Refabrication of an implant-retained obturator using the denture duplication technique in a bilateral maxillectomy patient with a free fibula osteocutaneous flap

Islam E. Ali a,b, Takafumi Otomaru c, Yuka Sumita d,*

a Department of Maxillofacial Prosthetics, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University (TMDU), Tokyo, Japan
b Department of Prosthodontics, Faculty of Dentistry, Mansoura University, Mansoura, Egypt
c Hibiya Park Front Dental Clinic, Tokyo, Japan
d Department of Maxillofacial Prosthetics, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University (TMDU), Tokyo, Japan

Abstract

Purpose: We aimed to introduce a simple method for refabrication of an implant-retained obturator using the denture duplication technique while retaining the custom abutments for a patient who underwent bilateral maxillectomy and reconstruction with a free fibula osteocutaneous flap. We have proposed this technique to facilitate the impression-making procedure for this extensive maxillary defect and to avoid lengthy and complicated laboratory procedures.

Methods: A custom tray was developed by duplicating the fitting surface of an old obturator using silicone putty. The tray was used for a bite-pressure impression wherein both definitive impression and jaw relation were obtained simultaneously, reducing the time required for the placement of a new obturator.

Conclusion: We used the denture duplication technique to refabricate an implant-retained obturator while retaining the custom abutments. Decreased chairside time, fewer visits, the use of easily available materials, and uncomplicated laboratory procedures make this technique more economical and acceptable for patients. Using this approach, the patient was able to use the old prosthesis until the delivery of the new prosthesis. The replacement obturator that was developed using this method maintained an acceptable level of oral function.

Keywords: Bilateral maxillary resection, Obturator replacement, Denture duplication, Free fibula osteocutaneous graft, Implant-retained obturator

1. Introduction

Rehabilitation of maxillectomy defects can pose a major challenge to maxillofacial prosthodontists[1,2]. Depending on the size of the defect, problems related to compromised retention, support, and stability may be encountered to some extent[1]. Placing implants in the residual or grafted bone can help overcome these problems, enabling an obturator to occlude the defect and remain stable during use[3–6]. However, patients with maxillectomy defects require long-term maintenance of their dental prosthesis, which often involves replacement. With increased life expectancy, it is common for a definitive obturator to need replacement at least once during the patient’s lifetime[7]. This need arises from continuous changes in the oral tissues and/or breakage or distortion of the denture components, often resulting in a prosthesis that fails to function properly. This necessitates frequent re-evaluation, repair, or refabrication[2]. When an obturator needs to be replaced, it is desirable to retain the general form of the old prosthesis, particularly in older patients who may have reduced adaptability and limited neuromuscular functions[7]. Sometimes, handling of the prosthesis during placement is also an important consideration in older patients. Thus, changing the design could result in confusion. Moreover, extensive maxillary defects with complex contours render the impression-making procedures time-consuming and challenging. Therefore, fabricating a new obturator by duplicating the existing one could be of great value, as it would promote faster adaptation to the new prosthesis[1,2,7–10]. While an implant overdenture can be a good option for patients who have undergone maxillectomy, no studies have investigated the various refabrication methods and their long-term follow-up. Occasionally, a new obturator is required to improve the retention and stability problems associated with the existing one. The switch to a new obturator should occur in a smooth and timely manner with continuity of care, which poses a challenge for maxillofacial prosthodontists, dental hygienists, and dental technicians. To overcome these challenges, we introduced a simple method for refabrication of an implant-retained obturator using the denture duplication technique while retaining the existing abutments in a patient who underwent bilateral maxillectomy and reconstruction with a free fibula osteocutaneous flap. The duplicate obturator was used as a custom tray for bite-pressure impression wherein both definitive impression and jaw
2. Materials and Methods

A patient who underwent bilateral subtotal maxillectomy, reconstruction with a free fibula osteocutaneous flap, and placement of an implant-retained obturator with magnetic retention (Gigauss C400; GC Corp., Tokyo, Japan) and custom abutments was enrolled in this technical report[11]. Due to decreased magnetic retention, instability of the obturator, and increased leakage to the nasal cavity (Figs. 1A-1C), a new implant-retained obturator was required to compensate for the tissue changes and to improve the obturator retention. Although the abutment design was not amenable to easy cleaning (Figs. 1D and 1E), we proposed refabrication of only the obturator without removing the custom abutments for three reasons: the high cost of refabricating custom abutments, possibility of accidental ingestion during try-in and replacement of the abutments, and the need to improve oral function as soon as possible with continuity of care during the switch to the new prosthesis. The patient agreed with this treatment plan and the denture duplication technique was used to fabricate the new obturator[12].

2.1. Duplication procedures of the old obturator

A conventional denture duplicator could not be used due to the large size of the obturator. Therefore, silicone putty (Exafine; GC Corp., Tokyo, Japan) was used as a mold to duplicate the tissue surface of the old obturator (Fig. 2A)[13]. After removing the old obturator from the mold, the auto-polymerized acrylic resin was pressed into the mold to fabricate a custom acrylic tray (Fig. 2B). After polymerization, the tray was retrieved from the mold, the borders were adjusted, and intraoral stability was checked (Fig. 2C).
2.2. Final impression and a simultaneous jaw relation record

The tray was modified by adding a wax rim for simultaneous jaw relation registration and evaluation of lip support (Fig. 2D). Before making the impression, a piece of gauze was inserted below the custom abutments to prevent the impaction of the impression material into undesirable areas. The final impression was made using a regular silicone impression material (Exaflex; GC Corp., Tokyo, Japan) and a jaw relation record was obtained using a silicone bite material (Exabite II NDS; GC Corp., Tokyo, Japan) (Figs. 2E and 2F). Try-in was performed on the second visit and the new implant-retained obturator was delivered on the third visit (Fig. 1F). After some adjustments and confirmation of stability without magnetic retention, magnetic attachments (Gigauss C400; GC Corp., Tokyo, Japan) were applied to the new obturator without any delay in the switch between the prostheses (Figs. 3A and 3B).

3. Difference from conventional methods

The duplication method used in this report involved two basic steps: fabrication of a custom tray using a duplication procedure and intraoral impression with simultaneous jaw relation. Previous reports have described various duplication methods for an obturator[1,2,7–10]. However, they had some limitations such as the requirement of an additional visit for jaw relation, multiple and complex laboratory procedures, and the patients being left without an obturator until the delivery of the new prosthesis. Moreover, the contours of the prostheses were not as complex as those in the present case, the oral function was not objectively assessed after the delivery, and the follow-up of the replacement obturator was not presented[1,2,7–10]. Kim et al.[14] described a digital duplication technique of the tissue surface of the obturator in a patient who underwent partial maxillectomy to generate a three-dimensional digital cast. However, this
technique can be used only in patients with multiple remaining natural teeth. In addition, the digital technique has not been applied previously to the duplication of an implant-retained obturator. Thus, the learning curve associated with the technique, use of expensive tools, and the lack of this facility in some areas, are some of the limitations of the digital technique[15].

4. Effect of performance

Using silicone putty as a mold for the duplication procedure facilitated the retrieval of the original obturator from the impression without damage and allowed the patient to continue using the original obturator while the new one was being fabricated. The external form of the custom impression tray that duplicated the tissue surface of the existing obturator fit the defect perfectly and facilitated the implantation-making procedure. Decreased chairside time, use of easily available materials, and uncomplicated laboratory procedures make this technique more economical and acceptable to patients. Handling of various materials and the possibility of contact with infectious body fluids are some of the disadvantages of this technique.

The patient was followed up for 3 years after the delivery of the second implant-retained obturator. There was no evidence of prosthetic problems clinically (Figs. 1G and 1I) or on panoramic radiographs (Fig. 1H). The masticatory performance was evaluated after the insertion of the new obturator by measuring glucose extraction while masticating a piece of gummy jelly (Glucorum; GC Corp., Tokyo, Japan)[16]. Considering the larger size of the defect in the present case, the patient’s masticatory efficiency (106.6 mg/dL) was comparable to the results of a previous study that reported a masticatory efficiency of 99.6 mg/dL (59.0–124.0) for an acrylic resin obturator and 126.0 mg/dL (118.0–142.0) for a soft-liner obturator in masticatory efficiency of 99.6 mg/dL (59.0–124.0) for an acrylic resin obturator in patients with surgical resection for oral cavity tumors. J Investig Clin Dent. 2017;8:e12207. https://doi.org/10.1111/jcidd.12207, PMID:26749068.


5. Conclusion

In the present report, the denture duplication technique was used to refabricate an implant-retained obturator while retaining the custom abutments. Decreased chairside time, fewer visits, the use of easily available materials, and uncomplicated laboratory procedures make this technique more economical and acceptable to patients. Using this approach, the patient was able to use the old prosthesis until the delivery of the new prosthesis. The replacement obturator fabricated using this method maintained an acceptable level of oral function.

Acknowledgements

This work was supported by Project for Promoting Leading-edge Research in Oral Science at Tokyo Medical and Dental University (TMDU). This work was partially supported by the Japan Society for the Promotion of Science (JSPS KAKENHI grant number 17H00755).

Conflicts of interest

All authors have no conflict of interest.

References