Inspiration Breath-Hold Radiotherapy Technique

Techniques. Our experience indicates that CK-SAPBI delivered tissue sparing and offers improvements over existing PBI.

Selection of patients with left breast cancer for Deep-Breath-hold radiotherapy technique (DIBHRT) in the treatment of left breast cancer has the ability to reduce doses to heart left anterior descending coronary artery (LAD) and lung. Before introduction of DIBHRT into routine clinical practice, we conducted a prospective study to assess the extent of dosimetric benefit of this technique in order to select a group of patients for whom this technique should be routinely applied.

**Purpose or Objective:** The voluntary deep-inspiration breath-hold radiotherapy technique (DIBHRT) in the treatment of left breast cancer has the ability to reduce doses to heart left anterior descending coronary artery (LAD) and lung. Before introduction of DIBHRT into routine clinical practice, we conducted a prospective study to assess the extent of dosimetric benefit of this technique in order to select a group of patients for whom this technique should be routinely applied.

**Material and Methods:** Thirty one consecutive patients qualified for whole breast irradiation (WBI) with tangential fields following breast conserving surgery for left-sided early breast cancer were included. All patients underwent breath-hold training, free-breathing (FB), and DIBH planning-CT. Separate radiotherapy treatment plans for WBI in total dose of 39.9 Gy in 15 fraction were prepared based on both planning-CT. Doses like mean heart, heart V20Gy, maximum LAD, left lung V20Gy were calculated for each plan and the difference in respective values (delta) for FB and DIBH were calculated. If relative improvement of at least 20% for any evaluated dosimetric parameter were found for DIBH plan without significant worsening of other measures, this plan was selected for treatment. Daily three-dimensional surface imaging (VisionRT) and weekly electronic portal imaging were performed. The data distribution were assessed using chi² test, correlations were analyzed using the Pearson test. Furthermore, receiver operating characteristic (ROC) analysis was performed.

**Results:** In 30 of 31 patients a reduction at least 20% in one or more evaluated parameters (i.e.mean heart, heart V20Gy, maximum LAD and left lung V20Gy in 29, 29, 26, and 7 patients respectively) was achieved. The relative worsening of left lung V20Gy was found for in 10 cases and of maximum LAD in 2 cases. Eventually 25 patients were qualified to DIBHRT. Mean delta(Gy) were: mean heart 1.51 (range: 0.06-6.45), heart V20Gy:3.0 (range: 0.0-6.59), maximum LAD:18.5 (range: -3.29-36.68), left lung V20Gy:1.7 (range: 2.71-8.7). Correlations between delta values of mean heart, maximum LAD, heart V20Gy with length of cardiac contact distance (CCD) (ρ<0.05, AUC=0.6) and maximum LAD, heart V20Gy with Body Mass Index (BMI)(ρ=0.05, AUC=0.6) were found. ROC analysis showed that a 2.5 cm of CCD is a threshold for reduction at least 20% in one or more parameters. For BMI no specific threshold for predefined improvement of any dosimetric parameter was identified, which means that despite correlation of dosimetric cardiac benefit with higher BMI, some patients with low BMI may also have cardiac doses reduced with DIBHRT.

**Conclusion:** In our center we have prospectively confirmed an ability of DIBHRT for heart and LAD but not for lung-sparing. We are going to use this technique routinely for left-sided breast cancer patients with CCD above 2.5 cm.