

Innovative Reconstruction Techniques for Extensive Head and Neck Tumors

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Abstract

In the challenging landscape of malignant head and neck tumors, surgeons grapple with intricate obstacles to achieve effective reconstruction. When facing extensive involvement of soft and bone tissue, reestablishing acceptable aesthetics and function to patients should always be focused on restoring both form and function, we encountered a compelling case—a significant squamous cell carcinoma deeply rooted in the anterior mandibular region, necessitating substantial soft tissue and bone resection. Our innovative approach involved a carefully tailored extended prosthesis designed for the mandible and its temporomandibular joint, accompanied by a skillfully deployed deltopectoral myocutaneous flap. This surgical intervention successfully brought about the triumphant resurgence of reconstruction of mandibular function, marking a state of disease-free well-being for the patient. This narrative unfolds at the forefront of transformative reconstruction, where the synergy of innovation and expertise redefines the narrative, showcasing victory over adversity in the intricate realm of head and neck tumor surgery.

Keywords: deltopectoral flap; extended temporomandibular joint prosthesis; total joint replacement; head and neck cancer; reconstruction surgery.

Dear Editor,

The Deltopectoral Myocutaneous Flap (DP) with a medial base was historically regarded as the primary flap for reconstructing oropharyngeal and pharyngoesophageal defects. This flap derives its primary irrigation from the perforating branches of the internal mammary artery, coursing through the second, third, and fourth intercostal spaces. An irrigation terminal emanates from a local subdermal plexus [1]. In 1965, Bakamjian employed a medial deltopectoral flap for pharyngoesophageal reconstruction, bearing a striking resemblance to Aymard's flap published in *The Lancet* half a century earlier; however, Bakamjian did not reference Aymard in any of his articles [2].

The flap's positioning relative to the head and neck renders it an excellent choice for reconstructing defects in this region. DP boasts advantages in both the quality and quantity of harvestable tissue. Its robust nature facilitates not only the closure of various defects in the head and neck but also covers reconstruction plates used in mandibular surgery, consequently reducing the likelihood of exposure of the reconstruction plate through the skin or mucosa [3,4].

In scenarios necessitating mandibular resection without the option of preserving the temporomandibular joint (TMJ), the consideration of customized implants catering to both the mandible and TMJ becomes imperative. Elledge et al. validated a system and classification for these defects [5]. In cases involving substantial losses of associated soft tissue during ablative head and neck cancer (HNC) surgeries with mandibular involvement, pedicle flaps can be deployed to shield mandibular reconstruction plates [6,7].

This study elucidates the application of DP for coating a customized implant employed in mandibular and TMJ reconstruction, along with soft tissue reconstruction following ablative surgery for oral cavity cancer.

In this case, a woman of 78 years presented with an extensive oral squamous cell carcinoma that had infiltrated the mandibular body, extending into the right parasinifary region, and exhibiting exophytic characteristics in the adjacent labiogenious region (Figure 1). An incisional biopsy confirmed the presence of squamous cell carcinoma.

Subsequent diagnostic procedures included a CT scan to assess the extent of the lesion's intraosseous component and a PET SCAN to evaluate tumor invasion in adjacent tissues. Upon evaluation, it was determined that the lesion exhibited significant local infiltration in the skin, adjacent tissues, and mandible. However, there were no metastases observed in nearby lymph nodes, and there was no invasion into the tongue region. Consequently, a plan for ablative surgery involving the total resection of the lesion in the affected soft tissue and mandible was devised.

Given the extensive bone defect resulting from the safety margin, which extended from the right temporomandibular joint (TMJ) to the contralateral parasinifary region, the chosen approach involved the utilization of an extended customized prosthesis for the TMJ, ramus, body, and symphysis. This prosthesis featured

perforations to facilitate the fixation of the microvascularized free graft of the fibula, intended for the reconstruction of intra and extraoral soft tissue (Osteomed®, Rio Claro, Brazil) (Figure 2). Simultaneously, the severely destroyed contralateral TMJ, afflicted by osteoarthritis, was replaced by a stock prosthesis (Osteomed®, Rio Claro, Brazil).



Figure 1. Extra oral view of the extensive oral squamous cell carcinoma in the right mandible. The exophytic pattern along with the bad medical status influenced in the decision of a pedicle flap to reconstruct the soft tissue defect created with the resection.

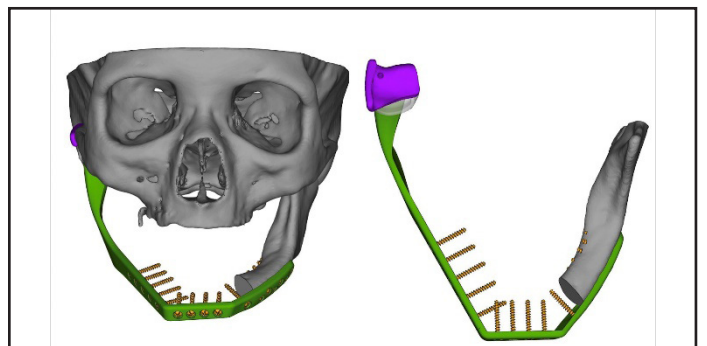


Figure 2. 3D virtual planning of the extended TMJ and mandibular reconstruction with a customized prosthesis designed by Osteomed® (Rio Claro, Brazil). Note the virtual simulation of the bicortical screws designed for fixation of the fibula graft. Only after the prosthesis manufacture, the patient's primary physician contraindicated the fibula graft due to her medical status that would make a more extensive surgery more dangerous to the patient. The virtual planning also showed the condylotomy of contralateral TMJ due to aggressive osteoarthritis for the TJR with a stock prosthesis (Osteomed® Rio Claro, Brazil).

In executing a strategy for intra and extraoral soft tissue reconstruction, an ipsilateral deltopectoral flap was implemented. The initial choice of a microvascularized free fibula graft for reconstruction was, however, discarded at the last minute by the patient's physicians due to her severe coronary disease. This decision was influenced by the need to avoid subjecting her to an extended period of general anesthesia typically associated with the use of this technique. The entire procedure unfolded smoothly over a span of 5 hours, in contrast to the potential 8 hours that might have been required for the use of free grafts (Figure 3).



Figure 3. Design of the deltopectoral flap elevated after dissection and after lesion resection and TMJ and mandibular prosthesis placement. Then, the flap was rotated and sutured in place for both intra and extra oral soft tissue reconstruction. Patient underwent tracheostomy for mechanical ventilation and NG tube for parenteral feeding.

Although osseocutaneous free flaps are considered a superior option for reconstructing mandibular defects after ablative head and neck cancer (HNC) surgeries, their application is constrained in elderly patients with significant comorbidities, anticipating a low rate of graft absorption. Due to the advanced age and extensive comorbidities of our patient, we opted for the Deltopectoral Myocutaneous Flap (DP). This choice was motivated by its thickness, which effectively covers the mandibular implant and reconstructs all lost soft tissue following lesion resection, whether intra or extraoral—a capability commonly achieved by this flap. A retrospective study by Sekhar et al. [8], encompassing 127 patients, demonstrated that DP is widely employed for post-ablation reconstruction in HNC, particularly in cases involving extensive intra and extraoral defects without bone reconstruction. The flap exhibits commendable success rates, minimal recovery time, and favorable aesthetic outcomes, positioning it as a viable option for HNC treatment.

Lee et al. [6] detailed the successful use of myocutaneous pedicle flaps for the customized coating of titanium mesh after HNC ablation. Customized implants tailored to individual patients are extensively discussed in the literature, particularly for TMJ reconstructions and extensive mandibular defects. Huang et al. [9] emphasized the diverse anatomical considerations, complex mandibular movements, saliva contamination, and dental rehabilitation as key factors leading to the utilization of customized implants in maxillofacial reconstructions. The authors reported that, when used in conjunction with flaps for complex mandibular defects, patient-specific cutting and perforation guides corresponding to the specific reconstruction plate enable precise 3D orientation of bone segments. Elledge et al. [5] validated a protocol for the classification of extended alloplastic reconstructions of the temporomandibular joint (TMJ). According to the size of the mandibular bone defect and the extent of the prosthetic component involved, the prosthesis used corresponds to an M2, with a fossa component equivalent to F0.

Voss et al. [10] also described the use of customized implants for post-ablation reconstruction involving the mandible and TMJ, albeit using vascularized flaps from the scapula and latissimus dorsi. Notably, there was no mention of the reconstruction of the mandibular fossa, only the condylar component. To date, there are no reported cases employing our approach.

The removal of the TMJ was not directly related to cancer involvement but rather due to the scant bone remnant needed to fix a reconstruction plate. In most oncological or infectious processes of the head and neck, TMJ engagement is uncommon. This rarity can be attributed to the protective distance of most intraoral tumors, which initially infiltrate the mandibular body before extending late to the TMJ. Similarly uncommon is the involvement of cutaneous and subcutaneous tumors on the right wing, although infiltration due to parotid tumors is observed. The occurrence of metastatic oncological disease in the TMJ is infrequent and rarely warrants ablative surgery [10].

Oncological or infectious indications for TMJ reconstruction introduce several complex factors, including scarring and tissue loss from previous surgery or destruction, as well as potential poor vascularization. These factors contribute to increased complications, limited function, and decreased quality of life. The management of TMJ involvement in cancer patients varies significantly, ranging from non-reconstruction and free

autologous grafts to vascularized grafts and partial or total replacement with prostheses. Despite numerous case reports and comparative series, there is a scarcity of guidelines regarding the management of resected TMJ components in cancer patients.

Yours Sincerely,

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REFERENCES

- [1] Shah JP, Patel SG, Singh B. Chap. 15: Reconstructive Surgery. In: Head and Neck Surgery. 4th Ed., Mosby, 2012.
- [2] Hwang K. The Origins of Deltopectoral Flaps and the Pectoralis Major Myocutaneous Flap. *J Craniofac Surg.* 2016. 27(7):1845-1848. <https://doi.org/10.1097/SCS.0000000000003057>
- [3] Aldelaimi TN, Khalil AA. Reconstruction of Facial Defect Using Deltopectoral Flap. *J Craniofac Surg.* 2015. 26(8):e786-8 <https://doi.org/10.1097/SCS.0000000000002056>
- [4] Abrar Y, Muntaha ST, Khan K, Hameed U. Successful Use of Deltopectoral Flap in Reconstruction of Defect Caused by Squamous Cell Carcinoma. *J Coll Physicians Surg Pak.* 2018. 28(6): S125-S127. <https://doi.org/10.29271/jcpsp.2018.06.S125>
- [5] Elledge ROC, Higginson J, Mercuri LG, Speculand B. Validation of an extended total joint replacement (eTJR) classification system for the temporomandibular joint (TMJ). *Br J Oral Maxillofac Surg.* 2021. 59(7):788-791 <https://doi.org/10.1016/j.bjoms.2020.10.020>
- [6] Lee WB, Choi WH, Lee HG, Choi NR, Hwang DS, Kim UK. Mandibular reconstruction with a ready-made type and a custom-made type titanium mesh after mandibular resection in patients with oral cancer. *Maxillofac Plast Reconstr Surg.* 2018. 25;40(1):35. <https://doi.org/10.1186/s40902-018-0175-z>
- [7] Sekhar MR, Patil BR, Krishnamurthy B, Rao CB, Gopalkrishna K. Soft tissue reconstruction after hemimandibulectomy in oral malignancies: a retrospective study. *J Maxillofac Oral Surg.* 2012. 11(1):72-7. <https://doi.org/10.1007/s12663-011-0272-3>
- [8] Huang MF, Alfi D, Alfi J, Huang AT. The Use of Patient-Specific Implants in Oral and Maxillofacial Surgery. *Oral Maxillofac Surg Clin North Am.* 2019. 31(4):593-600. <https://doi.org/10.1016/j.coms.2019.07.010>
- [9] Voss PJ, Steybe D, Fuessinger MA, Semper-Hogg W, Metzger M, Schmelzeisen R, Poxleitner P. Vascularized scapula and latissimus dorsi flap for CAD/CAM assisted reconstruction of mandibular defects including the mandibular condyle: technical report and clinical results. *BMC Surg.* 2019. 26;19(1):67. <https://doi.org/10.1186/s12893-019-0535-3>
- [10] Bredell M, Grätz K, Obwegeser J, Gujer AK. Management of the temporomandibular joint after ablative surgery. *Craniofac Trauma Reconstr.* 2014. 7(4):271-9. <https://doi.org/10.1055/s-0034-1378181>

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