Whole Body MR: The Basics
Lil-Sofie Ording Muller, MD, PhD

1. 10-year-old girl presented with acute left hip pain and MRI shows a bone infarct in the right ilium (illustrated on the coronal STIR image). What is the underlying pathology best seen on the T1 TSE images? Which one of the following diagnosis is most likely to be correct?
   A. Stress fracture
   B. Osteomyelitis
   C. Leukemia
   D. Fatty infiltration of the marrow

Correct Answer: C

Reference(s):
Marrow: red, yellow and bad.
Guillerman RP.
Pediatr Radiol. 2013 Mar;43
Epub 2013 Mar 12.
PMID: 23478934

Normal bone marrow: signal characteristics and fatty conversion.
Babyn PS, Ranson M, McCarville ME.
PMID: 9654581

Whole-body MRI in paediatric oncology.
Nievelstein RA, Littoij AS.
PMID: 26631075
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2. Which sequence is the most specific for bone marrow pathology and why?
   A. T1 TSE because this sequence is less prone to susceptibility artefacts and is superior to demonstrate fat.
   B. Gradient echo sequences because there are less susceptibility artefacts.
   C. Diffusion weighted images because if a lesion shows restricted diffusion it will most likely be malignant.
   D. STIR because only pathology will return high signal.

Correct Answer: A

Reference(s):
Whole-body MRI in paediatric oncology.
Nievelstein RA, Littooij AS.
PMID: 26631075

The paediatric wrist revisited: redefining MR findings in healthy children.
Müller LS1, Avenarius D, Damasio B, Eldevik OP, Malattia C, Lambot-Juhan K, Tanturri L, Owens CM, Rosendahl K
2010 Dec 20.

High signal in bone marrow at diffusion-weighted imaging with body background suppression (DWIBS) in healthy children.
Ording Müller LS, Avenarius D, Olsen OE.
PMID: 20652234

Whole Body MR: Pitfalls and Incidental Findings
Øystein E. Olsen, MD, PhD

3. Of all children with malignant x-oma, 10% have metastases at the time of diagnosis. Whole-body MRI has sensitivity of 95% and specificity of 60% for the diagnosis of metastases. A child with a new histopathological diagnosis of malignant x-oma undergoes staging. Whole-body MRI is positive for metastatic disease. What is the likelihood that the child has metastatic disease?
   A. 95%
   B. 21%
   C. 60%
   D. 57%

Correct Answer: B
Rationale(s):
Likelihood for mets given positive WBMRI = PPV = true positive MRIs/(true positive MRIs + false positive MRIs) = (0.1*.95)/(0.1*.95+0.9*.40) = 0.21

The modest specificity (typical of MRI) is the problem. The ratio false-positives:true-positives is 4:1.
Clinical medicine is rather different to retrospective research in that we actually don’t know the correct answer.

So, would you treat the child for metastatic rather than localised disease?

Wrong answers:
A. No, this is the sensitivity
C. No, this is the specificity
D. No, this is the accuracy

Reference(s):
1. Ording Muller et al., Pediatr Radiol 2011 41: 22-6

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4. A prolific paediatric MRI research group has had success in developing the WBMRI technique. This increases the specificity (for diagnosis of metastatic disease) from 60% to 90%. The sensitivity remains 95%. The same child as before has a pretest likelihood of metastatic stage of 10%. The high-specificity MRI is positive. What is the likelihood that the child has metastatic disease?
   A. 51%
   B. 21%
   C. 90%
   D. 95%

Correct Answer: A

Rationale(s):
Likelihood for mets given positive WBMRI = PPV = true positive MRIs/(true positive MRIs + false positive MRIs) = (0.1*.95)/(0.1*.95+0.9*.1) = 0.51.
90% specificity is really rather good in imaging.

To treat or not to treat can now be decided by tossing a coin.
Wrong answers:
B. No this is the old PPV
C. No this is the specificity
D. No this is the sensitivity

Reference(s):
1. Ording Muller et al., Pediatr Radiol 2011 41: 22-6

Whole Body Vascular MRI
Shreyas S. Vasanawala, MD, PhD
5. Which fat suppression method is most appropriate for MRA/MRV?
   A. Spectrally-selective saturation
   B. Spectrally-selective inversion
   C. Two-point Dixon
   D. Three-point Dixon

Correct Answer: C

Reference(s):
Fast dixon-based multisequence and multiplanar MRI for whole-body detection of cancer metastases.

Ghanouni P1, Walters SG, Vasanawala SS.

Whole Body Vascular MRI
Shreyas S. Vasanawala, MD, PhD
6. Which of the following is true for whole body MRA/MRV?
   A. Pre-contrast imaging is always necessary
   B. Dynamic imaging is always necessary
   C. Blood-pool contrast agents can improve image quality
   D. Body coil imaging suffices

Correct Answer: C
Whole Body Imaging of Non-Oncologic Disorders
Andrew T. Trout, MD

7. Which of the following sequence combinations is most commonly used for whole body MRI?
   A. Coronal STIR, Coronal T1, Axial or coronal diffusion
   B. Coronal STIR, Coronal balanced (e.g. FIESTA / BTFE), Axial or coronal diffusion
   C. Coronal T2, Axial T1, Axial or coronal diffusion
   D. Axial balanced (e.g. FIESTA / BTFE), Axial T1 post contrast, Axial or coronal diffusion

Correct Answer: A

Reference(s):

Whole Body Imaging of Non-Oncologic Disorders
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8. Which of the following is correct about current evidence for WB-MRI in non-malignant processes?
   A. WB-MRI is considered by the ACR to be the most appropriate imaging test for fever of unknown origin (FUO)
   B. WB-MRI cannot replace skeletal survey in suspected abuse
C. WB-MRI outperforms bone scintigraphy in assessment of chronic recurrent osteomyelitis
D. WB-MRI at 3 T outperforms WB-MRI at 1.5 T in terms of image quality and detection of abnormalities

Correct Answer: B

Reference(s):