Dosimetry Evaluation of MIM Symphony LDR Brachytherapy Treatment Planning for Prostate Seed Implant (PSI)

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Purpose/Objectives
To evaluate the accuracy of MIM Symphony planning software for PSI using AAPM TG-43 formalism and treatment planning comparisons.

Methods/Methods
MIM Symphony (MIM-Software, Inc – Cleveland, Ohio) is a newer brachytherapy treatment computer system capable to combine multi-modalities such as MR, CT, US in one single integrated system. In this work, we evaluated its utility for clinical use at Seidman Cancer Center, University Hospitals Case Medical Center.

Doses calculated by MIM for a single seed using point and linear approximation were compared with the tables and formalisms from AAPM Task Group 43/U1. Pd-200 (Pd-103) and AgX100 (I-125), both from Theragenics Corp., and Oncoseed 6711 (Amersham/Oncura) were compared with hand calculation using TG-43/U1 1D and 2D formalism.

The doses calculated by MIM Symphony software for single seed and seed arrangements are also compared STRATA Suite (Best Medical). STRATA has been in clinical use for 10 years at this clinic and is TG-43 compliant. The volume for 2D geometric shapes such as elulated cube and prisms, and shapes of patients were also investigated.

Three different patient plans configurations were inter-compared to evaluate DVH's between the two planning software systems.

Results
Comparison between MIM point source model calculation and TG-43 "gold standard" are within 2%. MIM line source model calculations are within 2.5% at points perpendicular to the seed’s long axis (Mid-Tran), and 6% at points along the seed’s axis (Long) compared to TG-43 formalism. Points along a 0-40 degrees are 3% for iodine and 7.5% for Palladium. Similar differences exist for an elogated square of sources. Dose comparisons inside the structure are within 5%; doses perpendicular to the length of the seeds are within 5%, and dose points along the axis are within 10%; from calculated, iodine seeds have generally less deviation than Palladium, when compared to TG-43.

DVH comparisons between MIM Symphony and STRATA, for urethra, rectum, prostate and bladder were compared using line model dose calculation. Up to 4% deviation was calculated in V10, V20, and V50 for all four organs and plan comparisons. For prostate and urethra, D0.1, Dp, and D90 were within 8%.

Conclusions
MIM Symphony software algorithm is compliant to TG-43 formalism, and is within acceptable limits for clinical use. Deviations between MIM and TG-43 are possibly from data interpolation. The magnitude of this deviation varies between planning systems and seed type, distance and location of calculation points.

Our experience has shown that the flexibility of MIM multi-modality software can bring to the clinical community a significant improvement for image guided procedures. Further advantages include image fusion and dose combination from previous treatments modalities.

References