

**CASE REPORT**

Companion or pet animals

**Traumatic lateral patellar luxation in a dog****Matthew Simpson**  | **Charlotte Louise Banks** | **Anna Frykfors von Hekkel** | **Thom Watton** | **Richard Meeson**Department of Clinical Science and Services,  
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Email: [msimpson20@rvc.ac.uk](mailto:msimpson20@rvc.ac.uk)**Abstract**

A 2-year-old, female, entire, German shepherd dog presented for investigation of non-weight-bearing right hindlimb lameness following a suspected road traffic accident 1 day prior. Orthopaedic examination confirmed right lateral patellar luxation. Stifle radiographs revealed normal patella positioning with stifle joint effusion and periarticular soft tissue swelling. A surgical approach to the stifle was performed via a cranio-medial parapatellar incision. A 10 cm proximodistal tear was present in the medial retinacular muscular fascia, vastus medialis, medial parapatellar fibrocartilage and joint capsule. The soft tissues were meticulously reconstructed using absorbable monofilament sutures. Surgical repair of the traumatised medial soft tissues allowed for complete resolution of the traumatic lateral patellar luxation. Moderate right hindlimb lameness persisted immediately postoperatively and improved to only a mild lameness before discharge (4 days postoperatively). The dog returned to normal exercise, with no lameness or postoperative complications reported at short- or long-term follow-up (42 and 424 days, respectively).

**KEYWORDS**

orthopaedics, surgery, trauma

**BACKGROUND**

This report documents a rare case of traumatic lateral patellar luxation in a dog. Meticulous reconstruction of the medially torn parapatellar soft tissues resulted in complete resolution, with the dog returning to normal exercise 2 months postoperatively. This report highlights that soft tissue repair alone (without the need for tibial tuberosity transposition, femoral tracheoplasty or distal femoral osteotomy) was acceptable in this case of traumatic patellar luxation. This is in contrast to cases presenting with developmental patellar luxation, where assessment and potential alteration of femorotibial alignment is critical to prevent re-luxation.

**CASE PRESENTATION**

A 2-year-old, female, entire, German shepherd dog (weight, 32 kg; body condition score, 5/9) was referred for a non-weight-bearing right pelvic limb lameness following a suspected road traffic accident 1 day prior. The dog was otherwise in good health, with no prior history of comorbidity or orthopaedic disease. On examination, the dog was cardiovascularly and respiratory stable, with a non-weight-bearing right

pelvic limb lameness. Full-thickness cutaneous wounds were present on the left lateral shoulder (3 × 3 cm) and right caudomedial stifle (2 × 2 cm), neither extended deeper than the subcutis. Point-of-care thoracic and abdominal ultrasound revealed findings consistent with bilateral pulmonary contusions and a moderate peritoneal effusion. Abdominocentesis was performed. Comparison of the packed cell volume of the aspirated fluid and peripheral blood confirmed a haemoabdomen. Methadone (0.2 mg/kg intravenously [IV] every 4 hours; Comfortan, Dechra) and ketamine (0.3 mg/kg/h IV constant-rate infusion; Anesketin, Dechra) analgesia were administered. Amoxicillin-clavulanate was initiated (20 mg/kg IV every 8 hours; Co-amoxiclav, Sandoz). The dog was monitored in the intensive care unit for 24 hours, during which time the haemoabdomen resolved.

**INVESTIGATIONS**

Orthopaedic investigations were carried out the following day. Gait evaluation confirmed non-weight-bearing right pelvic limb lameness (10/10). Conscious orthopaedic examination identified grade 3/4 right lateral patellar luxation, with marked discomfort and periarticular soft tissue swelling.

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**FIGURE 1** Right mediolateral (a) and craniocaudal (b) radiographic projections of the right pelvic limb. The right patella is seen laterally displaced on the craniocaudal projection. The patella is superimposed on the lateral femoral condyle and is caudodistally displaced on the mediolateral projection. There is marked thickening of the patellar ligament.

Right stifle cranial and caudal drawer and cranial tibial thrust were negative. No medial or lateral stifle instability was present on palpation. The medial ridge of the femoral trochlear was more easily palpated under the skin compared to that of the left stifle joint. When the laterally displaced patella was manually reduced, the dog's lameness improved with only a mild persistent lameness (3/10).

The dog was premedicated with methadone (0.2 mg/kg IV; Comfortan, Dechra) and dexmedetomidine (1 µg/kg IV; Dexdomitor, Zoetis). Anaesthesia was induced with propofol (3.1 mg/kg IV; Propoflo, Zoetis) and maintained with sevoflurane (1.6%–2.4%; Sevoflo, Zoetis) in 100% oxygen.

Orthopaedic examination was repeated under general anaesthesia and remained unchanged. Orthogonal right stifle radiographs were obtained, which showed that the right patella was positioned lateral to the femoral trochlear groove (Figure 1). A moderate right stifle joint effusion and periarticular soft tissue swelling were also present.

Ultrasound was performed in the region of the swelling at the medial aspect of the stifle. The soft tissues in this area were thickened, heterogeneous and disrupted, with multifocal accumulations of anechoic fluid identified between fascial planes (Figure 2). The ligamentous structures in this region were not readily identified.

## TREATMENT

A lumbosacral epidural was performed using methadone (0.2 mg/kg) and bupivacaine (1 mg/kg). Perioperative anti-

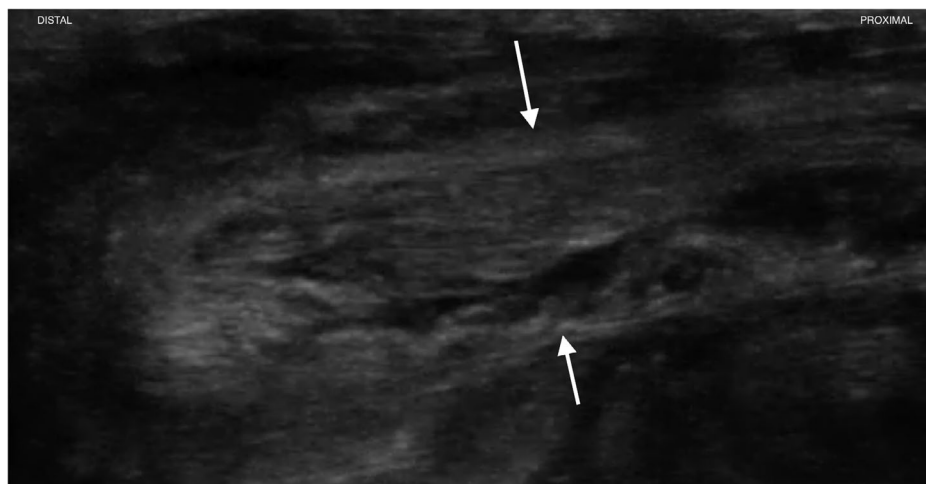
## LEARNING POINTS/TAKE-HOME MESSAGES

- Traumatic lateral patellar luxation can be successfully treated by surgical apposition of the damaged medial parapatellar soft tissues.
- Unlike developmental patellar luxation, provided that the femorotibial axis is maintained and trochlear groove depth is appropriate, femoral tra-cheoplasty, tibial tuberosity transposition or lateral retinacular release is not required for successful treatment.
- No short- or medium-term complications were documented. However, further research is required to determine the occurrence of postoperative osteoarthritis in cases of traumatic patellar luxation in dogs.

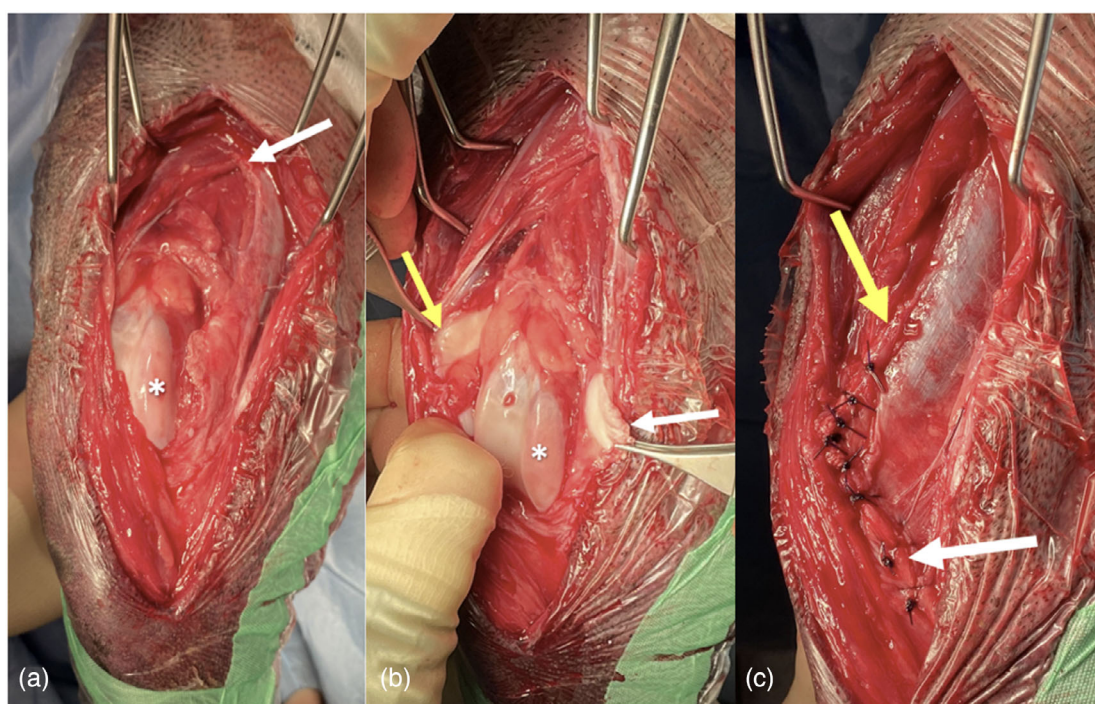
icrobial therapy was administered and continued every 90 minutes during the procedure (20 mg/kg cefuroxime IV; Zinacef, GlaxoSmithKline). The patient was positioned in dorsal recumbency, with the right pelvic limb hanging for aseptic preparation.

A right craniomedial parapatellar approach to the stifle was performed.<sup>1</sup> Following incision through the skin and subcutaneous tissues, a large proximodistal tear (approximately 10 cm in length) was identified in the medial retinacular muscular fascia, vastus medialis, medial parapatellar fibrocartilage and joint capsule. The tear in the vastus medialis extended proximally to the distal third of the femur (Figure 3a,b). The articular bone and cartilage of the patella and femoral trochlear groove were normal in appearance and on palpation. A 2 mm piece of cartilage was identified in the proximal stifle joint and removed. It was not possible to determine the origin of this defect. The surgical site was copiously lavaged with sterile saline, and the patella was reduced into the trochlear groove. The quadriceps mechanism and the patella alignment were evaluated in relation to the femorotibial axis confirming normal anatomical alignment. The ruptured medial parapatellar fibrocartilage and joint capsule were apposed with 0 polydioxanone (PDS II; Ethicon) pre-placed interrupted cruciate mattress and simple interrupted sutures, and were tied sequentially (Figure 3c). The vastus medialis proximal and distal to the parapatellar fibrocartilage was apposed in the same manner. The overlying medial retinacular fascia was closed with 2-0 polydioxanone (PDS II; Ethicon) in a simple continuous pattern. The stability of the patella was evaluated, and the patella could no longer be laterally luxated. The subcutaneous tissue and skin were closed routinely using 3-0 Poliglecaprone 25 (Monocryl; Ethicon) simple continuous sutures and skin staples. Before anaesthetic recovery, on palpation the patella was confirmed to be stable and could not be luxated.

The right caudomedial stifle and left shoulder wounds were aseptically prepared, debrided and lavaged with sterile saline. A swab for bacterial culture was obtained from both wounds. Hydrogel (Intrasite; Smith & Nephew) was placed into both wounds and covered with polyurethane foam dressings (Allevyn Adhesive, Smith & Nephew). Orthogonal



**FIGURE 2** Ultrasound image of the medial stifle showing that the parapatellar soft tissues were disrupted, thickened and heterogeneous (between the white arrows). Multifocal accumulations of anechoic fluid were identified between fascial planes. Proximal is to the right of the image.



**FIGURE 3** Intraoperative images taken following craniomedial parapatellar approach to the right stifle. Following skin and subcutaneous incision, the medial trochlear ridge (\*) was visualised due to a large (10 cm) proximodistal tear involving the medial retinacular muscular fascia, vastus medialis, medial parapatellar fibrocartilage and joint capsule. The tear in the vastus medialis extended proximally (white arrow) to the distal third of the femur. Image b shows the medial aspect of the patella (white arrow), from which the medial parapatellar fibrocartilage tore (yellow arrow). Image c shows the soft tissue reconstruction of the joint capsule and medial parapatellar fibrocartilage (white arrow), which was sutured with pre-placed interrupted cruciate mattress sutures. The vastus medialis (yellow arrow) was opposed in a similar manner, which can be seen during suturing. Proximal is to the top of the image with gelpi retractors positioned.

postoperative radiographs of the right stifle were obtained, and they confirmed that the patella was positioned in a normal anatomical position (Figure 4).

Postoperatively, an Elizabethan collar was placed, and the dog received methadone (0.2 mg/kg IV; Comfortan, Dechra) every 4 hours for 20 hours before reducing to 0.1 mg/kg every 4 hours for 12 hours. Following this, the dog received buprenorphine (0.02 mg/kg IV; Vetergesic, Ceva Animal-Health) every 6 hours for 48 hours. Meloxicam (0.2 mg/kg IV; Metacam, Boehringer Ingelheim) was administered post-operatively and continued (per os [orally: PO] 0.1 mg/kg) for 14 days. Paracetamol (10 mg/kg PO; Braun) every 12 hours for 10 days and amoxicillin clavulanic acid (20 mg/kg PO; Noroclav, Norbrook) was started pending bacterial culture

results. The wounds were managed with daily conscious lavage and dressing changes, initially while hospitalised and continued by the owner and referring veterinary surgeon following discharge, until a healthy granulation bed had formed. The wounds were left open to continue healing by second intention.

## OUTCOME AND FOLLOW-UP

One day postoperatively, the dog had moderate lameness (6/10). The right pelvic limb lameness improved daily to only a mild lameness (3/10) at discharge. The dog was discharged 4 days postoperatively.





**FIGURE 4** Right mediolateral (a) and craniocaudal (b) radiographic projections of the right pelvic limb postoperatively. The right patella is seen in an anatomical position. There is a stifle effusion and regional soft tissue swelling present consistent secondary to surgical trauma.

Microbial culture and susceptibility results documented a mixed culture of *Actinetobacter pittii*, *Escherichia coli*, *Staphylococcus aureus* and *Enterococcus faecium*. All isolates were susceptible to enrofloxacin, which was administered once daily for 7 days (5 mg/kg PO; Baytril, Bayer).

A video consultation re-examination was performed 42 days postoperatively. The cutaneous wounds had completely healed. Gait evaluation revealed no appreciable lameness. The dog returned to normal off-lead exercise 2 months postoperatively.

Physical examination performed by the referring veterinarian, at 44 and 174 days postoperatively, revealed no concerns.

At telephone follow-up, performed at 6 months postoperatively, the owner reported no concerns regarding right pelvic limb use and that the dog continued to exercise normally with an excellent quality of life. At 424 days postoperatively, further communication with the owner confirmed that the dog was exercising normally with no concerns reported.

## DISCUSSION

To the best of the authors' knowledge, this is the first report to detail the diagnosis, surgical treatment and outcome of a case of traumatic lateral patellar luxation in a dog. Successful resolution of the patellar luxation was achieved by medial parapatellar soft tissue reconstruction, allowing the dog to return to normal exercise 2 months postoperatively.

Patellar luxation is a common developmental disorder that can cause pelvic limb lameness in dogs. In small dogs, patellar luxation is most frequently medial (98%); however, lateral patellar luxation has also been described.<sup>2,3</sup> In large and giant breeds, the prevalence of lateral patellar luxation is higher, with lateral luxation occurring in 17% and 33% (respectively) of patellar luxation cases.<sup>2</sup>

Patellar luxation can also occur acutely following trauma. Traumatic medial patellar luxation has been reported following disruption of the lateral parapatellar tissues.<sup>4</sup> Traumatic lateral patellar luxation has been previously described in other species, and are limited to single case reports including an

alpaca, a foal and a heifer.<sup>5-7</sup> Surgical treatment in these cases included lateral retinacular release in addition to medial parapatellar soft tissue imbrication. A block trochleoplasty was also performed in two of these three reports.<sup>5,6</sup>

In this dog, there was no previous history of patellar luxation, the femorotibial axis was well aligned and the femoral trochlear groove depth was considered appropriate. For these reasons, additional surgical techniques such as trochleoplasty, tibial tuberosity transposition or distal femoral osteotomy were not deemed necessary.

In the human literature, acute traumatic patellar luxation accounts for up to 3% of all knee injuries.<sup>8</sup> Traumatic patellar luxation is typically reported following a sporting injury and is most common in patients of less than 20 years of age.<sup>9</sup> Preoperative arthroscopy is recommended to evaluate the integrity of the intra-articular structures before performing definitive corrective surgery.<sup>10</sup> In this dog, orthopaedic examination ruled out appreciable instability of the medial and lateral collateral ligaments and cranial and caudal cruciate ligaments, and so arthroscopy was not considered necessary.

In conventional patellar luxation surgery, in addition to trocheoplasty and tibial tuberosity transposition, imbrication of the lateral or medial muscular fascia is often performed by use of modified Mayo mattress sutures. Before imbrication, removal of redundant joint capsule (capsulectomy) can also be performed. In the case described, once the patella had been reduced, there was no redundant joint capsule that required removal. This is likely due to the acute presentation as opposed to the traditional chronic presentation of patella luxated cases. The patella tracked well within the trochlear groove and, following closure of the joint capsule, the patella was unable to be luxated. Therefore, imbrication of the medial retinacular muscular fascia was deemed unnecessary, and it was opposed using cruciate mattress sutures without an imbricating technique.

Recurrence following surgical management of acute traumatic patellar luxation has been reported in up to 40% of human patients.<sup>11</sup> The development of osteoarthritis was reported in 17% of people at a mean of 13 years postoperatively.<sup>12</sup> In dogs with surgically treated medial patellar luxation, the progression of osteoarthritis has been shown not to be correlated with luxation grade or postoperative

time to follow-up.<sup>13</sup> In the reported case, no abnormalities of the articular cartilage of the femoral trochlear or patella were identified on intraoperative visual assessment. A 2 mm fragment of cartilage was found in the proximo-medial joint on exploration; however, the site from where it originated could not be identified. The trauma was acute and the repair was performed promptly, which may have limited the development of osteoarthritis. It could be proposed that any resultant irregularity in the cartilage surface could result in abnormal wear of the cartilage surface and predispose this dog to osteoarthritis development. In this case, there was no clinical evidence of lameness associated with osteoarthritis or recurrence of lateral patellar luxation within the follow-up period. Long-term follow-up including radiographic assessment is warranted to document the occurrence of osteoarthritis following traumatic patellar luxation.

#### AUTHOR CONTRIBUTIONS

Matthew Simpson was responsible for data acquisition, drafting and revising the manuscript. Charlotte Louise Banks was responsible for drafting the manuscript. Anna Frykfors von Hekkel, Thom Watton and Richard Meeson were responsible for case management, conceptualisation of the case report and revision of the manuscript.

#### CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

#### ETHICS STATEMENT

Informed consent was obtained from the dog's owner.

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