Purpose:

To study prostate-bed motion after prostatectomy using the surgical clips as a surrogate.

Methods:

On the treatment planning CT, surgical clips within the PTV are identified and contoured. They are also identified and contoured in each daily CBCT. The center of mass (COM) coordinates for each clip within the native reference frame of each image set of CT and CBCT are recorded. Each CBCT (for daily image guidance) is registered to the planning CT based on the pelvic bony structure. The resulted 3D transformation matrix is used to convert the clip coordinates in the CBCT to the planning CT reference frame. Difference between the converted COM coordinates and the one in planning CT is taken as the rigid motion of the prostate bed relative to the pelvic bony structure during the course of radiation therapy.

The motion data are then analyzed using statistical error analysis and quantified by the commonly defined M (average over all fractions and all patients), σ (stdev of averages per patient, the systematic motion), and \( \bar{\sigma} \) (root mean square of stdev per patient, the random motion).

Among a large pool of patients, seven patients were selected for this retrospective study, each with 3 to 11 identifiable clips and 17 to 26 CBCT sets. The total number of clips is 44 and total daily CBCT sets 160.

Results:

In the (right-left, anterio-posterior, foot-head) directions, the M values are (0.2 mm, 0.4 mm, -0.6 mm), σ (0.2, 2.5, 3.2), and \( \bar{\sigma} \) (1.7, 2.6, 2.1).

Conclusions:

Relative to the bony pelvic structure, the prostate bed motion characteristics are similar to that of intact prostate, as summarized in Table 2 of Rasch et al 2005 (Target Definition in Prostate, Head, and Neck Semin Radiat Oncol 15:136-145).