

AbstractID: 3680 Title: Comparison of a 3D multi-group  $S_n$  particle transport code with Monte Carlo for intracavitary brachytherapy of the cervix uteri

**Purpose:** To calculate and compare 3-D CT-based patient dose distributions between Monte Carlo and a 3D multi-group  $S_n$  particle transport code for intracavitary brachytherapy of the cervix uteri.

**Method and Materials:**

MCNPX version 2.5.c, a general purpose Monte Carlo code, was used to simulate the tandem and ovoids. An input file was created that simulated the tandem and ovoids together. A reference geometry was created in the input file whereby each applicator could be positioned in each patient CT derived geometry by applying a transformation obtained from the patient CT scan.

A 3D multi-group  $S_n$  particle transport code, Attila™ (Transpire, Inc., Gig Harbor, WA) was used to simulate the same applicator set. Each applicator was built in Solidworks™ (Solidworks Corp., Concord, MA), a mechanical design package and then assembled with a coordinate transformation and rotation for each patient case. Solidworks™ exported applicator geometries as a parasolid geometry, which were imported into Attila™ for calculation.

Water photon kerma rates were converted to dose delivered over the length of one insertion. Dose matrices were overlaid on each patient geometry. Dose volume histograms and point doses were compared for two patient cases. Applicator to applicator comparisons were performed between the two codes.

**Results:**

The Attila™ code calculated doses to within 4% of MCNPX for 95% of the points in a comparison of the ovoid and to within 4% of MCNPX for 94% of the points in a comparison of the tandem. On average, Attila™ calculated dose fourteen times as fast as MCNPX.

**Conclusion:** The Attila™ code can calculate doses for the tandem and ovoids accurately and with less computational time than MCNPX. Further refinements may decrease calculation times for the Attila™ code.

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