

# Rehabilitation after partial mandibulectomy - Clinical report

**Zenha M<sup>1</sup>, Carvalho RB<sup>1</sup>, Correia-Pinto J<sup>2</sup>, Zenha H<sup>2</sup>, Costa H<sup>3</sup>**

*Affiliations:*

1. Zenha Implantologia e Estética Orofacial, Porto
2. Plastic, Reconstructive and Craniomaxillofacial Surgery Department, Centro Hospitalar Vila Nova de Gaia/Espinho
3. Head of Department of Plastic, Reconstructive and Craniomaxillofacial Surgery Department, Centro Hospitalar Vila Nova de Gaia/Espinho

*Corresponding author:*

Marisa Zenha  
geral@marisazenha.com

## **ABSTRACT**

**Purpose:** The rehabilitation of oral function impairments secondary to acquired defects following segmental mandibulectomy continues to be a major challenge. The success in rehabilitating patients who had undergone tumour resection depends upon the nature and extent of the surgical defect, treatment plan, type of prosthesis and patient co-operation. Removable dentures supported by remaining teeth and/or gum are often unstable and rarely satisfactory. However, given the recent advances in maxillofacial prosthetics and reconstructive surgery, it is possible to restore most individuals to nearly normal anatomy and function with immediate vascularized bone graft reconstruction followed by rehabilitation with removable or fixed implant-supported prosthesis.

**Case report:** This case report emphasises the truly multidisciplinary approach, as it describes the prosthodontic rehabilitation of a patient with history of a segmental mandibulectomy that involved the use of a vascularized bone graft, to reconstruct the mandible, and an implant-supported fixed partial denture to restore oral function.

**Conclusion:** Prosthetic rehabilitation with dental implants and fixed implant-supported prosthesis is a valid tool advocated by several authors as they provide stability with enhanced masticatory efficiency as well as aesthetics, hence providing the best dental rehabilitation with a stabilized or immobilized prosthesis.

## **KEYWORDS**

Odontogenic keratocyst, oral rehabilitation, hemimandibulectomy, implant-supported rehabilitation

## INTRODUCTION

Keratocystic Odontogenic Tumour (KCOT) is a common odontogenic cyst that originates from the epithelial dental lamina of the upper and lower jaw with a strong predilection for the mandible (approximately 75%) occurring at any age and more commonly in men.<sup>1,2</sup> Most lesions are benign however, due to its high proliferation and recurrence rates as well as an aggressive behaviour, and considering that they may reach large dimensions and have a propensity for anterior and posterior growth often without clinical symptoms since clinically there is minor evident buccolingual expansion of the cortices, they are long covert and typically discovered during incidental x-ray examination.<sup>2-4</sup>

The constantly rising incidence of orofacial tumours compel us to implement treatment modalities increasingly invasive and damaging since tumour lesions of the oral cavity are mostly surgically treated to properly eliminate and prevent further recurrences. In some malignant tumours, a more aggressive approach is elected resorting to ablative surgery in conjunction with radiotherapy and adjuvant chemotherapy, for localized and distant metastasis treatment.<sup>5-7</sup>

The KCOT's treatment may cause severe maxillo-facial deformities, in the cases of involvement of surrounding tissues or when surgical treatment implicates the comprehensive loss of muscles, soft tissues, articular discs and mandibular condyles and its affiliated functions, i.e. speech, swallow, chew. The loss of these structures may also impact the patient's appearance and,

consequently, its self-esteem and quality of life.<sup>5,7-9</sup>

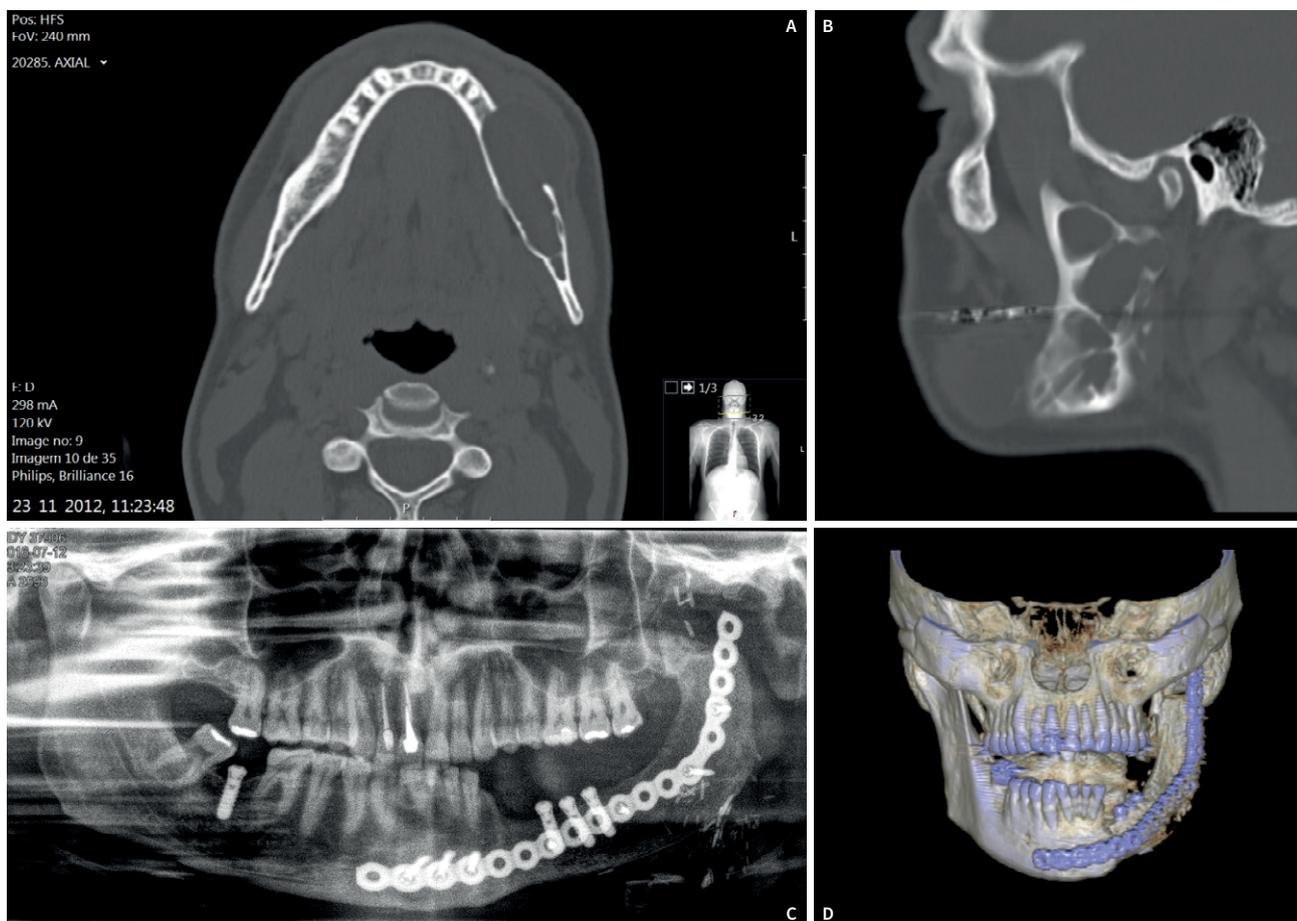
During the last decades the application of vascularized bone graft – iliac crest or fibula free flap – has been considered the “gold standard” for patients with major segmental mandibular defects to correct both functional and aesthetic impairments.<sup>10-14</sup> Patients requiring mandibular reconstruction, particularly those with benign tumours, should comprise not only the reconstruction of the lower jaw but also the restoration of masticatory and speech function with dental implants followed by implant-supported prosthesis.

Osseointegrated dental implants have been proposed as an alternative to rehabilitate patients after segmented mandibulectomy because they may improve prosthesis retention, stability and function with high survival rates for both the implants and dentures.<sup>12,14,15</sup>

## CASE REPORT

A 35-year-old caucasian male was admitted to the dental clinic complaining of pain and edema on the left posterior region of the mandible. After anamnesis, a Cone Beam Computed Tomography (CBCT) (Figure 1) was performed and the patient was referred to the Plastic, Reconstructive and Craniomaxillofacial Surgery Department of Centro Hospitalar de Vila Nova de Gaia (CHVNG), Portugal.

The suspected diagnosis was defined as odontogenic keratocyst that was confirmed on a histopathological examination of an incisional biopsy sample. Based upon the dimension of the



**Figure 1.** Radiographic Examinations – (A) Preoperative Computed Tomography showing an extensive radiolucent area, with defined limits, extending from the region of the left canine to the left condyle (B) Lateral view of preoperative Computed Tomography showing an extensive radiolucent area lodged on the left ramus of the mandible (C) Postoperative Panoramic Radiograph after mandibular reconstruction and implants placement (D) Postoperative Cone beam computed tomography (CBCT) showing stability of fixation after reconstruction and implants placement

lesion and in order to eliminate the entire tumour the treatment choice selected was surgical resection (Figure 2).

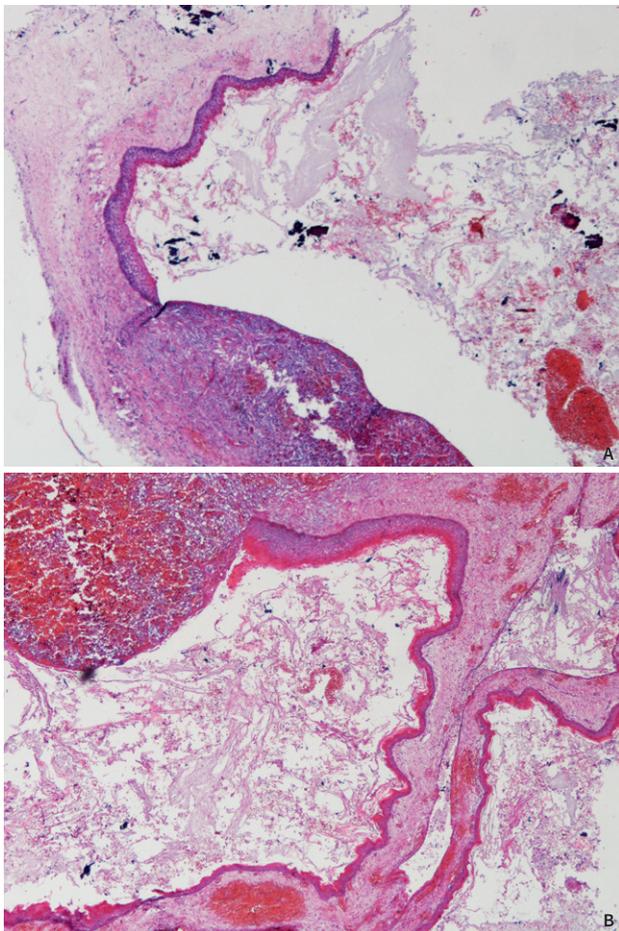
Thereby, the patient was submitted to a left hemimandibulectomy (through tooth 33) including condyle with safety margins. Immediate reconstruction was performed with an autogenous vascularized iliac crest bone graft with microsurgical vascular anastomosis to the facial vessels (Figure 3).

After one year of the surgery the patient showed no signs of recurrence and based on history, clinical findings, radiographic examinations and general health of the patient, a treatment plan was devised to perform the prosthetic rehabilitation.

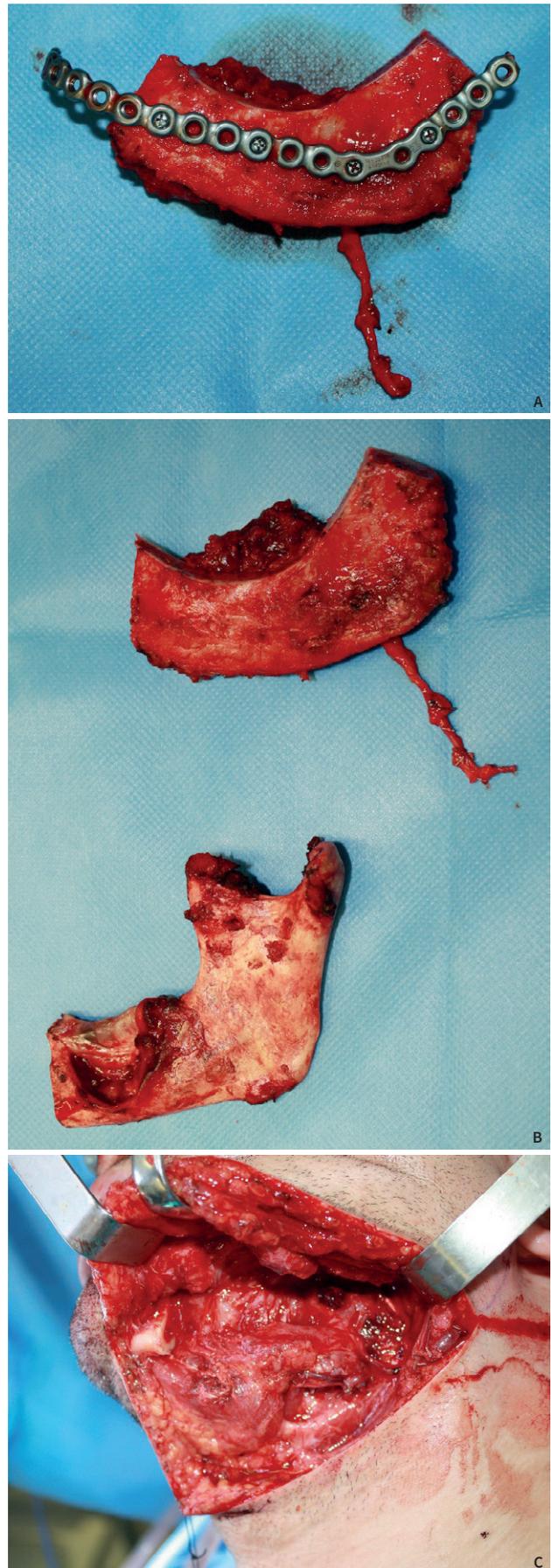
The patient presented reduced oral aperture, approximately 30mm, with severe deviation to the left side, explained due to the absence of the left condyle. Though, these are common issues acquired during surgical resections. Nonetheless, the patient had satisfactory salivary flow and the autogenous bone graft from the iliac crest has proven successful, displaying low bone resorption, and considering the treatment alternatives available we discarded conventional dentures, because of the absence of alveolar ridge, and opted for bone and gingival grafts reconstruction and further rehabilitation with osseointegrated dental implants and subsequent implant-supported fixed partial denture (Figures 4 and 5). The upper jaw was also rehabilitated with ceramic veneers to improve the aesthetics (Figure 6).

At the final appointment, the patient was informed regarding cleaning procedures for the prostheses and the oral cavity.

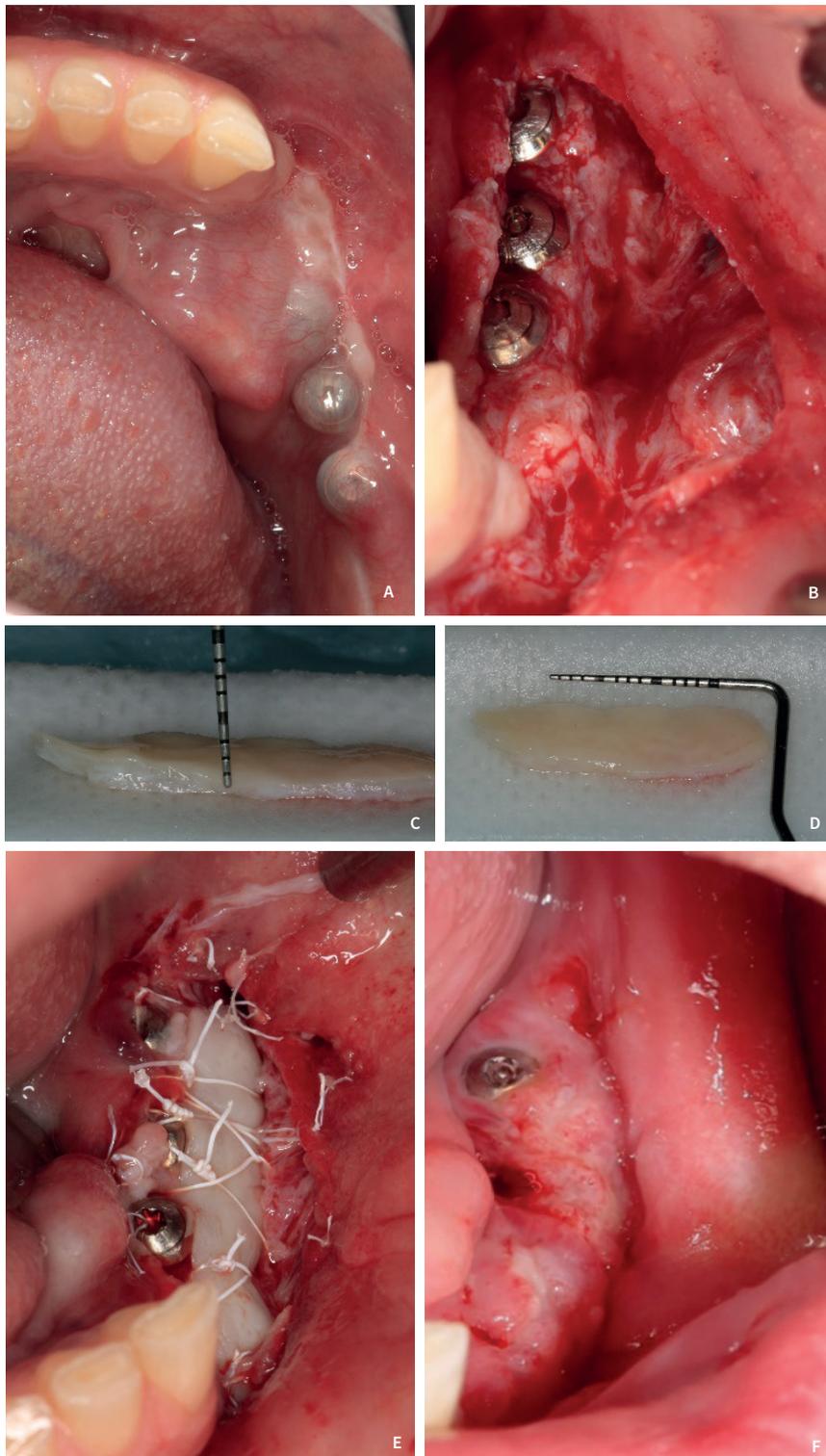
After 18 months of post-resection follow-up, the patient showed no evidence of recurrence or metastasis and was completely adapted to the fixed partial denture and extremely satisfied with its retention and aesthetics. He continues to be under follow-up by the medical team (Figure 7).



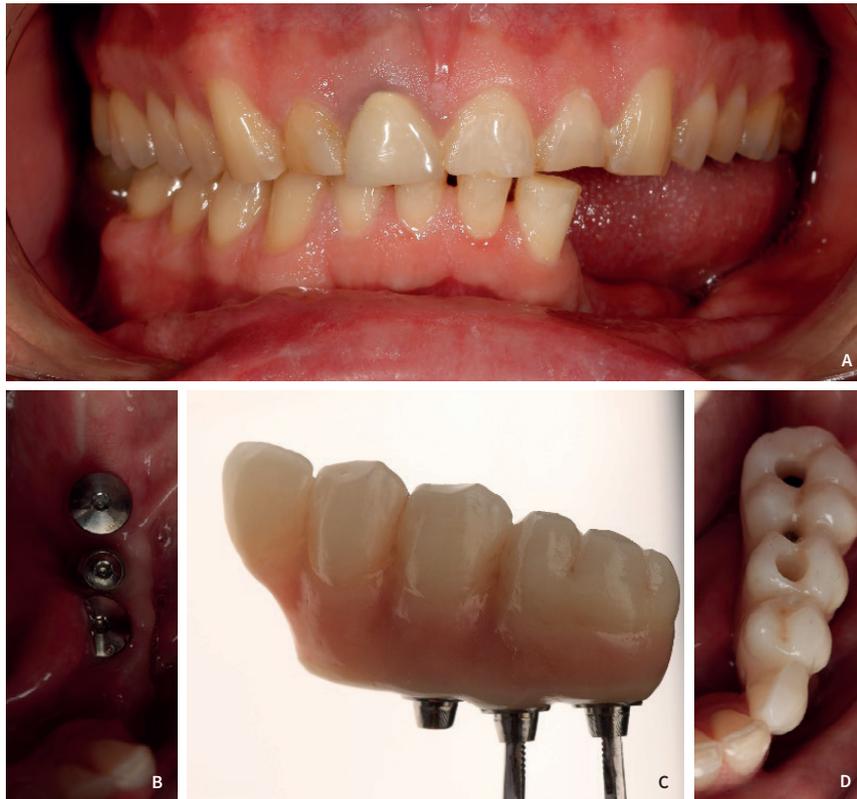
**Figure 2.** (A and B) Histological features from the biopsy sample



**Figure 3.** Clinical features – (A) Transoperative period showing mandibular osteotomy for tumour exeresis (B) Tumour piece after exeresis and iliac crest bone graft (C) Iliac crest bone graft



**Figure 4** – Free Gingival Graft (FGG) – (A) and (B) Preoperative view of recipient site (C) and (D) FGG harvested (E) Placement of FGG (F) 15 days postoperative



**Figure 5** – Implant-supported fixed partial denture – (A) Clinical view before implant rehabilitation (B) Implants placed on the left posterior region of the mandible (C) Partial denture before placement (D) Partial denture placed on the left posterior region of the mandible



**Figure 6** – Aesthetic Rehabilitation with Ceramic Veneers – (A) Minimum teeth preparation for ceramic veneers (B) After adhesion of ceramic veneers



**Figure 7** – Rehabilitation (A) Lower jaw after rehabilitation (B) Frontal view of final result (C) Lateral view of final result (D) Frontal view of final result (Smile)

## DISCUSSION

Mandibular bone reconstruction should always be considered after mandibulectomy defects independently of the aetiology (benign tumour, cancer, trauma or other). Several techniques are well described and extensively examined and, generally, when bone defects are relatively small it is easy to achieve decent aesthetic and functional results. However, it is difficult to adequately reconstruct larger defects which eventually cease to restore occlusion via removable prosthetic options.<sup>6,8</sup>

Defects on the mandible, subsequently to oral tumour excision, cause not only cosmetic damage but also pronounced functional impairments of eating, swallowing, chewing, speech and articulation due to disfigurements of the hard and soft tissues. Other complications may arise including the loss of teeth, malocclusion, infection, injury to the inferior alveolar nerve and dehiscence.<sup>5,8,9,16</sup>

With recent developments in plastic and reconstructive surgical procedures, it has become possible to reconstruct a relatively large defect in the mandible by the transplantation of vascularized complex tissues containing bone, muscle, vessels and even skin. For that reason, the use of free flaps has become the prime method for tissue regeneration used for mandibular reconstruction.<sup>10,12-14</sup> Nonetheless, each case must be carefully considered and planned as transplantation for large defects requires invasive surgical procedures and donor site morbidity which can also cause additional oral dysfunction.

Oral rehabilitation after hemimandibulectomy is always a challenging event but deemed essential for the patient's self-esteem. The surgical excision of unilateral mandible causes it to deviate towards the extirpated side with the loss of occlusal contact. On dentulous patients an acceptable maxillo-mandibular relationship can be achieved with training and the use of a definitive mandibular guidance protheses with a metal guiding flange to stabilize the occlusion and correct the deviation. However, the same does not happen with edentulous individuals, and as a result, in the majority of times, they can never achieve an adequate maxillomandibular relationship which affects both function and aesthetics.<sup>17,18</sup>

Studies have emphasized the importance of immediate mandibular reconstruction and how it influences the patients' quality of life regarding masticatory performance, aesthetic outcome, and psychosocial impact with high survival rates of both the implants and the prosthesis.<sup>9,12,15</sup> In an initial phase, post-reconstruction of the mandible, the focus must be on the patient's motivation to control oral hygiene and its appreciation for the importance of the current treatment. Thereafter the dental implants are placed in the planned position, as confirmed by the radiographic records.

Once dental implants osseointegration occurs, improvement

of the soft tissues condition is often required. Frequently there is presence of inadequate scar tissue, absence of an adequate vestibulum and altered anatomy which inapt the proper rehabilitation with fixed implant-supported dentures as they may also cause discomfort for patients due to reduced keratinized tissue.<sup>9,19,20</sup>

There have been controversial discussions concerning the mucosal condition adjacent to the dental implant and abutment, however it is generally agreed upon the scientific community that firmly attached keratinized mucosa surrounding the implant is thought to provide additional protection against mechanical trauma. It is established that the skin flap around the abutment is particularly susceptible to infection due to its mobility during mastication and hyperplasia of the mucosa may be induced by insufficient hygiene. Furthermore, muscle attachment in proximity to peri-implant mucosa can be responsible for soft tissue inflammation in areas lacking attached keratinized mucosa that could result in peri-implantitis and consequently marginal bone loss or hyperplasia of the surrounding mucosa which might incite implant failure and/or recurrent inflammation.<sup>19-21</sup>

The increase in the survival rate of patients with oral tumours, achieved with the advances in surgery, radiotherapy and chemotherapy, as well as the increase of patients with different therapeutic needs, obliges us to pay special care to the functional evaluation and oral rehabilitation of these patients in an effort to re-establish, as much as possible, the abilities lost during the treatment of this disease.

## CONCLUSION

Post-resection mandibular bone reconstruction enables oral rehabilitation with osseointegrated dental implants. This process is the culmination of the entire reconstructive phase allowing the patients to access comfortable and aesthetically pleasing prothesis, capable of restoring lost functions due to surgical intervention and increasing the quality of life of these already fragile patients.

Prosthetic rehabilitation with dental implants and fixed implant-supported prosthesis is a valid tool advocated by several authors as they provide stability with enhanced masticatory efficiency as well as aesthetics, hence providing the best dental rehabilitation with a stabilized or immobilized prothesis. The crucial aspect is to respect the basic principles of conventional prosthodontics to avoid several compromising factors that may impact upon the feasibility of an optimal rehabilitation and, consequently, on the quality of life of these individuals.

## DISCLOSURES

None to declare.

---

**REFERENCES**

1. Rahrotaban S, Nikparto N, Yousefizadeh P, Javad Kharazifard M, Derakhshan S. Fascin Expression in Ameloblastoma, Odontogenic Keratocyst and Dentigerous Cyst 2018.
2. Pazdera J, Kolar Z, Zboril V, Tvrdý P, Pink R. Odontogenic keratocysts/keratocystic odontogenic tumours: Biological characteristics, clinical manifestation and treatment. *Biomedical papers of the Medical Faculty of the University Palacky, Olomouc, Czechoslovakia*. 2012(2):170-4.
3. Li N, Gao X, Xu Z, Chen Z, Zhu L, Wang J, et al. Prevalence of developmental odontogenic cysts in children and adolescents with emphasis on dentigerous cyst and odontogenic keratocyst (keratocystic odontogenic tumor). *Acta Odontologica Scandinavica*. 2014;72(8):795-800.
4. Bilodeau EA, Collins BM. Odontogenic Cysts and Neoplasms. *Surgical Pathology Clinics*. 2017;10(1):177-222.
5. Barasch A, Coke JM. Cancer therapeutics: an update on its effects on oral health. *Periodontology 2000*. 2007;44(1):44-54.
6. Shah JP, Gil Z. Current concepts in management of oral cancer--surgery. *Oral oncology*. 2009;45(4-5):394-401.
7. Tschiesner U, Linseisen E, Coenen M, et al. Evaluating sequelae after head and neck cancer from the patient perspective with the help of the International Classification of Functioning, Disability and Health. *Eur Arch Otorhinolaryngol*. 2009;266(425).
8. Nabil S, Nazimi AJ, Nordin R, Hariri F, Mohamad Yunus MR, Zulkiflee AB. Mandibulotomy: an analysis of its morbidities. *International Journal of Oral and Maxillofacial Surgery*. 2018;47(12):1511-8.
9. Schepers RH, Slagter AP, Kaanders JHAM, van den Hoogen FJA, Merks MAW. Effect of postoperative radiotherapy on the functional result of implants placed during ablative surgery for oral cancer. *International Journal of Oral and Maxillofacial Surgery*. 2006;35(9):803-8.
10. Kharade P, Islam S, Verma M, Sharma S, Bodh R. Fibular Graft-Effective Panorama for Prosthetic Rehabilitation of Resected Mandible. *Journal of Craniofacial Surgery*. 2017;28(8):e735-e7.
11. Oh KC, Park J-H, Lee J-h, Moon HS. Treatment of a mandibular discontinuity defect by using a fibula free flap and an implant-supported fixed complete denture fabricated with a PEKK framework: A clinical report. *Journal of Prosthetic Dentistry*. 2018;119(6):1021-4.
12. Pappalardo M, Tsao C-K, Tsang ML, Zheng J, Chang Y-M, Tsai C-Y. Long-term outcome of patients with or without osseointegrated implants after resection of mandibular ameloblastoma and reconstruction with vascularized bone graft: Functional assessment and quality of life. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2018;71(7):1076-85.
13. Li L, Blake F, Heiland M, Schmelzle R, Pohlentz P. Long-Term Evaluation After Mandibular Reconstruction With Fibular Grafts Versus Microsurgical Fibular Flaps. *Journal of Oral and Maxillofacial Surgery*. 2007;65(2):281-6.
14. Chiapasco M, Biglioli F, Autelitano L, Romeo E, Brusati R. Clinical outcome of dental implants placed in fibula-free flaps used for the reconstruction of maxillo-mandibular defects following ablation for tumors or osteoradionecrosis. *Clinical Oral Implants Research*. 2006;17(2):220-8.
15. Sekine J, Sano K, Ikeda H, Inokuchi T. Rehabilitation by means of osseointegrated implants in oral cancer patients with about four to six years follow-up. *Journal of Oral Rehabilitation*. 2006;33(3):170-4.
16. Goiato MC, de Medeiros RA, Vechiato Filho AJ, da Silva EVF, Sônego MV, de Carvalho KHT, et al. Prosthetic rehabilitation of a patient after a partial mandibulectomy. *Annals of Medicine and Surgery*. 2015;4(2):200-3.
17. Marathe A, Kshirsagar P. A systematic approach in rehabilitation of hemimandibulectomy: A case report. *The Journal of Indian Prosthodontic Society*. 2016;16(2):208-12.
18. Sahu SK, Motwani BK, Dani A. Prosthetic rehabilitation of edentulous hemimandibulectomy patient: a clinical report. *Clinical case reports*. 2017;5(11):1739-42.
19. Esper LA, Ferreira SB, de Oliveira Fortes Kaizer R, de Almeida ALPF. The Role of Keratinized Mucosa in Peri-Implant Health. *The Cleft Palate-Craniofacial Journal*. 2012;49(2):167-70.
20. Famili P DA. The Importance of Keratinized Gingiva Surrounding Dental Implants. *J Dent Health Oral Disord Ther*. 2015;2(5):00061.
21. Grover H, Yadav A, Yadav P, Nanda P. Free Gingival Grafting to Increase the Zone of Keratinized Tissue around Implants 2011. 117-20 p