Clinical utility of exercise testing and high-sensitivity cardiac troponin I in early diagnosis of arrhythmogenic right ventricular cardiomyopathy in apparently healthy Boxer dogs

Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a primary myocardial disease recognized in dogs and humans. It is characterized by fibrofatty replacement of right ventricular myocardium, and less frequently, of the interventricular septum, left ventricular and atrial myocardium. Boxer dogs have a genetic predisposition for ARVC. Family history of the disease, documentation of ventricular arrhythmias (premature ventricular complexes, PVCs), history of syncope, or exercise intolerance are important clinical data to guide the diagnosis in affected dogs. In dogs with a lack of clinical signs (apparently healthy dogs), the electrocardiographic finding of ventricular arrhythmias is a major means of suspecting a diagnosis of ARVC antemortem. Of concern, however, is that the earliest latent stage of ARVC is characterized by normal electrocardiographic findings with undetectable structural heart disease but a risk for sudden cardiac death. The identification of this subclinical population of Boxer dogs having latent disease is challenging but important for prognosis and monitoring recommendations and in selection of breeding animals. Therefore, testing that can unmask ventricular arrhythmias or increase blood levels of biomarkers of myocardial injury in subclinical Boxer dogs may be beneficial in guiding monitoring and treatment recommendations. In the present study, we 1) investigated the effects of exercise testing (ExT) on the occurrence of ventricular arrhythmias in apparently healthy Boxer dogs; 2) performed an analytical and clinical comparison between point-of-care (POC) cardiac troponin I (cTnI) and high-sensitivity cTnI (hs-cTnI) assays; and 3) investigated whether an association could be demonstrated between ventricular arrhythmias, cTnI concentration ([cTnI]), and genetic mutation status in these Boxer dogs. One hundred and fifty-eight client-owned Boxer dogs were screened to select a population of apparently healthy dogs. Of these, 30 dogs completed the study.
This study showed that the effects of ExT on number and complexity of ventricular arrhythmias are inconsistent in apparently healthy Boxer dogs. However, in many dogs, PVCs were clustered around exercising (median, 33.3% of total daily PVCs occurring in the peri-exercise period). The results of this study demonstrated that the two cTnI assays cannot be used interchangeably, the hs-cTnI assay may be a more sensitive and specific test that the POC assay, and [cTnI] measured by either assay does not differ in dogs with and without the striatin mutation that has been associated with ARVC in some Boxer dogs. Furthermore, the results of this study suggest that the exercise-associated increase in [cTnI] and number of PVCs may be a manifestation of increased propensity to the development of the ARVC phenotype in Boxer dogs. Dogs' recent exercise history should be considered when measuring [cTnI] and when quantitating PVCs via 24 h at-home electrocardiogram (Holter monitor). Long-term follow up of these Boxer dogs may provide further evidence in support of our hypotheses and overall conclusion, which could be a focus for future studies.

Publications

Peer-reviewed Publications (in chronological order)


9. Cardinale JP, Sriramula S, Mariappan N, Agarwal D, Francis J. Angiotensin II-induced hypertension is modulated by nuclear


Manuscripts in review


Presentations


2. Dange RB, Agarwal D and Francis J. Inhibition of TLR4 within the PVN attenuates hypertension and inflammatory signaling cascade in spontaneously hypertensive rats. American College of Veterinary Pathologists Meeting 2014, Atlanta, GA. Poster presentation.


Awards

2020 3 Minute Thesis Competition (First prize and People’s Choice Award), UPEI

2019 Alice Peake Residency in Companion Animal Scholarship, UPEI

2019 Class of 2006 Mentorship Award, University of Prince Edward Island

2014 Best Poster Presentation Award, Annual Meeting of the American College of Veterinary Pathologists, Atlanta, GA

2014 Best Poster Presentation Award at the Phi Zeta Research Emphasis Day, Louisiana State University, Baton Rouge, LA

2012 Best Poster Presentation Award, Phi Zeta Research Emphasis Day, Louisiana State University, Baton Rouge, LA

2011 Best Poster Presentation Award, Annual Meeting of the American College of Veterinary Pathologists, Nashville, TN

2011-2012 Graduate School Dissertation Fellowship, Louisiana State University, Baton Rouge, LA

2007 Young Scientist Award, VIII Annual Convention & National Symposium of Indian Association of Lady Veterinarians, India

2006 Gold Medal for the best master’s student, Madras Veterinary College, India

2006 Field Veterinarian Best Presentation Award, XXIV Annual Convention of Indian Society for Veterinary Medicine, India

2004-2006 Merit scholarship (Pattukkottai Azhagiri Endowment Award), Madras Veterinary College, India

2004 Academic excellence award in Veterinary Pathology, Veterinary Science and Animal Husbandry, India

2001-2004 Merit scholarship, College of Veterinary Science and Animal Husbandry, India