

CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

The day following discharge from the hospital from an uneventful vaginal term delivery, a 29 year old woman presents with the acute onset of left lower extremity pain and swelling. There is no history of trauma. Her blood pressure is 100/70, her pulse is 70, her respiratory rate is 18, and her temperature is 98.1. On physical examination, her left lower extremity is tender and swollen. She has full range of motion at the ankle, knee, and hip joints.

Which of the following imaging studies is the best first step for imaging evaluation and why?

- (a) leg plain film evaluation to evaluate for stress fracture
- (b) lower extremity nuclear medicine bone scan to evaluate for stress fracture
- (c) lower extremity venous ultrasound to evaluate for deep venous thrombosis
- (d) knee magnetic resonance imaging to evaluate for meniscal tear

RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

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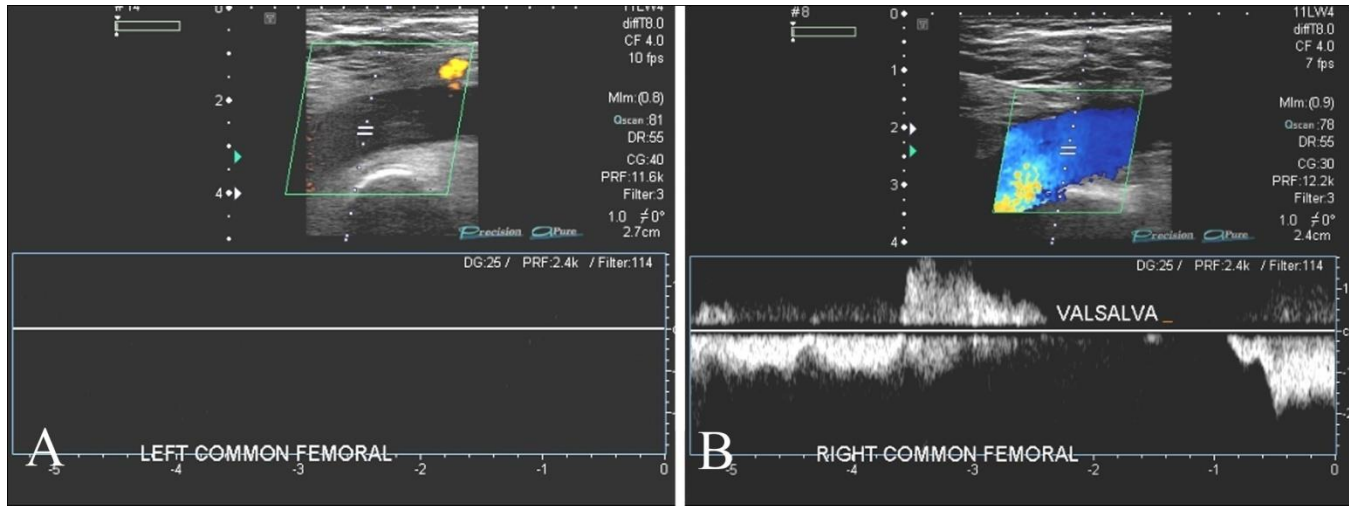
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Answer: (c), lower extremity venous ultrasound to evaluate for deep venous thrombosis is the correct answer. The patient's presentation is typical for deep venous thrombosis, and pregnancy (as well as the early post-partum period) is a known risk factor for deep venous thrombosis.

Leg plain film evaluation to evaluate for stress fracture (a) is incorrect. Patients with stress fractures typically have gradually increasing pain. Young patients with stress fractures usually have fatigue fractures caused by overuse. Lower extremity nuclear medicine bone scan to evaluate for stress fracture (b) is also incorrect, for the same reason. Note that bone scans *are* more sensitive for the detection of stress fractures, but in many institutions, magnetic resonance imaging has supplanted bone scans for the evaluation of suspected stress fractures because of the ability to diagnose alternatives to stress fracture (e.g. muscle sprain) and the lack of ionizing radiation. Knee magnetic resonance imaging to evaluate for a meniscal tear (d) is incorrect. Meniscal tears may cause lower extremity pain, but would not typically be associated with acute swelling or a full range of motion of the knee joint.

IMAGING STUDY AND QUESTIONS

The patient underwent further imaging:

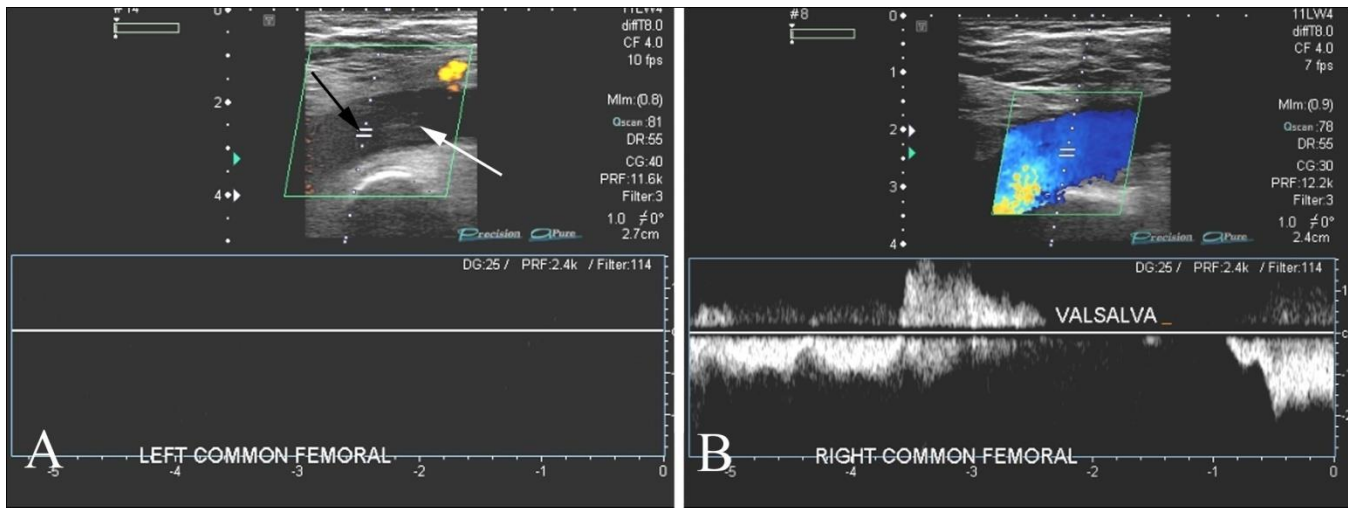


Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

IMAGING STUDY QUESTIONS AND ANSWER

The patient underwent further imaging:



Imaging questions:

- 1) What type of study is shown? Venous ultrasound of the lower extremities. Panel A shows the left common femoral vein and panel B shows the right common femoral vein.
- 2) Are there any abnormalities? Yes. The vessel in panel A is filled with a blood clot (white arrow) and therefore shows no flow on color Doppler imaging; compare with the flow documented in panel B with color filling the lumen of the vessel inside the box showing the sampling volume for the color flow study. Note also that there is no flow on spectral Doppler exam in the sample volume in panel A (black arrow) with no reading seen along the bottom of the panel; compare with the flow documented in panel B along the normal contralateral right common femoral vessel, including cessation of flow with Valsalva. The common femoral vein was also noncompressible (not shown on these images), another finding indicating that the vessel lumen is filled with clot.
- 3) What is the most likely diagnosis? Deep venous thrombosis.
- 4) What is the next step in management? Anticoagulation.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

The patient was treated with enoxaparin and warfarin until her INR reached 2.0, at which time her enoxaparin was discontinued. Despite adequate anticoagulation, the patient's leg pain and edema progressed and a repeat ultrasound demonstrated progression of lower extremity deep venous thrombus. The patient was referred to a hematologist and then to interventional radiology, where a venogram showed extensive deep venous thrombus extending into the left iliac vein. A CT documented that the left iliac vein was compressed between the right iliac artery and the spine, predisposing the left iliac vein to poor flow and thrombus formation (May Thurner Syndrome). The patient underwent clot thrombolysis, left iliac vein stent placement, and anticoagulation. Unfortunately, she developed a large intrapelvic hematoma. Her anti-coagulation was reversed temporarily and an inferior vena cava filter was placed.

Laboratory testing showed that the patient had normal protein C, a normal antiphospholipid antibody screening study, a normal thrombin level, and was negative for factor V Leiden. The patient had low protein S levels. She was found to be homozygous for prothrombin gene mutation.



29 year old woman with May Thurner Syndrome with a left iliac vein stent. Sequential posterior to anterior coronal CT images show the left iliac stent (white arrow) immediately posterior to the crossing right iliac artery (black arrow). On axial images (not shown) the left iliac vein was compressed between the right iliac artery and spine.

SUMMARY

Presenting symptoms: The patient had acute onset of lower extremity pain and swelling shortly following pregnancy (a known risk factor for deep venous thrombosis). The patient's Wells score was at least 3, indicating a high probability of deep venous thrombosis.

Imaging work-up: In patients with suspected deep venous thrombosis, ultrasound of the lower extremity is the study of choice. Ultrasound has largely supplanted venography because of the lack of ionizing radiation and the ability to avoid injecting contrast material.

Establishing the diagnosis: When there is a classic appearance of deep venous thrombosis with an echogenic filling defect within the vein, no flow on color Doppler imaging, no flow on spectral Doppler imaging, and lack of compressibility of the vessel (as in this case), the imaging study establishes the diagnosis. Contrast venography is considered the reference standard but is usually not necessary when non-interventional imaging studies are diagnostic.

Take-home message: Acute onset lower extremity pain and swelling should prompt evaluation for deep venous thrombosis with a lower extremity venous ultrasound study which includes gray scale imaging, color Doppler examination, spectral Doppler examination, and compression ultrasound.

FURTHER READING

Bauer KA, Lip GYH. Overview of the causes of venous thrombosis. UpToDate, accessed 3/15/12.

Grant BJB. Diagnosis of suspected deep vein thrombosis of the lower extremity. UpToDate, accessed 3/15/12.

Landaw SA, Bauer KA. Approach to the diagnosis and therapy of lower extremity deep venous thrombosis. UpToDate, accessed 3/15/12.

Wells PS, Anderson DR, Rodger M et al. N Engl J Med 2003;349:1227.