

# CLINICAL REMISSION OF TYPE II DIABETES AT A FEMALE DOG AFTER SURGICAL STERILIZATION

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## **Abstract**

*In dogs and cats develops more frequently the type II diabetes, non-insulin-dependent, generated by peripheral resistance to insulin and often associated with hypercholesterolemia and obesity. In this study we analyzed the beneficial influence of sterilization on the evolution of canine diabetes. The studied case was a overweight female dog (German Sheperd, 9 years old, 33 Kg), that has presented for 8 months diabetic symptoms, dominated by hyperglycemia (160-186 mg/dL) inconsistently associated with glucosuria and constantly with polydipsia and polyphagia. In time these events have worsened despite the implementation of a rigorous program for the control of diabetes, based on appropriate measures of diet, exercise and socializing. Moreover, the emergence of severe genital complications (pyometra/polycystic ovaries) resulted in a emergency extirpation of the whole genital apparatus. During the post-operative examinations, within 3 weeks a significant amendment of diabetic symptomatology was noticed, following that, within two months the blood glucose decreased to 110 mg/dL and the main blood-biochemical parameters returned to physiological limits. In another few weeks the blood sugar level stabilized around 75 mg/dL and diabetic manifestations resolved completely. In conclusion we believe that the results of this case study are a relevant information for clinicians regarding the use of which require sterilization, or other pathologies related to therapy in clinical remission to normalize glycemia and some forms of canine diabetes.*

**Keywords:** control, diabetes, female dog, sterilisation

Modernization and evolution of human caused important changes to the way of life and to the activity of people and also to their cohabitation relationships with their pets. Thus, in recent decades it has greatly increased interest in animal welfare and the general in pets welfare in particular (Dombay E., 2011). These developments led to changes in common diseases in pets, because if in the past were infectious nature diseases, now are likely metabolic and neoplastic ones, having similar forms to those found in humans. In the front stands of dismetabolics is diabetes, which is the most common disease found in humans and with a rising incidence in carnivores and other animals. This metabolic disease has a pale clinical course, especially in the early stages, which makes diagnosis and confirmation of it to raise issues. Regarding the study on diabetes in different animal species, research has primarily interested in dog, cat, pig, sheep, goat and monkey and quite sporadic in fox, dolphin, hippo or elephant (Roep B.O. and Atkinson M., 2004). The research of diabetes in dogs and cats have a major concern for humans and is focused on addressing the complexity of the factors and ethiopathogenetic's mechanisms related to the lifestyle and the diet, general health and the physiological conditions of risk, such as pregnancy and reproductive function in general (Fleeman M. and Rand J.S., 2001). All these converge towards developing a prophylactic-therapeutic conduct adopted to the predominate risk factors, reaching a real development of protocols for monitoring, supervision and treatment of the animals predisposed or affected by various forms of diabetes (Fleeman M. and Rand J.S., 2001). In the context of what was presented, it is enroll the motivation of this case study, whose purpose is focused on informing clinicians about the complexity and diversity of palliative therapeutic formulas that can lead to remission of clinical forms of canine diabetes (DZC).

## **Material and method**

The case taken in study was a bitch (Cora) German Shepherd breed, 9 years old and weighing 34 Kg. The animal received a special life regime in terms of movement and socialization being maintained in the yard with plenty of space and free movement regime, supplemented with regular walks. The feeding included constantly two portions per day and relied on pelleted feed, with average protein completed with one appreciable proportion of the cooked food from owners' cuisine.

From the development of the health of this female it is to note the presence of a generalized dental aplasia and the early hormonal infertility, which started after her only gestation at 11 months old, with only 2 puppies, feeding and foaled natural and normal. Also remember that the sexual activity of this female who in the meantime was diagnosed with polycystic ovaries, and it was characterized by prolonged estrous cycles (18-22 days) accompanied by heavy hemoragic and with increased frequency leakage (sometimes repeating at every 4 months).

Noteworthy is also the development of two tumoral formations of relatively stable nature: one, richer vascularized at the level of the glandular parenchyma of the first right abdominal mamelon and another, devoid of vascularization and benign, near the left mamelon groin. The patient also presents locomotor disorders manifested by difficult raising and walking, with periodic aggravation, due to spondylosis, clearly diagnosed during radiological examination. The patient was taken in study based on the results recorded during the questionnaire we implemented in the clinic for Canine Diabetes (DZC) screening, which revealed that during the last month it showed diabetic symptoms, dominated by hyperglycemia (160-186 mg/dL) associated with inconstant glucosuria and constantly polydipsia and polyphagia. In time, these events have worsened despite the implementation of a rigorous program of diabetes control, based on appropriate measures of diet, exercise and socialization, completed by administration of the product Diavit for 3 months. This is an herbal supplement (Morar R. and Dana Liana Pusta, 2004). Moreover, the emergence of severe genital complications (pyometra/polycystic ovaries) resulted in the emergent extirpation of the whole genital apparatus. 6 months before and after surgery weekly clinical evaluations were performed, completed by rapid testing of glycemia (with equipment Accu-Chek Active) and every 2 months biochemical testing (the analyzer Abaxis Vet Scan), hematologic (with analyzer Abacus Junior Vet), cardiac (ECG) and ultrasound complex. The genital tract harvested after surgical removal has undergone a thorough morphopathologic examination, also including histopathological investigations, focused on highlighting possible tumor formations.

Data from evaluations and tests were analyzed statistically for this purpose using the usual tests of biostatistics.

## **Results and discussions**

Following the first evaluation we found that the patient has received a very good regime of movement, being permanently free in the yard and walked out occasionally. Therefore we excluded the involvement of a sedentary lifestyle and stress factors generated by this in the onset of diabetes for this patient. We also note that we have not found an account of the development of diabetes in the patient's family because during our inquiries no case of confirmed disease or clinical symptoms was identified. In contrast, we consider that the use of dried fodder and, especially, remnants of food in the kitchen in the patient's alimentation had a major impact in the onset of the disease along with hormonal disorders, infertility and disruption of consecutive estrous cycles.

Regarding the onset and development of diabetes in this female German Shepherd of

9 years a few aspects are noteworthy. At the onset of symptoms that led to suspecting the disease (polyphagia and especially polydipsia), it was recorded a glucose level of 163 mg/dL. At the subsequent application of the questionnaire for Canine Diabetes screening (DZC), it was confirmed the information already submitted. In addition to that, it was found out that the female passed through a single gestation/lactation at 11 months. It was also confirmed the daily regime of free movement in the yard and socializing with another pet (a cat) and the clinical history previously mentioned. During the blood and biochemical complex tests conducted during the following days we noticed only a granulocytic neutrophils (75.8%) and glycemia level of 185 mg/dL (Tab. 1 and 2). Under these circumstances was established the treatment with Diavit (3 + 3 tablets) and hipoglucidic diet with pelleted feed for Type II Canine Diabetes (DZC), excluding totally the feeding with kitchen scraps. We managed to stabilize the glycemia around 185 mg/dL. Meanwhile, during the ultrasound it was diagnosed a significant polycystic ovary, the start of pyometra, the 2 mammary tumoral formations and during the radiological investigations the progression of thoraco-lumbar spondylosis with "parrot beaks". In less than a month after these investigations, the patient made a sudden superacute crisis spurt, which began by vomiting and was manifested then by immobility, deep deviation, anorexia and low grade fever. In the next 2 days was established a symptomatic treatment, using nutrient infusion, rehydration and cardio-circulatory support, filled in with antibiotic therapy. Through this therapeutic protocol we have not managed to stabilize the patient and not to risk a more severe deterioration in health status it was proceeded to urgently total sterilization operation (ovariohysterectomy). Laparotomy surgery showed the onset of sero-fibrinous peritonitis, which explained the severity of the crisis triggered previously. The patient has undergone surgery and postoperative treatment well, following that within a week to restore fully to overall condition the temperature, the appetite and the vital functions. Assessments made at one month postoperatively revealed its framing in physiological limits for blood counts, for blood chemistry and cardio-vascular (Tab. 1 and 2; Fig. 1), except for total platelets which decreased and resolved in the following two months. Surprisingly, at the same time it was normalized also the glycemia levels which dropped to 74 mg/dL and diabetic symptoms (polydipsia and polyphagia) faded. Histopathological examination of the excised genital tract outlined a lesional array of bilateral polycystic ovaries and pyometra in early stage, with no evidence of tumoral formation. At the next 3 months monitoring the health of the patient was maintained at stabilized level and everything is back to normal, except for the locomotor symptoms given by spondylosis. We also note that among the therapeutic measures that were implemented was maintained the hypoglucidic diet, being recommended the a regular monitoring of health status with frequent assessment of glycemia.

Table 1.

Dynamics of haematological parameters during patient monitoring time period

Parameters	Recorded values			Measurement units	References
	Initial	Preoperative	Final		
WBC	10.23	13.70	9.39	x 10 <sup>9</sup> /L	6.00-17.00
LYM	2.02	1.10	5.52	x 10 <sup>9</sup> /L	1.00-4.80
MID	0.45	1.14	0.30	x 10 <sup>9</sup> /L	0.20-1.40
GRA	7.76	11.46	3.57	x 10 <sup>9</sup> /L	3.00-11.40
LY %	19.7	8.0	58.8	%	12.0-30.0
MI %	4.4	8.3	3.2	%	2.0-10.0
GR %	75.8	83.7	38.0	%	60.0-70.0
RBC	19,8	8.56	6.93	x 10 <sup>12</sup> /L	5.50-8.50
HGB	9.2	14.8	15.7	g/dl	12.0-18.0

HCT	31.17	44.30	44.2 3	%	37.0-55.0
MCV	66	67	64	fl	60-77
MCH	19.5	22.5	22.6	pg	19.5-24.5
MCHC	29.5	33.4	35.4	g/dl	32.0-36.0
RDWc	14.4	14.9	15.5	%	
PLT	784	472	97	x 10 <sup>9</sup> /L	200-900

Initial - 10.12.2015; Preoperative - 19.02.2016; Final - 29.06.2019

Table 2.

The dynamics of blood biochemical indices during the patient monitoring time period

Parameters	Recorded values			Measurement units	References
	<i>Initial</i>	<i>Preoperative</i>	<i>Final</i>		
GLU	185	111	74	mg/dL	60-110
BUN	6	7	17	mg/dL	7-25
TBIL	0.3	0.4	0.3	mg/dL	0.1-0.6
CA	<4.0	10.3	<0.4	mg/dL	8.6-11.8
TP	6.4	6.1	5.7	mMol/L	5.4-8.2
ALB	3.7	3.4	3.1	g/dL	2.5-4.4
ALT	71	80	86	U/L	10-118
CRE	0.7	0.8	0.9	mg/dL	0.3-1.4

Initial - 10.12.2015; Preoperative- 19.02.2016; Final - 29.06.2019

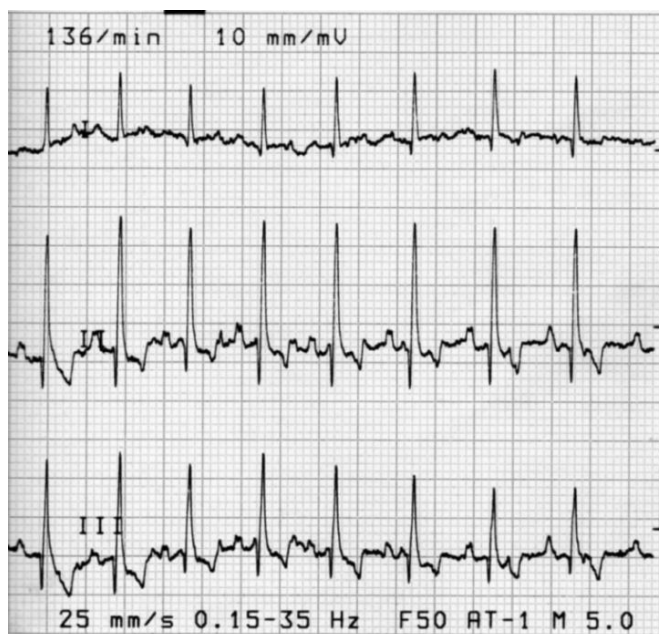


Figure 1. Preoperative appearance of ECG, showing normal morphology of each of wave and the lack of cardiac dysfunctions

According to bibliographical data, the incidence of diabetes in pets is growing, and it is appreciated between 0.2% and 1% at dog (Hess RSET al., 2000), which is a relevant argument to convince vets clinicians to accept that the evolution of this disease is a real problem for dogs and cats. Such a conception is essential for shaping an early diagnosis and for appropriately and effectively treatment. This is essential to ensure animal welfare and owners' comfort.

In terms of age as contributing factor in canine diabetes (DZC), the data indicate long intervals between 2.5 and 12 years, with a peak of susceptibility between 6-9 years (Hess R.S. et al., 2000). Most of the research in the field have investigated the impact of overweight and obesity major, known as factor in onset of diabetes in humans, and including canine diabetes (DZC). Thus, some recent studies show that over 50% of dogs and cats between the ages of 5-10 years are obese, their life span is 15% lower than those of normal weight (Scherk Margie, 2012). So overweight or obese cats are 2 to 4 times more likely to develop diabetes than those with normal weight (Rand J.S. et al., 2004). We must remember that there are studies according to which dogs have the ability to offset the excess fat tissue by increasing insulin production (Rand J. S. et al., 2004).

Interesting data also provided a study focused on assessing overweight as a contributing factor in diabetes taking up the correlation owner-dog, according to which 44% of dogs susceptible to diabetes belong to overweight or obese owners, 25% are diabetic with normal weight and belong to owners of normal weight and 31% of diabetics are owned by healthy propretors with normal weight (BO Roep and M. Atkinson, 2004).

Research on the influence of pregnancy and sterilization reveals that females with blood glucose levels above the normal rule passed one or two gestations before being sterilized (S.D. Greco, 2001). Also relevant is the data which shows the favouring influence of pyometra and ovarian cysts in the onset of diabetes, associated with other pathologies such as acute renal failure or heart failure (B.T. Larson et al., 2003).

Among the commonly used therapeutic formulas in prevention and control of Canine Diabetes (DZC), the one based on Diavit is already well known, also being an alternative to synthetic antidiabetic products implemented in pets' medicine. (Lantus commercial products or Caninsulin).

Finally we believe it could be relevant to canine diabetes (DZC) detection criteria ADA (American Diabetes Association) indicated in the diagnosis of diabetes in humans. They are based on develop symptoms (polyuria, polydipsia, weight loss unexplained), accompanied by glucose values "random" at or above 200 mg/dL, basic glucose at or above 126 mg/dL, and the tolerance test glucose (75 g of glucose, 2 h) equal to or more than 200 mg/dL.

## **Conclusions**

1. According to the recorded data of the investigated patient the evolved pathologies involved in triggering the canine diabetes (DZC).
2. Female sterilization produces significant changes in the hormonal profile, which can cause significant fluctuations of glycemia, with hyperglycemia frequently.
3. The history of feeding the patient with predominantly dry pelleted feed and leftover food from the owner's kitchen has greatly increased susceptibility to diabetes.
4. For this diabetic patient the postoperative feeding has proved very beneficial and comfortable a hypoglycudic diet with a rich containing in proteins.
5. Post-sterilization remission of the diabetic symptoms for this patient reveals that is essential to treat the related various diseases to normalize blood glucose level.
6. An efficient management in controlling of this diabetes disease it is attribute hormonal

and emotionally balance and physical exercise provided, along with proper diet based on fiber with a hypoglycemic effect.

7. bună eficiență în controlul acestui caz de boală diabetică atribuim echilibrului hormonal, emoțional și fizic asigurat, alături de regimul alimentar adecvat bazat pe fibre cu efect hipoglicemiant.
8. We believe that this case study is a relevant information for clinicians regarding the use of sterilization which require therapy or other pathologies related to normalize glycemia and clinical remission of some forms of canine diabetes (DZC).

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