The swollen leg: ultrasonographic demonstration of non-thrombotic causes

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Summary: Grey-scale ultrasound is a useful investigation in selected patients with a painful swollen leg. It is of particular value in cases in which there is a clinical suspicion of deep vein thrombosis (DVT) but other features, such as an atypical history or equivocal radiology, suggest alternative pathology. Five such cases are presented in which ultrasound showed transonic lesions. The cause of the swelling of the leg was thus shown to be 'cystic' in nature and therefore not due to DVT. This enabled inappropriate and potentially harmful therapy to be avoided and the correct therapy, such as surgical drainage, to be undertaken.

Introduction

The investigation of patients with a painful swollen leg is of considerable importance since the treatment regimes for the different diagnoses are conflicting. The main differential diagnoses include deep venous thrombosis (DVT), ruptured Baker's cyst, haematoma or abscess formation. All of these can be confused with each other (Hughes & Pridie, 1970; Rosewarne, 1978; Gompels & Darlington, 1979). This paper reports the use of grey-scale ultrasound in 5 patients with a painful swollen leg.

Materials and methods

Grey-scale ultrasound was performed on five patients aged 37 to 89 years, who presented to the Bristol Royal Infirmary or Weston General Hospital with pain and swelling in the leg. Examination in each case had confirmed that their legs were swollen and painful but investigations had not established a diagnosis.

Grey-scale ultrasound was performed with the patients lying supine in one case and prone in the other four cases. Longitudinal and transverse scans were done using a variety of ultrasound machines (Diasonograph, Phosonic, Philips and A.T.L.).

Case histories

Case 1

A 37 year old man sustained lacerations and contusions to the right leg in a road accident. Eight days later he was admitted with a suspected DVT, his leg having become very swollen and tender. Plain radiographs showed no bone injury. Ultrasound showed a transonic area superficially in the right calf. The calf muscles were also shown to be enlarged due to bruising (Figures 1a and 1b). The transonic area was diagnosed as a haematoma. Computed tomography the following day showed a homogeneous mass lying superficially in the calf (Figure 2). 50 ml of liquid haematoma were subsequently drained surgically, confirming the diagnosis.

Case 2

A 45 year old man, neutropaenic due to acute myelomonocytic leukaemia developed severe, painful swelling of his left thigh and knee. He had a previous history of DVT. On examination he was in addition found to have a knee joint effusion. The initial diagnosis of leukaemic infiltration was soon abandoned in favour of that of DVT and he was anticoagulated. The pain and swelling, however, became worse. Plain radiographs confirmed the presence of a joint effusion. Ultrasound showed a large transonic area in the back of the lower thigh extending laterally. A few echoes were present within this area. It was thought probably

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Figure 1a Case 1. Ultrasound of the calf, midline longitudinal scan with the patient prone. There is a transonic mass superficially and increased echogenicity of the underlying muscle. (PF: popliteal fossa, H: haematoma, A: towards the ankle).

Figure 1b Cross-sectional ultrasound scans of both legs of the same patient. The appearances in the right leg represented a superficial haematoma and bruising of the underlying muscles. (H: haematoma, T: tibia, F: fibula).

to be an abscess containing necrotic tissue, although the alternative of a haematoma containing some thrombus was also considered.

The lesion was subsequently drained producing 700 ml of green pus from which *Staphylococcus aureus* was grown.

Case 3

A 73 year old man with ankylosing spondylitis affecting his spine presented with a one week history of increasing pain, swelling and stiffness in his right calf. There was no previous involvement of his right knee with ankylosing spondylitis. The calf was found to be

hot, tender and indurated with distended superficial veins. A diagnosis of DVT was made and he was anticoagulated. Over the following week his leg became worse and further investigations were instigated. A knee arthrogram was reported as normal and a venogram showed a small thrombus in one of the deep veins of the calf. The DVT was too small to fully account for the clinical picture. Ultrasound was therefore performed and showed a large collection of fluid posteriorly extending above and below the knee.

The abscess was surgically drained producing a large quantity of pus from which *S. aureus* was cultured.

Case 4

A 69 year old woman presented with a five day history of a painful swollen right calf. This was found on examination to be slightly red with some pitting oedema. She had a history of a Charnley hip prosthesis some years previously and a vaginal hysterectomy one month before admission. A diagnosis of DVT was made but following anticoagulation her leg became worse. A knee arthrogram was then performed and showed a ruptured Baker's cyst. Bloody pus was aspirated and *S. aureus* was subsequently grown. The pain and swelling became worse despite appropriate antibiotics. Ultrasound was then performed and showed a mass of mixed echogenicity between the gastrocnemius and soleus muscles which was thought to be an abscess (Figures 3a and 3b). Computed tomography also clearly showed a mass with a central denser part and surrounding lower attenuation (Figure 4). The abscess was surgically drained.

Case 5

An 89 year old woman was admitted with a two week history of a painful swelling in the left thigh. She had 2 months previously had a dynamic hip screw inserted for an inter-trochanteric fracture of the left hip. On

examination the thigh was hot and swollen with blue discolouration of the skin. There was also peripheral oedema of the lower leg. Clinically a DVT was initially suspected and a venogram requested. Ultrasound of the thigh was, however, considered to be a more valuable first examination and this showed a large lesion with mixed echogenicity and some transonic areas. This was thought to be a haematoma containing thrombus, a diagnosis favoured by the profound anaemia which had developed since her hip operation. As the cause of the haematoma was uncertain an arteriogram was performed. This showed a leaking false aneurysm of one of the branches of the profunda femoris artery just distal to the fracture site.

The leg was explored, the haematoma drained and the feeding vessel ligated. The aneurysm was found to have been caused by a small bone spicule from the fracture site.

Results

In all 5 patients ultrasound demonstrated partially or completely transonic lesions at the site of the leg swelling. This confirmed that all of the lesions were wholly or partially cystic and therefore not likely to be due to DVT. In the two cases in which echoes were

Figure 2 Computed tomography of both lower legs at the same anatomical level as that shown in Figure 1b (L20, W400 HU). The haematoma is seen as a superficial swelling of homogeneous density. Although the scans were performed with the patient supine they have been inverted for easier comparison with the ultrasound.

Figure 3a Case 4. Longitudinal ultrasound scan of the calf with the patient prone. There is a mass of mixed echogenicity, being mainly transonic but containing a few scattered echoes. (PF: popliteal fossa, A: towards the ankle, Ab: abscess).

Figure 3b Cross-sectional ultrasound scans of the same patient (case 4). The appearances represented an abscess deep in the calf muscles. (Ab: abscess, T: tibia).

present within the lesion the ultrasound appearances suggested either an abscess containing necrotic debris or a partially liquefied haematoma. In all cases the information obtained by ultrasound was considered as sufficient justification for surgical intervention. In 2 patients already anticoagulated, this therapy was stopped following ultrasound. In all cases surgery confirmed the lesion to be due to either abscess or haematoma.

Discussion

Confusion between different conditions that may cause a painful swollen leg is not uncommon (Tait *et al.*, 1965; Rosewarne, 1978; Clain, 1980). The main differential diagnoses to be considered are DVT, ruptured Baker's cyst, haematoma and abscess. However the treatment for these conditions differ widely and appropriate therapy for one may be inappropriate or even dangerous in another. It is

therefore of paramount importance to establish the correct diagnosis as early as possible. Several of the possible causes of a swollen leg (Baker's cyst, abscess and haematoma) are likely to contain cystic areas and may thus be easily demonstrated by ultrasound (Hamments, 1982).

In cases of swollen legs where DVT is a possible diagnosis a variety of radiological investigations are available. Venography carries a risk of causing deep vein thrombosis (Berge *et al.*, 1978) although recent evidence suggests this may be minimized by using the new low-osmolality contrast media (Thomas *et al.*, 1984). In patients with a swollen, oedematous foot, cannulation of a foot vein may prove very difficult, a problem also encountered in isotope venography. Doppler ultrasound is often inaccurate and requires sudden firm pressure on the affected part causing considerable pain. Arthrography for suspected Baker's cyst rupture can prove of value (Tait *et al.*, 1965; Rosewarne, 1978) but in patients with a very painful leg flexion may be difficult and the arthrography equivocal. Grey-scale ultrasound has the advantages of being non-invasive, painless and free from side effects.

It is clear that ultrasound has a valuable role in the assessment of the painful swollen leg. While it was not possible in this series to be entirely tissue-specific valuable information was obtained which enabled appropriate treatment to be undertaken and potentially dangerous treatment to be stopped. It is of particular use in cases where DVT had been suggested as a possible cause of the swelling of the leg, but there are atypical features in the history or on examination which cast doubt on the diagnosis.

Figure 4 Computed tomography of both lower legs at the same anatomical level as that shown in Figure 3b (L00, W800 HU). The abscess is again seen between the gastrocnemius and soleus muscles. (Ab: abscess, T: tibia, F: fibula).

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