

Ultrasound technology continues to advance, offering veterinary practitioners a safe and cost-effective diagnostic tool that can be applied in a wide range of clinical scenarios.

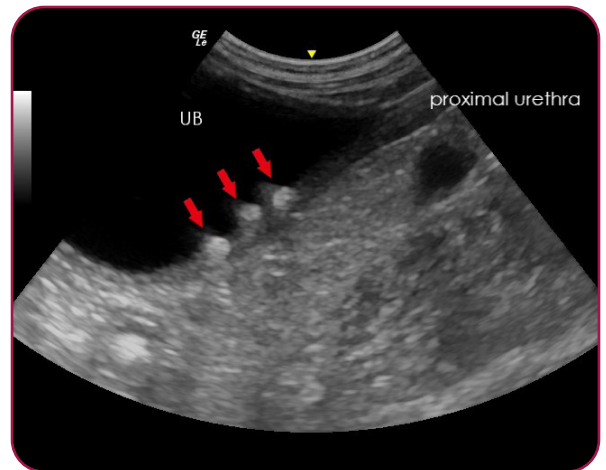
The scope of clinical applications for ultrasound is very wide but we can begin to examine some of the uses for sonography by thinking **ULTRASOUND**.

## **U**-is for urinary tract and many other body systems.

Where presentation, clinical exam and initial tests indicate problems in a specific area, ultrasound can provide a means of quickly assessing the anatomy involved.

Some common system specific ultrasound examinations are:

- Gastro-intestinal tract – foreign bodies, inflammatory bowel disease, neoplasia
- Hepato-biliary system – neoplasia, diffuse and focal hepatopathies, cholecystitis and cholelithiasis
- Spleen – Splenic torsion, neoplasia, parenchymal changes
- Urinary tract – Urolithiasis, cystitis, neoplasia
- Vascular system – Thromboembolism, neoplasia, quantifying blood flow to organs and pathological changes



*This image shows the urinary bladder (UB) containing multiple calculi (red arrows).*

## **L**-is for limbs or the musculoskeletal system.

Ultrasound can provide detailed images of soft tissue structures and is complementary to other techniques such as radiography when investigating musculoskeletal conditions.

- Identify pathology and track healing in tendons, ligaments and muscles
- Examine the surface of bony structures for changes
- Assess articular structures such as cartilage, collateral ligaments and menisci
- Guide needle placement for therapy and sampling



*This image shows the tendons and ligaments within the proximal metacarpal region of a horse's right forelimb.*

## T is for triage in emergencies.

In emergencies, ultrasonography can be used to rapidly gain information with less risk of compromising the patient compared to other imaging modalities.

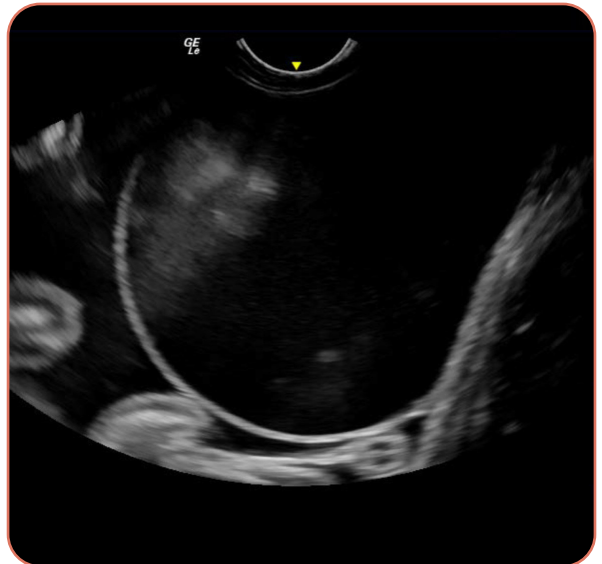
In small animal patients, ultrasound can be used to rapidly and accurately:

- Assess body cavities for the presence or absence of free fluid or haemorrhage
- Assess the thorax to aid detection of pneumothorax and pericardial effusion
- Semi-quantify the changes present and, as ultrasound is easily repeatable, it allows for serial monitoring to be performed

In equine patients, ultrasound can be used for local abdominal assessment to:

- Evaluate intestinal position and motility
- Assess intestinal content, wall thickness and distension
- Identify free fluid

*Ultrasound can be used to rapidly identify the fluid surrounding the bladder and small intestine in this patient.*

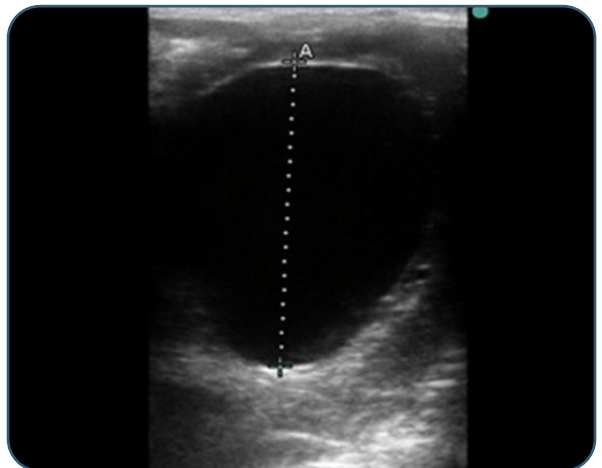


## R is for reproduction in equine patients.

The portability and image quality of modern ultrasound systems make them ideal for use in equine reproductive management. Ultrasound has improved reproductive efficiency and is an essential part of artificial insemination (AI) and embryo transfer programs.

- Pre-breeding reproductive assessment
- Monitoring ovarian activity can help guide effective breeding and the timing of AI
- Investigate behavioural and hormonal problems
- Early detection of pregnancy and management of twin pregnancies

*Ultrasound allows the evaluation of ovarian activity and the assessment of follicle size, as in this image showing a 55mm follicle.*



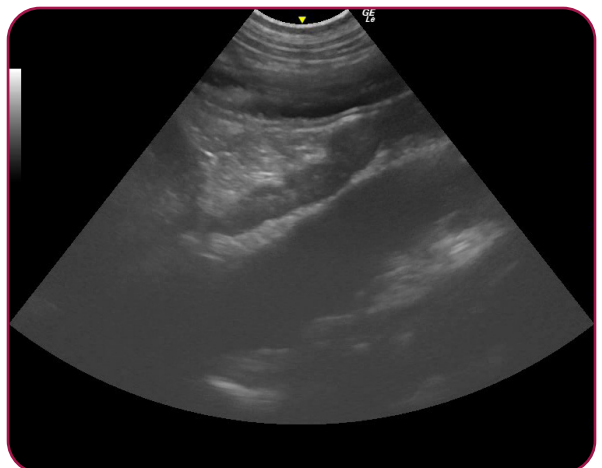
## A is for abdomens in multiple species.

The versatility and additional diagnostic tools that ultrasound offers has seen an ultrasonographic examination become a part of the baseline medical evaluation for many species.

A structured and thorough evaluation of the abdomen can provide a large amount of information to the clinician and can be applied in many scenarios, including the investigation of:

- Palpable abdominal masses
- Abdominal pain
- Lethargy and weight loss
- Vomiting and diarrhoea
- Suspected endocrine diseases
- Changes detected on haematology and biochemistry
- Polyuria and polydipsia

*In this image, the left adrenal gland can be visualised.*

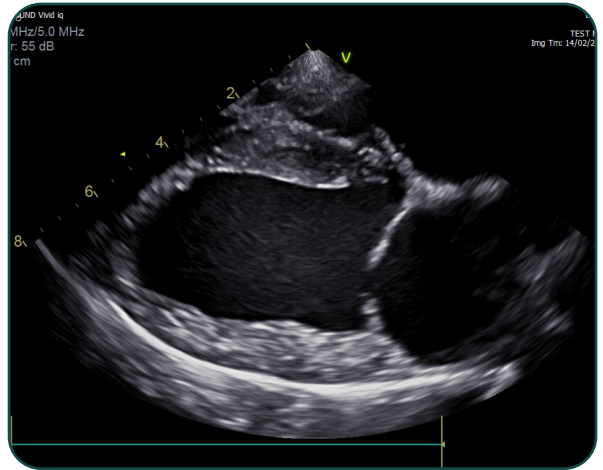


## S-is for strange sounds or the investigation of heart murmurs.

Echocardiography allows clinicians to gain detailed, real-time images of the heart and surrounding structures. Using a phased array transducer capable of continuous wave Doppler ultrasound can allow accurate measurements of higher velocity blood flow.

- Assess pericardial structures and identify pericardial effusions
- Examine the structure and function of cardiac chambers and valvular structures
- Quantify chamber size and document blood flow patterns and velocities through the use of Doppler ultrasonography
- Identify the source of heart murmurs and the location of cardiac abnormalities

*This right parasternal long axis image of the heart provides detailed information on the left ventricle, left atrium and mitral valve.*

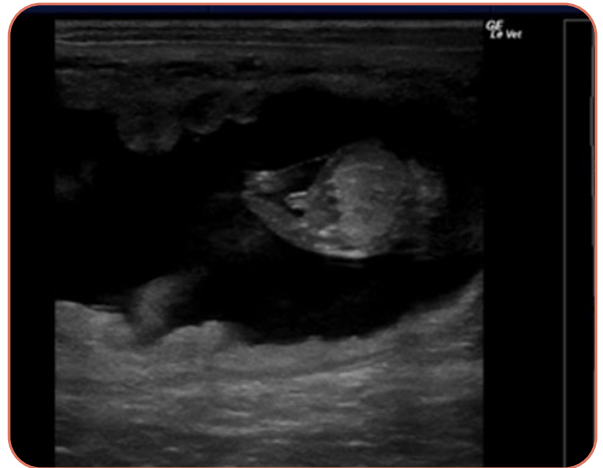


## O-is for obstetrics.

As is the norm in human medicine, ultrasound is an excellent tool for the detection and monitoring of pregnancy in all species.

- Early detection of pregnancy so that appropriate management and forward planning can be instigated
- Identification of abnormalities and changes, allowing early intervention
- Gestational ageing and quantification of foetal numbers
- Monitoring foetal viability throughout pregnancy
- Can facilitate foetal sexing in some species

*In this image part of a 72-day equine foetus can be seen.*

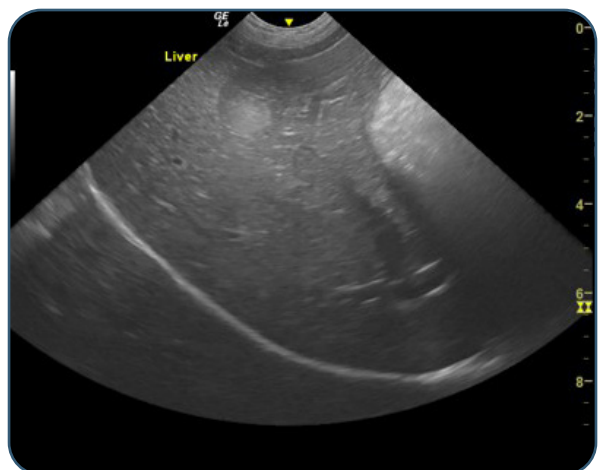


## U-is for ultrasound guided sampling.

Using ultrasound during tissue sampling techniques allows for real time monitoring of needle placement, aiding accuracy, and improving safety. Samples can be obtained more quickly with a better chance of achieving a diagnostic sample.

- Prior assessment with ultrasound and Doppler functions can help plot the safest route to the area to be sampled
- Ultrasound can guide needles to focal lesions within larger organs such as the liver and spleen
- As well as for diagnostic samples, ultrasound guidance can aid therapy in:
  - Cystocentesis
  - Thoracocentesis
  - Cholecystocentesis
  - Synoviocentesis

*Ultrasound can help accurate needle placement for fine needle aspiration or biopsy of these liver lesions.*

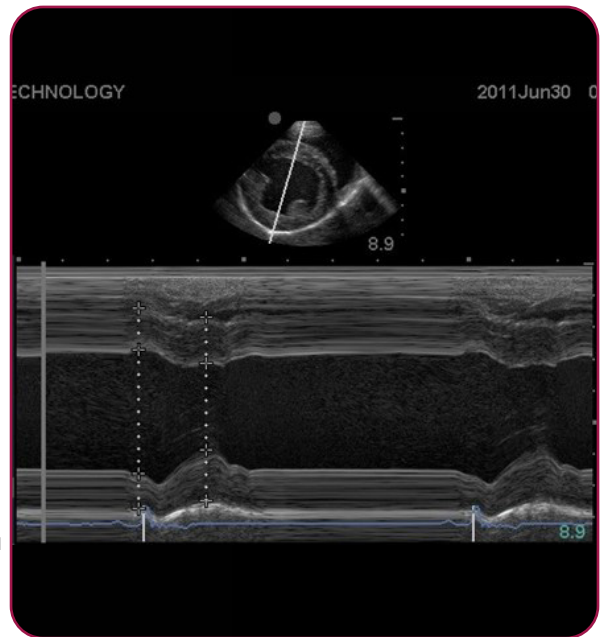


## N is for numbers or measurements.

Ultrasound systems provide a suite of diagnostic tools that can be used to quantify changes in a wide range of clinical scenarios.

- Ultrasound can measure the depth and size of anatomy and, where reference ranges exist, these can be compared to normal. Some examples include:
  - Gastrointestinal wall measurements
  - Gall bladder wall
  - Urinary bladder wall
  - Lymph node size
  - Adrenal size
  - Renal size
- Measurements can be used to document progression of changes through serial ultrasound assessment
- M-mode imaging can aid accurate quantification of chamber size in the heart and help assess systolic and diastolic function
- Some measurements obtained by ultrasound can be essential in informing therapeutic decisions such as left atrial to aortic ratio in dogs with myxomatous mitral valve disease

*An M-mode image of the left ventricle taken at the level of the papillary muscles.*

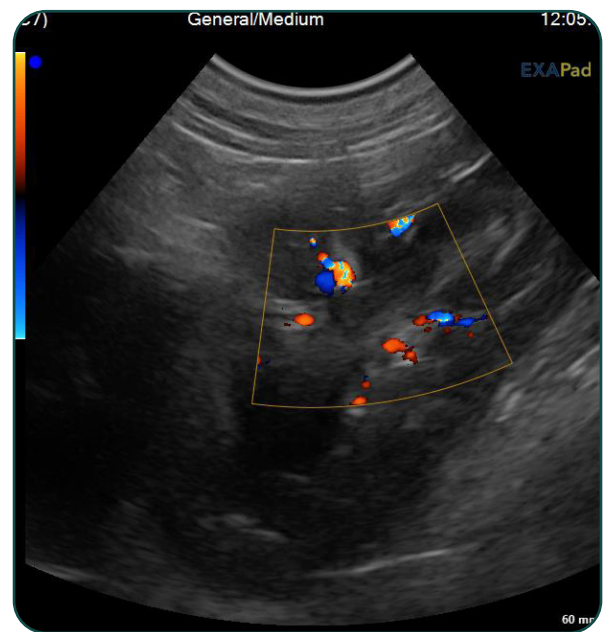


## D is Doppler.

Doppler ultrasonography allows the quantification of blood flow velocity and can be used to visualise blood flow to organs and pathology. Modern ultrasound systems are capable of multiple Doppler modes including colour, power and pulsed wave Doppler, all of which offer different ways of assessing blood flow.

- Document the presence or absence of flow to organs and lesions. For example, this can help to establish the vascularity of a neoplastic lesion or the absence of flow in an area affected by thromboembolism
- Doppler modes can help to identify smaller structures close to vessels by highlighting the vasculature
- The pattern and velocity of blood flow can be examined. This is an important part of echocardiography examinations as well as where vascular abnormalities are present such as portosystemic shunts
- Visualisation of blood flow can aid planning - blood vessels can be avoided when acquiring samples and vascular invasion by neoplastic lesions can be documented

*In this image, Doppler ultrasound allows the visualisation of blood flow within the left kidney.*



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