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Coelomic Ultrasound in Avian Patients

Dr Katrina Garrett
The University of Queensland Veterinary Medical Centre
Cnr. Main Drive and Outer Ring Road, Gatton Campus
Gatton Qld 4343 Australia
k.garrett@uq.edu.au

Introduction

Traditionally, coelomic ultrasound in birds is thought to be inhibited by the location of the air sacs and radiography has been the mainstay of the diagnostic investigation for coelomic distension. However, many conditions causing coelomic distension (such as organomegaly or coelomic effusions) cause displacement or compression of the air-sacs, aiding sonographic examination of the coelom.

A thorough systematic approach is essential for ultrasound of the avian coelom. Images should be optimised through correct probe selection and use of controls such as depth, focus and gain. Each organ should then be systematically evaluated in two planes, making note of any abnormalities as they arise.

Transducer selection: The range of frequencies of probes available for use in abdominal ultrasound in avian patients ranges from 1 megahertz (MHz) to 18 MHz. Higher frequency probes have increased image resolution resulting in greater image quality however the trade-off is depth. As the frequency of the probe increases, the depth to which you can image will decrease. Therefore, as a rule of thumb, select the highest frequency probe you can to reach the required depth. The size of the "foot print" (coupling surface) of the probe should also be taken into consideration and curvilinear probes are usually more useful than linear probes due to the smaller size of the transducer head.

As a general guideline, an 8 MHz curvilinear probe will provide good images in a most avian patients.

General Principles

Each time you image an organ you should optimise your image using the following controls:

Depth: The images are not displayed in real size; adjust the depth to the organ of interest so that it fills the screen. Refer to the cm marker on the side of the screen.

Focus: The best resolution is displayed for structures in the focal zone, therefore set the focus to the level of the organ you are examining.

Gain: Controls the overall brightness of the image; usually multiple adjustments are required during the examination.

Time-Gain Compensation: Adjusts the gain at individual depths. Used to compensate for sound beam attenuation and even out the brightness of the image.

Frequency Adjustment: Changes the frequency on multi-frequency transducers.

Dynamic Range: Increases or decreases the number of grey shades depicted

Patient Preparation

1. **Plucking**: usually not required as the apterylae (featherless tracts) are used or the feathers can be parted.
2. **Alcohol** (methylated spirits): although commonly used in cats and dog, this is not routinely used due to potential to cause hypothermia and intoxication.
3. **Fasting**: usually not performed.
4. **Sedation**: most patients are not sedated or anaesthetised for the examination and are manually restrained, however this does depend on temperament and stress.

Birds with dyspnoea or coelomic distension should be examined in an upright position. Use of both lateral approaches (caudal to the last rib, examined from left and right sides) and ventromedial approach (between the sternum and pubis) enables more

thorough examination of the coelom.

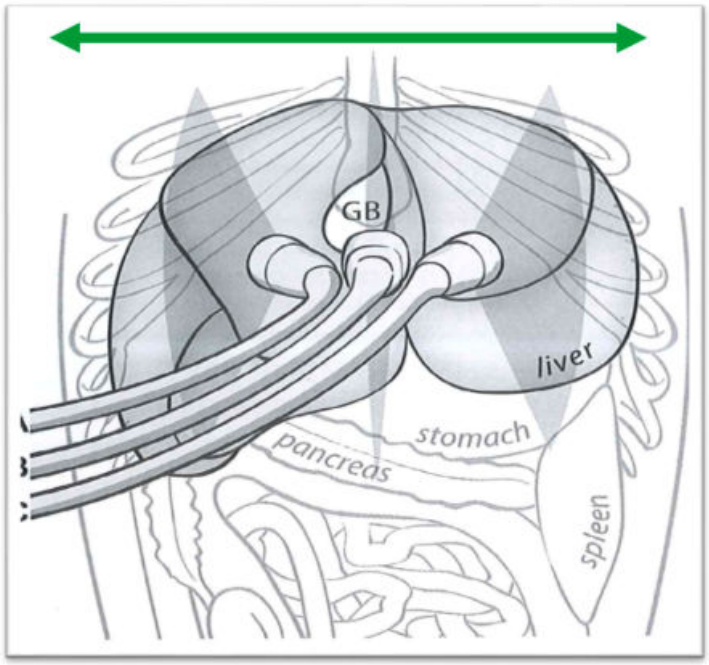
Systematic Approach to Coelomic Ultrasound

It is important to have a thorough and systematic process to performing an ultrasound examination. One approach is:

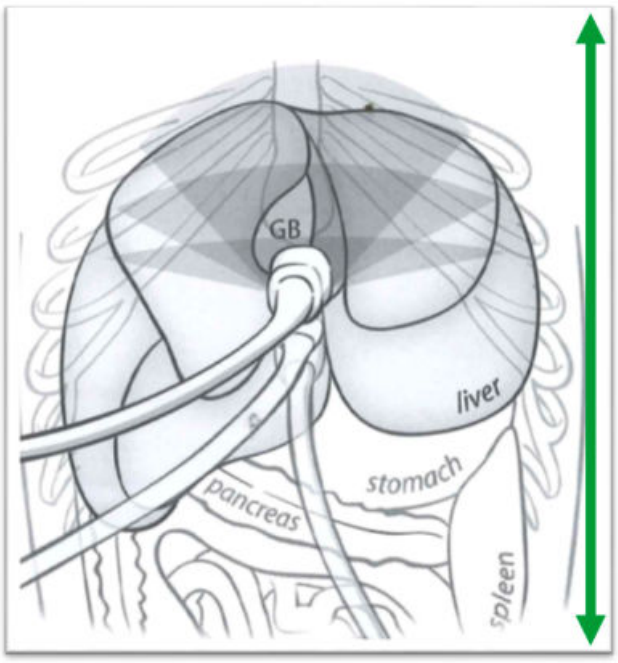
1. Liver and gall bladder
2. Cardiovascular structures
3. Urogenital tract
4. Gastrointestinal tract and pancreas

As each organ is scanned, consider:

- Size
- Shape
- Margins
- Number
- Echogenicity
- Echotexture
- Position/location
- Function



Sagittal plane, liver



Dorsal plane, liver

From Penninck D and d'Anjou M (2015)

Organs should be scanned in two planes (long and short axis). First start in the sagittal plane and fan through the organ from side-to-side (medial to lateral) until the organ has been examined completely. Then rotate the probe 90 degrees (anti-clockwise) and fan through the organ again (from cranial to caudal) in the transverse or dorsal plane.

Tips on Examining Structures

Urogenital tract: Most birds have one ovary and one oviduct, located on the left side of the coelom. However, birds of prey have two ovaries and two oviducts and the New Zealand Kiwi has two ovaries and one oviduct. Common condition affecting the reproductive tract include pyometra, salpingitis, egg-yolk peritonitis, retained eggs and ovarian neoplasia. Ultrasound is a useful tool in identifying these conditions.

Liver: is normally easily accessible and this organ can be examined for common conditions such as hepatic lipidosis (often secondary to high-fat diet) and also less common conditions such as other inflammatory /infectious or neoplastic disease. The gall bladder is usually identified from the right lateral approach.

Spleen: is usually not readily identified unless enlarged. When enlarged, the spleen is frequently round or oval in shape and best identified from the lateral approach, immediately caudal to the liver.

Kidneys: are usually not visualised unless enlarged as they are located dorsally within the depressions of the pelvis and covered by air-sacs.

Cardiovascular structures: Echocardiography is an excellent test for cardiac evaluation in birds. The approach to this has been described by Krautwald-Jung-

hanns et al. (1995)1 using an apical four-chamber view and apical longitudinal view from the ventromedial approach, and the lateral four-chamber view and transverse view from the lateral approach. Conditions identified in the Gatton VMC include dilated cardiomyopathy and pericardial effusions.

Gastrointestinal tract: Sonographic examination of the crop is often unrewarding due to acoustic shadowing from grit, however a fluid-filled crop can be more easily examined. The ventriculus is usually visualised from the lateral approach on the left side, then re-examined from the right lateral approach and the descending duodenum traced. The pancreas lies adjacent to the descending duodenum; identification of the pancreaticoduodenal vein can facilitate identification. The jejunum can be assessed by a quadrant-to-quadrant search, similar to other small animal patients. Examination of the cloaca is best approached from the ventrocaudal aspect.

References

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