PELVIC FRACTURES – SACROILIAC FRACTURES / LUXATIONS

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The most commonly seen fractures in the dog are those of the pelvis: in a review of 112,826 cases of musculoskeletal disorders, they represented 22.4% of all fractures of the appendicular skeleton [1], a figure that is supported by other, less extensive studies. They are nearly always the result of road traffic accidents. Stress fractures are seen in greyhounds. In the cat, the percentage is even higher, 32% of 544 fractures [2], and their origin is similar, with falls only accounting for a very small percentage.

The pelvic girdle is composed of two os coxae (hipbones) and the sacrum to which they are joined by the powerful sacroiliac ligaments. Each hipbone is formed by the fusion of the ilium, ischium and pubis. Its main function is to transmit the forces of the hind limb to the vertebral column. The pelvic girdle protects important organs, which are often present with lesions associated with pelvic fractures.

The clinical manifestations of pelvic fractures, as well as sacroiliac fracture / luxations are very variable. Some animals are ambulatory, others are prostrate from the outset. The degree of pain is also very different from one case to another. Clinical examination begins with palpation of the bony landmarks: the wing of the ilium, the greater trochanter and the ischial tuberosity. The inguinal and perineal regions are examined. A rectal examination is performed. Abdominal palpation and neurological examination should also be performed.

Pelvic fractures are high impact / energy injuries, which can be fatal and are always associated with soft tissue lesions. In addition to the hematoma at the fracture site, there are always vascular lesions that lead to the formation of a significant retroperitoneal hematoma.

The urinary apparatus is injured in nearly 40% of cases [3], almost half of which require surgical repair. The most common lesion is a ruptured bladder. Other injuries include avulsion of the urethra from the bladder neck, urethral rupture (in the male), and ureteral or renal lesions. Three mechanisms can lead to bladder tears: a sudden increase in internal pressure in a full bladder, the penetration of a fragment of bone, and localized necrosis following an initial contusion. In the latter case, the extravasation of urine may occur several days after the accident, after normal urinations have been observed. Extravasation of urine may be intra- or extraperitoneal, depending on the location of the lesion within the urinary apparatus. All intraperitoneal effusions require surgical intervention. The others should be carefully investigated. Radiographic investigation of lesions should be performed with care to avoid exacerbating the injury: the bladder should ideally be studied using intravenous urography; an urethrogram should be performed prior to retrograde cystography or the placement of a urinary catheter.

Peripheral nerve lesions are common, their incidence being estimated at 11% [4], which is no surprise considering the close anatomical relationship between the pelvic bones and the nerves of the lumbosacral trunk. The latter is the main component of the lumbosacral plexus. Identical in the cat and the dog, it is composed of the ventral branches of the last two lumbar nerves and the first two sacral nerves. It runs under the sacrum and then onto the medial aspect of the ilium. Lesions of the lumbosacral trunk are found in sacroiliac fracture / luxations with cranial displacement of the ilium, and in ilial fractures with craniomedial displacement. The lumbosacral trunk becomes the sciatic nerve at the greater ischiatic foramen with the union of the ventral root of the second sacral nerve. Due to its more dorsal location, further away from the bone, it appears to be damaged less frequently. However, it can be injured following an acetabular or ischial fracture, even though these rarely cause dorsal displacements. Although such a lesion may be primarily and directly associated with trauma, it may be secondary and delayed for several months, due to the inclusion of the nerve into the fracture callous. Calcifications can also form slowly at the level of the ischial neck, which lateralizes the sciatic nerve and causes significant pain. The various neurological lesions are seen clinically as changes in sensory perception, decrease or loss of the cranial tibial reflex, and the inability to actively flex the stifle [(negative withdrawal reflex)].

Intestinal lesions are rarely associated with pelvic fractures [5]. However, they can be very serious since they are easily overlooked. Rectal perforations should be suspected if rectal examination reveals bleeding. If a more cranial tear is suspected, ultrasound examination should be undertaken.

The investigation of pelvic fractures is essentially performed using radiography. The rigid frame-like structure of the pelvis means that simple fractures are very unusual. As a rule, multiple fractures are present in so many different combinations that nobody has been able to classify them! Several views are required for this examination. Firstly, a ventrodorsal view, which should be as symmetrical as possible. The lateral view is of limited interest due to superimposition. Two oblique views help in the analysis of lesions: the oblique “butterlied” projection in which, from a ventrodorsal position, a 45° rotation is applied to the side to be studied, such that the femur is in contact with the table in a lateral position. The obturator oblique view is identical, but with the rotation limited to 30°, which enables the ischium of the contralateral side to lie flat.

For a long time the treatment of choice was conservative (i.e. cage rest), recovery rate was 75% [6]. However, it can be associated with a prolonged recovery period, and sequelae due to a reduction in the size of the pelvic canal and misalignment of the coxofemoral joint. Conservative management remains indicated for minimally displaced fractures and those involving regions that do not play a role in the transmission of hind limb forces to the vertebral column: wing of the ilium cranial to the sacroiliac articulation, pubis and ischium. Treatment consists of prolonged cage rest, combined with nursing to avoid pressure sores and urine and / or fecal scalding. Pain decreases towards the second or third week. Reduction of the pelvic canal leads, particularly in the cat, to chronic constipation and megacolon. At which point it is too late to consider surgery to enlarge the pelvic narrowing [7] as the intestinal lesions are irreversible. A subtotal colectomy is then indicated [8].

These days, surgical treatment is performed in the vast majority of pelvic fractures, enabling the combination of rapidity and quality of recovery. It is very beneficial in fractures that prevent the transmission of hind limb forces, i.e. fractures of the body of the ilium, fractures of the acetabulum and sacroiliac

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fractures / luxations. “Tripod fractures” of the ilium-ischiium-pubis, that create a floating acetabulum, are particularly prone to very prolonged recoveries, if they heal at all. As with all articular fractures, acetabular fractures require very precise repair, i.e. surgical fixation. Finally, the surgical repair of bilateral fractures, and those associated with other long bone fractures, shortens an otherwise painful and prolonged recovery.

Due to the wide variety of fractures seen, implants may need to be applied to all of the boney structures. It is therefore necessary to be familiar with all of the surgical approaches to a hemi-pelvis [9] : 
- Dorsal to the sacroiliac articulation
- Ventral to the ilium
- Craniolateral to the hip
- Caudal to the hip
- Trans-trochanterian

As well as some useful variations such as the disinsertion of the rotator muscles or osteotomy of the ischial tuberosity [10] [11]. A plate-screw system is required for fracture fixation.

Sacral fractures and fracture-luxations may be uni- or bilateral. Fixation is accomplished using a screw, and its success depends upon the implantation depth of the screw in the sacrum, which necessitates that it be implanted above the vertebral canal. [12, 13].

Ilial fractures are fixated using plates, following a ventral approach. The gluteal muscles can be extensively elevated, since the risk of devitalization is low, moreover, pseudoarthroses are very rare. Reduction is unusual in that the cranial fragment is fixed. Care must be taken not to damage the sciatic nerve close to the medial aspect of the ilium. The plate is used to complete the reduction: the plate is first fixed to the caudal fragment and then used as a lever to perfect the reduction prior to cranial fixation.

All acetabular fractures require surgical repair, including fractures of the caudal third [14]. Several different approaches may be used, but the caudal and trans-trochanterian approaches are the most indicated. The approach should enable precise reduction, a femoral head and neck excisional arthroplasty is recommended. Fixation is achieved using a plate. Brinker’s specialized acetabular plates or tridimensional reconstruction plates can be used. In the latter case, it is advisable to pre-mould the implant in advance on a dry bone. In comminuted fractures, whose fragments do not enable such a reconstruction, fixation can be accomplished with the use of pins, screws and methylmethacrylate cement [15].

REFERENCES