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IRON DEFICIENCY ANEMIA ASSOCIATING WITH PURPURA HEMORRHAGICA (POST-STRANGLES COMPLICATION) DISEASE OF HORSES

(With 1 Table)

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ترافق أنيميا نقص الحديد مع مرض الزفرية النزفية (إحدى مضاعفات مرض الخناق) في الخيل

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خلال فترة الفحص (مارس ١٩٩٨ - يناير ١٩٩٩) تم تشخيص ١١ حصان إكلينيكيا مصاب بأعراض مرض الزفرية النزفية وهى إحدى مضاعفات مرض الخناق. وكانت هذه الحالات مصابة بمرض الخناق. وكانت هده الحالات غير مصابة بالطفيليات. وقد تم عمل هستوجرام لخلايا الدم الحمراء (Erythrogram) مع قياس عنصر الحديد في أمصال هذه الحالات ووجد أن الخيل المصابة بالزفرية النزفية تعانى من أنيميا نقص الحديد (Hypoferremia) بصورة حادة بالمقارنة بالمجموعة الضابطة. وقد تم مناقشة الأسباب المحتملة لملازمة أنيميا نقص الحديد لهذا المرض. هذا وقد تم تعداد خلايا صفائح الدم أيضا ووجد أنها في حالة نقص غير معنوي(Non-thrombocytopenia) .

SUMMARY

During the period of investigation (Marsh, 1998 - Jan., 1999), 11 diseased horses were clinically diagnosed as purpura hemorrhagica disease. These cases were previously infected by strangles. They were parasitic free. Erythrogram including measurement of the red cell distribution width (RDW), thrombocytes counts and serum-iron levels in these cases were monitored. A significant decrease ($P < 0.05$) in the total erythrocytic counts with highly significant ($P < 0.01$) decrease in the values of hemoglobin concentration and hematocrit were the characteristic hematological findings of the diseased horses. Mean corpuscular volume

and mean corpuscular hemoglobin were also significantly decreased ($P > 0.05$). In addition to the latter findings, there was also a significant increase ($P < 0.05$) in the RDW parameter suggesting the occurrence of microcytic-hypochromic anemia due possibly to iron deficiency in the diseased cases. Such suggestion was confirmed by the highly significant ($P<0.01$) decreased in the level of serum-iron of the diseased horses in comparison with the control group. The probable causes of iron deficiency anemia associating with purpura hemorrhagica disease in horses were discussed. Thrombocytic counts were insignificantly ($P>0.05$) decreased (non thrombocytopenia).

Key words: *Purpura Hemorrhagica (Post-Strangles Complication), Erythrogram, Red Ristribution Width, Thrombocytes and Serum-Iron Level.*

INTRODUCTION

Strangles of horses and other animals of the family Equidae was an upper respiratory tract infection, usually characterized by fever, bilateral and/or unilateral mucopurulent nasal discharge and suppurative lymphadenitis of the mandibular lymph nodes (Newton et al., 1997). Undesirable sequlae of that disease included bastard strangles, which was systemic spread of *Streptococcus equi* infection throughout the infected host causing generalized abscessiation, guttural pouch empyema and purpura hemorrhagica were reported by Sweeny et al. (1987). Zaitoun and Ali (1999) suggested that the unhygienic therapeutic entrance of the classical strangles by intensive systemic antibiotics delayed the full maturation of the abscessed node (inadequate immune response). This may accelerated the complication of strangles or probably adversely increased the sensitization of the horses to streptococcal infection and/or its toxic products. Interestingly, only horses and humans seems to react with immune-mediated vasculitis and hemolysis following streptococci infection and the characteristic lesion in humans was post-streptococcal glomerulonephritis, while in horses developed purpura hemorrhagica (Galan and Timoney, 1985 and Rooney and Robertson, 1996). Purpura hemorrhagica was characterized clinically by painful, unsymmetrical, well-defined edematous swellings in the head, particularly in the supra-orbital fossae including the eye-lids, of the diseased horse without marked systemic reactions with exception of tachycardia (Zaitoun and Ali, 1999).

Hematological examinations of horses had strangles were monitored by Hamlen et al. (1992) who reported that the total leukocytic counts, neutrophils count and plasma protein concentration were significantly increased whereas the hematocrit, hemoglobin concentration and erythrocytic count were insignificantly decreased. Conversely, the hematological examinations of purpura hemorrhagica as a post-strangles complications of horses are apparently still scanty. However, Zaitoun and Ali (1999) reported that microcytic-hypochromic anemia and leukocytosis with neutrophilia and eosinophilia were the characteristic hematological findings of purpura hemorrhagica disease in horses. Erythrogram including measurement of the red cell distribution width (RDW) and determination of serum-iron level of horses that had signs of purpura hemorrhagica disease were aimed in the present work.

MATERIAL and METHODS

I - Animals:

A: Diseased group:

During the period of investigation (Marsh, 1998 - Jan., 1999), 11 diseased horses with signs of purpura hemorrhagica were clinically diagnosed; 5 diseased horses were reported by Zaitoun and Ali (1999), and 2 cases were admitted to the Veterinary Clinic of Assiut University, and 4 cases were clinically diagnosed during the summer training of the veterinary students at Sohag Governorate, Egypt (1998). These cases were previously suffered from classical strangles and due to unhygienic application of antibiotic without surgical interference of the abscessed lymph nodes, signs of purpura hemorrhagica were developed. The history taking and the clinical picture of these 11 cases were greatly similar.

B- Control group:

Seven clinically normal, and bacteriologically negative horses* (Zaitoun and Ali, 1999) of the same ages of the diseased group were selected and used as a control group. These selected cases were clinically and bacteriologically monitored for three successive weeks for detection of any abnormalities.

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* Three nasal swabs at weekly intervals were taken and subjected to bacteriological analysis using microbial culturing on blood agar for isolation of *Streptococcus equi*

II- Collection of the samples:

Blood samples:

Venous blood samples of the examined horses were withdrawal in clean dried screw capped tubes containing suitable amount of anticoagulant substance, EDTA (ethylene diamin tetra acetic acid, disodium salt). Another samples were also collected for serum analysis.

III- Laboratory analysis:

The collected blood samples were subjected to determination of the following parameter; erythrocytic count (RBC), hemoglobin concentration (Hb) and hematocrit (PCV) according to the methods described by Coles (1982). Mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) were mathematically calculated. Red cell distribution width (RDW) parameter of the collected blood samples were measured by using automated hematologic cell counter (Abott-cell dyne 700) at the Dept. of Animal Med., Faculty of Vet. Med., Assiut University. Thrombocytes were also manually counted by the methods described by Coles (1982).

Blood-serum iron level of the collected sera samples were colourimetrically determined according to the method reported by Garcic (1979).

IV- Fecal analysis:

All examined horses were subjected to fecal analysis by using flotation-sedimentation technique according to methods described by Coles (1982).

V- Statistical analysis:

The obtained data of the present work were statistically analyzed according to the methods reported by Milton and Tsokos (1983).

RESULTS

Results of erythrogram including the red cell distribution width, thrombocytic counts and the level of serum-iron were summarized and tabulated in Table 1. The examined cases were parastic free.

Table 1: Hematologic, RDW, thrombocytic parameters and serum-iron level of the diseased horses with signs of purpura hemorrhagica (post-strangles complication).

Parameter	Diseased group (n = 11) X ± S.E.	Control group (n = 7) X ± S.E.
RBC ($x10^6$ l)	4.21 ± 2.81*	7.10 ± 2.6
Hb (g/dl)	5.96 ± 1.43**	13.71 ± 1.5
PCV (%)	18.33 ± 1.51**	39.80 ± 3.0
MCV (fl)	34.98 ± 1.82**	56.14 ± 2.4
MCH (pg)	11.37 ± 1.32**	19.31 ± 1.5
RDW (%)	22.56 ± 2.83*	12.5 ± 1.3
Thrombocytes ($x10^9$/l)	207 ± 8.89	226 ± 21.64
Serum-iron (g %)	70.60 ± 1.86**	106.83 ± 3.43

X=Mean S.E. Standard error *Significant ($P < 0.05$)
** Highly significant ($P < 0.01$)

DISCUSSION

The red cell distribution width was a valuable indicator of the abnormal sized erythrocytes (anisocytosis), either microcytes or macrocytes, and was more sensitive than the calculation of mean corpuscular volume or microscopic evaluation of the red cell size in the stained blood film for monitoring the inequality of erythrocytes responded to anemia (Easely, 1985; Radin et al., 1986 and Jain, 1993). The RDW was significantly increased in the cases of hemorrhages, hemolysis and blood losses (Radin et al., 1986).

The obtained results listed in Table 1 revealed that there was a significant increased ($P<0.05$) in the RDW of the diseased horses indicating the presence of subpopulation of erythrocytes, either macrocytes or microcytes. The latter (microcytic-erythrocytes) was supported by the highly significant ($P<0.01$) decreased value of MCV. In addition to anisocytosis and the decreased MCV, there was also a highly significant ($P<0.01$) decrease in the value of MCH referring to the occurrence of microcytic-hypochromic anemia of the diseased group. Iron deficiency was frequently encountered as a commonest cause of microcytic-hypochromic anemia in the domestic animals (Coles, 1982 and Jain, 1993). Analysis of the collected blood sera of the diseased horses

revealed that the level of serum-iron was highly significantly (P>0.01) decreased (Table 1) adverting the presence of hypoferremic condition. This prove that the type of the resulted anemia was Iron deficiency anemia.

Blood losses, defective iron utilization and deficient iron-diet intake (rarely occurred in the domestic animals) were commonly encountered as a possible reasons of iron deficiency anemia (Smith, 1997). The former reason (blood losses) was overwhelmingly suspected than the two later. Because of purpura hemorrhagica disease in horses was adverse consequence of immune response to streptococcal antigen resulting undesirable unions (immune complexes). These unions led to severe vasculitis particularly in the small cutaneous blood capillaries (Galan and Timoney, 1985). Consequently blood losses through the damaged blood capillaries were developed and subsequently iron deficiency anemia was resulted. Another probable reason was reported by Jain (1993) who suggested that hypoferremia of the inflammatory origin was probably considered as an important non specific host defense against the bacterial infection as iron was an essential factor for the life of the bacteria. Moreover, Smith (1997) reported that iron was essential compound for the biological processes of all living micro-organisms, except possibly lactobacillus, and the living bacteria used a variety of mechanism to get iron from the surrounding environment.

Iron element plays a pivotal role in the formation of gastric acid secretion in ruminant and non ruminant herbivorous animals (Smith, 1997). Consequently, when iron is deficient, gastric acid secretion is reduced and subsequently the efficacy of the intestinal absorption is impaired. This probably explain the signs of constipation with firm dark colored fecal ball of the diseased horses, which observed by Zaitoun and Ali (1999).

Table 1 also showed that the blood platelet counts of the diseased horses was insignificantly (P>0.05) decreased (non-thrombocytopenia). Such result is coincided with the conclusion of Rooney and Robertson (1996) who reported that the thrombocytes count in case of purpura hemorrhagica in horses was in a normal range. Dodds (1997) reported that the immunological diseases associated with non-thrombocytopenic conditions has a better prognosis. This may interpret the successful treatment of the diseased horses with purpura hemorrhagica reported by Zaitoun and Ali (1999).

In conclusion, according to the obtained results and the results of Zaitoun and Ali (1999), erythrogram in association with leukogram may have a beneficial value in diagnosis of purpura hemorrhagica in horses. Moreover, thrombocytopenic-and/or non-thrombocytopenic conditions may have a valuable indicator for prognosis of such disease.

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