

AbstractID: 4956 Title: Dose delivery to curved structures in intra-operative high dose rate (IOHDR) brachytherapy

Purpose: To investigate the magnitude of overdosage / underdosage for curved surfaces in intra-operative high dose rate (IOHDR) brachytherapy when the original treatment plan assumed a planar geometry.

Method and Materials: The archived IOHDR brachytherapy treatment plans of 5 cases were used in this study. Plans of 3 patients treated in our facility were chosen for the different treatment surface areas and two plans with square fields were developed to compare with irregular shape of clinical cases. Phantoms with four various radii (5 cm to 13.5 cm) were used to simulate the treatment planning geometries which were calculated in 2-dimensional plans. EDR2 radiographic film dosimetry was used to evaluate the dose distribution for each case. Each film was digitized with 0.17 mm resolution using a film dosimetry system and converted to dose.

Results: A 2-D planar implant was designed to deliver a dose of 200 cGy to the prescription depth. This implant applicator was then wrapped around curved phantoms of different radii and the identical treatment was delivered for each curved structure. However, the actual doses delivered to the prescription points were about 9 % (5.5 % for small treatment area - 3 catheter x 4 cm²) higher for the convex with respect to the prescription point with 5 cm radius at 1 cm prescription distance. The actual delivered dose was increased linearly proportional to decreasing of the radius of convex.

Conclusion: In IOHDR clinical cases, 2-dimensional planning geometry is typically used without considering the curved shape of the patient's structure. Our measurements have shown an overdosage when the original planar treatment plan was delivered in a convex setting resulting in an increase in the prescription depth which may be clinically relevant.