

EP-1189 Right Coroner Artery Assessment in Radiotherapy of Breast Cancer

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Purpose or Objective

The risk of developing coronary ischemic heart disease and the radiation doses to heart and left anterior descending coronary artery (LAD) have been very well documented in breast cancer patients who underwent radiotherapy (RT). On the other hand, there is limited information regarding the right coronary artery (RCA) doses which feeds the heart in 48% of the human population. In this study proximal RCA (pRCA) doses are evaluated in the treatment plans of breast cancer patients who underwent RT.

Material and Methods

RCA was contoured with a radiologist in 40 patients. Group A included patients with right-sided breast cancer who underwent only tangential breast RT. Group B included right-sided breast cancer patients who received internal mammary (IM) chain RT in addition to breast. Group C included left-sided breast cancer patients with only tangential breast RT and Group D included left-sided breast cancer patients who received IM chain RT in addition to breast. The distribution of the number of patients in each group was equal. 3D conformal radiotherapy planning technique was used for all patients. The mean and maximum point doses of RCA, LAD and heart were calculated in the final dose volume histogram. One-way ANOVA test was used to determine the independent group variances and Tamhane's T2 test was used for comparison of pairwise differences.

Results

The mean and maximum (max) doses for Group A, Group B, Group C and Group D are calculated in cGy as 131mean-202max, 192mean-284max, 64mean-113max and 113mean-174max, respectively. In pairwise comparisons, pRCA mean doses for right breast group are statistically higher than left breast and not different than left breast with IM. pRCA mean doses for right breast with IM group are the highest. There is no difference in mean pRCA doses between left breast and left breast with IM. However, mean pRCA doses for left breast with IM is lower than right breast with IM. pRCA max values for right breast and right breast with IM are statistically higher than only left breast, there is no difference between them and left breast with IM.

The doses for heart and LAD is higher, as expected, in Group C and Group D than Group A and Group B. Figures are listed in Table-1.

Conclusion

pRCA receives 130 to 190 cGy when Group A and Group B are irradiated. Especially, when IM is included in RT field with right breast (Group B), pRCA doses are at the highest. But, increase in pRCA dose is not observed in left breast with IM (Group D). Furthermore, pRCA doses for Groups A and B are not as high as LAD doses in left breast and left breast with IM is irradiated. It may be necessary, as in the case for LAD, to include pRCA in planning and constrain the dosage delivered. The correlation between the dosage and ischemic heart disease needs to be established.

Table-1

	Group A	Group B	Group C	Group D
pRCA-mean	131	192	64	113
pRCA-max	202	284	113	174
LAD-mean	7.9	36.8	356	398
LAD-max	28	81	1733	1249
Heart-mean	42	76	121	147

EP-1190 Assessment of the dose to the heart and the LAD for the left breast radiotherapy

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Purpose or Objective

Radiotherapy for left breast cancer may increase risk of cardiovascular diseases. Exposing the anterior portion of the heart and left anterior descending coronary artery (LAD) to the highest radiation dose depends on individual anatomical location of these structures.

The purpose of this work was to assess the radiation doses delivered to the heart and the LAD for the left sided breast cancer patients treated with 3D conformal radiotherapy.

Material and Methods

Thirty two randomly selected patients referred for adjuvant radiotherapy after breast-conserving surgery for left-sided breast cancer in 2014-2016: all women, age ranging from 36 to 85 years, median 59 years, at the time of treatment. The radiotherapy target volume typically encompasses the remaining breast tissue after resection of the tumor and, in cases with lymph node metastases, also the regional lymph node areas. Prescribed total radiation dose to the planning target volume (PTV) was 50 Gy in 25 daily fractions (5 fractions a week; delivered in 5 weeks).

The dose to the 5% and 10% of heart volume and average mean heart dose were evaluated. The D^{max} , D^{mean} and V^{20} (10% of the contoured volume received 20 Gy or more) of LAD in comparison with LAD^{arch} were assessed.

The acceptability of the radiotherapy plans in this study is then analysed assessing the dose delivered to the whole heart (1), the LAD^{arch} (2) and the whole LAD (3). The whole LAD is considered to be receiving a high dose when over 10% of the contoured volume received 20 Gy or more.

Results

For all 32 patients, the plans are acceptable based on the criteria for whole heart and LAD^{arch} . The results of this study showed that the mean doses to the three cardiac structures are 1,88 (range, 1,25-3,98 Gy) for the heart, 7,3 (range, 3,82-17,15 Gy) for the LAD^{arch} and 9,64 (range, 3,24-27,84 Gy) for the LAD.

Most important results shows, that for 11 patients the heart D^{mean} was only 2,15 (range, 1,37 - 3,98), while a significant dose to the whole left anterior descending interventricular branch being delivered.

We found 4 cases, in which the dose to the LAD^{arch} was with marginal increase, but significant portion of the heart and whole LAD is included in the field. There were no cases where the dose to the LAD^{arch} , LAD and whole heart dissociated. But in 7 cases the dose to the LAD^{arch} was relatively low, however the dose to the whole LAD was significantly higher (14,6-37,6% of the contoured volume received over 20 Gy).

Conclusion

Evaluation of the mean dose to the heart only could lead to excessive heart irradiation. The results of the study indicate that it is necessary to assess the dose delivered to the whole heart as well as to the whole LAD for evaluation of the left breast irradiation treatment plan. This is very important to minimise the risk of clinically significant cardiac events after left breast radiotherapy.