Late radiation-induced heart disease after radiotherapy. Clinical importance, radiobiological mechanisms and strategies of prevention.

Abstract:
The clinical importance of radiation-induced heart disease, in particular in post-operative radiotherapy of breast cancer patients, has been recognised only recently. There is general agreement, that a co-ordinated research effort would be needed to explore all the potential strategies of how to reduce the late risk of radiation-induced heart disease in radiotherapy. This approach would be based, on one hand, on a comprehensive understanding of the radiobiological mechanisms of radiation-induced heart disease after radiotherapy which would require large-scale long-term animal experiments with high precision local heart irradiation. On the other hand - in close co-operation with mechanistic in vivo research studies - clinical studies in patients need to determine the influence of dose distribution in the heart on the risk of radiation-induced heart disease. The aim of these clinical studies would be to identify the critical structures within the organ which need to be spared and their radiation sensitivity aswell as a potential volume and dose effect. The results of the mechanistic studies might also provide concepts of how to modify the gradual progression of radiation damage in the heart by drugs or biological molecules. The results of the studies in patients would need to also incorporate detailed dosimetric and imaging studies in order to develop early indicators of impending radiation-induced heart disease which
would be a pre-condition to develop sound criteria for treatment plan optimisation.