

AbstractID: 11565 Title: The optimal number of lumens for multi-lumen devices used in partial breast irradiation

Purpose: To compare the dosimetry of single-lumen MammoSite device to multi-lumen devices and to find the optimal number of lumens

Methods and Materials: Four designs of multi-lumen devices are studied: a central lumen with two, three, four, or six off-set lumens which are 180°, 120°, 90° and 60° rotationally symmetric around the central lumen. All lumens are straight and parallel to the central lumen. Patients of three different clinical conditions are simulated: (1) skin and chest wall spacing from balloon are larger than 10 mm, (2) smaller than 5 mm and (3) between 5 mm and 10 mm. 10 mm extension from the balloon is defined as planning target volume (PTV). In clinical conditions (2) and (3), where the spacing of skin and/or the spacing of chest wall are less than 10 mm, PTV are shaped to avoid skin and chest wall. The region of PTV excluding balloon is defined as PTV_EVAL, which is used for DVH constraints and dosimetric comparison.

Results: For clinic condition (1), where the PTV is symmetric, single-lumen MammoSite and multi-lumen devices provide similar dosimetric results, whereas in clinic condition (2) and (3), the PTV is asymmetric, the multi-lumen devices provide good coverage to PTV_EVAL with V95 > 90%, and the multi-lumen devices deliver significantly less incidental dose to skin and chest wall: three-lumen device reduce the dose to skin/chest wall by 10%, while four- five- and six-lumen device provide similar results, reducing the skin/chest wall dose to be less than 120% of the prescription dose, a 25% drop.

Conclusion: Compared with single-lumen MammoSite device, Multi-lumen device have better dosimetric results in partial breast irradiation where the PTV spacing is less than 10 mm. Devices with more than four lumens provide similar results to four lumen device.

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