

## MANAGEMENT OF POLYCYSTIC KIDNEY DISEASE BY ULTRASOUND-GUIDED PERCUTANEOUS ASPIRATION IN A CAT

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### Abstract

A 5-year-old female Persian cat was presented with the owner's complaint about lethargy, anorexia, and no defecation. Physical examination revealed relatively poor general health status. Also, marked azotemia was one of the prominent findings of clinical pathology. Abdominal ultrasound revealed smooth-walled anechoic cysts in both kidneys, characteristic of feline polycystic kidney disease. Three weeks after the initiation of supportive therapy, percutaneous aspiration of large cysts was performed under the guidance of ultrasonography. The contents of the cysts were hypocellular and did not contain infectious or neoplastic cells. Following the re-examination of the patient after 30 days, the clinical and hematological parameters were notably improved. Therefore, aspiration of cysts guided by ultrasonography can be beneficial in alleviating some of the complications of polycystic kidney disease and improving the life quality of affected cats. However, it may be temporary, and this method needs to be repeated periodically.

**Key Words:** feline, needle aspiration, renal cysts, renal failure, ultrasonography

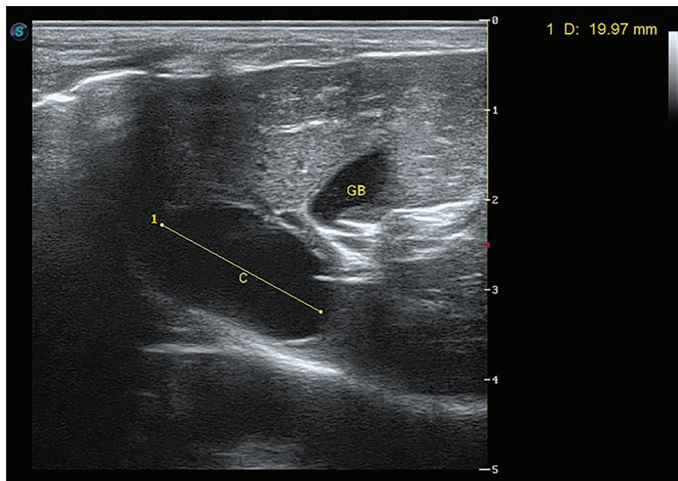
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## CASE PRESENTATION

The owner of the animal provided written informed consent for the use of data related to pet for the purpose of publishing professional and scientific papers. A 5-year-old spayed female Persian cat was referred to the veterinary teaching hospital of Urmia University with the owner's complaint about lethargy, anorexia, and no defecation in the past few days. Vaccination and anti-parasite treatment courses were done regularly, and the cat's diet was a combination of commercial and home-prepared food. There were no other pets in the household, and the cat was kept indoors. Clinical examination revealed normocardia, normopnea, pale mucous membranes, poor body condition, poor hair coat, moderate dehydration, and mild hypothermia. Hematological and biochemical evaluation showed anemia, severe azotemia, and hyperphosphatemia, implying advanced chronic kidney disease (CKD) (Table 1). Also, marked toxic changes in neutrophils were observed in the morphological examination of blood cells.

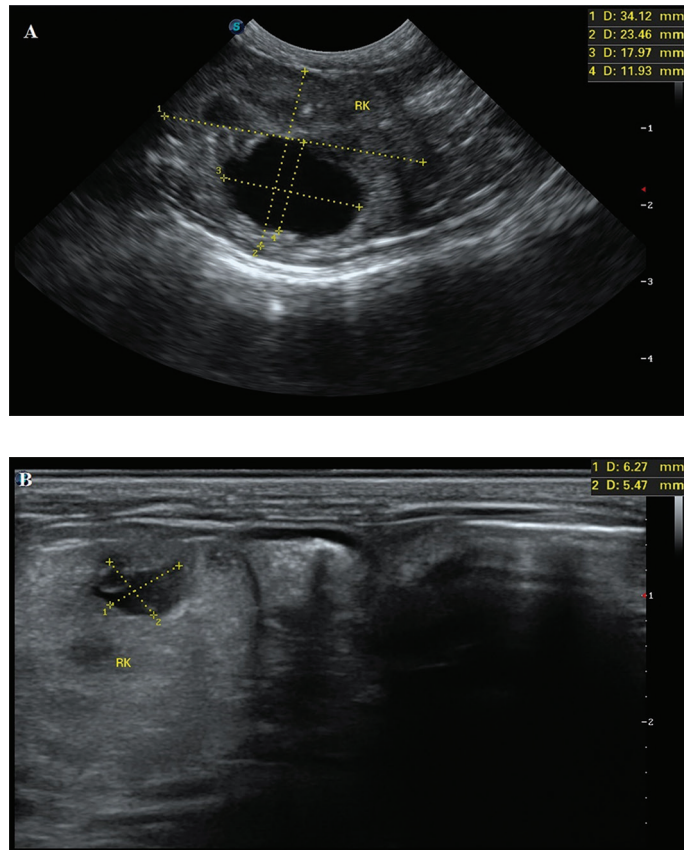
X-ray examination confirmed constipation. While the cat was physically restrained in dorsal recumbency by her owner, a veterinary radiologist performed ultrasonographic evaluations. The kidneys' echotexture and echogenicity were examined in transverse and longitudinal planes using an ultrasound machine with an 8-13 MHz linear transducer (SonoScape, China). The kidneys were slightly malformed with irregular focal margins, and oval to round anechoic structures of various sizes in both kidneys were diagnostic for feline polycystic kidney disease. Furthermore, the pancreas and liver were subjected to ultrasound examination for parenchymal anechoic cysts. Interestingly, a cyst with a length of about 20 mm was also observed in the liver (Figure 1).



**Figure 1.** A liver cyst observed in ultrasonography of the cat with polycystic kidney disease. C: cyst, GB: gallbladder.

An enema with warm saline, fluid therapy with normal saline, antibiotic therapy (amoxicillin, 12 mg/kg, p.o. q8h), and appetite stimulation (mirtazapine, 1.9 mg/kg, p.o. q48h) were prescribed for primary support; furthermore, a commercial renal diet was recommended.

Three weeks later, the cat was presented for re-examination. Due to the unchanged kidney ultrasound findings, the animal's owner consented to the aspiration of the cysts' fluid. Therefore, the cat was intravenously sedated with ketamine (2.5 mg/kg) and midazolam (0.2 mg/kg), placed in dorsal recumbency, and the skin was prepared aseptically. The largest cysts were percutaneously aspirated under ultrasound guidance using a 23-gauge hypodermic needle connected to a three-way stopcock and syringe (Zatelli et al., 2007). About 8 mL of semi-transparent fluid was uncomplicatedly aspirated from the cysts of both kidneys. Following aspiration, a very small lumen of the cysts remained on ultrasonography (Figure 2). A sample of the aspirated content of the cysts was sent to the laboratory for cytology and bacterial culture.



**Figure 2.** A large cyst in the right kidney (RK), (A) before and (B) after ultrasound-guided percutaneous aspiration.

Prepared slides were stained by the Giemsa method and examined by a veterinary clinical pathologist. On cytological examination, the aspirated contents of the cysts were hypocellular with few epithelial cells and amorphous crystals, while no signs of infection or neoplasia were observed. Also, bacterial culture had negative results.

Four weeks later, the owner was asked to bring her cat to the hospital for follow-up and re-examination. The clinical parameters were clearly improved, and the owner was satisfied with the improved appetite, ease of defecation, and increased physical activity of the cat. There were no signs of recurrence of previously aspirated cysts on ultrasonography. Hematological and biochemical parameters also showed promising results, especially in terms of reducing the concentration of urea, creatinine, and phosphorus (Table 1).

**Table 1.** Hematological and biochemical parameters before and one month after ultrasound-guided percutaneous aspiration of cysts in a cat with polycystic kidney disease

Parameter	Before intervention	After intervention	Reference range
White blood cell	9.35	10.20	5.5-19.5×10 <sup>3</sup> /μL
Neutrophil	96	77	35-75%
Lymphocyte	2	20	20-55%
Red blood cell	4.89	5.11	6-10×10 <sup>6</sup> /μL
Hemoglobin	6.73	6.68	9.5-15 g/dL
Hematocrit	22	21	29-45%
Mean corpuscular volume	39.54	40.12	41-54 fL
Mean cell hemoglobin concentration	25.23	23.97	29-36 g/dL
Platelet	364	347	100-504×10 <sup>3</sup> /μL
Urea	220.3	132.0	14-72 mg/dL
Creatinine	4.25	3.02	0.8-2.3 mg/dL
Total protein	10	8.5	5.2-8.5 mg/dL
Fasting blood glucose	179	91	70-150 mg/dL
Alkaline phosphatase	78	38	0-62 IU/L
Alanine aminotransferase	45	62	28-76 IU/L
Aspartate aminotransferase	19	18	5-55 IU/L
Calcium	11.18	12.20	9.1-11.2 mg/dL
Potassium	4	4.15	3.9-5.5 mmol/L
Phosphorus	11.70	6.82	3.0-6.6 mg/dL
Urine specific gravity	1.035	1.032	>1.025

## DISCUSSION

Polycystic kidney disease (PKD) is probably the most common genetic disease in cats, often affecting Persian and Persian-related breeds (Schirrer et al., 2021). It is estimated that about 6% of the world's feline population and 33.80% of Persian cats in Iran suffer from this disease (Schirrer et al., 2021; Tavasolian et al., 2018). The mutation at position c.10063 in exon 29 of PKD1, as the implicated gene, modifies the polycystin-1 protein that is expressed in the primary cilium. These cilia act in fluid transport and chemical and mechanical receptors. It appears that modification of polycystin-1 is involved in the cystogenesis in PKD (Schirrer et al., 2021). PKD is characterized by the formation and gradual development of renal cysts, and sometimes pancreatic and hepatic cysts, often leading to the insidious deterioration of kidney tissue and, ultimately, fatal renal failure (Guerra et al., 2019). Ultrasonography is the most practical imaging method for diagnosing and monitoring PKD in cats (Guerra et al., 2019). The sensitivity and specificity of this method for detecting kidney cysts are 91% and 100%, respectively, and identifying at least one cyst in the kidney is diagnostic for PKD (Guerra et al., 2019).

Although there is no cure for PKD, the clinical symptoms can be relieved with palliative measures (Schirrer et al., 2021). Since the presence of cysts causes renal capsule distension, compresses the adjacent tissues, elicits pain, and promotes fibrosis of the renal parenchyma (Adamama-Moraitou et al., 2017; Casteleijn et al., 2014), it is assumed that draining the cysts can help in the alleviation of symptoms.

Renal cysts as space-occupying lesions can cause parenchymal ischemia, urinary obstruction, and renal failure. The epithelium that covers the inner surface of cysts is metabolically active and involved in transporting solute and fluid among the adjacent interstitial tissue and cyst cavity, causing the cyst to increase in volume gradually (Zatelli et al., 2007). Therefore, draining a cyst's fluid can remove the compression associated with the cyst on the adjacent renal parenchyma and urinary tract (Zatelli et al., 2005).

Renal cysts can be managed through percutaneous aspiration with or without sclerosing agents or surgical procedures (Hamid et al., 2012). However, surgery can have many complications, requires general anesthesia and hospitalization, and has a high cost (Shao et al., 2013). Percutaneous aspiration of renal cysts is the first-line intervention before surgery (Akinci et al., 2005). In humans with simple renal cysts, the recurrence rate of one-time aspiration has been reported to be between 33% and 80%, and some authors suggest multi-aspiration to reduce the recurrence rate (Van Dyck et al., 2018). Different sclerosing agents (e.g., ethanol, tetracycline, glucose, OK-432, etc.) can be injected into the cyst cavity to destroy the cyst's secretory epithelium and reduce the recurrence rate (Shao et al., 2013). Nevertheless, there is a possibility of kidney dysfunction following the use of some sclerosing agents, and it is also unclear whether this method will be effective for long-term management in small animals (Zatelli et al., 2007). In 2013, Shao et al. (2013) compared aspiration-sclerotherapy with laparoscopic decortication in managing humans with simple renal cysts. They

suggested aspiration-sclerotherapy for medium renal cysts (4-7 cm diameter) and laparoscopic decortication for large renal cysts (more than 7 cm diameter). Also, it was demonstrated that aspiration-sclerotherapy of larger cysts has a higher recurrence rate than for smaller cysts (Shao et al., 2013).

In PKD, surgical procedures or aspiration with sclerotherapy can be challenging due to secondary renal complications, risk of anesthesia, and the relatively small size and possibly multiple number of cysts. The main limitation of our study was the impossibility, due to financial reasons, of performing genetic tests to determine the presence of the mutation responsible for the occurrence of PKD.

In conclusion, percutaneous aspiration of renal cysts is a minimally invasive procedure that, if performed under ultrasound guidance, can immediately manage PKD with rare complications, low cost, and no need for hospitalization. However, long-term studies on more feline patients are needed to evaluate the results of this palliative method in managing PKD.

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### **Authors' contributions**

RA designed the project, SMHA performed ultrasonography, SAR performed clinical pathology evaluation, RA wrote the paper, and SMHA and SAR edited the manuscript.

### **Competing interests**

The authors declare that they have no competing interests.

## **REFERENCES**

- Adamama-Moraitou K. K., Pardali D., Vafiadis I., Patsikas M. N., Prassinou N. N. 2017. Perinephric pseudocyst in a cat: management by ultrasound-guided drainage. *Journal of the Hellenic Veterinary Medical Society*, 68(2):245-250. DOI: 10.12681/jhvms.15612.
- Akinci D., Akhan O., Ozmen M., Gumus B., Ozkan O., Karcaaltincaba M., Cil B., Haliloglu M. 2005. Long-term results of single-session percutaneous drainage and ethanol sclerotherapy in simple renal cysts. *European Journal of Radiology*, 1;54(2):298-302. DOI: 10.1016/j.ejrad.2004.07.008.
- Casteleijn N. F., Visser F. W., Drenth J. P., Gevers T. J., Groen G. J., Hogan M. C., Gansevoort R. T., DIPAK Consortium, Drenth J. P., de Fijter J. W., Gansevoort R. T. 2014. A stepwise approach for effective management of chronic pain in autosomal-dominant polycystic kidney disease. *Nephrology Dialysis Transplantation*, 1;29(suppl\_4):iv142-153. DOI: 10.1093/ndt/gfu073.

- Guerra J. M., Freitas M. F., Daniel A. G., Pellegrino A., Cardoso N. C., de Castro I., Onuchic L. F., Cogliati B. 2019. Age-based ultrasonographic criteria for diagnosis of autosomal dominant polycystic kidney disease in Persian cats. *Journal of Feline Medicine and Surgery*, 21(2):156-164. DOI: 10.1177/1098612X18764591.
- Hamid A., Wani M. S., Thakur N., Wazir B. S., Shaheen F., Mir M. F. 2012. Percutaneous aspiration and single-session ethanol sclerotherapy for symptomatic simple renal cortical cysts. *Turkish Journal of Urology*, 1;38(3):149-153. DOI:10.5152/tud.2012.032.
- Schirrer L., Marín-García P. J., Llobat L. 2021. Feline polycystic kidney disease: an update. *Veterinary Sciences*, 8(11):269. DOI: 10.3390/vetsci8110269.
- Shao Q., Xu J., Adams T., Tao S., Cui Y., Shen H., Cao W., Xie J., Fan Y., Zhang Y., Huang M. 2013. Comparison of aspiration-sclerotherapy versus laparoscopic decortication in management of symptomatic simple renal cysts. *Journal of X-Ray Science and Technology*, 1;21(3):419-428. DOI: 10.3233/XST-130393.
- Tavasolian P., Rajabioun M., Sedigh H. S., Azizzadeh M. 2018. Survey of polycystic kidney disease and other urinary tract abnormalities using ultrasonography in Persian and Persian related cats in Iran. *Veterinary Research Forum*, 9(2):99-103. DOI: 10.30466/VRF.2018.29956.
- Van Dyck R., Fina C., Buresova E., Paeppe D., De Wilde H., Daminet S. 2018. Successful management of a solitary simple renal cyst in a dog. *Vlaams Diergeneeskundig Tijdschrift*, 87(3):134-138. DOI: 10.21825/vdt.v87i3.16076.
- Zatelli A., Bonfanti U., D'Ippolito P. 2005. Obstructive Renal Cyst in a Dog: Ultrasonography-Guided Treatment Using Puncture Aspiration and Injection with 95% Ethanol. *Journal of Veterinary Internal Medicine*, 19(2):252-254. DOI: 10.1892/0891-6640(2005)19<252:orci ad>2.0.co;2.
- Zatelli A., D'Ippolito P., Bonfanti U., Zini E. 2007. Ultrasound-assisted drainage and alcoholization of hepatic and renal cysts: 22 cases. *Journal of the American Animal Hospital Association*, 43(2):112-116. DOI: 10.5326/0430112.



## **KONTROLA POLICISTIČNOG OBOLJENJA BUBREGA MAČAKA PRIMENOM PERKUTANE ULTRAZVUKOM VOĐENE ASPIRACIJE**

Reza AZARGOUN, Seyed Mohammad HASHEMI-ASL, Siamak ASRI-REZAEI

### **Kratak sadržaj**

Persijska mačka, ženka, starosti pet godina donešena je kod veterinara na pregled zbog potištenosti, anoreksije i odsustva izmeta. Klinički pregled je otkrio relativno loše opšte zdravstveno stanje. Takođe, azotemija je bila jedan od nalaza analize biohemijskih parametara krvi. Ultrazvučnim pregledom abdomena su bile uočljive anehogene ciste u tkivu oba bubrega, karakteristične za policistično oboljenje bubrega mačaka. Tri nedelje nakon početka potporne terapije, izvršena je perkutana aspiracija sadržaja velikih cista vođeno ultrazvukom. Sadržaj cista je bio hipocelularan i nije sadržao infektivne ili tumorske ćelije. Nakon ponovnog pregleda pacijenta posle 30 dana, klinički i hematološki parametri su značajno poboljšani. Stoga, aspiracija cista vođena ultrazvukom može biti korisna u ublažavanju nekih komplikacija policističnog oboljenja bubrega i poboljšanju kvaliteta života obolelih mačaka. Međutim, poboljšanje je privremeno i ova metoda mora biti periodično ponavljana.

**Ključne reči:** mačka, aspiracija iglom, bubrežne ciste, poremećaj funkcije bubrega, ultrazvuk