

# A combination of two regional flaps for the complex reconstruction after head and neck cancer surgery as an alternative approach during the COVID-19 pandemic: A case report

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**Abstract.** Since the COVID-19 pandemic outbreak, the medical systems were challenged by continuously increasing numbers of infections and faced critical issues when trying to find solutions for patients suffering from other diseases, including patients with head and neck cancers. Complex surgeries were delayed due to an acute deficit of specialized intensive care medical staff and equipment, which were redirected towards COVID-19 hospitalized cases, with irreversible consequences for the patients. In the present study, the case of locally advanced head and neck cancer was presented, which was treated radically during the heaviest wave of the COVID-19 pandemic in Romania using an alternative approach for immediate defect reconstruction. The case of locally advanced buccal carcinoma (staged T4aN0Mx) was reported, where radical tumor excision was followed by immediate reconstruction using a combination of two regional flaps, temporal and submental, in order to provide timely and optimal medical care. In the difficult context of the COVID-19 pandemic, the standard reconstructive technique, which is the

free vascularized tissue transfer, could not be performed for this patient, due to the acute deficit of anesthetists and associated medical staff, as well as the lack of free beds in intensive care units. Combinations of local and regional flaps, such as temporal muscle flap and submental flap, are simple and accessible surgical techniques that require reduced surgical time, minimal equipment, and basic surgical training, advantages that become crucial in historically challenging times, such as a global pandemic. Individual cases, like elderly patients or patients with severe comorbidities, should be considered for these types of reconstructive techniques: simple solutions, single or in combination, which may be an improved therapeutic option for these patients.

## Introduction

Since the COVID-19 pandemic outbreak, medical systems in all affected countries have tried to identify rapid solutions to adapt to the arising new challenges (1). Besides management strategies developed for patients suffering from COVID-19 infection, which exert an enormous burden on the medical system, critical issues emerged when trying to find solutions for patients suffering from other diseases (2,3), including patients diagnosed with head and neck cancers (HNC). HNC was ranked the sixth most common malignancy worldwide during the last 5 years, representing ~6% of all cancer cases (4), and despite all efforts for early disease detection, up to 70% of the patients are in advanced stages of the disease at the moment of diagnosis (5,6). In most cases, these patients are candidates for extended surgeries, which imply complex reconstructive solutions using free flap techniques. For the reconstruction of simple or composite oral defects, current reports indicate the

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forearm, anterolateral thigh and fibula as the common donor sites for free tissue transfer, considered today the golden standard for this type of defect reconstruction (7,8). The advances made in microsurgery and reconstructive surgery during the last decades allowed for numerous medical centers to conduct these types of surgeries with very high rates of success (9,10). However, in most cases, patients which undergo head and neck surgeries with free vascularized flap reconstructions, require specific postoperative care from several h up to days (11), which represented an enormous challenge during the last two years since the COVID-19 pandemic outbreak, due to both lack of available beds in intensive care units and the deficit of qualified medical staff which was massively redirected for the treatment and surveillance of COVID-19 patients (12). Unfortunately, this new context was associated with concerning reports regarding access to adequate medical care for patients with HNC eligible for radical surgeries (13). An increase in avoidable deaths associated with malignancy is expected in the following years, as a consequence of the limited access to medical care that patients faced during the last two years of the COVID-19 pandemic (14).

In this challenging context, surgeons from different specialties tried to identify timely solutions to treat oncologic patients (15). These would usually imply simpler methods of therapy, which could be conducted without or with the minimal implication of intensive care units. Management strategies in complex head and neck defects, initially delayed due to an acute deficit of medical staff specially trained for perioperative care, were reconsidered and alternative solutions were identified to provide proper and timely surgical treatment to patients with resectable HNC, as part of the multimodal oncological therapy (16). Reconstruction methods with local and regional flaps, widely used before the microsurgery era, were reintroduced as valid management alternatives for large head and neck defect reconstruction. Techniques using temporalis or pectoralis major muscles, submental or deltopectoral flaps, for the repair of a variety of oral defects (17,18), have been reported during the last years, in this pandemic context, as alternatives for free flap reconstructive methods (16,19).

In the present study, the clinical case of a patient diagnosed with locally advanced buccal cancer during the heaviest wave of COVID-19 pandemic in Romania was presented (when our medical system was severely challenged), for whom a combination of two local flaps: temporal and submental flap was used, as an alternative for a free flap reconstruction technique, in order to restore the defect resulted after radical tumor resection. The aim of the present case report is to provide alternative approaches for the reconstruction of complex head and neck defects in cases where standard care is not possible, thus assuring the best medical care for the patients.

## Case report

In September 2021, when the fourth wave of the COVID-19 pandemic heavily hit Romania and an important part of the medical staff was redirected for the management of COVID-19 patients, a 66-year-old male patient was referred to the Department of Oral and Maxillofacial surgery of 'Carol Davila' Central University Emergency Military Hospital (Bucharest, Romania), for specific treatment with a confirmed

diagnosis following an incisional biopsy of an oral squamous cell carcinoma. The clinical examination revealed an extensive ulcero-infiltrative lesion involving the entire buccal mucosa on the right side, extended to the upper vestibulum, right labial commissure and a limited area of the perioral skin, upper right lip, retromolar region, with a diameter of ~7/5 cm (Fig. 1A and B). The mouth opening was restricted and the patient complained of local pain, oral bleeding, halitosis and significant eating impairment. The medical history revealed no significant preexisting conditions except for hypertension, which was controlled with specific medication. The patient was a heavy smoker for more than 30 years and had a history of alcohol abuse. The computed tomography (CT) scan revealed a contrast-enhancing lesion measuring 6.9/3.9/4.1 cm, involving the right buccal soft tissues including the buccal muscle, associating right alveolar bone lysis and lateroanterior maxillary sinus invasion, inferiorly extended to the vicinity of the right mandibular ramus, with no cortical bone invasion. The pterigopalatine fossa was tumor-free. The cervical CT scan objectified a level IIA lymph node with the largest diameter of 1.3 cm and no other evidence of suspicious nodes in the right cervical area (Fig. 1C and D). The whole-body CT scan did not reveal any lesions suggestive of distant metastases.

The indication for urgent radical tumor resection and immediate defect reconstruction, in order to allow for timely initiation of the adjuvant therapy, was obvious, but at that moment, all surgical procedures requiring specialized postoperative care were restricted due to an acute deficit of medical staff and available beds in the intensive care units. In our hospital, as in numerous medical facilities in Romania, other departments were temporarily adapted to admit COVID-19 patients and medical staff from other specialties were redirected towards treating COVID-19 hospitalized cases, a situation that was somehow similar to war conditions. In this context, an alternative procedure was selected for the defect reconstruction after radical tumor resection, that would not imply free vascularized tissue transfer and microsurgery, which according to our protocols should be followed by a temporary patient transfer to the intensive care unit for specialized postoperative care, for at least 12 h. Preoperative assessment included blood tests, electrocardiogram, cardiac and pulmonary evaluations, with no abnormal findings. The surgical procedure, conducted under general anesthesia with oro-tracheal intubation, consisted of radical tumor resection with intraoperative confirmation of tumor-free margins and concomitant functional radical neck dissection (type III). The resection specimen included segments of the lips plus labial commissure, buccal soft tissues until the subcutaneous layer of genian skin, right hemimaxilla from the midline, right maxillary sinus, right pterygoid plates with partial resection of the right pterygoid muscles (Fig. 2), as well as the neck dissection specimen (lymph node stations 1-5). Defect reconstruction was conducted through a composite technique, using a right temporal muscle flap for closure of the oro-antral and oro-nasal fistula and a submental flap for the reconstruction of the buccal and retromolar regions. The temporal muscle flap was advanced under the temporozygomatic arch. No arch osteotomy was required for the advancement, only the release of the fascia from the arch in order to obtain a tension-free suture to the recipient site. The superficial layer of the temporal fascia

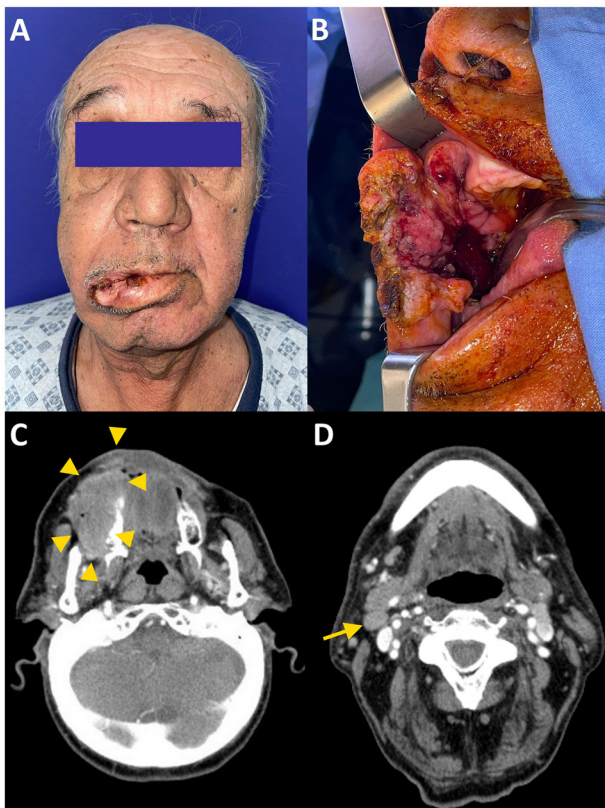


Figure 1. Preoperative (A and B) clinical and (C and D) computed tomography imaging features. Large infiltrative and ulcerating mass (C, arrowheads) associating with an upper jugular anterior tumoral lymph node (D, arrow).

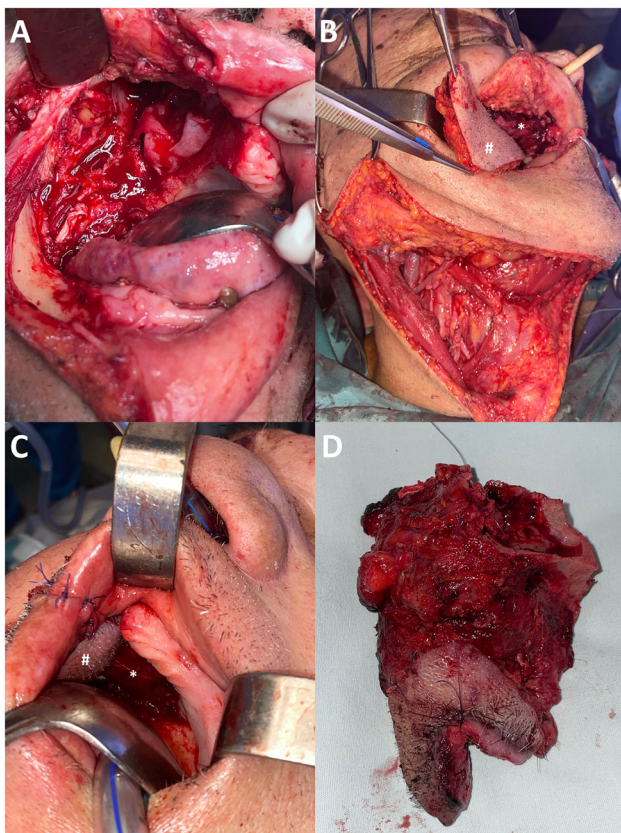


Figure 2. Intraoperative aspects. (A) Resection defect. (B) Neck dissection and advancement of the flaps. (C) Reconstruction of the defect. (D) Resection specimen. \*, temporalis muscle flap and #, submental flap.



Figure 3. Postoperative and postradiotherapy aspects. (A-C) One month postoperative aspect. (D-F) Postradiotherapy aspect (3 months after surgery). \*, temporalis muscle flap and #, submental flap.

was preserved and reinserted in order to prevent the volumetric defect of the donor temple. The submental flap had a diameter of 5/3 cm, pedicled on the right facial vessels, advanced to the right inner surface of the cheek through the floor of the mouth, posterior to the mylohyoid muscle. The total length of the surgery was 6.5 h. At the end of the surgery, a nasogastric tube was placed to assist with feeding during the first postoperative days. Immediately after surgery, the patient was transferred to the postoperative ward within our department where the monitoring and treatment were conducted by the medical staff from the oro-maxillo-facial department, with no indication for temporary placement in a specialized care unit or an intensive care unit. Postoperatively, the patient received intravenous antibiotic therapy [Amoxicilin + Clavulanic acid 1 g, three times per day (TID)], anti-inflammatory and analgesic drugs (Paracetamol 10 mg/ml, Metamizole 5 ml TID), and nutritive support for a total of 5 days. The patient underwent the standard postoperative care protocol: Daily wound cleaning with antiseptics, removal of the two draining tubes at 24 and 48 h (drainage of 20 ccs per tube), and dressing. Postoperative recovery was optimal, with no significant events or complications. The length of the hospitalization was of 5 days, which was an important advantage considering the limited number of beds for non-COVID patients in our hospital.

The cutaneous sutures were removed one week after the surgery. Intraoral wounds were sutured with resorbable sutures. The patient returned for the first follow-up visit 4 weeks after surgery, when the normal metaplasia process of the transplanted tissues was in progress (Fig. 3A-C). The healing was optimal, with no evidence of fistulas or other complications. The final pathology report described a poorly-differentiated, keratinizing squamous cell carcinoma, with bone invasion, positive perineural invasion, and no evidence of vascular invasion. Intense intratumor and peritumor inflammatory infiltrate was present. Resection margins, as well as all lymph nodes within the specimen, were tumor-free. Pathological staging was pT4aN0Mx. According to national guidelines and

based on the clinical staging and final pathology report the oncology board proposed adjuvant therapy. Within 6 weeks after surgery, the patient initiated radiotherapy associated with chemotherapy. At the first follow-up visit, one month after completion of the adjuvant treatment, the patient was in a favorable general condition, with no significant complaints, except for minor microstomia. The oral and cervical surgical wounds had a normal appearance, with partial shrinkage of the intraoral flaps secondary to radiotherapy, no signs of tumor progression or recurrence, and no evidence of dehiscence or chronic fistulas (Fig. 3D-F). The follow-up contrast CT scan revealed a normal postoperative/post-irradiation aspect, with no evidence of tumor progression or recurrence. The patient reported a healthy appetite and minor weight gain. Furthermore, the patient reported cessation of smoking and alcohol consumption. The patient is enrolled in a follow-up program with regular visits and imaging assessments.

## Discussion

The COVID-19 pandemic outbreak has shattered the entire world, challenged the medical systems worldwide, and tested the speed of reaction of the scientific and medical community when facing unexpected aggression (20). At certain points, in different countries, heavy pandemic waves severely affected surgical departments, which are directly dependent on anesthetists as part of the medical team and intensive care units for patient management (12,19). The challenges related to the reconstruction of head and neck defects emerged once the first surgical procedures of head and neck tumor resections were performed (21). This anatomical region is of great complexity and surgery can have a major impact on the quality of life of the patient, associated with all the functional roles attributed to this region—speech, chewing, swallowing, breathing as well as social reintegration, as the face represents the projection of one's identity in the society. Therefore, the perfect reconstruction technique would lead to a '*restitutio ad integrum*' of the highly specialized noble structures and is continuously pursued by both researchers and medical practitioners. Different techniques have been reported and implemented in clinical practice during the last century, since the discovery of general anesthesia allowed for an accelerated progress in surgical procedures (22). Currently, free flap reconstruction techniques have been accepted worldwide as the 'gold standard' for the reconstruction of wide, complex head and neck defects (23). In the last decade, these types of surgeries are conducted in numerous medical facilities with continuously increasing rates of success, for the great benefit of patients (24). However, unexpected local or global events, similar to the pandemic situation that emerged during the last two years have raised new challenges, when the sudden acute necessity of intensive care units and specialized medical staff was redirected to provide specific medical care for the patients with severe COVID-19 infections (15). The limited access of patients to appropriate treatment had negative, occasionally even dramatic, consequences for patients with other types of diseases, including patients with HNC (25). The massive redirection of intensive care equipment and trained staff for the management of continuously rising number of

COVID-19 patients led to a major reduction, and at certain moments even cessation, of non-emergency surgeries. In this context, complex, extended surgeries, including free flap reconstructive surgery for head and neck defects, could not be performed, forcing the maxillofacial surgeon to look for alternative solutions in order to provide the best medical care for the patients. Large defects, routinely reconstructed using free flap techniques, were reconsidered for reconstructive options with local or regional flaps, alone or in different combinations (19).

In the present case, regional flaps—temporal muscle flap and submental flap—were associated as a simpler and reliable alternative for a composite free flap reconstruction technique of a large, complex defect of the right hemimaxilla and cheek resulting after radical tumor excision. Recent studies have reported similar approaches in the management of patients with HNC during this pandemic period (16,26). The renewed interest for temporal muscle flap in the reconstruction of maxillary defects is due to the advantages of this reconstructive method: a simple and rapid technique, performed by a single surgeon, with high reliability of vascular supply and a hidden donor site scar in the hair-bearing skin, which provides very well matching, thin and pliable tissue for the immediate closure of oro-antral fistulas resulting after maxillary resection, with an excellent functional outcome in terms of speech and swallowing (27). The main complaint of the patients after using this technique is the impaired appearance caused by the temple hollowing after temporal muscle displacement into the oral cavity (28). For our patient, a modification of the procedure was used, with preservation of the superficial layer of the temporal fascia, thus allowing for a reconstruction of the donor site with minimal hollowing, otherwise not reported by the patient. The initial result was stable at the last follow-up visit, 4 months after surgery and radiotherapy completion. Permanent facial nerve palsy after flap harvesting is another complication when raising temporal muscle flap, however, it is uncommon in experienced hands (28).

The submental flap, used in our patient for the reconstruction of the buccal and retromolar area, is another flap that has been reconsidered during the last two years as a valid alternative for free flap reconstruction techniques (13). This flap was designed and reported by Martin *et al* (29) as an alternative to free flaps for the reconstruction of oral cavity defects. The donor site for this flap is actually within the operating field, providing a generous and versatile skin paddle, with a wide rotation arch and perfectly matching color and texture, suitable for various cutaneous and oral reconstructions. The major drawback of this flap is related to the potential risk of metastatic lymph node transplantation in patients with occult level I lymph node involvement (30). Several systematic reviews reported significantly decreased operating time and hospitalization length, with similar long-term results for submental flap reconstructive surgeries compared with free flap reconstruction techniques. However, the size of the reconstructed defect was smaller and the incidence of partial flap failure was higher in submental flap groups (31,32). In the present case, in order to compensate for the limitations related to the size of the defect, it was chosen to combine two reconstructive techniques, thus increasing the supply of transferred tissue, which allowed for an appropriate



reconstruction of the entire defect, with no postoperative complications. In order to minimize the risk of local recurrence secondary to occult lymph node metastasis, a careful skeletonisation of the vascular pedicle during flap harvesting was implemented, with complete removal of surrounding fatty tissue. Modified techniques, such as the inclusion of mylohyoid muscle, in order to minimize the risk of flap loss due to a compromise in vascular supply, are indicated only in patients with clinically negative necks and primary tumors with a very low risk of level I lymph node metastasis, which is not the case for buccal cancer where level IB lymph node involvement is more common (33). However, these modified techniques are useful for training purposes of resident doctors, increasing their level of confidence when performing submental flap harvesting (34). To the best of our knowledge, this is the first report of a combined technique using these two flaps for the reconstruction of a composite head defect, resulted after tumor resection. The main advantages of our proposed approach are related to the simple, fast and reliable character of the surgical technique, which does not require any specialized equipment, thus allowing to implement this reconstructive method in any challenging context, such as a global pandemic or war. By contrast, microsurgical reconstruction through free flaps involves complex and lengthy surgeries, which require highly equipped and specialized facilities, as well as dedicated postoperative care units. The main limitation of local and regional flaps in head and neck defect rehabilitation is related to the size of the reconstructed area. This limitation was overcome through the use of a combination of two distinct regional flaps-temporal and submental-thus allowing an optimal primary repair of the wide defect resulted after tumor resection.

In conclusion, both temporal muscle and submental flaps are defined by an easy harvesting technique and reduced surgical time in experienced hands, advantages that become crucial in historically difficult times. One of the drawbacks of modern medical training systems is that younger surgeons are mainly trained in free flap reconstruction techniques and are less familiar with these alternative methods of reconstruction, thus excluding them as the option of treatment when making treatment plans. This aspect emphasizes the importance of a broad program of surgical training for young surgeons, even if conducted only on cadaveric specimens, in order to maintain a versatile, flexible ability of approach in treatment planning. These situations may become useful not only in severe global situations, such as the COVID-19 outbreak but also when assessing individual cases. HNC arises frequently in elderly patients, numerous of whom have other severe comorbidities, that are not compatible with lengthy, complex, high-risk surgeries (35,36). Simple solutions, represented by local flaps, single or in combination, may be an improved option for these patients.

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#### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### Authors' contributions

AC was responsible for conceptualization, methodology and writing the manuscript. AC, LM, RMC, RSC, TAF, CS, DOC and CC performed the data analysis, literature research and original draft preparation. CC was responsible for editing, critical review of the manuscript and supervision of the project. AC and CS confirm the authenticity of all the raw data. All authors read and approved the final manuscript.

#### Ethics approval and consent to participate

The present study was approved (approval no. 504/1.03.2022) by the Local Ethics Committee of the 'Carol Davila' Central Military Emergency University Hospital (Bucharest, Romania). Written informed consent was obtained from the patient.

#### Patient consent for publication

Written informed consent was obtained from the patient.

#### Competing interests

The authors declare that they have no competing interests.

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