Summary of the International Federation of Psoriasis Associations (IFPA) Meeting: A Report from the GRAPPA 2009 Annual Meeting

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ABSTRACT. The International Federation of Psoriasis Associations (IFPA) organized the second World Psoriasis and Psoriatic Arthritis Conference in Stockholm, Sweden, in June 2009. The 2009 collaborative multidisciplinary meeting attracted nearly 1000 clinicians and investigators from dermatology, rheumatology, basic science, and industry, as well as patients and leaders of patient organizations, from 68 countries. The major theme of the meeting was "Psoriasis — Skin and Beyond," and the primary aim was to highlight the significant effects of psoriasis and related comorbidities on patient function and quality of life. The annual meeting of GRAPPA (Group for Research and Assessment of Psoriasis and Psoriatic Arthritis) was held concurrently, and several GRAPPA members attended both meetings. Key presentations at IFPA that GRAPPA members believed were highlights of that meeting are summarized here. (J Rheumatol 2010;38:530–9; doi:10.3899/jrheum.101115)

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The leaders of the International Federation of Psoriasis Associations (IFPA) organized the second World Psoriasis and Psoriatic Arthritis Conference in Stockholm, Sweden, in June 2009, following a successful first World Meeting in 2006. The 2009 collaborative multidisciplinary meeting attracted nearly 1000 clinicians and investigators from dermatology, rheumatology, basic science, and industry, as well as patients and leaders of patient organizations, from 68 countries. The conference was chaired by Jörg Prinz (Ludwig-Maximilians-University, Munich, Germany) and supported by co-chairs Christopher Ritchlin (University of Rochester Medical Center, Rochester, NY, USA) and Mona Ståhle (Karolinska Institutet, Stockholm, Sweden).

The major theme of the meeting was "Psoriasis – Skin and Beyond," and the primary aim was to highlight the significant effects of psoriasis and related comorbidities on patient function and quality of life. Mounting evidence supports the concept that psoriasis is associated with increased cardiovascular (CV) morbidity; this key message was emphasized throughout the meeting.

The annual meeting of GRAPPA (Group for Research and Assessment of Psoriasis and Psoriatic Arthritis) was held concurrently to the 2009 IFPA meeting, and the majority of GRAPPA members attended both meetings. Summaries of key presentations at IFPA that were attended by GRAPPA members are provided here.

The Collateral Damage: Comorbidities and Life Expectancy (Joel Gelfand, University of Pennsylvania, Philadelphia, PA, USA)

Dr. Gelfand introduced the concept of comorbidities in psoriasis in the first plenary of the conference. He explained why psoriasis may be a systemic inflammatory disease, citing profound immune abnormalities and elevated inflammatory markers in patients with psoriasis, coupled with the fact that many patients with psoriasis are undertreated and continue to have a significant burden of disease. He highlighted the association of psoriasis with multiple known CV risk factors and discussed his work investigating psoriasis as an independent, additional risk factor. The research, first published in JAMA in 2006, used a United Kingdom general practice database to examine the association between psoriasis and myocardial infarction (MI), stroke, and CV mortality. Results confirmed a 50% increased risk of mortality and higher levels of MI and stroke in patients with psoriasis, independent of standard CV risk factors[1]. Although this association has since been supported in a number of confirmatory studies, Dr. Gelfand said they do not prove causality, and further research is required. In particular, interven-

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tional studies are required to determine if aggressive treatment of psoriasis can lower the risk of major morbidities.

The Outcasts: Living with Stigmatization (Gerhard Schmid-Ott, Department of Psychosomatic Medicine, Berolina Clinic Löhne and Hannover Medical School, Hannover, Germany)

Dr. Schmid-Ott discussed living with stigmatization and the strong impact that social exclusion has on the quality of life of patients with psoriasis. He said that psychosomatic aspects are more common in psoriasis, and discussed common quality-of-life measurement tools like the Dermatology Life Quality Index (DLQI). He reported findings from his study comparing psoriasis and atopic dermatitis patients with comparable sociodemographic characteristics. In results from a "Questionnaire on Experience with Skin Complaints"[2], it was observed that stigmatization and quality of life were not significantly different in these 2 diseases, a result that stands in contrast to previous observations.

Dr. Schmid-Ott also showed interesting data on the influence of psychosocial stress situations on psychobiological mechanisms under experimental conditions and how they result in different immunologic effects in psoriatic individuals compared to healthy men[3]. He suggested that dealing with stigmatization is a constant challenge and that it is now time to address this[4]. Additional educational effort is needed to promote public acceptance of psoriasis in order to reduce stigmatization. He concluded by quoting R. v. Weizsäcker: "There is no norm for human beings, it is normal to vary."

Stressing Psoriasis: The Psychosocial Impact (Francesca Sampogna, Dermatological Institute IDI-IRCCS, Rome, Italy)

Dr. Sampogna advanced the discussion of the psychosocial impact of psoriasis, explaining how psoriasis causes psychological as well as social problems and how the affected individual enters a vicious cycle, finally leading to unhealthy behavior, comorbidities, and exaggeration of disease symptoms — all of which make up the real burden of psoriasis. She highlighted a review by Alexa Kimball on the psychosocial burden of psoriasis[5], and referred to her own extensive experience on the negative influence of psoriasis in daily life, social activities, sexuality, occupation, and finances[6]. Emotional stress is accompanied by coping and avoidance strategies and is associated with patients' experiences or impressions of being evaluated exclusively on the basis of their skin. Dr. Sampogna concluded that inclusion of psychosocial morbidity measures during assessment of psoriasis severity is essential.

Making It Worse: Triggers and Risk Factors for Psoriasis and Psoriatic Arthritis (Luigi Naldi, Centro Studi GISED, Bergamo, Italy)

Dr. Naldi explained triggers and risk factors for psoriasis and psoriatic arthritis (PsA). He cited work by Grjibovski, *et al*, where the best model of heritability in psoriasis showed that additive genetic effects can explain 66% of the variations in the liability for the disease, and that the remaining 34% of variations are due to non-shared environmental influences[7]. He reported data from his own studies as well as other publications to document the relevance of common triggers and risk factors like obesity, smoking, infections, medications, and stressful life events for psoriasis along with a heritable background[8,9,10,11,12]. He also briefly mentioned the influence of environmental risk factors and the CV risk in PsA[13,14]. He concluded that in the future, it will be necessary to distinguish affected individuals according to their phenotype, their risk profile, and their genotype[15].

Patient Education: What Do Psoriasis Patients Need to Learn? (Anne Lene Krogstad, Rikshospitalet, Oslo, Norway)

Dr. Krogstad noted that targeted education should help psoriasis patients to improve self-management of their condition. She highlighted how the complexities of disease mechanisms affect disease management and how they depend on several factors. Healthcare workers and patient organizations both have an important role to play.

Dr. Krogstad quoted Gordon[16], saying that although evidence-based data on education status and clinical outcomes in skin disease are rare, the assumption is probably correct that the more knowledgeable patients are about their disease, the more favorable their disease course will be. Dr. Krogstad showed data substantiating that patients who are members of the National Psoriasis Foundation are generally better informed and more satisfied with available treatment options than non-member patients[17]. She also discussed an Italian survey of patients' opinions on the best sources for disease information, which included the general practitioner, the dermatologist, the Internet, and patients' organizations[18]. Results showed that 95.7% of psoriasis patients think their dermatologist is the best source for treatment information; however, 96.4% believe that patients need more information concerning therapy options[9].

Early Diagnosis of Psoriatic Arthritis: Is Enthesitis the Primary Lesion? (Philip Helliwell, Senior Lecturer, University of Leeds, Leeds, UK)

Dr. Helliwell presented a summary of enthesitis in psoriatic disease. He noted that the importance of the enthesis in inflammatory arthritides had been well recognized for many years[19], and that knowledge in this field has increased dramatically recently. McGonagle, *et al* hypothesized that the enthesis may be the primary site of inflammation in PsA, as opposed to rheumatoid arthritis (RA), where inflammation is thought to originate in the synovium[20]. Interestingly, Gisondi, *et al* have identified a high prevalence of subclinical enthesitis in patients with skin psoriasis compared to other patients with dermatologic conditions[21].

Dr. Helliwell also outlined the clinical and imaging modalities used to evaluate enthesitis and reviewed their

validity. A number of clinical enthesitis tools are currently in use, but only one was developed specifically for PsA, the Leeds Enthesitis Index (LEI)[22]; it has been shown to be reliable[23] and to have a significant effect size in clinical trials[22]. Imaging is increasingly being used to investigate enthesitis. Ultrasound can identify tendon thickening and increased power Doppler signal, while new magnetic resonance imaging (MRI) techniques, such as ultra-short echo time scanning, allow tendon visualization[24]. Recently, clinical and ultrasound assessments of enthesitis were compared in cohorts of PsA and RA patients; the study found a poor correlation between clinical tenderness and ultrasound enthesitis, and surprisingly, found a higher prevalence of enthesitis in patients with RA[25].

Dr. Helliwell summarized the key future research areas: improving our understanding of the significance of enthesitis using longitudinal studies, and further developing imaging techniques that may help to visualize structures that are central to disease pathogenesis.

Looking At It: Psoriasis and Eye Disease (James Rosenbaum, Oregon Health and Science University, Portland, OR, USA)

Dr. Rosenbaum presented an overview of eye disease in PsA. Although uveitis is a feature in many of the spondyloarthritides (SpA), he highlighted the differential presentation of the disease in patients with PsA. The prevalence of uveitis in PsA is slightly lower than that in other forms of SpA, but approached 25% in one series[26]. Key differences can be identified in the type of uveitis observed in different forms of SpA. In general, patients with PsA who develop uveitis are 5 times more likely to develop bilateral uveitis, in contrast to patients with ankylosing spondylitis (AS); further, the onset of disease is more commonly insidious, with chronic disease seen in a higher proportion of patients. Importantly, the prevalence of posterior uveitis in addition to the more common anterior uveitis seen in the SpA is higher than that seen in AS[27]. This has important diagnostic and treatment implications; posterior pole involvement often requires a detailed ophthalmological examination because patients with retinal disease more likely require more invasive and systemic treatment than topical eye drops.

Dr. Rosenbaum also reviewed subsets of patients with PsA at higher risk for uveitis. Despite the common association between AS and uveitis, Paiva, *et al*[27] found that patients with peripheral PsA or a mixed presentation of axial and peripheral disease were more likely to develop uveitis than those with a pure axial form of the disease. This is in contrast to other work by Queiro, *et al*[28,29], who found that uveitis in PsA was associated with axial involvement. The role of HLA-B27 is less clear. The presence of this antigen is less common in PsA than in AS, and Paiva, *et al*[27] confirmed a lower prevalence of HLA-B27 positivity in patients with arthritis, psoriasis, and uveitis compared to the mixed-SpA group. Interestingly, all the patients with axial PsA and uveitis were HLA-B27-positive, in contrast to none of the patients with peripheral PsA[27]. Queiro, *et al* found an association between HLA-B27 positivity and the presence of uveitis in univariate analysis, but this association was lost in multivariate analysis, where only significant axial disease was a predictor of uveitis[29].

Standing Straight: Spinal Disease in Psoriasis (Vinod Chandran, University of Toronto, Toronto, Canada)

Dr. Chandran presented a summary of spinal disease in PsA on behalf of his colleague, Dafna Gladman. He first addressed the prevalence of spinal PsA. There is no clear definition of spinal involvement in PsA; therefore, the estimates of prevalence vary significantly between 25% and 70% depending on how involvement was defined. Examining the Toronto observational cohort, about one-fourth of their patients had spinal PsA; with further analysis, Dr. Chandran and colleagues identified clinical risk factors for spinal PsA.

Dr. Chandran also reviewed the assessment tools for spinal PsA and compared their validity in AS and PsA. The INSPIRE study (INternational SPondyloarthritis Inter-observer Reliability Exercise), organized by GRAPPA, compared the use of spinal metrology in AS and axial PsA, and showed similar agreement between observers in both conditions. Newer work has investigated the use of radiological spinal scoring systems in axial PsA, and a new scoring system called the PsA Spondylitis Radiology Index (PASRI) has now been developed. Further validation work is required, particularly addressing sensitivity to change, before this can be recommended for use. Finally, Dr. Chandran reviewed the prognosis for patients diagnosed with axial SpA, again using data from the Toronto cohort. He confirmed that patients continue to show radiographic progression with worsening metrology and ongoing inflammatory back pain.

Psoriasis Through Generations: The Genetic Predisposition of Psoriasis and Psoriatic Arthritis (James T. Elder, Department of Dermatology, University of Michigan, Ann Arbor, MI, USA)

Prof. Elder gave a keynote lecture about the genetic predisposition of psoriasis and PsA. He explained that in polygenic disorders, disease alleles are typically common, non-catastrophic, and of ancient origin and are best identified by case-control studies. Although the genetic burden of psoriasis differs from patient to patient, there are some generally accepted facts: in more than one-third of patients, a first-degree relative is affected; and psoriasis itself is 5–10 times more common in patients with affected relatives. From 60% to 90% of the risk-variability for psoriasis is due to genetic factors, and early-onset cases show stronger human leukocyte antigen (HLA) association and familial inheritance. Interestingly, PsA has even more of a genetic character than cutaneous psoriasis.

Psoriasis has a polygenic heredity. Prof. Elder explained

that in polygenic disorders, the disease alleles are common, not catastrophic. Some gene-environment interactions are known, and environmental triggers represent common examples. He said that the allele mix we inherit determines the nature and severity of skin lesions and the extent and type of arthritis in psoriasis. Association and genome-wide association studies (GWAS) are the tools of choice to investigate polygenic disorders. For psoriasis, a Collaborative Association Study of Psoriasis (CASP) was done, which included a genome-wide association scan of 450,000 single-nucleotide polymorphisms in 1359 cases and 1400 controls and a followup assessment of the top 18 "hits" in 5048 cases and 5051 controls. Per Nair, *et al*[30], results from these studies showed that 7 of 18 hits were replicated with genome-wide significance in psoriasis. Prof. Elder also reviewed the results of a GWAS in PsA and its association with confirmed CASP hits: for PsA, a genome-wide significance was found for 3 loci (HLA-C, IL12B, and TNIP1). For the genetic susceptibility in psoriasis, HLA-C was found to be very important[31] as well as 1ß1 integrin (VLA-1)[32]. The detection of interplay of Th17 and Th1 cells and their cytokines led to the assumption that psoriasis is a Th1/Th17-polarized disease, in contrast to atopic dermatitis, for example, which is Th2-polarized. Prof. Elder concluded that the variety of predisposing genetic factors emerging from current research is reflected by the complex immune processes that are involved in psoriasis.

Family Members and Partners: First-degree Sufferers (Andrew Finlay, Cardiff University, Wales, UK)

Prof. Finlay addressed the psychosocial effects of psoriasis on family members of patients. The secondary effect of skin disease on family is reflected in extra time spent on housework (70% of patients), impaired daily activities (37%), social or holiday/sport disruption (55% and 44%, respectively), and finally psychological pressures (57%)[33]. The impaired quality of life in family and partners can be assessed with a tool called the Family Dermatology Life Quality Index (FDLQI), developed by Basra, *et al*[34]. A large field of possibly disturbed areas is investigated using 10 questions involving emotional distress, leisure activities, physical well-being, the burden of care, relationships, housework, reactions of others, occupation or study, social life, and expenditure. Prof. Finlay concluded that the huge secondary effect of a skin disease like psoriasis on the family implies a need for new strategies; for example, educational programs for children or partners.

Family Planning and Psoriasis Treatment: Contraception, Pregnancy, and Lactation (Alexa Kimball, Harvard Medical School, Vice Chair of Dermatology, Massachusetts General Hospital, Boston, MA, USA)

Dr. Kimball discussed pregnancy and lactation in women with psoriasis. She said that because data on pregnancy and lactation and psoriasis are limited, the evaluation of risk associated with various treatment options is difficult. Disease severity in psoriasis is unpredictable in pregnancy: about 50% of patients improve, but 15%–25% worsen. Psoriasis often gets worse in the postpartum phase, usually within 4 months of delivery. The development of a generalized pustular psoriasis is problematic; it can be provoked by premenstrual hormonal changes, pregnancy, high-dose estrogen therapy, or withdrawal of systemic steroids[35]. Prof. Kimball reported a treatment algorithm for pregnant women that included the recommendation to avoid systemic medication in the first trimester. Topical treatments that should generally be avoided during pregnancy include anthralin, calcipotriene, and coal tar, whereas systemic agents that are not allowed include methotrexate, systemic retinoids, and psoralen plus UV-A light (PUVA). During breast-feeding, petroleum jelly and low-potency topical corticosteroids could be used as first-line therapies. Prof. Kimball emphasized the importance of monitoring therapy during the first trimester, but said that further evaluation of risks is complicated because of the lack of data.

Psoriasis and Psoriatic Arthritis in Childhood: Therapeutic Challenges (Amy Paller, Dermatology, and Professor of Pediatrics, Northwestern University Feinberg School of Medicine, Chicago, IL, USA)

Prof. Paller spoke of the therapeutic challenges in psoriasis and PsA in children. Psoriasis has a strong influence on pediatric patients and family members. The Children's Dermatology Life Quality Index (CDLQI) could serve as a possible measurement tool for impairment of quality of life[36]. Prof. Paller said the emotional outcome depends on the individual personality and sensitivity; it is important that the parents encourage healthy psychosocial development and promote effective therapy in their children, who need to accept their disorder. Education on the course of the disease, trigger factors, Koebner phenomenon, treatment, and social behavior for children, adolescents and parents is mandatory. She also gave a detailed overview of the existing data for the treatment of psoriasis, guttate psoriasis, and early pustular psoriasis in children, and highlighted the risks to develop metabolic disease for affected individuals. Few safety data on topical or systemic therapies in children exist, and further investigations on childhood psoriasis are warranted. The results of genetic studies may increase understanding of mechanisms in childhood and suggest new interventions. Prof. Paller showed an example of how interleukin 1 receptor (IL-1R) antagonist mutations may be of interest in early-onset pustular psoriasis[37]. She called for clinical studies that could evaluate the implications and prevention of metabolic effects in childhood psoriasis. She concluded that education of primary care physicians can help to prevent the common problem: that psoriasis often stays unrecognized in children.

Cytokines and Synovial Biology (Iain McInnes, Professor of Experimental Medicine and Rheumatology, University of Glasgow, Glasgow, Scotland)

Prof. McInnes discussed cytokines and synovial biology in

PsA. He focused on one molecule, ST2, and on the role of interleukin 33 (IL-33) in synovial membranes. ST2 is an orphan IL-1 receptor. It has been described as a negative regulator of Toll-like receptor-IL-1 receptor signaling, but it also functions as an important effector molecule of T helper type 2 responses. IL-33 is a member of the IL-1 family and mediates its biological effects via the IL-1 receptor ST2, activating nuclear factor- B and MAP kinases and driving production of TH2-associated cytokines from *in vitro* polarized TH2 cells. *In vivo*, IL-33 induces the expression of IL-4, IL-5, and IL-13[38].

Prof. McInnes discussed several studies of IL-33 and ST2 in DBA/1 mouse models and RA synovial membranes. The administration of sST2 decreased the production of inflammatory cytokines and the severity of collagen-induced arthritis (CIA) in a study by Leung, *et al*[39]. In another study, mice deficient in ST2 had an attenuated form of CIA, which was restored by administration of IL-33 in ST2-deficient mice engrafted with wild-type mast cells, suggesting that the effects of IL-33 may be mediated by stimulation of mast cells[40].

In another study in a CIA mouse model, IL-33 mRNA expression increased in the paws of mice with CIA during the inflammatory early phase of the disease. Administration of neutralizing anti-ST2 antibodies reduced the severity of the arthritis and the production of interferon-γ (IFN-γ) by lymph node cells stimulated *ex vivo*. IL-1ß and TNF-α induced the production of IL-33 by synovial fibroblasts in culture[41]. Further, IL-33 is present in endothelial cells in normal human synovial tissue, and its expression has also been detected in synovial fibroblasts and CD68-positive cells in the synovium of RA patients[42].

Of interest is the recent discovery of IL-33 expression in murine and human vascular structures, which raises the question of whether systemic release of soluble ST2 in inflammatory arthropathies could influence atherosclerosis. In apolipoprotein E-deficient mice fed with a high-lipid diet, an experimental model of atherosclerosis, IL-33 markedly reduced the severity of aortic lesions via induction of Th2 responses such as IL-5. In contrast, the administration of sST2 led to opposite results, with significantly increased atherosclerotic plaque thickness[43].

IL-33 appears to have biphasic activities linking T cells, synovial fibroblasts, and mast cell biology in the synovium. Prof. McInnes said future studies might reveal more about the role of IL-33 in cutaneous inflammation. Perhaps it functions as an endogenous alarmin in skin as well as in synovium. Or perhaps its role is different depending on disease progression: it might function as an alarmin in early disease, allowing an inflammatory response; and in established disease, it might have a proinflammatory role, in which sST2 release causes comorbidity.

Hit Hard and Early: Can Progression of Psoriasis Be Prevented? (Neil McHugh, Consultant Rheumatologist, Royal National Hospital for Rheumatic Diseases; Senior Lecturer, Department of Medical Sciences, University of Bath, Bath, UK)

Prof. McHugh spoke about preventing progression and possible treatment regimens in PsA. He defined disease progression as a triangle of disease activity, damage (musculoskeletal, psychosocial, and CV), and patients' perception as measured by patient-reported outcomes.

Measurement of disease progression, therefore, makes measuring these different aspects necessary. Musculoskeletal progression can be measured by imaging and questionnaires measuring physical function, e.g., the Health Assessment Questionnaire (HAQ). Psychosocial disease progression can be measured by health utility and work impairment. One study found 33% work disablement in a cohort of 271 patients with PsA aged 18 to 45 years[44].

Cardiovascular progression as measured by carotid artery intima-media thickness (IMT) was shown to be increased in a cohort of 59 patients with PsA. These patients were compared to ethnically matched controls and had no CV risk factors or clinically evident CV disease[45]. It appears that treatment with TNF inhibitors can also influence CV risk factors and thereby CV disease progression. In a double-blind study in 127 patients with PsA, TNF blockade with onercept significantly decreased lipoprotein(a) and homocysteine levels and elevated apolipoprotein AI and sex hormone-binding globulin concentrations. However, these are only putative risk factors for CV disease[46].

As for optimizing treatment regimens in PsA, Prof. McHugh said it makes sense from a clinical perspective that just as in RA, tight control of inflammation and early treatment with biological agents can delay progression of joint disease and axial disease and perhaps other manifestations of PsA as well. However, no study of tight disease control versus usual care has been performed in PsA to date.

Members of GRAPPA have developed treatment recommendations for peripheral arthritis, axial disease, psoriasis, nail disease, dactylitis, and enthesitis in the setting of PsA. Nineteen treatment recommendations were drafted for each of the clinical manifestations by rheumatologists, dermatologists, and PsA patients based on the literature reviews and consensus opinion, and over 80% agreement was obtained on 16 of them. In addition, a grid that factors disease severity into each of the different disease manifestations was developed to help the clinician with treatment decisions for the individual patient from an evidence-based perspective. Periodic updates of these recommendations will be made as new data become available[47].

Can Efficient Treatment of Psoriasis Prevent Inflammation-related Comorbidities? Lessons from Rheumatoid Arthritis (Oliver FitzGerald, Newman Clinical Research Professor, St. Vincent's University Hospital and the Conway Institute, University College, Dublin, Ireland)

Prof. FitzGerald discussed comorbidity issues in the treat-

ment of PsA and differences with regard to comorbidities between patients with psoriasis and those with PsA. The prevalence of obesity and the metabolic syndrome have been poorly studied in PsA. It is not clear whether obesity is as prevalent in PsA as it is in psoriasis. It also appears likely that PsA and psoriasis patients have a different genetic susceptibility to comorbidities. Multiple studies have shown that skin activity scores are lower in PsA patients than in psoriasis, and in genetic studies the HLA-B alleles differ in PsA cohorts. The Cw*0602 allele is not as prevalent in PsA as in psoriasis[48]; in contrast, HLA-B7 and -B27 are far more prevalent in PsA than in psoriasis[48,49].

As for comorbidities, uveitis occurs in about 30% of patients with SpA. It can be recurrent and lead to visual impairment. Monoclonal anti-TNF treatment is probably more effective than TNF receptor antagonists.

Cardiovascular disease was the leading cause of death in a cohort of Canadian patients with PsA[50]. An increased prevalence of CV risk factors in PsA patients has been found in a number of studies[14,50,51]. In a study by Kimhi, *et al*, PsA had a higher prevalence of subclinical atherosclerosis as measured by IMT than healthy controls[52]. In a study that Prof. Fitzgerald's group performed, IMT was measured in groups of patients with RA and PsA and in healthy controls. In contrast to the previous study, they found that IMT measurements were equal in the patients with PsA and the healthy controls; however, IMT was increased in male patients with RA.

At the moment, there are no clear guidelines for CV risk management in inflammatory systemic diseases. In a recent review by Kaplan, a useful strategy for the management of CV risk in RA and SLE was suggested[53]. For patients considered at high risk according to general guidelines for assessment of CV risk or for those with specific CV risk factors in addition to autoimmunity, specialized testing might be necessary. This could include 24-hour monitoring of ambulatory blood pressure, stress tests, or echocardiography, but until clear guidelines exist for inflammatory diseases, the need for these tests remains unclear.

Psoriasis and Psoriatic Arthritis: Can Remission Be Achieved? (Philip Mease, Director of Rheumatology Research, Swedish Medical Center, and Clinical Professor, University of Washington, Seattle, WA, USA; president of GRAPPA)

Dr. Mease discussed the issue of achievement of remission in PsA and psoriasis. Resounding themes in RA management are (1) that achievement of disease remission is an achievable goal with early and aggressive therapy, especially with the more effective biologic agents currently available; (2) that treating to remission yields superior outcomes in terms of function, quality of life, inhibition of joint damage, and possibly reduction of comorbidities, with potential consequences regarding morbidity and mortality; and (3) that an important element in the achievement of remission, besides use of effective medications, is the measurement of disease activity and treating to a measurable target[54,55]. Rheumatologists, knowledgeable about this paradigm in RA, are inclined to approach PsA in a similar fashion, but are still trying to determine what constitutes remission in PsA and how to measure it. Joint damage can occur even when clinical symptoms appear quiescent due to "smoldering" synovitis, so it is important to understand if normalization of inflammatory markers and absence of clinical evidence of joint, entheseal, spine, and skin inflammation accurately reflects a state of remission, or whether "imaging" remission, i.e., absence of signs of inflammation on ultrasound or MRI, is also necessary. The task for dermatologists assessing the skin is more straightforward: psoriasis lesions are visible and when they clear, one can be confident they are clear and do not leave scars. Well established and validated quantitative disease activity measures in RA include the Disease Activity Score (DAS) and its associated EULAR Responder Index and derived simpler measures such as the Simplified Disease Activity Score (SDAI) and Clinical Disease Activity Score (CDAI)[56]. All have specified thresholds for low disease activity and remission that, if achieved, provide a quantitative sense of whether a target has been reached. It should be noted that "remission" in these systems may represent quiescent but not absent disease activity, whereas more objective documentation of absence of disease activity may require ultrasound or MRI evidence of absence of synovitis. Also, none of these definitions of remission requires that the patient be off therapy. Sustained remission off therapy is not easy to achieve.

In PsA, it tends to be assumed but is not yet known that "treating to target" yields optimal outcomes. Also, although in some studies the DAS scoring systems have been applied to questions like "can remission be achieved?", this RA scoring system may not be appropriate in terms of quantitative threshold and does not characterize the additional clinical domains of PsA, enthesitis, dactylitis, spine, and skin disease. GRAPPA and other groups are actively trying to ascertain if a composite disease activity score addressing all clinical domains of PsA can be developed that can be easily performed and identify the influence of each domain on outcomes[57,58]. A measure for defining "minimal disease activity" (MDA) in PsA has been developed. Coates, *et al*[59] led an exercise among GRAPPA members, based on reviewing hypothetical cases, which led to the definition of MDA criteria as 5/7 of the following elements: tender joint count ≤ 1, swollen joint count ≤ 1, Psoriasis Area and Severity Index ≤ 1 or body surface area ≤ 3, patient pain visual analog scale (VAS) score ≤ 15, patient global activity VAS ≤ 20, Health Assessment Questionnaire ≤ 0.5, and tender entheseal points ≤ 1[59]. These criteria were validated by assessing patients in Gladman's patient cohort in Toronto[60] and in interventional trial datasets[61]. Development of this instrument is a step toward "treatment to target" in PsA.

In a review of studies on remission in PsA, de Vlam, *et al* stated, "At this time, specific tools to define PsA remission are not available. New assessments to define remission must be developed and incorporated into clinical trials and longitudinal registries"[62]. In one of the most substantial efforts to assess this, and typical of other studies, Cantini, *et al*[63] observed 236 PsA and 268 RA patients over 5 years. Remission was defined by the more stringent 1981 ACR criteria of 0 tender and swollen joints; normal erythrocyte sedimentation rate and C-reactive protein; fatigue; pain < 10; stiffness ≤ 15 minutes; and additionally, absent dactylitis, enthesitis, and inflammatory spinal pain. Remission was noted in 24% of PsA patients, enduring a mean of 13 months, and up to 12 months after interruption of therapy, whereas remission was observed in only 7.5% of RA patients, lasting 4 months, and just 3 months after interruption of therapy. This suggests that remission may be more likely and achievable in PsA than in RA. Further, remission was more likely to be achieved in patients receiving anti-TNF therapy than oral disease-modifying antirheumatic drugs. No baseline characteristics predicted who would achieve remission[63]. It is encouraging to know that with more effective medicines for PsA, such as the anti-TNF therapies, it may be more likely to achieve remission in an enduring way, even off therapy, in PsA than in RA.

The Economic Burden of Psoriasis and PsA (Arthur Kavanaugh, University of California, San Diego, CA, USA)
Dr. Kavanaugh summarized the economic burden of psoriatic disease as well as recent work that examined the cost-benefit of treatments, particularly the biologic drugs. He examined the impact of psoriatic disease in terms of both quality of life and cost burden, and he highlighted the work of Rapp and colleagues[64] who recently examined the influence of major medical conditions on many patients' quality of life. Very few medical problems had a larger negative effect on quality of life than psoriasis; it was also found that patients with psoriasis plus arthritis had an even greater impairment of physical functioning compared to those with psoriasis alone[64]. The significant costs of psoriasis and PsA were outlined; first, the direct costs including physician appointments, hospitalizations, and treatment costs[65], and then the indirect costs. The indirect costs are far more difficult to assess and include costs of treatment to the patient and family, effects on work and associated income (including absenteeism and presenteeism), and the intangible costs associated with the influence on quality of life, mood, and social participation[66].

These indirect costs can be calculated by 2 primary approaches, termed human capital and friction cost. The human capital approach measures the potential wealth lost by society as a whole due to the disease, e.g., all the potential lost earnings related to sick days, permanent disablement, or premature death. The friction cost approach, however, considers that short-term absences from work may not be so costly because work can be made up or covered by a colleague. Replacement of a worker due to medical retirement may employ someone previously receiving unemployment benefits, thereby partially offsetting the cost of the disease. Thus, the friction cost approach returns a lower figure[67].

Huscher, *et al*[68] estimated the direct and indirect costs of PsA using German rheumatology registry data. The direct costs (estimated in 2002) were €3,156, of which approximately one-third were drug costs and one-third hospital costs. The indirect costs were estimated at €11,075 using the human capital approach or €5,570 using the friction cost approach. The researchers found that the costs were related to patients' functional status as measured by the HAQ, with progressive impairment causing significantly higher indirect costs[68].

Multiple studies have addressed the use of TNF inhibitors in PsA and their effects on health economics outcomes. TNF inhibitors have been shown to reduce absenteeism from work and to improve productivity when at work[69,70]. Depending on the methods used and the study data analyzed, results for a cost per quality-adjusted life year (QALY) related to TNF-blocking therapy varied between £15,000 and nearly £50,000[71,72,73,74]. This massive variation results principally from the approach used to estimate effects on costs and is crucial, because cost per QALY is used by many healthcare providers and systems to assess the cost-effectiveness of therapies.

Dr. Kavanaugh concluded that future considerations may alter these estimations of cost-effectiveness. As more TNF inhibitors and other biological drugs become available, the costs may fall, and generic biologics may be available in years to come. Many companies are considering programs to support free initial treatment to incentivize prescription of their particular drug, which could affect cost-effectiveness if only the responsive patients continue using the drug beyond the free period. Further research may allow us to assess additional effects of therapies, such as the effect on comorbidities, which are significant in PsA. The possibility of personalized medicine in the future, with biomarkers or genetic tests predicting the ideal treatment for individual patients, would also allow a significant increase in the cost-effectiveness of therapies in PsA.

Imaging: Assessing Severity and Activity of Psoriatic Arthritis by Ultrasonography, MRI, and CT (Fiona McQueen, University of Auckland, Auckland, New Zealand)
Prof. McQueen provided an overview of imaging in PsA, including work from MRI, ultrasound, and CT. She reviewed an interesting case of a patient with PsA who manifested both extensive bone resorption and new bone formation. He developed the arthritis mutilans subtype of PsA with significant damage and resorption to the phalanges of both hands and feet. Subsequently, he complained of myelopathic symptoms, and an MRI showed extensive bone pro-

liferation with bridging in the cervical spine, in complete contrast to the phenotype of his disease seen peripherally. The presence of different features of altered bone remodeling at different sites is a frequent finding in PsA.

Prof. McQueen highlighted the advantages of MRI in visualizing many of the different features of PsA, including synovitis and tenosynovitis as seen in RA, but also extracapsular inflammation with soft-tissue edema seen more frequently in PsA, and bone edema, which appears to be seen almost exclusively in PsA rather than RA[75]. She also discussed the extensive involvement of all the tissues seen in MRI studies of dactylitis, with all of these features visible in involved digits[76]. A study of MRI in subtypes of PsA was also discussed. Bone edema MRI score was higher in those PsA patients with arthritis mutilans compared to those with other forms of PsA, and this was associated with radiographic erosive damage[77].

Prof. McQueen then discussed the OMERACT (Outcome Measures in Rheumatology Clinical Trials) MRI in Inflammatory Arthritis Group initiative to develop an MRI scoring system for PsA (PsAMRIS). She reviewed the development of the scoring system[78], which is modeled on the RAMRIS score (RA MRI score) already developed and validated in RA, but which also scores additional features typically seen on MRI in PsA. The PsAMRIS system scores multiple pathologies seen on MRI, scoring involvement in the metacarpals and interphalangeals of the fingers as well as bone and soft-tissue involvement in the second to fifth digits. She also summarized the recent validation work, which confirmed a reasonable interreader reliability and sensitivity to change for this score[79]. Further validation work is under way.

Prof. McQueen briefly reviewed ultrasound in PsA and its ability to identify enthesitis, synovitis, and bone erosions, as well as work comparing its sensitivity to MRI in PsA[80]. A topical report by Gisondi, *et al* showed the high prevalence of ultrasound-identified enthesitis in patients with psoriasis only when compared to other dermatology patients, which raised the issue of possible identification of subclinical disease using sensitive imaging techniques. Finally, Prof. McQueen summarized the use of a range of imaging modalities in PsA and the individual disease features that can be identified with each of these approaches.

Conclusion

The 2009 IFPA meeting brought together world leaders in psoriatic disease with key presentations particularly related to the effects and comorbidities associated with psoriatic disease. IFPA members are currently planning a third World Psoriasis and Psoriatic Arthritis Conference in 2012.

REFERENCES

1. Gelfand JM, Neimann AL, Shin DB, Wang X, Margolis DJ, Troxel AB. Risk of myocardial infarction in patients with psoriasis. JAMA 2006;296:1735-41.
2. Schmid-Ott G, Burchard R, Niederauer HH, Lamprecht F, Kunsebeck HW. [Stigmatization and quality of life of patients with psoriasis and atopic dermatitis]. Hautarzt 2003;54:852-7.
3. Schmid-Ott G, Jaeger B, Boehm T, Langer K, Stephan M, Raap U, et al. Immunological effects of stress in psoriasis. Br J Dermatol 2009;160:782-5.
4. Henderson C, Thornicroft G. Stigma and discrimination in mental illness: Time to change. Lancet 2009;373:1928-30.
5. Kimball AB, Jacobson C, Weiss S, Vreeland MG, Wu Y. The psychosocial burden of psoriasis. Am J Clin Dermatol 2005;6:383-92.
6. Sampogna F, Gisondi P, Tabolli S, Abeni D. Impairment of sexual life in patients with psoriasis. Dermatology 2007;214:144-50.
7. Grjibovski AM, Olsen AO, Magnus P, Harris JR. Psoriasis in Norwegian twins: contribution of genetic and environmental effects. J Eur Acad Dermatol Venereol 2007;21:1337-43.
8. Naldi L, Parazzini F, Brevi A, Peserico A, Veller Fornasa C, Grosso G, et al. Family history, smoking habits, alcohol consumption and risk of psoriasis. Br J Dermatol 1992;127:212-7.
9. Naldi L, Parazzini F, Peli L, Chatenoud L, Cainelli T. Dietary factors and the risk of psoriasis. Results of an Italian case-control study. Br J Dermatol 1996;134:101-6.
10. Naldi L, Peli L, Parazzini F. Association of early-stage psoriasis with smoking and male alcohol consumption: evidence from an Italian case-control study. Arch Dermatol 1999;135:1479-84.
11. Naldi L, Peli L, Parazzini F, Carrel CF. Family history of psoriasis, stressful life events, and recent infectious disease are risk factors for a first episode of acute guttate psoriasis: results of a case-control study. J Am Acad Dermatol 2001;44:433-8.
12. Naldi L, Chatenoud L, Linder D, Belloni Fortina A, Peserico A, Virgili AR, et al. Cigarette smoking, body mass index, and stressful life events as risk factors for psoriasis: results from an Italian case-control study. J Invest Dermatol 2005;125:61-7.
13. Pattison E, Harrison BJ, Griffiths CE, Silman AJ, Bruce IN. Environmental risk factors for the development of psoriatic arthritis: results from a case-control study. Ann Rheum Dis 2008;67:672-6.
14. Tam LS, Tomlinson B, Chu TT, Li M, Leung YY, Kwok LW, et al. Cardiovascular risk profile of patients with psoriatic arthritis compared to controls — the role of inflammation. Rheumatology 2008;47:718-23.
15. Guinot C, Latreille J, Perrussel M, Doss N, Dubertret L. Psoriasis: characterization of six different clinical phenotypes. Exp Dermatol 2009;18:712-9.
16. Gordon KB. Patient education and advocacy groups: a means to better outcomes? Arch Dermatol 2005;141:80-1.
17. Nijsten T, Rolstad T, Feldman SR, Stern RS. Members of the National Psoriasis Foundation: More extensive disease and better informed about treatment options. Arch Dermatol 2005;141:19-26.
18. Altobelli E, Maccarone M, Petrocelli R, Marziliano C, Giannetti A, Peris K, et al. Analysis of health care and actual needs of patients with psoriasis: A survey on the Italian population. BMC Public Health 2007;7:59.
19. Ball J. Enthesopathy of rheumatoid and ankylosing spondylitis. Ann Rheum Dis 1971;30:213-23.
20. McGonagle D, Conaghan PG, Emery P. Psoriatic arthritis: a unified concept twenty years on. [see comment] [erratum appears in Arthritis Rheum 1999;42:1997]. Arthritis Rheum 1999;42:1080-6.
21. Gisondi P, Tinazzi I, El-Dalati G, Gallo M, Biasi D, Barbara LM, et al. Lower limb enthesopathy in patients with psoriasis without clinical signs of arthropathy: a hospital-based case-control study. Ann Rheum Dis 2008;67:26-30.
22. Healy PJ, Helliwell PS. Measuring clinical enthesitis in psoriatic arthritis: Assessment of existing measures and development of an instrument specific to psoriatic arthritis. Arthritis Rheum

2008;59:686-91.
23. Gladman DD, Inman RD, Cook RJ, Maksymowych WP, Braun J, Davis JC, et al. International spondyloarthritis interobserver reliability exercise — the INSPIRE study: II. Assessment of peripheral joints, enthesitis, and dactylitis. J Rheumatol 2007;34:1740-5.
24. Coates LC, McGonagle DM, Hodgson R, Gisondi P, Kavanaugh AF, Qureshi AA, et al. Imaging in psoriasis and psoriatic arthritis: GRAPPA 2008. J Rheumatol 2010;37:448-52.
25. Ibrahim GH, Groves C, Chandramohan M, Valle R, Beltran A, Reyes B, et al. Ultrasound validation of the Leeds Enthesitis Index in psoriatic arthritis. Ann Rheum Dis 2010; submitted.
26. Zeboulon N, Dougados M, Gossec L. Prevalence and characteristics of uveitis in the spondyloarthropathies: a systematic literature review. Ann Rheum Dis 2008;67:955-9.
27. Paiva ES, Macaluso DC, Edwards A, Rosenbaum JT. Characterisation of uveitis in patients with psoriatic arthritis. Ann Rheum Dis 2000;59:67-70.
28. Queiro R, Sarasqueta C, Belzunegui J, Gonzalez C, Figueroa M, Torre-Alonso JC. Psoriatic spondyloarthropathy: a comparative study between HLA-B27 positive and HLA-B27 negative disease. Semin Arthritis Rheum 2002;31:413-8.
29. Queiro R, Torre JC, Belzunegui J, Gonzalez C, De Dios JR, Unanue F, et al. Clinical features and predictive factors in psoriatic arthritis-related uveitis. Semin Arthritis Rheum 2002;31:264-70.
30. Nair RP, Duffin KC, Helms C, Ding J, Stuart PE, Goldgar D, et al. Genome-wide scan reveals association of psoriasis with IL-23 and NF-kappa B pathways. Nat Genet 2009;41:199-204.
31. Nair RP, Stuart PE, Nistor I, Hiremagalore R, Chia NV, Jenisch S, et al. Sequence and haplotype analysis supports HLA-C as the psoriasis susceptibility 1 gene. Am J Hum Genet 2006;78:827-51.
32. Conrad C, Boyman O, Tonel G, Tun-Kyi A, Laggner U, de Fougerolles A, et al. Alpha 1 beta 1 integrin is crucial for accumulation of epidermal T cells and the development of psoriasis. Nature Med 2007;13:836-42.
33. Eghlileb AM, Davies EE, Finlay AY. Psoriasis has a major secondary impact on the lives of family members and partners. Br J Dermatol 2007;156:1245-50.
34. Basra MK, Sue-Ho R, Finlay AY. The Family Dermatology Life Quality Index: measuring the secondary impact of skin disease. Br J Dermatol 2007;156:528-38.
35. Murase JE, Chan KK, Garite TJ, Cooper DM, Weinstein GD. Hormonal effect on psoriasis in pregnancy and post partum. Arch Dermatol 2005;141:601-6.
36. Beattie PE, Lewis-Jones MS. A comparative study of impairment of quality of life in children with skin disease and children with other chronic childhood diseases. Br J Dermatol 2006;155:145-51.
37. Aksentijevich I, Masters SL, Ferguson PJ, Dancey P, Frenkel J, van Royen-Kerkhoff A, et al. An autoinflammatory disease with deficiency of the interleukin-1-receptor antagonist. N Engl J Med 2009;360:2426-37.
38. Schmitz J, Owyang A, Oldham E, Song Y, Murphy E, McClanahan TK, et al. IL-33, an interleukin-1-like cytokine that signals via the IL-1 receptor-related protein ST2 and induces T helper type 2-associated cytokines. Immunity 2005;23:479-90.
39. Leung BP, Xu D, Culshaw S, McInnes IB, Liew FY. A novel therapy of murine collagen-induced arthritis with soluble T1/ST2. J Immunol 2004;173:145-50.
40. Xu D, Jiang HR, Kewin P, Li Y, Mu R, Fraser AR, et al. IL-33 exacerbates antigen-induced arthritis by activating mast cells. Proc Natl Acad Sci USA 2008;105:10913-8.
41. Palmer G, Talabot-Ayer D, Lamacchia C, Toy D, Seemayer CA, Viatte S, et al. Inhibition of interleukin-33 signaling attenuates the severity of experimental arthritis. Arthritis Rheum 2009;60:738-49.
42. Gabay C, McInnes IB. The biological and clinical importance of the 'new generation' cytokines in rheumatic diseases. Arthritis Res Ther 2009;11:230.
43. Miller AM, Xu D, Asquith DL, Denby L, Li Y, Sattar N, et al. IL-33 reduces the development of atherosclerosis. J Exp Med 2008;205:339-46.
44. Wallenius M, Skomsvoll JF, Koldingsnes W, Rodevand E, Mikkelsen K, Kaufmann C, et al. Work disability and health-related quality of life in males and females with psoriatic arthritis. Ann Rheum Dis 2009;68:685-9.
45. Gonzalez-Juanatey C, Llorca J, Amigo-Diaz E, Dierssen T, Martin J, Gonzalez-Gay MA. High prevalence of subclinical atherosclerosis in psoriatic arthritis patients without clinically evident cardiovascular disease or classic atherosclerosis risk factors. Arthritis Rheum 2007;57:1074-80.
46. Sattar N, Crompton P, Cherry L, Kane D, Lowe G, McInnes IB. Effects of tumor necrosis factor blockade on cardiovascular risk factors in psoriatic arthritis: a double-blind, placebo-controlled study. Arthritis Rheum 2007;56:831-9.
47. Ritchlin CT, Kavanaugh A, Gladman DD, Mease PJ, Helliwell P, Boehncke WH, et al. Treatment recommendations for psoriatic arthritis. Ann Rheum Dis 2009;68:1387-94.
48. Ho PY, Barton A, Worthington J, Plant D, Griffiths CE, Young HS, et al. Investigating the role of the HLA-Cw*06 and HLA-DRB1 genes in susceptibility to psoriatic arthritis: comparison with psoriasis and undifferentiated inflammatory arthritis. Ann Rheum Dis 2008;67:677-82.
49. Rahman P, Elder JT. Genetic epidemiology of psoriasis and psoriatic arthritis. Ann Rheum Dis 2005;64 Suppl 2:ii37-9; discussion ii40-1.
50. Gladman DD, Ang M, Su L, Tom BD, Schentag CT, Farewell VT. Cardiovascular morbidity in psoriatic arthritis. Ann Rheum Dis 2009;68:1131-5.
51. Han C, Robinson DW Jr, Hackett MV, Paramore LC, Fraeman KH, Bala MV. Cardiovascular disease and risk factors in patients with rheumatoid arthritis, psoriatic arthritis, and ankylosing spondylitis. J Rheumatol 2006;33:2167-72.
52. Kimhi O, Caspi D, Bornstein NM, Maharshak N, Gur A, Arbel Y, et al. Prevalence and risk factors of atherosclerosis in patients with psoriatic arthritis. Semin Arthritis Rheum 2007;36:203-9.
53. Kaplan MJ. Management of cardiovascular disease risk in chronic inflammatory disorders. Nat Rev Rheumatol 2009;5:208-17.
54. Bakker MF, Jacobs JW, Verstappen SM, Bijlsma JW. Tight control in the treatment of rheumatoid arthritis: efficacy and feasibility. Ann Rheum Dis 2007;66 Suppl 3:iii56-60.
55. Mease PM, Chernoff D. Tighter control in RA: exploring new paradigms. Semin Arthritis Rheum 2010; [in press].
56. Zatarain E, Strand V. Monitoring disease activity of rheumatoid arthritis in clinical practice: contributions from clinical trials. Nat Clin Pract 2006;2:611-8.
57. Schoels M, Aletaha D, Funovits J, Kavanaugh A, Baker D, Smolen JS. Application of the DAREA/DAPSA score for assessment of disease activity in psoriatic arthritis. Ann Rheum Dis 2010;69:1441-7.
58. Mumtaz A, Gallagher P, Kirby B, Waxman R, Coates LC, Veale D, et al. Development of a composite disease activity index in psoriatic arthritis [abstract]. Ann Rheum Dis 2010;69 Suppl:115.
59. Coates LC, Fransen J, Helliwell PS. Defining minimal disease activity in psoriatic arthritis: a proposed objective target for treatment. Ann Rheum Dis 2010;69:48-53.
60. Coates LC, Cook R, Lee KA, Chandran V, Gladman DD. Frequency, predictors and prognosis of sustained minimal disease activity in an observational psoriatic arthritis cohort. Arthritis Care Res 2010;62:970-6.
61. Coates LC, Helliwell PS. Validation of minimal disease activity for psoriatic arthritis using interventional trial data. Arthritis Care Res

2010;62:965-9.
62. de Vlam K, Lories RJ. Remission in psoriatic arthritis. Curr Rheumatol Rep 2008;10:297-302.
63. Cantini F, Niccoli L, Nannini C, Cassara E, Pasquetti P, Olivieri I, et al. Frequency and duration of clinical remission in patients with peripheral psoriatic arthritis requiring second-line drugs. Rheumatology 2008;47:872-6.
64. Rapp SR, Feldman SR, Exum ML, Fleischer AB Jr, Reboussin DM. Psoriasis causes as much disability as other major medical diseases. J Am Acad Dermatol 1999;41:401-7.
65. Javitz HS, Ward MM, Farber E, Nail L, Vallow SG. The direct cost of care for psoriasis and psoriatic arthritis in the United States. J Am Acad Dermatol 2002;46:850-60.
66. Ackermann C, Kavanaugh A. Economic burden of psoriatic arthritis. Pharmacoeconomics 2008;26:121-9.
67. Koopmanschap MA, Rutten FF, van Ineveld BM, van Roijen L. The friction cost method for measuring indirect costs of disease. J Health Econ 1995;14:171-89.
68. Huscher D, Merkesdal S, Thiele K, Zeidler H, Schneider M, Zink A. Cost of illness in rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis and systemic lupus erythematosus in Germany. Ann Rheum Dis 2006;65:1175-83.
69. Kavanaugh A, Antoni C, Mease P, Gladman D, Yan S, Bala M, et al. Effect of infliximab therapy on employment, time lost from work, and productivity in patients with psoriatic arthritis. J Rheumatol 2006;33:2254-9.
70. Kavanaugh A, Gladman D, Mease P, McInnes I, Beutler A, Zrubek J, et al. Golimumab administered subcutaneously every 4 weeks in psoriatic arthritis patients: 52-week health-related quality of life, physical function and health economic results of the randomized, placebo-controlled GO-REVEAL study [abstract]. Ann Rheum Dis 2009;68 Suppl:652.
71. Bansback NJ, Ara R, Barkham N, Brennan A, Fraser AD, Conway P, et al. Estimating the cost and health status consequences of treatment with TNF antagonists in patients with psoriatic arthritis. Rheumatology 2006;45:1029-38.
72. Marra CA, Farewell V, Antoni C, Rashidi A, Maetzel A, Kavanaugh A, et al. The cost-effectiveness of adding infliximab to usual therapy in the treatment of psoriatic arthritis [abstract]. Ann Rheum Dis 2005;64 Suppl:333.
73. Olivieri I, de Portu S, Salvarani C, Cauli A, Lubrano E, Spadaro A, et al. The Psoriatic Arthritis Cost Evaluation Study: a cost-of-illness study on tumour necrosis factor inhibitors in psoriatic arthritis patients with inadequate response to conventional therapy. Rheumatology 2008;47:1664-70.
74. Woolacott N, Bravo Vergel Y, Hawkins N, Kainth A, Khadjesari Z, Misso K, et al. Etanercept and infliximab for the treatment of psoriatic arthritis: a systematic review and economic evaluation. Health Technol Assess 2006;10:iii-iv, xiii-xvi, 1-239.
75. Narvaez J, Nolla J, Valverde J. Comparative study of MR imaging findings in wrist and hands in early psoriatic arthritis and rheumatoid arthritis [abstract]. Arthritis Rheum 2007;56 suppl:S281.
76. Healy P, Groves C, Chandramohan M, Helliwell PS. MRI changes in psoriatic dactylitis — extent of pathology, relationship to tenderness and correlation with clinical indices. Rheumatology 2008;47:92-5.
77. Tan YM, Ostergaard M, Doyle A, Dalbeth N, Lobo M, Reeves Q, et al. MRI bone oedema scores are higher in the arthritis mutilans form of psoriatic arthritis and correlate with high radiographic scores for joint damage. Arthritis Res Ther 2009;11:R2.
78. Ostergaard M, McQueen F, Wiell C, Bird P, Boyesen P, Ejbjerg B, et al. The OMERACT Psoriatic Arthritis Magnetic Resonance Imaging Scoring System (PsAMRIS): definitions of key pathologies, suggested MRI sequences, and preliminary scoring system for PsA Hands. J Rheumatol 2009;36:1816-24.
79. McQueen F, Lassere M, Duer-Jensen A, Wiell C, Conaghan PG, Gandjbakhch F, et al. Testing an OMERACT MRI scoring system for peripheral psoriatic arthritis in cross-sectional and longitudinal settings. J Rheumatol 2009;36:1811-5.
80. Weiner SM, Jurenz S, Uhl M, Lange-Nolde A, Warnatz K, Peter HH, et al. Ultrasonography in the assessment of peripheral joint involvement in psoriatic arthritis: a comparison with radiography, MRI and scintigraphy. Clin Rheumatol 2008;27:983-9.