Reminder of important clinical lesson

Be aware of wood in the knee

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The authors report a case of a 7-year-old boy who sustained a penetrating injury of a splinter of wood to the knee. Arthroscopic examination, removal of visualised foreign material and washout did not alleviate the symptoms of pain and swelling in its entirety. Microbiology cultures also failed to determine the cause of the on-going symptoms. Five days later, the patient underwent a mini arthrotomy through a lateral incision, which demonstrated synovitis, and removal of the remaining embedded foreign body from the lateral condyle. Although the authors advocate arthroscopy as the surgeon's first choice for removal of a foreign body from the knee, a mini-arthrotomy should also be considered to facilitate superior visualisation and easier instrumentation to remove embedded foreign bodies.

BACKGROUND

Foreign body penetration of the knee is rare, but will be encountered on occasions by a trauma and orthopaedic unit. Prompt arthroscopic washout is the main stay of treatment but if symptoms persist the surgeon is left with a dilemma of what to do next. We recommend either further imaging or a mini arthrotomy if there is suspicion of residual foreign material within the joint that is not visible or accessible by arthroscopy.

CASE PRESENTATION

We report a case of a 7-year-old boy who fell while playing football onto a small, sharp piece of wood which penetrated the anterolateral surface of his left knee. Initially the boy's mother removed the visible spike of wood which was 1.5 cm in length and he was able to mobilise. However, his knee became swollen and painful over subsequent hours and he presented to his local accident and emergency department. On examination, there was a large effusion, with no evidence of surrounding erythema or calor. Over the anterolateral surface of the knee, there was a 0.5 cm puncture wound with no evidence of bleeding or synovial fluid leakage. Knee extension was normal, but flexion was limited to 60 degrees. A radiograph of the knee did not demonstrate a fracture or a foreign body. Blood results

showed a slightly raised white cell count of $13.4 \times 10^9/l$ (normal range $3.5\text{--}10 \times 10^9/l$) and a normal C-reactive protein (CRP) of 4 mg/l (normal <5 mg/l).

Given the clinical picture, the patient underwent an arthroscopic examination of his knee. This showed a piece of residual wood that was firmly embedded in the femoral condyle above the lateral meniscus (figure 1). It proved difficult to remove the splinter, though a 'piecemeal' effort was made using grasper, knife and curette. Following this, the knee joint was washed out and lavage fluid sent for microscopy, culture and sensitivity. The patient was given intra and postoperative antibiotics.

Over the next few days, the patient's symptoms became progressively worse with continued pain and swelling of the knee joint. He remained systemically well, did not show any signs of sepsis, and the knee was not erythematous or hot. Direct microscopy and culture failed to grow any microorganisms.

Due to persistent symptoms, a decision to carry out a formal lateral arthrotomy of the knee was made. This confirmed ulceration over the lateral condyle where the foreign body had been removed and inflammation of the surrounding synovium. On tunnelling into the bone using a curette, a larger piece of wood measuring 15 mm in length was retrieved (figure 2).

Figure 1 Photograph during arthroscopy with wood splinter embedded in the femoral condyle.

INVESTIGATIONS

Blood results:

- ▶ White cell count $13.4 \times 10^9/l$ ($3.5\text{--}10 \times 10^9/l$)
- ▶ C-reactive protein (CRP) of 4 mg/l (<5 mg/l).

Knee radiograph:

- ▶ No foreign body or fracture identified.

Microscopy, culture and sensitivity of lavage fluid from arthroscopy:

- ▶ Negative for microorganisms.

Figure 2 Splinter of wood removed during arthrotomy.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis after the first operation: septic arthritis.

Septic arthritis of the knee was considered as a possible cause of the on-going swelling and pain. However, the child was afebrile and systemically well. Furthermore, the knee was not hot or erythematous and he was able to flex the joint to 60 degrees. Microbiology cultures from the lavage fluid were also negative for organisms.

Reactive synovitis

Reactive synovitis secondary to the foreign body was the most likely cause of the symptoms from the differential diagnoses. Although the symptoms may be clinically indistinguishable from septic arthritis, in a reactive synovitis the symptoms may be less severe without the systemic response of fever and sepsis. The child in this case remained systemically well without fever. The main symptom was that of swelling, on a background of negative microbiology cultures which lead to a differential diagnosis of reactive synovitis being the most likely cause of the symptoms

OUTCOME AND FOLLOW-UP

Postoperatively the patient was followed up closely by the consultant orthopaedic surgeon. He made a good functional recovery with physiotherapy. Initially, the knee remained mildly swollen and the wound healed well and the patient did not complain any further pain or systemic symptoms. As he was clinically improving, further investigation was not deemed necessary at the time. Six months later, a MRI scan was undertaken as an outpatient for final

Figure 3 MRI of knee 6 months post injury. Small defect in lateral femoral condyle visible.

confirmation that there was no further foreign material in the knee and that the inflammatory process was settling before the patient was discharged. This MRI (figure 3) confirmed a small effusion with no evidence of osteomyelitis. At 1 year follow-up, the remaining swelling had subsided, the patient had a full range of knee movement, and he was back to playing soccer.

DISCUSSION

Foreign bodies within the knee are relatively rare, but cases of a plant thorn,¹ glass,² bullet³ and sewing needle⁴ have been reported in the literature. In this case the history of a penetrating injury was clear, however the diagnosis can be missed if the history is less certain.²

Metallic foreign bodies are usually easily diagnosed and localised with plain radiography.^{3–5} However, glass and wood are much more difficult to identify using this imaging modality.^{6–7} Washout and removal of the foreign body from the knee is mandatory to reduce the risk of infection. Vegetative material, due to its porous structure and organic nature, provides an ideal medium for microorganisms. The most common microorganism isolated in cases of septic arthritis in the presence of a vegetative material foreign body is *Pantoea agglomerans*,⁸ a gram negative bacterium found on feculent material, plants and soil.⁹ *P. agglomerans* has antimicrobial susceptibility patterns which mirror those of other gram-negative pathogens. Diagnosis of bone/joint infection is often delayed due to the indolent nature of the pathogen and only made when the patient develops evidence of chronic osteomyelitis. This usually requires treatment with an extended course of antibiotics.

There are documented cases of children presenting with recurrent episodes of pain and swelling without a history of penetrating trauma and negative microbiological cultures.¹⁰ In these cases, arthroscopy several months or even years after the onset of symptoms demonstrated chronic proliferative synovitis and presence of a foreign body. Symptoms subsided when the material was removed.

Washout and removal of foreign bodies may be achieved via arthrotomy or arthroscopy. In this case, although the surgeon was a very experienced arthroscopist, removal of the entire splint of wood embedded in the lateral femoral condyle was challenging. It was thought at the time that all the foreign material had been removed, although subsequently this was found not to be the case. The continued swelling, pain and negative microbiology postoperatively gave rise to the diagnosis of reactive synovitis secondary to persistent foreign material. Although it is a more invasive procedure, the mini-arthrotomy incision provided direct visualisation of the bony defect, enabled improved access to the femoral condyle thus facilitating the use of instruments to burrow into the femoral condyle and remove the material in one piece. Previous reports favour arthroscopic methods for foreign body removal,^{3–4} as do studies comparing arthroscopy verses arthrotomy for specific paediatric conditions such as osteochondritis

dessicans.¹¹ However, a recent study comparing treatment for lateral discoid menisci showed superior functional outcome in children undergoing mini arthrotomies compared to the arthroscopic approach.¹² This is likely as a result of improved visualisation of the joint and easier instrumentation.

Learning points

- ▶ Penetrating foreign bodies, though relatively rare, may result in diagnostic uncertainty if the history is unclear and the penetrating foreign body is not readily identified on imaging.
- ▶ If a foreign body is suspected, arthroscopy constitutes an excellent tool to facilitate the removal of the foreign body and washout of the affected joint. Fluid should be sent for microbiology.
- ▶ Continued swelling and pain in a systemically well patient, with negative microbiological cultures should raise suspicion of a reactive synovitis secondary to a persistent foreign body within the joint, especially if initial removal was difficult.
- ▶ We recommend a second look inside the joint or further imaging to localise residual foreign material if symptoms are persistent after initial removal.
- ▶ Although we advocate arthroscopy as the surgeon's first choice procedure, a mini-arthrotomy should also be considered to facilitate easier instrumentation to remove embedded foreign bodies.

Competing interests None.

Patient consent Obtained.

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