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PHYSIOLOGICAL AND HAEMATO-BIOCHEMICAL CHANGES DURING SALVAGE PROCEDURES FOR HIP DYSPLASIA IN DOGS

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Abstract: The study was conducted to evaluate salvage procedures as Excision arthroplasty, Denervation and transfemoroarticular wiring for hip dysplasia in dogs. 18 dogs with clinical hip dysplasia were divided into three groups of six animals each based on grade of lameness and age. Group I dogs (> 7 months) were having lameness of Grade III and Grade IV. Group II dogs (2.2 to 7 years) with lameness grade III, IV and V wherein the owners are reluctant for major surgery and mostly geriatric breeds. In Group III dogs (< 1 year) with lameness grade IV and V. Physiological and hematobiochemical changes were recorded on pre-operative, day of surgery, 7^{th}, 15^{th}, 30^{th}, 45^{th} and 60^{th} day after surgery. The variations of physiological parameters (rectal temperature, respiratory rate and heart rate) during study period was statistically non significant in group I and II and significant increase on day of surgery noticed in group III which declined during study period however, all the changes were within the normal physiological range. Hematological parameters (hemoglobin %, TEC, TLC, PCV%, Neutrophil %, Lymphocyte %, Eosinophil %) varied non significantly during the study period in group I and group II dogs and statistically significant variation noticed on day of surgery in TLC, Neutrophil% and lymphocyte% in group II and variations during study period were within the normal physiological range. Serum calcium, serum phosphotase and serum alkaline phosphotase values varied non significantly during the study period but within the normal physiological range in all the three groups.

Keywords: Physiological, hematobiochemical, hip dysplasia.

Introduction

Canine hip dysplasia (CHD) remains a common orthopedic disease of dogs despite many years of selective breeding based on early detection of animals. Although selective breeding can alter an animals genes, factors such as diet, body weight and exercise have major influence on phenotypic expression of an individuals genotype (Corr, 2012). It is characterized by laxity of the joint and subsequent development of osteoarthritis (Anderson, 2011). The aim of the treatment is to reduce or eliminate pain thereby improving or restoring limb function to normal. Disease progression may be influenced by conservative management or by specific surgical procedures in the young dog. Salvage surgical procedures can be performed where conservative management fails to result in adequate clinical improvement

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(Anderson 2011).This paper describes the physiological and haemato-biochemical changes during salvage procedures for hip dysplasia in dogs.

Materials and methods:

Eighteen dogs with hip dysplasia showing varying degree of lameness presented to clinics were divided into three groups based on degree of lameness. Dogs aged after puberty and up to 7 years of age with lameness grade III and IV were kept in Group I. Group II dogs were in the age range of 2-7 yrs with lameness grade III,IV and V were confined to group II. Group III dogs were young and within the age of one year with lameness grade IV and V.

Group I dogs were subjected to excision arthroplasty/Femoral head and neck excision as per standard procedure described by Piermattie and Johnson (2004).

All the Group II dogs were placed in lateral recumbency with affected limb up. Destruction of sensory nerves of cranial gluteal nerve were destroyed using curette and flushed with normal saline as per procedure described by (Kinzel et al., 2002).

Group III: C-Arm guided Transfemoro acetabular/articular wiring was done for Group III dogs as per the standard procedure mentioned by Tomlinsong (1998).

In all the three groups physiological, hematobiochemical parameters were estimated on preoperative, 0,7,15,30,45 and 60 days after the surgery as per the standard procedure.

For hematological observations, two ml of blood was collected in EDTA coated vials using disposable syringes through cephalic or recurrent tarsal vein. The estimations of packed cell volume (%), hemoglobin (g/dl), total erythrocyte count ($X10^6$ /µl) and total leukocyte count ($X10^3$/µl) were carried out on fully automated haematology cell counter. Blood smear for differential leukocyte count were stained with Giemsa stain and cell counted by using Battlement method as described by Jain (1993).

For biochemical parameters, blood samples were collected in blood clot activator vials to separate the serum. The parameters serum calcium(mg/dl) estimated by O-cresophtalien complex method as per Mayne (1994),serum phosphorus by modified metol method as per Burtis and Ashwood (1996) and serum alkaline phosphotase (IU/L)were estimated by biochemical analyzer by kinetic photometric test as prescribed by Tietz et al., (1983).

The physiological and haemato-biochemical values over different period of time post operative were statistically compared with pre operative values for all the surgical procedures using paired Student 't' test at 0.05% level of significance using computer based statistical programme, Graph pad prism, and interpreted as per the procedure described by Snedecor and Cochran (1996).

Results and discussion

The physiological parameters like rectal temperature, respiratory rate and heart rate recorded in the present study were given in the table 1.

The temperature increased marginally on the day of surgery, which declined by 7th day in group I and group II and differences in temperature was statistically non significant and the changes in temperature were within the normal physiological range. However, in group III, there was significant increase in temperature on the day of surgery which declined by 7th day. The respiratory rate increased marginally on the day of surgery, which declined later on in group I and II during study period whereas in group III there was significant increase on day of surgery which declined on 7th day but differences in respiratory rate during post operative period in all the groups were statistically non significant and were within the normal physiological range. The heart rate increased marginally on the day of surgery, which declined later on in group I and group II where as statistically significant rise in heart rate on day of surgery noticed in group III. In all the treatment groups, differences in heart rate over the period of time with in the groups were statistically non significant and were within the normal physiological range.

In the present study rectal temperature, respiratory rate and heart rate were elevated on day of surgery and there after values declined to normal range suggesting the reduction of stress on animals in group I and group II dogs. In group III dogs, significant increase on the day of surgery, later decline towards normal range. Elevated rectal temperature, respiratory rate and heart rate could be attributed to more surgical stress. These observations were in accordance with Patil., (2017), Rameshrathod et al., (2013), Smitha et al., (2014) and Arunprasad et al., (2012) and Maruthi (2016).

Hematological parameters:

Hematological parameters Haemoglobin (%) Packed cell volume (%) TLC, TEC, Neutrophil (%) lymphocyte (%), Eosinophil (%) were given in the table no. 2.

The haemoglobin percentage in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant. The Packed Cell Volume (%) in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant. The Total Erythrocyte Count in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant.

Although there was minimal bleeding during surgical procedure, slight variations in values of haemoglobin(%), PCV(%) and Total erythrocyte count in all the three groups during study period non significant. These observations are in agreement with the findings of Singh et al., (2008), Arunprasad et al., (2012) and Maruthi (2016).

The Total Leukocyte Count in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant I and II dogs. In group III dogs significant increase observed on day of surgery which declined to normal during study period. Leucocytosis occurred in condition where there was corticosteroid release in state of stress, pain anesthesia, trauma and surgical manipulation. These findings were similar to the findings of Maiti et al., (1999) and Patil et al., (2017).

The Neutrophil (%) in the dogs of group I and group II treatment groups were within the physiological range and the changes over the study period was statistically non significant. In group III dogs, statistically significant increase noticed on day of surgery which declined towards the study period however the differences were within the physiological range. Marginal increase in neutrophil could be attributed to tissue damage.

The Lymphocyte (%) in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant in group I and group II treatment group. In group there was significant variation on day of surgery and the variations during study period was within the physiological range. Lymphocytopenia could be due to stress related response and acute inflammatory condition.

The Eosinophil (%) in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was statistically non significant. Eosinophil count was within normal range indicating free of anaphylactic reaction. Similar findings were observed by Nagaraja (1996), Singh et al., (2008), Arunprasad et al., (2012) and Maruthi (2016).

Biochemical parameters:

Biochemical parameters serum calcium, serum phosphorus and serum alkaline phosphotase values were recorded as given in the table no.3.

The serum calcium level (mg/dl) in the dogs of all the three treatment groups were in the physiological range and the variations over the study period was statistically non significant and within the higher normal physiological change. Hyper calcemia indicates osteolytic bone lesions which was not evident in all the treatment groups.

The serum phosphorus level (mg/dl) in the dogs of all the three treatment groups were within the physiological range and the changes during the study period was within the physiological range and statistically non significant.

The non significant variation of serum calcium and serum phosphorus values during study period was similar to findings of Vasantha (1991) and Prachasilpchai et al., (2003).

The Serum alkaline phosphotase level in the dogs of all the three treatment groups were within the physiological range and the changes over the study period was within the normal physiological range and statistically non significant. Elevated alkaline phosphotase indicates the increased production of growing bone which was not evident in treatment groups.The findings were similar to findings of Vasantha (1991) and Maiti et al., (1999).

Conclusion

In conclusion the above physiological and haemato-biochemical findings on different postoperative days helped in knowing the healing of hip joint.

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Table 1: Mean±SE of temperature, respiratory rate and heart rate of dogs subjected to Excision arthroplasty (Group I), Denervation (Group II) and Transfemoroarticular wiring (Group III) dogs (N=6)

Parameter	Group	Pre Operative day	Post Operative days					
			0	7	15	30	45	60
Temperature (0 F)	I	102.52 ±0.10	102.85 ± 0.2	102.3±0.12	102.3 ± 0.1	102.42 ± 0.16	102.22 ± 0.14	102.42 ± 0.09
	II	102.33 ±0.15	102.86 ± 0.07	102.53 ±0.07	102.58 ± 0.14	102.65 ± 0.28	102.45 ± 0.03	102.38 ± 0.08
	III	102.6 ± 0.15^{a}	103.37 ± 0.21^{b}	102.9 ± 0.08^{ab}	102.73 ± 0.08^{a}	102.43 ± 0.13^{a}	102.47 ± 0.08^{a}	102.5 ± 0.10^{a}
Respiratory rate (per min)	I	35.5 ± 2.08	38 ± 2.14	35.17 ± 1.78	37.5 ± 2.26	35.5 ± 2.01	34.83 ± 1.6	34.5 ± 2.13
	II	33.5 ± 0.62	33.83 ± 0.95	33.17 ± 0.48	33.17 ± 0.6	32.83 ± 0.6	34.67 ± 2.08	33.5 ± 1.15
	III	40.07 ± 1.15^{a}	41.83 ± 1.45^{b}	39.67 ± 1.48^{a}	39 ± 1.46^{a}	39.67 ± 0.88^{a}	39.67 ± 0.92^{a}	39.33 ± 1.12^{a}
Heart Rate	I	87.5 ± 1.71	88.33 ± 1.09	87.17 ± 1.22	88.5 ± 2.19	86.67 ± 2.46	87 ± 1.55	87.5 ± 1.48
	II	89.67 ± 2.42	91.67 ± 2.28	89.5 ± 0.96	89.33 ± 0.84	89.33 ± 1.31	89 ± 1.13	88.67 ± 1.09
	III	88.5 ± 2.19^{a}	92 ± 2.46^{b}	89 ± 2.56^{a}	88.83 ± 3.43^{a}	89.83 ± 1.82^{a}	89 ± 2.66^{a}	88.17 ± 1.89^{a}

The values in rows with different superscript differ significantly at 0.05% level of significance.

Table 2: Mean±SE of hematological parameters in dogs subjected to Excision arthroplasty (Group I), Denervation (Group II) and Transfemoroarticular wiring (Group III) dogs (N=6)

Parameter	Group	Pre Operative day	Post Operative days					
			0	7	15	30	45	60
Haemoglobin(%)	**I**	12.68 ± 0.4	12.43 ± 0.41	12.38 ± 0.42	12.23 ± 0.43	12.15 ± 0.45	12.18 ± 0.56	12.22 ± 0.59
	II	12.27 ± 0.21	12.22 ± 0.2	12.03 ± 0.17	12.07 ± 0.18	11.98 ± 0.45	12.2 ± 0.23	12.4 ± 0.3
	III	11.98 ± 0.2	11.85 ± 0.32	12.02 ± 0.21	12.18 ± 0.25	12.12 ± 0.25	12.13 ± 0.23	12.27 ± 0.28
TEC	**I**	5.48 ± 0.2	5.45 ± 0.16	5.36 ± 0.29	5.42 ± 0.23	5.52 ± 0.21	5.81 ± 0.2	5.87 ± 0.17
	II	5.65 ± 0.11	5.52 ± 0.09	5.42 ± 0.11	5.43 ± 0.15	5.64 ± 0.09	5.86 ± 0.11	5.93 ± 0.14
	III	5.73 ± 0.12	5.61 ± 0.09	5.61 ± 0.12	5.61 ± 0.12	5.64 ± 0.07	5.77 ± 0.05	5.83 ± 0.12
TLC	**I**	13 ± 0.5	14.54 ± 0.72	13.68 ± 0.47	13.53 ± 0.52	13.38 ± 0.53	13.06 ± 0.58	12.87 ± 0.42
	II	14.14 ± 0.64	15.41 ± 0.7	15.13 ± 0.65	14.87 ± 0.62	15.23 ± 0.68	15.1 ± 0.59	14.93 ± 0.59
	III	13.6 ± 0.35^{a}	15.49 ± 0.38^{b}	15.11 ± 0.26^{b}	14.62 ± 0.35^{ab}	14.63 ± 0.22^{ab}	14.36 ± 0.22^{a}	13.8 ± 0.29^{a}
PCV(%) in	**I**	34.67 ± 0.84	34.25 ± 0.85	34.51 ± 1.45	35.63 ± 1.67	35.58 ± 1.82	35.59 ± 1.65	36.03 ± 1.74
	II	35.43 ± 0.7	35.18 ± 0.83	35.05 ± 0.66	35.48 ± 0.84	35.43 ± 0.82	35.09 ± 1.4	36.57 ± 0.83
	III	33.73 ± 0.48	34.04 ± 0.77	34.07 ± 0.98	35.15 ± 1.13	35.59 ± 0.91	35.19 ± 1.26	35.9 ± 0.72
Neutrophils	**I**	72.67 ± 0.56	73.83 ± 0.48	73.67 ± 0.56	72.67 ± 0.61	72 ± 0.68	72.67 ± 0.42	71.83 ± 0.31
	II	73 ± 0.52	74.83 ± 1.01	74.67 ± 0.95	74.83 ± 0.83	73.33 ± 0.42	73.13 ± 0.91	72.83 ± 0.75
	III	74.17 ± 1.05^{a}	78.83 ± 1.22^{b}	77.83 ± 1.35^{b}	77.17 ± 1.38^{b}	75.67 ± 1.43^{a}	75.33 ± 1.23^{a}	75.83 ± 0.95^{a}
Lymphocyte (%)	**I**	27.5 ± 0.67	25.67 ± 0.56	25.67 ± 0.76	26.83 ± 0.75	27.83 ± 0.79	26.83 ± 0.54	27.17 ± 0.65
	II	26.33 ± 0.42	24.67 ± 0.95	23.83 ± 0.95	24.17 ± 0.87	26 ± 0.68	25.33 ± 1.15	26.33 ± 0.8

	III	25 ± 1.13 [a]	20.33 ± 1.23 [b]	21.17 ± 1.35	21.83 ± 1.42	23 ± 1.34	23.67 ± 0.99	24.67 ± 0.95
Eosinophils (%)	**I**	0.83 ± 0.4	0.5 ± 0.22	0.67 ± 0.33	0.5 ± 0.34	0.17 ± 0.17	0.5 ± 0.34	1 ± 0.37
	II	0.67 ± 0.21	0.5 ± 0.22	0.5 ± 0.34	1 ± 0.26	0.67 ± 0.33	0.83 ± 0.4	0.83 ± 0.31
	III	0.83 ± 0.31	0.83 ± 0.4	1 ± 0.26	1 ± 0.26	1.33 ± 0.21	1 ± 0.37	0.5 ± 0.22

The values in rows with different superscript differ significantly at 0.05% level of significance.

Table 3: Mean±SE of biochemical parameters of dogs subjected to Excision arthroplasty (Group I), Denervation (Group II) and Transfemoroarticular wiring (Group III) dogs (N=6)

Parameter	**Group**	**Pre Operative day**	**Post Operative days**					
			0	**7**	**15**	**30**	**45**	**60**
Serum calcium (%)	**I**	10.59 ± 0.08	10.5 ± 0.11	10.52 ± 0.05	10.78 ± 0.18	11.06 ± 0.22	10.73 ± 0.16	10.82 ± 0.2
	II	10.33 ± 0.11	10.38 ± 0.07	10.46 ± 0.08	10.51 ± 0.07	10.51 ± 0.08	10.53 ± 0.05	10.58 ± 0.04
	III	10.37 ± 0.05	10.41 ± 0.05	10.43 ± 0.05	10.49 ± 0.05	10.5 ± 0.05	10.51 ± 0.05	10.55 ± 0.06
Serum phosphorus (mg/dl)	**I**	4.82 ± 0.07	4.78 ± 0.08	4.79 ± 0.08	4.84 ± 0.07	4.9 ± 0.07	4.94 ± 0.07	5.01 ± 0.08
	II	4.98 ± 0.09	5.06 ± 0.1	5.07 ± 0.1	5.11 ± 0.1	5.1 ± 0.12	5.11 ± 0.12	5.13 ± 0.12
	III	5.11 ± 0.03	5.21 ± 0.03	5.22 ± 0.03	5.25 ± 0.02	5.24 ± 0.02	5.26 ± 0.03	5.27 ± 0.02
Serum Alkaline Phosphotase (mg/dl)	**I**	111.2 ± 1.78	113.83 ± 1.01	113.83 ± 2.46	117.67 ± 1.86	120.33 ± 1.5	121.83 ± 1.54	121.67 ± 1.43
	II	111.5 ± 2.05	114.67 ± 1.2	114.83 ± 1.14	115 ± 0.73	115 ± 1.03	117.17 ± 0.75	118.67 ± 0.8
	III	114 ± 1.13	117 ± 1.46	121.5 ± 2.42	123.33 ± 1.74	124.67 ± 1.73	121.17 ± 0.98	121 ± 1.03