

# A novel radiographic projection for the detection of a scapula body fracture in a Thoroughbred foal

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## Abstract

This case report describes the clinical and diagnostic imaging findings, treatment, and outcome of a three-month-old Thoroughbred foal referred for the evaluation of severe left forelimb lameness and presents the acquisition of a novel radiographic projection of the scapula used to achieve the diagnosis. No abnormalities were found with the standard radiographic examination of the left shoulder. Ultrasound and a dorsal 45° lateral-ventral lateral oblique radiographic view were performed to evaluate the body of the left scapula. A longitudinal, minimally displaced fracture of the infraspinous fossa was diagnosed with this projection that was not detected in the routine projections. Ultrasound was used in conjunction to confirm the diagnosis, assess the displacement of the fracture in the frontal plane, and evaluate soft tissue damage. The foal was treated conservatively with anti-inflammatory drugs and stall rest. A radiographic follow-up and clinical reassessment were performed, and the horse appeared sound, no atrophy of the region was appreciated, and no radiographic abnormalities were found.

## A novel radiographic projection for the detection of a scapula body fracture in a Thoroughbred foal

**Running title:** Scapular body fracture in a foal.

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Key Points: horse, scapula, fracture, foal, radiograph.

## Summary

This case report describes the clinical and diagnostic imaging findings, treatment, and outcome of a three-month-old Thoroughbred foal referred for the evaluation of severe left forelimb lameness and presents the acquisition of a novel radiographic projection of the scapula used to achieve the diagnosis. No abnormalities were found with the standard radiographic examination of the left shoulder. A dorsal 45° lateral-ventral lateral oblique radiographic view was performed to evaluate the body of the left scapula. A longitudinal, minimally displaced fracture of the infraspinous fossa was diagnosed with this projection. Ultrasound was used in conjunction to confirm the diagnosis, assess the displacement of the fracture in the frontal plane, and evaluate soft tissue damage. The foal was treated conservatively with anti-inflammatory drugs and stall

rest. A radiographic follow-up and clinical reassessment were performed, and the horse appeared sound, no atrophy of the region was appreciated, and no radiographic abnormalities were found.

## INTRODUCTION

Scapular fractures are uncommon in horses (Adams and Nixon, 2019; Dyson, 1985; Auer and Furst, 2017). Fractures may involve the supraglenoid tubercle, neck, spine, body, and glenoid cavity (Adams and Nixon, 2019; Richardson and Ortvét, 2022). These fractures are usually caused by traumatic processes or stress fractures in race breeds (Thoroughbreds and Quarter Horses). The latter may evolve into comminuted catastrophic fractures (Auer and Furst, 2017).

The distribution of shoulder fractures generally includes horses less than two years of age due to the presence of the physis between the supraglenoid tubercle and the neck of the scapula. An overload of tension at the attachment of the biceps brachii and coracobrachialis tendons to the supraglenoid tubercle makes this the most common site for fracture of the shoulder (Auer and Furst, 2017; Fortier, 2019; Richardson and Ortvét, 2022).

Fractures involving the supraglenoid tubercle and the neck of the scapula are identified with routine radiographic projections of the shoulder (Adams and Nixon, 2019, Dyson, 1985). Due to the amount of superimposition of soft tissue and thoracic structures with the proximal thoracic limb, other methods of imaging, such as ultrasonography and nuclear scintigraphy, have been used to diagnose fractures involving the body and spine of the scapula (Vallance et al, 2009; Richardson and Ortvét, 2022).

Conservative management of scapular body fractures not involving the glenoid cavity has been described (Dyson, 1985). Kidd et al described a longitudinal fracture of the body of the scapula in a 2-year-old Paint horse with successful surgical treatment (Kidd et al, 2007).

The aim of this case report is 1) to describe a novel radiographic projection, a dorsal 45deg lateral-ventral lateral oblique, which is used to image the body of the scapula and 2) to describe the outcome of conservative management of a longitudinal scapular body fracture.

## CASE HISTORY AND CLINICAL FINDINGS

A 3-month-old Thoroughbred filly was referred to the Davidson Surgery Center at the Hagyard Equine Medical Institute in Lexington, Kentucky for a history of left forelimb lameness of three days duration. The lameness was first noted by the owner when the filly was brought in from turnout with other mares and foals. There was no evidence of visible trauma and the filly had been reportedly healthy. At the time of admission, the foal appeared bright, heart rate was 60 beats per minute, respiratory rate was 24 breaths per minute, and temperature was 38.0 oC. There was no evidence of joint sepsis or other co-morbidities on physical examination. The foal was mildly resistant to palpation of the proximal forelimb. Passive range of motion of the proximal forelimb appeared normal. No crepitus, asymmetry, or muscle atrophy of the region was appreciated. The foal's lameness was described as a 4/5 left forelimb lameness (AAEP grading scale, AAEP, 2018) with a reduction of the cranial phase of the stride at a walk.

## IMAGING FINDINGS

The foal was sedated with xylazine (0.5 mg/kg IV) and radiographs of the left scapulohumeral joint were obtained due to high suspicion of fracture in the proximal forelimb, with a low-output radiographic generator and direct digital radiography (Enduras Wireless- MinXray, Cuattro Hub- Heska). Standard radiographic projections, including mediolateral (ML) and cranial 45deg medial-caudolateral oblique (Cr45degM-CaLO) views of the left scapulohumeral joint were unremarkable (Fig 1). A dorsal 45deg lateral-ventral lateral oblique (D45degL-VLO) projection was obtained with the leg in flexion and the cassette placed closest to the affected limb, with the radiographic beam at 45deg with respect to the sagittal plane of the horse (Fig 2). This image revealed a longitudinal fracture of the infraspinous fossa, coursing from the caudal border of the scapula, proximal to the neck, through the infraspinous fossa, parallel to the spine, and exiting through scapular cartilage (Fig 3). Ultrasound examination of the left scapula, performed with a multi-frequency

linear probe (GE Logiq E, 3-10MHz), identified a defect in the surface of the infraspinous fossa, with no displacement of the fracture in the frontal plane (Fig 4). Similar radiographic evaluation performed six months later revealed complete healing of the fracture.

## TREATMENT AND OUTCOME

The foal was confined to stall rest for thirty days with five days of non-steroidal anti-inflammatory therapy (firocoxib 0.1mg/kg orally [PO] once a day). After six months, the filly was considered to be sound at the walk. No atrophy or asymmetry of the shoulder muscles were appreciated during the examination. The filly is expected to enter training the following year.

## DISCUSSION

In small animals, fractures of the scapular body are categorized by articular involvement as well as stability including intra-articular, unstable extra-articular, and stable extra-articular (Cook et al, 1997). This categorization scheme guides the need for stabilization (surgical or coaptation) as well as prognosis. Surgical intervention is recommended for intra-articular as well as unstable extra-articular fractures of the scapula. The filly in this report fits into the category of a stable extra-articular fracture in which conservative management is an appropriate treatment option. The comfort level of the horse in this case was also a large determinant of management, as the horse was weight-bearing. Potential complications for conservative management of this fracture include mal- or non-union, propagation or displacement of the fracture, development of angular limb deformities or laminitis in the support limb or flexural limb deformity in the affected limb, secondary suprascapular neuropathy, and persistence of lameness.

There are several reports of surgical repair of fractures of the supraglenoid tubercle in horses, only one case report describing the repair of a fracture of the scapular body was identified (Auer and Furst, 2017; Kidd et al, 2007). Kidd et al reported a longitudinal scapular fracture of the infraspinous fossa in a 2-year-old horse. The horse was reported to be sound by ten months (Kidd et al, 2007). Repair of these fractures in a foal could result in an increase in morbidity due to the application of internal fixators to thin, compact bone. The ability to reduce the fracture line would be limited and the goal of repair would be to provide stability, which is inherently provided by the large muscle mass surrounding this region. With lack of glenoid cavity involvement, the risk of degenerative joint disease was negligible. In the authors' opinions, the treatment of choice for stable extra-articular fractures of the scapula is conservative management.

The prognosis for return to full function for such fractures with conservative management in small animal medicine is said to be excellent (Peck, 2012; Cook et al, 1997). The prognosis for equine athletes cannot be determined based on the extrapolation of small animal cases, as the definition of full function for a pet animal and an adult horse differ. Recovery of three cases with longitudinal body fractures has been described in the equine veterinary literature. As previously mentioned, a single case report by Kidd et al describes one horse returning to soundness after surgical repair. Dyson reports one horse returning to previous use while another was retired. Based on reported cases, of both small animals and horses, it is suggested that scapular fractures without articular involvement carry a better prognosis for future soundness than fractures with articular involvement (Peck, 2012; Cook et al, 1997; Dyson, 1985; Kidd et al, 2007).

With suspected fractures of the equine proximal forelimb, ultrasound has been described as a valuable diagnostic tool (Davidson and Martin, 2004). Ultrasound has the limitation of only being able to highlight the lateral aspect of the scapula and centers of ossification or normal roughening of the bony surface can be confused with a fracture line. While the exact configuration of a fracture cannot be determined by two-dimensional imaging alone, radiography was able to highlight the displacement in the cranial-caudal plane, while ultrasonography was performed as an adjunctive diagnostic tool to evaluate displacement of the fracture in the frontal plane and the concurrent soft tissue damage. Nuclear scintigraphy has been reported to have little value in the diagnosis of lameness in foals due to a diffuse increase in radiopharmaceutical uptake of the normal physes (Hunt, 2011).

The gold standard for the determination of the exact configuration of fractures is a computed tomographic

(CT) examination. Prohibiting factors of such examination include patient size as well as equipment access, owner funds, and the associated risks of general anesthesia. With standard radiographic views of the shoulder, the diagnosis would have not been reached in this case. In cases where the standard radiographic views are non-rewarding and there is an indication of proximal limb lameness such as crepitus, reduced cranial phase of the stride, dropped elbow, or pain on palpation, an additional skyline view of the body of the scapula may be indicated. The skyline radiographic view described in this report was sufficient for the diagnosis and development of a treatment plan. To the knowledge of the authors, this radiographic projection has not yet been described in the equine literature. This radiograph was captured with a low-output portable generator making the acquisition of this image achievable to field practitioners. Superimposition of the opposing limb and thoracic structures makes the diagnosis of a dorsal scapular fracture difficult with traditional radiographic views. In neonatal foals, a lateral view of the cranial thorax may allow for visualization of the entire scapula, however, the described oblique view (D45oL-VLO) provides the advantage of anatomic isolation.

When the radiographic examination was repeated after six months with a low-output portable generator, the fracture was no longer present. As the horse aged and significantly increased in size, the radiographic image quality decreased, especially in the distal aspect of the scapula. Better radiographic images could likely be obtained with a high-output radiographic generator and a higher exposure. Based on the findings in this case report, the authors recommend using the described radiographic projection in conjunction with ultrasound if there is a suspicion of a fracture of the scapular body. In addition, extra-articular stable fractures, with none or minimal displacement carry on a good prognosis with conservative management.

## CONCLUSION

A dorsal 45deg lateral-ventral lateral oblique is an easily achievable radiographic projection that allows for diagnosis of scapular body fractures in foals. Multiple diagnostic aids such as radiography paired with ultrasound can provide a better understanding of fracture configuration for areas in which more advanced imaging is not possible. The radiographic projection described in this report is recommended when the suspicion of a scapular body fracture is present. Stable, extra-articular fractures of the scapula can be managed conservatively with a favorable outcome.

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