

Purpose:

To discuss physical considerations of breast brachytherapy.

Method and Materials:

Breast brachytherapy is rapidly becoming a common procedure, driven, to a great extent, by patient demand. Most therapy regimens deliver the definitive course over four or five days of B.I.D. treatments. The treatments irradiate the target at risk without unnecessary exposure to skin (except as noted below) or lung. The placement of catheters is performed with a minimum of pain, and the patients tolerate well the presence of catheters over the week duration. Currently, there are two approaches to breast brachytherapy. One major approach places the patient prone on a breast biopsy table with the target breast hanging through a hole in the table. Using a digital mammography unit, the radiation oncologist places a needle-guiding template on the breast. Holes in the template are selected that cover the telycomy cavity plus a 2 cm margin (the clinical target volume, CTV). Another approach begins with the patient supine, and uses either ultrasound or CT guidance for needle placement. With any of the approaches, flexible catheters replace the needles, and CT images are taken for dosimetry planning. Optimization molds the prescription isodose surface to the CTV, with no coalescing of the 150 percent isodose surface around more than single catheters.

The other approach uses a single balloon catheter placed in the telyctomy cavity, either at the time of surgery or shortly thereafter. While easier for both the patient and the physician, placing the catheter at the time of surgery runs the risk of having to remove it if pathological examination shows insufficient margins around the tumor. The balloon is then filled with saline and dilute contrast medium to fill the cavity. The dose is prescribed to an isodose surface 1 cm beyond the balloon surface. For spherical balloons, often a single dwell position is placed in the center of the balloon, although some facilities add short dwells along the catheter to compensate for source anisotropy. Oblong balloons always require multiple dwell positions. The intracavitary approach often produces higher skin doses than the interstitial, and finding a skin dose greater than 150% is reason to abort the treatment. Air cavities often become trapped near the surface of the balloon, pushing the target tissue outside the treatment levels of dose. While the air pockets sometimes disappear with time, they often simply fill with fluid, leaving the target tissue at a great distance. Only MRI can determine if the tissue has collapsed onto the balloon or the pocket filled with fluid. Air pockets of 1 mm and 1.6 mm reduce the dose to target tissue by 5% and 10% respectively.

For either approach, quality management plays an important role, and prevents inappropriate treatments.

Results:

Comparing the two, the intracavitary approach is slightly simpler but more prone to aborting the procedure, while the interstitial approach allows high conformance of the isodose distribution to the CTV.

Conclusion:

Breast brachytherapy provides an effect delivery vehicle for patient breast radiotherapy.

Conflict of Interest (only if applicable): None