“Tiger Tracks”

Sacroiliac Joint Luxation and Pelvic Fractures in the Cat

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Class of 2019

Prepared for
Clinicopathologic Conference

Presented on
May 11, 2018

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Introduction:

The pelvis is the second most frequently fractured bone in the cat (13), second to the femur, and accounting for approximately 20-32% of feline fractures (10). Pelvic fractures in cats most commonly occur as a result of vehicular accidents, while falls and crush injuries result in a relatively small proportion of fractures. The average age of cats with pelvic fractures, and traumatic injuries of all types, has been found to be less than 24 months. It has been reported that trauma generally tends to occur more often in male cats (9), however, several studies have found similar rates of fractures of all types in both male and female cats.

Given the force of traumatic insult necessary to fracture the pelvis, additional injuries are seen in a large number of cases, with incidences of up to 71% being reported (1). These extra-pelvic injuries often take precedence in management, as cats rarely die from pelvic fractures. Thoracic trauma occurs frequently, with the most commonly seen concomitant injuries being pneumothorax and pulmonary contusions. Bladder rupture can also occur, but is seen much less often in cats than dogs. Additional injuries include sacral fracture, coxofemoral joint injury, femoral fracture, and peripheral nerve paralysis (10). Femoral, sciatic, pudendal and pelvic nerve injury can occur, ranging from mild paresis to loss of deep pain sensation, or loss of anal tone and motor function of the tail and inability to fully empty the bladder in the case of the pudendal nerve. Sciatic paresis is reported to occur most frequently in association with ilial body fractures and sacroiliac luxation but can also occur as a result of callus formation during healing (9). Due to the high rate of concurrent injuries seen with pelvic fractures, a thorough examination of the entire patient, including a full neurologic examination, and abdominal and thoracic radiographs, are indicated when a cat presents with pelvic pain following a traumatic event.

Due to the box-like structure of the pelvis, pelvic fractures almost always occur in multiples. Sacroiliac fracture luxation accounts for 19-27% of pelvic bone injuries in cats (4). Sacroiliac luxation can be either unilateral or bilateral, however, if unilateral, it is always accompanied by one or more pelvic fractures or a symphyseal separation (4). With sacroiliac luxation, the ilium typically displaces in a cranial and dorsal direction. The most common combination of fractures include a pelvic floor fracture with unilateral ilial body fracture and contralateral sacroiliac luxation, as were seen in the case that will be discussed (9).

History and Presentation:

On October 12th, 2017, Tiger, a 17-year old Domestic Shorthair cat presented to the Animal Emergency & Referral Center (AERC) in Flowood, MS shortly after he was run over by a car. Tiger's owner reported that she accidently ran him over when returning home, and noted that he was limping on one of his hind limbs following the accident. She also reported that he was an outdoor cat that was not up to date on vaccinations, and had last visited a veterinarian when he was neutered years prior. On presentation at AERC, Tiger was laterally recumbent, in respiratory distress, and severely painful on abdominal palpation and pelvic manipulation. He was tachycardic (heart rate: 232 bom), tachypneic (respiratory rate: 78 breaths per minute), and hypothermic (temperature: 96.6 F). He was unwilling to stand, but motor function was noted in all 4 limbs. A complete blood count performed at that time revealed a moderate microcytic hyperchromic anemia (HCT: 16.2%, MCV: 33.8 fL, MCHC: 37.0 g/dL), with a mild thrombocytopenia. Serum chemistry revealed a mild hypophosphatemia (2.1 mg/dL), mild hypocalcemia (6.6 mg/dL), mild hypoproteinemia (5.4 g/dL), moderate hypoalbuminemia (1.7 g/dL), severe hypernatremia (>180 mmol/K), mild hypokalemia (2.5 mmol/L), mild hyperchloremia (137 mmol/L), and a mildly decreased alkaline phosphatase (<10 U/L) and amylase (454 U/L). An iSTAT was run the following morning to reevaluate sodium levels, which were then within normal limits (159 mmol/L), thus it is possible that the initial blood work was taken following hypertonic saline administration. However, the timeline of obtaining bloodwork was incompletely documented. Blood pressure was elevated with a systolic pressure of 192 mmHg, diastolic of 156 mmHg, and a mean arterial pressure of 175 mmHg. Thoracic radiographs were suggestive of rib fractures, which were determined to be fractures of the costochondral junctions on repeat radiographs performed the following morning. Pelvic radiographs revealed severe comminuted fractures of the right pelvis. On abdominal FAST scan, the bladder was noted to be intact and no free abdominal fluid was observed.

Initial stabilization included a 4 ml/kg bolus of hypertonic saline, followed by a 16 ml/kg bolus of Normosol R. Following these boluses, Tiger was started on Normosol R at a rate of 4 ml/kg/hrml/hr. He was also given Cerenia (1 mg/kg IV q 24 hr), Methadone (0.1 mg/kg IV q 6 hr), and Unasyn (30 mg/kg IV q6 hr). Tiger was maintained on intravenous fluids and oxygen support throughout the night and transferred to Mississippi State University College of Veterinary Medicine the following morning for a surgical consultation.

On presentation at MSU CVM, Tiger exhibited signs of respiratory distress, including tachypnea (respiratory rate: 80 breaths per minute) and increased respiratory effort, while his heart rate was within normal limits at 160 beats per minute. His mucous membranes were pale, with a capillary refill time of less than 2 seconds. He was also still significantly hypothermic, with a temperature of 95 F. Tiger had minimal tail tone and absent anal tone. He was found to have a severely delayed withdrawal response and absent deep pain sensation on manipulation of the distal aspect of his right hind limb. Radiographs taken at AERC were sent to MSU CVM for review and a right ilial wing fracture, a right ischial table fracture, a left sacro-iliac luxation, and comminuted fractures of the pubis were diagnosed.

Pathophysiology:

The pelvis is a box like structure made up of two os coxae and the sacrum. The os coxae is composed of four developmentally different bones, the ilium, ischium, pubis, and acetabular bone. The ilium, acetabulum, and sacroiliac joint comprise the weight bearing axis of the pelvis. The anatomy around the sacroiliac joint is complex, as the location of the spinal canal, the nerve roots exiting the first sacral foramina, the lumbosacral intervertebral disc space and the pelvic canal all must be considered when placing an implant into the sacrum (7). The lumbosacral plexus is made up of the last five lumbar nerves and the three sacral nerves that travel ventrolateral to the sacrum and along the medial surface of the ilium, where the sciatic nerve then separates to leave the pelvic canal caudodorsal to the hip joint (12). Any of these nerves can be damaged directly during trauma, iatrogenically during fracture repair, or post operatively due to callus formation.

In general, most fractured bone will heal eventually without surgical intervention. Fractures can heal via 3 different pathways including indirect bone union, direct bone union, and intramembranous bone formation. Indirect bone healing occurs in unstable environments in which there is motion of the bone segments. It is characterized by the formation of fibrous connective tissue and a cartilage callus at the fracture site. Once the callus bridges the fracture site, stability is achieved and bone remodeling begins. Direct bone healing takes place when absolute fragment stability is achieved at the fracture site. For this type of healing to occur, there needs to be close to no movement at the fracture site, and the fragments need to be in contact or separated by a gap of less than 300 μm. With direct bone healing, there is no intermediate cartilage stage or visible callus formed, thus radiographically, direct bone healing appears as an increasing density of the fracture line. This bone is not strong enough to withstand full weight bearing until remodeling completes. Intramembranous bone formation is the direct differentiation of mesenchymal stem cells into osteoblasts. In this type of healing, bone forms without a cartilaginous precursor. Indirect and intramembranous bone healing are generally combined (7). Given the nature of pelvic fractures, with multiples typically occurring, perfect reduction and alignment of fracture fragments is often difficult to achieve, but must be done for direct bone healing to occur. Furthermore, fractures of the pelvic floor that do not affect weight bearing are often left to heal without surgical stabilization, and thus undergo indirect bone healing.

Due to the close proximity the sciatic, femoral, pudendal, and pelvic nerves to the pelvis, peripheral nerve injury frequently occurs with pelvic trauma. There are three classes of nerve injury. Class I, or neuropraxia, is typically caused by ischemia and mild demyelination without any structural damage. Clinically, neuropraxia appears as a transient lack of nerve function with variable motor and proprioceptive dysfunction. Nociceptive function is generally preserved and spontaneous recovery occurs within days to months. Class II, axonotmesis, mainly occurs with crush injuries and results in substantial motor, proprioceptive, and nociceptive dysfunction. With class 2 injuries there is a structural disruption of axons, but connective tissue support remains intact and axons may regrow along this scaffold. Class III, neurotmesis, injuries occurs with severe contusion, stretch, or laceration. With neurotmesis a complete severance of axons of the nerve occurs which will not regrow without surgical intervention. Complete motor, proprioceptive, and nociceptive dysfunction is present (7). Any of these types of nerve injury are possible with the trauma associated with pelvic fractures, depending on the specific circumstances of the injury. Prognosis for return to function varies widely from good (neuropraxia) to poor (neurotmesis) depending on the degree of structural disruption of axons and the length of the nerve required to regenerate. In general, axons can be expected to grow at a rate of 1 to 4 mm per day (7). In order to better estimate prognosis following traumatic events with associated neurologic dysfunction, it is important to know the characteristics of each of these classes, as well as the expected recovery time and stages of healing.

Diagnostic Approach/ Considerations:

Cats presenting with sacroiliac luxations are usually non- to minimally-weight-bearing on the affected side, however may have to bear some weight if there is a contralateral long bone or pelvic fracture. Instability is usually difficult to palpate, and attempts to do so should only be performed on sedated and/or appropriately analgesed patients. Dorsoventral movement of the ilium may be detected with severe displacement. Diagnosis of pelvic fractures in cats is usually done radiographically. Ventrodorsal and lateral radiographs of the pelvis are necessary to assess the degree of injury. SI luxation is diagnosed by a visible step at the sacroiliac joint, often diagnosed on the ventrodorsal view (18). An apparent widening of the sacroiliac joint can be seen if the pelvis is not straight on radiographs, thus appropriate patient positioning is crucial to accurately interpret the sacroiliac joint. Commuted tomography is more sensitive than radiographs and may be considered to further evaluate acetabular and sacral fractures, and sacroiliac joint integrity.

Once a pelvic fracture has been diagnosed, the decision must be made whether to manage it medically or surgically. Due to the high incidence of concurrent injuries with pelvic fractures, it is crucial to fully evaluate the patient prior to making this decision, ensuring that more critical or life threatening injuries are addressed first. Efforts should be made to repair pelvic fractures within 5 days of injury, as delaying beyond this time may make adequate reduction difficult to achieve. Conservative management of sacroiliac luxation in cats has historically been considered more successful than that in dogs, due to the belief that feline patients are better able to compensate for this type of injury. However, surgical fixation re-establishes normal pelvic anatomy and the firm attachment between the appendicular and axial skeleton, facilitating a decrease in pain and quicker return to function, which not only improves initial quality of life, but also long term prognosis. Conservative treatment may be considered in cases with minimal displacement and instability, minimal pain, absence of neurological deficits, and the absence of pelvic canal obstruction (8). Long term complications associated with conservative treatment of sacroiliac luxations include degenerative osteoarthritis in the injured sacroiliac joint, the contralateral sacroiliac joint, and the lumbosacral joint, as well as pelvic canal narrowing which may lead to constipation and obstipation if it is greater than 45% of the pelvic canal diameter (7). Conservative treatment is comprised of 8 to 12 weeks of strict cage confinement along with analgesic therapy to mitigate associated pain (1).

Surgery is indicated in extremely painful patients, in cases with severe neurological deficits or marked instability of the pelvic canal with fractures of any of the weight bearing structures, in any fracture which severely compromises the diameter of the pelvic canal, and in patients with an inability to walk after 3 days of conservative management (3, 9). If surgical management is elected, a decision must be made whether to perform an open or closed reduction and implant placement across the sacroiliac joint. The open approach was the primary option for SI luxation repair prior to 1999 when a closed approach using fluoroscopic guidance in the cat was first described (6). The traditional open approach involves extensive soft tissue dissection and retraction of the ilial wing to visualize the sacral wing and place the screw (6). The extensive dissection required, as well as the complicated anatomy in the pelvic region, are likely why conservative management of SI luxation was so heavily relied on in the past. A 1992 study evaluating characteristics of pelvic fractures in the cat found that only 30% of cats that presented during the study underwent surgery, while over 90% had at least one of the surgical indications listed above (3). Utilization of the closed technique is limited by the availability of fluoroscopic equipment, and poses the risk of additional radiation exposure to staff. Without the use of fluoroscopy, the desired area of the sacral body cannot be directly visualized during surgery and anatomical landmarks must be utilized to ensure appropriate implant placement. In human medicine, the use of fluoroscopy has become the standard method for determining the correct position of iliosacral implants in SI luxation repair (14). A study evaluating lag screws placed with the aid of intra-operative radiology and screws placed using a traditional open technique found 13% of screws placed in the intra-operative radiology group exited the sacrum in an inappropriate location as opposed to 47% in the other group. Mean sacral width purchased was also significantly higher in the group that used intra-operative radiology, which correlates to a decreased risk of screw loosening during the recovery period (14).

Numerous surgical stabilization methods have been suggested, with lag screw fixation being the preferred method (1). Additional surgical fixation methods that have been described include transilial pins passed through the ilial wings and the spinal process of L7. Reduction and lag screw placement can be performed with an open approach and bone screws or via a closed fluoroscopically assisted technique. Regardless of fixation method, the area for appropriate screw placement is an average size of less than 0.5 cm^{2}, which is about 25% of the size of the articular surface of the sacral wing (4).

Repair of a contralateral ilial or acetabular fracture should be performed prior to sacro-iliac luxation repair as it will likely decrease the displacement of the sacroiliac joint, making the final reduction of the joint easier. However, placement of a bone plate on the ilium may obscure the view of the sacrum, making it more difficult to visualize the Kirschner wire and lag screw placement. If the sacroiliac luxation repair is done first, exact reduction is required or repair of the contralateral fracture becomes close to impossible (8). Improper screw positions include ventral placement, premature exit of the sacral wing, cranial placement into the L7-S1 intervertebral disc space, and dorsal placement into the sacral wing (1). These screw positions may endanger the spinal cord or result in short, shallow screw placement, leading to screw loosening and stabilization failure. To ensure adequate reduction and proper implant placement, post-operative radiography is required.

Following surgery, activity should be limited for 4 to 6 weeks, or until radiographic union of the fracture is observed. Physical rehabilitation following surgery is important to limit muscle atrophy and maintain optimal limb function during fracture healing by encouraging controlled use. With appropriate surgical planning and technique, prognosis for bone healing of pelvic fractures is usually excellent. In a study evaluating neurological deficits associated with pelvic fractures in the cat, 79% of all neurological deficits resolved and the remainder improved, with 75% of cats in this study being managed surgically. This same study found that long-term mobility was not impaired in 86% of cats, and 84% did not have lameness detectable (9).

Treatment and Management:

Upon presentation at MSU CVM abdominal FAST and thoracic FAST scans were performed and revealed no free fluid in the thorax or abdomen. Methadone was administered intravenously at 0.2 mg/kg and a urinary catheter was placed to ensure that Tiger was emptying his bladder appropriately, as he exhibited absent anal tone, and damage to the pudendal nerve can lead to problems completely emptying the bladder. He was then started on a fentanyl constant rate infusion at 3 mcg/kg/hr, which was increased to 4 mcg/kg/hr, because he still appeared painful, and Lactated Ringers Solution spiked with potassium chloride at a rate of 4 mL/kg/hr, which was decreased to 3 mL/kg/hr and then 2 mL/kg/hr (maintenance) on the morning of 10/15/17, due to adequate urine production of 3.5 mL/kg/hr. Fluids were briefly discontinued on 10/13/17, due to a period of increased respiratory rate that was suspected to be caused by iatrogenic fluid overload. Thoracic radiographs were performed on 10/16/17 to evaluate residual pulmonary damage from the suspected fluid overload event, but no radiographic signs of fluid overload were observed. Urine production was monitored closely to adjust fluid rates once fluids were reinstituted. Repeat bloodwork performed on 10/13/17 revealed a PCV of 21%, a total protein of 6.4 mg/dl, a moderately decreased PO2 (34 mmHg, normal= 90-110), a mild hyperglycemia (169 mg/dL, normal= 60-130), and a moderate anemia (17%, normal= >25%). These changes are consistent with stress and anemia, likely due to blood loss or chronic disease. A urine specific gravity performed on 10/14/17 revealed a USG higher than the refractometer could read, estimated to be near 1.080. Although Tiger was non ambulatory, depressed, and inappetant throughout the weekend, he was stable, and surgery was scheduled for Monday morning.

Surgery was postponed until Tuesday in order to perform commuted tomography of the pelvic region to evaluate the right acetabulum and determine if the right sacroiliac joint was luxated, and to administer a blood transfusion which was indicated due to consistently low PCV readings over the weekend. Tiger was blood typed and a cross match to determine compatibility with donor blood was performed prior to blood administration. He was determined to be a Type

A blood type, which is the most common amongst cats. He received a total of 65 mL of whole blood over a 4.5 hour time period and was monitored throughout for reactions. No transfusion reactions were observed during or following the transfusion. Tiger's PCV increased 5% on a PCV reading 7 hours post transfusion to 24%. Commuted tomography of the pelvis revealed a short oblique, comminuted fracture of the right ilial wing and body with cranioventral displacement of the caudal fracture fragment, and subluxation of the left sacroiliac joint with cranioventral displacement of the ilium. Additionally, a small chip fracture of the left ventral aspect of the sacrum at the level of the sacroiliac joint, multiple comminuted fracture of the pelvic floor (left and right pectines of the pubic bone, pubic symphysis, and ischiatic table), and right ischial fractures were observed. These fractures caused a moderate to severe narrowing of the pelvic inlet. There was also decreased muscle mass of the left hindlimb musculature and mild spondylosis deformans at L7-S1, and multiple smoothly marginated, ovoid, fat attenuating masses in the caudal hindlimb musculature.

On 10/17/17, Tiger underwent surgery to repair his right ilial wing fracture and left sacroiliac luxation, as well as esophagostomy tube placement due to his continued anorexia. Tiger was induced with midazolam and propofol and maintained on isoflurane and a fentanyl CRI (4 mcg/kg/hr). He received cefazolin preoperatively and every 90 minutes intraoperatively. He was initially placed in left lateral recumbency and the right hind limb was prepared for ilial fracture repair. The right ilium was accessed using a lateral approach, incising from the center of the iliac crest and ending just cranial to the greater trochanter. Kern bone holding forceps were placed on the body of the ilium and traction was placed to reduce the two major fracture segments into proper position. Once sufficient reduction of the ilial fracture was achieved, a 2.7 mm 6 hole SOP plate was contoured and applied to the ilium with five 2.7 mm cortical screws, three cranial and two caudal to the fracture site. An encircling ligature using 2-0 PDS was placed around the third fracture fragment (located cranioventral to the main fracture line) and looped around the SOP plate to bring it into alignment with the rest of the ilium. The surgical site was lavaged with warm sterile saline solution and closed.

Tiger was then rotated into right lateral recumbency and the left hind limb and pelvis were clipped and prepped. A 22g needle was inserted into the area of the ilial wing and sacrum and viewed with fluoroscopy. When acceptable needle placement was achieved, a stab incision was made through the skin and subcutaneous tissue in that area with a #15 blade. Fluoroscopy was used to drive a 0.062" K-wire across the sacroiliac joint. A second K-wire was placed immediately ventral to the first and caudal to the desired area of lag screw placement. When acceptable pin position was achieved a tap sleeve was slid over the K-wire and pushed down to contact the ilium. The ventral most K-wire was removed and a 2.7 mm drill bit was used to drill a thread hole through the ilium and across approximately 60% of the sacrum. A measuring device was used to ensure that the appropriate sacral depth had been reached, and to determine cortical screw length. Next, a 3.5 mm drill bit was used to drill a guide hole through the ilium. A 3.5 x 24 mm cortical screw was then placed. The implant placement was assessed intra-operatively using fluoroscopic imaging. The site was closed and surgical adhesive was then placed over the incision. Telfa and SureSites were then applied over both incisions. Post-operative radiographs revealed improved alignment and apposition of the right ilial fracture and persistent, but stabilized displacement of the left sacroiliac joint. An esophagostomy tube check revealed appropriate placement into the distal esophagus. Anesthetic recovery was uneventful, but Tiger exhibited an episode of tachycardia and tachypnea later in the evening, which was treated with a 50 mL bolus of Lactated Ringers Solution and an increase in his fluid rate to 4 ml/kg/hr. He began receiving feedings of Hills Urgent Care a/d diet made into a slurry through his esophagostomy tube the evening following surgery. The amount of food given was slowly increased by 25% each day until he reached basal energy requirement.

The morning after surgery, Tiger's deep pain sensation was rechecked in his hind limbs. He was appropriately responsive to stimulation of the lateral aspect of his right hind limb, while the reduced response of the medial aspect persisted, but was slightly improved from prior to surgery. Decreased nociception of the medial aspect of the right hind limb following traumatic insult is consistent with axonotmesis or neurotmesis of the femoral nerve. Tiger's fentanyl CRI was decreased to 3 mcg/kg/hr and then discontinued the following day due to his continued dull mentation. He was then started on Onsior at 2 mg/kg orally ever 24 hr and Buprenorphine at 0.01 mg/kg orally every 8 hours to help decrease inflammation and control pain. Due to Tiger's dull mentation and consistently low PCV's, an ELISA snap FELV/FIV test was performed on 10/19/17 and a complete blood count and reticulocyte count were performed, revealing a stress leukogram, non-regenerative anemia , and a positive result for FIV antibodies. To the knowledge of Tiger's owners, he had never been vaccinated for FIV before, which suggests that the results likely indicated a true infection. Mirtazapine therapy was initiated on 10/20/17 at 1.8 mg orally every other day for appetite stimulation. Cerenia administration was also begun on 10/20/17 at 1 mg/kg orally every 24 hours as an antiemetic in case nausea was contributing to his continued inappetance. Intravenous fluids were discontinued on 10/20/17. On 10/20/17, Tiger began eating a small amount of food and attempted to stand multiple times, but had much trouble manipulating his right hind limb. On 10/23/17 his urinary and jugular catheters were removed and he was provided with a litter box. During this phase of recovery, Tiger's kennel was heavily bedded and he was cleaned with a damp cloth frequently to remove urine from his skin and fur and prevent urine scalding.

On 10/25/17, Tiger began receiving physical therapy. He received laser therapy on each of his hind limbs, as well as assisted standing exercises with sling support of his hind end. Initially, he was able to intermittently bear full weight on his left hind limb and place it normally, but showed reduced to absent conscious proprioception of the right hind limb, frequently knuckling over at the paw when he attempted to bear weight. For the following 13 days, Tiger attended physical therapy sessions 5 days a week and participated in exercises including laser therapy, electrical stimulation, therapeutic massage, passive range of motion, and assisted standing and walking. Strength of both of his hind limbs slowly increased and he continued to show progress appropriately placing his right hind limb, especially when a “No Knuckle” boot used to prevent his right hind paw from knuckling under when he walked, was worn. His appetite also steadily increased during this time and the mirtazapine (10/25/17), Cerenia (10/29/17), and buprenorphine (10/31/17) were discontinued. On 10/27/17 redness, swelling, and discharge were observed around the esophagostomy site and Tiger was started on Clavamox at 18.75 mg/kg orally every 12 hours. Clavamox was discontinued after a vomiting episode on 10/31/17. Esophagostomy tube feedings were continued until 10/29/17and the esophagostomy tube was finally removed on 10/30/17.

After a 27 day stay in the hospital, Tiger was discharged on 11/8/17. At the time of discharge, Tiger had a good appetite and was eating full meals on his own. He was able to urinate and defecate on his own and ambulated appropriately with his left hind limb. He was able to bear some weight on his right hind limb. While the function of his right hind limb was still reduced, he showed vast improvement in placing it from what he had 2 weeks prior. Tiger was discharged with strict instructions for cage rest for 8 to 12 weeks, with recheck radiographs to be performed 4 and 8 weeks following surgery.

Case Outcome:

At a 4 week recheck examination, both of Tiger's incision sites appeared to have healed appropriately and Tiger did not exhibit a pain response on manipulation of his pelvis or hind limbs. On neurologic assessment, he had an appropriate withdrawal response of both hind limbs, and only slightly decreased conscious proprioception of the right hind limb. Radiographs revealed that the right ilial fracture was healing appropriately. The screw placed to stabilize the left sacro-iliac subluxation had backed out of the sacrum approximately 30%, but the sacrum and ilium still appeared appropriately aligned. Screw migration was likely associated with excessive movement during the previous 4 week recovery period. Tiger was again discharged with instructions for strict activity restriction to minimize the likelihood of implant failure.

At an 8 week recheck examination, Tiger exhibited appropriate placement of both hind limbs and ambulated well around the exam room. Radiographic evaluation of his pelvis revealed that the screw placed to stabilize the sacroiliac luxation had not backed out any further and the sacrum and ilium appeared to be appropriately aligned. . There was still a lucent fracture line present on the right ilial wing with significant callous formation observed. Given that the fracture line was still visible on the right ilial wing, activity restriction was recommended for 4 additional weeks.

At a final recheck 12 weeks after surgery, Tiger's owner reported that he had returned to close to full function ambulating at home and had not exhibited any trouble defecating. Radiographs of the pelvis revealed stable implants and appropriate healing of the ilial fracture and sacroiliac luxation.

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