallowing movements, the patient was instructed to pout, pucker, hold water in the mouth, and smile broadly. The procedure was repeated till the correct recording of the neutral zone was obtained (Figure 7, Figure 8)



Figure 7: Denture base to record the neutral zone



Figure 8: Neutral zone record

The vertical dimension was recorded by reheating the mandibular bite rim. The patient was guided in centric relation and instructed to swallow till both the rims are in contact. This procedure resulted in the creation of an anterior stop.

Excess material was trimmed. This tentative vertical dimension was evaluated by closest speaking space, Niswonger's method, overall facial support, and patient reported comfort. Freeway space was increased to 5-6 mm.

Centric relation was recorded using bite registration paste (Zhermack Occlufast Rock Bite Registration Material C200726).

Orientation of the maxilla was recorded using HANAU Spring Bow and the maxillary cast was mounted on the Hanau articulator using the facebow as a guide and the mandibular cast with centric relation record. (Figure 9, Figure 10)



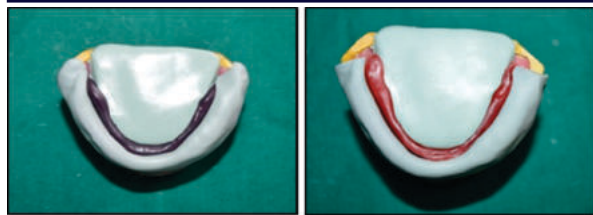
Figure 9: Facebow record



Figure 10: Facebow transfer

The condensation-silicone putty (Zhermack Zetaplus Putty) was used to make a neutral zone index. One rope was molded into the tongue space and another one on the labial and buccal surface of the neutral zone record.

We ensured that it completely filled in the tongue space, level with the occlusal plane, and extended up to the posterior land area of the cast. After polymerization, the index was checked on the cast without record to ensure complete seating. Melted wax was flown into the putty space after removing the recorded impression compound rim. And the lower wax rim was made. (Figures 11 & 12)



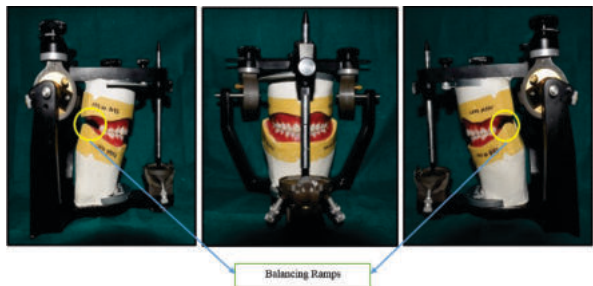
Figures 11 & 12: Putty index for the neutral zone

Non-anatomic monoplane teeth were selected for this patient. Maxillary and mandibular anterior teeth were arranged to satisfy the esthetics and phonetics, and the mandibular posterior teeth were arranged within the recorded neutral zone, touching the lingual index and at the level of the recorded occlusal plane. The maxillary teeth were arranged in maximum intercuspation with the mandibular teeth. (Figures 13, 14, 15)



Figures 13, 14, 15: Try-in

Balancing ramps were added distal to the second molar on the mandibular denture that was mounted on the Hanau articulator. The balancing ramps were adjusted such that there is a uniform contact of maxillary molars on the balancing ramp during the patient's protrusive movement of the mandible, making the lower denture more stable. And try-in of the denture was done. Hanau balancing ramp was confirmed intraorally during try-in. (Figures 16, 17, and 18)



Figures 16, 17, and 18: Teeth arrangement on the articulator

Metallic oxide paste was used to develop a polished surface contour. Polyvinyl siloxane light body can be used alternatively. To record the facial aspect of the maxillary trial denture, the patient was instructed to pucker his lips forward, smile broadly, open her mouth, and move the mandible side to side. The palatal surface was recorded by asking the patient to sip, swallow, and produce fricative and sibilant sounds. (Figure 19)



Figure 19: External surface impression

Mandibular labial and buccal surfaces were recorded by asking the patient to pucker her lips and move the mandible side to side. Finally, the mandibular lingual surface was recorded by asking the patient to sip and swallow water several times, protrude the tongue and touch the anterior palate, move the tongue from side to side, and lick the upper and lower lips.

Investment, processing, laboratory remounting, finishing, and polishing were done conventionally.

After processing, finishing, and polishing, a clinical remount was performed by a new centric record, and occlusal refining was done on the articulator.

After insertion, (Figure 20, 21) the patient was recalled for post-insertion adjustment at 48 hours and then asked to come for periodic checkups, initially at 1-month intervals to look for any signs of intolerance to the prosthesis in the form of redness and ulceration and, later, at 6-month intervals for the maintenance of oral health.



Figure 20: Denture insertion



Figure 21: After insertion

DISCUSSION:

Microstomia due to OSMF is the major hindrance in the fabrication of a complete denture in edentulous patients. A systematic review of 21 cases and analysis from 17 papers published in the English-language literature conducted in 2017 showed that 9 cases employed the sectional denture technique, 4 cases emphasized the need-based treatment approach in which conventional methods were modified, and 4 cases used mouth-exercising devices. Finally, 1 case each involved a flexible denture, oral screen prosthesis, oral stents, and surgery in conjunction with dentures.^[13]

In this case, the neutral zone technique with modifications was utilized to fabricate the complete denture prostheses.^[14] The neutral zone is defined as the potential space between the lips and cheeks on one side and the tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal.^[15] Since the patient suffered from OSMF, available space for denture teeth placement is altered; hence, the neutral zone concept proved beneficial to achieve the coordination of complete denture with the existing neuromuscular function.^[10]

Challenges during the prosthodontic rehabilitation phase, include insertion of the loaded impression tray, recording neutral zone incorporating functional movements, insertion of a trial denture, and the final prostheses.

Various techniques have been employed to manage patients with OSMF seeking oral rehabilitation. The techniques vary right from recording impressions, to neutral zone, jaw relations, and teeth selection.

Conventionally, impression compound is used for making a primary impression. But in this case, since the patient had OSMF, we used alginate impression material. Sheela K. et al described using silicon putty impression material by hand manipulation for primary impression.^[16] Kumar KA et al reviewed the literature published from 1971 to 2015 concerning preliminary impression techniques and described 9 techniques based on various tray designs for recording preliminary impressions in patients with Microstomia.^[17] These include numerous techniques employing flexible trays and sectional trays. In this patient, even though the mouth opening was reduced, it was sufficient which eliminated the use of sectional trays, so the making of both impressions [primary and final] of an individual arch was not a problem. Open-mouth impression was the technique of choice in the second half of the nineteenth century. Although anatomy, atmospheric pressure, extension, adaptation, and distribution of pressure were considered, tissue behavior was not given importance.^[18] The closed-mouth impression method was proven to be a solution for flat ridge cases.^[19] The closed mouth functional technique by Winkler has certain advantages; since it is time-saving, interference due to tray handling is eliminated; also there are fewer chances of under- or overextensions as movements are performed by the patient and pressure applied by the patient during impression-making is the same as the pressure applied while occluding.^[20]

In this case for making the final impression, first border molding was done then the closed mouth technique was employed to record functional movements and finally, the final impression was recorded with Condensation silicone impression material. Border molding was not done for the mandibular final impression due to insufficient vestibular space. Since the mandibular ridge was highly resorbed and offered no stability, therefore we used a heat cure resin for the mandibular trial denture.

The neutral-zone philosophy is based upon the concept that for each patient, there exists within the denture space a specific area where the function of the musculature will not unseat the denture and where forces generated by the tongue are neutralized by the forces generated by the lips and cheeks.^[21] Saravanakumar Pratibha et al used the improvised neutral zone technique which permits the patient to mold into the neutral zone with less amount of time and effort. In this patient, admix material where a combination of impression compound and green stick (low-fusing) compound in the ratio of 3:7 was used for recording the neutral zone taking into consideration our patient's history of neuromuscular incoordination.^[22] The mixing of a low-fusing compound with the impression compound results in a low-viscosity material allowing for ease in the manipulation of the oral musculature. The admix material allowed better flow and an accurate impression.

Occlusion is one of the main factors responsible for the success of a prosthodontic appliance. One study reported a case where semi-anatomic teeth were used to rehabilitate an edentulous patient with oral submucous fibrosis.^[10] Monoplane occlusion with balancing ramps was introduced by Sears wherein teeth that are flat mesiodistally and buccolingually.^[23] Non-anatomic teeth are indicated in the case of neuromuscular incoordination and flat or knife-edge ridges, rendering dentures more susceptible to horizontal force. In this case, the Monoplane occlusion was balanced with the use of customized balancing ramps placed distal to the mandibular second molar. The ramps provide a tripodal effect of contacts of denture bases. In eccentric relation, there is smooth contact anteriorly on teeth and posteriorly on the balancing ramp. Balancing ramp improves the horizontal stability of the denture.^[24]

CONCLUSION:

Limited mouth opening frequently complicates and jeopardizes medical and dental care. However, for the overall well-being of the patient, extensive treatment planning and thoughtful designing of prostheses should be done. To improve the patient's health status, supportive care should be given in addition to the prosthetic procedure. In this patient, the conventional complete denture was fabricated utilizing the neutral zone technique with modifications to meet with patient's special requirements.

Clinical Significance:

The objectives of the treatment include maximizing prosthesis stability, comfort, and function in a patient with reduced mouth opening and inelastic buccal mucosa by using an improvised neutral zone technique; locating the neutral zone; positioning the denture teeth in accordance with the neutral zone; and minimizing the ongoing diminution of the residual alveolar ridges. This case study emphasizes the significance of early intervention and comprehensive treatment planning in achieving favorable outcomes and highlights the modifications made in the neutral zone technique for fabricating complete dentures in an edentulous patient with OSMF.

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