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Longterm effects of cardiac mediastinal nerve cryoablation on neural inducibility of atrial fibrillation in canines.

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Abstract

In canines, excessive activation of select mediastinal nerve inputs to the intrinsic cardiac nervous system induces atrial fibrillation (AF). Since ablation of neural elements is proposed as an adjunct to circumferential pulmonary vein ablation for AF, we investigated the short and long-term effects of mediastinal nerve ablation on AF inducibility. Under general anesthesia, in 11 dogs several mediastinal nerve sites were identified on the superior vena cava that, when stimulated electrically during the atrial refractory period, reproducibly initiated AF. Cryoablation of one nerve site was then performed and inducibility retested early (1-2 months post Cryo; n=7) or late (4 months post Cryo; n=4). Four additional dogs that underwent a sham procedure were retested 1 to 2 months post-surgery. Stimulation induced AF at 91% of nerve sites tested in control versus 21% nerve sites early and 54% late post-ablation (both $P < 0.05$). Fewer stimuli were required to induce AF in controls versus the Early Cryo group; this capacity returned to normal values in the Late Cryo group. AF episodes were longer in control versus the Early or Late Cryo groups. Heart rate responses to vagal or stellate ganglion stimulation, as well as to local nicotine infusion into the right coronary artery, were similar in all groups. In conclusion, focal damage to intrinsic cardiac neuronal inputs causes short-term stunning of neuronal inducibility of AF without major loss of overall adrenergic or cholinergic efferent neuronal control. That recovery of AF inducibility occurs rapidly post-surgery indicates the plasticity of intrathoracic neuronal elements to focal injury.

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