



Evaluation of a novel echocardiographic view for the assessment of the pulmonary artery in dogs

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Abstract *Objectives:* 1) To describe a novel echocardiographic view (left cranial oblique) for the assessment of the pulmonary artery in dogs 2) To compare this novel view with other standard views.

Animals: Prospective inclusion of 48 echocardiograms performed on client-owned dogs.

Methods: Two standard views and the novel view were compared for quality of 2D images and spectral Doppler traces and also for pulmonary annulus diameter and spectral Doppler velocities. Association between view, heart rate and body weight and quality, annulus diameter, pulsed-wave and continuous-wave velocities were analyzed using regression analysis. Agreement between views was assessed by Bland–Altman analysis. Pulsed-wave and continuous-wave velocities were compared using the sign test for medians.

Results: Forty-eight studies were undertaken of which thirty-nine were analyzed. The quality of 2D images was associated with view and heart rate. No significant difference was found in quality of spectral Doppler traces between views. Annulus diameter showed significant association with view, heart rate and weight. This measured about 0.26 cm less on one particular view. Spectral Doppler velocities

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showed no association with view, heart rate or weight. Continuous-wave velocities were significantly higher than pulsed-wave velocities in every view.

Conclusions: The novel left cranial oblique view can be used as an additional tool for the echocardiographic evaluation of the pulmonary artery. The pulmonary annulus diameter was consistently smaller measured from the one standard view compared to both the novel and other standard views. Comparable quality and velocities were obtained for spectral Doppler. Continuous-wave and pulsed-wave modes were not interchangeable.

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Abbreviations

2D	2-dimensional
CW	continuous-wave
HR	heart rate
LCLA	left cranial long-axis
LCO	left cranial oblique
PW	pulsed-wave
RPSA	right parasternal short-axis

Introduction

Echocardiography is one of the most important tools in veterinary cardiology and it is commonly used for the evaluation of structural and functional heart disease [1,2]. Standardized views have been established for the performance of an echocardiographic study [3–5]. These established views have been assessed by different studies in the past [6,7]. The right ventricular outflow tract and pulmonary artery have been considered areas particularly challenging to image in human medicine due to the complex anatomy and the difficulty of alignment of the blood flow with the probe beam [8]. Alignment of the blood flow with the interrogation beam is of crucial importance for precise estimation of flow velocity [4,7]. The conformation of the thorax and other individual factors have been described to influence the quality of the echocardiographic study and some publications recommend the use of as many different views and positions as possible to maximize image quality and accuracy of Doppler-estimated blood flow velocities [7,9].

Several views have been described to visualize and interrogate the pulmonary artery in dogs. The most commonly used and described are the right parasternal short-axis (RPSA) view at the level of the heart base and the left cranial long-axis (LCLA) view optimized for the pulmonary artery [3,10,11]. The 2-dimensional (2D) and spectral Doppler echocardiographic study of the pulmonary artery gives information on valve morphology, annulus and

vessel diameters, presence of abnormal structures, valvular insufficiency, flow pattern, flow velocity and estimation of pressure gradients. This information is particularly useful for cases of pulmonic stenosis or pulmonary hypertension [11–13]. Pulmonic stenosis is one of the most common congenital heart diseases in dogs [14,15] and accurate echocardiographic assessment is crucial for appropriate therapeutic management [16,17].

We describe a novel left cranial oblique (LCO) echocardiographic view for the assessment of the pulmonary artery in dogs and compare it with standard views. We hypothesized that the novel view allows good visualization of the pulmonary artery and valve and provides good alignment for spectral Doppler interrogation leading to a comparable assessment of the pulmonary valve apparatus and blood flow relative to the other most commonly used views.

Animals, materials and methods

Study design and population

Cases for the study were prospectively recruited from client-owned dogs presented for clinical cardiac evaluation over a period of two months (end of April 2014 – end of June 2014). Repeated echocardiographic studies from the same patient were not included. All the echocardiographic studies were performed by the same operator (JPR) and were supervised by a board-certified cardiologist (ATF). None of the dogs was sedated during the examinations.

Echocardiography

A single ultrasound machine ^c with a 5S multi-frequency (2.2–5.0 MHz) phased array probe was used for all the studies performed.

^c Vivid 7, GE Ultraschall KG, Postfach, Deutschland.

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