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Incidence of urinary calculi in dogs

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Abstract
The characterization of urinary calculi into distinct chemical type is very important for understanding its pathophysiology, treatment modality and prevention of reoccurrence of urolithiasis. For retrospective study of urinary calculi, twenty clinical cases affected with obstructive urolithiasis in dogs were studied at Teaching Veterinary Clinical Complex and Department of Veterinary Surgery and Radiology, College of Veterinary Science & Animal Husbandry, Odisha University of Agriculture & Technology, Bhubaneswar, Odisha. For quantitative analysis, all urolith were subjected into scanning electron microscope which reported the presence of chief chemical constituent included ammonium magnesium phosphate, calcium oxalate, phosphate, silica and hydroxyapatite. Among, the chief chemical type urolith was calcium oxalate and struvite. Males were at high risk for obstructive urolithiasis. The most susceptible age in dogs affected with urolithiasis was found to be 4-6 years. Labrador had higher prevalence rate for urolithiasis amongst breed.

Keywords: Dog, incidence, urinary calculi

Introduction
Formation of uroliths is not a disease but rather a complication of several disorders as well as result of a combination of both pathological and physiological factors (Watson, 2010) [1]. Factors like age, sex, breed, genetic makeup, season, feeding, source of water, mineral and infection play major role in the genesis of urolithiasis (Osborne *et al*., 1986) [2]. Many qualitative and quantitative analytics aid are available to identify the various pathological crystals seen in urine of dogs as well as the composition of urolith but quantitative technique is most effective and referable one (Marickar *et al*., 2009) [3]. In the present study, 20 canine urolithiasis patients were taken for analysis of urolith to study the incidence of urinary calculi.

Materials and Methods
The present study was conducted on 20 canine patients with history of obstructive urolithiasis presented to the Teaching Veterinary Clinical Complex (TVCC) and Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar. All the cases were treated surgically and the uroliths were collected in a sterile vial. The age, sex, breed and site of lodgment of urinary calculi were recorded. Uroliths were quantitatively studied using scanning electron microscope (HITACHI S-3400N Type-II) at Central Laboratory, OUAT. Dried stone sample was subjected to fine layer of gold coating in HITACHI ion spotter coater under vacuum for 20 seconds. High vacuum was applied follow by high voltage (from 1 KV to 30KV) to the sample after keeping in SEM chamber. The monitor fitted to SEM chamber shown high resolution good surface photograph. The instrumental parameter such as DET area 10 mm2, window, ATW 2; resolution at 10 KeV and bias-500 V was set on SEM for this study. The instrument was calibrated properly before each procedure and operated at 20 KeV. Surface topography of the urolith samples was studied with scanning electron micrographs (SEM) which require electron beam higher than 10KV.

Results and Discussions
The major objective of this studies included characterization of urinary calculi into different chemical constituent by quantitative analysis tools (SEM) as well as their incidence in terms of age, breed, sex etc. All the 20 cases were included in this study and their clinical data were given in Table 1. The mean age of incidence of all type of chemical stones were found to be 5.3 year (4-6 years) i.e. most susceptible age group for obstructive urolithiasis in dogs in present study (Table.2) which was also observed by Amarpal *et al*. (2004) [4] in their study. Among all mineral composition of calculi, struvite and calcium oxalate was highly

documented across all age groups having mean age of 6.7 years (Table 1.). The above study reported Labrador was highly susceptible for urolithiasis having higher no. of cases. Spitz breed had higher prevalence rate of stone formation among small breeds in this study.

The above clinical study documented that the incidence of struvite urolith had higher occurrence in small breed but, in large breed higher risk for formation of calcium oxalate urolith. Chemical type of urolith i.e. silica was only seen in German shepherd (Table.1.). The present study also revealed that female dogs had higher prevalence rate of struvite stones. Among uroliths, calcium oxalate and struvite were seen higher in males fallowed by calcium oxalate (Table.3). There was no evidence of presence of stones in upper urinary tract like kidney and ureter in dogs shown in Table.1. Urinary bladder is the common anatomical position in urinary tract of female dogs for concretion of struvite stones (Kim Chaewook *et al*., 2004) [5] which was also observed here. The present clinical study documented that struvite and calcium oxalate was chief chemical type stone found in dogs fallowed by calcium oxalate.

Table 1: Clinical data related to obstructive urinary calculi of 20 dogs under this study.

Sl. No.	Breed	Age (Year)	Gender	Stone lodgement site	Calculi Compositions
1	Rottweiler	3	M	Urinary bladder & Penile urethra	Struvite & Calcium oxalate
2	Lab	6	M	Urinary bladder	Calcium oxalate
3	Desi	4	M	Penile urethra	Calcium oxalate & Struvite
4	Golden Retriever	3	M	Urinary bladder & Penile urethra	Calcium oxalate
5	GSD	2	M	Urinary bladder	Struvite & Calcium Hydroxyapatite
6	Pug	3	M	Penile urethra	Struvite & Calcium oxalate
7	Spitz	10	M	Urinary bladder & Penile urethra	Struvite & Calcium oxalate
8	Lab	11	M	Urinary bladder	Struvite, calcium oxalate & Calcium phosphate
9	Beagle	6	F	Urinary bladder	Struvite
10	Spitz	4	F	Urinary bladder	Struvite
11	GSD	2	M	Urinary bladder & Penile urethra	Silica
12	Spitz	8	M	Urinary bladder & Penile urethra	Struvite & Calcium oxalate
13	Pug	3	M	Urinary bladder	Struvite
14	Lab	5	M	Urinary bladder & Penile urethra	Struvite, calcium oxalate & Calcium phosphate
15	GSD	5	M	Urinary bladder	Struvite & calcium hydroxyapatite
16	GSD	7	M	Penile urethra	Struvite & calcium oxalate
17	Lab. Mix	6	M	Urinary bladder & Penile urethra	Calcium oxalate
18	Spitz	12	M	Penile urethra	Struvite & Calcium oxalate
19	Beagle	4	M	Penile urethra	Calcium oxalate
20	Lab	5	M	Urinary Bladder	Struvite, calcium oxalate & Calcium phosphate

Table 2: Relation between age and chemical type of Stone

Age Range (Years)	Struvite	Calcium oxalate	Struvite & calcium oxalate	Struvite & calcium hydroxyapatite	Silica	Struvite, calcium oxalate & phosphate	Total
1-3	1	1	2	1	1		6
4-6	2	3	1	1		2	9
7-9			2				2
10-12			2			1	3
Total	3	4	7	2	1	3	20

Table 3: The influence of sex on different types of calculi composition

Chief chemical constituents	No. of Male cases	No. of Female cases	Total
Struvite	1	2	3
Calcium oxalate	4	0	4
Struvite & calcium oxalate	7	0	7
Struvite & calcium hydroxyapatite	2	0	2
Silica	1	0	1
Struvite, calcium oxalate & phosphate	3	0	3
Total	18	2	20

Table 4: Relationship between the position of lodgement of calculi and the chemically distinct types of calculi

Chemical types	Position of lodgement of calculi			Total
	Urinary bladder	Urinary bladder & penile urethra	Penile urethra	
Struvite	3	-	-	3
Calcium oxalate	1	2	1	4
Struvite & calcium oxalate		3	4	7
Struvite & calcium hydroxyapatite	2	-	-	2
Silica		1	-	1
Struvite, calcium oxalate & phosphate	2	1	-	3
Total	8	7	5	20

Conclusion

SEM (for typically surface topography) is valuable supplementary methods in the study of calculi in dogs which ensured the findings those obtained light microscopic crystal analysis. Urinary bladder was common site for lodgment of calculi in dogs affected with urolithiasis, followed by penile urethra and bladder. Mixed type uroliths comprise of calcium oxalate and struvite was chief chemical type stone found in dogs fallowed by calcium oxalate.

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