

THIS HOUSE BELIEVES THAT THE USE OF FUNCTIONAL IMAGING FOR TREATMENT PLANNING OF HEAD AND NECK TUMORS NEEDS TO BE CAREFULLY CONSIDERED

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Biological image-guided radiotherapy aims at specifically irradiating biologically relevant sub-volumes within the tumor, as determined for instance by PET imaging. This approach requires that PET imaging be sensitive and specific enough to image various biological pathways of interest, e.g. tumor metabolism, proliferation and hypoxia. In this framework, the use of PET imaging for adaptive radiotherapy needs to be evaluated in term of accuracy and added value in comparison with standard procedures.

It first requires the optimization of the PET image quality during the acquisition and the reconstruction, to try to improve the spatial resolution, the level of noise and the contrast, that are typical features of PET imaging. Thereafter, it requires robust and validated tools for accurate segmentation of the regions of interest. The blur effect related to the poor spatial resolution of the camera and the high level of noise severely corrupt the images, and consequently interfere with the tumor segmentation. The use of “image restoration tools” for deblurring and denoising PET images before any segmentation represents an elegant way to improve image quality. Associated with a gradient-based segmentation technique, this approach has been shown to outperform the conventional threshold-based methods. However, even when using optimal procedures for image acquisition, reconstruction and segmentation, one has to keep in mind that there will always exist some discrepancies between the information from a PET image and the underlying microscopic reality. Such differences may be of critical importance when considering giving boost doses to small and highly active PET regions. This issue should be carefully looked at before applying on a clinical routine basis sub-volume segmentation with some form of dose-painting. Last outcome studies should be ideally performed as an ultimate endpoint to ascertain the clinical benefit of the use of functional imaging in routine practice.