Osteointegration in oncologic patients: a case report

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Summary
Objective: the present case report aims at illustrating how implant-prosthetic rehabilitation in patients with oral cancer resection aids to improve their quality of life.
Material and methods: a patient with verrucous squamous cell carcinoma of the mandible was treated with surgery and rehabilitation with three interforaminal dental implants and Toronto bridge. Three years after treatment, because of cancer recurrence, a segment of jaw and one of the three mandibular implants were removed. The histological examination showed healthy bone contact to implant surface, despite proximity to the neoplastic area.
Results: the case shows the maintainance of the osseointegration implants despite the cancer recurrence in the same area. Conclusions: endosseous implants represent a useful and valid tool for the prosthetic rehabilitation of cancer patients. Long-term effects of implant-prosthetic rehabilitation in patients with cancer still need to be verified. It would be interesting to confirm the data obtained by numerical studies of representative samples.

Key words: oral cancer, oral surgey, neoplastic relapses, osseointegration, prosthetic rehabilitation.

Introduction

Several cases of implant-prosthetic rehabilitation in patients undergoing resection and microvascular reconstruction due to oral cancer have been described (1); in some cases, the presence of carcinomatous lesions near implants (2) was observed. In the present study the tumour recurrence and cancer were not related to the implant placement itself. On the contrary the tumor recurrence which requested an osteotomy highlights that osteointegration in oncologic patient is possible.
Although there are few studies concerning this problem, we observed that the first clinical manifestation of these lesions may look as a simple peri-implantitis. This observation supports the hypothesis that a malignant tumor may be masked by implant complications (3,4). Correlation between implants and oral cancer seems to be unconfirmed because most of the cases described in the literature have at least one risk factor for oral cancer (5). The squamous cell carcinoma represents about 95% of the annual incidence of oral cancer lesions. The most frequently affected sites are the tongue (35%), the lip (25%), the floor of mouth (15%), the alveolar ridge (10%), the buccal mucosa (7%), the hard palate (6%) and the mucosa of the alveolar process (2%) (6). The surgical therapeutic approach in these cases is usually the best solution to completely eradicate the lesion with wide margins of safety. In 70-80% of cases a relapse is observed within the first two years, after which the percentage changes to 10 and 30% (6).

Case report

The patient, 70 years old, came to our attention at the Oral Cancer Center in the dental clinic of the University of Milan-Bicocca in Monza in 2005 requiring treatment for an exophytic leucokeratosic lesion localized at the level of the interforaminal portion.
Initially, incisional biopsy of the lesion was performed, allowing to diagnose a framework of hyperplasia verrucosa. Then we proceeded executing an excisional biopsy allowing to diagnose an epidermis keratoblastic carcinoma, warty type, which was treated with partial right mandibulectomy and reconstruction with forearm microvascular flap.
Two years later at the Department of Otolaryngology of S. Gerard Hospital in Monza, during a cancer follow-up, a lesion in the left lingual edge was found. Furthermore, after the removal of an old bridge at the level of posterior teeth of the third quadrant, a large ulcerated lesion in the left jowl mucosa and in the left alveolar ridge and a leucoplasic lesion in the left oral floor and contiguous body of the tongue were observed. Biopsy and histological examination allowed the diagnosis of a leukoplakia in the left margin of the tongue. Furthermore, through excisional biopsy in the left alveolar ridge a keratinizing G2 carcinoma was diagnosed and treated with chemotherapy and radiotherapy.

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After 12 months of radiation therapy, the implant-prosthetic rehabilitation of the patient was performed at the S. Gerard Hospital dental Clinic placing three endosseous implants in the intraforaminal portion using the two-stage technique (7-9, 13). Due to the considerable thickness of the radial flap, we decided to use healing screws 4 mm high. This solution allowed adequate stability and perfect adaptation of the flap in the early phase of healing.
Following the prosthesis phase, a fixed prosthesis type Toronto Bridge was placed (Fig. 1).

Figure 1. Fixed prosthesis type Toronto Bridge.

Before each new round of radio- and chemotherapy, the patient was monitored and treated from the dental point of view in order to promptly remove the potential infective hotbed that could affect the overall health of the patient during chemotherapy immunosuppression.
In 2009, during cancer follow-up through positron emission tomography (PET), a lesion measuring 3 cm in diameter in the right jowl mucosa was found. The lesion extended for 3-4 mm posterior to the retromolar trigone. A biopsy and subsequent histological examination were performed. A squamous cell keratinizing carcinoma was diagnosed, which was removed with laser diodes.
In February 2010 a new ulcerated lesion was found in the right jowl and alveolar mucosa. Therefore, we proceeded with functional emptying of the right neck and removal of the right submandibular gland. Due to the contiguity of the implant with the relapse (Fig. 2), it was necessary to remove the corresponding mandibular segment with one of the three dental implants (Fig. 3). Following the demolitive surgery, a right radial flap reconstruction was processed using a microvascular right radial flap and a radial beam skin taken from the same radial forearm (Fig. 4). By histological examination of the removed mandibular fragment, containing one of the three implants, we noted a good peri-implant bone healing, despite being close to the neoplastic tissue (Fig. 5).
It should be specified that the biopsy was performed at the level of a bone fragment, obtained unintentionally during the peri-implant osteotomy performed with piezosurgery, in direct contact with the coils implant. The use of the

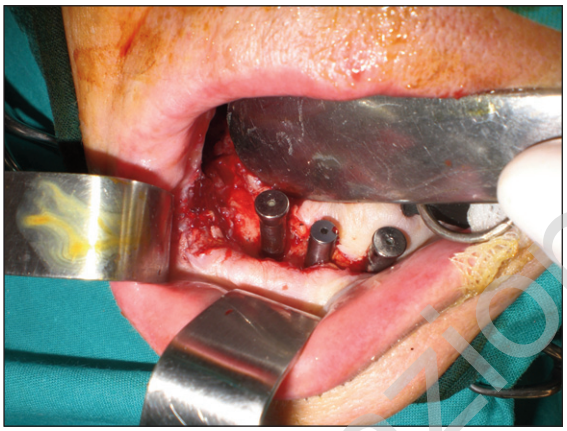

Figure 2. Presence Implant in proximity to tumor recurrence.

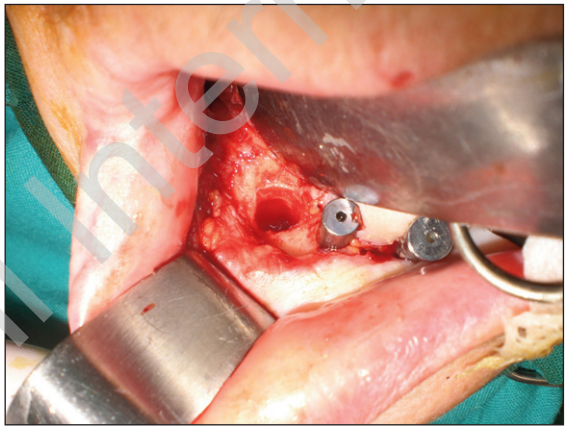

Figure 3. Surgical removal of the implant near the endosteal tumor recurrence.

Figure 4. Radial beam skin flap.

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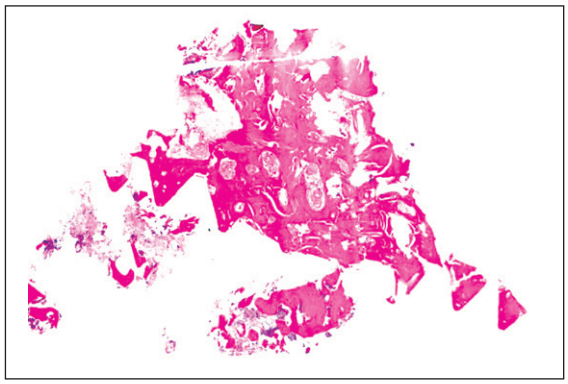

Figure 5. Histological examination of the removed jaw fragment containing one of the three plants.

piezosurgery was fundamental to perform an osteotomy as conservative as possible because the implant itself was osseointegrated. The decision to remove the implant was dictated by the need to obtain an adequate space for the proper positioning of the reconstructive flap that otherwise would have been placed on the implant likely invalidating its success.
In June 2010 the patient was again accepted at the S. Gerard Hospital in Monza because of the emergence of a strong pain, swelling and hyperemia in the skin of the right submandibular region. The biopsy revealed a relapse of spinal cell carcinoma of the right alveolar ridge and of the right jowl mucosa. Because of the severely impaired general condition and the extent of the relapse after oncological evaluation, a pain management and a tracheotomy to protect the airway were implemented. The patient was not considered suitable neither for chemotherapy, nor for surgery.

Discussion

Few reported cases (3,4,10-12) show the presence of a malignancy in correspondence of endosseous implants. Some authors discuss the topic of peri-implant carcinomas first presenting them as peri-implantitis. Obviously, if the patient has a history of malignancy, each oral lesion, including peri-implantitis, could represent a suspect carcinoma (10).
The case report allows to understand how the implant-prosthetic rehabilitation in oncologic resected patients represents the best prosthetic solution. It provides clear advantages compared to the traditional rehabilitative solution, including a greater masticatory comfort and psychological acceptance. In particular, it provides an improvement of the functions of the mouth and of the prosthesis stability, despite the tissues on which we operate are often reconstructed by means of revascularized free flaps characterized by thickness and volumes that would limit the stability and the retention of traditional removable prostheses.
It is important to highlight that the success of prosthetic rehabilitation in cancer patients is influenced not only by the hard tissue but also by the soft tissues. In these patients the soft tissues have often undergone repeated surgery, radiotherapy and therefore they are less elastic and inadequate to traditional prosthetic solutions.
In fact during surgical placement of endosseous implants in cancer patients it is necessary to observe certain surgical recommendations. First of all it is necessary to limit the periosteal dissection because radiotherapy compromises the vascularization of the target tissues. Second, drilling a bone with impaired mineralization is more complex, making necessary a greater surgical precision. Third, a careful evaluation of peri-implant soft tissues is often required to perform surgical procedures on soft tissue in case of vascularized composite grafts in order to change the thickness and to ensure a functional excursion of tongue and lip preventing any interference with the health of peri-implant tissues.

Conclusions

In this case report it is possible to understand how cancer patients can be rehabilitated from a dental point of view adopting prosthesis supported by implants, ensuring a greater masticatory comfort and a better quality of life associated with a varied diet.
Although the patient in question developed further relapse, this did not seem related to the implant placement. The mandibular resection involved one of the implants because during the demolitive-reconstructive treatment, it was been necessary to expand the surgical excision margins in order to ensure the correct positioning and engraftment of the radial flap.
The flap appeared to be contiguous to the implant in question.
Although many cases in the literature associate the tumor relapse to the implant placement, with complications such as peri-implantitis (5,10,12), in the present study, the tumour recurrence and cancer were not related to the implant placement itself. The histology of the resected bone fragment in fact demonstrates the proper implant osseointegration and the absence of any peri-implant complication (Fig. 6).
In the literature the appropriateness of using dental implants in irradiated patients may be questionated. In the study of Cao et al. (14) after approximately 2 years of follow-up, the results showed a significantly lower implant

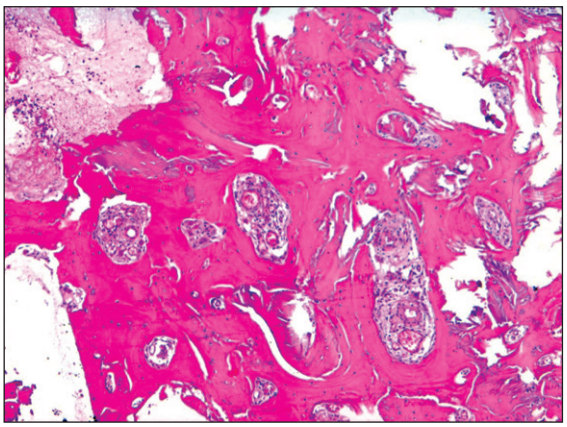

Figure 6. Well differentiated spongy bone tissue, regular architecture. 10x

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survival rate (ISR) in irradiated-compared to non-irradiated patients. In another study (15) prognosis of implant-retained prosthesis was shown to be superior in non-irradiated patients compared to patients having undergone radiotherapy following oral cancer surgery.
Thus, the appropriateness of using DI in irradiated patients may be questioned. On the contrary, some studies (16-18) have reported that DI installed in patients having undergone oral cancer therapy, can osseointegrate and remain functionally stable over long durations. In a study by Cuesta-Gil et al. (19) the 9-year followup results showed a high ISR (92.9%) of DI in irradiated patients. Similar results were reported by Taira et al. (18).
So we can conclude that dental implants can osseointegrate and remain functionally stable in patients having undergone oral cancer therapy, however, such patients should be informed and consented in advance regarding complications associated with implant treatment following irradiation.

Ethics

The authors declare that the presented study was carried out in accordance with the ethical standards established in the Declaration of Helsinki.
The authors state that they have no conflict of interest.
The authors state that they have not received institutional funds for this study.
The authors declare that the informed consent was obtained from all participants before their enrolment in the study.

Patient consent

The authors declare that the informed consent was obtained from all participants before their enrolment in the study.

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