ULTRASOUND IN REPTILES
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Abstract: Ultrasound is a very helpful diagnostic tool in reptiles especially for investigation of ovary function, in cases of egg binding, and in working up liver and kidney disease.

Key words: ultrasound, reptiles, ovarian follicles, kidney, liver

INTRODUCTION

Radiographic examination and interpretation of reptiles is often more difficult due to the presence of an exoskeleton or epidermal scales (Schildger, et al, 1996). As a noninvasive examination, an ultrasound is a very helpful and stress free method for diagnosis as compared to other more invasive techniques such as venipuncture or endoscopy (Gobel, et al, 1990). The organs in the coelomic cavity can be visualized and differentiated by their specific ultrasonographic texture.

It is very important to know the normal anatomy of the species you are dealing with when interpreting the image produced by the ultrasound.

MATERIAL AND METHODS

In our clinic we use the Scanner 200 (Pie Medical, The Netherlands; in Austria mir medical instruments marketing gmbh), the two probes which are used in reptiles are 5/7.5 megahertz (MHz) convex and 7.5 MHz linear transducer using real time (B mode) scanning. The material is documented either using a video recorder or by video printer. For chelonians, depending on the size of the animal, either the 5 MHz convex or the 7.5 MHz linear are used with an acoustic stand-off to provide adequate contact in the inguinal and pre-femoral window for visualization of the caudal organs of the coelomic cavity. As a stand-off we use an investigation glove filled with acoustic coupling gel. In snakes we use a 7.5 MHz linear transducer and for lizards depending on the size of the patient and examination, either transducer can be used (Schildger, et al, 1994).

Most animals will tolerate ultrasonographic examination in either lateral or dorsal recumbency without anesthesia. In lizards and snakes, ultrasonography may not be possible just prior to ecdysis due to air between the layers of the cutis. Ultrasonography is also not possible in species with ossified scales (i.e., Tiliqua spp, Heloderma spp). Also it is very difficult to examine the coelomic organs in some snakes and lizards because the lungs can reach almost caudal to the pelvis.
As in small animals a special order of investigation should be performed (Nyland and Mattoon, 1995). For example, in snakes due to the longitudinal positioning of their organs along the body axis the procedure should start cranially beginning with the heart and end with the cloaca. Alternatively, in some patients it is possible to start at the midline with the liver and the gallbladder and then scan for other organs in a certain order. In chelonians due to the presence of the shell there are only three ultrasonographic windows on each side: between the neck and forelimb, caudal to the forelimb and cranial to the hind limb (Penninck, et al, 1991).

The reptilian heart has three chambers with a right and left atrium and a single ventricle. The heart muscle is much smaller than in mammals and the valves can be identified as highly reflective ribbons. Fluid in the pericardium or storage of uric acid in visceral gout can be visualized. The liver in snakes can be located from just caudal to the heart to the middle of the body with the gall bladder positioned further caudally. In chelonians and lizards the liver is bilobed, the right lobe is larger and the anechoic gallbladder is attached to it. The structure of the liver is homogeniously hypoechoic with anechoic vessels. Compared to the fat body, the liver is less echoic and has no septa (Pennick, et al, 1991; Schilder, et al, 1994). Pathological changes can be seen as changes in size, reflexogenicity (higher or lower), and local or general changes of the texture of the organ. The size of the fat bodies depend on the shape of the animal. They lie on both sides of the coelom and extend from the pelvis to as far cranially as the heart. The fat bodies are more hypoechoic than the liver with a granular structure and the typical hyperechoic septa..

The spleen can be only visualized in larger snakes as a circular shaped organ with higher echogenicity than the liver. It is located caudal to the liver and cranial to the gonads (Sainsbury and Gill, 1991). The gonads can be easily visualized when they are large such as in gravid females. In males it is difficult to find the testicles without special scanners. Some authors perform the transintestinal sonography, with special scanners for sexing birds and reptiles (Hildebrand, et al, 1997). The testicles are located cranial to the kidneys and show less echoic pattern than the kidneys. The size of the ovary depends on the stage of the female reproductive system and range from the size of the spleen to filling the entire coelomic cavity. The ovaries are anechoic in snakes and lizards and in chelonians they show up as hyperechoic round structures. The round shaped follicles elongate in the uterus and are surrounded by a highly echoic wall. In chelonians the inner layers of the egg can be distinguished as a nonechogenic layer of albumin, and in the center the hyperechoic yolk. The shell can prohibit further investigation of the egg depending on the amount of calcification due to the acoustic shadow. In lizards and snakes the eggs seem to contain two layers, the upper layer consists of the anechoic albumin and the lower layer is the highly echoic yolk. In ovoviviparous snakes the embryo can be visualized.

The kidneys are located caudal to the gonads. In lizards they are located within the pelvis but if they are enlarged, they can be seen cranial to the pelvis. In snakes the right kidney is located cranial to the left kidney and they are cylindrical in shape. On ultrasound they show a homogenic texture with a higher echoic structure than a fat body and a granulated structure. There is no distinction between the renal sinus, medulla and cortex as seen in mammals (Tenhu, et al, 1995).

The urinary bladder is located ventrally in the caudal section of the coelomic cavity. It is thin walled with anechoic contents. The anal bladder appears as a round or oval structure depending on the contents and is either anechoic or hyperechoic. The uric acid particles appear as snowflakes or as conglomerated hyperechoic structures. Pathologically there can be eggs distinguished in the anal sac.
The image created by the intestine varies very much, depending upon whether the reptile is herbivorous or carnivorous. In carnivores the stomach is very large with longitudinal folds and the intestines are smaller and shorter. In herbivores the stomach is small with a thin wall and the intestines are elongated and show mucosal folds. The typical five layers of the intestine can only be distinguished in larger specimens. Sometimes it is possible to detect foreign bodies in the stomach or the intestines with the typical sonographic changes depending on the composition of the foreign bodies (e.g., needles) (Schildger, et al, 1994; Hildebrand, et al, 1997).

DISCUSSION

Ultrasound helps to clarify suspected abdominal masses shown on radiographs. In cases where ascites is present it acts as a "contrast medium" allowing the inner organs to be investigated more efficiently using ultrasound. For the investigation of ovary function ultrasound is a very good noninvasive procedure. Especially in patients with a history of eggbinding, the shape of the ovary or the eggs can lead to an accurate diagnosis (e.g., pre-ovulatory egg binding in iguanas) and to the correct treatment. In these cases ultrasound can replace radiology. The detection of structural abnormalities in the liver or the kidneys is an additional advantage of this procedure. Only in a few species and in some special situations (e.g., gas in the intestine or coelomic cavity, ecdysis) it is not possible to perform this diagnostic technique. Since ultrasound is a moving image some clinical cases can be demonstrated by video performance.

REFERENCES


