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Sudden Death Associated with Acute Hepatic Rupture in A 3-Year-Old Cane Corso Dog Following a Breeding Attempt

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* Author for Correspondence: christianchukwudi007@gmail.com.**ABSTRACT**

This case report describes the sudden death of a 3-year-old Cane Corso bitch following an unsuccessful breeding attempt, attributed to acute hepatic rupture with resultant fatal hemoperitoneum. The dog, weighing 42 kg, was presented for necropsy after collapsing and dying shortly after a forced mating encounter during which she was non-receptive to the stud. Postmortem examination revealed approximately two litres of unclotted blood within the peritoneal cavity, with a packed cell volume (PCV) of 43% in the effusion, confirming acute haemorrhage. Vulvar abrasions suggested traumatic manipulation during the breeding attempt. Histopathological evaluation of the liver revealed severe macrovesicular hepatic lipidosis characterized by marked intracytoplasmic vacuolation of hepatocytes, thinning of hepatic cords, and multifocal hepatocellular necrosis. These findings indicate underlying hepatic pathology that likely compromised hepatic integrity and predisposed the organ to rupture. Additional findings included marked left ventricular hypertrophy, pulmonary congestion, and thymic ecchymoses, consistent with agonal changes secondary to hypovolemic shock. This case highlights the multifactorial aetiology of hepatic rupture in breeding dogs, wherein physical trauma during mating may precipitate rupture in a liver already rendered fragile by pre-existing lipidosis. Furthermore, it emphasizes the need for careful breeding management, particularly in large breeds such as the Cane Corso, where physical exertion during mating may have fatal consequences in the presence of underlying disease.

Keywords: Acute hepatic rupture, hemoperitoneum, sudden death, cane corso, hepatic lipidosis, canine reproduction**INTRODUCTION**

Hepatic rupture is an uncommon but life-threatening emergency in dogs, characterized by disruption of the hepatic parenchyma or capsule, often resulting in fatal haemorrhage into the abdominal cavity. The liver, being a highly vascular organ, is susceptible to rupture from a variety of causes, including blunt abdominal trauma, hepatic neoplasia, amyloidosis, severe hepatic congestion, and, rarely, spontaneous rupture in the absence of identifiable antecedent events (Saviano *et al.*, 2022). In most instances, rupture results in death from haemorrhage, although small capsular breaks may occasionally heal. Trauma remains the most frequently reported cause of hepatic rupture in dogs, with common scenarios including road traffic accidents, falls from heights, bite wounds, and the so-called "big dog/little dog syndrome" where a larger animal inflicts blunt force on a smaller one (Davros *et al.*, 2023).

The Cane Corso is a large, muscular breed of Italian origin, historically used as a guardian and hunting dog. While generally robust, the breed is not immune to reproductive complications. Unsuccessful breeding attempts,

particularly when accompanied by significant physical exertion, stress, or aggression, may subject the dam to abdominal trauma sufficient to injure a friable or enlarged liver. The presence of hepatic lipidosis, which has been reported to cause spontaneous liver rupture in certain breeds, should also be considered as a potential predisposing factor in cases of periparturient or breeding-associated hepatic haemorrhage (Webb, 2018). Liver ruptures often result in haemorrhage into the peritoneal cavity (hemoperitoneum), and depending on the degree and duration of rupture there is consequent hypovolemic shock and death of the animal (Maxwell *et al.*, 2014; Padmanabhan *et al.*, 2024).

Prevention of hepatic rupture in breeding dogs' hinges on several key strategies. First, a thorough pre-breeding health evaluation, including serum biochemistry and abdominal ultrasonography, should be performed to identify underlying hepatic disease that may predispose to rupture. Second, breeding should be conducted in a controlled environment to minimize the risk of trauma from excessive physical exertion, aggression, or falls. Third, careful

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breeding management, including accurate timing of mating relative to ovulation, can reduce the number of unsuccessful breeding attempts and the associated stress and physical strain. Finally, in bitches with known hepatic pathology or a history of reproductive complications, alternative breeding strategies such as artificial insemination should be considered.

This case report describes an unusual instance of acute hepatic rupture in a Cane Corso bitch following an unsuccessful breeding attempt, highlighting the potential for reproductive activity to precipitate severe hepatic haemorrhage and underscoring the importance of pre-breeding screening and careful breeding management in high-risk breeds such as the Cane Corso.

CASE PRESENTATION

Case History

The 3-year-old female Cane Corso dog named Nicki which was thought to be on heat was introduced to a stud for mating. However, she was not receptive to the stud which resulted in forceful attempts at mating. Shortly afterwards, the bitch collapsed and died. Weighing 42kg, she had previously given birth to 10 puppies, although the timing of this whelping relative to the current incident was not specified by the owner who consented to a necropsy examination to determine the cause of sudden death.

Gross Postmortem Findings

The carcass was fresh and in good body condition. There was bloody discharge from the oral cavity and nostrils. A few *Rhipicephalus sp.* ticks were present on the skin, and there were multiple linear abrasions on the vulva (Figure 1). The tracheal lumen contained copious froth, and the lungs were wet, heavy, and congested, especially the caudal lobes. The left ventricular wall was markedly thickened (approximately 5x normal), and there were multiple ecchymotic haemorrhages on the thymus. There were approximately 2 litres of unclotted blood in the peritoneal cavity. The liver was severely enlarged, congested, and friable, with multiple ruptures on the right and left lobes (Figure 2), as well as a few hematomas on the capsular surface. The spleen was shrunken, consistent with acute sympathetic contraction in response to haemorrhagic shock. The gastrointestinal mucosa was moderately hyperaemic.

Laboratory Findings

Vaginal cytology revealed a reddish background with numerous red blood cells (likely from vulvar abrasions), approximately 90% large superficial nucleated epithelial cells, and 10% neutrophils, consistent with pro-oestrus. The Packed cell volume (PCV) of the peritoneal effusion was 43%, confirming that the fluid was fresh whole blood (hemoperitoneum). Peripheral blood PCV was not available for comparison.

Histopathological Findings

Haematoxylin and Eosin (HandE) stained section of the liver showed severe intracytoplasmic vacuolation of hepatocytes (predominantly macro vesicular lipidosis), thinning of the hepatic cords, and focal areas of hepatocellular necrosis (Figure 3).

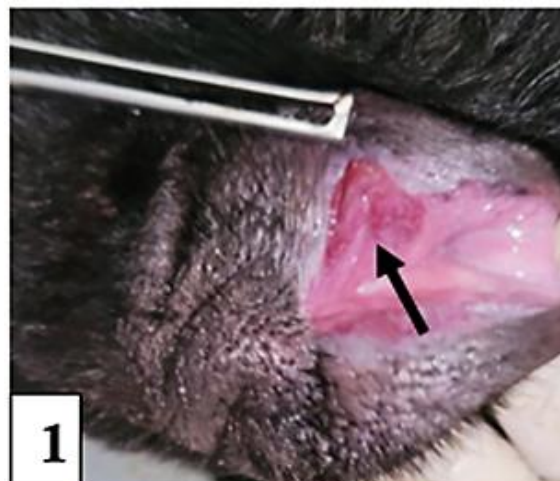


Figure 1: Vulva with multiple abrasions and haemorrhages (arrow)

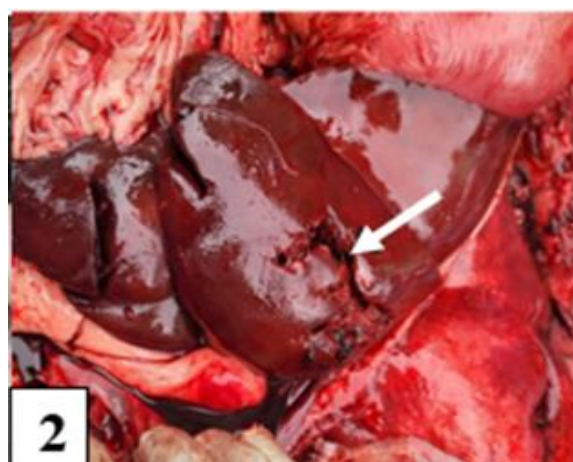


Figure 2: Liver showing site of rupture (arrow)

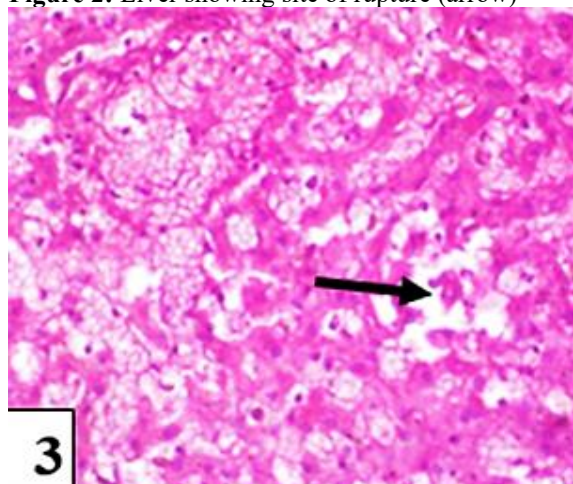


Figure 3: Liver; HandE ×400 showing severe intracytoplasmic vacuolation of hepatocytes (hepatic lipidosis), with foci of hepatocellular necrosis (arrow)

DISCUSSION

The acute hepatic rupture observed in this case represents a fatal complication that most likely resulted from the interaction of physical trauma during the breeding attempt and pre-existing hepatic pathology. While vulvar abrasions provide evidence of significant physical manipulation during mating, the absence of detectable external abdominal trauma such as rib fractures, contusions, or

bruising of the abdominal wall raises the question of whether the hepatic rupture resulted directly from external force or occurred spontaneously in a predisposed liver. The histopathological finding of severe macrovesicular hepatic lipidosis is particularly significant, as this condition is known to increase hepatic fragility, potentially allowing rupture to occur with minimal external force or even spontaneously under physiological stress.

The volume of haemorrhage observed in this case, approximately two (2) litres of unclotted blood in the peritoneal cavity is consistent with fatal haemorrhagic shock. In a 42 kg adult female Cane Corso, the estimated total blood volume is approximately 3.1 to 3.5 litres, based on the standard canine blood volume range of 80–90 mL/kg (Silverstein and Hopper, 2015). Thus, the observed haemorrhage represents approximately 57–65% of total blood volume, well exceeding the 30–40% acute blood loss threshold typically associated with fatal hypovolaemic shock in dogs (Silverstein and Hopper, 2015). The presence of unclotted blood in the peritoneal cavity suggests acute, rapidly fatal haemorrhage, as delayed bleeding would have resulted in clot formation and subsequent fibrinolysis. Furthermore, the absence of widespread petechial or ecchymotic haemorrhages beyond the thymus militates against a primary coagulopathy, although coagulation studies were unfortunately not performed.

The pulmonary congestion, tracheal froth, and thymic ecchymoses observed at postmortem are consistent with agonal changes secondary to hypovolaemic shock and terminal hypoxia (Maxwell *et al.*, 2014). The marked thickening of the left ventricular wall, approximately five times normal dimensions, is an incidental but noteworthy finding. While this may represent physiological cardiac hypertrophy commonly observed in large, athletic breeds, it could also indicate underlying cardiovascular disease that may have compromised the animal's haemodynamic reserve and capacity to compensate for acute blood loss (Janik *et al.*, 2025). However, without antemortem cardiac evaluation, the clinical significance of this finding remains speculative.

Hepatic lipidosis, characterized by excessive accumulation of triglycerides within hepatocytes, is a well-recognized cause of hepatic dysfunction and fragility (Webb 2018). The condition may be primary or secondary to various metabolic and nutritional disturbances, including obesity, diabetes mellitus, hyperadrenocorticism, and nutritional imbalances (Stockhaus *et al.*, 2019). In this case, the severe macrovesicular lipidosis identified histologically likely rendered the liver enlarged, friable, and susceptible to rupture. While the owner did not report a history of liver disease, subclinical hepatic lipidosis can remain asymptomatic until a precipitating event such as trauma, stress, or reproductive activity triggers rupture. Studies have demonstrated that hepatic lipidosis can significantly impair hepatic architecture, with hepatocyte vacuolation and cellular swelling increasing intrahepatic pressure and compromising the integrity of the hepatic capsule (Bandara *et al.*, 2021). Additionally, lipid-laden hepatocytes are more susceptible to ischaemic injury and necrosis, as observed in this case, further weakening the hepatic parenchyma.

The Cane Corso breed, while generally robust, may have specific predispositions relevant to this case. As a large, powerful breed with a high muscle mass and intense physical activity during breeding, Cane Corso dogs may be at increased risk of abdominal trauma during mating, particularly when the female is non-receptive. The forced mating attempt in this case likely subjected the bitch to significant physical strain, potentially including compression or torsion of the abdomen, which may have been sufficient to rupture a liver already compromised by lipidosis. While breed-specific hepatopathies are not well-documented in the Cane Corso, studies have suggested that breed-related factors may influence susceptibility to hepatic disease (Watson, 2017). The combination of large body size, high activity levels, and potential genetic predisposition warrants further investigation in this breed.

Reproductive factors may have also contributed to the outcome. The bitch was in pro-oestrus, as confirmed by vaginal cytology showing approximately 90% superficial nucleated epithelial cells. While there is no direct physiological link between pro-oestrus and hepatic fragility, hormonal changes associated with the oestrous cycle may influence vascular permeability and tissue elasticity (Kustritz, 2018). Additionally, the behavioural non-receptivity typical of pro-oestrus likely contributed to the forceful nature of the breeding attempt, increasing the risk of physical trauma. The previous successful whelping of 10 puppies, while not temporally specified, may have contributed to nutritional depletion or metabolic stress, potentially predisposing to hepatic lipidosis (Stockhaus *et al.*, 2019).

Differential diagnoses for hemoperitoneum in dogs include splenic rupture (from neoplasia or trauma), hepatic neoplasia (hemangiosarcoma, hepatocellular carcinoma), anticoagulant rodenticide toxicity, coagulopathies, and traumatic injury (Maxwell *et al.*, 2014; Padmanabhan *et al.*, 2024). In this case, the liver was clearly identified as the source of haemorrhage, and no splenic masses, neoplasms, or other intra-abdominal lesions were identified at necropsy. The absence of widespread haemorrhagic diathesis makes a primary coagulopathy less likely, although the lack of coagulation testing remains a limitation of this report. The presence of *Rhipicephalus* ticks, while noteworthy, is unlikely to have been directly contributory, as tick-borne diseases typically cause chronic rather than acute haemorrhage.

The prevention of hepatic rupture in breeding dogs requires a multifaceted approach. Comprehensive pre-breeding health evaluation should include serum biochemistry to assess hepatic enzyme activities, bile acids, and other markers of hepatic function, as well as abdominal ultrasonography to evaluate hepatic size, echotexture, and the presence of structural abnormalities (Schaeffer *et al.*, 2015). Early identification of subclinical hepatic lipidosis or other hepatopathies would allow for dietary modification, weight management, and other interventions to reduce the risk of rupture. Breeding should be conducted in a controlled environment to minimize the risk of trauma from excessive physical exertion, aggression, or falls. Accurate timing of mating relative to ovulation can reduce the number of unsuccessful breeding attempts and the associated stress and physical strain (Goodman, 2001). In

bitches with known hepatic pathology or a history of reproductive complications, alternative breeding strategies such as artificial insemination should be considered to avoid the physical demands of natural mating.

In conclusion, the acute hepatic rupture in this Cane Corso dog during a breeding attempt was likely multifactorial, with significant contributions from underlying hepatic lipidosis, physical trauma during a forced mating attempt, and potentially breed-related factors. This case highlights the importance of thorough pre-breeding health screening, particularly in large breeds that may be at increased risk of complications. Veterinary practitioners and breeders should be aware of the potential for fatal hepatic haemorrhage in breeding dogs, especially when underlying liver disease is present, and should implement preventive strategies to minimize risk.

Conflict of Interest

The authors have no conflict of interest to declare.

Author Contributions

OOS conceptualized, provided resources, investigated, and supervised the research, curated the data, performed the analysis, and wrote the original manuscript; UAA provided resources, curated data and performed analysis, provided software, visualized the data, and wrote the original manuscript; ECC performed analysis, and contributed to the manuscript writing and review. All the authors approved the final manuscript before publication.

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