Bulletin UASMV, Veterinary Medicine, 69(1-2)/2012
Print ISSN 1843-5262; Electronic ISSN 1843-5378

Aspects of B mode echocardiography of the Burmese Python (*Python molurus bivittatus)*

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Keywords: echocardiography, B mode, Burmese Python

Introduction. Although echocardiography is an integral part of cardiac evaluation of humans, dogs, cats or other small animals, being a useful, noninvasive technique, there are few reports of it's use in reptiles, thus the echographical limitations of the ophidian heart examination. The ophidian heart can be subject to various lesions: endocarditis, myocarditis, infarction, pericarditis, cardiomyopathy, parasitic infection and tumors (Barten and Frye, 1981, Frye, 1991a, Jacobson, et al, 1991, Hruban, et al, 1992). The diagnosis in most cases is delivered post mortem. As in mammals, echocardiography should provide a noninvasive means of evaluating cardiac anatomy and function in snakes.

B mode echocardiography, or brightness mode, uses the principle that each returning echo is displayed on the screen as a dot; the brighter the dot the higher the intensity of the returning echoes (Frye, 1994).

The Burmese Python, *P. m. bivitattus*, is one of the largest snakes in the world and one of the popular snake pets, due to their docility, therefore there is a lot of interest in obtaining ecocardiographical data regarding these animals.

Aims and objectives. The objectives of this study were the assessment of optimal approaches of echocardiography in the Burmese Python, so to identify the normal echoanatomy of the heart and the identification of possible measurements B mode for further evaluation of the normal echocardial anatomy.

Materials and methods. Six Burmese Pythons (*Python molurus bivittatus*), three males and three females, weighing between 1,4 and 18,7 kg and measuring from 1,10 to 3,3 m were echocardiographed. All animals were pets and were brought to consult upon owner agreement. The snakes were each held both in ventral and dorsal recumbency, with no anesthesia necessary. A Mindray DC-6 unit ultrasound, equipped with a 7,5-10 MHz linear probe and 5-7,5 MHz phased- array transducer was used. Ventral and right intercostals approaches were used for the evaluation in B mode. The heart was located by visualization of movement of the ventral scutes over the heart and by palpation. Two-dimensional echocardiographic images were obtained by placing the transducer head directly on the ventral midline over the heart or laterally, on the right intercostals space corresponding to the heart. Long axis (sagittal) images were obtained by aligning the ultrasound beam with the long axis of the snake on the midline and then angling the head to the right and then left (ventral aproach) and smooth lateral movements (intercostals aproach). While maintaining the midline position, the transducer head was rotated 90‘ from the midsagittal plane and angled cranially from the apex to the base of the heart to obtain the short axis (transverse) images. Real-time images and videos were stored.

Results and Discussion. Using the ventral approach, short-axis and long axis sections were obtained. Transventricular and subarterial short axis sections were analised, assessing the ventricle and the origin of the great vessels respectively. The Doppler image of the transventricular section shows mixed arterial and venous blood going out during the systole. Long axis sections permited the evaluation of the ventricle with the cavum arteriosum and cavum pulmonale, the left atrium, the pulmonary trunk and the aortic arch and visualization of the atrio-ventricular valvae. The right intercostal approach permitted further more evaluation.

With the short axis view, most of the anatomical characteristics of the ophidian heart could be observed: from the ventricle myocardium in both systole and dyastole to the two atria, the pulmonary trunk and aortic arches and the sinus venosus. Long axis intercostals evaluation offered echoanatomical information regarding the pulmonary trunk and the aortae, the ventricle with it's septae and the left atrium. This view also offers data regarding the blood flow from the ventricle to the three vessels. Although some authors (Schillinger et al, 1996) suggest that the ventral approach to both types of evaluation, short and long axis, permits a better evaluation of the ophidian heart, we find that the intercostals approach provides more echoanatomical data, with the benefit of comfort for the animals (physiological ventral restraint). Because of the fact that the ophidian heart shows two types of movements, the systolic movement, characteristic in all animals, and also an "up and down" movement, due to the fact that the heart is not suspended by any ligament in the body, we can presume that no measurements in B mode are exact, but purely informative. We have not used immersion of the animals body in water, like some authors suggest (Snyder P., 1999) and believe that a good quantity of acoustic gel is enough for the echocardiac evaluation.

Conclusion. In general, both the ventral window and the intercostals window provide a nearly complete echocardiographic evaluation of the ophidian heart, but, due to the fact that the animal can be in a ventral recumbency, lowering the stress factor, the intercostal approach is more useful. For a good assessment of the two atria, as well as the single ventricle, the three cava, pericardium, sinus venosus, arterial efference and venous afference, both projections, short-axis and long-axis, should be used. B mode evaluation offers an overview of the ophidian heart echoanatomy and pathology, one snake in the study presenting evident wall pathological enlargement.

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