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Renal pathology associated with visceral gout in ducks#

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Abstract

Visceral gout is a metabolic disease of birds characterized by deposition of urate crystals in visceral organs. Though occurrence of visceral gout is common in chicken, reports from ducks and descriptions of its renal pathology are scarce. The present study describes visceral gout in Kuttanad duck, a native breed and in a White Pekin duck. A Kuttanad and a White Pekin duck of about one and a half years of age and reared under intensive system and brought for postmortem examination to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Pookode formed the material for the study. Grossly, visceral organs such as kidney, liver and heart showed diffuse deposition of chalky white material on the surfaces. Ureters were dilated and engorged with urate crystals. Histologically, kidney revealed extensive degeneration of epithelial cells of proximal and distal convoluted tubules with urate crystals in the lumen. Characteristic lesions noticed in kidneys of both cases were glomerular sclerosis, severe interstitial fibrosis causing tubular atrophy and mild infiltration of mononuclear inflammatory cells in the interstitium. This chronic lesion in kidney might be the primary reason for impaired uric acid excretion and deposition of uric acid crystals in various internal organs of the ducks.

Keywords: *Visceral gout, duck, renal interstitial fibrosis, glomerulosclerosis*

Visceral gout is an important metabolic disorder characterized by deposition of uric acid as chalky white crystals in various internal organs. Outbreaks of visceral gout have been reported worldwide among commercial broiler chickens (Nayak *et al*., 1988) as well as in native chicken (Mudasir *et al*., 2017) and may result in heavy mortality in the flock even up to 40 per cent in young chicks (Bulbule *et al*., 2013). Even though the occurrence of gout is common in chicken, reports from ducks are very scarce (Ravikumar *et al*., 2019). Further, pathological changes in

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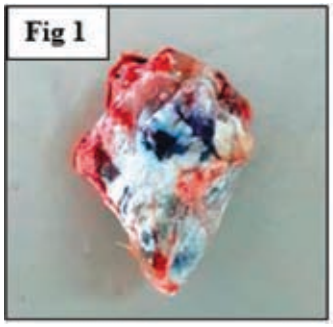

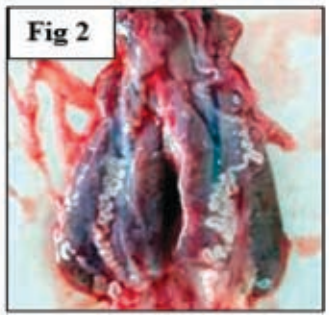

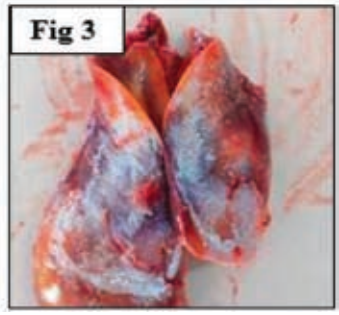

Deposition of white chalky material **Fig. 1.** Pericardium **Fig. 2**. Kidneys **Fig**. **3**. Liver

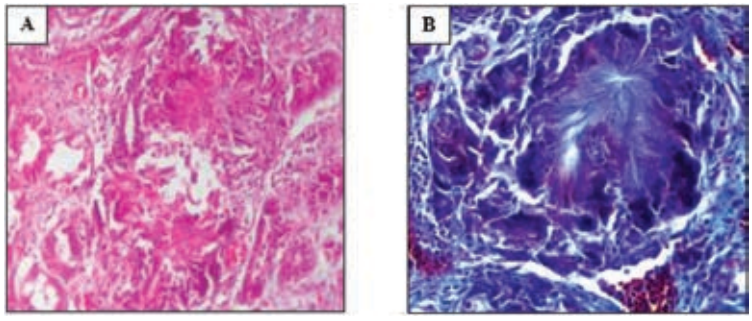

Fig. 4. Degeneration of tubules with needle like crystals in the lumen surrounded by inflammatory cells. H&E 400X (**A**), Masson's trichrome 400x (**B**).

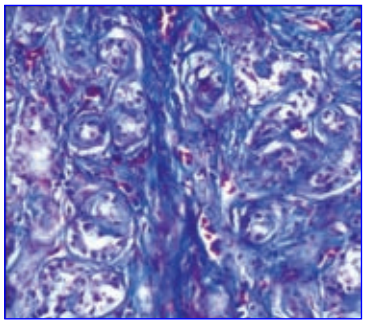

Fig. 5. Interstitial fibrosis, Masson's trichrome 100x

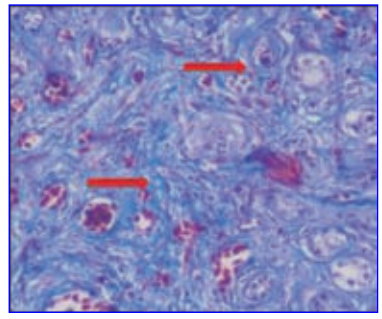

Fig. 6. Atrophy of kidney tubules (Arrows) by proliferating fibrous tissue (blue stained) Masson's trichrome 40x

kidneys associated with visceral gout in ducks are rarely detailed. The present study describes visceral gout in ducks and the characteristic chronic histopathological lesions in kidneys.

Duck carcasses were subjected to detailed post mortem examination, gross lesions were recorded and samples for histopathology were collected in 10 per cent Neutral buffered formalin (NBF). The tissues were processed by paraffin embedding, sectioned at 5µm thickness and stained with routine haematoxylin and eosin (H&E) method. Special staining of kidney sections with Masson's trichrome was

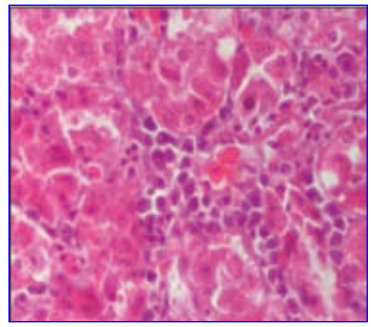

Fig. 7. Mononuclear cell infiltration in interstitium, H&E 1000X.

performed as per protocol described by Luna (1968).

Gross examination revealed diffuse deposition of chalky white material on pericardium (Fig. 1), kidneys (Fig. 2) and liver (Fig. 3). The kidneys were characterised by atrophy of cranial lobes and compensatory hypertrophy of caudal lobes. Mottling of kidneys due to dilatated and engorged tubules with chalky white material (Fig. 2) were evident. Gross lesions were similar to lesions reported by Ravikumar *et al*. (2019) in ducks. Histologically, kidney revealed extensive degenerative changes in epithelial cells of proximal convoluted tubules (PCT) and distal convoluted tubules (DCT) with presence of needle like crystals in the lumen (Fig. 4). Severe interstitial fibrosis confirmed by Masson's trichrome staining (Fig. 5) causing atrophy of many PCTs and DCTs (Fig. 6) were evident. Multifocal areas of infiltration with mononuclear cell in the interstitium (Fig. 7) were also observed. Glomeruli showed atrophy and sclerotic changes in multiple areas. Histopathological changes in kidneys of birds with gout were reported earlier by different authors in chicken (Lakkawar *et al*., 2018; Sathiyaseelan *et al*., 2018) and in duck (Ravikumar *et al*., 2019) which includes tubular degeneration, necrosis, needle like crystals in the lumen and inflammatory cell infiltration. Unlike the previously described histological lesions, fibrous tissue proliferation was a unique and prominent finding in the present study pointing out the chronicity of lesion in kidney that would have resulted in gout development.

Gout in birds has multifactorial etiology. Dehydration due to inadequate water intake (Pollock, 2006), increased dietary calcium and crude protein (Eldaghayes *et al*., 2010) are the common cause of avian gout. But possibility of such etiology is very less in the present case as the farm provided balanced diet and ad-libitum water. Both the cases occurred in winter months (January and February). Singh *et al*. (2013) reported a higher occurrence of gout in chicken during winter months citing possibility of reduced dissolution of uric acid in cold temperature. Mortality in the present study occurred in adult ducks, which was contradictory to the observations of Wideman and Cowen (1987) and Mallinson *et al.* (1984) who observed increased mortality in chicks.

Histological findings of kidney in the present study indicate chronic kidney lesions such as interstitial fibrosis, tubular atrophy and glomerulosclerosis. Hence the etiology of gout in the present study could be attributed to primary kidney damage which might have resulted in impairment of uric acid excretion and deposition of urate crystals in the visceral organs. Causes of renal sclerosis could be age related or chronic irritation. Further study is needed to elucidate the causes for renal sclerosis in ducks.

Summary

The pathological changes associated with visceral gout in ducks have been discussed. The present study has revealed characteristic sclerotic changes in interstitium and glomeruli of kidneys with visceral gout and point out the possibility of chronic kidney damage resulting in visceral gout.

Conflict of interest

The authors declare that they have no conflict of interest.

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