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Severe Maxillectomy Defect Rehabilitation with an Implant-Retained Obturator Prosthesis: A Case Report

Somayeh Niakan[1], Nafise Asgari[1*], Niyousha Rafeie[2], Solmaz Barati[1]

1. Department of Prosthodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
2. Dental Research Center, Dentistry Research Institute, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

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**** Corresponding author:***
Department of Prosthodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

Email: nafise.asgari_72@yahoo.com

A B S T R A C T

Conventional obturator prostheses might cause dissatisfaction in patients with hard or soft palate defects due to inadequate retention and function during speech, mastication, and swallowing. Thus, surgical reconstruction and implant-supported obturators are considered as alternative treatments for these patients. This case-report study describes the prosthetic reconstruction of an 88-year-old patient suffering from a hard palate defect after surgical resection of verrucous carcinoma in the left side of the hard palate. Fifteen months after radiotherapy, two implants were placed in the right side of the remaining ridge, in the second and third molar region. After the implant healing period, the implant-supported obturator prosthesis was fabricated. The patient was satisfied with the esthetics and function of the obturator at the 12-month recall visit and radiographs showed normal healing and no bone loss around the implants.

Keywords: Dental Implants; Palatal Obturators; Surgery, Oral

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INTRODUCTION

Cancers in the maxilla are treated by a variety of methods including chemotherapy, radiotherapy, surgery, or a combination of these treatments. Depending on the severity of the tumor, partial or complete maxillectomy may be necessary. While this treatment approach can effectively manage the tumor, it can also result in a substantial defect in the maxilla, leading to discomfort for the patient [1]. These defects can be reconstructed with the help of surgical techniques or maxillofacial prostheses depending on the size, severity, and location of the defect and also the patient's preference [2].

A study conducted by Kornblith et al. [3] demonstrated that obturator prostheses have greatly improved the psychological well-being and overall quality of life for patients who have undergone maxillectomy surgery. Despite these positive outcomes, there are still numerous challenges that we face when constructing prostheses for these individuals. The primary factor for the success of maxillofacial obturator prostheses is retention [4]. The movement of these prostheses can vary depending on factors such as the contour of the palatal shelf, the height of the remaining alveolar ridge, the size of the defect, and the presence of any undercut. When a larger area of tissue has been resected, there is a loss of mucogingival support. Consequently, this can lead to increased off-axis loads being placed on the teeth and the remaining ridge [5,6].

Since the introduction of implant-supported prostheses, the retention and stability of

obturators have improved, especially in cases that surgical reconstruction is contraindicated [5-7]. Effectiveness of implant-supported obturators has been established in the literature as these prostheses provide more stability and retention compared to conventional obturators and have led to increased patient satisfaction and improved quality of life [8-11].

Treatment of tumors and malignant maxillary lesions varies depending on the size, type, grade, etiology and location of the tumor [12]. Verrucous carcinoma (VC) is a malignant tumor characterized by slow exophytic growth that appears as a cauliflower-like exophytic tumor. VC is known as a rare variant of low-grade squamous cell carcinoma [13]. Locally advanced lesions are treated with multimodal approaches including the combination of surgery and adjuvant radiation or chemoradiation [14].

Following the surgical resection of maxillary malignant, lesions many consequences may occur which decreases the quality and life expectancy of patients. Therefore, treatment of maxillary defects should be done with the aim of decreasing subsequent problems, improving quality of life, and increasing patient satisfaction [3,15,16].

This article describes the fabrication of an implant-supported obturator for a patient who was referred to the Department of Prosthodontics, Tehran University of Medical Sciences. The patient was dissatisfied with her conventional obturator and requested a new prosthesis with improved function during mastication and swallowing.

CASE REPORT

An 88-year-old woman was referred to our Department and requested a prosthesis with improved retention and stability. She was dissatisfied with the retention of her interim surgical obturator. The mandible ridge was completely edentulous. According to her medical history she had undergone surgical resection of the left side of the palate two years ago due to verrucous carcinoma. The patient was also treated with radiotherapy at a dose of 65Gy and 15 months had passed since her last session.

Cone-beam computed tomography images were obtained and two 10×4.1mm implants (RN SLActive®, Straumann, Switzerland) were placed in the right side of the maxillary ridge, distal to the second and third molar region, without any bone augmentation (Figure 1).

Fig 1. The occlusal view of the maxilla after implant placement

The existing obturator was then relined by a soft liner (Mollosil R, Detax Dental GmbH 8 Co. KG. Ettlingren, Germany) to improve its function. Six months after implant surgery, the patient was recalled and primary impressions were taken with a prefabricated tray (Dental Taksan, Tehran, Iran) and condensation silicone impression material (Spidex, Asia Chemi Teb Mfg Co., Tehran, Iran) for the maxilla. Irreversible hydrocolloid impression material (Alginoplast, Heraeus Kulzer, GmbH 8 Co Wehrheim, Germany) was used for the mandible (Figure 2, top panel). Before taking the impressions, the defect area was completely cleaned and any trace of saliva and mucous was removed. The maxillary custom-tray was open in the area of the defect to provide improved accessibility during border molding.

Green compound (Grey Impression Compound; Kerr Italia S. p. A., Salerno, Italy) was used for border molding the peripheral borders and ISO functional compound (ISO Functional Compound; GC; Japan) was used for border molding the defect area due to its longer

Fig 2. Primary impression of the jaws (top panel), border molding of the maxillary prosthesis (middle panel), and final impression of the jaws (bottom panel)

maintenance of heat. For a precise border molding of the defect, the patient was instructed to bend her head back and forth, left and right, rotate her head and swallow her saliva. Other border molding movements were performed by the clinician.

After completion of border molding (Fig 2, middle panel), the defect area was blocked-out by using gauze impregnated with Vaseline. The final impression of the maxilla was made using medium body additional silicone impression material (Betasil vario Implant; Muller-Omicran GmbH & Co. KG; Germany) with the splinted open tray technique while the patient was in an upright position.

For the mandible, the border molding and final impression were made by using green compound and zinc oxide-eugenol (ZOE) impression paste (Cavex Outline, Cavex Holland BV; Netherlands), respectively (Figure 2, bottom panel). ZOE was used as impression material for the mandible since no deep undercut was observed in the mandibular ridge.After teeth set-up and try-in, we obtained a silicon index from the buccal surface of the teeth to evaluate the restorative space and select the appropriate attachments. Based on the adequate restorative space (>15mm) and the divergence of the implants (Figure 3, left panel), we decided to use ball and bar attachment. This choice allowed us to take

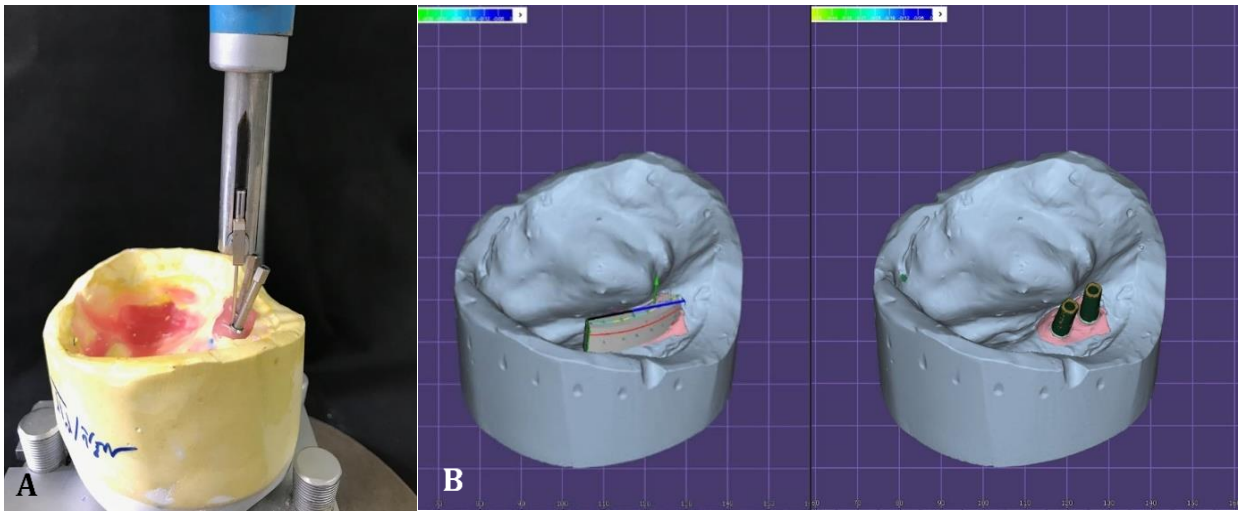

Fig 3. Surveying the maxillary cast to assess the implants angulation (left panel) and designing the custom abutments and bar attachment in Exocad software (right panel)

advantage of the benefits of splinting the implants as well as making use of the resilience of the prosthesis against different prosthetic movements. To design the custom abutments and bar attachment, we used Exocad software (Exocad GMBH, 2020). The bar was fitted with two Rhein mini-balls (Rhein83, USA) (Figure 3, right panel).

Figure 4 shows the custom abutments and bar attachment in the patient's mouth. Passiveness and adaption of the bar attachment was checked directly in the mouth by the one-screw test and X-ray radiography, respectively.

The teeth were set up on the metal framework and arranged in a monoplane occlusion. The final wax-up was completed and then, the obturator was fabricated by use of the compression molding technique. Following laboratory remount, occlusion adjustment (monoplane occlusion), was fabricated by use of the compression polishing, and finishing, the obturator was delivered to the patient (Figure 5). After 12 months, the patient was satisfied with the esthetics and function of the obturator and X-ray radiography showed no bone loss around the implants (Figure 6).

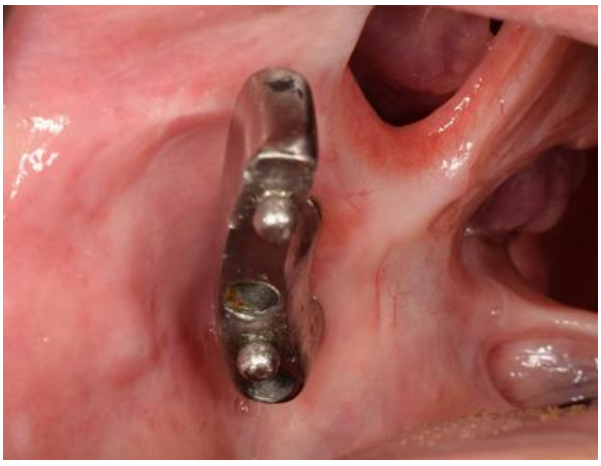

Fig 4. The custom abutments and bar attachment in the patient's mouth

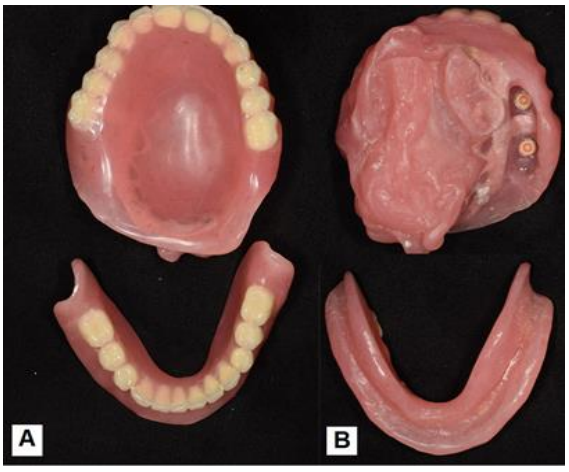

Fig 5. Final prostheses delivered to the patient. A: Polished surface, B: intaglio surface

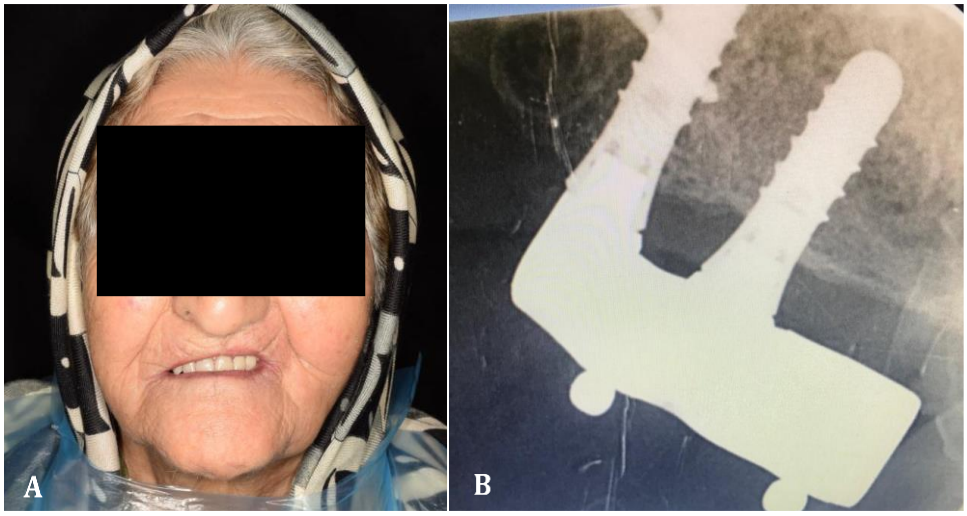

Fig 6. Patient's face after delivery of the obturator and follow-up X-ray after 12 months

DISCUSSION

Fabrication of maxillofacial prostheses in patients suffering from complete or partial maxillary defects follows two primary goals; first, restoring the function of mastication and speech, and second, achieving a normal oral and facial appearance [17].

Fabricating maxillary obturator prostheses is considered a challenging procedure in these patients since the final prosthesis relies solely on the remaining teeth, alveolar ridge, and defect margins. It should be noted that unfavorable conditions are exacerbated in completely edentulous patients [18].

Implant insertion can significantly affect the stability and retention of prostheses in maxillectomy patients who are completely edentulous [11]. Conventional implants and zygomatic implants are considered as alternative treatments to bone graft in patients suffering from severe maxillary bone resorption [19].

Implants should be placed where the bony support is sufficient; however, in maxillectomy patients, the location and number of implants is limited by the remaining bone and extension of the defect. Moreover, the amount of keratinized tissues might influence the angulation of the implants [20,21]. Thus, the risk of implant overload is higher in maxillectomy patients and it necessitates the maximum involvement of peripheral tissues to provide maximum support for implant-supported obturators [5]. Various retention mechanisms are used in implant-supported obturators such as magnet, bar and clip, and milled bar. ERA and O-ring attachments have been used by some technicians when the vertical space is limited [22].

Milled bar attachment significantly increases prosthesis retention [5]. Amer et al. [23] evaluated the stress distribution in implant-supported obturators with different attachment designs. They concluded that the best stress distribution was observed in ball and socket and magnet attachments, followed by bar and clip attachments, respectively.

Another parameter which plays a crucial role in the retention of maxillofacial obturator prostheses is occlusion. Teeth are set at centric relation and deflective occlusal contacts in lateral movements are removed [24]. Occasionally, the occlusion without bilateral balance is chosen in completely edentulous patients due to the unfavorable conditions presented in these patients. It should be noted that the occlusion in the defect area is a matter of concern as unfavorable distribution of occlusal forces could be destructive. Thus, using fewer teeth with smaller size and setting them in a more anterior position and also removing premature contacts are beneficial in designing occlusion in the defect area [25].

The patient expressed dissatisfaction with her interim obturator and requested a new one that provided better retention and stability. Therefore, the treatment team considered an implant-supported obturator based on the maximum number of implants and the best location for insertion, taking into account the quality of the remaining bone and soft tissue. Since the patient refused reconstructive surgery, it was decided to fabricate an implant-supported obturator instead.

Considering the limited amount of remaining bone, only two implants were inserted unilaterally in the second and third molar region. To maximize retention, a bar and ball attachment was used. It is typically recommended to place an adequate number of implants bilaterally for successful fabrication of implant-supported prostheses. However, in some cases, treatment plans may have to be less than ideal due to the quantity and quality of the remaining bone in these patients. Despite this, these alternative treatment plans can still effectively meet the patients' needs.

CONCLUSION

The present study described the fabrication of an implant-supported obturator for a patient who had undergone maxillary resection and radiotherapy. The obturator successfully provided the retention and stability that the patient desired. When determining the number and location of implants in maxillofacial patients, it is important to consider the limitations of the remaining bone and soft tissues. However, this study does not provide sufficient information on the optimal number and location of implants in these patients, highlighting the need for further research in this area.

CONFLICT OF INTEREST STATEMENT

None declared.

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