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PATHOMORPHOLOGY OF PRESUMPTIVE POISONOUS SNAKE ENVENOMATION IN TWO FEMALE ADULT GERMAN SHEPHERDS IN ZARIA, NIGERIA - CASE REPORT

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Abstract
Snakebite is an important medical and veterinary problem but often overlooked in Nigeria with many health institutions yet to become aware of the magnitude of this problem. Despite its clinical significance, there is little published information on the pathomorphology of snake envenomation in Zaria, Nigeria. We report the gross and microscopic lesions associated with presumptive snakebite envenomation in two German shepherds. The prominent gross lesions in both cases included punctured site, multicavitary serosanguineous effusions, and localized oedema in the regions of the presumed bite wounds. Histopathology revealed coagulative hepatocellular necrosis and acute renal tubular necrosis in both cases. The case was diagnosed as snake bite based on the history, gross and microscopic changes. This report provides valuable veterinary pathological diagnostic information on snake bite.

Key: Snake bites, German shepherds, Gross lesions, Histopathology

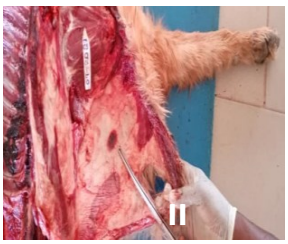
Introduction

Snake envenomation is one of the common accidental emergency cases encountered in companion animals including dogs, in many countries (Padula *et al.,* 2018; Boller *et al.,* 2020). There are 2,500-3,000 species of snake distributed worldwide out of which, about 500 are venomous (Mathew and Gera, 2005). Form the 500 identified venomous snakes, 25 are known to cause mortality in Africa. In Nigeria, the most common venomous snakes of medical and veterinary importance are the Elapids and the Vipers including the *Naja melanolema* (black cobra), *Naja nigricolis* (spitting cobra), *Viperid echis carinatus* (carpet viper) and *Bilis asietaurs* (puff adder) (Habib *et al.,* 2001; Eric *et al.,* 2002; Omogbai *et al.,* 2002). However, studies in Zaria, Nigeria have shown that snake envenomation are mainly caused by Spitting Cobra and Carpet Viper (Aguiyi *et al.,* 1999). Most cases of snake bite had been encountered in animals with higher prevalence in dog and horse (Garg, 2000). Snake venoms contain complex mixtures of enzymes, glycoprotein, lipids, histamine, serotonin, acetylcholine and catecholamine, that appeared to have more lethal effects in snakebite's victim (Alder and Kraig, 2002; Joshua *et al.,* 2010). Garg, (2000) and Klaassen, (2008) opined that typical clinical signs include vomition, frothy/ foamy salivation, tingling of limbs and head, swelling and pain at the affected parts, puncture wounds or fang marks on bitten area. An immediate constant attention is required for relive from the condition otherwise delayed and improper treatment may culminate to grave prognosis. There is little or no reports regarding pathomorphological changes following presumptive snake bites in dogs in Zaria and environ.

Case Report

The carcasses of 1½ (case 1) and 2½ (case 2) -year old females German shepherds were presented for necropsy at the Department of Veterinary Pathology, from the Veterinary Teaching Hospital (VTH), Ahmadu Bello University (ABU), Zaria on the 5th February and 8th April, 2021, respectively. History revealed that the two dogs were suddenly found recumbent, weak with dilated pupils, bloody/dark urine, irregular bleeding (from the nose and anus) and respiratory distress. Case 1 died on arrival to the VTH while case 2 died few hours upon supportive therapy. History further revealed that the dogs were alerts, apparently healthy a day prior to their presentations and were always caged especially in the day time, and had complete vaccination and deworming history. Postmortem (PM) examination revealed; Good body conditions, pale ocular and buccal mucous membranes, inflamed submandibular lymph nodes, bite sites on the left lateral abdominal region of the skin which penetrate down to the subcutis with diameters 0.8 to 3 cm (Plate I). Left ventricular hypertrophy (Plate III), severe frothy exudate in the

trachea and lungs, severe congestion and haemorrhagic lungs (Plate IV) with leaking serosanguineous foamy fluid on cut surfaces (indicative of pulmonary oedema). The livers were severely enlarged, congested and firm with gritty sound on cut (Plate V). Multi-focal haemorrhagic areas and congestion were observed on the spleens (Plate VI), haemorrhagic gastro intestinal tract with ulceration of the mucosal surface of the pyloric part of the stomach and the cranial part of the duodenum (Plate VII). The kidneys were bilaterally and uniformly enlarged with dark red to black colouration (indicating severe pigmenturia) (Plate VIII). In addition, case1 had sloughing and ballooning gastric mucosa, while case 2 had in addition, wooden pegs in the empty stomach. Microscopic examination revealed Zenkers degeneration and congestion in the heart, congestion, haemorrhges and generalized oedema in the lungs, congestion, haemorrhagic areas and coagulative necrosis of the the hepatocytes, congestion of the blood vessels within the submucosa and muscularis mucucosa, haemorrhages in the intervilli, cript of liberkuhn that involve the intestinal gland and degeneration of the intestinal villi. The kidney revealed congestion and coagulative necrosis of the the glomeruli and renal tubules. Diagnosis of snake envenomation was made on the basis of the pathomorphological findings. The case was diagnosed as snake bite based on the history, general physical examination, PM changes and microscopic findings.



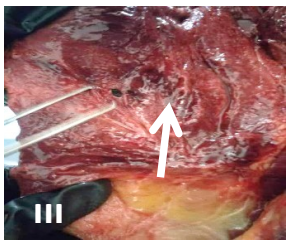
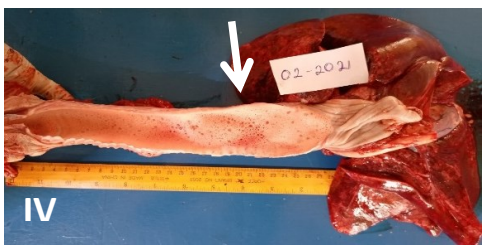
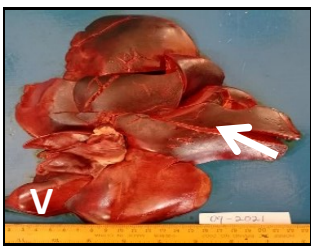


Plate I: Ia, Photograph of the skin of the dog (case II), note the sites of the bites (arrows). Ib, Site of bite at the subcutinous muscle (poiter). Plate II: Photograph of subcutenous muscle of the dog (case I), note the site of bite (tip of thumb forcep) with diffuse muscular hemorrhagic and gelatinous oedematous areas. Plate III: Photograph of heart of the dog (case I) showing Left ventricular hypertrophy (arrow).





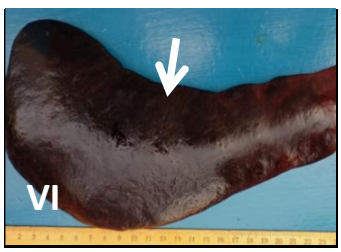


Plate IV: Photograph of the trachea and lungs of the dog (case I) with frothy exudate within the trachea (arrow), congested and haemorrhagic lungs. Plate VI: Photograph of the liver of the dog (case I), note the severe congestion and hepatomegaly (arrow). Plate VI: Photograph of the spleen of dog (case I), note the congested and enlarged spleen (splenomegaly) (arrow).

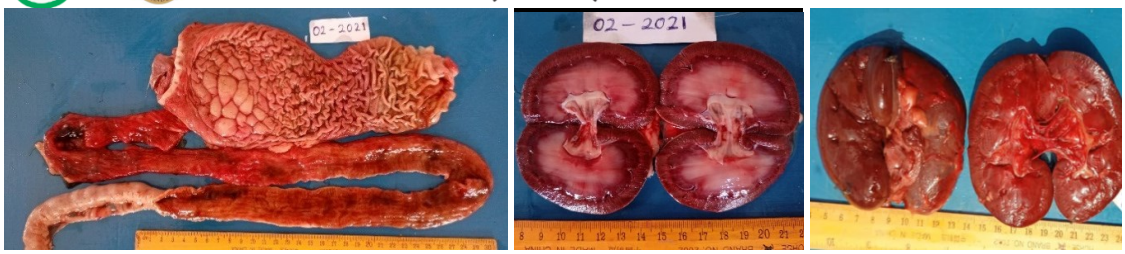


Plate VII: Photograph of the gastrointestinal tract (G.I.T.) of dog (case I), note the haemorrhagic gastroenteritis (arrows), corrogation and sloughing of the gastric mucusae (arrow head). Plate VII: VIIIa, Photograph of kidneys of dog (case I), note the enlargement and congested corticomedullary junction (arrow). VIIIb, Photograph of kidneys of the dog (case II), note enlargement and renal congestion.

Plate IX (case I): **a,** Photomicrograph of heart of the dog showing Zenkers degeneration (arrow) and congestion (arrow head). H&E stain x 200. **b,** Photomicrograph of the lungs of dog showing congestion (arrow), haemorrhges and generalized oedema (arrow head). H&E stain x200. **c,** Photomicrograph of liver of the dog showing congestion (arrow), haemorrhagic areas and coagulative necrosis of the the hepatocytes (arrow head). **d,** Photomicrograph of intestine of the dog showing severe congestion of the blood vessels within the submucosa and muscularis mucucosa (arrow), haemorrhages (arrow head) at the intervilli, cript of liberkuhn that involve the intestinal gland, degeneration of the intestinal villi. H&E stain x200. H&E stain x200. **e,** Photomicrograph of kidney of the dog showing congestion (arrow) and coagulative necrosis of the the glomeruli and renal tubules. H&E stain x200.

Discussion

Previous snakebite investigations in dogs and cats highlighted that 78% of envenomation occurred in rural and 22% in urban areas (Mirtschin *et al.,* 1998). There were striking similarities in the pathology of the two cases. The observed dilation of the pupils indicates neurological effects of the venom on the nervous system. Snakes' venoms have been reported to have neurotoxic (Hart *et al.,* 2013), haemolytic (Vaughan *et al.,* 1981), anticoagulant and procoagulant effects (Lane *et al.,* 2011), greatly increasing the risk of bleeding to death. The observed intense, gelatinous, and yellowish serous hemorrhagic eodema with coagulated blood seen at the site of bites, were also supported by the findings of Berrocal *et al.* (1998); Bicudo (1999); Ferreir Junior (2002). The muscular weakness could be due to the presence of hyaluronidase enzyme in the snake venom (Klaassen, 2008; Thangamani *et al.,* 2018). Cardiac lesions may be due to a triggered cardiac arrhythmias as reported by Lervik *et al.* (2010). Manifestations in other organs were generalized pulmonary emphysema, hemorrhagic areas in the epicardium, miocardium, endocardium, lungs, GIT, and kidneys were similar to previous reports by Chugh et al. (1975); Berrocal *et al.* (1998). Similar renal lesions were reported following bites from Vipers, Echis carinatus (Sitprija and Boonpucknavig, 1979; Chugh *et al.,* 1984) and puff adder (Warrell *et al.,* 1975). The microscopic changes reported conform to variable lesions reported by Date and Shastry (1988); Fonteque *et al.* (2001); Ferreir Junior (2002) who observed severe congestion and hemorrhage in most organs, acute tubular necrosis, acute interstitial nephritis, glomerulonephritis and renal necrosis following snakes' bite. Among patients hospitalized with snake bite in Nigeria, the incidence of acute renal failure was approximately 1% after Echis carinatus poisoning, and 10% following puff adder bites (Warrell *et al.,* 1975).

Conclusion

Snake bite is an important medical condition in our environment. To the best of our knowledge, pathology of snake envenomation in companion animals is rare in Zaria and its environ. This report provides valuable veterinary pathological diagnostic information on snake bite. Snake envenomation should be considered as a cause of multicavitary effusion, congestion and haemorrhages, respiratory and neurological disorders in dogs. Based on our findings, we recommend that suspected snake envenomation should be handled promptly and manage with polyvalent antivenom as a preference to

monovalent antivenom. Other symptomatic management should be employed to arrest the undesired manifestations and death of animals and possibly humans, sequel to snake bite envenomation. Bushes should be cleared around residences and close monitoring of dogs in addition to prompt report of any suspicious casess to the nearest veterinary clinics or VTH.

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