Influence of different treatment techniques on radiation dose to the LAD coronary artery.

Abstract:

BACKGROUND: The purpose of this proof-of-principle study was to test the ability of an intensity-modulated radiotherapy (IMRT) technique to reduce the radiation dose to the heart plus the left ventricle and a coronary artery. Radiation-induced heart disease might be a serious complication in long-term cancer survivors. METHODS: Planning CT scans from 6 female patients were available. They were part of a previous study of mediastinal IMRT for target volumes used in lymphoma treatment that included 8 patients and represent all cases where the left anterior descending coronary artery (LAD) could be contoured. We compared 6 MV AP/PA opposed fields to a 3D conformal 4-field technique and an optimised 7-field step-and-shoot IMRT technique and evaluated DVH's for several structures. The planning system was BrainSCAN 5.21 (BrainLAB, Heimstetten, Germany). RESULTS: IMRT maintained target volume coverage but resulted in better dose reduction to the heart, left ventricle and LAD than the other techniques. Selective dose reduction could be accomplished, although not to the degree initially attempted. The median LAD dose was approximately 50% lower with IMRT. In 5 out of 6 patients, IMRT was the best technique with regard to heart sparing.

CONCLUSION: IMRT techniques are able to reduce the radiation dose to the heart. In addition to dose reduction to whole heart, individualised dose...
distributions can be created, which spare, e.g., one ventricle plus one of the coronary arteries. Certain patients with well-defined vessel pathology might profit from an approach of general heart sparing with further selective dose reduction, accounting for the individual aspects of pre-existing damage.