

## Points

- 3DCT is useful in helping surgeons obtain a visual understanding of the pathology before surgery
- However with soft tissue tumors, this is difficult technically, since soft tissues cannot be seen well on 3D
- On PET, soft tissue tumors light up considerably and this helps generate 3D - PET/CT images, where the tumor, the bones and vessels, all three can be exquisitely

## 3D PET/CT

PET/CT is an excellent tool throughout the oncology gamut and is useful in

- Detection
- Staging
- Monitoring and evaluation of post-operative recurrence, pre-planning, etc.

In many parts of the body, especially the head and neck region, surgeons require visual support for planning surgery. This is usually done using various forms of imaging, especially CT scanning with reconstruction techniques, mostly in the form of images in multiple planes and 3DCT. However, 3DCT has always been hampered by the fact that it is difficult to obtain good 3D visualization of the soft tissue lesions and the bone together (Fig. 1).

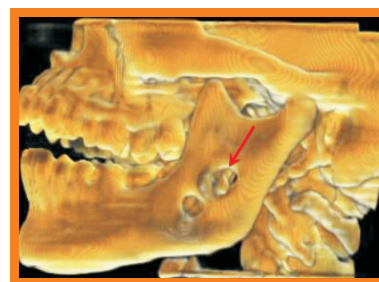


Fig. 1

Fig. 1: 3DCT of a patient with a mandibular ramus lesion. The 3DCT image shows osteolytic lesions, but the soft tissue pathology cannot be seen on the same image.

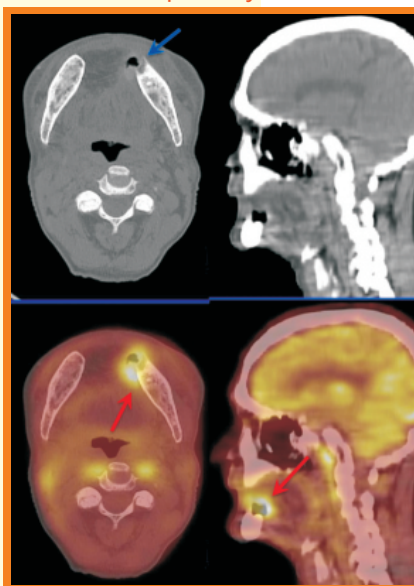


Fig. 2A



Fig. 2B

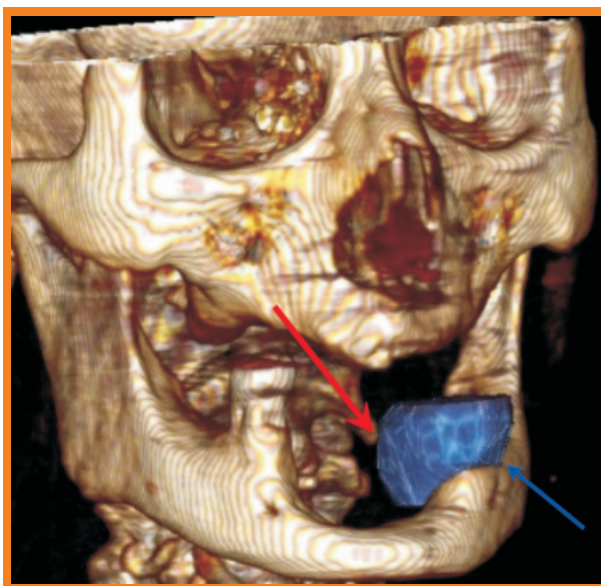


Fig. 2C

Fig. 2: Case 1 (A-C). Recurrent buccal carcinoma. This 36-year old man had a buccal carcinoma 2 years ago, for which he was operated with a rim resection of the mandible. He came back recently with a recurrent lesion, seen well on the standard PET and PET/CT images (A), the lesion (red arrows) eroding the mandible on the left (blue arrow). The 3D PET/CT images (B,C) were able to depict the tumor (red arrows) and the underlying mandibular involvement (blue arrows) in the same image. The yellow arrow shows evidence of rim resection.



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PET/CT

With PET, this problem is solved. On PET, the tumor usually picks up significant FDG; an active neoplasm will light up brightly and its margins can be easily separated from the normal adjacent tissues (Fig. 2A, 3A). Using advanced segmentation techniques, this soft tissue with increased uptake can then be superimposed on the bone, giving surgeons an unparalleled 3D visualization of the tumor, the vessels and the adjacent bony landmarks (Figs. 2B, 2C, 3B, 3C).

Both the cases illustrated below (Figs. 2, 3) show the usefulness of 3D PET/CT. Also, since the tumor margins depicted on PET correlate well with those seen on histopathology, the 3D images are actually quite accurate in their delineation of the soft tissue margins and the bony involvement.

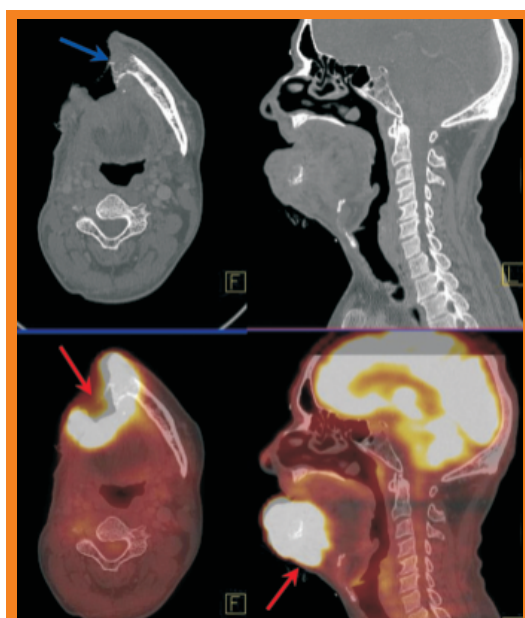


Fig. 3A

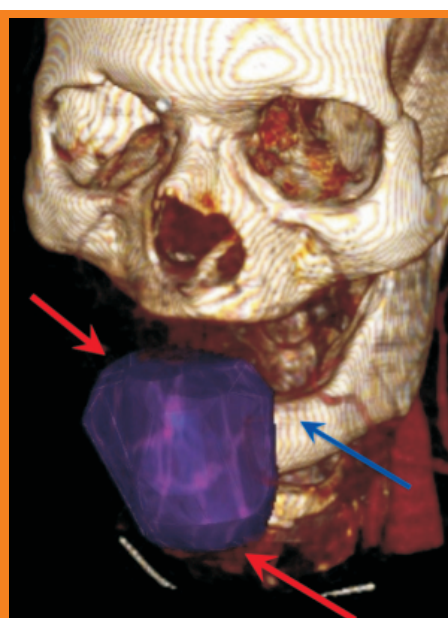


Fig. 3B

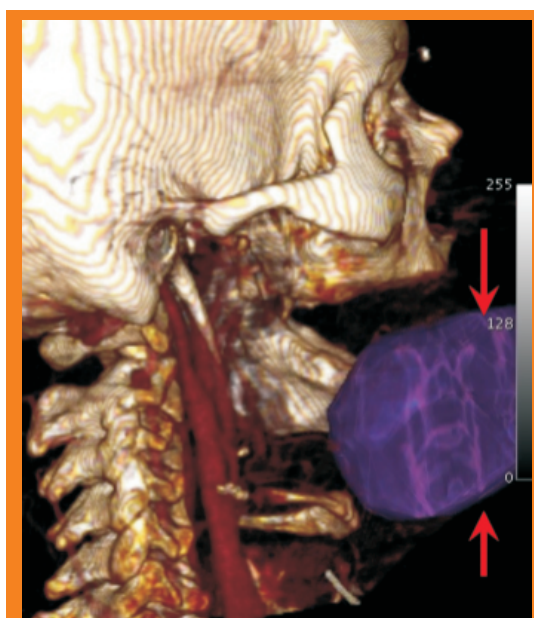


Fig. 3C

Fig. 3: Case 2 (A-C). Recurrent buccal carcinoma. This 43-year old man had been operated in the past for a large buccal carcinoma. He came back with a recurrent mass involving the floor of the mouth. Standard PET and PET/CT images (A) show the large mass (red arrows) and the mandibular involvement (blue arrows). The 3D PET/CT images (B,C) show the large, recurrent mass (red arrows) and the underlying bone involvement (blue arrow). Note the right hemimandibulectomy appreciated in C.

Designed by



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