



Contribution ID: 13

Type: Oral

Motion management and dose reconstruction for MRI guided cardiac radiosurgery

Thursday, November 21, 2019 10:30 AM (15 minutes)

Purpose: To evaluate the dosimetric effect of the residual breathing motion during gating for the first patient treated with MRI guided cardiac radiosurgery.

Methods: A patient with ventricular tachycardia was treated in one fraction with a dose of 25 Gy to the 85%-isodose line to the planning target volume (PTV). The target volume (TV) was defined according to the cardiologists interpretation of the electrophysiological mapping of the arrhythmic substrat and expanded by 2 mm axially and 3 mm craniocaudally to the PTV. The patient was treated with the MRIdian system (Viewray). A mix of instructed breath-hold and free-breathing was performed, while a structure close to the diaphragm was tracked for respiratory gating at end-of-exhale using sagittal 2D cine-MR with 4 fps. A gating window of 5 mm was defined and maximal 20% of the structure were allowed outside of the window for irradiation. The residual motion during gating was evaluated in the two directions (SI and AP) and a 2mm-binned position-probability map was generated. The dose to the patient was recalculated for each possible combination of SI- and AP-shift and summed with the weighting of the probability map.

Results: In total, 46 min of cine-MR were recorded for treatment and the target was within the gating window for 24 min. Thereof, 14 min were in breath-hold (≥ 10 s, 55 holds) and 10 min in free-breathing (< 10 s, 257 breaths). The mean 2D offset could be reduced from 6.8 mm to 3.7 mm with gating. The reconstructed dose distribution showed a TV Dmean of 27.6 Gy (planned: 27.8 Gy) and D95 of 26.3 Gy (planned: 27 Gy). Organs at risk did not show any increase in dose, except for the bronchial tree with a Dmean of 2.5 Gy (planned: 1.6 Gy).

Conclusion: MRI guided cardiac radiosurgery was successfully applied. With the motion tracking and gating, the patient could be treated with a good coverage of the target volume and minimal dose to organs at risk.

Primary author: EHRBAR, Stefanie (Radiation Oncology Department, Universitätsspital Zürich, Switzerland)

Co-authors: Dr TANADINI-LANG, Stephanie (Radiation Oncology Department, Universitätsspital Zürich, Switzerland); Mr MAYINGER, Michael (Radiation Oncology Department, Universitätsspital Zürich, Switzerland); Ms CHAMBERLAIN, Madalyne (Radiation Oncology Department, Universitätsspital Zürich, Switzerland); Prof. AN-DRATSCHKE, Nicolaus (Radiation Oncology Department, Universitätsspital Zürich, Switzerland)

Presenter: EHRBAR, Stefanie (Radiation Oncology Department, Universitätsspital Zürich, Switzerland)

Session Classification: Session I: Image Guidance - Chair: Prof. Philippe Cattin