



A RARE CASE OF TRANSVERSE PATELLAR FRACTURE IN A CAT

R. GARNOEVA & R. ROYDEV

Department of Veterinary Surgery, Faculty of Veterinary Medicine,
Trakia University, Stara Zagora, Bulgaria

Summary

Garnoeva, R. & R. Roydev, 2020. A rare case of transverse patellar fracture in a cat. *Bulg. J. Vet. Med.* (online first).

A case of transverse patellar fracture in a cat with preserved patellar ligament integrity and no history of traumatic injury is described. The patient is presented with grade 3 weight-bearing lameness and pain after palpation. Osteosynthesis with two Kirschner wires and figure-of-eight wiring was performed. The postoperative period was without complications. Three months post surgery, radiography demonstrated relatively good bone bridging at the fracture site and a very good clinical result.

Key words: cat, osteosynthesis with 2 Kirschner wires, patellar fracture

Patellar fractures are rarely seen in veterinary practice: about 0.1% of all fractures (Harari *et al.*, 1990). Traumatic injuries e.g. strong direct impact on the patella or falls from height are considered the main causes of patellar fractures in men and dogs (Langley-Hobbs *et al.*, 2008). In cats, apart traumatic fractures, a spontaneous patellar fracture syndrome of unclear aetiology is described (Langley-Hobbs, 2009). The cause of spontaneous patellar fractures in cats is attributed by some to disturbance in patellar ossification centre (Denny & Butterworth, 2000), while another hypothesis affirms that a form of osteogenesis imperfecta could be involved in this condition with bluish

sclera, loose joints, hip, tibial and fibular fractures, dental anomalies as concomitant clinical signs (Drogemuller *et al.*, 2009). The majority of cats presented with patellar fractures had retained deciduous teeth or improper position/growth of deciduous teeth – a condition described as “Knees and Teeth Syndrome” or “Patellar fracture and dental anomaly syndrome” (PADS) (Langley-Hobbs, 2014; Howes *et al.*, 2019; Reyes *et al.*, 2019).

Patellar fractures could be transverse, longitudinal, fragmented or distal patellar pole avulsion fractures (Vasseur, 2003; Tomlinson, 2005). The commonest pattern observed in cats is a transverse fracture in the upper third of the patella

(Arnbjerg & Bindseil, 1994; Langley-Hobbs, 2009).

The treatment of patellar fractures in cats could be conservative or operative (Langley-Hobbs, 2009; Salas & Popovitch, 2011). The information about the outcome of patellar fracture surgery in cats is scarce. Some authors (Salas & Popovitch, 2011) reported that patellar fracture surgery was not successful due to implant migration, while conservative therapy resulted in excellent clinical results.

The aim of the present report was to describe a rare case of transverse mid-patellar fracture in an young cat with no history of trauma and the results from the osteosynthesis using two parallel Kirschner wires and figure-of-eight wiring.

An European shorthair intact male cat, 1.5 years of age, weighing 2.4 kg was referred to the Small Animal Clinic to the Faculty of Veterinary Medicine, Stara Zagora, Bulgaria with lameness in the right pelvic limb without history of traumatic injury. The initial orthopaedic exam showed grade 3 weight bearing lameness

as well as pain, loose joint and distance between *m. quadriceps* and the patellar ligament upon palpation. Physical examination did not reveal dental anomalies, bluish sclera or other fractures. After deep sedation with 0.075 mg/kg medetomidine hydrochloride (Dorbene vet[®], 1 mg/mL, Syva, Spain) and 7.5 mg/kg ketamine hydrochloride (Anaket[®], 100 mg/mL, Richter Pharma, Austria) mixed in one syringe and applied i.m. in *m. quadriceps femoris*, mediolateral and caudocranial radiographies were performed (Philips, Bucky Diagnost CS4, Holland). Radiographs showed fracture line and dislocation of patellar bone fragments (Fig. 1). Proximal and distal fragments were of almost equal size, the former one being located dorsally above the trochlear groove and the latter – 1.8 cm away. No pathological changes of femur and tibia were identified. Complete blood counts and blood biochemistry results were within the reference ranges.

Anaesthesia protocol included pre-medication with 0.2 mg/kg acepromazine maleate (Neurotranq[®], 10 mg/mL, Alfasan International, Netherlands) and 0.01 mg/kg

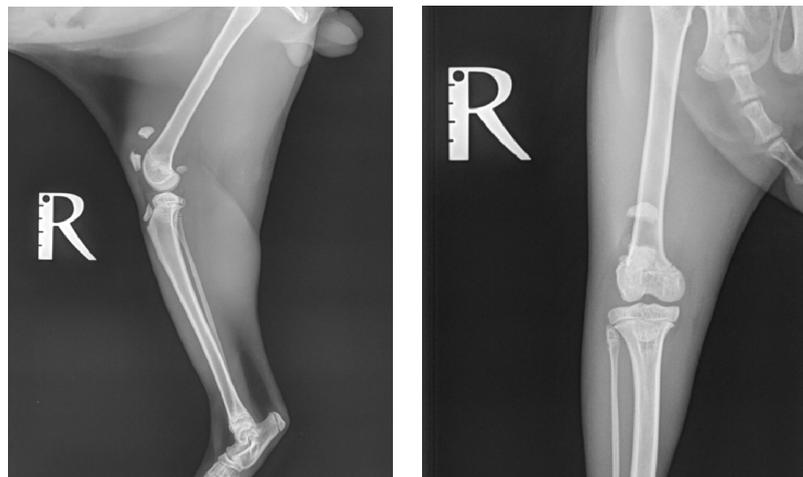


Fig. 1. Pre-operative stifle radiographs of the cat in mediolateral (left) and caudocranial (right) views.

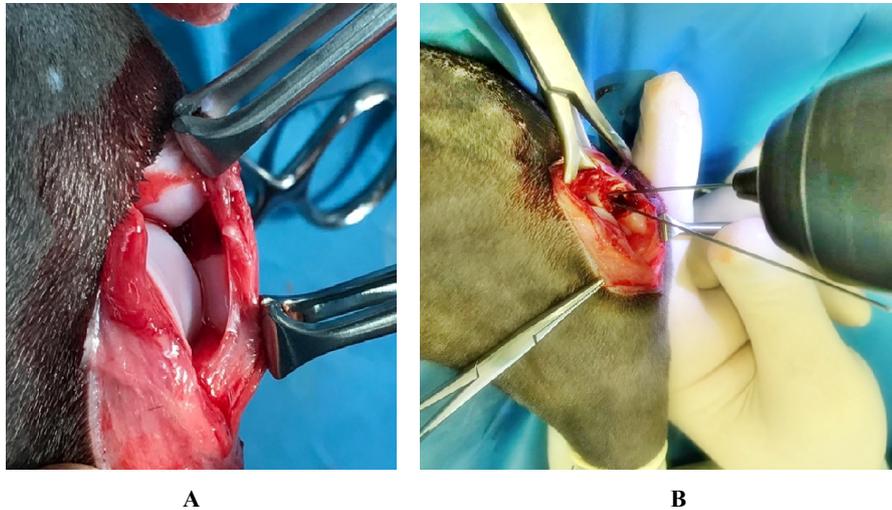


Fig. 2. A. Smooth trochlear groove and fracture line of the patella with proximal and distal fragments; **B.** Retrograde insertion of two parallel 1-mm Kirschner wires.

buprenorphine (Bupaq[®], 0.3 mg/mL, Richter pharma, Austria) applied together in a syringe, i.m. in *m. quadriceps femoris*. After 30 min, induction was done with 5 mg/kg i.v. propofol (Propofol Fresenius[®], Fresenius Kabi GmbH, Germany). After endotracheal intubation, maintenance of inhalational anaesthesia was done with 1.5–2 vol% isoflurane (Forane[®], Abbott Laboratories Limited, United Kingdom) in 100% O₂. Fluid therapy comprised 10 mL/kg/h Ringer lactate (Ringer Braun, B. Braun Melsungen AG, Germany).

The lateral parapatellar approach was used to access stifle joint and patella. The trochlear groove was relatively deep and smooth, without erosions or osteophytes on the surface and femoral condyles (Fig. 2A). The patellar ligament and cruciate ligaments were intact. After localisation of the fracture line and both bone fragments, two parallel 1-mm Kirschner wires were introduced retrogradely (from the fracture line towards the proximal fragment) (Fig. 2B). To reduce the tension and for maximum apposition of bone fragments, the

limb was in full extension. Bone fragments were fixed with bone holding forceps and wires were inserted towards the distal fragment. Finally, a 0.6-mm figure-of-eight orthopaedic wire embracing both ends of Kirschner wires and patellar ligament was placed for maximum apposition and compression of fragments. Joint capsule was sutured with interrupted absorbable 3-0 polydioxanone (PDS, Kruuse, Denmark) sutures and above lying soft tissues and the skin were routinely closed. For prevention of post operative infection, oral amoxicillin/clavulanic acid (Synulox[®] RTU, Zoetis, Belgium) was prescribed at 12.5 mg/kg at 12-hour intervals for 7 days.

The orthopaedic examination at post operative month 3 demonstrated no lameness, crepitation and pain. The stifle joint's range of motion was normal, and the patella sat within the trochlear groove. Control radiography showed a relatively good bridging at the fracture site with insignificant distraction of fragments without loosening or migration of fixation

implants. Radiography of contralateral intact stifle joint showed no abnormalities (Fig. 3).

Eight months after the surgery, control check-up radiography revealed loosening of the figure-of-eight wire cerclage in the distal part of the patella (Fig. 4). Nevertheless, the fixation devices were not removed due to lack of migration of Kir-

schener wires and the yet incomplete bridging of the fracture line. The orthopaedic exam showed no deviations in the gait and limb function.

Patellar fractures are extremely rare in dogs and cats: 0.1% (Anderson, 1994; Vasseur, 2003), motivating us to share our clinical experience from the treatment of a feline transverse patellar fracture.

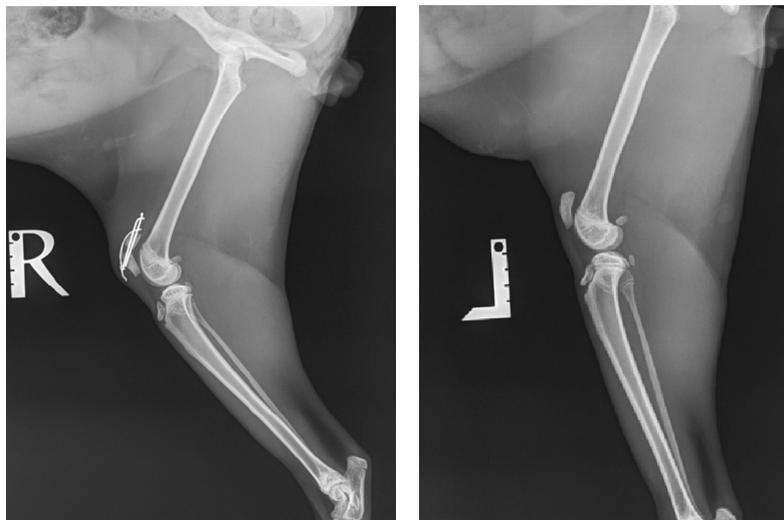


Fig. 3. Mediolateral radiographs of the operated stifle (left) and the healthy contralateral stifle (right) by the 3rd post operative month.



Fig. 4. Mediolateral (left) and craniocaudal (right) radiographs of the operated stifle by the 8th post operative month.

Most of these fractures in cats are stress fractures. They occur after repeated strong impact from the part of m. quadriceps femoris (extensive flexion, extension or avulsion) on the patella or following minimum traumatic injury (Langley-Hobbs, 2009). In the described case, no history of trauma was present, but the owner noted that the cat often jumped while playing. Young cats are vivacious, and frequent jumps are associated with strong extension of pelvic limbs and consequently, strong pressure of quadriceps muscle on the patella which could result in its disintegrity especially after repeated impact.

The fracture line in a large part of described cases is situated in the upper third of the patella (Harari *et al.*, 1990; Arnbjerg & Bindseil, 1994; Langley-Hobbs, 2009). In our patient however, it was in the middle of the patella so both fragments were of almost equal size. Literature reports show that spontaneous transverse patellar fractures were mostly encountered in young cats, 1–3 years of age (Langley-Hobbs *et al.*, 2009), and what is more, in over 50% of cases, fracture of the contralateral patella was consequently seen, usually within 3 months. Our patient was also within this age range but radiography of the contralateral pelvic limb did not find any osteosclerotic zones or fractures, allowing excluding osteogenesis imperfecta as a probable cause due to lack of other clinical signs specific for this condition. Osteogenesis imperfecta is extremely difficult to diagnose, even histopathologically, so it could be only hypothesised (Langley-Hobbs, 2009).

Unlike dogs, feline patellar fractures are affirmed to occur more frequently after fall from height (Sarieler *et al.*, 2013). However, we agree with another opinion (Langley-Hobbs *et al.*, 2009) that

the so-called high rise syndrome is more likely to cause a traumatic injury of vertebral column of extremities than patellar fractures. The usual cause for the latter is direct impact on the cranial part of the stifle.

So far, 88 patellar fractures in cats are described in the literature (Guillaumot *et al.*, 2008; Langley-Hobbs *et al.*, 2008; 2009; Cusack & Johnson, 2013; Palierne *et al.*, 2010; Herndon, 2017). It is reported that 75% of cats with spontaneous patellar fractures had retained deciduous teeth (molars and canines) presuming a form of osteogenesis imperfecta (Langley-Hobbs *et al.*, 2009). The cause of described patellar fracture is assumed to be repeated jumping while playing and associated strong impact of m. quadriceps femoris on the patella.

Conservative treatment of patellar fractures in cats was reported to yield better clinical outcome than surgery (Langley-Hobbs, 2009; Salas & Popovitch, 2011). In our patient, we decided to perform osteosynthesis because of the high grade lameness, pain and substantial dislocation of fragments. The choice of a surgical technique usually depends on the fracture type and surgeon's preferences. In this case, the fracture was transverse, in the middle of the patella, both fragments were of almost equal size so we decided to attempt fixation with two Kirschner wires and figure-of-eight wiring. The insertion of wires is believed to result in additional fragmentation of bone fragments, so the application of orthopaedic wiring only or conservative treatment was affirmed to yield a better clinical result (Langley-Hobbs, 2014). In this case, the lack of additional fragmentation was due to the fracture type. When the fracture site is in the upper third of the patella, fragmentation may occur due to the smaller

size and strength of the proximal fragment.

So far, only 7 longitudinal patellar fractures with good outcome from surgery were reported (Guillaumot *et al.*, 2008; Langley-Hobbs *et al.*, 2008; Herndon, 2017). Complications in transverse patellar fractures are more common due to forces acting on these fractures. During flexion, the entire quadriceps mechanism, in particular m. rectus femoris exerts tension on the patella and patellar ligament. These forces are perpendicular in transverse fractures and in 86% of operated cats fixed with Kirschner wire and figure-of-eight wiring were reported to result in distraction of fragments and migration of implants in the post operative period (Langley-Hobbs, 2009). In our patient, no migration of fixation elements has occurred by the 3rd post operative month. The use of two parallel Kirschner wires and figure-of-eight wiring provided better stability of fragments against tensile forces acting on the fracture line. This was possible because the fragments were of equal size. When the size of one of fragments was 2/3 of the patella's size, the other fragments are removed (Harari *et al.*, 1990).

In conclusion, transverse patellar fractures in cats with proximal and distal fragments of equal size could be fixed with Kirschner wire and figure-of-eight wiring. This technique yielded superior stability and bond bridging at the fracture site 3 months after the osteosynthesis.

REFERENCES

- Arnbjerg, J. & E. Bindseil, 1994. Patella fracture in cats. *Feline Practice*, **22**, 31–35.
- Cusack, L. & M. Johnson, 2013. Arthroscopic assessment for patellar injuries and a novel suture repair of patellar fracture in cats. *Journal of the American Animal Hospital Association*, **49**, 267–272.
- Denny, H. R. & S. J. Butterworth, 2000. The stifle. In: *A Guide to Canine and Feline Orthopaedic Surgery*, Blackwell Science, Oxford, p. 512.
- Drogemuller, C., D. Becker, A. Brunner, B. Haase & P. Kircher, 2009. A missense mutation in the SERPINH1 gene in Dachshunds with osteogenesis imperfecta, *PLOS Genetics*, **5**, 7.
- Guillaumot, P., S. Scotti & C. Carozzo, 2008. Two cases of surgically treated feline patellar fractures. *Veterinary and Comparative Orthopaedics and Traumatology*, **21**, 156–158.
- Harari, J. S., M. Person & C. Berardi, 1990. Fractures of the patella in dogs and cats. *Compendium on Continuing Education for the Practising Veterinarian*, **12**, 1557–1562.
- Herndon, G. D., 2017. Complete longitudinal patellar fracture in a cat: A rare case. *Canadian Veterinary Journal*, **58**, 387–390.
- Howes, C., M. Longley & N. Reyes, 2019. Skull pathology in 10 cats with patellar fracture and dental anomaly syndrome. *Journal of Feline Medicine & Surgery*, **21**, 793–800.
- Langley-Hobbs, S. J., G. Brown & U. Matis, 2008. Traumatic fracture of the patella in 11 cats. *Veterinary and Comparative Orthopaedics and Traumatology*, **21**, 427–433.
- Langley-Hobbs, S. J., 2009. Survey of 52 fractures of the patella in 34 cats. *Veterinary Record*, **164**, 80–86.
- Langley-Hobbs, S. J., S. Ball & W. M. Mckee, 2009. Transverse stress fractures of the proximal tibia in 10 cats with non-union patellar fractures. *The Veterinary Record*, **164**, 425–430.
- Langley-Hobbs, S. J., 2014. Patella fractures in cats with persistent deciduous teeth – Knees and Teeth Syndrome (KaTS). *Companion Animal*, **21**, 11.

- Palierno, S., F. Palissier & I. Raymone-Letron, 2010. A case of bilateral patellar osteochondrosis and fracture in a cat: Clinical and histological findings. *Veterinary and Comparative Orthopaedics and Traumatology*, **2**, 128–133.
- Reyes, N. A., M. Longley & S. Bailey, 2019. Incidence and types of preceding and subsequent fractures in cats with patellar fracture and dental anomaly syndrome. *Journal of Feline Medicine & Surgery*, **21**, 750–764.
- Salas, N. & C. Popovitch, 2011. Surgical versus conservative management of patella fractures in cats: A retrospective study. *Canadian Veterinary Journal*, **52**, 1319–1322.
- Sarierler, M., I. Akin & A. Belgie, 2013. Patellar fracture and patellar tendon rupture in a dog. *Turkish Journal Of Veterinary and Animal Sciences*, 2013, **37**, 121–124.
- Vasseur, P. B., 2003. Stifle joint. In: *Textbook of Small Animal Surgery*, ed D. Slatter, Saunders, Philadelphia, pp. 2126–2128.

Paper received 11.05.2020; accepted for publication 20.07.2020

Correspondence:

Radka Garnoeva, PhD,
Department of Veterinary Surgery,
Faculty of Veterinary Medicine,
Trakia University, Stara Zagora, Bulgaria,
e-mail: dr.garnoeva@abv.bg,
ORCID: 0000-0002-3373-3468