**Differential diagnosis of calf pain with musculoskeletal ultrasound imaging**

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**CASE HISTORIES**

**Case 1: Massive Baker’s cyst presenting as a deep venous thrombosis (fig 1)**

A 68 year old woman presented to the accident and emergency department describing a three day history of acute left calf pain and swelling associated with severe difficulty in weight bearing. She had been previously diagnosed with hypertension, peptic ulcer disease, and had had seronegative rheumatoid arthritis affecting hands, knees, and hips for the past five years. Regular drugs included celecoxib and ranitidine. She was a smoker with a body mass index of 27 and had been on an airline flight from Spain to Scotland two weeks previously. The D-dimer level was increased at 1463 μg/l and she was initially treated with Dalteparin for a presumptive diagnosis of deep venous thrombosis (DVT). A Duplex ultrasound (US) scan of the leg was performed and did not show any evidence of a DVT. The left calf pain had now increased and new bruising was noticed at the infero-posterior aspect of the left calf. Dalteparin was discontinued and musculoskeletal ultrasound (MSUS) confirmed the presence of a large Baker’s cyst extending from the popliteal fossa to the junction of the gastrocnemius and Achilles tendon, at the site of the new bruising (fig 1). The patient now admitted that calf pain and swelling had been present for several months. A diagnosis of Baker’s cyst with minor rupture was made. The left knee was aspirated and injected with little improvement in calf swelling. Two attempts to reduce the cyst by direct US guided aspiration with an 18G and 16G needle were unsuccessful. The patient declined a further surgical opinion and was managed conservatively.

**Case 2: Achilles pain in ankylosing spondylitis (fig 2)**

A 50 year old man presented with an exacerbation of longstanding ankylosing spondylitis affecting cervical and lumbar spine, both hips, and both ankles and heels. He had noted a recent spontaneous increase in left lower calf and heel pain that was beginning to resolve. On clinical examination he was found to have tenderness in both Achilles tendons—left worse than right—consistent with a diagnosis of bilateral Achilles tendinitis. A US examination was performed to confirm the diagnosis. The right Achilles tendon was normal. At the middle third of the left Achilles tendon a 2 cm × 0.25 cm × 0.36 cm anechoic collection was observed within the Achilles tendon (fig 2). A small area of disruption between the fibres of the deep part of the Achilles tendon was noted adjacent to the collection. The findings were consistent with a left Achilles tendon cystic fluid collection resulting from an atraumatic longitudinal Achilles tendon tear. No evidence of retrocalcaneal bursitis was found, and the Achilles pain was managed conservatively.

**Case 3: Diagnosis and treatment of “tennis leg” with ultrasound imaging (fig 3)**

A 51 year old man in good health presented with diffuse swelling and tenderness of the right calf, worse on weight bearing. This had developed acutely during a tennis match, but had worsened over four days. He was due to undertake a long haul flight and wanted a musculoskeletal injury to be confirmed and a DVT excluded. A US study of the calf demonstrated a well localised hypoechoic collection interposed between the medial head of the gastrocnemius and the soleus muscle, typical of a small tear of the medial head of gastrocnemius or of the plantaris tendon. About 30 ml of serosanguinous fluid was drained under US guidance, resulting in collapse of the central hypoechoic fluid collection and restoration of the normal apposition of the gastrocnemius and soleus muscles. The patient noted a marked symptomatic and functional improvement immediately after the procedure.

**DISCUSSION**

The differential diagnosis of calf pain and swelling includes DVT, cellulitis, Baker’s cyst, muscular injury, tumour or infection, arterial aneurysm, and Achilles tendon inflammation or rupture. Much emphasis in current clinical practice is placed on the diagnosis of DVT owing to the serious risk of pulmonary embolism. The sophisticated use of risk stratification models, D-dimer measurement, and Duplex venous studies correctly identifies most DVTs. However, a number of musculoskeletal disorders may present with a similar clinical picture and require careful evaluation in order to avoid inappropriate investigation and management. Dual pathology or the presentation of a Baker’s cyst mimicking a DVT is well described, it is often not considered or diagnosed during the initial venous US study. We suggest that both venous and musculoskeletal US scanning should be performed in cases of acute calf pain and swelling and in all cases of calf pain with a negative venous US examination.

In the three cases described, a careful history was the key to the identification of a probable underlying musculoskeletal disorder. In the first case the patient presented to casualty and gave a history of acute calf pain and swelling. D-dimer levels were raised and treatment was started with low molecular weight heparin. Her symptoms subsequently worsened with a further leak of the Baker’s cyst. On further questioning, she admitted to a much longer history of calf swelling, and MSUS confirmed a massive Baker’s cyst. In the second case the patient clearly identified a recent atraumatic
toid arthritis, better for the detection of enthesopathy in examination of knee effusion and popliteal cyst in rheumatism has been clearly shown to be better than the detection on clinical collection. The findings are consistent with a left Achilles tendon fluid collection resulting from an atraumatic partial Achilles tendon tear (T).

Figure 2

Achilles tendon tear. (A) Longitudinal and (B) transverse images of the calf: at the middle third of the left Achilles tendon there is an anechoic collection (C) lying within the Achilles tendon. A small area of disruption (T) of the deep part of the Achilles tendon fibrillar structure is adjacent to the collection. The findings are consistent with a left Achilles tendon fluid collection resulting from an atraumatic partial Achilles tendon tear (T).
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MSUS improves the success rate of joint aspiration in
everyday rheumatology practice. In the first case, aspiration
using real time US imaging was unsuccessful, possibly
because the collection was long standing and gelatinous.
The hypoechoic nature of the cyst was more typical for an
effusion, and further confirmation of a gelatinous cyst at
surgery was not possible. In the third case, US guided
aspiration of the blood stained collection was successful and
produced a prompt symptomatic response. MSUS has the
total potential to significantly improve clinical diagnosis and
management of patients presenting with calf pain.
Rheumatologists are increasingly using MSUS in their daily
practice to aid diagnosis and therapeutic skills. Initial
evidence suggests that the application of MSUS in rheuma-
tology improves diagnostic and therapeutic skills and has a
significant impact on patient management.

THE LESSONS

- Careful evaluation of the history usually indicates a
  musculoskeletal cause of calf pain.
- D-dimers may be raised in patients with inflammatory
  arthritis in the absence of a DVT.
- The presentation of a Baker's cyst mimicking a DVT is well
described; we recommend musculoskeletal ultrasound in
all cases of calf pain and swelling with a negative venous
ultrasound study of the lower limbs.
- Musculoskeletal ultrasound allows differentiation of
  synovial fluid cysts or collections from muscle haematoma
  and tears aiding rapid differential diagnosis of a number of
  causes of musculoskeletal calf pain.
- Musculoskeletal ultrasound allows guidance of injection
  therapy in the management of calf pain.

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UNUSUAL AND MEMORABLE

Case Number 28: Rheumatoid arthritis and congenitally short fourth metacarpals

A 53 year old man had a long history of rheumatoid arthritis (RA) necessitating hip, knee and elbow replacements. Hand deformity and pain progressed (right worse), particularly at the metacarpophalangeal (MCP) joints. However, he had congenital short fourth metacarpals and fourth MCP joints which were clinically and radiologically sound. He underwent prosthetic replacements of the right 2nd/3rd/5th MCP joints (fig 1B). A similar picture (preoperative) was seen in the left hand (fig 1A).

Radiographs may underestimate the severity of RA changes, but it is interesting to speculate why an MCP joint of a short metacarpal might be protected against degeneration. There might be an associated MCP joint anomaly, making it less prone to erosive change. However, we suggest that MCP joint biomechanics are important—not only are flexor and extensor functions altered but also the fourth MCP joint is splinted by the neck/head of the 3rd and 5th metacarpals, preventing valgus/varus deviation.

Although RA is appropriately considered an inflammatory condition, these pictures emphasise the importance of mechanical factors in joint failure.

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Figure 1 Posteroanterior views of the left (A) and right (B) hands.