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**Thangjam Reena Devi**

Department of Veterinary Surgery and Radiology,  
Teaching Veterinary Clinical Complex College of  
Veterinary Sciences and Animal Husbandry  
Central Agricultural University  
Selesih, Aizawl, Mizoram, India

**Dhruba Das**

Department of Veterinary medicine, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**Bedanga Konwar**

Department of Veterinary Surgery and Radiology,  
Teaching Veterinary Clinical Complex College of  
Veterinary Sciences and Animal Husbandry  
Central Agricultural University  
Selesih, Aizawl, Mizoram, India

**Hitesh Bayan**

Department of Veterinary Surgery and Radiology,  
Teaching Veterinary Clinical Complex College of  
Veterinary Sciences and Animal Husbandry  
Central Agricultural University  
Selesih, Aizawl, Mizoram, India

**Basanta Saikia**

Department of Veterinary Surgery and Radiology,  
Teaching Veterinary Clinical Complex College of  
Veterinary Sciences and Animal Husbandry  
Central Agricultural University  
Selesih, Aizawl, Mizoram, India

**Kalyan Sarma**

Department of Veterinary medicine, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**Chethan GE**

Department of Veterinary medicine, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**Dibyajyoti Talukdar**

Department of Animal Reproduction, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**SK Behera**

Department of Veterinary medicine, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**Ashiho Kayina**

Department of Animal Reproduction, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

**A Khozhiio Kayina**

Department of Livestock Production and  
Management, Teaching Veterinary Clinical Complex  
College of Veterinary Sciences and Animal  
Husbandry Central Agricultural University Selesih,  
Aizawl, Mizoram, India

**Corresponding Author:****Kalyan Sarma**

Department of Veterinary medicine, Teaching  
Veterinary Clinical Complex College of Veterinary  
Sciences and Animal Husbandry Central Agricultural  
University Selesih, Aizawl, Mizoram, India

## Diagnosis and management of ammonium urate cystoliths in a bitch

**Thangjam Reena Devi, Dhruba Das, Bedanga Konwar, Hitesh Bayan, Basanta Saikia, Kalyan Sarma, Chethan GE, Dibyajyoti Talukdar, SK Behera, Ashiho Kayina and A Khozhiio Kayina**

### Abstract

A seven-year-old bitch weighing 10.5 kg body weight was presented to Teaching Veterinary Clinical Complex, with a history of urinary incontinence since 3 months with dysuria, haematuria, dribbling of urine at the end of urination. Ultrasound examination of urinary bladder showed the presence of hyperechoic mass with distal acoustic shadow indicative of calculi. Further, lateral and ventro-dorsal radiography examination confirmed the presence of four large-sized bladder calculi. Haematological examination revealed marked lymphocytosis. Urinalysis revealed specific gravity of 1.015, pH 7.9 with the presence of glucose, leukocytes, erythrocytes and trace protein. The microscopic examination of urinary sediment confirmed the presence of ammonium urate crystals. The culture of the urine revealed the presence of *Staphylococcus species* as the predominant organism. The case was diagnosed as ammonium urate cystolithiasis with cystitis based on history, clinical examination, laboratory evaluation and imaging techniques. Four different sizes of calculi weighing altogether 40 gm were successfully removed by cystotomy procedure. The animal made an uneventful recovery after the surgical management.

**Keywords:** Ammonium urate, bitch, cystolithiasis, cystotomy

### Introduction

Cystoliths (bladder stones) are concretions of solid mineral and organic compounds that cause disease through direct trauma to the urinary tract and obstruction of urinary outflow [1]. The occurrence of cystic calculi in dogs and cats has a multifactorial etiologies which include a dietary origin, abnormal urine pH (alkaline pH i.e. pH > 8.0, favours the formation of phosphate, carbonate and struvite calculi whereas acidic pH i.e. pH < 7.0, favours the formation of urate and silicate calculi), urinary tract infections associated with urease-producing bacteria such as *Staphylococcus* spp, drug-induced formation, genetic disorder and metabolic or endocrine causes [2, 3]. The overwhelming majority of canine ammonium urate urolithiasis occurs in females due to host factors which enhance the possibility of bacterial urinary tract infections (UTI) Cystolithiasis occurs in 0.4-2% of the canine population [4] and smaller dog breeds are more prone than larger breeds [5]. Diagnostic imaging techniques like radiography and ultrasonography are sensitive in diagnosis, with abdominal ultrasonography having 90% sensitivity, 98% specificity and 97% accuracy in case of urolith [6]. Medical dissolution of calculi is impossible if the urolith size is bigger enough to obstruct the urine flow and surgical removal is necessary [7]. In this study, the case was relieved by cystotomy.

### Materials and Method

#### Case history

A seven-year-old bitch weighing 10.5 kg body weight was presented to the Teaching Veterinary Clinical Complex (TVCC), College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram with a history of urinary incontinence since 3 months with dysuria, haematuria, dribbling of urine at the end of urination. The animal was being fed with dry packaged feeds for 3 years. Vaccination and deworming history was improper.

#### Clinical observation and Laboratory Evaluation

On physical examination the bitch was found mildly dehydrated and discomfort on abdominal palpation.

The physical parameters were within the normal range i.e. rectal temperature (101.2<sup>0</sup>F), heart rate (122bpm), respiration rate (24), pink mucous membrane, skin turgor test (> 1 secs) and capillary refill time (=1 sec).

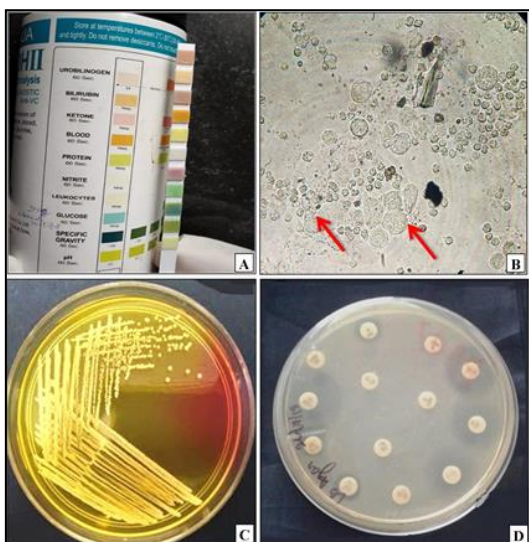
2ml Blood sample was collected from the cephalic vein in EDTA vial for haematological examination with the help of an automated blood cell counter (MS<sub>4</sub>e, Netherland). Haematology revealed marked lymphocytosis indicative of chronic infection due to cystitis (Table 1). Urine was analyzed with the help of the urine strip test method (Fig.1 A) and analysis revealed the presence of glucose, leukocytes, erythrocytes and trace protein (Table 2 B). The microscopic examination of urine sediment showed the presence of numerous leucocytes and transitional epithelial cells which indicates cystitis (Fig. 1B). The urine sample was also sent to the Department of Microbiology, College of Veterinary Sciences & A.H., CAU, Selesih, and Aizawl for urine culture and ABST (Fig.1C & D). The culture of the urine revealed presence of *Staphylococcus species* as the predominant organism (Fig. 1 B). The ABST result is shown in Table 3.

**Table 1:** Haematological analysis result of the dog with cystolithiasis

Haematological parameters	Result	Reference values
Haemoglobin (g/dl)	15.9	12-18
Packed cell volume (%)	49	37-55
Red blood cell count (M/mm <sup>3</sup> )	6.58	5.5-8.5
White blood cell count (m/mm <sup>3</sup> )	8.41	6-17
Platelet count (m/mm <sup>3</sup> )	396	200-500
Lymphocyte (%)	79.5	8-38
Monocyte (%)	7.5	1-9
Granulocyte (%)	15.2	51-84

**Table 2:** Qualitative analysis of urine in the dog with cystolithiasis

Parameters	Quantities
Urobilinogen	Normal
Bilirubin	NIL
Protein	+
Leukocytes	++
Ketone	NIL
Nitrite	NIL
Glucose	+
Specific gravity	1.015
pH	7.9
Blood	Non-haemolysed

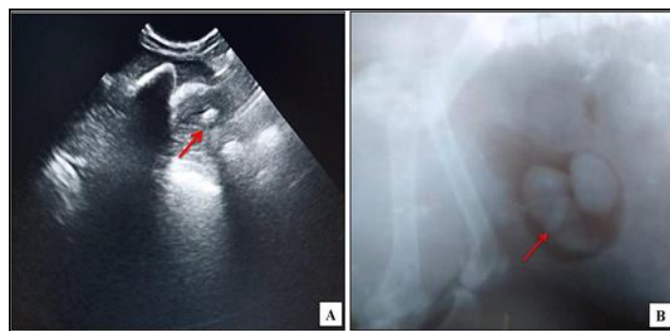


**Figure 1:** Urine analysis

- Urine Strip test
- Microscopic examination of urine sediment showed the presence of numerous leucocytes and transitional epithelial cells
- Bacterial culture of urine showed positive for *Staphylococcus* spp.
- ABST result for *Staphylococcus* spp.

### Examination by imaging techniques

Ultrasonography of caudal abdomen showed thickened urinary bladder wall with hyper-echoic masses which cast clear acoustic shadow indicative of cystitis with Cystoliths (Figure 2A). Radiographic examination of the lateral abdomen revealed the presence of four big radiopaque masses in the urinary bladder which was diagnosed as Cystoliths (Figure 2B).



**Figure 2:** Examination of Urinary bladder by imaging techniques

- USG of urinary bladder showing thickened urinary bladder (cystitis) with triangular-shaped hyperechoic mass with acoustic shadow indicative of cystoliths
- Lateral radiograph of lower abdomen revealing the presence of four different sizes radiopaque masses inside the urinary bladder

### Results and Discussion

As per the ABST report (Table 3) the dog was initially stabilized with Inj. Ceftriaxone and sulbactam (Xonexef-s) @ 25 mg/kg body weight intravenously for 5days with inj. DNS+RL @ 30 ml/kg slow IV, urinary acidifier (Syp. Cytrol TM 10 ml, PO, BID) and renoprotectant (Tab. Nefrotec-DSTM 2 tabs, PO, BID) for 3 days. After stabilizing the animal, the cystoliths were removed by cystotomy.

**Table 3:** Antibiotic sensitivity test result of urine of dog with cystolithiasis

Name of the antimicrobial agents	Sensitivity
Amoxycillin	R
Nitofurantoïn	S
Cephotaxime	I
Enrofloxacin	R
Ceftriaxone	S
Streptomycin	S
Amikacin	I
Tetramycin	R
Chloramphenicol	S
Ciprofloxacin	R
Penicillin	R
Nalidixic Acid	R
Ampicillin	R

### Surgical intervention

Bitch was premedicated with DNS @ 20ml/kg BW IV and

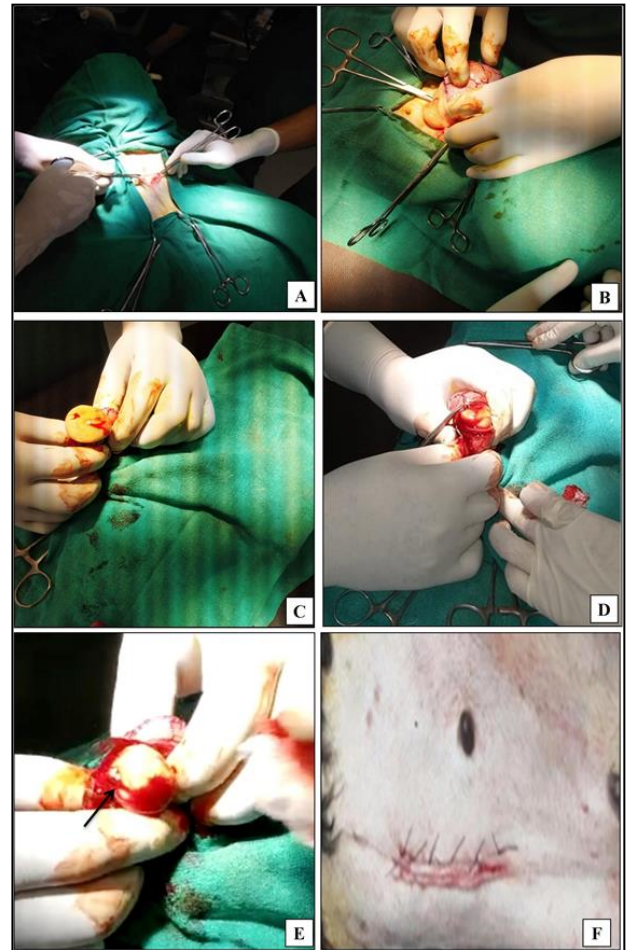


meloxicam @ 0.3mg/kg BW IM. The caudal ventral abdomen was prepared for aseptic laparotomy. The bitch was anesthetized with Diazepam @ 1mg/kg BW IV and Ketamine @ 10mg/kg BW IV. Placing the Foleys catheter in urinary bladder, a caudal ventral midline laparotomy was performed to do the cystotomy. Following laparotomy, the urinary bladder was exteriorized and on examination whole urinary bladder was found to be filled with calculi. Cystotomy was performed on the avascular part of dorsal curvature of the urinary bladder and the incision was lengthened with mayo scissor to remove the Cystoliths (Fig 3). The urinary bladder wall was found markedly thickened and inflamed. The bladder wall was sutured in two layers using Vicryl 1-0, an intraluminal simple continuous pattern was done for the first layer followed by Lambert suture for the second layer. Urinary bladder was placed in normal position and peritoneum and muscles were closed with a continuous suture pattern using Vicryl 1-0. Skin was sutured in a horizontal mattress pattern using nylon. Post-operative follow up was done with Inj. Ceftriaxone and sulbactam (Xonexef-s) @ 25 mg/kg body weight intravenously for 14 days, Inj. Meloxicam @ 0.3 mg/kg body wt. and Inj. NSS 250 ml for three days. The owner was advised to avoid packaged dry feeds and to keep on a home-prepared diet for a minimum period of 4 weeks.

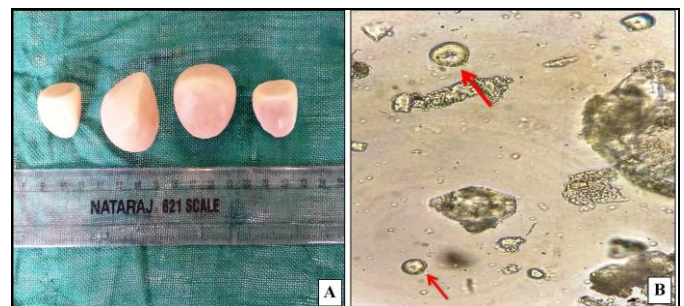
The cystoliths retrieved from the urinary bladder were four in numbers weighing 40 gm altogether which were of different sizes (1.5x 1.5cm to 2 x 2.75cm) and dirty white (Figure 4A). The cystoliths were diagnosed as ammonium urates based on their morphological appearance under microscopic examination (Figure 4B).

The animal made an uneventful recovery after post-surgical management and thereafter the case was followed up to 3 months without recurrence.

Ammonium urate is the third most common urolith reported in dogs and cats [8]. Phosphate, ammonium and magnesium are oversaturated in alkaline urine and as a result urolith is formed. This condition is also associated with urinary tract infection by urease positive bacteria (*Staphylococcus* spp., *Streptococcus* spp. or *Proteus* spp.) [9]. This statement is agreement with the present case as the pH of urine of the present case was alkaline and infected with *Staphylococcus* spp. Urate calculi can be associated with signs like pollakiuria, dysuria and hematuria are commonly present due to blockade of the urinary tract [10] and the calculi rubbed against the bladder wall, irritating and damaging the tissue causing bleeding and inflammation [11]. Leukocytosis in urine noticed in the present case might be due to the presence of *Staphylococcus* bacterial infection which was confirmed by urine culture. Cystolithiasis of the present case was confirmed by imaging techniques using radiography and ultrasonography. Bumin and Soylu [12] suggested that simultaneous examination of dogs using radiography and ultrasonography helped diagnose cystic calculi. Generally cystolithiasis is treated either by medical or surgical intervention. Medical management involves the dissolution of the crystals by altering urine pH, antilithiatic agents and supportive therapy. In the present case, medical management is not possible because of the larger size of the cystoliths. Therefore, cystotomy is recommended in this case which cannot be dissolved by medical management.



**Fig 3:** Surgical procedure for cystotomy. Chronological orders from A to F



**Fig 4:** Ammonium urate cystoliths

- 40 gm Cystoliths altogether measuring 2x2.75cm size in larger two and 1.5x1.5 cm in small two with a smooth margin
- Microscopic examination of cystoliths was identified as ammonium urate crystal based on its shape

### Conclusion

Confirmatory diagnosis of cystolithiasis was done by safe and non-invasive diagnostic techniques such as radiography, ultrasonography along with microscopic and macroscopic urine examination. Urolithiasis in canines can be primarily managed by nutritional and dietary changes in early stages; however, the condition can be treated successfully by surgical intervention as the calculi were bigger in size and numerous in numbers.

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