Dose-response irradiation effect on rat heart

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Introduction: Non-invasive radioablation has recently been used for treatment of refractory ventricular arrhythmia in humans. However, the pathological changes of myocardium brought on by irradiation has not been well known. Dose-responsive histologic changes were examined after irradiation of rat hearts.

Methods: Whole hearts of 33 wild-type Lewis rats were irradiated with 20, 25, 30, 40, and 50 Gy of radiation (6 mice in each group and 3 mice for control). Hearts were explanted at 2-week (3 mice) or 3-week (3 mice) after irradiation.

Result: From irradiation to 3 weeks, there were no changes in body weights of rats irradiated with 20 to 30 Gy, while a 3 and 20% serial decrease in body weight was observed in rats irradiated with 40 and 50 Gy group, respectively. There was left ventricular functional changes, but LV chamber sizes were decreased. Pathology showed subepithelial lymphocytic infiltration and mucosal epithelial atrophy in the trachea and esophagus, especially in 50 Gy irradiated rats. There were prominent lymphocyte and endothelial damages in all-dose group, esp in 3-week harvest rats. Focal myocyte necrosis was showed in high-dose 3-week group.

Conclusion: High dose irradiation effect on heart is mainly caused by endothelial cells and lymphocytes damage.