

AbstractID: 9788 Title: Breast Brachytherapy Using a Single Balloon Catheter

Theory and Criterion. For breast cancer patient with very small disease, stages T1 and T2, a novel approach makes use of a single balloon catheter. The catheter is placed in the tyelectomy cavity, and the balloon filled with a mixture of contrast and water. The treatment delivery uses a single high dose-rate (HDR) dwell position, usually centered in the balloon (exceptions discussed below). The target dose is delivered to a radius 1 cm beyond the surface of the balloon. During the inflation, it is believed that the target tissue surrounding the balloon thins, effectively treating a larger radius from the cavity than the physical.

Procedure. Insertion of the treatment catheter usually accompanies the tyelectomy, but occasionally the insertion follows by up to a couple of weeks. A surgical drain helps prevent air from being trapped on the surface of the balloon.

Dosimetry. Because of the dosimetric criteria for aborting the treatment, volume-image based (i.e., CT) localization becomes a necessity. Even if the computer dosimetry system does not allow CT input, the scans are needed. The single dwell position produces a nearly spherical dose distribution, but retracted somewhat within about 30° of the cable axis, resulting in a low dose in those directions. Unlike implants, the spherical dose distribution generally pushes the treatment dose beyond the skin. The skin dose becomes a major factor in deciding to go forward with treatment. The treatment should be aborted if:

- The balloon surface lies less than 0.5 cm deep to the skin;
- The dose to the skin exceed 1.5 times the prescribed dose;
- The shape of the balloon deviates significantly from a sphere; or
- There are significant air pockets around the balloon that push the tissue away from the balloon surface. ("Significant" is not well defined yet, but may be taken as 3 mm radially).

Even in cases with greater than 0.5 cm between the balloon surface and the skin, the skin may receive too much dose. Sometimes the dwell position can be altered from the center of the balloon by a few millimeters away from the skin.

Quality Management. Verification of the treatment plan becomes easy, since a simple calculation at a radial point from the single position suffices. Before each treatment, or at least once a day, a fluoroscopic examination of the balloon diameter verifies that no fluid has been lost, and the target tissues remain at the reconstructed locations (a loss in fluid would increase the doses the patient's tissues would receive).

Discussion. While a very simple treatment technique, single-catheter breast implants have many limitations. The spherical dose distribution assumes that the target tissues conform to the balloon, with no customizing to the patient. Placements frequently violate a criterion leading to abortion. Treatment durations are as long as multiple-catheter implants, and, in general, the patients are no more comfortable. On the other hand, such insertions require little skill on the part of the radiation oncologist since placement is by the surgeon.