

Radiotherapy and the heart

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Lancet 2007; 369: 1762

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In June, 2006, a 47-year-old man was admitted to our emergency department with chest pain. There was ST segment elevation on his ECG, and his troponin T concentration was raised at 0.24 µg/L (normal <0.10 µg/L). His LDL cholesterol concentration was marginally raised at 3.1 mmol/L, but his total cholesterol concentration was within the normal range, as was his blood pressure. He was a non-smoker, and had been working as an instructor in a gymnasium. His medical history had only one notable feature: in his teens, he had been diagnosed with Hodgkin's lymphoma, for which he had undergone mediastinal radiotherapy at a total dose of 40 Gy (figure).

Coronary angiography showed 50% stenosis of the left anterior descending coronary artery, and 90% stenosis of the right coronary artery. Since radiation exposure was the most striking risk factor, the patient was considered likely

to have radiation-induced coronary-artery disease. The right coronary artery was stented, and the patient was prescribed clopidogrel, aspirin, metoprolol, and atorvastatin. However, 6 months later, he developed unstable angina. Angiography showed that his coronary-artery disease had progressed rapidly: the stenosis of the left anterior descending coronary artery had progressed to 90% proximally and 70% distally; the stenosis of both the left main coronary artery and the left circumflex coronary artery was 50%. Coronary-artery bypass grafting was therefore undertaken. The internal mammary arteries, of which no stenosis was evident on angiography, were used for the grafts: the left internal mammary artery was grafted to the left anterior descending coronary artery, and the right internal mammary artery to the left circumflex coronary artery. The postoperative course was uneventful. When last seen in November, 2006, the patient was asymptomatic.

Mediastinal radiation is commonly used successfully to treat Hodgkin's disease. The risk of long-term damage depends on the dose of radiation and the field of exposure. Radiation can cause atherosclerosis by stimulating endothelial and fibroblast proliferation. Atherosclerosis is yet more likely to develop in the presence of additional cardiovascular risk factors, such as hypercholesterolaemia.¹ It is estimated that 5.5–12% of people who receive mediastinal radiation develop radiation-induced coronary-artery disease; the latency of onset is between 3 and 29 years.² We believe that people who have undergone mediastinal radiotherapy should be screened regularly for symptoms and risk factors of coronary-artery disease, particularly if the radiation dose has been high. Radiation-induced coronary-artery disease can progress rapidly, even in the absence of other cardiovascular risk factors.² Debate continues over whether coronary-artery bypass grafts should use the internal mammary artery, if the latter has been exposed to radiation.^{3,4}

References:

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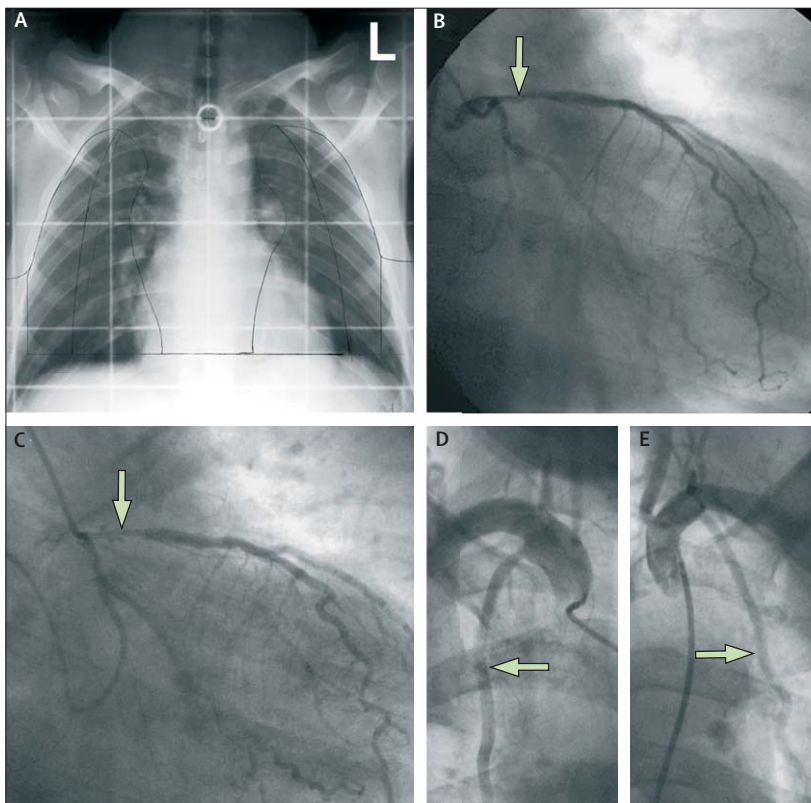


Figure: Application and possible consequences of radiotherapy

(A) The central four squares indicate the target area for radiotherapy; the black lines depict the protection shields for the lungs. (B) First coronary angiography, showing 50% stenosis of the left anterior descending coronary artery. (C) Second coronary angiography, showing increased stenosis of the same artery. (D, E) Angiography of the right (D) and left (E) internal mammary arteries, indicating the absence of stenosis.