

Clinical, haematobiochemical, radiographic and ultrasonographic features of traumatic reticuloperitonitis in bovines

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ABSTRACT

Study was conducted to compare the clinical, haematobiochemical, radiographic and ultrasonographic features of traumatic reticuloperitonitis in bovines. Clinical cases (4 cows and 17 buffaloes) presented with a history of anorexia, fever, decreased milk yield and loss of defecation/scant faeces, were used. Haematological picture revealed neutrophilic leucocytosis with left shift and blood biochemical status showed elevated levels of total protein, albumin, and fibrinogen. Decreased plasma concentration of sodium, potassium and chloride was observed in majority of the cases. Radiographic examination revealed presence of multiple metallic foreign densities in the reticulum of the bovines. Ultrasonographically, morphological changes of reticular wall and reticulophrenic adhesions in cases of localised peritonitis were visualized. The presence of anechoic fluid without echogenic margins, not restricted to reticulum and sometimes with floating fibrinous shreds was observed in cases of diffuse peritonitis. Ultrasonography in B mode and B+ mode found helpful for the diagnosis of traumatic reticuloperitonitis and differentiation of localised peritonitis from diffuse peritonitis.

Key words: Left shift, Neutrophilic leucocytosis, Radiography, Traumatic reticuloperitonitis, Ultrasonography

Peritonitis is an inflammatory process that involves the peritoneal cavity and its serosal surface, the peritoneum (Smith 1996). In ruminants, it is mainly caused by penetrating metallic foreign body through the reticulum which initially causes acute local peritonitis or may spread to cause diffuse peritonitis or remain localized to cause subsequent damage including vagal indigestion and diaphragmatic hernia and is accompanied by abdominal pain, fever, toxemia and a reduction in the amount of faeces (Radostits *et al.* 2000). Clinical, haematobiochemical, radiographic and peritoneal fluid examination are common methods for diagnosis of traumatic reticuloperitonitis. Ultrasonography has emerged as a successful diagnostic method for the evaluation of bovine gastrointestinal tract including reticulum and peritoneal cavity. It has been used in cows to diagnose traumatic reticuloperitonitis (Braun *et al.* 1994). The present study was aimed to record ultrasonographic features of traumatic reticuloperitonitis in bovines and correlate it with clinical, haematobiochemical and radiographic findings.

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MATERIALS AND METHODS

Clinical cases (4 cows and 17 buffaloes) presented to the Department of Veterinary Surgery and Radiology from April 2008 to March 2009, were used for this study. Animals were divided into 2 groups based on clinical, haemato-biochemical, radiographic and ultrasonographic findings. Group 1 (n=12) included animals having localised peritonitis while group 2 (n=9) included animals suffering from diffuse peritonitis based on the ultrasonographic and clinical examinations. History regarding duration of illness, feed intake, defecation, reproductive status, regurgitation and signs of pain was recorded. Clinical examination included recording of general status of animal, rectal temperature, respiratory rate and heart rate. Haemoglobin (Hb g/dL), packed cell volume (PCV%), total leukocyte count (TLC per μ L) and differential leukocyte count (DLC%) were estimated by standard methods (Benjamin 1985, Jain 1986). Total protein (g/dL) and albumin (g/dL) were estimated by Biuret method, using diagnostic kit. Plasma fibrinogen was measured by heat precipitation test, using hand held refractometer. Plasma sodium (mEq/dL) and potassium (mEq/dL) levels were estimated using ortho-clinical diagnostics slides. Plasma chloride was estimated by auto analyser (Schoenfeld and Lewellen 1964). Peritoneal fluid samples were obtained from standing animals restrained in a crate under ultrasound guided needle centesis

with 16 G sterilized needles after aseptic preparation of the site. Total leukocyte count, differential leukocyte count and total protein concentration of peritoneal fluid were estimated. Reticular radiographs in right lateral recumbency with forward stretched forelimbs were made. Survey radiographic evaluation consisted of one 14 inch $\times$ 17 inch radiograph of the reticulum using X-ray machine having maximum mAs of 400 and KVP of 150. The exposure factors used for the present study were 50–60 mAs, 90–100 KVP at a film focal distance of 90 cm. Ultrasonography was performed on the standing animals restrained in a cattle crate without any sedation. For ultrasonographic examination, ventral aspect of the body and right side of the body up to the level of elbow was shaved, washed, cleaned and transmission gel was applied liberally for optimal transmission of sound waves.

RESULTS AND DISCUSSION

Animals suffering from localized peritonitis (group 1) were females and included 12 bovines (2 cattle, 10 buffaloes) with a mean age of 6.12 ± 0.51 years. All the 9 animals (2 cattle and 7 buffaloes) suffering from diffuse peritonitis (group 2) were females and had a mean age of 6.78 ± 0.40 years. This was concurrent to findings of Singh *et al.* (1983) who have reported that buffaloes over 6 years of age showed high incidences of TRP. The exposure of animals to foreign bodies increases with age (Maddy 1954). Five animals (41.67%) of group 1 showed complete anorexia while others were partially anorectic. In animals of group 2, complete (66.67%) or partial (33.37%) anorexia was recorded which was similar to the findings of Turkar (2004). This variability in feeding pattern could be due to different types of reticular foreign bodies and peri-reticular adhesions, which might have hindered the flow of ingesta. Seven animals (58.33%) of group 1 had either recently calved or were in mid to late stage of pregnancy while in group 2, seven animals (77.78%) had recently calved or were in mid stage of pregnancy. Blood and Hutchins (1955) reported that pregnancy was not an important risk factor in traumatic reticulitis but prognosis of cows affected during the advanced stages of pregnancy was very poor. The duration of illness in animals of group 1 was 15.11 ± 2.50 days while in animals of group 2, it was 6.89 ± 1.39 days indicating that diffuse peritonitis had more acute onset than localised peritonitis.

Majority of group 1 animals (58.33%) of passed scanty but normal faeces, 25% showed absence of defecation, while 16.67% animals passed normal faeces. In contrast majority of the animals (55.55%) suffering from diffused peritonitis (group 2) showed absence of faeces, while 22.22% of animals passed scant faeces, 11.11% constipated and 11.11% animals had diarrhoeic faeces. Guard (2002) also reported that in acute cases of peritonitis, faeces was present in small amounts and often dry while in chronic cases faeces tend to be diarrhoeic. The amount and composition of faeces is usually abnormal as the transit time of ingesta through alimentary tract

increases and dry matter content of the faeces increases (Radostitis *et al.* 2000). Most of the animals of group 1 (75%) and group 2 (77.78%) did not show any tympany. Similar findings were reported by Turkar (2004). There was no history of regurgitation in both the groups, whereas milk yield was found decreased in majority (90.47%) of the animals. Roth and King (1991) also reported decreased milk yield, as the most common clinical sign observed in 68% animals suffering from traumatic reticulitis.

Clinical examination of both groups revealed that 18 animals were dull, depressed along with reduced rumen motility. Reduced ruminal motility might be attributed to pain caused by the different types of penetrating and non-penetrating reticular foreign bodies. Rehage *et al.* (1995) and Ramprabhu *et al.* (2003) also reported significant reduction of rumen motility in cows suffering from localized reticular adhesions. Hypomotility of rumen may also be caused by either a reduction in the excitatory drive to the gastric centre or an increase in inhibitory inputs (Leek 1969). Rumination was absent in 17 animals while 4 were ruminating irregularly. Signs of pain like arching of back, reluctance to move and long standing posture were noticed in 18 animals. The mean rectal temperature in animals of group 1 was $101.5 \pm 0.29^\circ\text{F}$, while in animals of group 2, it was $102.7 \pm 0.43^\circ\text{F}$. Heart rate of 59.83 ± 3.61 beats/min and 66.55 ± 3.46 beats/min and respiratory rate of 27.92 ± 3.03 breaths/min and 28.89 ± 1.44 breaths/min were noted in animals of group 1 and group 2 respectively. Our results are concurrent to the findings Turkar (2004).

The haematobiochemical findings in animals of both groups are presented in Table 1. The mean Hb and PCV levels found elevated in the animals of both groups may be attributed to the presence of dehydration in TRP cases as reported by Jain (1986). Elevated levels of total leukocyte count with neutrophilia recorded in animals of both groups were similar to the reports of Radostits *et al.* (2000). TLC is not a reliable indicator of inflammation in large animals

Table 1. Haematobiochemical findings in animals suffering from traumatic reticuloperitonitis

Parameter	Localised peritonitis Group 1	Diffuse peritonitis Group 2	Normal range (Radostits <i>et al.</i> 2000)
Hb (g/dL)	11.33 ± 0.62	12.91 ± 1.01	8–15
PCV (g%)	35.42 ± 2.31	39.12 ± 3.25	24–46
TLC/ μL	12362.00 ± 2670.19	13574.44 ± 1832.5	4000–12000
Total protein (mg/dL)	7.75 ± 0.31	8.43 ± 0.24	6.74–7.46
Albumin (mg/dL)	3.1 ± 0.07	3.09 ± 0.08	3.03–3.55
A/G	0.69 ± 0.03	0.59 ± 0.32	0.84–0.94
Fibrinogen (mg/dL)	0.68 ± 0.05	1.32 ± 0.28	0.20–0.70
Sodium (mEq/mL)	131.00 ± 2.07	130.33 ± 1.71	132–152
Potassium (mEq/mL)	4.11 ± 0.28	4.11 ± 0.28	3.9–5.8
Chloride (mEq/mL)	99.08 ± 3.84	92.89 ± 1.91	95–110

(Coles 1974). However, relative neutrophilia and lymphopenia indicated stress induced lymphocytic destruction (Jain 1986). Hyperproteinemia in the animals of this study could be due to subacute to chronic response to inflammation (Dubensky and White 1983). Hypoalbuminemia may be secondary to the sequestration of proteins into extravascular spaces such as body cavity effusions and vasculopathy or decreased production, i.e. hepatic failure, malnutrition, malabsorption, maldigestion and inflammatory response (Jain 1986). Hyper-globulinemia in cattle is observed in cattle suffering from TRP (Hirvonen and Pyorala 1998) and traumatic pericarditis (Fisher and Pirie 1965). Similar results of increased mean total plasma protein were reported by Braun *et al.* (1998) and Fecteau (2002) in peritonitis in ruminants. Plasma fibrinogen levels elevated in diffuse peritonitis indicate inflammatory nature of the disease. The serum sodium and potassium levels in animals of both the groups were within the normal physiological range, whereas chloride levels decreased non-significantly in animals of group 2. Normal plasma sodium and potassium levels were in contrast to the findings of Toor (2003). Hypochloraemia in animals of group 2 may be attributable to the anorexia, and decreased rumino-reticular motility (Behl and Krishnamurthy 1996). Abdominocentesis and analysis of peritoneal fluid can be a valuable aid in the diagnosis of TRP. Peritoneal fluid could be collected in 3 animals of group 1, while it was collected in all the animals of group 2. Failure of collection of the peritoneal fluid does not rule out TRP because peritonitis in cattle is characterized by marked fibrinous response and localization of the lesion and the amount of exudative fluid available at the site may be minimal (Radostitis *et al.* 2000). Peritoneal fluid analysis showed TLC of $6231.23 \pm 562.34/\mu\text{L}$ and $9500.00 \pm 3500.00/\mu\text{L}$ and neutrophil 45.33% and 67.00%, respectively, in animals of groups 1 and 2. Concentration of total proteins in the peritoneal fluid in animals of the groups was found elevated. Similar findings in peritonitis were reported by Saini *et al.* (1992) and Braun *et al.* (1993). Hirsch and Townsend (1982) reported that nucleated cell count of greater than 6000 cells/ μL and total protein content of greater than 3 g/dL was consistent with the diagnosis of peritonitis in 80% cases.

Dorsal reticulography is an accurate diagnostic method for evaluation of cattle with traumatic reticuloperitonitis (Ducharme *et al.* 1983), whereas standing reticular radiography has been proved to be a useful diagnostic aid in cattle with traumatic reticuloperitonitis (Fubini *et al.* 1990). Radiographic examination was performed in 10 animals of group 1. Diaphragmatic line was clearly distinct in seven animals while multiple penetrating/non-penetrating metallic foreign bodies were seen in 9 animals. In some animals soft tissue density appeared to be present between the reticulum-diaphragm-heart, thus strongly suggestive of cardio-phrenic/reticulophrenic adhesions (Fig.1). In group 2, radiographic examination of reticulum revealed metallic foreign bodies

in 4 animals. Braun *et al.* (1993) reported that atypical position of foreign bodies, abnormal gas density in the reticulum and depression in the cranioventral margins of reticulum were diagnostic for TRP.

Ultrasonography was performed in 10 animals of group 1. In 8 cases, the reticular wall was evident as a typical crescent shaped structure having a smooth contour or undulating wall as earlier reported by Braun *et al.* (1993), Braun and Gotz (1994) and Braun (2003). Typical biphasic reticular motility was not recorded in any of the animal. Partial reticular motility was recorded in 4 animals while 2 animals showed atony of reticular wall and in 4 animals reticulum moved with each respiration indicating presence of reticulo-phrenic adhesions. Similar findings were recorded by Braun *et al.* (1994), Braun (2003) and Kumar *et al.* (2007). These findings were further established with B+M mode ultrasonography, which was helpful in pictorial representation of reticular motility and confirming diagnosis of

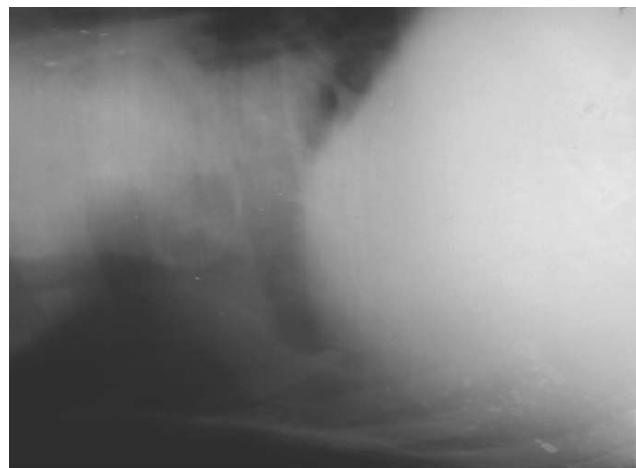


Fig. 1. Left lateral radiograph showing indistinct line of diaphragm

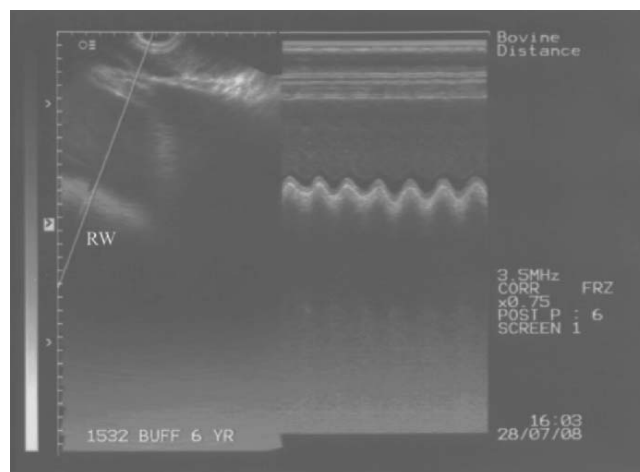


Fig. 2. Ultrasonogram in B+M mode showing reticular wall moving with respiratory movements in the form of crists and troughs.

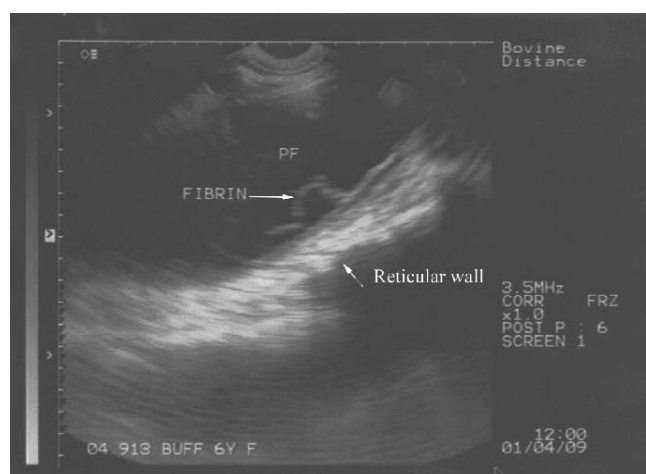


Fig. 3. Ultrasonogram in B mode showing morphological changes in the reticular wall along with fibrin floating in the anechoic peritoneal fluid

reticulophrenic adhesions. Partial reticular motility was seen as reduced biphasic displacement of reticular wall away from the transducer and reticulophrenic adhesions, which appeared as crusts and troughs on B+M mode ultrasonogram as reticulum was adhered to diaphragm and moved along with it (Fig. 2). Ultrasonographic evaluation was performed in all the animals suffering from diffuse peritonitis in group 2. In all the animals, reticular wall was displaced away from the abdominal wall with an anechoic fluid without margin and which was not restricted around the reticular area was present in many cases. In 2 cases, bands of fibrin were seen floating in the anechoic fluid (Fig. 3). In 6 animals no reticular motility was present while as in other animals partial reticular motility was present. B+M mode ultrasonography revealed displacement of reticular wall away from the transducer along with the motility of reticulum (Fig. 4). In all the cases, presence of fluid was confirmed by ultrasound guided tapping using a sterile 16/18 gauze needle. Kumar *et al.* (2008) reported that diffuse peritonitis was visible ultrasono-

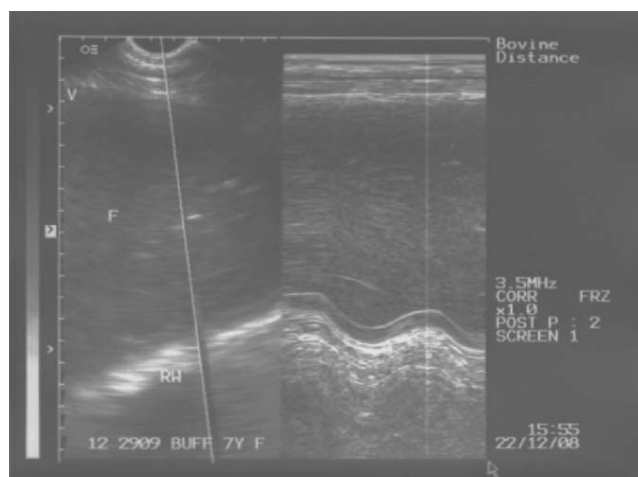


Fig. 4. Ultrasonogram in B+M mode showing displacement of reticular wall with peritoneal effusion

graphically as accumulation of fluid with or without adhesions covering the entire peri-reticular area or sometimes whole peritoneal cavity. Depending on the fibrin or cell contents of the fluid the echotexture was anechoic to hypoechoic with evidence of some bands. Similar features were reported in peritoneal effusions and diffuse peritonitis by Braun *et al.* (1994) and Braun (2003). Ultrasonography was found to be a reliable tool in diagnosis of diffuse peritonitis of bovines. Ultrasonography not only helped in localization of the lesion but also its size and extent (Ramprabhu *et al.* 2003).

From the present study it was concluded that ultrasonography in B mode and B+ mode is helpful for the diagnosis of traumatic reticuloperitonitis and differentiation of localised peritonitis from diffuse peritonitis.

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