

**Purpose:** Concept of image guided radiotherapy (IGRT) is on the forefront of current efforts to improve tumor control by increasing dose to target volume and decreasing the dose to the nearby critical structures. Most IGRT methods handle the inter-fractional target position uncertainties. However, intra-fractional motion is either incorporated into the remaining PTV margin, or subsequently incorporated into forthcoming treatments based on inter-treatment Cone Beam CT acquired images.

Brachytherapy, by its nature, does not suffer from the intra-treatment target motion uncertainties. Adding the image guidance to improve the inter-treatment target uncertainties makes the Image Guided Brachytherapy (IGBT) one of the most sophisticated image guided radiation therapy modalities. The incorporation of a Cone Beam Simulator CT (CBSCT) in the brachytherapy suite opens the door to a step forward, toward a 3D IGBT.

**Materials and Methods:** We describe a 3D image guidance method using a CBSCT for fractionated HDR brachytherapy, based on 3D CT based treatment planning.

**Results:** Before every treatment a Cone Beam CT (CBCT) image set is acquired with the applicator and/or catheters in its place and patient in treatment position. Planning CT images and CBCT images are imported into appropriate treatment planning software and co-registration of the two image sets is performed based on previously inserted radio-opaque clips and bony and reliable soft-tissue landmarks.

**Conclusions:** The full three-dimensional patient anatomy data with respect to brachytherapy catheters prior to treatment provides additional information to further decrease uncertainty in daily target position with respect to delivered dose distribution during HDR brachytherapy treatments. Cone Beam Simulator CT may provide the ability to move from 2D to 3D Image Guided Brachytherapy.