

# Virtual Surgical Planning in Complex Head & Neck Reconstruction

Su Mei Lilyanne Cheah<sup>1,2</sup>, Frank Reilly<sup>2</sup>, Dylan Murray<sup>2</sup>, Shirley Potter<sup>2</sup>, Fergal O'Duffy<sup>1,2</sup>

1. University College Dublin, Dublin 4

2. Mater Misericordiae University Hospital, Dublin 7  
University College Dublin, Dublin 4

This case demonstrates the use of virtual surgical planning in complex head and neck reconstruction.

## Method:

A 54 year old male patient with a T4N1M0 maxillary sinus squamous cell carcinoma was initially treated with radiotherapy. There was subsequent recurrence of the disease with erosion of the anterior wall of the maxillary sinus, and the orbital floor. Following MDT discussion, he underwent a maxillectomy and neck dissection involving a very large tumour ablation, causing an extensive defect, and requiring complex reconstruction of the bony and soft tissue using an osteocutaneous fibular flap. Due to the complex nature of the reconstructive procedure, preoperative virtual surgical planning was used. Preop-

erative fine slice computed tomography scans were taken of the skull and left lower limb, and in conjunction with an American based company "Healthcare 3D systems," were used to generate comprehensive 3D models. This allows for detailed visualisation of tumour constraints and simulation of the proposed tissue to be resected. The surgical team utilised the models to predetermine the sites of bony cuts, and patient-specific osteotomy guides of both the tumour ablation site and fibular donor site were produced based on CT-generated models and the pre-planned cuts. This cohesive pre-planned approach to tumour ablation and plastic reconstruction aids surgical planning at tumour and donor sites.

Increased precision of tumour ablation and harvesting of bone reduces excessive osteotomies and bone grafts. Furthermore, it also reduces operative time by allowing for the maxillectomy and fibular components of the surgery to occur simultaneously, as the exact dimensions of both the ablated tissue and necessary bone graft are known.

**Result:**

There was successful tumour ablation and reconstruction of the resultant extensive maxillectomy defect, with good functional and aesthetic outcome.

**Conclusion:**

Virtual surgical planning in complex head and neck reconstruction is cost effective, reduces operative time, length of hospital stay while improving the accuracy of osteotomies and bone grafts. Cumulatively, this allows for a better functional outcome for the patient.