Short Communication

Ultrasonographic Changes in Stage II and Stage III of Chronic Kidney Disease in Dogs

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Abstract

Dogs with stage II and stage III of chronic kidney disease were subjected for ultrasonographic examination. Ultrasonographic changes of kidney were observed in 78.13 percent (25 out of 32) and 83.72 per cent (36 out of 43) of CKD stage II and stage III respectively. The major sonography changes observed in stage II and stage III of CKD were altered corticomedullary junction, hyperechoic cortex, reduced renal size, irregular shape and reduced kidney to aorta ration.

Key words: CKD, Dog, Ultrasound Examination

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Introduction

Chronic kidney disease is more common as age advances. It is estimated that more than 1 in 10 dogs will develop kidney disease over a lifetime (Brown, 2015). Normal renal function is vital for excretion of waste products of protein metabolism, acid-base balance and synthesis of erythropoietin. However, the kidneys are constantly exposed to various insults like toxins, oxidative stress and alterations in blood supply. Thus, kidney should adapt to carry out life-supporting functions, unfortunately, when stress is more resulting in acute renal disease or if it is for long duration resulting in CKD. To recognize CKD requires a complete medical history from the pet owner combined with physical examination, renal function tests, urinalysis and renal imaging studies. Renal sonography is an essential tool in nephrology for diagnosis and management of kidney disease. This study was undertaken to record ultrasonography changes in stage II and stage III of CKD.

Material and Methods

Total of 75 dogs in stage II (32) and stage III (43) of CKD were subjected for renal sonography examination. For ultrasonography examination, patch of hair was clipped just ventral to the sub lumbar muscles, just behind the last rib on the left and over the last two intercostal spaces on the right. The skin was prepared by cleaning the area, and an enough quantity of acoustic gel was applied.

Ultrasonography examination of kidney was performed by placing animal either on dorsal or sternal recumbency by using CE Vet-Ultrasound machine supplied by GE Health Care, USA. For small size 3.5 MHz probe, for medium size animal 5.0 MHz and for large dogs 8 MHz probe was used. The right kidney was imaged caudal to right liver lobes, lateral to the caudal venacava and right adrenal gland at the level of L1 to L3 vertebrae and left kidney was imaged caudal to the greater curvature of the stomach, caudo-dorsal to the spleen, later to the aorta and left to adrenal gland at the level of L2 to L4 vertebrae (Armbrust *et al*., 2011).

Results and Discussion

The ultrasonography changes in dogs suffering with CKD stage II and III were presented in Table 1, Fig. 1 and Fig. 2.

Table 1: Ultrasonography changes in dogs suffering with CKD stage II and III

Observations	CKD II (N=32)	CKD III (N=43)	Overall (N=75)
Altered Corticomedullary Junction	43.75 % (14)	65.12 % (28)	56%
Hyperechoic Cortex	65.63 % (21)	81.4 % (35)	74.67%
Reduced Renal Size	40.63 % (13)	67.44 % (29)	56%
Irregular Shape	37.5 % (12)	62.79 % (27)	52%
K/Ao ratio- Right Kidney	5.22 ± 0.16^{aA}	4.98 ± 0.14^{bA}	-
K/Ao ratio- Left Kidney	5.21 ± 0.15^{aA}	4.99 ± 0.15^{bA}	-

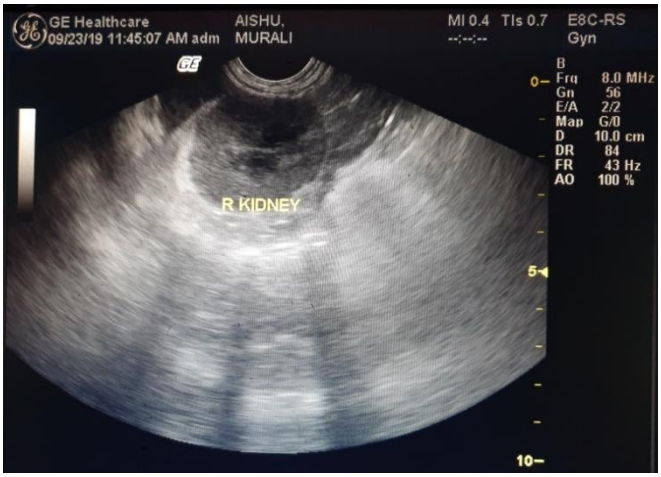

Fig. 1: Round right kidney with altered corticomedullary junction

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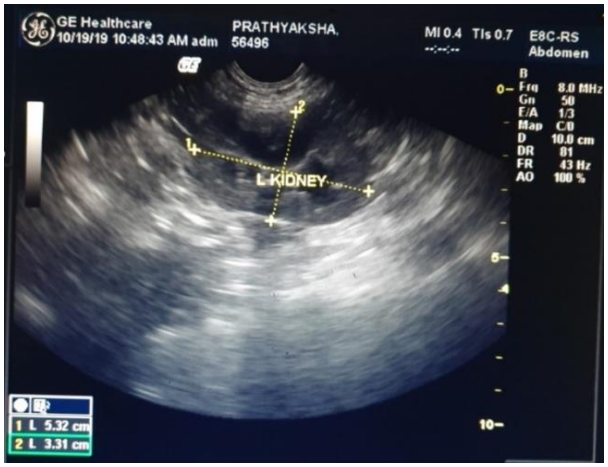

Fig. 2: Altered shape of left kidney with indistinct corticomedullary junction

Ultrasonographic changes like altered corticomedullary junction, hyperechoic cortex, altered renal size and shape were observed in 78.13 percent (25 out of 32) and 83.72 per cent (36 out of 43) of CKD stage II and III respectively. In this study 21.88 percent and 16.28 per cent of CKD stage II and III dogs had normal ultrasonographic observations, but presence of normal ultrasonographic picture does not entirely rule out renal disease (Walter *et al*., 1987). The ultrasonographic changes observed in Stage II of CKD dogs were altered corticomedullary junction in 43.75 percent, hyperechoic cortex in 65.63 percent, reduced renal size in 40.63 percent and irregular shape in 37.5 percent. The ultrasonographic changes observed in Stage III of CKD dogs were altered corticomedullary junction in 65.12 percent, hyperechoic cortex in 81.4 percent, reduced renal size in 67.44 percent and irregular shape in 62.79 percent. These changes are in accordance with observations of Oburai *et al.* (2015) and Ajay and Raj (2018). In stage II of CKD, kidney/aorta ratio of right kidney was 5.22 ± 0.16 and left kidney was 5.21 ± 0.15. There was no significant variation was observed in K/Ao ratio of right and left kidneys of CKD stage II. In stage III of CKD, kidney/aorta ratio of right kidney was 4.98 ± 0.14 and left kidney was 4.99 ± 0.15. There was no significant variation was observed in K/Ao ratio of right and left kidneys of CKD stage III.

Loss of architectural details/ alteration of corticomedullary junction and hyperechoic cortex are significant feature of chronic renal disease in dogs, which occurs due to gradual loss of nephrons over a period of time (Felkai *et al.*, 1992). In healthy animals, normal K/Ao ratio ranges from 5.5 to 9.1, if the K/Ao ratio is below 5.5, is considered as renal size is reduced (Mareschal *et al.*, 2007). As CKD progresses visible structural changes in ultrasound examination becomes more prominent.

Conclusion

In CKD stage II and III altered corticomedullary junction architecture, hyperechoic cortex, reduced renal size (K/Ao Ratio) and irregular shape kidney are the prominent changes observed in ultrasonography examination.

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References

1. Ajay, K. and Raj, D. (2018). Diagnosis and therapeutic management of renal failure in dogs. PhD Thesis, CSKHPKV, Palampur.
2. Armbrust, L.J., Biller, D.S., Hoskinson, J.J., Meier, H.T. and Lora-Michiel, S.M. (2001). The basics of renal ultrasonography. *Vet. Med*., 96: 114-133.
3. Brown, S.A. (2015). Renal Dysfunction In Small Animals. The Merck Veterinary Manual. https://www.merckvetmanual.com/urinary-system/noninfectious-diseases-of-the-urinary-system-in-small-animals/renal-dysfunction-in-small-animals.
4. Felkai, C.S., Voros, K., Vrabely, T. and Karsai, F. (1992). Ultrasonographic determination of renal volume in the dog. *Vet. Radiol. Ultrasound*, 33(5): 292-296.
5. Mareschal, A., D'anjou, M.A., Moreau, M., Alexander, K. and Beauregard, G. (2007). Ultrasonographic measurement of kidney-to-aorta ratio as a method of estimating renal size in dogs. *Vet. Radiol. Ultrasound*, 48(5): 434-438.
6. Oburai, L.N., Vaikunta Rao, V. and Naik, B.R. (2015). Clinical and nephrosonographic findings in canine chronic renal failure: A prospective study. *IOSR J. of Agri. Vet. Sci.* 8(6): 11-16.
7. Walter, P.A., D.A. Feeney, G.R. Johnston and T.P. O'leary. (1987). Ultrasonographic evaluation of renal parenchymal diseases in dogs: 32 cases (1981-1986). *Journal of American Veterinary Medical Association*, 191:999-1007

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