Steroids and Antioxidant Drugs Are Equally Effective in Preventing Late Extension of Radiofrequency Ablation Lesions: Do Multiple Mechanisms Play a Role in This Phenomenon?

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Background: Delayed effects of radiofrequency (RF) may occur, particularly as late atrioventricular block, but their mechanisms are unknown. We recently demonstrated that combined therapy with steroids and antioxidants (allopurinol and verapamil) prevents late extension of RF lesions. To further characterize the mechanisms involved in this phenomenon, we compared the effects of anti-inflammatory and antioxidant drugs on the healing of RF-induced histological and ultrastructural (US) abnormalities. Methods: Temperature-controlled RF lesions (70°C/90 s) were created in the right ventricular endocardium of 13 dogs (15-20 kg) with standard techniques. Lesion size, histological and US characteristics in 3 zones extending from the visible pathologic lesion border, namely, A (0-3 mm); B (3-6 mm) and C (6-9 mm), were assessed at 30 days. Dogs were divided into 3 groups: group 1 (n=7) receiving combined therapy with allopurinol (400mg po for 2 hours before RF); verapamil (200mg/kg iv for 15 min before and after RF); hydrocortisone (10 mg/kg iv after RF) and prednisone (20 mg po for 29 days); group 2 (n=3) receiving allopurinol and verapamil; and group 3 (n=3) receiving hydrocortisone and prednisone. Results: Lesion size was similar in all groups, but pathological analysis revealed that healing was delayed in the groups receiving steroids. In all groups, significant abnormalities of the plasma membrane, gap junctions, mitochondria, sarcosomes and nuclei were noted in zone A. However, the extent of US injury and collagen proliferation was slightly less in group 1. In zone B, minor abnormalities were consistently noted in groups 2 and 3 but this region was normal in 57% (71%) dogs from group 1. Zone C was normal in all groups. Conclusion: Anti-inflammatory and antioxidant drugs are equally effective in limiting late extension of RF lesions. Further, combined therapy with these agents seems to exert an additive effect. These findings suggest that different mechanisms of action may be responsible for the delayed myocardial effects of RF ablation.

Circumferential Ultrasonic Ablation of Pulmonary Vein Ostial: Relationship Between Ablation Time and Lesion Formation


Animal and clinical studies have used ultrasound (US) for ablation and electrical isolation of PVs. US has been applied for 120-240 sec. We evaluated the effect of US application times on US lesion formation. Methods: In 12 dogs, intracardiac echocardiography (Acuson) and PV angiography were obtained to assess PV dimensions before and after ablation. An 11.5F catheter with a distal balloon/steerable (Atrions) was advanced into the right superior PV for a single US application targeting 65°C. Groups of 3 animals each received US application for 30 sec Group 1, 60 sec Group II, 120 sec Group III, and 240 sec Group IV. The animals were sacrificed 6-12 weeks post procedure. Results: Lesion size was similar in all groups, but pathological analysis revealed that healing was delayed in the groups receiving steroids. In all groups, significant abnormalities of the plasma membrane, gap junctions, mitochondria, sarcosomes and nuclei were noted in zone A. However, the extent of US injury and collagen proliferation was slightly less in group 1. In zone B, minor abnormalities were consistently noted in groups 2 and 3 but this region was normal in 57% (71%) dogs from group 1. Zone C was normal in all groups. Conclusion: Anti-inflammatory and antioxidant drugs are equally effective in limiting late extension of RF lesions. Further, combined therapy with these agents seems to exert an additive effect. These findings suggest that different mechanisms of action may be responsible for the delayed myocardial effects of RF ablation.

Radiofrequency Ablation of Supraventricular Tachycardia Using an Ultrasonic-Based Navigation System and a Cooled Ablation Catheter

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A novel mapping system (RMU, Cardiac Pathways) has been developed as an aid for mapping and catheter ablation. This system uses ultrasonic signals generated between small crystals placed on two reference catheters and a mapping/ablation catheter (Chilli, Cardiac Pathways) to determine the three-dimensional location of the mapping catheter in the ultrasound field. It can be used in combination with two-dimensional echocardiography to guide and precisely locate ablation sites. We used this system for electro-anatomic mapping in 24 patients (pts) with supraventricular tachycardia including atrial flutter (AFL) in 9, AV nodal re-entry (AVRT) in 7, an accessory pathway (AP) in 10, and ectopic atrial tachycardia (EAT) in 1 pt. In 3 pts, a cooled tip ultrasound catheter was placed within the procedure (AVRT and AFL in 1 pt, AP and AVRT in 1 pt, EAT and AFL in 1 patient). Pts ages ranged 10-77 years (mean ±44) and 11 pts were female. The mapping system was used to generate electro-anatomic maps of the right atrium during coronary sinus pacing in patients with AVRT and AFL. Energy was applied along the interior border of the triangle of Koch for AVRT and along the cavo-tricuspid isthmus for AFL. In pts with APs, activation over the AP was mapped during sinus rhythm (pre-excitation), ventricular pacing, or induced tachycardia. Energy was delivered at sites of early activation along the tricuspid annulus in 3 pts and along the mitral annulus (in the left atrium) in 7 pts. The right atrium was mapped during EAT in one pt and sites of early activation were targeted. Cooled ablation was used in all of the pts except those with AVRT in whom temperature monitoring without irradiation was used. All pts had successful ablation without recurrence of the targeted arrhythmias during 1-10 months ( mean ± 5 ) of follow-up. There were no complications noted. Conclusions: This new navigational tool can be used in a wide variety of clinical supraventricular tachycardias. It allows use of an internally irrigated (cooled) electrode. Accurate localization of ablation lesions combined with super-imposition of the lesions on an electro-anatomic map facilitates treatment of arrhythmias which are amenable to anatomically-placed ablation lesions.