

A technique using digitally reconstructed radiographs (DRRs) as an alternative to conventional simulation radiographs has been developed for use in brachytherapy treatment planning. Since soft tissue structures and target volumes delineated on CT images can be projected onto the DRRs, the technique allows CT information to be used on non-CT based brachytherapy planning systems.

The patient is CT scanned in the treatment position with the catheters/applicators and dummy source markers in place. CT slice thicknesses and separations of at most 2 mm are necessary to obtain good resolution on the DRRs. The planning target volume (PTV) and applicators can be outlined on each CT slice, and slices through reference source positions can be identified accurately from the CT pilot images. Orthogonal DRRs are then created for various gantry and couch orientations until a combination is found in which all the applicators can be visualized. The grid axes on the DRRs are used to determine the film magnification factors. The DRRs are then imported into the brachytherapy planning system, and the optimization of the dose distribution with respect to the outlined PTV is performed. A conventional radiograph is taken prior to the treatment to verify that the applicator position is the same as during the CT scan for treatment planning.

The technique allows the dose distribution to be optimized to treat a PTV determined from CT images. An example of the use of orthogonal DRRs for a rectal treatment is presented.