

Case Report

Rehabilitation of Completely Edentulous Patient with Cleft Palate Using Neutral Zone and Palatogram Technique

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Abstract: Cleft lips and palates are congenital anomalies affecting the mouth and face. For fully edentulous patients with a cleft palate, crafting complete dentures is particularly challenging. These dentures, which incorporate an obturator and extend into the palate, must be meticulously designed to address issues related to appearance, speech, swallowing, and chewing. Treatment for cleft lip and palate aims to restore function, speech, and aesthetics through the use of fixed prostheses, removable prostheses, and implants. The approach should follow key principles of oral rehabilitation, including maintaining proper physiology, stability, aesthetics, hygiene, and considering patient expectations. To ensure the durability of prosthetic solutions, it is crucial to respect both the periodontal and dental tissues and the biomechanics of the prosthesis. Palatogram is an effective and straightforward technique for assessing and verifying palatal contours, which helps in addressing speech deficiencies related to affected sounds. Managing completely edentulous adults with cleft palates, particularly those who have not undergone surgical intervention, presents a significant challenge for prosthodontists. This case report explores the use of a conventional complete denture for a cleft palate patient, utilizing the palatogram technique to precisely record the palatal contours, the neutral zone technique to optimize denture stability by aligning forces in harmony with oral musculature, and monoplane teeth to reduce lateral forces and enhance denture stability. Together, these techniques aim to improve speech, mastication, and comfort, providing a functional and aesthetic prosthesis suited to the patient's unique anatomical needs. This case demonstrates the successful rehabilitation of an edentulous cleft palate patient using a conventional complete denture with specialized techniques to address the unique anatomical and functional challenges presented. The neutral zone technique, monoplane teeth arrangement, and palatogram technique were crucial in achieving a stable, functional, and aesthetically pleasing denture. These methods helped optimize denture retention and stability, improve phonetics, and enhance masticatory efficiency, providing the patient with a significant improvement in quality of life and self-confidence. For patients unable to pursue more invasive and costly implant-supported options, such techniques offer a viable and effective solution for complete denture fabrication, allowing for functional and aesthetic rehabilitation within economical constraints.

Keywords: Complete Denture, Palatogram, Neutral Zone, Cleft Palate.

INTRODUCTION

Cleft lip and palate represent a congenital anomaly characterized by an opening between the oral and nasal cavities, accompanied by dental malformations or absence of teeth near the cleft and restricted growth of the maxilla in both sagittal and transverse dimensions. Advancements in understanding the etiology and multidisciplinary management of cleft lip and palate have enabled patients to participate more fully in social and functional aspects of life. This understanding has led to the development of a variety of treatment philosophies that address the anatomical, functional, and psychosocial needs of these patients.

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Cleft palate repair typically involves a series of surgical interventions, beginning with cheiloplasty (lip repair) in early infancy and followed by palatoplasty (palate repair) later in childhood. Despite these surgical procedures, the need for additional rehabilitative support often persists, particularly through prosthetic devices. Depending on the type and extent of the cleft, various factors—such as speech, hearing, occlusal development, and craniofacial growth—may be affected, necessitating a collaborative, multidisciplinary approach to achieve comprehensive rehabilitation.

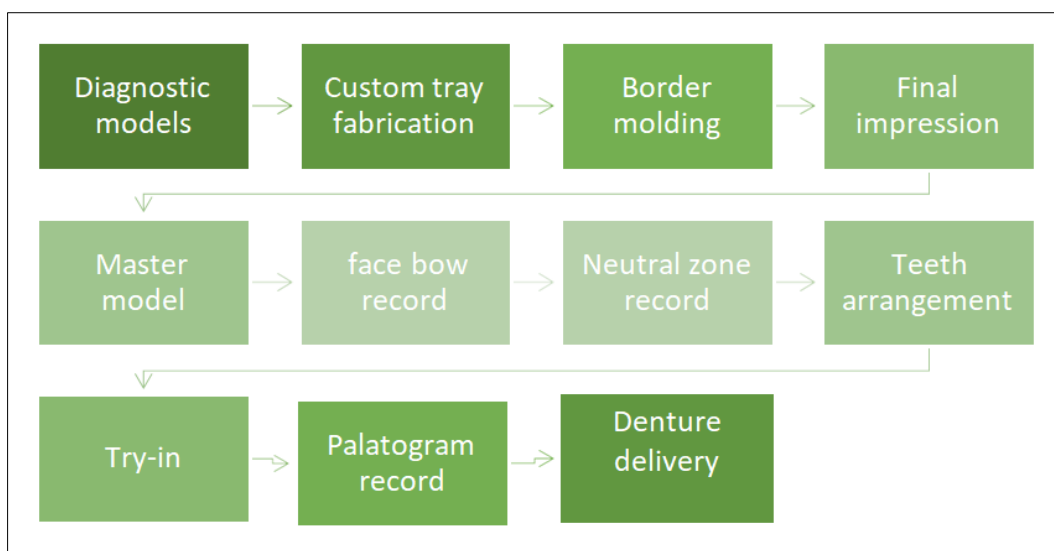
The prosthodontist contributes significantly to the rehabilitation process, offering prosthetic options that enhance function and aesthetics, thus supporting psychological and social well-being. Additionally, treatments like alveolar bone grafting help create a stable foundation in the cleft region, improving support for adjacent teeth and the structural integrity of the maxilla. Implant- retained prostheses offer advantages in retention, stability, and chewing efficiency compared to conventional removable prosthetics, though implants require more invasive procedures. Managing edentulous patients with a cleft palate presents unique challenges due to the compromised anatomy and oronasal communication associated with the defect. Traditional denture fabrication may be insufficient in providing stability, retention, and functional occlusion for such patients. This case report explores the use of a conventional complete denture for a cleft palate patient, utilizing the palatogram technique to precisely record the palatal contours, the neutral zone technique to optimize denture stability by aligning forces in harmony with oral musculature, and monoplane teeth to reduce lateral forces and enhance denture stability. Together, these techniques aim to improve speech, mastication, and comfort, providing a functional and aesthetic prosthesis suited to the patient’s unique anatomical needs.

CASE REPORT

A 56 year old male patient reported to the department of prosthodontics with chief complain of difficulty in chewing and unesthetic appearance, on extra oral examination it was noticed that patient had asymmetrical facial symmetry, healed scarring for operated cleft lip as when patient was 10 months old. On intra oral examination it was noted that patient underwent complete extraction in maxilla and mandible due to poor periodontal health of teeth and increase incidence of caries in the teeth. On acquiring about the congenital defect patient expressed on how the defect was operated when he was 10 months old, due to economical constraints patient could not undergo further surgeries to completely close the defect hence patient also complained of food getting entrapped in the open palatal defect. Various treatment options were explained to the patient which were inclusive of rehabilitation using all on 4 or all on 6 concept, rehabilitation with patient specific implant, implant supported overdenture and conventional complete denture. Due to economical constraints patient opted for conventional complete denture.

The intra oral inspection of the patient lead to the conclusion that maxilla was severely resorbed posteriorly with partially closed palatal defect in pre-maxilla and resorbed mandibular ridge which indicated for neutral zone technique and using monoplane teeth for better stability of the denture. Also to incorporate palatogram technique to enhance the phonetics of the patient which prior to treatment was nasally.

The following were the decided treatment steps of the patient:



The radiograph showed resorbed maxilla and mandible. After selecting proper impression trays, heat molded edentulous trays were used to take the primary diagnostic impression. The partially closed palatal defect in the pre-maxilla

was closed using a gauze ball with floss attached to it, to prevent it from going deep into the defect, primary impressions were taken using irreversible hydrocolloid material i.e. alginate. Undercuts on the diagnostic casts were blocked using modelling wax and custom trays were fabricated with auto-polymerized acrylic resin. Border molding was carried out a silicone putty in maxilla and with a green stick impression compound in mandible. To record the posterior extension of the denture, the patient was asked to bend the head forward slowly, touch the chest, and then move it backward. The patient was also asked to say *ah* phonate repeatedly and forcefully. The impression surface was adjusted till the patient was satisfied with the speech and comfort. Secondary impressions were made with light-body elastomeric impression material in maxilla and in mandible. After obtaining the master models, face-bow record was taken followed by doing the neutral zone technique. After fabricating record bases on maxilla and mandible, two pillars were made on mandible record base in the posterior region, a rim of green stick was made over which soft liner rim was made and placed in patients' mouth. Patient was asked to do the functional movements like puckering of lips, sucking, lateral movements of tongue, touching the upper lip with the tip of tongue. After the soft liner rim was set, it was taken out from patient's mouth and putty index was made around the obtained rim along with index with POP (plaster of paris) was also made as it's more stable while making the final occlusal rims when compared with putty index. Occlusal rims were made using modelling wax and teeth arrangement was done using monoplane teeth, during try in palatogram technique was done using unscented talcum powder mixed with olive oil, the mixture was applied on the palatal surface of the maxillary record base and both the record bases were placed in patient's mouth and patient was asked to say the vowels A, E, I and U. Alphabet O was eliminated as its pronunciation doesn't cause the tongue to touch the palate other alphabets which were asked to pronounce were K, J, C, CH. The recorded pattern was stabilized using mock up wax and rugae was duplicated from another patient's master which had prominent rugae. Dewaxing was done using the coring technique and denture was cured. Patient was given post insertion instructions on the day of denture delivery, the denture lacked proper retention which was enhanced using permanent soft liner on maxilla. Patient was satisfied with the denture as it enhanced the masticatory ability, phonation and esthetics of the patient's profile.



Fig. 1: Extra Oral View



Fig. 2: OPG



Fig. 3: Intra Oral View



Fig. 4: Intra Oral View

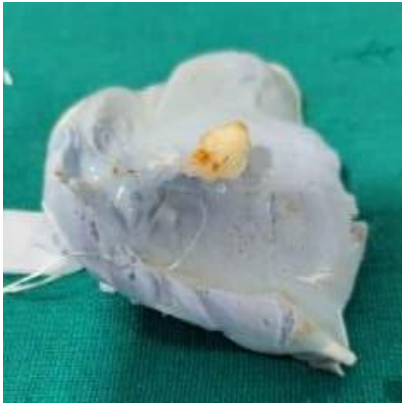


Fig. 5: Diagnostic Impression



Fig. 5: Diagnostic Impression



Fig. 5: Diagnostic Impression



Fig. 8: Diagnostic Models



Fig. 8: Diagnostic Models



Fig. 10: Maxillary Custom Tray

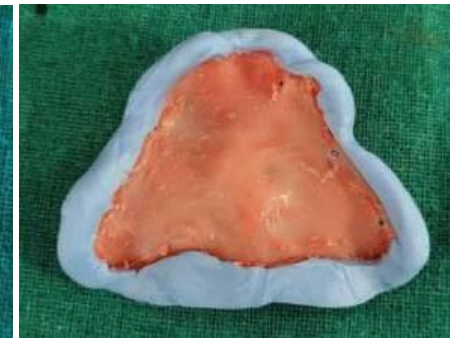


Fig. 11: Maxillary Border Molding with a Silicone Putty



Fig. 12: Maxillary Final Impression with Light Body



Fig. 13: Mandibular Final Impression with Light Body





Fig. 14: Face Bow Record

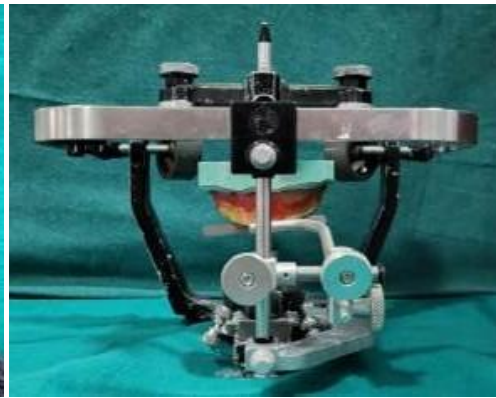


Fig. 15: Face Bow Transfer



Fig. 16: POP Index



Fig. 17: Putty Index



Fig. 18: Neutral Zone Record and Transfer



Fig. 19: Teeth Arrangement Try-in



Fig. 20: Palatogram Record



Fig. 21: Rugae Index



Fig. 22: Rugae Transfer



Fig. 23: Dewaxing



Fig. 24: Coring Technique



Fig. 25: Final Denture

DISCUSSION

Rehabilitating edentulous patients with cleft palate defects using conventional complete dentures presents distinct functional and anatomical challenges. Achieving optimal retention, stability, and occlusion is complicated by the lack of a continuous palatal structure and often, irregular maxillary arch contours. This case report utilized the palatogram and neutral zone techniques alongside monoplane teeth to address these issues and improve the prosthetic outcome. The palatogram technique played a crucial role in capturing the specific palatal contours and the dynamic contact points between the tongue and the palate, essential for creating a denture that accommodates speech and swallowing. By recording the unique surface characteristics of the cleft palate region, the palatogram provided valuable guidance in customizing the prosthesis to enhance patient comfort and reduce the likelihood of gagging or air escape through the oronasal communication. The neutral zone technique allowed for the strategic positioning of the denture within the neutral zone, the area where forces from the tongue and cheeks are balanced. This approach is particularly beneficial for cleft palate patients, as it minimizes the risk of denture displacement due to atypical muscle dynamics or irregular maxillary arch form. By aligning the denture with the natural muscular forces, the prosthesis achieves greater stability during functions like speech and mastication. The neutral zone technique is a proven method for improving retention in patients with challenging maxillofacial anatomy and was essential in this case for delivering a stable, functional denture. Monoplane teeth were selected to reduce lateral forces on the prosthesis, which is especially important in cases involving cleft palate, where excessive lateral movements can destabilize the denture. Unlike cusp teeth that require precise intercuspation, monoplane teeth offer a simplified occlusal scheme that reduces horizontal stresses during chewing. This is beneficial for patients with cleft palate, as it minimizes the risk of lateral displacement and increases comfort and functionality, particularly for patients with limited biting forces or compromised oral anatomy. Overall, the integration of these techniques demonstrates an effective approach to fabricating a conventional complete denture for a cleft palate patient. By considering the unique anatomical and functional needs of the patient, these methods contribute to enhanced stability, comfort, and performance of the denture. This approach can serve as a useful protocol for other prosthodontic cases involving cleft palate patients, offering them a non-surgical, cost-effective option for achieving oral rehabilitation and improved quality of life.

CONCLUSION

This case demonstrates the successful rehabilitation of an edentulous cleft palate patient using a conventional complete denture with specialized techniques to address the unique anatomical and functional challenges presented. The neutral zone technique, monoplane teeth arrangement, and palatogram technique were crucial in achieving a stable, functional, and aesthetically pleasing denture. These methods helped optimize denture retention and stability, improve phonetics, and enhance masticatory efficiency, providing the patient with a significant improvement in quality of life and self-confidence. For patients unable to pursue more invasive and costly implant-supported options, such techniques offer a viable and effective solution for complete denture fabrication, allowing for functional and aesthetic rehabilitation within economical constraints.

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