

We have investigated the applicability of a deformable registration algorithm developed at UNC for automatically localizing the prostate in serial CT image sets. The algorithm generates a high dimensional transformation that maps a region of interest in one CT study into another. This preliminary investigation examines transformations between pairs of CT studies of prostate patients, acquired prior to and just after a treatment session. Thus far we have evaluated data sets in which there was not a large change in rectal gas. Following rigid bony registration, the deformable registration produced a transformation between the pre- and post-treatment scans in a manually defined rectangular volume of interest that encompassed the prostate, seminal vesicles and rectum. Prostate localization was performed by applying the transformation to physician drawn contours of the prostate body seen in the pre-treatment study. The resulting warped contours were compared with physician drawn contours of the post-treatment study. Differences in organ shape were estimated by producing surfaces from the contours, aligning prostate centroids from each study pair, and examining the difference in surface intersection points from randomly oriented rays cast from the common centroid. In 14 paired data sets (5mm slice spacing), the mean absolute difference in prostate centroids was 0.9 mm, 1.5, and 2.4 mm in the left-right, anterior-posterior and superior-inferior directions respectively. Mean and standard deviation differences in prostate shape were 1.6 +/- 3.2 mm. These results indicate that the method has potential for the automatic delineation of the prostate in CT image guided therapy.