FELINE DIABETES MELITUS
PROS AND CONS OF HOME GLUCOSE MONITORING

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INTRODUCTION

Diabetes mellitus is one of the most common endocrine disorders in cats. In most cases, 80% approximately, it is similar to human type 2 diabetes. Unlike what happens in the dog, obesity is considered a risk factor for diabetes in cats, in similar way to humans, once again. Another differentiating factor in the cat is the percentage of remission that occurs in this species as well as its association with other endocrinopathies such as acromegaly and hyperadrenocorticism. Finally, hyperglycemia caused by stress is a recognized entity that often complicates the diagnosis of diabetes, and renal glucose threshold is higher.

Currently the diagnosis of diabetes mellitus in cats is based on the demonstration of clinical signs: polyuria, polydipsia, polyphagia and weight loss in the presence of hyperglycemia, glycosuria and increased levels of serum fructosamine. There are stages known as pre-diabetes, where concepts like glucose tolerance test and blood glucose reference values are introduced.

The most effective treatment of diabetes involves using long-acting insulin (PZI, glargine or detemir) and diets with a high protein content (between 40 and 45% of ME) and low carbohydrates (between 12 and 15% of ME). The aim of treatment is to reduce the severity of clinical signs (polyuria, polydipsia, polyphagia and weight loss), maintain blood levels of glucose between 80 and 270 mg/dL, a fructosamine between 350 and 450 μmol/L, avoid the complications of the diabetes such as episodes of ketoacidosis and hypoglycemia, and finally, improve the quality of life.

MONITORING

Monitoring is an essential tool to maximize the control as there can be a remission in any cat. As described in the introduction, some differentiating factors in cats such as the influence of stress on glucose levels and their greater renal threshold make the control different from that often used in the canine species.

The use of the glucose test strips in urine will be useful only in stages of diabetes when the patient is approaching remission. It will be then that the absence of glucose in urine will indicate the proximity of remission, since it is very difficult that cats that are even well controlled do not have glycosuria. Another use of urine strips is the detection of ketone bodies and the consequent suspicion of ketoacidosis, but once again, there are limitations to the technique since the test strips only detect acetone and acetoacetate while do not detect beta-hydroxybutyrate, the most important one.

Fructosamine, product of the irreversible reaction between glucose and the amino group of plasma proteins, is more than useful for the diagnosis, it is an indispensable tool for the monitoring of diabetic patients. Its concentration depends on the concentration of glucose but also of present plasma proteins and their metabolism. Generally, it is considered to reflect glycemia 1 to 2 weeks prior to sampling. At least initially, it shouldn't be affected by hyperglycemia due to stress, but a relatively fast increase has also been described in stressful situations. On the other hand, cats with hyperthyroidism with poor control or before the diagnosis and diabetes have fructosamine levels in the normal reference values. We can also find normal fructosamine levels in diabetic patients with hypoproteinemia. Finally, note that the
different measurements of fructosamine must always be compared to samples sent to the same laboratory.

The determination of blood glucose to monitor diabetes will have a variable frequency depending on the patient tolerance to undergo blood extractions and if the owners are trained to perform it at home or just in the veterinarian clinic. The aim of treatment will be attained in proportion to the better or worst adjustment of insulin dosage, and it is to reduce the severity of clinical signs (polyuria, polydipsia, polyphagia and weight loss), maintain blood levels of glucose between 80 and 270 mg/dL, a fructosamine between 350 and 450 μmol/L, avoid the complications of the diabetes such as episodes of ketoacidosis and hypoglycemia, and finally, improve the quality of life.

In the first stages, the clinician indicates a starting dose of insulin (usually from 1-2 IU/cat every 12 hours) and re-examines the patient a week later, after having received a dose of insulin and being fed, to perform a glucose curve in the clinic. This curve will help us to determine the minimum glucose concentration or nadir and the duration of the effect of insulin and its effect on glucose levels. Fructosamine can also be used to get more information of the initial control of the disease.

The importance of home monitoring comes into play after the first weeks of treatment with insulin, preferably using species-specific validated glucometers, and the transmission of data to the vet. Human glucometers can be used, but it should be taken into account that they usually under-estimate glycemic values. The frequency of blood glucose measurements and curves at home will depend on each case and the risk for of hypoglycemic episodes. There are phone apps that facilitate data storage and shipment to the vet. In the same way, we can use spreadsheets located in the cloud that can be edited and seen in a shared way by the owner and the vet.

Disadvantages of home monitoring include those relating to the collection of capillary blood samples, especially the occurrence of aural haematomas. In addition, having only values prior to the dose of insulin will avoid the opportunity to better adjust the dose after knowing the nadir and the duration of action of insulin.

Recently, using wireless sensors (FreeStyle Libre) that allow the measurement of interstitial glucose without needing repeated tapping the pinna and tarsal or carpal pads has also been evaluated. Interstitial glucose reflects blood sugar levels with a difference of eleven minutes in the cat. The validation of these sensors in the feline species has not been performed. Therefore, the footsteps of the canine species, where there is a study that showed its effectiveness in obtaining reliable measures, are being followed.

Home monitoring is a method that ensures less stress for the cat, with an improved quality of life after a better control of blood sugar, as well as a tool that allows a sooner detection of hypoglycemic episodes or periods of poor control.

Home monitoring is extremely important when the cat is receiving high doses of insulin, as is often common in cats with acromegaly, where the cat can receive up to 12 units of insulin every twelve hours.

Finally, the main problem of home monitoring is the lack of communication of the results to the vet and dosage changes without veterinary approval. Often, especially when owners do not understand that dosage adjustments need some time to evaluate its effectiveness, owners make the mistake of changing the dosage too quickly.

REFERENCES