imaging academy

Ultrasonography in Colic Patients
FLASH scanning

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Background

Abdominal pain or 'colic' is a common emergency presentation for horses, which encompasses a wide range of conditions with very different prognoses and treatment protocols. In so-called 'surgical' colic cases, a fast diagnosis and referral to a hospital is vital for a successful outcome. However, achieving a fast and accurate diagnosis is not always easy using history, physical examination and per-rectum palpation alone. Peritoneal fluid analysis and abdominal ultrasonography both provide important additional information and form part of the routine diagnostic investigation of horses with colic in referral hospitals. Haematological and biochemical analysis is not readily available and results are usually slow, so integrating this into the first line of investigation by ambulatory practitioners is often impractical. However, ultrasound equipment is increasingly portable and provides practitioners with the ability to perform a simple, additional diagnostic test which can provide valuable information and potentially improve patient outcomes. It is of particular value in horses where small patient size, temperament, or advanced pregnancy does not allow per-rectum examination.

What does the research say?

Transabdominal ultrasonography accurately identified small intestinal obstruction[1] and was better than per-rectal palpation at predicting small intestinal obstruction that was subsequently confirmed at surgery.[2] Ultrasonography can distinguish between non-strangulating and strangulating small intestinal pathologies and therefore help in the decision-making process when a horse requires surgical intervention.[3] Intestinal wall thickness can be measured reliably[4] and large colon strangulating volvulus can be identified.[5,6] In a retrospective study, transabdominal ultrasonography performed in horses with small intestinal strangulation had 100% sensitivity, specificity, PPV and NPV.[7] In the same study, per-rectum palpation had only 50% sensitivity but 98% specificity, revealing that ultrasonography is more accurate for detecting strangulating lesions of the small intestine than per-rectum evaluation. Busoni et al. (2011) described and evaluated the diagnostic accuracy of Fast Localised Abdominal Sonography of Horses, a 'FLASH' protocol in horses referred with colic.[8] The examination, performed by inexperienced clinicians, took approximately 10 minutes and yielded good to excellent sensitivity (80%), specificity (96%), positive predictive value (PPV; 89%) and negative predictive value (NPV; 93%).

What is a FLASH examination?

Fast Localised Abdominal Sonography of Horses, or FLASH, does just that- it is a rapid, focussed abdominal scanning technique for abdominal emergencies. The aim is to identify major abdominal abnormalities that require fast surgical intervention or intensive care. It is easy to perform; all you need is the essential equipment, fundamental scanning knowledge, to know what 'normal' looks like, and a guide to the protocol.

How to perform a FLASH examination[8]

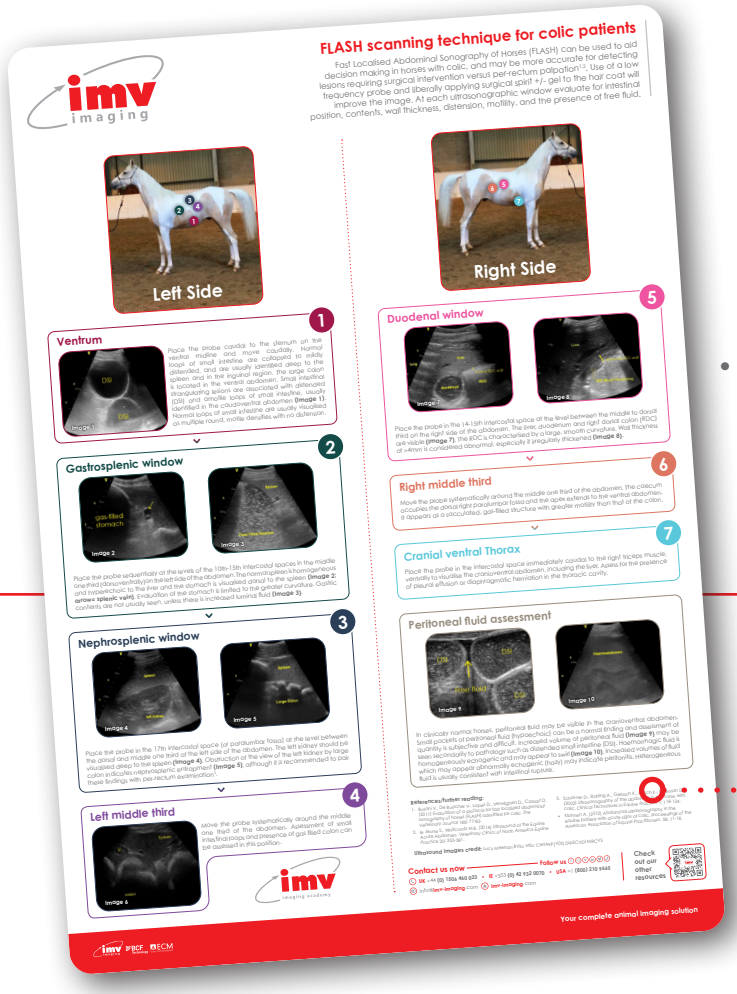
Get prepared

Equipment

- **Ultrasound scanner**
- **Transducer –** a low frequency convex transducer will give the best images because it has the greatest potential depth of penetration and a wide field of view. However, important information can still be obtained with a linear transducer set at the lowest frequency setting, depending on the size of the patient.
- **Isopropyl alcohol** is applied liberally to the area being scanned. Remember to gently wash it off the transducer after the examination to avoid degradation of the rubber footprint.
- **Clippers –** clipping of the hair coat is usually only required for very hairy patients.

Before you start

- **Know what normal is.** You should either have reference images with you to compare with, or ideally, you will have practiced this technique on a few normal horses before using it in an emergency situation. Make sure that you know where structures should normally be located, what they look like, and how they move.
- **Ultrasound machine: input patient details and optimise your image** for abdominal imaging. The settings that you should optimise include
  1. **Presets –** choose an abdominal scanning present, if you have one);
  2. **Depth –** increase the depth appropriately, indicated by the scale to the side of the image. For example, if you want to see something that is 20cm deep into the abdomen, then make sure the depth is set to at least 20cm);
  3. **Frequency –** lower frequencies will give a greater depth of penetration, which is required for equine abdominal imaging);
  4. **Focal point –** this should be moved to the far field for a FLASH scan);
  5. **Gain and TGC –** alter these so that the image is an even, appropriate brightness).
- **Prepare the patient.** Brush off any dirt or debris and apply isopropyl alcohol liberally so that the coat in the regions to be scanned is saturated. Acoustic contact gel can be applied if desired, but is not necessary. This is a non-invasive procedure that is normally well tolerated.



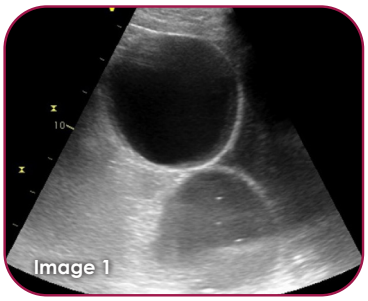
Have you got your quick reference guide at hand?

Follow **info-international.imv-imaging.com/equine-veterinarian-clinical-resources** to download you free FLASH scanning poster.

How to perform a FLASH examination[8]

Ventrum

1



Place the transducer just caudal to the sternum on the ventral midline and slide caudally to the inguinal region. A small volume of anechoic peritoneal fluid located just caudal to the sternum is normal. Large volumes, echogenic fluid, or swirling fluid are abnormal. Normal loops of small intestine are collapsed to mildly distended, with a wall thickness of < 3mm and a total diameter of < 3cm. They are usually motile and it can be hard to make out individual loops in normal horses. The large colon is also located in the ventral abdomen. Small intestinal strangulating lesions are associated with distended (round) and sub-motile or amotile loops of small intestine, usually identified in the caudoventral abdomen **(Image 1)**. The wall of strangulated small intestines may be congested and appear thickened (>3mm). It is not unusual for an increased volume of peritoneal fluid to also be observed.

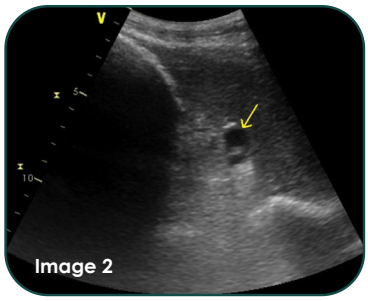
Left Middle Third

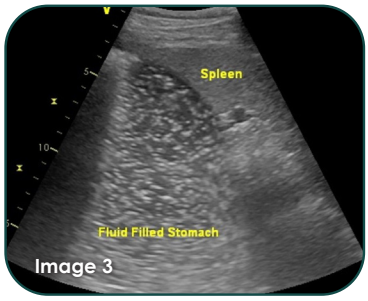
2

Move the transducer systematically around the middle one third of the abdomen, i.e., by sliding the transducer from cranial to caudal in a grid pattern, followed by dorsal to ventral sliding in a grid pattern. Assessment of small intestinal loops and presence of gas filled colon can be performed in this position.

Gastrosplenic Window

3

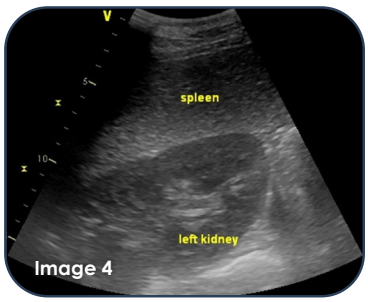


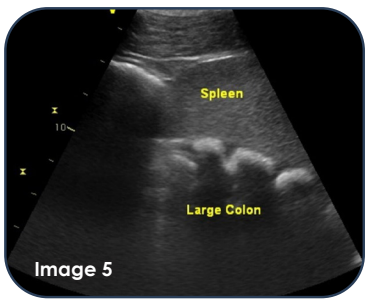


Place the transducer sequentially at the levels of the 10th-15th intercostal spaces in the middle one third (dorsoventrally). The normal spleen is homogeneous and appears hyperechoic relative to the liver. The stomach is visualised dorsal to the spleen **(Image 2; arrow= splenic vein)**. Evaluation of the stomach is limited to the greater curvature. The stomach does not normally extend beyond the 13th rib. Gastric impaction may cause extension of the stomach caudal to the 13th rib. The gastric wall is <1cm thick and the layering can be appreciated. Gastric contents are not usually seen, unless there is increased luminal fluid **(Image 3)**, which would indicate the presence of reflux, and a nasogastric tube should be passed.

Nephrosplenic Window

4



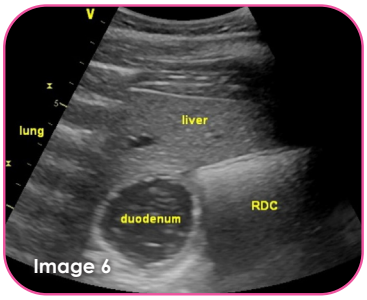


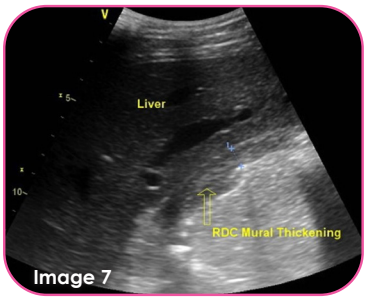
Place the transducer in the left paralumbar fossa at the level between the dorsal and middle third of the left side of the abdomen. The left kidney should be visualised deep to the spleen **(Image 4)**. There should be good corticomedullary demarcation and no abnormal anechoic areas indicating possible distension of the renal pelvis with fluid. The large colon with its associated 'gas shadow' caused by acoustic shadowing artefact may be seen caudally in this window. Obstruction of the view of the left kidney by large colon indicates nephrosplenic entrapment **(Image 5)**, although it is recommended to pair these findings with per-rectum examination.[2]

How to perform a FLASH examination[8]

Duodenal Window

5

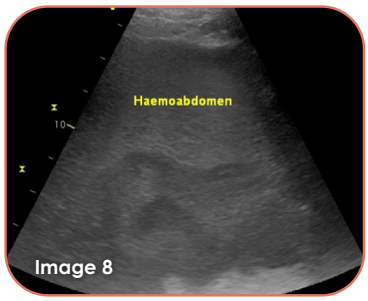




Place the transducer in the 14-15th intercostal space at the level between the middle to dorsal third of the abdomen. The liver, duodenum and right dorsal colon (RDC) are normally visible **(Image 6)**. The RDC is characterised by a large, smooth curvature. Wall thickness of >4mm is considered abnormal, especially if irregularly thickened **(Image 7)**.

Right Middle Third

6



Move the transducer systematically around the middle one third of the abdomen. The caecum occupies the dorsal right paralumbar fossa and the apex extends to the ventral abdomen. Small pockets of peritoneal fluid (hypoechoic) can be a normal finding and assessment of quantity is subjective and difficult. Haemorrhagic fluid is homogeneously echogenic and may appear to swirl **(haemoabdomen; Image 8)**. Heterogeneous fluid is usually consistent with intestinal rupture.

Cranial Ventral Thorax

7

To complete the examination, place the transducer in the intercostal space immediately caudal to the right triceps muscle, ventrally, to visualise the cranioventral abdomen, including the liver.

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Ultrasound image credit

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