PELVIC SKELETAL DAMAGE AND THE DOWNER COW

V. S. Cox
College of Veterinary Medicine, University of Minnesota, 1988 Fitch Ave. (295), St. Paul, MN 55108, USA

Skeletal damage in the pelvic region should always be a consideration when examining a downer cow. Diagnosis of skeletal damage is difficult, but lifting the cow is often helpful especially when performing rectal examination (1). Specimens from 11 cases are presented here to illustrate the variety of lesions which can occur so that examiners have a better idea of possible problems and their consequences. These cases are summarized as follows:

iliac shaft fracture, one with sacroiliac ankylosis	2 cases
massive healed fracture of pelvic floor	1 case
unilateral fracture of the femoral head	3 cases
hip luxation with femoral chip fracture near the head	4 cases
hip dysplasia-like lesion, unilateral	1 case

Three of these cases recovered enough to became ambulatory, the other 8 were considered to be hopeless.

Fractures

The pelvis is like a rigid box so that trauma to it is likely to cause multiple fractures. The sacroiliac joint is the only flexible part of this rigid box which can serve as a shock absorber. The sacroiliac joint can lose this shock absorbing function due to ankylosis. While usually bilateral, unilateral ankylosis of the sacroiliac joint was associated with iliac fracture in one specimen (2). Since the ankylosis and iliac shaft fracture were on the same side, there may have been a cause and effect relationship.

The floor of the pelvis is the thinnest part, and therefore, it is not surprising to see multiple fractures in that location. The possibility of repair in such cases should not be discounted. Figure 1 shows 2 views of a fractured pelvis which was found during rectal examination in a pen of normal appearing cattle at a sale barn. Upon rectal examination a sharp spike-like structure was discovered, but there was never any evidence of rectal damage from this sharp object and gait deficits in this cow were subtle. Post mortem examination revealed that the spike-like object was a displaced fragment from a fracture of the pelvic floor.

Damage to the femoral head was seen in several cases. In three cases the femoral head was fractured (Figure 2, left), but also chip fractures off the cranial edge of the base of the femoral head were seen with femoral luxations (Figure 2, right). In one case the chip fractures were bilateral in association with bilateral luxation, and the chip included the head of the femur as well as the base of it. It is likely that the chip fractures occur after hip luxation as a result of the femoral head colliding with some part of the pelvis during movement.

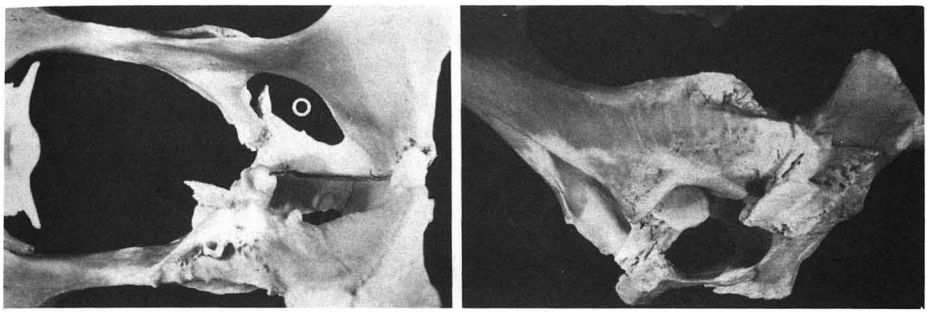

Figure 1, Left is caudal view of healed pelvic fracture turned so that dorsal is to the left, O = obturator foramen. Right is lateral view of the same specimen.

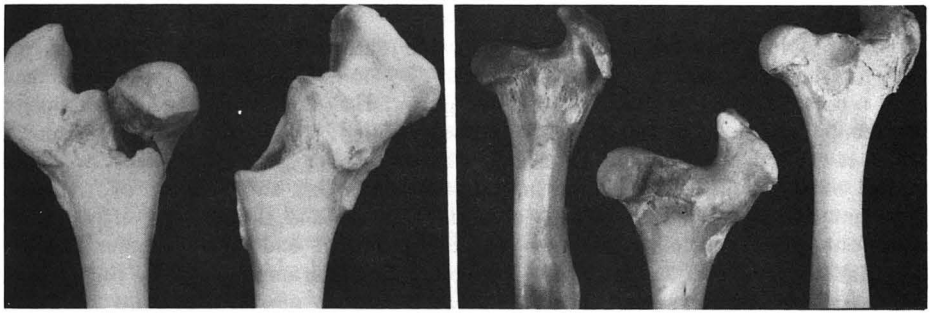

Figure 2, Left: two examples of pelvic head fractures. The femur on the right was associated with 3 rib fractures indicating a predisposing metabolic problem. Figure 2, Right: three examples of femoral chip fractures associated with hip luxations. The specimen on the left was from a bilateral luxation and the contralateral femur had a similar chip fracture involving the head of the femur while the chip was adjacent to the head on the middle and right specimens.

Hip Luxations

As the sciatic nerve passes caudally and distally, it lies close to the dorsal and caudal aspects of the hip joint. This path makes damage to this nerve a major consequence of hip luxation. Periostitis adjacent to the acetabulum in three cases indicated that the luxated femoral head moved over a wide area which included the path of the sciatic nerve (figure 3). It is concluded that sciatic nerve damage can occur due to trauma from a luxated femoral head.

While in most cases new bone formation due to dislocation of the femur resulted in very irregular roughened surfaces, in two instances a smooth surface was also formed (10 and figure 3). This polished area was caudal to the acetabulum and was associated with a congruent groove on the femur indicating that these surfaces were new articular surfaces. The filled acetabular fossa mentioned below is another example of the same process.

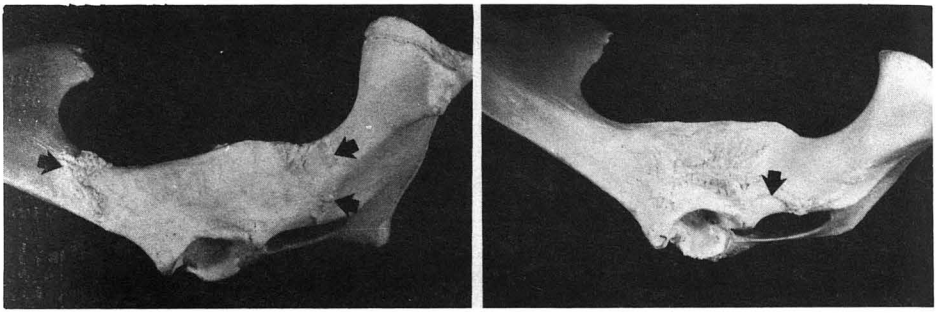

Figure 3. Two cases of hip luxation. On the left the extent of periostitis due to femoral movement is indicated by the arrows. On the right a polished new articular surface is seen caudal to the acetabulum (arrow).

In previous reports of bovine (3-5) and canine (6) coxofemoral luxation, many of the cases had a fall in the history. Human cases of hip luxation have been reported to occur due to low energy injuries occurring during rotation of the femur while dancing (7) or playing football (8). After hip luxation the femur is pulled in a cranial dorsal direction by the gluteal muscles or caudal ventral and medially by the quadratus femoris and obturator muscles. Ruminant animals lack an internal obturator muscle and, hence, the effect of the entire obturator muscle mass is to pull the proximal end of the femur medially towards the ventral aspect of the obturator foramen where the muscle originates. In dogs the strong internal obturator muscle can pull a luxated femur in the dorsal direction. These anatomic differences explain the observation that caudal ventral hip luxation occurs in half of bovine cases (5,9) but is less common in canine cases (6). The head of the femur was in the obturator foramen in 5 of 9 bovine hip luxations in a Scottish report (5), but no mention of this finding was made in a report of 22 American cases (9). An early report from Cornell, however, also made this observation (3). In 3 of 4 luxations in the present series there was evidence of displacement of the femoral head into the obturator foramen. In one case a massive bulla of new bone was formed around the displaced femoral head on the cranial medial edge of the obturator foramen (10).

Previous reports (5,9) indicate that caudal ventral luxations are more grave than cranial dorsal luxations. In one report all 4 cows with caudal ventral luxations were unable to stand whereas 4 out of 5 with cranial dorsal luxations were able to stand on admission (9). One case in the present series recovered with a unilateral luxation and displacement of the femoral head into the obturator foramen (10). The recovery required 48 days until the cow could rise unassisted but from day 4 onward the cow was able to stand unassisted after being aided in rising to a standing position.

In one case a unilateral hip dysplasia-like lesion was an incidental finding during necropsy of an Angus cow that had died of anaplasmosis. The acetabulum was enlarged and there was no acetabular fossa. The articular

surface was enlarged presumably due to greater movement of the femoral head within a thickened fibrous joint capsule. This type of lesion was probably the result of rupture of the coxofemoral ligament without tearing of the joint capsule whereas in most hip luxations both the joint capsule and the ligament of the head rupture.

Summary

Pelvic skeletal damage should not be overlooked in examination of the downer cow even though on farm diagnosis of skeletal damage is difficult or impossible. Specimens from 11 cases illustrate the range of lesions which can occur and therefore serve to give examiners a better idea of possible lesions and their consequences. These cases are summarized as follows:

iliac shaft fracture, one with sacroiliac ankylosis	2 cases
massive healed fracture of pelvic floor	1 case
unilateral fracture of the femoral head	3 case
luxation with periostitis adjacent to acetabulum	4 cases
hip dysplasia like lesion, unilateral	1 case

Three of these cases recovered enough to became ambulatory, the others were considered to be hopeless. Lifting of the cow is a significant aid to diagnosis especially when performing rectal examination. Chip fracures of the cranial aspect of the femoral head were often associated with hip luxation. The proximity of the sciatic nerve to the hip joint makes damage to this nerve a major consequence of hip luxation. Periostitis adjacent to the acetabulum indicated that the luxated femoral head moved over a wide area which included the path of the sciatic nerve. It is concluded that sciatic nerve damage can occur due to trauma from a luxated femoral head.

Zusammenfassung

Bei der Untersuchung vom "Festliegen" sollte das Augenmerk auch auf Verletzungen des knöchernen Beckens gerichtet werden, obgleich das im Stall nicht einfach, oder sogar unmöglich ist. Knochenpräparate von 11 Fällen zeigen die Veränderungen die vorkommen können, und zeigen dem Kliniker die möglichen Schäden und deren Folgen. Diese Fälle sind wie folgt zusammengefasst:

Fraktur des Corpus ilii, einer der Fälle mit Ankylose im Art. sacroiliacus	2 Fälle
Ausgedehnte Fraktur des Beckenbodens	1 Fall
Einseitige Fraktur des Collum femoris	3 Fälle
Ausrenkung des Hüftgelenks mit Periostitis in der Nähe des Acetabulum	4 Fäll
Schaden ähnlich der Hüftgelenksdysplasie, einseitig	1 Fall

Drei dieser Fälle genesten genügend um wieder ambulant zu werden, die anderen wurden als hoffnungslos betrachtet. Das Hochheben (auf die Füsse

stellen) der Kuh ist von Wichtigkeit bei der Diagnose, besonders wenn rektal untersucht werden soll. Abspaltungen (chip fractures) an der kranialen Fläche des Caput femoris wurden oft bei Ausrenkungen beobachtet. Die Nähe des N. sciaticus zum Hüftgelenk ist entscheidend für schwerwiegende Folgen von Luxationen des Hüftgelenks. Die beobachtete Periostitis in der Umgebung des Hüftgelenks ist ein Anzeichen, dass das Caput femoris sich ziemlich weitläufig bewegen kann, auch in die Gegend dorsokaudal des Azetabulum wo der N. sciaticus sich um das Gelenk schlägt. Schädigung des N. sciaticus kann eine Folge eines ausgerenkten Caput femoris sein.

Resumen

Las lesiones de los huesos de la pelvis no debería ser pasadas por alto en el examen de la vaca caída, aunque el diagnóstico en el establecimiento es difícil o imposible. El rango de lesiones que pueden ocurrir es ilustrado a través de muestras de 11 casos; los cuales pueden servir como guía para que los examinadores tengan una mejor idea de las posibles lesiones que pueden encontrar y sus consecuencias. Los casos se resumen de la siguiente manera:

fractura del cuerpo ilíaco, una con anquilosis sacro-ilíaca	2 casos
fractura masiva recuperada del piso de la pelvis	1 caso
fractura unilateral de la cabeza del fémur	3 casos
luxación de cadera con periostitis adyacente al acetábulo	4 casos
displasia unilateral de la cadera igual a una lesión	1 caso

Tres de estos casos se recuperaron lo suficiente para pasar a ambulatorios, mientras que los otros fueron considerados con poca esperanza de recuperación. El levantamiento de la vaca es una ayuda importante para el diagnóstico, especialmente cuando se realiza un examen rectal.

Las fracturas de parte de la cabeza femoral fueron asociadas frecuentemente con luxación de cadera. La proximidad del nervio ciático a la unión de cadera hace que la lesión del nervio sea la mayor consecuencia de la luxación de esta. La periostitis adyacente al acetábulo es un indicador que cabeza femoral luxada se movió sobre un área amplia la que incluye el pasaje del nervio ciático sobre la cara dorso/caudal de la articulación de la cadera. Se concluye que la lesión del nervio ciático puede ocurrir como consecuencia del trauma producido por la luxación de la cabeza femoral.

References

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