

AbstractID: 5200 Title: Intra-Fraction Prostate Motion and Margin Calculations for Prostate Radiotherapy Using Electronic Portal Imaging, Implanted Fiducials and Four Localization Methods

**Purpose:**

This study presents the margins required for prostate EBRT if daily localization is based on skin marks, daily gold seed localization with a fixed threshold for correction, daily gold seed localization with no threshold, and daily bony anatomy alignment. The extent of intra-fraction motion of the prostate is also presented.

**Method & Materials:**

Fiducial markers were placed in the prostate and their position was determined based on CT. Skin marks established initial localization (84 patients). The second localization method (40 patients), used orthogonal pretreatment electronic portal images to visually match the markers. If the 3D offset exceeded 5mm, the patient was shifted. The no threshold result was taken as the subset of the patient fractions where shifts occurred in method 2 (40 patients, average of 21 fractions). The final localization technique was bony anatomy match (67 patients). Through-treatment EPIDs were taken to document the prostate position during treatment; they were used to determine the margin for the fiducial localization and intra-fractional analysis. Intra-fractional analysis on 40 patients was accomplished by comparing the position of a particular seed between opposing treatment fields.

**Results**

Margins for tattoo localization:

Left-Right 5.1mm, Inf-Sup 5.8mm and Ant-Post 8.4mm.

Margins for the EPID with fiducials:

Left-Right 3.4mm (2.9mm with no threshold), Inf-Sup 3.3mm (2.7mm with no threshold) and Ant-Post 3.3mm (2.8mm with no threshold).

Bony anatomy margins:

Left-Right 2.6mm, Inf-Sup 7.3mm and Ant-Post 8.9mm.

Margins intra-fraction motion:

Left-Right 2.1mm, Inf-Sup 2.8mm and Ant-Post 3.0mm.

**Conclusion:**

EPID localization allows a drastic (~60%) margin reduction when compared to tattoo localization. Except for the Left-Right, localizing on the bony anatomy leads to worse margins than tattoo setup. A significant intra-fractional prostate motion exists which is a limiting factor on margin reduction.

**Conflict of Interest:**

Partial funding provided by Varian Medical Systems.