Purpose: Conical brachytherapy surface applicators with diameters ranging from 10 mm to 45 mm have been developed by Varian Medical Systems, Inc. These applicators are designed to be used with the GammaMedplus iX and VariSource iX high-dose rate Ir-192 afterloaders, allowing for conformal dose delivery for the treatment of surface lesions. Treatment plans for these applicators are created in BrachyVision Acuros. Few studies have been completed with Acuros in clinical situations. The purpose of this work is to perform a comparison of the Acuros-calculated dose distributions with those calculated using Monte Carlo and measured with various detectors.

Methods: Surface applicator treatment plans for each source/applicator combination were created using Acuros and a virtual water phantom. Simulations to characterize the dose distributions were completed using MCNP5 based on specifications provided by the manufacturer. A collision kerma tally was used to determine the dose distributions at the surface and at depth in water. Experimental verification of the depth-dose and surface dose distributions was completed using an ionization chamber, and TLDs and film, respectively. Acuros-calculated depth-dose and isodose values were compared to the Monte Carlo and experimental values.

Results: Assessment of the surface dose distributions shows a peak at the center of the applicator with rapid fall off to the edges. The TPS-calculated percentage depth-dose curves were within 3.7% of the MC and 5.8% of the measured for the 30 mm applicator and were within 4.4% of the MC and measured for the 35 mm applicator.

Conclusions: BrachyVision Acuros is capable of calculating the depth-dose and surface dose distributions for the simple water phantom case with surface applicators. Investigation of additional treatment geometries and applicators is ongoing.

Conflict of Interest: Varian Medical Systems, Inc. provided financial support, software, sources, and applicators.

Funding Support, Disclosures, and Conflict of Interest:

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