



## CASE REPORT

# Infrastructure Maxillectomy With Reconstruction Using Fibula Free Flap With Immediate Dental Implant Placement

## The Surgeons

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## Introduction

Squamous cell carcinoma is the most common malignancy affecting the maxilla. The preferred treatment is surgical, where the extent and approach depend on the localization and size of the tumor<sup>1</sup>. Nowadays, virtual preoperative planning with patient-specific surgical guides leads to shorter operation time, and improved clinical outcomes<sup>2</sup>. In addition, it allows to simultaneously plan additional steps, eliminating the need for secondary procedures, and facilitating earlier functional rehabilitation.

# The Case



## Patient Profile

A 54-year-old male presented with a progressively enlarging lesion involving the right maxilla, associated with pain, nasal obstruction, and intermittent epistaxis. Clinical and radiographic evaluation revealed an extensive lesion involving the right maxillary gingiva, alveolus, and maxillary sinus (Figure 1). Histopathological examination confirmed squamous cell carcinoma of the right maxilla, necessitating comprehensive oncologic resection and reconstruction.



Figure 1: Preoperative image, demonstrating the extensive lesion of the right gingiva.



## Preoperative Analysis/Clinical Findings/Assessment

Contrast-enhanced CT and MRI demonstrated a locally advanced tumor involving the right maxillary alveolus with extension into the maxillary sinus without orbital involvement. Following multidisciplinary tumor board discussion, the tumor was staged as cT4aN0M0, and surgical management with right infrastructure maxillectomy and immediate reconstruction was planned. Preoperative planning involved virtual surgical planning with three-dimensional reconstruction of the maxilla, design of patient-specific cutting guides, and fibula segmentation planning (Figure 2A and 2B). Particular attention was given to planning immediate dental implant placement to facilitate early prosthetic rehabilitation. CT angiography of the lower extremities confirmed adequate vascular supply for fibula flap harvest.

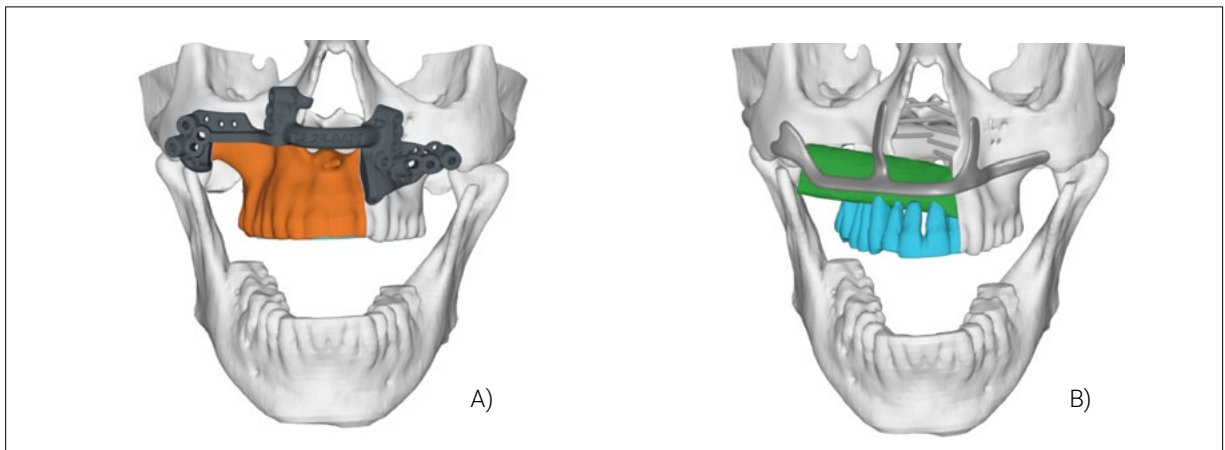


Figure 2: A) CMX design of the patient-specific cutting guides. B) CMX planning of the reconstruction using the fibula graft



### Surgical Treatment

Under general anesthesia, a right infrastructure maxillectomy was performed with oncologically safe margins. Simultaneously, a right osseocutaneous fibula free flap was harvested. The fibula was osteotomized to reconstruct the maxillary arch and restore alveolar height suitable for dental rehabilitation. Patient-specific cutting guides were utilized for both the maxilla and fibula to ensure precision ( Figure 3A and 3B).

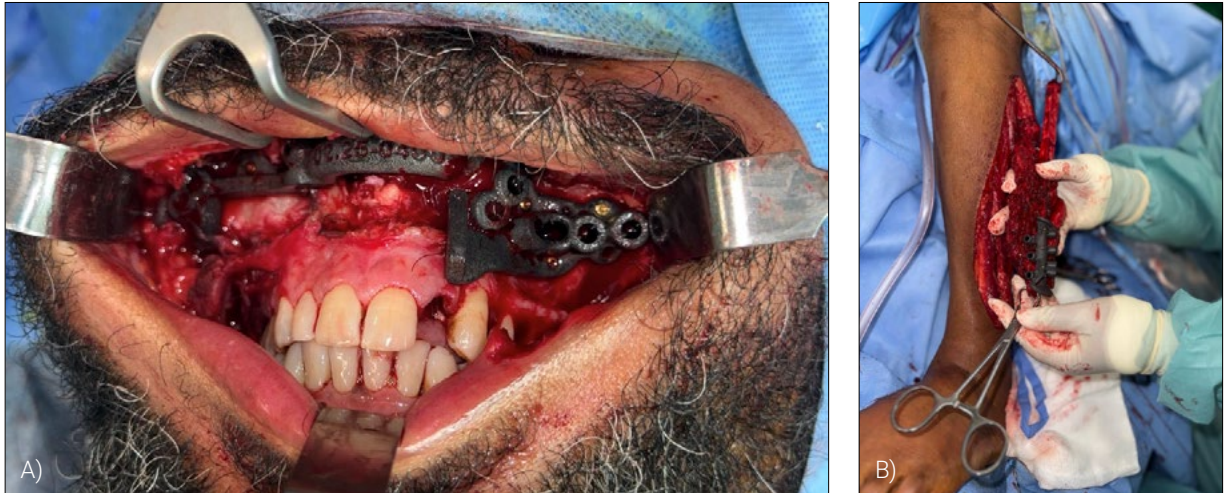


Figure 3: Placement of the patient-specific cutting guides on A) the maxilla and B) the fibula

The fibula segment was carefully contoured to recreate the alveolar ridge and midfacial projection and was secured using a patient-specific reconstruction plate (Figure 4A). Three endosseous dental implants were placed immediately into the fibula segment (Figure 4B). Microvascular anastomosis was performed to recipient vessels in the neck, achieving successful flap perfusion.

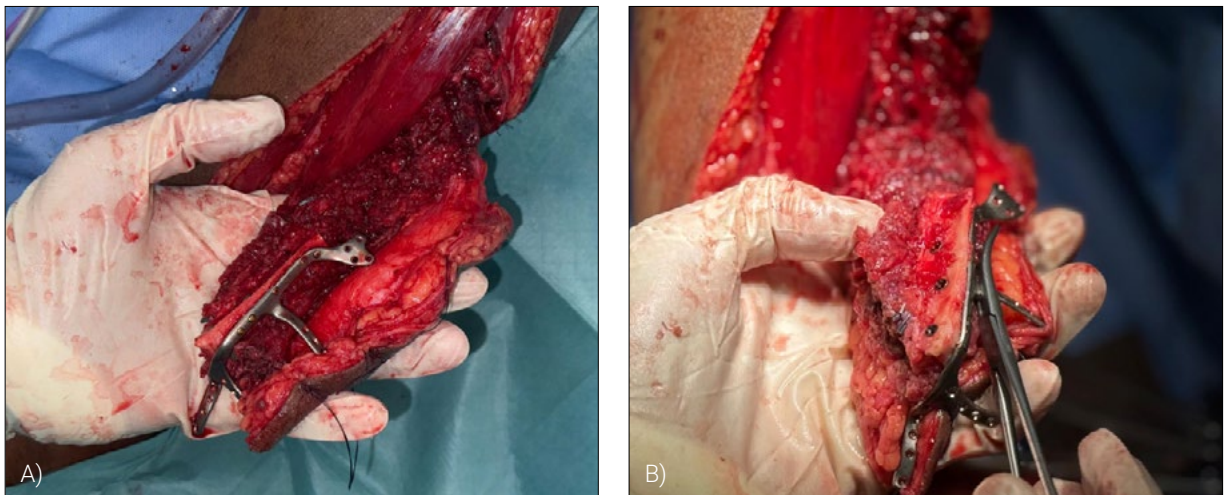


Figure 4: A) the contoured fibula segment secured with the reconstruction plate, B) Placement of the three endosseous dental implants



### Intraoperative Findings

Complete tumor resection was achieved with clear margins (R0 resection). The fibula free flap provided adequate bone length and vertical height for maxillary reconstruction, along with well-vascularized soft tissue suitable for intraoral lining. Immediate implant placement demonstrated good primary stability, allowing for future prosthetic rehabilitation.



## Postoperative Treatment

The postoperative course was uneventful, with successful flap survival, no vascular complications, and satisfactory intraoral healing. Postoperative CT imaging confirmed accurate positioning of the fibula segments in accordance with the preoperative plan (Figure 5A, 5B, and 5C). Final histopathology confirmed squamous cell carcinoma with negative margins (R0) and no nodal metastasis (pN0). Following adequate healing and completion of adjuvant therapy as indicated, prosthetic rehabilitation was carried out using the pre-placed dental implants. The patient achieved restoration of mastication, improved speech, and acceptable facial aesthetics.

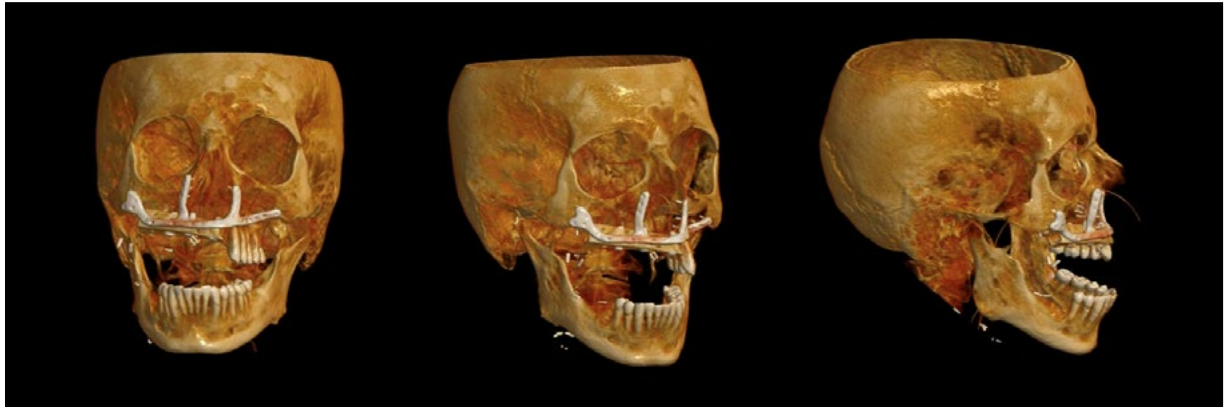


Figure 5: 3D reconstruction of the postoperative CT scans showing the position of the fibula segments

Reconstruction of maxillary defects remains complex due to the need to restore facial contour, oral-nasal separation, and dental function simultaneously. The fibula free flap is widely considered a reliable option due to its ability to provide adequate bone stock for implant placement, allow for multi-segment osteotomies, and offer dependable vascularity and soft tissue coverage. This case demonstrates the advantages of immediate reconstruction with simultaneous implant placement, which reduces overall treatment duration, eliminates the need for secondary implant procedures, and facilitates earlier functional rehabilitation. The integration of virtual surgical planning and guided reconstruction enhances surgical accuracy, predictability, and overall outcomes.



## Conclusion

Immediate reconstruction using a fibula free flap with simultaneous dental implant placement represents a reliable and effective approach for managing complex maxillary defects following oncologic resection. A multi-disciplinary approach combined with advanced digital planning enables precise tumor resection, functional and aesthetic reconstruction, and early dental rehabilitation. This technique represents a contemporary standard of care in selected head and neck oncologic cases.



## References

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