



AN INVESTIGATION ON SERUM TROPONIN CONCENTRATION IN HEALTHY CATS IN BAGHDAD PROVINCE

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ABSTRACT

The present study aimed to investigate the cardiac troponin I (cTn I) levels in healthy Cats. The study involved 60 cats (30 male, 3 female), and all animals were clinically healthy. The studied animals were grouped as 0-5 years, 5-10 years and 10-15 years and over. Blood samples were obtained from jugular vein and cardiac troponin I levels, and biochemical parameters (CK, AST and LDH) were measured. Troponin I values were 0.01-0.04 ng/ml (mean 0.02 ng/ml) in cats. Although AST, CK and LDH values weren't in normal ranges, AST levels were higher in cats at 5-10 years of age and, CK levels were higher in cats at 10-15 years of age. In conclusion, obtained troponin values in this study could be values for healthy cats.

KEYWORDS: cats LDH AST CK Troponin.

INTRODUCTION

Cardiac troponin (cTn), an inhibitory protein complex located on the actin filament in all striated muscles, consists of three subunits T, I, and C^[1] and coordinates striated muscle contraction in response to voltage changes^[2]. Although the half-life of cTnI is relatively short (90 minutes), its diagnostic time range is unusually wide (ranging from a few hours to 10–14 days after the episode of myocardial injury) as a consequence of intracellular compartmentation^[3]. Cardiac troponin I ("I" for inhibition) is uniquely expressed in the myocardium and is a potent inhibitor of the process of actin-myosin cross-bridge formation^[4]. The inadequate sensitivity and specificity of creatine kinase (CK), lactate dehydrogenase (LDH), aspartate amino transferase (AST) and alanine amino transferase (ALT) have led scientist to develop new methods^[5]. Troponins consist of 3 subunits: cTn I is the largest subunit and bound to actin, cTn T is bound to tropomyosin and cTn C is placed between Tn I and Tn T and has a high affinity against Ca²⁺ ion, Troponins don't exist in the blood of healthy persons or are suggested to exist in very small amounts^[6]. Cardiac troponins (cTn-T and cTn-I) are highly sensitive markers for myocardial necrosis. In recent years, it has been suggested as an important marker of cardiac diseases in veterinary medicine^[7]. Measurement of circulating cTnI concentration ([cTnI]) is a more sensitive means of detecting myocardial cell injury than measurement of either plasma [cTnT] or serum creatine kinase isoenzyme MB (CK-MB) concentration in dogs and cats after blunt chest trauma^[8].

MATERIALS & METHODS

The material in this study consisted of 60 Cats. All animals were found healthy on clinical examination by checking body temperature, respiratory and heart beat

frequency and general clinical appearance. The animals were grouped according to gender (male and female) and age. Each group comprised of 30 male and 30 female and animals were also categorized as 20 animals in 0-5 years, old (n=20), 5-10 years old (n=20), and 10-15 years old (n=20). The blood samples from all animals were obtained from jugular vein into anticoagulant-free container. Sera were obtained by centrifugation at (3000 rpm for 10 min). Serum samples were preserved at -20°C until analyses. Serum cardiac troponin I (cTn-I) values were determined calorimetrically using commercial test kits (Troponin I kit - DRG Diagnostic) on an ELISA readers (ELISA reader®-DAS for cTn-I). Serum lactate dehydrogenase, aspartate aminotransferase, creatin kinase and myocard originated creatine kinase levels were measured spectrophotometrically (Photometer® 5010 Boehringer Mannheim) using commercial test kits (Randox®-UK) as instructed by producer. The statistical evaluation of data was made by student's t test using SPSS statistical package^[9].

RESULTS

Clinical Findings

All animals included in the study were determined as healthy on clinical examination.

Serum Troponin I Concentration

cTn-I concentrations determined for the groups and ages did not significantly differ ($P > 0.05$) (Table 1).

Biochemical Results

Serum Troponin I concentrations of healthy cats according group, sex and age did not differ significantly ($P > 0.05$) and they are shown in the Table 1. AST, CK and LDH concentration in gender, groups and ages are given in Table 2 and Table 3 respectively.

TABLE 1. Serum troponin I levels in healthy cats

Groups	N	serum ctni (Xmin-Xmax)Mean ng/ml	
Total (ng/ml)	60	0-1. 04	0.02
male (ng/ml)	30	0.02-0.04	0.03
female (ng/ml)	30	0.01-0.03	0.02
0- 5 years(ng/ml)	20	0-1.0.4	0.02
5-10 years (ng/ml)	20	0.02-0.04	0.03
10-15 years(ng/ml)	20	0.02-0.04	0.03

TABLE 2. The Serum AST, CK,and LDH enzymes according to sex in healthy cats

parameters	gender	N	serum ctni Mean (Xmin-Xmax)
AST (IU/L)	Male	20	30.063 ± 1.21
	Female	20	27.96 ± 0.96
CK (IU/L)	Male	20	69.9 ± 1 0.0
	Female	20	26.6 ± 2.8
LDH (IU/L)	Male	20	171.15 ± 11.25
	Female	20	156.65 ± 9.65

TABLE 3. The Serum AST, CK,and LDH enzymes according to age in healthy cats

parameters	age	N	serum ctni Mean (Xmin-Xmax)
AST (IU/L)	0- 5 years	20	13.55 ± 2.36c
	5-10 years	20	33 .00 ± 1.18a
	10-15 years	20	26.55 ± 4.72b
CK (IU/L)	0- 5 years	20	54.7±3.98c
	5-10 years	20	62.6±5.23b
	10-15 years	20	94.6±11.3a
LDH (IU/L)	0- 5 years	20	267.1±19.2
	5-10 years	20	297.3 ±30.43
	10-15 years	20	208.0±21.15

Means with different subscript letters in the same column differ significantly (P< 0.01) .

AST values obtained in cats aged 5-10 years was significantly (P < 0.01) higher than the other age groups. CK was higher in cats aged 10-15 years old (P<0.01) as compared with aged 5-10 years and 0-5 years old. A fluctuation of LDH was shown in cats in all age groups.

DISCUSSION

Animals included in the study were healthy based on examination and cardiac troponin I values and other biochemical parameters were determined. However, a high [cTnI] has been associated with myocardial damage in other species. There have been no reports of [cTnI] in humans with HCM, but our findings are consistent with those of previous investigations in humans in which myocardial damage was secondary to non ischemic myocardial disease, including in humans with idiopathic dilated cardiomyopathy^[10]. cTn I was reported to have high sensitivity in the diagnosis of cardiac diseases^[11]. In recent years their use as an important markers of diseases causing cardiac damage in veterinary medicine. Cats with congestive heart failure had significantly higher [cTnI] than did cats with no clinical signs and those with a history of heart failure^[12]. cTn I was reported to be 0 .1- 0.04 ng/ml in healthy cats. The results obtained for sex and age groups (0-5 years, 5-10 years, and 10 -15 tears) were within the references range. The results obtained for cats are in congruity with the data reported. Myocardial cell injury, manifested anatomically as inflammation

(endomyocarditis, myocarditis, perimyocarditis), acute degeneration, apoptosis, or necrosis or hemodynamically as transient or permanent cardiac contractile dysfunction, was a frequent consequence of physical myocardial trauma (cardiac contusion), cardiomyopathy, metabolic (diabetes mellitus, renal insufficiency, pancreatitis) or toxic myocardial damage (anthracyclines, catecholamines, bacterial endotoxins, tumor necrosis factor myocardial ischemia (tachycardia-induced, pathologic hypertrophy with small vessel disease, arterosclerosis) or infarction. Diagnostic sensitivity^[13], electrocardiography (ECG) or echocardiography to diagnose minor myocardial injury is poor. However, early diagnosis of myocardial injury may be important from a therapeutic and prognostic perspective^[14]. The biochemical parameters for the diagnosis of cardiac muscular diseases, AST, CK-MB, LDH have commonly been used. However these parameters were replaced with newly developed cardiac markers such as cTn I and cTn T. CK enzyme exists in high amounts in striated muscles. Increased serum activity indicates skeletal or cardiac muscle injury^[15]. AST is mostly found in cardiac muscle and liver in lower amounts. AST is not an organ specific enzyme. The reference levels for AST are reported to be 280 IU/L in sheep and 14-33 IU/L in cats^[16]. CK enzyme exists in high amounts in striated muscles. Increased serum activity indicates skeletal or cardiac muscle injury. The normal level of CK in cats has been reported as 69-214 U/L^[17]. LDH levels are increased

during skeletal muscle diseases, cardiac muscle diseases and cellular liver diseases. In cardiac diseases including trauma, necrosis, neoplasia and tissue degeneration, LDH activity is low. The references values of LDH are reported to be 200-300 IU/L in cats^[18].

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