Purpose:Recent studies have demonstrated that per-beam, planar IMRT QA passing rates do not predict clinically relevant patient dose errors. This work is to evaluate the effect of dose variation induced by dynamic MLC at different gantry angles on clinically relevant metrics for IMRT delivery.

Methods:Ten head and neck IMRT plans were randomly selected for this study. The conventional per-beam IMRT QA using MapCHECK in an Isocentric Mount Fixture (IMF) was performed for each plan by 2 different methods: (1) with gantry angle of 0 (gantry pointing downward) for all IMRT fields, (2) with gantry at specific angles as designed in the IMRT plan. For each patient, a batch analysis was done for each scenario and then imported to the 3DVH (Sun Nuclear Corp.) for processing. A "true DVH" was generated and compared to the DVH from the treatment plan. Their differences represented errors induced from the combination of treatment planning system (TPS) dose calculation algorithm and beam-delivery. The dose metrics from the two scenarios were compared with the corresponding calculated doses from TPS, and then their differences were analyzed.

Results:Although all per-beam planar IMRT QA had high Gamma passing rates (92-100%) for "2%/3mm" criteria, there were significant errors in some of the calculated clinical dose metrics. For example, there were 5.5%,5.9%,7.6%,5.1%,9.8%,7.1%,6.9% in max cord dose, max brainstem dose, mean parotid dose, mean larynx dose, max retina dose, max chiasm dose, and mean PTV dose, respectively. The differences in errors for clinical metrics obtained between the two scenarios can also be significant: max cord dose (5.1% vs. 2.8%), Larynx mean dose (4.6% vs. 0.2%), mean parotid dose (7.4% vs. 2.9%), and PTV mean dose (4.8% vs. 3.1%).

Conclusions:Per-beam IMRT QA should be conducted at gantry angles as designed for the patient treatment in order to obtain true clinical dose metrics.