

**Purpose:**

To develop a patient-specific quality assurance protocol for RapidArc™ radiotherapy.

**Method and Materials:**

Following the commissioning of RapidArc™ treatment delivery, we tested several methods of patient-specific quality assurance (QA). Ion chamber and film measurements were used as the “gold standard”. One ion chamber measurement was taken in a region of low-dose gradient. Four film measurements were taken in three planes: axial, sagittal, coronal, and a coronal180° (testing setup uncertainty). Measurements were also taken using the Matrixx® device (IBA Dosimetry, Bartlett, TN) in two orientations, sagittal and coronal. The Matrixx® consists of a 24x24cm<sup>2</sup> grid of ion chambers, providing a 2D absolute dose comparison. All plans were designed and calculated using Eclipse (Varian Medical Systems, Palo Alto, CA). Eleven patient plans were evaluated, consisting of 4 brain, 1 head&neck boost, and 6 prostate radiotherapy treatments.

**Results:**

Ion chamber measurements were typically ~2% greater than those predicted by Eclipse.

Using a gamma index with 3%, 3mm, 5% threshold criteria, 88% of films had gamma pass rates of >90%. Three of 7 axial films failed, but passed with thresholds of 30-40%.

Similarly, Matrixx® measurements had gamma pass rates of >90% for 100% of measurements. The average reading of 4 Matrixx ion chambers was significantly correlated with the single ion chamber results (Pearson correlation coefficient = 0.839, p = 0.002), and the 2D Matrixx results agreed well with film measurements (gamma pass rate >90% for 10 of 11 comparisons).

**Conclusion:**

These QA measurements produced good agreement between planned and measured doses. Through utilizing ion chamber and film measurements, we have gained confidence in the Matrixx® for RapidArc QA. The chosen passing criteria were +/-3% for ion chamber readings, and gamma passing rates of >90% for film and Matrixx® with 3%, 3mm, and 5% threshold.