Purpose: TBI treatment delivery MU and patient dose estimation are calculated manually at our institution. This study was to verify the accuracy of MU calculation and dose estimation of bilateral TBI by application of tissue heterogeneity correction.

Methods: Twelve TBI patients were simulated from neck to thigh in bilateral TBI position. CT images were imported into the treatment planning system (Philips, Pinnacle3). Treatment dose was prescribed to the midpoint at the level of the umbilicus. Treatment distance was 519 cm. Both 6MV and 23 MV opposite lateral beams delivered 200 cGy to the dose prescription point with a 40 x40 cm2 field size and 45o collimator angle. A 1 cm thick spoiler was placed about 15 cm from patient skin. Adaptive convolution superposition with and without heterogeneity correction was used for calculation of MUs and doses at the midpoints of the shoulder, chest, abdomen, and pelvis.

Results: Monitor units calculated with heterogeneity correction were 1.1% and 0.9% smaller on average than those without heterogeneity correction for 6MV and 23MV beams respectively. The maximum deviations of MU were 3.8% and 2.8% smaller. Average percentage differences of point doses with and without heterogeneity corrections were -0.2%, 17.0%, -0.3%, and -2.7% at the levels of shoulder, chest, abdomen, and pelvis for 6MV beam and 0.4%, 11.0%, 0.2%, and -1.7% for 23MV beam. Discrepancy of doses to the points at the shoulder level varied from -6.8% to 8.9% for 6MV beam and from -1.6% to 5.1% for 23MV beam.

Conclusions: Bilateral TBI MU calculation errors caused by ignoring tissue inhomogeneity would be less than 4% and 3% for 6MV and 23 MV beam. Dose estimation is less accurate using 6MV beam and the inaccuracy could be more than 8% for shoulder midpoint and 4% for pelvis midpoint.