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**Case Study: Removal of Calculi in The Bladder using Cystotomy  
Method in Female Pomeranian Mix Pekingese Dog  
at Winadi Vet Animal Clinic Malang**

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**ABSTRACT**

Urolithiasis is a disease caused by calculi, crystals, or excessive sediment in the urinary tract, which is generally composed of one or more types of minerals such as struvite, calcium oxalate, calcium phosphate, uric acid, and cystine. A 10-year-old female Pomeranian mix Pekingese dog was referred to Winadi Vet Animal Clinic Malang with clinical signs of dysuria, strangury, and hematuria. The physical examination findings were lethargy, caudal abdominal pain, and bladder distension. Radiological examination results indicated distension in the urinary bladder containing two stones occupying with clear margins and radiopaque-like opacity, with lengths of 3.44 cm and 3.35 cm, respectively. Cystotomy to remove the calculi was performed by incision on the midline. The urinary bladder was closed using a two-layer closure suture type, the first layer used simple interrupted, and the second layer used simple continuous suture with 3-0 polyglactin (Vicryl®) suture. The animal recovered on the fourteenth day after surgery.

Keywords: calculi, cystotomy, dog, urolithiasis

**ABSTRAK**

Urolithiasis merupakan penyakit yang terjadi karena adanya kalkuli, kristal atau sedimen pada saluran urinari yang terdiri dari satu/lebih jenis mineral diantaranya kalsium oksalat, struvit, asam urat, kalsium fosfat, dan sistin. Seekor anjing Pomeranian mix Pekingese umur 10 tahun berjenis kelamin betina dibawa ke Winadi Vet Animal Clinic Malang dengan gejala klinis *disuria*, *stranguria*, dan *hematuria*. Gejala klinis yang muncul berupa lethargy, kesakitan saat palpasi caudal abdomen dan distensi vesika urinaria. Hasil radiografi menunjukkan distensi pada vesika urinaria, terdapat dua massa dengan opasitas mineral, marginasi halus dan jelas, berukuran sekitar 3.44 cm dan 3.35 cm. Tindakan yang dilakukan yaitu *Cystotomy* dengan membuat insisi di bagian *midline abdomen*. Penutupan vesika urinaria dilakukan menggunakan tipe jahitan *two-layer closure*, lapisan pertama dengan *simple interrupted* dan lapisan kedua dengan *simple continuous* menggunakan benang *polyglactin* (Vicryl®) 3-0. Hewan dinyatakan sembuh pada hari ke-14 setelah operasi.

Kata kunci: anjing, *cystotomy*, kalkuli, urolithiasis

## **INTRODUCTION**

Urolithiasis is a urinary tract disorder due to calculi, which can cause blockages and injury to the urinary bladder, kidneys, ureters, or urethra (Men and Arjentina, 2018). Calculi are generally composed of one or more minerals, such as struvite, calcium oxalate, calcium phosphate, uric acid, and cystine. The most common crystals in dogs are calcium oxalate, with a percentage of 41.50%, and magnesium ammonium phosphate, at 43.80% of cases, reported by Canadian Veterinary Urolith Centre from February 1998 to April 2003 (Houston *et al.*, 2004). Urolithiasis is commonly found in the urinary bladder and urethra. Tion *et al.* (2015) reported that the prevalence of urolithiasis in dogs was 0.25% in Sweden, 0.50% in Norway, and 3% in Ukraine. The leading cause of urolithiasis is increased urine saturation of different salts. Dissolved salts eventually precipitate and form calculi. The presence of calculi in the urinary tract could trigger strangury, dysuria, and hematuria (Men and Arjentina, 2018).

Clinical signs in dogs with urolithiasis vary depending on location, the number of calculi/crystals, and sex. In severe cases, dogs with urethral obstruction will show signs of vomiting, weakness, abdominal tightness, and pain during palpation. If the blockage persists for longer, it will cause pain that leads to depression, lethargy, anorexia, and uremia. Animals with urolithiasis must be treated because calculi can cause urinary tract obstruction. In addition, the accumulation of calculi in the urinary bladder can cause a rupture of the

bladder wall, which can cause inflammation and hemorrhage. In an advanced case, Calculi can also block urine flow, causing distension and rupture of the urinary bladder, making the urine contaminate the organs in the abdominal cavity and resulting in a fatal outcome. (Men and Arjentina, 2018).

This study aimed to describe the surgical treatment of a urolithiasis case in a Pekingese dog with cystotomy.

## **CASE STUDY**

### **Signalment and Anamnesis**

A 10-year-old Pomeranian mix Pekingese female dog was referred to the Winadi Vet Animal Clinic for strangury, hematuria, and lethargy. The patient had a history of urolithiasis and a cystostomy in the last few months. The patient has a good appetite, no vomiting, and no diarrhea. The dog's daily feeding included dry commercial food, rice with a combination of wet food, vegetables, and gravy.

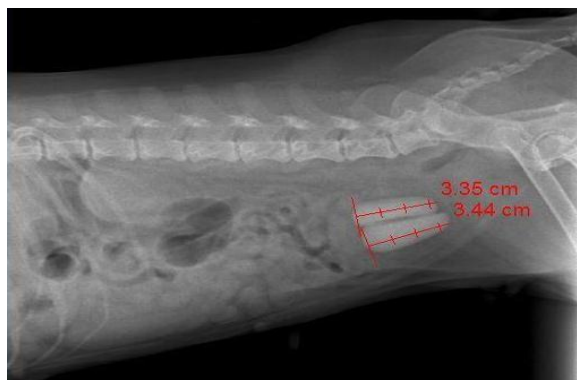
### **Physical and Clinical Examination**

The respiratory rate was 56 times/minute, a pulse rate of 148 beats/minute, a body temperature of 38.3°C, and a CRT of fewer than two seconds. Physical examination showed pain, and distention of the bladder was confirmed on palpation of the caudal abdomen.

### **Radiological examination**

The radiograph was taken in a right lateral projection. The results showed an

abnormality in the caudoventral aspect of the abdominal with bladder distention. Two stones with smooth margination with mineral opacity were found in the bladder with lengths of approximately 3.44 cm and 3.35 cm (**Figure 1**).



**Figure 1.** The right lateral projection of the abdominal radiograph illustrated the two stones in the bladder (red line)

## Diagnosis

The animal was diagnosed with urolithiasis with a prognosis of dubious or infausta.

## Treatment

The treatment of this urolithiasis was cystotomy. Hematological tests were carried out before the surgery. Hematological test results showed leukocytosis, lymphocytosis, granulocytopenia, and increasing MCH-MCHC values, platelet count (PLT) (**Table 1**). The blood chemistry tests showed hyperbilirubinemia (**Table 2**).

**Table 1.** Hematological Test Result

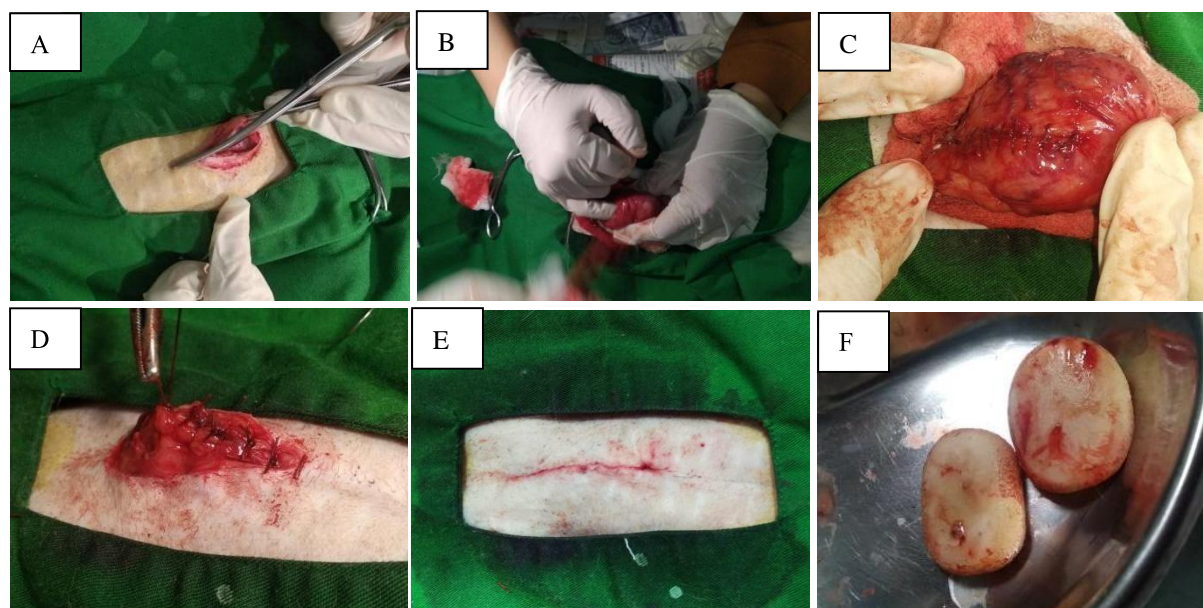
Test	Result	Unit	Reference Interval	Description
WBC	19.20	$10^3/\mu\text{L}$	6.00 – 17.00	high
LYM	10.10	$10^3/\mu\text{L}$	0.80 – 5.10	high
MID	2.10	$10^3/\mu\text{L}$	0.00 – 1.80	high
GRA	7.00	$10^3/\mu\text{L}$	4.00 – 12.60	Normal
LYM%	52.80	%	12.00 – 30.00	high
MID%	10.70	%	2.00 – 9.00	high
GRA%	36.50	%	60.00 – 83.00	low
RBC	6.93	$10^6/\mu\text{L}$	5.50 – 8.50	Normal
HGB	19.00	g/dL	11.00 – 19.00	Normal
MCHC	39.00	g/dL	30.00 – 38.00	high
MCH	27.40	Pg	20.00 – 25.00	high
MCV	70.20	gL	62.00 – 72.00	Normal
RDWCV	13.00	%	11.00 – 15.50	Normal
RDWSD	41.80	fL	35.00 – 56.00	Normal
HCT	48.70	%	39.00 – 56.00	Normal
PLT	506.00	$10^3/\mu\text{L}$	117.00 – 460.00	high
MPV	7.90	fL	7.00 – 12.90	Normal
PDW	16.10	fL	10.00 – 18.00	Normal
PCT	0.40	%	0.10 – 0.50	Normal
P-LCR	18.30	%	13.00 – 43.00	Normal

Notes : WBC (White Blood Cell), LYM (Lymphocyte), MID (MID-size cell count), GRA (neutrophils, monocytes, eosinophils, and basophils), RBC (Red Blood Cell), HGB (Hemoglobin), MCHC (Mean Corpuscular Hemoglobin Concentration), MCH (Mean Corpuscular Hemoglobin), MCV (Mean Corpuscular Volume), RDWCV (Red Cell Width Curve Volume), RDWSD (Red Cell Width Standart Deviation), HCT (Hematocrit), PLT (Platelet), MPV (Mean Platelet Volume), PDW (Platelet Distribution Width), PCT (Procalcitonin) dan P-LCR (Platelet-Large Cell Ratio)

**Table 2.** Blood Chemistry Result

Test	Result	Unit	Reference Interval	Description
Heparin tube / serum Blood sample volume <0.3 ml, hemolyzed sample 2+				
ALT / SGOT	23.00	U/L	10.00 – 118.00	Normal
ALP	46.00	U/L	20.00 – 150.00	Normal
TP	6.40	g/dL	5.40 – 8.20	Normal
ALB	2.80	g/dL	2.50 – 4.40	Normal
GLOB	3.60	g/dL	2.30 – 5.20	Normal
A/G Ratio	0.78		0.60 – 1.00	Normal
AMY	759.00	U/L	200.00 – 1200.00	Normal
GLU	88.00	mg/dL	60.00 – 110.00	Normal
Total Bilirubin	0.80	mg/dL	0.10 – 0.60	high
BUN	21.00	mg/dL	7.00 – 25.00	Normal
CRE	0.70	mg/dL	0.30 – 1.40	Normal
CA	10.00	mg/dL	8.60 – 11.80	Normal
PHOS	6.30	mg/dL	2.90 – 6.60	Normal
Na+	145.00	mmol/L	138.00 – 160.00	Normal
K+	5.30	mmol/L	3.70 – 5.80	Normal

Notes : ALT (Alanine Transaminase)/SGOT (Serum Glutamic Oxaloacetic Transaminase), ALP (Alkaline Phosphatase), TP (Total Protein), ALB (Albumin), GLOB (Globulin), A/G Ratio Albumin/Globulin Ratio), AMY (Amylase), GLU (Glucose), Total Bilirubin, BUN (Blood Urea Nitrogen), CRE (Creatinine), CA (Calcium), PHOS (Phosphate), Na+ (Sodium), K+ (Potassium)



**Figure 2.** Cystotomy procedure (A) The abdominal incision (B) The bladder was pulled out from the peritoneal cavity and incised on the dorsal of the bladder, (C) The urinary bladder incision area was closed with two layers of two-layer closure sutures, simple interrupted and simple continuous sutures. (D) Abdominal suturing, (E) Intradermal suture type for the closing of the skin, (F) The bladder stones.

## DISCUSSION

A dog came to the Winadi Vet Animal Clinic Malang on October 5, 2021.

Calculi were identified by X-ray, and cystotomy was successfully performed to remove the calculi. The formation of calculi in the urinary tract can be caused by



factors such as breed, age, sex, diet, rearing management, and feed control. Calculi contained in the urinary bladder can cause blockages to the tubules and injuries due to friction of the calculi to the bladder wall, resulting in bleeding and inflammation of the bladder (Men and Argentina, 2018).

Cystotomy surgery is performed by opening the abdomen on the ventral side and then opening the urinary bladder, after which the bladder is closed again (Sardjana and Kusumawati, 2011). Hematological and blood chemistry tests in pre-operative management support treatment through cystotomy.

The hematological test showed leucocytosis and lymphocytosis and increases in MID cells. Increased WBC, lymphocyte, and MID values indicate the response to inflammation due to infection or foreign bodies (Kartika et al., 2020, Prakoeswa, 2020). The hematological tests showed an increase in MCH, MCHC, and platelet. MCH and MCHC were increased, indicating that the hemoglobin concentration in the red blood cells was high. MCH and MCHC increased values can occur due to iron deficiency, while an increase in platelets indicates a bleeding event.

The blood chemistry test was carried out to see the patient physical condition before surgery. The test indicates that the animal was in an acceptable condition for surgery. Blood chemistry revealed hyperbilirubinemia. Bilirubinuria might indicate intravascular hemolysis, liver disease, or bile duct obstruction (Chew and Dibartola, 2004, Putri et al., 2018). In the present study, hyperbilirubinemia was

most likely due to a hemorrhage in the urinary bladder due to a scratch by the calculi. Patients were given ringer lactate infusion therapy intravenously during surgery to prevent dehydration. Cystotomy was performed using the midline method. The patient was premedicated with atropine sulfate (0.01-0.02 mg/kg of body weight). Furthermore, the anesthetic combination of ketamine (2-25 mg/kg of body weight) and medetomidine (0.01-0.08 ml/kg of body weight) was an injection.

The cystostomy was performed in the dorsal recumbency. Several layers of the midline incised were the skin, subcutaneous, and internal and external rectus abdominal muscles. The bladder is pulled out of the abdomen carefully. Then the abdominal cavity and the bladder were kept moist by wrapping them with sterile gauze moistened with normal saline to reduce contamination of the peritoneal cavity (Antika et al., 2021). The urinary bladder incision was made at a minimally vascularized area to avoid bleeding. A bladder incision was made in the area between the apex of the bladder and the trigone. Urine that came out at the incision was collected immediately, and the remaining was wiped with a tampon to avoid contamination of the abdominal cavity. In this case, when the bladder was open, there was an accumulation of blood mixed with urine in the bladder, and two calculi were found. The calculi were removed, and the bladder was flushed from blood-tinged urine using normal saline. After the calculi were successfully removed, the urinary bladder was given antibiotics and closed with a two-layer closure suture. The first layer was sutured

using a simple interrupted suture. Then the second layer was sutured using a simple continuous suture type using polyglactin (Vicryl®) 3-0. The bladder was inserted back and into the abdominal cavity, and all organs were repositioned to their original position. After completing the procedure, the abdominal cavity was flushed using sodium chloride before closure. The following steps were consecutive: suturing the linea alba using simple interrupted, rectus abdominis internus and externus muscle to subcutaneous with simple continuous suture. The last process was suturing the skin using intradermal suture types. Before the bandage was applied, the incision wound was sterilized with antiseptic, administration of topical gentamicin ointment, and then covered with a sterile dressing.

The intravenous analgesic tramadol was given after surgery at 2 mg/kg body weight. In addition, colibact® antibiotics (sulfadiazine and trimethoprim) and gabapentin were injected intramuscularly for three days. The patient's condition was good; the surgical wound was dry and normal in the urinary without a catheter. Monitoring patient's urine was yellowish without blood, and no more difficulty or pain was observed during urination. The owner was advised to change the dog's feed to a prescription urinary feed to prevent the recurrence of urolithiasis. Two weeks post-operation, the surgical wound was completely closed, dried up, and the patient was considered fully recovered.

## CONCLUSION

The case of urolithiasis was confirmed using a radiographic examination. Cystotomy using a ventral midline method was a suitable method of surgery to treat recurrent urolithiasis.

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