

Pre study for MRSLinac: interfractional anatomical and dosimetry changes based on CBCT images for rectal cancer.

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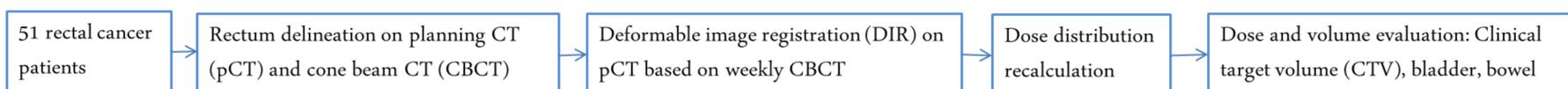
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Aim: Study anatomical changes and predict the dosimetric consequences for rectum cancer to evaluate the usefulness of magnetic resonance imaging (MRI) linear accelerator (Linac)

Methods:

Retrospective study



Results: Rectum delineation

- Rectal volume: decrease for 32 patients, stable for 4 patients, increase for 4 patients (figure 1)
- Bad quality CBCT images: 10 patients excluded
- Sum of all rectum: larger than CTV Tumor but smaller than PTV Tumor (figure 2)

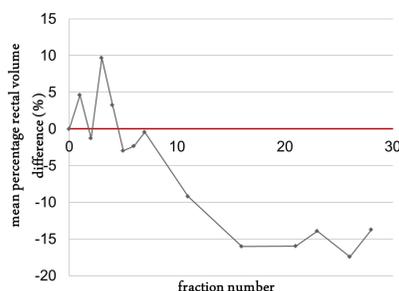


Figure 1: mean percentage rectal volume difference (%) during the treatment.

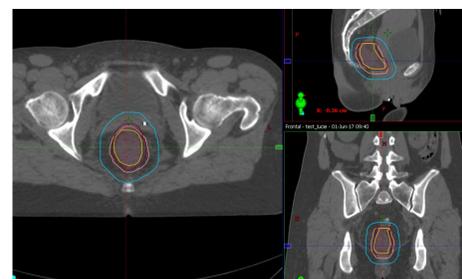


Figure 2: Axial, sagittal and coronal slice showing PTV tumor (blue), CTV Tumor (pink) rectum delineated on pCT (yellow) and total sum rectum created (brown) for one patient.

Results: DRR for CTV Tumor

- The CTV Tumor was well covered (figure 3).
- The median CTV Tumor volume decrease of 13% between the pCT and the last fraction of treatment (figure 4)

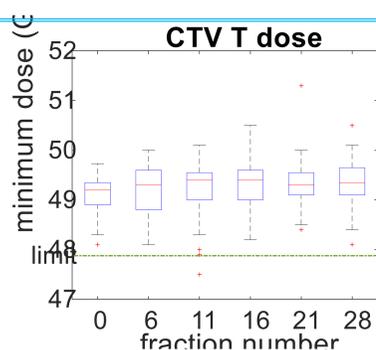


Figure 3: boxplot of the minimum dose received by CTV Tumor during the treatment.

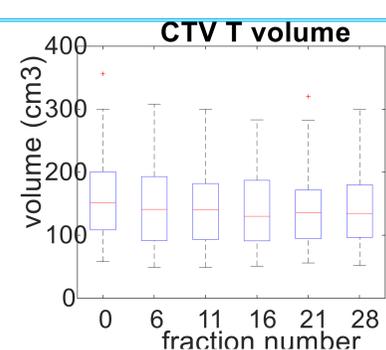


Figure 4: boxplot of the CTV Tumor volume during the treatment.

Results: DRR for bowel and bladder

- The median volume of bladder is smaller on all deformed CT compared to pCT (figure 5).
- The bladder volume receiving more than 35 Gy is stable.
- For 9 patients, more than 20% of the bladder volume received more than 50 Gy during the treatment (figure 6).
- The bowel dose and volume are stable during the treatment

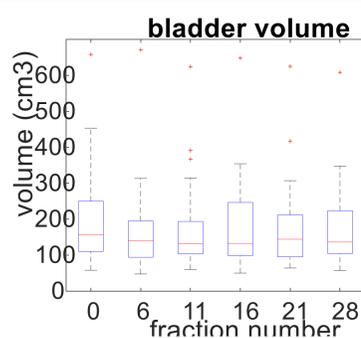


Figure 5: boxplot of the bladder volume during the treatment.

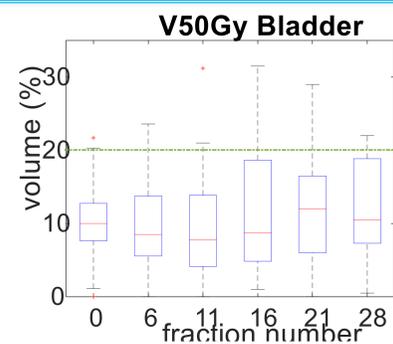


Figure 6: boxplot of the volume of bladder receiving more than 50Gy during the treatment.

Conclusion:

- DRR: works for bones and target. Difficulties with artefact on CBCT images, bowel gas and large bladder volume differences between pCT and CBCT.
- Except bladder, all structures received similar dose at all treatment fractions.
- 10 patients are excluded because of the poor quality image of CBCT (gas in the bowel, big patient).

→ We assumed that MRSLinac can be used to delineate the rectum and/or the tumor more precisely, making it possible to reduce the PTV margin.