CLINICAL ORAL SCIENCE AND DENTISTRY

CASE REPORT ISSN 2688-7428 Open Access

Treatment of Stage IV Oral Squamous Cell Carcinoma Via Composite Segmental Mandibulectomy with Fibula-Free Flap Reconstruction. A Case Report

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Received date: February 12, 2024, **Accepted date:** February 19, 2024, **Published date:** March 01, 2024.

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Abstract

Purpose: Oral Squamous Cell Carcinoma (OSCC) is the most common malignant epithelial neoplasm of the oral cavity, accounting for over 90% of oral cancers. Many OSCCs are asymptomatic in the early stages. Early detection through oral screening increases survival rates and allows for treatment with minimal morbidity and dysfunction. In this case report, we present the importance of routine oral screening in the early detection of oral malignancies, and the multidisciplinary team approach needed for oral rehabilitation via segmental mandibulectomy, neck dissection, and fibula-free flap reconstruction (FFFR).

Methods: A 46-year-old woman presenting with an OSCC (cT4aN0M0) originated in the left mandibular gingiva; it was found to be locally invasive to the floor of the mouth and mandibular bone. After comprehensive clinical, pathological, and radiographical examinations, the OSCC was classified as stage IV.

Results: To remove the tumor entirely, a composite segmental mandibulectomy and neck dissection via a transcervical approach was

performed.

Conclusion: Routine oral screening is crucial for the early detection of oral cavity cancers, especially the malignant types, as it prevents severe and life-threatening deformities. When detected late, tumor eradication and oral rehabilitation become challenging and require a multidisciplinary team approach.

Keywords: oral squamous cell carcinoma, early detection, oral screening, mandibulectomy, fibula-free flap reconstruction, multidisciplinary

Introduction

Oral squamous cell carcinoma (OSCC) is the most common malignant epithelial neoplasm of the oral cavity, accounting for over 90% of oral cancers [1]. However, when detected early, higher survival rates are expected, with less morbidity and deformities. Smoking, alcohol use, and HPV status are the primary risk factors for such neoplasms. Consequently, lowering the patient's exposure to these factors reduces its incidence [2]. Furthermore, most OSCC cases are initially asymptomatic, making them more likely to be found at a later stage. Hence, secondary prevention involving periodic oral screening is critical for improved patient care, survival rates, and quality of life. Routine oral screening can be done via a thorough dental clinical examination and palpation at every dental visit, especially at high-risk oral cavity sites.

High-risk oral areas encompass the soft palate, the ventrolateral tongue surface, the lower lip, and the floor of the mouth [3]. If any suspicious lesions are noted, a biopsy should be taken. Nevertheless, owing to the expense of population screening, it is best to start with high-risk individuals, such as those over 40, smokers, heavy drinkers, and family members of patients with a history of oral cancer [4]. Complete oral rehab often takes a multidisciplinary team approach between the ablative surgeon, reconstructive surgeon, and dental providers.

The preferred course of treatment for late-detected OSCC involves a wide excision of the tumor by the head and neck ablative surgeon, with simultaneous reconstruction by a reconstructive surgeon, followed by oral rehabilitation with the help of the prosthodontist [5]. Afterward, depending on the final histopathological reports, radiation therapy may also be necessary.

Case Report

A 46-year-old Caucasian female presented in late March 2022, complaining of a growing mass around the left mandibular gingiva for about three weeks (Figure 1 a). First, complete medical and dental histories were obtained from the patient. Dental records showed some fillings, extraction of all four wisdoms and teeth #2 and #15, a root canal treatment, and a crown on tooth #31. However, the patient's last dental visit was two years ago, before the COVID-19 pandemic. The patient was medically fit with no medications taken. The patient is an ex-smoker (10 pack-years), but she quit two years ago. Clinical examination revealed grade III mobility in teeth #20, #21, and #22, along with an erythroleukoplakic exophytic mass surrounding the buccal and lingual gingiva between teeth #19 and #25. (Figure 1 b) The mass was friable and suspicious of malignancy.

The extra oral exam was remarkable for a 2 cm x 2 cm area of fixed skin adjacent to the tumor. Panoramic radiological imaging showed irregular radiolucency around the apices of teeth #19-22 (Figure 2). The patient was referred to the oral and maxillofacial department. A cone-beam computed tomography (CBCT) showed a radiolucent, erosive, ill-defined lesion around the apices of teeth #19-22, suspicious of malignancy. Consequently, an incisional biopsy of the lesion was done, accompanied by the extraction of teeth #20 and #21. The biopsied specimens, along with the extracted teeth, were sent for pathology, and the patient was referred for a magnetic resonance imaging (MRI) and a positron emission tomography (PET) scan for the standard NCCN oral cancer metastatic workup.

The MRI findings revealed a mass of 4 x 2 x 3.5 cm in the left

mandibular body, extending to the floor of the mouth and displacing the geniohyoid muscle. The PET scan showed a soft tissue lesion in the mandibular left area measuring 3.2 x 1.8 cm with intense fluorodeoxyglucose (FDG) activity. The histopathological report of the incisional biopsy taken confirmed the finding of an invasive, well-differentiated squamous cell carcinoma. The patient has staged an OSCC stage IV (cT4aN0M0). As per NCCN, treatment for OSCC involves surgery first, followed by possible radiotherapy and chemotherapy.

The surgery involved a composite resection of the mandible and the affected facial skin, and selective neck dissection via a transcervical approach to excise the tumor and tracheostomy, followed by FFF, cervical facial advancement, and split-thickness skin graft under general anesthesia. Donor sites (the right lower extremity for the FFF, and the right thigh for the skin graft) were assessed first. The tumor was removed with a 1 cm margin in all directions as a composite resection with the mandible (Figure 3 a) and a selective neck dissection was performed. (Figure 3 b). Subsequently, the left inferior alveolar nerve was reconstructed via an Axogen (Alachua, Fl) (Figure 3 c). At the same time as tumor extirpation, an osteocutaneous fibula flap with microvascular anastomosis was harvested from the patient's right leg (Figure 3 d), the bone was shaped as per the pre-surgical virtual surgical plan, and a 2.0 custom reconstruction plate was placed. (Figure 3 e). Finally, a split-thickness skin graft was obtained from the patient's right leg to cover the surgical area (Figure 3 f). Final pathology returned as a pT4aN0M0 OSCC with negative margins. Pathology showed both bone and skin invasive of the tumor.

Radiotherapy was recommended by the tumor board as per the NCCN guidelines to prevent the reoccurrence of the tumor, but the patient refused such treatment and agreed to a regular monitoring follow-up for early recurrence detection. In the postoperative phase, the patient was dismissed two weeks after the surgery. Analgesics were prescribed for the pain. After eight weeks, the patient switched from feeding through the Dobhoff nasal feeding tube to ingesting a liquid and soft diet orally. All surgical sites were healing properly.

Five months later, the patient presented for a head and neck computed tomography (CT) scan and fusion of the free fibula (Figure 4). One year post-operatively, the intraoral flap showed proper healing with healthy keratinized skin. (Figure 5a) Similarly, the extraoral cervical-facial advancement flap with a hypertrophic scar was healed well. (Figure 5b). Ultimatey, the patient was referred to the prosthodontic department to continue the oral rehabilitation to restore function.

Figure: 1a: Skin fixed over the mandibular body indicating skin invasion **b** exophytic mass in the mandibular left area between teeth #19-25 extending to the buccal and lingual soft tissues.

Figure 2: Panoramic x-ray showing bone resorption in the mid-ramus area, including the apices of teeth #19-22

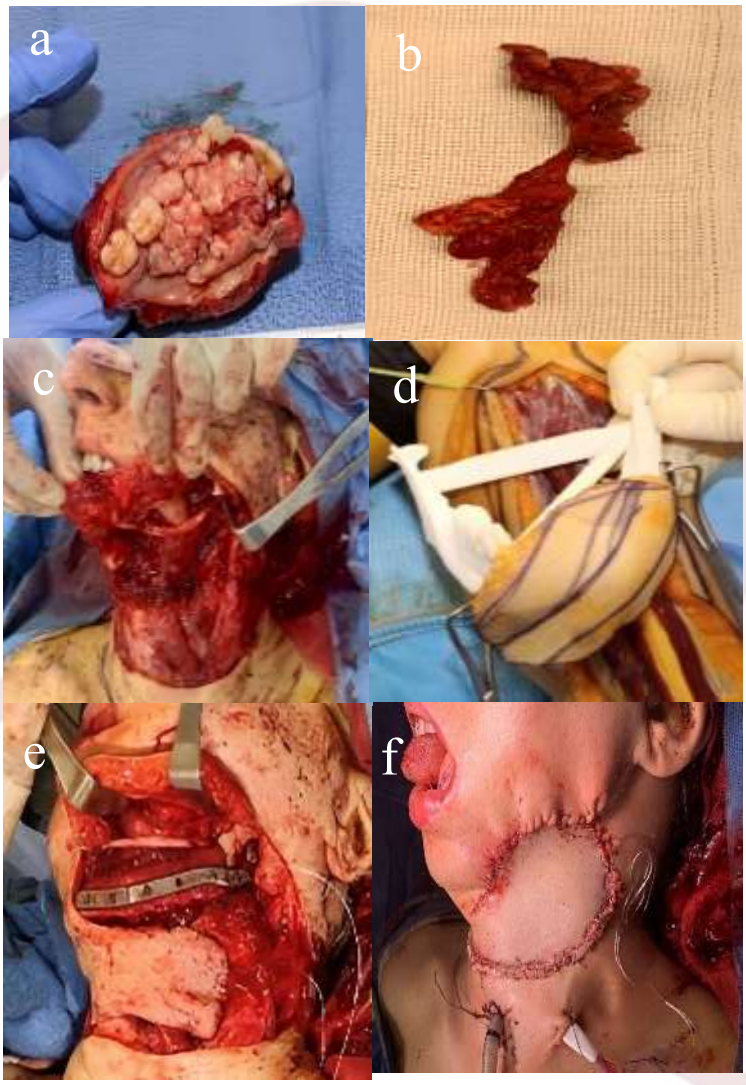

Figure 3: Composite mandibulectomy followed by FFF and cervical facial advancement flap a composite segmental mandibulectomy for the left mandible, b selective neck dissections level I-III c reconstruction of the left inferior alveolar nerve, d costeocutaneous fibula flap, e reconstruction of the left mandibular area using the fibula-free flap with the titanium plate, f coverage of the surgical site with a cervical facial advancement flap

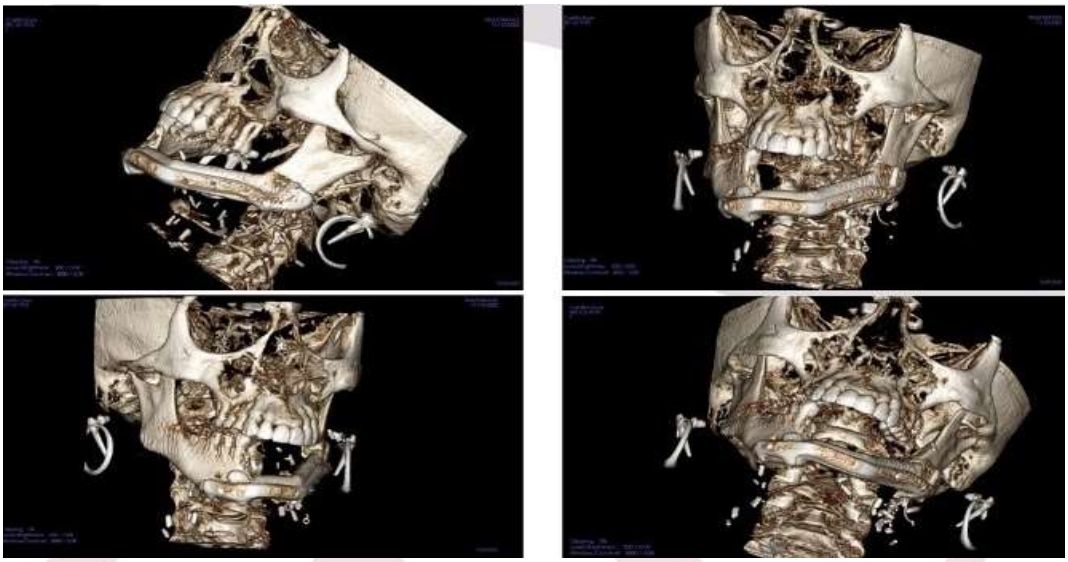

Figure 4: Five months follow CT showing fusion of the fibula flap with the mandibular bone

Figure 5: One year postoperative follow up, a proper healing of the intraoral fibula skin paddle b proper healing of the cervical facial advancement with a hypertrophic scar

Discussion

Oral cancer is a worldwide health concern. The World Health Organization reports that over the last few decades, there has been a rise in oral cancer cases [6]. Over 90% of these cancers are OSCCs, with more than "350,000 new cases and 177,000 deaths" worldwide each year [7]. The rising incidence can be explained by the rising use of alcohol and tobacco, which are the main risk factors [2]. As such, limiting their exposure is thought to be the primary preventive measure. Furthermore, most OSCC cases are initially asymptomatic, making them hard to notice early. Hence, secondary prevention involving periodic oral screening is rewarded by better treatment prognosis, patient's quality of life, and survival rates. In early detected tumors, the survival rate is more than 80%. Meanwhile, the survival rates drop to less than 30% in advanced stages [8]. Accordingly, thorough dental clinical examination and palpation achieve early detection through periodic oral screening, especially at the high-risk areas of the oral cavity, including the ventrolateral tongue surface, the lower lip, and the floor of the mouth [3]. A biopsy should be taken if any suspicious lesions are noted. Nevertheless, owing to the expense of population screening, it is best to start with high-risk individuals, such as those over 40, smokers, heavy drinkers, and family members of patients with a history of oral cancer [4].

The COVID-19 pandemic has brought many challenges to the daily lifestyles of the population. “In response to the pandemic, global lockdown, social distancing, and quarantine procedures were imposed.” [6] Due to the high risk of transmission of the COVID-19 virus through aerosol, routine oral health care was suspended in many countries during the pandemic's peak. “Therefore, opportunities for screening the oral cavity might be significantly disrupted, and consequently, diagnosis of malignant and/or potentially malignant lesions might be delayed.” [9]

In addition, the COVID-19 pandemic has created much anxiety and stress worldwide. Some of the COVID-19 stressors might be social isolation, financial hardship, fear of an unknown disease with no cure or established medical management, and the death toll/grief. The question is whether the COVID-19 psychological distress has contributed significantly to the progression of cancer cells in this case, as there is evidence that “stress hormones, along with damping the activity of the immune system, directly affect all facets of hallmarks of cancer.” [10]

Regarding oral rehabilitation for OSCC, the ablative surgeon, reconstruction surgeon, and prosthodontist must collaborate as a multidisciplinary team. The preferred course of treatment for advanced aggressive OSCC includes the wide excision of the lesion in the affected bone and soft tissue by the head and neck surgeon, followed by mandibular reconstruction and rehabilitation by a reconstructive surgeon. It is helpful to plan the reconstruction with prosthetic rehabilitation in mind; if the bone is not in the right place for dental rehab, it may prove impossible to restore these patients.

In this case report, the aggressive neoplasm was diagnosed in the mandibular gingiva, requiring a composite segmental mandibulectomy, including facial skin and a neck dissection via a trans-cervical approach. It was reconstructed with a free fibula flap and a cervical facial advancement flap.

Significant advancements have been made toward the complete reconstruction of the mandible in the past few decades. This includes the use of bone grafts, titanium reconstructive plates, and pedicle flaps [5]. However, after being first described by Hidalgo in 1989, the free fibular graft (FFF) has become the gold standard for mandibular reconstruction owing to its high success rate [11]. The fibula flap has many advantages, such as a distal harvest site, allowing for multiple teams working at once, and the ability to be easily shaped into whatever structures needed. Additional advantages of the FFF include superior bone quality and quantity, high union expected, decreased donor site morbidity, segmental blood supply, ease of graft harvesting, and uniformity of bone structure [5]. Conversely, this technique's downsides include decreased vertical height, thin cutaneous tissues, and the absence of a vestibular groove, resulting in a less retentive prosthesis. Additionally, the FFF thickness is more than that of the gingiva, not attached to the bone by the periosteum, and doesn't reconstruct the vestibule. These flaps must often be debulked and thinned for an ideal dental rehabilitation. Appropriate control of the oral soft tissues is needed for long-term stability, oral health, and function [5].

Finally, after segmental mandibulectomy and proper reconstruction with the FFF, multidisciplinary treatment options are available to restore function, including implant-supported prosthesis or simple prosthesis rehabilitation. The treatment chosen depends on several factors, such as the financial ability of

the patient, the ability to maintain proper oral hygiene, and the patient's cooperation. In ideal cases, implant placement, followed by implant-supported prosthesis fabrication, is the best treatment modality to restore function. However, simple prosthesis rehabilitation, including partial or complete removable dentures, is also a choice if the patient can't afford the implant treatment [12].

Conclusion

To sum up, OSCC is the most common malignant tumor of the oral cavity. Early detection by routine oral screening helps improve the patient's survival rate, quality of life, and treatment prognosis. Alcohol, stress, and smoking are contributing factors to the development of cancerous cells, and the COVID-19 pandemic has increased the lack of access to routine oral health and enhanced stressors. When detected late, the treatment requires a multidisciplinary approach between the many different services. The ablative surgeon removes the tumor in its entirety, while a reconstructive surgeon can repair the defect. Extensive soft tissue modification often needs to happen to allow the patient to have a prosthesis. Finally, the prosthodontist is responsible for restoring the patient's aesthetic and function by fabricating a proper dental prosthesis.

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