HAEMATOLOGICAL ALTERATIONS IN BITCHES AFFECTED WITH PYOMETRA

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ABSTRACT

Haematological parameters were evaluated in nine pyometric and eight healthy bitches before and after ovario-hysterectomy. Significantly lower pre-operative mean haemoglobin (Hb) and total erythrocyte count (TEC) was found in pyometric bitches (11.22±0.83 g % and 5.76± 0.33 million/ cmm) than in healthy bitches (14.90±0.34 g % and 7.80±0.18 million/cmm). The mean pre-operative PCV value was significantly (P<0.01) lower (35.14±2.10 vs 42.02±0.88 %) and that of ESR was higher (10.36±1.48 vs 2.74±0.22 mm/hr) in pyometric bitches as compared to healthy ones. There was slight improvement in the Hb and TEC, and significant (P < 0.01) improvement in ESR post-operatively, but not in PCV, in pyometric bitches. The mean pre-operative total platelet count (TPC) was significantly (P<0.01) lower in pyometric bitches than in normal healthy bitches (212.67±18.94 vs 421.00±26.62 thousand/cmm) and it improved significantly after ovario-hysterectomy. Pyometric bitches showed a significant (P< 0.01) leukocytosis as compared to healthy ones (31.98 ± 4.80 vs 14.79 ± 0.68 thousand/cmm). Neutrophil count was significantly (P < 0.01) higher (76.84 ± 1.96 vs 64.40 ± 2.12 %) and lymphocyte count was lower (18.83 ± 1.30 vs 32.93 ± 1.30 %) in pyometric bitches than the normal ones. The post-operative TLC and DLC counts shifted towards normalcy. The Hb, TEC, TLC, ESR and lymphocyte count were apparently higher in close than open pyometra and correlated with clinical signs. These findings were of prognostic value in diagnosing canine pyometra.

KEY WORDS: Bitch, pyometra, haematology, ovario-hysterectomy.

INTRODUCTION

One of the meticulous life-threatening reproductive disorders in pet bitches is pyometra. It alters the haemato-biochemical profile creating clinical manifestations in affected animals. Significant prognostic changes in haematological profile of pyometric bitches in comparison to healthy ones have been documented (Wakanker, 1993; Gandotra *et al*., 1994; Hagman, 2004, Dabhi *et al*., 2009) with shift towards normalcy after ovario-hysterectomy (Hagman, 2004; Dabhi *et al*., 2009). The aim of this study was to compare haematological profile of pyometric and healthy bitches before and after ovario-hysterectomy, so as to evaluate its prognostic significance.

MATERIALS AND METHODS

This study was carried out during the year 2011-2012 on 17 pet bitches presented for treatment of pyometra (n=9) and/or neutering/spaying (elective surgery, n=8). Following retrieval of detailed history of each patient from the owner and its clinical and radiological examinations, ovario-hysterectomy was performed as per the technique described by Bojrab (1985) through a mid-line approach as a treatment of pyometra or for elective sterilization. From all the bitches, whole blood samples were collected from cephalic vein in vials containing EDTA twice, i.e. just before operation and 15 days after the ovario-hysterectomy/spaying for evaluation of haematological parameters, viz., Hb, PCV, ESR, TEC, TLC, platelet count and DLC (Jain, 1986). ESR was determined by Westergren method, while all other parameters were assessed on blood auto-analyzer (Abacus Junior Vets 5: 22 Parameter Blood Cell Counter). Data so obtained of individual bitches with open

pyometra (6), closed pyometra (3) and normal spaying (8) pre- and post-operatively were analyzed statistically using completely randomized design and 't' test (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Haematological profile observed before and after ovario-hysterectomy in bitches affected with open and close pyometra and those under normal spaying is presented in Table.

Haemoglobin and Total Erythrocyte Count

The pre-operative haemoglobin (Hb) and total erythrocyte counts (TEC) in pyometric bitches averaged 11.22 ± 0.83 (range 6.20 to 13.80) g % and 5.76 ± 0.33 (4.30 to 7.50) million/ cmm, respectively. These were significantly (P<0.01) lower than those in normal healthy bitches (14.90 ± 0.34 g % and 7.80 ± 0.18 million/cmm). The values of both Hb and TEC were non-significantly higher in cases of closed pyometra than the open ones. Moreover, there was improvement in the concentration of Hb and TEC at 8-15 days following ovario-hysterectomy in all the cases of pyometra, but the difference was significant only in TEC (P<0.01), especially in cases of open pyometra. No such variation was observed in the Hb and TEC profile before and after surgery among normally spayed bitches (Table). These observations on Hb compared well with the reports of Wakankar (1993), Gandotra *et al.* (1994), Dave (2002), Rao *et al.* (2002), Dabhi *et al.* (2009) and Hagman *et al.* (2009), but the present values of TEC were little higher than their findings. Hagman (2004), however, recorded higher Hb content of 17.3 and 13.6 g % in healthy and pyometric bitches. The lower values of Hb and TEC observed in pyometric bitches was due to anaemic condition caused through loss of red blood cells by diapedesis into uterine lumen (Borresen and Skrede, 1980; Stone, 1995), and depressed feed intake and erythropoesis under toxaemic condition in severely affected cases. The improvement in the levels of both Hb and TEC observed after surgery is conceivable as it removed the diseased organ and toxic exudates percolating to the blood stream from the uterus.

Packed Cell Volume and Erythrocyte Sedimentation Rate

The mean pre-operative packed cell volume (PCV) was significantly (P<0.01) lower (35.14 ± 2.10 vs 42.02 ± 0.88 %) and ESR was higher (10.36 ± 1.48 vs 2.74 ± 0.22 mm/hr) in pyometric bitches as compared to healthy ones. The post-operative ESR improved significantly (P<0.01), but not PCV, in pyometric bitches. No such change was observed in healthy spayed bitches. Moreover, the ESR was significantly higher in closed pyometra than the open ones at both pre- and post-operative stages (Table). These findings of PCV and ESR corroborated with the previous reports of Borresen (1980), Bojrab (1985), Wakankar (1993) and Dabhi *et al.* (2009). These authors stated that the PCV may be less than 36 % in pyometric bitches because of normochromic normocytic anaemia. Rao *et al*. (2002), however, observed much lower mean PCV of only 28 % in pyometric bitches. The apparently lower ESR with identical PCV observed at post-operative stage as compared to pre-operative values in this study could signify the removal/prevention of toxic material from being entering into the blood stream from the uterus after its removal, which could help shift towards normal rauleux formation. The opinion of Borresen (1980) and Bojrab (1985) that the PCV was valueless measurement in pyometra cases was also supported by our findings of identical profile of PCV pre- and post-operatively as well as in close and open pyometra cases, though it was significantly lesser than in normal bitches. The significantly raised ESR in some of the cases, particularly in closed pyometra, could be associated with acute endometritis and toxaemia.

Total Platelet Count

The mean pre-operative total platelet count (TPC) recorded was significantly (P < 0.01) lower in pyometric bitches than in normal healthy bitches (212.67 ± 18.94 {range 154 – 320} vs 421.00 ± 26.62 {350 – 578} thousand/cmm). The values were almost identical in cases of open and closed pyometra, but varied significantly between pre-operative and post-operative periods in cases of

Table: Mean (± SE) haematological profile before and after ovario-hysterectomy in pyometric and healthy bitches

Parameter	Period	Pyometra			Normal Spaying (n=8)
		Open (n=6)	Close (n=3)	Overall (n=9)	
Haemoglobin (Hb, g%)	Pre-op.	10.78±1.17	12.10±0.87	11.22±0.83$**	14.90±0.34
	Post-op.	12.32±0.69	12.86±1.06	12.50±0.55**	14.33±0.41
Packed cell volume (PCV, %)	Pre-op.	34.82±2.96	35.80±3.00	35.14±2.10**	42.02±0.88
	Post-op.	35.55±1.20	34.58±2.02	35.23±0.98**	41.50±0.51
Erythrocyte sedimentation rate (ESR, mm/hr)	Pre-op.	8.87±1.66	13.33±2.40$	10.36±1.48$$**	2.74±0.22
	Post-op.	6.17±0.58	9.07±1.82	7.13±0.81**	2.58±0.22
Total erythrocyte count (TEC, $x10^6$/cmm)	Pre-op.	5.48±0.34$	6.33±0.67	5.76±0.33$$**	7.80±0.18
	Post-op.	6.33±0.39	6.73±0.67	6.46±0.33**	8.05±0.18
Total leucocyte count (TLC, $x10^3$/cmm)	Pre-op.	27.61±3.06$$	40.71±13.15	31.98±4.80$$**	14.79±0.68
	Post-op.	19.48±2.06	25.60±6.75	21.52±2.57*	13.80±0.40
Total platelet count (TPC, $x10^3$/cmm)	Pre-op.	208.33±18.87$$	221.33±49.67	212.67±18.94$$**	421.00±26.22
	Post-op.	309.50±21.93	303.00±38.08	307.33±17.96**	471.63±24.33
Neutrophils (%)	Pre-op.	75.42±2.62$$	79.70±2.38	76.84±1.96$$**	60.40±2.12
	Post-op.	68.83±1.72	71.33±3.47	69.66±1.55**	61.36±1.77
Lymphocytes (%)	Pre-op.	20.20±1.64$$	16.10±1.04	18.83±1.30$$**	32.93±1.30
	Post-op.	27.50±1.57	25.57±3.30	26.86±1.43**	33.63±1.45
Monocytes (%)	Pre-op.	2.17±0.54	2.40±0.92	2.24±0.44	3.76±0.60
	Post-op.	2.30 ±0.35	2.33±0.39	2.31±0.25	2.54±0.34
Basophils (%)	Pre-op.	0.60±0.23	0.23±0.19	0.48±0.17	0.98±0.17
	Post-op.	0.32±0.11	0.08±0.02	0.24±0.08**	0.79±0.15
Eosinophils (%)	Pre-op.	1.62±0.69	1.57±0.27$	1.60±0.45	1.94±0.38
	Post-op.	1.05±0.29	0.69±0.32	0.93±0.22	1.69±0.32

Pre-op. = Pre-operative just before surgery, Post-op. = Post-operative 8-15 days post-operative.

't' test: significant at * P < 0.05, ** P < 0.01 between pyometra and spaying within the row.

$ P < 0.05, $$ P < 0.01 between periods for a trait within the column.

None of the other means differed significantly between periods for a trait within the column OR between open and close pyometra within the row (P > 0.05).

open pyometra (208.33 ± 18.87 vs 309.50 ± 21.93 thousand/cmm) (Table). These observations compared well with the reports of Hagman (2004) and Tanja *et al.* (2006). They also reported marked thrombocytopenia in pyometric bitches and suggested that marked depression in platelets count might be due to increased consumption (endometrial bleeding) and/or decreased production of thrombocytes in the bone marrow or mediated by endotoxin through production of platelet activation factor.

Total and Differential Leukocyte Count

The mean pre-operative total leukocyte count (TLC) was significantly (P<0.01) higher in pyometric bitches than in normal healthy bitches (31.98 ± 4.80 {range 18.50 – 65.70} vs 14.79 ± 0.68 {12.40–17.30} thousand/ cmm). There was no difference in the TLC values of open and close pyometra cases, but a significant (P<0.01) reduction in the TLC within 8-15 days following ovario-hysterectomy was observed, particularly in open pyometra, however no such change was noted in healthy bitches (Table). Marked leucocytosis has also been reported as a constant feature in pyometric bitches by many previous workers (Gandotra *et al.* 1994; Rao *et al.,* 2002; Hagman, 2004; Dabhi *et al.,* 2009). In the present study, no distinct feature was observed between close and open pyometra cases in TLC counts. Dave (2002) and Hagman (2004), however, recorded marked increase (almost double) in TLC count in cases of close than the open pyometra. Leucocytosis depends upon the severity of inflammation. Blood leukocytic value was found to be positively correlated with the degree of anaemia (De Schepper *et al*., 1989). The increased leukocyte count observed in pyometra cases might be due to cellular immune response to local uterine inflammation.

A marked neutrophilia and lymphocytopenia with left shift is a feature of canine pyometra. In present study, significant (P<0.01) leucocytosis with marked neutrophilia ranging from 64.0 to 82.7 (mean 76.84 ± 1.96 vs 64.40 ± 2.12 %) and lymphocytopenia (18.83 ± 1.30 vs 32.93 ± 1.30 %) was found in pyometric bitches as compared to healthy bitches. However, there was no much difference in the DLC values between open and close pyometra at pre-operative stage, but at 8-15 days post-operative period the shifting towards normalcy was faster in cases of open pyometra than the close pyometra (Table). The present findings of neutrophil counts in pyometric bitches were slightly lower than those reported by Wakankar (1993) and Dave (2002). They also reported severe neutrophilia with left shift in cases of close pyometra as compared to open ones. This was, however, not distinctive in the present study. The overall marked increase in neutrophils in pyometric bitches under study might be due to inflammatory condition of uterus and even septicaemia in some bitches. Sevelius *et al*. (1990), Hagman (2004), Arora (2005) and Dabhi *et al.* (2009) observed marked leucocytosis with neutrophilia, a left shift to immature forms and substantial monocytes in most cases of pyometra. The prognosis was poor for animals with leucopenia with a left shift. Present findings to some extent also corroborated with these views. There was no significant difference between affected and healthy bitches, between close and open pyometra cases and even between pre- and post-operative periods in the percentages of monocytes, basophils and eosinophils, except the eosinophilic count which was significantly higher in pre-operative than post-operative phase in close pyometra (Table). Wakankar (1993) and Dave (2002) reported comparable findings in normal and pyometric bitches.

It was concluded that significant decline in Hb, PCV, TEC and platelet count with marked elevation of ESR, TLC and neutrophil count in bitches with pyometra suggested toxaemia. Hence, these parameters could be used as good probe to diagnose the condition. Marked leucocytosis, neutrophilia and lymphocytopenia observed in pyometra improved post-operatively suggesting reversal of toxaemia.

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