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Evaluation of red cell distribution width in dogs with pulmonary hypertension

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Abstract *Objectives:* To compare red cell distribution width (RDW) between dogs with different causes of pulmonary hypertension (PH) and a control dog population to determine whether RDW was correlated with severity of PH as measured by echocardiography. A further aim was to determine the prognostic significance of increased RDW for dogs with PH.
Animals: Forty-four client-owned dogs with PH and 79 control dogs presented to a single tertiary referral institution.
Methods: Signalment, clinical pathological and echocardiographic data were obtained retrospectively from the medical records of dogs with PH, and RDW measured on a Cell-Dyn 3500 was compared between dogs with pre- and post-capillary PH and a control population. Referring veterinary surgeons were contacted for follow-up information and Kaplan—Meier analysis was conducted to investigate differences in survival time between affected dogs with different RDW values.
Results: The RDW was significantly greater in dogs with pre-capillary PH compared to control dogs. There was no difference in median survival times between dogs with PH divided according to RDW values. The RDW was positively correlated with

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mean corpuscular volume and haematocrit in dogs with PH, but did not correlate with echocardiographic variables.
Conclusions: An association was found between dogs with PH and increased RDW; however there was considerable overlap in values between control dogs and dogs with PH. The RDW was not associated with survival in this study.

Abbreviations

cTnI	cardiac troponin I
IQR	inter-quartile range
LA:Ao	ratio of left atrial to aortic root diameter
NT-proBNP	N-terminal pro-brain natriuretic peptide
PH	pulmonary hypertension
PR	pulmonic regurgitation
PRPG	peak diastolic pulmonic regurgitant pressure gradient
RDW	red cell distribution width
ROC	receiver operator characteristic
TR	tricuspid regurgitation
TRPG	peak systolic tricuspid regurgitant pressure gradient

Introduction

Red cell distribution width (RDW) is a measure of degree of anisocytosis in the erythrocyte population and is expressed as the coefficient of variation of the erythrocyte size distribution data.[b] The RDW is regularly reported by modern haematology analysers.[1–3] A number of recent publications have identified RDW as an independent predictor of outcome in a wide range of different human diseases.[4–9] The ability of RDW to predict outcome independently in human patients with pre- and post-capillary pulmonary hypertension (PH) has been widely investigated and found to be clinically useful.[10–15]

Pulmonary hypertension is recognised in dogs with increased frequency due to growing access to Doppler echocardiography enabling non-invasive measurement of tricuspid and pulmonic insufficiency jet velocities, which are surrogate measures of systolic and diastolic pulmonary artery pressure gradients, respectively.[16] Pulmonary hypertension can be classified as pre-capillary or post-capillary, or a five point classification system can be used based on the pathological process underlying the PH. These five categories of PH include pulmonary arterial hypertension associated with parasite infestation or congenital systemic-to-pulmonary shunts, PH due to left-sided cardiac disease, PH related to diseases of the pulmonary parenchyma, PH resulting from thromboembolic events involving the pulmonary vasculature, and miscellaneous causes.[17,18]

A number of studies have explored the diagnostic utility of circulating biomarkers, including natriuretic peptides and cardiac troponin I (cTnI), in dogs with pre- and post-capillary PH.[19–22] To date, the relationship between PH and RDW in dogs has been described in a single study, which suggested that RDW was increased in dogs with pre-capillary PH when compared to controls.[c] There remains a paucity of information regarding the diagnostic and prognostic utility of RDW in dogs with PH due to a variety of causes.

The aims of the study were to determine if RDW differed between dogs with pre- and post-capillary PH and clinically normal dogs, to ascertain if RDW is associated with severity of PH determined by Doppler echocardiography, and to evaluate the prognostic value of a single measurement of RDW at time of presentation in dogs with PH.

Animals, materials and methods

Selection of cases and controls

The computerised medical record system of a tertiary referral hospital was searched to identify dogs that had a diagnosis of PH between February 2008 and February 2012. Cases were selected if a complete medical history and physical examination were available, routine diagnostic samples were submitted for complete haematology and

[b] Cell-Dyn 3500 System Operators Manual, Abbott Laboratories, Abbott Park, Illinois, USA.

[c] Poser H, Mazzotta E, Menciotti G, Contiero B, Baron Toaldo M, Guglielmini C. Red blood cell distribution width in dogs with pre-capillary and post-capillary pulmonary hypertension. Poster presented at the 23rd ECVIM-CA Congress, Liverpool, UK, September 2013.