

Position Accuracy And Timer Linearity HDR Test Phantom Employing Radiochromic Film.

Testing of source-position accuracy and dwell time linearity are essential components of the mandated QA program for HDR brachytherapy. We have designed a new tool employing radiochromic (RC)^a film dosimetry capable of simultaneously performing and providing permanent documentation for both of these tasks.

The HDR QA phantom is constructed of lucite and makes use of a recessed tungsten wire scale for placement of RC film strips (12cm x 1.5cm). Additional lucite strips were used for buildup and to assure good film-tungsten wire contact. The HDR catheter can be reproducibly inserted into the hole drilled through the lucite below the tungsten scale central to the RC film strip.

The source-position accuracy is checked by programming a sequence of increasing dwell times at intervals corresponding to the tungsten scale. Autoradiographs of the source are superimposed on the tungsten scale image due to both direct film exposure and photoelectrons from the tungsten wires¹. The RC films were analyzed using a laser densitometer and our measurements confirm its ability to detect source positioning errors as small as 0.2mm. Successive optical densities were plotted against the programmed dwell times to test for timer linearity. An additional advantage of this methodology is its ability to create a permanent documentation of HDR QA without the need for a film processor.

(1) L.L.Anderson et.al., "Photoelectrons facilitate autoradiography for ¹⁹²Ir remote afterloaders," Med.Phys. 22(11), 1759-1761 (1995).

(a) Radiochromic film type MD-55, Distributed by Nuclear Associates, Carle Place