Alterations in Some Hematological and Biochemical Parameters in Egyptian Buffaloes Suffering from Traumatic Reticuloperitonitis and Its Sequelae

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Abstract

Thirty four buffaloes were introduced to Veterinary Clinic at the Faculty of Veterinary Medicine suffered from anorexia. Clinical examination revealed stiffness in gait with positive pain reactions. By using ultrasonographic examinations, buffaloes were classified into two groups. The first group was recognized as traumatic reticuloperitonitis (TRP) while the second group was recognized as traumatic pericarditis (TP) while another ten buffaloes used as healthy control. Hematological studies revealed non significant change in erythrogram. Granulocytic leucocytosis, lymphopenia, monocytosis and thrombocytosis in both traumatic groups. Biochemical studies revealed hyperglobulinemia, hypoalbuminemia, hyperfibrinogenemia in both traumatic groups. While an increase of cardiac troponin I (cTnI), blood urea nitrogen and activities of alanine and aspartate aminotransferase (ALT & AST) in TP buffaloes with increase in heart rate, distension of the jugular vein and brisket oedema. Without alteration in creatinine level in all groups. So it is concluded that estimation of cTnI could be aid for diagnosis of traumatic pericarditis in buffaloes.

Keywords: *Blood chemistry, Buffaloes, Cardiac makers, Hematology, Pericarditis, Troponin I.*

INTRODUCTION

Buffaloes have economical importance in milk and meat production in the valley of the River Nile in Egypt (GOVS, 2005). There are many causes in which myocardial damage happens in animals as infectious diseases, toxic chemicals, nutritional deficiencies or trauma etc., Yearly we lose a lot of money and time due to missed diagnoses of heart diseases or problems. There are some external tools and some traditional cardiac markers for routine diagnosis of heart diseases, but all of these have some limitations as they do not possess specificity and sensitivity to heart (Undhad *et al.*, 2012).

Troponin is a complex of regulatory proteins that are integral to contraction of cardiac muscle, but not smooth muscle. Troponin is not found in

other tissues (Winder and Walsh, 1990). Cardiac troponin I (cTnI) is uniquely expressed in the myocardial and has been widely recognized as highly sensitive and specific serum markers for diagnosis of non-invasive myocardial necrosis (Zethelius and Johnston, 2006).

The most common sequelae of TRP are TP (Watts and Tulley, 2013) which mean an inflammation of the pericardium with accumulation of inflammatory exudates. In bovine, it is always attributable to long sharp foreign bodies that penetrate reticulum, diaphragm then pericardium (Braun 2009). This perforation in the wall of the reticulum allows leakage of rumen contents, which contaminates the peritoneal cavity develops a localized peritonitis and frequently results in adhesions and less commonly

develops diffuse peritonitis. Early diagnosis of TP is more difficult in buffaloes than in cattle (Saleh *et al.*, 2008 and Mohamed, 2010) despite using of ultrasonographic examination remain a confirmatory tool for diagnosis of diseases of the digestive tract, but, it still not available for most veterinarians as much expensive and need for more experience and training. Therefore, the aim of this work is to diagnose of TP as a common sequelae of TRP in buffaloes by simple and inexpensive tests include hematological and biochemical markers.

MATERIAL AND METHODS

Buffaloes

Thirty four water buffaloes (*Bubalus bubalis* L.) 3-5 years old were introduced to the Veterinary Clinic at the Faculty of Veterinary Medicine, Zagazig University, Egypt. The animals were clinically diagnosed as traumatic using pain test reaction (Dirksen *et al.*, 1990) and confirmed by ultrasonographic examinations of the reticulum, rumen and heart (Braun and Goetz, 1994 and Braun *et al.*, 2001) that classified them into two groups. The first group was TRP (17 buffaloes). The second group was TP (17 buffaloes); another ten buffaloes were used as a normal (apparently healthy group). All buffaloes were fed on wheat hay, *Trifolium alexandrinum* and concentrate.

Blood sampling

Blood was collected from all animals by puncture of the jugular vein into three samples. The 1st blood samples were drawn into EDTA tubes for hematological analysis. A 2nd blood samples were drawn without anticoagulant in a sterile test tube for separation of serum then frozen for clinical chemistry analysis. A 3rd blood samples were drawn on sodium citrate for fibrinogen estimation.

Hematological examination

The Complete Blood Count was evaluated in an automatic cell counter (Hospitex Hemascreen 18, Italy).

Biochemical examination

The serum total protein and serum albumin levels were measured (Dumas *et al.*, 1981 and Drupt, 1974). The serum globulin level was calculated (Coles, 1986) and serum activities of alanine and aspartate aminotransferase (ALT & AST) were determined (Reitman and Frankel, 1957). While fibrinogen concentration was estimated in citrated plasma (Benjamin, 1979),

cardiac troponin I (cTnI) was estimated (Collinson and Boa, 2001) using commercial kits. Serum creatinine level was estimated (Husdan and Rapoport, 1968) while blood urea nitrogen was estimated (Putton and Crouch, 1977)

Statistical analysis

Data obtained from this investigation were statistically analysed using the one way analysis of variance (ANOVA) using SPSS 16.0 for windows (Tamhane and Dunlop, 2000). Means at the same column followed by different letters were significantly different and the highest value was represented with the letter (a). Significant difference at $p \leq 0.01$

RESULTS AND DISCUSSION

Traumatic reticuloperitonitis (TRP) or hardware disease is a relatively common disease in adult bovine due to using of their tongue without differentiate between feed and metallic objects in feedstuffs (Divers and Peek, 2007). The risk of TRP and sequelae is considerably higher in buffaloes than in cattle (Misk *et al.*, 2001). TRP were caused by the ingestion of a sharp foreign body, such as a piece of wire or a nail in the reticulum, in the presence of predisposing factors such as pregnancy and parturition (Rebhun *et al.*, 1995), resulting migration of it into the reticular wall which is anatomically besides the heart and peritoneum (Divers and Peek 2007). Peritonitis, reticular abscess, thoracic abscess and traumatic pericarditis (TP) were detected as sequelae of TRP (Abd El-Aal, 2009 and Hajighahramani and Ghane, 2010).

Regarding the results of hematological studies (Tab. 1) revealed insignificant change in erythrogram. While granulocytic leucocytosis and thrombocytosis as a common finding of inflammation (Douglas and Wardrop, 2010), granulocytosis, lymphopenia may be as a result of stress reaction to inflammation (Douglas and Wardrop, 2010) in the both traumatic groups. Monocytosis could be due to chronic inflammation (Coles, 1986)

Clinical symptoms of the both affected buffalo groups include anorexia. In addition, there were a positive reactions during pain test including stiffness in gait, lordosis and painful during defecation and urination, which are common signs of TRP (Radostits *et al.*, 2000). Increase heart rate (Tab. 2) in TP that may be due to pressure on the heart as a result of fibrinous changes in the

pericardial sac (Braun, 2009). Ultrasonographic examination (Fig.1) revealed presence of a large network represent fibrin, fibrinous exudates and fluid in pericardial sac in the TP, which affecting basic cardiac function (Danjuma *et al.*, 2014). Distension of the jugular vein, oedema in brisket and move towards of the umbilical region in case of TP (Fig.2), which could be attributed to congestive heart failure (Kahn and Line 2010). TRP showed half moon shape of the reticulum with a deposit on it's surface representing fibrin between reticulum and abdominal wall (Fig.3). These results explain the elevation in (cTnI) in the TP buffaloes that have been widely recognized as highly sensitive and specific serum markers for increased myocardial necrosis (Zethelius and Johnston, 2006). ALT revealed an increase in the TP group only that indicating hepatic congestion leads to degenerative change in liver, but not primary to liver disease (Braun, 2009). AST was increased in both groups which may be due to involvement of liver and or myocardial muscle (Kaneko *et al.*, 2008). Prerenal azotemia i.e. increase of blood urea nitrogen in TP group could be caused by a decrease in blood flow to the kidneys due to congestive heart failure (Kumar *et al.*, 2005). However, normal creatinine level in all groups confirms that there is no inherent kidney disease (Coles, 1986).

Analysis of blood serum and plasma proteins (Tab. 3) revealed alteration which may follow

tissue destruction and inflammation (Gruys *et al.*, 1994) and or anorexia due to indigestion (Abd El-Aal *et al.*, 2009). Hypoalbuminemia in TRP and TP could be attributed to the production of protein in the liver during inflammation is switched towards increased synthesis of positive acute phase proteins (APPs.) with a concomitant decrease in the synthesis of albumin. APPs play a major role to prevent inflammation, and contribute to healing (Cray *et al.*, 2009). The decreased albumin level also suggested a selective loss of albumin or sequestration of albumin into body spaces (Coles, 1986) which were seen as oedema in brisket and move towards of the umbilical region. Despite a hypoalbuminaemia, the total serum protein concentrations increased as a result of hyperglobulinaemia (Saleh *et al.*, 2008). Hyperproteinaemia was also reported as a differentiating tool for TRP from other gastrointestinal diseases in cattle (Jafarzadeh *et al.*, 2004). Hyperfibrinogenemia may be due to fibrinogen elevation in patients with gastrointestinal abnormalities (Memeh *et al.*, 1992).

CONCLUSIONS

Buffaloes with TRP and TP revealed inflammatory markers manifested by granulocytic leucocytosis, thrombocytosis, hyperfibrinogenemia etc., cTnI, AST and azotemia were increased in TP only. But, AST and azotemia can occurs in other

Fig.1. Ultrasonographic picture of TP group showed large network represent fibrin in the pericardium, 3.5 MHz sector probe.

Fig.2. Buffalo suffered from TP showed oedema in brisket

Fig.3. Ultrasonographic picture of TRP group showed half moon shape of the reticulum with a deposit on it's surface representing fibrin between reticulum and abdominal wall, 3.5 MHz sector probe.

Tab. 1. Alteration in some hematological parameters in buffaloes suffering from Traumatic reticuloperitonitis and its sequelae (mean values $\pm$ SE)

Groups	Parameters							
	TLC $\times 10^3/\mu\text{l}$	LYM $\times 10^3/\mu\text{l}$	GRA $\times 10^3/\mu$	MID $\times 10^3/\mu\text{l}$	Plattlets $\times 10^3/\mu\text{l}$	RBCs count $\times 10^6/\mu\text{l}$	Hb gm%	PCV %
TRP	10.49 ^a $\pm$ 0.14	3.78 ^b $\pm$ 0.03	3.50 ^a $\pm$ 0.12	3.21 ^a $\pm$ 0.12	419 ^a $\pm$ 5.78	8.33 ^a $\pm$ 0.20	13.55 ^a $\pm$ 0.07	41.41 ^a $\pm$ 0.34
TP	10.47 ^a $\pm$ 0.22	3.66 ^b $\pm$ 0.06	3.50 ^a $\pm$ 0.15	3.31 ^a $\pm$ 0.17	415.4 ^a $\pm$ 5.12	8.23 ^a $\pm$ 0.16	13.63 ^a $\pm$ 0.08	41.87 ^a $\pm$ 0.35
Healthy buffaloes	8.41 ^b $\pm$ 0.04	4.98 ^a $\pm$ 0.14	1.49 ^b $\pm$ 0.12	1.93 ^b $\pm$ 0.02	338.2 ^b $\pm$ 9.36	8.39 ^a $\pm$ 0.15	13.59 ^a $\pm$ 0.06	41.05 ^a $\pm$ 0.73
F test	**	**	**	**	**	N.S	N.S	N.S

** Highly significant difference at $p \leq 0.01$; **N.S** not significant; **PCV** packed cell volume; **RBC** total erythrocytic count; **LYM** lymphocytes; **TLC** total leukocytic count; **GRA** neutrophil, eosinophil and basophil; **MID** monocytes and some eosinophil; **TRP** traumatic reticuloperitonitis; **TP** traumatic pericarditis; **LSD** least significant difference. Means in the same column with different superscript letters are significantly different.

Tab. 2. Alteration in some biochemical parameters in buffaloes suffering from Traumatic reticuloperitonitis and its sequelae (mean values $\pm$ SE)

Groups	Parameters					
	Heart rate Sec.	Troponin I (ng/ml)	AST (Unit/l)	ALT (Unit/l)	Creatinine (mg/dl)	Urea (mg/dl)
TRP	78.8 ^b $\pm$ 0.86	0.093 ^b $\pm$ 0.01	29.5 ^b $\pm$ 0.24	12.00 ^b $\pm$ 0.36	0.54 ^a $\pm$ 0.02	18.32 ^b $\pm$ 0.28
TP	112.6 ^a $\pm$ 5.61	0.865 ^a $\pm$ 0.72	39.3 ^a $\pm$ 0.37	17.39 ^a $\pm$ 0.24	0.59 ^a $\pm$ 0.03	26.4 ^a $\pm$ 0.50
Healthy buffaloes	77.6 ^b $\pm$ 1.63	0.089 ^b $\pm$ 0.01	26.9 ^c $\pm$ 0.31	11.59 ^b $\pm$ 0.50	0.57 ^a $\pm$ 0.01	17.9 ^b $\pm$ 0.87
F test	**	**	**	**	N.S	**

** Highly significant difference at $p \leq 0.01$; **LSD** least significant difference; **AST** aspartate aminotransferase; **ALT** alanine aminotransferase; **TRP** traumatic reticuloperitonitis; **TP** traumatic pericarditis. Means in the same column with different superscript letters are significantly different.

Tab. 3. Alteration in blood proteins in buffaloes suffering from Traumatic reticuloperitonitis and its sequelae (mean values $\pm$ SE)

Groups	Parameters			
	Total proteins (g/dl)	Albumin (g/dl)	Globulins (g/dl)	Fibrinogen (mg/dl)
TRP	9.25 ^a $\pm$ 0.07	2.29 ^b $\pm$ 0.08	6.95 ^a $\pm$ 0.23	484.4 ^a $\pm$ 4.20
TP	9.01 ^a $\pm$ 0.34	2.35 ^b $\pm$ 0.06	6.65 ^a $\pm$ 0.30	492.0 ^a $\pm$ 2.25
Healthy buffaloes	7.57 ^b $\pm$ 0.14	4.47 ^a $\pm$ 0.18	3.09 ^b $\pm$ 0.16	231.6 ^b $\pm$ 1.66
F test	**	**	**	**

** Highly significant difference at $p \leq 0.01$; **TRP** traumatic reticuloperitonitis; **TP** traumatic pericarditis. Means in the same column with different superscript letters are significantly different.

diseases .So it can be used to differentiate between them and TP marker.

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