Purpose:

To quantitatively evaluate a lung tumour autocontouring algorithm using in-vivo lung cancer patient MR images with varying contrast to noise ratios (CNR) simulating images acquired at various MR field strengths.

Methods:

A non small cell lung cancer patient with posterior lung tumour is imaged (sagittal plane) in a 3T MRI using a dynamic bSSFP sequence (FOV: 40x40cm<sup>2</sup>, voxel size: 3.1x3.1x20mm<sup>3</sup>, TE = 1.1ms, TR = 2.2ms, 275ms per image) under free breathing for approximately 3 minutes (650 images). Gaussian random noise is added to the 3T images to approximately simulate the equivalent CNR in images acquired at 1.5T, 1.0T, 0.5T, 0.3T and 0.2T. The moving tumour in all 3T images is contoured by a physician for reference. The first 20 of these manual contours are used for the parameters optimization of auto-contouring algorithm. The automatic contours from the remaining images are quantitatively compared with the physician's contours using the centroid's displacement and the Dice's coefficient (DC).

Results:

The oncologist's contours of the 3T images show a maximum S-I motion of 26mm. Compared to the oncologist's contours, automatic contours have an average centroid displacement of 1.37mm, and an average DC of 0.881. The autocontouring algorithm's performance with images in the range of 1.5T to 0.5T equivalent CNRs is similar to that of the 3T data. However, for the lowest CNR datasets (0.2, 0.3T) an increase in centroid displacement and decrease in DC is observed, with mean displacements of 1.56mm, 1.71mm and DCs of 0.870, 0.836 for the 0.3T and 0.2T dataset, respectively.

Conclusions:

With in-vivo MR images, the autocontouring algorithm generated lung tumour contours similar to ones drawn by a physician (DC > 0.83). In this patient, additional CNR from >0.5 T MRIs does not provide statistically significant improvement in the accuracy of our autocontouring software.

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