Secondary reconstruction with a free fibula flap after invasive oral squamous cell carcinoma with continuity resection of the mandible

The Surgeons

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The Case

Patient Profile
A 65-year-old male presented with an intraoral wound suspected to be malignant. Histological analysis confirmed an extensive oral squamous cell carcinoma, necessitating comprehensive surgical intervention (Figure 1 a & b).

Figure 1: cT4a squamous cell carcinoma of the right mandible with bone invasion (1a) axial reconstruction a CT scan, (1b) pre-operative orthopantomography.

Clinical Findings / Preoperative Analysis

Following interdisciplinary tumor board discussions, the extent of the tumor required a continuity resection of the mandible along with bilateral neck dissection (Figure 2).

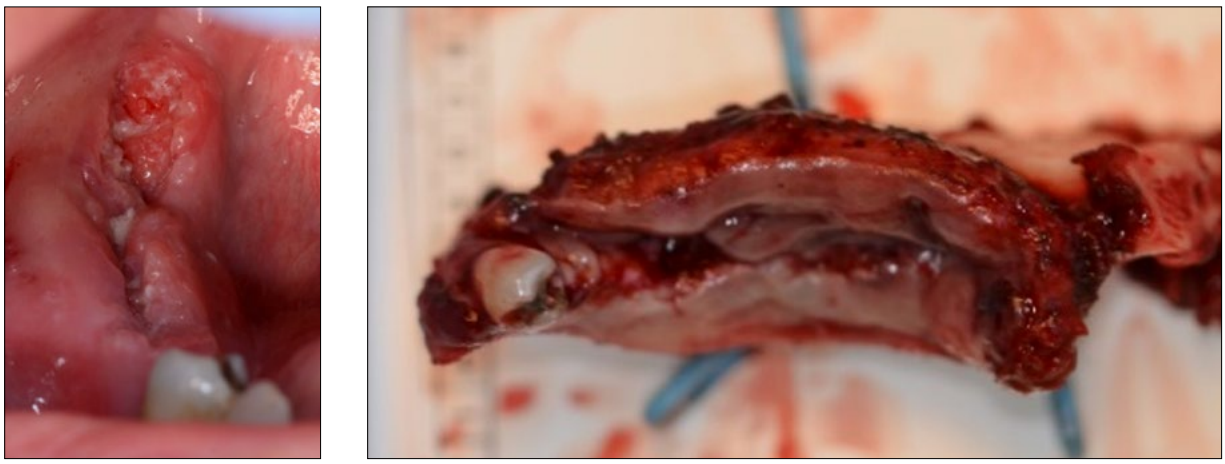

Figure 2: (2a) clinical appearance of oral squamous cell carcinoma of the right mandible and (2b) resection of the tumor and the mandible.

The patient was informed that immediate reconstruction with an osseocutaneous free fibula flap or a free flap from another donor site was deemed necessary. However, the patient declined osseous reconstruction. Given the tumor's size and anticipated postoperative radiation therapy, the focus shifted to ensuring stability. The defect was reconstructed using a alloplastic reconstruction plate (MODUS 2 Mandible, Medartis®, Basel, Switzerland) and a free ulnar forearm flap (Figure 3). Additionally, damaged teeth were removed before initiating irradiation therapy.

The final pathology revealed a tumor stage of pT4a, pN0, and R0, with resection margins exceeding 1 cm. After adjuvant radiotherapy with a dose of 64 Gy and no evidence of tumor recurrence, the patient expressed a desire for secondary osseous reconstruction.

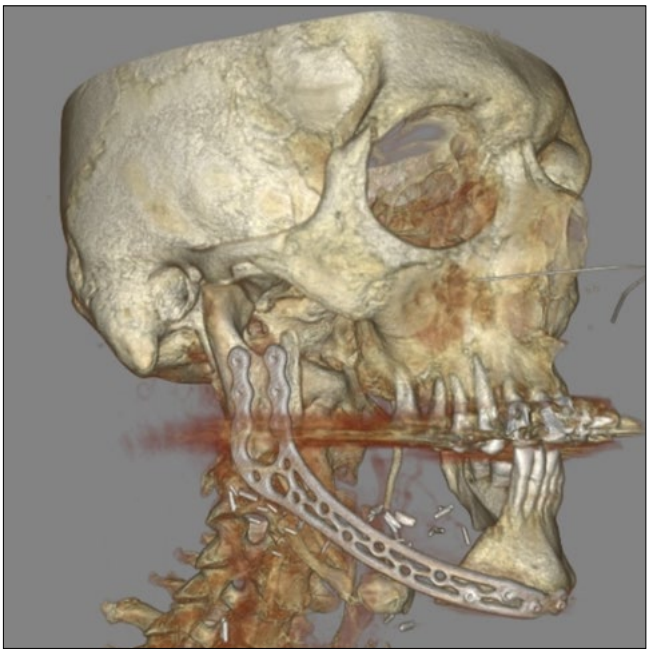

Figure 3: 3D-reconstruction of the postoperative CBCT

Surgical Treatment

Subsequent planning involved a microvascular free fibula flap (two segments) to restore mandibular stability. CT angiography confirmed adequate vascular supply in both lower limbs. Virtual surgical planning, including 3D-printed cutting guides for the mandible and fibula, was employed to optimize the procedure (Figure 4). Particular attention was given to enabling future dental implant placement and functional rehabilitation.

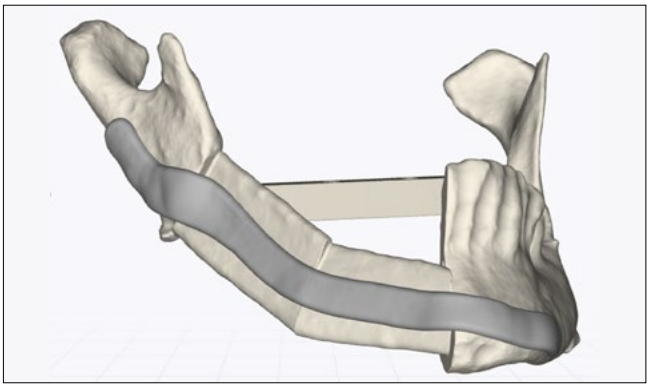

Figure 4: Virtual surgical planning of the reconstruction using a free fibula flap and an individualized reconstruction plate

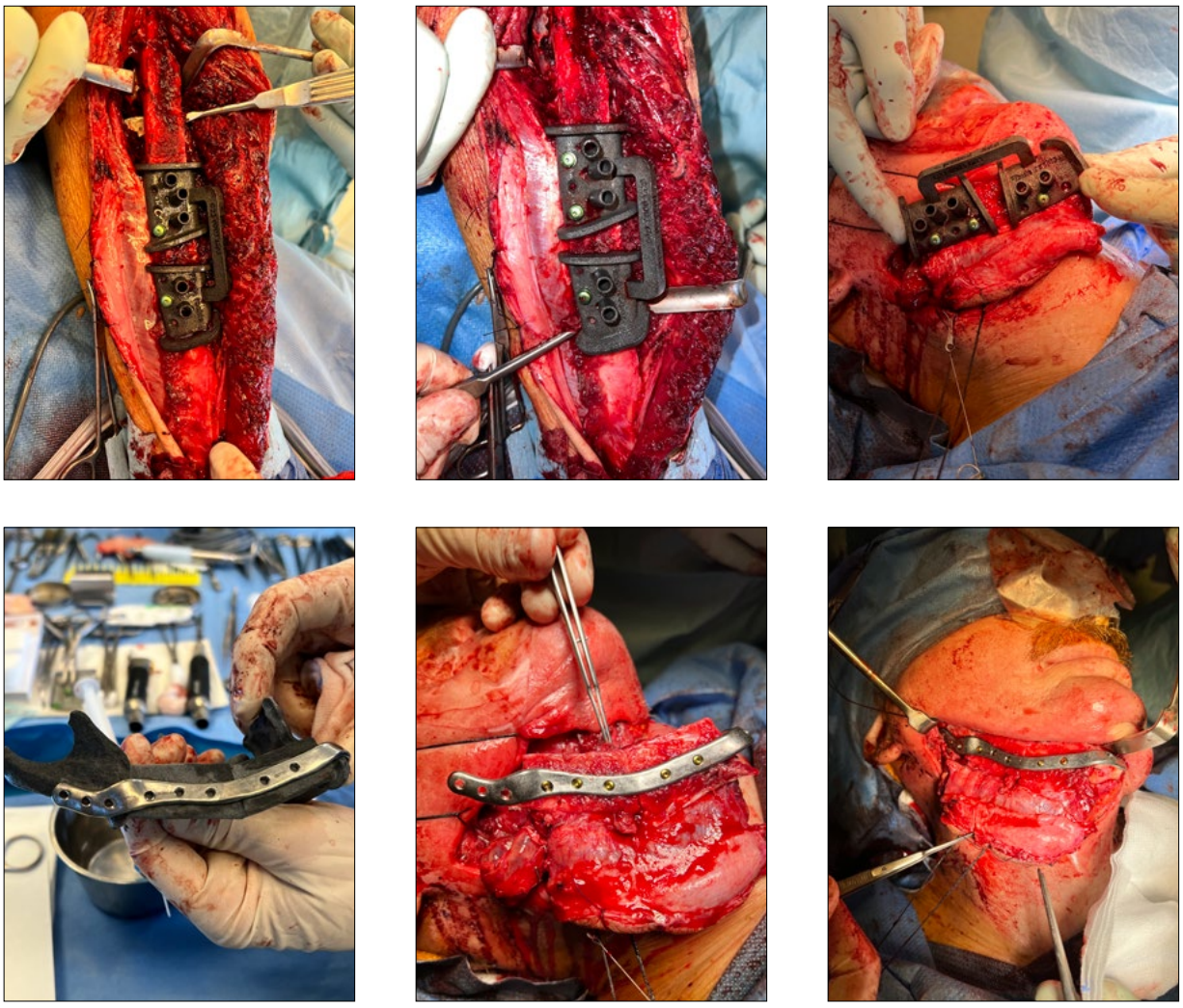

Figure 5: Reconstruction using a free fibula flap and an individualized reconstruction plate

Intraoperative Findings

During surgery, customized cutting guides facilitated precise mandibular resection, and the free fibula flap was harvested from the right lower leg. Osteosynthesis was completed using a pre-fabricated reconstruction plate. Vascular anastomoses were performed to establish circulation after attaching the fibula flap to the plate (Figure 6).

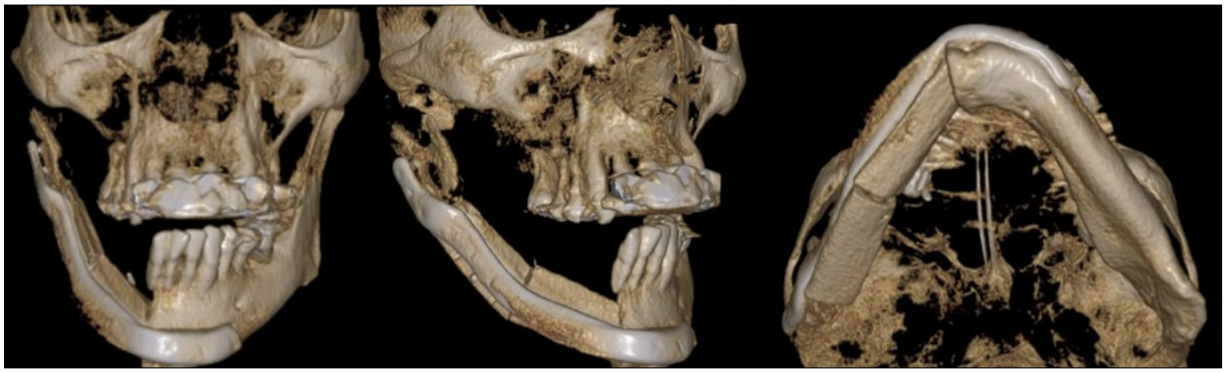

Figure 6: Right mandible reconstructed with a two-segment microvascular free fibula flap and a patient-specific reconstruction plate.

Postoperative Treatment

Eight months post-reconstruction, dental rehabilitation was achieved using five tissue-level implants to restore oral function. The prosthodontic restoration was carried out after another five months of healing (Figure 7).

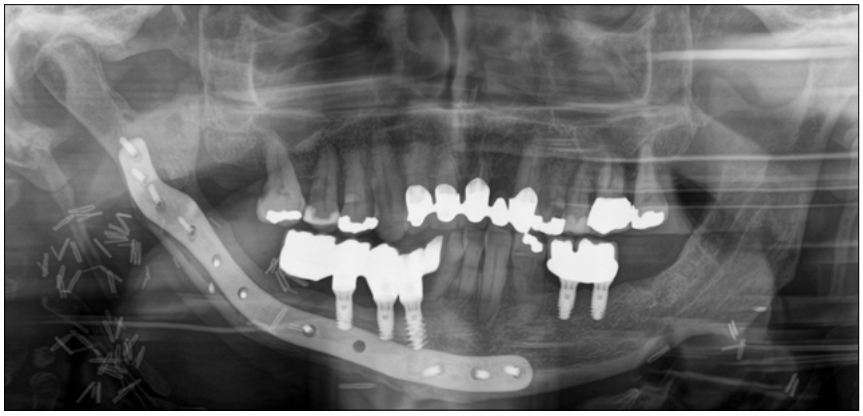

Figure 7: Dental Implants inserted into the free fibula flap.

Conclusion

This case highlights the importance of preoperative planning and multidisciplinary collaboration in managing complex mandibular defects. Integrating virtual surgical planning and customized reconstruction plates ensured precise execution, minimizing complications and optimizing functional outcomes. By delaying osseous reconstruction until after radiotherapy, we accommodated the patient's preferences while achieving long-term stability and successful dental rehabilitation. This approach underscores the value of patient-centered care and technological advancements in reconstructive surgery, offering valuable insights for similar clinical scenarios.

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