

Case Report

Fracture of the ischium in an eight-year-old Arabian gelding: A diagnostic challenge

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Summary

Proximal hindlimb lameness remains a diagnostic challenge despite modern imaging techniques. In the case described here, a fracture of the ischium produced false negative results on initial ultrasound and scintigraphy examinations, despite a 14 day delay from onset of clinical signs to the time of the nuclear bone scan. However, the history and clinical examination were strongly suggestive of a pelvic injury and this was only confirmed by the use of a novel radiographic technique.

False negative findings from diagnostic imaging can, and do, occur, even with high sensitivity techniques such as nuclear bone scans used after an appropriate delay period. Therefore, equal weighting should be given to all facets of a lameness investigation, including the history and clinical examination, while remembering the limitations of any imaging modalities used.

Introduction

Acute, severe lameness after a traumatic incident can often be a diagnostic challenge, particularly when involving the proximal limb, with or without any localising clinical signs. With the evolution of diagnostic imaging, many previously undiagnosed conditions are now identifiable. However, as this clinical case will show, it is important to remember that false negative findings can and do occur, and that the presenting clinical signs should always carry as much weighting as other diagnostic tools.

Case history

An 8-year-old Arabian gelding had a fall in a paddock that resulted in an acute nonweightbearing left hindlimb lameness. Prior to referral to the authors, the horse had undergone a full

diagnostic work-up, including clinical examination, rectal examination, diagnostic nerve blocks up to a tibial-peroneal nerve block, radiography of the fetlock, cannon, hock and stifle, all without identification of the cause of lameness. At that time the first author also performed an ultrasound examination of the pelvis and femur, without detecting any abnormalities. The horse had been on strict box rest since the incident and was treated with 1 g phenylbutazone b.i.d. *per os*, for 7 days, without any clinical improvement. The horse was referred to the hospital for scintigraphy of the hindlimbs and pelvis, 2 weeks after the traumatic incident.

Clinical findings

On admission to the hospital the horse was in a generally fair body condition but with mild atrophy of the left gluteal muscle mass. There did not appear to be any pelvic asymmetry of the bony prominences and no crepitus was detected within the pelvic region. There was a marked pain response to abduction and caudal extension of the left hindlimb, with a mild pain response to deep palpation of the left gluteal muscle mass. No other significant abnormalities were detected on the clinical examination. The horse was observably lame left hind at the walk (4/5 lame on the AAEP scale of lameness). The horse was not trotted due to the severity and longevity of the lameness and the concern of a pelvic fracture.

The horse was injected with 4 GBq of technetium^{99m} methylene diphosphonate i.v. followed by 30 mg frusemide i.v. 60 min later, to aid urination prior to scanning, so reducing the radiation contamination risk and improving the image quality of the pelvic region. A third phase scan of the hindlimbs and pelvis was performed 3 h after injection of the radiopharmaceutical. The results revealed mild to moderate focal increased radiopharmaceutical uptake in the dorsal aspect of the centro-distal tarsal joint region in both hocks. These findings corresponded with osteoarthritic changes seen on the radiographs of the hocks taken prior to referral.

A complete set of views of the pelvis were acquired during the bone scan, including oblique views of each ilial wing,

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dorsal views of the sacroiliac, coxofemoral and *tubera ischii* regions, and lateral views of each coxofemoral joint. All of these images were within normal limits (**Figs 1 and 2**).

Due to the severity of the lameness, and the clinical findings it was felt that a pelvic fracture was still high on the list of differential diagnoses. For this reason a novel technique was used for standing oblique radiographs of the left and

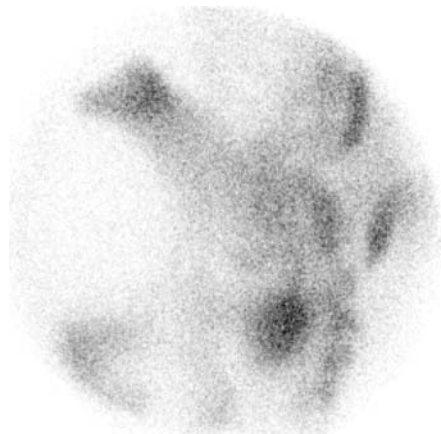


Fig 1: Lateral oblique scintigram of the left hemi-pelvis, with marked uptake in bladder adjacent to sacrum.

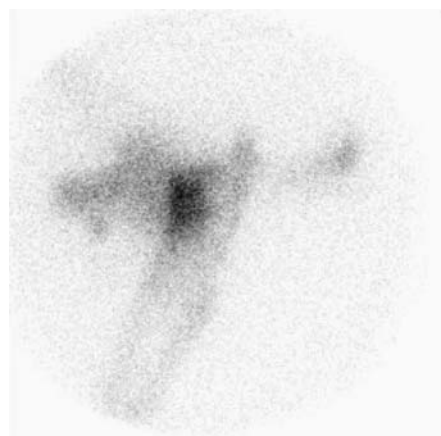


Fig 2: Lateral scintigram of the left coxofemoral joint and ischium with localised moderate uptake in bladder cranial to coxofemoral joint.

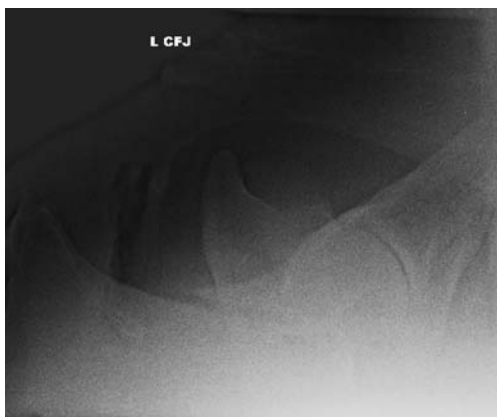


Fig 3: Radiograph of left ischial fracture.



Fig 4: Radiograph of normal right ischium and coxofemoral joint.

right coxofemoral joint and ischium (Barrett *et al.* 2006). The horse was prepared by manual evacuation of the rectum, and air insufflated into the rectum with a small nasogastric tube and stomach pump. The radiographs clearly identified a simple complete, oblique fracture running in a dorso-caudal to cranio-ventral direction from the mid-ischium towards the caudal aspect of the acetabulum. There was mild displacement of the ischium ventrally (**Fig 3**). Coxofemoral joint integrity was maintained, with the femoral head in a normal position within the acetabular cup under a weightbearing load. Radiographs of the right coxofemoral joint and ischium were within normal limits (**Fig 4**).

From the radiographs a diagnosis of a simple complete left ischial fracture was made. It was not certain whether the fracture entered the coxofemoral joint or not, but, considering its location and configuration, a guarded prognosis was given for long-term return to soundness. The horse was treated conservatively with box rest for an initial 8 week period. After 7 weeks of box rest the horse was reassessed. At that time there was further atrophy of the gluteal muscle mass, and



Fig 5: Follow-up radiograph at 7 weeks showing callus formation at the fracture site.

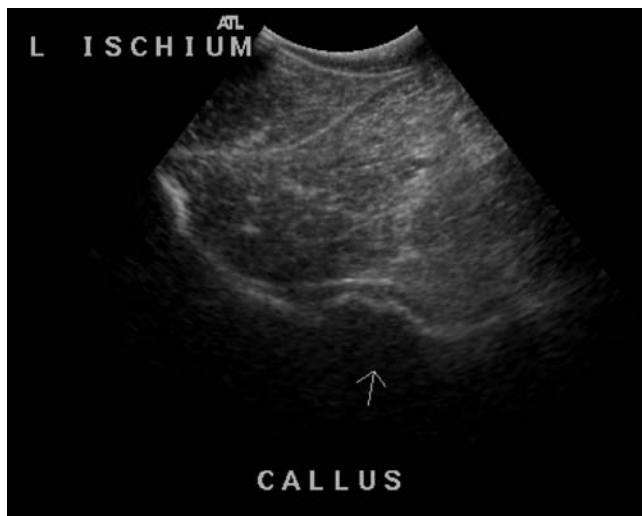


Fig 6: Follow-up ultrasound examination of the fracture site 7 weeks post injury showing callus formation.

there was a persistent pain response to palpation of the left gluteal muscles. The horse was sound at the walk but was 2/5 lame left hind at the trot. Repeat standing oblique radiographs of the left ischium revealed significant bridging callus at the fracture site on the dorsal aspect (**Fig 5**). Repeat ultrasonography of the left ischium and coxofemoral joint also revealed smooth, undulating callus at the fracture site, with normal, striated muscle pattern extending to the surface of the callus, indicating that there had been no recent haemorrhage or disruption of the adjacent soft tissues at the fracture site (**Fig 6**). Unfortunately the horse was lost to follow-up after this examination.

Discussion

Scintigraphy is commonly recognised as being more sensitive than radiography for the detection of bone pathology (Mattheson *et al.* 1987), and in the horse allows imaging of sites in which radiography would be difficult or contraindicated, such as the pelvis (Driver 2003; Davenport-Goodall and Ross 2004). However, it is important to remember that all imaging modalities have limitations and the potential for false negative results. Therefore their findings should never be taken in isolation, as this case demonstrates.

It is believed that negative results from scintigrams of a pelvic fracture are related to compromise of the blood flow to the bone at the fracture site, attenuation of the gamma-radiation by the large overlying musculature and count-capture from localised increased activity in the bladder, or not allowing sufficient time after injury for bone turnover to increase (Attenburrow 1997; Erichsen and Berger 2001; Dyson and Weekes 2003). In this particular case it is unlikely that the false negative scintigram was due to insufficient time delay between incident and scan, as 14 days separated the 2 events. Also, although there was some activity in the bladder, it was not marked, and was not causing count capture from the surrounding bone structure, so would have been unlikely to

have masked the fracture site increased activity if present. With the camera placed in a dorsal or oblique location, there is a significant distance and thickness of muscle between the fracture site and camera, but the lateral view of the coxofemoral joint allows close apposition of the camera to the site, with significantly less muscle covering. In this case it is felt that the most likely cause for the false negative bone scan is a compromise of the blood flow to the fracture site, which would therefore prevent delivery of the radiopharmaceutical. From this case it can be suggested that this cause of false negative scintigrams can have an extended effect up to 14 days after the inciting incident.

Ultrasonography is also a useful diagnostic imaging modality for the detection of pelvic fractures (Shepherd and Pilsworth 1994; Tomlinson *et al.* 2000). In this case the original ultrasound examination also failed to identify the fracture in the ischium. This may have been due to the fracture being missed at the examination, the fracture being incomplete originally and only progressing to a complete fracture at a later date, and the fracture site being obscured by the overlying caudal component of the greater trochanter of the femur. It has been suggested that if a transcutaneous ultrasound examination is negative then a rectal ultrasonographic examination should be performed (Reef 1998). In this case a detailed rectal examination was negative, and so an ultrasound examination was not performed, maybe incorrectly. The follow-up ultrasound examination did identify the fracture site, with marked callus formation, indicating that it was unlikely that the caudal component of the greater trochanter of the femur would have obscured the fracture site at the initial examination. This would suggest that the fracture was either nondisplaced or incomplete originally, or that it was missed at the original examination.

Since the advent of scintigraphy and improved ultrasound imaging, radiography of the pelvis for the diagnosis of fractures is performed less frequently. However, as is shown in this case, it still has a role to play, particularly with the use of a recently published technique in the standing horse (Barrett *et al.* 2006). Other techniques for ventro-dorsal radiography of the pelvis in the standing horse have been described (May *et al.* 1991). However, in this case it is unlikely that the ventro-dorsal technique would have visualised the fracture site, due to its position. Straight lateral radiographs of the pelvis in the adult horse have also been described (Little and Hilbert 1987), but again would probably have been undiagnostic for fractures at this site due to super-imposition of both ischii and the overlying musculature at that level. Ventro-dorsal radiography of the pelvis, performed under general anaesthesia may have been beneficial, but the inherent risks of anaesthetising a horse with a suspected pelvic fracture excluded the technique in this case.

Fractures of the ischium are rare, but most commonly involve the caudal aspect of the *tubera ischii* (Rutkowski and Richardson 1989; Davenport-Goodall and Ross 2004). This case was unusual in that it involved the main body of the ischium. The clinical examination did not reveal any asymmetry of the pelvis, pain to palpation or swelling over the *tubera*

ischii, as has been described (Davenport-Goodall and Ross 2004). The localising signs of pain to manipulation of the left hindlimb and palpation of the overlying gluteal musculature have not previously been described for this type of fracture to the authors' knowledge. Interestingly, the pain to manipulation of the coxofemoral joint increased concern that the fracture extended to the acetabulum, even though it could not be demonstrated unequivocally. This also led to the more guarded prognosis for return to soundness being given. Box rest is the usual treatment for ischial fractures (Dyson 2003; Pilsworth 2003) and the follow-up examination revealed a good healing response at 7 weeks post injury.

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