

Subcutaneous Adipose-Tissue Thickness is a more Accurate Indicator of the Variation of the Interfraction Prostate Position throughout radiation treatment than Patient's weight or Body Mass Index.

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Purpose

Recent clinical outcome studies on prostate cancer reported the influence of patient's obesity on the biochemical failure rates of these patients following various treatment modalities. Recently, we reported a strong correlation between obesity (BMI) and variance of lateral prostate shift (1). Our result indicated that without IGRT, the target volume may not receive the intended dose. We follow up this study by examining the correlation of the interfractional positioning of the prostate glands with respect to the patients' weight, body mass index and a newly introduced concept—subcutaneous adipose tissue thickness.

Method and Materials

Subcutaneous adipose tissue thickness (SAT) is defined as the distance (in centimeter) measured along the central axis from the anterior skin to the portion of the closest muscle group (for the AP direction with prostate cancer treatment set up, it would be the rectus abdominus muscle overlying the symphysis pubis).

We retrospectively analyzed 117 prostate patients who received 10 to 15 fractions of IGRT treatment using CT-on-Rails from January 2006 to December 2007 in the first course. The daily prostate shift data along with patient's weight, BMI, and SAT were collected and analyzed.

Results

Our data indicates that lateral target shifts tend to increase with weight or BMI whereas the AP shift tends to decrease with weight or BMI. The Spearman ranked correlation coefficients between shift and the three body parameters indicate that all three body parameters are negatively correlated with the AP shift but positively correlated with the lateral shift. While all three parameters are statistically significantly associated with patients' lateral shift ($p < 0.05$), only SAT is significantly correlated with shifts in both LR ($p = 0.001$) and AP ($p = 0.007$) dimensions (Fig. 1).

Conclusions

Our correlation study demonstrates that prostate shift is most likely associated with the subcutaneous adipose-tissue thickness. The stronger correlation between SAT and target shift over the other two body parameters (BMI and patient weight) imply that SAT might

be a better indicator than the patient's weight or BMI to predict each patient's shift variation during their treatment, and to correspondingly carry out appropriate clinical interventions. A large SAT of 8 cm may imply substantial interfractional movements and warrant the use of image guided radiation treatment. Furthermore, this concept of large SAT maybe generalized for the treatment of other cancers in addition to prostate cancers.