AbstractID: 2040 Title: Development of a Mobile C-Arm Platform for Cone-Beam CT Guidance of Surgical Procedures

A mobile, isocentric surgical C-arm is under development for multi-mode fluoroscopy and cone-beam CT image-guidance of surgical procedures. The platform for this technology is a Siemens PowerMobil, modified within our laboratory to include a flat-panel detector (Varian 4030CB), a versatile detector mount and collimator (providing extended field-of-view), and a control system for acquisition of fully 3D cone-beam CT images. Fluoroscopic imaging is performed at up to 15 fps. Volume image reconstruction is performed using a modified Feldkamp algorithm, utilizing ~200 - 1000 projections acquired over ~182^{o}. Acquisition time is ~60 s, with an additional ~60 s for 3D reconstruction (256^3 voxels). Imaging performance was investigated through measurement of 3D spatial resolution, image noise, and soft-tissue detectability as a function of dose. The performance of the C-arm was investigated in pre-clinical studies of photodynamic therapy of spinal metastases using an in vivo porcine model. Placement of fiber optic probes within L1 and L2 vertebrae was performed under fluoroscopic and volume CT guidance, and transpedicular trajectories were verified. Initial pre-clinical experience illustrates the potential of this technology as a general platform for image-guided surgical procedures and highlights a number of significant challenges, including image quality, speed of 3D image acquisition, and integration of the imaging system with navigation and interventional tools. Potential application of this technology in a variety of surgical applications is discussed.