Scientific Works. Series C. Veterinary Medicine. Vol. LXXII (1), 2026
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

PANCREATIC INSULINOMA IN A DOG - CASE STUDY

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Abstract

Insulinoma is the most common functional pancreatic endocrine tumor in dogs, characterized by autonomous insulin secretion and persistent hypoglycemia. This case study describes a 9-year-old female Wirehaired Fox Terrier presenting with recurrent neurological episodes. Clinical evaluation revealed severe hypoglycemia (28 mg/dL) and elevated insulin levels (76 µIU/mL). Imaging investigations, including ultrasonography and computed tomography, identified pancreatic masses and lymphadenopathy. Surgical excision was performed, and histopathology confirmed malignant insulinoma with metastases. Despite treatment, the outcome was unfavorable. This case highlights the diagnostic challenges of insulinoma and emphasizes the importance of considering hypoglycemia in dogs with neurological signs for early diagnosis and management.

Key words: *insulinoma, dog, hypoglycemia, pancreatic tumor, case study.*

INTRODUCTION

Insulinoma represents the most common functional pancreatic endocrine tumor in dogs, originating from the neoplastic proliferation of pancreatic β-cells and characterized by autonomous insulin secretion, independent of circulating glucose levels. This inappropriate insulin release leads to persistent or episodic hypoglycemia, which is responsible for the majority of clinical manifestations observed in affected patients (Feldman et al., 2015).

Although insulinomas may initially appear clinically localized, they are considered highly malignant tumors in dogs, with a significant propensity for early metastasis, particularly to regional lymph nodes and the liver (Ettinger et al., 2017). At the time of diagnosis, a substantial proportion of cases already present with metastatic disease, which significantly influences prognosis and therapeutic outcome (Harris et al., 2020).

The clinical presentation is often dominated by neuroglycopenic and adrenergic signs secondary to hypoglycemia. These include tremors, muscle fasciculations, weakness, ataxia, seizures, behavioral changes, and altered levels of consciousness. Due to the intermittent nature of hypoglycemic episodes and the variability of clinical expression, these signs may be misinterpreted as primary neurological disorders, such as idiopathic epilepsy, leading to delays in diagnosis (Nelson & Couto, 2019).

The diagnostic approach to insulinoma requires the integration of clinical findings, laboratory data, and imaging techniques. Persistent hypoglycemia in conjunction with inappropriately normal or elevated insulin levels is considered highly suggestive of the disease. Imaging modalities such as abdominal ultrasonography and computed tomography are essential for tumor localization and staging, although their sensitivity may vary depending on tumor size and operator experience (Goutal et al., 2012).

Therapeutic management includes both medical and surgical approaches. Surgical excision remains the treatment of choice and offers the best chance for prolonged survival, although recurrence is common due to the high metastatic potential of the tumor. Medical management is generally reserved for non-surgical candidates or as an adjunct therapy and focuses on controlling hypoglycemia through dietary modifications and pharmacological intervention (Polton & White, 2007).

The aim of this study is to describe a clinical case of pancreatic insulinoma in a dog,

highlighting the diagnostic challenges, the importance of correlating clinical and paraclinical findings, and the evolution of the disease despite therapeutic intervention.

MATERIALS AND METHODS

The study was conducted on the patient Terry, a 9-year-old neutered female Wirehaired Fox Terrier, presented to the veterinary clinic for recurrent neurological episodes characterized by convulsive manifestations.

Hematology tests were performed using a Esaote My Lab70 automated analyzer, biochemical tests were performed using an ARKRAY Spotchem EZ SP-4430 analyzer, and blood glucose levels were measured using an Accu-Chek glucose meter (Figure 1).

The medical history included trauma resulting from a fight with another dog, for which anti-shock therapy, analgesia, and supportive treatment were administered. The treatment was administered over a period of approximately three days, and the clinical evolution was favorable, with complete recovery within approximately ten days, with no evidence of major residual lesions.This aspect was considered relevant in the differential diagnosis of neurological disorders, particularly seizure activity, as post-traumatic complications could not be initially excluded.

RESULTS AND DISCUSSIONS

During the period 24-28 March 2022, the patient began to present acute neurological manifestations, consisting of muscle contractions, generalized tremor, episodes of empty biting and epileptiform manifestations associated with altered state of consciousness.

A complete set of hematological and biochemical analyses was performed at the first clinical evaluation. The complete blood count revealed changes in the erythrocyte series, thrombocytopenia and a slight lymphocytosis. Biochemical analyses revealed an increase in alanine aminotransferase (ALT = 167 U/L; reference value < 88 U/L), the other parameters being located within the upper limits of the reference range.

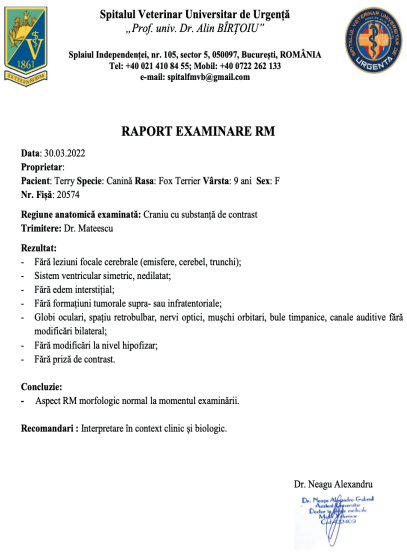
Blood glucose determination revealed markedly low values (28 mg/dL). Initially, hypoglycemia was considered possibly secondary to rehydration infusions, intense muscular effort and reduced food intake. However, hypoglycemia persisted even after intravenous glucose administration (Figure 3).

Given the persistence of muscle contractions and convulsive episodes, a primary neurological condition was initially suspected.

To evaluate the central nervous system, a cranial magnetic resonance imaging (MRI) with contrast agent was performed. The examination did not reveal structural lesions, tumor processes or focal or diffuse changes in the cerebral parenchyma. It is worth noting that during the imaging investigation the patient presented an epileptiform seizure characterized by muscle contractions, intense vocalizations and episodes of aggression (Figure 2).



Figure 1. ARKRAY Spotchem EZ SP-4430 dry biochemistry analyzer



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RAPORT EXAMINARE RM

Data: 30.03.2022
Proprietar:
Pacient: Terry **Specie**: Canină **Rasa**: Fox Terrier **Vârsta**: 9 ani **Sex**: F
Nr. Fișă: 20574

Regiune anatomică examinată: Craniu cu substanță de contrast
Trimitere: Dr. Mateescu

Rezultat:
- Fără leziuni focale cerebrale (emisfere, cerebel, trunchi);
- Sistem ventricular simetric, nedilatat;
- Fără edem interstițial;
- Fără formațiuni tumorale supra- sau infratentoriale;
- Globi oculari, spațiu retrobulbar, nervi optici, mușchi orbitari, bule timpanice, canale auditive fără modificări bilateral;
- Fără modificări la nivel hipofizar;
- Fără priză de contrast.

Concluzie:
- Aspect RM morfologic normal la momentul examinării.

Recomandari : Interpretare în context clinic și biologic.

Dr. Neagu Alexandru

Figure 2. Result of the MRI examination - normal morphological appearance



Figure 3. Blood glucose - value 28 mg/dL

Subsequently, abdominal ultrasound revealed changes in the pancreas, consisting of the presence of hypoechoic formations in the left pancreatic lobe, suggestive of a tumor process of a neuroendocrine nature (Figure 4).

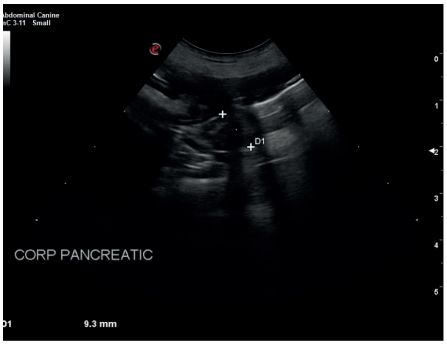


Figure 4. Ultrasound examination - presence of hypoechoic formations in the left pancreatic lobe

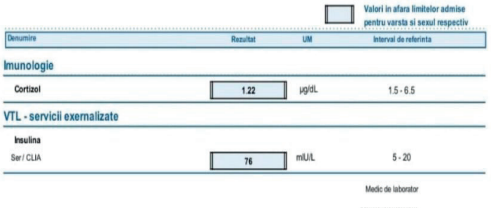
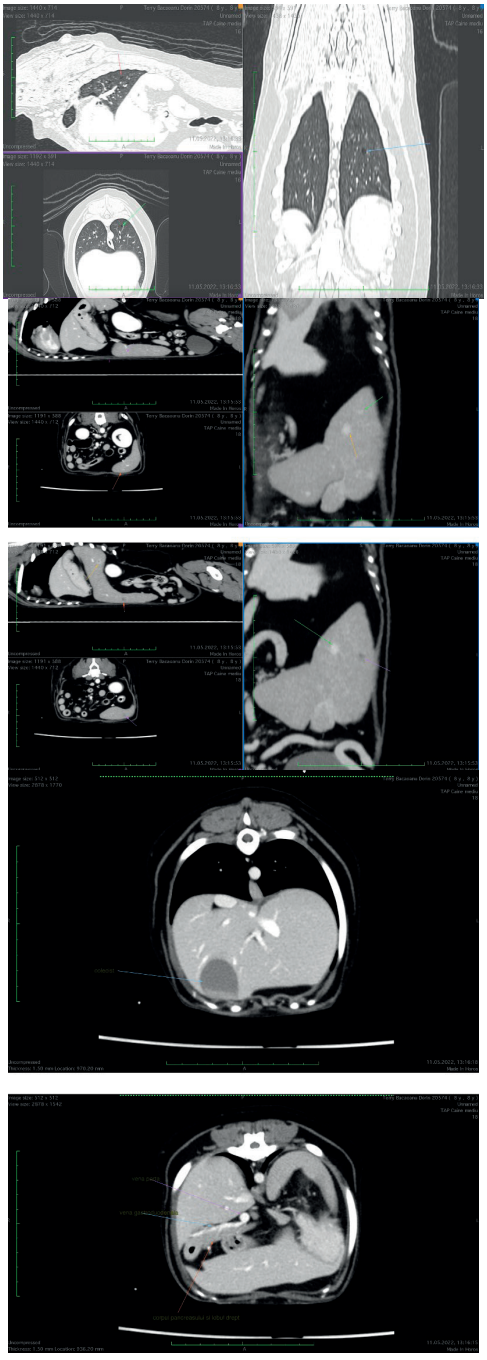


Figure 5. Insulin dosage in insulinoma

The CT scan revealed pulmonary bulla in the terminal portion of the left caudal lobe, slightly enlarged gallbladder with sludge, nonhomogeneous pancreatic parenchyma (small diffuse hyperattenuated areas – minimal contrast enhancement) and deformation of the terminal portion of the left pancreatic lobe (with minimal contrast enhancement), splenic parenchyma with multiple areas of both hyperattenuation (contrast enhancement) and hypoattenuation (cyst), various degrees of osteophytosis (C6→T1; T5→T6; L6–L7–S1) and moderate lymphadenopathy (Figure 6).



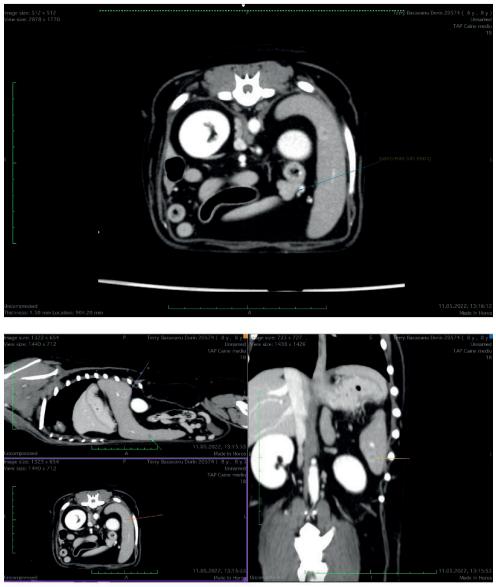


Figure 6. CT Scan - nonhomogeneous pancreatic parenchyma (small diffuse hyperattenuated areas – minimal contrast enhancement) and deformation of the terminal portion of the left pancreatic lobe

Under symptomatic treatment, consisting of anticonvulsants (diazepam administered intrarectally during seizures and phenobarbital administered daily), glucose infusions and supportive therapy (vitamin B complex, antispasmodics and corticosteroids), a transient improvement in symptoms was observed for a period of approximately 3-4 days. However, the convulsive episodes recurred.

On April 23, 2022, the patient was admitted to the Mobile Vet Clinic, where the tests again confirmed persistent hypoglycemia, despite repeated administration of glucose boluses and supportive treatment.

In order to establish a definitive diagnosis, an additional evaluation was recommended at the "Prof. univ. dr. Alin Bîrțoiu" University Hospital of Veterinary Medicine Bucharest. Imaging investigations and laboratory tests were repeated, and the correlation of persistent hypoglycemia with pancreatic changes observed by ultrasound led to the clinical suspicion of pancreatic insulinoma.

Furthermore, the serum insulin concentration was 76 µIU/mL in the presence of hypoglycemia, representing an inappropriately elevated value consistent with insulinoma (Figure 5).

Given the unfavorable clinical evolution and the persistence of hypoglycemia, a surgical excision of the pancreatic masses was elected.

Intraoperatively, two tumor formations located at the pancreatic level were identified and excised. The samples taken were sent for histopathological examination to the LABOKLIN and HISTOVET SRL laboratories, the diagnosis of insulinoma being confirmed after 21 days.

Histopathological examination revealed a pattern consistent with endocrine pancreatic carcinoma (malignant insulinoma), with metastases to the lymph nodes, liver, and spleen.

In the early postoperative period, the patient's clinical condition did not improve. Four days after the surgical intervention, a significant deterioration in the general condition was observed, with the intensification of convulsive seizures.

Given the guarded prognosis and the persistence of severe symptoms, the owner opted for euthanasia of the patient.

The present case illustrates the typical yet diagnostically challenging presentation of canine insulinoma, characterized by recurrent neurological manifestations secondary to persistent hypoglycemia. The initial clinical suspicion of a primary neurological disorder was justified by the predominance of epileptiform episodes, a common feature reported in dogs with insulinoma (Nelson & Couto, 2019). However, the absence of structural abnormalities on MRI redirected the diagnostic approach toward metabolic causes.

Persistent hypoglycemia (28 mg/dL) despite glucose supplementation represented a key diagnostic indicator. In insulinoma, hypoglycemia results from unregulated insulin secretion by neoplastic β-cells, leading to increased peripheral glucose utilization and decreased hepatic glucose production (Feldman et al.,, 2015). The lack of response to glucose therapy observed in this case is consistent with previous reports, where transient correction is followed by rapid recurrence due to continued insulin release (Goutal et al., 2012).

The hematological findings, including thrombocytopenia and mild lymphocytosis, although nonspecific, may reflect systemic stress or paraneoplastic effects. Elevated ALT levels likely indicate hepatic involvement,

which was later confirmed by histopathological evidence of metastasis. Hepatic metastasis is frequently reported in canine insulinoma and is associated with a poorer prognosis (Withrow & Vail, 2013).

Abdominal ultrasonography proved to be a valuable diagnostic tool, identifying hypoechoic pancreatic nodules suggestive of a neuroendocrine tumor. However, it is well documented that ultrasonography may have limited sensitivity in detecting small insulinomas (Polton & White, 2007). In this case, CT examination provided additional information regarding pancreatic architecture and regional lymphadenopathy, supporting the suspicion of malignancy and possible metastatic spread.

Surgical intervention remains the treatment of choice for insulinoma, offering the best chance for temporary clinical improvement and prolonged survival (Tobin et al., 1999). In the present case, the identification of two pancreatic masses and the presence of metastases indicate an advanced stage of disease at the time of diagnosis. This finding aligns with the literature, which reports that most canine insulinomas are malignant at the time of diagnosis, even when clinically localized (Trifonidou et al., 1998).

Despite surgical excision, the postoperative evolution was unfavorable, with worsening neurological signs. This outcome can be explained by several factors, including persistent hypoglycemia due to residual or metastatic tumor tissue, as well as possible postoperative complications. The presence of metastases in the liver, lymph nodes, and spleen significantly worsens the prognosis and limits the effectiveness of surgical management.

An important aspect highlighted by this case is the delay in diagnosis caused by the initial misinterpretation of clinical signs as neurological in origin. This emphasizes the need for routine blood glucose evaluation in dogs presenting with seizures or altered consciousness, especially in middle-aged to older patients. Early identification of hypoglycemia can significantly shorten the diagnostic pathway and improve clinical outcomes.

CONCLUSIONS

Pancreatic insulinoma should be included in the differential diagnosis of older dogs presenting with seizures or other neurological manifestations, especially in the context of persistent hypoglycemia. Establishing the diagnosis requires a multidisciplinary approach based on the correlation of clinical, laboratory and imaging data. Determination of blood glucose, serum insulin dosage and the use of advanced imaging methods, such as MRI or CT, are essential for confirming the diagnosis and establishing the therapeutic course.

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