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HEMATOLOGICAL IMPACT IN FELINE FRACTURE HEALING: ALKALINE PHOSPHATASE LEVELS WITH EXTERNAL SKELETAL FIXATOR AND INTRAMEDULLARY PIN TIE-IN VIA EPOXY PUTTY

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Abstract: The healing process of long bone fractures in cats is an important area of veterinary research. This study aimed to evaluate haemato-biochemical changes during healing of long bone fractures in cats, which were stabilised with a combination of external skeletal fixator with intramedullary pin tie-in configuration using epoxy putty. Six clinical cases of long bone fractures in cats were selected, and blood samples were collected from each cat preoperatively, on the day of surgery, and postoperatively on Day 14, 28, and 42, for evaluation of haematological parameters and serum levels of alkaline phosphatase. Statistical analysis revealed no significant variation in haematological evaluation preoperatively and postoperatively, but an elevation of serum levels of alkaline phosphatase was observed throughout the study. The results suggest that the increase in serum alkaline phosphatase during the postoperative period could indicate osteoblastic activity at the fracture site, which could be useful in assessing the healing process of long bone fractures.

Keywords: Cat, Fracture, Alkaline Phosphatase, Haemato-Biochemical Changes, External Skeletal Fixator.

Introduction

Long bone fractures in cats can lead to serious health complications if not treated promptly and appropriately. The disruption in continuity of bones where the fragments may or may not be displaced from its original position and damage to the soft tissues or injury to vital organs may happen subsequent to trauma . [1] Proper assessment and diagnosis of long bone fractures in cats are therefore crucial. Blood tests are often required prior to surgery to assess the animal's status for surgery . [4] Although haemato-biochemical changes in dogs during fracture repair have been reported, information is lacking for cats . [1] Therefore, this study aimed to evaluate haemato-biochemical changes during fracture repair in cats and assess the possible changes in haematological parameters and serum levels of alkaline phosphatase in cats undergoing surgery for fracture repair. The results of this study may provide useful information for veterinary surgeons in assessing the healing process of long bone fractures in cats.

Materials and methods

The study was conducted on six clinical cases of long bone fractures in cats presented for treatment to the Teaching Veterinary Clinical Complex, Mannuthy and University Veterinary Hospital,

Kokkalai during the period from January 2021 to September 2021. Routine clinical examination followed by radiography were employed for diagnosis of the fracture in cats. After confirmation of complete fracture of long bone, six cases irrespective of breed, sex or age were selected for the study. After confirming fitness of the animal for surgical correction of fracture, cats were subjected to treatment with combination of external skeletal fixator with intramedullary pin tie-in configuration. Blood samples were collected in EDTA vacutainer tube preoperatively, on the day of surgery and postoperatively on Day 14, 28 and 42 in all cats for evaluation of haematological parameters *viz.* haemoglobin concentration (Hb), volume of packed red cells (VPRC), total leukocyte count (TLC), total erythrocyte count (TEC) and differential leukocyte count (DLC) and platelet count and for evaluation of serum levels of alkaline phosphatase. Serum alkaline phosphatase was estimated by DGKC-SCE recommended procedure using semi auto biochemical analyser with Alkaline Phosphatase kit.

Results and discussion

Total erythrocyte, total leucocyte count, differential leucocyte count, volume of packed red cells and platelets were all within the normal range and there was no statistically significant difference in the values pre-operatively and throughout the observation period. There was slight reduction in haemoglobin values initially but got normal on subsequent postoperative periods (Table 1). Heamorrhage occurs with fracture due to damage to medullary arteries which could cause slight anaemia as suggested by Newton and Nunamaker (1985). Decrease in haemoglobin could be caused by varying factors like bleeding from the wound site, bleeding into soft tissues, loss in drains and the dilutive effect of postoperative fluids (Nagra *et al.,* 2016). The mean serum alkaline phosphatase levels were elevated on the preoperative day and on postoperative days. The level of alkaline phosphatase showed an increase by day 14 then decreased by day 28. A slight elevation was noticed on day 42 which could be due to the agile nature and self-mutilation by the cat (Table 2). The alkaline phosphatase activity correlates proportionately with the callus formation (Muljačić *et al.,* 2013). Further increase in serum alkaline phosphatase level during postoperative period could be due to damage caused to bone by the implant fixation. Increase in serum alkaline phosphatase postoperatively may be indicative of osteoblastic activity at the fracture site (Hansda *et al.,* 2012). Increased chondroblastic proliferation may cause new bone formation during fracture repair and the periosteal destruction may cause an increase in the serum alkaline phosphatase level (Phaneendra *et al.,* 2016).

Table 1. Haematological Parameters

Variables	**PO**	**DOS**	**Postoperative day**		
			Day 14	**Day 28**	**Day 42**
Granulocyte (%)	27.317 ± 8.254	28.450 ± 8.261	29.700 ± 6.767	25.600 ± 6.755	21.950 ± 5.421
Haemogobin (mg/dl)	7.400 ± 0.553	7.233 ± 0.357	7.517 ± 0.269	8.217 ± 0.607	8.667 ± 0.641
Lymphocyte (%)	64.700 ± 9.248	62.833 ± 8.907	60.783 ± 7.712	66.583 ± 7.824	71.517 ± 5.448
Monocyte (%)	7.983 ± 1.368	8.633 ± 1.022	9.450 ± 1.334	7.817 ± 1.142	6.533 ± 0.906

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Volume of paced red cell (%)	30.150 ± 2.269	29.183 ± 1.739	31.267 ± 1.225	31.617 ± 2.173	33.383 ± 1.309
Platelet count (10^3/ µL)	216.000 ± 41.24	295.833 ± 66.72	304.833 ± 35.52	255.833 ± 54.38	277.667 ± 63.30
Total erythrocyte count (10^6/ µL)	5.823 ± 0.152	5.632 ± 0.123	6.112 ± 0.376	6.193 ± 0.492	6.523 ± 0.397
Total leucocyte count (10^3/ µL)	12.500 ± 2.754	11.033 ± 2.997	12.067 ± 2.526	12.950 ± 1.910	9.967 ± 1.253

Ns- non n Significant (P>0.05); * Significant at 0.05 level Means having different letter as superscript differ significantly (p<0.05)

Table 2. Serum Biochemistry parameters

Parameters	**Pre-operative**	**On the day of surgery**	**Postoperative week**		
			Day 14	**Day 28**	**Day 42**
Alkaline phosphatase IU/dL	200.750 ± 50.43	204.133 ± 51.00	263.567 ± 41.25	240.567 ± 37.35	257.000 ± 39.61

Ns- non n Significant (p<0.05)

Conclusion

There were no significant changes in the haematological parameters which can be useful in assessing the healing of the fracture. The serum alkaline phosphatase was on the higher range throughout the study. The alkaline phosphatase activity correlates proportionately with the callus.

Conflict of interest

The authors declare that they have no conflict of interest.

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