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Equine Colic and Coagulation Disorders

K.M. Alsaad and Abid-albar A. Nori
Department of Internal and Preventive Medicine, College of Veterinary Medicine,
University of Mosul, Mosul, Iraq

Abstract: The objective of this study was to investigate the coagulation disorders in drought horses suffering from colic. A total of (125) local drought male horse of different ages were investigated, among these animals (100) were suffering colicky sings and (25) clinically normal drought male horses served as control. Results indicated that colicky horses showed sings of pain which manifested by, restlessness, anxiety, sweating, lip curling, flank watching, pawing at the ground, kicking at the belly and rolling, more over body temperature, respiratory and heart rate, capillary refilling time were also increased, petechial hemorrhages were also detected on mucus membranes of the eyes. The statistical analysis appeared significant decrease ($p<0.05$) in the TRBCs, Hb in horses suffering the recurrent type of colic compared with animals suffering the acute, mild type and control normal horses and PCV were significantly higher ($p<0.05$) in diseased horses than in normal control animals. Data concerning the indices of clotting factors of normal control and colicky horses showed that the platelet count and fibrinogen was lower significantly ($p<0.05$) in diseased horses than in control normal horses. This count was significantly lower in horses suffering the acute and recurrent type of colic than horses suffering the mild type. The platelet volume, platelet distribution width clotting time, prothrombin time and activated partial thromboplastin time values were significantly higher ($p<0.05$) in diseased horses suffering the acute and recurrent type of colic than in diseased horses suffering the mild type and normal control animals. Results of biochemical changes indicated significant decrease ($p<0.05$) in total protein and albumen in colicky horses showed the mild and recurrent type of colic where as significant increase ($p<0.05$) of same values were seen in animals suffering the acute type, further more significant decrease ($p<0.05$) in calcium values were encountered in horses suffering the acute and recurrent type of clic.

Key words: Equine colic, hematology, indices of clotting factors, drought, significant, diseased

INTRODUCTION

Colic is a general term indicating abdominal pain, (Abutarbush *et al*., 2005). It is not a disease but a combination of signs that alert us to abdominal pain in the horse (Aiello, 1998). Colic is the single most important cause of death in horses (Archer *et al*., 2006). The reaction of a horse to abdominal pain were kicking, rolling, sweating and others, which can originate from stomach, small intestine or the large intestine, (True colic), or other organs (False colic) (Hewetson, 2006).

There are a variety of different causes of colic, as dietetic causes concerned with quality and quantity of feeding, gastro-intestinal accidents, gastro-intestinal worms infestation, urinary tract dysfunction, exhaustion due to hard work, seems to be the most common (Radostitis *et al*., 2000).

Hemostasis is a complex process with positive and negative regulators for formation and degra-dation of fibrin (Prasse *et al*., 1993). Imbalanced regulation may lead to hyper coagulation (Thrombosis), hypo-coagulation (Hemorrhage), or paradoxically to both of them (Byars, 1987; Collatos *et al*., 1995; Petterson *et al*., 1995). Haemostatic abnormalities such as thrombo-cytopenia, prolonged clotting times, prothrombin time, activated partial thrombopastine time, increased fibrinogen degradation products activity have been reported in horses with colic (Parry, 1987; Monreal *et al*., 2000; Monreal and Cesarini, 2009).

Primary hemostasis can be evaluated by determination of platelet numbers, platelet volume and platelet distribution width, more over secondary hemostasis can be evaluated by the activated partial thromboplastin for intrinsic and common pathway abnormalities, fibrinogen quantification (common pathway abnormalities) and prothrombin time for extrinsic and common pathway abnormalities (Welch *et al*., 1992).

The purpose of this study was to determine the abnormalities of hemostatic profiles in drought horses suffering from colic in Mosul, Mosul-Iraq.

Corresponding Author: K.M. Alsaad, Department of Internal and Preventive Medicine, College of Veterinary Medicine, University of Mosul, Mosul, Iraq

MATERIALS AND METHODS

Animals and study design: The study was conducted on 125 local drought male horses of different ages, among these 100 animals were naturally suffering from colicky signs and 25 clinically normal horses served as control. Diseased animals were divided into three groups according to severity of colic, as (20) suffering from mild type of colic, (47) from acute (sever)type and (33) from the recurrent type. The study was carried out in Mosul (Mosul-Iraq). Careful clinical examination had been carried out in all animals and fecal samples were screened for parasitic loud using standard technique.

Blood collection and hematology: Ten milliliter of blood were drained from each animal by jugular vein-puncture, from these 2.5 mL of blood mixed with EDTA used to determine total erythrocyte count (TRBCs), Hemoglobin concentration (Hb), Packed Cell Volume (PCV), Platelets count (Plt), Mean Platelets Volume (MPV), Platelets Distribution Width (PDW), (Automatic Full Digital cell Counter, Beckman, USA), another 2.5 mL of blood mixed with Trisodium citrate (used plasma) were used to determine prothrombine time (Prt) and activated partial thromboplastine time (Aptt) (Coles, 1986). Clotting Time (CT) was also estimated according to (Bush, 1975).

Blood serum samples were tested spectrophotometrically for total protein, albumin, globulin calcium and fibrinogen, using available kids (Biolabo, France).

Statistical analysis: The significance of variations in the various values of diseased horses and those of normal control animals were analyzed statistically using SPSS (Leech *et al*., 2007).

RESULTS

Diseased horses showed different clinical signs including, sings of pain which manifested by, restlessness, anxiety, sweating, lip curling, flank watching (Fig. 1), pawing at the ground (Fig. 2), kicking at the belly and rolling, more over body temperature, respiratory and heart rate, capillary refilling time were also increased, petechial hemorrhages were also detected on mucus membranes of the eyes. Statistically significant decrease ($p<0.05$) were encountered in TRBCs, Hb in horses suffering the recurrent type of colic compared with animals suffering the acute, mild type and control normal horses, PCV were significantly higher ($p<0.05$) in diseased horses than in normal control animals (Table 1).

Fig. 1: Looking at flank region

Fig. 2: Pawing at the ground

Data concerning the indices of clotting factors of normal control and colicky horses are presented in Table 2. The platelet count and fibrinogen was lower in diseased horses than in control normal horses. This difference was statistically significant ($p<0.05$). This count was significantly lower in horses suffering the acute and recurrent type of colic than horses suffering the mild type. The platelet volume, platelet distribution width clotting time, prothrombin time and activated partial thromboplastin time values were significantly higher ($p<0.05$) in diseased horses suffering the acute and recurrent type of colic than in diseased horses suffering the mild type and normal control animals.

Results of biochemical changes indicated significant decrease ($p<0.05$) in total protein and albumin, in colicky horses showed the mild and recurrent type of colic, where as significant increase ($p<0.05$) of same values were notice in animals suffering the acute type of colic, further more significant decrease ($p<0.05$) in calcium values were also encountered, in horses suffering the acute and recurrent type of colic (Table 3).

Table 1: Blood parameters of colicky horses and normal control animals

Parameters	Control	Mild colic	Acute colic	Recurrent colic
TRBCs ($\times 10^6$)	9.6±0.3a	9.7±1.2a	9.2±0.3a	8.4±0.7b*
HB (mg dL^{-1})	13.3±1.7a	12.9±1.9a	13.5±1.7a	118±0.3b*
PCV (%)	34.7±2.7a	42.8±1.7b*	51.4±2.3c*	44.8±0.2b*

Table 2: Indices of clotting factors of colicky horses and normal control animals

Parameters	Control	Mild colic	Acute colic	Recurrent
Plt (×1)	577.8±20.4a	522.3±33.7a	240.5±46.3c*	336.4±40.7b*
MPV (fl)	9.6±0.6a	9.4±0.71a	12.8±2.4c*	10.2±1.6b*
PDW (%)	16.6±1.8a	17.5±1.7a	19.9±2.7b*	19.3±2.5b*
CT (min)	3.4±0.5a	4±0.7a	5.7±1.7c*	4.3±0.9b*
Prt (sec)	10.8±1.3a	10.4±2.1a	26.9±4.6c*	16.3±3.6b*
Appt (sec)	50.4±4.7a	54.2±4a	71.7±6.3c*	66.3±5.4b*
Fibrinogen (mg/100 mL)	366.5±22.2a	310.4±24.6a	268.3±56.1b*	298.2±48.7b*

Table 3: Biochemical changes of colicky horses and normal control animals

Parameters (gm/100 mL)	Control	Mild colic	Acute colic	Recurrent
Total protein	6.1±0.2a	5.4±0.6a*	7.1±0.8c*	4.9±0.4b*
Albumin	2.9±0.1a	2.1±0.1a*	3.9±0.9c*	1.8±0.6b*
Globulin	3.2±0.2a	3.3±0.3a	3.2±0.3a	3±0.3a
Calcium	12.4±1.3a	11.9±1.3a	8.2±1.1b*	8.5±1.7b*

Values are mean±standard error of mean. Values with different letters mean the presence of significant differences ($p<0.05$)

DISCUSSION

In current study, colicky horses showed different clinical sings, as sings of pain which manifested by, restlessness, anxiety, sweating, lip curling, flank watching, pawing at the ground, kicking at the belly and rolling, were more prominent, more over body temperature, respiratory and heart rate, capillary refilling time were also increased, beside the presence of petechial hemorrhages on mucus membranes of eyes, those signs were in agreement with others (Radostitis *et al*., 2000; Pratt *et al*., 2003), severity of sings were different according to severity of the disease (mild, acute and recurrent) (Sharky *et al*., 2006). Clinical and laboratory findings as well as coagulation profiles changes on the basis of severity of colic in horses were also reported (Parry, 1987; Henry and Moore, 1991; Prasse *et al*., 1993; Topper and Prasse, 1998). Colic in horses very often induces changes in the coagulation system causing the development of disseminated intravascular clotting (Monreal and Cesarini, 2009). It is promoted by blood concentration and an increase in exposition of coagulation activators with a simultaneous decrease in coagulation inhibitors activity (Stokol *et al*., 2005). The most common coagulopathy in horses with colic is a hypercoagulable state associated with disseminated intravascular coagulation and the intensity of this coagulopathy depends on the severity and duration of the gastrointestinal lesions or other causes of colic, with the ischemic and inflammatory problems and peritonitis being the most frequently affected by coagulopathies (Collatos *et al*., 1995). In current study, results showed decrease values of total platelet count, fibrinogen as wall as increase platelet volume and its distribution width, beside increase values of clotting time, prothrombin time and activated partial thromboplastine time specially in horses suffering the acute and recurrent type of colic, these results were also mentioned by Johonstone and Cdane (1986), Prasse *et al*. (1993), Monreal *et al*. (2000) and lmaz *et al*. (2002) as thrompocytopenia, hypofibrinogemia and decrease clotting time of the blood were reflected the petecheial hemorrhages seen on mucus membranes of colicky horses and the prolongation of capillary refilling time (Edwards, 1998) moreover, this might attributed to the release of endogenous mediators such as platelet activating factor in inflammatory disorders (Zbanyszek *et al*., 2004). Any bleeding tendency were occur in the body regions must followed by the process of clotting and there are sever factors play an important role in this process such as vascular factors (which is characterized by a rapid response, is narrowing and contraction of the vessel, causing decreased pumping mechanism of the blood) and are directly related to the integrity of blood vessels, more over the numbers of blood platelets and activity have significant role in the process of coagulation, in which the accumulation of blood platelets (Platletes aggregates) and then its adherence within the vessel wall causing Platelets thrombus (temporary plug) (Smith, 1996). Depression of platelets number may also occur due to depression of bone marrow activity, spleenomegaly and platelets sequestration (Rebar *et al*., 2005). The clotting phase (Coagulation) considered as the final stages of the clotting mechanism which are activated by such factors as, Hagman factor (XII), Plasma thromboplastin antecedent factor (XI) and Thromboplastin component (IX) in the form of cascades, which are responsible for transforming prothrombin to thrombin and the fibrinogen to fibrin, resulting in deposition of Fibrin clot within the blood vessels (Smith, 1996), which will lead to disorganization of hemostatic mechanism causing micro thrombosis and infarction of special organs (Bick, 2003). It has been reported that prolonged PT and Appt was the most frequently observed abnormality in the coagulation profile and was more likely to be prolonged in horses with colic that did not survive (Michelle and Moore, 1991; Imaz *et al*., 2002).

There were significant reduction seen in total protein and albumin in horses suffering from the mild and recurrent type of colic which were agree with (Topper and Prasse, 1998) whose stated that decrease protein levels in colicky horses may occur due to gastro-intestinal accident

(strangulation, obstruction, twisting, volvulus), male absorption, starvation or destruction of proteins due to fever, where as high levels of total protein values and albumin were registered in animals showed the acute type of colic, this was mentioned by Tinker *et al.* (1997) and Radostitis *et al.* (2000) whose stated that protein level may become higher due to, dehydration, hemoconcentration, shock or as apart of acute phase response. Results were also indicated slight hypocalcaemia , which might be responsible for muscle tremors and some sings showed by colicky horses, this were agreed by Galvin *et al.* (2004) whose refer that calcium play a major role at the stage of coagulation specially in the process of shrinkage of the fibrin clots and that might lead to a decrease in its level in the blood steam, moreover (Doxy, 2006) were also mention the important role of calcium in clotting processes.

CONCLUSION

Equine colic were affected drought horses and exhibited different clinical signs, a significant changes were noticed between diseased and control animals concerning the indices of clotting factors, very often induces changes in the coagulation system causing the development of disseminated intravascular clotting and high mortalities of colicky horses will follow.

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