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Two clinical cases of prosthetical rehabilitation after a tumor of the upper maxilla

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Abstract. – The most frequent type of treatment for patients diagnosed with a malignant neoplasia of the oral cavity is surgical removal of the tumor.As a result of the resection performed, it is difficult to obtain satisfactory results in the oral rehabilitation of these patients.

When possible, fixed prostheses are the best option, because they guarantee stability, but they should be made so that the operator can remove them periodically to check the health of the oral tissues underneath and to intercept any relapse of the tumor.

This study analyses two cases of patients surgically treated for a tumor of the upper maxilla at the Oral and Maxillo-Facial Surgery of Sapienza University, in Rome. In the first case the surgical site was covered with local flaps, and the patient was rehabilitated with an implant-supported removable prosthesis. In the second case the maxilla was reconstructed with a fibula vascularized free flap, and the patient was rehabilitated with an implant-supported prosthesis screwed to a titanium bar solidarizing the implants. Therefore, this prosthesis was fixed, but could be removed by the dentist.

The different approach to these two cases was influenced by the different anatomic situations after the reconstruction.

It is important for the dentist to approach these patients knowing the kind of surgery they received because this aspect will influence rehabilitative choices. Rehabilitation should be planned, when possible, before surgical treatment, in order to cooperate with the maxillo-facial surgeon in choosing the most appropriate restorative treatment.

Key Words:
Oral cancer, Radiotherapy, Implant-supported rehabilitation.

Introduction

Oral cancer is not an uncommon disease, and its treatment requires the cooperation of various practitioners and health workers, who follow the patient through the phase of diagnosis of the tumor, therapy and oral rehabilitation.

The most frequent type of treatment for patients diagnosed with a malignant neoplasia of the oral cavity is surgical removal of the tumor. Ablative surgery may be followed by a reconstructive phase, in which the surgeon may choose between local flaps, non-vascularized bone grafts or free vascularized flaps to close the surgical site, depending on the general conditions of the patient and the extent of the anatomic damage. Before or after the surgical procedures, or between the ablative and reconstructive phases, the patient may need to undergo radiotherapy and/or chemotherapy. After cancer treatment, a prosthetic rehabilitation is usually necessary to restore oral functions and facial harmony.

Aesthetic and functional results are challenging to achieve for the prosthodontist, because the removal of the tumor unavoidably determines loss of soft and hard tissues and often of the alveolar ridge and buccal vestibule, which are a fundamental requisite for retention of a removable prosthesis[1]. Surgical reconstruction of the defects can only partially overcome these drawbacks: the entire range of prosthetic alternatives must be considered and rehabilitation should be planned, when possible, before surgical treatment, in order to cooperate with the maxillo-facial surgeon in choosing the most appropriate restorative treatment.

When rehabilitating a completely edentulous patient, the options are either conventional complete prosthesis or implant-supported overdenture (ball-retained or bar-retained, supported by at least two implants). In both these options the acrylic resin used for shaping the flange of the denture offers excellent possibilities for filling and replacing lips and cheeks, but implants confer a degree of stability to rehabilitation that the oral structures, deformed by surgical treatment, are no longer able to provide[2]. Fixed prostheses are the best option, because they guarantee stability, but they should be made so that the operator can remove them whenever necessary, to peri-

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odically check the health of the oral tissues underneath them, in order to intercept any relapse of the tumor.

Tumor treatment often requires radiotherapy in the areas affected by the lesion: this is another condition that may compromise the success of oral rehabilitation: in fact, as a result of RT-induced xerostomia a conventional prosthesis is unable to maintain its stability via the suction effect guaranteed by the saliva. Furthermore, implant placement is hindered by a prior RT, because irradiation reduces bone vitality through a progressive fibrosis of blood vessels, leading to hypoxia and hypocellularity. In similar conditions osseo integration of the implants is more difficult and may result in failure[3]. Even the soft tissues are damaged by RT, because of the loss of attached and keratinized gingiva in the irradiated areas, that hence become less resistant to the traumatic effect of a removable prosthesis and implant placement[4-6].

Moreover, xerostomia increases the risk of a periimplant inflammation with loss of the implant. To allow the recovery of tissues after irradiation, implants should not be positioned earlier than 12 months after irradiation[7,8]. According to other Authors, shorter times are sufficient[9, 10] (not before six months after RT).

Although fixed rehabilitation is theoretically the most suitable solution, in practice, unreconstructed patients do not have the necessary tissue support to sustain a fixed prosthesis, meaning that, they would benefit more from a removable prosthesis. Moreover, reconstructed patients, having restored their oral structures, can exploit the advantages of a fixed prosthesis[11, 12].

This study analyses two cases of patients surgically treated for a tumor of the upper maxilla at the Oral and Maxillo-Facial Surgery of Sapienza University, in Rome. In the first case the surgical site was covered with local flaps from the temporal muscle, and the patient was rehabilitated with an implant-supported removable prosthesis with ball attachment. In the second case the maxilla was reconstructed with a fibula vascularized free flap, and the patient was rehabilitated with an implant-supported prosthesis screwed to a titanium bar to make the implants more solid. Therefore, this prosthesis was fixed, but could be removed by the dentist.

Case 1

In 2005 the patient – a 60 year old woman – was referred to us for a leucoplakia on the left side of the upper maxilla. Radiological investigation showed a mass with apparently infiltrated edges. Histological analysis revealed a squamous carcinoma. Surgical ablation of the tumor was planned and the patient underwent left hemimaxillectomy.

At the same time the surgical site was covered with a local flap from the left temporal muscle[1].

The patient did not receive any radio- or chemotherapy.

After four years of follow-up, a sinus graft of the right maxillary sinus was performed.

The patient was initially rehabilitated with a removable complete denture for the upper arch and a removable partial denture for the lower arch (Figure 1). A side effect of the operation was the limited amount in the mouth opening (1.5 cm), due to the use of the temporal muscle to close the surgical site (Figure 2).

Radiological markers were positioned in the prosthetic teeth in order to perform a CT Cone beam dentascan and implant positioning was planned in the residual maxillary bone (Figure 3). Four implants were inserted (Dentsply® Int. Incorporated, York, PE, USA) diameter 3.8mm using a computerized surgical template (Materialize® Leuven, Belgium) (Figure 4).

Two implants were placed at the level of the canine and first molar on the right, and another two were placed in the premaxillary zone; one implant in the premaxillary zone, near the resection margin, was lost before loading.

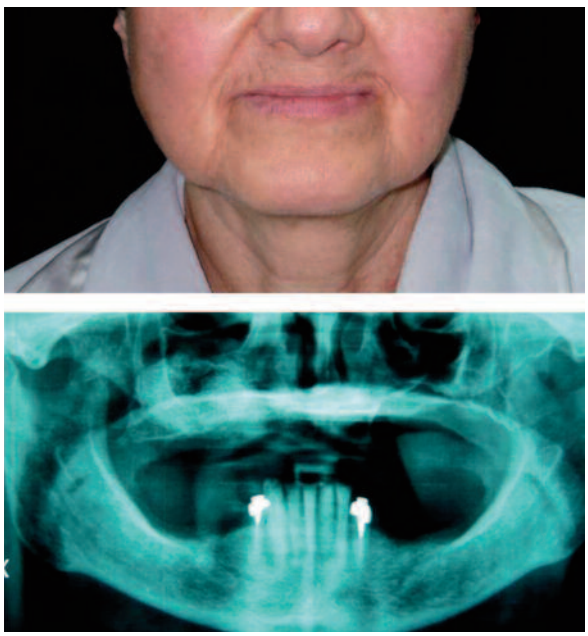

Figure 1. Patient after surgery; extraoral view and OPG (orthopantomography).

Figure 2. Patient wearing the removable prostheses after surgery and detail of the limitation in mouth opening.

Due to the physiotherapeutic effect of temporary removable prosthesis, mouth opening significantly improved (from 1.5 cm to 2.5 cm mouth opening after 4 months) (Figure 4). Finally, the patient was rehabilitated using acompletely removable resin prosthesis, fitted to the ball attachment of the abutment of the implants (Figure 5). Figure 5 shows a cross-bite on the left side of the prostheses, that helps in guaranteeing stability of the denture in this particular condition.

The lower jaw was rehabilitated using a partially removable prosthesis.

The quality of life of the patient improved significantly thanks to the rehabilitation treatment, that restored oral functions and refined facial harmony (Figure 6).

Case 2

In 2009 the patient – a 41 year old woman – came to our observation: the anamnesis revealed

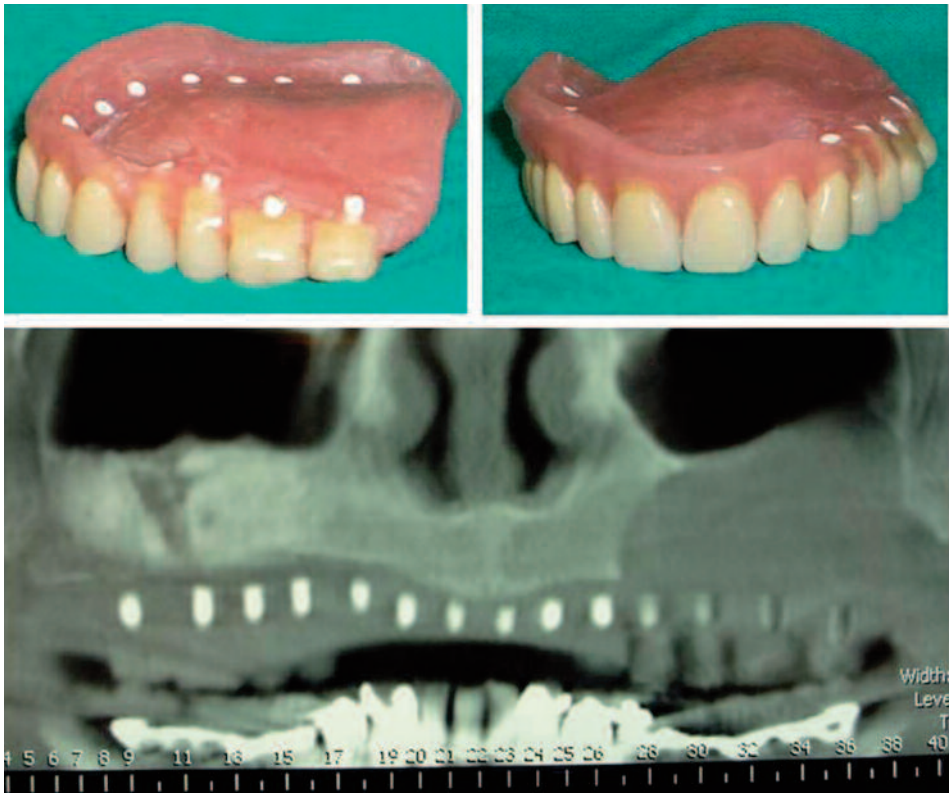

Figure 3. Planning of implant insertion; CT (computed tomography) with removable prosthesis used as radiological template.

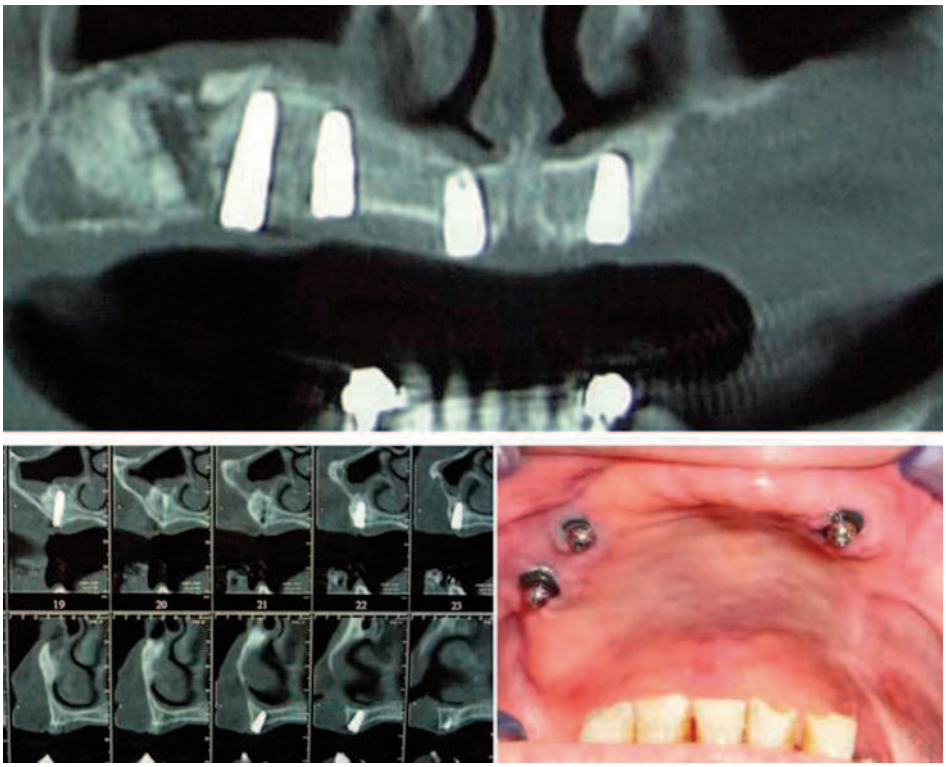

Figure 4. Implants inserted; CT and intraoral view.

that the patient had been treated in 2007 for an osteosarcoma of the upper maxilla (Figure 7) with a maxillectomy performed from the second right premolar to the left maxillary tuber. The surgery site had been reconstructedat the same time using a free vascularized fibula flap (Figure 8)[13]. In 2008, after the surgical phase of resection and reconstruction, the patient underwent 33 cycles of radiotherapy.

The patient came to our observation eight months after the end of radiotherapy, so we decided to perform a temporary removable prosthesis and to wait at least for one year after RT had ended before placing implants. The temporary prosthesis allowed restoration of occlusal stability lost after the surgery (Figure 9).

One year after RT, implant-supported rehabilitation was planned to confer greater stability to

Figure 5. Patient wearing the final prosthesis and a detail of the improvement in mouth opening.

Figure 6. Patient after rehabilitation.

the denture, and seven implants were placed in the new premaxilla built by the fibula flap (Camlog®, Basel, Switzerland) diameter 3.8 mm six implants, diameter 4.3 mm one implant) (Figure 10). The temporary resin prosthesis was maintained for another four months. Then, to create a fixed partial prosthesis and to consolidate the implants, a titanium structure, screwed to the implants, was chosen, covered by a secondary titanium structure screwed to the primary structure. The secondary structure was covered by composite to simulate soft tissues and teeth (Figure 11). The prosthesis, although fixed by screws, could be removed by the operator in case of need. The patient achieved very satisfactory functional and aesthetic results,taking advantages from an optimal retention of the prosthesis and avoiding the embarrassment of wearing a removable denture in public (Figure 12).

Discussion

Tumors of the palate represent 8% of oral cavity cancers[14]; reconstruction of the palate after ablation of the neoplasia is necessary, in order to create an anatomic limit between oral cavity and the overlying structures (nasal cavity or maxillary sinus); otherwise, deglutition and phonation would be compromised.

Flaps from the temporal muscle are a good compromise for patients with limited resection, and for patients who, for general health reasons, cannot undergo general anesthesia for a long time, or for patients with a high risk of losing a free flap

Figure 7. Patient before surgery; extraoral and intraoral view and CT.

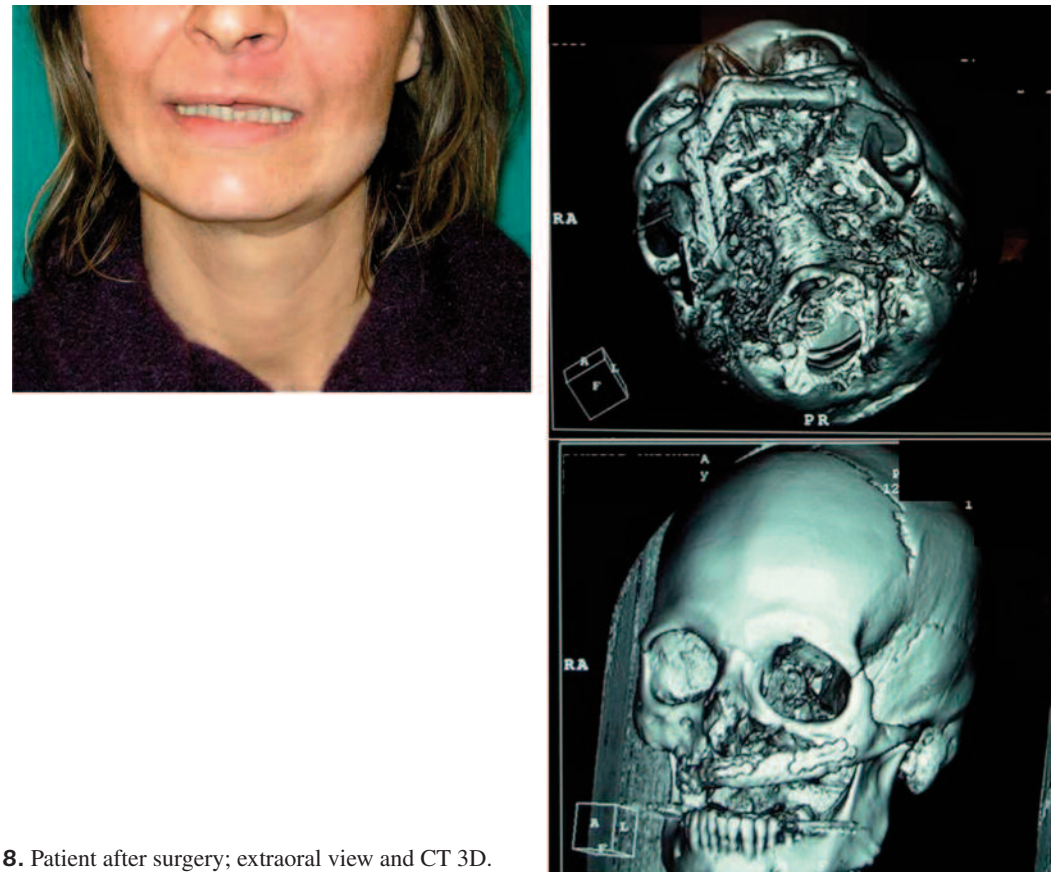

Figure 8. Patient after surgery; extraoral view and CT 3D.

Figure 9. Patient wearing the temporary removable prosthesis.

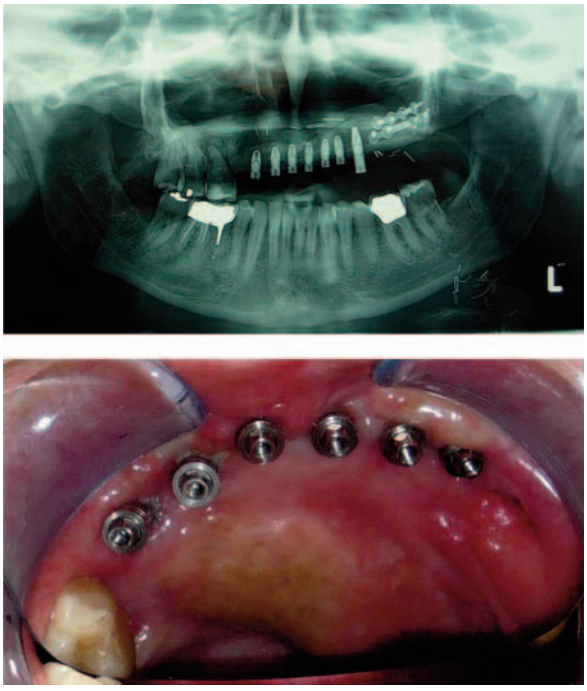

Figure 10. CT and patient after implants placement; OPG and intraoral view.

Figure 11. Final prosthesis sustained by titanium structure.

(cardiovascular diseases, diabetes mellitus). Temporal flaps are very versatile, and, paying attention not to injure the facial nerve, are able to cover the contralateral hemipalate, ensuring an efficient blood supply. They guarantee good results in terms of deglutition, phonetics and aesthetics (good symmetry and malar prominence)[15-17].

When more extensive areas are resected, free flaps are more indicated. Several flaps have been experimented throughout the years, such as the radial forearm free flap, the vascularized fibular free flap, the free deltoid flap, the lateral arm free flap, the iliac crest free flap and the anterolateral thigh flap. Each individual case may benefit from one kind of flap rather than another. The fibular free flap (D1 bone, Misch classification[18]) offers remarkable advantages: good vascularization of the bone gives the possibility of performing multiple osteotomies, guaranteeing a more precise reconstruction;the length of the bone is well suited to large resections; the donor site shows low morbidity; it can be combined it with cutaneous flaps; the high cortical content of the fibula allows a good osseointegration of the implants[19-23].

Figure 12. Patient at the end of the rehabilitation.

When rehabilitating the upper maxilla with implants, the higher risk of failure, compared to the lower maxilla, should be taken into account. Some Authors attribute this difference to the variation in bone density and quality between the upper and lower jaw[4,5,10].

Insertion of implants may be performed together with reconstruction; this is called primary implant insertion. This approach avoids submitting patients to additional surgical procedures for implant placement, but it does not ensure a correct implant positioning and parallelism between the implants placed. Moreover, osseointegration in a site recently traumatized by the flap positioning risks failure.

Secondary implant insertion (4-6 months after the first surgery if there is no need for RT) offers more predictable results, giving the flap time to reach an appropriate level of vascularization, an essential factor in ensuring the success of the first surgery and osseointegration of the implants; it guarantees a correct implant positioning, using, if necessary, a surgical template. The only disadvantage is the need for a second surgical procedure.

Resected patients are at a high risk of breaking their dentures, owing to the fact that after surgery they lose their proprioceptive sensitivity and consequently exert excessive occlusal forces[8]: these forces may damage not only the prostheses, but also the implants, determining a marginal bone resorption and loss of the implant. A possible solution to improve distribution of occlusal loads is to splint the implants with a bar that makes the implants more solid and reduces their micromovements[24-27].

In the treatment of both oncological or non oncological patients, the success of an oral rehabilitation is measured by evaluating three parameters: phonetics, alimentation, aesthetic results.

Phonetics is quite simple to evaluate by asking the patient to pronounce letters as "S","D", "F", "T" while wearing the prosthesis. Improvements during alimentation can be explained by the patient and in some cases evaluated with radiological investigations such as baritate bolum. To evaluate aesthetics it is important to consider facial symmetry, harmonious proportions, malar prominence and labial competence while, of course, attempting to fulfill the expectations and needs of the patient.

Obtaining satisfactory results in terms of these three parameters allows the patients to improve their quality of life. The choice of rehabilitation is influenced by the clinical situation, patient expectations and economic possibilities[28].

The different approach to these two cases was influenced by the different surgical treatment the patient received and the different anatomic situations after the reconstruction[29].

It is important for the dentist to approach these patients knowing the kind of surgery they received because this aspect will influence rehabilitative choices[30].

Referring to the two cases described here the surgical choice to close the surgery site with a fibula vascularized flap or with a temporal muscle local flap influenced the choices of the prosthodontist, for this reason it isimportant, whenever possible, to plan the kind of rehabilitation in advance with a collaboration between the dentist and the maxillo-facial surgeon.

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