# Macroscopical and microscopical findings of polycystic kidney disease in a cat

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**Abstract**

Autosomal dominant polycystic kidney disease (AD-PKD) is a genetic feline disease characterized by fluid-filled cysts formation in one or both kidneys. Persians and Persian-related cats can be affected. A five-year-old male Persian cat weighing 6.5 kg with severe bilateral abdominal swelling was referred to the Clinic**.** Radiography and ultrasonography were performed. Finally, the cat was euthanized due to the severity of clinical signs, and necropsy was performed. Histopathologically, cystic structures filled with eosinophilic material lined by cuboidal or squamous epithelium were seen. Based on ultrasonographic images, clinical, radiological and histopathological findings, this disease was diagnosed polycystic kidney disease.

**Keywords:** Cat, Necropsy, Pathology**,** PKD

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## Introduction

Polycystic kidney disease is a common hereditary disease in human being and is one of the leading causes of end-stage renal disease that is characterized by progressive formation of multiple liquid-filled cysts in kidney (Rahmati-Holasoo *et al.,* 2015). Pathogenesis of cystic lesions of animals is usually congenital or parasitic (Rahmati-Holasoo *et al.,* 2020). Autosomal dominant polycystic kidney disease (AD-PKD) is one of the most common life-threatening inherited disorders in cats, characterized by abnormal fluid-filled cysts formation in one or both kidneys, sometimes, in other organs such as liver and pancreas.

The affected cats exhibit clinical signs, including vomiting, anorexia, fatigue, polyuria and polydipsia (Michel-Regalado *et al.,* 2022). The renal cysts are congenital, can arise from any part of the nephron, are highly variable in number and are initially very small, but tend to increase in size with age (Bosje *et al*., 1998; Norman, 2011; Bilgen *et al.,* 2020; Guerra *et al.*, 2020). The Persian cat is affected by AD-PKD. Other breeds such as the Chartreux, Maine Coon and Neva Masquerade breeds can be affected (Jasik and Kulesza, 2014). Recently, in America and Germany were found that 95-100% respectively of Persian cats diagnosed with polycystic kidney disease (PKD) by ultrasound scanning had the mutation identified by polymerase chain reaction restriction fragment length polymorphism (PCR-RFLP) (Lyons *et al*., 2004; Kappe *et al*., 2005). Clinical findings, radiography, ultrasonography and histopathological examination can guide the diagnosis of disease.

## Materials and methods

In August 2021, a five-year-old male Persian cat weighing 6.5 kg with severe bilateral abdominal swelling and a clinical history of lethargy, anorexia, polyuria, polydipsia and vomiting was referred to the Clinic. Physical examination, blood cell counts, serum biochemistry tests and urinalysis were performed. Cat was restrained by his owner in the awake state and sedated with ketamine (10 mg/kg), administered intramuscularly, and ultrasound examination was performed on cat. Dorsoventral digital radiograph was taken. Finally, the cat was euthanized due to the severity of clinical signs, and necropsy was performed. For histopathological examinations, samples of kidneys and internal organs were dissected and preserved in 10% buffered formalin, dehydrated and embedded in paraffin (with paraffin tissue processor and paraffin dispenser), sectioned at 5 μm, stained with hematoxylin and eosin, and observed with light microscopy.

## Result

Hematology and biochemistry results showed mild leukocytosis, mild anemia and severe azotemia. Dorsoventral radiograph showed bilateral abdominal distention (Fig. 1a). Ultrasonography revealed significant enlargement of both kidneys with multiple anechoic or

hypoechoic cysts (Fig. 1b). At necropsy, on cut surface, the sonographically diagnosed polycystic structure was apparent, and the cystic cavities were contained varying amounts of water-like fluid (Fig. 1c-d). Histopathological examination of the kidneys revealed cystic structures of tubules. The cystic tubules were lined by cuboidal or squamous epithelium and separated by a band of fibrous connective tissue (Fig. 2a-b). Some cysts were filled with eosinophilic and amorphic material (Fig. 2c). Birefringent crystals were observed with polarized and non-polarized light (Fig. 2b, d).

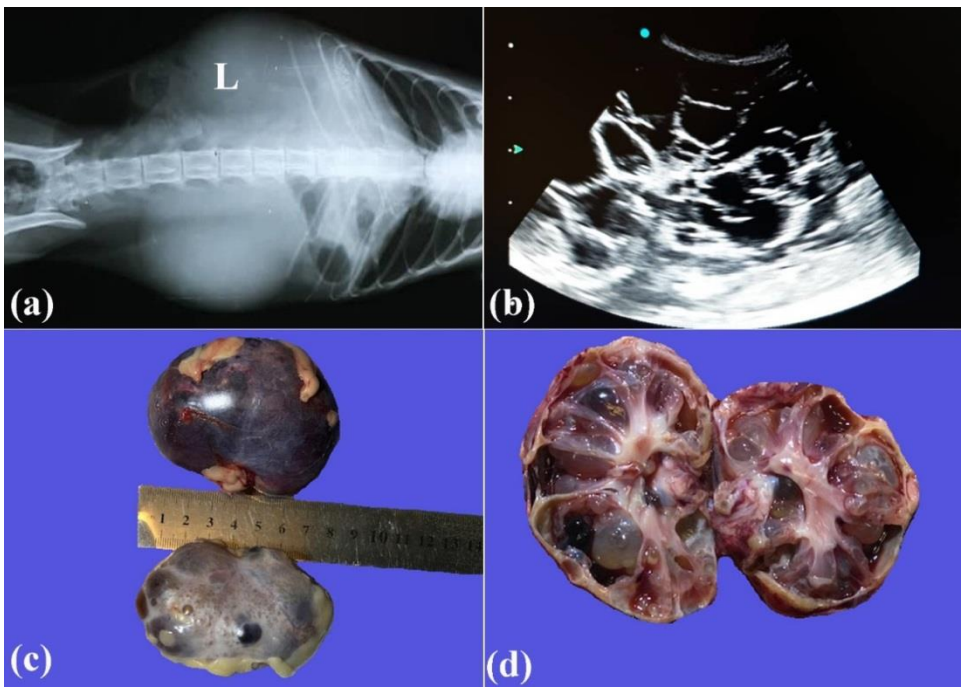


**Figure 1: (a-d) Radiography, ultrasonography and Necropsy findings of polycystic kidney disease in a Persian cat. (a) Dorsoventral digital radiograph showing abdominal distention, left kidney (L), (b) Ultrasonographic image showing multiple fluid-filled cysts of varying size, (c) Gross Appearance of affected kidneys, (d) Numerous variably sized cysts in the cortex and medulla.**

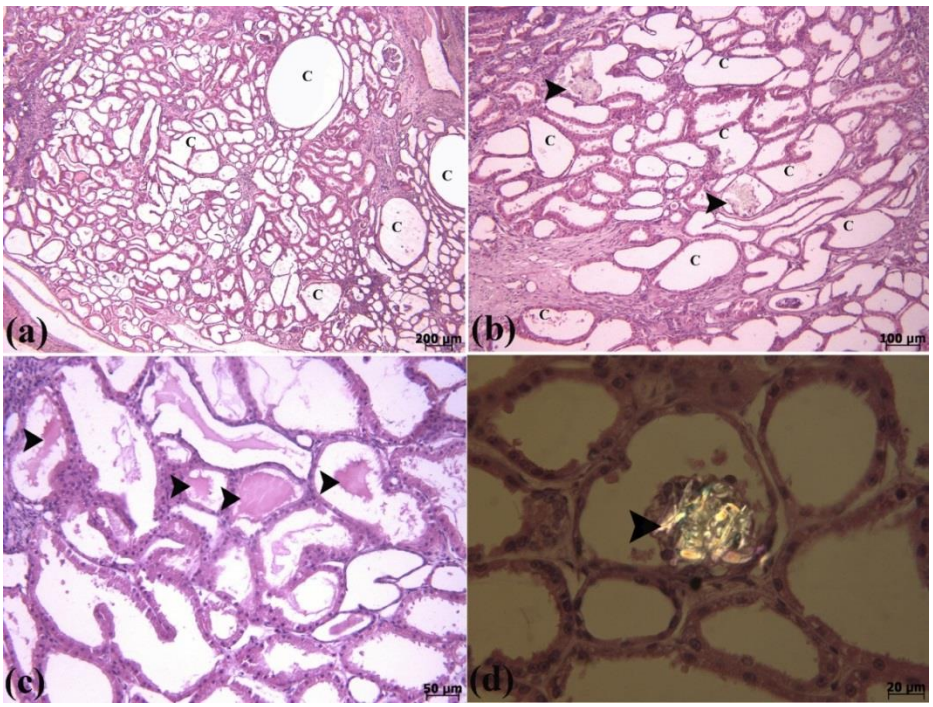


**Figure 2: (a-d) Histopathological findings of polycystic kidney disease in a Persian cat. (a) Multiple cysts (C) of varying size, (b) Some cysts (C) contain crystals (arrowheads), (c) cysts contain proteinaceous material (arrowheads), (d) Note the birefringent radiating crystal (arrowhead) in renal tubule. Polarized light. H&E stain.**

## Discussion

The most important clinical manifestation of PKD in cats is chronic renal failure. As cysts enlarge and increase in size, they compress surrounding normal renal parenchyma and lesions of chronic interstitial nephritis occur. For these reasons, PKD is considered a progressive disease, and the prognosis is guarded (Biller *et al*., 1996; Barrs *et al*., 2001). Ultrasonography is one of the main methods for detection of PKD in human and cat (Chapman, 2007; Domanjko-Petrič *et al*., 2008). Ultrasound as a noninvasive technique is the most commonly used imaging modality for diagnosis of PKD in cat (Guerra *et al*., 2019; Noori *et al*., 2019). Similar to our case, ultrasound was of value in the diagnosis of PKD in a Chartreux cat (Volta *et al*., 2010). Ultrasonographic images, clinical, radiological and histopathological findings in this case are similar to the other studies (Volta *et al*., 2010; Gendron *et al*., 2013; Jasik and Kulesza, 2014; Schirrer *et al*., 2021). In conclusion, the progressive nature of PKD that leads to irreversible renal failure, should raise the interest of veterinarians and breeders of cats that have current or past links with Persians. Although renal cysts may be identified in kittens, their absence does not preclude detection at an older age. In fact, the sensitivity of renal cyst detection by ultrasonography increases with the age, because in affected cats, cysts enlarge with age, and this is an imperative factor in screening and breeding programs. This report points out that PKD should be considered as a

possible cause of renal failure and Persian cats should be included in the screening program of PKD.

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