Evaluation of Mammosite Multi-Lumen Rotation and its Dosimetric Consequences

Innovation/Impact: Mammosite Multi-Lumen (MSML) is a relatively new device that allows for increased flexibility in the planning and delivery of accelerated partial breast irradiation (APBI) compared to single lumen Mammosite. The MSML provides a platform to deliver APBI with shaped, asymmetric dose distributions, which opens the door for an increased number of patients to be treated with APBI with potentially decreased skin and chest wall toxicity. However, MSML introduces increased complexity into the treatment process, as the possibility of misalignment of a shaped MSML dose distribution now exists. In this work, we are some of the first to examine and quantify the effects of rotation and misalignment of the MSMLS balloon in phantom and patient.

Figure 1: Orthogonal image planes through the center of the MSML. (left) The $\theta$ rotations are in the plane of the page. (center) The $\psi$ rotations are in the plane of the page. (right) The $\phi$ rotations are in the plane of the page. The solid yellow line represents the PTV_EVAL structure, which is a 1 cm ring around the MSML balloon. The shaded red area represents the 3.4 Gy isodose line. The catheter towards the top of the image in the central and right panes contains the active dwells. The 3.4 Gy line covers the portion of PTV_EVAL that is closest to the active catheter.

Figure 2: (a) Maximum point dose on the PTV_EVAL surface for the MSML phantom as a function of angle. The measurement points are spaced in 10° intervals in $\varphi$, $\theta$, and $\psi$. (b) Percent difference in PTV coverage as a function of angle. The measurement points are spaced in 10° intervals from 0 – 350°. The measurement points in $\theta$ and $\psi$ are spaced in 10° intervals from -90° – 90°.