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ARQUIVOS EM ODONTOLOGIA

Prosthetic rehabilitation in mandibulectomized patients

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Introduction: Surgical intervention for the treatment of oral squamous cell carcinoma often involves partial or total mandibulectomy, resulting in the loss of teeth and mandibular bone. The sequelae of these surgeries can lead to functional and morphological deficits, significantly impacting patients' quality of life. Dental prostheses have become a therapeutic alternative for mandibulectomized patients; however, their use remains challenging for clinicians due to anatomical changes caused by surgery, as well as complications associated with radiotherapy, such as hyposalivation and the increased risk of osteoradionecrosis. Additionally, the general and psychological health conditions of these patients may further complicate rehabilitation.

Aim: This study aims to describe two successful clinical cases of patients who underwent segmental mandibulectomy and were prosthetically rehabilitated using different strategies.

Materials and Methods: In these case reports, we describe the fabrication of two prostheses: one with a modified contour due to the presence of a retained bridge, and another consisting of an overdenture supported by a single implant.

Conclusion: These cases demonstrate that prosthetic rehabilitation in patients treated for oral cancer must be individualized in order to restore adequate oral function.

Uniterms: mandibular osteotomy; head and neck neoplasms; dental implants, single-tooth; maxillofacial prosthesis; case reports.

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INTRODUCTION

Mandibular resection is challenging for head and neck physicians, oral and maxillofacial surgeons, and the entire multidisciplinary team, usually because it requires multiple clinical interventions, risk of osteoradionecrosis (in cases where radiotherapy is used for oncologic treatment), long treatment periods, soft tissue insufficiency, poor general health conditions, and high costs. The sequelae generated by these surgeries can cause functional and morphological deficits to a greater and lesser degree, which lead to problems associated with mastication,[1-3] speech,[4, 5] and swallowing,[4] directly impacting systemic health, in addition to psychological[4] and aesthetic-related problems,[4] which have repercussions on the patient's social relationships,[4] culminating in a deficit in their quality of life.

Muco-supported, implant-supported, or implant-mucosupported dental prostheses can be applied to enhance functional impact and improve the quality of life. Reconstructed segmental resection is a complex case for oral rehabilitation; however, prosthetic rehabilitation of non-reconstructed hemimandibulectomized patients is especially challenging, primarily

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due to the changes that occur in the patient's stomatognathic system after oncologic treatment.[6] Therefore, individualized planning that considers the unique characteristics of each case, such as the patient's systemic condition, the extent of resection,[7] soft tissue compromise,[8, 9] extents of the buccal and lingual sulcus,[9] tooth loss,[3] dental occlusion, and mouth opening, is essential. This study aimed to report two cases of patients who underwent segmental mandibulectomy and were prosthetically rehabilitated, one with a muco-supported prosthesis and the other with implant-mucosupported dental prostheses, to re-establish their oral functions and consequently improve their quality of life.

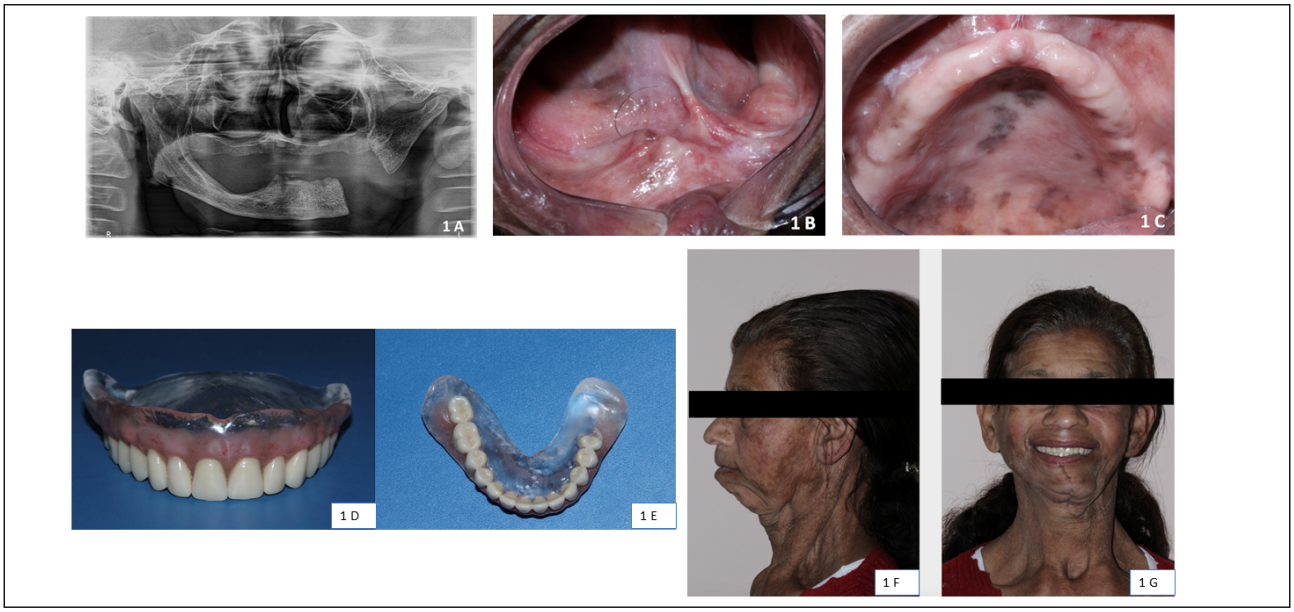
MATERIALS AND METHODS

Patient 1

A 68-year-old female patient complained of discomfort due to missing teeth and facial deformity. The patient had a history of squamous cell carcinoma in the mouth and metastasis in the cervical region that was surgically removed through segmental mandibulectomy in 2017. The patient had not undergone a reconstruction and presented the need for prosthetic rehabilitation. In addition, the patient underwent 30 radiotherapy sessions in early 2018, with a total dose of 44 Gy.

During the anamnesis, the patient reported hypertension and rheumatoid arthritis. A radiographic examination (Figure 1A) showed a total dental absence and a segmental bone defect on the left side of the mandible. Intraoral clinical examination (Figures 1B-1C) revealed the presence of a bridle in the mandible, which would hinder the functional stability of the total prosthesis. A prior surgical intervention was presented to the patient as a treatment option; however, she refused the procedure due to a previous psychological trauma caused by procedures to remove the neoplastic lesion. Thus, rehabilitative planning was suitable for the patient's condition.

Figure. 1. 1A) Panoramic radiograph showing the mandibular region undergoing surgical procedure for removal of oral squamous cell carcinoma; 1B) Intraoral aspect of the lower alveolar ridge; 1C) Intraoral aspect of the upper alveolar ridge; 1D) Total upper and lower dentures, note the characterization of the artificial gingiva and the distribution of teeth in the lower denture, respecting the principle load to where there is bone support; 1E)Final appearance of the patient at rest (side view) and smiling (front) with the prostheses in mouth.



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Oral rehabilitation was performed using muco-supported prostheses. Initially, primary impressions of the upper and lower arches were obtained with alginate (Jelltrate, Dentsply) to obtain the study models with plaster type III (Stone, Asfer Indústria Química LTDA). Functional molding was performed using a low-fusion Godiva for peripheral sealing (Godiva exata; Nova DFL) and polyether (Impregum Soft, 3M ESPE) to obtain the working models.

Test bases were then made with upper and lower wax planes to assist in mounting the working

models in a semi-adjustable articulator (Bio-art) using a facial arch (Bio-art) in a centric relationship to mounting the artificial teeth. Subsequently, the maxillomandibular relationship was recorded, and only verbal guidance was provided. The patient was seated in a normal upright postural position and instructed to move the mandible in the direction of the non-surgical side and to close it in a non-rigid recording medium at the pre-established vertical dimension of occlusion, which became the occlusal contact position, thereby establishing a centric occlusion relationship.

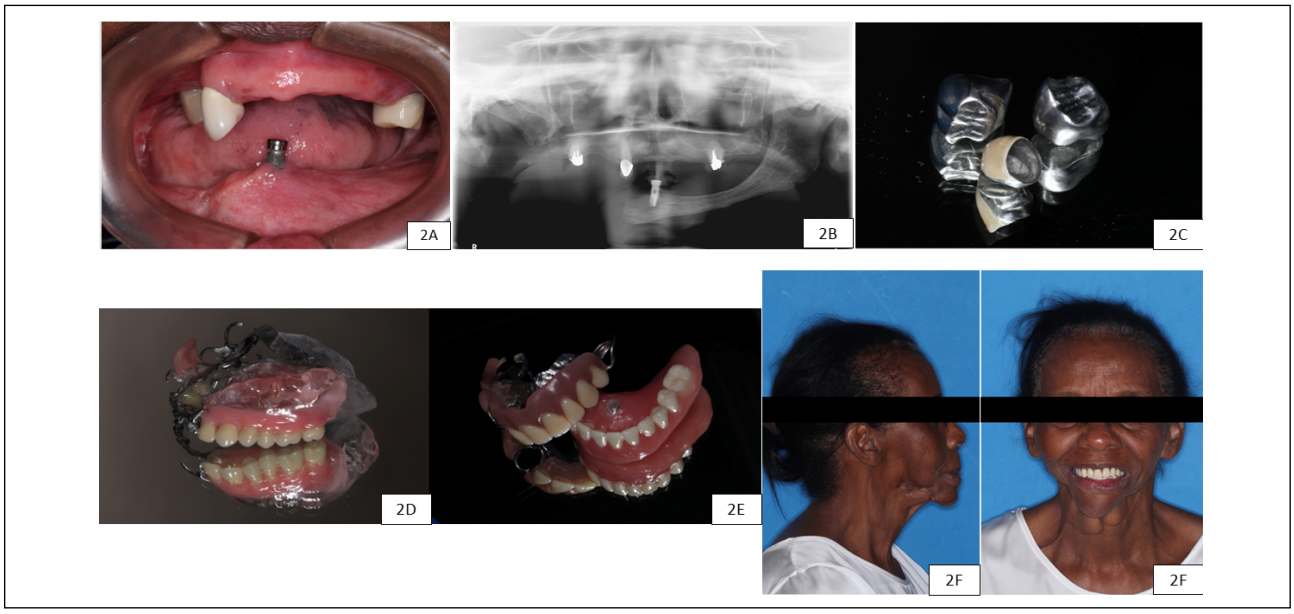
Teeth selection, color, and shape were done considering the patient's natural dental anatomy, which was obtained through photographic records. Moreover, for better stabilization of the prostheses, stock teeth with zero cusp angulation were selected and mounted on the first molar.

After obtaining the patient's consent, the prosthesis was done considering the patient's natural dental anatomy, which was obtained through photographic records. The spatial distribution of the teeth of the mandibular prosthesis respected the basal area with bone support, that is, the tooth to which there was support (second premolar). Moreover, owing to the presence of the bridle resulting from the scar tissue the prosthesis moved easily during function, and for this reason, it was decided to relieve the basal area of the mandibular prosthesis in the region of the bridge, and the patient was instructed to use a denture fixator. The prostheses were delivered to the patient after adjustments and polishing (Figures 1D-G). More adjustment and follow-up sessions are necessary because of the greater difficulty of adaptation in mandibulectomized patients than in healthy patients. Adjustment and follow-up sessions were performed weekly for 30 days.

Patient 2

A 76-year-old female patient presented difficulties in masticatory and speech functions, with a history of squamous cell carcinoma of the inferior alveolar ridge surgically removed through hemimandibulectomy without reconstruction and presented the need for a prosthetic rehabilitation (Figure 2A). Radiographic examination revealed the presence of three upper teeth, a mandibular implant, and a segmental bone defect on the right side of the mandible (Figure 2B). Clinical examination revealed provisional crowns in the upper right third molar, upper right canine, and upper left second molar, a removable provisional partial denture in the upper arch, and a dental implant in the lower central region (Figure 2A). Initial impressions were made with alginate (Jelltrate, Dentsply) to obtain the study models of plaster type III (Stone, Asfer Indústria Química Ltda). Subsequently, test bases were made with upper and lower wax planes to assist in mounting the study models in a semi-adjustable articulator (Bio-art) using a facial arch (Bio-art) in centric relation for study, diagnosis, and case planning.

Figure. 2. 2A) Panoramic radiograph; 2B) Intra oral aspect, note the presence of teeth 18,13 and 27 and the dental implant in the mandible; 2C) Metal crowns (18 and 27) and metal-ceramic (13) protheses; 2D)Upper removable partial dentures; 2E)Upper removable partial denture and implant-mucosupported overdenture type; 2F)Final appearance of the patient at rest (side view) and smiling (front) with the prostheses in mouth.



Source: Authors.

The teeth (upper right third molar, upper right canine, and upper left second molar) with an indication for a full metal-ceramic crown were re-prepared, impressed with casts of Duralay acrylic resin (Duralay, Reliance), and captured with medium-viscosity polyether (Impregum Soft, 3M ESPE). The model was then obtained with plaster type IV (Durone IV, Dentsply), and the dies were constructed and sent to the prosthetic laboratory. After the laboratory phase, copping tests, and the aesthetics of the ceramic (Figure 2C), the full crowns were cemented with zinc phosphate cement (S.S. White Artigos Dentários Ltda). The full crowns were made after the case design for removable partial dentures; thus, it was possible to obtain milled crowns with properly positioned supports.

After cementing the crowns, functional impressions were obtained using a low-fusion Godiva (Godiva exata; Nova DFL) for peripheral sealing and alginate (Jeltrate, Dentsply Indústria e Comércio Ltda) on the upper and lower arches. The metallic structure of the upper arch was approved, and the intermaxillary relationships were recorded in the same way as described for the first patient, only with verbal guidance, and the models were transferred to the semi-adjustable articulator (ASA).

Artificial teeth were also selected. After the aesthetic and functional assembly of the teeth, the prostheses were finalized. After the installation of the prostheses, a ball attachment (Neodent) retention system was positioned on the implant, and the total prosthesis of the mandible was captured as an overdenture with the aid of a chemically activated acrylic resin (JET; Artigos Odontológicos Clássico Ltda) (Figures 2D and 2E).

Adjustments and follow-up sessions were performed weekly for 30 days; in other words, more sessions with longer durations were needed so that the difficulties imposed by the new anatomy generated by the mandibulectomy could be overcome, and better adaptation of the prosthesis could be achieved (Figures 2F and 2F).

DISCUSSION

Both the patients included in this study had a history of oral squamous cell carcinoma with invasion of the mandibular bone tissue. Segmental mandibulectomy and adjuvant radiotherapy were used in both cases. Thus, after completion of oncologic treatment, these patients presented a demand for prosthetic rehabilitation treatment, having an uncommon feature in the dental surgeon's clinical routine: a segmental bone defect. The literature recognizes the physical, social, and emotional impact of prosthetic rehabilitation, and its importance on patients' quality of life, not just on cancer patient survival.[6,8]

Mandibulectomized patients with a discontinuity of the mandible may present with altered bone and muscle positions, since the defect generated by surgery causes the mandible to deviate towards the side of the defect, often with uncoordinated movements due to the unilateral presence of muscles. This becomes an additional challenge to prosthetic rehabilitation since it is more difficult to reproduce the mandibular positions, therefore, the prosthesis must work from a new bone and muscle organization to return the patient's functions. However, bone defects generated by resective surgeries for head and neck cancer may or may not be reconstructed, which can affect prosthetic rehabilitation. Therefore, for patients with or without reconstructive plates, the placement of teeth on the bone defect area is not recommended. There is no support for the masticatory loads in the region where there is no bone, which can affect the soft tissue by causing perforation of the mucosa by the action of the functional loads on the tissue.[9] In both clinical cases, regardless of the type of prosthesis (muco-supported or implant-mucosupported dental prostheses), the distribution of teeth on the prosthetic base respected this principle.

The occurrence of segmental mandibular defects can be associated with different causes, including not only the surgical treatment of squamous cell carcinoma with involvement of bone, but also due to many other types of bone neoplasms, traumatic events,[10] osteoradionecrosis[11] or infectious processes.[12]

Patients undergoing cancer treatment have several implications for their oral and general health. As a result of these issues, surgery for implant placement after recent radiotherapy is often inadvisable, first by the concern of implant survival, which is proven to be lower in these patients than in patients without a history of oncological approaches mainly the radiotherapy,[13] and second by the risk of developing osteoradionecrosis,[14] which, although uncommon, is a serious complication and difficult to manage. [14] Thus, these issues discourage the rehabilitation treatment option.

Likewise, we understand that implant removal surgery can offer the same risks to the patient by subjecting him/her to a new physical trauma. In this sense, although the standard

protocol for making mandibular overdentures involves the installation of at least two implants in the interforamen region, we chose to rehabilitate Patient 2 with an overdenture supported only by the implant in the mouth. Literature has pointed out that it is possible to achieve clinical success with overdentures under a single implant.[15] Compared to a conventional mucous-supported denture, a single implant overdenture promotes better retention and stability of the prosthesis. From this, prosthesis-related functions are also improved, such as chewing, bite strength, and swallowing,[15] which consequently can improve the nutritional intake and satisfaction in single implant overdenture patients, such as that observed in our patient by the report of greater safety when chewing and speaking. Thus, in one of the presented clinical cases, positioning of the implant in the midline favored the choice of this rehabilitative option. We emphasize that the installation of other implants or even removal of the existing implant was contraindicated because of a history of recent head and neck radiotherapy.[14]

In addition to the impact of resective surgery on hard tissues during the treatment of jaw cancer, soft tissues are also affected. Fibrous scar areas impact the movement of the tongue, lips, and cheeks or even reduce the buccal and lingual grooves.[9] These morphological changes negatively influence the patient's rehabilitation, sometimes making it impossible. We recognize that immediate reconstruction is crucial for the retention of prostheses and stabilizing and maintaining the soft tissues, that are inserted at the final moment of the surgery and remain in the mouth during healing, and that the placement of implants can provide a more efficient and acceptable lower prosthesis for the patient.[16] However, any dental treatment requires patient compliance, so the rehabilitative treatment of one of the cases was adapted since the patient refused to undergo oral surgery to remove the bridge due to psychological trauma. In one of our cases, the patient chose not to undergo oral surgery for bridle removal because of psychological trauma. In these cases, it is up to the dental surgeon to recognize the patient's psychological condition and move on to another alternative, such as creating an appropriate contour in the basal area of the prosthesis that favors tissue movement when functional;[17] however, the surgeon should always inform the patient about the disadvantages of the option chosen. Due to the maintenance of the bridle, the use of adhesive was recommended to improve the retention of the lower prosthesis.

We emphasize the importance of medium- and long-term follow-ups, since rehabilitating such patients requires constant management of issues such as fibrosis and hyposalivation to avoid the appearance of mucosal lesions and opportunistic infections, thus increasing the success of prosthetic rehabilitative therapy. This study exemplifies the prosthetic rehabilitation of patients with segmental bone defects in the mandible due to squamous cell carcinomas; however, the therapy used can be applied in the rehabilitation of patients who have such bone loss for other reasons, as described above. One limitation of this study was that it presented rehabilitative options for patients who underwent segmental mandibulectomy without reconstruction, which are not fully applicable in patients with some type of reconstruction.

It is concluded that the rehabilitation of patients who have undergone segmental mandibulectomy without reconstruction, despite great complexity, can be carried out with different approaches considering the specificities of each case.

AUTHORS` CONTRIBUTION

Fábio F. Melgaço: Methodology, Investigation and writing; Francisca D. M. Jardilino: Conceptualization, Investigation and review; Amália Moreno: review; Patrícia. C. Caldeira: review; Aline A. Sampaio: Conceptualization, Investigation, review and supervision.

CONFLICT OF INTEREST

There is no conflict of interest.

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