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TRAUMATIC INJURIES IN EUROPEAN ROE DEER: CLINICAL AND RADIOGRAPHIC INSIGHTS FROM A FOUR-YEAR STUDY

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Abstract

This retrospective study investigated traumatic injuries in nine European roe deer (*Capreolus capreolus*) admitted to the Emergency Unit of the Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania, from 2021 to 2025. Clinical and radiographic evaluations, utilizing the Synthesis Opera G800 DR x-ray system under sedation (butorphanol 0.2 mg/kg, medetomidine 8–10 µg/kg, ketamine 2 mg/kg), revealed a spectrum of skeletal and soft tissue injuries, primarily resulting from vehicle collisions and predatory attacks. Findings included transverse, spiral, and comminuted fractures, as well as soft tissue complications such as edema, hematomas, and pneumothorax. Only one case was amenable to surgical intervention, highlighting the challenges of managing severe trauma in wild ungulates. Radiographic imaging proved critical for accurate diagnosis, underscoring its value in wildlife veterinary medicine. These results emphasize the need for advanced diagnostic protocols and preventive strategies to mitigate the ecological and clinical impacts of traumatic injuries in roe deer populations.

Key words: deer, trauma, wildlife, radiography

The family *Cervidae*, including various ungulate ruminant mammals commonly referred to as deer, currently comprises 53 species distributed across 18 genera, with ongoing taxonomic revisions refining this classification. (Knight K., van Wick P., 2020))

The European roe deer (*Capreolus capreolus*) represents a characteristic faunal component of the Holocene epoch. Fossil evidence indicates its presence in Europe dating back at least 600,000 years, with occurrences documented across both glacial and interglacial periods. Represented by nearly 3,000 fossil and subfossil records, *C. capreolus* ranks among the most prevalent mammals of the Late Quaternary. (Sommer S. *et al*, 2009)

Capreolus capreolus is the most abundant and widely distributed cervid species in Europe, recognized as a presumably monotypic species (Lorenzini). Ecologically, this species plays a significant role as an undergrowth browser, contributing to vegetation management, while its status as a game animal underscores its economic importance (Nihil H.O. *et al*, 2010).

Morphologically, *C. capreolus* is a telemetacarpal deer characterized by a small body size. Its forelimbs are shorter than its hindlimbs, and it possesses a long neck, large ears (12–14 cm), a rudimentary tail (2–3 cm), and lacks preorbital glands or a mane. Seasonal pelage variation is notable: winter coloration ranges from grayish brown to dark brown with a prominent white caudal patch, while summer pelage shifts to reddish or red-brown, with a gray or brown cranial dorsum, brown to dark-brown metatarsal glands, and a reduced or absent caudal patch. Antlers, exclusive to males, are relatively short (15–30 cm) and closely positioned at their base (Sempere A.J. *et al*, 1996).

In Europe, *C. capreolus* is among the most frequently involved mammal species in vehicle-related collisions, with an apparent upward trend in such incidents (Madsen A.B. *et al*, 2002). These animal-vehicle collisions pose significant ecological, social, and economic challenges, including wildlife mortality, property damage, human injuries, and fatalities (Nocera I. *et al*, 2021).

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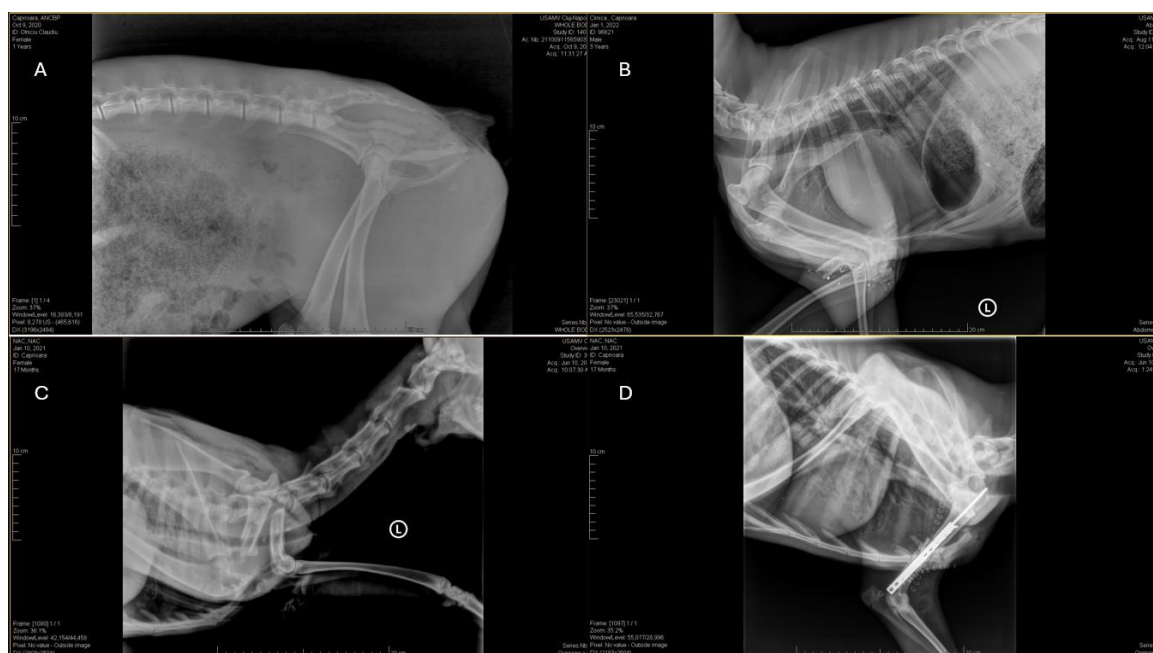


Figure 1 Traumatic injuries in deer. A. Complete tail avulsion. B. Transverse fracture of the radius with multiple bone fragments and soft tissue reaction. C. Oblique humeral fracture with bone displacement. D. Stabilization of the fracture through surgical intervention.

MATERIAL AND METHOD

A retrospective study was conducted on nine European roe deer (three males, six females) admitted to the Emergency Unit of the Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania, over a four-year period from 2021 to 2025. The subjects, ranging in age from 1 to 4 years and in body weight from 12.2 to 22.7 kg, were all sourced from Cluj County. Clinical histories indicated that three individuals had been involved in vehicle collisions, two exhibited bite wounds consistent with attacks by a larger predator, and the remaining four lacked documented prior history.

Upon admission, patients presented with either non-ambulatory status or lameness in one or more affected limbs. Initial clinical assessments revealed variable behavioral states, with individuals displaying either agitation or apathy. Tachycardia, attributed to pain and stress, was observed in most cases, and dyspnea was noted in several individuals. In one case, dyspnea was later determined to stem from an underlying pathology unrelated to pain or stress. Mucous membrane coloration was generally unremarkable with a capillary refill time (CRT) of less than 2 seconds, except for one individual exhibiting cyanosis.

Given the high likelihood of skeletal injuries, all patients were referred to the Radiology Clinic for diagnostic imaging. To facilitate imaging and ensure patient immobility, sedation was administered via intramuscular injection of a combination of butorphanol (0.2 mg/kg),

medetomidine (8–10 µg/kg), and ketamine (2 mg/kg). Following sedation, patients were positioned in lateral, dorsal, or sterno-abdominal recumbency on the imaging table. Radiographic examinations were performed using a Synthesis Opera G800 DR x-ray system, targeting regions of clinical concern.

RESULTS AND DISCUSSIONS

A detailed clinical and radiographic evaluation of the nine European roe deer (*Capreolus capreolus*) admitted to the Emergency Unit revealed a spectrum of traumatic injuries. The following describes the specific findings for each individual, based on clinical presentation and diagnostic imaging performed under sedation.

One individual presented with multiple bite wounds affecting the gingival mucosa and both hind limbs. Radiographic imaging confirmed a complete tail avulsion, likely resulting from a predatory attack (figure 1 a).

Another deer exhibited an oblique fracture of the humerus with significant displacement of the bone fragments (figure 1 c). This injury was subsequently addressed through surgical intervention, involving stabilization and realignment of the fracture (figure 1 d).

A third individual was diagnosed with a transverse fracture of the radius, characterized by a clean break perpendicular to the bone's long axis, identified via radiographic examination. Additionally, multiple bone fragments were observed, accompanied by a soft tissue reaction,

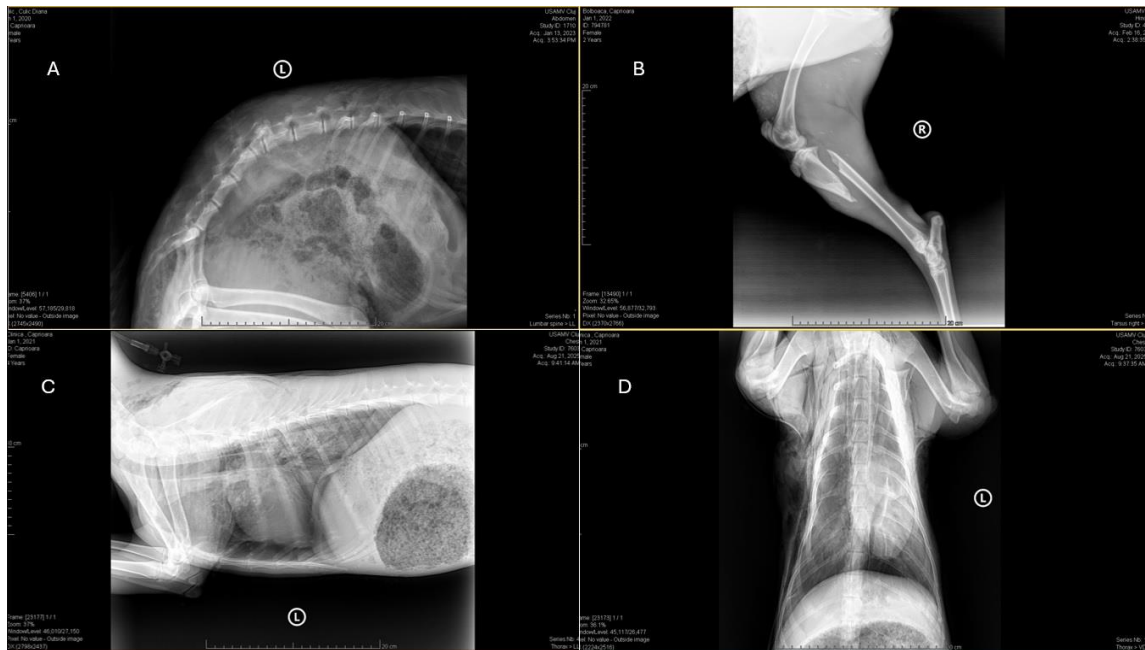


Figure 2 Severe traumatic injuries in deer. A. Irreparable fracture of vertebra L3 accompanied by subcutaneous hematoma. B. Spiral tibial fracture surrounded by soft tissue reaction. C and D. Costal fractures with secondary pneumothorax, subcutaneous emphysema and increased lung opacity.

likely indicative of localized inflammation and edema, as evidenced by radiographic findings (figure 1 b).

A fourth deer sustained multiple bite wounds in the thoracolumbar region, accompanied by a severe, irreparable fracture of the third lumbar vertebra (L3), rendering surgical correction unfeasible. Increased opacity in the surrounding soft tissue, observed radiographically, was consistent with a subcutaneous hematoma (figure 2 a).

Another case involved a spiral fracture of the right tibia, distinguished by a twisting fracture pattern, likely resulting from high-torque trauma, as confirmed by x-ray imaging. Radiographic evaluation also revealed increased soft tissue opacity, suggestive of edema and potential hematoma in the affected region (figure 2 b).

A sixth individual presented with multiple costal fractures, affecting the 6th, 7th, 8th, 9th, and 10th ribs on the right side and the 5th, 9th, and 10th ribs on the left side. Associated findings included severe pneumothorax and subcutaneous emphysema in the scapular region, which accounted for the previously observed dyspnea and cyanotic mucous membranes. Radiographic imaging further identified densification across much of the pulmonary parenchyma, most likely attributable to pulmonary contusions and hemorrhage (figure 2 c, d).

A seventh deer was diagnosed with bilateral fractures of the ilium, compromising pelvic stability, as evidenced by radiographic assessment. Alterations in soft tissue density were

observed, likely resulting from edema and hematomas within the subcutaneous and muscular structures, as indicated by radiographic findings (figure 3 a).

An eighth individual sustained a comminuted fracture of the right calcaneus, characterized by fragmentation of the bone, likely resulting from high-impact trauma (figure 3 b).

The final deer presented with a compound injury, including an oblique fracture of the left ulna and a linear fracture of the left tibia, both identified through radiographic imaging. The ulnar fracture was associated with a soft tissue inflammatory response, likely characterized by edema and hematoma, as evidenced by radiographic evaluation (figure 3 c, d).

The findings of this study underscore the diverse and severe nature of traumatic injuries sustained by wild European roe deer (*Capreolus capreolus*), with a particular emphasis on those resulting from vehicle collisions and predatory attacks. The range of injuries documented, including fractures (oblique, transverse, spiral, and comminuted), soft tissue trauma, and associated complications such as pneumothorax, subcutaneous emphysema, and hematomas, highlights the complex clinical presentations encountered in wildlife veterinary practice. These injuries not only pose significant challenges to the survival and welfare of affected individuals but also reflect broader ecological and anthropogenic pressures impacting wild ungulate populations.

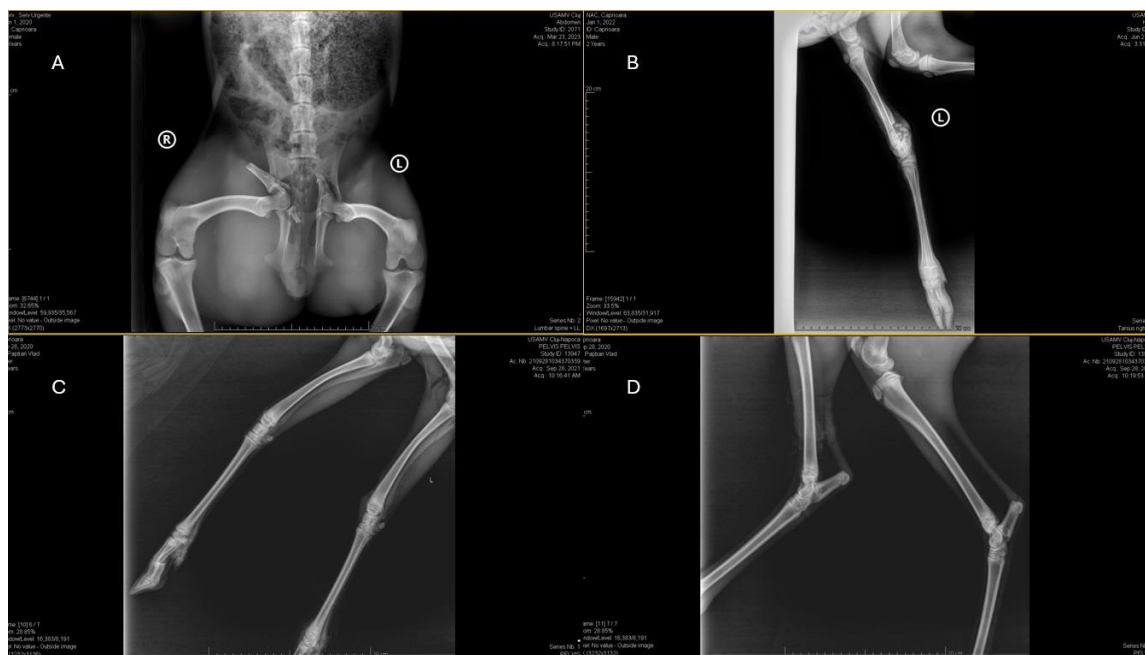


Figure 3 Radiographic evidence of traumatic injuries in deer. A. Bilateral ilium fractures with extended reaction of the soft tissue. B. Calcaneal fracture with multiple bone fragments visible. C. Oblique fracture of the left ulna with subsequent reaction of the soft tissue. D. Linear fracture involving the right tibia.

CONCLUSIONS

The findings of this study corroborate existing literature demonstrating that traumatic incidents, primarily resulting from vehicle collisions or predatory attacks, are the predominant reasons for the rescue and hospitalization of European roe deer (Nocera I. *et al.*, 2021). Consistent with prior research, the majority of cases in this cohort presented with traumatic skeletal injuries, often accompanied by soft tissue complications such as edema and hematomas.

Previous studies have highlighted the challenges associated with the hospitalization of roe deer, particularly the low survival rates due to the severity of traumatic injuries (Nisbet H.O. *et al.*, 2010). The current findings align with this observation, as only one of the nine cases was amenable to surgical intervention. Nevertheless, this surgically managed case provides valuable insights for field veterinarians, offering guidance on the clinical management of traumatic injuries in wild ungulates and suggesting that, in select cases, survival may be achievable with appropriate intervention.

Radiographic imaging proved to be an indispensable diagnostic tool in this study. Its ability to accurately characterize the extent and nature of skeletal and soft tissue injuries underscores its utility in the clinical assessment of

trauma patients, whether domestic or wild. Given the increasing accessibility of radiographic technology, its routine use should be strongly considered in the diagnostic workup of wildlife trauma cases to facilitate precise diagnosis and inform therapeutic strategies.

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