

## AbstractID: 6822 Title: Study of the Long Term Stability of the Radiation Isocenter of the Cone-Based SRS System on Varian's Trilogy Linac

**Purpose:** The accuracy of the SRS radiation isocenter is of critical importance since it directly affects the dose distribution in patients undergoing SRS procedures. The cone-based SRS system on Varian's Trilogy® linac consists of a gantry mount and a set of 13 cones with sizes varying from 5mm-35mm. The system has a rotational isocenter accuracy of better than 0.5mm according to manufacturer's specification. To evaluate the long term stability of the SRS radiation isocenter, we analyzed its off-set based on the data collected since January 2006.

**Method and Materials:** Before each SRS procedure, the radiation isocenter of the SRS system is checked from different gantry angles to make sure it is within specification. A small steel ball is positioned accurately at the ideal isocenter and a 12mm cone is mounted onto the gantry. Gafchromic® films are then exposed at five angles (240°, 270°, 0°, 90°, and 120°) along the most commonly used arcs in our treatment plan. A template of isocentered circles and an Edmund Optics® magnifier are then used to measure the off-set of circular radiation field from the center of the steel ball. This method can provide an accuracy of 0.1mm and a total of 23 measurements are analyzed in this study.

**Results:** During the period of more than one year, the average off-sets of the isocenter at the 5 angles are  $0.31 \pm 0.09$ mm (240°),  $0.27 \pm 0.06$ mm (270°),  $0.48 \pm 0.08$ mm (0°),  $0.21 \pm 0.07$ mm (90°), and  $0.33 \pm 0.09$ mm (120°). We observed that they all fall within the 0.5mm specification of the system. We further observed that the offset at 0 gantry angle (AP) is the largest among the five due to mechanical tilt of the gantry head.

**Conclusion:** The radiation isocenter of Varian Trilogy® cone-based SRS system is very stable and can provide sub-millimeter accuracy required for the SRS procedures in the long term.