Algorithms for the Verification
of 3D Conformal Prostate Treatment using EPID

Organ motion and setup errors are an important underestimated issue in 3D conformal irradiation of the prostate gland. The purpose of this study is to implement in clinic an automatic algorithm for the evaluation of setup error and organ motion. The algorithm was initially design for a box technique conventional RT. It has been modified for 3D conformal RT fields. The algorithm is used in conjunction with radioopaque markers to study organ motion relative to bone structures. Before simulation and CT scans are performed, patients are transperineally implanted with 3 radiopaque markers under ultrasound guidance and local anesthesia. Patients are treated with a six field conformal technique: 2 lateral and 4 oblique. Electronic portal images are acquired for each field and used on-line to verify the proper locations of the markers relative to the reference set of images. EPI are then processed off-line: First, setup deviations are measured using the cross correlation of extracted structures relative to the field center of geometry. Bone edges are detected using the Laplacian of a Gaussian operator without the use of fiducial points or user intervention. Marker positions are then extracted to assess organ motion. Setup deviations measured by the correlation algorithm are presented as actions to be performed, both in magnitude and direction. Action levels based simultaneously on bone structure deviations and marker positions are under study.