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Digital Transition from Fixed to Removable Prosthesis in a Unilateral Cleft Lip and Palate Patient: A Case Report

Introduction

Patients with unilateral cleft lip and palate present complex challenges in prosthodontic rehabilitation. These patients often have a combination of anatomical and functional impairments,1-3 including compromised occlusal relationships, bone defects, rotated or malpositioned teeth, scar tissue, and a shallower oral vestibule. Such factors not only complicate the design and fabrication of a prosthesis but also contribute to diminished oral function and esthetics, significantly impacting quality of life.4,5 Conventional prosthodontic approaches, particularly fixed prostheses, may not have predictable long-term outcomes in these cases because of poor retention, recurrent detachment, and difficulty achieving optimal support from compromised dentoalveolar structures.2 Furthermore, a fixed partial denture in patients with a cleft lip may not accommodate changes in oral conditions over time to allow adequate dental hygiene, leading to increased maintenance needs and patient dissatisfaction.6 On the other hand, a removable denture is frequently associated with negative perceptions on the part of patients, including a perceived decrease in comfort, esthetic concerns, and psychosocial acceptance.7 In addition, the replacement of a fixed partial denture with a removable prosthesis may be a rather difficult matter regarding the adaptation of the patient, especially due to the presence of complex anatomical deficiencies that are inherent in cleft patients.

The case report is the clinical management of a patient with a unilateral cleft lip and palate who had undergone recurrent detachment of a fixed partial denture. Through the incorporation of digital technology, a removable prosthesis was created and produced as a transitional device to enhance functionality, comfort, and serviceability.

Case History

A 57-year-old patient who had a history of unilateral cleft lip and palate was referred to our department to deal with a continuously dislodging fixed dental prosthesis. The patient has used a fixed partial denture since childhood, which was remade three times. However, in recent years, the prosthesis had started to detach as often as every 7 days. This instability made it hard to do the mastication, and it affected the professional communication of the patient, producing a lot of anxiety.

Clinical observation showed that the short and narrow abutment teeth were due to the repeated replacement of the fixed partial denture, and there was a saddle pontic that overranged the alveolar cleft. The periodontal involvement of the abutment tooth that was next to the cleft was severe as well and exhibited high levels of mobility. Radiographic evaluation proved that there was insufficient support for further usage of a fixed prosthesis. As a result, no longer was fixed rehabilitation possible.

The patient had never experienced a removable prosthesis and had serious concerns about the possible alterations in appearance, a different voice, and pain. Since the patient was referred to another institution, there was a lack of rapport and, therefore, psychological acceptance of the removable prosthesis

was a critical component of treatment planning.
To reduce the burden of adaptation in the patient and preserve continuity of esthetics and speech, the available fixed partial denture was digitally scanned by the use of an intraoral scanner, which could then be duplicated, preserving the familiar morphology without further loading the weakened abutment teeth. A treatment procedure was laid down to develop a digitally-controlled removable transitional prosthesis based on the three-dimensionally-derived morphology of the available fixed partial denture, but with the remaining fixed partial denture intact in the event that temporary reimplantation is required during the transition.

Methods

This research was carried out with the principles of the Declaration of Helsinki, and the institutional ethics review board gave its consent.
During the first visit, intraoral photographs and computer-aided impressions were taken with the help of an intraoral scanner to record the state of the mouth of the patient, as well as the fixed prosthesis that had been in place for a long time (Figure 1). Clinical assessment and radiographs showed that there is a poor prognosis for a number of abutment teeth, so a conservative but reversible treatment should be used. The patient who never had a removable prosthesis claimed her major anxiety about the possibility of alteration of images, speech, and comfort. In order to reduce the psychological distress, the patient was advised to visit again to evaluate further when the fixed partial denture becomes dislodged, so that the supporting dentition and soft tissues can be assessed under unloaded conditions.
The patient had an unscheduled, second emergency visit after spontaneously removing the fixed partial denture during mastication (Figure 2). Cognizant of the patient's concerns, the treatment plan was expounded upon, including that of a dual-use approach whereby the current fixed prosthesis would still be available to be used periodically during the adaptation phase, once the new removable appliance had been delivered. This strategy served to calm down the patient and develop cooperation during the procedures.
At this stage, preparations for a removable prosthesis were initiated. Rest seats were placed on the abutment teeth (upper right No. 6 and left No. 7) to prevent settling of the denture base, and guide planes were established to enhance retention and stability. Importantly, no modification was made to the anterior abutments to maintain the option for future reattachment of the existing fixed partial denture.
Separate digital impressions of the intraoral structures after removal of the fixed partial denture and of the dislodged fixed partial denture itself were taken using the intraoral scanner (Figure 3). This dual-scan protocol enabled accurate replication of the morphology of the original prosthesis while preserving the esthetic and phonetic characteristics to which the patient was accustomed. Digital models were generated from these datasets using three-dimensional dental model resin (Dima Print Stone beige, Heraeus Kulzer GmbH, Hanau, Germany) (Figure 3, left), and the original fixed partial denture served as a template (Figure 3, right) for the fabrication of the anterior teeth in the removable prosthesis.
In view of the known limitations of intraoral scanning for long-span impressions, the duplicated fixed partial denture and clasps were fabricated as separate components rather than as a single denture base (Figure 4, centre). These components were provided to the dental technician, who reinforced the denture base with self-curing acrylic resin (Figure 4, right).
The fit of the two clasps was confirmed intraorally (Figure 5). Finally, the denture base and clasps were assembled intraorally using self-curing acrylic resin to achieve precise adaptation and ensure function, comfort, and esthetics (Figure 6).

Results

The transitional removable prosthesis was successfully delivered, and the patient adapted to it without difficulty. The possibility of intermittently reattaching the former worn-out fixed partial denture remained, but it was not, in fact, necessary, as the removable prosthesis proved to be adequate in terms of its functionality and stability (Figure 7).
Clinically, the patient indicated that she had better comfort, effective mastication and general stability of the prosthetic during her daily activities. Familiarity with tooth morphology, digitally reproduced of the initial fixed partial denture, had a role to play in an easy transition between the fixed partial denture and the removable partial denture without compromising a satisfactory esthetic look and the quality of speech. The patient was able to resume professional duties immediately with no interruption or social concerns.
During follow-up visits, the prosthesis continued to perform reliably. The patient expressed a high degree of satisfaction with both the functional and esthetic outcomes, confirming the effectiveness of this digitally guided transitional approach to management of complex prosthodontic challenges in a patient with unilateral cleft lip and palate.

Discussion

Fixed prostheses do not always have predictable long-term outcomes in patients with unilateral cleft lip and palate because of compromised support structures. In the case described here, repeated dislodgement of a fixed partial denture caused functional impairment and distress to the patient, prompting a transition to a digitally fabricated removable transitional prosthesis.8Use of digital technology allowed precise documentation of both the oral cavity and the existing prosthesis, which served as a template for the new appliance. Lip movements are sometimes affected by surgery in a patient with a cleft lip, so the morphology of the teeth is a sensitive issue, and ready-made artificial teeth are sometimes not a good fit. However, this approach enabled accurate replication of tooth morphology while minimising changes to the patient's facial profile and speech. Digital workflows also reduced chair time and improved communication with the dental technician and the overall predictability of

treatment.[9] To overcome the limited ability of intraoral scanners to capture long-span impressions, the prosthetic components were fabricated separately and assembled intraorally, ensuring optimal fit and alignment while preserving the position of the remaining dentition.

Importantly, the success of digital prosthodontics in this case was closely linked to continuous collaboration with the dental technician. This cooperation not only reduced the patient's clinical burden but also allowed incorporation of the morphology of the existing fixed partial denture into the removable partial denture, maintaining familiar esthetics and function. Furthermore, use of a reversible treatment strategy alleviated the patient's anxiety regarding a change in prosthesis, facilitating effective rapport-building despite referral from another institution.

The positive experience of the case in question shows that even in cases where a traditional fixed prosthesis is not an option anymore, a digitally guided, transitional removable prosthesis can offer functional stability, maintain esthetics, and lead to patient-centred care. After this success, the treatment plan will further move to the reconstruction of the alveolar defect and implants in the reconstructed bone. This is a continuous process that presupposes collaboration between the prosthodontists, dental technicians, oral surgeons, implant specialists, and rehabilitation clinicians as a patient-centred, multidisciplinary approach.

The case highlights the importance of using a combination of digital technology and team-based approaches to clinical management of a complex case like cleft palate. Digital workflows facilitate reversible, precise, and individualised prosthodontic solutions and can play an essential role in maintaining patient confidence, function, and appearance throughout treatment.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Vyas, T., Gupta, P., Kumar, S., Gupta, R., Gupta, T, and Singh H.P. Cleft of lip and palate: a review. J Family Med Prim Care, 2020; **9**:2621-2625.
2. Yuzugullu, B., Acar, O., Kaya, B., and Saka, M. Prosthodontic rehabilitation of cleft lip and palate patients using conventional methods: a case series. Int J Prosthodont Restor Dent, 2013; **3**:120-124.
3. Ayna, E., Başaran, E.G., and Beydemir, K. Prosthodontic rehabilitation alternative of patients with cleft lip and palate (CLP): two cases report. Int J Dent, 2009; **2009**:515790.
4. Yusof, M.S. and Mohd Ibrahim, H. The impact of cleft lip and palate on the quality of life of young children: a scoping review. Med J Malaysia, 2023; **78**:250-258.
5. Gkantidis, N., Papamanou, D.A., Christou, P., and Topouzelis, N. Aesthetic outcome of cleft lip and palate treatment. Perceptions of patients, families, and health professionals compared to the general public. J Craniomaxillofac Surg, 1013; **41**:e105-e110.
6. Reisberg, D.J. Prosthetic rehabilitation of patients with clefts. Clin Plast Surg, 2004; **31**:353-360.
7. Özhayat, E.B. and Gotfredsen, K. Effect of treatment with fixed and removable dental prostheses. An oral health-related quality of life study. J Oral Rehabil, 2012; **39**:28-36.
8. Hattori, M., Yamatani, T., Murase, M., Haraguchi, M., Sumita, T., and Wakabayashi, N. Application of digital technology in prosthetic treatment for a cleft lip and palate patient: a novel dental technique. Cureus, 2025; **17**:e87298.
9. Okazaki, T., Kawanabe, H., and Fukui, K. Comparison of conventional impression making and intraoral scanning for the study of unilateral cleft lip and palate. Congenit Anom (Kyoto), 2023; **63**:16-22.

Figure Legends

Figure 1. Initial intraoral views at the first visit. At the time of examination, the fixed partial denture remained in situ and had not yet detached.

Figure 2. Intraoral views and a panoramic radiograph obtained after dislodgement of the fixed prosthesis. The right upper photographs show the dislodged fixed prosthesis.

Figure 3. Digital scans of the intraoral structures and of the dislodged fixed partial denture were obtained to capture morphological and positional details using an intraoral scanner after the rest seats and guide plane were placed on the abutment teeth.

Figure 4. The photograph on the left shows the three-dimensional digital model reconstructed from intraoral scans of both the oral condition and the detached prosthesis used for planning and design. The photographs in the center and on the right show the duplicated fixed partial denture and clasps that were fabricated separately to prevent positional discrepancies, which may occur with long-span optical impressions captured using an intraoral scanner. The denture base created by the dental technician was reinforced using self-curing acrylic resin before intraoral assembly.

Figure 5. Confirmation of the fit of the fabricated clasps.

Figure 6. After confirming the fit of the digitally fabricated denture base and clasps, the two components were connected intraorally using self-curing acrylic resin to ensure accurate integration.

Figure 7. Final intraoral views of the digitally fabricated removable prosthesis in place, demonstrating satisfactory adaptation and esthetic integration. appropriate as the root-clearing and canal staining techniques