PO-0905
Preparation for the first in man on the MR-Linac: virtual couch shift and on line plan adaptation
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Purpose or Objective: The MR-Linac (MRL) combines a linear accelerator and a 1.5T MRI scanner, which provides the possibility for on line adaptation on the current anatomy. In the current workflow, compensation for discrepancies between pre-treatment and daily treatment geometry is performed using couch translations. On the MRL it is not possible to shift the couch in left-right and anterior-posterior direction. Instead a Virtual Couch Shift (VCS) is applied: the volume by moving the MLC aperture. After VCS, it is also possible to perform Segment Weight Optimization (SWO) and Segment Shape Optimization (SSO). The first in man on the MR-Linac will be a patient with vertebral metastases. The purpose of this study was to assess the accuracy and usability of VCS and possibly subsequent optimization for palliative treatment of patients with vertebral metastases.

Material and Methods: Three patients with repeated CT scans of the thoracic spine were included. A CTV of one thoracic vertebra was delineated, a PTV was created with an isotropic margin of 5 mm around the CTV. A clinical reference plan with a prescription dose of 800cGy (single fraction) was created in a research version of Monaco (Elekta)(figure 1). The second CT scan was used to mimic daily imaging at the MRL. The second CT was shifted in left-right and superior-inferior direction from -5 to 5 cm and in the anterior-posterior direction from -1 to 1 cm. VCS plans were created for each shift resulting in 60 plans. These were further optimised by SWO (60 plans) and by both, SWO and SSO (60 plans). To determine the accuracy of all 180 plans, the dose distributions and DVH’s were evaluated and compared with the reference plan. Plans were acceptable if V107<2cm³, the V99 decreased less than 2%, the V95 decreased less than 1% and the Dmean differed maximal 1% from the reference plan. Also time was evaluated to determine the usability in an online situation at the MRL.

Results: In total, 52% of the VCS plans were acceptable. Left-right shifts resulted mainly in an unacceptable V107. Superior-inferior shifts resulted mainly in lower coverage. With SWO, 63% of the plans were accepted, the unaccepted plans had a V107<2cm³. With SWO+SSO, 98% of the plans were accepted. The last 2% failed due to minimal hotspots in the PTV. The average calculation time to create a reference plan was 205 sec. The mean calculation time of a VCS plan, SWO plan and SWO+SSO plan was 125 sec, 9 sec and 507 sec, respectively.

Conclusion: VCS seems to work well for half of the cases, further optimization results in acceptable plans. The time to create VCS plans and SWO plans is compatible with an online setting. SWO+SSO results in stable plans. However, this takes long time in comparison with creating a new plan. To determine for what extent of shifts, acceptable plans can be created, more plans will be made. Then a trade of can be made when to create a VCS/SWO(+SSO) plan or start a new plan.

PO-0906
NTCP differences between planned and delivered dose in treatment for head and neck cancer
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Purpose or Objective: During the 7 weeks of radiation therapy, the anatomy of head and neck cancer patients changes, resulting in a difference between planned and delivered dose. Currently, the allocation of adaptive radiotherapy (ART) is often based on visual inspection on repeated imaging or dosimetric criteria and thus only implicitly on changes in treatment outcome. Normal Tissue Complication Probability (NTCP) is a metric that translates the treatment dose distribution to treatment outcome. The goal of this study was to assess the impact of anatomical changes over the course of radiation therapy and the consequential difference in NTCP.

Material and Methods: For 36 squamous cell head and neck cancer patients treated in a single tertiary cancer center, daily in room CT scans were made in treatment position using CT on rails. In post-treatment analysis, the original beam set up was used to calculate dose of the day. Additionally, the daily CT was deformably registered to the planning CT (pCT). These daily doses were propagated to the pCT and