Abstract:
The Strut Adjusted Volumetric Implant, SAVI, is a relatively new device for breast cancer treatments. The goal of this project was to create a model of the geometry of the device and a template for actual treatment plan simulations. The template will work in mcnp5, the newest Monte Carlo N-Particle code used for neutron, photon, electron, or coupled neutron/photon/electron transport, to create accurate dose distributions of normalized breast cancer treatments. The mcnp5 results will be useful as a second check of the treatment plan to verify that accurate doses could be delivered to SAVI treatment patients.

Background:
There are three generations of breast cancer brachytherapy treatments for breast cancer. With each new device comes more freedom in treatment plans and this freedom allows doctors, dosimetrists and medical physicists to create more accurate treatment plans specific to the patient. The SAVI is the newest of these devices. Its design allows the radioactive source to follow any of the nine catheter paths. Compared to the first two implants, the Mammocite with one path and the Contora with five, it is obvious that there is more control of the dose distribution. The advantages are greater than just an increase in the number of struts. By changing the overall design the SAVI is able to be used to make highly asymmetric dose distributions that can both more accurately mimic the shape of the affected tissue and limit exposure to important structures such as the chest wall, heart, lungs, and mammary glands.

Relevance:
Brachytherapy, especially for breast cancer, can improve the quality of life of a patient as well as the quality of treatment. This is a high dose radiation treatment where the radioactive source is placed inside of the affected tissue. This results in very targeted treatment with the highest doses being delivered directly to the tumor as indicated with the dose depth curve below. This treatment, while more invasive, has the capability of being faster, safer, and more reliable for some forms of cancer treatment.

Conclusion:
Work with radiation therapy is always growing and adapting to overcome the obstacles that arise from working to improve the quality of life for patients. With proper simulation of the SAVI dose distribution there will be a greater confidence in this high dose radiation treatment. The SAVI can shorten treatment time, reduce damage to healthy cells, prevent burning of skin, have better cosmetic results, and reduce tough scar tissue that is both uncomfortable and a challenge for accurate self examinations.

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