Dosimetric and Geometric Evaluation of a Novel Stereotactic Radiotherapy Device for Breast Cancer: The GammaPod

The GammaPod stereotactic radiotherapy device is an assembly of a hemi-spherical source carrier containing 36 $^{60}\text{Co}$ sources, a tungsten collimator, a dynamically controlled patient support table and the breast immobilization system which also functions as a stereotactic frame.

An artist rendering and 3D model drawing of GammaPod depicting prone placement of a patient is shown on the right.

Concentric design of hemispherical source carrier and the collimator structures is shown on right. The outer source carrier bowl and the inner collimator with three selections (1.5, 2.5 cm and blocked) are shown with different color coding. The convergence of 36 non-coplanar beams to create a high-dose spherical dose distribution at isocenter is also portrayed.

Dosimetric verifications of dynamically delivered patient plans are performed for 8 patients in hypothetical pre-op, post-op and target-in-target treatment scenarios. Isodose distribution comparison of prone setup partial breast treatments in a post-operative setting planned with 3DCRT and GammaPod is shown on left.

Verifications of GammaPod plan dosimetry with comparison of radio-chromic film measurements (solid lines) with MC based treatment planning system calculations (dotted) are shown below. Fraction of dose points passing the Gamma index condition of less than 1.0 with 2 mm distance-to-agreement and 3% dose-difference criteria were 99.6, 99.7 and 99.2 % for the post-op, pre-op and target-in-target plans.