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The Use of Magnetic Resonance Imaging in Axial Spondyloarthritis: Time to Bridge the Gap Between Radiologists and Rheumatologists

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ABSTRACT

Objective:

Magnetic resonance imaging (MRI) plays a major role in assessment of axial-spondyloarthritis (axSpA); however, anecdotal evidence suggests diverse practice amongst radiologists. The objective of this study was to describe current practice in the use of MRI for assessment of axSpA by UK radiologists.

Methods:

Six-hundred ninety-nine UK radiologists were invited to complete an online survey. Availability of MR scanners, familiarity with axSpA disease-specific lesions, and MRI protocols and definitions of positive sacroiliac joint (SIJ) or spinal MRI were assessed.

Results:

Two-hundred sixty-nine radiologists (38%) from 131/180 (73%) acute NHS trusts/health boards responded. MRI waiting times <2 months were reported by 90% of radiologists. Twenty-nine radiologists (11%) used contrast as standard, 256 (91%) used T1 and short tau inversion recovery (STIR), and 172 (64%) also used T2 sequences. Five percent only scanned SIJs, 33% scanned SIJs and lumbar spine, 29% scanned SIJs and thoracolumbar spine, and 30%

scanned SIJs and the whole spine. Mean scan time was 34 min. Eighteen percent did not use subchondral bone marrow oedema of the SIJ to help diagnose axSpA and 18% did not use inflammatory vertebral corner lesions to assist diagnosis. Awareness of axSpA was reported by 75% of radiologists, and awareness of definitions for positive MRI of SIJ and spine by 31% and 25%, respectively.

Conclusions:

These data highlight the need for better rheumatology-radiology collaboration on the identification of diagnostic axSpA MRI lesions and supports the need for a consensus on the most appropriate MRI protocols for the assessment of axSpA.

Key Indexing terms: axial spondyloarthritis; magnetic resonance imaging; radiology; survey; clinical protocols; diagnosis

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Short running footline: MRI in axSpA survey

Introduction:

The use of magnetic resonance imaging (MRI) has been instrumental in the early recognition of axial spondyloarthritis (axSpA). Indeed, the superior capability of MRI to identify active inflammatory lesions has allowed for the identification of an earlier phase of the disease, which was not identifiable using conventional radiography. The 2009 Assessment of Spondyloarthritis International Society (ASAS) classification criteria (1) refer to this disease stage as “non-radiographic” (nr; nr-axSpA), where axial inflammation is often detectable on MRI but not on conventional radiography. Patients with nr-axSpA have similar pain and disease activity to those patients with established ankylosing spondylitis (AS). Therapies are now available for symptom control (2) that potentially modify disease activity, emphasising the importance of early diagnosis.

According to the ASAS criteria, nr-axSpA can be identified using either a clinical or imaging arm (1). The latter is defined by the presence of sacroiliitis either by radiograph or MRI in addition of one other feature of axSpA. It is, however, recognised that spinal disease may occur early and in isolation from sacroiliitis in 23% to 49% of cases (3,4) and may help support a diagnosis of axSpA in appropriate clinical presentations (5,6). It is also useful in predicting (7) spinal outcome and may help to determine treatment response to anti-tumor necrosis factor (TNF) therapy (4). The ASAS group recently published a consensus document defining a positive spinal MRI for axSpA (8). Most recently, the newly published National Institute for Health and Care Excellence (NICE) final appraisal determination for the use of anti-TNF therapy for AS and nr-axSpA

(9) infers that inflammation in either the sacroiliac or spine as determined by MRI is one of the prerequisites for the treatment of nr-axSpA with anti-TNF therapy, emphasising the importance of the correct use and interpretation of MRI in the assessment of axSpA.

Anecdotal evidence suggests that variations may exist in access to services, treatment, availability of imaging, and expertise of those interpreting the images of patients with axSpA within the United Kingdom. A survey by Hamilton et al. (10) indicated that whereas 93.1% of rheumatology departments (109/117) had access to an MRI scanner on site, only 78.6% (92/117) had a dedicated musculoskeletal radiologist, with only a small percentage of musculoskeletal radiologists specialising in inflammatory rheumatology. This survey also indicated that a variety of different MRI protocols were being used to investigate axSpA. The majority of rheumatologists are dependent on the radiologist for interpreting complex imaging investigations such as MRI. A recent survey of ASAS international members with a specialist interest in axSpA identified that <25% of rheumatology members were comfortable interpreting MRI scans in patients with axSpA (11).

The aim of this study was to investigate the level of awareness of axSpA and to formally establish current common practice and knowledge in the use of MRI in the assessment of axSpA amongst UK-based radiologists.

Materials and Methods:

Six hundred ninety-nine consultant radiologists currently working within a UK National Health Service (NHS) trust (England) or health board (Scotland, Wales, or Northern Ireland) were approached and invited to participate in a 15-minute online survey (see Data Supplement). The survey was completed anonymously and did not include any patient data, therefore, ethical review and approval was not required in accordance with local Ethical committee guidance. The survey explored the availability of local MRI services, collaboration between rheumatologists and radiologists, knowledge of axSpA, and standard MRI protocols and sequences used in assessing patients with probable axSpA. The knowledge of radiologists on diagnostic MRI lesions and standard definitions of a positive MRI for the sacroiliac joint (SIJ) and the spine in axSpA was also assessed. Data were analysed using descriptive statistics and are presented as n (%) or mean (range).

Results:

Of the 699 consultant radiologists that were contacted, 269 (38%) completed the questionnaire, with respondents covering 73% (131 of 180) of acute NHS trusts and health boards in the United Kingdom. Fifty-two responding radiologist (40%) worked in University Teaching Hospitals and 79 (60%) worked in District General Hospitals. All but one unit reported access to an MRI scanner, with a median of 2 MRI scanners available for each responding radiologist. Waiting times of <2 months were reported by 90% of radiologists (n=242). Regular meetings with rheumatology colleagues were reported by 65% of radiologists

(n=174), 23% (n=61) reported meeting as required and 13% (n=34) reported never meeting with local rheumatologists.

Use of MRI in the Diagnosis of AxSpA:

Of the 269 radiologists who completed the survey, 175 (65%) reported only using MRI in the diagnosis of axSpA when specifically requested to do so by rheumatologists. Eighteen percent of radiologists (n=48) routinely used MRI instead of radiographs of the SIJs and spine and 12% (n=32) used MRI only if X-rays were not diagnostic. The mean reported time to perform an MRI for axSpA was 34 minutes (range, 14–90 minutes; n=269).

MRI Protocols:

Five percent of radiologists reported scanning the SIJs alone, 33% scanned the SIJs and lumbar spine, 29% scanned the SIJs and the thoracolumbar spine, and 30% scanned the SIJs and whole spine (Figure 1; panel A) as part of their standard axSpA MRI protocol. Of those radiologists who did not routinely scan any of the spine, 12% reported this was due to scan times taking too long, 9% reported that it was too costly to scan the spine, and 8% reported that either there were no specific MRI spinal features of axSpA or spinal lesions were not used in the diagnosis of axSpA.

MRI Sequences and Use of Contrast:

When scanning the spine, 54% of radiologists reported performing sagittal and axial sequences of the spine, 26% performed sagittal, axial, and coronal sequences, and 16% performed sagittal slices only (Figure 1; panel B).

Use of T1 protocols with either short tau inversion recovery or other fat-suppressed sequences were reported by 91% of radiologists, with 23% performing these sequences in isolation. Inclusion of additional T2 sequences was reported by 64% of radiologists and 11% reported using contrast and performing T1 post-gadolinium sequences (Figure 1; panel C).

Knowledge of axSpA and MRI Lesions and Definitions:

Awareness of the term “axial spondyloarthritis” was reported by 75% of radiologists (n=202). Awareness of the ASAS definitions of a positive MRI for axSpA for the SIJ and for the spine was reported by 31% (n=84) and 25% (n=67) of radiologists, respectively.

The lesions most frequently used to diagnose axSpA in the SIJs were reported to be subchondral bone marrow oedema (82%), erosions (74%), enthesitis (63%), and sclerosis (61%; Figure2, panel A). In the spine, the lesions used most frequently to diagnose axSpA were reported to be vertebral corner bone marrow oedema (81%), syndesmophyte formation (71%), vertebral body endplate oedema (57%), and vertebral corner fat infiltration (56%; Figure 2, panel B). For both SIJ and Spinal MRI 96% of responding radiologist used a combination of the above lesions to assist in making a diagnosis of axSpA.

Discussion:

Data from this study shows that the awareness of axSpA is variable, there is relatively poor knowledge of positive MRI definitions of axSpA, and there is diverse use of MRI in the diagnosis of axSpA amongst UK radiologists. The

concept of spondyloarthritis is not new, dating back to Moll and Wright in 1976 (12); however, the use of MRI to diagnose and classify axSpA is relatively recent. The ASAS classification criteria published in 2009 (1) was the first to formalise the role of MRI in the diagnosis of axSpA. Subsequently, definitions of a positive MRI for the SIJs (13) and the spine (8) that indicate the presence of axSpA have been published, aiming to standardize implementation of the criteria. The European Society of Skeletal Radiology (ESSR) consensus publication on the imaging and interpretation of MRI in axSpA stated that in the cases of suspected axSpA with normal X-rays, MRI is mandatory (14). Furthermore, combined scanning of the whole spine and the SIJs rather than the SIJs alone was recommended to enhance confidence in diagnosing nr-axSpA, and specific MRI protocols are provided for scanning the spine and SIJs in the diagnosis of axSpA. These modified whole spine and SIJ protocols are cost- and time-effective and can be performed in a standard 30-minute MRI slot (14,15). Yet despite these internationally published recommendations, the current study indicates that only 30% of radiologists scanned the whole spine and SIJs. Indeed, the methods of the use of MRI in the diagnosis of axSpA employed across the United Kingdom were diverse and generally did not follow the ESSR protocol.

This study indicates that, although MRI is readily available to the majority of radiologists, with waiting times of generally <2 months, there is a lack of consistency in the MRI protocols and sequences used to investigate axSpA. This diversity and inconsistency of practice across the United Kingdom, with different areas of the spine being scanned and different sequences being used

despite clear recommendations from the international ESSR consensus publication, is of concern, as it highlights potential inequalities in the diagnosis and assessment of affected individuals (14). Further, our data indicate that >10% of UK radiologists are using intravenous contrast, with the subsequent potential risk to patients (16,17) and increased cost and time of the investigation, which goes against published guidance (14,18,19).

Axial spondyloarthritis is a condition that often has little objective evidence of disease, both clinically and on investigation. Unlike rheumatoid arthritis, which will frequently present with obvious diagnostic signs and symptoms (clinical synovitis of hand joints, inflammatory findings on ultrasound scan, erosion or other characteristic signs on X-ray, raised C-reactive protein (CRP) levels, and the presence of characteristic antibodies), axSpA can be more difficult to recognise, especially in the early phase of the disease. In fact, the clinical history of the disease may not always be classical, CRP may be well within the normal range despite active disease, and X-rays are often normal for the first 10 years of disease (20); therefore, the role of MRI, in particular to identify potentially diagnostic inflammatory lesions, is critical. Clinical rheumatologists are not specifically trained to analyse and interpret MRI scans and are therefore dependant on radiologists to advise on the most appropriate protocols and sequences to perform and identify and report diagnostic lesions. However, the results of the present survey indicate generally low levels of knowledge and understanding of axSpA amongst radiologists.

Moreover, recognition of the specific term “axSpA” was as low as 75% amongst radiologists. Of even more concern was that only 33% and 25% were aware of “positive” and, in the correct clinical context, “diagnostic” definitions of MRI findings of the SIJs and spine, respectively, for axSpA. These definitions were formulated by a working party composed of radiology and rheumatology experts; however, 18% of radiologists in this survey did not use subchondral bone marrow oedema of the SIJs and 18% did not use inflammatory vertebral corner lesions to assist in diagnosis. These findings suggest that published definitions have not yet penetrated mainstream radiology practice in the United Kingdom. These findings are even more relevant now, as recent NICE guidance (9) for the use of anti-TNF therapies in nr-axSpA hinge largely on the presence of axial inflammation as noted on MRI. With these guidelines, it is expected in due course that pelvic radiographs will no longer be used as a diagnostic investigation in axSpA, which, given the high dose of radiation and poor inter-observer reliability, is a positive step.

This low level of understanding of axSpA amongst radiologists may be partially because rheumatology–radiology interdisciplinary meetings are not standard practice, with only two thirds of radiologists having regular meetings with their rheumatology colleagues. These findings emphasise the need for agreed-upon best practice guidelines.

One of the main limitations of this study is the low response rate (38%). However, the responding radiologists covered 73% of the hospital trusts and health boards in the United Kingdom, suggesting that the results of the present

study are generalizable to current practice amongst UK radiologists. The other possible limitation is potential bias in the results. This could have been created from radiologists, unfamiliar with axSpA classification criteria and MRI definitions, being less likely to respond to the survey. In which case the data presented is a best-case scenario emphasising even more the requirement for further collaboration and guidance in this field.

In conclusion, there is diverse practice in the use of MRI and limited knowledge of the features defining a diagnostic MRI for axSpA amongst radiologists in the United Kingdom, suggesting international guidance has not widely infiltrated national practice. We propose that this gap should be bridged by a joint rheumatology and radiology consensus statement on the use of MRI in the assessment of axSpA to help standardise best practice, ensuring prompt and effective patient management in the diagnosis and treatment of axSpA.

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Figure Legends

Figure 1. Routine use of MRI by UK radiologists when investigating for axSpA. Panel A: regions of the axial skeleton scanned; Panel B: MRI sequences performed for scanning the spine; Panel C: MRI sequence protocols performed for scanning the axial skeleton.

Figure 2. Lesions most frequently used by UK radiologists to diagnose axSpA. Panel A: SIJ lesions; Panel B: spine lesions.