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Case report: calcaneal fractures in a cat

Abstract: A one year four month old male neutered domestic shorthair cat was presented for sudden onset, left pelvic limb lameness. Upon clinical examination, pain was localised to the hock region and the cat was found to have persistent deciduous teeth. No evidence of trauma was apparent. Radiographs revealed a transverse fracture at the base of the calcaneus. The fracture was stabilised with a Steinmann pin and tension band wire. Eleven weeks after fixation of the fracture, the cat presented with lameness of the contralateral limb and again no evidence of trauma was identified. Radiographs revealed a transverse fracture at the base of the right calcaneus. Fracture repair was performed as for the left. 14 months following the initial surgery, the cat was ambulating normally with no signs of pain or lameness in either pelvic limb. This case supports the association between persistent deciduous teeth and spontaneous fractures in cats.

Key Words: Calcaneus, Deciduous teeth, Fracture, Feline

Introduction

Calcaneal fractures are rare in the cat with trauma considered to be the most common aetiology (Schmokel, Hartmeier et al. 1994). One case of spontaneous calcaneal fracture was reported in a case series of cats with patellar fracture (Langley-Hobbs 2009) and a recent report documented spontaneous bilateral calcaneal fractures in two cats (Cantatore and Clements 2015). One of these cats had signs of healed fractures in other sites (ribs, vertebrae). We report a case of bilateral calcaneal fracture in a young cat from a litter of kittens, all with persistent deciduous teeth.

History

A one year four month old, male neutered, domestic shorthair cat was presented to the referring veterinarian with lameness of the left hind limb. Pain was localised to the hock and standard mediolateral and caudocranial radiographs under sedation obtained revealed a transverse fracture at the base of the calcaneus (Fig 1). No other signs of trauma were present and no other radiographic abnormalities were noted. Routine biochemical and haematological analysis was unremarkable. Radiographs of the right hock were unremarkable (Fig 2)

An additional finding in the animals' history was the presence of persistent deciduous teeth, with dental abnormalities also present in its two siblings (one with persistent deciduous teeth, the other with apparently missing lower cheek teeth). The sibling with persistent deciduous teeth was consequently euthanized as a consequence of dental problems. The other sibling developed onychodystrophy and recurrent nail bed infections which resulted in osteomyelitis necessitating amputation of several digits.

Surgery

The cat was premedicated with 0.3mg/kg methadone (Comfortan®, Dechra Veterinary Products Ltd.) and 0.01mg/kg acepromazine (ACP®, Novartis Animal Health UK Ltd.) intravenously prior to induction of anaesthesia with 4mg/kg propofol intravenously (Rapinovet®, Bayer Healthcare LLC.). A plantarolateral approach was made to the calcaneus. The fracture was reduced and a Steinmann pin placed in a normograde fashion and seated into the calcaneus (Piermattei and DeCamp 2006). A

tension band wire was then placed through bone tunnels in the calcaneus. Post-operative radiographs showed good reduction of the fracture (Fig 3). Post-operative analgesia was provided with 0.1mg/kg meloxicam (Metacam® injection for cats, 2mg/ml, Boehringer Ingelheim) subcutaneously once, 0.2mg/kg methadone (Comfortan®, Dechra Veterinary Products Ltd.) intravenously every four hours for two doses then continued with 0.02mg/kg buprenorphine (Vetergesic®, Reckitt Benckiser Health Ltd.) intravenously every six hours for a further 24 hours based on pain scoring. 0.05mg/kg meloxicam (Metacam® oral suspension for cats, 0.5mg/ml, Boehringer Ingelheim) was continued orally once daily for five days post-operatively. A dressing was applied for 24 hours post-surgery to reduce swelling and the cat was discharged with instructions for strict crate rest for six weeks. The skin incision healed unremarkably and sutures were removed after 14 days by the referring veterinarian. Repeat radiographs were obtained at six weeks post-surgery. These revealed some signs of remodelling at the fracture site (Fig 4) though healing of the fracture was incomplete. The Steinmann pin could be seen to have bent slightly though this was not clinically significant. A further six weeks house confinement was recommended.

Eleven weeks post-surgery, the cat was referred with non-weight bearing lameness of the right hind limb having jumped from a height. The referring veterinarians' lateral radiographs revealed a fracture in the base of the right calcaneus (Fig 5.) with similar configuration to the previous contralateral calcaneal fracture. Radiographs of the left hock showed some further remodelling at the fracture site though healing was still incomplete.

On this occasion, ionised calcium was found to be 1.4mmol/l (ref 1.2-1.32mmol/l) on pre-operative blood biochemical analysis though other parameters were within the normal range. The cat was premedicated with 0.3mg/kg methadone (Comfortan, Dechra Veterinary Products Ltd.) and 5μg/kg dexmedetomidine (Dexdomitor, Zoetis Inc.) intramuscularly prior to induction with 4mg/kg propofol (Rapinovet, Bayer Healthcare LLC.) intravenously. Surgery was performed on the right hock in a similar manner to the left with an intramedullary pin and tension band applied. Post-operative analgesia was provided as for the left leg. Post-operative radiographs showed good reduction of the fracture (Fig 6). Again a dressing was applied overnight and the cat was discharged with instructions for a further six weeks of crate rest.

Six week post-operatively the cat was ambulating well with no signs of discomfort, hyperflexion of the hock or lameness of either limb. Radiographs of the right hock were obtained by the referring veterinary surgeon which showed the implants to be in position with no signs of loosening, though the Steinmann pin had bent slightly as previously noted on the left leg. The fracture showed evidence of remodelling of the previously visible fracture line, though as on the left leg, bone healing was not complete.

10 months after the surgery on the left tarsus the cat was again presented to the referring veterinarian with mild lameness of the left pelvic limb. Radiographs were obtained which showed complete healing of the previously visible fracture line (Fig 7). No further investigation was performed, the lameness resolved within 24 hours and no further episodes of lameness had been observed by the owner 14 months after the first fracture was stabilised. No objective assessment of limb function was attempted.

Discussion

Calcaneal fractures are most commonly seen in young racing greyhounds, often in association with fracture of the central tarsal bone (Ost, Dee et al. 1987, Carmichael 2012). Fractures of the calcaneus result in loss of function of the common calcaneal tendon, and fractures of the base of the calcaneus tend to result in plantar instability (Piermattei and DeCamp 2006). Thus presenting signs are either of non-weight bearing lameness or a plantigrade stance.

Calcaneal stress fractures are well known in humans, usually associated with intense physical activity (e.g. military recruits) either alone or combined with other factors such as immunosuppression or systemic disease (e.g. diabetes mellitus) (Voormolen, Canete et al. 2012). However, there are few reports of calcaneal fractures in the peer-reviewed veterinary literature.

Stress fractures are defined as fractures of a bone which has not accommodated to the forces being applied to it (Mason, Moore et al. 1996). They are further defined as fatigue fractures or insufficiency fractures. Fatigue fractures are a result of increased loading of a normal bone whereas insufficiency fractures are a result of normal forces acting on a bone weakened by a generalised pathological process (e.g. osteoporosis). In humans, pain is a common feature in the early stages of stress fracture and at this stage radiographic changes may be absent. Later changes which may be observed are a faint radiolucent line, cortical thickening and sclerosis (Patel, Roth et al. 2011). Sclerosis has been a frequent finding in the spontaneous fractures of cats (Langley-Hobbs 2009, Langley-Hobbs, Ball et al. 2009, Cantatore and Clements 2015) including the contralateral patellar in unilateral patellar fracture cases. However, sclerosis was not a prominent feature in the present case.

An interesting finding in this case was the persistence of deciduous teeth which is a rare finding in felines. A previous publicationon cats with stress patellar fractures reported a relatively high number of animals with persistent deciduous teeth (5/34) (Langley-Hobbs 2009). This has led to use of the term Knees and Teeth Syndrome (KaTS) (Brooks and Bailey 2012). One cat with persistent deciduous teeth in this report went on to spontaneously fracture one of its calcanei, though a number of other animals developed spontaneous fractures in other sites such as proximal tibia, pelvis (acetabulum and ischium) and humerus. A series of cats with stress fractures of the proximal tibia were all found to have bilaterally fractured patellae (Langley-Hobbs, Ball et al. 2009). It has therefore been speculated that cats developing such stress fractures may be suffering from a generalised osteopathy leading to increased fragility. No clear explanation for the pathogenesis of the fractures has been put forward, but it has been hypothesised that a defect of collagen production such as that seen in osteogenesis imperfecta may be involved (Langley-Hobbs 2009). At the time of follow-up radiographs, the cat in this case report had no other findings that could be suggestive of impending fracture in other sites (e.g. patellar or proximal tibial sclerosis) although only the stifles were examined radiographically.

Extraction of the persistent deciduous teeth was recommended in this case in an attempt to prevent complications associated with their presence (e.g. dentigerous cysts, osteomyelitis) which has been documented by the author in other cases (unpublished findings).

It is unclear whether cats suffering from calcaneal fractures are suffering from the same underlying pathophysiological mechanism of fracture as those with spontaneous patellar fracture. The mean age of cats with patellar fracture was two years and five months (median 1-2 years) (Langley-Hobbs 2009). The cat in this report was one year and four months old at first fracture. This, in conjunction with persistent deciduous teeth may suggest that this cat is affected by KaTS. In the only other case report of bilateral feline calcaneal fracture , the animals were seven years and five years respectively (Cantatore and Clements 2015). Although one of these animals had radiographic findings consistent

with vertebral and rib fractures, these were not typical of KaTS affected animals. There was no record of dental abnormalities in these animals.

In the case reported here, an elevated ionised calcium level was noted when presented for the second fracture. This finding remains unexplained and no further investigation was undertaken due to this elevation being mild. .

Internal reduction and fixation of calcaneal fractures is generally considered to be necessary (Carmichael 2012), though external coaptation is possible for undisplaced fractures (Scott HW. 2007). Pin and tension band fixation is frequently considered optimal since this converts the tensile pull of the tarsal extensor muscles into a compressive force at the fracture site. However, lateral plate fixation of calcaneal fractures has been reported (Piermattei and DeCamp 2006, Carmichael 2012) and has been placed bridging the middle tarsal and tarsometatarsal joints to effect partial tarsal arthrodesis with good outcome (Cantatore and Clements 2015). In this case, fixation with pins and wire was elected. The pin was seated into the calcaneus to prevent irritation of the superficial digital flexor tendon with good outcome based on owner feedback.

In conclusion, the presence of persistent deciduous teeth in cats should arouse suspicion of potential bone pathology. Counselling of owners of affected cats may help improve vigilance for early signs of fracture, such as lameness. Early radiography of these cases may be prudent to look for signs of stress fracture. This may allow early intervention with enforced rest in order to prevent progression to complete fracture.

The authors are conducting research into cats with persistent deciduous teeth or spontaneous fractures. Any veterinarians involved with such a case are requested to contact us with information. We are also happy to provide advice on case management if required or to see affected animals by referral if desired.

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Figure 1. Lateral radiograph of the left calcaneus on presentation. Fracture within the base of the bone is clearly visible with subsequent cranial rotation of the proximal fragment.

Figure 2. Lateral radiograph of the right hock at the time of presentation for left calcaneal fracture. The calcaneus appears normal.

Figure 3. Lateral view of the left hock post-surgery. The fracture has been repaired with a Steinmann pin and tension band wire. The Steinmann pin was countersunk into the bone to reduce the risk of irritation to the common calcaneal tendon.

Figure 4. Six week post-operative view of left hock. The implants are still in position with no evidence of loosening. The Steinmann pin has bent slightly due to the pull of the common calcaneal tendon. There is some remodelling of the fracture site but a lucent region is still visible.

Figure 5. Fracture of the right calcaneus. Fracture morphology is similar to that of the left.

Figure 6. Post-operative lateral radiograph of the right hock. Pin and tension band fixation has achieved good fracture reduction.

Figure 7. 10 month post-operative view of the left hock. The implants are still in position. There has been no further bending of the Steinmann pin and the fracture has completely healed.

References

Brooks, T. S. and S. J. Bailey (2012). "Knees & Teeth Case Series Presentation." Veterinary Information Network.

Cantatore, M. and D. N. Clements (2015). "Bilateral calcaneal stress fractures in two cats." J Small Anim Pract **56**(6): 417-421.

Carmichael, S. M., W. (2012). Tarsus and metatarsus. In: Veterinary Surgery Small Animal. St. Louis, MO, USA., Elsevier Saunders.

Langley-Hobbs, S. J. (2009). "Survey of 52 fractures of the patella in 34 cats." Veterinary Record **164**(3): 80-86.

Langley-Hobbs, S. J., S. Ball and W. M. Mckee (2009). "Transverse stress fractures of the proximal tibia in 10 cats with non-union patellar fractures." Veterinary Record **164**(14): 425-430.

Mason, R. W., T. E. Moore, C. W. Walker and M. H. Kathol (1996). "Patellar fatigue fractures." Skeletal Radiology **25**(4): 329-332.

Ost, P. C., J. F. Dee, L. G. Dee and R. B. Hohn (1987). "Fractures of the calcaneus in racing greyhounds." Vet Surg **16**(1): 53-59.

Patel, D. S., M. Roth and N. Kapil (2011). "Stress Fractures: Diagnosis, Treatment, and Prevention." American Family Physician **83**(1): 39-46.

Piermattei, D. L. F., Gretchen L. and C. E. DeCamp (2006). Brinker, Piermattei, and Flo's handbook of small animal orthopedics and fracture repair. St. Louis, Mo., Saunders/Elsevier.

Schmokel, H. G., G. E. Hartmeier, B. Kaserhotz and U. T. Weber (1994). "Tarsal Injuries in the Cat - a Retrospective Study of 21 Cases." Journal of Small Animal Practice **35**(3): 156-162.

Scott HW., M. R. (2007). Feline Orthopedics. London, Manson Publishing.

Voormolen, N., A. N. Canete and M. Reijnierse (2012). "Calcaneal stress fracture revisited." Jbr-Btr **95**(2): 114-117.