MRI OF THE APPENDICULAR SKELETON

The deluge of articles extolling the virtues and near magical properties of MRI makes the individual doctor a little uneasy lest his patients are not properly investigated if they are not put through the scanner. The situation is not helped by the failure of virtually every article to differentiate the examinations performed for academic interest from those performed to direct useful patient management. By-and-large, the literature recounts the experience of the most capable and experienced radiologists working with the most advanced equipment with infinite time at their disposal—frequently compared with other investigations done poorly. It is useful, therefore, to look at current practical applications of MRI in the appendicular skeleton.

Miraculous and magical MRI may well be, but it is also unpleasant, uncomfortable, and, in some patients, threatening to the point of terror. Few patients enjoy the experience. Very few of the currently practised radiological examinations of the appendicular skeleton are more uncomfortable or more unpleasant than an MRI scan. Although it is stated that 2% of patients are claustrophobic to the degree that they will not enter the scanner and approximately 4% are too large or too deformed to fit in the scanner’s bore, in our experience approximately one patient in five who is booked for an MRI scan will for reasons of non-attendance, fear, claustrophobia, intraocular metal fragment, deformity, or sheer bloody-mindedness, not end up with a wholly diagnostic scan.

MECHANICAL DISORDERS

If MRI is to be followed by another diagnostic test such as arthroscopy its main use will be to find those patients who do not need another investigation and, perhaps, to guide the investigatory to the areas of interest in those who do. In other words, it is a screening test for which a very high sensitivity is necessary. Virtually all authors agree that MRI has 95% sensitivity in mechanical disorders of the knee (this is the lowest sensitivity that a reasonable person would accept in a screening test. Missing one abnormality in 20 is still very high). However if MRI is to be followed by definitive surgery a high specificity is required and few reports claim fewer than 5% false positives in disorders of the knee. (Fruitless surgery more frequently than one patient in 20 is unacceptable when more accurate techniques are available.) MRI has high sensitivity and specificity for ligament injuries but is significantly insensitive in the assessment of lesions of the articular cartilage. Nevertheless, arthroscopy of the knee is here to stay and so is MR scanning [1].

In shoulder instability, MRI has been touted as the investigation of choice by innumerable authors but this does not stand up to critical assessment and the visualization of the capsular and labral structures is better on CT arthrography than on MRI scanning [2, 3].

Imaging of the rotator cuff for the impingement syndrome has also been called the province of MR scanning. There is no doubt [4] that MR scanning can show all complete rotator cuff tears if there is a gap in the tendon. Arthrography, equally, shows all these tears. However, a simple active abduction frontal radiograph will show the complete rotator cuff tear [5] making both arthrography and MRI unnecessary. It is conceivable that future modifications will allow one to differentiate the retracted cuff from the scarred and fibrosed cuff allowing different surgical procedures to be performed but at the moment this is not possible. Partial tears of the rotator cuff are not well shown by either CT arthrography or MRI and both are less accurate than tossing a coin. It may be possible to diagnose impingement earlier than the stage of rotator cuff atrophy or disintegration but one suspects it will be a long time before MRI reaches the accuracy of a careful clinical examination followed by diagnostic injection of local anaesthetic in the sub-deltoid bursa. Early decompressive surgery based on clinical assessment seems a much more sensible approach than awaiting MRI changes which, at best, will be doubtful.

The wrist and ankle are fruitful areas for the keen imager and beautiful descriptive works have been produced [6, 7]. In some cases position triggered MRI will allow cine-recording of movement [8]. One feels that the reason why MRI of the wrist is less useful than in the knee is the lack of understanding of what to do with the information that is supplied rather than a failure to provide that information. Whatever the reason, MRI is of little value in mechanical disorders of the wrist except, perhaps, to assess the integrity of the intercarpal ligaments if a local fusion is to be performed or to investigate the carpal tunnel in intractable or atypical carpal tunnel syndromes. In the ankle there is still not uniform agreement on the treatment of ligament injuries which MRI can, without doubt, demonstrate clearly. Tendon diseases, injuries and inflammations are clearly demonstrated by MR (perhaps no more reliably than with ultrasound but certainly more understandably for the clinician). The ability of MRI to assess the state of tendons in a predictive sense has been established [9] and may well be a major use of the procedure in the future. Currently MRI is of practical use in demonstrating tendon integrity or otherwise and identifying tendon oedema and synovial disease of tendons. It has less place in ligament injuries.

NON-MECHANICAL DISORDERS

Let us dispose of tumours with the statement that MRI should not be used for the diagnosis of bone tumours but only for their assessment whereas with soft tissue tumours MRI should be used for both. No doubt MRI is magnificent for demonstrating synovial-based
disorders whether they be inflammatory or neoplastic and in the suspect joint tumour MRI is the diagnostic technique of choice [10]. In selected diseases such as pigmented villonodular synovitis enhanced CT scanning is as informative. In the unknown, MRI takes some beating and is indicated for the painful intermittent or persistent joint swelling of unknown aetiology.

There is no doubt that gadolinium enhanced MRI can show inflammatory disease of the synovium and define its extent and the amount of bone involved by it. As yet there is no general practical use to which this ability can be put and one awaits with interest various ongoing studies of the place of gadolinium-enhanced synovial assessment. Similarly joint revascularization such as following osteochondritis dissecans is under investigation but as yet there is no practical use for the data.

MRI is extremely sensitive in demonstrating avascularity of bone which creates a problem because of the poor relationship of bone avascularity to bone avascular necrosis (AVN) [11, 12]. There is no doubt that some avascular episodes which can be identified by MR subsequently heal and revascularize and others do not progress to the standard disorder that we call AVN [13]. MRI is the most sensitive method of detecting established AVN, but, unfortunately there is considerable doubt about the efficacy of any form of management of AVN especially established AVN. Further work is necessary.

Although one has a gut feeling that MRI will supplement all standard X-rays of the appendicular skeleton in the near future, current practical MRI is the examination of choice in soft tissue tumours and in the patient with joint pain of unknown cause. It has an established place in mechanical disorders of the knee but its place is not established in mechanical disorders of the shoulder, elbow, wrist, hip or ankle where other methods of investigation are available. MRI is the technique of choice to demonstrate ligament and tendon disturbances in an understandable way provided the information will be useful. There are few conditions that MRI can't examine but there are many that it shouldn't. All will change in the next decade, but for now modest access to MR scanning is sufficient.

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REFERENCES