

# Ultrasound Diagnosis

Phiwipha Kamonrat

## History

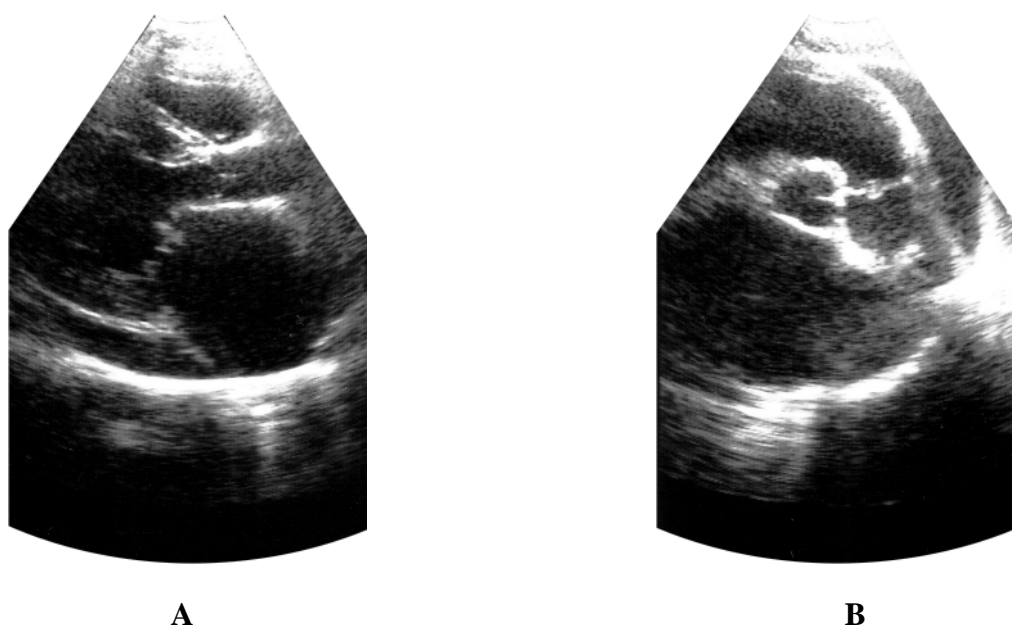
A 14-year-old, 6-kilogram-body weight, castrated, male Poodle was presented at the Chulalongkorn University, Small Animal, Veterinary Teaching Hospital with persistent cough, dyspnea and anorexia. The dog had had a cardiac treatment for 5 years. Abnormalities found on auscultation were murmur and muffled heart sounds. Complete blood count and serum biochemistry profile were within the normal range, with the exception of mild elevation of alkaline phosphatase (388 units). The blood morphology showed poikilocytosis. An electrocardiogram revealed a sinus arrhythmia. Survey thoracic radiographs revealed a left-sided heart enlargement with perihilar lung edema. An echocardiography was performed to investigate the heart chamber.

## Ultrasonographic Findings

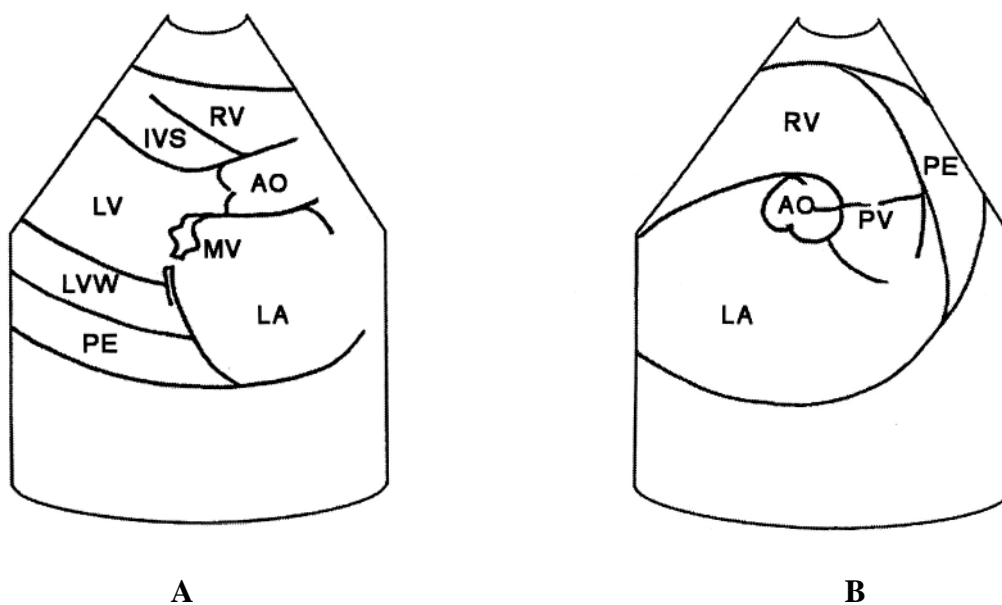
An echocardiography was performed, using a real-time scanner, with 8-5 MHz broadband, convex, phased array transducer. Two-dimensional echocardiograms, with both long and short axes, showed a marked

dilatation of the left atrial chamber (Figure 1 and 2). The left atrium-to-aortic root ratio from the right parasternal short-axis view, when the aortic valve cusps were closed, was 2.0. On the right parasternal long-axis view, the left ventricle was also dilated with bowing of the interventricular septum towards the right. The mitral valve leaflets appeared mildly thickened. The small anechoic effusion was apparent around the heart, between the pericardial sac and the ventricular wall, measured as 1.1 cm of echo-free space. Color Doppler examination through the mitral valve revealed the turbulent jet of mitral regurgitation.

An M-mode study of the left ventricle revealed a mild thickening of the left ventricular wall and interventricular septum. The left ventricular free wall diameters in diastole and systole were 6.4 and 9.9 mm, respectively. The diastolic and systolic dimensions of the inter-ventricular septum were 5.3 and 14.5 mm, respectively. The fractional shortening was slightly increased, approximately 48%.



**Figure 1** A 14-year-old, neutered, male Poodle with coughing and murmur heart sound. A. Right parasternal long-axis left ventricular outflow view showing dilation of both left atrium and ventricle as well as thickening of mitral valve. An echo-free space below the left ventricular wall, representative of pericardial effusion. B. Right parasternal long-axis view showing the increased ratio of the diameters of the left atrium and aortic root, suggesting the left atrial dilatation.



**Figure 2** Schematics of the relative positions of the structures scanned in Figure 1. LA-left atrium; LV-left ventricle; RV-right ventricle; IVS-interventricular septum; LVW-left ventricular free wall; MV-mitral valve; AO-aorta; PV-pulmonic valve; PE-pericardial effusion

## Diagnosis

Ultrasonographic diagnosis—Mitral insufficiency secondary to endocardiosis.

## Comments

Acquired mitral valve insufficiency is usually secondary to degenerative valvular disease, which causes the valve leaflets to thicken with eventual lack of proper leaflet alignment and closure. The echocardiographic characteristics of mitral insufficiency include marked left atrial dilation, left ventricular dilation, mild left ventricular hypertrophy, thickening of the mitral valve leaflets and normal or increased fractional shortening (Boon, 1998). Less common features include pericardial effusion, lack of hypertrophy and leaflet prolapse. Right parasternal four-chamber views of the heart are excellent for imaging the mitral valves. Left ventricular outflow views are also good, but the valves may appear thicker than they are if the transducer is not held properly. The use of color Doppler readily confirms the diagnosis, revealing turbulent flow across the valve and the regurgitant flow into the atrium. Bowing of the interventricular septum towards the right ventricle indicates left ventricular volume overload.

The left atrial to aortic root ratio has been used to evaluate atrial size. The most accurate method measures this ratio from the right parasternal short-axis view of the aorta and left atrium when the aortic valve cusps are closed. The internal short-axis measurement of the aorta is

made along the closure line between the noncoronary and right coronary cusps. The internal short-axis measurement of the atrium is made from a line parallel to the closure line between the noncoronary and left coronary cusps, extending across the body of the left atrium. A ratio of greater than 1.6 suggests left atrial dilation (Rishniw and Erb, 2000).

Normal values for M-mode cardiac measurements have been shown to vary with breed and body weight (Morrison et al., 1992). In normal 1.4-9 kg, Miniature Poodle, mean diastolic and systolic dimensions of both left ventricular free wall and interventricular septum are 5 and 8 mm, respectively. An average fractional shortening is 47%.

## References

- Morrison S.A., Moise N.S., Scarlett J., Mohammed H. and Yeager A.E. 1992. Effect of breed and body weight on echocardiographic values in four breeds of dogs of differing somatotype. *J. Vet. Intern. Med.* 6: 220-224.
- Rishniw M. and Erb H.N. 2000. Evaluation of four 2-dimensional echocardiographic methods of assessing left atrial size in dogs. *J. Vet. Intern. Med.* 14: 429-435.
- Boon, J.A. 1998. Acquired heart disease. In: *Manual of Veterinary Echocardiography*. J.A. Boon (ed.) Baltimore: Williams & Wilkins. 261-286.