# AbstractID: 5777 Title: Impact of Linac Isocenter Shifts on Stereotactic Radiosurgery Dose

**Introduction:** Of the various sources of error in Stereotactic radiosurgery, linac isocenter shift can be the largest. We present a method of quantifying this error using Winston Lutz (WL) QA films and evaluate its impact on patient dose.

**Methods and Materials:** WL films (5mm ball and 10mm cone) were acquired for 16 gantry and couch angles for a NOVALIS linac. Films were scanned at high-resolution (89 μm) and analyzed using RIT software to determine differences between ball and radiation field centroids. An algorithm was developed to transform these to patient reference frame and map out shifts between target and linac isocenter for all allowed gantry and table angles. For this study, a patient with trigeminal neuralgia (70Gy with 6 arcs and 4mm cone) was considered. The impact on delivered dose was evaluated by weighting each treatment arc with its appropriate isocenter shift. Also for comparison, the treatment plan was recalculated using the maximum shift observed in film data.

**Results:** Minimum target dose (Dmin) in the original patient plan was 54.6Gy and target D95 was 61.6Gy. When maximum shift was used to modify treatment plan, DVH data erroneously showed 30% target underdosage: Dmin = 38.5Gy; D95 = 44.2Gy. However, for the "weighted-arc" plan, Dmin = 53.9Gy and D95 = 61Gy were within 1% of the original plan. Therefore, in evaluating dose delivered to the patient, it is important to consider the impact of isocenter shift on each treatment arc for highly accurate treatments. In appropriate cases, this method can also be used to compensate for gantry-table combinations that may fall outside the acceptable limits (> 1 mm).

**Conclusions:** We have presented a method that allows quantitative evaluation of dose errors that result due to shifts in linac isocenter as a function of gantry and table angles.