

ULTRASONOGRAPHY OF THE NEONATAL FOAL

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Umbilical remnants

Transducer selection: 6 to 10 mHz

Structures: umbilical vein from stump to liver, urachal sheath, umbilical arteries.

Study: Enlargement of these structures (vein and arteries are generally less than 1 cm diameter, the urachal sheath is generally less than 1.8 cm diameter) should be noted. Enlargement due to fluid accumulation should be differentiated from enlargement due to fibrous thickening. Fluid accumulations within any of these structures may represent infection, however seromas (loculated anechoic fluid) may be identified dorsal to the urachus or sometimes within the urachal sheath presumably as a result of birth trauma). Fibrous tissue thickening of any of these structures does not necessarily indicate infection or inflammation.

We rarely perform umbilical remnant resections; affected individuals can be treated successfully medically and ultrasonography can be used to monitor response to therapy.

The apex of the bladder as it communicates with the urachal sheath can be examined in long axis for evidence of a diverticulum, which may be associated with stranguria in the foal.

Urinary tract

Transducer selection: 5 to 6 mHz

Structures: bladder, urachus, peritoneal contents, kidneys

Study: The degree of bladder distension and tone is easily appreciated on ultrasound (a flaccid appearance to the bladder is not uncommon with bladder rupture, however a small tear at the urachus may not result in deformation of the bladder). The site of disruption is not readily apparent in most cases. Examination of the urachus in urachal disruption may reveal edema of the urachus, or evidence of infection. Peritoneal fluid quantity and echogenicity can also be easily assessed (typically foals with uroperitoneum have anechoic effusions, however transient mild anechoic effusion has been observed in ultimately normal foals).

Primary renal disease is uncommon in the foal, however ureteral ectopy can be associated with hydroureter, hydronephrosis, and renal dysplasia, which may be detected sonographically. In most cases however hydroureter, hydronephrosis, and changes in renal architecture may take time to develop.

Gastrointestinal tract

Transducer selection: 5 to 6 mHz

Structures: stomach, small intestine, colon, peritoneum

Study: Although foals presenting with abdominal pain in the neonatal period infrequently have disorders requiring surgery, ultrasonography can be used to support the clinician's diagnosis. However, gastric and small intestinal distension with ileus can be identified in neonatal foals with enteritis and may be difficult to differentiate from mechanical obstructions. Fortunately in most cases of enteritis, loops of fluid filled small intestine with increased motility are more commonly observed. Intestinal thickening is not specific and can be seen with edema or inflammation due to any cause. Small intestinal intussusception is more commonly seen in older foals rather than the neonatal foal, but is often readily identified in affected individuals.

The colon is not normally seen in the neonatal foal, however in cases of colitis the colon may be readily seen with fluid contents.

Peritoneal fluid quantity and echogenicity should also be noted during the examination. In foals suspected of having a ruptured viscus, fluid may be seen in the cranial abdomen, between the liver edges even if there is little effusion in the mid ventral abdomen. Peritoneal fluid analysis, particularly including cytology, confirms the diagnosis, not the ultrasound examination.

Musculoskeletal

Transducer selection: 7.5 to 10 mHz

Structures: ribs, synovial structures, gastroc origin.

Study:

1. rib fractures of the cranial to middle ribs (typically the 5th rib caudally), just above to about 2 cm above the costochondral junction, are fairly common in neonatal foals. Such fractures are likely due to birth trauma, with compression of the elbow against the chest during passage through the birth canal. Palpation of swelling or crepitace is generally evident on neonatal examination. Ultrasonography can be used to confirm the diagnosis (since stall rest for 3 to 4 weeks is generally recommended), as well as to determine whether any complications such as hemothorax, hemopericardium, or diaphragmatic hernia are

present in compromised foals. The ultrasound reveals disruption of the normal contour of the affected rib in the long axis view. Occasionally subcutaneous emphysema prevents visualization of the fractures. Bridging callus can generally be seen by 2 to 3 weeks of age.

2. synovial structures: Foals with septic joints occasionally have soft tissue swelling in the region that prevents differentiation of cellulitis or periarticular disease from joint disease. Ultrasonography can be used to differentiate these processes. Synovial distension, echogenicity of synovial fluid, and the thickness of the synovium can be ascertained with ultrasound. The periarticular soft tissue structures can be evaluated for ligament damage, edema within the tissues, or focal abscessation.
3. gastroc origin: tearing of the gastroc origin at the gastroc fossa of the femur is not uncommon in neonatal foals, and is likely a result of birth trauma when the hock may be trapped in flexion during delivery. Bilateral disease is not unusual. Affected foals have a “dropped” hock, and may have difficulty standing or ambulating. Swelling in the region of the gastroc muscle may occur due to fluid accumulation resulting from muscle disruption. Ultrasonography of the gastroc fossa reveals loculated hypoechoic tissue within the fossa, rather than the more echodense linear tendinous structure. Prognosis appears to be excellent provided the foal receives adequate assistance in rising if necessary.

Thoracic

Transducer selection: 5 to 6 mHz

Structures: lung surface, pleural contents

Study: pneumonia in the neonatal foal is often hematogenous in origin, and the ultrasound study may not reveal consolidation even in the presence of severe disease. Radiography often better demonstrates the extent of pulmonary disease in the neonate. Ultrasonography is useful in determining whether hemothorax or diaphragmatic hernias are present, however the foal should be positioned sternally or the examination be performed standing to eliminate interference by overlying aerated lung. Fluid within the pleural cavity, ranging in echogenicity from anechoic to slightly echogenic with floating gas echoes can be seen in foals with hemothorax due to rib fractures.