AbstractID: 11603 Title: The use of general anesthesia and suspended ventilation to halt respiratory motion during single-fraction cone beam based radiotherapy of a liver metastasis.

Purpose: To determine the accuracy, with which a liver tumor can be positioned for single-fraction radiotherapy by using general anesthesia, controlled ventilation and apneic oxygenation.

Methods and materials: The first patient accrued to an IRB-approved protocol received 24 Gy in a single fraction while under general anesthesia to eliminate respiratory motion. Respiratory motion was halted at the point of maximum expiration for each imaging procedure and each beam delivery. Initial target localization was done using an IV-contrast enhanced cone-beam scan. The actual couch correction was based on 3D registration of fiducial markers implanted near the tumor. For each beam: ventilation was suspended, the tumor position checked and if necessary corrected, the IMRT beam delivered with a sliding window technique , then ventilation re-commenced. The tolerance for marker positioning was 3 mm. For 6 of the 12 beams, the marker positions were checked radiographically. For every beam delivery, a check that ventilation had been suspended at maximum expiration was done using stereoscopic infra-red tracking of a reflector placed on the patient's stomach.

Results: After the initial cone-beam guided correction, the implanted fiducial markers were within 3 mm of the design position in 5 of the 6 radiographic checks. A slow drift in the superior direction of 3 mm was observed over the first 27 minutes of treatment. At the 4^{th} check, the couch position was corrected, the target reimaged, and beam delivered all within 280 seconds of suspended ventilation.

Conclusions: The use of suspended ventilation, cone-beam and radiographic imaging makes possible the delivery and verification of radiation to liver tumors with unprecedented accuracy.