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Prosthetic Rehabilitation of a Patient after Surgical Reconstruction of the Maxilla: A Clinical Report

Hakan Bilhan, DDS, PhD,[1] Onur Geckili, DDS, PhD,[1] Canan Bural, DDS, PhD,[1] Esma Sonmez, DDS,[1] & Erdem Guven, MD, PhD[2]

[1] Department of Prosthodontics, University of Istanbul Faculty of Dentistry, Istanbul, Turkey
[2] Department of Plastic and Reconstructive Surgery, University of Istanbul Faculty of Medicine, Istanbul, Turkey

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Correspondence
Onur Geckili, University of Istanbul Faculty of Dentistry—Department of Prosthodontics, 2nd floor, 34390, Çapa, Istanbul, 34063, Turkey. E-mail: geckili@istanbul.edu.tr

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Abstract

Prosthetic management of maxillectomy cases is challenging, and a multidisciplinary approach is usually needed. This clinical report describes the treatment provided to a patient who presented with a moderately differentiated squamous cell carcinoma. A two-stage surgical protocol was followed for this purpose. At the first surgery, the anterior maxilla was resected, and the oral and nasal mucosal and osseous defect was reconstructed with an osteocutaneous flap from the radial forearm. At the second surgery, all fascias and the connective tissue between the skin and the bone were resected to provide an optimal thickness for denture stability. Two months after the second surgery, prosthetic rehabilitation was completed with a maxillary telescopic overdenture. During the 15-month follow-up period, the patient's oral condition and physical appearance improved, and no complications occurred.

Cancer of the head and neck is a generic term applied to a group of malignant tumors occurring in the anatomic regions of the head and neck. The most common cancer involving the oral cavity is squamous cell carcinoma.[1,2] Cancers of the oral cavity are still managed primarily with surgery, regardless of the stage of the tumor and the node.[2]

Reconstruction of head and neck defects can be accomplished surgically, prosthetically, or both.[3–11] Usually, a multidisciplinary approach is needed. The aims of reconstructive surgery are to repair the defect, enable successful wound healing, restore function, and provide acceptable esthetics.[4,5]

Advancements in microvascular surgical techniques have enabled new prosthodontic guidelines for surgically constructed maxillary defects.[6,7,12] Various free-tissue transfers have been advocated for reconstructive surgery using scapular, fibular, radial forearm, rectus abdominus, iliac crest, and latissimus dorsi flaps or local flaps for palatal and midfacial reconstruction.[3,6,13–15] Prosthetic rehabilitation of the maxillectomy patient can be managed according to the quality of supporting tissues such as the defect, the residual palatal base, or the remaining dentition.[11,16,17]

Defects in the palate after ablative oncologic surgery can cause some functional and esthetic problems. These defects are traditionally restored with obturators.[4,6,10,17] An obturator to close a palatal defect is, in fact, two prostheses in one with a metal framework and an obturating portion.[11] Acceptable clinical results can be achieved with obturators; however, the prosthodontist or the patient might encounter some problems. The obturator must be in place and retentive for adequate speech, swallowing, etc. The patient must maintain adequate hygiene of the surgical site and the denture. Poor retention, oronasal leakage, hypernasality, reflux of liquids into the nasal cavity, and denture bulkiness are the most common problems.[12,15,18] Therefore, surgical sealing of the palatal defect with free flaps is of paramount importance because it separates the oral cavity from the nasal and sinus cavities and eliminates the bulky portion of the obturator.

When the anterior arch of the maxilla is missing, the use of free flaps from the radial forearm has been suggested.[12] The characteristics of the radial forearm flap include long vascular pedicle, good vesicle caliber, pliable tissue, and ease in harvesting. For these reasons, the radial forearm flap has long been used in intraoral linings.[3,14,19] By contouring the alveolar arch form with radial bone, an acceptable lip support and anterior midface projection was also maintained. The results of a study indicated that radial forearm-free flap patients reported higher scores in speech quality, comfort, convenience, and social interaction than the defect-matched patients.[18] It should be kept in mind that use of free flaps is limited to the amount of tissue available and/or to pedicle length.[12]

This report presents the surgical and prosthetic therapy of a patient who underwent oncological surgery due to squamous cell carcinoma in the maxilla.

Clinical report

A 42-year-old man presented to the Faculty of Dentistry at Istanbul University with a swelling in the anterior region of the hard palate. Radiographic analysis revealed a wide radiolucent lesion in the anterior maxillary region where formerly two palatal impacted canine teeth had been extracted. A biopsy revealed moderately differentiated squamous cell carcinoma with dimensions of 2 cm × 4 cm. The patient was treated with surgical resection of the anterior maxilla including teeth # 5, C, 7, 8, 9, 10, H, and 12 (Fig 1). The palatal defect was reconstructed with a radial forearm osteocutaneous flap elevated by a second surgical team at the same operation. An oscillating saw was used for elevation of the bone segment from the distal third of the radius. The bone flap was at about the anterior 40% portion of the radius cross section. Periosteum was kept attached to the elevated bone segment for preservation of circulation of the bone flap. Securing the vascular branches of the radial artery and vein that feed the periosteum, the conventional radial forearm fasciocutaneous flap was elevated from distal to proximal until bifurcation of the brachial artery. In the meantime, the resection team finished tumor ablation and prepared the recipient vessels (facial artery, facial vein, external jugular vein). Before dividing the vascular pedicle, the bone flap was bent by two closing wedge ostectomies to mimic the arc of resected maxillary segment. One U-shaped and two straight titanium miniplates were applied for the fixation of the bone graft (Fig 2). As a precaution, a titanium reconstruction plate was placed on the radius, bridging the donor site defect. The exposed tendons were covered with neighboring muscles, and a split thickness skin graft was then used as coverage of the skin defect site (Fig 3). A static splint that provided a resting position for hand and forearm was used for the next 2 weeks.

Eighteen months after the surgery, the patient was examined for prosthodontic rehabilitation. The patient had a partially edentulous maxilla (Class IV Prosthodontic Diagnostic Index for Partial Edentulism classification, American College of Prosthodontists)[20] and a dentate mandible (Fig 4). The maxillary incisors, premolars, and first molars were missing. The palpated mobile, thick mucosa on the hard palate was considered to negatively affect the denture's future stabilization (Fig 5). Therefore, a second surgery was planned to eliminate the thickness and mobility of the mucosa. Before surgery, an interim partial denture was fabricated to provide a tight adhesion of the mucosa to the underlying maxillary bone and to help maintain the patient's nutrition during healing.

Maxillary and mandibular irreversible hydrocolloid impressions were made with stock trays (TRA Tens, Teledyne Water Pik, Ft. Collins, CO). The casts were poured in dental stone (Moldano, Heraus Kulzer, Hanau, Germany). A wax occlusal rim formed on a maxillary trial record base was used to transfer the maxillomandibular relation record into a semiadjustable articulator (IML ARTI S4, IML-Instrumenta Mechanik Labor System GmbH, Wiesloch, Germany) using a facebow transfer. After the arrangement of artificial teeth (VitaPan, Vita Zahnfabrik GmbH & Co KG, Bad Säckingen, Germany) and evaluation of occlusal vertical dimension (OVD), esthetics, phonetics, and occlusion intraorally, the interim prosthesis was processed using a heat-polymerized denture base acrylic resin (Meliodent Heat-cure Denture Base Material, Heraus Kulzer). The interim

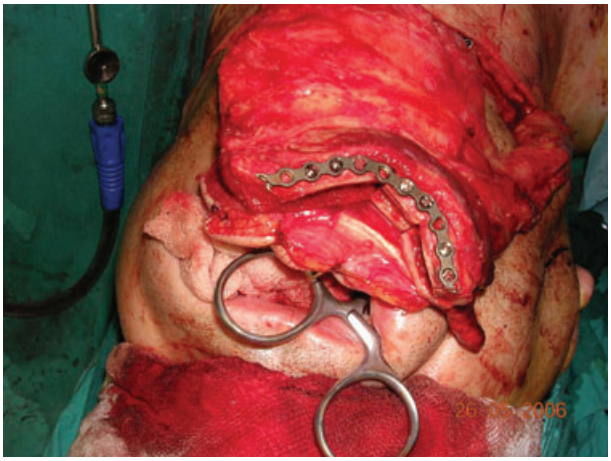

Figure 2 Fixation of the graft with a U-shaped titanium miniplate.

Figure 1 Postoperative view of resected portion of anterior maxilla.

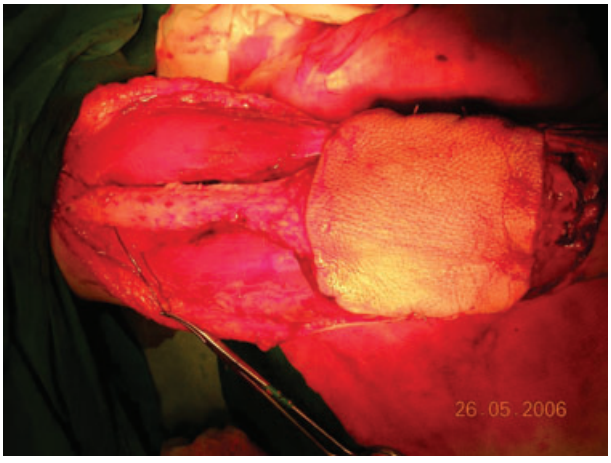

Figure 3 Radial forearm osteocutaneous flap.

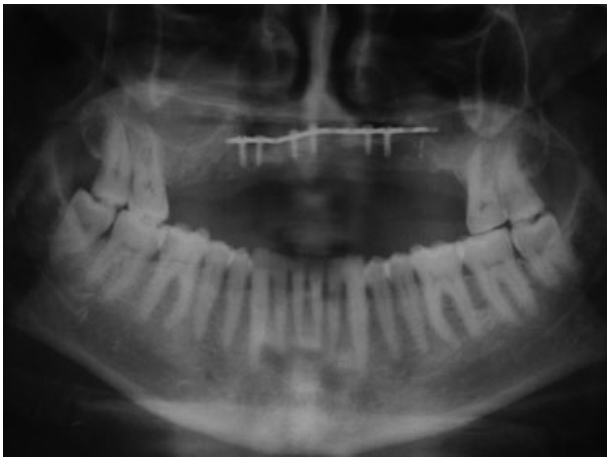

Figure 4 Panoramic radiograph after tumor resection and grafting.

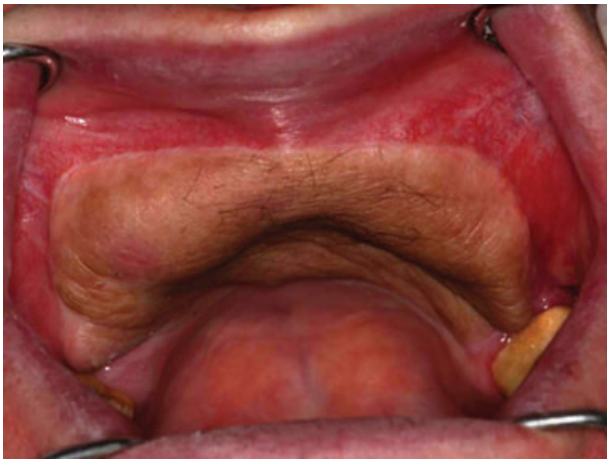

Figure 5 Mobile, thick mucosa on the hard palate that might negatively affect denture stabilization.

Figure 6 Interim denture lined with a tissue conditioner and fixed with splinting wires.

Figure 7 Intraoral view of the remaining teeth prepared for telescopic crowns and the healed mucosa.

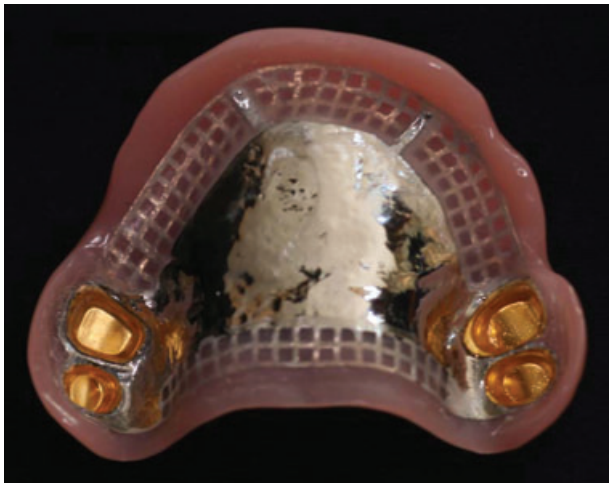

Figure 8 Finished overdenture with secondary telescopic crowns.

Figure 9 Intraoral view of the telescopic overdenture.

prosthesis was inserted into the patient's mouth and adjusted for proper occlusal contacts. Two holes on the buccal flanges were prepared for fixing the denture to the mucosa at the surgery.

At the next surgical appointment, all fascias and the connective tissue between the skin and the bone were resected. The U-shaped Ti miniplate on the superior side of the bone flap was left in place, and the skin was primarily sutured. The intaglio surface of the interim prosthesis was relined with a tissue-conditioning material (Viscogel, Dentsply DeTrey Gmbh, Konstanz, Germany) and was fixed on the skin flap using splinting wires applied on both sides (Fig 6).

Splinting wires were removed 2 weeks after surgery, and the interim denture was relined with fresh tissue-conditioning material (Viscogel). At the 1-week postinsertion evaluation, the patient reported reasonable adaptation to the interim prosthesis. No tissue problem was found upon examination.

After 2 months of healing, the patient was examined for definitive prosthodontic treatment. Intraoral findings showed a stable mucosa with optimal thickness and no mobility. A telescopic overdenture that would support the upper lip and enhance esthetics was planned. The remaining teeth (#1, 2, 15, 16) were prepared with a chamfer margin (Fig 7). A definitive impression of the tooth preparations was made using vinylpolysiloxane material (Brecision, Bredent, Senden, Germany). Telescoping superstructures were fabricated using galvanoelectroforming.[21] Primary telescopes were milled from pure Ti using CAD/CAM technology (Everest system, KaVo, Biberach, Germany), and the secondary copings of 99.9% pure gold were generated by automatic electroforming in the galvano bath (AGC-Micro; Wieland, Pforzheim, Germany) within approximately 8 hours. The overdenture framework was fabricated in cobalt chrome (Biosil F, DeguDent GmBH, Hanau, Germany) and was luted to the secondary galvano copings. After recording and transferring the maxillomandibular relation onto a semiadjustable articulator (IML ARTI S4) using a facebow transfer, artificial teeth (VitaPan) were selected and arranged. The trial arrangement was evaluated intraorally for esthetics, phonetics, OVD, and centric relation.

The telescopic overdenture was processed using a heat-polymerized denture base acrylic resin (Meliodent Heat-cure Denture Base Material), and finished (Fig 8). The primary telescopes were cemented (Harvards cement, Richter & Hoffmann, Berlin, Germany), and the finished overdenture was delivered. The patient was instructed in maintenance and hygiene procedures associated with the overdenture. Routine recall appointments were scheduled on a monthly basis, and no complications occurred during the 15-month follow-up period (Fig 9).

Discussion

Comprehensive treatment planning and a multidisciplinary approach are of paramount importance in head and neck cancer patients. A team, including a maxillofacial surgeon, reconstructive surgeon, prosthodontist, speech and swallowing therapist, and psychiatrist, should cooperate to achieve an acceptable clinical result and to meet the patient's rehabilitative needs during and after the therapy.

Since the defect of the patient presented was surgically closed with an osteocutaneous flap, it was planned to derive the retention of the definitive denture from the grafted palatal base and the remaining teeth. At the prosthodontic appointment before the first surgery, the intraoral examination revealed a mobile palatal base with resilient mucosa, which would possibly impair the overdenture's retention and stability. Therefore, a second surgery was planned to eliminate the mobility. Use of an interim denture also served to provide the tight adhesion of the graft to the underlying bone during healing. Additionally, the patient was able to function properly during this period with the aid of the interim denture. Although the need for a second surgery and the fabrication of an interim denture had some negative effects, such as time loss and increased cost, it was thought that the outcome of the final treatment relied on a properly formed palatal base in addition to the support of the remaining posterior abutment teeth.

The remaining posterior teeth provided reasonable support and retention in the company of the properly formed grafted mucosa on the palatal region. Tooth support might have also prevented the possible downward rotation of the overdenture on the resilient grafted palatal denture base area.

The quality of life issue is critical to the planned treatment, and the patient with a partial maxillectomy can be restored to normal appearance and function.[16] The patient presented had no discomfort either in physical appearance or in overdenture retention and stability during the 15-month follow-up period.

Summary

Management of maxillectomy defects represents a complex challenge in the field of prosthetic dentistry. This report describes the treatment sequence of a patient with a squamous cell carcinoma in the maxillary anterior region. The telescopic overdenture improved both the esthetic appearance and the chewing function of the presented patient.

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