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Fatal occult diaphragmatic hernia in a small Indian civet (Viverricula indica taivana) presenting with rectal prolapse: A case report

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Case Report

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Abstract

Wildlife trauma cases frequently present with overt external signs that may mask underlying life-threatening conditions, leading to diagnostic prioritization bias. This report describes a juvenile small Indian civet (*Viverricula indica taivana*) in which rectal prolapse dominated the clinical presentation but obscured a fatal diaphragmatic hernia. A 3-month-old civet was rescued after a suspected chase incident and presented with rectal prolapse and mild systemic compromise. Despite unremarkable thoracic radiographs and absence of respiratory signs at admission, the animal underwent standard treatment for recurrent prolapse, including surgical correction. Clinical condition appeared to improve during hospitalization, supported by increased appetite and stabilization of body condition. However, serial biochemical analysis revealed progressive hepatic dysfunction, including marked hyperbilirubinemia and elevated liver enzymes, suggesting ongoing internal pathology. Unexpected death occurred on Day 18. Postmortem examination identified a diaphragmatic defect with herniation of abdominal organs into the thoracic cavity, resulting in severe pulmonary compression, circulatory impairment, and secondary multiorgan changes. These findings indicate that clinically silent or radiographically occult diaphragmatic hernia can progress despite apparent clinical recovery. This case demonstrates that reliance on dominant clinical signs and single time-point imaging may lead to underdiagnosis of concurrent thoracoabdominal injuries in wildlife patients. Longitudinal monitoring, integration of clinicopathological data, and repeated imaging should be emphasized, particularly in trauma-associated cases. Recognizing subtle indicators of internal compromise is essential for improving diagnostic accuracy, guiding clinical decision-making, and optimizing welfare outcomes in wildlife rehabilitation.

Introduction

The small Indian civet (*Viverricula indica taivana*) is a medium-sized viverrid and a protected wildlife species in Taiwan. It is primarily nocturnal and exhibits an omnivorous diet, consisting of fruits, insects, and small vertebrates (Chuang and Lee 1997). It is occasionally presented to rehabilitation centers for medical management following trauma or illness. Clinical evaluation and treatment of wildlife patients are often complicated by limited medical history, handling constraints, and welfare considerations.

Rectal prolapse is characterized by protrusion of rectal mucosa through the anal opening and is commonly observed in juvenile animals (Huck 2022). It is frequently associated with gastrointestinal disorders, parasitic infections, enteritis, and tenesmus (Igna et al. 2021; Seim III 1986). In wildlife species, rectal prolapse may also be related to stress, malnutrition, and environmental disturbances (Kalema-Zikusoka and Lowenstine 2001). Acute cases are typically managed by manual reduction and purse-string suturing, whereas recurrent prolapse often requires surgical intervention such as colopexy (Goodall et al. 2018).

Diaphragmatic hernia occurs when disruption of the diaphragm allows abdominal organs to herniate into the thoracic cavity (McClaran 2023). This condition may be congenital or traumatic in origin, and

differentiation between these forms remains challenging in clinical practice (Tovar 2012). Traumatic diaphragmatic hernia is commonly associated with blunt force injury and sudden increases in intra-abdominal pressure, whereas congenital defects arise from developmental abnormalities of the diaphragm (Luo et al. 2026). Clinical signs may be minimal, delayed, or nonspecific, depending on the severity and location of the defect.

In cases where prominent gastrointestinal or anorectal abnormalities are present, concurrent thoracoabdominal injuries may be overlooked. In wildlife rehabilitation settings, diagnostic evaluation is further limited by restricted access to advanced imaging and concerns regarding animal stress, increasing the risk of occult internal pathology remaining undetected.

Reports describing diaphragmatic hernia concurrent with rectal prolapse in wildlife species are scarce. This report describes a juvenile small Indian civet that initially presented with recurrent rectal prolapse and subsequently died unexpectedly. Postmortem examination revealed an undiagnosed diaphragmatic hernia. This case highlights the diagnostic challenges associated with misleading clinical presentations and discusses considerations for clinical management and prognostic assessment in wildlife rehabilitation practice.

Case presentation

History

A 3-month-old, 322 g weighing, female small Indian civet was rescued and admitted to the Wildlife Rescue Center of National Pingtung University of Science and Technology following reports that the animal had been chased by another animal prior to rescue.

Upon admission, the civet exhibited a red protrusion from the anus and an external wound on the neck. Physical examination revealed approximately 6–8% dehydration and pale mucous membranes. Fecal examination showed no evidence of parasitic infection. Based on the clinical history and physical findings, gastrointestinal and traumatic etiologies were initially suspected.

A comprehensive diagnostic evaluation was performed, including hematological, serum biochemical analysis, parasitological examination, and radiography, to further investigate the underlying condition.

Imaging

Thoracic and abdominal radiographs were obtained in ventrodorsal and right lateral projections using a digital radiography system (Fig. 1). Evaluation of the thoracic cavity revealed normal cardiac silhouette and pulmonary parenchymal opacity. The diaphragmatic margin was continuous and well-defined on both projections. No radiographic evidence of diaphragmatic herniation, abdominal organ displacement, or pleural effusion was identified. The abdominal cavity showed normal organ positioning without

evidence of free abdominal gas or significant soft tissue mass effect. Skeletal structures were unremarkable.

Hematological and biochemical analysis

Hematological analysis revealed mild anemia with normocytic and normochromic erythrocytes. Serial biochemical analysis demonstrated progressive increases in total protein (from 4.6 to 6.4 g/dL), albumin (from 1.8 to 2.8 g/dL), and calcium (from 8.1 to 10.9 mg/dL) concentrations during hospitalization, suggesting improved nutritional status. Creatinine concentration was initially low (0.24 mg/dL) and gradually increased toward the reference range (0.5 mg/dL) as body weight improved.

On Day 12, total bilirubin markedly increased from 0.2 to 11 mg/dL compared to earlier measurements. Concurrent elevations in aspartate aminotransferase (AST; up to 136 U/L), alanine aminotransferase (ALT; up to 93 U/L), and gamma-glutamyl transferase (GGT; 10 U/L) were observed, consistent with hepatic injury. Blood urea nitrogen (BUN) was also elevated during hospitalization (up to 49.1 mg/dL). These changes were retrospectively considered compatible with compromised hepatic circulation secondary to diaphragmatic herniation.

Treatment and Surgical Management

Due to recurrent rectal prolapse during hospitalization, surgical intervention was performed to prevent further episodes. Following manual reduction of the prolapsed tissue, colopexy was conducted in combination with a purse-string suture to stabilize the rectum and reduce the risk of recurrence.

Sedation and anesthesia were achieved using intramuscular dexmedetomidine (0.03 mg/kg), ketamine (3 mg/kg), and midazolam (0.3 mg/kg), followed by maintenance with isoflurane inhalation anesthesia. Atipamezole (0.3 mg/kg, IM) was administered for reversal after the procedure.

Postoperative management included antimicrobial and analgesic therapy to prevent infection and control pain, consisting of oral enrofloxacin (6.5 mg/kg) and meloxicam (0.2 mg/kg). Supportive care was provided to promote recovery and general condition, including lysozyme (4.5 mg/kg), a bromelain–L-cysteine supplement, and vitamin B complex.

Pathology

On Day 18 of hospitalization, the civet was found dead in its enclosure without prior signs of acute deterioration. A complete necropsy was subsequently performed to determine the cause of death.

Gross examination revealed herniation of abdominal organs, including the stomach and spleen, into the thoracic cavity through a defect in the diaphragm (Fig. 2A). The torn margins of the diaphragm were

clearly visible, and marked compression of the lungs was observed. These findings were consistent with a diaphragmatic hernia causing severe thoracic space occupation.

The lungs appeared diffusely congested and edematous, with multifocal areas of hemorrhage and collapse (Fig. 2B, C). Histopathological examination confirmed severe pulmonary edema, widespread atelectasis, and macrophage infiltration within the alveolar spaces, accompanied by vascular congestion. These lesions were consistent with chronic respiratory compromise and impaired gas exchange.

In addition, the liver exhibited multifocal pale yellow to red foci distributed throughout all lobes (Fig. 2E). Histopathological examination revealed mild, multifocal hepatocellular vacuolar degeneration characterized by cytoplasmic vacuolation (Fig. 2F). These hepatic changes may reflect secondary effects of circulatory disturbance, including passive congestion or hypoxia associated with diaphragmatic herniation.

Collectively, the gross and microscopic findings supported respiratory and circulatory failure secondary to diaphragmatic herniation as the primary cause of death.

Discussion and conclusions

This report describes a fatal case of diaphragmatic hernia in a juvenile small Indian civet that initially presented with rectal prolapse. The clinical presentation and subsequent findings provide important insights into the diagnostic challenges associated with misleading clinical signs and the limitations of conventional imaging in detecting occult thoracoabdominal injuries in wildlife species.

In wildlife rescue cases, trauma is the most commonly encountered presentation (Cox 2022). However, visible injuries do not necessarily reflect the primary pathology and may lead to diagnostic overshadowing. Rectal prolapse is typically associated with gastrointestinal disorders, parasitic infections, and tenesmus, particularly in young animals (Igna et al. 2021). However, It can also occur secondary to systemic conditions or stress-related factors (Marjani et al. 2009; Todd 1959). In the present case, rectal prolapse was the most apparent clinical finding and initially directed the diagnostic and therapeutic approach toward gastrointestinal etiologies. However, this case illustrates that the most visible clinical sign is not always the most critical underlying problem. Especially in wildlife patients, where medical history is often unavailable, reliance on overt clinical findings alone may obscure more significant systemic or life-threatening conditions.

Diaphragmatic hernia is a well-recognized condition in small animals and may be either congenital or traumatic in origin (Hyun 2004). However, distinguishing congenital from traumatic diaphragmatic hernia is often uncertain unless you have a strong trauma history or clear associated lesions in wildlife (Luo et al. 2026). Traumatic diaphragmatic hernia is typically associated with blunt force injury, leading to increased intra-abdominal pressure and subsequent rupture of the diaphragm (Luo et al. 2026). In this case, the reported history of being chased by another animal suggests a possible traumatic etiology.

Notably, the animal did not exhibit overt respiratory signs during the initial clinical assessment, and the initial thoracic radiographs were unremarkable. This presentation may have contributed to diagnostic prioritization bias, leading clinicians to assign a lower index of suspicion to diaphragmatic hernia and thereby delaying its recognition. This case underscores the limitation of relying on a single time-point evaluation, particularly in early or mild presentations where clinical and radiographic findings may be subtle or absent. Therefore, even in the absence of initial abnormalities, diaphragmatic hernia should remain a differential diagnosis in animals with potential traumatic exposure. Greater emphasis should be placed on the need for repeated imaging, with follow-up radiographic examinations during hospitalization to assess disease progression and improve diagnostic accuracy.

In the present case, serial hematologic and biochemical findings may have provided early evidence of underlying internal pathology before overt clinical signs appeared (Dell'Osa and Jaensch 2016). It is recognized that uncomplicated diaphragmatic hernias may not result in significant alterations in complete blood count (CBC) or serum biochemistry (Monsang et al. 2014). In contrast, more severe conditions, such as strangulated, obstructed, or painful herniation, are more likely to induce measurable changes, including leukocyte shifts and biochemical evidence of tissue injury, hypoperfusion, or dehydration (Mottelib and Misk 1976). In this case, a marked elevation in total bilirubin was observed on Day 12, followed by increases in hepatic enzymes, including aspartate aminotransferase (AST) and alanine aminotransferase (ALT), suggesting progressive hepatic dysfunction. These alterations are supported by histopathological findings of mild, multifocal hepatocellular vacuolar degeneration, which likely reflect compromised hepatic perfusion and passive congestion secondary to displacement of abdominal organs into the thoracic cavity. Such changes are consistent with circulatory disturbance and hypoxic injury, which may occur in diaphragmatic hernia due to impaired venous return and increased intra-thoracic pressure, as similarly reported in a cat with peritoneopericardial diaphragmatic hernia and concurrent hepatic dysfunction (Kim et al. 2004).

This interpretation is further supported by histopathological findings in the lungs, which revealed severe pulmonary edema, vascular congestion, and widespread atelectasis. These lesions indicate impaired pulmonary circulation and reduced effective oxygen exchange, which may contribute to both systemic hypoxia and altered erythrocyte dynamics (Ettinger et al. 2024). Collectively, these clinicopathological correlations suggest that dynamic changes in hematological and biochemical parameters may serve as more sensitive early indicators of internal organ dysfunction than imaging alone in similar cases.

Ultimately, this case highlights the diagnostic challenges in wildlife, where limited history and misleading clinical signs may obscure life-threatening conditions. It underscores the importance of maintaining a broad differential diagnosis and not relying solely on initial clinical or imaging findings, particularly in trauma-associated cases. Integration of laboratory data, repeated imaging, and careful longitudinal monitoring are essential for improving early detection of occult conditions such as diaphragmatic hernia. Collectively, this report provides practical insights into improving diagnostic strategies and clinical management in wildlife patients.

Declarations

Declaration of competing interest

The authors declare no conflicts of interest.

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Author Contribution

Author contributions AMC, HJL, and WXC designed the study. HJL, WXC, and LTL participated in clinical case management, sample collection, and data acquisition. AMC, HJL, and WXC analyzed the clinical and pathological findings and managed literature searches. YCL provided histopathological interpretation and pathological guidance. HJL, WXC, and AMC wrote the first draft of the manuscript. AMC and CCC managed the study and edited the final manuscript. All authors read and approved the final manuscript.

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Data Availability

Data availabilityThe datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figures

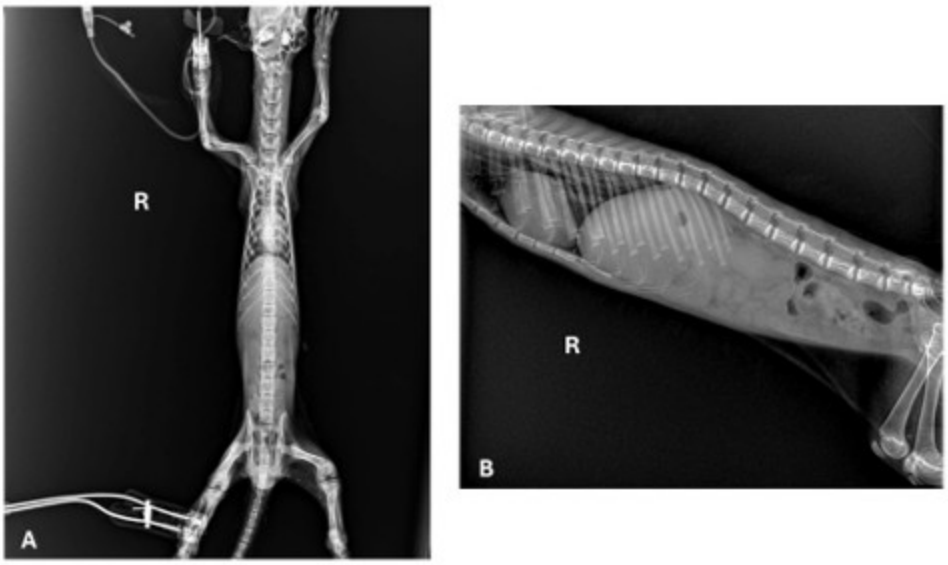


Figure 1

Thoracic and abdominal radiographs of a 3-month-old small Indian civet at presentation. (A) Ventrodorsal view. (B) Right lateral view. No obvious radiographic abnormalities were identified.

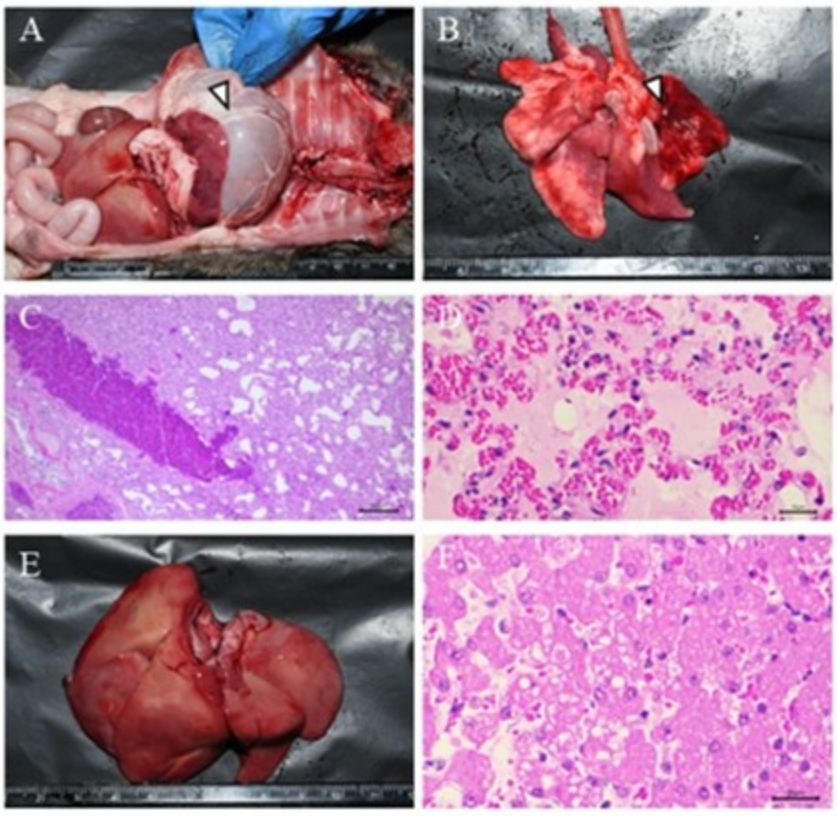


Figure 2

Gross and histopathological findings. (A) Diaphragmatic hernia with herniation of abdominal organs into the thoracic cavity. The arrowhead indicates the displaced abdominal organ within the thoracic space.

(B) Lungs showing severe, multifocal to coalescing red lesions across all lung lobes, consistent with pulmonary congestion and hemorrhage. The arrowhead indicates a representative lesion. (C, D) Histopathological section of the lung showing severe, multifocal pulmonary edema with macrophage infiltration, accompanied by alveolar collapse and consolidation (H&E stain, 40&400x). (E) Multifocal pale yellow to red lesions were observed across all hepatic lobes. (F) Mild, multifocal hepatocellular vacuolar degeneration characterized by cytoplasmic vacuolation is observed (H&E stain, 400x).