

AbstractID: 6687 Title: Evaluation of respiratory movement during gated radiotherapy using film and electronic portal imaging

We have studied the effectiveness of a commercial respiratory gating system (Varian Medical Systems) in reducing anatomical motion by examining films and electronic portal images acquired during gated conformal radiation treatments. The gating system uses a camera to track the position of a reflective marker block placed on the patient, and synchronizes dose delivery from a linear accelerator. Eight patients (4 lung, 4 liver) received fluoroscopic examination, during which respiration is simultaneously recorded, and a CT scan for planning purposes, synchronized to acquire axial slices at the intended phase of respiration for treatment (7 patients treated at end-expiration, 1 at end-inspiration). Patients received recorded instructions at all sessions to regularize respiration. The fluoroscopic data show patient-averaged diaphragm excursion to be 2.3 cm without gating, reduced to 0.8cm with gating. Comparison of diaphragm-to-vertebral-body distance between gated localization films and digitally-reconstructed radiographs show patient-averaged differences of 0.9 mm (standard deviation 3.6 mm). The average daily variability in diaphragm position was 2.8 mm. In addition, we examined the daily variation in the position of anatomic features visible during gated treatment for two patients using an amorphous silicon electronic portal imaging device. The position of these features relative to the field edge varied by 3.2 mm on average. Variations within a given day, however, were only 1.3 mm indicating that most of the variability is due to setup errors rather than respiratory motion. This gating system is successful at reducing respiratory motion in a reproducible way.