Conclusion: Our proposed 3D automatic contouring method achieves an accuracy of \( >0.8 \) and sensitivity of \( >0.7 \), which is comparable to the performance of manual contours clinically. We are currently working on a fully automated setup (parameters selection) of the method which is learned from a set of 3700 manually contoured treatment scans.

**EP-1894**

Evaluation of a novel method for automatic segmentation of rectum on daily MVCT prostate images


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**Purpose or Objective:** Rectal toxicity is a major complication from radiotherapy (RT) for prostate cancer. The VoxTox project aims to link rectum dose to the observed toxicity for 500 prostate cancer patients who received intensity modulated RT on TomoTherapy with daily image guidance (IG).

Rectum dose is calculated using IG megavoltage CT (MVCT) scans. MVCT images have lower soft tissue contrast and signal-to-noise ratio than conventional CT. To date, there are no auto-segmentation methods for rectum delineation on MVCT. With 200,000 rectum contours required, an experienced oncologist would need over 2 years to complete the outlining.

To automate this task, we developed an in-house auto-contouring software to outline the rectum. Our software can complete the outlining in several days.

The aim of this work is to evaluate the quality of auto-generated contours and to provide a basis for further refinement of the algorithm. The method can be extended to evaluate other auto-segmentation tools.

**Material and Methods:** Rectum contours were produced using a Matlab code based on 2D Chan-Vese segmentation method. The contours were overlaid on the corresponding MVCT images centred at 87 Hounsfield Units (HU) and width of 220 HU.

7110 slices from 689 daily IG MVCT scans of 20 patients were inspected by a trained doctor.

A contour quality index was defined where 1 was ‘very poor’ and 5 was ‘very good’ (clinically acceptable).

Contouring errors were categorized as
1) too large;
2) too small;
3) cut air pocket (contour cut through gas pocket in rectal lumen);
4) missed air pocket (contour excluded gas pockets);
5) shift (contour is shifted with respect to actual organ location);
6) shape (sharp corners present in contour).

**Results:**

**Contour quality:**

70% of contours were scored as “very good” (Figure 1a), and 12% were “good”. 13% of contours were of “average” quality, and 4% were “poor” or “very poor”.

**Figure 1:** Auto-contoured (red line) and reference (yellow line) rectum. a) Clinically acceptable error-free contour, b) c) d) Error examples.}

**Error distribution:**

The most frequent error was under-contouring ("too small", 21% of all reviewed images), followed by "cut air pocket" (14%). We observed an even error distribution across scans and patients (Table 1).

**Conclusion:** Our auto-contouring method produces clinically usable contours for the majority of cases and offers a considerable time- and resource-saving potential. We identified six error categories, four of which can be automatically detected during the auto-outlining and will drive the re-contouring process. The presented method can be used to evaluate the performance of other auto-segmentation tools for cavitary organs.

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Towards adaptive radiotherapy: a new registration-segmentation framework for focal prostate cancer


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**Purpose or Objective:** Commercial treatment planning systems can combine pre-treatment magnetic resonance (MR) images with radiotherapy planning computed tomography (CT) images using rigid or non-rigid registration. However, these systems lack the ability to combine registration with automatic image analysis/segmentation methods that may be helpful in prostate cancer boost therapy when mapping of a