

Rehabilitation of Partial Mandibulectomy Using Implant-Supported Removable Prosthesis in an Irradiated Patient: Case Report

Kısmi Olarak Mandibulası Çıkarılmış Hastanın İmplant Destekli Hareketli Protez ile Rehabilitasyonu

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ABSTRACT Patients who have jaw resections with unrestored mandible display cosmetic disfigurement, compromised function, and frustration in social functions. Implant retained prosthesis is the best treatment option for these patients. Furthermore, this treatment improves the quality of life. However, mandibular resection patients usually undergo radiotherapy, so implants may fail, and treatment plan can be changed. The purpose of this clinical report is to present a patient with a partially resected mandible treated with implant supported prosthesis. A 51 year-old man with partially resected mandible was referred to prosthetic department for the treatment. The patient was treated with implant supported removable prosthesis with precision attachments as locator and bar retained attachments. For improving the retention; an extracoronal attachment was placed to remaining canine. And the maxilla was rehabilitated with fixed partial dentures and precision attachment prosthesis. Finally, the patient was satisfied with the final result of the function and esthetic appearance of the prostheses.

Key Words: Radiotherapy; mouth neoplasms; dental prosthesis, implant-supported

ÖZET Protetik tedavi yapılmamış mandibular rezeksiyonlu hastalar; estetik açıdan yüz deformitesi, dengeli olmayan bir oklüzyon ve sosyal fonksiyonlarındaki eksiklikten yakınmaktadır. İmplant destekli protez yapımı bu hastaların fonksiyonel ve estetik açıdan tedavisi için etkili bir seçenektir. Ayrıca, bu tip protezler yaşam kalitesinin yükselmesini sağlamaktadır. Bununla birlikte bu hastalar çoğu zaman radyoterapi almak zorunda kalırlar ve implant kaybı nedeniyle protetik planlamanın değişmesi gerekebilir. Bu vaka raporunun amacı, mandibulası kısmi olarak rezeksiyon edilmiş ve radyoterapi almış bir hastaya ait implant destekli protez yapımının sunulmasıdır. 51 yaşındaki erkek hasta protetik tedavi için protez bölümüne başvurdu. Hastaya kron dışı hassas tutucu, lokator ve bar tutuculu hareketli bir implant destekli protez yapılmasına karar verildi. Üst çenenin tedavisinde; sabit parsiyel protez ve hassas tutuculu hareketli protez kullanıldı. Hasta daimi protez fonksiyonu ve estetik görünümü açısından memnun olarak kliniğimizden ayrıldı.

Anahtar Kelimeler: Radyoterapi; ağız tümörleri; diş protezi, implant destekli

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Tumor resections of the tongue, mandible, and adjacent tissues cause problems in prosthetic treatment. Resection of the large parts of these tissues may result in several problems such as speech and articulation problems, difficulty in chewing and swallowing, retrusion and deviation of the mandible, difficulty in controlling lips and jaws in excursions, compromised control of salivary secretions or xerostomia, facial asymmetry, sensory loss, and severe cosmetic disfigurement.^{1,2}

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Surgery is often necessary for the treatment of maxillofacial tumors. However, surgical treatment must generally be combined with radiotherapy.¹ Postoperative radiotherapy generally compromises oral functions. Changes in oral anatomy as a result of resection, and complications of radiotherapy such as xerostomia and intolerance to mechanical loading, limit prosthetic rehabilitation in these patients.^{3,4} In healthy patients oral functions can be improved using implant supported prostheses, and this treatment has become important in the rehabilitation of oral cancer patients.⁵⁻⁷ Implants can be inserted at the same stage of the primary reconstruction or not. Advantages of insertion of the implants at the same stage of the primary reconstruction are to avoid the need for a second surgery, to shorten the time of dental rehabilitation and to improve the social adjustment.⁸ Placement of osseointegrated implants with a second stage surgery may be beneficial to perform blood supply of the bone flap which might be compromised at the primary surgery due to osteotomies and hardware placement.⁹

Although implant supported prostheses provide appropriate retention and stabilization on the resected patients, increasing the surgical stages may not be favorable on the irradiated jaws. However, studies showed that insertion of an implant into irradiated mandible neither affects the osseointegration period nor the survival rate.^{2,10} Furthermore, it was also stated that implants on irradiated mandibles show a high success rate.¹⁰⁻¹⁵ On the other hand, Raoul et al. stated that when the radiation dose exceeds 50 Gy, risk of the implant failure due to peri-implantitis and osteoradionecrosis increases.¹⁶ The placement of implants before and after radiotherapy has been reported and a period of 6 weeks between reconstruction and radiation therapy was recommended.¹⁷ On the other hand, it was also reported that postoperative radiation increases the risk of loosening of implants and osteoradionecrosis.^{18,19} Placement of implants after radiotherapy prevents loosening of implants. Decreased implant survival has been reported for irradiated mandibles in previous studies.^{20,21}

This clinical report presents the rehabilitation of an irradiated patient who has undergone partial mandibulectomy and hemiglossectomy with an implant-supported removable prosthesis for mandible together with tooth supported precision attachment prosthesis for the maxilla.

CASE REPORT

A 53-year old man was referred to Gazi University, Faculty of Dentistry, Department of Prosthodontics. The anamnesis revealed that the patient had been treated for the well-differentiated squamous cell carcinoma of tongue with partial mandibulectomy and hemiglossectomy. The resection was located on the right side of the mandible and the patient underwent six cures radiotherapy until May 2011 after the surgical phase in March 2011. After two and a half years from the radiotherapy, the prosthetic treatment began. In the intraoral examination, it was observed that the patient had remaining teeth on both maxilla and mandible, and a resection area including tongue were on the right lower border of the mandible. The radiographic examination revealed that the resected parts of the corpus mandible were fixed with reconstruction plates. At the surgical phase, mandibular nerve was also resected with the tumor and innervation could not be achieved on this region (Figures 1A, B).

To provide good masticatory function and meet the esthetic expectations of the patient, it was decided to insert endosseous dental implants into mandible for treating the patient with fixed prostheses. Before implant surgery, treatment details were discussed and patient approved the treatment protocol and signed a informed consent form. Five endosseous implants (Nobel Biocare AB, Goteborg, Sweden) were inserted into mandible on the location of 32, 35, 36, 41, and 43 (Figure 1C). Due to the insufficient bone height and width in the mandible because of the resection and resorption, the implants were planned to be inserted where the bone height, width, and volume were adequate. Two implants were lost during the osseointegration period due to effect of the radiotherapy on mandible. So the treatment plan was changed. It was decided to treat the patient with removable implant supported

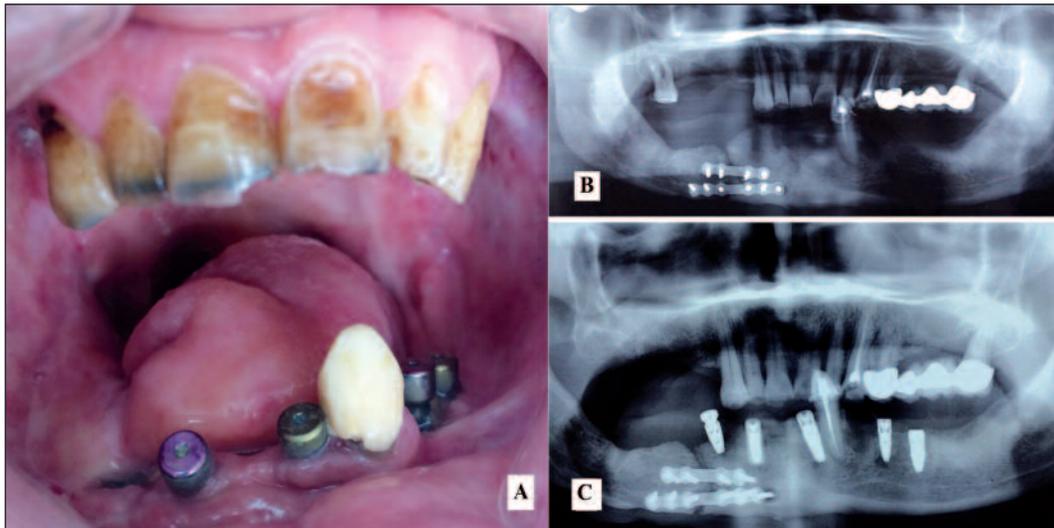


FIGURE 1: Initial view of the patient. **A)** Intraoral view. **B)** Initial radiograph of the patient. **C)** Radiograph of the placed implants.

prosthesis. Four months after insertion of dental implants, healing caps were placed and waited for one week for soft tissue healing. Before prosthetic rehabilitation, vitalities of the teeth were evaluated. Devital mandibular canine was endodontically treated. Remaining teeth on the maxilla were prepared for metal-ceramic crowns, then impressions were taken with silicone elastomere (Zetaplus, Oranwash, Zhermack, Rovigo, Italy). After the preparation of the mandibular canine teeth, impression posts were inserted onto the implants and impressions were taken with silicone elastomere (Zetaplus, Oranwash, Zhermack, Rovigo, Italy) with double-mix technique. Two implants which were inserted on the anterior mandible were fixed with a bar retained attachment and a locator attachment was placed on the single implant located on the left side.

Then, metal substructures of fixed partial prostheses were tried in. A resilient precision attachment (Bredent VKS-SG-SV Senden, Germany) was placed on the remaining mandibular canine, and 1-2 mm gap between the oral mucosa and bar attachment was left for providing the patient's sustainability on oral hygiene procedures. Porcelain try-in was carried out. Maxillary preliminary impressions were made by using a metal stock tray and irreversible hydrocolloid (Jeltrate Type II; Dentsply, Milford, Del) impression material and a stone cast was obtained. Then, individual trays were made on the casts. Definitive impression was also taken with the irreversible hydrocolloid. Then a cast metal base framework was tried in (Figures 2A, B). At the phase of recording the maxillomandibular relationships, low vertical dimension of occlusion was es-



FIGURE 2: Try-in phase. **A)** Framework try-in. **B)** Porcelain try-in.

tablished in order to facilitate insertion of the bolus between both jaws and prevent the movement of the prosthesis during function.²² After this step, waxed up dentures were tested. The patient's occlusion was set to group function occlusion in order to increase the stability of removable prostheses. At the delivery phase, the position of the locator attachment was determined on the prosthesis and a slot was prepared for the attachment on the mucosal side of the prosthesis, and then the attachment was directly retained to the prosthesis (Figures 3A, B, C). Contacts in eccentric movements were avoided, and oral hygiene instructions were summarized to the patient.

The patient was satisfied with the final result of the prostheses. During six month follow-up period, no mechanical or biological complications was observed and the patient stated that he had not any difficulty during function.

DISCUSSION

Mandibular defects are classified by the location of the defects which can include anterior mandible, lateral mandible, and ramus/condyle.²³ Classifica-

tion of mandibular defects defined as; central defects including both canines are abbreviated as "C," lateral defects that do not include the condyle are abbreviated as "L", and the defects include the condyle which is resected together with the lateral mandible abbreviated as "H".^{23,24} The classification was modified to include "t" representing a significant tongue defect, "m" a mucosal defect, and "s" an external skin defect.^{23,25} According to this classification, the case presented in this article was classified as L-t defect. Mandibular resections extending to the midline indicate a poor prosthetic prognosis, and if the resection is limited to the premolar region anteriorly, the prognosis is more pleasing.²² Status of the remaining tongue may be the most important prosthodontic prognosis indicator.²² In this patient the resection area was located on the lateral mandible, the patient had sensory control of the tongue, and the tongue was mobile. The resected parts of mandible are often rebuilt with reconstruction plates. Reconstruction plates are either rigid plates that are applied to the lower border of the mandible to fix corticocancellous blocks or vascularized bone grafts to the re-

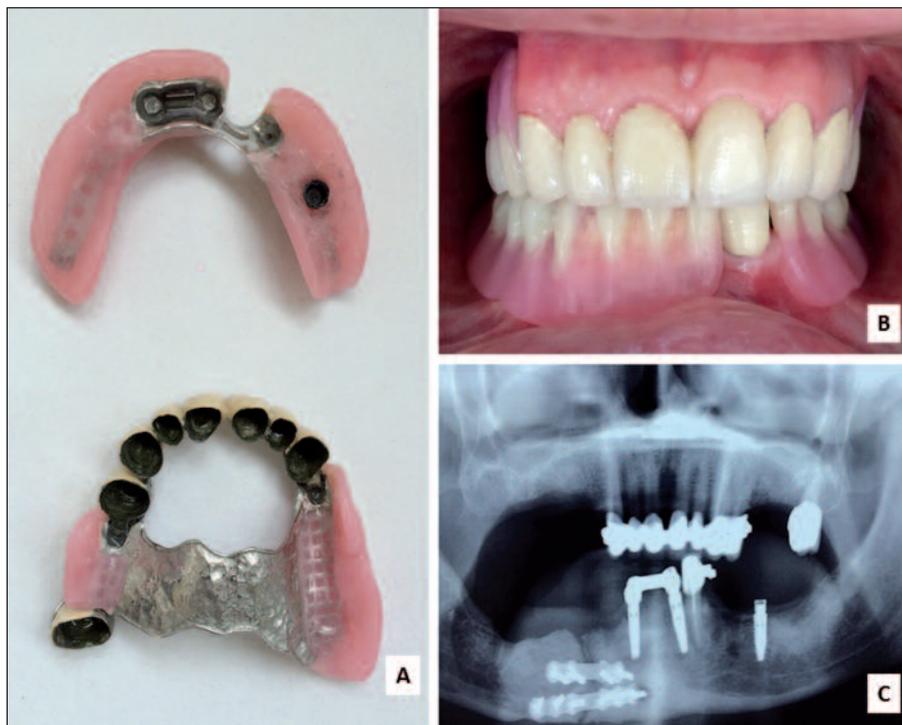


FIGURE 3: Definitive prostheses. **A)** Maxillary and mandibular removable prostheses. **B)** Prostheses are in situ. **C)** Radiograph of the implants and attachments.

maintaining bone tissues. They are made with the intention of bridging a defect, stabilizing remaining segments, and maintaining occlusion and facial contour.²⁶ In this patient, the resected area was small and vascularized bone grafts were not used, and any complications related with reconstruction plates were not observed.

Impairments of motor and sensory control of the tongue, lip, and cheek affect the patient's ability to control the prostheses during function.²⁷ Fixed prostheses may offer the best solution for avoiding trauma on mandible caused by removable dentures and eliminating soft tissue coverage to prevent bone exposure and osteoradionecrosis.²⁷ In this patient, firstly it was decided to use implant supported fixed prosthesis for the rehabilitation. For this aim, five implants were inserted into mandible to support the prosthesis. However, two implants were lost during the osseointegration period. Oral functions, patients' satisfaction, condition of peri-implant tissues, and survival of implants up to 14 years were investigated in oral cancer patients who had mandibular overdentures. It was reported that irradiated patients had more problems in oral functions and less satisfaction than those who had not, and loss of implants was higher in patients treated by radiotherapy than in patients who were not treated.³ Implants which were placed in irradiated bone had been reported to show progressive loss for up to 6 years after placement. Failure rates of mandibular implants placed in irradiated bone with more than 5000 cGy had been reported to be as high as 33%.²⁸ For this a minimum of 9-12 months between radiotherapy and implant placement is recommended to allow for the regeneration of depressed bone segments.²⁹ Despite the high rate of implant loss, radiotherapy

can not be considered as a contraindication for the insertion of mandibular dental implants.^{30,31} Radiotherapy was associated with higher rates of implant loss and surface texture may be a key factor in the success of implants placed in irradiated bone.³² Placement of implants after radiotherapy prevents failure of implants in patients with a poor prognosis. Implant survival has been reported to be worse in irradiated mandibles compared with that of mandibles not exposed to radiation.^{20,33}

In the literature, there is no special information about specific characteristics of resection prostheses.³⁴ Removable prostheses are generally used in resected patients, because these patients had few remaining teeth. In addition, uneven distribution of support (teeth and/or implants) made removable prostheses necessary.³⁵

In this patient, after the exaction of the implants, new implants were not placed into mandibular bone due to the insufficient bone volume. And also, healing period of the implant sockets and the osseointegration process of the new implants could take time to finish the treatment of the patient. In this case, the treatment plan should have been changed because of the failed implants. The patient was treated with implant supported removable prosthesis by using the remaining implants. The maxillomandibular relationships were generated as group function occlusion to provide contacts on working side at the same time when sliding laterally, and to avoid forces on the non working side (defect area). Use of implant supported prosthesis enables to solve function, speech, and esthetic problems. Results indicated that the patient was satisfied with the prosthesis during 6-month follow-up period. And also, the patient stated that the prostheses improved his quality of life.

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