

## AbstractID: 6923 Title: Evaluation and Comparison of Inter-fractional Femoral Head Variations for Two Pelvic Immobilization Devices

**Purpose:** To compare and evaluate the inter-fractional femoral head (FH) translation and rotation of prostate cancer patients receiving conventional lateral proton radiotherapy using two commercially available pelvic immobilization devices, the Vac-Lok™ and Dual Leg Positioner (Civco Medical Solutions).

**Methods and Materials:** This study enrolled two groups of ten patients to investigate inter-fractional FH variations. Each patient received serial in-room CT scans during his or her routine radiotherapy treatment. The FH and upper femurs were contoured on each set and exported to in-house CT registration software. Daily translation and rotation of the FH were assessed with a rigid registration of the FH from the reference CT to the daily CT, followed by a rotational registration of the upper femur.

**Results:** The average daily translational variation of the FH relative to external skin fiducials was almost identical between both groups along all three directions (AP: 0.24 cm vs. 0.20 cm, SI: 0.11 cm vs. 0.11 cm, RL: 0.26 cm vs. 0.29 cm, Vac-Lok and Dual Leg Positioner group respectively). The dominant rotation was found in the axial plane. The average daily rotational variation was 1.94 degrees for the Vac-Lok group and 2.04 degrees for the Dual Leg Positioner group. The standard deviation of patients' systematic FH rotation was 3.13 degrees for the Vac-Lok group and 3.05 degrees for the Dual Leg Positioner group.

**Conclusion:** Both pelvic immobilization devices appeared to give identical FH immobilization. A 2-degree (1SD) random FH rotation may not have significant dosimetry impact to proton therapy; however, a larger than expected 3-degree systematic rotation (1SD) may be a concern. Additional effort should be made to reduce the uncertainty at the initial treatment simulation. When considering the convenience of use, the Dual Leg Positioner system is ideal because it does not require additional storage space for patient-specific immobilization devices.