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2D Ultrasonographic and computed tomography of renal cyst with concurrent chronic kidney disease in two dogs

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Abstract

Renal cysts, which represent the most uncommon structural abnormalities in the kidneys and these cysts are fluid-filled cavities lined with epithelium and can develop singularly or in clusters. A nine-month-old non-descriptive dog was diagnosed as bilateral single renal cortical cyst and 15 month old Doberman dog was diagnosed as bilateral polycystic kidney both were in stage IV chronic kidney disease. A comprehensive assessment was conducted, encompassing clinical examination, hemato-biochemical evaluation, abdominal ultrasonography, and computed tomography. The results were thoroughly discussed in detail. An elevated level of creatinine in a juvenile dog should be considered as one of the potential differential diagnoses, including congenital single renal cyst and polycystic kidney disease.

Keywords: Computed tomography, polycystic kidney and renal cyst

Introduction

Renal cysts, which represent the most uncommon structural abnormalities in the kidneys, encompass a diverse spectrum of conditions, each possessing unique clinical significance. These cysts are fluid-filled cavities lined with epithelium and can develop singularly or in clusters. They may arise from either congenital or acquired factors and can be categorized as either simple or complex based on the presence of cells, bacteria, or fungi (Eissa *et al.*, 2018)^[1]. Renal cysts can be classified as solitary or multiple, inherited or acquired and simple or complicated. The simple cysts do not contain cells, bacteria or fungi (Zatelli *et al.*, 2007)^[8]. Simple renal cysts display distinct ultrasonographic characteristics of a benign lesion, including a well-defined cavity with anechoic content, high distal acoustic enhancement, and crisp demarcation (Nyland *et al.*, 2015)^[4].

Case history and observation

A nine-month-old male non-descriptive dog weighing around 12 kg and 15 month old male Doberman dog weighing around 14 kg was presented to the ultrasound referral unit, Department of Veterinary Clinical Medicine, Veterinary College and Research Institute, Namakkal. Both dogs exhibited symptoms of vomiting, dark coloured diarrhoea, weight loss, lethargy and hyporexia. Clinical examination showed pale mucous membrane, tachycardia and reluctant to move. Detailed clinical examination, haemato-biochemical evaluation, abdominal ultrasonography, computed tomography, systolic blood pressure and urine protein creatinine ratio was done.

Results and Discussion

The haemato-biochemical parameters for both dogs are presented in Table 1. Haematology revealed decrease in the level of haemoglobin, packed cell volume, red blood cells and lymphocytosis in both dogs. Serum biochemistry showed elevated blood urea nitrogen, creatinine, phosphorus and hyperkalemia in non-descriptive dog and hypokalemia in Doberman dog. Similar to what we found in our study, Kim *et al.* (2012)^[3] reported azotemia, Hyperphosphatemia, and non-regenerative anaemia in dogs with severe renal failure.

Urine protein creatinine ratio of non-descript and Doberman was 1.2 and 1.6 respectively. Systolic blood pressure non-descript and Doberman was 140 and 150 respectively. Ultrasonographic examination of non-descriptive dog revealed bilateral, single, thin walled anechoic cyst and left kidney and right kidney size was 1.34 cm and 1.6 cm respectively. Computed Tomography of the abdomen was performed using a 16 slice CT scanner (Toshiba, Alexion) under general anesthesia by positioning in sternal recumbency to rule out renal cyst. CT revealed left kidney had renal cyst with 4 HU and remaining kidney area showed 9 HU. Simple renal cysts are often seen as round or oval lesions on ultrasound examination with anechoic content, distal acoustic amplification, and a thin hyperechoic wall. However, the pathologic implications of unilateral or bilateral renal cysts are yet unknown. Simple renal cysts are varied in size and big cysts have the potential to distort the kidney (Risdon *et al.*, 1998) [6]. Cysts having a diameter of at least 1 cm are clearly seen. When compared to other diagnostic techniques like CT and MRI, ultrasonography is the safest, most accessible, and least intrusive method for diagnosing renal cyst. Based on the biochemical and ultrasonographic examination this case was

diagnosed as bilateral renal cysts with stage IV chronic kidney disease.

Ultrasonographic examination of Doberman dog revealed thin walled with multiple anechoic structures noticed both the kidney and also perinephric cyst noticed in the left kidney. These findings similar to the findings of Sumathi *et al.*, (2019) [7]. However, there have been limited studies conducted to investigate the genetic factors contributing to congenital polycystic kidney disease (PKD) in dogs, with the exception of autosomal dominant polycystic kidney disease, which has been reported in Bull Terriers (O’Leary *et al.*, 2003) [5]. Both dog kidneys showed hyperechoic cortex with indistinct cortico-medullary junction. The left kidney-to-aorta ratio for the non-descript dog was 5.2, while for the Doberman dog was 5.0. These values suggest chronic kidney disease and reduced kidney size. Based on the biochemical and ultrasonographic examination this case was diagnosed as bilateral polycystic kidney with stage IV chronic kidney disease. An elevated level of creatinine in a juvenile dog should be considered as one of the potential differential diagnoses, including congenital single renal cyst and polycystic kidney disease.

Table 1: Haemato-biochemical changes of renal cyst and poly cystic kidney dogs

S. No.	Parameters	Bilateral renal cyst dog	Bilateral polycystic kidney dog	Reference value (Ettinger <i>et al.</i> , 2017) [2]
1.	Haemoglobin (g/dL)	4.1	6.6	12-19
2.	Packed cell volume (%)	15	22.2	37-57
3.	Red Blood Count ($\times 10^6/\mu\text{l}$)	2.1	2.69	5.0-9.0
4.	White Blood Count ($\times 10^3/\mu\text{l}$)	5.46	20.0	5.0-15.0
5.	Platelet Count ($10^5/\mu\text{l}$)	4.40	3.78	1.6-5.1
6.	Neutrophils (%)	12	11	60-75
7.	Lymphocytes (%)	81	82	17-21
8.	Monocytes (%)	7	7	2-10
9.	Total protein (g/dL)	6.0	6.6	5.4-7.1
10.	Albumin (g/dL)	3.0	3.2	2.3-3.3
11.	ALT (U/L)	42	60	10-109
12.	SAP (U/L)	83	94	13-66
15.	BUN (mg/dl)	123	147	8-28
16.	Creatinine (mg/dl)	8.9	15.8	0.5-1.8
17.	Calcium (mg/dL)	7.5	13.4	9-11.7
18.	Phosphorus (mg/dL)	9.6	17.8	2.6-5.3
19.	Glucose (mg/dL)	132	186	65-118
20.	Potassium (mEq/L)	5.7	1.2	3.9-5.1

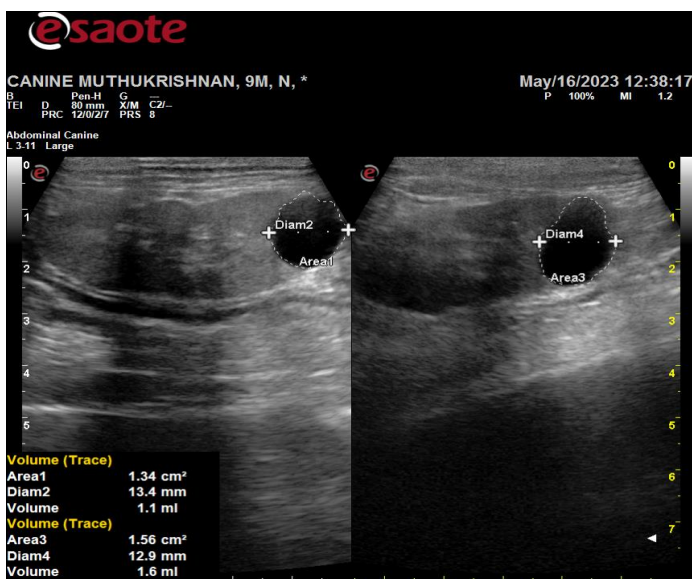


Fig A: Ultrasound of kidney (Sagittal view) bilateral, single, thin walled anechoic cyst present in both kidney **Fig B:** CT image showed cyst attenuation in the left kidney (arrow mark)



Fig C: Ultrasound of kidney (Sagittal view) thin walled multiple cyst

Conclusion

The left kidney-to-aorta ratio for the non-descript dog was 5.2, while for the Doberman dog was 5.0. These values suggest chronic kidney disease and reduced kidney size. Based on the biochemical and ultrasonographic examination this case was diagnosed as bilateral polycystic kidney with stage IV chronic kidney disease. An elevated level of creatinine in a juvenile dog should be considered as one of the potential differential diagnoses, including congenital single renal cyst and polycystic kidney disease

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