Paediatric Body MRI

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The definition of Paediatric Whole Body (WB) MRI is arbitrary and varies from the entire body to the trunk only depending on the indication. It has great potential in conditions that are diffuse or multifocal, especially oncology (eg. Sarcomas, Neuroblastoma, Lymphoma and Langerhans Cell Histiocytosis) and also inflammatory diseases (eg. Chronic Recurrent Multifocal Osteomyelitis (CRMO), Dermatomyositis and Fever of Unknown Origin) and non accidental injury.

When imaging these conditions the regions imaged are primarily bone marrow, solid organs and soft tissues. The imaging alternatives to WB MRI include the skeletal survey, computed tomography, nuclear medicine (bone scan, gallium scan and MIBG) and PET all of which use radiation and have a variable sensitivity and specificity to disease. Bone marrow aspiration is also used routinely in several conditions, such as neuroblastoma. However, it is invasive and it is limited by sampling error.

In paediatrics, the size of the patient is an advantage in WB MRI as fewer stations are required compared to adults. However, there are many challenges in paediatrics.

WB MRI is a compromise between performing the scan in as short a time as possible (usually between 20 to 60 minutes), and the sensitivity and specificity of the examination. Factors that are important in this compromise include the number of sequences and resolution. Other factors that need to be controlled are physiological and voluntary motion, which are always more challenging in children.

Specificity of findings is also an issue. Lymph node size is often not reliable in determining whether disease is present. In addition focal pathology may be incidental and not related to the disease process (eg. Trauma, benign cysts and vascular malformations).

The important factors to consider with respect to the MRI technique used are: the patient position, patient coverage, the sequence planes, the sequences and whether to use 1.5 or 3T.

The scan can be performed in either the supine position or prone with the arms above the head, which is less comfortable for the patient, however enables better imaging of the upper limbs. The coverage depends on the disease process and varies from the trunk only, to the entire body including all limbs. Coronal imaging is the most efficient plane and allows correlation with other techniques which commonly display in this plane (eg. Nuclear medicine and PET). Axial imaging is more useful for the ribs, scapula, and brain/skull and the sagittal plane for the spine and sternum.
The most useful sequences are STIR or Fat Saturated T2 and T1 weighted imaging. Post contrast, Diffusion Weighted Imaging and Out-Of-Phase also have a role in improving the conspicuity and specificity of MRI findings. If there is an option of using 3T, this can be used to reduce imaging time and/or improve resolution. However, 3T for this purpose has the disadvantage of increased artefacts most importantly from field inhomogeneities with body MRI. At 1.5 T with the use of array receiver coils and parallel imaging, acceptable signal to noise can be achieved.