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Meatus Obturator- An Innovative Method for Soft Palate Defect Management

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Abstract

Hard and soft palate abnormalities can pose challenging issues for prosthodontists. Among these, restoring soft palatal defects proves particularly challenging. This condition involves difficulty in achieving proper closure between the soft palate and the pharyngeal walls during activities like swallowing or speaking. Rehabilitating a palatal defect requires addressing challenges such as maintaining speech, chewing function, and appearance. For prosthodontists, the primary objective in each case is to create a prosthesis that not only repairs the defect but also enhances speech clarity, swallowing ability, chewing efficiency, aesthetics, and overall psychological well- being of the patient. When dealing with a maxillary defect using a fully or partially toothless obturator, the key considerations include ensuring secure retention, improved stability, and strong vertical support. This case study outlines a new method for fabricating a maxillary metal obturator for a patient with Velopharyngeal insufficiency, detailing each step of the process.

Keywords: Meatus Obturator, Soft Palate Defect, Prosthodontists, Velopharyngeal Insufficiency, Stability

Introduction

Maxillofacial Prosthetics combines artistic and scientific approaches to reconstruct or restore anatomical, functional, or cosmetic deficiencies using non- living substitutes. These substitutes are utilized to address missing or impaired areas in the maxilla, mandible, face, and other body parts due to surgical procedures, trauma, disease, or developmental anomalies. Defects affecting the hard and soft palates can be categorized into three types: congenital, acquired, and developmental (Taylor, 2000). Congenital cleft palate occurs when the normal embryological development of the hard and soft palates is disrupted or incomplete. Acquired defects, such as those resulting from surgical removal of neoplastic tissue, alter the continuity of the soft palate. Functional deficiencies in the soft palate may stem from developmental, muscular, or neurological conditions. In such cases, an obturator, also known as a speech aid or speech bulbprosthesis, is crafted to achieve closure between the existing hard and soft palatesand the pharynx. A soft palate cleft represents one of the most frequent causes of velopharyngeal incompetence, where the soft palate fails to effectively seal with the posterior or lateral pharyngeal walls. Veau's 1922 classification categorizes congenital defects of the soft palate into four types. Class I involves the soft palate only, potentially including a submucous cleft. Classes II, III, and IV affect bony structures, either unilaterally or bilaterally. Both acquired and congenital defects of the soft palate can result in velopharyngeal insufficiency, impacting the function of muscles and structures needed for closure with the pharynx. This condition can cause nasal regurgitation of liquids, hypernasal speech, nasal escape, speech sound errors, and reduced speech clarity. A palatal meatus obturator is recommended when the entire soft palate is absent in edentulous patients. This clinical case report details the restoration of a congenital defect of the soft palate using palatal meatus obturator prosthesis. The prosthesis aims to reconstruct the physical barrier between the nasopharynxand oropharynx.

Case Report

A 55-year-old female patient reported to the department of Prosthodontics, crown and bridge with a chief complaint of missing teeth in her upper left back teeth region and lower right and left (Front and back) teeth region along with difficulty in chewing food. Intraoral examination revealed a residual palatal defect. On extraoral examination hypernasality of voice was observed. Upon investigation of the patient's history, it was discovered that they had a congenital defect of thesoft palate, which had not undergone any previous surgical repair.

Diagnosis and Treatment Plan

The patient presented with a Veau's Class I cleft palate defect and partially edentulous maxillary and mandibular arches. Due to financial constraints, the patient declined surgical reconstruction or any implant- supported prosthesis. Therefore, it was planned to fabricate definitive mandibular removable partial denture (Cusil) and maxillary removable partial denture prosthesis along with meatus obturator to close the velopharyngeal defect so as to improve retention, phonetics and enhance mastication. The patient was informed about the procedure and the expected outcomes of the treatment plan, and she willingly provided consent for the procedure.

Procedure

An 18- gauge wire loop is incorporated into the posterior border of the denture using autopolymerizing acrylic resin. The loop is horizontally extended to pass behind the

remaining soft palate tissue and then vertically into the region of the posterior nasal openings. Care is taken to ensure the loop does not contact the mucosa at any point and is narrow enough at the isthmus to avoid interfering with the function of residual muscles. 1. A primary impression was taken using condensation silicone putty (Dental World Official Zetaplus Condensation Silicone Putty). The putty material was thoroughly mixed and loaded over the selected tray and placed inside the mouth gently with required physiologic pressure, carefully inserted into the soft palate defect area without risking any trauma to the soft tissue. Once the material had fully set, it was gently removed from the defect area. A thread was attached to the recorded impression, which ensured stability and facilitated easy retrieval of the impression. Subsequently Mandibular alginate impression was made. 2. The primary casts were poured in dental stone for enhanced strength and detailed reproduction. 3. On the preliminary cast, a 2mm wax spacer was adapted on remaining teeth with tissue stops, extending 4mm short of the sulcus, and the defect area was filled with wax to create a concave surface on the upper side. A custom tray was then fabricated using auto-polymerizing acrylic resin, designed to extend 2 mm short of the sulcus. 4. The fabricated custom tray was inserted into the patient's mouth to ensure it did not cause any trauma or blanching of the soft tissue. This step is crucial to prevent mucocompressive impression making, which could potentially affect the stability of the prosthesis later on. 5. Conventional sectional border moulding using fusing modelling compound (DPI PINNACLE tracing sticks, India) was done to record the borde of edentulous region in functional state within the physiological limits. 6. Final border moulding was conducted intraorally to assess soft tissue response and identify any necessary adjustments for optimal custom tray retention. Similarly, conventional border moulding was performed in the mandibular arch to ensure accurate border definition within physiological limits, crucial for achieving secure retention. 7. During the secondary impression process, the wax spacer was carefully removed from both the upper and lower trays. 8. Multiple relieving holes were then created using a frenum relieving bur along the mid- palatal raphe and alveolar ridge regions. Vinylpolysiloxane (Reprosil regular body) elastomeric material was used for the secondary impression in the upper arch, while pick up impression with alginate was done for lower arch. 9. Conventional beading and boxing were performed on both impressions, which were subsequently poured to create the master cast. 10. The master cast was duplicated using reversible hydrocolloid material as a precaution in case the original cast was damaged during the acrylic process. 11. Denture base was constructed on the maxillary cast using pink heat-cured acrylic resin. The defect area defect area within the wax rim was filled with gypsum to block out the region. Retention clasps were fabricated bilaterally for the maxilla to enhance retention. 12. Occlusal wax rims were created on the denture bases using modeling wax. The vertical and centric jaw relations were recorded using the 'Nick and Notch' method and subsequently mounted on the mean value articulator. 13. Later, a 'try-in' procedure was performed intraorally to confirm the centric relation, occlusion, phonetics, and aesthetics in a traditional manner. During this stage, the fit and function of the velopharyngeal obturator were assessed to detect hypernasality of voice and fluid regurgitation. The patient sat upright and was instructed to drink water from a glass to observe any signs of regurgitation during swallowing, thereby verifying functional sealing. 14. The final wax-up was completed, followed by dual curing using pink heat- cured acrylic resin with the compression moulding technique. 15. After curing the prosthesis, it was delicately removed from the cast, meticulously finished, and polished. Once placed in the patient's mouth, the prosthesis was assessed for correct

extension using pressure-indicating paste. Any identified pressure points were promptly relieved. The patient received training on how to insert and remove the prosthesis. Post-insertion instructions were provided, and regular follow- up appointments was recommended. The patient expressed satisfaction with the prosthesis, noting significant improvements in swallowing and speech. 16. The definitive prostheses were delivered to the patient following necessary adjustments, and the patient was recalled after 24 hours for final adjustments. Subsequently, continuous recall visits were scheduled every month for six months to monitor and observe the patient. 17. After six months, the patient was recalled and examined. He expressed satisfaction and reported using the obturator comfortably without any discomfort. There was a noticeable decrease in hypernasality of his voice, which was confirmed by his family members as well. The patient expressed high satisfaction with the prosthesis and the overall treatment outcome.

Fig.1: Stock Tray Extension with Orthodontic Wire

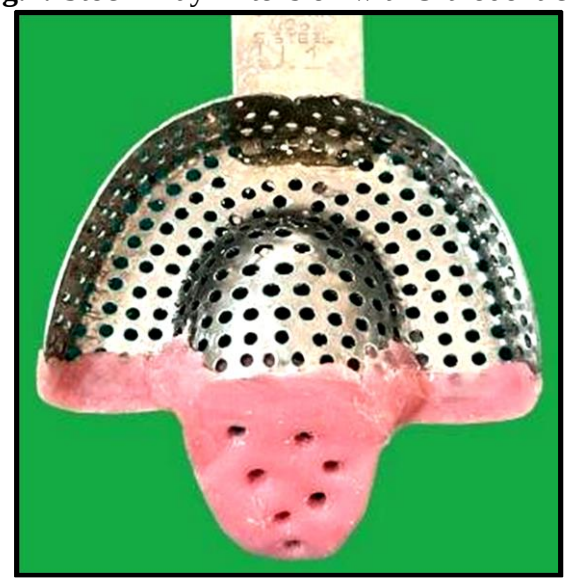

Fig.2: Stabilizing The Wires With Autopolymerising Acrylic Resin

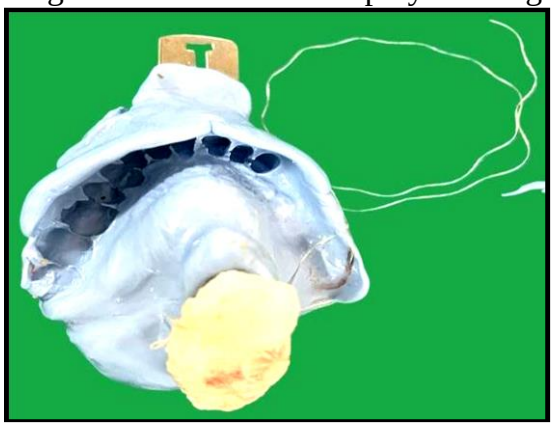

Fig. 3: Primary Impression

Fig.4: Primary Cast

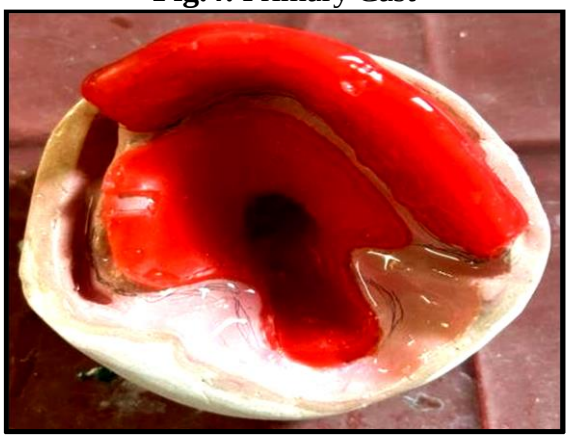

Fig.5: Wax Spacer

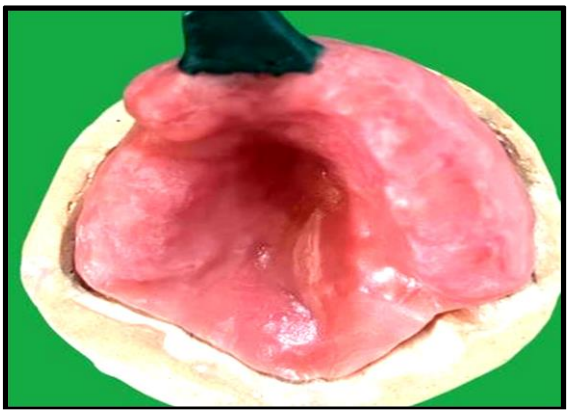

Fig.6: Fabrication of Custom Tray

Fig 7: Sectional Border Moulding

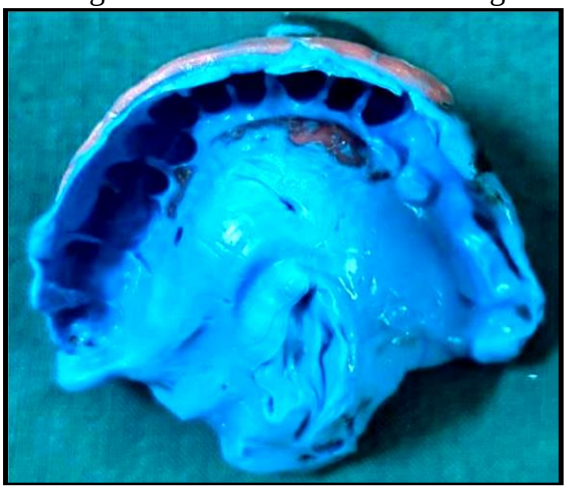

Fig 8: Secondary Impression

Fig 9: Master Cast

Fig 10: Occlusal Wax Rims

Fig 11: Try-In

Fig 12: Final Wax-Up

Fig 13: Final

Discussion

The velopharynx serves as a three-dimensional muscular valve positioned between the nasal and oral cavities, comprising the lateral and posterior pharyngeal walls along with the soft palate. Its primary function is to regulate the passage of air. Any issues affecting this valve, whether due to insufficient tissue (velopharyngeal insufficiency) or inadequate movement (velopharyngeal incompetence), can lead to velopharyngeal dysfunction. Patients with such dysfunction typically experience impaired speech clarity, nasal secretions entering the oral cavity, and vice versa. Additional symptoms may include difficulties in swallowing (deglutition), altered resonance, articulation challenges, and hypernasality. Treatment options for velopharyngeal dysfunction vary and may involve surgery, prosthetic devices, speech therapy, or a combination thereof, depending on the specific case. Velopharyngeal deficiencies can be categorized based on physiological and/or structural criteria into two main types: Palatal insufficiency and Palatal incompetency. The optimal protocols for prosthetic treatment of patients with a palatal defect can be categorized into three stages: immediate obturator, interim obturator, and definitive obturator. Each type of obturator serves specific purposes and meets the patient's needs at different phases of treatment. In this case, the patient presented with a soft palate defect where retention was achieved through fabrication of retentive clasps in the maxillary arch bilaterally. The limitation was noted due to the absence of a post-dam, which resulted in an inadequate posterior palatal seal. However,

adequate retention was achieved by extending the obturator upward. Stability of the prosthesis was primarily ensured by the maxillo-mandibular occlusion. The aesthetic and phonetic outcomes were highly satisfactory in this case, as acknowledged by the patient's family members.

Conclusion

The primary objective of treating hard and soft palate defects is to prevent leakage of liquids and food between the oral and nasal cavities, enhances speech clarity, and improves chewing function. Retention and stability of the prosthesis can be achieved through various means such as implants, remaining teeth, or utilizing hard and soft tissue undercuts. Prostheses can be designed as a single unit or in sections, tailored to the patient's specific dental and maxillary condition. However, this approach may not be economically feasible for every patient. In cases of completely or partially edentulous maxilla complicated by Velopharyngeal insufficiency, the Meatus obturator offers enhanced retention and stability of the prosthesis. This design also facilitates comfortable breathing, restores masticatory function, and prevents fluid regurgitation through the nose. It represents a valuable treatment alternative to surgical interventions for completely and partially edentulous patients with cleft palate defects.

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