

AbstractID: 3316 Title: Verifying correct location of HDR source dwell position in the MammoSite catheter using an integral linear MOSFET dosimeter array

Purpose: Correct centering of the HDR source with the spherical MammoSite balloon is critical for proper brachytherapy delivery. We tested a MammoSite modified to incorporate a linear MOSFET dosimeter array to assess whether real-time dosimetry measurements could confirm HDR source centering in MammoSite catheters.

Method and Materials: A “MammoSite with MOSFETs” was simulated using a linear MOSFET array (Thomson Nielsen) consisting of 2 MOSFETs at the end of a flexible strip spaced 4 cm apart. The MOSFET array was placed along an uninflated 6-French endobronchial catheter within a water-equivalent solid phantom. This arrangement simulated having the detectors along the source pathway of a MammoSite, with the detectors within the balloon. The first detector was located at distal end of the “MammoSite” and the second at the proximal balloon collar. The HDR source was programmed to dwell at various positions relative to the “center” and MOSFET readings were obtained. Also, a prototype “MammoSite with MOSFETs” was built with the MOSFET array in a lumen adjacent to the source lumen. The scatter conditions (i.e., variable skin thicknesses) have been assessed by proximal MOSFET readings at various depths in a water phantom.

Results: Ratio of the distal and proximal MOSFETs’ readings showed high sensitivity to changes in dwell position. The fractional standard deviation of the ratio ranged from 0.9% to 3.2%, while each 1 mm shift from center caused at least 15% change in ratio. These ratios were not strongly affected by dose, dose rate, or nearby scatter media.

Conclusion: The “MammoSite with MOSFETs” showed the potential to dosimetrically verify HDR source position with a linear resolution of 1mm or better. Further investigations are warranted to make this a routine clinical tool.

Conflict of Interest: AH, Employed by Thomson-Nielsen. JS, BS, MW, employed by Proxima Therapeutics.