

Clinical radiotherapy procedures aim at high accuracy. A safety margin is required to ensure that the planned dose is actually delivered to the target volume. A major error source is organ motion including inter-fraction motion and intra-fraction motion. Respiratory motion is known to be the largest intrafractional organ motion cause. Radiotherapy techniques such as controlling, gating, or tracking respiratory motion are under investigation to enable the use of smaller safety margins and higher doses for moving tumors. However, data on intrafractional tumor motion are sparse. In this paper we report the use of fast cine MRI to measure the motion of gastro esophageal tumors. The maximum motion during normal breathing was measured in two dimensions (superior-inferior & laterally) during normal breathing. Patients signed an Institutional Review Board (IRB) approved informed consent prior to cine MRI after CT simulation. MRI cines were performed using a 0.23 Tesla open MRI scanner (Philips Medical Systems, Cleveland, OH). A CBASS (completely balanced state) images (TR/TE=19/8.5 ms; FOV= 475 mm; matrix=128x200 with reconstructed matrix=192x300; slice thickness=10 mm; flip angle=90°; image time 2s) were continuously obtained for 3 minutes. The preliminary results for 11 patients with esophageal carcinoma showed that in the superior and inferior direction the tumor motion is  $14 \pm 4.6$  mm; ranged from 9.0-24 mm. The lateral motion is  $9.4 \pm 4.5$  mm; ranged from 4.7-15.8 mm. The measured values for each patient were used directly in determining the proper planning tumor volume (PTV).