

Ultrasonography As Diagnostic And Prognostic Tool For Traumatic Reticuloperitonitis In Cows

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ABSTRACT

This study was performed to document the importance of ultrasonography in detection of traumatic reticuloperitonitis (TRP) and its sequelae. Twenty nine cows affected with traumatic reticuloperitonitis and 5 clinically healthy cows (control group) were investigated. By using ultrasonography and some confirmatory tests as paracentesis, laparotomy and post-mortem examinations, the various sequelae of TRP were clarified. Acute local peritonitis, chronic local peritonitis, acute diffuse peritonitis, reticular abscesses, thoracic abscesses and or pericarditis have been detected as sequelae of TRP in cattle. The clinical findings of all sequelae are described. The results of the present study indicate that the classical symptom of pain and systemic reactions were common in cows with acute conditions and less severe in chronic conditions and abscesses formation. Therefore, the clinical detection of chronic condition and abscesses formation was difficult. Hence, it is important to use ultrasonography in early detection of TRP and to discriminate between different sequelae.

INTRODUCTION

Traumatic reticuloperitonitis is primarily a disease of cattle rather than other ruminants. It occurs when pieces of wire, or other sharp metal objects have been eaten by the cattle along with its food penetrate the reticular wall as a result of the forceful contractions during the cudging process (1). Female cattle are affected more than male and pregnant cow more than non pregnant one. During pregnancy the rumen and reticulum are displaced forward. At the time of calving, forceful abdominal movement may cause migration of the foreign body toward the reticular wall (2, 3).

Traumatic reticuloperitonitis (TRP) is a common reason for abdominal surgery in cattle. The complexity of development and the possibility that a number of syndromes can occur together makes the tentative diagnosis difficult. In practice, the diagnosis is mainly made by physical examination—although additional diagnostic methods (such as hematological tests, abdominocentesis, radiography, ultrasonography, laparoscopy or exploratory laparoruminotomy) might be used. Because complications of the disease are frequent, a more accurate indication of its presence or severity would be valuable (4, 5).

The signs of TRP are dependent upon the site of reticular perforation and lesions caused by the foreign body in the surrounding areas (6). There are numerous scientific papers describing the clinical signs of traumatic reticuloperitonitis in cattle. Anorexia, decrease in milk production, fever, tachypnea, reluctance to move and stand with an arched back and abducted elbows are the most common signs (7). Hence it is important to found a suitable technique for early detection of TRP and its different sequelae.

MATERIALS AND METHODS

Animals

Clinical examinations were carried out on 29 cows with traumatic reticuloperitonitis and 5 clinically healthy one (control). The animals aged from 3-8 years and their body weights were from 450 to 700 kg. Fifteen cows were pregnant over 6 months, 10 cows had calved since 4 weeks ago and 4 cows were non pregnant.

Clinical examination

All cows under investigation were subjected to thorough clinical examination (8). Testing for foreign bodies in the reticulum consisted of pinching of the withers, side stick method and turning in acute angle to the left side.

Ultrasonographic examination

The ultrasonographic examinations were carried out on all cows under investigation. The examination was made with a 3.5- and 5-MHz convex transducer using an ultrasound unit*. The hair was clipped on the ventral abdomen and on both sides of the thorax. After the application of transmission gel to the transducer, the animals were examined beginning at the ventral abdomen and extending forward to the intercostal spaces on both sides of the thorax. Each intercostal space was examined dorsoventrally. The reticulum, rumen, omasum, abomasum, spleen, liver,

lungs, pleura and heart were examined. The reticulum and surrounding tissues were examined (9). The pleura and pulmonary surface were examined on both sides (10). The heart was examined (11).

Confirmatory tests

Paracentesis (abdominocentesis and thoracocentesis) under ultrasonographic guidance, laparotomy and post mortem examinations were used to confirm the diagnosis (Table 1).

Table 1. Confirmatory tests used in cows with TRP.

TRP sequelae	Diseased animals	Confirmatory tests*	Frequency distribution
	Cows (no = 29)		Cows
Acute local peritonitis	4	Abdominocentesis Laparotomy Post mortem None	3 3 - -
Chronic local peritonitis	3	Abdominocentesis Laparotomy Post mortem None	3 1 1 -
Acute diffuse peritonitis	6	Abdominocentesis Laparotomy Post mortem None	5 - 1 -
Reticular abscesses	5	Abdominocentesis Laparotomy Post mortem None	5 1 2 -
Thoracic abscesses	2	Thoracocentesis Laparotomy Post mortem None	1 - - 1
Pericarditis	9	Thoracocentesis Laparotomy Post mortem None	- - 5 4

* In 2 animals with acute local peritonitis, 1 with chronic local peritonitis and 2 with reticular abscesses more than one confirmatory test was used.

RESULTS

Clinical examination

Acute local peritonitis, chronic local peritonitis, acute diffuse peritonitis, reticular abscesses, thoracic abscesses and pericarditis were detected as sequelae of TRP in cows. The clinical findings of every sequela are reported in Table, 2. Decreased appetite, decreased ruminal contractions and positive pain tests were reported in most diseased cows with TRP. Decreased milk production was shown in all diseased cows with history of recent parturition and in non pregnant ones. Pain reactions including stiffness in gait and arched back during walking, audible grunting sound, abducted elbows during standing position were described in all diseased cows with TRP sequelae. Systemic reactions including, temperature $> 39.5^{\circ}\text{C}$, pulse $> 90/\text{min.}$ and respiration $> 50/\text{min.}$, were observed in most cows. Normal temperature, pulse and respiratory rate were noticed only in 2 cows with chronic local peritonitis. All cows with pericarditis had brisket oedema and corded jugular veins. Muffled heart sound was heard in 7 cows with pericarditis while splashing sound was heard in 1 cow only with pericarditis. One cow with thoracic abscesses had abnormal respiratory sounds including wheezes, crackling, dyspnoea and cough.

Ultrasonographic examination

The results of ultrasonographic examination of healthy reticulum of control cows are shown in Table, 2 and Fig. 1. The normal reticulum appeared as a half-moon-shaped structure with a smooth contour. The reticular thickness ranged from 0.33 to 0.59 cm. The distance between reticulum and diaphragm was ranged from 0.42 to 0.52 cm

and the biphasic contraction of reticulum occur every 40.0 to 61.0 sec Fig. 1. While the ultrasonographic examination of reticulum and adjacent organs in cattle with traumatic reticuloperitonitis are shown also in Table, 3 and Figures 2, 3, 4, 5 and 6. Presence of large amount of echogenic bands from fibrous tissues inbetween reticulum, ruminal atrium and diaphragm. In addition to the absence of reticular movement, increased thickness of reticulum and the distance between reticulum and diaphragm Fig. 2. This picture was presented only at area just behind the xiphoid cartilage in case of local peritonitis. Moreover, the presence of large amount of echogenic debris and bands with hypoechoic exudates that extending from xiphoid cartilage until the udder was the characteristic picture of diffuse peritonitis Fig. 3. Reticular abscesses were characterized by the presence of circumscribed masses with echogenic capsule and its content varied from anechoic with echogenic debris (in one case), or hypoechoic content (four cases). These abscesses were located caudoventrally inbetween reticulum and spleen at left side in 4 cases and between reticulum and abomasum at the right side in one case. Their diameter ranged from a few centimeters to more than 15 cm (Fig. 4). While the anterior mediastinal abscesses were characterized by presence of circumscribed masses with echogenic capsules and its contents varied from hypoechoic content (one case) to echogenic content (one case). These abscesses were presented in the thoracic cavity Fig. 5. Traumatic pericarditis was characterized by presence of hypoechoic fluid (pus) or echogenic network (fibrin) in pericardial sac in between the two layers of pericardium (Fig. 6).

Table 2. Clinical examination of cows with Traumatic reticuloperitonitis and its sequelae.

Variables		Cows with traumatic reticuloperitonitis and its sequelae						
		AL	CL	AD	RA	TA	STP	FTP
Appetite	normal	-	-	-	-	-	-	-
	decreased	-	1(33.3%)	-	1(20%)	-	-	-
	absent	4(100%)	2(66.6%)	6(100%)	4(80%)	2(100%)	3(100%)	6(100%)
Defecation	scanty hard	3(75%)	3(100%)	5(83.3%)	5(100%)	2(100%)	3(100%)	6(100%)
	scanty soft	1(25%)	-	-	-	-	-	-
	diarrhoea	-	-	1(16.7%)	-	-	-	-
Positive pain test ^a		4(100%)	3(100%)	6(100%)	5(100%)	2(100%)	3(100%)	6(100%)
Pain reaction ^b	mild	2(50%)	3(100%)	3(50%)	5(100%)	1(50%)	1(33.33%)	4(66.66%)
	severe	2(50%)	-	3(50%)	-	1(50%)	2(66.66%)	2(33.33%)
	negative	-	-	-	-	-	-	-
systemic reaction ^c	mild	4(100%)	1(33.3%)	5(83.3%)	4(80%)	2(100%)	3(100%)	6(100%)
	severe	-	-	1(16.7%)	1(20%)	-	-	-
	negative	-	2(66.6%)	-	-	-	-	-
Ruminal atony		4(100%)	3(100%)	6(100%)	5(100%)	2(100%)	3(100%)	6(100%)
Heart sound	normal	4(100%)	3(100%)	6(100%)	5(100%)	1(50%)	-	-
	tachycardia	-	-	-	-	1(50%)	-	1(16.66%)
	muffled	-	-	-	-	-	2(66.66%)	5(83.33%)
	splashing	-	-	-	-	-	1(33.33%)	-
Brisket edema		-	-	-	-	-	3(100%)	5(83.33%)
Corded jugular vein		-	-	-	-	-	3(100%)	6(100%)
Abnormal lung sound		-	-	-	-	1(50%)	-	1(16.33%)
Dyspnea		-	-	-	-	1(50%)	-	-
Cough		-	-	-	-	1(50%)	-	-
Recumbency		-	-	1(16.7%)	-	-	1(33.33%)	-
Bloat		2(50%)	3(100%)	6(100%)	4(80%)	2(100%)	2(66.66%)	5(83.33%)

- a) Positive pain tests are indicated by observing the cows grunting or detecting the grunting sound by putting the stethoscope on trachea while pain tests applied (by pinching of withers, side stick method, turning the animals in acute angle).
- b) Mild pain reaction includes stiffness in gait and arched back during walking, while severe pain reaction is noticed on the animal as an audible grunting sound, abducted elbow during standing position, animal reluctant to move and if it forced to move, it moves with short steps, stiffness and arched back.
- c) Mild systemic reaction includes respiration (40-50/ min), pulse (85-99/min), and temperature (39.2-39.9)
Severe systemic reaction includes respiration (more than 50/ min), pulse (more than 100/min), and temperature more than 40
- d) Abnormal lung sounds as wheezes and crackling and whistling.

Table 3. Ultrasonographic appearance of clinically healthy (control) cows.

Shape of reticulum	Frequency distributions	Reticular motility/ 3 min.	Frequency distributions	Site of examination
Smooth surface with half moon shape	5	3 biphasic contractions	3	Just behind the xiphoid cartilage
		4 biphasic contractions	2	

Table 4. Ultrasonographic appearance of traumatic reticuloperitonitis and its sequelae in cattle.

TRP Sequelae	Ultrasonographic appearance
Local peritonitis	Is observed as small echogenic bands representing the fibrin in between the reticulum and the diaphragm in addition to absence of reticular movement and thickening of reticular wall with a slight increase in the distance between the reticulum and the diaphragm (Fig. 2). This picture is presented only at area just behind the xiphoid cartilage.
Diffuse peritonitis	Is observed as a large amount of echogenic debris and bands with hypoechoic exudate. This picture is presented from xiphoid cartilage until the udder at abdominal region (Fig. 3).
Reticular abscesses	Are seen as circumscribed masses with echogenic capsule and its content varied from anechoic with echogenic debris (in one cow), or hypoechoic content (four cows). And its size varied from few centimetres to 15 cm (Fig. 4). These abscesses were presented in between reticulum and diaphragm.
Thoracic abscesses	Are seen as circumscribed masses with echogenic capsule and their content varied from hypoechoic content (one cow) to echogenic content (one cow). And its size more than 15 cm (Fig. 5). These abscesses were presented in the thoracic cavity.
Suppurative pericarditis	It is observed as a hypoechoic fluid (pus) in between the two layers of pericardium extended from 3-15 cm (Fig. 6).
Fibrinous pericarditis	It is seen as an echogenic network or masses in pericardial sac extended from 10-15 cm (Fig. 6).

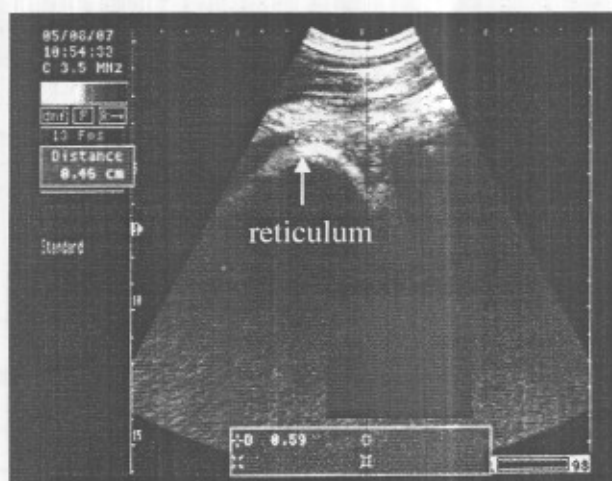


Fig.1. Ultrasonographic image of normal reticulum which appear as a half-moon-shape structure with a smooth contour. Using 3.5 MHz sector probe.



Fig.2. Ultrasonographic image shows large amount of echogenic bands from fibrous tissues in between reticulum, ruminal atrium and diaphragm (This picture presented only at area just behind the xiphoid cartilage) 3.5 MHz sector probe

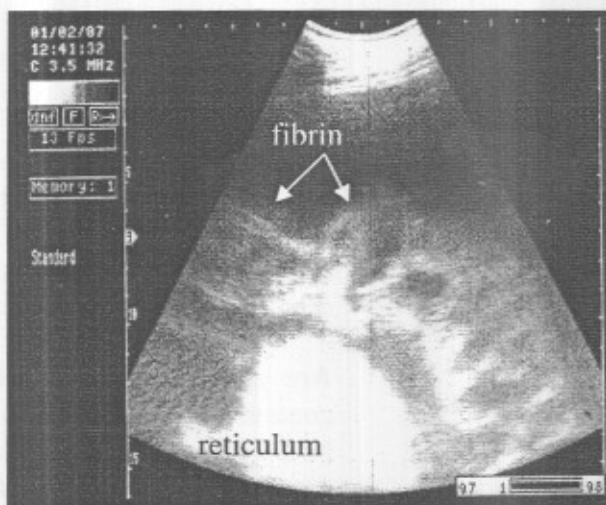


Fig.3. Ultrasonographic image shows large amount of echogenic debris and bands with hypoechoic exudates. Extend from xiphoid cartilage until the udder. Using 3.5 MHz sector probe.

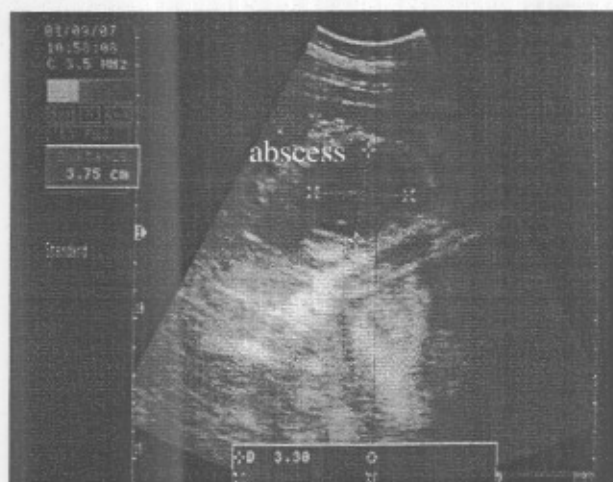


Fig.4. Ultrasonographic image shows small circumscribed mass with echogenic capsule anechoic content with hypoechoic debris (pus cells), located caudoventral in between reticulum and spleen at left side its diameter 3.34 x 3.75 cm. Using 3.5 MHz sector probe.

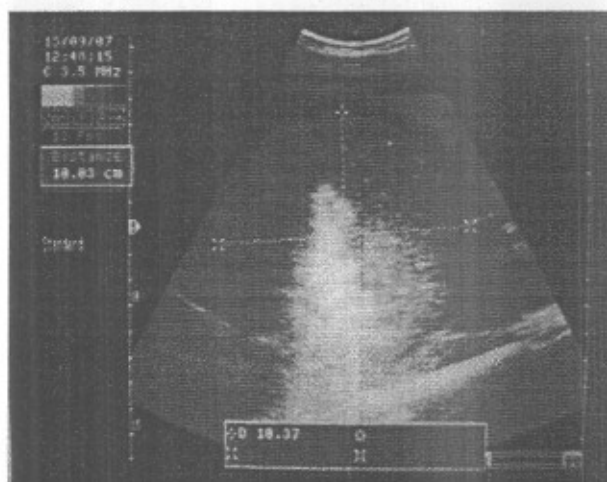


Fig.5. Ultrasonographic image shows circumscribed mass with echogenic capsule with hypoechoic content and present at left 4th intercostals space abscesses were presented in the thoracic cavity. Using 3.5 MHz sector probe.

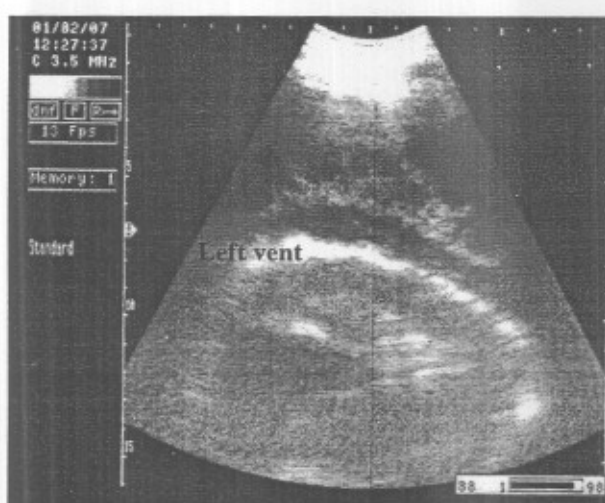
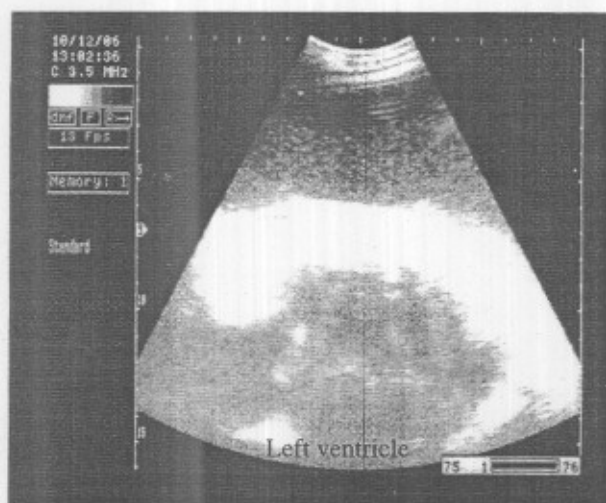


Fig.6. Ultrasonographic image shows presence of hypoechoic fluid (pus) a. or echogenic network (fibrin) b. in pericardial sac in between the two layers of pericardium (imaged from 3rd intercostals space of left thorax). Using 3.5 MHz sector probe.

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الملخص العربي

دراسة الموجات فوق الصوتية كوسيلة تشخيصية وتنبؤية لمرض التهاب الوخزي الشبكي البريتوني في الإبقار
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أجري هذا البحث لتوضيح أهمية دراسة الموجات فوق الصوتية للكشف عن مرض التهاب الشبكي البريتوني
 الوخزي والمسارات المختلفة له في الإبقار.

تم اختبار تسعة وعشرون بقرة مريضة تم اختيارهم من العيادة الخارجية بكلية الطب البيطري- جامعة الزقازيق.
 باستخدام جهاز الموجات فوق صوتية مع إجراء بعض الاختبارات التأكيديّة مثل البزل والعمليات الاستكشافية للبطن والكرش
 والفحص بعد الوفاة تم توضيح الأشكال المختلفة لهذا المرض وكانت كالآتي:

- (أ) التهاب الوخزي الشبكي البريتوني الموضعي الحاد
- (ب) التهاب الوخزي الشبكي البريتوني الموضعي المزمن
- (ج) التهاب الوخزي الشبكي البريتوني المسهب الحاد
- (د) خراييج بين الكرش وجدار البطن
- (هـ) خراييج داخل القفص الصدري
- (و) التهاب الوخذي التاموري

كما تم تسجيل الأعراض الاكلينيكية للمرض بمساراته المختلفة والتي أسفرت عن الآتي:

١- الأعراض المتعارف عليها والتي تدل على الألم وعن خلل النظام الداخلي للجسم كانت أكثر حدوثاً في الإبقار التي تعاني
 من الشكل الحاد للمرض عن التي تعاني من الشكل المزمن.

٢- لا توجد أعراض محددة ومميزه تدل على وجود خراييج سواء في البطن أو في القفص الصدري.

ولذلك من الضروري استخدام جهاز الموجات فوق الصوتية كوسيلة تساعد في تشخيص المرض والفرقة بين المسارات
 المختلفة للمرض.