

# xSPECT Bone sharply delineates acetabular osteomyelitis in a 12-year-old boy

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Data courtesy of West Virginia University, Morgantown, West Virginia, USA

## History

A 12-year-old boy presented with pain and swelling in the right hip over a 2 week duration. No fever was reported. Hip mobility was restricted and painful upon physical examination. A pelvic MRI was initially performed but was deemed inconclusive. The patient subsequently underwent a  $^{99m}\text{Tc}$ -methyl diphosphonate (MDP) bone SPECT/CT scan using xSPECT Bone™.

The SPECT/CT study was conducted on a Symbia Intevo™ 2 system 3 hours following an intravenous injection of 16 mCi (613 MBq) of  $^{99m}\text{Tc}$ -MDP. The initial diagnostic CT (130 kV, 26 eff mAs, 2 x 2.5 mm collimation) was followed by a SPECT acquisition (60 stops per detector, 20 seconds per stop). xSPECT Bone reconstruction was performed using CT-based zone maps. Reconstructed xSPECT Bone data was subsequently fused with CT for final interpretation.

## Findings

The initial MRI was performed to evaluate joint and adjacent soft tissue and acetabular marrow pathology. Figure 1 demonstrates effusion in the right hip joint with subtle marrow



- 1 A coronal fat suppression MRI image shows hyperintense marrow in the right acetabulum (see white arrow), which possibly reflects early marrow changes related to acetabular osteomyelitis. Hyperintensity of fluid within right joint space (see red arrow) reflect large joint effusion with associated soft tissue edema of the proximal right thigh. Hyperintensity within the medial acetabular periosteum and adjacent obturator internus muscle (see orange arrow) probably reflect reactive fluid collection or sub-periosteal abscess secondary to acetabular osteomyelitis. The right femoral head does not show marrow changes.



- 2 Anterior view MIP image of a xSPECT Bone reconstruction of  $^{99m}\text{Tc}$ -MDP bone SPECT/CT show focal area of increased tracer uptake in the right acetabulum. The epiphyseal plates in the right femoral head and trochanter show slightly increased uptake, which is normal for the age of the patient. The right femoral head and neck at rest show normal tracer uptake. The left hip joint also shows normal uptake in the head and neck of the left femur and physiological increase in uptake in the femoral and trochanteric growth plates. Increased uptake in the growth plates of the left acetabulum is well visualized and the area within the expected levels compared to age. The right acetabulum growth plate uptake cannot be separately delineated from the overall increased right acetabular uptake.

signal abnormality of the right acetabulum, which most likely reflects marrow edema and is suggestive of early changes of osteomyelitis. MRI images also suggest the possibility of subperiosteal abscess in the medial aspect of the acetabulum adjacent to the lateral pelvic wall. The effusion in the right hip joint seen on the MRI scan was deemed to be secondary to acetabular pathology, but septic arthropathy could not be ruled out. The absence of marrow hyperintensity on the femoral head ruled out avascular necrosis. In view of the need to distinguish between acetabular pathology and septic arthritis of the hip involving both acetabulum and femoral joint space, a  $^{99m}\text{Tc}$ -MDP bone SPECT/CT was performed.

As evident from CT, xSPECT Bone, and fused images in Figures 2, 3, and 4, there is intense hypermetabolism in the acetabulum (especially the upper part just above the tri-radiate cartilage, which is accompanied by mild bony erosion with surrounding sclerosis on CT). The acetabular ossification center appears slightly hypermetabolic with fragmentation of cartilage on CT. Although the right hip joint space is only mildly enlarged, the head of the right femur does not show significant hypermetabolism. This suggests the pathology is more related to acetabulum rather than the joint space or femoral head. Such pattern of hypermetabolism and CT sclerosis is consistent with the diagnosis of early acetabular osteomyelitis.

Surgical drainage of right hip joint and obturator fossa yielded fluid which confirmed acetabular osteomyelitis in bacteriological and pathological examination. Patient was subsequently put on antibiotic therapy and physiotherapy.

## Comments

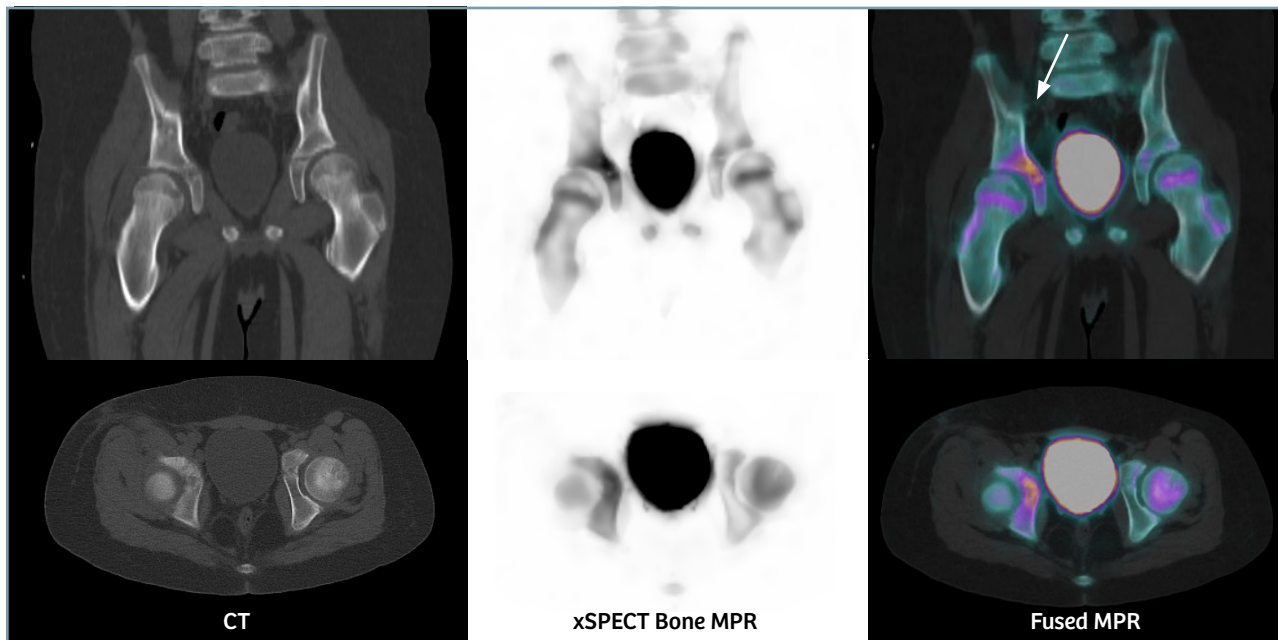
Pelvic osteomyelitis is a rare form of hematogenous osteomyelitis in children.<sup>1</sup> An uncommon entity, acetabular osteomyelitis comprises only 7-12% of all pelvic osteomyelitis cases.<sup>1,2</sup> It is often confused with acute appendicitis.<sup>3</sup> Early diagnosis is important for timely antibiotic therapy, with or without surgical intervention, in order to avoid permanent hip joint defects, avascular necrosis of femoral head, and acetabular deformities.

In this patient, hypermetabolism in the upper acetabulum adjacent to and above the tri-radiate cartilage (as shown by intense  $^{99m}\text{Tc}$ -MDP uptake) was key to suspicion of acetabular osteomyelitis in the absence of corresponding hypermetabolism in the head of right femur.

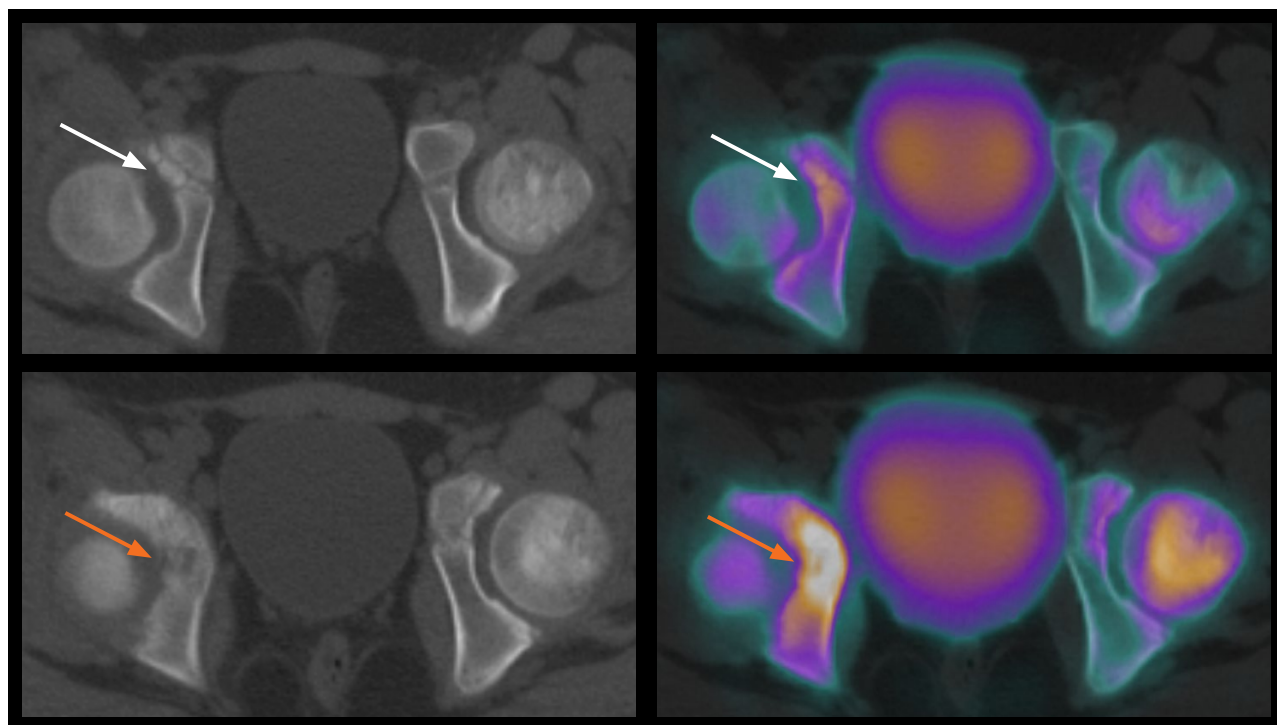
CT delineation of mild erosion of the upper acetabulum corresponding to the highest intensity of hypermetabolism as delineated on xSPECT Bone with adjacent sclerosis was also supportive evidence pointing towards acetabular pathology.

## Conclusion

In a 12-year-old boy with pain and restriction of mobility in the right hip joint, sharp definition of acetabular hypermetabolism by xSPECT Bone—in correlation with findings of CT and MRI—helped arrive at the diagnosis of acetabular osteomyelitis. ●



- 3 Coronal and axial images of CT, xSPECT Bone multiplanar reconstruction (MPR), and fused MPR of xSPECT Bone and CT show slightly increased sclerosis in the right acetabulum adjacent to the zone of incomplete ossification corresponding to the area of focal hypermetabolism (see arrow). Incomplete ossification of the acetabular plates is evident on the CT scan on both sides as expected for age. The xSPECT Bone images show sharp delineation of acetabular uptake with clear visualization of joint space which appears un-involved with no irregularity in joint margins, but with a slight increase in the joint space. The femoral head and epiphyseal plate appear normal for age. Fused images show exact co-registration of xSPECT Bone with CT, especially the acetabular uptake and the acetabular margins.



- 4 Axial CT and fused images of xSPECT Bone and CT at 2 levels within the acetabulum including the acetabular ossification center (tri-radiate cartilage). The CT scan shows mild erosion with bone loss in the upper acetabulum with adjacent mild increase in sclerosis, which corresponds to the highest metabolic activity and  $^{99m}\text{Tc}$ -MDP uptake seen on xSPECT Bone and fused images (see orange arrows). The tri-radiate cartilage appears hypermetabolic with CT signs of cartilage fragmentation (see white arrows). The right hip joint space appears slightly enlarged on the CT.

**References**

<sup>1</sup> Fukuda S, Wada K, Yasuda K, Iwasa J, Yamaguchi S. Acute osteomyelitis of the acetabulum induced by staphylococcus capitis in a young athlete. *Pediatric Reports*. 2010;2:e2. doi:10.4081/pr.2010.e2.

<sup>2</sup> Weber-Chrysochoou C, Corti N, Goetschel P, Altermatt S, Huisman TA, Berger C. Pelvic osteomyelitis: a diagnostic challenge in children. *J Pediatr Surg*. 2007;42(3):553-557.

<sup>3</sup> Scillia A, Cox G, Milan E, Kaushik A, Strongwater A. Primary osteomyelitis of the acetabulum resulting in septic arthritis of the hip and obturator internus abscess diagnosed as acute appendicitis. *J Pediatr Surg*. 2010;45(8):1707-1710.

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**Examination protocol**

**Scanner: Symbia Intevo 2**

<b>SPECT</b>	
Injected dose	16 mCi (613 MBq) <sup>99m</sup> Tc-MDP
Scan delay	3 hour post-injection delay
Acquisition	60 stops/detector 20 seconds/stop xSPECT Bone reconstruction
<b>CT</b>	
Tube voltage	130 kV
Tube current	26 eff mAs
Slice collimation	2 x 2.5 mm
Slice thickness	3 mm

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