Original Article

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CLINICAL AND ULTRASONOGRAPHIC ASSESSMENT OF TRAUMATIC PERICARDITIS AND TRAUMATIC RETICULOPERITONITIS IN BUFFALOES

Ankit Prajapati*, Prakash Chauhan, Abhinav Suthar, Kalpesh Patel and Jignesh Patel

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ABSTRACT

Traumatic injury by a foreign body is a common cause of traumatic pericarditis (TP) and traumatic reticuloperitonitis in buffaloes. Both mimics almost the same clinical sign under field conditions. Clinical, hematobiochemical and ultrasonographic changes between TP and TRP cases in buffaloes were evaluated in the present study. From the period of January 2020 to December 2020, a total of twelve buffaloes were investigated with TP and TRP conditions. Six animals each suffering from TP and TRP were included along with six normal healthy animals as control. Different clinical signs, haemato-biochemical parameters and ultrasonographical findings were recorded in each group and comparative analysis was done. Brisket edema in TP affected buffaloes and arch back condition in TRP affected buffaloes was the common clinical finding. Ferroscopy was performed to confirm the location of foreign body. Jugular pulsation was noted in Group II as well as Group III buffalo. A significant increase in WBC count and a significant decrease in hematocrit was noted in Group III animals compared to healthy animals. SGOT and fibrinogen concentration was significantly increased in both group animals. Anechoic fluid accumulation in TP and thickening of the reticular wall in TRP were the most consistent ultrasonographic findings in buffaloes.

Keywords: *Bubalus bubalis*, buffaloes, fibrinogen, foreign body, pericarditis, reticuloperitonitis, ultrasonography

INTRODUCTION

Ingestion of metallic and non-metallic foreign bodies by cattle and buffalo is a devastating problem not only because of mortality and morbidity but also because of the noticeably unfavorable effects on animal production (Tesfaye and Chanie, 2012). Traumatic pericarditis (TP) and traumatic reticuloperitonitis (TRP) are the maximum recorded condition among the various abdominal disorders in ruminants (Mohamed, 2010). Most foreign bodies are present in the reticulum due to specific honeycomb-like structure and contraction of the same allows the foreign body to penetrate the wall further leading to reticulo-peritonitis and pericarditis subsequently (Braun, 2003). Traumatic reticulitis is one of the common sequelae (Roth and King, 1991) and depending upon the direction of

Department of Medicine, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Gujarat, India, *E-mail: ankitprjpt1@gmail.com

the foreign body further complications occur.

Buffaloes are less likely susceptible to TP and TRP-like conditions. Incidences of TP and TRP are more in cattle than buffalo. Cattle are more susceptible to foreign body syndrome than small ruminants because they do not use their lips for prehension and are likely to choose chopped feed (Braun, 2003). Buffaloes are strict grazers and only browse when feed is utterly scarce. Buffalo commonly ingests foreign objects, due to a poor ability to identify metal objects in their feed and incomplete mastication of feed before swallowing (Mostafa *et al*., 2015).

Ultrasonography and radiography are well-established diagnostic tools for the detection of TP and TRP in large animals by complimenting each other in definitive diagnosis. Limited work was done in bubaline and due to lack of scientific research in buffaloes, a veterinarian has to rely on cattle data for diagnosis. So, the present study was undertaken to evaluate TRP with its most common complication TP based on clinical examination, hematobiochemical analysis and ultrasonographic evaluation.

MATERIALS AND METHODS

The present study was conducted from January 2020 to December 2020 at Veterinary Clinical Complex, Dantiwada and Deesa, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat, India.

Animals

Twelve buffaloes were selected for the study. The age of all animals was between four to seven years. Buffaloes were categorized into three different groups. Six healthy buffaloes were kept in the study as a control (Group 1). Group 2 and Group 3 buffaloes were categorized into traumatic pericarditis and traumatic reticuloperitonitis based on various clinical signs.

Clinical examination

All buffaloes were subjected to the various clinical parameters. Rectal temperature (°F), heart rate (bpm), respiratory rate (breath/minute), jugular pulsation, brisket edema, arch back condition and mucus membrane were evaluated and noted (Table 1).

Hemato-biochemical parameters

Blood was collected in EDTA and clot activator vials for evaluation of different haemato-biochemical parameters e.g., white blood cells (10^3/µL), red blood cells (10^6/µL), hemoglobin (g/dl), hematocrit (%), SGOT (U/L), total protein (g/dl), albumin (g/dl), creatinine (mg/dl), blood urea nitrogen (mg/dl) and fibrinogen (mg/dl). Blood was collected in vials with a heparin anticoagulant for plasma separation. Fibrinogen concentration was estimated from separated plasma by using a semi-automatic coagulometer.

Ferroscopy and ultrasonographic examination

Metal detection was implemented on all the animals to check for the metallic foreign body. Ultrasonography was executed to evaluate the internal damage of various structures and to confirm the status of the heart. Animals were kept in a standing position. The area between the 3rd to 7th rib was clipped. Gel was applied on the same for better visualization. A convex probe was used for ultrasonography having a 2.5 to 5 MHz frequency.

Radiographic examination

All radiographic examinations were performed using fixed radiographic apparatus. The cranial abdominal region and caudal thorax radiograph were taken to confirm the position of the foreign body. Buffaloes were kept in a standing position. Eighty-five (85) kilo-voltage and five (5) milliampere second setting was used for taking a quality radiograph.

Statistical analysis

The results of hematology and biochemical data were analyzed by using one-way ANNOVA in GraphPad Prism 9.2.0. All the data were presented as mean ± standard error of the mean (Table 2).

RESULTS AND DISCUSSIONS

Various clinical observations were recorded in all three groups of the animals. Buffaloes having traumatic pericarditis (TP) and traumatic reticulo-peritonitis (TRP) exhibited different clinical signs during the above study.

Clinical examination

Temperature, heart rate and pulse rate evaluation are important for the involvement of vital organs and the crucial aspects in disease diagnosis. In the present study elevated rectal temperature was observed in buffaloes with TRP and moderate change in buffaloes having TP. An increase in heart rate and pulse rate in TRP affected animals was observed compared to healthy and Group 2 animals. Evident jugular pulsation was noted in both groups as compared to the healthy group. Arched back condition and congested mucus membrane were the frequently observed sign in TRP affected animals. Whereas in TP affected animals, pale mucus membrane and brisket edema were regularly evident (Figure 1). Study performed in buffaloes having non-traumatic pericarditis revealed similar findings in buffaloes affected with traumatic pericarditis (Patel *et al*., 2018).

Ferroscopy

Ferroscope is a noninvasive, cheap, safe and highly sensitive tool for detection of foreign bodies in cases of traumatic pericarditis, pleural effusion and traumatic reticulo-peritonitis under field conditions where facilities like radiography and ultrasonography are not available (Hussain *et al*., 2018). Buffaloes were investigated for the same by using metal detectors. Metal detection showed a positive result in buffalo (n = 4) having TRP condition whereas only one buffalo was positive having TP condition. Ferroscope was unable to detect the foreign body due to inflammatory conditions and distance from the body to the metal detector. All Group 1 animals were found negative for any metallic object.

Hemato-biochemical parameter

All three group animals were subjected to hemato-biochemical analysis shown in Table 2. A significant increase was observed in WBC count in Group 3 animals as compared to a healthy animal. This might be due to internal damage due to a foreign body. No significant change was observed in RBC and hematocrit values in all three group animals. Hemoglobin value was significantly decreased in TRP affected animals. Decreased in hemoglobin level might be due to internal bleeding due to a sharp foreign body. Non-significant alterations were observed in the parameters like total protein, albumin, creatinine and blood urea nitrogen. Increased in SGOT level was observed in buffaloes with TP and TRP suggesting that more

Table 1. Clinical finding in buffaloes affected with TP and TRP compared to healthy.

Clinical parameters	Group 1	Group 2	Group 3
	Control (n=6)	**TP (n=6)**	**TRP (n=6)**
Age	5-7 Years (n=5)	5-7 Year (n=4)	<5 Year (n=1)
	>7 Year (n=1	>7 Year (n=2)	5-7 Year (n=4)
			>7 Year (n=1)
Temperature (ºF)	99.5-102 (n=6)	99.5-102 (n=5)	99.5-102 (n=4)
		>99.5 (n=1)	>102 (n=2)
Heart rate (bpm)	40-60 (n=5)	>40 (n=2)	40-60 (n=1)
	>60 (n=1)	40-60 (n=3)	>60 (n=5)
		>60 (n=1)	
Respiration rate (breath/min)	10-30 (n=6)	10-30 (n=2)	10-30 (n=1)
		>30 (n=4)	>30 (n=5)
Jugular pulsation	Present (n=0)	Present (n=4)	Present (n=5)
	Absent (n=6)	Absent (n=2)	Absent (n=1)
Ferroscopy	Positive (n=0)	Positive (n=1)	Positive (n=4)
	Negative (n=6)	Negative (n=5)	Negative (n=2)
Brisket edema	Present (n=0)	Present (n=5)	Present (n=1)
	Absent (n=6)	Absent (n=1)	Absent (n=5)
Arch back condition	Present (n=0)	Present (n=0)	Present (n=5)
	Absent (n=6)	Absent (n=6)	Absent (n=1)
Mucus membrane	Normal (n=6)	Normal (n=3)	Normal (n=2)
	Pale (n=0)	Pale (n=3)	Congested (n=4)

Table 2. Blood biochemical profile of buffaloes affected with TP and TRP compared to healthy buffaloes.

Parameters	Group I Control (n=6)	Group II TP (n=6)	Group III TRP (n=6)
WBC (10^3/µL)	10.20±0.65	10.65±0.47	12.34±0.53*
RBC (10^6/µL)	7.15±0.73	6.32±0.14	6.20±0.21
Hemoglobin (g/dl)	12.48±0.79	10.27±0.65	9.12±0.63*
HCT (%)	33.90±0.86	32.71±1.08	31.23±1.15
SGOT (U/L)	99.6±1.61	125.4±3.56**	157.32±5.22**
TP (g/dl)	7.67±0.19	7.68±0.65	9.03±0.57
Albumin (g/dl)	3.90±0.12	3.27±0.27	3.20±0.31
Creatinine (mg/dl)	1.55±0.13	1.47±0.18	1.62±0.22
BUN (mg/dl)	10.73±2.94	17.45±2.87	20.68±2.39
Fibrinogen (mg/dl)	281.33±7.16	668.17±6.92**	494.50±6.91**

Significance * P<0.05; ** P<0.01

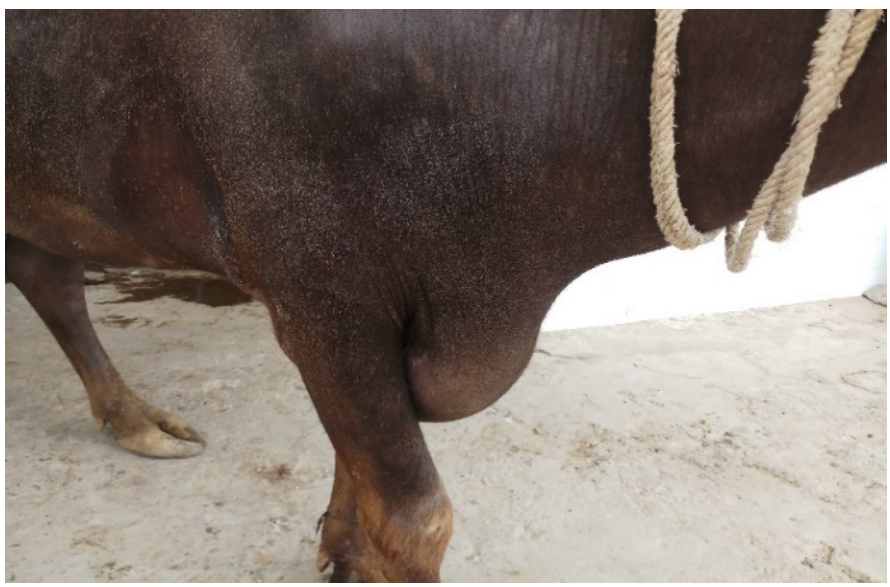

Figure. 1 Brisket edema in buffalo affected with TP condition.

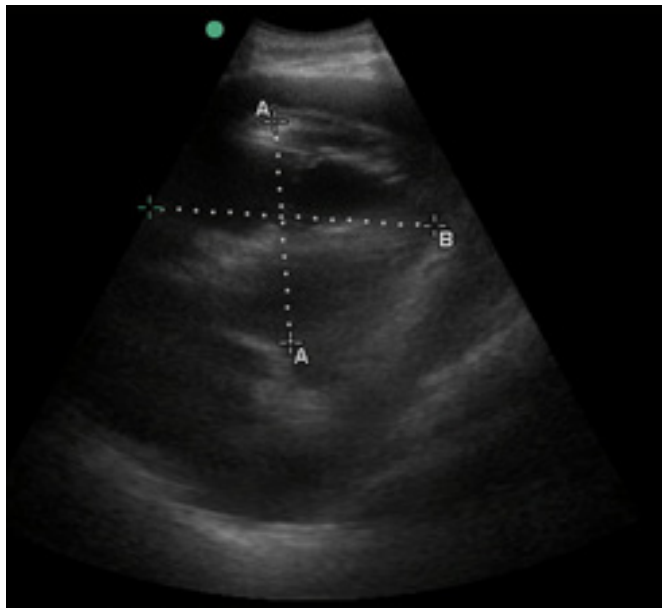

Figure 2. Accumulation of anechoic fluid around heart.

Figure 3. Fibrin deposits with fluid accumulation around heart.

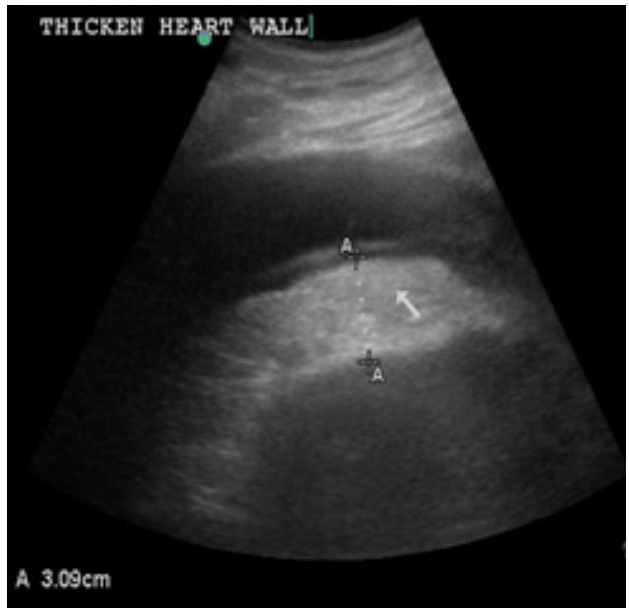

Figure 4. Thickening of heart wall with fluid accumulation.

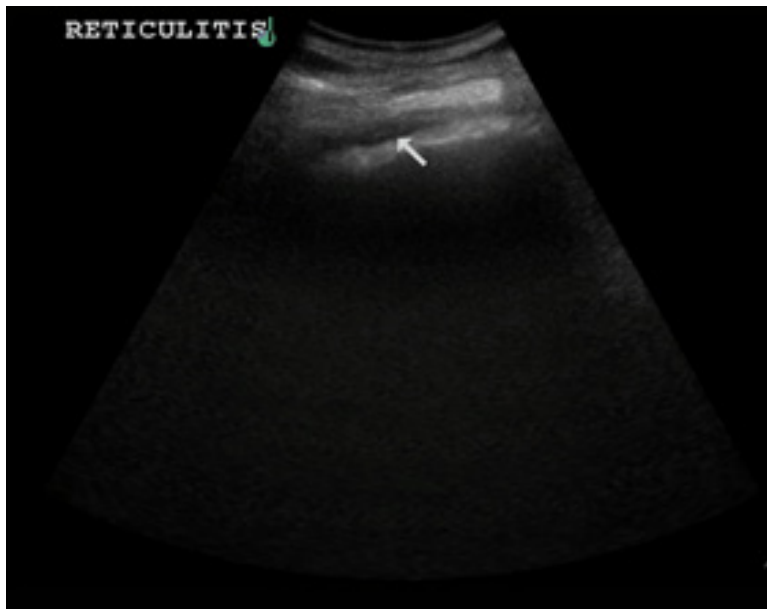

Figure 5. Thickening of the reticular wall.

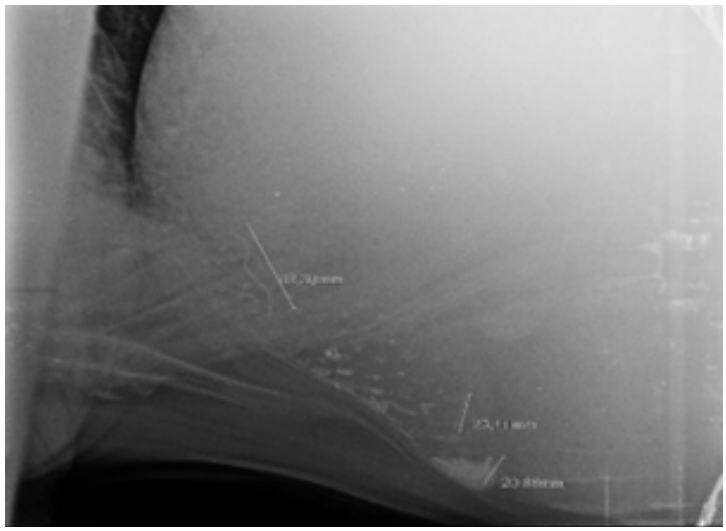

Figure 6. Radiograph showing metallic foreign bodies in reticulum.

severe damage to the liver and muscles is associated with both the conditions. Fibrinogen values was significantly increased in Group 2 and 3 animals which might be due to enhanced hepatic synthesis as the result of a severe inflammatory process following foreign body penetration. Fibrinogen is one of the most important tools to identify the magnitude of inflammation and period of illness in dairy animals (Francoz and Guard, 2015).

Ultrasonographic findings

Ultrasound examinations are now routinely applied for the diagnosis of cardiac, thoracic, abdominal, reproductive, ocular, and musculoskeletal abnormalities in buffaloes (Nyland, 2002). Group 2 and 3 animals were evaluated ultrasonographically in the present study. Accumulation of fluid around the heart, floating fibrin strings and heart wall enlargement were common findings in Group 2 animals (Figure 2, 3 and 4). Reduction in diameter of heart chambers was a significant variation in TP affected buffalo. Whereas thickness of the reticular wall and reduced reticular motility were consistent findings in Group 3 animals (Figure 5). The ultrasonographic picture of the normal buffalo reticulum was similar to studies done in cattle (Braun, 1994; Braun *et al*., 1993). Damage to the reticulum and accumulation of fluid by continuous penetration leads to the accumulation of fluid in the cavity. Studies were done in cattle and showed similar findings as compared to buffaloes (Abdelaal *et al*., 2009; Khalphallah *et al*., 2015). Ultrasound was capable of identifying the inflammatory changes that occurred on the reticular serosa as well as reductions of reticular contractility.

Radiographic findings

Ultrasonography failed to visualize the foreign objects inside the reticulum (Braun, 2003). To overcome this problem and to confirm the metallic foreign body in and outside the reticulum,

radiographic examination is routine practice in large animals. Kilovoltage and milliampere second are the critical factors to generate quality radiograph and the position of the foreign body is the most reliable indicator for diagnosing TRP by radiography. Radiographs were taken in Group 2 and 3 animals and showed metallic foreign bodies inside the reticulum in Group 3 animals (Figure 6). Damage by the sharp object cannot be visible by this technique but differentiation between TP and TRP is quite easy. Studies also stated radiography had a diagnostic significance in acute TRP in buffaloes (Khalphallah *et al*., 2015).

Accumulation of fluid around the heart in TP, thickening of reticular wall and adhesions of reticulum with the abdominal wall in TRP are the most reported ultrasonographic findings. Ultrasonography and radiographic evaluation give more reliable diagnoses in TP and TRP cases in buffalo. Radiography is an important tool for differentiation between TP and TRP in buffalo. Hematological and serological analysis with clinical examination aids in the diagnosis. Fibrinogen is an acute-phase protein that has a major role in the diagnosis of TP and TRP cases.

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