

ULTRASOUND DIAGNOSTIC OF TRAUMATIC RETICULOPERITONITIS IN CATTLE

DIAGNOSTICUL ECOGRAFIC AL RETICULOPERITONITEI TRAUMATICE LA BOVINE

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ABSTRACT | REZUMAT

Ultrasound is an ideal diagnostic tool for the investigation of bovine gastrointestinal disorders like traumatic reticuloperitonitis, left and right displacement of the abomasum, ileus of the small intestine and dilatation and displacement of the caecum.

An ultrasound examination is performed on non-sedated, standing cattle using a 3.5-5 MHz linear or curvilinear transducer after the application of transmission gel. For ultrasound examination of the reticulum, the transducer is applied to the ventral aspect of the thorax on the left and right of the sternum as well as to the left and right lateral thorax up to the level of the elbow. The reticulum is first examined from the left side and then from the right. The normal reticulum appears as a half-moon-shaped structure with an even contour. Traumatic reticuloperitonitis is the most common cause of anterior abdominal pain in cattle.

Fibrinopurulent collections may be identified between reticulum and abdominal wall, as hypoechoic collection (purulent liquid, rich in cells) containing irregular hyperechoic masses (fibrine).

Keywords: cattle, traumatic reticuloperitonitis, ultrasound examination

Ecografia este un mijloc de diagnostic ideal pentru investigarea tulburărilor gastrointestinale ale bovinelor, precum: reticuloperitonita traumatică, deplasarea abomasului pe stânga/dreapta, ileusul intestinului subțire, dilatarea și deplasarea cecumului.

Examenul ecografic se realizează pe bovinele neseedate, cu o sondă liniară sau semiconvexă de 3,5-5 MHz, după aplicarea gelului de transmisie. Pentru examinarea ultrasonografică a rețelei, sonda se aplică pe zona ventrală a toracelui, pe partea dreaptă și stângă a sternului, deasupra cotului pe părțile laterale dreaptă și stângă a toracelui. Rețeaua se examinează mai întâi pe partea stângă și apoi pe partea dreaptă. În mod normal, rețeaua apare ca o semilună cu un contur uniform. Reticuloperitonita este cea mai frecventă cauză a durerii din regiunea anterioară a abdomenului.

Structuri fibrinopurulete pot fi identificate între rețea și peretele abdominal sub formă de colecții hipocogene (lichid purulent bogat în celule) cu formațiuni hiperecogene neregulate (fibrină).

Cuvinte cheie: bovine, reticuloperitonită traumatică, examen ecografic

Traumatic reticuloperitonitis (TRP) is a common accidental disease caused by the ingestion behavior of cattle (superficial mastication), which predisposes them to the accidental swallowing of metal foreign objects. Ingestion of a foreign body may also be associated with diseases that cause pica, such as phosphorus deficiency (1, 8, 9, 16).

Adult dairy cattle are most commonly affected because of their more frequent exposure. Most cases of TRP are sporadic, but outbreaks have occurred when such things as multi-stranded cables have been chopped up by a forage harvester and ensiled or when cattle have chewed nails containing charcoal from burned buildings (11).

Gröhn and Bruss reported a 0.6% prevalence of TRP diagnosis in dairy cattle in 1990. Data from England and Wales indicated that 5.2% of adult cattle carcasses submitted to the Veterinary Laboratories Agency from January 2004 to May 2008 had a diagnosis of TRP (13).

If the object is large enough and sharp enough, it can be pushed, most often through the cranial wall of the reticulum, by the forceful, normal reticular contractions. Normal forestomach bacteria leak through the hole thus created and may establish infection locally along the foreign body (11).

The localized infection established by reticulorumenal perforation causes inflammation of the forestomach wall and adjacent peritoneal cavity and pain in the anterior abdomen, inhibiting forestomach motility, appetite, and aboral flow of ingesta. Pinching of the withers or upward pressure on the xiphoid region may

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elicit a grunt on expiration. Affected cattle may stand with an arched back and resist ventral flexion of the back when pinched over the withers. Tachycardia, reluctance to move or lie down, mild bloat, constipation, or abducted elbows, milk production sudden decreased may also be seen (8, 16).

The diaphragm, pericardium, and heart muscle are located just cranial to the reticulum, with the liver positioned medially and dorsally and the spleen laterally and dorsally. If the pericardial sac has been seeded with bacteria, pericarditis usually develops. The foreign body may penetrate the liver or spleen, leading to abscess formation. These abscesses as well as reticular adhesions may be responsible for ruminoreticular outflow problems and may lead to vagal indigestion (9, 14). Clinical diagnosis of TRP, based on direct or reflected hyperesthesia is not very reliable in some cases, since some other painful foci from the region may give false positive results (acute ruminal acidosis, abomasal ulcerus, hepatic abscesses, pleuritis) or in chronic cases the tests are false negative.

Ultrasound evaluation of the ruminant abdomen has become an important part of the diagnostic work-up in ruminants suspected of abdominal disease in combination with complete blood count (CBC), serum chemistry, peritoneal fluid analysis, urinalysis, and ruminal fluid analysis and can often provide valuable information that may preclude the need for exploratory laparotomy (3, 4). The area should be washed thoroughly with water, degreased with soap or alcohol if it is necessary and ultrasound coupling gel applied to the region. An ultrasound examination is performed on non-sedated, standing cattle using a linear or curvilinear transducer (3.5 to 5 MHz) which provides penetration to a depth of 24 to 30 cm (2, 5, 17). For ultrasound examination of the reticulum, the transducer is applied to the ventral aspect of the thorax on the left and right of the sternum as well as to the left and right lateral thorax, up to the level of the elbow at sixth and seventh intercostal spaces, ventral to the spleen and cranial to the rumen at a scanning depth of 10 to 14 cm in cattle. The reticulum is first examined from the left side and then from the right (Fig. 1). The reticulum should be also evaluated during the examination for normal biphasic contractions, which should occur approximately once per minute. The reticulum contracts approximately 5 to 10 cm away from the abdominal wall during the first phase of contraction and more than 17 cm away during the second phase of contraction in cattle (5). When in a relaxed state the normal reticulum appears as a half-moon-shaped (se-

micircular) structure with an even contour, immediately adjacent to the ventral abdominal wall (Fig. 2).

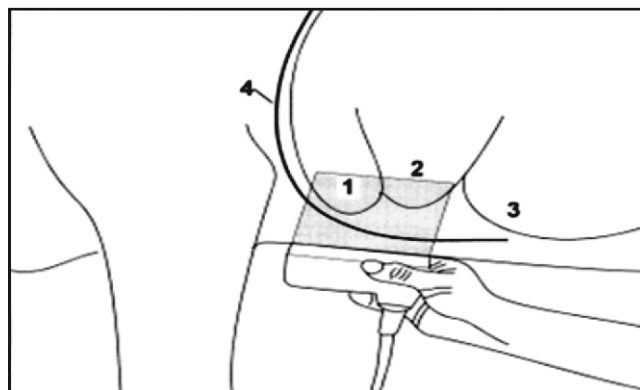


Fig. 1. Ultrasound examination of the left paramedian view of the reticulum: (1) Reticulum, (2) craniodorsal blind sac of the rumen, (3) ventral sac of rumen, (4) diaphragm (Braun, 2003).

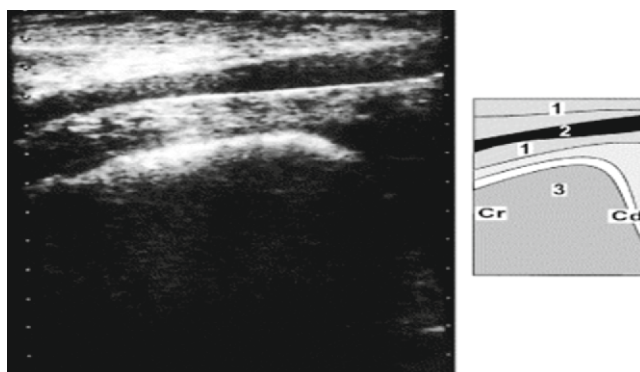


Fig. 2. Ultrasound exam of the normal reticulum viewed from the left ventral thorax: (1) ventral abdominal wall, (2) musculophrenic vein, (3) reticulum. Cr: cranial and Cd: caudal (Braun, 2003).

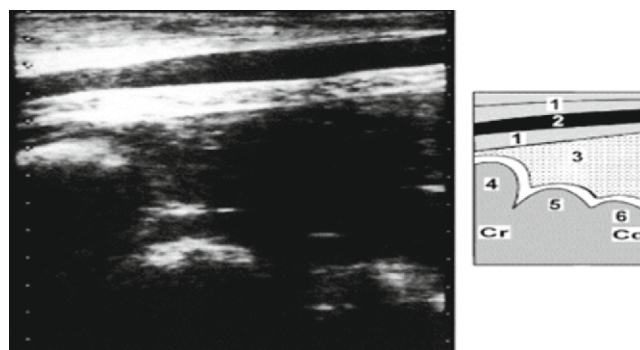


Fig. 3. Ultrasound exam of the normal reticulum, craniodorsal blind sac of the rumen, ventral sac of the rumen, and abomasum viewed from the left ventral thorax: (1) ventral abdominal wall, (2) musculophrenic vein, (3) abomasum, (4) reticulum, (5) craniodorsal blind sac of the rumen, (6) cranial part of the ventral sac of the rumen (Braun, 2003).

Reticular abscesses caused by TRP can be seen between the reticulum and body wall, spleen, diaphragm, or liver (4, 8, 15). The caudoventral reticular wall is the most frequently affected, often in association with the craniodorsal blind sac of the rumen. The changes in the contour of the reticulum depend on the severity of the inflammatory changes. Deposits of fibrinous tissue interspersed with fluid pockets are frequently seen on the reticular serosa. At ultrasound exam, these appear as echoic areas caviated by hypo-echoic areas (Fig. 4).



Fig. 4. Ultrasound exam of the reticulum and craniodorsal blind sac of the rumen of a cow with traumatic reticuloperitonitis. Echoic deposits caviated by hypo-echoic fluid ventral to the reticulum and cranio-dorsal blind sac of the rumen (original TK).

In incipient form the exsudate is well delimited (Fig. 5) and a conservative (medicamentous) treatment with antibiotics and fibrinolytics intraperitoneally could be efficient. Peritoneal effusion is visible as an accumulation of fluid without an echoic margin and restricted to the reticular area. Depending on the fibrin

and cell content, the fluid may be anechoic or hypo-echoic (8). In acute reticuloperitonitis, the exsudate is predominantly liquid (Fig. 6), once in chronic cases the exsudate becomes predominantly fibrinous (Fig. 7).

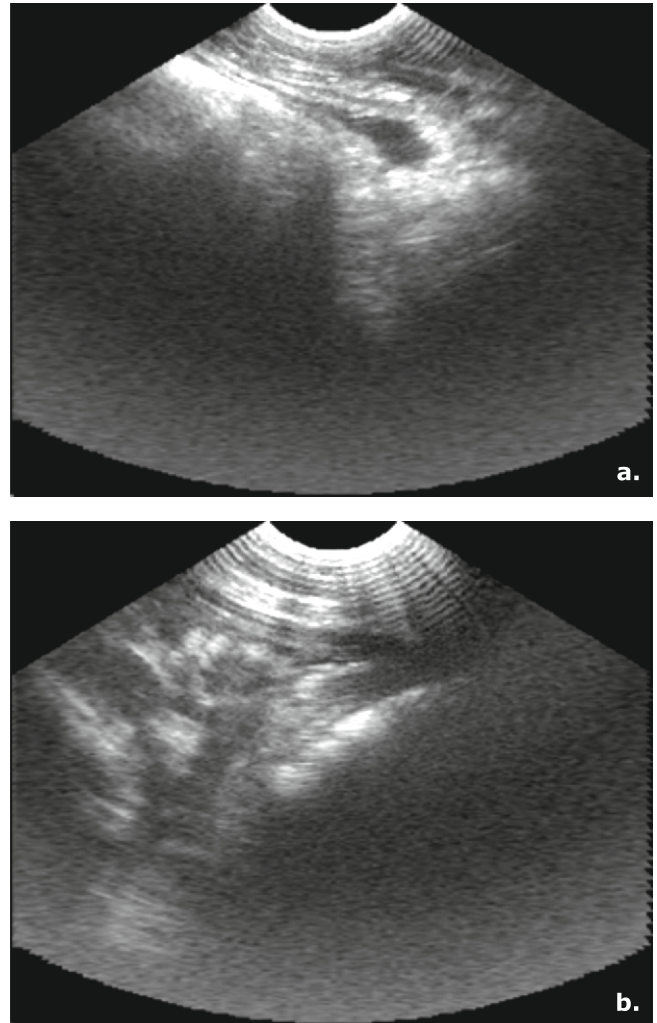


Fig. 5. Incipient traumatic reticuloperitonitis. **a.** Left side view, **b.** right side view (original, GS).

In case of generalized purulent peritonitis an important amount of exsudate, hypo-echoic, very rich in inflammatory cells (Fig. 8). Significant quantities of peritoneal exsudate, often up to 8–10 cm between peritoneum and reticular wall, and thick fibrin deposits on the reticular wall, are commonly observed in traumatic reticulitis where the cow has been sick for more than one week (15). Reticular contractions are often absent, reduced or indistinct in affected animals and can be an indication of adhesions between the reticulum and body wall. (4, 7). The amplitude of reticular contractions is reduced to only 1 to 3 cm, the reticulum is displaced from the ventral body wall. In cattle with reticulomasal obstruction caused by a foreign body,

the frequency of reticular contractions may be increased. Neither magnets nor foreign bodies can be visualized by ultrasound exam (8).



Fig. 6. Acute reticuloperitonitis.
The exudate is predominantly liquid (anechoic-hypo-echoic) (original, GS).



Fig. 7. Chronic reticuloperitonitis.
The exudate is predominantly fibrinous (hyper-echoic) (original, GS)

Other abnormalities associated with TRP include changes in the contour of the reticulum, echoic fibrinous deposits on the reticular serosa, nonencapsulated fibrinous exudate between the reticulum and body wall, and adhesions between the reticulum and the peritoneum or adjacent organs (4, 6, 7).

TRP must be differentiated from other causes of cranial abdominal pain. They mainly include abomasal ulcers, hepatic abscesses from other causes, and pleuritis (1). TRP must be also differentiated from other causes of ruminal distention and vagal indigestion. When thoracic structures are involved, TRP must be

differentiated from primary pneumonia, pleuritis, diaphragmatic hernia, heart diseases such as endocarditis, lymphosarcoma of the heart, and pulmonary cord. Finally, TRP must be differentiated from others causes of ruminal distention and vagal indigestion (although TRP is a leading cause of vagal indigestion) (11).

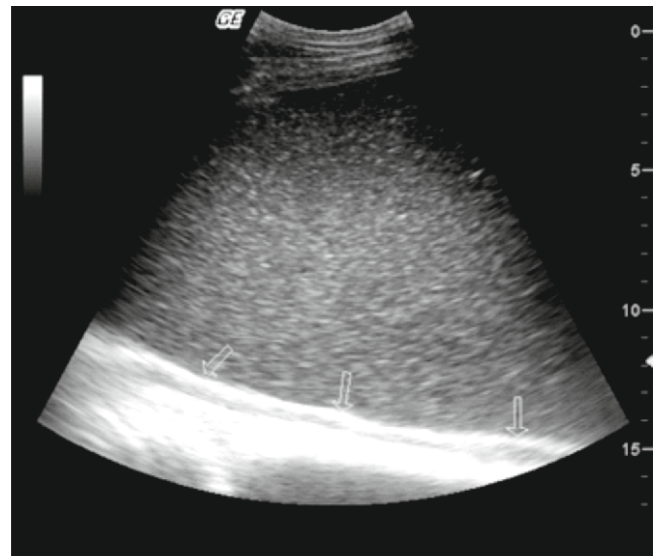
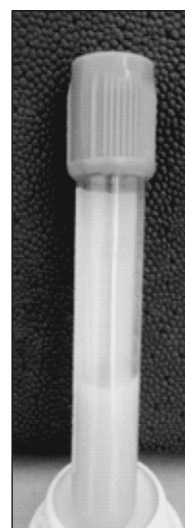


Fig. 8. Generalized purulent peritonitis. Hypo-echoic exudate, very rich in inflammatory cells (original, TK)

Abdominocentesis is very useful to confirm TRP diagnosis and may be performed blind or with ultrasound guidance. Aseptic preparation of the skin and local anesthesia of the region to be punctured are required. A 5 to 10 cm spinal needle or intravenous catheter can be used; the length required depends on the size of the animal and the amount of subcutaneous fat (11). Normal fluid is clear and often in small quantity. Easily collecting a large amount of fluid should arouse suspicion. A sanguineous fluid leads to suspicion of a compromised bowel problem.



A cloudy fluid, yellow (Fig. 9) or reddish leads one to lean toward peritonitis (Fig. 10). Any foul smell is enough to conclude that septic peritonitis is occurring.

A nucleated cell count above 6000 cells/ μ L and total protein above 3 g/dL is consistent with the diagnosis of peritonitis in 80% of cases (8, 16).

Fig. 9. Peritonitis. Purulent liquid obtained by abdominocentesis (original, AA).

Excessive accumulation of inflammatory exudate and fibrin deposition over several days/weeks causes abdominal distension, despite a poor appetite (15).

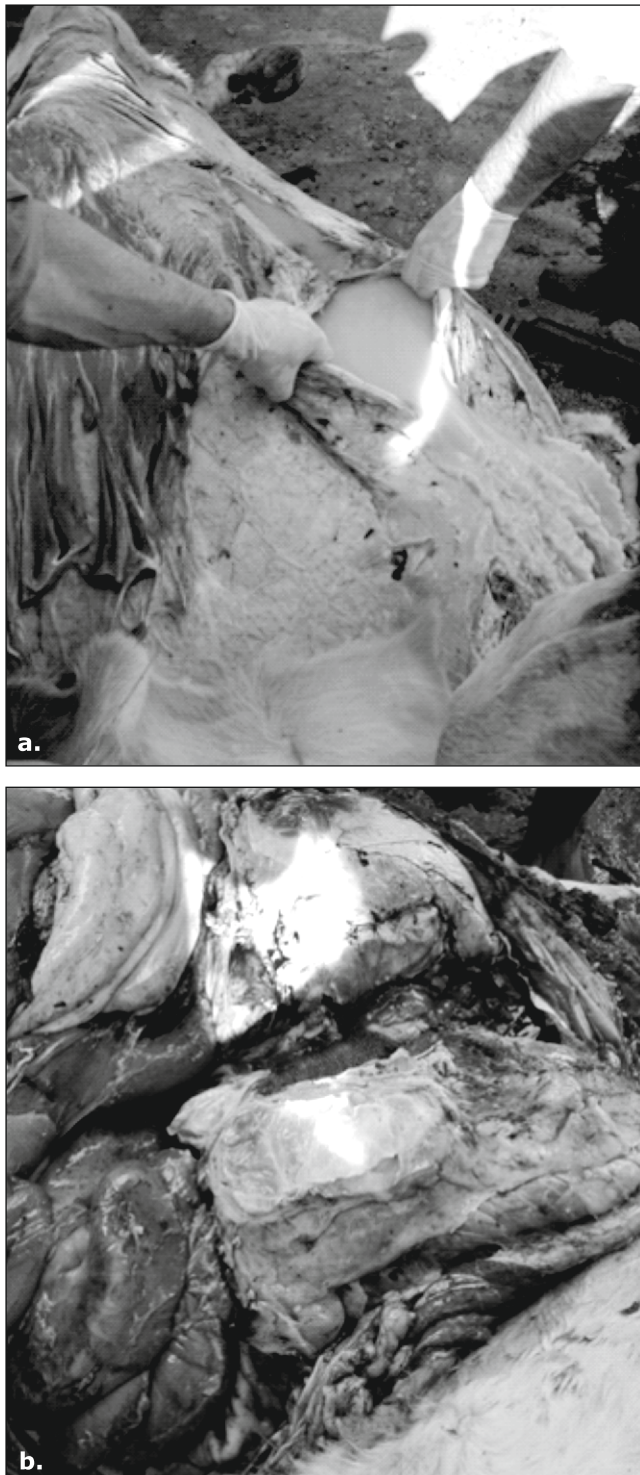


Fig. 10. Generalized peritonitis. Postmortem findings.
a. Massive purulent collection into abdominal cavity.
b. Same case-abundant fibrinous exudate between abdominal wall and forestomach; adhesions between intestinal loops (original, AA, GS).

Prognosis of TRP is good in early acute cases following rumenotomy and removal of penetrating wire in reticulum (1, 8, 9). Alternative medical management involves antibacterials for several days, elevation of the forequarters and oral administration of a magnet which is useful both for prophylaxis and treatment. Prognosis is hopeless when penetrating wire has perforated the pericardium (traumatic pericarditis) or myocardium leading to cardiac tamponade (1).

CONCLUSIONS

Ultrasound exam is an ideal diagnostic tool for the investigation of bovine gastrointestinal disorders like traumatic reticuloperitonitis. Fibrinopurulent collections may be identified between reticulum and abdominal wall, as hypoechoic collection (purulent liquid, rich in cells) containing irregular hyperechoic masses (fibrine). Ultrasound exam in association with clinical and paraclinical signs is very useful for therapeutic decision.

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