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FAQ for MR Neuro Protocols

FAQ 11

Q: Why a TSE/FSE T2 AX whole brain rather than FLAIR ?
A: For cranial nerve pathology, evaluation of the brainstem is very important. T2 is superior to FLAIR in evaluating the brainstem.

FAQ 20

Q: For patients who have had C-spine surgery, should we do a routine noncontrast C-spine MRI or a post-contrast C-spine MRI ?

A: It depends. For patients who have had anterior cervical fusion (ACF or ACDF), which is the vast majority of cases, sometime in the past, gadolinium just isn't useful (unlike in the L-spine in which all patients who have had L-spine surgery any time in the past should receive gadolinium). There are 2 exceptions to this rule: (1) The prior surgery was for tumor or infection, and the current MRI is a follow-up for that. (2) The referring physician is looking for complications of recent surgery such as infection or postoperative cyst. For these 2 exceptions, MR22 or MR23 should be performed, as appropriate.

FAQ 22a

Q: Why don't we do pre-GAD T1 AX for C-spine MRI's ?
A: You don't need it, and it adds extra time. That's not just us; most facilities across the country have long ago dropped it, just like they have dropped proton density sequences for all spines. For noncontrast routine C-spine's, all the axial information you need is on the T2 or T2* weighted axial sequences. The one exception is if there is significant magnetic susceptibility artifact from metallic hardware: T2* (gradient echo, aka field echo) sequences are the most severely affected by this. FSE (TSE) T2 sequences are moderately affected. FSE (TSE) T1 sequences are the least affected. For contrast C-spine studies, you can easily tell (in the vast majority of cases) whether a bright object on the post-gad T1 axial sequence is enhancement or not, by simply comparing it to the pre-gad T1 sagittal sequence. For example, you are almost never going to encounter a lipoma (bright on T1) in the C-spine, unlike in the Lumbar spine. For hemorrhage, the T2* weighted (gradient echo/field echo) will make it obvious.

FAQ 22b

Q: For contrast MRI of C-spine, why do you need both a T2 weighted axial and a gradient (field) echo axial ? You're not looking for fine T2 detail like neuroforaminal narrowing and nerve root impingement.

A: Cord edema and myelomalacia can be better seen sometimes on the T2 WI, sometimes better on the gradient (field) echo sequence, and sometimes both. It's difficult to predict which. We've seen examples of this in several cases in which patients who have had follow-up MRI's.

FAQ 23

Q: Why not do FATSAT on the postGAD T1 SAG and AX for the MR22 C-spine contrast (noninfection) protocol ? Why use FATSAT only on the infection protocol ?

A: The fat saturation images are inherently noisy (low signal:noise ratio), such that it can be often difficult to determine whether or not there is subtle intramedullary enhancement. Next time you see an infection protocol C-spine MRI, look at the cord on the FATSAT post-GAD T1 images and see how grainy it is. However, fat suppression is important in discitis-osteomyelitis because you need to be able to determine the boundary between abnormal enhancement from normal bone which has inherently short T1 (bright on noncontrast T1WI).

FAQ 25

Q: Why do both a FATSAT and non-FATSAT for the post-GAD T1 AX ? Why not just do the FATSAT ?

A: Chemical fat saturation images are inherently noisy (low signal-to-noise ratio), and for adequate spatial resolution to see if something is scar tissue or recurrent/residual disc material, you need to look at the FATSAT and the non-FATSAT images at the same time. Also, because the FATSAT images are noisy, it can be difficult to tell whether or not there is abnormal enhancement of cauda equina nerve roots in the uncommon case of drop mets (CSF seeding of tumor), especially when there is fine coating of nerve roots (sugar-coating, frosting, zuckerkruste) or sarcoidosis or meningitis, rather than focal nodules (Christmas balls).

Q: Why not do the FATSAT for the post-GAD T1 SAG ?

A: I've visited this question many times over the years. Here are some of the reasons:

1) See the answer to the 1st question above.
2) We're trying to limit the number of sequences. There are already 7 sequences for a contrast L-spine! Patients find it difficult to hold still for 45 minutes to an hour.
3) You can use the STIR SAG sequence together with the GAD T1 SAG to distinguish the boundary between an abnormally enhancing lesion in bone and fatty marrow.

FAQ 26

Q: For axial L-spine sequence, you don't want to skip those areas of the spinal canal in between the disc space levels. Yet you want to skip those areas and do only the disc space levels on axial T-spine sequences. Why ?

A: For the L-spine, we don't want to miss the occasional superiorly or inferiorly migrated disc extrusion. Not so for the T-spine, in which the intervertebral disc volumes are smaller than those of the L-spine, such that you rarely see disc extrusions large enough to migrate significantly. Furthermore, we're covering 8 levels or more on the axials! That's a lot of time and a lot of images.

Q: Why skip T1-2, T2-3, and T11-12 on AX ?

A: See the last 2 sentences for the answer to the question above. Also, the signal to noise ratio for those levels is bad because they are at the upper and lower edges of the coil routinely used for T-spines. Those levels are better imaged with C-spine coils and L-spine coils, respectively. If there is significant pathology, disc or otherwise, at those levels, then the technologist should include them of the axials.

Q: Why not do T1 AX on routine T-spines ?

A: See the last 2 sentences for the answer to the 1st question of FAQ 26.