



Contribution ID: 80

Type: Oral Presentation

“Hybrid” 3D/VMAT technique for irradiation of patients with breast cancer and unfavorable anatomy. Preliminary dosimetric study.

Wednesday, 21 June 2017 09:28 (8 minutes)

Introduction. Breast cancer irradiation improves local control and survival. Currently, there is a tendency towards an increase of full node irradiation (FNI), including the fossa supraclavicular nodes, with or without axillary nodes and the internal mammary nodes (IMN), even for early stage, high-risk patients. However, besides the low morbidity of this approach, most of the patients may present a long life-expectancy (> 10 years) and are at higher risk for late toxicity with the larger irradiated volumes.

The objective of this study was to perform a dosimetric comparison between a “hybrid” volumetric modulated arc technique (3D/VMAT) and 3D conformal technique in the irradiation of patients with breast cancer where FNI was indicated.

Methodology. Five patients with indication of adjuvant radiotherapy of the breast or chest wall and FNI were evaluated. Three presented left side disease. Contours were based on the RTOG recommendation. Planning target volumes (PTV) were defined with 5mm margin from the Clinical Target Volumes (CTV) and, when applicable, a 5 mm margin was cropped from the skin surface for dosimetric evaluation. PTV margins for the IMN were 3 mm. Prescribed dose was 50 Gy in 25 fractions (4 patients) and 50,4 Gy in 28 fractions (1 patient). All but one received a 10 Gy boost (5 x 2 Gy). Patients were first planned according to the departments’ routine: 3D conformal planning combined with modulated field-in-field technique. VMAT was indicated mainly when appropriate coverage of the IMN was not achieved with the 3D technique, respecting the organs at risk (OAR) constraints, due to unfavorable anatomy of the patients. A hybrid VMAT technique was developed and consists of two 3D conformal tangent fields delivering around 50% of the prescribed dose to the breast only and three partial VMAT arcs added to deliver the full dose to the IMN and fossa supraclavicular, and complement the dose to the breast. Patients were treated using image-guidance (IGRT). Eclipse[®] v.10 planning system (Varian Medical Systems) was used for calculations with Analytical Anisotropic Algorithm (AAA).

Results. Dose-volume histograms parameters with both techniques were generated and analyzed. Table 1 presents the results of targets coverage and dose at OAR using both techniques.

Table 1. Mean values of the respective studied parameters (n = 5 patients).

Dosimetric parameters 3D

field-in-field Hybrid VMAT Relative difference (%)

PTV D95

D90

D2

Dmax 45.2 Gy

48.7 Gy

61.6 Gy

62.9 Gy 45.5 Gy

47.7 Gy

60.8 Gy

64.5 Gy 0.7

- 2.1

- 1.3

2.5
 SCN D95
 D90
 Dmax 45.6 Gy
 46.9 Gy
 48.6 Gy 49.3 Gy
 50.4 Gy
 50.8 Gy 7.5
 6.9
 4.3
 IMN D95
 D90
 Dmax 31.4 Gy
 36.2 Gy
 56.3 Gy 46.5 Gy
 49.3 Gy
 59.2 Gy 32.5
 26.6
 4.9
 Ipsilateral lung V5
 V10
 V20
 Dm 53.1 %
 50.2 %
 42.6 %
 21.0 Gy 93.1 %
 59.1 %
 30.3 %
 15.9 Gy 43.0
 15.0
 - 40.6
 - 32.1
 Heart V10
 V20
 Dm 7.4 %
 4.8 %
 4.7 % 2.8 %
 12.8 %
 5.5 % - 164.3
 62.5
 14.5

Contralateral breast Dmax 36.9 Gy 18.6 Gy - 98.4

Contralateral lung V5 0.1 % 37.5 % 99.7

Both lungs V20 20.8 % 13.6 % - 52.9

Legend: PTV = Planning Target Volume; SCN = Supraclavicular / axillary levels 2 and 3 nodes; IMN = Internal mammary nodes; Dxx = Dose received by xx% of the respective volume; Dmax = Maximum dose; Dm = Mean dose; Vxx = Volume that receives xx dose (Gy).

Conclusions. Both techniques achieved adequate coverage of the breast or chest wall and the supraclavicular/axillary nodes. However, IMN were better covered with hybrid VMAT. Overall, OAR dose constraints were respected, but V20 and Dm of the ipsilateral lung were higher with 3D technique. The lung volumes receiving low dose and the heart mean dose, independent of the side of disease, were higher with hybrid VMAT. On the other hand, contralateral breast maximum dose was lower with hybrid VMAT. Hybrid VMAT may be an option for better coverage of the IMN when FNI is indicated in patients with unfavorable anatomy.

Country

Brazil

Institution

Hospital Sirio Libanes

Primary authors: MANCINI, Anselmo (Hospital Sirio Libanes); HADDAD, Cecilia Maria Kalil (Sirio Libanes Hospital)

Co-authors: MIRANDA, Fabiana (Hospital Sirio Libanes); CARVALHO, Heloisa (Hospital Sirio Libanes); ARTEAGA, Ligia (Hospital Sirio Libanes); VIEIRA, Marina (Hospital Sirio Libanes); HANNA, Samir (Hospital Sirio Libanes)

Presenter: HADDAD, Cecilia Maria Kalil (Sirio Libanes Hospital)

Session Classification: Session 10a - Breast and Cervix