WHEN ASYMMETRICAL LOWER LIMB SWELLING ISN'T A DVT

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INTRODUCTION

Asymmetrical leg swelling requiring exclusion of deep vein thrombosis (DVT) is an extremely common, almost reflex, ultrasound (US) request with dedicated clinical pathways and daily available scan slots. Our departmental Venous Doppler Ultrasound scans are sonographer performed, largely protocol driven, with the report mentioning the presence or absence of a Baker's cyst. When other abnormalities are spotted a dedicated Musculoskeletal scan is arranged. In this pictorial review we will discuss the wide spectrum of pathologies we have encountered when asymmetric lower limb or calf swelling is not caused by a DVT. All cases were initially referred for a scan to look for a DVT as a cause of their leg swelling. Several patients had more than one DVT scan, on occasion despite the report identifying an alternative possible cause and suggesting further evaluation.

PROTOCOL

No GP direct access. Patients with unilateral swollen/painful leg are clinically assessed via SDEC with history, examination, D Dimer, Wells score and venometry performed where appropriate.

Patients with high probability for DVT or risk factors including IVDU, pregnancy, recent surgery, prior thrombus, thigh superficial thrombosis etc referred for venous doppler US of the symptomatic leg. Bilateral scans only performed in pregnant patients with very high clinical suspicion or where clot is seen to extend into the IVC on scanning.

SCAN TECHNIQUE

Identify Common Femoral Vein (CFV) at groin:

Assess grey scale for intraluminal echoes from thrombus, compressibility, and dilatation of vein with Valsalva.

Spectral doppler in CFV should be spontaneous, phasic with respiration and show response to Valsalva and augmentation with calf squeeze.

Assess whole vein from groin to proximal calf (CFV, SFV through adductor canal to popliteal vein and trifurcation into proximal calf veins):

Transverse grey scale for compressibility.

Colour doppler to assess good filling of veins.

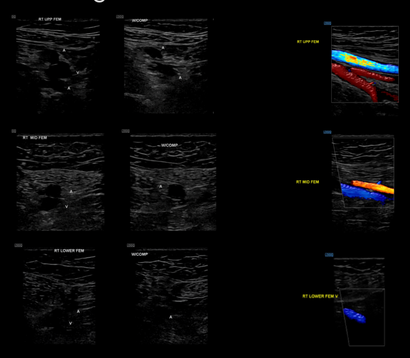
Assess presence or absence of Baker's cyst.

CONCLUSION

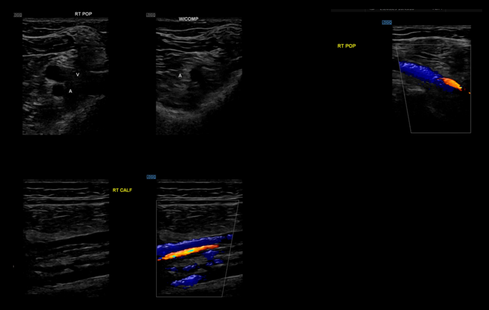
Venous Doppler US scans are commonly performed to rule out DVT in patients with asymmetrical lower limb swelling. In cases with no DVT but significant swelling, other causes may be encountered and where there is high clinical suspicion, should be actively sought.

Scanning Technique

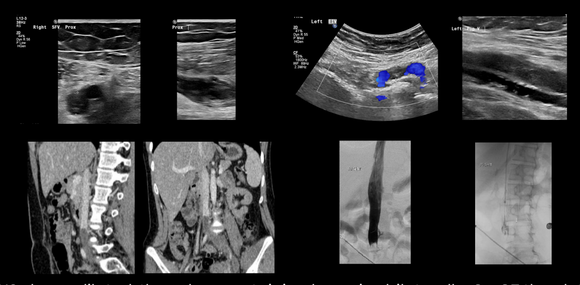
Protocol images from Normal DVT US - Femoral



Protocol images from Normal DVT US - Popliteal

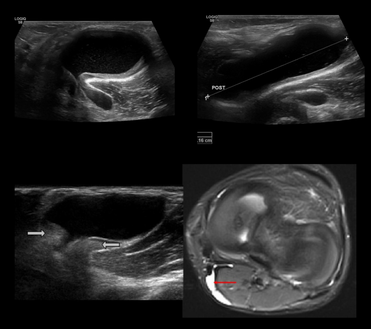


Images from positive bilateral DVT scan



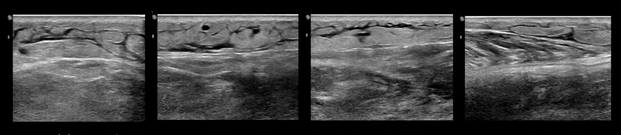
US shows dilated, thrombus containing leg veins bilaterally. On CT the clot is seen extending from the left external iliac vein into the lower IVC. Venogram prior to IVC filter insertion shows clot in lower IVC blocking flow of contrast.

Baker Cyst

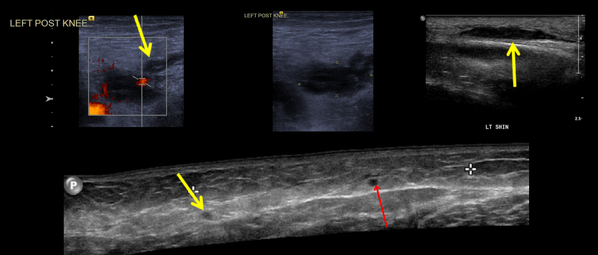


A Baker or popliteal cyst is a fluid filled lesion arising in the popliteal fossa between the medial head of gastrocnemius and the semimembranosis tendon (arrows). This gives a typical speech bubble appearance in TS. The lesion is synovial –lined and usually communicates with the posterior knee joint

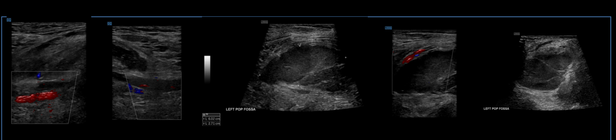
Cases



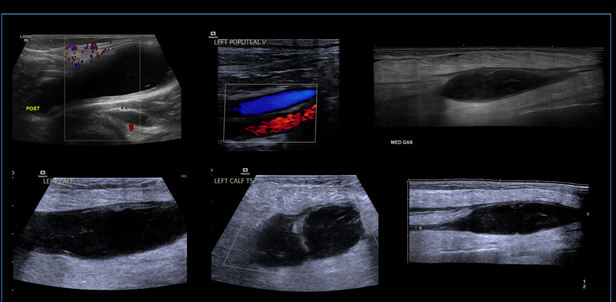
Cellulitis L calf: 69yo man with tender, swollen left calf. DVT scan requested despite skin warmth and erythema. No DVT seen. US shows mild dermal thickening with increased echogenicity of subcutaneous fatty lobules separated by anechoic branching striations of oedema to give a cobblestone appearance. Often there is associated hyperaemia.



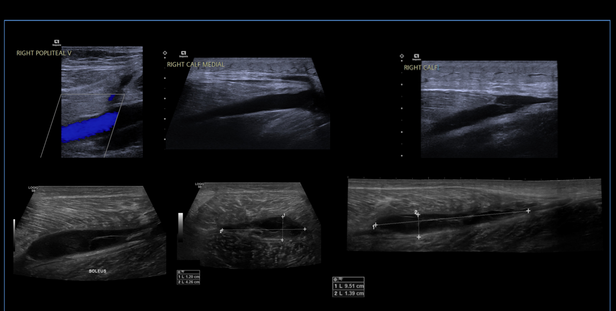
Superficial Thrombophlebitis: 61 yo lady with swollen, erythematous left calf. Initial Doppler US scan demonstrated patent deep venous system with a thrombosed varicosity in the medial aspect of the popliteal fossa. This thrombosed superficial vein (yellow arrow) could be traced distally in a later scan. There was increased echogenicity of the surrounding fat and anechoic oedema between fatty lobules. In the panorama image note the appearance of the thrombosed vein in comparison to the adjacent patent vein (red arrow).



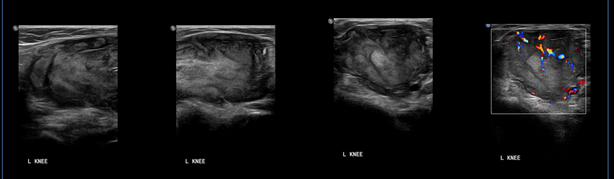
DVT secondary to compression from Haemorrhagic Baker cyst: 53 yo immobile man with complex history presented with new swelling of left leg. US demonstrated clot within the popliteal vein owing to compression by a large popliteal cyst. This was tender with multiple, fluctuant, bright internal echoes, through transmission and absent internal vascularity, in keeping with acute haemorrhage within a typically sited Baker cyst.



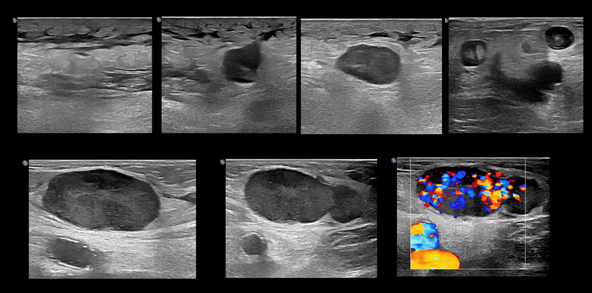
Ruptured Baker cyst: 57yo man with prior Baker cyst on US presented with painful swollen left calf. No DVT. Irregular, decompressed popliteal cyst seen communicating with haematoma extending between soleus and gastrocnemius muscles and also just deep to the investing fascia in keeping with rupture of known Baker cyst. Follow up scan 1 month later showed little change.



Calf Muscle Tear: 42 yo man with painful swollen right calf and raised D dimer. Doppler US requested which showed a tear of the medial gastrocnemius muscle with fluid extending around the distal tip of the muscle and along the aponeurosis with soleus. Follow up dedicated MSK scan showed some consolidation of the haematoma with fibrin strands forming within the fluid.

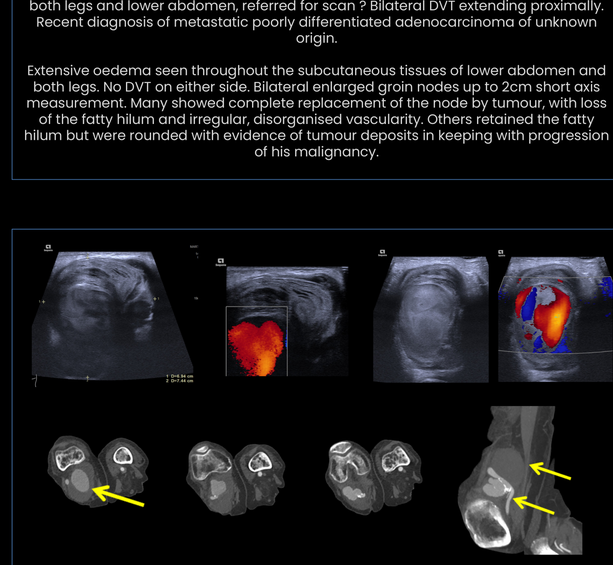


Popliteal Lymphadenopathy – Mantle cell lymphoma: 70yo female with painful oedematous left calf and new mass behind knee. Doppler US requested to diagnose presumed ruptured Baker cyst +/- DVT. 7cm solid lesion within popliteal fossa. There is central echogenicity and peripheral vascularity making it likely to be an abnormal lymph node. The popliteal vein was mildly compressed but patent. Biopsy proven Mantle cell lymphoma.

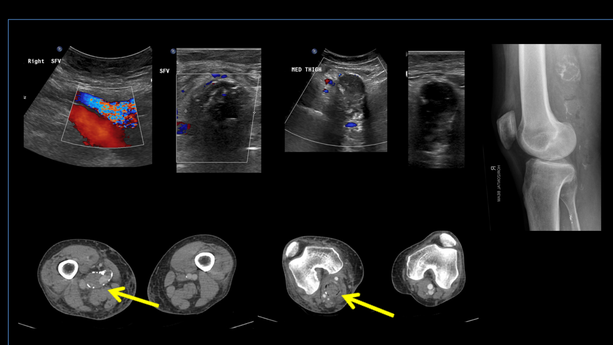


Abnormal Groin Lymph Nodes: 66 yo man presented with swelling and oedema of both legs and lower abdomen, referred for scan ? Bilateral DVT extending proximally. Recent diagnosis of metastatic poorly differentiated adenocarcinoma of unknown origin.

Extensive oedema seen throughout the subcutaneous tissues of lower abdomen and both legs. No DVT on either side. Bilateral enlarged groin nodes up to 2cm short axis measurement. Many showed complete replacement of the node by tumour, with loss of the fatty hilum and irregular, disorganised vascularity. Others retained the fatty hilum but were rounded with evidence of tumour deposits in keeping with progression of his malignancy.



Popliteal pseudoaneurysm: 83 yo lady with painful, swollen right lower leg, swelling behind the knee felt to be Baker cyst with possibility of rupture or DVT. US showed a 7cm vascular structure within the popliteal fossa. There was lamellated peripheral thrombus and pulsatile central flow consistent with a popliteal artery aneurysm or pseudoaneurysm. Axial and sagittal recon images from CT angiogram confirm a large popliteal pseudoaneurysm (yellow arrows) arising from a patent, calcified, but normal calibre popliteal artery. Contrast is seen within the artery and lower pseudoaneurysm with surrounding, low attenuation thrombus.

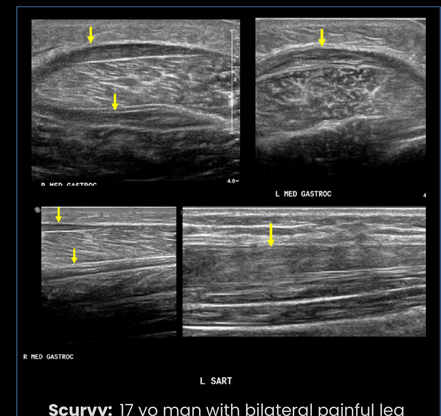


Infected Thrombosed Popliteal Artery Aneurysm: 68 yo man with swollen right leg, recent abdominal surgery and history of prior DVT. No prior history of vascular surgery given! No DVT seen. Area of tender, mixed echogenicity with calcified rim extending from medial thigh through popliteal fossa on US, no internal blood flow. Diagnosed as likely thrombosed popliteal artery aneurysm sac +/- infection.

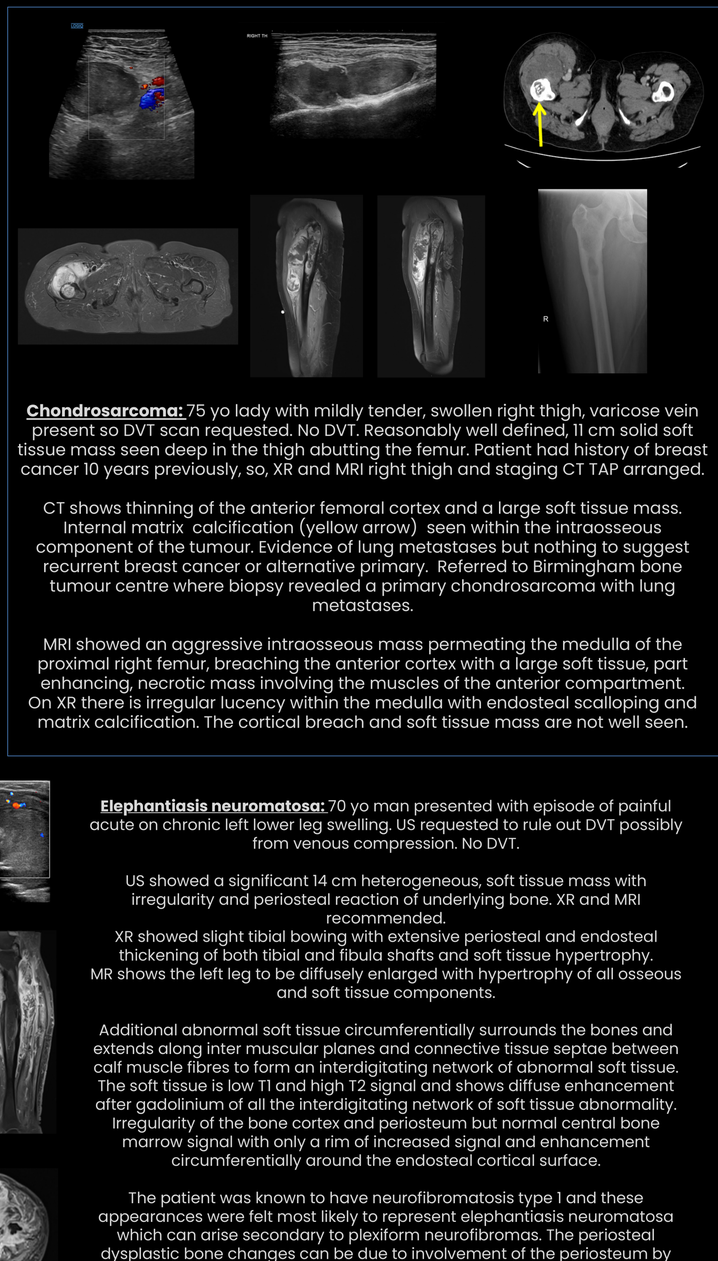
Axial images from CT venogram demonstrate patent graft bypassing entire popliteal artery. The popliteal artery sac (yellow arrow) is thrombosed with multiple internal gas locules and a rim of surrounding oedema indicating likely infection of the thrombosed aneurysmal popliteal artery.

MRI Sag T2 Image courtesy of Ali Alsmair, Radiopedia.org rID: 97087
Shows an accessory soleus muscle anterior to the distal achilles

Accessory soleus muscle: 16 yo boy with painful calf asymmetry. No DVT seen, US demonstrated that the swelling was muscular, an accessory soleus muscle was seen to insert into the Achilles tendon 2mm above the calcaneum. The soleus insertion in the right leg was still slightly low but muscle bulk was more normal. On direct questioning the pain had worsened recently especially after exercise, possibly secondary to compartment syndrome, he was training for a half marathon



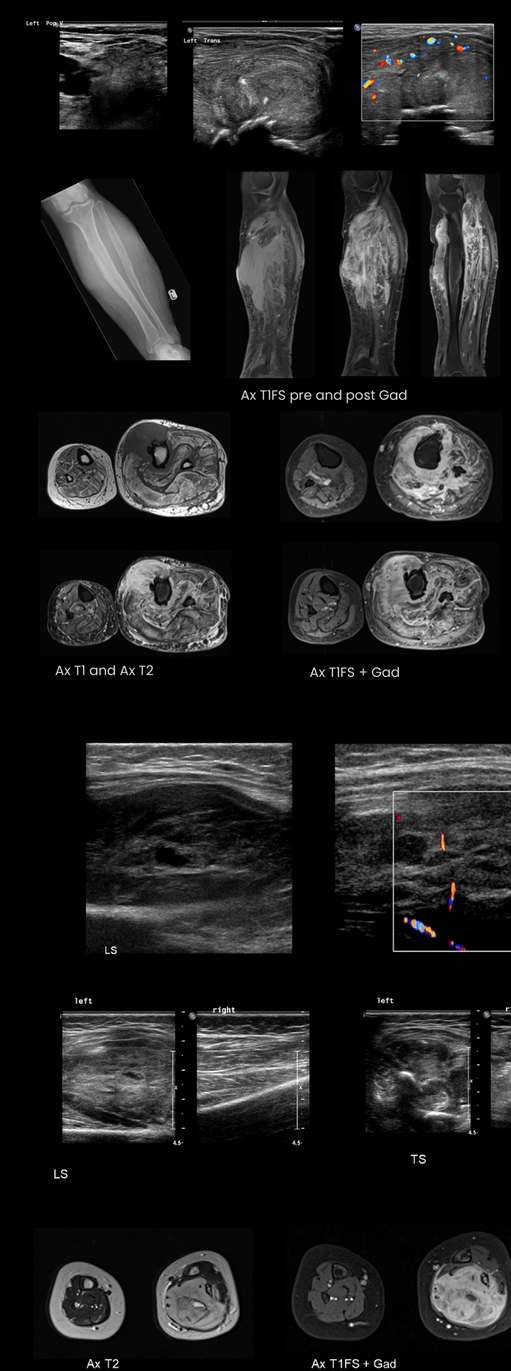
Scurvy: 17 yo man with bilateral painful leg swelling. DVT scan left leg requested by GP as swollen from thigh. Both legs scanned, no DVT. On the left haemorrhage (yellow arrows) surrounded the medial head of gastrocnemius in plane between muscle and deep fascia. Intramuscular haemorrhage within left sartorius. On the right there was haemorrhage surrounding the entire medial gastrocnemius muscle. Widespread subcutaneous haemorrhagic change seen. A fading petechial rash and bruise behind right knee noted, haematology referral recommended. The patient was very thin and had a poor diet. No clotting disorder found, and changes were all attributed to scurvy resulting from dietary vitamin C.



Chondrosarcoma: 75 yo lady with mildly tender, swollen right thigh, varicose vein present so DVT scan requested. No DVT. Reasonably well defined, 11 cm solid soft tissue mass seen deep in the thigh abutting the femur. Patient had history of breast cancer 10 years previously, so, XR and MRI right thigh and staging CT TAP arranged.

CT shows thinning of the anterior femoral cortex and a large soft tissue mass. Internal matrix calcification (yellow arrow) seen within the intraosseous component of the tumour. Evidence of lung metastases but nothing to suggest recurrent breast cancer or alternative primary. Referred to Birmingham bone tumour centre where biopsy revealed a primary chondrosarcoma with lung metastases.

MRI showed an aggressive intraosseous mass permeating the medulla of the proximal right femur, breaching the anterior cortex with a large soft tissue, part enhancing, necrotic mass involving the muscles of the anterior compartment. On XR there is irregular lucency within the medulla with endosteal scalloping and matrix calcification. The cortical breach and soft tissue mass are not well seen.

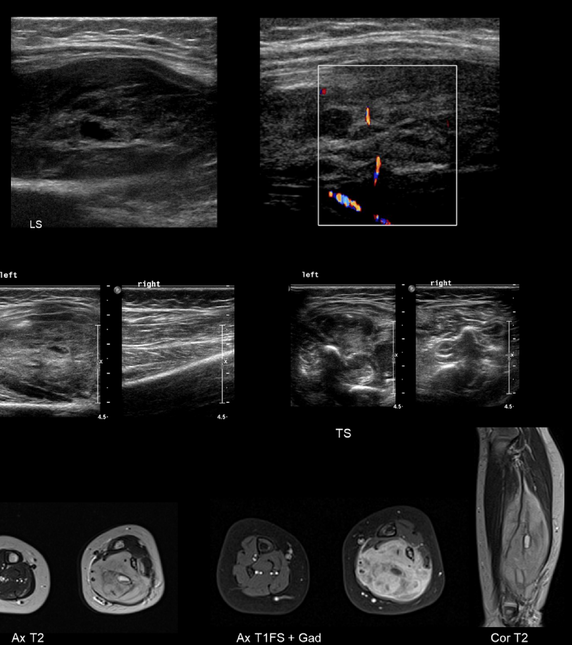


Elephantiasis neuromatosa: 70 yo man presented with episode of painful acute on chronic left lower leg swelling. US requested to rule out DVT possibly from venous compression. No DVT.

US showed a significant 14 cm heterogeneous, soft tissue mass with irregularity and periosteal reaction of underlying bone. XR and MRI recommended.
XR showed slight tibial bowing with extensive periosteal and endosteal thickening of both tibial and fibula shafts and soft tissue hypertrophy.
MR shows the left leg to be diffusely enlarged with hypertrophy of all osseous and soft tissue components.

Additional abnormal soft tissue circumferentially surrounds the bones and extends along inter muscular planes and connective tissue septae between calf muscle fibres to form an interdigitating network of abnormal soft tissue. The soft tissue is low T1 and high T2 signal and shows diffuse enhancement after gadolinium of all the interdigitating network of soft tissue abnormality. Irregularity of the bone cortex and periosteum but normal central bone marrow signal with only a rim of increased signal and enhancement circumferentially around the endosteal cortical surface.

The patient was known to have neurofibromatosis type 1 and these appearances were felt most likely to represent elephantiasis neuromatosa which can arise secondary to plexiform neurofibromas. The periosteal dysplastic bone changes can be due to involvement of the periosteum by neurofibromas or due to recurrent subperiosteal haemorrhage. The hypertrophy of the soft tissue and bone elements can also be secondary to relative hyperaemia. The plexiform nature of this lesion is best appreciated on the post gadolinium coronal images where it can be seen interdigitating with the muscle components throughout the soft tissues of the calf.
He was referred to Birmingham tumour unit to exclude sarcomatous change, given the acute alteration in symptoms but unfortunately died from pneumonia before he was seen.



Soft Tissue Mass – Alveolar Rhabdomyosarcoma

14 month girl with prior traumatic groin cannulation and left calf swelling. US requested to exclude DVT and look for alternative cause of swelling.

No DVT. US shows a solid, complex heterogenous intramuscular mass of left calf with some internal vascularity and areas of cystic change. The mass was seen to surround the fibula.

MRI confirmed an infiltrative, cellular, intramuscular mass with fairly uniform enhancement and necrotic areas.

The patient was referred to the local tertiary centre where an alveolar rhabdomyosarcoma was diagnosed. She was treated with amputation, radiotherapy and chemotherapy.

References

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(2)Polat AV, Bekci T, Say F, Bolukbas E, Selcuk MB. Osteoskeletal manifestations of scurvy: MRI and ultrasound findings. Skeletal radiology. 2015 Aug;44:1161-4.
(3)Kruger PC, Eikelboom JW, Douketis JD, Hankey GJ. Deep vein thrombosis: update on diagnosis and management. Medical Journal of Australia. 2019 Jun;210(11):516-24.