PET/CT with low dose FDG provides good image quality and is a promising method for frequent monitoring of tumour response during CCRT, with reduced imaging dose and cost relative to standard PET/CT. A multidisciplinary approach in protocol development and image acquisition is essential to derive safe and efficient workflows.

OC-0563
MRI based 3D reconstruction of pharyngeal cancer to aid clinical oncologists in radiotherapy treatment planning
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Purpose/Objective: Magnetic resonance imaging (MRI) is increasingly becoming the preferred modality for radiotherapy treatment planning (RTP) of oropharynx and larynx cancer due to its excellent soft tissue contrast. Two dimensional (2D) outlines of these cancer regions from sequential axial MRI slices restrict the view of cancer regions with respect to other anatomical structures. Three dimensional (3D) volume reconstruction of cancer from contiguous MRI slices help oncologists to understand the complex structure of cancer with a greater degree of certainty. 3D views allow oncologists to understand the geometry, margin and specific morphological features of cancer regions from different angles. In this work we use a novel Level Set based method to automatically reconstruct 2D oropharynx and larynx cancer boundaries from real MRI slices, for 3D visualisation and subsequent quantification.

Materials and Methods: Axial gadolinium-enhanced T1-weighted (T1+Gd) MRI scans were obtained for 2 patients with pharyngeal cancer. Contours of cancer region from 12 contiguous MRI slices of oropharynx cancer and 7 contiguous MRI slices of larynx cancer were obtained, using our new automatic processing method, and then compared to the contours defined manually by clinical experts. Information from DICOM header, such as slice location, slice thickness and spacing in between slices, is used to reconstruct cancer in 3D. For this, each contour is sampled into uniformly spaced 100 points. These contours are stacked to produce the 3D dataset. Furthermore 2 additional contours are inserted in-between real contours using a conventional spline interpolation technique. 3D cancer region is reconstructed from these contours using rectangular mesh.

Results: The agreement between manual and automatic contours was estimated by the dice similarity coefficient (DSC). The DSC for all 19 slices is shown in Table1. It can be observed that most slices have value greater than 0.75, except the first or last slices where cancer region is small, hence the DSC value is small. The average DSC value for 2 patients is 0.82. Fig.1 shows the 3D view of oropharynx and larynx cancer regions. From Fig.1 it is clear that 3D reconstructed cancer region from automatic and manual contours are comparable. The average error between automatic volume and manual volume1 is 4.62% using manual volume1 as reference. This error is 9.52% between manual volume1 and manual volume2 using manual volume1 as reference. The tumor-cut technique developed in 2012 for 3D brain tumour segmentation from T1+Gd MRI demonstrates volume error of 5.7% for two best cases which is comparable with this automatic technique.

Conclusions: This reconstruction tool produces smooth, acceptable 3D surface for cancerous regions. The reconstructed surfaces provide oncologists with additional information not easily available from simple 2D MRI slices, about cancer regions. It is anticipated that this will lead to improved RTP.

OC-0564
Implementing a remote access database for clinical trials’ IGRT quality assurance in the United Kingdom
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