Transition of lesion characterization in Late Gadolinium Enhancement following Cryo ablation – Serial MR Imaging

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Introduction : RF ablation has been shown to mature over the span of 8 to 12 weeks but the extent and time course of cryo lesion maturation is still unknown. Our goal was to assess cryo lesion maturation using serial magnetic resonance imaging (MRI).

Methods : Ventricular ablation was performed in a canine model using a cryo catheter (Freezor® MAX, Medtronic) with freeze times of 120 and 240 secs. T2-weighted edema imaging and Late Gadolinium Enhancement (LGE) MRI were done immediately after ablation and repeated after 1, 4, and 12 weeks. After the final MRI, hearts were excised for pathological and histological evaluation. Edema, microvascular obstruction (MVO), and hyperenhancement (HE) volumes were calculated (Panel A) and normalized to chronic pathological lesion volume.

Result : Thirty-three ventricular lesions were evaluated. Immediately after contrast administration, the MVO volume was 1.9±0.5 times and the HE volume was 6.9±3.7 times larger than the chronic pathological lesion volume. Fifty minutes after contrast administration, the normalized HE volume was 4.8±0.5 and the MVO volume was 0.5 (Panel B). The logarithmic curve fitted to the normalized MVO showed that the MVO volume at 19.1 minutes (95% prediction interval, 17.2–21.1 mins) after contrast injection (Panel B) was the best predictor of chronic lesion volume. When analyzing ablation lesions with 120 sec and 240 sec freeze times the predictive values were 18.2 minutes and 20.2 minutes, respectively.

Conclusion : In cryo ablation, the MVO volume measured 19.1 minutes after contrast injection on acute LGE-MRI predicts the chronic lesion volume. This time was not strongly affected by the freeze time.