

AbstractID: 5320 Title: Implementation of Four Different Image-Guided Radiotherapy (IGRT) Systems in a Radiotherapy Department

Purposes: to implement and compare four newly developed image-guided radiotherapy systems (Varian's Cone-Beam CT, BrainLAB ExacTrac, Restitu Ultrasound (U/S)-Sim and Guide, and in-house stereovision) in one department. **Methods and Materials:** The cone-beam CT (CBCT) and the ultrasound (US) systems provide volumetric images of the target at daily setup. The ExacTrac system acquires the biplanar radiographs at patient setup. Both the US and ExacTrac systems are integrated with infrared-tracking systems for patient-couch positioning. The in-house stereovision system captures 3D surface images of the patient at the instants of daily patient setup and during individual beam irradiation. All of four IGRT systems have used treatment planning volumetric imaging information for target position verification and adjustment. Electronic portal images are routinely used for patient position verification. External markers and possible internal markers such as seeds or small cysts or calcifications can be localized and used for additional verification. **Results:** Emerging data from several institutional IRB-approved clinical trials demonstrate that the target reposition error and dose delivery uncertainties can be significantly reduced by using such image-guided systems, each of which may be most useful in specific clinical situations. **Conclusions:** Our customized stereovision system, which, like US, involves no radiation exposure, is extremely efficient (<2 minutes) and accurate (<2 millimeters) for superficial sites, such as breast cancer. The ExacTrac system appears ideal for lesions associated with bony structures, such as spine and skull. The US and CBCT may be most useful for deformable internal structures, such as prostate cancer. Special methods for dealing with imaging artifacts, such as ring patterns in CBCT, shadow casts and multiple reflections in stereovision and US, and patient motion in ExacTrac and stereovision will be presented.