Implant-supported rehabilitation of a patient with mandibular ameloblastoma

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Summary
Objectives: this report describes the masticatory implant-supported rehabilitation of a patient undergoing resection for mandibular ameloblastoma.
Case report: in the reported case the patient underwent resection and reconstruction with a fibula flap for masticatory rehabilitation of 7 implants at the level of the mandible. Discussion: ameloblastoma is a benign locally invasive tumor of maxillary bones that often causes facial disfigurement. The dental management of the patient requires a collaboration of various specialists such as anesthetists, maxillofacial surgeons, and dentists.
Conclusions: in patients with oral cancers such as ameloblastoma, the correct planning of surgery for the tumor resection as well as prosthetic rehabilitation are crucial. Osseointegrated implants open a new perspective of treatment to improve the quality of life of patients resected for cancer.

Key words: ameloblastoma, fibula free flap, mandibular reconstruction, oral rehabilitation.

Introduction

Ameloblastoma is a common and aggressive odontogenic epithelial tumor. It has an aggressive behavior and recurrent course, and is rarely metastatic. It represents 1% of all tumors and cysts that involve the maxillomandibular area and about 10% of the odontogenic tumors. It is primarily seen in adults in the third to fifth decade of life, with equal sex prediction. Radiographically, it appears as a san expansile radiolucent, with thinned and perforated cortices, and it is known to cause root resorption. As it shares common radiographic features with other lesions such as the giant cell tumor, aneurismal bone cyst, and renal cell carcinoma metastasis, a definitive diagnosis can only be made with histopathology (1).
The maxillary mandibular ratio of ameloblastoma is 5 to 1, in favor of the mandible. Its most common site of occurrence is the mandibular molar region. More than 50% of recurrence appears within the first 5 years after primary surgery. Even though ameloblastomas are well studied and documented, little is known about their malignant features (2).
Conventional ameloblastomas tend to grow slowly but are locally invasive and can be highly destructive of the surrounding dental anatomy. Aggressive resection is the most effective method of eliminating the tumors, but treatment can further contribute to patient deformity and malfunction (3).
This leads to serious complications such as facial deformity, oronasal and oro-antral communications, phonetic difficulties, problems with swallowing, loss of teeth and alveolar basal processes wich cause significant chewing impediments.
Surgeons have adopted different techniques for autogenous grafting including “free flaps” with microvascular anastomosis during the recent years. It represents a good solution to restore the anatomy of the arch, oral functions, and facial aesthetics, despite some disadvantages. For example, the thin cutaneous tissue, the thickness of subcutaneous tissues, the absence of the pelvilingual and vestibular groove, and the fragility of the soft tissues complicate the subsequent application and stability of a prosthesis (4).
Also, the edges of the soft tissues are devoid of intrinsic motility and thus may limit the neutral zone, the dynamic space available for a prosthesis between the lips, the cheeks and the tongue.
Regarding the masticatory rehabilitation of these patients, the application of a removable prosthesis, not supported by implants, may be difficult or even impossible due to the post surgical alteration of the anatomy, the low salivary flow and the acceptability by the patient.
A further potential problem consists of a possible inability of the patient to tolerate the prosthesis, especially if unstable, due to the friction created by the bases of acrylic resin on the irradiated mucosa atrophic.
Rehabilitation with implant therapy is therefore potentially more acceptable and reliable for the restoration of masticatory and aesthetics functions (5).
The benefits of implant-retained prosthesis have been recognised since several years. Dental implants may improve denture retention and stability without unnecessary

loading of the vulnerable mucosa. Function, comfort, aesthetics, and eventually the quality of life can be improved (6,7).
Traditionally, implants have been selectively placed secondarily after oncological resection and reconstruction. The merits of the secondary placement include adequate recognition of recurrence and survival, a more accurate assessment of oral health and postoperative function and, in cases of mandibular segmental resection, a better appreciation of the positioning of the implants compared to the primary placements. A less common approach is to place dental implants at the time of resection and reconstruction. Recent publications reported encouraging results using primary insertions at the time of the tumour ablation. Implants can be placed and osseointegration can take place before radiotherapy starts expediting the oral rehabilitation (8).
The next section deals with a general assessment of peri-and post-operative treatments in the oral surgery of a patient resected for mandibular ameloblastoma.

Case report

In February 2006, the patient CT, 53 years old, came to our attention at the San Gerardo Hospital of Monza where a mandibular ameloblastoma was diagnosed. In anamnesis, the patient, who was a sporadic smoker and drinker, did not present any other major disease.
After detailed anesthesiological and preoperative analyses, the patient underwent surgery for tumor excision and resection of the mandibular body.
The surgeon performed the removal of bone from the lower right first molar to the second lower left premolar with the dental elements (31-33, 36, 41, 42, 43-45) and part of the lingual gingiva. Then he performed a simultaneous reconstruction by positioning a free flap bundle-osteo-cutaneous fibula after the execution of osteotomy and modeling with template.
Furthermore, the osteosynthesis of the fibula was executed in order to reconstruct the mandibular body modeled through Synthes plates 2.4 previously modeled on templates. Finally, the microsurgical anastomosis of the peroneal arteries with facial arteries and of the comitantes peroneal veins with the facial vein was carried out (Fig. 1).
In 2007, the patient was hospitalized and underwent surgery under general anesthesia for the removal of the exposed reconstruction plate. The clinical outcome was regular with a stable condition of the patient at hospital discharge.

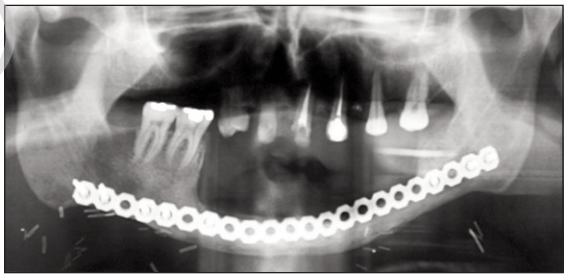

Figure 1. Orthopanthomography post-resection.

The dental procedure provided for the secondary dental implant placement after complete healing of the operated site. This allowed better planning of implant placement based on an accurate evaluation of the residual and reconstructed tissues.
Two years later at the Dental Clinic of Monza, a scrupulous study of potential alternative rehabilitations and a precise assessment of the functionality after the operation wes carried out considering the requirements and the expectations of the patient.
Following prosthetic considerations, the insertion of endosseous implants was performed.
The initial situation showed partial edentulism with the elements 4.7 and 4.8 and the presence of the outcome of the previous surgical operation (Figs. 2-3).

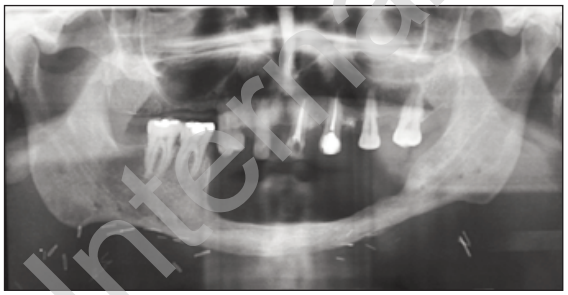

Figure 2. Orthopanthomography pre-rehabilitation.

Figure 3. Intraoral evaluation.

After anaesthesia and dissection of a full-thickness flap the surgeon prepared the sites to receive three endosseous implants exploiting the interforaminally areas 3.3, 4.1, 4.3 of diameter and height respectively 3.6 and 8.5 for the first one and 4.7 and 8.5 for other two (Fig. 4) (Phibo® TSA® Aduance).
Dedicated drills were used with respect to the existing bone and its consistence.
Instead, in the fourth quadrant the avulsion of teeth 4.7 and 4.8 was performed with subsequent resection of the mandible ipsilateral and ostectomy for the regularization of edges and removal of bone spicules. In this area the surgeon inserted two implants 6 and 4.7 for 11.5. At the level of the same zone following the implant placement, an autologous bone removal removed was carried out (Fig. 5).

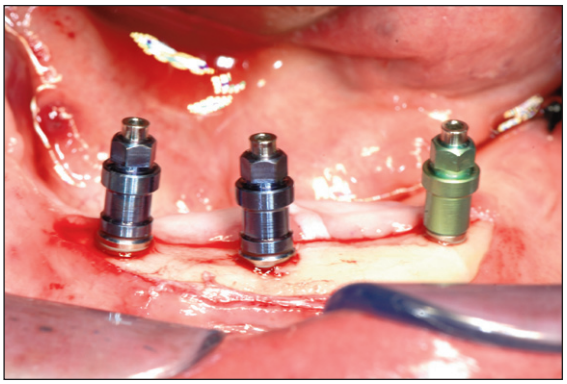

Figure 4. Interforamina implants.

Due to the arisen complications, the uncovering occurred six months later, even though the patient was never subjected to radiotherapy. Once the screws were applied to healing (tissue?) it was observed by the Implant Stability Quotient (ISQ) of osseointegrated implants as shown in the following Table:

tooth	MD	LV
38	73	70
37	75	63
33	69	67
41	75	69
43	70	68
47	73	71
48	61	68

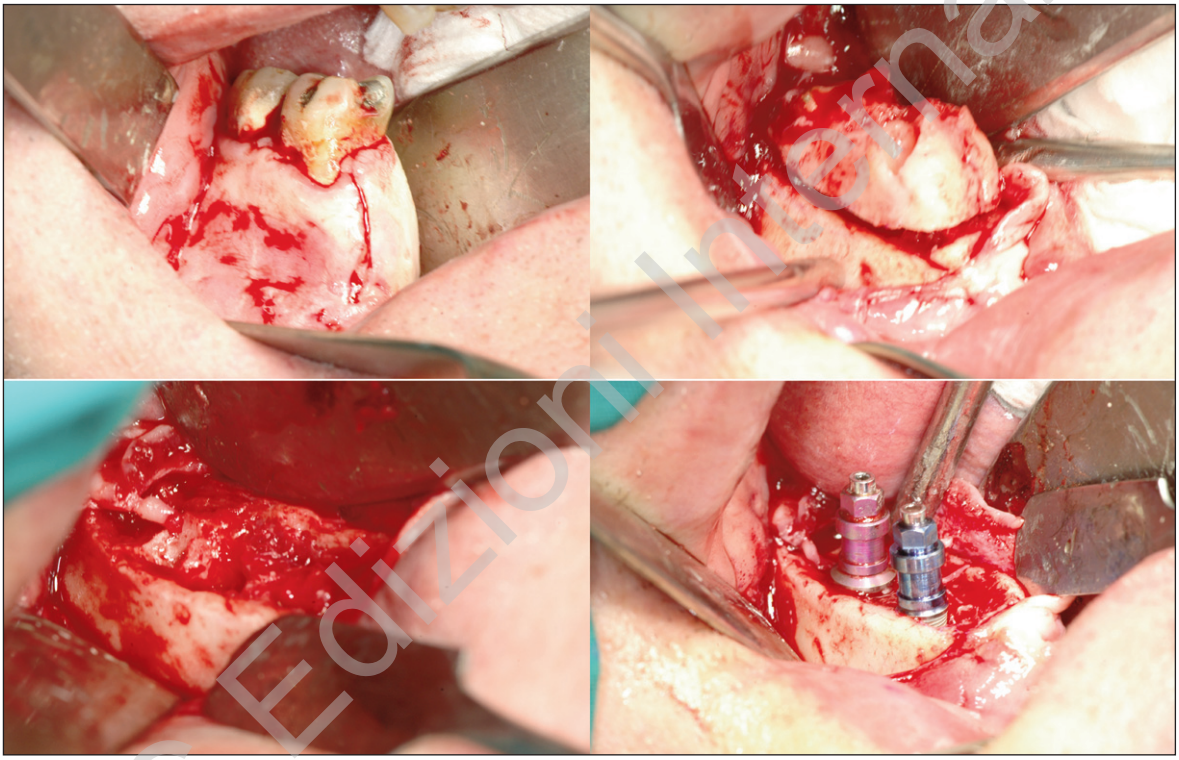

Figure 5. Alveolar ridge resection and implants positioning.

Also, for the third quadrant implant 4.7 for 8.5 in area 3.7 and 3.8 were selected.
Finally, the screws were applied. Following the execution, the flaps of periosteal were released, to allow a greater elasticity of the flap and to ensure a first intention closure: sutures 3/0 silk were performed.
After about one week, the sutures were removed and the healing process appeared slow but normal (Fig. 6).
After about two weeks, an exposure of the grafted bone took place in the peri-implant area showing dark bone, lifeless and bleeding. For this complication, a review of the site has been performed with curettage of bone and elimination of the non-viable spicules to restore the bleeding of the adjacent vital bone. After two months, a perfect flap closure with a normal healing process was observed (Fig. 7).

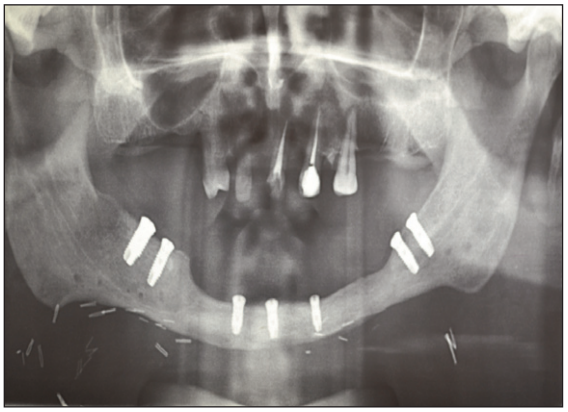

Figure 6. Orthopanthomography.

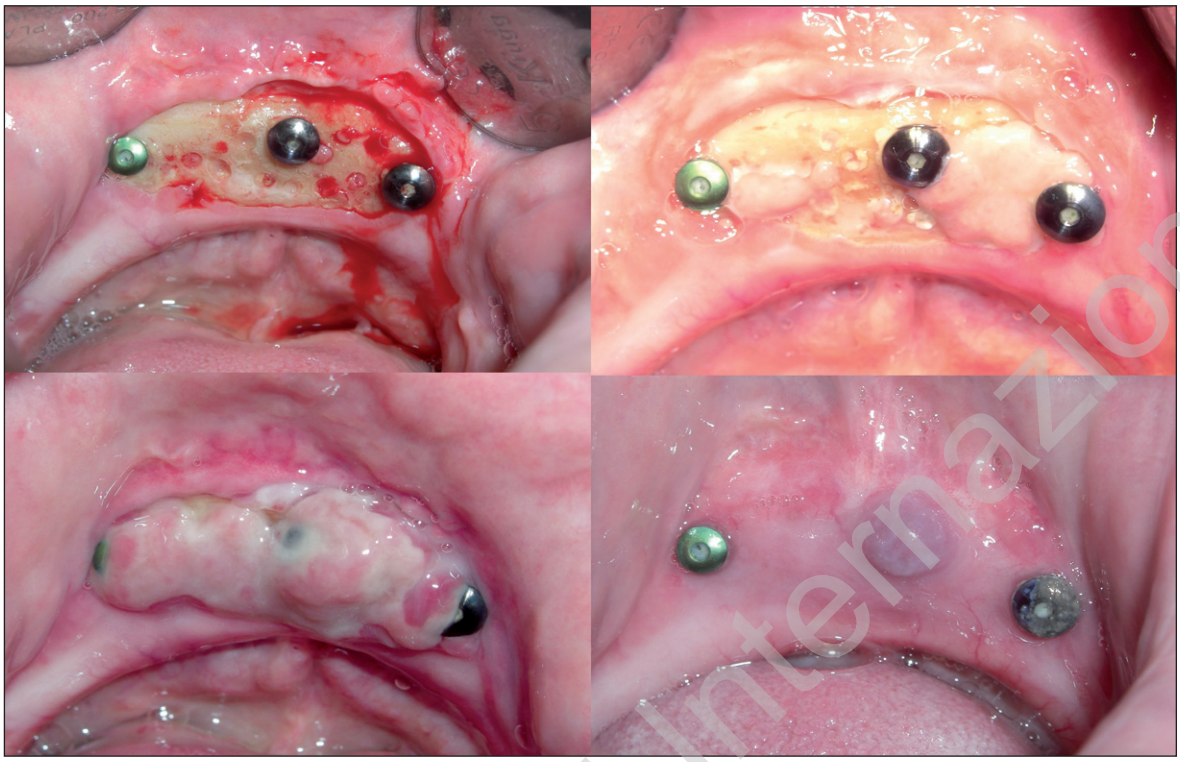

Figure 7. Bone exposure.

Masticatory rehabilitation was provided by the application of a Toronto Bridge allowing greater stability. This prosthesis was studied in order to correct the third class that the patient had at the beginning of therapy through the execution of a metal bar with flanges to lingually displace the front teeth. Superiorly, it was realized, with skeletonized hooks exploiting the presence of surviving elements, quite stable (Fig. 8).

At two years follow up, excellent integration of grafted tissue, steady levels of bone around the fixtures, and healthy peri-implant tissue were reported (Fig. 9).

At the prosthetic and surgical follow-up, the patient showed the achievement of a confortable condition, good aesthetics and recovery of mastication. This prosthesis, tailored to the examined patient, presents some special features related to the fact that patients resected have one or more different issues related to the different morphology of the bone residue and/or reconstruction.

Figure 8. Prosthetic rehabilitation.

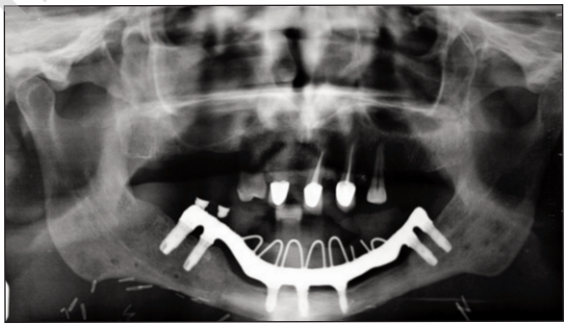

Figure 9. Orthopanthomography follow up.

Discussion

Dental implants are an important component of multidisciplinary rehabilitation for patients after surgical resection of ameloblastoma.

Several factors must be considered for the post-surgical patient.

Leung and Chung (2003) reported that most patients with mandibular reconstruction after tumor ablation are satisfied with bone and soft-tissue restoration. In their study, only 32.1% of dentally reconstructed patients had no limitations on food consistency, whereas, 28.6% complained about problems associated with instability of their dental prosthesis (9).

This is understandable due to the fact that muscular and nervous structures, which contribute to complex oral functions are also removed by the primary tumor surgery. The

osteocutaneous fibula free flap provides only bony and soft tissue covering of the defect, but does not re-establish the function of these structures (5).
There are various treatment strategies to achieve different types of implant anchored prosthesis, and the treatment planning must be based on a cost-benefit analysis of the prosthesis for each patient.
The reconstruction and the placement of implants must be prosthetically driven within the limits imposed by the anatomical conditions, and the use of surgical masks to correct the distances and the trajectories of the systems is recommended.
As regards the rehabilitation with osseointegrated implants, there are two different options:

- fixed prostheses supported by implants, that don't involve any contact with the oral mucosa preventing ulcers from friction
- prosthesis-assisted implants that allow a better hygiene.

The placement of three or five implants allow the realization of either mobile rehabilitation retine with bar or ball attachments or fixed rehabilitation like for Toronto bridge. The latter allows a good stability and comfort (10,11).

Conclusions

The reconstruction of the upper and lower jaw with a microsurgically reanastomosed fibula flap, in combination with dental implants, leads to satisfactory functional and aesthetic results in patients after the resection of ameloblastoma. The fibula flap seems to prevent peri-implantary resorption processes and is capable of withstanding the masticatory forces that develop during functional loading. In conjunction with the new prosthetic attachments, like the titanium magnetic inserts, the fixation of cover dentures and oral hygiene is simplified and improved (12).
Dental implants have an important role in the rehabilitation of oral cancer patients in provision of an oral prosthesis. Healing and survival rates of implants may be influenced by the medical status of the patient, age, and whether or not the patient has undergone radiotherapy (13).
Implant survival was higher in patients who did not receive radiotherapy after tumour surgery. This is in general agreement with other studies (14).

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Conflict of interest

The authors declare to have no conflict of interest.

Informed consent

The study was carried out in accordance with the ethical standards established in the Declaration of Helsinki.

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