AbstractID: 9214 Title: Evaluation of the Interfraction Dose Variation of MammoSite HDR Brachytherapy Using the Concept of Biological Effective Dose

Purpose: To evaluate the interfraction dose variations due to changes of balloon shape and location in MammoSite HDR brachytherapy using the concept of biological effective dose (BED). **Method and Materials:** A method was developed to account for non-uniform dose distribution in the BED calculation. A prescription dose of 34 Gy was delivered twice daily in 10 fractions to 19 patients. The BED value was computed by two different methods: one using the same dose distribution of fraction 1 over fraction 2-10 (constant case) and one using the actual delivered dose distribution for each fraction 1-10 (interfraction variation case – Fx case). The α/β values were adopted from literature and ranged from 2 to 11 based on specific clinical endpoints: acute effects (erythema, desquamation), late effects (fibrosis, telangiectasia) and tumor control. The α value of 0.3 $Gy^{-1}$and T_{pot} value of 13 days were used for cell proliferation. **Results:** The average difference in BED values between the constant and Fx cases was less than 0.1 Gy over the range of α/β ratios. The maximum difference was larger for late effects (fibrosis, telangiectasia) than acute effects (erythema, desquamation): −3.3 Gy and −2 Gy versus −1.5 Gy and −1.4 Gy corresponding to α/β ratio of 2 and 4 versus 8 and 11, respectively. The negative value means the BED value of Fx case is smaller than that of constant case. By disregarding high inhomogeneity in HDR brachytherapy, the simple calculation assuming uniform dose distribution tends to overestimate BED for fibrosis while underestimating BED for erythema and desquamation. **Conclusions:** The BED calculation accounting for non-uniform dose distribution is more clinically relevant compared to the BED calculation which assumes uniform dose distribution across the target volume. Because the mean interfraction variation in dose was within 0.1 Gy across the target volume, the biological effect was clinically insignificant.