Central Diabetes Insipidus in a Cat

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ABSTRACT

Background: Diabetes insipidus is a rare disease in cats with few reports in the scientific literature. It has two major forms: Central Diabetes Insipidus (CDI); characterized by decreased secretion of antidiuretic hormone (ADH), and Nephrogenic Diabetes Insipidus (NDI); characterized by decreased ability to concentrate urine because of resistance to ADH. The diagnosis is based on excluding diseases with polydipsia/polyuria, the water deprivation test and response to desmopressin. This case report describes Central Diabetes Insipidus in a domestic cat, as well as its response to desmopressin administered intranasally.

Case: A 2-year old, male cat of non-defined breed and castrated was seen due to a history of polyuria and polydipsia (PU/PD) that arose after allegedly ingesting thorns that got stuck to its body while going out of the house. Physical examination revealed an active well-fed animal with mild dehydration and persistent paradoxical ischuria. The complementary tests performed: abdominal ultrasound, blood test, urinalysis, serum urea, creatinine, glucose, cortisol, total T4, Total T3 and vasopressin, were within the reference values, except for urinary density and T4 that were below the standard. Based on the laboratory results, conditions compatible with PU and PD symptoms were excluded; however, despite normal vasopressin levels, diabetes insipidus was not ruled out, given the prevailing clinical manifestations. The water deprivation test was dispensed to the patient in the face of dehydration accompanied by hyposthenuria, keeping the patient dehydrated despite polydipsia and water availability. This was followed by the response to desmopressin given intranasally, where gradual increase of urinary density and consistent reduction in urinary volume over time were observed. The findings confirmed the Central Diabetes Insipidus diagnosis. The home therapy treatment consisted of intranasal administration of 10 µg desmopressin of continuous use, every 24 h.

Discussion: ADH or vasopressin is synthesized in the supraoptic and paraventricular nuclei of the hypothalamus and released by the posterior lobe of the pituitary gland. Its main role is to maintain water homeostasis in the body. This hormone secretion is regulated by the osmolarity of body fluids, volume and pressure of the vascular system. The animals with central diabetes insipidus condition display failing ADH secretion, resulting in water intake generally superior to 100 mL/kg/day (Normal: 40-70 mL/kg/day) and the clinical symptoms, PU and PD, weight loss and dehydration, the latter when deprived of water intake. The cat in the study displayed acute symptoms. However, the lack of neurologic symptoms commonly observed in animals with diabetes insipidus caused by either trauma or brain neoplasms, and physical examination findings that could explain the origin of the disease, raised doubts about the triggering event. Therefore, it is believed that in the reported case the nature of the disease is idiopathic. The diagnosis was reached by excluding major diseases with the same symptoms, PU and PD, plus by the water deprivation test and response to intranasal administration of desmopressin. Given the normal level of DHA serum recorded, its measurement was not an efficient diagnosis method for DIC. The use of intranasal desmopressin was a good administration route for the species given the absence of discomfort, good applicability and the excellent clinical response observed, thus constituting an excellent therapeutic method for continuous use in cats.

Keywords: polyuria, polydipsia, hyposthenuria, desmopressin.
INTRODUCTION

Diabetes insipidus is a disease characterized by polyuria and polydipsia (PU/PD), a rare occurrence in cats with few records in the literature [1]. This disease can be idiopathic, but can also result from trauma, tumor or malformation of the posterior part of the pituitary [7]. There are two forms of this disease. The Central Diabetes Insipidus (CDI) is caused by a deficiency in the secretion of antidiuretic hormone (ADH), and the Nephrogenic Diabetes Insipidus is characterized by renal insensitivity to ADH [4]. The diagnosis is based on laboratory evaluations such as complete blood count (CBC), serum renal and hepatic markers, blood glucose, serum electrolytes, urinalysis, and hormonal evaluation [6]; however, the most efficient diagnosis method is both the water deprivation test and response to administration of vasopressin/desmopressin [3,7,8]. This case report describes Central Diabetes Insipidus in a domestic cat, as well as its response to intranasal administration of desmopressin.

CASE

A 2-year old, male cat of non-defined breed was seen with a history of polyuria and polydipsia (PU/PD) that arose after allegedly ingesting thorns that got stuck to its body while going out of the house. Physical examination revealed an active animal, well-fed presenting mild dehydration and rapid bladder filling and polyuria. The supplementary examinations performed; abdominal ultrasound, blood count, urinalysis, serum urea (57 mg/dL), creatinine (1.8 mg/dL), glucose (76 mg/dL), cortisol (1.87 mcg/dL), total T3 (0.44 ng/mL) and vasopressin (5.2 pg/mL), were within the reference values, except for urinary density (1004) and total T4 (1.17 mcg/dL) which were below the standard. The laboratory findings excluded some organic disorders whose symptoms are PU and PD; however, despite normal levels of vasopressin, the prevailing symptoms did not rule out diabetes insipidus. In the face of dehydration presented in association with the hyposthenuria the water deprivation test was waived, and the patient underwent the response to ADH test. Initially recording the estimated dehydration and urine density, 6% and 1004, respectively, which served as baseline data (T0). This was followed by complete emptying of the bladder and immediate beginning of the vasopressin test, which consists of intranasal administration of 10 µg desmopressin1 and systematic measurements, every 30 min, for two and half hours (T1, T2, T3, T4 and T5). The variables recorded were urinary volume and density, totaling six records including the baseline data (T0). Urinary density increased gradually up to standard values and urinary volume decreased consistently over time (Figure 1). Based on these findings, the diagnosis of Central Diabetes Insipidus was confirmed. Home therapy treatment consisted of intranasal administration of 10 µg desmopressin of continuous use, every 24 h.

Figure 1. Plots showing volume and urine specific gravity after the response to intranasal desmopressin of a cat diagnosed with central diabetes insipidus. It highlights the remission of hyposthenuria and the increasing urine density over time, measured every 30 min during 150 min (T1, T2, T3, T4 and T5). Black arrow - baseline value, application of 10 µg of desmopressin (T0).
ADH or vasopressin is synthesized in the supraoptic and paraventricular nuclei of the hypothalamus and released by the posterior lobe of the pituitary gland. Its main role is to maintain water homeostasis in the body [8]. This hormone secretion is regulated by the osmolarity of body fluids, volume and pressure of the vascular system [9]. The animals with central diabetes insipidus condition display failing ADH secretion, resulting in water intake generally superior to 100 mL/kg/day (Normal: 40-70 mL/kg/day) and the clinical symptoms, PU and PD, weight loss and dehydration, the latter when deprived of water intake [7].

The cat in the study displayed acute symptoms. However, the lack of neurologic symptoms commonly observed in animals with diabetes insipidus caused by either trauma or brain neoplasms, and physical examination findings that could explain the origin of the disease [1,2,5,11], raised doubts about the triggering event. Therefore, it is believed that in the reported case the nature of the disease is idiopathic.

The initial step for the definite diagnosis consisted of excluding major diseases with PU and PD clinical symptoms, such as diabetes mellitus, chronic renal failure and hyperthyroidism [7]. The final diagnosis of diabetes insipidus may be performed by the water deprivation test and for response to desmopressin test, which is a synthetic analogue of the endogenous vasopressin. The water deprivation test is contraindicated in dehydrated patients and inability to concentrate urine, and wasn’t realized in this case. According to Peterson [7] and Rijnberk [8], desmopressin has presented good results as a means of diagnosis and treatment, reducing urine volume in more than 50% of the patients as well as hyposthenuria 1-2 h after administration [4,9], highlighting the importance of these methods in the differential diagnosis between central and nephrogenic diabetes insipidus [2,5,10]. The level of serum DHA in this study was not efficient to diagnose CDI, unlike the results obtained by Simpson et al. [11] who reported DHA level below the reference threshold in a cat with central nervous system lymphomas of B-cell origin.

The use of intranasal desmopressin proved to be as good as the subcutaneous route [1,5] for the species because of absence of discomfort, good applicability and excellent clinical response observed. The oral and conjunctival routes have limited use. The first is very costly compared to others and the second due to controversial efficiency reports and the development of local irritation in cats [1,11].

The prognosis of central diabetes insipidus, even without treatment, is favorable provided that the animal always has water available [10]. However, in this study the animal showed evident dehydration when subjected to short periods of water deprivation, as well as behavioral changes suggestive of stress. It was, therefore, unfeasible to let it remain untreated due to the imminent risk of fatal dehydration if it was deprived of water intake by only a few hours [8].

Thus, it is concluded that both the water deprivation test and the response to vasopressin/desmopressin are essential for the definitive diagnosis of central diabetes insipidus and that intranasal administration of desmopressin constitutes an excellent therapy of continuous application in feline species.

SOURCE AND MANUFACTURER

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Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES


