AbstractID: 10686 Title: Effects of Respiration on Proton Dose Distributions and DVHs in Pancreatic Cancer as Assessed by 4D Treatment Planning

Purpose: To study the effects of respiratory motion on dose distributions and DVHs in patients with pancreatic cancer treated by proton beam therapy. **Methods and Materials:** A 4D CT scan was acquired on 10 patients studied; target and 11 organs-at-risk structures were contoured on the T30 phase scan. Contours were propagated to other respiratory phases using B-spline deformable registration. A compensating bolus was designed to cover the CTV for both gated and ungated treatment. Field arrangements included laterals and a posterior field. Dose distributions were calculated for each respiratory phase and then mapped to a single anatomical reference phase. A time weighted DVH was calculated for the VOIs. **Results:** Impact of motion on dosimetry was evaluated by two approaches. Data browsing of the 4D dose distribution movies showed robustness to motion in target coverage. During breathing, ripples in the high dose gradient are small (~few mm). In the organ's eye view reference frame, isodose lines move and the principal observation is that lower isodose lines expand into the liver during inhalation by as much as 1-2cm, resulting in higher DVHs at the 25% dose level. The dynamic range of volume irradiated during respiration can be 15% for >10mm COM motion of the liver. The time weighted DVH of the liver is ~6% greater than the T50 liver DVH. **Conclusion:** 4D dose distributions show that proton beam coverage of the target can be robust during light breathing. DVHs of the liver are increased typically by ~5% at lower isodose values when ungated treatment is delivered, and can be improved through gating. 4D treatment planning can be completed in ~2 hours, making it feasible to analyze the effects of motion routinely.