An Investigation into Methods of Radiotherapy in BCT (Breast Conserving Therapy) for Large Breast

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***Abstract*—**Radiation therapy plays an essential and critical role in the management of breast cancer. In a general radiation oncology practice, breast cancer typically comprises approximately 25% of the total patient caseload. X-ray energies of 4 to 6 MV are preferred to treat the breast. Photon energies >6 MV under dose superficial tissues beneath the skin surface, but higher-energy photons may be helpful in large breasts to decrease the integral breast dose.

***Keywords*—**Breast Conserving therapy, large breast ,Radiation therapy, 3 D treatment planning.

I. Introduction

THIS document is Radiation therapy uses high-energy radiation to shrink tumors and kill cancer cells . X-rays, gamma rays, and charged particles are types of radiation used for cancer treatment. The radiation may be delivered by a machine outside the body (external-beam radiation therapy), or it may come from radioactive material placed in the body near cancer cells (internal radiation therapy, also called brachytherapy). The female breast lies on the anterior chest wal l superficial to the pectoralis major muscle (330). The breast can extend from the midline to near the midaxillary line and cranial-caudally from the second anterior rib to the sixth anterior rib. The upper-outer quadrant of the breast extends into the region of the low axilla and is frequently referred to as the axillary tail of Spence. This anatomical feature leads the upper-outer quadrant of the breast to contain a greater percentage of total breast tissue compared to the other quadrants, and, therefore, a greater percentage of breast cancers occur in this anatomical location. The breast is made up of the mammary gland, fat, blood vessels, nerves, and lymphatics (1) .Breast cancer is the most frequently diagnosed cancer in women, and it is estimated that there will be 212,920 new cases of invasive breast cancer and 61,980 new cases of in situ breast cancers among women in the United States in 2006 (2,3). X-ray energies of 4 to 6 MV are preferred to treat the breast. Photon energies >6 MV underdose superficial tissues beneath the skin surface, but higher-energy photons may be helpful in large breasts to decrease the integral breast dose. In these patients, the high-energy photon beam may be "degraded" to bring the maximum dose to more superficial tissues.

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It is not necessary to apply bolus to the breast because the skin is usually not at risk for recurrence after complete excision of a T1 or T2 lesion, as is the skin of the chest wall after a mastectomy.

II. Breast Conserving therapy

Breast-conserving surgery followed by radiation therapy to the intact breast is now clearly established as the most acceptable standard of care for the majority of women with early stage invasive breast cancer. In 1992, the National Cancer Institute published a monograph that stated that breast conservation treatment is an appropriate method of primary therapy for most women with stage I or II breast cancer and is preferable because it provides survival equivalent to that of total mastectomy and axillary dissection while preserving the breast (4).

Recommended techniques for breast-conservation treatment are wide local excision of the primary tumor, preferably with clear margins, axillary lymph node dissection, and breast irradiation (45 to 50 Gy), usually with a boost (10 to 20 Gy, depending on tumor size and status of the surgical margins).

III. 3 D treatment planning

Three-dimensional treatment planning systems allow for evaluation of dose distributions in multiple off-axis slices and calculations of dose using heterogeneity correction factors. Dose distributions can be modulated through standard wedge compensators or field-in-field techniques. Electron energies for the medial chest wall/internal mammary lymph node fields should ensure that the 90% isodose curve covers the contoured volume and avoids irradiation of the heart. In addition, the upraclavicular dosimetry should be checked to verify that the 90% isodose curve fully covers the undissected level III axilla.

IV. Material and Method

All measurements were performed using a Primus linac (Siemens, Germany) established in the Mahdieh Radiotherapy and Oncology, Hamadan, Iran. The primus linac provides two low and high energy photon beams (6 and 15 MV) and a range of electron beams (5-12 MeV).

Breast size can be a relative contraindication. Treatment by irradiation of women with large or pendulous breasts is feasible if reproducibility of patient set-up can be assured and the technical capability exists for > 6 MV photon beam irradiation to obtain adequate dose homogeneity. The radiation oncologist should use measures to assure reproducibility of

patient set-up, treatment simulation, treatment planning, and choice of supervoltage equipment to assure dose homogeneity. High-energy photons (> 10 MV) may be indicated for very large-breasted women or patients with significant dose inhomogeneity on treatment planning (COREPLAN , SC&J Inc Company) using lower energy photons.

V. Treatment Methods

Initial fields and target volumes should be treated to a total dose of 50 Gy in 25 fractions over 5 weeks. Three- to 5-mm bolus over the chest wall every other day or every day for 2 weeks (20 Gy total dose) and then as needed to ensure that a brisk radiation dermatitis develops. However, this dermatitis should not lead to a treatment interruption. There are no studies evaluating the optimal total dose, but in our institution we boost the chest wall with electron fields (5 to 10 cm beyond the mastectomy scar and covering the tumor bed location of the original primary) for an additional 10 Gy in five fractions over 1 week beyond the initial 50-Gy course. In addition, we boost all sites of unresected but initially involved adenopathy in the internal mammary, infraclavicular, and supraclavicular regions with a radiation boost.

VI. Results

A. Method 1

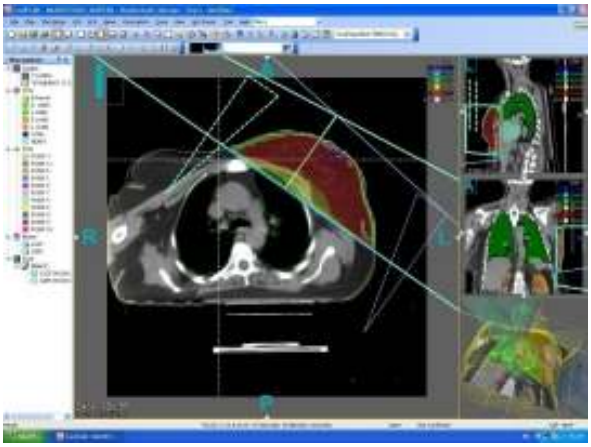

Fig. 1 Patient with large, pendulous breast in lateral decubitus treatment position. Lateral decubitus isodose distribution with 15-degree wedge. Isodose curves for 6 and 15 MV x-rays (source-axis distance, 100 cm) using tangential breast portals without compensators. The lack of a separate IM field can result in irradiation of an excessive volume of lung, particularly in largechested patients.

B. Method 2

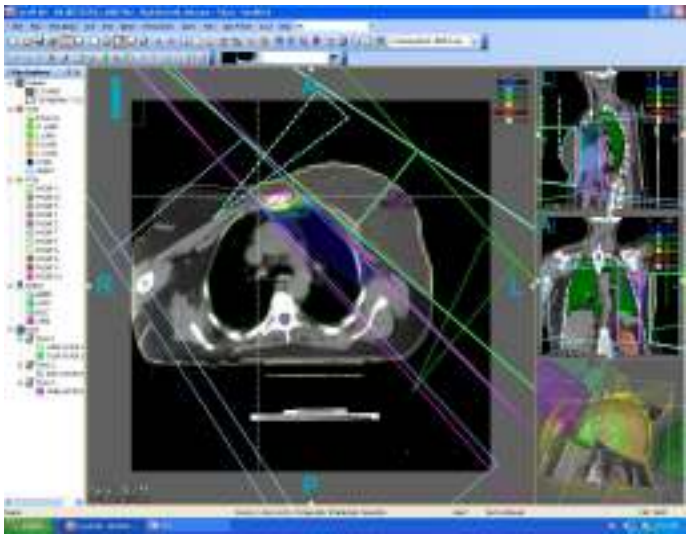

Fig 2 Images of radiation treatment fields to treat the chest wall and internal mammary lymph nodes. In this case, a medial electron field were angled 10 degrees toward a matched pair of photon fields.

C. Method 3

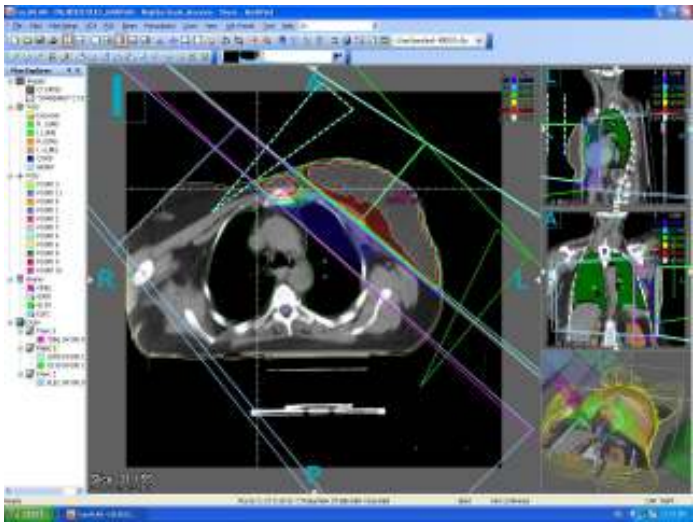

Fig. 3 An obliquely incident electron beam matched to the usual tangential beams. Isodose presentation of optimal matching of an obliquely incident electron beam to the tangential beams. The target volume is enclosed by the 90% isodose line (equals 40.5 Gy).

D.Method 4

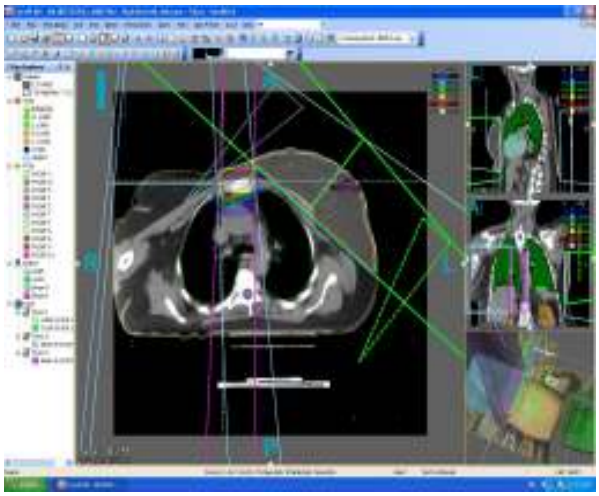

Fig. 4 picture showing relationships between internal mammary and tangential fields. A significant cold region exists if the internal mammary (IM) tangential matchline overlies a large amount of breast tissue. The cold area may be negligible if the breast tissue beneath the matchline is thin. The lack of a separate IM field can result in irradiation of an excessive volume of lung, particularly in largechested patients .

VII. Conclusion

Women with large, pendulous breasts have been documented to have poorer cosmetic outcomes when undergoing irradiation after breast conservation surgery (thought to be caused by dose inhomogeneity) compared with women with small or medium-size breasts. There are Various Field arrangements for irradiation of chest wall and internal mammary and supraclavicular nodes who mention in article(5-7) .

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