



## Struvite Bladder Stone in A Cat With Hyperthyroidism: Case study

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### ABSTRACT

Urinary crystals and uroliths could harm cats by causing local or systemic symptoms that could vary from mild to severe. Regardless of the type of stone, the diagnostic methods are the same. However, in addition to detecting the stone alone, revealing the factors causing the formation of the stone is important in increasing the patient's quality of life and in guiding the treatment. In some of these cases, the underlying causes can be revealed, while in others, no cause can be found. Some recent studies have reported that unexplained urinary crystals and uroliths may be associated with many hormonal disorders, especially thyroid hormones. In order to reveal the cause of the struvite stone, hormonal analyses were performed on the patient in the light of current studies, and in the end, although the patient did not show any clinical symptoms, hyperthyroidism was detected in accordance with the studies. As a result, it was concluded that in patients with alkaline urine with sterile struvite crystals and uroliths, it would be beneficial to monitor some hormone levels, especially the thyroid, and to reveal the relationship between struvite and thyroid with more comprehensive studies to be done in the future.

### Case study:

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### INTRODUCTION

Uroliths are common problems in small animal medicine, that could harm cats by leading some systemic symptoms such as vomiting, anorexia and lethargy or local symptoms such as dysuria, haematuria, pollakiuria, periuria and even total obstruction by localizing in different parts of the urinary tract (Bartges *et al.*, 1996). Uroliths can be consist of various types of minerals, however occurring clinical symptoms and diagnostic procedures for all types of uroliths are nearly the same (Langston *et al.*, 2008). According to the results of many studies, it is accepted that struvite crystals and uroliths in cats are rare compared to calcium oxalate (CaOx) uroliths (Langston *et al.*, 2008; Houston and Moore 2009; Tion *et al.*, 2015). However, some recent studies have reported that struvite is more common nowadays. (Okafor *et al.*, 2018; Alford *et al.*, 2020). Even some researchs claims that the increase in struvite cases could be related to some metabolic disorders such as diabetes, hyperparathyroidism and hyperthyroidism, therefore it is recommended that cats with alkaline urine should also be investigated for metabolic diseases (Lew-Kojrys *et al.*, 2017; Kartashov *et al.*, 2021).

### Case presentation

The material of this case consisted of a 7-year-old male cat brought to Petcode Animal Hospital with complaints of hematuria and pollakuria. In the anamnesis, hematuria and intermittent urination were indicated for two days. Clinical examination revealed, bladder fullness and mild pain symptoms as mentioned in other studies (Houston and Moore 2009). No significant disorder was found in hemogram and serum biochemistry analyses (Table 1).

It has been stated in previous studies that hemogram and biochemistry values may not be affected in some urinary system disorders and this may be related to the stage of the disease and the general health status of the patient. The absence of abnormal laboratory findings in our case is consistent with previous studies in this sense (Lew-Kojrys *et al.*, 2017). In most cases it is indicated that combined use of ultrasonography and x-ray examinations are paramount to reveal the stones in bladder and in determining the thickness of the urinary bladder wall (Tion *et al.*, 2015). In the light of previous studies, x-ray and ultrasonography examinations were performed and revealed the presence of 3.54- 2.21 cm stones in the

urinary bladder accompanying thickening of the urinary bladder wall (Figs. 1 and 2).

studies, and it is seen that more than one finding has emerged prominently (Bailiff et al., 2008, Okafor et al., 2019).

Table 1. Hemogram and serum biochemistry

Test	Result	Unit	Reference
ALB	2.5	g/dL	2,3-3,5
BUN	27.7	mg/dL	17,6-32,8
CRE	1.42	mg/dL	0,8-1,8
GLUCOSE	74	mg/dL	71-148
ALP	24	U/L	Sep-53
ALT	44	U/L	22-84
Total Protein	7.1	g/dL	5,7-7,8
WBC	21.83	10 <sup>9</sup>	5,5-19,5
Neutrophil	14.04	10 <sup>9</sup>	3,12-12,58
Lymphosit	6.57	10 <sup>9</sup>	0,73-7,86
Monosite	0.37	10 <sup>9</sup>	0,07-1,36
Eosinophil	0.85	10 <sup>9</sup>	0,04-1,93
Basophil	0	10 <sup>9</sup>	0,00-0,12
RBC	7.75	10 <sup>12</sup>	4,6-10,2
HGB	111	g/L	85-153
HCT	32	%	26-47
PLT	329	10 <sup>12</sup>	100-518
SDMA	10	ug/dL	0 14

results:

Table 2. Urinalysis:

Leu	+2
Ket	-
Uro	-
Bil	-
Glu	-
Pro	+3
SG	1.025
pH	8.0
Bld	+3
Ca	1.0 mmol/L

Numerous struvite crystals, erythrocytes and leukocytes were seen in the analysis of the urine sample taken by cystocentesis via ultrasonography (Figs. 3 and 4). In the urine examination following cystosentesis, an increase in pH, leukocyte, erythrocyte and protein levels were observed (Table 2). All of the changes in the urine in the formation of lower urinary tract diseases and urinary tract stones in cats have been revealed in detail in previous studies. The findings obtained in our case also overlap with all of these



Fig.1. X-ray



Fig. 2. Abdominal USG



Fig.3: Numerous struvite crystals, erythrocytes and leukocytes.

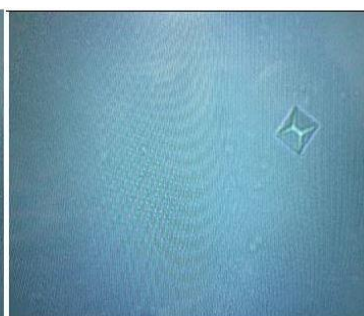


Fig. 4. Struvite crystal.

Following the examination, the stone was surgically removed and it was concluded that it was 'sterile' according to the results of bacterial cultivation. In order to reveal the underlying etiologic cause, the patient's thyroid stimulating hormone (TSH), triiodothyronine (T3) and thyroxine (T4) levels were measured and it was observed that the free thyroxine (fT4) level was above the reference range in line with current studies (Table 3) (Lekcharoensuk et al., 2001, Mayer-Roenne et al., 2007; Bailiff et al., 2008; Litster et al., 2011; Martinez-Ruzafa et al., 2012; Lew-Kojrys et al., 2017).

Table 3. Thyroid hormone levels:

Total T3	73	Ng/dL	40-90
Total T4	4,3	Ng/dL	1,5-5,0
TSH	0,12	Ng/dL	0,0-0,38
Free T3	0,82	Ng/dL	0,5-0,9
Free T4	2,7	Ng/dL	1,0-2,5

### CONCLUSION

In cats with struvite stones, it may be useful to monitor the endocrine causes and thyroid hormone levels among the predisposing factors. Since there is not enough data and throughput about these cases, more detailed studies are needed on this subject.

Further researchs would reveal the relationship between thyroid hormone and struvite stones more clearly. thus, the well-being of patients could be increased by revealing underlying causes, preventing recurrences and assisting to diagnose asymptomatic thyroid diseases.

### **Conflict of interest**

All authors discussed the results, commented on the manuscript and declares that there is no conflict of interest for this study.

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