Evaluation of Target Motion During Stereotactic Body Radiotherapy of Ventricular Tachycardia

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Objectives: To evaluate the motion of a target in the heart using implantable cardioverter defibrillator (ICD) lead as surrogate.

Methods: We analyzed the log files of surrogate motion of 4 patients treated with SBRT of ventricular tachycardia. All clinical target volumes (CTV) were in direct contact with ICD lead. Targets were localized anterolateral (3) and inferolateral (1) in the heart. We evaluated the ICD lead motion amplitudes; intrafraction amplitude variability; correlation error between the ICD lead and external markers.

Results: In the superior-inferior (SI), latero-lateral (LL), and anterior-posterior (AP) directions, respectively, the median motion amplitudes were 5.5 mm (range 3.9 - 6.3 mm), 2.9 mm (range 2.1 - 3.2 mm), and 3.0 mm (range 2.1 - 4.9 mm). The median intrafraction amplitude variability was 2.2 mm (range 2.0 - 4.6 mm), 1.6 mm (range 0.4 - 2.4 mm), and 1.7 mm (range 1.6 - 4.4 mm) in the SI, LL, and AP directions, respectively. The median correlation error was 1.9 mm (range 1.8 - 2.6 mm).

Conclusions: Tracking of ICD lead as surrogate is feasible method to compensate breathing motion during SBRT of VT. Data from online tracking indicate motion irregularities and correlation errors consistently > 1mm what indicates the influence of the heartbeat.