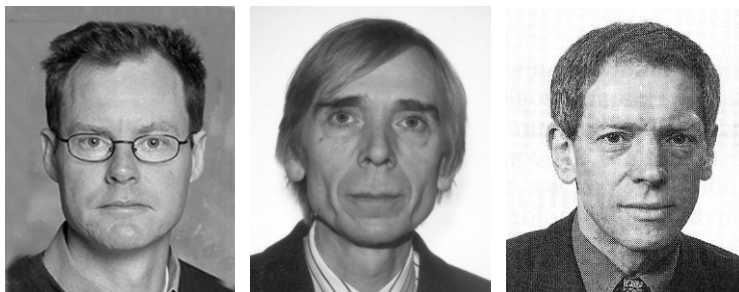


Problems with the Definition of Axial and Peripheral Disease Patterns in Psoriatic Arthritis



For the last 30 years research in psoriatic arthritis (PsA) has acknowledged the contribution of Moll and Wright in 2 ways. First, the suggested diagnostic criteria — an inflammatory arthritis associated with psoriasis in the absence of rheumatoid factor — have been widely adopted. Second, their subgroup classification, the signs and symptoms of which are useful for describing the varied manifestations of the disease, has mandated other authors to describe their disease population in these terms. However, an obsession with subgroups has distracted authors from the important question of diagnostic disease classification.

To date there is only one validated system, developed by Fournie and colleagues¹, for case definition based on patient data. Their definition includes clinical and radiological features and HLA status as criteria and consequently is of limited use clinically.

Among the several proposed definitions of distinct subsets of PsA the simplest approach is to form 2 classes: axial (with or without peripheral features) and peripheral alone. We review the different approaches taken since Moll and Wright's original formulation in 1973 and suggest research designs that might help to resolve the issue.

In 1959, Wright originally proposed 3 subgroups². These were “distal interphalangeal (DIP) predominant disease,” “severely deforming arthritis” (which included patients with axial disease), and “rheumatoid-like disease.” Later, Moll and Wright described 5 subgroups of PsA (relative proportions in parentheses): predominant DIP joint disease (5%), asymmetrical oligoarthritis (70%), polyarthritis (15%), spondylitis (5%), and arthritis mutilans (5%)³. This classification was supported by cluster analysis of a large number of cases of PsA across several centers⁴. Minor modifications have been made to the Moll and Wright subgroups by authors including Gladman, *et al*⁵, Torre-Alonso, *et al*⁶, Helliwell, *et al*⁷, and Veale, *et al*⁸.

Before discussing modifications to the criteria, it is interesting to note marked differences between original Moll and Wright series and subsequent reports with respect to relative proportions of asymmetrical oligoarthritis and symmetrical polyarthritis subgroups: indeed, in most series proportions

are the reverse. Assuming that there have been no fundamental changes to the disease in the last 40 years, and acknowledging that established cases were included in all series, it must be concluded that subsequent authors have interpreted the diagnostic criteria and/or the subgroup criteria of Moll and Wright in different ways.

Moll and Wright described 5 subgroups. Gladman, *et al* expanded this (7 groups) to distinguish between pure axial disease or axial disease with and without peripheral features⁵: distal disease (DIP affected only), oligoarthritis (< 4 joints), polyarthritis, spondylitis only, distal plus spondylitis, oligoarthritis plus spondylitis, and polyarthritis plus spondylitis. In their cross-sectional study, 33% of patients had axial disease with or without peripheral features. Arthritis mutilans was not seen sufficiently frequently to require its own subgroup and was believed to be an indicator of severity, rather than a distinct group. Torre-Alonso, *et al* also concluded that since DIP arthritis occurs in any other subgroup, this particular category is not valid but otherwise distinguished the other 4 Moll and Wright categories. They explicitly included patients with peripheral manifestations in combination with axial manifestations in the spondylitis subgroup, but did not report whether spinal radiographic changes and/or axial symptoms were required for the axial appellation. Helliwell, *et al*⁷ took an empiric approach to classification using scintigraphy to identify the distribution of both clinically apparent disease and subclinical disease. This led to only 3 subgroups: peripheral polyarthritis; spondylitis; and synovitis/acne/pustulosis/hyperostosis/osteomyelitis (SAPHO) — because of an appreciable incidence of extra-articular disease seen on scintigraphy. Veale, *et al*⁸ applied the Moll and Wright and Helliwell formulations to their cohort and concluded that the peripheral arthritis group of Helliwell was too broad, containing patients with symmetrical polyarthritis (SP) and asymmetrical oligoarthritis (AO). Since it was possible to show that there were significant differences in clinically deforming arthritis and radiographic erosive disease between these 2 groups (SP and AO), the distinction appeared valid. They also agreed that DIP

involvement did not require a separate category and proposed the following 3-group classification: asymmetric oligoarthritis, symmetric polyarthritis, and predominant spondylitis. It is not clear from their article how the diagnosis of spondylitis was operationalized. The low numbers of diagnosed spondylitis (4%) and the absence of cervical or lumbar spinal radiographs suggest that a definition requiring radiographic sacroiliitis was required, although this is not clear.

Subgroup classification ought to be stable over time, otherwise the validity of the different distinctions becomes questionable. Jones, *et al* studied 100 patients and found frequent progression from an oligoarticular pattern at onset to a polyarticular pattern at final assessment⁹. Marsal, *et al* studied 73 patients over a median followup of 8 years using a standard clinical protocol¹⁰. They also showed that oligoarthritis was common at presentation (52% with fewer than 4 affected joints), but not at followup (6.8%). Using radiographic sacroiliitis (1966 New York criteria) to define axial disease (with or without peripheral arthritis), 29% had axial disease. The authors felt that a 2-group classification system was likely to be most robust: axial or peripheral. It was noted, however, that radiographic sacroiliitis can develop over time. In a further longitudinal study of patients with early arthritis¹¹, there was significant progression over time from polyarticular to oligoarticular that was attributed to disease treatment effects.

In any study of patterns of joint involvement it must be recognized that clinical examination is a relatively insensitive way of identifying articular involvement; the use of other modalities to identify involvement, such as radiographs, bone scintigraphy, color Doppler ultrasound, and magnetic resonance imaging (MRI), suggests that differential articular involvement is a quantitative rather than a qualitative distinction¹². In this way different methods of evaluation produce different patterns of joint and enthesal involvement: what appears oligoarticular by one method may be polyarticular by another.

Based on data reported at this point, the following conclusions about disease patterns can be drawn:

1. DIP predominant and arthritis mutilans are probably not distinct subgroups, but may occur as a general manifestation of PsA or as a representation of severity of disease.
2. The distinction between oligoarticular and polyarticular disease is not useful since one form evolves into another (and in both directions), and subclinical disease may be present to confound these groupings.
3. SAPHO may be a separate subgroup, but its clinical rarity makes this hard to study among cohorts of patients with PsA. Further work is needed on this group of patients in order to complete the taxonomy.
4. The definition of axial disease remains problematic.

Turning to this last issue, it is apparent from the preceding discussion that there are a number of ways to define axial disease: alone or in combination with peripheral man-

ifestations; and based on inflammatory spinal symptoms, radiographic sacroiliitis, other radiographic signs of spondylitis, or on combinations of features such as the European Spondylarthropathy Study Group criteria for spondyloarthritis¹³.

Is there a way of empirically determining the best way of defining axial disease? The similarities between axial PsA and ankylosing spondylitis suggest that similar definitions of disease can be employed. However, although the New York criteria for diagnosing (and classifying) people with ankylosing spondylitis are widely used, these criteria still require validation. The New York criteria for ankylosing spondylitis require a symptom (back pain), a clinical sign (restriction of back or chest expansion), and a radiological feature (sacroiliitis)¹⁴. The restriction of back or chest expansion and the radiological feature are based on earlier approaches where diagnosis was made relatively late, usually after several years of symptoms¹⁵. As a further complication, some cases of established ankylosing spondylitis and axial PsA are clearly asymptomatic for many years, the diagnosis only being made by chance¹⁶.

On the other hand, the dissimilarities between axial PsA and ankylosing spondylitis suggest that these features could be employed to distinguish between true axial PsA and psoriasis with coincidental ankylosing spondylitis. These differences were originally described by McEwen and colleagues¹⁷ and, in part, later confirmed by Helliwell, *et al*¹⁸. The features more often seen in association with psoriasis (and reactive arthritis) can be summarized as follows:

- Asymmetrical sacroiliitis
- Non-marginal syndesmophytes
- Asymmetrical syndesmophytes
- Paravertebral ossification
- More frequent involvement of cervical spine

In fact, the later study by Helliwell, *et al* found paravertebral ossification to be so rare as to be of little value in discrimination, and predominance of cervical spine involvement was a result of a relative sparing of the lumbar spine in psoriatic spondylitis. Further work by de Vlam, *et al* has suggested a possible mechanism for the non-marginal “bulky” syndesmophytes, which are seen more frequently in association with psoriasis. de Vlam and colleagues argue that syndesmophyte morphology is simply a function of the amount of mobility in the adjacent facet joints, and that the relative sparing of the zygapophyseal joints in PsA preserves mobility, resulting in more prolific new bone anteriorly between the vertebral bodies¹⁹.

Can the differences between psoriatic and classical ankylosing spondylitis be, as in the case of peripheral arthritis, ascribed to quantitative rather than qualitative differences? There would certainly be some support for this, particularly if the difference in syndesmophyte morphology can be explained by the coexisting involvement of the zygapophyseal joints.

Could the diagnosis of axial involvement be based solely on axial symptoms and signs? Low back pain is ubiquitous and symptoms and signs do not correlate well with radiological evidence of sacroiliitis or spondylitis, frequently occurring in their absence. Certainly, sacroiliitis can occur in the absence of spinal symptoms in PsA²⁰, and clinical evaluation of sacroiliitis is especially inaccurate. In a recent series from Oxford, UK, clinical features of sacroiliitis were present in 14/42 (33%) with normal MRI scans and 10/26 (38%) with abnormal scans²¹. It has also been suggested that radiographic spondylitis can occur without sacroiliitis in PsA (in contrast to ankylosing spondylitis, where, by definition, this cannot occur). The extent of this non-overlap determines how important it is to evaluate spinal radiographs in addition to sacroiliac (SI) joint radiographs and clinical symptoms and signs. In a study of 343 patients with PsA carried out in Bradford, UK, and Milan, Italy, 94 patients had both spinal and SI radiographs²². Seven of 22 with radiographic spondylitis (32%) did not have radiographic sacroiliitis, and 15 of 30 (50%) with radiographic sacroiliitis did not have radiographic spondylitis. There was also poor concordance between clinical inflammatory spinal symptoms and radiographic axial disease: 16 of 43 (37%) with inflammatory axial symptoms did not have radiographic spondylitis or sacroiliitis, and 31 of 67 (46%) of those without inflammatory axial symptoms did have radiographic spondylitis or sacroiliitis. Therefore, in order to capture the totality of the axial manifestations in PsA, it is necessary to include radiographic changes (both spinal and at SI joints) and symptoms.

The next question concerns early disease. The plain radiographic changes indicated above clearly take time to develop, and represent a late stage of the pathophysiology occurring at the entheses and in the interspinous ligaments. We do know that the spinal radiographic changes progress with time in ankylosing spondylitis and we must suppose that the same is true for PsA²³. However, abnormalities can be seen on MRI prior to plain radiographic abnormalities in ankylosing spondylitis; these changes are seen at the entheses and in the underlying bone and presumably represent the early phases of the disease process²⁴. Although it has been hypothesized that disease taxonomy can be predicted early on the basis of MRI appearances of peripheral joints, this hypothesis remains unproven²⁵. At this time we may have to accept that much of what is seen as very early inflammatory arthritis remains unclassifiable and possibly undifferentiated²⁶. All existing criteria sets in rheumatology are fallible in this way, and it seems futile to try and encompass this problem before resolving the question of classifying established disease.

Probably the only reason that one would want to subgroup patients in the first place is that these groups might behave differently over time, either in terms of natural history or in response to treatment. It is clear that sulfasalazine works differently for peripheral manifestations compared to

axial manifestations in spondyloarthropathies²⁷, so it is reasonable to at least examine this possibility by separately analyzing people with axial disease and peripheral disease. However, although the manifestations of PsA are heterogeneous, the same could be said for rheumatoid arthritis; yet a single set of criteria are used for this condition. There is a strong argument, therefore, for abandoning the concept of subgroups altogether. Classification sets for PsA might then include the various manifestations of the disorder within this rubric, allowing case identification on the basis of combinations of these features. In many ways the ESSG criteria for spondyloarthropathy are crafted in this way, but show poor sensitivity and specificity when applied to a case series of PsA and rheumatoid arthritis²².

There are 2 possible ways of resolving difficulties with the meaning of axial disease in PsA: to collect data from a large number of centers on people with axial and peripheral PsA using the treating physician's opinion regarding presence of axial and peripheral disease and to have a contrasting group of patients with ankylosing spondylitis and rheumatoid arthritis. This would enable examination of the relative sensitivity and specificity of the different definitions of axial involvement, from symptoms only to combined clinical radiographic evaluation. It may also be possible to develop a method to determine the distinction between classical ankylosing spondylitis and axial PsA using a scoring system based on the observed differences between these forms of spinal involvement (including syndesmophyte morphology, symmetry of sacroiliitis, symmetry of spinal disease, and possibly paravertebral ossification). Such data have already been collected for the CASPAR classification project²⁸ and would require little further input before such an analysis could be performed.

The second method would be to conduct a consensus exercise among experts in PsA to determine which definition of axial disease is most acceptable. However, there is circularity with this approach, although it may offer a starting point for further studies. We would contend that a starting point has already been reached based on the studies quoted above. We are now in a position to take this matter forward using existing data. The collective interest of GRAPPA (Group for the Research and Assessment of Psoriasis and PsA) to establish a worldwide registry of cases of PsA collected prospectively will provide an ideal testing ground for any newly developed criteria²⁹.

WILLIAM J. TAYLOR, MChB, FRACP, FAFRM,
Rehabilitation Teaching and Research Unit,
Department of Medicine,
Wellington School of Medicine and Health Sciences,
University of Otago,
Wellington, New Zealand;
HANS-GEORG ZMIERCZAK, MD,
Department of Rheumatology,
Ghent University Hospital,
Ghent, Belgium;

PHILIP S. HELLIWELL, MD, PhD,
Academic Unit of Musculoskeletal Medicine,
University of Leeds,
36 Clarendon Road,
Leeds LS2 9NZ, UK.

Address reprint requests to Dr. Helliwell. E-mail: p.helliwell@leeds.ac.uk

REFERENCES

1. Fournie B, Crognier L, Arnaud C, et al. Proposed classification criteria of psoriatic arthritis. A preliminary study in 260 patients. *Rev Rhum Engl Ed* 1999;66:446-56.
2. Wright V. Rheumatism and psoriasis; a re-evaluation. *Am J Med* 1959;27:454-62.
3. Moll JMH, Wright V. Psoriatic arthritis. *Semin Arthritis Rheum* 1973;3:51-78.
4. Seleznick M, Feigenbaum P, Wright V, Fries J. Psoriatic arthritis subsets: a cluster analysis. In: Brooks PM, York JR, editors. *Rheumatology* 85. Amsterdam: Elsevier Science Publishers; 1985:398-412.
5. Gladman DD, Shuckett R, Russell ML, Thorne JC, Schachter RK. Psoriatic arthritis (PSA) — an analysis of 220 patients. *Q J Med* 1987;238:127-41.
6. Alonso JCT, Perez AR, Castrillo JMA, Garcia JB, Noriega JLR, Larrea CL. Psoriatic arthritis (PA): a clinical, immunological and radiological study of 180 patients. *Br J Rheumatol* 1991;30:245-50.
7. Helliwell P, Marchesoni A, Peters M, Barker M, Wright V. A re-evaluation of the osteoarticular manifestations of psoriasis [see comments]. *Br J Rheumatol* 1991;3:339-45.
8. Veale D, Rogers S, Fitzgerald O. Classification of clinical subsets in psoriatic arthritis [see comments]. *Br J Rheumatol* 1994;33:133-8.
9. Jones SM, Armas JB, Cohen MG, Lovell CR, Evison G, McHugh NJ. Psoriatic arthritis: outcome of disease subsets and relationship of joint disease to nail and skin disease. *Br J Rheumatol* 1994;33:834-9.
10. Marsal S, Armadans-Gil L, Martinez M, Gallardo D, Ribera A, Lience E. Clinical, radiographic and HLA associations as markers for different patterns of psoriatic arthritis. *Rheumatology Oxford* 1999;38:332-7.
11. Kane D, Stafford L, Bresnihan B, Fitzgerald O. A classification study of clinical subsets in an inception cohort of early psoriatic peripheral arthritis — 'DIP or not DIP revisited'. *Rheumatology Oxford* 2003;42:1469-76.
12. Backhaus M, Burmester GR, Sandrock D, et al. Prospective two year follow up study comparing novel and conventional imaging procedures in patients with arthritic finger joints. *Ann Rheum Dis* 2002;61:895-904.
13. Dougados M, van der Linden S, Juhlin R, et al. The European Spondylarthropathy Study Group preliminary criteria for the classification of spondylarthropathy. *Arthritis Rheum* 1991;34:1218-27.
14. Bennett PH, Wood PHN. Population studies of the rheumatic diseases. *Proceedings of the 3rd International Symposium, New York, 1966.* Amsterdam: Excerpta Medica; 1968.
15. Hill HFH, Hill AGS, Bodmer JG. Clinical diagnosis of ankylosing spondylitis in women and relation to presence of HLA-B27. *Ann Rheum Dis* 1976;35:267-70.
16. Helliwell PS, Wright V. Ankylosing spondylitis. In: Bellamy N, editor. *Prognosis in the rheumatic diseases.* London: Kluwer Academic Publishers; 1991:133-52.
17. McEwen C, Di Tata D, Lingg C, Porini A, Good A, Rankin T. A comparative study of ankylosing spondylitis and spondylitis accompanying ulcerative colitis, regional enteritis, psoriasis and Reiter's disease. *Arthritis Rheum* 1971;14:291-318.
18. Helliwell PS, Hickling P, Wright V. Do the radiological changes of classic ankylosing spondylitis differ from the changes found in the spondylitis associated with inflammatory bowel disease, psoriasis, and reactive arthritis? *Ann Rheum Dis* 1998;57:135-40.
19. de Vlam K, Mielants H, Verstaete KL, Veys EM. The zygapophyseal joint determines morphology of the enthesophyte. *J Rheumatol* 2000;27:1732-9.
20. Battistone MJ, Manaster BJ, Reda DJ, Clegg DO. The prevalence of sacroiliitis in psoriatic arthritis: new perspectives from a large, multicenter cohort. A Department of Veterans Affairs Cooperative Study. *Skeletal Radiol* 1999;28:196-201.
21. Williamson L, Dockerty JL, Dalbeth N, McNally E, Ostlere S, Wordsworth BP. Clinical assessment of sacroiliitis and HLA-B27 are poor predictors of sacroiliitis diagnosed by magnetic resonance imaging in psoriatic arthritis. *Rheumatology Oxford* 2004;43:85-8.
22. Taylor WJ, Marchesoni A, Arreghini M, Sokoll K, Helliwell PS. A comparison of the performance characteristics of classification criteria for the diagnosis of psoriatic arthritis. *Semin Arthritis Rheum* 2004;34:575-84.
23. Calin A, MacKay K, Santos H, Brophy S. A new dimension to outcome: application of the Bath Ankylosing Spondylitis Radiology Index. *J Rheumatol* 1999;26:988-92.
24. Oostveen J, Prevo R, den Boer J, van de Laar M. Early detection of sacroiliitis on MRI and subsequent development of sacroiliitis on plain radiography. A prospective, longitudinal study. *J Rheumatol* 1999;26:1953-8.
25. McGonagle D, Gibbon W, Emery P. Classification of inflammatory arthritis by enthesitis. *Lancet* 1998;352:1137-40.
26. Berthelot JM, Saraux A, Maugars Y, Le Goff P. The fuzzy nosology of early rheumatoid arthritis and early spondylarthropathies: square classifications produced by circular reasoning? *Joint Bone Spine* 2001;68:285-9.
27. Clegg DO, Reda DJ, Abdellatif M. Comparison of sulfasalazine and placebo for the treatment of axial and peripheral articular manifestations of the seronegative spondylarthropathies: a Department of Veterans Affairs cooperative study. *Arthritis Rheum* 1999;42:2325-9.
28. Helliwell PS, Taylor WJ. Classification and diagnostic criteria for psoriatic arthritis. *Ann Rheum Dis* 2005;64 Suppl 2:ii3-ii8.
29. Gladman D, Ritchlin C, Helliwell PS. Psoriatic arthritis: clinical registries and genomics. *Ann Rheum Dis* 2005;64 Suppl 2:ii103-ii105.