Conclusion: Proton beam irradiation affects the early electrophysiological properties of the infarcted myocardium with the greatest effect on bipolar voltage and CV seen by 4 weeks. This could be responsible for the early arrhythmic effects.

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THE ATRIAL-PULMONARY VEIN JUNCTION CONSTITUTES AN ARRHYTHMOGENIC SUBSTRATE

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Background: Ablative pulmonary vein isolation (PVI) is ineffective in atrial fibrillation (AF) prevention in 40% of AF patients. The role of the atrial-pulmonary vein (A-PV) junction in arrhythmogenesis is poorly understood since incomplete PVI can be curative. We aimed to test the hypothesis that the A-PV junction constitutes a structural and functional arrhythmogenic substrate.
Objective: To evaluate electrophysiology in-vivo and morphology of the A-PV junction.
Methods: We performed percutaneous endocardial electrophysiological studies and histological preparations of the right pulmonary vein (PV) in healthy sheep.
Results: The proximal PV wall contained more myocytes than distal PV and a higher percentage of collagen and fat tissue than both distal PV and left atrial walls. Local fractionated electrograms occurred in both distal and proximal PV, however a large local activation in the unipolar electrograms ($>$0.75mV) was more often present in the proximal than distal PV (86% vs. 50% of electrograms, respectively, $p=0.017$). While proximal PV premature stimulation caused atrial arrhythmias in 10/14 sheep (1-147 premature atrial complexes (PACs) per run), distal PV premature stimulation was less arrhythmogenic (1-6 PACs per run in 2/14 sheep, $p=0.004$ vs. proximal). The refractory period was shorter in the proximal than distal PV (170 ± 50 (mean$\pm$SD) vs. 244 ± 57ms, $p<0.001$). The diastolic stimulation threshold was higher in proximal than distal PV (0.8 ± 0.3 vs. 0.4 ± 0.2mA, $p=0.004$).
Conclusion: Atrial arrhythmias were induced by premature stimulation in the proximal PV but not in the distal PV. The structural and functional properties of the A-PV junction differ from those of the distal PV and favor re-entrant arrhythmias. Ablative therapy guided by electrogram morphology should focus on this substrate.

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REMODELING IMPROVES EXERCISE CAPACITY IN DOGS WITH AV BLOCK

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Background: Children with congenital complete atrioventricular block (AVB) do not often report exercise intolerance due to compensatory mechanisms. The effect of cardiac remodeling being absent and present after AV block on exercise capacity has not yet been reported.
Objective: We studied the cardiorespiratory changes due to exercise at three different timepoints after inducing AV block in dogs.
Methods: Mongrel dogs ($n=8$) were placed on a treadmill with a 10% incline in a custom-build closed chamber and performed a moderate exercise protocol (10 minutes at a speed of 6 km/h). Dogs ran at sinus rhythm (SR), at two days after AV block (AVB2d) lacking cardiac remodeling, and at three and six weeks of chronic AV block (CAVB) remodeling (CAVB3 and CAVB6, respectively). ECG tracings were recorded via electrodes on the back. Stroke volume and cardiac output were recorded via a thoracic electrical bioimpedance-based device (PhysioFlow®). pO_2, pCO_2, SpO_2 and pH levels were determined from venous blood samples. O_2 consumption (VO_2) and CO_2 production (VCO_2) were measured within the chamber.
Results: All dogs completed the exercise protocol at SR, CAVB3 and CAVB6, but 5/8 dogs failed at AVB2d (average run duration: 7min23sec, SD: 2min38sec), due to ventricular tachycardia and/or staggering. Changes in heart rate, stroke volume and cardiac output upon exercise were not different between the timepoints after AV block. At AVB2d, pO_2 was lower (3.3 ± 1.1 vs. 5.2 ± 0.7 kPa (SR), $p<0.01$), the SpO_2 was decreased (31 ± 16 vs. 67 ± 7 % (SR), $p<0.001$), the pCO_2 was higher (7.3 ± 1.4 vs. 5.5 ± 0.3 kPa (SR), $p<0.01$), and the pH was decreased (7.23 ± 0.06 vs. 7.36 ± 0.02 (SR), $p<0.001$) at 2min exercise. Similar values were found at 5min exercise e.g., for pCO_2 (6.8 ± 1.8 vs. 5.1 ± 1.3 kPa (SR), $p<0.05$) and pH (7.22 ± 0.08 vs. 7.37 ± 0.03 (SR), $p<0.001$). Venous blood parameters were not different between SR, CAVB3 and CAVB6 at rest and during exercise. At the end of the run (at steady state), VO_2 and VCO_2 are lowest at AVB2d with a 10% and 5% decrease, respectively, compared to SR ($p=0.05$ and 0.33).
Conclusion: Dogs without remodeling after AV block have a reduced exercise capacity, which seems to be reflected in changes in cardiorespiratory parameters. Remodeling after chronic AV block improves the exercise capacity in dogs.

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REPEATABILITY OF VENTRICULAR ARRHYTHMIA CHARACTERISTICS DURING EXERCISE STRESS TESTING IN PATIENTS WITH CATECHOLAMINERGIC POLYMORPHIC VENTRICULAR TACHYCARDIA

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Background: In patients with catecholaminergic polymorphic ventricular tachycardia (CPVT), the exercise stress test (EST) is the cornerstone for both the diagnosis of CPVT and assessment of therapeutic efficacy. In general, the presence of couplets or more complex ventricular arrhythmias (VA) during EST compels treatment intensification. However, the repeatability of VAs on consecutive ESTs is unknown.
Objective: To test the repeatability of VA characteristics on consecutive ESTs in patients with CPVT.
Methods: We retrospectively assessed all ESTs of patients diagnosed with CPVT and included EST pairs (defined as consecutive ESTs within 18 months and without treatment or on the exact same treatment). Multiple EST pairs per patient were allowed. We performed paired analyses of VA complexity, which was defined as mild [absence of ventricular ectopy, isolated premature ventricular complex (PVC), or bigeminal PVCs] or complex [couplets or NSVT], and heart rate at the first PVC (HR-PVC1).
Results: A total of 128 EST pairs from 71 patients (median age at first EST: 32.0 [16.5-45.5] years, 52.1% female) were included with a median time interval of 6.2 [4.2-11.7] months between ESTs. Nineteen (14.8%) EST pairs were off treatment, 46 (35.9%) on beta-blocker monotherapy, 5 (3.9%) on flecainide monotherapy and 58 (45.3%) on therapy with beta-blocker and flecainide. Baseline heart rate, maximum heart rate, exercise time, maximum workload, protocol and reason for discontinuation