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Histopathological characterization of cryolesions at growing myocardium

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Introduction: Animal studies and clinical observations have demonstrated that radiofrequency current (RF) application at growing myocardium may result in coronary artery obstruction. Experimental data of the histopathological effects of cryoenergy application at growing myocardium is limited.

Methods: Cryoablation was performed in ten piglets (body weight 14-18 kg) at -75 °C for 4 minutes with a 6-mm-tip electrode (Freezor Xtra®) at the posterior and lateral atrial aspect of the tricuspid valve annulus. Additional cryoenergy lesions were induced at the lateral and posterior atrial and ventricular aspect of the mitral valve annulus, respectively. After 48 hours and 6 months the hearts were removed in 5 piglets for further histological work-up, respectively. The results were compared with our previous results after RF application.

Results: In contrast to RF lesions, acute and chronic cryolesions were sharply demarcated, no affection of the adjacent coronary artery was noted. As RF lesions, the acute hemorrhagic cryolesions were bordered by a layer of neutrophile leucozytes. Thrombus formation was noted in 2/3 of the acute lesions. In chronic cryolesions myocardium was replaced by fibrous tissue in the upper endocardial layer and by fat cells in the deeper layers. Lesion size is displayed in the table:

	Cryoenergy [mm³]	RF energy [mm³]	P-value
Acute atrial lesions	52 ± 45	49 ± 14	Non significant (N.s.)
Chronic Atrial lesions	40 ± 20	27 ± 5	N.s.
Acute ventricular lesions	144 ± 203	150 ± 50	N.s.
Chronic ventricular lesions	192 ± 118*	97 ± 90*	P<0.05

Conclusions: Due to these results cryoenergy appears favorably in tachycardia substrates close to the coronary arteries. However, the increase of ventricular lesions size over time after cryoenergy long-term effects of cryoenergy application should be further evaluated.