AbstractID: 10142 Title: Integral Target Dose Comparison for MammoSite Brachytherapy and Axxent Electronic Brachytherapy Systems

Purpose: Compare the integral target dose to further understand their clinical suitability.
Materials /Methods: Dose rate for MammoSite and Axxent S700 source due to an isotropic point source can be calculated by: $D(r) = S_k \Lambda\Phi_{an}\, g(r) / r^2$. The dose is the products of D(r) and Δt, where Δt is the dwell time. Δt is obtained from PLATO planning system using 40820 U (10 Ci) source strength. Assuming Axxent S700 produces comparable air kerma strength with that of a 10 Ci Ir-192 source, the same treatment time is used. Target for both systems is a 1.0 cm thickness spherical shell from the surface of the balloon; the integral target dose is obtained by integrating the point source model over this spherical shell. Dosimteric parameters for MammoSite are obtained from AAPM TG43. For Axxent S700, data are obtained from published data[1]. Radial dose function for Axxent S700 (50 keV) is curve-fitted with a polynomial to facilitate calculation.
Results: For a treatment of 340 cGy, MammoSite delivers 3.80 joules for balloon radius of 2.0 cm, increases to 6.66 joules for balloon radius of 3.0 cm, while Axxent S700 delivers 0.98 joules and 1.32 joules respectively. MammoSite delivers 3.9 times more than Axxent S700 at balloon radius of 2.0 cm. This number increases to 5.0 for balloon radius of 3.0 cm.
Conclusion: The integral target dose increases with balloon size for both systems. So is the integral target dose difference between the two. The difference in energy deposition is attributed to the differences in physical characteristics, such as, dose rate constant and radial dose function. Non-target integral dose evaluations for both systems are underway. Further, equivalent uniform dose (EUD) for both systems can be calculated, when air cavities are present.
Reference: *Mark Rivard, et al. Med. Phys. 33, 4020-4032, 2006*