

Knowledge of the magnitude and direction of abdominal organ movement during respiration is important in assessing the impact of such motion on IMRT, determining the degree of organ deformation, and devising mitigation strategies. We have quantified the motion of surgical clips in patients with pancreatic cancer by digitization of clip positions. Fluoroscopic image data were recorded digitally over several breath cycles during conventional simulation in both AP and lateral views. During CT simulation, volumetric image data were taken during light respiration, and near the maximum and minimum tidal lung volumes. Radio-opaque markers were also placed on skin during CT. Typically, anterior / posterior movement is on the order of 5-7mm. Craniocaudal displacement ranged from 16mm to <5mm, with individual clips in the same patient showing relative movement at a given moment of 4-5mm. Motion along the lateral axis (R/L) is small, on the order of 2-3mm. From digitization of clips in CT studies, coordinates of multiple clips and skin surface markers were generated at inhale / exhale conditions. These data are in general agreement with fluoroscopic studies in the same patient. Three-dimensional transformations to bring these fiducials into best alignment showed clip position differences suggestive of local organ deformation. Analysis indicates that image guidance of therapy based on movement of a single or limited fiducials is not indicative of the entire organ motion. Data of this type is of potential use as input into dose calculations assessing the effect of organ motion on Dose Volume Histograms of the target.