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# CLINICOPATHOLOGICAL, ULTRASONOGRAPHIC AND PERICARDIOCENTESIS FINDINGS IN CATTLE AND BUFFALOES WITH TRAUMATIC RETICULO-PERITONITIS AND PERICARDITIS

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## SUMMARY

Thirty animals (17 cows and 13 buffaloes) with traumatic reticulo-peritonitis (TRP) and pericarditis (TP) and 10 apparently healthy animals (5 cows and 5 buffaloes) (control group) were included in the present study. In cases suspected to have traumatic reticulo-pericarditis, ultrasonography and pericardiocentesis for pericardial fluid analysis were evaluated as ancillary diagnostic aids. The obtained findings were discussed. It was concluded that ultrasonography was the most safest, useful, reliable and confirmatory aid in diagnosis of traumatic reticulo-peritonitis and pericarditis. Pericardiocentesis should also be considered as the last invasive diagnostic index.

## INTRODUCTION

Traumatic reticulo-peritonitis and pericarditis are two common serious problems affecting cattle and buffaloes and have considerable economic implications. The etiopathogenesis of these problems depend on the nature of metallic foreign bodies, its direction and extent of penetration. Perforation of the reticular wall into the peritoneal or thoracic cavities resulting in peritonitis, abscessation, vagal indigestion, pericarditis, myocarditis, pleuritis or other secondary disorders (Bastawi, 1958; Khamis and Fahmy, 1976; Jennings, 1984; Sojka, et al., 1990; Ward and Ducharme, 1994; Misk and Semieka, 2000; Radostits, et al., 2000; Misk, et al., 2001).

Beside clinical signs encountered in traumatic reticulo-peritonitis, animals with traumatic pericar-

ditis showed additional manifestations: peripheral edema, jugular venous distension, excessive pericardial effusion / purulent exudates and thickened adhered pericardium. Systemic disorders; namely bacterial endocarditis, pleurisy, mediastinitis and hepatopathies might show similar clinical signs of traumatic pericarditis (Dukes, 1963; Button, 1986; Ducharme, 1990; Rebhun et al., 1995; Rings, 1995;Jackson and Slater, 1997;Radostits, et al., 2000; Reef and McGuirk, 2002).

In bovine, several tools were used for diagnosis of traumatic reticulo-peritonitis and pericarditis. Reticular radiography, pericardiocentesis and pericardial fluid analysis might be helpful in the differentiation of traumatic reticulo-peritonitis and pericarditis (Spurrell and Kernkamp, 1952; Frederik and Wintzer, 1959; Donawick, 1980; Else, 1980; Wallace, 1980; Ducharme, et al., 1983; Button, 1986;Fubini, et al., 1990; Braun et al., 1994&2003; Ward and Ducharme, 1994; Farrow, 1999&1999a; Misk and Semieka, 2001).

Ultrasonography is superior to radiography in evaluation of reticular contour, fibrinous deposits, abnormal gas / fluid accumulation and intra-abdominal masses. Moreover, it is useful in evaluation of pericardium, chamber size, wall thickness, and description of cardiac motion. Ultrasonography can be of diagnostic value in many bovine cardiopathies: congenital anomalies, pericardial effusion, valvular disorders, vegetative lesions and different types of endocarditis (Pipers, et al., 1978a&b; Lacuata, et al., 1980; Bonagura, 1983; Yamaga and Too, 1984; 1986 & 1987; Pipers et al., 1985; Ware et al., 1986; Itabisashi, et al., 1987; Amory, et al., 1991; Kurosawa, et al., 1991; V^ros et al., 1992; Braun, et al., 1993, 1994& 1995; Moghaddam, et al., 1999; Starke and Rehage, 2000; Nassif and El-Khodery, 2001; Herzog, et al., 2002).

Bovine foreign bodies syndrome is still a serious problem and correct diagnostic skills are needed to differentiate chronic cases of traumatic reticulo-peritonitis and pericarditis from other related systemic disorders (Bastawi, 1958; EL-Sheikh, 1970; Said et al., 1975; Khamis and Fahmy 1976; Fox, 1980; Berbish, 1983; Ducharme, 1990; Braun, et al., 1993 and Reef and McGuirk, 2002). The aim of the present study was to evaluate ultrasonography and pericardiocentesis for pericardial fluid analysis, as diagnostic aids in cattle and buffaloes with traumatic reticulo-peritonitis and pericarditis.

## MATERIAL AND METHODS

The present study was carried out on thirty female animals with foreign bodies syndrome (15 Friesian and 2 native cows and 13 buffaloes). Ten apparently healthy animals (5 native cows and 5 buffaloes of 3 to 11 years old) were used as a control group. These control animals were pregnant, (5 cows in late pregnancy) and (5 buffaloes in early pregnancy). All animals were collected from



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the Surgery and Internal Medicine Clinics, Faculties of Vet. Med., Cairo Univ. and Free-Berlin Universities.

The presented cases were divided into two groups: Group A. Fifteen cows with traumatic reticulo-peritonitis (TRP) (15 Friesian cows of 2 to 10 years old). Nine cows were in late pregnancy, 5 cows were recently calved and one cow was non-pregnant. Group B. Thirteen buffaloes and 2 native cows with traumatic reticulo-pericarditis (TP) of 4 to 13 years old. Seven buffaloes were pregnant, 6 were recently calved (within 2 weeks) and 2 were non-pregnant.

Both groups of animals were subjected to thorough clinical examination according to Rosenberger, (1979). Animals of group A were subjected to hematological and biochemical blood examinations, urinalysis and ultrasonographic examinations. Animals of group B were also subjected to pericardiocentesis for morphological examination of pericardial fluid.

**Clinical examination**

A thoroughly comprehensive clinical examination was performed for all patients. This included pain tests (fist, withers and stick) and metal detector.

**Hematological and biochemical examinations**

Whole blood samples with EDTA were analyzed for determination of hemoglobin, hematocrite, RBCs, total and differential leucocytic counts (Coles, 1986). Blood serum samples were used to determine the levels of glucose (Trinder, 1969), total protein, albumin (Weichselbaum, 1946), globulin by subtraction, urea (Fawcett and Scott, 1960), creatinine (Bartel, 1972), magnesium (Gindler, 1971), calcium (Corns and Ludman, 1987), inorganic phosphorus (Erthingshusen and Daly, 1972), sodium & potassium (Oser, 1965), bilirubin (Walters and Gerarde, 1970), aspartate-aminotransferase, (AST) & alanine - aminotransferase (ALT) (Reitman and Frankel, 1957), gamma-glutamyltansferase (Y-GT), creatine-phosphokinase (CPK) & Lactate dehydrogenase (LDH) (Froster, 1970) and total lipids (Zollner and Kirsch, 1962).

**Urinalysis**

Urine samples were physically examined for color, odor, aspect, PH and turbidity. After centrifugation, the supernatant was submitted to qualitative tests for protein, glucose, ketones, bilirubin, urobilinogen, nitrate, and blood by Comber 9 strips. The specific gravity was determined using small-size urinometer. The urine sediments were microscopically examined (Rosenberger, 1979 and Carlson, 2002).

**Ultrasonographic examination**

Ultrasonographic examination of apparently normal and affected animals was performed using 3.5 and 5 transducers. Ultrasonographic devices (SDR 1550 XP-Philips with 5MHz sector and Pie



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medical 240 Parus with 3.5 and 5MHz convex dual frequencies transducers) were used in scanning. On standing position, the areas over the reticulum and both sides of the thorax to the level of elbow joints were clipped. Before each imaging, transmission gel was applied. The reticulum and heart were scanned according to Vöros et al., (1992); Braun and Götz, (1994); Braun and Schweizer, (2001); Herzog, et al., (2002) (Fig. 1 & 2); over the ventral thoracic area to the right of midline, over the midline, over the ventral thoracic area to the left of midline, over the 6th - 7th intercostal spaces to elbow joints on the left and right sides and the heart was imaged on the cardiac area on both sides (4th-6th intercostals spaces) and on ventral midline.

Ultrasonographic findings in cases with TRP were confirmed during exploratory laparotomy or at slaughtering. Only 5 cases with TP were followed up at slaughtering.

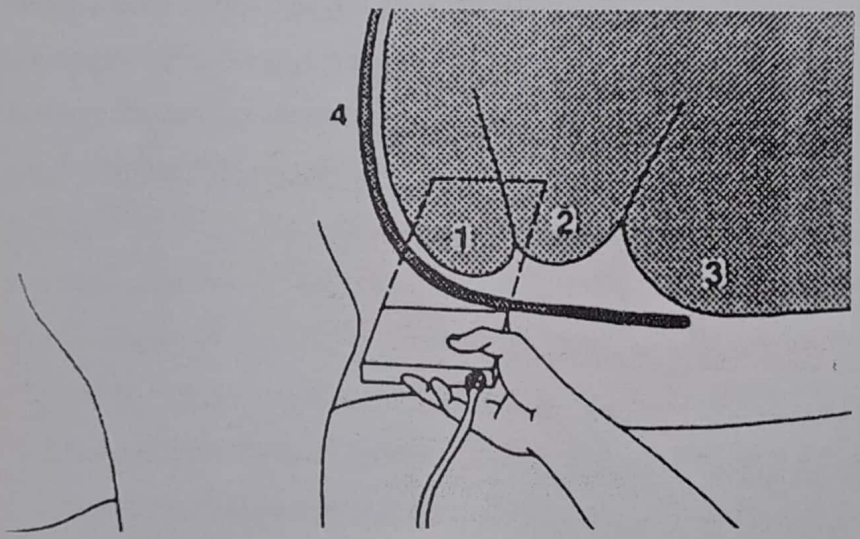


Fig. 1: Schematic diagram of ultrasonographic examination of the left paramedian view of the reticulum of dairy cow. 1= reticulum; 2= craniodorsal blind sac of the rumen; 3= ventral sac of the rumen; 4= diaphragm (after Braun and Götz, 1994).

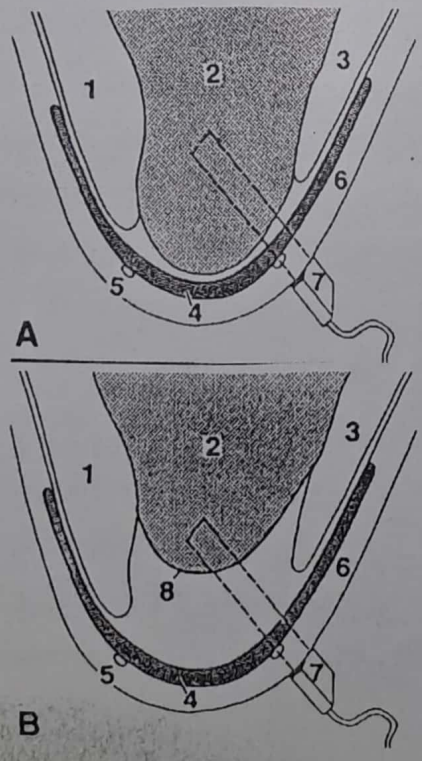


Fig.2: Schematic diagram of ultrasonographic examination of the cross sectional view of the reticulum of dairy cow. A= reticulum during relaxation; B= reticulum during contraction; 1= liver; 2= reticulum; 3= spleen; 4= sternal part of the diaphragm; 5= musculophrenic vein; 6= abdominal wall; 7= linear transducer [broken line= ultrasonographic beam]; 8= distal end of the reticulum at the end of the first reticular contraction (after Braun and Götz, 1994).

**Pericardiocentesis**

The area dorsal to the elbow, in the left 5th-6th intercostal spaces (over the most audible area of abnormal cardiac sounds) was prepared and locally infiltrated with 2% xylocaine Hcl solution. Skin incision of one-cm was made, then, a needle (10-18 gauge, 15-20 cm length) was inserted towards the heart. A Pericardial fluid was drained by aspiration. Fifty pericardial aspirates were taken from 50 apparently healthy animals (20 buffaloes, 15 native and 15 Friesian cows) and from suspected animals with TP (15 cases) from the slaughterhouse.

**Statistical analysis**

Statistical analysis of the data was done by means of ANOVA for repeated measures. When F-value was significant, least- significant differences among means using SPSS (Statistical product & Service solutions) was tested (Kuehl, 1994). All data were presented as mean ± Standard error and $P<0.05$ was considered significant.

## RESULTS

**Cows affected with traumatic reticuloperitonitis (TRP)**

**Clinical findings:**

In cows with TRP, reduction in milk production was a common history in all affected cases. Anorexia was noticed in 11 cases, dullness in 9 cases, tensed abdominal wall in 6 cases, arched back in 8 cases, recurrent tympany in 5 cases, incomplete ruminal filling in 2 cases, poorly digested material in 8 cases and loss in body condition in 7 cases. In four cows the foreign body migrating to the right side leading to swelling behind the right elbow (Fig.3).

Rectal temperature, heart and respiratory rates were 38.77 ± 0.21°C, 74.67 ± 4.62 beats/minutes and 32.0±8.0 breaths/minutes respectively. Ruminal movements were 2±0.04 /2minutes. In nine cases, stick and fist tests at xiphoid region were positive. Metal detectors were positive in 13 cases.

Fig.3: A 4-years-old pregnant Friesian cow with TRP. The foreign body migrating to the right side. Note the swelling behind the right elbow (arrow).

**Hematological and biochemical findings:**

Hematology of clinically healthy and affected cows revealed a significant decrease in hematocrite value and erythropenia, non-significant decrease in hemoglobin concentration and non-significant leucocytosis with highly significant neutrophilia and significant lymphopenia in the affected cases with TRP (Tab 1).

Biochemical serum analysis of healthy and affected cows revealed a significant decrease in serum magnesium, calcium, phosphorus and potassium concentrations. There was also significant increase in total protein; bilirubin and alanine-aminotransferase activity while creatine phosphokinase activity showed non-significant increase in the affected cases with TRP (Tab. 2). Urinalysis of the affected cows with TRP was normal.

Table. 1: Hematology of clinically healthy and affected cows with TRP

| Parameters | Clinically healthy cows | Affected cows with TRP |
|---|---|---|
| Hemoglobin (g%) | 10.5±8.60 | 9.83±16.57 |
| Hematocrit (%) | 31.3±0.027 | 28.9±0.039* |
| Erythrocytic count (x$10^6$ cells/µL) | 6.55±0.559 | 5.91±1.01* |
| Total leukocytic count (x$10^3$/cells/µL) | 9.22±2.51 | 11.53±5.61* |
| Proportion of seg. neutrophils (%) | 39.40±10.50 | 56.60±11.23* |
| Proportion of lymphocytes (%) | 51.50±12.36 | 39.46±10.25* |

* P<0.05 ** P< 0.01

Tab. 2: Some biochemical blood parameters in clinically healthy and affected cows with TRP

| Parameters | Clinically healthy cows | Affected cows with TRP |
|---|---|---|
| Magnesium (mmol/l) | 0.854±0.073 | 0.776±0.125* |
| Calcium (mmol/l) | 2.495±0.089 | 2.218±0.158** |
| Phosphorus (mmol/l) | 2.302±0.307 | 1.569±0.329** |
| Sodium (mmol/l) | 140.50±3.79 | 139.50±2.41 |
| Potassium (mmol/l) | 4.77±0.363 | 4.11±0.370** |
| Alanine-Aminotransferase (U/l) | 30.75±7.66 | 73.38±6.18* |
| Gamma-Glutamyltansferase (U/l) | 17.25±6.37 | 16.30±7.37 |
| Total protein (g/dl) | 65.65±5.87 | 208.90±7.45 |
| Creatine Phosphokinase (U/l) | 72.95±4.90 | 81.98±8.35* |
| Bilirubin (µmol/l) | 1.66±1.04 | 8.34±7.68** |
| Urea (mmol/l) | 3.40±0.612 | 3.738±1.491 |

* P<0.05 ** P< 0.01



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**Ultrasonographic findings of the reticulum in normal cows**

The layers of the ventral abdominal wall appeared as band-shaped structures of various echogenicities. The musculophrenic vein was seen as an anechoic band. The sternal part of the diaphragm and the peritoneum appeared as an echogenic band Normally, the reticulum appeared as a half-moon-shaped structure with a smooth contour from the ventral midline. When relaxed (Fig.4a), the reticulum was situated immediately adjacent to the diaphragm and ventral abdominal wall. When contracted it moved upward (Fig.4b). The contents of the reticulum were normally not visible because of its gaseous composition. By advancing the transducer caudally on the left side of the cow, parts of the craniodorsal blind sac, the ventral sac of the rumen and rumino-reticular groove were observed. The reticulum and the ventral part of the spleen could be imaged from the left sixth and seventh intercostals spaces. From right side, parts of omasum, abomasums and sometimes liver could be visualized by moving the transducer to the right ventral thoracic region (Fig.5 a, b & c).

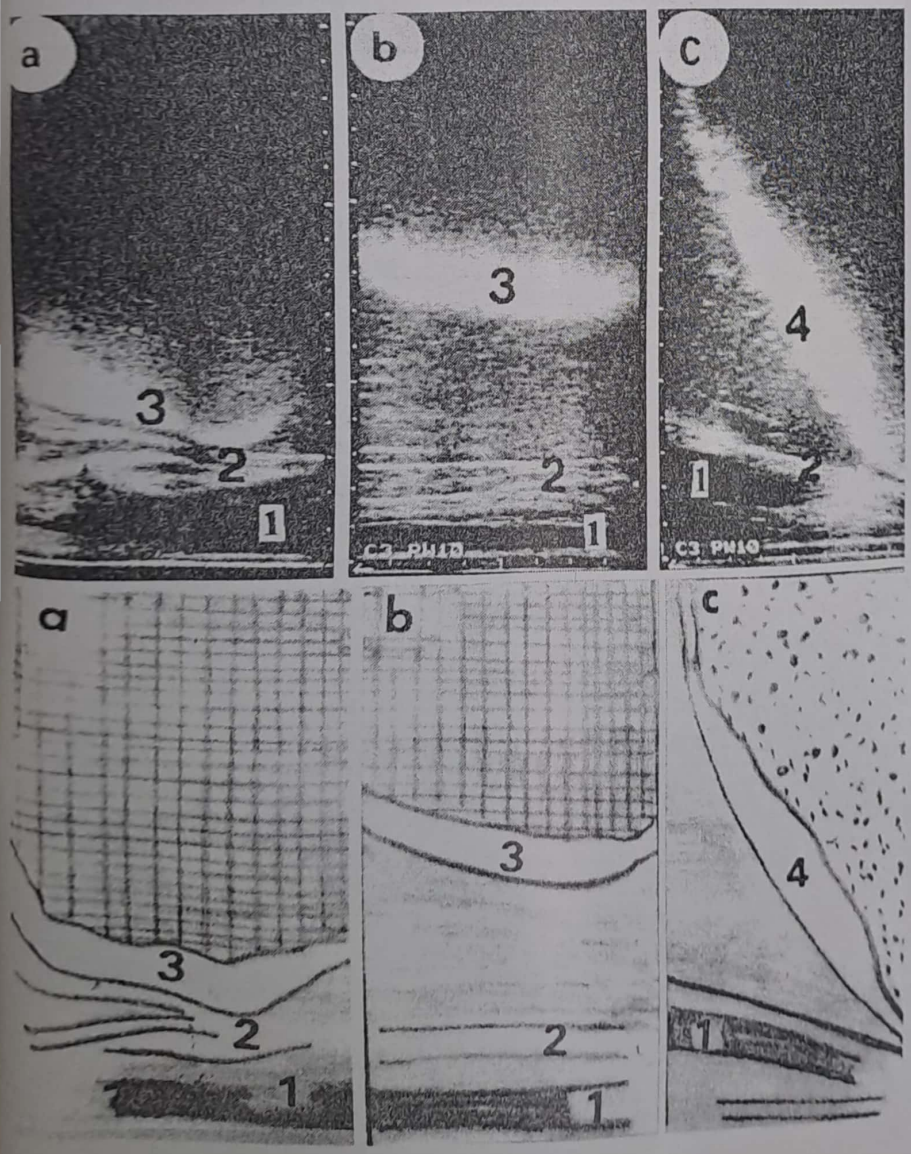


Fig.4: Normal ultrasonogram and schematic diagrams of reticular area from ventral thoracic area to the left of midline. Note the abdominal wall; musculophrenic vein (1), the sternal part of the diaphragm and the peritoneum (2). The reticulum (3) relaxed on abdominal wall, contracted in (b) and the ruminoreticular groove (4) (3.5 MHZ linear transducer).

**Ultrasonographic findings in cows with TRP**

Ultrasonographic findings in cows with TRP revealed the presence of echogenic material of varying intensity on the reticular serosa and anterior blind sac of the rumen. These inflammatory deposits appeared to be cavitated by accompanying hypoechogenic fluid (Fig.6).

Between reticulum, ventral abdominal wall and ventral sac of the rumen a spherical, echogenic, partitioned and capsulated structures (abscess) with different sizes (from 3 cm. to 15 cm.) with hypoechogenic cavities was noticed (Fig.7&8).

There was peritoneal effusion appear as hypoechogenic or moderately echogenic fluid without an echogenic margin and restricted to the reticular area. Thick echogenic fibrin deposits between the reticular serosa and abdominal wall (peritonitis) was imaged in all affected cases (Fig.9).

In all cows with TRP, detection of foreign bodies cannot be imaged ultrasonographically.

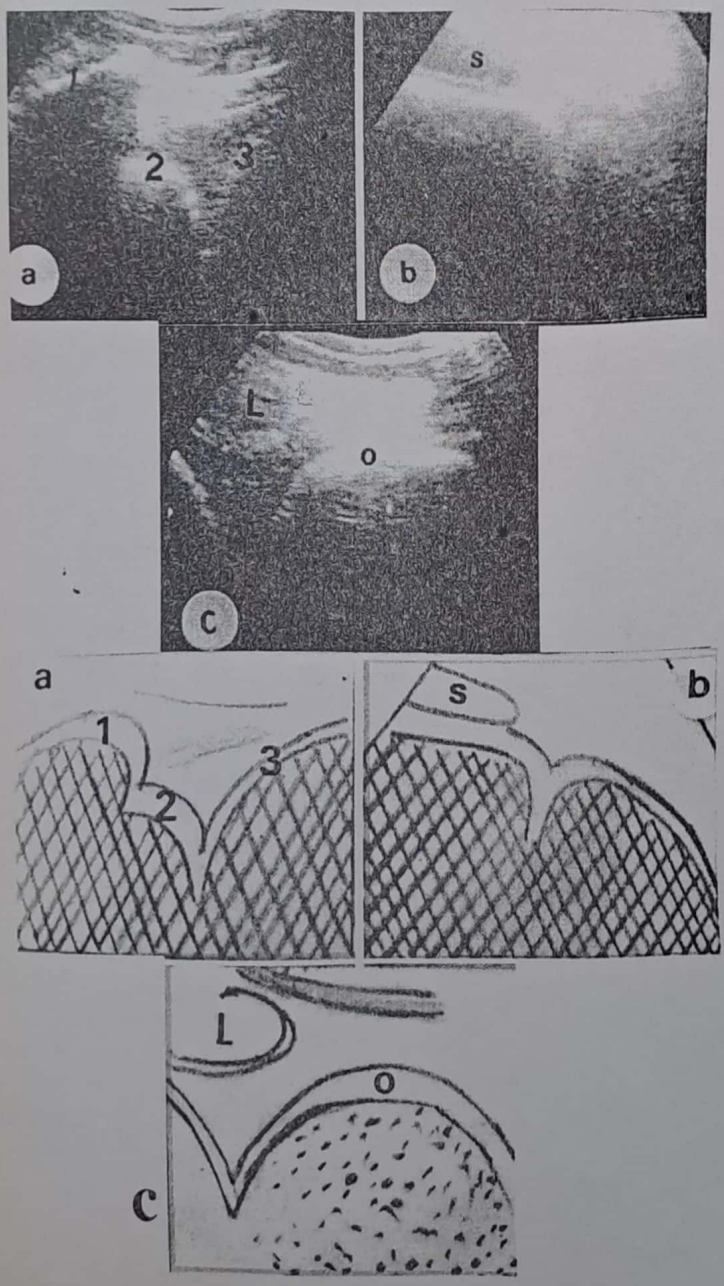


Fig.5: Normal ultrasonogram and schematic diagrams of reticular area from ventral thoracic area to the left of midline. Note the reticulum (1), craniodorsal blind sac (2), the ventral sac of the rumen (3) and the ventral part of the spleen (s). From right ventral thoracic region; omasum (o) and liver (L) were imaged (3.5 MHZ sector transducer).



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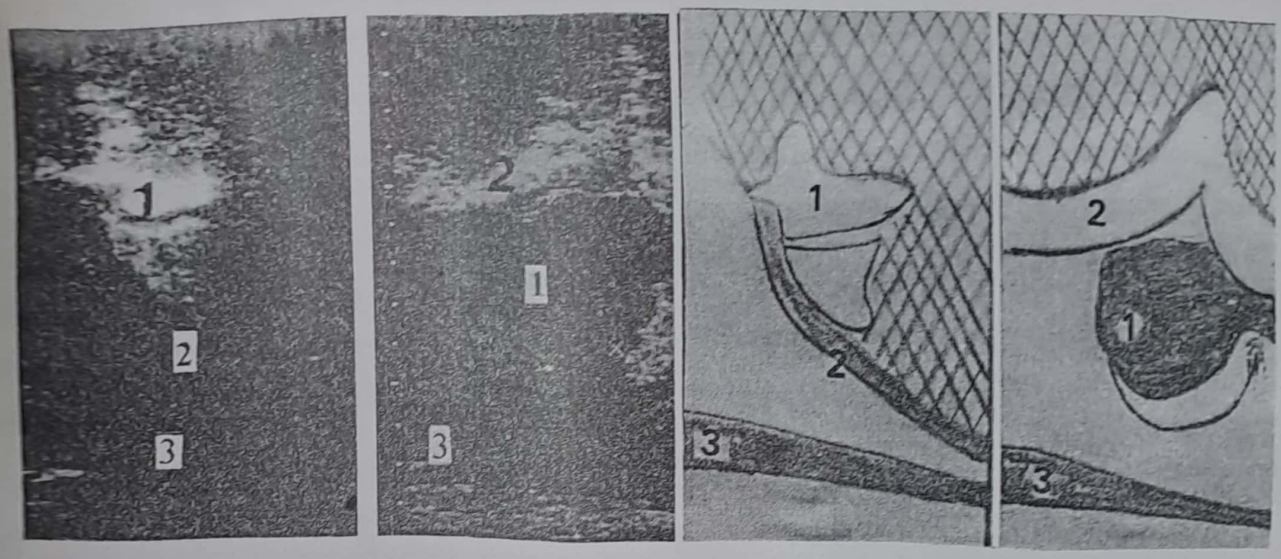


Fig.6: Ultrasonogram and schematic diagrams of cases with TRP. Note, hyperechogenic structures (1) adhered to the reticular wall (2) from inside (left). Capsulated structures with anechoic cavity (1) over the reticular wall (2) (right). The musculophrenic vein (3) (3.5 MHZ linear transducer on ventral thoracic area to the left of midline).

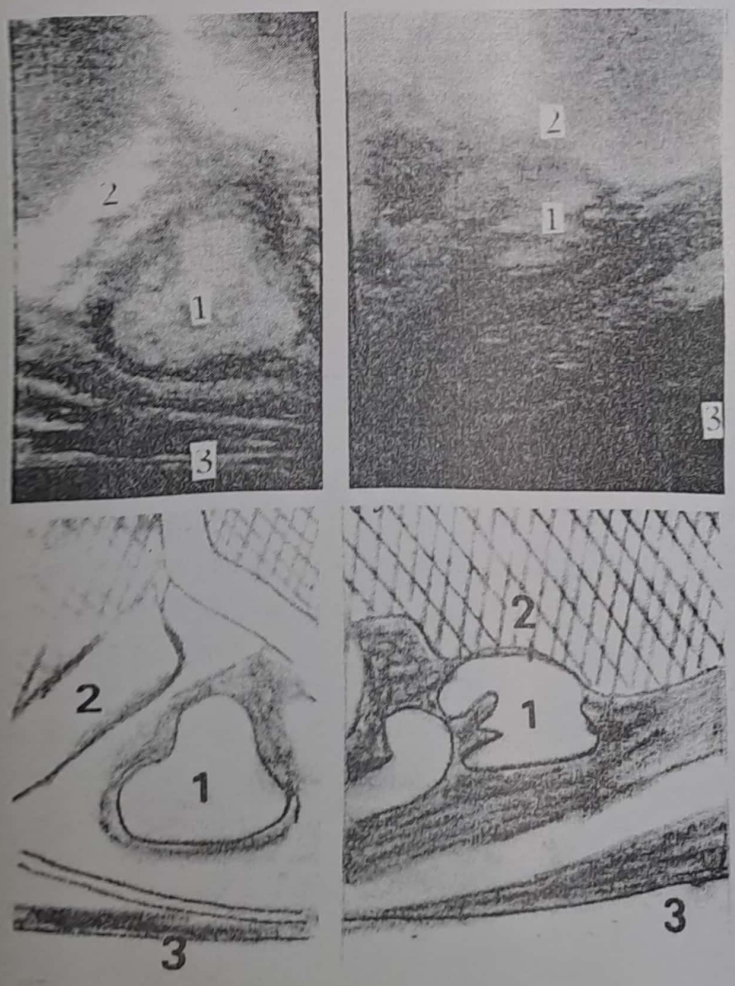


Fig.7: Ultrasonogram and schematic diagrams of cases with TRP from ventral thoracic area to the left of midline. The scan shows capsulated structures with echodense deposits (1) in its cavity between the reticular serosa (2) and abdominal wall (3) (3.5 MHZ linear transducer).



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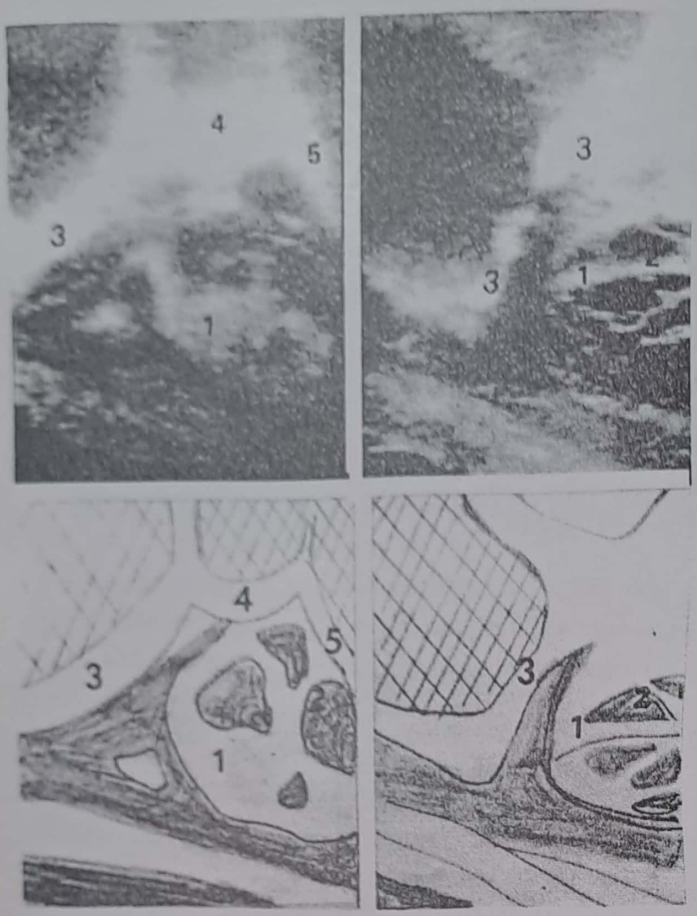


Fig.8: Ultrasonogram and schematic diagrams of cases with TRP from ventral thoracic area to the left of midline. Note; capsulated structures with echogenic deposits (1) interspersed with anechoic cavities (2) between an abnormal contoured reticular wall (3), craniodorsal blind sac of rumen (4) and ventral sac of the rumen (5) (3.5 MHZ linear transducer).

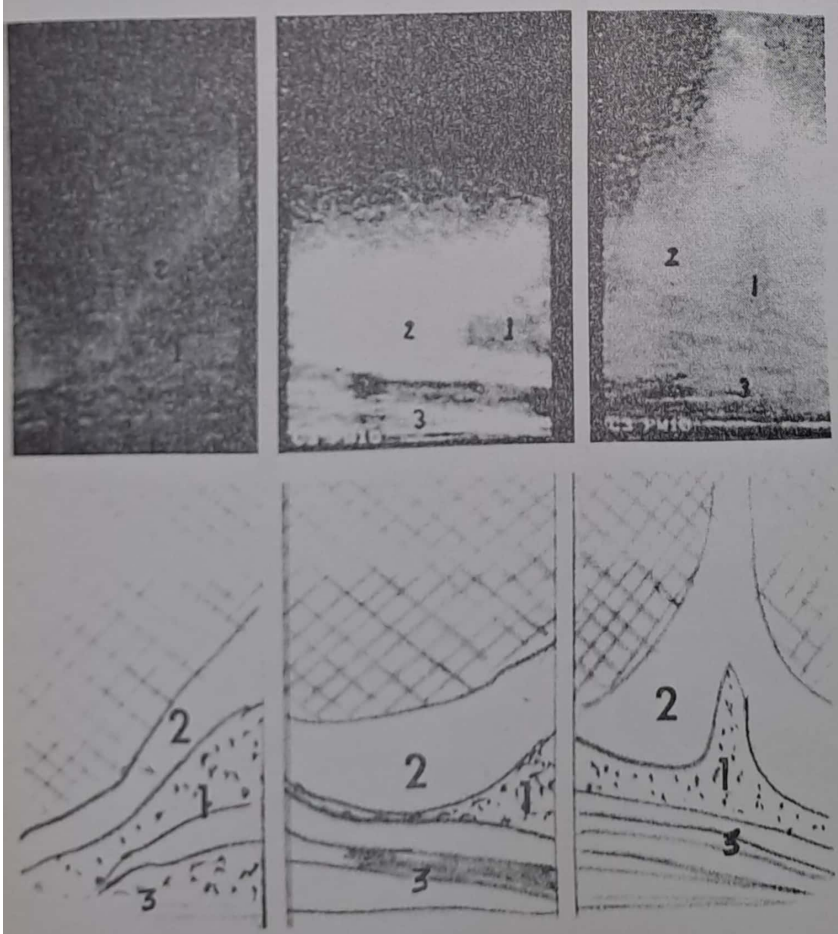


Fig.9: Ultrasonogram and schematic diagrams of cases with TRP from ventral thoracic area to the left and right of midline. The scan shows thick echogenic fibrin deposits (1) between the reticular serosa (2) and abdominal wall (3) (3.5 MHZ linear transducer).

**Animals affected with traumatic reticulo-pericarditis (TP)**

**Clinical findings:**

The affected animals (13 buffaloes and 2 native cows) showed the previous clinical signs of traumatic reticulo-peritonitis at different degrees. Brisket, neck and submandibular edema, jugular vein distension and congested mucous membranes were marked in 10 cases (Fig.10&11). Tinkling / splashing sounds superimposed on muffled cardiac sounds in 11 cases. A significant increase in heart and respiratory rates were observed in the affected animals. Ruminal movement was significantly decreased in all affected animals (Tab.3). In seven cases, stick and fist tests at xiphoid region were positive. Metal detectors were positive in 8 cases.

Fig.10: A Buffalo affected with TP shows brisket edema, Note also neck and submandibular edema.

Fig.11: A 4- year- old native cow with TP shows brisket edema. Note also jugular vein distension (arrows).

**Hematological and biochemical findings:**

The results of hematological analysis revealed a significant decrease in hematocrite value and erythropenia, and non-significant decrease in hemoglobin concentration. There was a significant leukocytosis, neutrophilia and lymphopenia (Tab. 4). A significant increase in serum glucose, urea and alanine aminotransferese values were observed in the affected animals. The other biochemical parameters showed unremarkable changes (Tab.5).

Urinalysis was positive to albumin (100mg/dl) and RBCs (8-10 HPF) and negative for WBCs (0-2HPF) except in two cases pus cells were (4-6HPF).

Table.3: Heart and respiratory rates, rectal temperature and ruminal movements In buffaloes with TP

| Parameters | Clinically healthy buffaloes | Affected buffaloes with TRP |
|---|---|---|
| Heart rate (beat /min.) | 48.5±0.48 | 78.5±5.8* |
| Respiratory rate (breath/min.) | 12.0±0.57 | 29.5±4.1* |
| Rectal temperature (°C) | 38.2±0.63 | 38.3±0.24 |
| Ruminal movements (movement /2min.) | 2.7±0.06 | 1.38±0.31* |

P<0.05

Tab. 4: Total blood picture in clinically healthy and affected buffaloes with TP

| Parameters | Clinically healthy buffaloes | Affected buffaloes with TRP |
|---|---|---|
| Hemoglobin (g%) | 12.23 ± 0.67 | 11.11 ± 0.8 |
| Hematocrit ( vol %) | 46.36 ± 0.61 | 33.35 ± 1.9* |
| Erythrocytic count (x$10^6$ /µL) | 7.17 ± 0.56 | 5.17 ± 0.32* |
| Total leukocytic count (x$10^3$/µL) | 6.53 ± 0.48 | 10.70 ± 0.53* |
| Proportion of segmented neutrophils (%) | 33.26 ± 0.46 | 39.61 ± 7.1 |
| Proportion of unsegmented neutrophils (%) | 4.43 ± 0.43 | 26.16± 6.4* |
| Proportion of lymphocytes (%) | 58.5 ± 0.48 | 29.4 ± 3.1* |
| Proportion of monocytes (%) | 2.17 ± 0.19 | 3.43 ± 0.90 |
| Proportion of eosinophils (%) | 0.27 ± 0.01 | 0.81 ± 0.40 |
| Proportion of basophils (%) | 0.9±0.05 | 0 |

P<0.05



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Tab. 5: Some biochemical blood parameters in clinically healthy and affected buffaloes with TP

| Parameters | Clinically healthy buffaloes | Affected buffaloes with TRP |
|---|---|---|
| Calcium (mmol/l) | 10.26 ± 0.4 | 9.42 ± 0.45 |
| Phosphorus (mmol/l) | 4.46 ± 0.61 | 3.51 ± 0.34 |
| Aspartate-aminotransferase (U/l) | 100.0 ± 5.7 | 123.0 ± 5.0 |
| Alanine- aminotransferase (U/l) | 6.0 ± 0.17 | 29.0 ± 9.0* |
| Glucose (mg/dl) | 55 ± 0.57 | 88.2 ± 7.3* |
| Total protein (g/dl) | 7.3 ± 0.52 | 7.5 ± 0.53 |
| Albumin (g/dl) | 3.66 ± 0.56 | 3.76 ± 0.25 |
| Globulin (g/dl) | 3.6 ± 0.49 | 3.1 ± 0.80 |
| Albumin / Globulin ratio | 1.1 ± 0.05 | 1.21 ± 0.005 |
| Total lipids (mg/dl) | 225.3 ± 3.7 | 322.3 ± 6.0 |
| Creatinine (mg/dl) | 1.20 ± 0.05 | 0.83 ± 0.11 |
| Urea (mg/dl) | 36.2 ± 0.52 | 50.3 ± 3.4* |

P<0.05

**Ultrasonographic findings:**

Ultrasonographic scanning of six apparently normal buffaloes and cows revealed an echo-free space between visceral and parietal pericardium ranged between 0.6 and 0.9 cm (0.78 cm.± 0.048) with minimal amount of fluid accumulation (Fig.12). Ultrasonographic examination of eight buffaloes with traumatic reticulo-pericarditis showed the presence of anechoic fluid filled the pericardial spaces, which ranged between 2.52 and 2.65cm (2.60cm ± 0.023). In 7 cases, there was an echodense structures (fibrin or exudates) appeared in the echo-free pericardial space (Fig.13). In all buffaloes with TP, detection of foreign bodies cannot be imaged ultrasonographically.

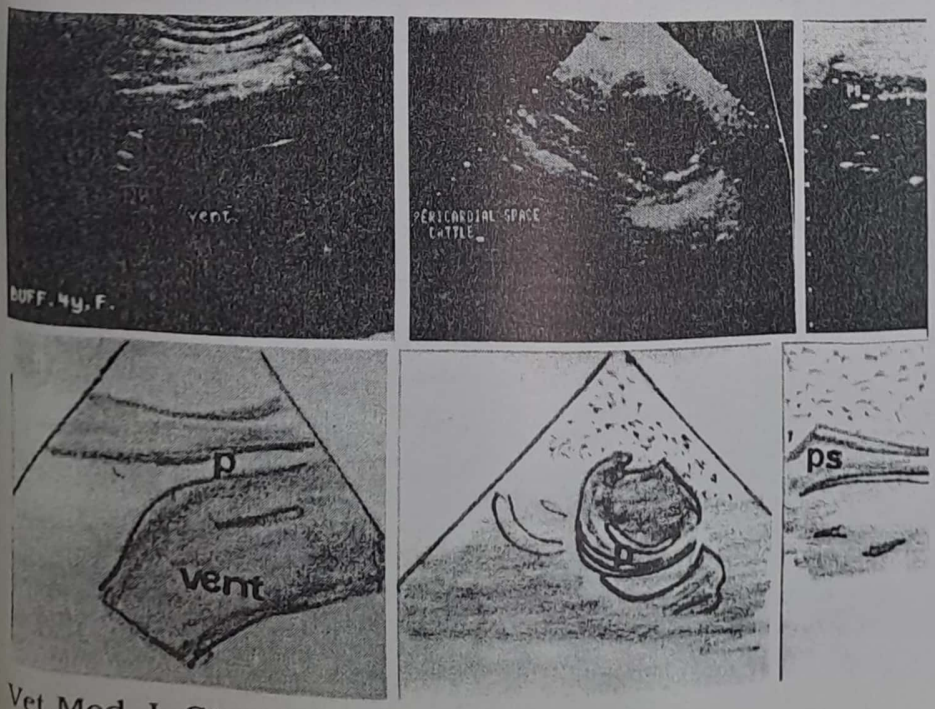


Fig. 12: Sagittal and transverse ultrasonogram and schematic diagrams of apparently normal animals show an echo-free space between visceral and parietal pericardium with minimal pericardial fluid accumulation. Per.=pericardium, Ps.=pericardial space, Vent. =Ventricle (5 MHZ sector transducer on the 4th-5th intercostals spaces).

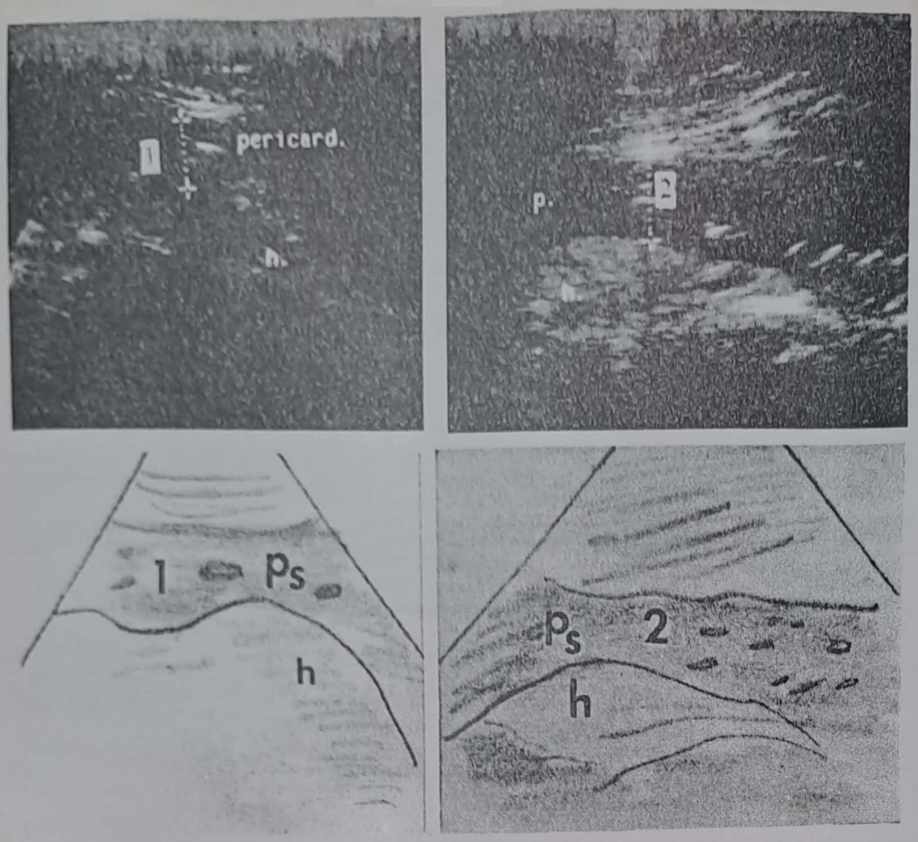


Fig.13: Ultrasonogram and schematic diagrams of cases with TP shows large anechoic fluid-filled pericardial space (1) with echodense-structures (fibrin - exudate) (2) (3.5 and 5 MHZ sector transducers on the 4th-5th intercostals spaces).

Pericardiocentesis of 13 cases suffered from traumatic reticulo-pericarditis revealed urine-colored, offensive, purulent fluid (50-100 ml). Pericardiocentesis was followed by temporally improvement in cardiac function in 9 cows and gradual deterioration terminated by slaughtering in 6 cows.

**Postmortem findings**

At postmortem, purulent exudates of quantities ranged between 750 and 2500ml mixed with fibrin clots were collected from the pericardial cavities in 5 cases with traumatic reticuo-pericarditis. The pericardial sac thickness reached 0.5 to 1.5cm (Fig.14). Wire segments of variable lengths protruding from reticulum and piercing the pericardium with hydrothorax was demonstrated in 3 cases.

Fig.14: A buffalo heart with traumatic reticulo-pericarditis shows thickened pericardial sac (arrow).

## DISCUSSION

Early diagnosis of traumatic reticulo-peritonitis (TRP) and traumatic pericarditis (TP) were the main challenge to bovine practitioners. In spite of tentative clinical diagnosis can be made, confirmatory ancillary aids are required (Braun, et al. 1993; 1994& 2003; Starke and Rehage 2000; Herzog, et al. 2002).

Results of the present work indicated that there was no age incidence for TRP and TP syndrome in cattle and buffaloes since the ages of the affected cases ranged between 2 and 13 years. The problem depends upon the chance of ingestion of the offending objects at any age and for longer period of time as mentioned by (Said et al. 1975; Braun, et al. 1993; Moghaddam, et al. 1999; Nassif and El-Khodery 2001).

More than half percentage of animals (53.3%) affected with TRP and TP were pregnant while recently calved animals represented 36.7%. Pregnancy (specially in last trimester) and the act of parturition increase the intra-abdominal pressure and consequently enhance the development of TRP and TP (Said et al. 1975; Jackson and Slater 1997; Radostits et al. 2000; Reef and McGuirk 2002).

The presence of typical clinical signs makes the diagnosis of acute TRP easier than chronic ones. However, except the history of milk yield reduction, not all animals with chronic traumatic reticulo-peritonitis showed all typical clinical signs (Bastawi 1958; Said et al. 1975; Said and Fahmy 1975; Khamis et al. 1985). Consequently, the probability of diagnosis of TRP decreased when these apparent typical signs decreased (Braun, et al. 1993 1994& 2003; Radostits, et al. 2000).

Although edema and jugular vein distension, which are characteristic signs of congestive heart failure, they were not observed in 5 cases of TP. Also, tinkling / splashing sounds superimposed on muffled cardiac sounds in 11 cases.

A variable number of cattle and buffaloes affected with both TRP and TP showed reaction to pain tests, however, these tests were positive in conditions of non-traumatic origin as simple indigestion, abomasal ulcer and non-traumatic peritonitis and in chest pain as pneumonia and pleuritis (Said et al. 1975; Fox 1980; Ducharme, et al. 1983; Rings 1995).

The results of hematology and biochemistry reflected the presence of anorexia, inadequate dietary intake, state of dehydration, stresses, presence of septic foci and the condition of the heart and liver (Bastawi 1958;EL-Saifi 1969; EL-Sheikh 1970;Misra and Angelo 1974;Said et al. 1975;Ramakrishna et al. 1979; Whitlock 1980; Berbish 1983;Khamis et al. 1985; Saleh 1990 & 1998; Ward and Ducharme 1994; Radostitis et al. 2000;Nassif and El-Khodery 2001; Carlson 2002;Garry 2002; Reef and McGuirk 2002).



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In this respect, 22% out of fifty cases of TRP exhibited more or less normal blood picture attributed to mild existing pathology (EL-Sheikh 1970). On the other hand, some patients with acute local peritonitis and most cases of acute diffuse peritonitis have shown more or less similar hematological and biochemical findings (Rebhun, et al. 1995 and Radostits, et al. 2000). Neither of the clinical, hematological and biochemical findings results in diagnostic confirmation of TRP and TP (Arthur 1947; Bastawi 1958; Khamis et al. 1985; Kurosawa, et al. 1991;Jackson and Slater 1997; Radostits et al. 2000; Carlson 2002).

Ultrasonographic findings of the reticulum in normal cows revealed the ventral abdominal wall and the sternal part of diaphragm as echogenic band-shaped structures. The reticulum appeared as a half-moon-shaped structure with a smooth contour and can be imaged when relaxed and contracted. On the left side, parts of the craniodorsal blind sac, the ventral sac of the rumen, rumino-reticular groove and ventral part of the spleen were scanned. From right side, parts of omasum, abomasums and sometimes liver could be visualized as reported by (Braun, et al. 1993, 1994 & 1995).

In the present study, ultrasonographic findings in cases with traumatic reticulo-peritonitis comprised hyperechoic, inflammatory fibrinous adhesions between reticulum, rumen and abdominal wall. Abnormal reticular contour was attributed to inflammatory reactions. The fibrinous tissues between reticulum and ventral abdominal wall may resulted from the healing of the lesions of reticuloperitonitis (Braun, et al. 1993, 1994, 1995&2003). Inflammatory adhesions in cattle with TRP lead to inhibition of reticular motility, which affects digesta passage (Starke and Rehage 2000 and Herzog, et al. 2002).

An echogenic capsulated structure with central hypoechoic to hyperechoic contents, which is the typical ultrasonographic image of an abscess were seen frequently inside and over the recticular serosa causing abnormal reticular contour. These abscesses were scanned not only in the cranial reticular aspects but also in the caudal ones. These findings may differentiate traumatic reticulo-peritonitis from non-traumatic ones and from other related chronic disorders (Braun, et al. 1993, 1994& 1995; Braun 1997; Starke and Rehage 2000 and Herzog, et al. 2002).

Ultrasonographic findings of apparently normal cows revealed measurable echo-free spaces between visceral and parietal pericardium with minimal amount of fluid accumulation. On the other hand, ultrasonographic examination of affected cases with TP revealed anechoic distended fluid-filled pericardial spaces with echodense-structures (fibrin or exudates) in the echo-free space. These confirmatory findings are consistent to those mentioned by (Vöros et al. 1992; Braun, et al. 1993, 1994 & 1995; Jackson, and Slater



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1997; Moghaddam, et al. 1999; Starke and Rehage 2000;Nassif and El-Khodery 2001 and Reef and McGuirk 2002).

In all cows and buffaloes affected with TRP and TP, detection of foreign bodies cannot be imaged ultrasonographically. These findings were in agreement with Braun, et al., (1994).

Pericardiocentesis of cases affected with TP revealed offensive, purulent fluid. Pericardiocentesis is not without risk; however, it is a worthwhile procedure to confirm the diagnosis of pericarditis (Coles 1974; Tabosa, 1980; Ducharme 1990; V^ros et al. 1991; Ward and Ducharme 1994; Rebhun et al. 1995; Rings 1995;Jackson and Slater 1997; Reef and McGuirk 2002).

In conclusion, ultrasonography is the most safest, non-invasive, useful, reliable and confirmatory aid in diagnosing traumatic reticulo-peritonitis and pericarditis in cattle and buffaloes.

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