

Purpose: Partial-breast brachy irradiation following the lumpectomy is effective in treatment women with early-stage breast cancer and is being broadly implemented in clinic. However, the current popular radiation treatments are limited to treat regularly shaped, spherical or ellipsoid, targets with strictly defined skin and rib distances. In reality, many treatment targets cannot be defined perfectly spherical or ellipsoid due to the irregularly shaped lumpectomy cavity and/or skin distance or nearby critical organ limits. In such cases, the 3D conformal brachytherapy becomes necessary. **Methods and Materials:** Multiple channel breast brachytherapy applicator is used to replace the single channel applicator for 3D conformal brachytherapy. Patient is CT scanned with slice thickness at 1 mm. The target and critical organs are delineated by radiation oncologist and planning staff. Brachytherapy source dwell positions and dwell time are the parameters for treatment planning optimization. The inverse planning and graphic optimization of Plato treatment planning system (Nucletron, Columbia, Maryland) are utilized to achieve conformal radiation dose to the target and spare the critical organs. Treatment plans are evaluated based on the isodose curves displayed on top of CT images, the dose conformality to the target and the dose volume histograms of target and critical organs. **Results:** Clinic cases with irregularly shaped targets and/or short skin distance, or closely located critical organs are planned and treated with 3D conformal brachytherapy. All the plans are achieved with satisfied dose distribution, i.e. good dose conformality to the target and sparing of critical organs. The after treatment following up demonstrates successful radiation treatment and good control of patient skin reaction. **Conclusion:** The 3D conformal brachytherapy for partial breast irradiation allow us to better treat the irregularly shaped targets and spare the critical organs. It also releases the restrictions of skin distance and air cavity volume in the selection of patients.