AbstractID: 2507 Title: Treatment planning isodose calculations with the Gliasite radiation therapy system

Purpose: From published data of dose rates and fractional depth doses (FDD) for various sizes of ^{125}I liquid-filled brachytherapy balloon applicators (the Gliasite RTS) we have developed templates of TG-43 compatible dosimetric parameters to be used in computerized treatment planning calculations and isodose generation.
Method and Materials: The Gliasite radiation therapy system is an intracavitary brachytherapy source that is implanted in brain cavities following excision of the tumor. The balloon can be inflated anywhere between 4 to 35 cc in order to achieve good conformance with the surrounding brain tissue. The initial dose rate in cGy/hr is a function of the balloon size, depth of prescription from the balloon surface and net afterloaded activity in mCi. FDD's, normalized to the balloon surface, are available for determining doses at various depths from the balloon. Based on tables of initial dose rates we have derived the dose rate constant Λ in (cGy/hr.U) at 1 cm from the balloon center for various balloon sizes. We have also calculated a two-dimensional table of the radial dose function g(r) for various balloon sizes and depths in tissue. These dosimetric parameters have then been entered into our brachytherapy planning system (ADAC Pinnacle), where the Gliasite balloon is modeled as a point source.
Results: Our CT-based three-dimensional dose calculations yield doses to the surrounding normal brain tissue and critical structures. In addition to isodose generation, we also calculate DVH's for critical structures, target volume and normal brain tissue and are able to add doses from external beam or other brachytherapy procedures that a patient may have received. We have spot-checked these isodose calculations using the Gliasite calculation tables.
Conclusion: CT-based isodose display is useful in assessing doses to neighboring critical structures and is also indicated when the balloon conformance to the surrounding tissue is not optimal.