



Contribution ID: 25

Type: Oral

Role of proton beam angle flexibility for combined proton-photon therapy of head and neck cancer

Friday, 28 October 2022 14:25 (10 minutes)

Aims: Optimally combined proton-photon therapy (CPPT) delivered with a fixed horizontal proton beamline (FHB) and a photon linac showed to be a promising option to increase access to proton therapy for head and neck (HN), breast and lung cancer (Fabiano 2020, Marc 2022, Amstutz 2022). Here, the investigation for HN cancer extends to explore the dependence of CPPT on the flexibility of proton beam angles and the impact of anatomical changes.

Methods: For a HN cancer patient with one planning CT and seven repeated CTs (repCTs) multiple treatment plans were optimized: a) IMRT (19 fields), b) IMPT-FHB (4 horizontal fields) c) IMPT-Gantry (3 gantry fields), d) IMPT-“arc”(19 gantry fields), e) CPPT-FHB (fields a&b), f) CPPT-Gantry (fields a&c), g) CPPT-“arc”(fields a&d). The CPPT gantry and “arc” plans are going beyond the motivation of increasing access to proton therapy and investigate the plan quality boundaries of CPPT. A non-adaptive (recalculations on repCTs) and an adaptive regime (replanning on repCTs) were investigated for each plan. Plans were evaluated visually, with DVHs, and with dose parameters. NTCPs for Xerostomia and Dysphagia of grade ≥ 2 were calculated for all plans (Langendijk 2021).

Results: Adaption showed to be necessary for all treatment plans to keep a high target coverage. The trend for the NTCPs are the same for both side effects. The CPPT improves plan quality compared to its IMPT counterparts, e.g. Xerostomia: FHB (24.6% vs. 30.3%), gantry (23.7% vs. 24.4%) and “Arc”(22.5% vs. 23.3%), and compared to IMRT (27.1%). Additionally, plan quality increases with more flexible proton beam angles. In parallel, the proton component increases, with the contribution from protons to the mean PTV dose being: FHB 77%, gantry 87%, “arc”99%.

Conclusion: Extending proton beam angles flexibility increases plan quality for CPPT. Meanwhile, the proton component of CPPT gets more dominant. However, the photon component can still increase the quality for each level of beam angle flexibility. Further investigations are needed to find the optimum between flexibility (costs) and plan quality.

Primary author: Mr AMSTUTZ, Florian (Paul Scherrer Institut)

Co-authors: KRCEK, Reinhardt; BACHTIARY, Barbara (Dr. med.); WEBER, Damien Charles (PSI); LOMAX, Antony John (PSI); Prof. UNKELBACH, Jan (University Hospital Zurich); ZHANG, Ye (PSI - Paul Scherrer Institut)

Presenter: Mr AMSTUTZ, Florian (Paul Scherrer Institut)

Session Classification: Session IV: Radioprotection, Treatment Techniques

Track Classification: Radiation Therapy