Guidelines for magnetic resonance imaging in axial spondyloarthritis: A Delphi study

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Abstract

Objective: The term axial spondyloarthritis refers to a group of chronic inflammatory rheumatic diseases with a common genetic basis that course with axial and peripheral involvement and enthesitis. Recently, the Assessment of SpondyloArthritis international Society (ASAS) established some diagnostic criteria, including for the first time magnetic resonance imaging (MRI) findings. Given the difficulties of obtaining MRI in some environments and the lack of experience with axial spondyloarthritis, a group of radiologists and rheumatologists sought to establish some practical guidelines to ensure the correct use of MRI in this disease.

Material and methods: Using the Delphi method, we used a questionnaire with 49 items stratified into 4 blocks to survey 46 experts in the MRI diagnosis of axial spondyloarthritis.

Results: The experts agreed on 82% of the items. The degree of agreement was 100% in the block "Importance of early diagnosis of axial spondyloarthritis", 69% in the block "Optimization of the use of MRI in the diagnosis of axial spondyloarthritis", 93% in the block "Use of MRI in axial spondyloarthritis: Technical aspects", and 57% in the block "Usefulness of MRI in the prognosis, follow-up, and evaluation of the response to treatment in axial spondyloarthritis".

Conclusions: Despite the importance of MRI in the early diagnosis of axial spondyloarthritis, this study shows the need for standardization and points to relative disagreement about how to use MRI in the follow-up of the disease and evaluation of the response to treatment. The results of this study can help improve the use of MRI in axial spondyloarthritis.

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PALABRAS CLAVE
Espondiloartritis axial; Diagnóstico; Resonancia magnética; Método Delphi

Resonancia magnética en espondiloartritis axial: estudio Delphi sobre pautas de actuación y realización

Resumen
Objetivo: La espondiloartritis axial (EspA) pertenece a un grupo de enfermedades reumáticas inflamatorias crónicas que cursan con afectación axial, periférica y de entesitis y tienen bases genéticas comunes. Recientemente, la Assessment of SpondyloArthritis International Society (ASAS) ha establecido unos criterios diagnósticos, incluyendo por primera vez la resonancia magnética (RM). Al ser esta una técnica de difícil acceso en determinados medios y ante la falta de experiencia con esta enfermedad, un grupo de radiólogos y reumatólogos propuso buscar recomendaciones prácticas para usarla correctamente.

Material y métodos: Encuesta realizada (método Delphi) a 46 expertos sobre el diagnóstico de EspA mediante RM, con 49 ítems estratificados en 4 bloques.

Resultados: Se consensuó el 82% de los ítems. El grado de consenso fue del 100% en el bloque «Importancia del diagnóstico precoz de la EspA», del 69% en la «Optimización del uso de la RM en el diagnóstico de la EspA», del 93% en el «Uso de la RM en la EspA: cuestiones técnicas», y del 57% en la «Utilidad de la RM en el pronóstico, seguimiento y valoración del tratamiento de la EspA».

Conclusiones: A pesar de la importancia de la RM para diagnosticar precozmente la EspA, este trabajo refleja la necesidad de estandarizarla, y pone de manifiesto una falta de consenso relativa sobre cómo usarla para seguir la enfermedad y valorar la respuesta al tratamiento. Se aportan recomendaciones para mejorar el uso de la RM para diagnosticar la EspA.

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Introduction
Spondyloarthritis (SpA’s) is a group of diseases characterized by inflammatory affection of the axial skeleton and the peripheral articulations and entheses that share pathogenic mechanisms, genetic characteristics and extra-articular and radiologic manifestations. SpA’s include ankylosing spondylitis (AS), reactive arthritis, psoriatic arthritis, arthritis associated with intestinal inflammatory disease, a subgroup of juvenile idiopathic arthritis and non-radiographic SpA.1

Within this group, AS is the most frequent subtype, and its most specific lesion is sacroiliitis.2 The prevalence of SpA is estimated between 0.23 and 1.8% of the overall population.3

In Spain, the prevalence in patients with some SpA treated in rheumatologic services is 13% (range: 8–16%).3

The term “axial spondyloarthritis” is used to define all the SpA’s in which the axial affection predominates, with or without visible structural damage in a simple radiography.4,5 SpA’s range from an initial stage in which the typical symptoms of the SpA are not yet accompanied by radiologic manifestations (non-radiographic SpA) to fully established AS.3 There is evidence showing that patients with AS and patients with non-radiographic SpA have similar clinical manifestations and they require similar treatments regardless of whether there are radiographic lesions or not.4

To diagnose AS clinically, the modified New York criteria are mostly used6 (Table 1), which take into account clinical and radiologic considerations.6 However, they are very limited for the early diagnosis of AS due to its low sensitivity7 because in order to do so there must be at least one Grade 2 bilateral radiologic sacroiliitis or one Grade 3 or greater unilateral radiologic sacroiliitis which greatly delays diagnosis in most cases. In Spain the diagnosis of AS is delayed 8 years of average from the symptom onset.8 In general the delay postpones treatment, which reduces the quality of life, causes prolonged sick leaves and increases the economic burden of the disease.8 Due to the repercussion of the disease has on functional capacity it also reduces work productivity.9

The criteria developed by the Assessment of Spondyloarthritis International Society (ASAS) group in 2009 aim at facilitating the classification of non-radiographic SpA. These criteria have two entry arms, one of them is image sacroiliitis, which includes radiographic sacroiliitis or MR sacroiliitis.10,11,12 MRI despite its limitations (false positives, unavailability in many centers, bad tolerance in patients with claustrophobia, certain contraindications or high cost)11,12 allows the early seeing of the inflammatory lesions of the sacroiliacs and the vertebral structures.

It has been proven that patients on non-radiographic initial stages have a disease activity similar to that of AS and therefore, their life quality is deteriorated. Different studies have proven that continued treatment with non-steroidal anti-inflammatory drugs (NSAIDs) reduces the radiologic progression of AS.13-15 On the other hand, biological therapies with antagonists of the tumor necrosis factor (anti-TNF) (adalimumab, etanercept and infliximab) have proven their efficacy to improve the signs and symptoms of AS and modify the evolution of the disease.16 In patients treated with maintained anti-TNFa therapy, the radiologic progression is slower than in patients without this treatment.17 In patients who have not responded to the NSAIDs treatment, the anti-TNFa therapy has proven to be very effective in many cases,
both in established AS and in patients with non-radiographic SpA.\textsuperscript{17,18}

MRIs allow us to diagnose non-radiographic SpA,\textsuperscript{19} but MRIs have diagnostic limitations and there remain unknown factors about how to make the most of it and optimize its use in these patients. Reaching a consensus among radiologists and rheumatologists would bring about great benefits for the patients. The goal of this study is to explore the opinion of a panel of experts to reach a consensus about the professional criteria that would determine the guidelines for the use of MRIs in SpA. We intend to evaluate the role of MRIs to diagnose SpA and monitor its evolution based on the evidence and clinical experience of the panel.

### Material and methods

#### Design

The modified Delphi method was used,\textsuperscript{20} it is a structured, professional-consensus remote technique which is an iteration of the original procedure developed by Dalkey et al. at Rand Corporation Santa Monica,\textsuperscript{21,22} maintaining its advantages while solving some of its main drawbacks. The Delphi method has advantages such as anonymity, which prevents the "authority effect" associated with the evidence generated by the experts’ opinion from ever happening.

The project was developed in 4 phases: (a) setting up of a scientific committee, responsible for managing the project; (b) setting up of an experts’ panel with special interest and implication in MRIs of SpA; (c) e-mail survey in two rounds, and (d) analysis and assessment of the results and drawing of conclusions by the scientific committee.

#### Participants

A scientific committee was in charge of systematically reviewing the bibliography, doing the questionnaire and selecting the experts’ panel (46 physicians specialized in Rheumatology and Radiology extremely prestigious in the field of axial SpA). In addition, there was a technical team, responsible for the instrumental implementation of the method.

#### Questionnaire

It was made up of 49 items. The scientific committee drafted it with a procedure of prior onsite qualitative work. It was structured into 4 large interest areas: (a) importance of early diagnosis of axial SpA: 11 items; (b) optimization of the use of MRIs in the diagnosis of axial SpA: 16 items; (c) use of MRI in axial SpA: technical questions: 15 items, and (d) utility of MRIs in the prognosis, follow-up and assessment of axial SpA treatment: 7 items. Each item in the survey was formulated as an affirmative or negative statement accompanied by a professional opinion of interest or controversy. The items were assessed through an ordinal Likert-type nine-point scale (Fig. 1) that characterized the answers through qualifiers presented in 3 areas: \([1,2,3] = "\text{disagreement}"; [4,5,6] = "\text{neither agreement nor disagreement}"; [7,8,9] = "\text{agreement}". The possibility was
offered to add free observations to each item. The unanswered questions—when the panelist thought he/she did not qualify were analyzed as lost cases for statistical purposes. The fieldwork of the study was conducted between March and April 2013.

**Analysis and interpretation of results**

To analyze the opinion of the group and the type of consensus reached, we used the position of the group’s score mean and the level of concordance reached by the people surveyed based on the following criterion: an item was considered to be agreed by consensus when there was opinion “concordance” in the panel; that is, when the experts who scored outside the three-point region containing the median ([1,2,3], [4,5,6], [7,8,9]) are fewer than one third of those surveyed. In such a case, the median value determined the group consensus reached: majority “disagreement” with the item, if the median ≤3, or majority “agreement” with the item if the median ≥7. The cases in which the median was in the 4–6 region were considered “dubious” items. On the contrary it was established that there was a “discordant” opinion on the panel when the scores of one third or more of the panelists were in region [1,2,3], and those of another third or more were in the region [7,8,9]. The remaining items in which neither concordance nor discordance was observed were considered to be with an “undetermined” consensus level. The panel considered once again in the second Delphi round all the items in which the group did not reach an evident consensus in favor or against the question posed (the dubious items, those in which discordance is appreciated and those showing a low level of undetermined consensus). Moreover, the items where there was a high dispersion of opinions among the people surveyed were reevaluated with an IQR ≥ 4 points (scores contained between the Q1 and Q3 values of the distribution).

**Results**

The questionnaires were completed by a total of 46 experts (23 radiologists and 23 rheumatologists) (see Annex 1). The result of each item is detailed in Tables 2–5 that specify the mean, the median, the distribution percentage of the people surveyed that is outside the region of the median, the interquartile range and the result of the consensus (agreement or disagreement) or no consensus. In the first round, 40 of the 49 items in the questionnaire were agreed by consensus. The experts reconsidered the items without consensus agreement (block 2: items 17, 19, 21, 24 and 27; block 3: item 36; block 4: items 47–49) in the second round and they did not manage to agree to them by consensus. Finally, the panel reached enough consensus in 40 of the 49 items (82%), all of them in terms of agreement with the statement, while in the remaining 9 (18%) no consensus was reached (Fig. 2).

In block 1 “Importance of early diagnosis of axial SpA” consensus was reached in the 11 items, all of them in terms of group agreement (Table 2). In block 2 “Optimization of the use of MRI in the diagnosis of axial SpA” consensus was reached in 11 of the 16 items (all of them in terms of group agreement). In 5 items consensus could not be reached (Table 3). In block 3 “Use of MRI in axial SpA: technical questions” consensus was reached in 14 of the 15 items, all of them in terms of group agreement. Consensus could not be reached in one item (Table 4). Lastly, in block 4 “Utility of MRI in the prognosis, follow-up and assessment of axial SpA treatment” consensus was reached in 4 of the 7 items, all of them in terms of agreement. There were three items in which consensus could not be reached (Table 5).

**Discussion**

The level of participation was high (46 out of 49 panelists) both in the first and the second rounds and a high level of agreement was reached in the vast majority of items in the questionnaire. In the few cases without consensus or of an agreement with little unanimity, the most important factor was lack of knowledge or uncertainty. Disparity of opinion has played a lesser role.

The results of the study show a virtually general agreement in how important early diagnosis of axial SpA is. Early referral of patients with symptoms to a rheumatologist reduces delay in diagnosis and allows the correct management of the earliest stage. There was agreement in the
difficulty of an early diagnosis, justifiable both due to causes inherent to the healthcare system and to the typical characteristics of the disease, as well as the need to improve the training of primary care physicians so they can recognize symptoms such as inflammatory lumbar pain (suspicion of SpA) and are able to refer patients correctly. The difficulty lies in the fact that lumbar pain is very frequent in the population and SpA is the cause in 5% of the cases only.

The importance of imaging modalities to diagnose SpA justified the need expressed by the panelists to improve its yield, especially that of MRI. After a non-diagnostic X-ray, sacroiliac MRI is the modality of choice to diagnose SpA quickly. The MRI has contributed decisively to diagnose SpA quickly, which has introduced the concept of non-radiographic SpA. This modality was included for the first time in the diagnosis of SpA in the ASAS criteria—the criteria recommended by the Spanish Society of Rheumatology. The consensus reached in this study by rheumatologists and radiologists reflects their awareness of this recommendation. The modified New York criteria generally used to diagnose AS are not sensitive enough in the initial stage of the disease.

Consensus could not be reached with the items about the usefulness of acute lesions (capsulitis, enthesitis, synovitis) in cases without edema/osteitis (ASAS criteria) to diagnose sacroiliitis. The lack of expert agreement about the diagnostic value of these active inflammatory lesions detected by MRI, not included in the ASAS criteria, may be due to its insufficient specificity or sensitivity, in addition to the need for gadolinium for its detection.

When it comes to the use of sacroiliac MRI to diagnose SpA, the experts agreed that it was more indicated than computed tomography or bone scans. MRIs allow us to detect axial inflammation long before the structural lesions are observed radiographically which in turn allows us to diagnose SpA early and act when the lesions are still reversible. However due to the fact that the studies published are small, it is necessary to validate it as the reference diagnostic standard for sacroiliitis and show the cost-efficiency relation. It is an expensive modality that is still largely

### Table 2 Results of block 1. Importance of early diagnosis in axial spondyloarthritis (SpA).

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>Median</th>
<th>% out of the median</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The clinical diagnosis of SpA is usually hard in its early stages</td>
<td>8.17</td>
<td>8</td>
<td>2.17</td>
<td>Agreement</td>
</tr>
<tr>
<td>2. The diagnosis of SpA is usually delayed several years</td>
<td>7.48</td>
<td>7</td>
<td>10.87</td>
<td>Agreement</td>
</tr>
<tr>
<td>3. There are usually delays when trying to refer patients with SpA to the rheumatologist</td>
<td>8.70</td>
<td>8</td>
<td>7.63</td>
<td>Agreement</td>
</tr>
<tr>
<td>4. The early diagnosis of patients with SpA needs to be considered a priority in rheumatologic medical care</td>
<td>7.76</td>
<td>8</td>
<td>10.87</td>
<td>Agreement</td>
</tr>
<tr>
<td>5. Non-rheumatologist doctors find it hard to identify lower back pain of inflammatory nature</td>
<td>7.65</td>
<td>8</td>
<td>4.35</td>
<td>Agreement</td>
</tr>
<tr>
<td>6. In the routine daily clinical practice the findings of the image are considered definitive to come to a diagnosis</td>
<td>7.11</td>
<td>7</td>
<td>17.39</td>
<td>Agreement</td>
</tr>
<tr>
<td>7. The early diagnosis of SpA is clinically significant since the early administration of treatment can stop the progression of this disease</td>
<td>7.07</td>
<td>7</td>
<td>28.26</td>
<td>Agreement</td>
</tr>
<tr>
<td>8. It is necessary to implement strategies aimed at promoting the understanding of SpA among primary care physicians in order to establish adequate criteria to refer these patients</td>
<td>8.46</td>
<td>9</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
<tr>
<td>9. It is necessary to implement strategies aimed at promoting the understanding of SpA among radiologists in order to improve the diagnostic process</td>
<td>8.37</td>
<td>8.5</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
<tr>
<td>10. It is necessary to promote the training of radiologists and rheumatologists in the interpretation of findings of SpA in the MRIs</td>
<td>8.15</td>
<td>8.5</td>
<td>4.35</td>
<td>Agreement</td>
</tr>
<tr>
<td>11. The sacroiliac MRI is the image modality of choice for the early diagnosis of SpA when X-rays are normal or inconclusive</td>
<td>8.35</td>
<td>9</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
</tbody>
</table>
### Table 3 Results of block 2. Optimization of the use of MRI in the diagnosis of axial SpA.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>Median</th>
<th>% out of the median</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. One sacroiliac joint MRI needs to be done to all patients with clinical suspicion of SpA and normal or dubious X-rays</td>
<td>6.93</td>
<td>8</td>
<td>21.74</td>
<td>Agreement</td>
</tr>
<tr>
<td>13. For the diagnosis of SpA it is recommended to follow the criteria from the Anklyosing Spondilitis Assessment Study (ASAS) group</td>
<td>7.17</td>
<td>8</td>
<td>2.17</td>
<td>Agreement</td>
</tr>
<tr>
<td>14. In many centers there is no standardized technique applied to the reading of MRIs of sacroiliac joint in cases of suspicion of SpA</td>
<td>7.17</td>
<td>8</td>
<td>6.52</td>
<td>Agreement</td>
</tr>
<tr>
<td>15. The use of computed tomographies is not recommended for the early diagnosis of SpA</td>
<td>7.72</td>
<td>8</td>
<td>8.7</td>
<td>Agreement</td>
</tr>
<tr>
<td>16. The use of bone gammagographies is not recommended for the early diagnosis of SpA</td>
<td>7.41</td>
<td>8</td>
<td>13.04</td>
<td>Agreement</td>
</tr>
<tr>
<td>17. Only the alterations of acute inflammation of the sacroiliac joint in the MRI (edema, osteitis in at least 3 consecutive cuts) need to be taken into consideration for the diagnosis of SpA</td>
<td>4.31</td>
<td>3</td>
<td>38.1</td>
<td>No agreement</td>
</tr>
<tr>
<td>18. The periarticular or subchondral bone edema in the sacroiliac joints is the signature mark of SpA</td>
<td>7.33</td>
<td>8</td>
<td>10.87</td>
<td>Agreement</td>
</tr>
<tr>
<td>19. The presence of acute lesions in the MRI of sacroiliac joints like capsulitis, enthesitis or synovitis without presence of bone edema or osteitis should not be taken into consideration for the diagnosis of SpA</td>
<td>6.15</td>
<td>7</td>
<td>38.1</td>
<td>No agreement</td>
</tr>
<tr>
<td>20. The presence of MRI of sacroiliac joints only of synovitis, capsulitis or enthesitis without edema/osteitis is compatible but not enough for the diagnosis of active spondilitis</td>
<td>7.24</td>
<td>8</td>
<td>17.39</td>
<td>Agreement</td>
</tr>
<tr>
<td>21. In patients with SpA it is recommended to follow-up the active inflammatory lesions in the sacroiliac joints after certain therapies</td>
<td>5.64</td>
<td>5</td>
<td>57.14</td>
<td>No agreement</td>
</tr>
<tr>
<td>22. The MRI of the backbone can help in the diagnosis of SpA</td>
<td>7.93</td>
<td>8</td>
<td>4.35</td>
<td>Agreement</td>
</tr>
<tr>
<td>23. It is useful to do an MRI of the backbone in the presence of back bone pain in patients with suspicion of SpA</td>
<td>7.07</td>
<td>7.5</td>
<td>21.74</td>
<td>Agreement</td>
</tr>
<tr>
<td>24. In patients with SpA it is recommended to follow-up active inflammatory lesions in the backbone after certain therapies</td>
<td>5.74</td>
<td>5</td>
<td>54.76</td>
<td>No agreement</td>
</tr>
<tr>
<td>25. In the MRIs of the backbone there are signs like the &quot;cornersign&quot; or fatty Romanus lesions that are very SpA-specific and can help in the diagnosis of SpA</td>
<td>7.74</td>
<td>8</td>
<td>6.52</td>
<td>Agreement</td>
</tr>
<tr>
<td>26. In the case of negative MRI and high suspicion of non-radiologic SpA it can be useful to repeat it after 6 months</td>
<td>7.24</td>
<td>7.5</td>
<td>28.26</td>
<td>Agreement</td>
</tr>
<tr>
<td>27. The full-body MRI can be useful in certain dubious cases suspicious of SpA</td>
<td>5.93</td>
<td>7</td>
<td>66.67</td>
<td>No agreement</td>
</tr>
</tbody>
</table>

 unavailable in the context of primary medical care which may justify the lack of unanimous agreement about the need to use it in the spine and the lack of consensus about the usefulness of full-body MRI. Other factors that can justify these results are the fact that diagnostic usefulness of MRI of the spine has not been properly validated, and the full-body MRI, despite its capacity to detect many places where entheses can be inflamed, is still a modality in the pipeline (it has limitations such as the length of the study and the lack of spatial resolution in some regions, especially in the small joints of the hands and feet). The answers by the panelists evidenced lack of standardization of the MRI protocols of the sacroiliac joints (Fig. 3). It has been published that many rheumatologists are not acquainted with this modality, and that the number of MRI sequences can make it difficult to interpret. However, the panelists claim to know, with an almost majority agreement, the technical requirements of the MRI machine, as well as the sequences (number and
<table>
<thead>
<tr>
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<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. The minimal MRI machine to perform a sacroiliac joint or backbone MRI for the diagnosis of SpA needs at least 1-1.5 T</td>
<td>7.85</td>
<td>8</td>
<td>13.04</td>
<td>Agreement</td>
</tr>
<tr>
<td>29. For the diagnosis of SpA through MRI sequences capable of detecting the inflammatory activity are needed</td>
<td>8.48</td>
<td>9</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
<tr>
<td>30. The most sensitive sequences for the detection of inflammatory activity of the SpA are the T1-weighted fat suppression sequences and the administration of gadolinium (T1-FS-Gd) and short tau inversion recovery (STIR)</td>
<td>8.26</td>
<td>9</td>
<td>6.52</td>
<td>Agreement</td>
</tr>
<tr>
<td>31. In the evaluation of sacroiliac joints through MRI 3-4 mm cuts covering the whole joint need to be performed—at least 10-12 cuts</td>
<td>8.37</td>
<td>8</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
<tr>
<td>32. The orientation of cuts in MRI sacroiliac studies needs to be parallel (oblique coronal or semi-coronal cuts) and perpendicular (oblique axial or semi-axial cuts) to the major axis of the sacrum</td>
<td>8.2</td>
<td>8</td>
<td>2.17</td>
<td>Agreement</td>
</tr>
<tr>
<td>33. A basic protocol of sacroiliac MRI studies in patients with suspicion of SpA needs to include oblique coronal cuts in T1-weighted sequences and oblique coronal and axial cuts in STIR sequence</td>
<td>7.98</td>
<td>8</td>
<td>15.22</td>
<td>Agreement</td>
</tr>
<tr>
<td>34. In the assessment of sacroiliac joints the MRI for the diagnosis of SpA can be performed without gadolinium</td>
<td>8.2</td>
<td>8</td>
<td>6.52</td>
<td>Agreement</td>
</tr>
<tr>
<td>35. In cases of suspicion of capsulitis, enthesitis or synovitis T1-weighted sequences with fat suppression and administration of gadolinium must be used</td>
<td>7.59</td>
<td>8</td>
<td>13.04</td>
<td>Agreement</td>
</tr>
<tr>
<td>36. In cases with abundant presence of red bone marrow like in children and patients with anemia T1-weighted sequences with fat suppression and administration of gadolinium must me used</td>
<td>6.57</td>
<td>7</td>
<td>38.1</td>
<td>No agreement</td>
</tr>
<tr>
<td>37. The assessment of the backbone through MRIs when suspicion of SpA needs to be performed through 3-4 mm thick sagittal cuts—at least 11-15 cuts</td>
<td>8.2</td>
<td>8</td>
<td>2.17</td>
<td>Agreement</td>
</tr>
<tr>
<td>38. The assessment of the backbone through MRIs when suspicion of SpA needs to include assessment from C1 to D10 and from D10 to S2</td>
<td>7.09</td>
<td>7.5</td>
<td>32.61</td>
<td>Agreement</td>
</tr>
<tr>
<td>39. The assessment of the backbone through MRIs when suspicion of SpA needs to be performed at least with T1 and STIR sequences</td>
<td>8.54</td>
<td>9</td>
<td>0.0</td>
<td>Agreement</td>
</tr>
<tr>
<td>40. In the assessment of the backbone through MRIs when suspicion of SpA the use of gadolinium needs to be reserved for dubious cases in studies without contrast</td>
<td>7.87</td>
<td>8</td>
<td>10.87</td>
<td>Agreement</td>
</tr>
<tr>
<td>41. In many centers the adequate technique to perform sacroiliac joint MRIs is not applied when suspicion of SpA</td>
<td>6.91</td>
<td>7</td>
<td>28.26</td>
<td>Agreement</td>
</tr>
<tr>
<td>42. In an MRI study of the backbone it is very important to include cuts and sequences that allow us to assess posterior elements</td>
<td>8.33</td>
<td>9</td>
<td>4.35</td>
<td>Agreement</td>
</tr>
</tbody>
</table>
Table 5  Results of block 4. Utility of MRI in the prognosis, follow-up and assessment of axial SpA treatment.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>Median</th>
<th>% out of the median</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>43. The sequences of choice for the diagnosis of structural damage (chronic lesions) through MRIs are T1-weighted sequences</td>
<td>7.72</td>
<td>8</td>
<td>6.52</td>
<td>Agreement</td>
</tr>
<tr>
<td>44. The severity of edemas in MRIs of sacroiliac joint can predict the development of radiographic damage and thus be of prognostic value</td>
<td>7.41</td>
<td>8</td>
<td>8.70</td>
<td>Agreement</td>
</tr>
<tr>
<td>45. The severity of edemas in MRIs of sacroiliac joint can predict good responses to therapies with anti-TNF drugs</td>
<td>6.87</td>
<td>8</td>
<td>19.57</td>
<td>Agreement</td>
</tr>
<tr>
<td>46. The disappearance of bone edema in the sacroiliac joint or in the backbone after the administration of anti-TNF drugs is a marker of good response to treatment</td>
<td>7.46</td>
<td>8</td>
<td>8.70</td>
<td>Agreement</td>
</tr>
<tr>
<td>47. The quantification of the severity of chronic lesions due to MRIs of the sacroiliac joints (erosions, sclerosis, fatty deposits, narrowing of the articular space or ankylosis) is not very useful from the clinical point of view so it should no be done systematically</td>
<td>6.05</td>
<td>7</td>
<td>35.71</td>
<td>No agreement</td>
</tr>
<tr>
<td>48. The quantification of the severity of chronic lesions due to MRIs of the backbone (erosions, sclerosis, fatty deposits, narrowing of the articular space or ankylosis) is not very useful from the clinical point of view so it should no be done systematically</td>
<td>5.8</td>
<td>7</td>
<td>76.19</td>
<td>No agreement</td>
</tr>
<tr>
<td>49. After anti-TNF therapies it is good to perform an MRI of the sacroiliac joints or the backbone to assess the response to these therapies</td>
<td>5.79</td>
<td>5.5</td>
<td>71.43</td>
<td>No agreement</td>
</tr>
</tbody>
</table>

Figure 2  Global result of consensus.

Recently it has been described that gadolinium does not add any extra value to the STIR sequence for the early detection of SpA.\(^9\) In concordance with this finding, the panelists said that it was not necessary to use gadolinium in sacroiliac MRIs. However in cases of capsulitis, enthesitis and synovitis, T1-FS-Gd did prove to be more useful than STIR.\(^9\) There
was no consensus about the use of T1-FS-Gd sequences in patients with abundant red bone marrow (BM) such as children or patients with anemia. This can be explained by the few studies published about it and the very few children examined with this disease. In a study conducted with patients with subchondral or periarticular bony edema-early stage of active sacroiliitis it was confirmed that MRI without contrast material is enough to identify it, although gadolinium facilitates diagnosis so it can be indicated in dubious cases such in the aforementioned population.

In addition to its diagnostic utility, prognostic value has been assigned to the acute lesions seen through MRIs. It has been published that the severity of edema predicts very well the appearance of radiographic damage, an observation that was agreed to by the panelists. Consensus was also reached about the value of the severity of edema in sacroiliac MRIs to predict response to treatment with anti-TNF-α. Treatment with anti-TNF-α is changing considerably the prognosis of axial SpA. The experts did not reach a consensus about the utility of MRIs to evaluate the response to treatment with these drugs; despite the fact that it has been confirmed that quantifying the inflammation helps us assess the response. This discrepancy that contrasts with the consensus about the disappearance of the bone edema in the MRI after anti-TNF-α treatment is a good response marker, can be due to the poor experience of some radiologists and rheumatologists in research studies, usually within clinical trials, or to the dubious need for monitoring if clinical evolution is good, given the limited availability of MRI.

The panelists did not agree either about the clinical utility of MRI to quantify the severity of chronic diseases (fat store, erosions, and subchondral sclerosis and bony bridges/ankylosis). It has been published that, except for fat infiltration lesions of the BM that are gaining more and more interest, for the remaining chronic lesions the MRI does not seem to be justified. This can explain the lack of consensus together with the fact that vertebral MRI is not part of any classification/diagnosis criteria and the lack of studies about the long-term evolution of these lesions.

The limitations of the study are those inherent to the Delphi method and they lie mainly in the problems related to the adequate selection of experts and in the difficulty entailed by drafting the questionnaire. We have tried to overcome these drawbacks by selecting panelists of renowned prestige and having the scientific committee prepare an adequate questionnaire.

In sum our results reflect the need to establish a standard protocol for sacroiliac or vertebral MRIs and to clarify the utility of MRI in the follow-up and the value of acute signs beyond osteitis. The results suggest that a considerable number of centers still do not use the right modality. This makes the radiologists have to establish common guidelines to find ruled, reproducible protocols that improve the use of MRI for the early diagnosis of this disease.

Ethical responsibilities

Protection of people and animals. The authors declare that no experiments with human beings or animals have been performed while conducting this investigation.

Data confidentiality. The authors declare that in this article there are no data from patients.

Right to privacy and informed consent. The authors declare that in this article there are no data from patients.

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Guidelines for magnetic resonance imaging in axial spondyloarthritis

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Conflict of interests

The authors declare no conflict of interests.

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References