

AbstractID: 8244 Title: Small Animal Conformal Radiation Therapy Device

Purpose: To develop a Small Animal Conformal Radiation Therapy Device (SACRTD) that will provide a degree of geometric/anatomic targeting comparable to what is achievable in current clinical radiotherapy practice to promote translational research in radiation oncology. **Method and Materials:** The SACRTD will integrate 3D-conformal radiation therapy delivery with cone beam CT (CBCT) imaging for image-based treatment planning and guided-delivery. The main system components are: A Seifert Isovolt Titan 225kV X-ray tube with focal spot sizes of 0.4 and 3 mm, which is mounted on a custom made “gantry” and has a special collimating assembly that allows field sizes down to 0.5 mm diameter at the 34 cm isocenter. A second main component is a computer-controlled robotic arm (Adept Viper S650) for animal positioning. The six degrees of freedom (6DOF) robot can be programmed to move with an accuracy ± 0.020 mm in XYZ directions. A third main component is a digital X-ray flat panel detector for CBCT. The X-ray source, the flat panel imager and the robot will be integrated for radiation delivery and imaging. A shielded enclosure housing the SACRTD is presented in a companion abstract. The final system will be capable of precise, accurate and quantifiable conformal delivery of radiation dose to selected targets within small animals in single or multiple fractions. **Results:** The development of SACRTD is in progress and current work is focused on stable gantry design, characterization of the X-ray beam at various energies and programming of the robotic animal positioning system. **Conclusion:** The development of the SACRTD in an academic laboratory is a feasible but challenging undertaking, which has been motivated by the need for a R&D tool for biological, functional and molecular studies in radiation oncology using small animals which can effectively mimic current and future clinical systems.