Comparison of the SBRT frame procedure versus Gold Anchor™ fiducial marker IGRT on Accuracy, Precision and Economy.

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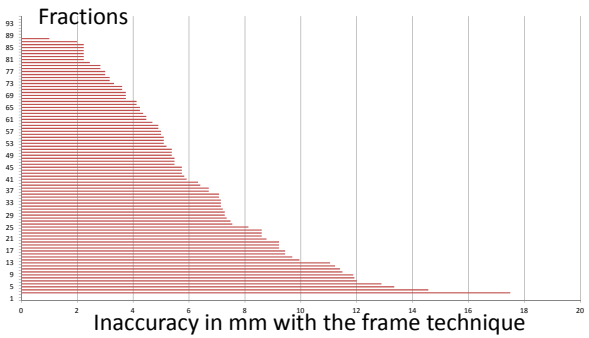
Purpose/Objective(s):
To determine if the use of fiducial markers are superior in accuracy, precision and compared to the SBRT frame set-up procedure that was developed at our institution in 1991.

Materials/Methods:
Twenty patients with abdominal tumors underwent SBRT according to our routine methods with the Elekta body frame. The fine needle marker, Gold Anchor, is implanted in the tumors percutanously, without the need of anesthesia before treatment planning using ultrasound or CT-guidance. Patients were accurately positioned in the treatment room by using the X, Y, Z coordinates on the frame according to the dose plan protocols. A CBCT was then performed to verify the location of the Gold Anchor in relation to the set point in the treatment plan.

The deviation from the actual value to the set point was noted automatically in the Aria system and correction of the patient position was made before treatment. Running time for the frame set-up procedure of the frame was measured.

Results:
The average interfraction tumor deviation in X, Y and Z for all patients with 94 fractions with the frame position to the fiducial marker were measured. The sum-vector represents the true deviation and is larger than the separate coordinates X, Y and Z. In the same sequence one fraction showed a deviation of 4 mm, 6 mm and 5 mm. The sum-vector is then 8.8 mm. Maximum deviation of the sum-vector in this study was 17.5 mm as shown in the graph.



Inaccuracy in mm with the frame technique

The Anchoring Fine Needle Marker

Deviations for the sum-vector of 5 mm or more was registered in 59 percent,

Deviations of 8 mm or more was seen in 24 percent,

Deviations of 10 mm or more was seen in 12 percent,

The preparation time for one patient to adjust the body contour in to the vacuum pillow and the management of the frame was in total about one hour of work. Typical set-up time for positioning a patient in the frame and then positioning of the frame to the X, Y and Z coordinates was 5-10 minutes at the CT and at every fraction in the treatment room. The time to implant Gold Anchor before CT for dose plan was 8-15 minutes.

Conclusions:
Positioning of the target with orthogonal images or CBCT with the Gold Anchor fiducial marker insertion is intuitive and easily accomplished for safe positioning. Excellent accuracy and precision can be achieved without the need of positioning patients in stereotactic whole body frames.

The total cost of treatments with the Gold Anchor technique is less than with the use of the stereotactic coordinate set up due to less time needed in the treatment room and for preparations. However a fixation system may be essential to minimize body movements during treatment.

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Gold Anchor ™ - SBRT

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