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Inflammatory Back Pain

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Introduction

Inflammatory back pain (IBP) is a relatively recent and well-accepted concept whose precise definition remains elusive. The first clinical description appeared in 1949 at which time Hart and colleagues provided the following account in AS patients: “A frequent feature of the pain and stiffness was the aggravation caused by immobility. Waking in the morning stiff and in pain, the patient gradually became more supple during the day, feeling at his best from the afternoon until bedtime. One patient noted that by frequent exercise, his condition was kept in check, but confinement to bed for any cause made him worse. Another woke himself up [every 2 hours] throughout the night to exercise his spine as otherwise, he suffered unduly in the morning” (Hart as quoted in Rudwaleit 2006). Subsequent efforts to articulate an improved definition of IBP have become intertwined with the development of criteria sets to operationalize its measurement; its definition has become subsumed under the rubric of features of IBP used to distinguish back pain seen in the spondyloarthropathies (SpA) from mechanical back pain. In principle, IBP is a condition characterized by inflammation of the sacroiliac joints and lower spine and is frequently seen in patients with ankylosing spondylitis (AS). Its primary features include: 1) relatively young age at onset, usually before the age of 40 or 45; 2) morning stiffness; 3) back pain present for at least 3 months or more, and 4) pain relieved by movement (Braun 2010). The characteristic pattern of IPB may occur in patients with AS as well as other chronic axial pain disorders such as undifferentiated SpA, reactive arthritis, inflammatory bowel diseases and psoriasis (Weisman 2012). While the concept of IBP has been most frequently used within the context of AS and SpA, the presence of IBP clinical features does not equate to a diagnosis of either of these conditions (Weisman 2012).

Although Hart and colleagues provided the first clinical description of IBP, it wasn’t until Calin et al proposed classification criteria for IBP (Calin 1977), that the study of IBP was brought to the forefront (Braun 2010). As will be demonstrated, the definition of IBP varies by criteria set, as does its sensitivity and specificity regarding screening and case-ascertainment in various clinical or epidemiological settings. The purpose of this chapter is to review the history of efforts to define IBP, particularly the criteria sets that have been built around its measurement, to describe assessment of IBP in the clinical setting, and to illustrate how IBP has been used in epidemiological and clinical research.

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IBP Clinical Assessment Criteria Sets

Several criteria sets have been developed that either measure IBP or incorporate indicators of IBP into more detailed clinical assessments of AS and other SpA. In chronological order, these criteria sets include: Calin (1977) (Calin), modified New York criteria for ankylosing spondylitis (1984) (van der Linden), Amor (1990) (Amor), European Spondylarthropathy Study Group (1991) (Dougados), Berlin criteria (2006) (Rudwaleit 2006), and Assessment of SpondyloArthritis International Society (ASAS) (2009) (Rudwaleit 2009; Sieper, van der Heijde et al 2009). These classification criteria are intended to be applied to confirm a diagnosis in patients who fulfill criteria (Rudwaleit 2005); they were not meant for diagnostic purposes, although they may have been used as such in the absence of diagnostic criteria and, more recently, by non-rheumatologists. The development of each of these criteria sets is discussed in turn below.

Calin Criteria

In 1977, Calin and colleagues developed criteria to measure differences in symptoms between patients with back pain of an inflammatory nature (specifically, AS) and patients with mechanical or nonspecific back pain (Calin). In this study, a 17-item questionnaire (Table 1) was administered to three groups of patients: 42 HLA-B27 positive AS patients, 21 HLA-B27 negative patients seen in an orthopedic clinic but with normal sacroiliac joints on x-ray, and 75 controls.

Analysis of the results reported by Calin et al showed that five of the 17 questions were able to detect AS with a sensitivity of 60% and specificity of 97%. The five questions were discomfort for three months or more, back stiffness in the morning, age of onset less than 40 years, insidious onset, and discomfort relieved by exercise. Furthermore, using four of these five characteristics differentiates AS from non-specific back pain with 95% sensitivity and 85% specificity in this test population. In comparing the five most discriminating items from the Calin questions to the 4 criteria for IBP (age of onset before age 40 or 45, morning stiffness, duration of back pain for at least 3 or more months, and pain relieved by movement), we see that with the exception of insidious onset, most all of the later classification criteria for AS, SpA, and IBP, are almost identical. Thus, it is understandable how the criteria for IBP and AS have become so intertwined. In fact, subsequent criteria sets are much more focused on the assessment of AS and other types of SpA than on the measurement of IBP itself. That said, though, each of the subsequent criteria sets retains one or more elements of the definition of IBP.

Modified New York Criteria for Ankylosing Spondylitis

The modified New York criteria for ankylosing spondylitis (Table 2) were developed in response to an evaluation of the sensitivity and specificity of the Rome criteria for AS proposed in 1961 and the New York clinical criteria for AS formulated in 1966 (van der Linden). van der Linden and his co-investigators studied 20 HLA-B27 positive AS probands and 102 first-degree relatives 15 years of age and older as well as 14 HLA-B27 negative probands and 74 first-degree relatives. Analysis of the Rome criteria and the New York criteria indicated that the history or presence of pain at the dorsolumbar junction or in the lumbar spine (one of the New York criterion) was not useful in discriminating between patients with AS and those without AS. In its place, the authors recommended that the original Rome criterion for inflammatory back pain, “low back pain and stiffness for more than 3 months which is not relieved by rest,” be modified to “low back pain and stiffness for more than 3 months which improves with exercise, but is not relieved by rest.” Thus, the modified New York criteria for AS replace the original New York pain criterion with the modification of the Rome pain criterion.

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It is important to note that the modified New York criteria for AS is a departure from the Calin criteria in that the focus is not exclusively on IBP. Rather, IBP is one of several clinical criteria used to characterize patients with AS. Also noteworthy is the fact that at this juncture in the development of IBP-related clinical assessments, the use of radiological findings is introduced as a criterion for AS.

Amor Criteria

The Amor criteria (Table 3) were designed to distinguish patients with SpA from patients without SpA. The Amor criteria were developed using a 5-step process that included 1,376 patients: 1,219 subjects with SpA and 157 controls (Amor 1990). The 1,219 subjects with SpA were divided into 3 study groups: 250 were included in a retrospective review, 890 were recruited from a multicenter collaboration, and 79 were reviewed prospectively. The final criteria proposed by Amor had a sensitivity of 90 percent and a specificity of 86.6 percent.

As may be seen by examining these criteria, however, IBP is not well-defined (Rudwaleit 2005) and elements of IBP have been relegated to relatively minor import in favor of other clinical factors, radiological findings, and genetic history. These fairly wide-ranging clinical criteria, while not emphasizing IBP, are nevertheless important to an understanding of the history of the development of IBP and SpA criteria sets.

European Spondylarthropathy Study Group

The European Spondylarthropathy Study Group (ESSG) sought to overcome the limitations of earlier criteria sets by proposing classification criteria that would encompass the entire panoply of the spondyloarthropathies (Dougados 1991). In order to meet the goal of being able to detect a range of SpA patients, the clinical variables included for evaluation in this study were quite diverse and encompassed far more than just definitional criteria for IBP. Data on 183 variables was collected from a total of 1,077 patients (403 with spondyloarthropathy and 674 controls with other rheumatologic conditions). The information from these 183 variables was evaluated by an expert panel that reduced the number of candidate criteria variables to 25 (Table 4). The specificity for these 25 variables ranged from 28.8% to 98.1% while the sensitivity ranged from 5.5% to 84.9%. Statistical analysis further reduced these 25 variables to the set that ultimately became known as the ESSG criteria. The ESSG criteria for the classification of spondyloarthropathy require the presence of inflammatory spinal pain **or** synovitis (either asymmetric or predominantly in the lower limbs) **and** one or more of the following: positive family history, psoriasis, inflammatory bowel disease, urethritis, cervicitis, or acute diarrhea within one month before arthritis, buttock pain alternating between right and left gluteal areas, enthesopathy, or sacroiliitis. Similar to the preceding criteria sets, the ESSG criteria illustrate that inflammatory back pain remains an important, but not an exclusive, element in these criteria sets.

Berlin criteria

The Berlin criteria are an outgrowth of a study specifically designed to assess the individual components of IBP, test various combinations of these features, and compare them with each other with the ultimate worthwhile goal of identifying and studying AS patients ahead of progressive but not reversible damage and disability (Rudwaleit 2006). A total of 213 patients (101 with AS and 112 with mechanical low back pain [MLBP]) younger than 50 years of age and with low back pain for at least three months were included in the study. Patients were queried about age at onset of back pain, time period of back pain onset prior to evaluation, preceding events (e.g., trauma, infection, mental/emotional stress), duration of morning stiffness, improvement in back pain, buttock pain, and awakening at night due to

back pain. Statistical analyses were used to identify variables that discriminated between patients with AS and patients with MLBP. The following three sets of 4 variable combinations were similar in their ability to distinguish between AS and MLBP patients:

> **Set 8c**: morning stiffness of > 30 minutes' duration, improvement in back pain with exercise but not with rest, alternating buttock pain, and age at onset of back pain < 30 years (sensitivity 78.1%; specificity 66.1%).
>
> **Set 7a**: morning stiffness of >30 minutes' duration, improvement in back pain with exercise but not with rest, awakening because of back pain during the second half of the night only, and age at onset of back pain < 30 years (sensitivity 82.2%; specificity 59.9%).
>
> **Set 8a**: morning stiffness > 30 minutes' duration, improvement in back pain with exercise but not with rest, alternating buttock pain, and awakening because of back pain during the second half of the night only (sensitivity 70.3%; specificity 81.2%).

The authors express a preference for Set 8a noting that it performed slightly better than Calin criteria and is easy to administer in a clinical setting.

Assessment of SpondyloArthritis International Society (ASAS)

The Assessment of Spondyloarthritis International Society (ASAS) convened a 2-day workshop in Berlin with 13 international experts in AS/SpA from 9 countries in Europe and North America to develop new classification criteria for axial and peripheral SpA (Sieper, van der Heijde, et al 2009). During the workshop, these 13 experts evaluated the clinical history of, and performed examination on, 20 patients with chronic back pain and suspected axial SpA, resulting in a total of 124 clinical judgments on IBP. There were 4–7 judgments for each patient and each IBP parameter. Analysis of the concordance among experts and logistic regression resulted in the ASAS IBP according to experts criteria (Table 5) so named because, in contrast to previous IBP criteria which were developed by comparing patients with AS to patients with other types of back pain, these new IBP criteria were based on the judgment of experts. These criteria do not significantly differ from other IBP criteria, but rather represent a synthesis of previous work. In fact, three of the items – disease onset < 40 years, insidious onset, and improvement with exercise – are included in the Calin criteria.

Value of IBP for diagnostic, classification, and screening purposes

The value of IBP with respect to diagnosis, classification, and identification of patients with SpA in the primary care setting has recently been called into question (Braun 2010). Thus far, there is limited evidence as to the value of IBP as a screening criterion in the primary care setting. This is not surprising given that the construct of IBP has been incorporated into various sets and algorithms mostly for classification purposes as well as for case-ascertainment in fairly limited and somewhat artificially constructed study populations.

Brandt *et al* investigated the value of proposed IBP screening parameters when used by primary care physicians and orthopedists for the detection of AS in patients with chronic back pain (Brandt 2007). Physicians participating in the study (114 orthopedists and 130 primary care physicians) were asked to refer patients to an outpatient rheumatology clinic if they possessed low back pain greater than 3 months duration and onset prior to age 45. In addition, patients were required to meet at least one of the three criteria: 1) IBP defined as morning stiffness greater than 30 minutes, pain at night or early morning with improvement by exercise; 2) positive HLA-B27 test; or 3) sacroiliitis detected by imaging. A total of 350 patients were referred by orthopedists and primary care physicians to the rheumatology clinic. Slightly more than 50% of the 350 patients were referred to the rheumatology clinic due to evidence of IBP, evidence that was confirmed by the rheumatologist in 76.8% of

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these patients. A diagnosis of axial SpA could be made in 62.6% of patients when more than one of the referral criteria was positive. This study suggests that the use of IBP is useful in the primary care setting when it is used as one component of a triad of referral parameters.

Solmaz and colleagues evaluated the sensitivity and specificity of the ASAS criteria for IBP relative to the Calin and Berlin criteria (Solmaz 2010). In this study of 214 patients with axial SpA and 44 patients with MLBP, sensitivity was highest with Calin criteria (92%) and specificity was best with the Berlin criteria (84%). Sensitivity and specificity for the ASAS were 77% and 72%, respectively.

Most recently, Braun et al analyzed selected clinical parameters of IBP for diagnosing axial SpA patients with chronic back pain (Braun 2011). Similar to the Brandt study, orthopedists were asked to refer patients to a rheumatologist if the patient had the onset of back pain between the ages of 16 and 45 years with chronic back pain lasting longer than two months, but less than 10 years. Patients were randomized to a rheumatologist based on four prespecified key questions: 1) morning stiffness lasting longer than 30 minutes; 2) pain improved by movement but not by rest; 3) waking up in the second half of the night due to back pain; and 4) improvement within 48 hours with non-steroidal anti-inflammatory drugs (NSAIDs). A total of 950 patients were screened and 670 were referred to a rheumatologist. Complete data was available on 322 patients; 133 out of these 322 referred patients were diagnosed with some form of axial SpA based on rheumatologists' expert opinion. While no single parameter alone was useful in diagnosing patients with axial SpA, combinations of selected parameters performed quite well and the authors state that "no single item was predictive, but ≥3 items proved useful for good sensitivity and specificity by receiver operating characteristic modeling" (Braun, 2011). It certainly seems clear from these recent data as well as others that performance of these criteria will vary depending on whether the outcome reflects different case definitions of disease such as fully developed AS or earlier forms of the disease, or perhaps even for different subsets of SpA. The authors do state with conviction that the definitions of primary care practices will differ from country to country and results using the same ascertainment tools might vary according to the setting (Braun, 2011).

Determining the prevalence of IBP/axial SpA in the general population

IBP and associated criteria sets were developed in well-defined health care settings and can be easily administered by general practitioners, rheumatologists, and orthopedic surgeons to determine whether a patient's IBP may be indicative of axial SpA. What do we know, though, about the prevalence of IBP in the general population? Can the aforementioned criteria sets be used in epidemiological studies to generate prevalence estimates?

The National Health and Nutrition Examination Survey is an ongoing program of studies combining interviews and physical examinations that assess the health and nutritional status of adults and children in the United States (US). Data is collected from a cross-sectional, nationally representative survey of the civilian, non-institutionalized population. The US prevalence of IBP by Berlin Criteria was estimated using data from NHANES II (1981–1975) for adults 25 to 49 years of age. At that time, the prevalence of IBP was 6.7% among those who reported having had a back pain episode for at least 4 months, and 0.8% of the overall adult US population (Dillon 2011). We recently had an opportunity to develop an IBP questionnaire specifically for the NHANES III 2009–2010 survey to provide population-based prevalence estimates for four published IBP classification criteria: Calin, ESSG, and Berlin criteria sets 8a and 7b (Weisman 2012). Table 6 provides an overview of the variables from each of the criteria sets included in our analysis. The ASAS criteria were not included in this study because they were published after the development of the

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NHANES IBP/SpA questionnaire. The NHANES IBP/SpA instrument used a spinal pain diagram to identify history of chronic pain, aching or stiffness at one of five specific axial locations (neck, upper, mid and lower back and sacroiliac joint area; see Figures 1 and 2). For those with axial pain at any of these sites, additional detail was obtained: age-at-onset of symptoms, timing of development of symptoms, temporal pattern of pain variation, duration of symptoms of the longest pain episode (6 weeks and/or 3 months), history of pain, aching and/or stiffness at the particular site, pattern of the onset of the pain, course of pain over a typical day, morning stiffness, history of rest pain, whether pain results in wakening from sleep, pain response to exercise, and history of alternating buttock pain.

A total of 980 out of 5,103 (19.2%) individuals in the NHANES 2009–10 survey had a history of pain from at least one axial site on the pain diagram for less than 3 months. Thus, it appears that back pain (from multiple sites, not just low back) is a very prevalent condition in the US population. IBP prevalence estimates were then constructed using accepted and validated criteria – revealing 5% by Calin, 5.6% by ESSG, 5.8% by Berlin criteria 8a, and 6.0% by Berlin criteria 7b. Since the Berlin criteria were only validated for adults under the age of 50, the NHANES 2009–10 prevalence estimates are for the subgroup of participants who were 20 to 49 years of age at the time of the survey (N=3188).

In a companion study, we used the NHANES 2009–2010 survey to estimate the prevalence of SpA in the US using the Amor criteria and the ESSG criteria (Table 7). The NHANES 2009–2010 questionnaire provided sufficient data for ESSG inflammatory spinal pain and captured 4 of the 7 additional ESSG SpA criteria elements. Several items could not be used to measure Amor back pain/stiffness.

Of 6,684 persons aged 20 to 69 screened for participation, 5,103 complete arthritis interview records were available for analysis. The age-adjusted prevalence of definite and probable SpA by Amor criteria was 0.9% and 1.4% by ESSG criteria. These compare quite favorably to estimates of .35 to 1.3% published by the US National Arthritis Data Workgroup. It does appear that 1% of the US population does suffer from some form of SpA, a figure that places this condition at a higher prevalence than quoted for rheumatoid arthritis (Helmick, 2008), although the ascertainment methodologies are different for each of these two conditions.

Unanswered Questions/Future Directions

IBP is one of the defining characteristics of AS and SpA, but does IBP constitute a separate nosologic entity? According to the NHANES surveys quoted above there is a gap between estimates of SpA (1 %) and the estimates of IBP by accepted criteria (5–6%). What remains in this gap? We accept the notion that classification of disease can be based on etiology, known pathogenetic mechanisms, symptoms alone, and nowadays genetics. AS classification remains a struggle since these various criteria are not clear cut in themselves, and the concept of SpA even suffers more because several of these features are even less well defined. Whether or not SpA is a precursor to AS or perhaps even a different entity is at the debating stage. IBP is the next hurdle to overcome – is it something in and of itself or is it a precursor for SpA or AS?

The value of the concept of IBP in the primary care setting is straightforward – it does define a group at risk for SpA or AS and it can defend further diagnostic testing such as advanced imaging or genetic testing. However, if these tests are negative, does IBP in and of itself justify anti-inflammatory therapy or even biologic drug intervention in an attempt to treat symptoms or potentially to prevent later development of SpA or AS? We do not, as yet, have an answer to these questions.

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However, one important usefulness of the concept of IBP appears to be in its role as a distinguishing feature in the criteria sets that have been developed to identify AS and SpA. In the thirty-five years since the Calin criteria were introduced, criteria sets have evolved from measurement of IBP to measurement of AS and/or SpA, and here we must be clear that IBP is not the same clinical entity as AS or SpA. These criteria sets share several key clinical features, while diverging on others such as radiographic parameters and genetic indicators. The difference among these criteria sets leads to several considerations for future research. First, do patients classified as having IBP who do not go on to develop AS or SpA represent a valid subset of IBP or are they false positives in IBP classification? Second, what is the association between IBP, elevated markers of inflammation, and HLA-B27? Third, can these criteria sets be used to analyze response to therapy (Braun 2010)? Finally, is it possible to develop a unified criteria set for IBP? We await answers to these questions.

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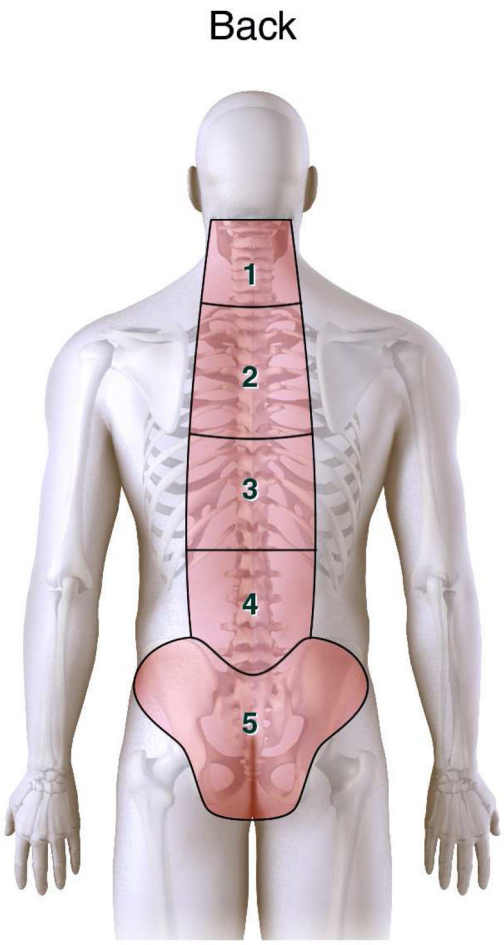

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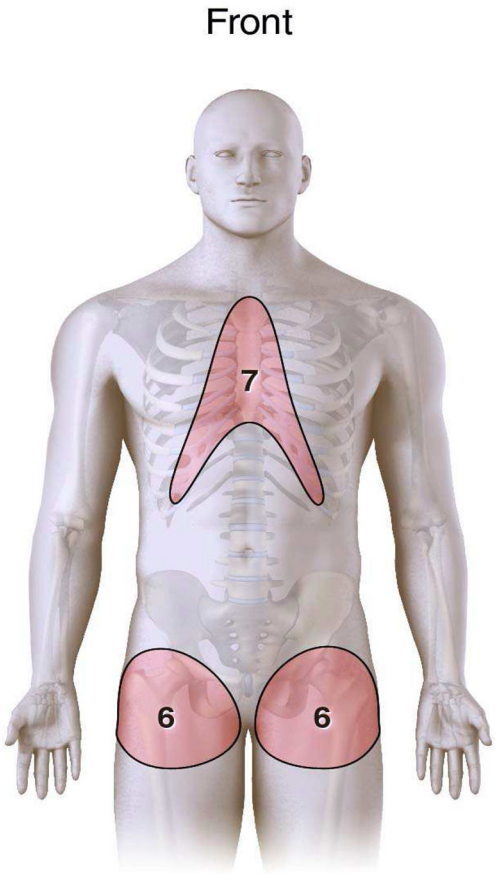

Figure 1.
Figure 1A&B. The NHANES IBP/SpA instrument used a spinal pain diagram to identify history of chronic pain, aching or stiffness at one of five specific axial locations

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Table 1

Calin Criteria

1. Have you ever had trouble with your back (excluding neck)? If yes, please answer the following:
2. Have you had any discomfort (pain and/or stiffness) in your back today?
3. Have you had any discomfort in the last three months?
4. Has the discomfort ever gone on for three months or more?
5. Was the discomfort caused by an injury?
6. Has the discomfort extended below the knee?
7. With the discomfort, has there been numbness or tingling in a leg?
8. Has the back been stiff, especially in the morning?
9. Has the discomfort awakened you at night?
10. Have you seen a physician for the back trouble?
11. Have x-ray films been taken of your back?
12. At what age did you discover your back discomfort (yr)?
13. Did the problem begin suddenly or (14)
14. Slowly ?
15. Has the discomfort been improved by rest or (16)
16. Exercise?
17. Have any members of your family had persistent back pain (include only immediate family members)?

Answers were either “yes” or “no” except where indicated.

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Table 2

Modified New York criteria for ankylosing spondylitis

Clinical criteria
• ■ Low back pain and stiffness for more than 3 months that improves with exercise, but is not relieved by rest.
• ■ Limitation of motion of the lumbar spine in both the sagittal and frontal plans.
• ■ Limitation of chest expansion relative to normal values correlated for age and sex.
Radiological criterion
• ■ Sacroiliitis grade ≥ 2 bilaterally or grade 3–4 unilaterally.

Definite AS if the radiological criterion is associated with at least one clinical criterion

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Table 3

Amor criteria for spondyloarthritis[†]

Criterion	Points
Clinical symptoms or past history:	
Lumbar or dorsal pain during the night, or morning stiffness of lumbar or dorsal spine	1
Asymmetric oligoarthritis	2
Buttock pain	1
If affecting alternately the right or the left buttock	2
Sausage-like toe or digit (dactylitis) [*]	2
Heel pain or any other well defined enthesiopathy (enthesitis) [*]	2
Iritis	2
Non-gonococcal urethritis or cervicitis accompanying, or within 1 month before, the onset of arthritis	1
Acute diarrhea accompanying, or within 1 month before, the onset of arthritis	1
Presence or history psoriasis, balanitis, or inflammatory bowel disease (ulcerative colitis or Crohn's disease)	2
Radiological finding:	
Sacroiliitis (grade ≥ 2 if bilateral; grade ≥ 3 if unilateral)	3
Genetic background:	
Presence of HLA-B27, or familial history of ankylosing spondylitis, Reiter syndrome, uveitis, psoriasis, or chronic enterocolopathies	2
Good response to NSAIDs in less than 48 h, or relapse of the pain in less than 48 h if NSAIDs discontinued	2

[†]From Sieper, Rudwaleit, et al 2009

[*]Terms were added by the authors for clarification, not in the original publication

A patient is considered to have spondyloarthritis if the sum of the point counts is 6 or more. A total point count of five or more classifies for probably spondyloarthritis.

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Table 4

Candidate variables of the European Spondylarthropathy Study Group criteria

1. Spinal pain
2. Inflammatory spinal pain
3. Anterior chest wall pain
4. Buttock pain
5. Buttock pain alternating between right and left gluteal areas
6. Buttock pain, unilateral, without radiation below the knee
7. Chest expansion > 2.5 cm
8. Reduction in spinal mobility
9. Synovitis, predominantly in the lower limbs
10. Asymmetric synovitis
11. Mono- or oligo- versus polyarticular involvement
12. Dactylitis
13. Enthesopathy at any site
14. Heel pain
15. Conjunctivitis
16. Uveitis (acute, anterior)
17. Psoriasis
18. Mucosal ulcerations
19. Acute diarrhea (1 month before arthritis)
20. Inflammatory bowel disease
21. Nongonococcal urethritis or cervicitis (1 month before arthritis)
22. HLA-B27
23. Family history of either ankylosing spondylitis, reactive arthritis, psoriasis, uveitis, or inflammatory bowel disease
24. Sacroiliitis (on radiography)
25. Positive effect of NSAIDs

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Table 5

Inflammatory back pain (IBP) parameters according to ASAS experts

1. Age at onset <40 years
2. Insidious onset
3. Improvement with exercise
4. No improvement with rest
5. Pain at night (with improvement upon getting up)

Sensitivity 77.0% and specificity 91.7% if at least four out of five parameters are present. Note that sensitivity and specificity refer to the presence of IBP, not to diagnosis.

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Table 6

Inflammatory Back Pain (IBP) Case Definition Criteria

IBP Criterion	NHANES 2009–2010	Calin et al.	ESSG	Berlin Set 8a	Berlin Set 7b
Spinal Pain Location	ARQ010; ARQ020	”Back”	Neck/dorsal/back	Low Back	Low Back
Current Age	RIDAGEYR	Any Age	Any Age	< 50 years	< 50 years
Duration of Back Pain (3 months)	ARQ024	√	√	√	√
“Insidious” Onset of Back Pain	ARQ025	√	√		
Age-At-Onset Back Pain (years)	ARQ023	< 40	< 45		< 30
Morning Stiffness > 30 Minutes	ARQ040	√*	√*	√	√
Pain Improves with Exercise or Activity	ARQ080	√	√		
Pain Improves with Activity/Not with Rest	ARQ060; ARQ080			√	√
Pain Awakens 2nd Half of Night	ARQ073; ARQ077			√	
Alternating Buttock Pain	ARQ100			√	

Abbreviations: ARQ = NHANES 2009–2010 Arthritis questionnaire; √ or text in gray highlight= mandatory IBP case definition criteria;

Berlin Criteria Sets= from Rudwaleit et al. 2006.

*Duration of AM Stiffness not specified in Calin and ESSG criteria.

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Table 7

The Amor and European Spondyloarthritis Study Group Case Definitions for Spondyloarthritis

Amor et al. SpA Criteria Elements	Score	NHANES	ESSG SpA Criteria Elements	NHANES
Nocturnal Spinal Pain or AM Stiffness *	1	Yes	Inflammatory Spinal Pain	Yes
Buttock/Alternating Buttock Pain	1 or 2	Yes †	Alternating Buttock Pain	Yes
Heel Pain/Enthesiopathy	2	Yes	Enthesopathy	Yes
Acute diarrhea at or Prior to SpA Onset	1	No	Urethritis, Cervicitis, Diarrhea	No
Radiologic Sacroiliitis	3	No	Radiologic Sacroiliitis	No
HLA-B27+ or Family/Genetic Background	2	No	Positive Family History	No
Psoriasis, Balanitis, Inflamm, Bowel Dis.	2	Yes £	Psoriasis	Yes
Iritis	2	Yes	Inflammatory Bowel Disease	Yes
Positive Response to NSAIDs	2	Yes		
Asymmetric oligoarthritis	2	No		
Dactylitis	2	No		

Definitions: ESSG=European Spondyloarthritis Study Group; SpA= Spondyloarthritis; Probable SpA is an Amor et al. a score of 5, definite SpA is a score of 6; the ESSG criteria for SpA is a history of inflammatory Spinal pain plus one other ESSG SpA criteria element.

* Lumbar or dorsal pain during the night, or morning stiffness of lumbar or dorsal spine.

† Buttock pain=1; history of alternating buttock pain=2.

£ NHANES did not collect a history of balanitis.