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Original Article

Integrating Rapid Maxillary Expansion and Le Fort Osteotomy for Esthetic Rehabilitation: A Clinical Case Report

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ABSTRACT

Achieving optimal pink and white esthetics is essential in the rehabilitation process, but it can be challenging when relying solely on surgical or prosthetic approaches. Successful esthetic restoration requires careful planning and a multidisciplinary approach for the best results. This case report describes the use of a fixed gingival prosthesis to treat a Siebert's Class III anterior ridge defect following Le Fort osteotomy and rapid maxillary expansion. A 17-year-old female presented with missing teeth and dissatisfaction with her smile. Upon clinical evaluation, a ridge defect and skeletal class III malocclusion were noted, alongside a constricted maxillary arch and crossbite. A comprehensive treatment plan was developed, beginning with rapid maxillary expansion to correct the crossbite. This was followed by Le Fort I osteotomy, fixed orthodontics, and the placement of CAD CAM gingival veneer prostheses to restore the anterior edentulous region and address the dental deformities. Through effective planning and collaborative team efforts, the treatment was completed. A multidisciplinary approach is essential to achieve positive results in such cases.

Keywords: Gingival prosthesis, Esthetics, Seibert class III defect, Residual ridge resorption.

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Introduction

Esthetics is a primary concern for patients who have high aesthetic demands. A comprehensive treatment plan that addresses both surgical and non-surgical aspects, with an interdisciplinary team approach, is highly recommended. Identifying problems and diagnosing them accurately allows for a personalized treatment strategy tailored to each patient. Missing teeth not only affect functionality but also impact the psychological well-being and overall appearance of patients. Therefore, replacing missing teeth and managing the lost alveolar ridge remains a considerable challenge for clinicians.

Preserving and reproducing optimal mucogingival aesthetics are fundamental goals in patient rehabilitation, though this can be difficult to achieve from both prosthetic and surgical perspectives. Achieving harmony between gingival and tooth proportions, whether through fixed or removable prosthetics, can often be a complex procedure [1]. The challenge may intensify in patients with a "high smile line" [2, 3], where varying lengths of teeth are exposed in the aesthetic zone. In such cases, the use of a 'gingival prosthesis' can significantly improve the aesthetic outcome, particularly for patients with a high smile line. A well-planned esthetic rehabilitation is achievable through a multidisciplinary approach, which offers the best outcome.

Malocclusion, clefts, and a constricted maxilla are contributing factors that impair esthetics. For Class III malocclusion combined with clefts, a surgical approach is often recommended along with maxillary expansion to address the constricted maxilla. Orthodontic correction is a non-invasive method to align teeth, and missing spaces post-orthodontic treatment can be restored using prosthetics. A gingival veneer is a prosthetic device placed on the labial aspect of the dental arch to restore mucogingival contours and enhance aesthetics in areas with periodontal tissue deficiencies. Siebert Class III defects, characterized by severe ridge loss both horizontally and vertically, are common yet challenging to restore. Proper diagnosis and treatment planning are crucial for the success of restorative treatments, leading to long-term patient satisfaction. This case report describes the use of a fixed gingival prosthesis to treat a Siebert's Class III anterior ridge defect following Le Fort osteotomy and rapid maxillary expansion.

Case Report

A 17-year-old female patient presented to the Department of Prosthodontics with concerns about missing teeth and dissatisfaction with her smile. Upon clinical examination, a ridge defect and skeletal class III malocclusion with a narrowed maxillary arch was observed (**Figure 1**). An interdisciplinary treatment plan was devised to address the deformity. Initially, rapid maxillary expansion was performed while a bonded hyrax appliance was used to widen the maxillary arch, followed by Le Fort 1 osteotomy. To correct the Class III malocclusion, fixed orthodontic treatment was employed (**Figure 2**). After completing the orthodontic and surgical phases, the patient was referred back to the Prosthodontics Department for esthetic rehabilitation.

The intra-oral evaluation revealed a residual ridge defect, both horizontally and vertically, classified as a Siebert Class III defect [4], measuring 5 mm in horizontal width and 10 mm in vertical height. The patient also had a partially edentulous maxillary arch with a midline shift, as a result of the maxillary expansion. Due to the inadequate soft tissue in the edentulous area, bone grafting for ridge augmentation was deemed questionable. Furthermore, considering the patient's high lip line, using a direct white ceramic prosthesis alone would lead to an aesthetically unappealing elongation of the tooth. Based on these diagnostic findings, the treatment plan involved rehabilitation of the ridge defect with a gingival prosthesis to achieve both white and pink esthetics with proper proportions [4, 5]. The patient was fully informed of the procedure, including its advantages and potential drawbacks, and consent was obtained.

a)

b)

c)

d)

Figure 1. Preoperative profile before orthodontic and surgical correction

a)

b)

Figure 2. Smile after orthodontic and surgical correction

The initial step in the treatment involved obtaining a diagnostic impression to create a cast, on which a wax-up was performed to adjust the smile line and ensure the patient's satisfaction. Radiographic evaluation revealed that teeth 11, 21, and 13 were suitable to serve as abutments for a more favorable prosthesis outcome. After preparing these teeth, a gingival retraction technique was applied using double cords (00 and 0, Ultradent), followed by taking a putty wash impression using polyvinyl siloxane (3M ESPE). The master cast was then poured into die stone for further use. The ceramic shade selection was based on the patient's age, gender, and individual characteristics, with the VITA Classic shade guide being utilized, along with photographs to replicate the gingival color.

A silicone index was created on the wax-up to maintain the final prosthesis's contours, shape, and size during temporization, which was achieved with Protemp (3M ESPE Protemp 4). Adjustments were made with composite material (3M Filtek Universal dental composite) in the patient's mouth, and the patient was called back after two weeks. A comprehensive assessment was carried out to ensure the smile line proportions, anterior guidance, and visibility were satisfactory. Necessary corrections were made to the gingival and incisal embrasures, contact points, and tooth morphology.

An alginate impression was taken to transfer the design to the lab, where a digital zirconia framework (**Figure 3**) was created. After scanning the cast (with temporization) for superimposition, the wax-up's outline was digitally reproduced during the CAD workflow. In the virtual planning stage, a zirconia substructure was designed to address the ridge defect and missing teeth after the midline was corrected. Ridge lap pontics were included in the design to facilitate oral hygiene. A trial of the zirconia framework was conducted to assess the marginal fit, followed by a radiograph for confirmation. During the bisque trial, the occlusion, anterior guidance, esthetics, and lip fullness were thoroughly checked. A fit checker was applied to detect pressure points under the pontic to prevent soft tissue irritation (**Figure 4**).

After glazing, the fixed prosthesis was secured using resin cement (3M ESPE), and the patient received instructions on oral care (**Figure 5**). A follow-up visit was scheduled three days later to evaluate the final prosthesis's fit, functionality, and the patient's satisfaction with the outcome.

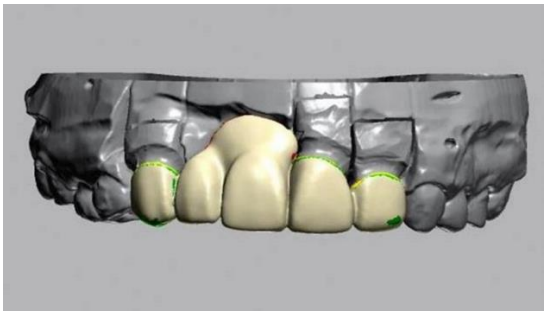

Figure 3. CAD-CAM virtual design for zirconia framework

a)

b) c)

Figure 4. Gingival prosthesis trial with fit checker

a)

b)

Figure 5. a) intraoral gingival veneer prosthesis, and b) post-op extraoral smile

Results and Discussion

Anteroposterior discrepancies are often cited as indications of rapid maxillary expansion (RME) [6]. RME is commonly recommended for patients with skeletal class II malocclusions, either with or without posterior crossbites, as well as those with class III malocclusions or borderline skeletal and pseudo-class III issues, provided they exhibit maxillary constriction or posterior crossbites. For individuals with class III skeletal malocclusion, surgical intervention involving the expansion and advancement of the maxilla is frequently the treatment of choice, yielding favorable functional and esthetic results [7-9]. In the case presented, the patient had a class III malocclusion with a crossbite, compounded by a cleft palate, which made the situation unique. After losing anterior teeth, ridge deformities are notably more common, affecting approximately 91% of patients, and these defects are influenced by various factors including, shape, location, and severity [10-13]. Bone volume loss can result in noticeable facial changes and reduced lip support. Therefore, it is essential to thoroughly assess the ridge defect and create a comprehensive treatment plan before attempting any restorative procedures.

For patients who are not suitable candidates for surgical intervention, prosthetic gingiva can offer an esthetic and functional solution for restoring ridge deformities in fixed partial dentures [14, 15]. This approach is particularly beneficial for those who prefer to avoid surgery, especially considering factors like invasiveness, treatment cost, and duration. Fixed prostheses have clear advantages over removable ones, such as enhanced patient comfort, greater self-esteem, and lower overall cost, although they may not be able to replace large tissue volumes [3, 11]. In this specific case, a fixed prosthesis was chosen due to the localized nature of the defect and the ability to maintain proper oral hygiene. Dental implants often have uncertain outcomes in such cases, including mini or short implants, as compromised bone support significantly lowers their success rate. Bone and soft tissue grafts are similarly unreliable in this context [2]. A bridge was not considered here due to the patient's age and oral hygiene concerns, as well as the acrylic material's tendency to degrade over time [16].

The gingival prosthesis used in this case offered several key advantages: it is metal-free, aesthetically pleasing, resistant to staining and bacterial growth, and more stable and retentive because it is entirely supported by the teeth. The occlusal forces in this prosthesis are directed along the long axis of the supporting teeth, enhancing its stability. For improved esthetics and durability, a zirconia-based prosthesis with a layered ceramic structure was selected.

Conclusion

The patient reported no discomfort with the prosthesis and experienced significant improvements in both esthetics and phonetics. The challenging site presented in this case necessitated careful planning and a step-by-step treatment strategy to restore both function and

appearance. Achieving optimal results requires a collaborative approach from multiple specialties.

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Conflict of Interest: None

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Ethics Statement: None

References

1. Patil VA, Desai MH. Assessment of gingival contours for esthetic diagnosis and treatment: A clinical study. Indian J Dent Res. 2013;24(3):394-5.
2. Trushkowsky RD, editor. Esthetic Oral Rehabilitation with Veneers: A Guide to Treatment Preparation and Clinical Concepts. Springer Nature; 2020.
3. Vinnakota DN, Akula SR, Kukunoor S, Mempally H. Diverse modalities of gingival replacement: A report of three cases. Contemp Clin Dent. 2012;3(3):320-22.
4. Rosenstiel SF, Land MF, Fujimoto J. Contemporary Fixed Prosthodontics. Mosby; 2015.
5. Goldstein RE, Chu SJ, Lee EA, Stappert CF, editors. Ronald E. Goldstein's Esthetics in Dentistry. John Wiley & Sons; 2018.
6. Karad A. Clinical Orthodontics: Current Concepts, Goals, and Mechanics. Elsevier Health Sciences; 2014.
7. Van der Wel H, Kraeima J, Spijkervet FK, Schepers RH, Jansma J. Postoperative skeletal stability at the one-year follow-up after splintless Le Fort I osteotomy using patient-specific osteosynthesis versus conventional osteosynthesis: a randomized controlled trial. Int J Oral Maxillofac Surg. 2022. doi:10.1016/j.ijom.2022.09.005
8. Wang YY, Lin YY, Qiao T, Duan JH, Yang YQ, Hou M. Extended Maxillary Osteotomy Guide: A Design That Allows Manipulation of the Osteotomy Direction on the Posterior and Inner Walls of the Maxilla. J Craniofac Surg. 2022;33(7):2146-53.
9. AlHussain BS, AlFantoukh MAM, Alasmari KMA, AlHrab FA, Alotaibi FA, Alaybani WH, et al. Clinical Knowledge of Orthodontics Complication and Emergencies Among Interns and Dentists in Riyadh City. Ann Dent Spec. 2022;10(2):45-51.
10. Matter JG, Weber HP. Extended edentulous spaces in the esthetic zone. Quintessenz Verlag; 2019.
11. Abrams H, Kopczyk RA, Kaplan AL. Incidence of anterior ridge deformities in partially edentulous patients. J Prosthet Dent. 1987;57(2):191-4.
12. Balaji A, Jei JB, Murugesan K, Muthukumar B. Rehabilitation of Distal Extension Edentulous Case With Claspless Extra-Coronal Attachments-A Case Report. Ann Dent Spec. 2022;10(2):1-4.
13. Aljulayfi IS, Almatrafi A, Alharbi AR, Aldibas AO, AlNajei AA. The Influence of Replacing Anterior Teeth on Patient Acceptance of Removable Partial Dentures in Saudi Arabia. Ann Dent Spec. 2022;10(2):5-10.
14. Genc A, Isler SC, Oge AE, Matur Z. Effect of Sagittal Split Osteotomy with Medpor® Porous Polyethylene Implant on Masticatory Reflex. Ann Dent Spec. 2022;10(3):12-6.
15. Urusov E, Li A, Davtyan A, Mikhaylova M, Diachkova E, Makarov A. Optimization of Prosthetic Treatment of Patients with Dental Tissue Using Metal-Free Restorations. Ann Dent Spec. 2021;9(4):48-51.
16. Zarb GA, Hobkirk J, Eckert S, Jacob R. Prosthodontic treatment for edentulous patients: complete dentures and implant-supported prostheses. Elsevier Health Sciences; 2013.