

Purpose:

High dose rate brachytherapy (HDR) is a very effective cancer treatment method. Localization of source positions is essential for dosimetric accuracy. Nucletron's PLATO TPS provides multiple means to reconstruct and localize source positions. Three commonly used methods are: (1) catheter describing using film, (2) catheter tracking using film, and (3) seed identifying on CT slices. Although all of these methods have been used in the clinic, the dose variance among them is unknown. The purpose of this project is to study quantitatively the dose discrepancy of these different source reconstruction methods.

Method and Materials:

A brachy phantom was constructed with CT compatible dummy sources and a tandem. Fiducials of 5mm in diameter were attached to the phantom surface. The phantom was CT scanned with 1mm slice thickness, and then was moved to a treatment couch under the reconstruction bridge. Orthogonal films were taken, and three HDR plans were created. Plan 1 and 2 used film images. Plan 1 reconstructed the source with the catheter describing method while Plan 2 employed the tracking method. Plan 3 was based on the CT images. Doses at the four fiducial points were calculated and compared. In order to minimize the uncertainty caused by human operators, each plan was repeated by three experienced physicists; one physicist repeated planning three times on every plan.

Results:

Dose points from CT based plan was used as a reference. When comparing plans by the source reconstruction method, we found significant dose difference on certain dose point between film based planning and CT based planning. The biggest dose difference was 10.3% on fiducial A.

Conclusion:

Through a series of planning on a phantom, we found the doses can differ significantly between the film and CT based- method. At certain locations, the film based- plan may underestimate the dose.