

Arthroscopic Removal of a Screwdriver Fragment in a Dog 6 Years after Femoral Fracture Repair

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Abstract

Objective The aim of this study was to report an unusual case of an iatrogenic foreign body within the stifle joint, removed 6 years after distal femoral fracture repair in a small dog. Acute lameness was caused by a migrating screwdriver fragment, which had been lost during initial fracture repair and which did not cause clinical signs for years until dislodged inside the joint.

Case Report A male Jack Russell, 7 years of age, underwent plate and screws fixation to treat a Salter-Harris type I fracture at the age of 9 months. Seven months after surgery, partial implant removal was performed. Six years after fracture repair, the dog presented for a non-weight-bearing lameness and pain on the previously operated stifle joint, which occurred suddenly while walking on the leash. Radiographs revealed a small intra-articular metallic radiodense foreign body. Arthroscopy was used to remove the migrating broken-tip of a screwdriver from the medial aspect of the tibiofemoral joint. Retrieving the foreign body led to the immediate resolution of clinical signs without complications.

Conclusion By reporting this case of a forgotten foreign body retained inside a stifle joint for 6 years, we aim to illustrate the potential risk of leaving a piece of metal inside the body. A high index of suspicion for such complications should be kept a long time after surgery. Arthroscopy was a useful first-line tool for efficiently and mini-invasively treating this unusual problem.

Keywords

- ▶ Complication
- ▶ foreign body
- ▶ tibiofemoral joint
- ▶ canine

Introduction

There are reports of joint foreign bodies caused by penetration of the skin or after arthroscopy in both human or veterinary medicine.^{1–10} Stifle joints arthroscopic removal of bullets, metal fragments, needles, glass and plastic objects have been reported.^{3,5,10–12} When being lodged intra-articular, foreign bodies can cause lesions of the cartilage, menisci or ligaments.^{10–14}

We report an unusual case in which arthroscopy was used to remove a broken and previously lost tip of a screwdriver from the medial aspect of the tibiofemoral joint of a small dog. There seems no similar report in dogs of a metallic foreign body penetrating and lodging

within the joint without, evidently, causing any clinical signs for several years.

Case Report

A 7-year-old male Jack Russell Terrier was presented for a non-weight-bearing right hind-limb lameness of 1-week duration, right stifle pain and joint swelling. Sudden onset of lameness occurred while the dog was walking on a leash without a history of trauma or excessive exercise.

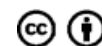
The dog's medical history included a right distal femoral Salter-Harris type I fracture, which occurred when the dog was 9 months old (→Fig. 1A, B). Fracture repair was performed using one locking plate and six screws (PAX 2.4mm

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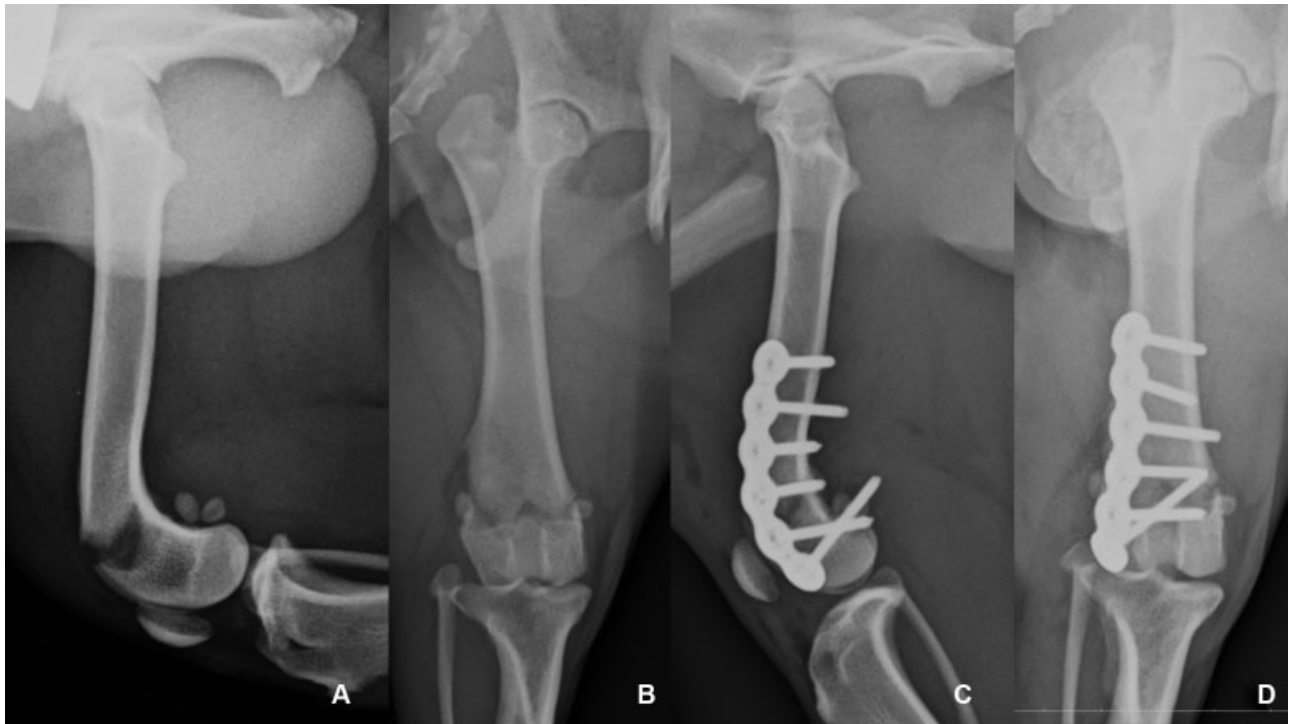


Fig. 1 Jack Russell Terrier, male, 9 months old. Mediolateral view and craniocaudal view of the right femur (A, B). Salter-Harris type I fracture was diagnosed. Fracture repair was performed using a 6-hole locking plate (C, D).

Polyaxial Locking Reconstruction Plate System, Securos Surgical, Massachusetts, United States) (►Fig. 1C, D). At 3 months, fracture healing was confirmed radiographically (►Fig. 2A, B). At 7 months, a radiographic examination showed some reabsorption of bone, secondary to alleged

stress shielding (►Fig. 2C, D). A radio-dense fragment of $\sim 2.5 \times 2$ mm dimension was noticed at the level of the distal pole of the patella in the mediolateral view and at the level of the lateral femoral condyle on the craniocaudal view (►Fig. 2C, D, arrows). Plate and screws were removed.

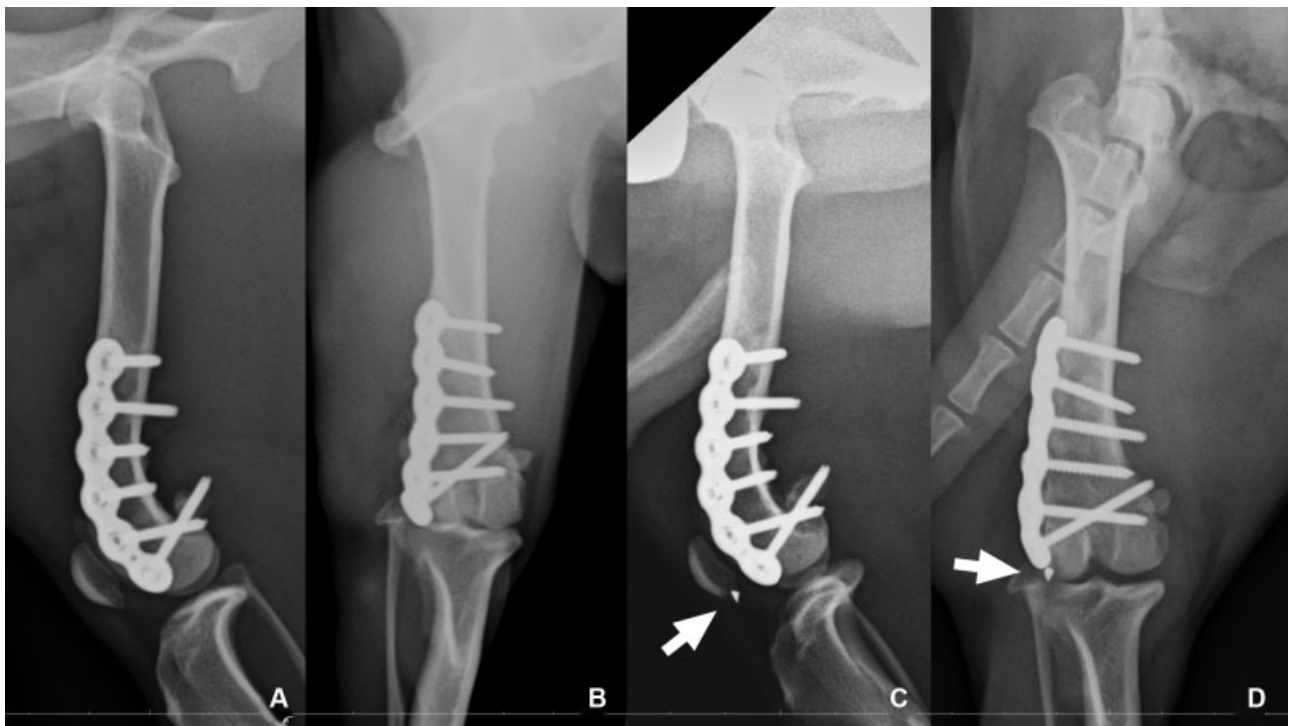


Fig. 2 Jack Russell Terrier, male, 1 year old. Three-month radiographic examination. Mediolateral (A) and craniocaudal (B) radiographs of the right femur showing bone healing. Jack Russell Terrier, male, 16 months old. Seven-month radiographic examination mediolateral (C) and craniocaudal (D) radiographs of the right femur showing the foreign body (arrows).

Postoperative radiographs showing implant removal were missing.

There was no apparent skin wound or redness over the stifle joint, and no trauma was reported by the owners. Orthopaedic examination revealed pain upon stifle palpation or joint motion and mild swelling of the stifle. The drawer test and the tibial compression test were negative. A provisional diagnosis of nonspecific synovitis was established. General haematological and biochemical tests showed no abnormalities. Plain stifle radiographs were obtained under general anaesthesia. Mediolateral or craniocaudal orthogonal radiographs showed a distinct small metal-dense foreign body in the region of the medial tibiofemoral joint (►Fig. 3A, B). The radiographs revealed that the two most proximal screws were left in situ after implant removal which occurred 5 years earlier. The patient was prepared for arthroscopic foreign body removal. Radiographs just before arthroscopy confirmed that the foreign body had not changed position. The stifle joint was inspected through a lateral parapatellar arthroscopic portal, just lateral to the patellar tendon and distal to the distal pole of the patella utilizing a 2.3 mm 30-degree fore-oblique arthroscope. Synovitis was present. Trochlear groove and patella seemed normal. Lateral femoral and tibial condyles, as well as the cruciate ligaments and the menisci, seemed uninjured. The cranial and caudal cruciate ligaments were probed and assessed for stability. The small foreign body was identified at the medial tibiofemoral joint partially sunk into the tibial cartilage. (►Fig. 4A, C). Chondral lesions were identified at both tibial and femoral medial condyles (►Fig. 4B, D). The foreign body was identified as being a broken Torx-type

screwdriver tip. During arthroscopic surgery, the foreign body was changing position and was dislodged because of the flushing liquid's turbulence. The foreign body was extracted using an alligator grasper (►Fig. 4E, F). The complete removal of the fragment was confirmed radiographically (►Fig. 3C). The dog was discharged from the hospital the same day and was weight-bearing. The patient's postoperative course was unremarkable and recovery to full weight-bearing and pain-free full range of motion occurred within 3 days.¹⁵ At 2, 4 and 8 weeks postoperative follow-ups, the dog showed no further signs.

Discussion

Given a clear indication for surgical foreign body removal, this could have performed either arthroscopically or through open arthrotomy. Arthroscopy was preferred. Advantages of arthroscopy included decreased morbidity through miniminvasiveness, rapid recovery, decreased complication rates, improved functional outcomes, shorter anaesthesia and surgery times, possibility for day-hospital care and enhanced client satisfaction.^{16–22} Disadvantages include the relatively high level of skill required, the high cost of the equipment and relatively high costs to the client.

Arthroscopy has been recognized as an efficient means for foreign bodies removal from the stifle joint in human surgery.^{5,8–12,14,23} Multiple attempts to arthroscopically remove a broken tip of a curette from an elbow joint failed in a dog.⁷ The fragment then migrated into the radial fossa of the humeral condyle and was left in situ. The dog made an uneventful recovery and, 6 months after surgery showed

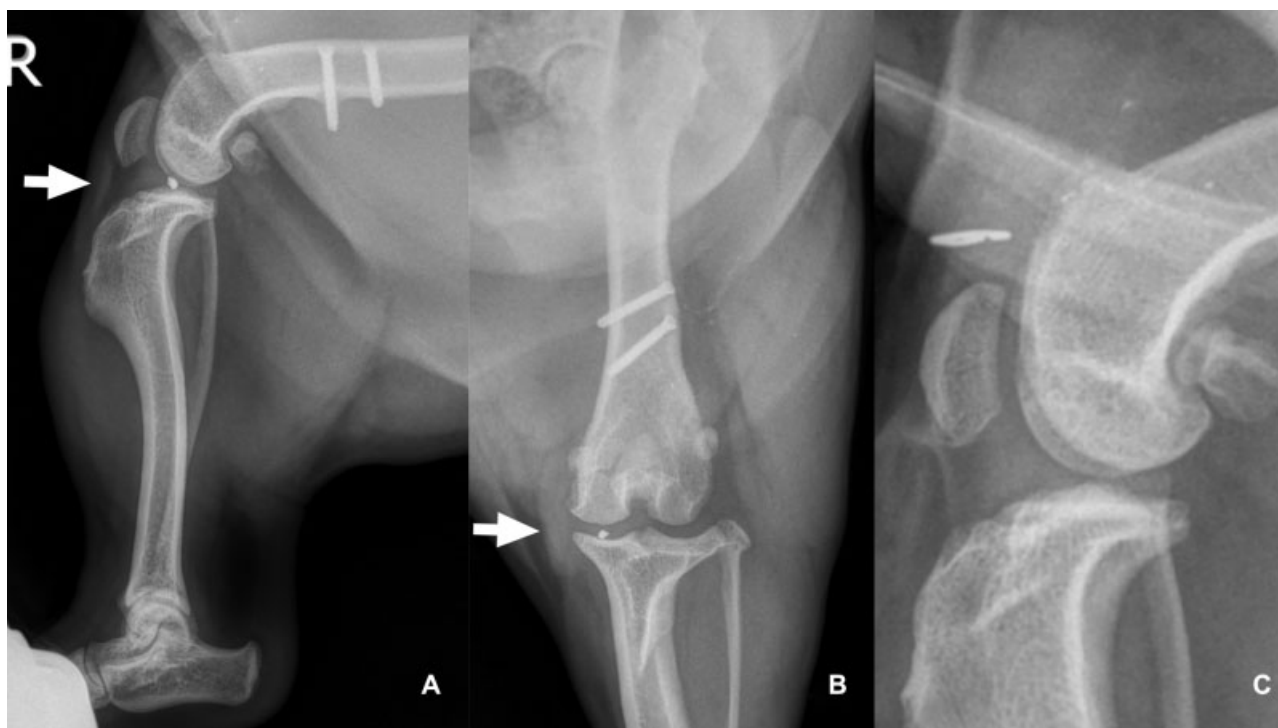


Fig. 3 Jack Russell Terrier, male, 7 years old. Preoperative foreign body arthroscopic removal mediolateral (A) and craniocaudal (B) views of the right femur showing the tibiofemoral joint space location (arrows). Mediolateral view of the right stifle after fragment removal (C).

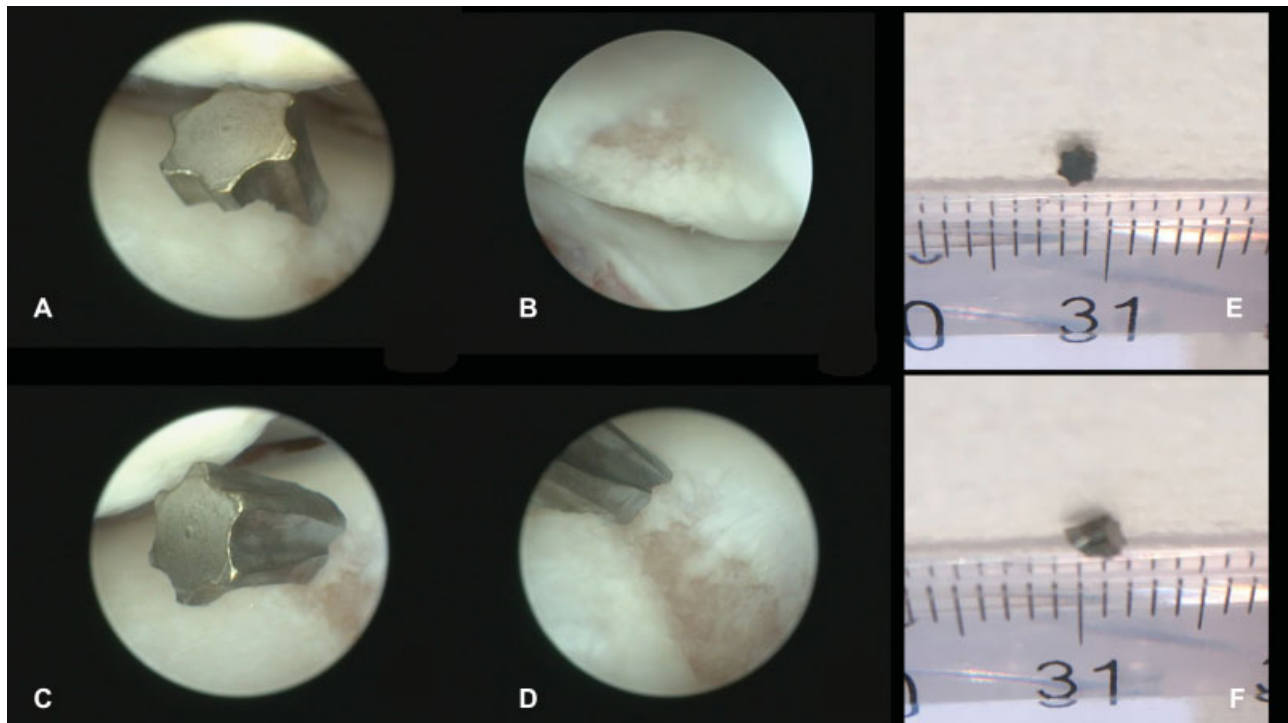


Fig. 4 Arthroscopic images of the foreign body (A, C) and femoral and tibial chondral lesions, respectively (B, D). Images of the screwdriver fragment measurement (E, F).

no lameness except after rest, and there was no evidence of later migration of the metallic fragment.⁷ In our case, the foreign body remained clinically silent for more than 6 years before producing clinical signs. In case of a foreign body left in situ, clinical examination and radiographic inspection should be performed routinely for early detection of potential damages. Foreign bodies can change position over time and sometimes cause delayed complications, as in our case.^{3,10}

Plain radiographs were able to detect the foreign body 7 months after surgery. The patient in this case had remained with no evident signs for about 6 years.

Grasping the fragment was technically difficult. The foreign body was continuously changing position because of the ingress-fluid turbulence within the relatively large joint space and because of the force of gravity on the small metallic object. The dislodged piece may migrate to the caudal joint compartment facilitated by the supine position of the dog for arthroscopy (dorsal recumbency). Controlling or closing fluid flow can help during searching for and grasping the foreign body.

In the knee of a human patient, a magnet was used to catch the fragment of a broken sewing needle and to deliver it into the anterior compartment during the removal attempt.¹⁰ However, we failed to know whether the metal of the screwdriver piece would have acted like a ferromagnetic material.

To ensure that the position of the metal fragment had not changed, radiographs were repeated. Intraoperative X-ray or fluoroscopic examination could be of help in case of migrating foreign bodies.^{1,3,24}

The fragment location did not look questionable on our radiographs. In case of doubt, a computed tomography should be performed to detect the exact location just before surgery.

The screwdriver fragment was neither visible on the postoperative radiographs nor at the 3-month radiographic examination (→ Fig. 2A, B). The fragment was first detected at the 7-month radiographic examination when implant removal was performed (→ Fig. 2C, D). We presume that the screwdriver tip broke during fracture plating and remained stuck within the screw-head recess until later migration through which the fragment became evident at the 7-month postoperative radiographs (→ Fig. 2C, D).

The synovitis was probably secondary to cartilage wear at the tibial and femoral medial condyles, or it was secondary to the mechanic irritation from the metallic foreign body.

Intra-articular foreign bodies usually provoke remarkable inflammation. Often neutrophils are the first subpopulation of leukocytes that appear at the injury site, and neutrophil invasion is followed by a sequential increase in the concentrations of macrophage subpopulations.^{25,26} Polymorphonuclear neutrophils are the first cells to take part in the local reactions to the foreign body at the aseptic knee. The local reactions caused by foreign bodies vary widely.^{10,26} In the case of intra-articular sterile foreign bodies, as in our case report, laboratory tests might be unhelpful. On admission, general haematological and biochemical tests showed no abnormalities. Maybe because there was no infection, and the acute phase of the inflammation was short and limited to the joint compartment, laboratory tests remained in the normal range.

Why and how the screwdriver tip broke, why the two most proximal screws were left in situ after implant removal and why the metal fragment was not removed during the procedure for implant removal is not known. The operative report was missing.

A high index of suspicion for such iatrogenic complications should be maintained even a long time after surgery.

Funding

None.

Conflict of Interest

None declared.

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