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The Global Reading Room: A Child With Lower Extremity Pain

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A 5-year-old girl without a history of witnessed trauma presents to the emergency department with nonlocalizing left lower extremity pain and unwillingness to bear weight. Initial lower extremity radiographs are interpreted as normal. What do you recommend for further management?

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Not uncommonly, radiographs demonstrate no abnormality in this scenario. Although this is a frequent occurrence, the result is dissatisfying, leaving no explanation for the child's symptoms. When possible, I discuss the case with the referring clinician, specifically assessing the level of suspicion for infection. If the child is irritable, I suggest obtaining a hip ultrasound. Performance of the ultrasound allows direct assessment of the child. Children with a septic joint or osteomyelitis are often very uncomfortable and reluctant to move the affected body part during the examination. A hip effusion, if identified, suggests various possible causes including transient synovitis. If a hip effusion is not identified, I assess for signs of soft tissue infection around the hip. If the adjacent soft tissues show no clues into the diagnosis, I perform a rapid knee or ankle ultrasound to assess for a joint effusion. Occasionally, I have identified soft tissue inflammation in the calf secondary to tibial or fibular osteomyelitis. If ultrasound provides evidence of joint or bone infection, the child is directed to the care of an orthopedic surgeon, and a targeted contrast-enhanced MRI is expedited to confirm the joint or bone(s) involved and presence of any adjacent soft tissue infection.

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I recommend performing lower extremity ultrasound, focusing on the hip joint. Of course, the diagnostic strategy changes depending on clinical findings such as presence of fever and the child's general condition. According to the American College of Radiology Appropriateness Criteria [1], the level of suspicion of infection is especially important as it determines whether initial imaging is radiography, ultrasound, or MRI. Imaging selection should also consider cost and invasiveness. Radiography was normal in the provided scenario. If suspecting infection, ultrasound is useful given its sensitivity to joint effusion and soft tissue edema, although has limited anatomic coverage. Ultrasound is additionally useful in the diagnosis of transient synovitis, which is the most frequent pathology in this age. If ultrasound shows negative findings, but there are persistent concerning clinical findings, I would then recommend focused unenhanced extremity MRI. Whole-body MRI has been shown to have superior sensitivity than other modalities; however, due to the higher cost and invasiveness, including sedation and scan time, it is appropriate to consider whole-body MRI only when all previously noted imaging tests are negative, and concerning symptoms persist without a diagnosis. CT and bone scintigraphy are not recommended due to radiation exposure and limited information gleaned.

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Non-localizable pain presents a challenge, and management is contextual. Even absent a witnessed event, minor trauma resulting in soft tissue injury or occult fracture is common. Symptoms are often self-limiting, however follow-up radiographs at day 10 can be obtained if symptoms persist. Attention should be given to development of subtle sclerotic bands at the proximal cuboid, talar head, and posterior calcaneus, indicating healing impaction injuries. As hip pain from transient synovitis or septic arthritis can refer to the knee, thigh, or buttock, initial hip ultrasound might also be considered, ideally informed by active and passive range of motion [2].

If findings of fever or erythema suggest osteoarticular infection, expedited extended-FOV MRI covering the entire limb is recommended following orthopedic consultation. IV contrast media is not necessary to diagnose osteomyelitis, but can identify actionable complications. Strategies to reduce acquisition time, including parallel imaging, compressed sensing, radial k-space sampling, and simultaneous multisection imaging, are incorporated to facilitate diagnosis and potentially obviate sedation requirements. Artificial intelligence-augmentation offers promise in these regards. Finally, an underlying hematologic or metabolic disorder (e.g., leukemia or scurvy) should always be considered if constitutional symptoms are present, with a low threshold for expanding imaging coverage to assess systemic involvement.

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As radiographs are inconclusive, ultrasound examination may help exclude the presence of synovial fluid and synovitis of the hip, knee, and ankle. In general, ultrasound cannot differentiate toxic synovitis of the hip with joint effusion from septic arthritis. Laboratory tests can help, but the validity of C-reactive protein as a marker of septic arthritis versus other synovitis has only been validated for the hip joint [3]. Ultrasound also allows aspirating synovial fluid or a periosteal abscess or excluding soft tissue abnormalities. The ultrasound assessment should include an examination of the left iliac fossa to exclude a pelvic mass causing radiating pain to the lower limb. If ultrasound is unremarkable, MRI should be performed to detect other lower limb causes, including early Legg-Calvé-Perthes disease, bone marrow abnormalities, septic arthritis of the sacroiliac joint, lumbar spondylodiscitis, or psoas muscle abscess. Clinical examination is mandatory to target the MRI protocol. In a 5-year-old girl with pain, general anaesthesia could be required. Therefore, ultrasound seems to be the technique of choice for further management. Bone scintigraphy should be considered if the ultrasound is normal, and MRI is contraindicated or not available.

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