

Prosthetic rehabilitation of a patient submitted to segmental mandibulectomy

Reabilitação protética de paciente submetido a mandibulectomia segmentar

Rehabilitación protésica de un paciente sometido a mandibulectomía segmentaria

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Abstract

Surgical rehabilitation with grafts and plates of an oncological patient submitted to segmental mandibulectomy may be limited due to the majority receiving late diagnosis, requiring rapid intervention with association of drug therapies and thus, the risk of osteonecrosis. We detail a dental prosthetic rehabilitation in a patient who underwent a segmental mandibulectomy without plates or grafts. Man, 47-years old, affected by a squamous cell carcinoma on the floor of the mouth, treated by segmental mandibulectomy, radiotherapy and chemotherapy, was attended to a dental prosthetic rehabilitation over the mandible segments with a removable partial denture. Initially, a temporary prosthesis was made, in order to adapt the patient with the restoration of the occlusion and recovering the muscle tone. The patient used the temporary removable partial denture for 6 months, accompanied by physical therapy to maintain occlusal stability and regain muscle tone. After this period, it was possible to make a removable partial denture for definitive rehabilitation. The patient proved to be adapted to the prosthetic device and satisfied with the treatment. Prosthetic rehabilitation is a viable option when surgical reconstruction is contraindicated or can be used until the surgical procedure can be realized.

Keywords: Squamous cell carcinoma; Oral rehabilitation; Maxillofacial prosthesis; Case report.

Resumo

A reabilitação cirúrgica com enxertos e placas de um paciente oncológico submetido à mandibulectomia segmentar pode ser limitada devido à maioria receber diagnóstico tardio, necessitando de intervenção rápida com associação de terapias medicamentosas e, portanto, risco de osteonecrose. Detalhamos uma reabilitação protética dentária em um paciente submetido a uma mandibulectomia segmentar sem placas ou enxertos. Homem, 47 anos, acometido por carcinoma espinocelular em assoalho de boca, tratado por mandibulectomia segmentar, radioterapia e quimioterapia, foi atendido em reabilitação protética dentária sobre os segmentos mandibulares com prótese parcial removível. Inicialmente, foi confeccionada uma prótese temporária, a fim de adequar o paciente com a restauração da oclusão e recuperação do tônus muscular. O paciente utilizou a prótese parcial removível temporária por 6 meses, acompanhada de fisioterapia para manter a estabilidade oclusal e recuperar o tônus muscular. Após esse período, foi possível confeccionar uma prótese parcial removível para reabilitação definitiva. O paciente mostrou-se adaptado ao dispositivo protético e satisfeito com o tratamento. A reabilitação protética é uma opção viável quando a reconstrução cirúrgica é contraindicada ou pode ser utilizada de forma útil para que o procedimento cirúrgico possa ser realizado.

Palavras-chave: Carcinoma de células escamosas; Reabilitação oral; Prótese maxilofacial; Relato de caso.

Resumen

La rehabilitación quirúrgica con injertos y placas de un paciente oncológico sometido a mandibulectomía segmentaria puede verse limitada debido a que la mayoría recibe un diagnóstico tardío, requiriendo una intervención rápida con asociación de terapias farmacológicas y, por tanto, riesgo de osteonecrosis. Detallamos una rehabilitación protésica dental en un paciente al que se le realizó una mandibulectomía segmentaria sin placas ni injertos. Un hombre de 47 años con carcinoma de células escamosas en el piso de la boca, tratado con mandibulectomía segmentaria, radioterapia y quimioterapia, se sometió a rehabilitación protésica dental en los segmentos mandibulares con una prótesis parcial removible. Inicialmente se realizó una prótesis temporal para adecuar al paciente con la restauración de la oclusión y recuperación del tono muscular. El paciente utilizó la prótesis parcial removible temporal durante 6

meses, acompañada de fisioterapia para mantener la estabilidad oclusal y recuperar el tono muscular. Después de este período, fue posible fabricar una prótesis parcial removible para la rehabilitación definitiva. El paciente se adaptó al dispositivo protésico y satisfecho con el tratamiento. La rehabilitación protésica es una opción viable cuando la reconstrucción quirúrgica está contraindicada o puede ser útil para realizar el procedimiento quirúrgico.

Palabras clave: Carcinoma de células escamosas; Rehabilitación bucal; Prótesis maxilofacial; Reporte de un caso.

1. Introduction

Oral cavity squamous cell carcinoma is a cancer that can affect lips, tongue, floor of the mouth, alveolar ridges, hard palate, gums, and the retromolar trigone region. The main risk factors for its occurrence are exposure to tobacco and alcohol, betel nut chewing, poor oral hygiene, and some dietary deficiencies. In addition to these factors, some pre-malignant lesions have been associated with the development of this type of cancer (Maruccia et al, 2012; Montero & Patel, 2015; Gonzalez & Riera, 2021). Oral cavity cancer is more common in men over 50 years of age, being the seventh most prevalent type of cancer in Brazil and the sixth most common in the world (Parkin et al., 2005; Jemal et al, 2011; Siegel et al., 2013).

Visual inspection and palpation are essential to detect this disease, its extent, and whether there is bone invasion or skin breakdown. Drawings, photographs and radiographic and computed tomography exams, in addition to a biopsy for the diagnosis, are essential documentation for the staging and follow-up of the tumor. However, although self-examination and physical examination are easy to perform, diagnoses are usually made at an advanced stage, requiring more invasive intervention.

The surgical excision of head and neck squamous cell carcinomas is well established for disease control, patient survival and quality of life, allowing the staging of the disease, providing information on dissemination and histopathological features, and aiding in subsequent management (Joo et al., 2018). Thus, surgery remains the mainstay of treatment for most of these patients, with tumor excision, lymph node dissection, and reconstruction when possible (Kuscu et al., 2016). Adjuvant treatments such as radiotherapy and/or chemotherapy may be necessary according to tumor stage and location (Montero & Patel, 2015). After resection, depending on the extension of the lesion, the stomatognathic functions can be seriously affected. The patient may exhibit difficulties during speech, swallowing, and mastication (Oskam et al., 2013; Crombie et al., 2014). The injury to the nerves during the intervention can also limit gustative or touch sensitivity and the motricity of the muscles (Kolokythas, 2010a; De Felice et al, 2018). Thus, a multidisciplinary team is essential to ensure a favorable outcome and several factors must be taken into account such as the risk of complications related to the treatment, physiological age, comorbidities, lifestyle, surgical procedures, and patient expectations.

Reconstruction surgery with plates and screws is indicated in order to stabilize bone segments or bone flaps (Kolokythas, 2010b); however, these materials can be subject to fatigue when handled excessively or when exposed to unbalanced masticatory forces, causing their exposure, screw loss or fracture and leading to secondary infections. Another option is the use of bone grafts; currently, non-vascularized or tibial grafts represent a practical method of reconstruction, generally avoided in patients with head and neck cancer due to the destructive effects of radiotherapy (Urlaub et al, 2019; Hamill et al., 2021), which can increase the risk of osteoradionecrosis due to changes in bone vascularization (Gazyakan et al, 2016). Another reliable reconstructive technique of low morbidity is reconstruction with tissue or a microvascular free flap (Marttila et al., 2018). Reconstructive surgery for major defects is complex and its method must be correctly and previously selected, so that the most appropriate surgical planning can be carried out for the patient. When there is the possibility of anatomical reconstruction of the lost bone tissue, using bone grafts and/or metal plates, prosthetic rehabilitation can be performed using prostheses on implants. This planning would be the gold standard, providing the patient with comfort and quality of life. (Jackson et al., 2016). However, according to the patient's health conditions, extension of resection, concentration of radiation exposure and previous history of osteonecrosis, this planning may be contraindicated. In these cases,

where the patient was exposed to radiotherapy without planning and prior execution of surgical reconstruction with plates and grafts, dental prosthetic treatment can be very challenging because, in addition to the unrepaired surgical defect, the patient may have several sequelae such as hyposalivation, increased risk of dental caries, fibrosis, mucositis, chemotherapy-induced neuropathy, dysgeusia, dysphagia, and mucosal infections (De Felice et al, 2018; National Cancer Institute, 2021), limiting the rehabilitative possibilities of conventional dentures. On this basis, the present case report describes a dental prosthetic rehabilitation with superior and inferior removable partial dentures for a patient who underwent mandibulectomy without surgical reconstruction.

2. Methodology

This case report was written according to the Case Reporting Guidelines (CARE) and was approved by the responsible Ethics Committee (CAAE: 52274521.2.0000.5419). A 47-year-old male patient, an ex-tobacco and alcohol user, came to the clinic with a positive history of liver damage due to alcohol use. The patient was diagnosed with an in situ squamous cell carcinoma in the floor of the mouth confirmed by histopathological examination indicating T4N0Mx stage, moderately differentiated, and invading the cortical bone of the mandible. Computed tomography with contrast indicated a vegetative lesion in the anterior floor of the mouth, right adenomegaly, and presence of bone rarefaction in the mental portion of approximately 2 cm. The patient was treated with resection of the floor of the mouth and anterior segmental mandibulectomy, bilateral neck dissection, adjuvant therapy and radiotherapy, with a total of 95 sessions, 35 for each side (right and left), and 25 for the posterior region of the head and neck, plus 3 weeks of chemotherapy with 54 mg of cisplatin. No metastasis was found in the dissected lymph nodes.

The patient was examined after consent. Clinical dental examination revealed a normal tongue, absence of mucosal lesions and normal saliva and, despite the surgery and scars, the patient had normal mouth opening, without trismus, pain or other limitations. Some remaining teeth had been restored with amalgam and periodontal examination demonstrated a periodontal pocket with a depth of 3.5 to 5.5 mm in sextants 1 and 4, accompanied by bleeding. There was absence of the mental bone and of teeth 26, 27, 31, 32, 33, 38, 41, 42, 43, 44, 45 and 46, as well as an exacerbated movement of the mandibular bone remnants at closure (Figures 1 and 2). Radiographic examination indicated maxillary bone integrity without ligament thickening or root lesions. Regarding the mandibular arch, in addition to the large bone loss in the anterior region, there was a decrease in the buccal bone plate of tooth 44.

Figure 1 - Lateral profile of the patient with bone deficiency in the mental portion of mandible.



Source: Authors.

Figure 2 - Oral condition of the patient showing a surgical sequel.



Source: Authors.

An impression of the superior and inferior arches was taken with alginate (Algi Gel, Maquira Dental Products Industry S.A, Maringá, Brazil) in order to obtain gypsum casts (Asfer, Chemical Industry Ltda, São Caetano do Sul, Brazil). Next, a personalized tray in self-polymerized acrylic resin (Clássico, Clássico Dental Articles, Campo Limpo Paulista, Brazil) was manufactured over the study models, the superior and inferior arch was molded again with condensation silicone (Speedex, Vigodent S/A Commerce and Industry, Rio de Janeiro, Brazil), and a new gypsum cast was obtained. The facial arch was molded and the superior model was adapted on a semi-adjustable articulator (Gnatus Medical and Dental Products Ltd, Barretos, Brazil). A maxillofacial register was taken with a self-polymerized acrylic resin occlusal guide previously confectioned over the inferior cast model, sectioned at the median line with a carborundum disc (Dentorium Products Co Inc, Farmingdale, USA), and relined with acrylic resin over the respective sides of the superior and inferior model. Next, the guide was inserted into the patient's mouth and placed over the upper tooth. The segments of the mandible were carefully

manipulated to conduct the jaw in a centric relation, permitting articulation of the tooth with the guide. The guide was fixed in this position, determining the occlusal relation between the arches. After registration with the facial arch, the superior model was mounted on a semi-adjustable articulator with the occlusal guide adapted and in order to correct the discrepancy between the arches and the mandible segments in impression, the inferior cast model was sectioned and the resin guide was adapted, with the superior cast model over both mandibular arches being fixed to them with wax. The inferior model was then filled with gypsum so that the parts were joined, and thus it was also mounted on the semi-adjustable articulator. (Figure 3).

Figure 3 - Articulated models for mounting on a semi-adjustable articulator, in order to correct the discrepancy between the arches and the mandible segments.



Source: Authors.

First, a provisional partial removable denture with acrylic resin and orthodontic wire clamps (Orthometric, Medical and Dental Commerce and Industry Ltd, Marília, Brazil) was made for occlusal stability and assessment of the adaptation of the patient muscles to his new jaw relation. The inferior lip showed hypotonicity because of the absence of anatomical support structures and therefore the patient was oriented to perform exercises with his lips in order to improve muscle tonicity. During the adaptation period with the provisional prosthesis, adequacy of the oral cavity was obtained by prophylaxis, supragingival scaling for all sextants and subgingival scaling for the sextants with a deep probe, restoration of teeth with caries or with poor previous restorations with composite resin (Filtek, 3M, Minnesota, USA), and reshaping and polishing of amalgam restorations.

After 6 months, the patient reported feeling well adapted without complaints of any muscle pain or tissue trauma in the mucosa, thus being ready to start definitive rehabilitation. The partial denture was planned by the study of the previously obtained cast models and dental preparation (occlusal supports and guide plan) was performed intraorally. Next, an impression of the superior and inferior arches was taken with condensation silicone in order to obtain the working model casts. The same procedure was performed with the resin guide for intermaxillary registration.

An Ni-Cr metallic framework was obtained (Wironia, Wilcos from Brazil Commerce and Industry Ltd, Petrópolis, Brazil), tested in both arches, and adjusted. Due to the complexity and difficulty of the case, the inferior framework had to be

sectioned in the anterior saddle to adapt it to the inferior arch and was then fixed with photopolymerized composite resin (Filtek, 3M, Minnesota, USA). The remaining teeth of the mandibular arch were positioned in occlusion with the maxillary teeth and the parts of the metallic framework was joined with Duralay resin (Figure 4).

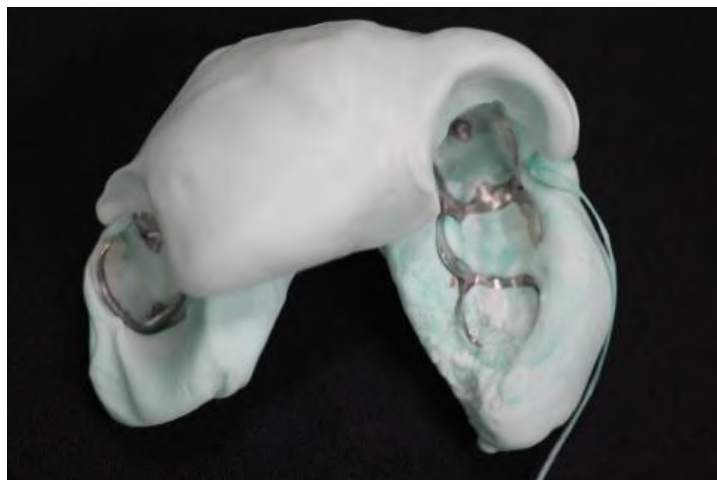
Figure 4 - Adjustment of the metallic structure of the inferior prosthesis, in a sectioned way in order to obtain the best adjusted of the piece and dental occlusion between the arches.



Source: Authors.

Each hemi-arch was then molded with condensation silicone (heavy paste), as also done for the mental portion in order to obtain a model with the metallic structure in position, enabling the welding of the parts and reconstruction of the mental portion to obtain a model that reproduced the size of the cavity resulting from the mandibulectomy. (Figure 5). A fitting was made in the mold, so that it was poured in order to reproduce exactly the molding performed and the position of the metallic structure without alterations.

Figure 5 - Mold of the metallic structure in position and the mental defect.



Source: Authors.

The framework was placed over the cast model and soldered. Next, it was tested and adjusted in mouth, and the adaptation was checked and the framework proved to be resistant and with good adaptation on the teeth and the alveolar ridge. After the tests and adjustments of the metallic structures, the patient's facial arch was taken again and the superior working

model was mounted in a semi-adjustable articulator. As the patient does not have inferior anterior teeth, so that the model could also be mounted on a semi-adjustable articulator, with the metallic structures in position, occlusion guide were made in duralay resin, for both sides and of the same thickness, and in the anterior region a duralay resin block that rested on the metallic bar of the structure and went up to the superior central incisors. Then, the inferior model was mounted on semi-adjustable articulator, and the set was sent to the laboratory, for the montage of the teeth and the waxing of a structure that descended from the metallic structure, so that the region of the mental portion had a filling and better contour, and the patient's saliva did not come out of his mouth during the use of the prosthesis. Artificial teeth were mounted and, after esthetic and functional proof, the dentures were processed by inclusion, pressing, and a long cycle of polymerization in water.

In the installation session, for greater retention and stability of the maxillofacial prosthesis, a contour addition was performed with composite resin on the buccal surface of the teeth that received a clamp (36, 37, 38, 47). Thus, the first adjustments were made to the prosthesis and the acrylic resin base and the patient received instructions regarding the use, cleaning, and conservation of the prosthesis. Exercises and their importance for strengthening the lower lip muscles and recovering their tone were also reinforced. The patient was followed up in consultations after 24, 48 and 72 hours, 7, 15 and 30 days, and 3, 6, 9 and 12 months for further adjustments and follow-up (Figure 6).

Figure 6 - Patient with a prosthesis installed.



Source: Authors.

3. Results and Discussion

Surgical removal of squamous cell tumors located in the head and neck region is well established for the control of the disease, allowing the staging of the disease, providing information about its spread and histopathological characteristics, and assisting with the subsequent management, patient survival and quality of life (Joo et al, 2018). Thus, surgery with tumor excision, lymph node dissection, and reconstruction when possible remains the mainstay of treatment for most of these patients (Kuscu et al, 2016). Adjuvant treatments such as radiotherapy and/or chemotherapy may be necessary according to tumor stage

and location (Montero & Patel, 2015). Oral cavity squamous cell carcinoma that invaded the floor of the mouth may affect the dental alveolus or dental pores of the alveolar process, requiring a computed tomography scan to verify its juxtaposition to the mandibular cortex; if the tumor is juxtaposed, mandibulectomy should be considered (Shah & Gil, 2009). After resection, depending on the extension of the tumor, the stomatognathic functions can be seriously affected. The patient may exhibit difficulties during speech, swallowing, and mastication (Oskam et al, 2013; Crombie et al, 2014). The injury caused to the nerves during the intervention can also limit gustative or touch sensitivity and muscle motricity (Kolokythas, 2010a; De Felice et al, 2018).

The treatment of an advanced oral cavity squamous cell carcinoma is complex and requires scientific knowledge and professional skills for adequate and effective reconstruction and rehabilitation of the patient. The treatment must involve a multidisciplinary team with dentists, physiotherapists, speech therapists, nutritionists, psychotherapists and nurses and, before the surgical procedures, the patient and his family should be counseled by these professionals about the risks involved, the required changes in routine before and after the treatments, and the care necessary during patient recovery (Montero & Patel, 2015; De Felice et al, 2018).

The consequences of resection are not well tolerated by the patient because of the great functional involvement that leads to poor nutrition, weight loss, malnutrition, and esthetic damage. Thus, a late diagnosis is an aggravating factor because the surgical treatment becomes aggressive and difficult, requiring not only resection but also adjuvant treatment such as radiotherapy and chemotherapy which cause other side effects that will be added to the effects of the surgery. This makes the construction of the dental prosthesis more challenging, as the patient may have sequelae such as hyposalivation, increased risk of dental caries, fibrosis, mucositis, chemotherapy-induced neuropathy, dysgeusia, dysphagia, and mucosal infections (De Felice et al, 2018; National Cancer Institute, 2021).

In the present case report, the patient underwent surgical resection of the floor of the mouth and of the anterior segment of the mandible, with adjuvant therapy with radiotherapy and chemotherapy. The patient used a nasogastric tube during the first postoperative days and, since the trans-surgical placement of plates or of a bone graft was not planned, this type of rehabilitation was not performed later due to the radiotherapy and its inherent risks. Thus, after cancer treatment, the patient had functional deficiency and apparent esthetic disfiguring.

On this basis, aiming at the well-being and restoration of the patient's functions, it was essential to discuss and elaborate as a team a correct and comprehensive treatment plan in order to minimize the risk of sequelae, with the main objective of planned rehabilitation being the execution of interventions that would preserve the integrity of the mandibular segments and the remaining teeth, providing improvement in masticatory and phonetic functions, as well as in social interaction and self-esteem. The treatment required a long clinical time, multidisciplinary assistance, and also the patient's collaboration.

Although rehabilitation with the aid of implants is recommended (Jackson et al, 2016), in the presented case this was not possible due to the absence of reconstructive surgery and radiation exposure. Because the patient did not undergo surgical reconstruction with grafts and/or plates, the mandibular remnants were not supported in the anterior region and were subject to muscle forces, which made it difficult to perform the procedures. Thus, during the treatment, it was necessary to make adaptations and individualizations, such as the use of a personalized tray and sectioning of the metallic framework, for the fidelity of the procedures and to reach the ideal occlusion. This shows that the prosthetic rehabilitation of patients with serious sequelae of the resection may render the procedures more difficult and not so predictable. The prosthodontist must always be ready to alter the treatment plan as a function of the individual difficulties encountered during treatment, carefully informing the patient about the procedures and the prognosis of rehabilitation.

Despite all the difficulties, the treatment was carried out successfully since the patient demonstrated satisfaction with

the result and made an effort to overcome the adaptation phase. In addition, the prosthesis proved to be well adapted to the support elements and provided occlusal re-establishment and stabilization of the mandibular segments over time.

4. Conclusion

Through this work, we can conclude that the best way to treat malignant tumors is prevention and an early diagnosis. When surgical reconstruction is contraindicated or not possible, prosthetic rehabilitation is a viable option and scientific knowledge and teamwork are essential for treatment success.

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Authors' contributions

All the authors meet the criteria for authorship: substantial contributions to the conception of the work, drafting of the work, final approval of the version to be published and agreement to be accountable for all aspects of the work. CMAPM, LRM and CHLS wrote and critically reviewed this article.

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