

## Unilateral Renal Subcapsular Abscess Associated with Pyelonephritis in a Cat

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**Abstract :** A 1-year-old intact male Russian blue cat was admitted with a history of depression, partial anorexia, vomiting and dysuria. Through the blood analysis, ultrasonography and urinalysis, this cat was diagnosed as feline lower urinary tract disease with cystitis. Despite antibiotic therapy the cat showed stranguria and urinary catheterization were repeated several times. One week after, this patient appeared depression, hyperthermia and leukocytosis. Ultrasonography revealed a small amount of hypoechoic fluid around the right kidney and bacteria were found in the urine. The amount of the right subcapsular fluid was increased and bacteria were found in the fluid. On the excretory urography, leakage of contrast media were detected. The right kidney was surgically removed and suppurative fluid between the renal parenchyma and the thickened capsule was identified. After surgery, subcapsular abscess of the right kidney associated with pyelonephritis was confirmed histologically and this cat recovered without complications.

**Key words :** cat, feline lower urinary tract disease, pyelonephritis, renal subcapsular abscess.

### Introduction

Feline urinary tract disease (FLUTD) describes collection of clinical signs associated with lower urinary tract, such as polakiuria, hematuria, dysuria, stranguria, inappropriate urination and partial or complete urethral obstruction. Pyelonephritis is inflammation of the kidney associated with bacterial infection and ascending pyelonephritis is a potential complication of FLUTD, especially if there have been repeated urethral catheterizations (4). Renal subcapsular abscess with pyelonephritis has been reported previously in a cat and it is a very rare disease in the human and veterinary medicine (9). This case report illustrates serial examinations of a cat with FLUTD. Pyelonephritis was caused by ascending urinary tract infection and produced subcapsular abscess. The medical imaging revealed that there is no response to antibiotic therapy, so the kidney was removed surgically.

### Case

A 1-year-old intact male Russian blue cat, weighting 3.3 kg, was admitted with a history of depression, partial anorexia, vomiting and dysuria of 3 days duration. There were leukocytosis (36900 / $\mu$ l, reference range: 5500-19500 / $\mu$ l), hyperkalemia

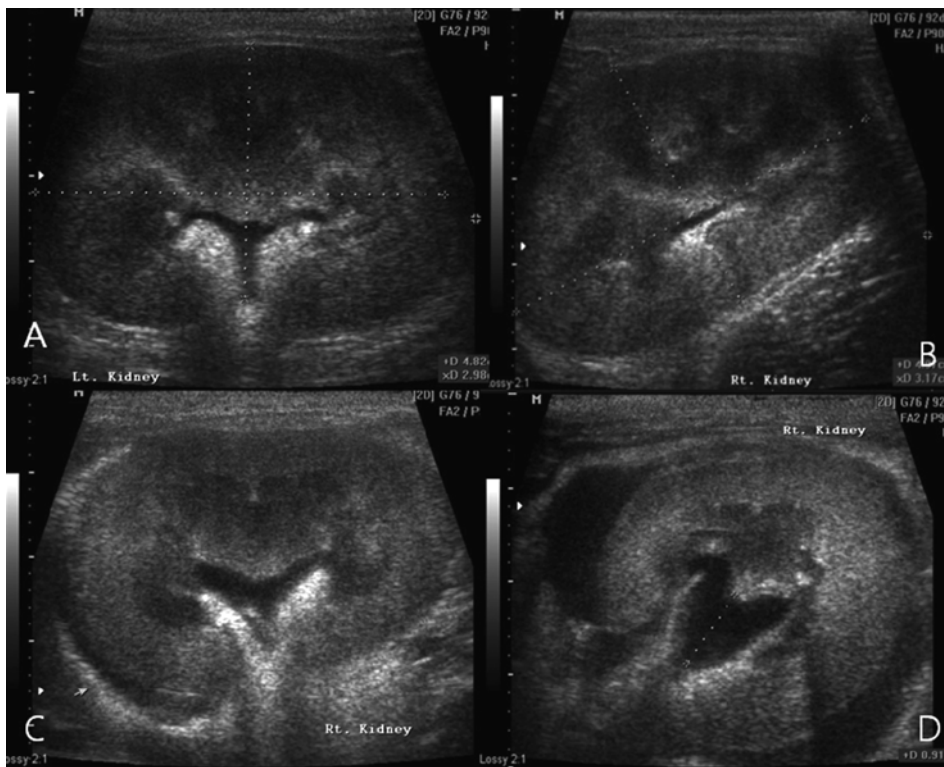
(7.6 mEq/L, reference range: 3.7-5.2 mEq/L) and severe azotemia (BUN 149.9 mg/dl, creatinine 9.5 mg/dl, reference range: BUN 15-34 mg/dl, creatinine 1.0-2.2 mg/dl) on the blood screening test. Survey abdominal radiographs showed enlarged bilateral kidneys.

On ultrasonographic examination of the first visit (day 1), bilateral enlarged kidneys showed increased echogenicity of the cortex (Fig 1A, B). The urinary bladder wall was thickened and there were moderate amounts of echogenic debris. The urethra was dilated and hyperechoic materials were found in it. There was a small amount of hypoechoic fluid around the urinary bladder. Haematuria and struvite crystalluria were identified by urinalysis. The cat was diagnosed as feline lower urinary tract disease with cystitis and struvite containing plugs are suspected as a cause of urethral obstruction.

After hospitalization, ampicillin (Sulbacillin<sup>®</sup> 10 mg/kg IM every 8 hours) treatment was initiated with fluids therapy and a Tomcat catheter was placed in the urethra. The cat got good appetite and azotemia was relieved in 3 days. Whenever a Tomcat catheter was removed, the patient showed stranguria and pollakiuria. Catheterization and its removal were repeated about five times.

One week after hospitalization (day 8), this cat showed depression, hyperthermia (40.1°C) and leukocytosis (22300 / $\mu$ l, reference range: 5500-19500 / $\mu$ l) with left shift. On ultrasonographic examination, a small amount of hypoechoic fluid was seen around the right kidney. Dilatation of the renal pelvis of both kidneys were detected (Fig 1C). Rod-shaped bacteria

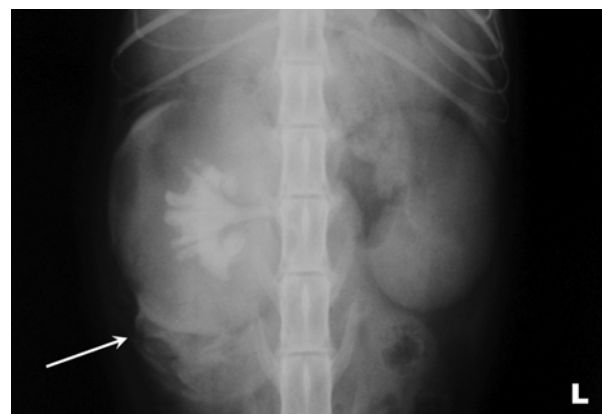
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**Fig 1.** Serial ultrasonographic assessment of the kidneys after admission. A, B (Day 1); enlarged bilateral kidneys (left kidney: 4.82 × 2.98 cm, right kidney: 4.97 × 3.17 cm) with mild pelvic dilation were showed on the first day of admission. C (Day 8); one week after hospitalization, a small amount of hypoechoic fluid was seen around the right kidney and there is also mild pelvic dilation. D (Day 10); the amount of hypoechoic fluid was increased within the thickened renal capsule.

were found in the urine sediment. The clinical signs together with the results of the diagnostic imaging suggested that pyelonephritis with a small amount of fluid in the right perirenal space. Enrofloxacin (Bytril® 2.5 mg/kg IM every 12 hours) and metronidazole (Metrynal® 15 mg/kg IV every 12 hours) were added to the treatment.

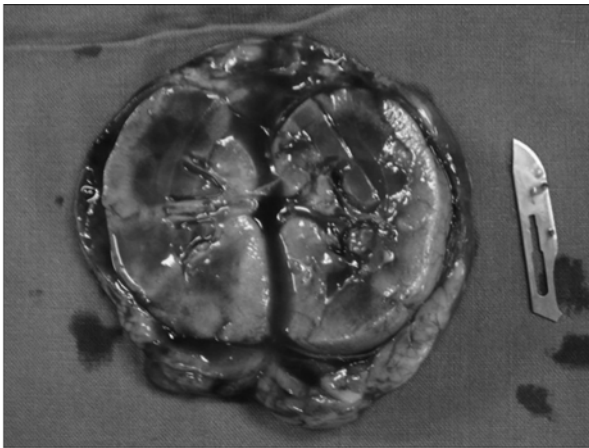
Pelvic dilation of the left kidney resolved on serial ultrasonography. But the amount of perirenal fluid and the dilation of the renal pelvis were increased in the right kidney. Fluid was accumulated in the subcapsular space and the capsule was thickened (Fig 1D). Mildly irregular and flattened renal parenchymal margin was also identified. On the day 10, aspiration of fluid in the subcapsular space was done with guidance of ultrasonography. The concentrations of BUN and creatinine were 62 mg/dl and 13.6 mg/dl, respectively. Cytological examination revealed many neutrophils, red blood cells, rod and coccus shaped bacteria. Culturing and antibiotic sensitivity test were requested. Excretory urography revealed normal findings in the left kidney. However, the right kidney showed inhomogeneous nephrogram with ill-defined margin and delayed pyelogram with short blunt pelvic recess and mildly dilated pelvis. About 2 hours after the contrast media injection, persistent pyelogram of the right kidney was shown and contrast media accumulation was appeared initially in the cranialateral aspect and subsequently caudolateral aspect of the subcapsular space. Leakage of contrast media was



**Fig 2.** Excretory urography of day 10. About 2 hours later, pyelogram of the right kidney is still shown and contrast media accumulates in the cranialateral and caudolateral aspect of the subcapsular space. Leakage of contrast media is detected in the caudal pole of the right kidney (arrow). The following day, nephrectomy of right kidney was performed.

detected in the caudal pole of the right kidney (Fig 2). Ultrasonography, excretory urographic findings and results of subcapsular fluid analysis suggested (that this patient has) subcapsular abscess associated with pyelonephritis of the right kidney and rupture of its capsule.

The day after excretory urography (day11), nephrectomy of



**Fig 3.** Surgically removed right kidney. There is suppurative hemorrhagic fluid in the space beneath the thickened renal capsule. Pyelonephritis with severe subcapsular inflammation (abscess) is diagnosed histologically.

the right kidney and urethrostomy were performed and confirmed the ultrasonographic findings. The right kidney was enlarged and its capsule was thickened. Suppurative fluid accumulated between the renal parenchyma and capsule and leakage in the retroperitoneal space was identified (Fig 3). Histopathologic examination of the right kidney revealed pyelonephritis and subcapsular abscess. After surgery, the cat made a good recovery without complications. Meropenem (Meropen® 12 mg/kg SC every 12 hours) was administered instead of ampicillin and enrofloxacin according to the antibiotic sensitivity test. After 5 days of this treatment, no bacteria were identified in the urine sediment.

## Discussion

Renal subcapsular abscess is defined by a suppurative process between the renal capsule and the renal parenchyma. It is a very rare disease in humans and also a rare finding in veterinary medicine.

A cat with bilateral subcapsular perirenal abscess and pyelonephritis was previously reported (9). According to this report, ultrasonography revealed perirenal subcapsular fluid contained echogenic debris. Ultrasound-guided percutaneous drainage of the subcapsular fluid was performed but the cat died 5 days later. In the present case, the abscess was identified as an accumulation of fluid which surrounded the kidney in the subcapsular space. Pyelonephritis may extend through the renal capsule and produce a perinephric abscess. Perinephric abscesses develop infrequently as a sequel to chronic pyelonephritis in cats (2). The differential diagnosis of perinephric accumulation of fluid includes perinephric abscess, subcapsular and perirenal hematoma, perirenal urine collection, renal lymphangiomatosis, pancreatic pararenal accumulation of fluid and transudates of fluid associated with nephropathies (5).

Ultrasonography is an excellent tool for assessing perinephric accumulation of fluid. And a sample of perinephric

fluid can be easily aspirated under ultrasound guidance (3,7). In this case, the subcapsular location of the lesion can be detected by ultrasonography and excretory urography. Serial examination revealed that there was no response to medical therapy. Excretory urography detected leakage of the subcapsular fluid and assessed the function of the kidneys. These findings did an important role in the surgical decision making.

In this case, it is considered that pyelonephritis was caused by ascending urinary tract infection. When the cat was first diagnosed as the feline urinary tract disease with cystitis, no bacteria was detected in urinalysis. Each time the urinary catheter was removed the cat still showed stranguria and polyuria, so catheterization and its removal repeated several times. Repeated catheterization is suspected to cause iatrogenic infection and through the vesicoureteral reflux, which progress to ascending infection (3). Iatrogenic bacterial urinary tract infection (UTI) is a common complication of indwelling urinary catheters, especially if an open-ended system is used. Bacterial UTI developed in 65% of healthy male cats within 3 to 5 days of open indwelling catheterization (1). The results of the present report also support that renal subcapsular abscess can be induced by ascending infection in the cat with feline lower urinary tract disease. And the serial assessment is important in FLUTD patients for detecting the subcapsular abscess and determining the surgical option.

In recent years, computed tomography has been found to be useful in the diagnosis and it is superior to both ultrasonography and excretory urography in detecting focal parenchymal abnormalities, defining the extent of disease and detecting perinephric fluid collections and abscesses (8). In a previous report, a radiolucent wedge within the kidney was demonstrated as a sign of pyelonephritis on contrast enhancement in a dog (6). Retroperitoneal fluid and cellulitis was also identified around the kidney.

In this case, computed tomography was not performed, and the anatomic relationships between lesion of parenchyma and perirenal space was not recognized, which is a limitation of this report.

## Acknowledgement

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## 고양이의 신우신염을 동반한 편측신장의 피막하 농포 증례

이혜연 · 장진화 · 정주현 · 오선경 · 김재홍\* · 김완희 · 윤정희 · 최민철<sup>1</sup>

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**요 약** : 한 살의 수컷 러시아 블루 고양이가 침울, 식욕저하, 구토, 배뇨장애를 주호소로 내원하여 방광염을 동반한 고양이 하부 요로계 질병으로 진단받았다. 입원 치료 시에도 배뇨곤란이 지속되어 요도카테터 삽입을 몇 차례 반복하였다. 일주일 뒤 환자는 침울, 발열, 백혈구증가증을 나타내었다. 초음파 검사 시 우측 신장 주변으로 소량의 저에코성 액체가 보였고 요검사에서는 세균이 확인되었다. 이후 우측신장 피막하 액체의 양은 증가하였으며 흡입 시 세균이 관찰되었다. 배설성 요로조영술에서는 우측신장으로부터 조영제의 누출이 확인되었다. 수술적으로 우측신장을 제거하였으며 신장실질과 비후된 피막 사이에서 농성 삼출물을 확인하였다. 수술 후 환자는 합병증 없이 회복하였으며 조직학적으로 신우신염을 동반한 우측신장의 피막하 농포로 확진되었다.

**주요어** : 고양이, 고양이 하부요로계 질병, 신우신염, 신장 피막하 농포.