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Analysis of selected biochemical parameters in dogs after coxofemoral joint affections

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Abstract

The present study was undertaken to analyse blood biochemical parameters after diagnose, treat and manage the affections of coxofemoral joints in dogs. A total of 2214 cases of dogs were presented in the Department of Veterinary Surgery and Radiology and Veterinary Clinical Complex (Surgery Unit), College of Veterinary Science, A.A.U., Khanapara during the period from 1st August 2019 to 31st July, 2020. Total number of dogs with coxofemoral joint affections was 24 (1.08%). Age of the dogs affected with coxofemoral joint affections varied from 1 month old to 11 years of age. Hip joint affections were recorded in 16 males and 8 females. Sixteen out of twenty-four cases turned up for clinical examination and treatment. Clinical assessment included physical, orthopedic and neurological examinations before and after treatment. Biochemical estimation of serum ALP, serum calcium and serum phosphorus were recorded before and after rendering the treatment. The haemato-biochemical parameters had no significant alterations before and after the treatment.

Keywords: alkaline phosphatase, calcium, phosphorus, coxo-femoral joint affections

1. Introduction

Dog is a very friendly, intelligent and adaptive species present on the planet. Along with the evolution of man, dogs have evolved too, so did their relation with the man. In the modern times of hustle and bustle, where human now have a good association with pets, especially dogs have accommodated certain roles in the lives of man such as guard dogs, companions and even in the defense services.

Coxofemoral joint/ hip joint is one of the major joints in the body. The affections associated with coxofemoral joint include fracture of acetabulum, luxation of hip, capital femoral physeal fracture, fracture of femoral head and neck, hip dysplasia/Legg-Calve-Perthes disease and degenerative changes which accounts to degenerative joint disease/ osteoarthritis. Pelvic fractures constitute approximately 25 per cent of all fractures seen in small animal practice [4]. Pelvic limb fractures result from high energy traumas which can cause serious threat to life or account to permanent disabilities [5]. Early diagnosis of the affection will allow and make the owner of the patient cautious to take certain measures to handle the condition before and post-treatment like avoiding the extensive exercise of the animal, diet control to prevent weight gain and if the condition is genetic (congenital luxation of the joint) avoid further breeding of the affected animal along with better management. Affections of coxofemoral joint is a burden to the owner as well as the animal. Most of the animals in the region are either left with those condition for prolonged period resulting in pseudo arthrosis and stiffening of the joint or euthanized according to the will of the owner. Weight is a significant risk factors for affections of the joints [8]. For the marked relief of pain in long run, ultimately surgery is the key to the answer [1].

Biochemical parameters in coxofemoral joint affections are molecules that occur during the physiological cycle of the bone and cartilage matrix, and they can be detected in blood. In addition to early recognition, follow-up of disease activity, determination of disease severity, prediction of prognosis, and evaluation of response to treatment are other purposes of these biochemical parameters measurement.

So keeping these points in consideration, the present study was undertaken to study the biochemical parameters in dogs after coxofemoral joint affection

2. Material and Methods

The study was conducted on the clinical cases of dogs presented for coxofemoral joint affections to the Department of Surgery and Radiology and Veterinary Clinical Complex

(VCC) at College of Veterinary Science, Khanapara, Guwahati-22 during the year starting from 1st August, 2019 to 31st July, 2020.

A total number of 24 dogs tentatively diagnosed for the coxofemoral joint affections were undertaken. On the day of presentation, they were clinically assessed starting from the signalment, history taking and other clinical parameters. These cases were subsequently rendered for further proceedings for confirmatory diagnosis which included their physical examination and orthopedic examination along with examining nervous reflexes corresponding to pain perception. This was followed by diagnosing and rendering treatment and post-operative management.

Blood samples were collected on the day of surgery (Day 0) before operation and on 30th day after surgery as per need and consent of the owner. Blood was collected with sterile 5 ml syringe from cephalic or saphenous vein. Blood was transferred to sterile SST advance vacutainer [1] vial and allowed to clot. The blood was centrifuged @ 2000 rpm for 20 minutes to separate the serum. The serum was collected in sterile micro tube using micropipette for estimation of Alkaline phosphatase (ALP), serum calcium and serum phosphorus. Estimation was done within 24 hours of blood collection.

2.1 Alkaline Phosphatase

Alkaline phosphatase was estimated as per the liquid stable DEA-PNPP kinetic method described in the kit (PATHOZYME DIAGNOSTICS) [2] by using UV-visible spectrophotometer [3] and expressed in U/L.

Table 2: Analysis of Variance (ANOVA) for Alkaline Phosphatase (ALP)

Haematological parameter		df	SS	MS	F Value	P Value*
Alkaline Phosphatase	Group	1	463.296	463.296	3.568	0.068 ^{NS}
	Residual	30	3894.904	129.830		

*(NS: non-significant)

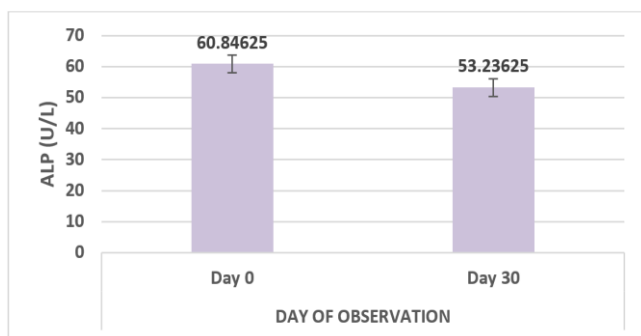


Fig 1: Graphical representation of ALP (U/L) Mean±SE values on day 0 and day 30

3.2 Calcium (Ca)

The mean ± SE values of Calcium (mg/dL) on day 0 and day 30 were 10.259 ± 0.192 and 9.938 ± 0.189 respectively (Table 3).

Statistical analysis (ANOVA Table 4) showed that the difference in the respective parameter at different days of observation was non-significant ($p>0.05$). Decreasing order of calcium on day 30 could be seen in Fig 2.

Table 3: Status of Calcium (mg/dL) on different days of observation

Day of observation	Mean±SE
DAY 0	10.259±0.192
DAY 30	9.938±0.189

2.2 Serum Calcium

Serum calcium was estimated by using modified Arsenazo III method as per the kit (PATHOZYME DIAGNOSTICS) by using UV-visible spectrophotometer and expressed in mg/dL.

2.3 Serum Phosphorus

Serum phosphorus was estimated by using Molybdate U.V. method as per the kit (PATHOZYME DIAGNOSTICS) by using UV-visible spectrophotometer and expressed in mg/dL.

2.4 Statical Analysis

Analyses of the studied data was done as per the method by SPSS 16.0 for Windows.

3. Result and Discussion

3.1 Alkaline Phosphatase (ALP)

The mean ± SE values of ALP (U/L) on day 0 and day 30 were 60.846 ± 2.819 and 53.236 ± 2.877 respectively (Table 1)

Statistical analysis (ANOVA Table 2) showed that the difference in the respective parameter at different days of observation was non-significant ($p>0.05$). Decreasing order of ALP on day 30 could be seen in Fig 1.

Table 1: Status of Alkaline Phosphatase (U/L) on different days of observation

Day of observation	Mean±SE
DAY 0	60.846±2.819
DAY 30	53.236±2.877

Table 4: Analysis of Variance (ANOVA) for Calcium (mg/dL)

Haematological parameter		df	SS	MS	F Value	P Value*
Calcium	Group	1	0.822	0.822	1.411	0.244 ^{NS}
	Residual	30	17.476	0.582		

*(NS: non-significant)

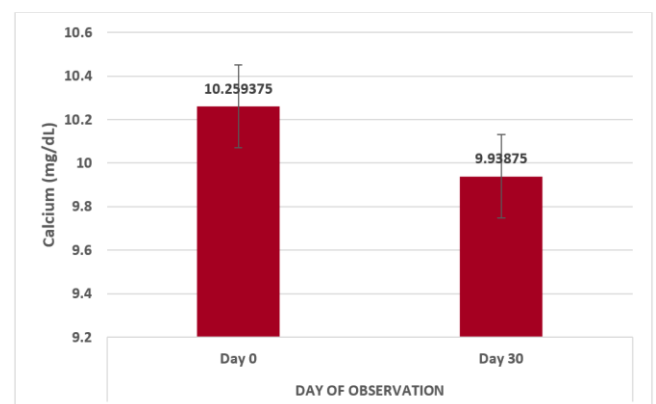


Fig 2: Graphical representation of Calcium (mg/dL) Mean±SE values on day 0 and day 30

3.3 Phosphorus (P)

The mean ± SE values of Phosphorus (mg/dL) on day 0 and day 30 were 4.463 ± 0.170 and 4.418 ± 0.196 respectively (Table 5).

Statistical analysis (ANOVA Table 6) showed that the difference in the respective parameter at different days of observation was non-significant ($p>0.05$). Mild decreasing order of phosphorus on day 30 could be seen in Fig 3.

Table 5: Status of Phosphorus (mg/dL) on different days of observation

Day of observation	Mean±SE
DAY 0	4.463±0.170
DAY 30	4.418±0.196

Table 6: Analysis of Variance (ANOVA) for Phosphorus (mg/dL)

Haematological parameter		df	SS	MS	F Value	P Value*
		Group	1	0.016	0.016	0.030
Phosphorus	Residual	30	16.239	0.541		

*(NS: non-significant)

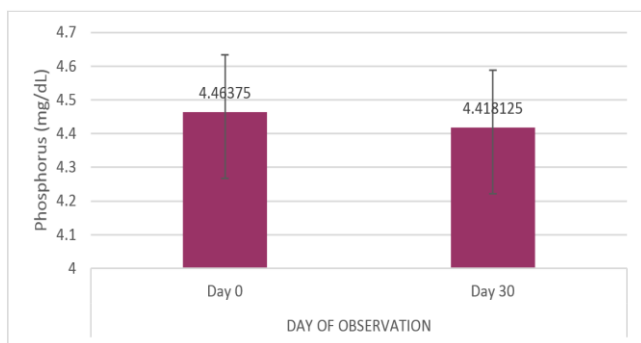


Fig 3: Graphical representation of Phosphorus (mg/dL) Mean±SE values on day 0

3.4 Alkaline phosphatase: Decreasing order of ALP on day 30 could be seen. This could be due to increase in osteoblastic activity immediately after the surgery to compensate with process of bone healing initially but gradually decreasing when healing process could have completed before 30th day. Also, not all cases underwent surgery. Moreover, the cases undertaken were of different affections which did not focus on only one type of affection like fractures alone (callus formation during healing). The ALP levels correlated with callus formation (6).

3.5 Calcium (Ca): Decreasing order of calcium on day 30 could be seen. This could be due to cessation of calcium supplements 20-30 days post-surgically and the normal body compensation of calcium level during the healing process. Also, the cases were focused on all the types of coxofemoral joint affections, which could have followed different ranges of calcium for different types of affections before and after treatment. Grassato *et al.* (2019) studied shoulder lameness in dogs who found serum calcium levels within normal range.

3.6 Phosphorus (P): Mild decreasing order of phosphorus on day 30 could be seen. This could be in accordance to the serum calcium level of the body and compensation of the body phosphorus levels during the healing process. Few authors (2,3) suggested that there were no significant changes in serum calcium, phosphorus along with serum alkaline phosphatase levels of dogs affected with hip dysplasia and polyarthritis. Their findings corroborated with the findings of present study.

4. Summary

The measurements of serum biochemical parameters viz. ALP, Ca and P may be of diagnostic and prognostic value in differentiating patients with early joint destruction and in determining disease progression. Biochemical parameters have definitive diagnostic value as well as with clinical and radiographic data would most likely help to improve the clinical assessment of patients affected early with this common disorder.

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