AbstractID: 5178 Title: Dosimetric characteristics of a titanium clad 90Y plaque for irradiation of sarcomas of the spine

Purpose: A ^{90}Y foil encased in polycarbonate plaque has been used to irradiate the dura for sarcomas of the spine. The plaque is applied to the dura intraoperatively after radiation therapy and surgery. Rapid falloff of % DD allows the surface of the dura to be treated and the spinal cord a few millimeters below to be spared. Fabrication of a polycarbonate plaque is a difficult process. Radiation and heat damage from the nuclear reactor used to activate the foil will compromise the polycarbonate housing. Requiring the plaque to be assembled in a glove box after the foil has been activated. This process limits design parameters. A new plaque design incorporating a ^{90}Y foil encapsulated in titanium has been developed to facilitate the manufacturing process. The plaque may be assembled before activation allowing for more flexibility in design.

Method and Materials: To study the dosimetric characteristics of this new plaque design, a flat plaque was constructed for measurements with radiochromic film. Surface profiles and %DD were measured and compared to previous results for a polycarbonate encapsulated ^{90}Y foil and to MCNP calculations generated for the new plaque. Surface profiles were evaluated using a Therapeutic Width Index (TWI), defined as the width of the surface profile at 90% divided by the width of the ^{90}Y foil.

Results: The titanium plaque's %DD measurements agreed well with the MCNP calculations and with the polycarbonate plaque measurements. Surface profiles for the titanium plaque were measured and the average TWI was 0.88. The average TWI for the polycarbonate plaque was 0.77. The increase in TWI for the titanium plaque corresponds to a 30% increase in useful treatment area.

Conclusion: Similar %DD characteristics and an increase in useful treatment area show the new plaque design to be clinically acceptable.