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University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

Submitted in Partial Fulfilment
of the Requirements for the

DEGREE OF MASTER OF SCIENCE

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Department of Companion Animals

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Use of two- and three-dimensional echocardiography for assessment of the left ventricular outflow tract velocity and aortic orifice area in dogs

Clinically, dogs are screened for subaortic stenosis (SAS) using two-dimensional (2DE) and Doppler echocardiography. Distinguishing between mild SAS and unaffected can be difficult, and a more precise evaluation of the left ventricular outflow tract (LVOT) is desirable. The aims of this study were to determine the step-up in Doppler-derived peak LVOT velocity, investigate associated variables, and determine the LVOT and aortic orifice areas using 2DE and three-dimensional echocardiography (3DE) in dogs.

Sixty-nine healthy, privately-owned dogs were enrolled. The continuous wave (CW) peak LVOT velocity and the pulsed wave (PW) Doppler-derived step-up in LVOT velocity at four locations were determined from both the subcostal (SC) and left apical (LAP) imaging windows. The LVOT and aortic valve (AoV) orifice areas were determined using 2DE AoV diameter, the continuity equation (CE), and 3DE planimetry at four locations.

The mean (range) total step-up in LVOT velocity was 105 cm/s (65-168 cm/s) and 83 cm/s (34-128 cm/s) from the SC and LAP imaging windows, respectively. Mean SC-derived peak CW LVOT velocity was significantly higher than LAP ($P<0.001$), and peak CW velocities derived from both imaging planes were greater post-stimulation ($P<0.001$). Heart rate, left ventricular end-diastolic and end-systolic volumes, and 3DE AoV area were significantly associated with SC CW LVOT velocity. Obtaining 3DE images and performing planimetric measurements of the LVOT was feasible in all dogs. The 2DE AoV area was significantly lower than that derived from 3DE ($P<0.001$). There was poor agreement between the CE-derived area and areas calculated using 2DE and 3DE, with the CE underestimating all other methods.

These results quantify the expected step-up in LVOT velocity, identify associated variables, and demonstrate that methods for determining LVOT and aortic orifice areas in dogs are not interchangeable. This information can be used for improving the accuracy of echocardiography in assessing dogs for SAS.

Presentations

Lakhdhir S, O'Sullivan ML, Côté E, Allen J, Creighton C, Stoughton W. Echocardiographic assessment of aortic velocity and effective orifice area in dogs. University of Prince Edward Island Graduate Studies and Research Conference. October 13, 2022. Oral abstract presentation.

Lakhdhir S, O'Sullivan ML, Côté E, Allen J. Two- and three-dimensional echocardiographic assessment of canine left ventricular outflow tract velocity and area. Submitted for oral abstract presentation at 2023 ACVIM Forum on January 25, 2023.

Publications

Lakhdhir S, O'Sullivan ML, Côté E, Allen J. Use of two- and three-dimensional echocardiography for assessment of the left ventricular outflow tract and aortic orifice area in dogs. Submitted to *J Vet Cardiol* Special Issue on Advanced Cardiac Imaging on December 31, 2022.

Biographical Data

Sarifa is originally from Calgary and received her Doctor of Veterinary Medicine degree from the University of Calgary in 2018, graduating as valedictorian of her class. Throughout veterinary school, she participated in several veterinary service-learning trips, including trips to Kenya, India, and northern Canada. She also served as the SCVMA representative for UCVM and chaired the annual SCVMA Symposium that was held in Calgary in January 2017.

Following graduation, Sarifa completed a rotating internship at Iowa State University in Ames, Iowa followed by a cardiology specialty internship at VERG in Brooklyn, NY. She is currently in the third year of the ACVIM-approved veterinary cardiology residency training program at the Atlantic Veterinary College and is concurrently working on her Master of Science degree. Her areas of interest in veterinary cardiology include interventional cardiology, congenital heart disease, and advanced cardiac imaging.