AbstractID: 13567 Title: Immobilization Bed for Multi-Modality Image Registration

Purpose: To construct an immobilization bed for mice that will allow for longitudinal multimodality imaging studies as well as conformal radiotherapy. The bed must be capable of both intra-examination immobilization as well as inter-examination positioning reproducibility. It must also accommodate mice of various sizes and facilitate image registration. **Method and Materials:** An immobilization bed was manufactured from clear acrylic to enable use with optical imaging modalities. Measurements of multiple mice of various ages and species were made in order to find the optimal size for the bed and for the restrainer pegs. The pegs were placed in stationary positions that effectively immobilize the majority of mice and enable high throughput imaging by avoiding adjustments for every mouse. The pegs were placed such that the front legs of the subject are each placed between two pegs as are the hind legs. An additional set of pegs were placed laterally and posteriorly to guide the hind legs in a reproducible direction. Na-22 PET/CT fiducials were put into the pegs at unique depths to provide a three-dimensional reference to allow fast and accurate image registration. **Results:** An average sized nude mouse without anesthesia (a worst case scenario test) was only capable of 3mm of movement vertically. Serial CT scans in-between which the bed was moved showed no shifts in bony anatomy or external soft tissues. When PET and CT scans were registered without use of the fiducials, the heart was misplaced medially by ~1mm and inferiorly by ~1mm. The fiducials have allowed for accurate CT registration. **Conclusion:** The bed is effective in immobilization and image registration. The use of this bed will be enable the elucidation of minute changes in the PET scans and the use of molecular imaging data for radiation treatment planning and followup.