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Feline diabetes mellitus-diagnosis and its clinical management: A case report

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Abstract

A cat aged 9 years old, male, intact was brought Kattankulathur, Chengalpattu District, which was referred by a veterinarian with a history of polydipsia and polyuria and sudden loss of body weight from 11kg to 9kg in one month. On clinical examination, animal appeared to be normal. Random blood glucose (RBG) level was taken and it found to be 395mg/dL. Hematology and serum biochemistry were normal except glucose. Animal was monitored for glucose level using glucometer before and after feeding and tabulated and found to be more than 270mg/dL. Glargine insulin was given as treatment subcutaneously at the dose rate of 0.2mg/kg and glucose level were monitored and found to be reduced to 70mg/dL. So, the dose was reduced to 0.1mg/kg and closely monitored. Glucose level of the animal was stabilized and given for one month. Feeding habit was also changed from complete commercial dry food to wet food and increased homemade food. Finally, animal was completely remised from diabetes and maintaining its glucose level without insulin therapy after one month.

Keywords: Feline, diabetes mellitus, glargine, insulin, hypoglycemia

Introduction

Diabetes mellitus is a common endocrine disease in cats. The majority of cats suffer a type of diabetes similar to type 2 in humans; in dogs, this type is extremely rare or may not exist at all (Reusch, 2015) [1]. As in humans, obesity is a major risk factor for diabetes in cats, and overweight cats are several times more likely to develop diabetes than optimal weight cats. Physical inactivity and indoor confinement, which is most likely associated with obesity ("sedentary lifestyle") as well as advancing age, have also been identified as important risk factors in cats. Obese cats are 3.9 times more prone for Diabetes Mellitus (DM) when compare to optimal weighed cat (Scarlett and Donoghue, 1998) [2]. The prevalence of DM in cats was ranged from 0.58 to 0.95% and sex was not significantly associated with DM (O'Neill *et al.*, 2016) [3]. Neutered cats are at greater risk of gaining weight, and it is probably the increased risk of obesity that contributes to the development of diabetes. Feline type 2 diabetes is a heterogeneous disease attributable to a combination of impaired insulin action in liver, muscle, and adipose tissue (insulin resistance), and β -cell failure (McCann *et al.*, 2007) [4]. There are two forms of diabetes:

1. Uncomplicated Diabetes, the most common form, and
2. Ketoacidosis, the life-threatening form.

A male intact 9 years old cat was brought to the Madras Veterinary College Teaching Hospital, Chennai, with a history of polydipsia and polyuria and sudden loss of body weight from 11kg to 9kg in one month.

Diagnosis:

The classic signs of diabetes are polydipsia, polyuria, polyphagia and weight loss documentation of persistent fasting hyperglycemia and glucosuria, which are highly correlated with the present case. Cats are prone to stress hyperglycemia, which may cause difficulties in diagnosis and monitoring of the disease (Reusch, 2015) [1]. Hyperglycemia affects the normal metabolism and there will be glucosuria which result in polyphagia and polydipsia. The vast majority of cats are not presented until blood glucose concentrations exceed the renal capacity for glucose reabsorption (approximately 270 mg/dL, 15 mmol/L) as in the animal brought for treatment when RBG was 395 mg/dL. Complete blood count (CBC) usually does not reveal major abnormalities, but in the present case, there was thrombocytopenia (90000/cu.mm.) (Table 3) (Marshall *et al.*, 2007) [5].

The most common biochemical abnormalities include hyperglycemia, hypercholesterolemia, and increased liver enzyme activities. 40% and 50% of diabetic cats have increased serum alanine aminotransferase (ALT) and/or alkaline phosphatase (ALP) activities, which is presumably due to diabetes-associated hepatic lipidosis. Blood urea nitrogen (BUN) and serum creatinine are usually normal in cats with uncomplicated diabetes, but the presented case was uncomplicated form and only hyperglycemia noticed (Table 4) (O'Brien *et al.*, 1998) [6]

Thoracic and abdominal radiographs play a limited role in the work-up of cats with newly diagnosed diabetes. In uncomplicated cases, hepatomegaly usually is the only relevant finding but not found in the presented case.

Treatment and Discussion

The primary goal in treating non ketotic diabetes mellitus is to eliminate the clinical signs of diabetes and thereby enable a good quality of life. Early treatment and good glycemic control are important to increase the chance of diabetic remission. Successful treatment requires that the owner is highly motivated, able, and willing to adapt his or her daily routine to the cat's treatment plan and to work in close collaboration with the veterinarian. The present case was thrombocytopenic and was treated with thrombomimetics orally to avoid further complication

The first phase of treatment of the uncomplicated form is called regulation. This means that insulin is given until the proper dose is found to keep the blood glucose in the range of 100-300 mg/dL (5.5-16.5 mmol/L) throughout the day and night. When this occurs, the signs of diabetes are relieved. The cat quits losing weight and begins to gain weight; this results in the appetite returning to normal. The cat's urination and water consumption also return to normal levels.

The second phase of treatment is called maintenance. This means that the cat has been regulated and has the appearance and behavior of a normal cat. Hopefully, the cat stays in this phase the rest of its life. However, some cats' need for insulin changes with time and new circumstances, so occasional re-regulation may be needed.

The administration of insulin is the most important part of the treatment regimen in diabetic cats and should be initiated as soon as possible after the diagnosis is established. Insulin therapy is superior to the currently available oral hypoglycemic drugs to reverse the negative effects of glucose toxicity and to increase the chance of diabetic remission. Short-acting insulin (regular insulin, short-acting analogues such as aspartate, lispro, glulisine) is typically used in cats with diabetic ketotacidosis (DKA), hyperglycemic hyperosmolar state, or with extremely unstable glycemic control. Intermediate and long-acting preparations are used for long-term control of cats with uncomplicated diabetes.

The longer duration of action is achieved by slowing the rate of absorption from the subcutaneous tissue. Owners should understand that home monitoring is an additional tool in the management of diabetes, which provides valuable information (Reusch, 2015) [1].

In the present case, asked the pet parents to take the blood glucose level before after feeding regularly using glucometer to identify the fluctuation in blood glucose level and to calculate the insulin glucose (Table 1). In Glargine is used together with a low-carbohydrate diet to minimize prandial increases in blood glucose in cats. Twice-a-day administration is recommended to provide overlap of insulin action from the proceeding injection and increase the probability of remission. The starting dose for glargine is 0.25 U/kg of ideal body weight, if blood glucose concentration is <360 mg/dL (<20 mmol/L) or 0.5 U/kg if blood glucose is >360 mg/dL (Bloom and Rand 2014) [7]. In the present case, Glargine was given at the dose rate of 0.25U/kg once daily subcutaneously for 3 days and food also changed from dry to wet food and the cat becomes hypoglycemic (70mg/dL) Table 1). So, again the dose reduced to 0.1U/kg once daily for one week with wet and homemade food, so the blood glucose level was monitored regularly before and after food by the owner using glucometer and glucose level was maintained within the normal range (Table 2).

A substantial percentage of cats with type 2 diabetes experience diabetic remission, and achievement of remission is nowadays one of the major treatment goals in diabetic cats (Reusch, 2015) [1]. Cats are newly diagnosed with diabetes and have no severe concurrent diseases. They are treated according to a standardized treatment protocol, which includes administration of insulin Glargine. and feeding a low-carbohydrate-high-protein diet. Frequent reevaluations are done during the first 4 months of therapy. Home monitoring of blood glucose has been shown to be advantageous because it allows close supervision bid and more frequent dose amendments.

Insulin Glargine is a long-acting type of insulin that works slowly, over about 24 hours. Insulin is one of many hormones that help the body turn the food we eat into energy. Remission of diabetes is defined as a situation in which clinical signs disappear, blood glucose concentration normalizes, and insulin treatment (or other antidiabetic drugs) can be discontinued. Cats experiencing diabetic remission are not "cured," because they have islet cell pathology, potentially predisposing them to a relapse of clinical diabetes. Diabetic remission most often occurs during the first 3 to 4 months of therapy. But in the present case, remission had occurred in one month and the cat was maintained with low carbohydrate and high protein diet usually of home made with regular exercise (Fig. 1)

Table 1: Glucometer reading before and during treatment

Time	Fasting Glucose level		After Feeding	
	Before Treatment	During Treatment	Before Treatment	During Treatment
Type of food given	Dry	Wet	Dry	Wet
Day 1 Morning	456	338	647	445
Day 1 Afternoon	470	312	700	402
Day 1 Night	530	215	674	308
Day 2 Morning	467	264	653	357
Day 2 Afternoon	452	242	678	327
Day 2 Night	469	259	698	309
Day 3 Morning	432	202	652	265
Day 3 Afternoon	475	154	598	209
Day 3 Night	412	72	544	170

Table 2: Glucometer reading after reducing the dose level to 1mg per 24 hours

Time	Fasting Glucose level	Type of food given	After Feeding
Day 1 Morning	124	Wet	168
Day1 Afternoon	110	Wet	154
Day 1 Night	102	Wet	149
Day 2 Morning	90	Wet	143
Day 2 Afternoon	95	Wet	136
Day 2 Night	84	Wet	129
Day 3 Morning	80	Home made	124
Day 3 Afternoon	93	Home made	120
Day 3 Night	82	Home made	125

Table 3: Haematological parameters

S. No.	Parameter	Normal Range	Actual Value
1.	Haemoglobin	8 - 15 g/dL	14.6 g/dL
2.	Packed Cell Volume (PCV)	25 – 45%	45.1%
3.	RBC	5 – 10 million/cu.mm	8.96 million/cu.mm
4.	WBC	5.5 – 19.5/cu.mm	11900/cu.mm.
5.	Platelets	3 – 8 lakhs/cu.mm	90000/cu.mm
6.	Differential count		
	Neutrophil	55 -75%	74%
	Lymphocyte	20 – 40%	19%
	Monocyte	2 – 8%	6%
	Eosinophil	1 – 4%	1%
	Basophil	0.5 – 1%	0%

Table 4: Serum biochemical parameters

S. No.	Parameter	Unit	Normal range	Actual value
1	Glucose	mg/dL	80-120 mg/dL	320
2	ALT	U/L	8.3 -53	61
3	Total proteins	g/dL	5.7 – 8	6.2
4	Albumin	g/dL	2.4 -3.8	2.6
5	cholesterol	mg/dL	120 – 230	222
6	BUN	mg/dL	14 -36	21.44
7	Creatinine	mg/dL	0.2 – 2.4	1.37
8	Calcium	mg/dL	8.2 - 10.8	9.97
9	Phosphorus	mg/dL	2.4 -8.2	4.53

**Fig 1:** Diabetes mellitus affected cat after treatment

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