

AbstractID: 2879 Title: Impact of Inter-Fractional Motion of the Anatomy on Prostate Proton Dose

**Purpose:** The purpose of this study is to determine whether the inter-fractional motion of the anatomy has a more significant impact on proton dose distributions compared to IMRT dose distributions. A secondary objective is to evaluate the impact of CTV-to-PTV margins on plans for protons produced with the double scattering technique.

**Method and materials:** Repeat CT scans of prostate patients acquired with a CT-on-Rails were used for this study. First, proton and IMRT plans were designed using (1) the CTV-to-PTV margin standard at our institution (normally 8 mm except at the rectum-prostate interface, where it is 5.8 mm) and (2) a small uniform margin (3mm). The proton and IMRT plans were then applied to 8 daily CT images aligned either to skin marks or the center of prostate. The doses for the 8 daily CT images were recalculated using the same beam configurations (aperture, compensators, gantry angles, Monitor Units etc).

**Results:** For proton plans, a 3mm margin appears to be adequate for tumor coverage even when a conventional skin mark alignment technique is used. The proton plans with 3mm margins lead to nearly the same coverage as in the IMRT plans with standard margins. For prostate center of volume-based alignment, this coverage was 98.6% for protons vs. % 98.1 for IMRT and 96.6% vs. 96.3% for skin marks-based alignment.

**Conclusions:** With the double scattering technique, the dose distribution from the proton plan is not very sensitive to the daily variation of the patient anatomy as compared to IMRT plans. The 3 mm CTV-to-PTV margin is acceptable for proton plans but not for IMRT plans for both alignment methods. The preliminary data show that the CTV-to-PTV margin can be reduced to 3mm if we use daily image guided set-up.