AbstractID: 9009 Title: Ultrasound Guided Radiotherapy - A Feasibility Evaluation

The ability of IMRT to achieve good dose conformality for an irregularly shaped volume has raised concerns that the treatment volume might be incorrectly dosed due to organ motion during treatment. Studies have been done elsewhere on both inter- and intra- fractional organ motion. Ultrasound is currently being used for prostate localization and for inter-fractional motion studies (e.g. with the NOMOS BAT™ system). This study examines the feasibility of utilising ultrasound technology during treatment for eventual real-time monitoring of intra-fractional motion. Our experiments have been designed to quantify the effect of linac noise on the ultrasound system and the effect of scatter from the transducer on dose distributions. For the first part, the ultrasound machine was set-up in the linac bunker, and either a tissue equivalent phantom, a water bath or air was imaged at several operating frequencies. The transducer was close to, but not in, the radiation field and operated at all times. Dose changes due to scatter were determined using TLD's in an Alderson/Rando phantom. Surface dose changes were measured using film. Our results indicate that, apart from a small increase in periodic noise in the ultrasound images, the linac beam presents no permanent or temporary adverse effects on the ultrasound transducer and its ability to acquire images. There are minimal changes in the dose distributions (<3% at any point). The ultrasound images acquired are of acceptable quality for tracking with either a visual technique or using computer software during a radiotherapy fraction.