AbstractID: 5016 Title: Imaging with brachytherapy sources

Purpose:

To demonstrate the concept of 2D projection and 3D volumetric imaging using brachytherapy treatment sources in patient prior to or during treatment.

Method and Materials:

As shown Figure 1, an Ir-192 HDR catheter is placed at 15 cm depth (a reasonable value for pelvic site) in a solid water phantom. XV films are placed on top of the phantom to capture 2D projection images. Vertebra-like structures serving as anatomical landmarks are placed at mid distance between the catheter and film.

Results:

The structures are clearly shown on the projection film with a dwell time of 600 seconds. Projection image acquisition time on the order of seconds or less is achievable with more sensitive (100 times more) detectors such as silicone flat panels and detectors used in SPECT cameras.

The projection of the landmark coincides with the reference mark when the source is at the correct dwell position and is off the mark when the HDR source is away from the correct dwell position, as shown in Figure 1b and 1c. Thus a “port film” approach can be developed to verify the source position prior to treatment.

With the possibility of verifying one dwell position against its reference mark, all other dwell positions can be verified against its own the reference mark. This provides a way of dynamically tracking the dwell positions of a multiple dwell position treatment plan.

With projections taken at multiple angles with sensitive detectors at a fraction of a typical therapeutic dwell time, it will be possible and useful to obtain volume images of the treatment sources superimposed on anatomy, using tomographic (CT, SPECT, tomosynthesis) reconstruction methods.

Conclusion:

Three dimensional volume imaging with a HDR treatment source has been demonstrated. The concept applies to other brachytherapy modalities, e.g., SPECT for permanent prostate implants, LDRs.