Contribution ID: **35**   Type: **Oral**

Dose guidance in daily adaptive proton therapy: Predicting the cumulative treatment dose

Thursday, 27 October 2022 13:45 (10 minutes)

Purpose: The prescribed treatment dose, routinely calculated on the planning CT and approved by the radio-oncologist, is assumed as the dose applied for the whole treatment (ApprovedTD). However, in online daily adaptive proton therapy (DAPT), the plan is optimized on the daily CT to correct for anatomical daily changes, while the patient is lying on the treatment table. Intrinsically, both the daily delivered dose and the total delivered treatment dose (DeliveredTD) can be more accurately estimated via dose accumulation. Before the end of the treatment series however, and to facilitate fraction-specific adjustments and day-to-day decisions, it can be advantageous to predict the DeliveredTD at the end of therapy dose as the treatment is progressing. In this study, two different approaches for predicting the total delivered treatment dose (PredictedTD) as part of a DAPT workflow are being presented.

Methods: For both models and every fraction, each daily adapted plan is accumulated on the planning CT for the already delivered fractions. The doses for the prospective fractions are then filled in in two ways. With either the initial reference plan optimised on the planning CT multiplied by the remaining fractions, or with the last daily delivered plan multiplied by the remaining fractions. Consecutively, the resulting PredictedTP is calculated for every fraction and compared with both the DeliveredTD and the ApprovedTP. All the aforementioned calculations are performed for 2 cases with 18 daily CTs each in our house-developed treatment planning system.

Results: For both cases, differences between the PredictedTP and the DeliveredTP are smaller than 0.5GyRBE for more than 87% and of 93% of organ-at-risk and target voxels respectively.

Conclusion: Early findings suggest that with both models it is indeed possible to accurately predict the delivered treatment dose. This creates new possibilities during DAPT to make informed daily decisions based on the delivered cumulative treatment dose.

Primary authors: CHOULILITSA, Evangelia (PSI - Paul Scherrer Institut); Dr WEBER, Damien Charles (Center for Proton Therapy, Paul Scherrer Institute, Switzerland, Department of Radiation Oncology, University Hospital Zurich, Switzerland, 4 Department of Radiation Oncology, University Hospital Bern, Switzerland); LOMAX, Antony John (PSI - Paul Scherrer Institut); ALBERTINI, Francesca (PSI - Paul Scherrer Institut)

Presenter: CHOULILITSA, Evangelia (PSI - Paul Scherrer Institut)

Session Classification: Session II: Radiobiology, Radiomics, Adaptive RT

Track Classification: Radiation Therapy