AbstractID: 11505 Title: Target and Peripheral Dose during Patient Repositioning with the Gamma Knife APS Device

Purpose: Measure unaccounted dose delivered to the target site and its periphery from the defocused and transit beam during automatic positioning system (APS) repositioning for Gamma Knife Radiosurgery. **Methods and Materials:** A stereotactic head-frame was attached to a 16cm diameter spherical phantom with a calibrated ion-chamber at its center. Using a fiducial-box to determine the coordinates of the target, a CT scan with 1mm slice thickness was taken of the phantom and registered in the GammaPlan TPS. 10Gy to the 50% isodose line was prescribed to the target site for all measurements. Plans were generated for the 18mm, 14mm and 8mm helmets with varying number repositions for each plan to determine the relationship of measured dose with number of repositions of the APS system and helmet size. The shot isocenter was identical in the entire study and there was no movement of APS between various shots; this allows for measurement of transit dose (couch moves from the focus to defocused position and back) and the least defocused dose (at defocused couch position). The couch was suspended in the defocused position allowing intracranial defocused dose measurements. **Results:** Dose increases with frequency of repositioning and collimator size. Overdose of up to 5.713±0.066% at target position can result from couch transfer. Dose rate of 8.807±0.411cGy/min (18mm helmet) and 5.891±0.509cGy/min (8mm helmet) where measured. During couch transit, the target receives more dose than peripheral regions; in the defocused position, the greatest dose is superior on the phantom where dose rate is 4.910±0.005cGy/min. **Conclusion:** APS repositioning results in additional dose to the target site and its periphery for multi-shot runs. Doses in superior regions should be monitored due to epilation. Consideration of conformity index is suggested, especially around critical structures (e.g. optic nerve), when generating a treatment plan as risk of toxicity is a concern.