

TOP TEN QUESTIONS TO A RADIOLOGIST:

1. Can we do an MRI when there is metal in the joint?

YES! MRI of metal is possible and routinely done. In fact, recently, MRI has been found to be extremely useful in assessing post arthroplasty pain. The artifact from the metal has to be reduced by modifying special sequences. The artifact is more with stronger magnets (3T) and less with weaker magnets (1.5T). Lower field magnets tend not to be so good in assessing these.

The major limitations to MRI are cardiac pacers, aneurysm clips/coils, metallic foreign bodies in the eye, cochlear implants etc. These can get dislodged or overheat during an MRI which could have drastic consequences. Orthopaedic implants in general are firmly fixed and not a problem. For more information on MRI safety, see: <http://www.mrisafety.com/>

2. Why do people differ in calling a tear and tendinosis on MRI?

Most MRI sequences (T2 and PD) we use to image tendons are a reflection of the mobility of water molecules in the tendon. Normally, the tendon has well ordered collagen with very little space for water molecules to move and so tendons (and ligaments) appear black on all sequences. As the collagen degenerates, the water molecules have more space to move and so the MRI signal gets brighter (grey). This continues to increase as the collagen degeneration increases till it reaches a maximum, which is as bright as water signal (white). At some point, it is difficult to tell the difference between tendinosis and a tear because it is difficult to differentiate visually between a very light grey and white (water). Most often though, an experienced musculoskeletal radiologist will be able to differentiate the two.

As sonography uses a different mechanism to image the cuff, I find this a useful tool to use when differentiating between bad tendinosis and a tear.

3. Must we do arthrograms to assess labral lesions in the hip and shoulder?

An arthrogram is a method where contrast is injected into the joint to distend it and let fluid track into potential spaces, making them more prominent. Certainly, labral and some small rotator cuff lesions may become more prominent as a result of these. Having said this, there is enough literature that shows that with high resolution imaging and an experienced musculoskeletal radiologist, MRI can remain a non invasive investigation with excellent sensitivity and specificity for labral lesions. Bottom line: Do what your radiologist is comfortable with.

4. Why are there so many partial thickness ACL tears called these days, when clinically there is no injury?

As mentioned above, the signal from a ligament is related to the mobility of water molecules. The anterior cruciate ligament has a wide tibial footprint, where the fibers fan out and are interdigitated by synovium/fat. These strands of synovium/fat result in some bright signal within the ligament which is often interpreted as partial tear/degeneration. Generally speaking, if the strands are linear and well defined, they are normal, but if they are irregular and hazy, they may reflect an element of degeneration. If they become rounded and globular, they probably reflect an evolving mucoid change.

On another note, ACL tears are often missed if the injury is at the femoral attachment because of over reliance on the sagittal images. Axial images are an excellent way to look for the femoral attachment of the ACL.

ACL tears are also overcalled on T1 weighted images as they can have a misleading signal. It is better to assess these on non fat suppressed proton density/T2 weighted images.

Note that this interdigitated appearance is unusual with the posterior cruciate and collateral ligaments because of their different anatomy.

5. Why are meniscal tears missed or overcalled?

Missed:

Meniscal tears are often missed because of imaging technique. Most musculoskeletal radiologists will use 2-3mm thick sections with no skip between slices and high resolution imaging to look at the meniscus. Using canned sequences built into the scanner sometime results in thick sections (4 mm) with 0.5 to 1 mm skips as well as poor resolution. What we don't image, we don't see. Katrina Kaif just doesn't look as good on an out of focus image even if it's taken on a 20 MP camera ;)

Another common area for missed tears is the meniscal root. This area can often be missed when being over reliant on the sagittal images. It is better seen on the posterior most coronal sections. A good clue to start looking for a root tear is when one sees an extruded body segment on coronal images.

Overcalls:

There are many areas where structures pass close to the meniscus, leading to a linear interface between the structure and the meniscus, which in turn looks like a tear. Common areas where this happens are at the junction between the posterior horn of the lateral meniscus and the popliteus tendon and the menisci with the transverse intermeniscal ligament anteriorly or the menisofemoral ligaments posteriorly.

Bright signal is often seen in the meniscus from degeneration and if it doesn't extend to the articular surface, it may not be seen arthroscopically. Also, at the anterior horn attachment of the lateral meniscus, there is often a fimbriated appearance, which is overcalled as a tear. In general isolated anterior horn tears without underlying discoid pathology or additional ligamentous injury are less common.

Learning point: Imaging maybe more or less sensitive for a meniscal lesion. Clinical symptoms pertaining to a meniscal lesion are important in assessing the need to intervene on an imaging finding.

6. Why are stenoses overcalled, especially on cervical spine MRIs

Many imaging centres perform only axial gradient echo images (GRE). These are the black axial images you see. This technique is more prone to imaging artifacts, exaggerates the "black" signal from bone or metal and it is this phenomenon that we use to differentiate between "hard" and "soft" discs. Often, this is the only axial sequence performed. This exaggerates the signal from bone/uncovertebral hypertrophy and facet arthrosis, falsely exaggerating the degree of especially foraminal stenosis. Ideally, T1 images are the most accurate to grade foraminal stenosis.

7. How can we tell TB from pyogenic infection on spine MRI?

TB typically affects the endplates first, tends to involve the paraspinal soft tissues (with collections) more and involves contiguous levels. For these reasons, when there is concern for an infectious condition, contrast MRI can be helpful in differentiating TB from pyogenic infection using these three main parameters. It is strongly recommended however given the incidence of multi-drug resistant TB and the considerable crossover in the imaging appearance that a biopsy should be performed prior to starting treatment.

8. How do we differentiate benign from malignant spine fractures?

Osteoporotic vertebrae can be likened to an empty cardboard box, while metastatic vertebrae to one filled with sawdust. Collapse of the empty cardboard box leads to sharply angled edges to the buckled vertebra (retropulsed fragment), a well defined crease at the area of collapse (fracture line) and often a small hematoma. Furthermore, these tend to happen to sequential vertebrae.

When metastatic vertebrae collapse, there is more of a convex (rather than acutely angled) posterior wall, the sawdust comes out on the sides (producing a surrounding soft tissue mass) and the creases are not as well delineated (poorly visualized fracture line). Furthermore, metastases tend to involve multiple and often skipped vertebrae.

Differentiating the two is often not a problem for an experienced musculoskeletal radiologist. The presence of a well-demarcated fracture line is often the most accurate predictor of a benign fracture.

9. Digital x rays in arthroplasty: Why all the headache?

Digital X rays (which include DR and CR systems) are acquired in the same way as conventional x rays. The major difference is that they can now be printed on a film of any size. This obviously leads to much confusion as regards estimating the size of the bones. This problem could be overcome by asking the centres to print films as regular sized films without zooming or shrinking them, looking for a scale/marker or placing a scale/marker when the film is acquired or viewing them electronically.

10. Is USG under-utilized in orthopaedics?

USG is one of the most useful tools in orthopaedics, especially for superficial structures. Part of the problem lies with the varied expertise of radiologists. This can be improved considerably by improved interaction between radiologists and orthopaedic surgeons while discussing clinical and surgical outcomes. Ultrasound is also extremely accurate and relatively pain free for guided injections into soft tissue or joints. Patient satisfaction and outcomes have been found to be excellent.

In our practice, clinical assessment is performed and if indicated the patient is immediately sent for an ultrasound examination, following which, again if indicated and ultrasound guided injection is performed. This is followed by appropriate physiotherapy guidance. Using this system, we have found excellent patient satisfaction and outcomes in patients. This system has been most beneficial to patients with shoulder, foot and ankle problems.

More recently, we have been performing minimally invasive surgery such as tendon releases and ganglion decompressions under ultrasound guidance, which save time and money for patients.