Clinical assessment of sacroiliitis and HLA-B27 are poor predictors of sacroiliitis diagnosed by magnetic resonance imaging in psoriatic arthritis


Objective. To determine the frequency and clinical predictors of sacroiliitis diagnosed by magnetic resonance imaging (MRI) in a psoriatic arthritis (PsA) population.

Methods. The studied comprised 103 patients with PsA. A careful clinical assessment for sacroiliitis was made from history and examination, and HLA-B27 testing was performed. Sixty-eight patients underwent tilted coronal fat-saturated T1-weighted and STIR MRI of the sacroiliac joints.

Results. Clinical features of moderate or severe sacroiliitis were found in 24/68 (35%) patients. MRI features of sacroiliitis were found in 26/68 (38%) patients. Clinical features of sacroiliitis were present in 14/42 (33%) with normal MRI scans and 10/26 (38%) with abnormal scans (normal vs abnormal scans, \( P = 0.7 \)). The presence of sacroiliitis on MRI was associated with restricted spinal movements \( (P = 0.004) \) and the duration of PsA \( (P = 0.04) \). There was no correlation between HLA-B27 and sacroiliitis diagnosed by MRI.

Conclusion. Sacroiliitis diagnosed by MRI occurs commonly in PsA but is difficult to detect clinically.

Key words. Sacroiliitis, HLA-B27, MRI, Psoriatic arthritis, Clinical assessment.

Psoriatic arthritis (PsA) can be associated with axial disease and sacroiliitis [1]. Previous studies have emphasized the lack of correlation between clinical and radiological progression of axial involvement [2]. Magnetic resonance imaging (MRI) of the sacroiliac joints is more sensitive than plain radiology in detecting early sacroiliitis [3–5], but the frequency of MRI-diagnosed sacroiliitis in PsA subjects is unknown. The aim of this study was to examine the hypothesis that MRI-diagnosed sacroiliitis is more frequent than clinically diagnosed sacroiliitis in PsA, and that HLA-B27 predicts MRI-diagnosed sacroiliitis.

Patients and methods

Patients with PsA attending rheumatology outpatient clinics in Oxford were identified from hospital records and invited to participate in this study. Ethical approval was obtained from the Central Oxford Research Ethics Committee.

Participants were studied from January 1999 to September 2000. They were considered to have PsA if they had inflammatory arthritis and psoriasis; those with a rheumatoid factor titre of >1:160 or reactive arthritis with a clear infective trigger were excluded. Patients were not selected for the presence of clinically apparent axial disease. Of 149 patients invited, 103 were eventually recruited to the study (41 declined to take part, two had rheumatoid arthritis, one had reactive arthritis and two had never had psoriasis). Written consent was obtained from all participating patients.

A detailed history for the presence of inflammatory type back pain, particularly sacroiliac pain, was evaluated at two separate outpatient visits (Table 1). A history of treated iritis was sought. Participants completed the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [6] and Bath Ankylosing Spondylitis Functional Index (BASFI) questionnaires [7].

Careful examination of the sacroiliac joints was undertaken at both assessments. Eight different tests of sacroiliac joint mobility and pain provocation were performed (Table 1). A clinical judgement was made about whether each patient had sacroiliitis prior to sacroiliac MRI scanning. This took into consideration the evidence from the history and clinical examination at both clinic visits. Each set of questions and examinations was given a score out of 4, where 1 was definitely normal, 2 was probably normal, 3 was probably abnormal and 4 was definitely abnormal.

The first interview screened for inflammatory back pain. At the second visit, questions were also asked specifically to look for problems at the sacroiliac joint. A score of 1 was given if all answers were negative, 2 if two or less answers were positive, 3 if more than two answers were positive and 4 if all were positive.

The first clinical examination assessed sacroiliitis using four clinical tests: flexion/abduction/extension, extension/hyperextension, lateral pelvic compression and prone sacral pressure. The second examination included two further sacroiliac pain provocation tests and two tests of sacroiliac joint mobility: pressure over S2, upward pressure on ischium, superior iliac glide and the Stork test. A similar scoring system was used: 1 if there were no abnormal tests, 2 if up to two tests were abnormal, 3 if more than two tests were abnormal or there was severe pain in one test, and 4 if more than three tests were abnormal. Confounding factors to interpretation of the tests such as hip and knee arthritis or psoriasis over the skin of the sacrum were...
noted but did not alter the scoring system. If a patient scored 4 in one test alone, or if they had a total score of more than 8, they were considered to have sacroiliitis. If there was discordance between the history and examination, the judgement was weighted in favour of history, and in particular, a history of inflammatory back pain. The 15-cm Schober test was used to measure lumbar spine forward flexion.

All 103 patients were invited to have MRI of the sacroiliac joints; 68 agreed to undergo MRI. All scans were performed on a 1-Tesla Siemens Impact Expert system using tilted coronal fat-saturated spin-echo T1-weighted (TR = 4450 ms, TE = 60 ms, flip angle = 90°, NEX = 2, matrix = 256/192) and short tau inversion recovery (STIR: TR = 4450 ms, TE = 60 ms, TI = 115 ms, flip angle = 180°, NEX = 2, matrix 256/242) sequences. Two independent specialists in musculoskeletal radiology, blinded to the clinical assessments, reported the MRI scans. Each sacroiliac joint was assessed for the presence or absence of subchondral oedema, joint irregularity, erosions and chronic changes representing either sclerosis or periarticular fat accumulation. Each scan was then classified overall as definitely normal, probably normal (showing minor degenerative changes), probably abnormal or definitely abnormal. The scores of the two radiologists were compared and any conflicts were resolved by consensus. For the purposes of this paper, only scans in the probable and definitely abnormal group are considered to demonstrate MRI-diagnosed sacroiliitis.

The presence of HLA-B27 was tested by polymerase chain reaction using sequence-specific primers [8]. Clinical and MRI assessment of sacroiliitis was assigned blind to the results of the HLA-B27 testing. HLA-B27 results were available for 98/103 patients, including 66/68 who underwent MRI scanning.

Data were analysed using contingency tables and Student t-tests. All P values are expressed as two-tailed values. The power calculation was based on the results from Scarpa et al. [9], where 12/22 patients with axial disease were HLA-B27 positive, compared with 2/21 without axial disease who were HLA-B27 positive. In order to be 80% certain of a difference at the 0.05 level of significance a sample size of 20 patients would be required.

### Table 1. Assessment of back pain, sacroiliac pain and clinical tests of sacroiliac joints used in the study

<table>
<thead>
<tr>
<th>Questions about inflammatory back pain</th>
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<td>At what age did your back pain start? (positive if &lt;40 yr)</td>
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<tr>
<td>Is your back stiff or painful in the morning? For how long? (positive if &gt;20 min)</td>
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<tr>
<td>Is your pain worse after rest?</td>
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<tr>
<td>Do NSAIDs improve your pain?</td>
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<tr>
<th>Questions about sacroiliac joint pain</th>
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<td>Where is your pain? (positive if over the sacroiliac joint or buttock)</td>
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<td>Is the pain worse at night?</td>
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<td>Is the pain worse on standing in the morning?</td>
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<tr>
<td>Can you turn over in bed at night without pain?</td>
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<tr>
<td>Is your back stiff or painful in the morning?</td>
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<td>Do NSAIDs improve your pain?</td>
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<th>Sacroiliac joint mobility and pain provocation tests</th>
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<td>Flexion/abduction/extension</td>
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<td>Extension/hyperextension</td>
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<td>Lateral pelvic compression</td>
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<td>Prone sacral pressure</td>
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<td>Pressure over S2</td>
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<td>Upward pressure on ischium</td>
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<td>Superior iliac glide</td>
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<td>Stork test</td>
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### Results

#### Patient characteristics

The mean age of the patients in the study overall was 45.6 yr (range 19–71 yr). There were 48 females. The mean disease duration of skin psoriasis was 19 yr (range 0.5–48 yr) and the mean duration of arthritis was 12 yr (range 0.5–40 yr). There were 82 patients (80%) with psoriatic nail disease.

#### Clinical features and MRI findings

Clinical features of sacroiliitis were found in 24/68 (35%) patients. The mean score from history and examination of the patients who were felt to have sacroiliitis on clinical grounds was 11.3 (range 7–16), compared with 5.4 (range 4–8) for those patients who were felt not to have sacroiliitis on clinical grounds. MRI-diagnosed sacroiliitis was present in 26/68 (38%). Of the abnormal scans, three showed oedema alone, eight showed oedema and chronic changes (erosions and/or periarticular sclerosis or fat accumulation) and 15 showed chronic changes alone. Clinical features of sacroiliitis were present in 14/42 (33%) with normal MRI scans and 10/26 (39%) with abnormal scans (normal vs abnormal scans, \( \hat{P} = 0.7 \)). The positive predictive value of clinical assessment to predict MRI-defined sacroiliitis was 42% and the negative predictive value was 64%. There was no association between clinical features of sacroiliitis and patterns of MRI changes.

Patients with abnormal MRI scans had a mean duration of arthritis of 14 yr compared with 9 yr in those with normal scans (\( \hat{P} = 0.04 \)). The duration of skin psoriasis was not associated with MRI-diagnosed sacroiliitis. There was a weak association between gender and MRI-diagnosed sacroiliitis; 18/37 males (49%) and 8/31 (26%) females had abnormal MRI scans (\( \hat{P} = 0.05 \)).

The presence of restricted spinal movements was the strongest clinical indicator of MRI-diagnosed sacroiliitis. There were 10 patients with a modified Schober test measuring less than 20 cm (i.e. lumbar forward flexion of < 5 cm); of these, eight (80%) had abnormal MRI scans of the sacroiliac joints. This contrasted with only 18/57 (32%) with a modified Schober test of 20 cm (\( \hat{P} = 0.004 \)) (data not available for one patient). There was no association between BASDAI or BASFI scores and sacroiliitis on MRI.

### HLA-B27 and sacroiliitis

HLA-B27 was detected in 20/98 (20%) of the PsA patients. This compares with the frequency in the general UK population of 9.5% (\( \hat{P} < 0.0001 \)) [8]. There were seven patients with a history of iritis; of whom five (71%) were positive for HLA-B27 compared with 14/91 patients (15%) with no history of iritis (\( \hat{P} < 0.001 \)). There was no association between HLA-B27 and the presence of clinically diagnosed sacroiliitis, limited spinal movements, BASDAI or BASFI.

HLA-B27 was present in 5/25 (20%) of those with sacroiliitis on MRI and 6/41 (14%) without sacroiliitis (normal vs abnormal scans, \( \hat{P} = 0.6 \)). HLA-B27 did not predict patterns of sacroiliac pathology on MRI. The positive predictive value of HLA-B27 for sacroiliitis on MRI was 46% and the negative predictive value was 64%.

### Discussion

This study has confirmed that MRI-diagnosed sacroiliitis often occurs in patients with PsA. Although the frequency of MRI changes is similar to that of clinical features of sacroiliitis, there is little correlation between the two. HLA-B27 predicts neither MRI-nor clinically diagnosed sacroiliitis. Indeed, disease duration and restricted spinal movements are the only clinical predictors of sacroiliitis on MRI.
MRI is now considered the investigation of choice for the diagnosis of early sacroiliitis, having superior sensitivity and specificity compared with plain radiographs or isotope bone scans [3–5]. In a prospective study [4] of 44 patients with symptoms of inflammatory low back pain and 20 healthy controls, MRI was found to have a sensitivity of 95% and specificity of 100%, compared with plain radiography with a sensitivity of 19% and specificity of 47%. This study showed that MRI detects 75% of early cases of sacroiliitis not detected by plain radiography. Given its superior sensitivity and specificity, MRI is now used routinely in our institution for diagnosis of sacroiliitis. In those units where plain radiography is the initial investigation to diagnose sacroiliitis, MRI is the next investigation in cases where there is clinical suspicion, but insufficient plain radiographical evidence of sacroiliitis. As MRI for the detection of sacroiliitis is now established, plain radiography was not considered ethical by the local research ethics committee and therefore was not used.

Gadolinium-enhanced MRI has been advocated as a useful technique and is more sensitive than $T_1$- and $T_2$-weighted gradient-echo sequences [10]. However, it has been shown that there is a good correlation between contrast-enhanced MRI and the more sensitive STIR sequence. The exception is in equivocal cases that show only minor signal abnormalities on STIR images when detectable enhancement is rare [11]. As such equivocal cases were not considered positive for sacroiliitis in our study we elected not to perform post-contrast scans.

The frequency of MRI-diagnosed sacroiliitis in this group of PsA patients is high (38%). This high frequency of MRI-diagnosed sacroiliitis may not be generalizable to the PsA population as a whole. Our patients were recruited from hospital out-patient clinics, and were therefore likely to have more severe disease. In addition, of the 144 patients with PsA invited to participate in the study, only 68 (47%) proceeded to MRI of the sacroiliac joints. These patients were not selected for the presence of clinically apparent sacroiliitis or axial disease, but there may have been some bias caused by patients with back pain being more likely to consent to MRI. However, this seems unlikely, as the frequency of inflammatory back pain was similar in those patients who underwent MRI and those who did not (data not shown).

Sacroiliac provocation and stress tests are widely used in clinical practice but their reliability has been questioned [12]. In this study of PsA patients, neither a clinical history of inflammatory back pain nor the presence of positive sacroiliac pain provocation tests predicted sacroiliitis on MRI. In patients with psoriatic arthritis, these tests may also be confounded by presence of skin lesions over the sacrum and large joint arthritis in hips and knees. This study is

![Fig. 1. Normal MRI sacroiliac joints on: (a) fat-saturated $T_1$-weighted scan, (b) STIR sequence.](image1)

![Fig. 2. Abnormal MRI sacroiliac joints on: (a) fat-saturated $T_1$-weighted scan, (b) STIR sequence. This scan demonstrates subchondral oedema, sclerosis and erosions.](image2)
the first to demonstrate the poor predictive value of such tests for sacroiliitis on MRI. The lack of association between clinical and MRI findings implies that sacroiliac symptoms and signs relate to abnormalities that are not detected on MRI, and that there may be sources of pain other than marrow oedema and cartilage erosion.

Although the majority of patients with abnormal scans showed at least some chronic changes, there were three patients with oedema alone. It is not known whether oedema on MRI precedes chronic changes in psoriatic spondylitis and it will be important to follow these patients in the light of recent reports of reversal of sacroiliac oedema using anti-tumour necrosis factor therapy [13].

Two other subgroups of patients are of particular interest. First, there is a group of patients without clinical symptoms or signs of sacroiliitis who have clear evidence of disease on MRI. Over one-third of patients (16/44) with no clinical features of sacroiliitis fell into this group. Second, there is a group of patients with clinical features but no MRI evidence of sacroiliitis. Of the 24 patients with clinical features of sacroiliitis, 14 (58%) were in this group. These patients will be followed carefully to see if they develop MRI changes of sacroiliitis in subsequent years.

As expected, the frequency of HLA-B27 is greater in this group of patients with PsA than in the general population [9, 14]. The strong associations of iritis with HLA-B27 [14, 15] are similar to those found in other studies. However, the presence of HLA-B27 is correlated poorly with clinical symptoms and signs or MRI-diagnosed sacroiliitis. These results suggest that HLA-B27 is not a useful diagnostic test to predict sacroiliitis in PsA.

In summary, sacroiliitis diagnosed by MRI occurs frequently in patients with PsA but is difficult to detect clinically.

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Conflict of interest

The authors have declared no conflicts of interest.

References