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Radiofrequency catheter ablation of accessory pathways in the dog: the Italian experience (2008–2016)

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Abstract *Introduction:* Accessory pathways (APs) in dogs are mostly right-sided, display nondecremental conduction, and mediate atrioventricular reciprocating tachycardias (AVRTs). Radiofrequency catheter ablation (RFCA) is considered the first-line therapy in human patients to abolish electrical conduction along APs.
Animals: Seventy-six consecutive client-owned dogs.
Material and Methods: Retrospective study to describe the precise anatomical distribution and the electrophysiologic characteristics of APs in a large population of dogs and to evaluate long-term success and complication rates of RFCA.
Results: Eighty-three APs were identified in 76 dogs (92.1% with single APs and 7.9% with multiple APs); 96.4% were right-sided, 3.6% left-sided. Conduction along the APs was unidirectional and retrograde in 68.7% of the cases and bidirectional in 31.3%. Accessory pathways presented retrograde decremental properties in 6.5% of the cases. They mediated orthodromic AVRT in 92.1% of the cases and permanent junctional reciprocating tachycardia in 6.5%. In one case, no AVRT could be induced. In 97.4% of dogs, RFCA was attempted with an acute success rate of 100%. In 7.7% of cases, recurrence of the tachycardia occurred within 18 months, followed by a second definitively successful ablation. A major complication requiring pacemaker implantation was identified in 2.6% of dogs.
Discussion: Accessory pathway distribution and electrophysiologic properties in these 76 dogs were similar to previous report. Long-term success and complication

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rates of RFCA in dogs appeared very similar to results of humans.
Conclusion: Radiofrequency catheter ablation of APs can be performed with a high success rate and low incidence of complications.

Abbreviation

AP	accessory pathway
AV	atrioventricular
AVN	atrioventricular node
AVRT	atrioventricular reciprocating tachycardia
CI	confidence intervals
CS	coronary sinus
EPS	electrophysiologic study
PJRT	permanent junctional reciprocating tachycardia
RFCA	radiofrequency catheter ablation
VA	ventriculoatrial
VPE	ventricular pre-excitation

Introduction

In 1913, Stanley Kent claimed to have found a human heart with an extra connection between the right atrium and right ventricle [1]. Since this initial description, atrioventricular accessory pathways (APs) have been described in both humans [2—11] and dogs [12—19].

Accessory pathways are anomalous muscular bundles that connect atrial and ventricular myocardium, bypassing the His-Purkinje system [2—4,7]. They are typically classified according to their anatomical position in the left free wall (posterior and lateral mitral valve annulus), the right free wall (posterior and lateral tricuspid valve annulus), and the posteroseptal, mid-septal, and anteroseptal segments of the tricuspid valve annulus. In dogs, APs are mostly right-sided, usually at the level of the right free wall and right posteroseptal region [12]. Accessory pathways occur as a single muscle bundle, or less commonly, multiple connections in both humans [8,9] and dogs [12]. In human medicine, multiple APs are present in 3.1—10% of patients with preexcitation syndrome, they are most commonly found in cases with concomitant structural heart diseases and present concealed conduction in one-third of the patients [8,9]. In dogs, multiple connections were previously reported in 20% of cases and were distributed around the tricuspid annulus and in the left atrioventricular free wall [12].

Accessory pathways have been described in various breeds but are predominantly found in young Labrador Retrievers and Boxers [12—17]. They can have antegrade or retrograde unidirectional conduction or bidirectional conduction. In dogs, retrograde unidirectional conduction is more common in 73.3% of cases [12]. It typically mediates orthodromic atrioventricular reciprocating tachycardia (AVRT) or permanent junctional reciprocating tachycardia (PJRT) [12—19]. Bidirectional conduction seems to be less frequent in dogs (26.7% of cases) [12] compared with human patients, in which most APs have bidirectional conduction [20—26] with electrocardiographic signs of ventricular preexcitation (VPE) during sinus rhythm.

In people, APs are also frequently associated with atrial fibrillation [3]. Reasons for this association have not been fully explained. Proposed mechanisms are as follows: 1) the different ability of the AP to adapt to the tachycardia rate changes, which leads to an alteration of the timing of atrioventricular contraction, and 2) a variation of retrograde conduction that does not adapt as a reaction to changes in antegrade conduction time [3]. The presence of atrial fibrillation associated with AP has also been previously described in dogs [12].

Supraventricular tachycardias mediated by APs, particularly in their incessant forms, can have a profound impact on myocardial function, and they are often responsible for arrhythmia-induced cardiomyopathy, which can mimic dilated cardiomyopathy [14,15,17].

Radiofrequency catheter ablation (RFCA) is considered the first-line therapy for the management of APs and related arrhythmias both in humans [4,21—31] and dogs [12—16,19]. It has a high success rate both in children and adults, and a low complication rate [4,21—31]. In veterinary medicine, limited data about the use the use of RFCA suggest that it is as safe and successful as in people [12—16,19].

The aims of this study are to precisely describe the anatomical distribution and electrophysiologic

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