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EMERGENCY DEPARTMENT DIAGNOSIS OF PEDIATRIC HIP EFFUSION AND GUIDED ARTHROCENTESIS USING POINT-OF-CARE ULTRASOUND

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□ **Abstract—Children with complaints of hip pain, a painful limp, or refusal to weight bear commonly present to the Emergency Department (ED). The ability to use point-of-care ultrasound in the ED to diagnose a hip joint effusion and to guide arthrocentesis can be helpful to facilitate diagnosis and management of these children. The capsular-synovial thickness of the hip is measured from the anterior bony cortical surface to the posterior surface of the iliopsoas muscle at the concavity of the femoral neck. A capsular-synovial thickness > 5 mm, or > 2 mm difference compared to the asymptomatic contralateral hip are the described sonographic criteria for hip joint effusion in children. We report on the use of point-of-care ultrasound to diagnose hip effusion and to guide arthrocentesis in a series of pediatric patients presenting with hip pain to the ED.**

□ **Keywords—pediatric; emergency ultrasound; diagnosis; hip; effusion**

INTRODUCTION

Bedside or point-of-care ultrasound is a versatile and important diagnostic tool for Emergency Physicians and Pediatric Emergency Physicians (1,2). Children with complaints of hip pain, a painful limp, or refusal to weight bear commonly present to the Emergency Department (ED) for evaluation. The differential diagnosis may include septic arthritis, transient synovitis, Legg-Calve-Perthes disease, slipped capital femoral epiphysis, and other musculoskeletal disorders (3). These conditions may present similarly, and knowledge of whether a hip joint effusion is present would be helpful to facilitate diagnosis and management in these children.

Confirming the presence of hip effusion by point-of-care ultrasound and performing ultrasound-guided hip arthrocentesis may be valuable, especially in the case of acute bacterial septic arthritis in children—a pediatric emergency. The use of ultrasound to evaluate pediatric hips for effusion and to guide arthrocentesis is not new, and is well documented in the medical literature (4–15). Furthermore, with readily identifiable sonographic landmarks, hip ultrasound is easy and rapid to perform (11,12). The growing availability of portable ultrasound machines in EDs will allow Emergency Physicians to rapidly diagnose hip effusion in the child with hip pain by incorporating focused point-of-care ultrasound into the physical examination (16).

We report a series of cases on use of point-of-care ultrasound to determine the presence or absence of hip effusion, and to guide arthrocentesis in children that presented with a painful hip to the ED. The technique of hip ultrasound, sonographic criteria for pediatric hip effusion, methods of ultrasound-guided hip arthrocentesis, and the role of point-of-care ultrasound in the evaluation of these patients are reviewed and discussed.

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CASE REPORTS

Case 1

A previously healthy 5-year-old boy was brought into the ED with difficulty walking and right-sided hip pain for 2 days. The patient's mother reported that he had nasal congestion and coughing for several days before presentation.

On physical examination, the patient's initial vital signs were: temperature 37.4°C (99.4°F), pulse 120 beats/min, respiratory rate 20 breaths/min, blood pressure 105/72 mm Hg, and oxygen saturation 99% on room air. He was alert and in no distress. Examination of the right hip did not reveal any point tenderness, erythema, or edema. However, there was some pain with passive range of motion of the right hip. There were no complaints of pain or limitation of range of motion in other joints. The remainder of the physical examination was unremarkable. A quick focused ultrasound of the hips was performed using a linear transducer at 7.5 MHz, which revealed a hip effusion on the right side when compared to the left hip (Figure 1). No obvious bony abnormalities were appreciated on the remainder of the point-of-care ultrasound.

Frog-leg and anterior-posterior view radiographs were obtained, and read as negative for bony abnormalities. Laboratory results obtained revealed a white blood cell (WBC) count of $8.4 \times 10^3/mm^3$; erythrocyte sedimentation rate (ESR) was 41 mm/h and C-reactive protein was 22.2 mg/L. The patient was discharged from the ED with the diagnosis of transient synovitis and instructed to take ibuprofen for pain.

Case 2

An 8-year-old boy presented to the ED accompanied by his parents with worsening right-sided hip pain, refusal to bear weight for 1 day, and a history of subjective fever for 2 days. Two days before presentation, he was kicked by a peer in the right knee and right groin. The patient's subjective fever began before the knee trauma, and he had an oral temperature of 38.3°C (101°F) at home later that evening. The child denied upper respiratory tract symptoms, vomiting, or diarrhea, and reported good oral intake. In the ED, the patient was in significant pain and refusing to bear weight, despite having taken acetaminophen a half hour before arrival in the ED.

On physical examination, the patient's initial vital signs were: temperature 38°C (100.4°F), pulse 125 beats/min, respiratory rate 20 breaths/min, blood pressure 127/76 mm Hg, and oxygen saturation 98% on room air. He was alert, but uncomfortable appearing. Examination of the right hip did not reveal any point tenderness, erythema, or edema. However, there was exquisite pain with any attempted motion of the right hip. There were no complaints of pain or limitation of range of motion in other joints. Scoliosis of the spine was not appreciated, and the remainder of the physical examination was unremarkable. A quick point-of-care ultrasound of the hips was performed using a linear transducer at 7.5 MHz, which revealed a hip effusion on the right side when compared to the left hip (Figure 2). No obvious bony abnormalities were appreciated on the remainder of the point-of-care ultrasound. Anterior-posterior hip radiographs were read as negative for bony abnormalities, and it was noted that the patient was in too much pain to obtain frog-leg views of the right hip. Patient's laboratory results were WBC $12.4 \times 10^3/mm^3$, ESR 34 mm/h, and C-reactive protein 34.4 mg/L. The patient was admitted for the suspected septic arthritis.

Pediatric orthopedic consultation was obtained, and ED arthrocentesis was deferred as the patient was imme-

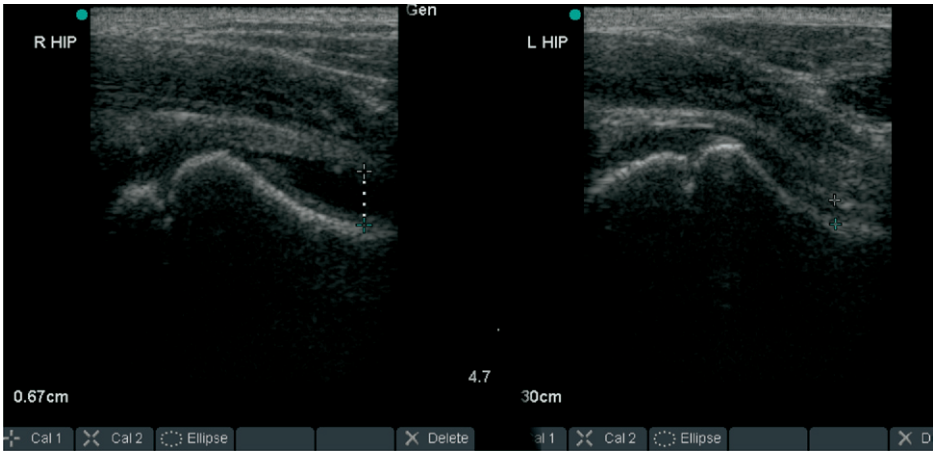

Figure 1. Effusion measured 7.5 mm and capsulosynovial thickness of right affected hip was measured at 10.1 mm. Capsulosynovial thickness of the normal left hip measured 4 mm with no effusion seen.