Interim 18F-FDG Positron Emission Tomography/Computed Tomography during chemoradiotherapy in the management of cancer patients: A response

As outlined by Garibaldi *et al* in their recent letter (1), there is increasing interest in the use of Positron Emission Tomography – Computed Tomography (PET-CT) to demarcate the Biological Gross Tumour Volume (bGTV) for radical radiotherapy treatment. In head and neck cancers, 18F-Fluorodeoxyglucose (18F-FDG)-PET-CT defined volumes have been shown to correlate with pathological specimens better than other imaging modalities (2). Additionally, PET-CT carried out at baseline (3) and/or during treatment (4), may offer prognostic and/or predictive information (5, 6).

Adaptive radiotherapy (ART) - the alteration of a treatment plan based upon anatomical changes during radiotherapy - is a rapidly growing area. ART could improve normal tissue sparing (7) or, conversely, escalate radiotherapy doses to poorly responding tumours (8).

Garibaldi's critical review of the utility of interim PET-CT (iPET) in head and neck cancer treatment (9) concluded there was a need for further research into its predictive and/or prognostic role. They called for more homogenous cohorts of patients and treatment regimens, and a standardised method of analysing PET data.

The PEARL study (NCT number pending) is a multicentre phase II feasibility study designed to explore the potential of 18-FDG-PET-CT-based ART to reduce toxicity in radically treated patients with low risk (10) Human Papilloma Virus positive oropharyngeal squamous cell carcinoma. Patients will undergo iPET after 2 weeks of conventionally fractionated IMRT.

ATLAAS (Automatic decision-Tree Learning Algorithm for Advanced Segmentation of PET images), a machine learning tool, will define the bGTV on the baseline and interim PET-CT (11). We have shown that ATLAAS can be trained to outperform any other individual PET-based automated segmentation algorithm (12) and is a useful tool in the standardisation of PET-based segmentation within clinical radiotherapy trials.

PEARL will address many of the shortcomings identified by Garibaldi et al. Furthermore, PEARL will offer important insight into the feasibility of PET-based ART to improve outcomes.

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