Ph.D. Project Title: New planning concept for online adaptive and online monitored MR-linac radiotherapy

Student name: Isak Wahlstedt

Project Report

My Ph.D. project is about describing, evaluating and improving the planning dose distributions for online adaptive and online monitored MR-linac (MRL) radiotherapy. The aims are described as (i) to define and evaluate the geometric and temporal uncertainties in online MR-guided and online-adapted radiotherapy, and (ii) transform the found uncertainties into new planning approaches, and (iii) evaluate the dosimetric impact of the new planning approaches. Thus far we have focused on objective (iii) by conducting two dose accumulation studies which resulted in two accepted abstracts, one for MRinRT 2020 in Heidelberg and one for ASTRO 2020. The former presentation was cancelled due to the covid-19 pandemic while the latter was presented at the virtual ASTRO meeting (see the poster below). Since our first two studies were on dose accumulation using deformable image registration, we are now conducting a study on the inter-software reproducibility of such accumulations. This study will hopefully be published in 2021.

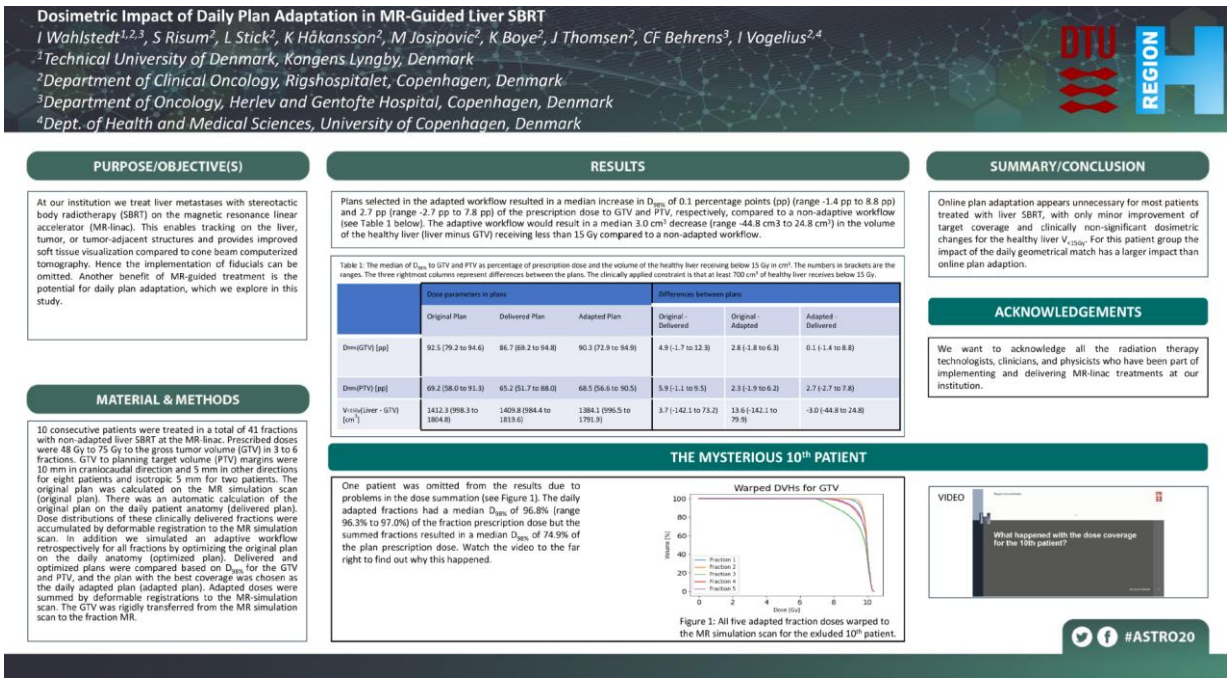
Publications

None

Poster Presentations

Heidelberg 2020: We got an abstract with the title "1 Year Experience with Liver SBRT on MR-linac: Planned vs. Delivered Dose" accepted for poster presentation. Unfortunately, this conference was postponed due to the covid-19 pandemic.

ASTRO 2020:



Talks

- I gave an oral presentation at the "2020 Øresund Workshop on Radiotherapy" titled "Individual planning dose distributions for online-adaptive treatments with internal MRI gating".
- I gave a flash talk at the yearly Ph.D. Symposium at Rigshopistalet titled "Dose Accumulation Reproducibility in an MR-linac Setting".

Project activities in 2021

- Estimate dose accumulation reproducibility for liver and lung patients treated at the MRLs at Herlev Hospital and Rigshospitalet.
- Setup 3D cine scans at the 3T MR scanner at Rigshospitalet for liver, lung and prostate patients treated at the MRL.
- Make 3D treatment cine by offline registrations of 3D MR scans and 2D treatment cines at the MRLs at Herlev Hospital and Rigshospitalet.