AbstractID: 13111 Title: Development of Image-Guided Radiosurgery with Novalis TX for Small Animal Study

Purpose: Developing a protocol to accomplish small animal radiosurgery study conducted at our clinic in evaluating radiation-induced erectile dysfunction.

Method and Materials: Animals were sedated and scanned using commercial CT scanner. Scans were imported into clinical treatment planning system. All interested anatomic structures were contoured. Two dynamic arc plans (using conformal arc and RapidArc techniques) were created for all animals. On-line target localization was conducted using 2D on-board imaging (OBI) and 3D cone-beam CT (CBCT). The treatment plans were finally delivered to animal on Novalis TX. Quality assurance (QA) for the delivered plans was conducted to evaluate delivery accuracy.

Results: The mean conformity index (100% dose cloud/PTV volume) for all plans was 1.6, showing minimal inclusion of non-target structures within the high-dose region. Median rectal dose for conformal arc plans was 41.6% of prescription, for RapidArc 19% of prescription. The mean shifts are -0.3 cm ±0.5 cm, 2.0 cm ±0.3 cm, and 0.2 cm ±0.1 cm in three dimensions based on 2D OBI matching and less than 0.1 cm based on 3D CBCT registration. Dose difference of QA plans are 2.6% and 1.6% for confromal and RapidArc plan at measured points (treatment isocenter), while the gamma indexes of pixels within range [0, 1] are 98.4% and 97.3% for conformal and RapidArc plan Based on 2D dose measurement.

Conclusion: The conformal arc plans were more homogeneous in treatment delivery and were well tolerated by the animals. The 2D on-line target localization for small animal is feasible and efficient. All QA plans passed the acceptance criteria which is used in our clinic and demonstrated a strong agreement between doses of delivered plans and calculated plans. Tightly dynamic arc plans to treat small animal prostate with minimal injury of non-target structures is feasible using Novalis TX and OBI.