Prosthetic rehabilitation after hemimaxillectomy: a case report

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Maxillofacial defects created by the surgical resection of a tumor negatively impact the mastication, phonation, swallowing, and psychological function of patients. A 68-year-old woman received a diagnosis of oral squamous cell carcinoma involving the hard palate. The hemimaxillectomy procedure for tumor resection created a defect on the left side of the palate. This case report describes the patient's cancer treatment from presurgical planning to final rehabilitation with a conventional obturator and subsequent follow-up care for 1 year. The rehabilitation strategy was satisfactory for the patient, reestablishing lost function and esthetics.

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Oral squamous cell carcinoma (OSCC) is the most common malignant epithelial neoplasm affecting the oral cavity, usually presenting between the fifth and seventh decades of life. OSCC represents 4% of all cancers of the body and 90% of cancers of the oral cavity, in addition to 14.1% of malignant tumors located in the head and neck.[1] Standard treatment for OSCC should follow the National Comprehensive Cancer Network guidelines whenever possible and as appropriate for a given patient.[2] Multidisciplinary care may include specialists in surgery, radiation oncology, oral pathology, and prosthodontics. Current treatment guidelines for OSCC continue to depend on the stage of the disease, although most early- and late-stage OSCCs are treated surgically with a goal of obtaining clear margins of 1 to 2 cm.[2,3]

Maxillary defects created after the resective surgery for a malignant lesion must be corrected because they can cause unnatural communication between the oral and nasal cavities, significantly affecting patients' function and quality of life.[4-8] Commonly, significant functional alterations predispose patients to hypernasal phonation, impaired chewing function, and problems with fluid leakage in the nasal and antral cavities.[4,9]

The prosthesis used to correct these defects is called a *maxillary obturator*. An obturator is a prosthesis used to close an acquired or congenital tissue opening, most commonly of the hard palate or adjacent soft tissue alveolar structures.[10,11] Some of the main goals of placing a maxillary obturator are to separate and create a barrier between the oral and nasal cavities, achieving a normal or near normal level of function. Obturator prostheses restore functions such as chewing, swallowing, and phonation while providing support to soft tissues such as the lips and cheeks of the patient, which results in a pleasant esthetic appearance.[12,13] Preparing a maxillary obturator involves a number of time-dependent phases requiring extremely detailed planning and execution, from refinement of the treatment plan in the presurgical phase up to placement of the prosthesis and clinical monitoring of the patient.[4,14]

Improving the quality of life for patients with head and neck cancer is imperative to treatment success, because they often experience emotional stress, anguish, body image disorders, and complications in social relationships.[5,15] Although it has been shown that obturator treatment can improve quality of life, the positive changes may be limited if the patient is not satisfied with the treatment.[9,16] Therefore, the surgical defect resulting from a maxillary resection is restored in 3 phases, requiring different obturator prostheses to support the patient during rehabilitation.[17,18] The treatment of the injury starts with an immediate obturator, which is fabricated from a presurgical cast and placed at the time of the maxillary resection. This prosthesis will be in service for approximately 1 to 2 weeks and is then

Fig 1. Asymptomatic ulcer in the region of the maxillary molars on the left side near the edentulous ridge.

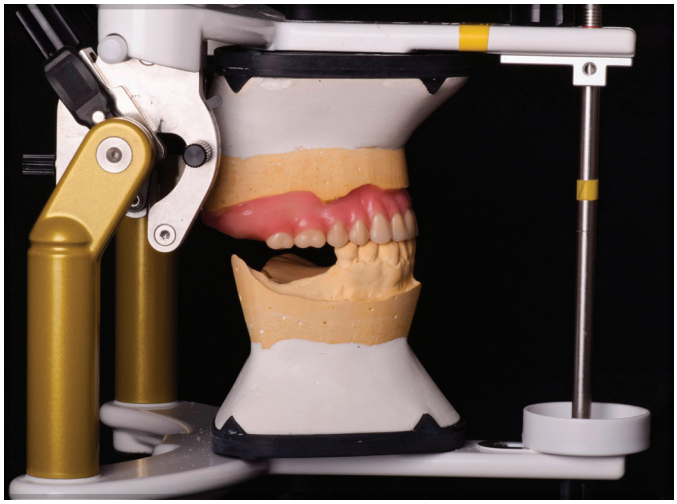

Fig 2. Final mounting of the teeth in a semiadjustable articulator.

replaced with a transitional obturator. The transitional prosthesis can be fabricated from a presurgical or a postsurgical impression of the site, which alters considerably as the patient heals. The obturator must include a soft lining material, which will be changed if the prosthesis does not fit properly in the soft tissues. The patient will use this prosthesis for approximately 2 to 6 months. Finally, the definitive obturator is placed approximately 6 months after surgery, following adequate healing and maturation of the tissues adjacent to the surgical bed.[14,17] This obturator must be comfortable and stable when placed in the area of the defect. However, changes associated with tissue remodeling will continue in the edentulous ridge and area of oroantral communication, so long-term monitoring of the obturator is required to ensure a proper fit.[19,20]

Various methods and obturator models for the treatment of edentulous patients with maxillary resection have been described—all prioritizing adaptation, retention, and functionality.[3,9,12,16,19-23] However, for successful prosthetic rehabilitation, one of the most critical features of a definitive obturator is retention.[20] The extent of the defect, the position of the remaining hard and soft tissues, and the weight of the prosthesis are the main factors affecting the retention and stability of the obturator.[19] Some authors recommend treatment with conventional obturators, and others prefer closed or hollow bulbs; however, there is no consensus.[23] Thus, the objective of this case report is to describe rehabilitation with a conventional obturator prosthesis and a mandibular removable partial prosthesis in a patient affected by OSCC in the maxilla. A multidisciplinary team planned and performed treatment from the presurgical phase through fabrication of the different obturators and post-delivery monitoring.

Case report

A 68-year-old woman sought care at the Department of Oral Surgery–Pathology, School of Dentistry, Autonomous University of Baja California, Mexicali, Mexico, due to the presence of an asymptomatic ulcer located on the left side of the hard palate and extending from the first to second molar (Fig 1). An incisional biopsy was performed to allow histopathologic study of the lesion. The result of the diagnostic testing showed OSCC. Once the diagnosis was obtained, the patient was referred to surgical oncology and maxillofacial prosthetics teams for assessment and treatment planning.

Presurgical prosthetic planning

One month before the surgery, polyvinyl siloxane (PVS) (Express STD, 3M) was used to take impressions for the planning and fabrication of immediate and transitional obturators as well as a transitional mandibular removable partial denture in the mandibular bilateral partial edentulous area to improve the support and stability of the obturators. Type IV plaster was poured into the impressions to obtain casts, and the maxillary cast was duplicated to allow fabrication of both obturators.

After the teeth were removed from the plaster cast, record bases and a wax rim were fabricated to register the maxillomandibular relationships. These records were oriented, and then plaster casts were mounted in a semiadjustable articulator (Stratos 300, Ivoclar Vivadent). A set of Newtek teeth (MDC Dental) in a color similar to that of the remaining mandibular teeth was used (Fig 2). Once the mounting and waxing had been performed and approved, a duplication was made to obtain a plaster cast that would be used to manufacture a vacuum-formed immediate obturator from a 1-mm acetate plate (Placa Soft, Bio-Art). Subsequently, the process of embedding, pressing, and acrylization of the transitional obturator using a heat-cured acrylic resin (Nictone R6V, MDC Dental) was performed. Finally, the prostheses were collected, trimmed, adjusted, and polished.

Surgical procedures

With the patient under balanced general anesthesia and nasal intubation, the neck dissection procedure to remove the lymph nodes was started. The malignant neoplasm was surgically removed using the hemimaxillectomy technique on the left side (Fig 3). The dissection border was extended 2 cm until the margins were negative for residual tumor. Once the

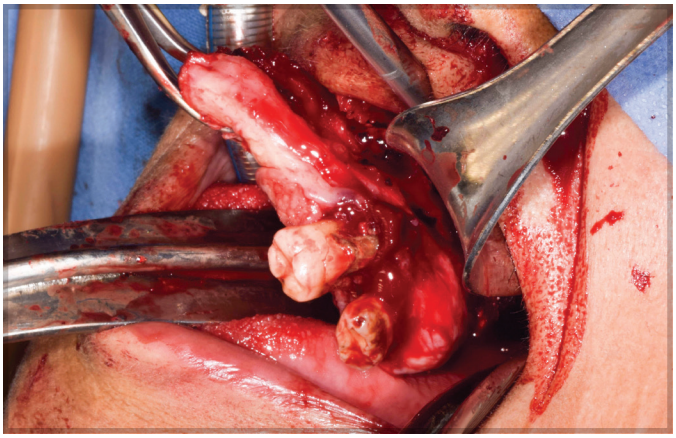

Fig 3. Surgical removal of the intraoral neoplasm.

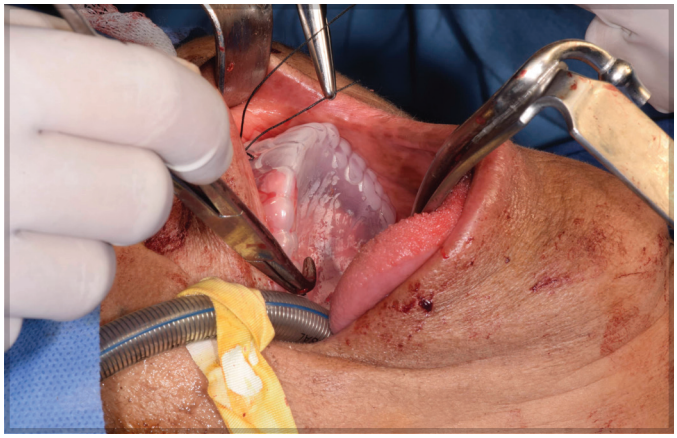

Fig 4. Placement of the immediate obturator in the edentulous arch and surgical area.

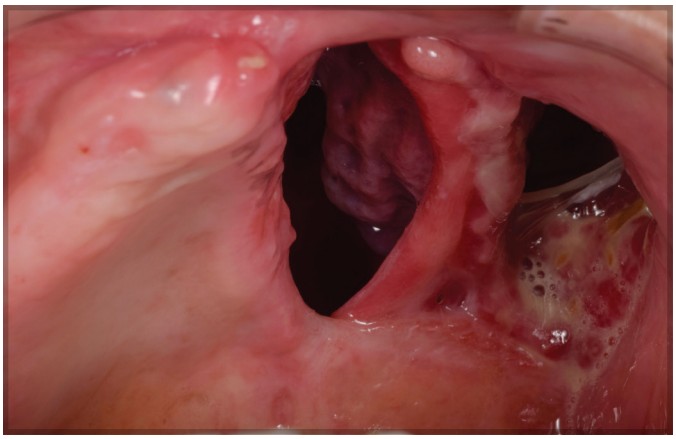

Fig 5. Surgical wound at the follow-up examination 15 days after surgery.

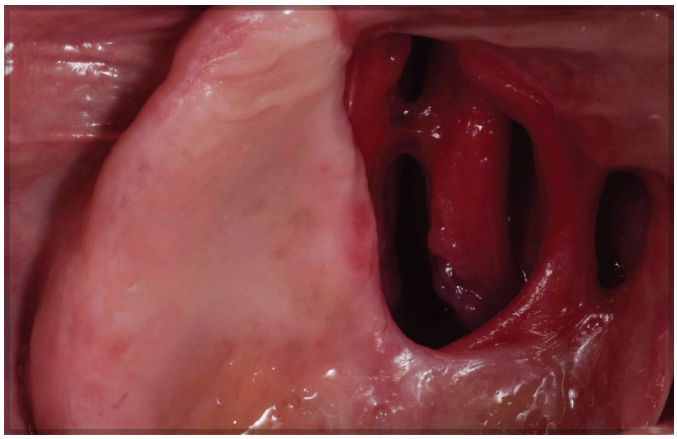

Fig 6. Surgical defect healed after 6 months' use of a transitional obturator prosthesis.

hemimaxillectomy was finished, the area was packed with a single gauze pad impregnated with antibiotic ointment. The immediate obturator was then placed and fixed to the surrounding mucosa with 3-0 silk sutures, separating the oral cavity from the nasal cavity and completing the surgical procedure (Fig 4).

The patient returned for a follow-up appointment 15 days after surgery. At this time, the immediate obturator was removed to allow the margins to finish healing (Fig 5). The patient was then referred to the prosthodontics department to continue with the prosthetic treatment.

Prosthetic procedures

The day the immediate obturator was removed, it was replaced with the transitional prosthesis, which was relined with a soft tissue conditioner (Lynal, Dentsply Sirona) so that healing of the surgical margins would not be compromised. Every 4 weeks the patient returned for examinations, during which the treatment team observed the maturation of tissue; analyzed the support, stability, and retention of the transitional prothesis; and addressed any issues with treatment adaptability that were noted in the clinical record. The obturator was relined and cut as needed to improve retention based on tissue conditions.

Six months after the resective surgery, the patient was evaluated to ensure correct tissue healing (Fig 6). In addition, the conventional procedure for the manufacture of the definitive prosthesis began with a preliminary impression to make a custom tray. During this procedure, gauze pads were inserted in the maxillary defect area to avoid extravasation of the impression material through the oroantral communication. Type III plaster (Magnum Plaster, MDC Dental) was used to pour the casts. Afterward, a functional impression was taken by applying selective pressure around the maxillary defect using a custom tray. The edges were refined using putty PVS (Express STD, 3M) followed by regular PVS to impress the defect, and then the area was protected with gauze again. Once the impression was obtained, the excess that entered the defect area was removed, creating a height margin of approximately 2 to 3 mm inside the defect, which was necessary for retention of the prosthesis (Fig 7). A working cast was poured in type IV plaster (Elite Master, Zhermack).

Custom record bases and a wax rim were fabricated, verifying the lip support, occlusal plane, and buccal corridor, and reference lines were defined for tooth selection. The vertical dimension of occlusion and centric relationship were recorded, and plaster casts were mounted in a semiadjustable articulator. Newtek teeth

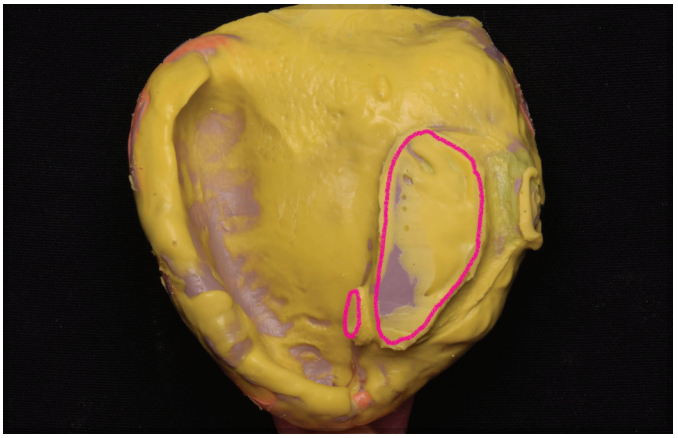

Fig 7. Final polyvinyl siloxane impression of the base and surgical defect. The circled areas correspond to the defect.

Fig 8. Finished conventional obturator.

Fig 9. Placement of the obturator in the maxillary edentulous arch.

Fig 10. Obturator in place after relining to alleviate loss of retention after 1 year's use of the definitive obturator.

were selected, mounted, and tested, and, following the patient's approval, the trial bases were acrylated using the IvoBase system (Ivoclar Vivadent) at 1500 pounds of pressure and 74°C for a period of 8 hours. After the acrylization process, both prostheses were returned to the articulator to receive occlusal adjustment, and finishing and polishing procedures were completed (Fig 8). The maxillary conventional obturator and the mandibular removable prosthesis were placed, and the patient was provided with recommendations for oral hygiene and prosthesis care (Fig 9).

The patient attended follow-up examinations at intervals of 3, 7, 14, and 21 days after placement of the definitive prostheses, and minor adjustments were made in occlusion and areas identified as having excessive pressure. Functions such as phonation, chewing, and swallowing were found to be normal, and the patient reported being greatly satisfied with the result and esthetic appearance. One year after delivery of the definitive obturator, the patient requested a review of the maxillary obturator, reporting lack of retention, which was clinically verified to be the result of physiologic residual ridge resorption of the toothless area and remodeling of the defect.

Monophase PVS and the existing prosthesis were used to make a new impression, so that the obturator could be relined with heat-cured denture resin. After relining, the obturator regained its initial satisfactory retentive characteristics (Fig 10).

Discussion

Many authors have analyzed and discussed obturator design for acquired maxillary defects, emphasizing the importance of the obturator's retention and comfort as well as the patient's adaptation to the prosthesis.[3,9,12,16,19-23] Consequently, the choice of a definitive obturator type is affected by factors such as the presence or absence of remaining teeth, extent of the defect, and retentive characteristics of the edentulous area.[14] In addition, optimal obturator functioning was found to be the most significant determinant for improved quality of life of patients who have undergone maxillary resection.[24] However, although the size of the primary tumor and the resultant maxillectomy defect have not been shown to have a strong influence on the function of the obturator, they are strong predictors of the quality of life.[24]

The present case report describes the process for fabricating a conventional obturator prosthesis, which proved to be satisfactory for 1 year of follow-up, after the use of an immediate obturator and a transitional obturator. Similar results also were observed in a study where the authors achieved the retention of the antral part of the obturator with help of resilient liners.[25] Based on this, the authors of the present report believe that both the alveolar ridge and the tissues surrounding defects will respond as expected when in direct contact with an obturator prosthesis, creating a physical barrier that allows satisfactory separation of the oral and nasal cavities. Nevertheless, in the present case, it was necessary to reline the prosthesis with heat-cured acrylic after 1 year due to physiologic alveolar resorption processes and slight modification of the regions near the defect, which aligned with the observations of other authors.[18]

Obtaining adequate prosthetic retention in edentulous patients who have undergone a maxillectomy is a challenge; however, estimating the dimensions of the defect to predict the retention of the obturator has been suggested as a starting point for prosthodontic treatment.[16,26] When a defect is considered small, as in the present clinical case, the nasal and/or antral opening space is an area that is commonly available to increase obturator retention in unilateral and bilateral maxillectomy patients.[27] Sometimes it is necessary to compromise this space by adding a prosthesis extension to help retain the obturator.[26] However, some authors have described a rise in phonetic problems if a high extension of the obturator coincides with an increase in the weight of the prosthesis.[26,27] In this clinical case, 2 to 3 mm of prosthetic material was extended within the defect, preserving the peripheral sealing of the obturator and providing adequate retention and stability without affecting the patient's phonetic function.

The weight of the prosthesis plays an important role in the retention of the obturator.[24,28] Before the definitive prosthesis was made, the patient described a lack of retention and constant dislodgment of the transitional prosthesis. This could have been associated with the amount and weight of the tissue conditioner used in the region of the edentulous area—disadvantages that were identified early and corrected with a reduction in the extension of the obturator within the defect and overflows of the basal area of the transitional and definitive prostheses. Once healing was complete and the defect created by the hemimaxillectomy had been analyzed, a conventional obturator could be made, respecting all the clinical principles and sequences of a conventional total prosthesis and taking appropriate care to record the anatomical structures.[28,29] Thus, the transitional phase should include adequate clinical evaluation of the size of the oroantral communication and weight of the obturator to avoid retention problems, especially with conventional obturators.

A large number of studies have evaluated new techniques for producing such restorations; among these are modifications within the body of the obturator (such as the presence of a hollow or closed bulb), application of new prosthetic materials, incorporation of dental implants, and use of resilient and magnetic retention systems.[9,21,22] Developments have been aimed at improving the retention, stability, and sealing of the obturator; however, increased difficulty in both the clinical and laboratory settings is associated with these innovations.[28] The treatment proposed in this clinical case resulted in satisfactory performance after a detailed analysis of the extent of the defect and adaptation of the patient to the transitional obturator prosthesis. Thus, a conventional obturator without a bulb or any type of additional retention attachment was able to provide adequate support, stability, and retention.

The multidisciplinary treatment provided to this patient, who was a user of public health services, was carried out at a dental school by teams from the maxillofacial surgery, oncology, speech therapy, and prosthodontics services. Sociodemographic and economic factors have been described as barriers to care in these scenarios, hindering patients' access to multidisciplinary teams with experience in this type of treatment and restricting them to surgical procedures and immediate or transitional prostheses.[24] In some cases, patients receive obturators with excessive weight and inadequate sealing or receive no follow-up care if physiologic functions are compromised.

Despite all of the limitations that this conventional obturator might present, improved phonation, mastication, and facial appearance were achieved due to restored muscle support in this patient. At the same time, leakage of liquids and solids through the oroantral communication was effectively controlled. Concurrently, a high degree of esthetics and function was attained, giving the patient a positive self-image and influencing her final satisfaction with the treatment, an objective considered of great importance for social reintegration of obturator prosthesis users.[6,15] It is important to note that other types of treatments could have been proposed for the resolution of this clinical case, although the proposed treatment plan was satisfactory and the expectations of the patient and clinicians were met.

Conclusion

When well indicated, the use of a conventional obturator in maxillary defects caused by oncologic resection is a simple and functional treatment choice. When the obturator is properly designed and fabricated, the patient will achieve a reasonable level of adaptation and functionality. In such cases, multidisciplinary planning of the surgical and prosthetic treatment is essential to block oroantral communication and ensure functional dental and occlusal rehabilitation, resulting in a significant positive impact on the patient's quality of life.

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Conflicts of interest

None reported.

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