Conformal Radiotherapy to Large Breast Using Segmented Fields

Zamzarinah KZ*, Ho GF*, Wong DWY*, Taufik Hidayat M¶, Ng KH*

*Medical Physics Unit, University Malaya Medical Centre, Malaysia
¶ Department of Human Anatomy, Faculty of Medicine and Health Sciences, University Putra Malaysia, Malaysia

zarinakz@ummc.edu.my

Introduction

Conventional radiotherapy planning for large breast is complicated by dose inhomogeneities. These include hot spots in the inferior and superior regions of the breast, as well as inadequate dose at the centre. This dosimetric exercise was conducted to optimize dose distribution for a defined treatment volume using tangential and conformal segmented fields.

Method

A patient with stage 1 left breast carcinoma was planned for post-operative radiotherapy after wide local excision. Planning images were acquired using AcQsim, and planned using Cadplan (Varian USA). Due to the large size of the breast and potential dose inhomogeneities, 50 Gy/25 #/5 weeks was prescribed to the whole breast, rather than the standard hypofractionated regimen. Beam energy of 10 MV was used.

Results

The original plan was done using 30° wedges for both the tangential fields. Due to the size of the breast, the central depth dose close to chest wall was only 90% of the prescribed dose, which was unsatisfactory.

The original plan was optimized by adding an anterior oblique beam segment to boost the central depth dose. This increased the depth dose at the central plane (figure a).

Nevertheless, hot spots of 110% still occurred in the inferior part of the breast. This was addressed by adding two segmented tangential fields (field-within-field technique) which reduced the dose to the inferior part of the breast (figure b).

Central depth dose can also be increased by choosing thinner wedges. With 15° wedge, the central depth dose was satisfactory, but the nipple received 114.4%. There was also a significant dose gradient in the sagittal plane, with the dose maximum inferiorly at 116.6%.

To improve the central depth dose to ≥95%, the weighting of both tangential beams was increased. However, this caused the formation of unacceptably large hot spot anteriorly.

The original plan was optimized by adding an anterior oblique beam segment to boost the central depth dose. This increased the depth dose at the central plane (figure a).

Hot Spots in inferior breast

Optimized plan

Conclusion

Although opposed tangential fields is the most common technique for breast irradiation, the dosimetry obtained with this ‘conventional’ technique may be unsatisfactory for patients with large breasts.

In the absence of IMRT, the dose distribution to the breast can be improved by using multiple conformal segmented fields.