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Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA)

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New York City, USA

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New York City, USA

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Prologue: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 Annual Meeting

Alice B. Gottlieb[1], April W. Armstrong[2], Oliver FitzGerald[3], and Dafna D. Gladman[4]

ABSTRACT. The 2022 annual meeting of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) was held from July 14 to 17, 2022, in New York City, New York, USA, and was attended by 420 rheumatologists, dermatologists, basic scientists, allied health professionals, patient research partners, and industry partners from 31 countries. A GRAPPA executive retreat, a Trainee Symposium, and the Patient Research Partners Network meeting were held prior to the annual meeting. Presentations included updates in basic research, focusing on biomarkers, personalization of treatments, and the promise of single-cell omics, elucidating the pathogenesis of psoriatic disease (PsD). Presentations also highlighted guttate and plaque psoriasis (PsO), the impact of coronavirus disease 2019 (COVID-19) and its treatments on patients with PsD globally, and the effects of sex and gender in PsD. Reports of ongoing projects included an update on the recently published treatment recommendations, educational initiatives, and the Diagnostic Ultrasound Enthesitis Tool (DUET) study. A session on early identification of psoriatic arthritis (PsA) among patients with PsO included an update on PsA screening tools. Debates were held on whether early intervention for PsO will reduce PsA, whether interleukin (IL)-17 or IL-23 inhibition is a better treatment for PsO and PsA, similarities and differences between axial PsA and axial spondyloarthritis with PsO, and data affecting the understanding of guttate and plaque PsO. Reports from the International Dermatology Outcome Measures (IDEOM) and Young GRAPPiAns concurrent sessions were presented in addition to reports of several other partner groups. Here, we highlight features of the annual meeting and introduce the manuscripts published together as a meeting report.

Key Indexing Terms: education, GRAPPA, psoriasis, psoriatic arthritis, research

Members of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) met for their 2022 annual meeting in New York City, New York, USA, to discuss research, education, partnerships, current and developing assessment and treatment recommendations, professional development, and other initiatives in the fields of psoriasis (PsO) and psoriatic arthritis (PsA). GRAPPA was formed in 2003 and includes members in the fields of rheumatology, dermatology, basic scientists, allied health professionals, patient research partners, and industry partners from around the world. The membership demographics and GRAPPA organizational structure are presented in Table 1 and Table 2.

Prior to the meeting, the GRAPPA leadership, including board members, steering committee members, and others in leadership roles (Table 2), congregated for a strategic planning meeting to review a survey related to GRAPPA's performance in research, education, assessment and treatment recommendations, professional development and collaboration, and organizational strength and communication. The group identified successes and areas for further improvement, identified key GRAPPA priori-

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

Financial support to enable the 2022 annual GRAPPA meeting was provided by AbbVie, Amgen, Boehringer Ingelheim, BMS, Janssen, Eli Lilly, Novartis, Pfizer, and UCB.

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ABG has received honoraria as an advisory board member and consultant for Amgen, AnaptypsBio, Avotres Therapeutics, BI, BMS, Dice Therapeutics, Dermavant, Eli Lilly, Janssen, Novartis, Pfizer, Sanofi, Sun Pharma, UCB, and Xbiotech, and has received research/educational grants from AnaptypsBio, Moonlake Immunotherapeutics, Novartis, BMS, and UCB (all paid to Mount Sinai School of Medicine). AWA has served as a research investigator and/or scientific adviser to AbbVie, Almirall, Arcutis, Aslan, Beiersdorf, BI, BMS, EPI, Incyte, Leo, UCB, Janssen, Lilly, Nimbus, Novartis, Ortho Dermatologics, Sun, Dermavant, Dermira, Sanofi, Regeneron, and Pfizer. OF has received grants for research and honoraria for advice and lectures from AbbVie, Lilly, Pfizer, Novartis, Janssen, BMS, UCB, and Biogen. DDG received consulting fees from AbbVie, Amgen, BMS, Eli Lilly, Galapagos, Gilead, Janssen, Novartis, Pfizer, and UCB, and research grants from AbbVie, Amgen, Eli Lilly, Janssen, Novartis, Pfizer, and UCB.

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Table 1. Composition of GRAPPA members.

Participant Type	Non-North America	North America	Total
Dermatologist	149	104	253
Rheumatologist	433	152	585
Geneticist	3	5	8
Methodologist	11	2	13
Radiologist	3	0	3
Others	31	12	43
Not filed	–	–	
Patient group/government representative	7	3	10
Sponsors	93	100	193
Total	730	378	1108

GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

Table 2. GRAPPA Executive and Steering Committee Membership.

Executive Committee	Position
April Armstrong	Co-president
Oliver FitzGerald	Co-president
Joseph Merola	Co-vice president
Arthur Kavanaugh	Co-vice president
Kristina Callis Duffin	Past president
Philip Mease	Treasurer/secretary
Vinod Chandran	Member
Steering Committee	**City, Country**
Ade Adebajo	Sheffield, UK
Laura Coates	Oxford, UK
Maria-Antonietta D'Agostino	Milano, Italy
Atul Deodhar	Portland, Oregon, USA
Lihi Eder	Toronto, Ontario, Canada
Dafna D. Gladman	Toronto, Ontario, Canada
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Fabian Proft	Berlin, Germany
Christopher Ritchlin	Rochester, New York, USA
Cheryl Rosen	Toronto, Ontario, Canada
Laura Savage	Leeds, UK
Claudia Goldenstein-Schainberg	Sao Paulo, Brazil
Stefan Siebert	Glasgow, UK
Ingrid Steinkoenig	Cleveland, Ohio, USA
Vibeke Strand	Portola Valley, California, USA
William Tillett	Bath, UK
Leonieke van Mens	Amsterdam, the Netherlands

GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

ties and activities for the next 5 years, and explored committee structures to best support these aims.[1]

The GRAPPA Patient Research Partner Network (PRPN) met prior to the meeting. The PRPN currently has 12 members from 7 countries with various backgrounds and careers who work to support the physicians, researchers, and scientists of the greater GRAPPA community. Seven members of the PRPN attended the annual GRAPPA meeting in person in 2022 and were included in the leadership retreat and gave input throughout the annual meeting.[2]

Young GRAPPiAns hosted an evening networking reception after the opening of the meeting. Young-GRAPPA (Y-GRAPPA) was introduced at the 2021 GRAPPA annual meeting and now has approximately 100 members (56% female, 28% dermatologists, 72% rheumatologists) from different parts of the world. Y-GRAPPA members attended the GRAPPA Leadership Retreat. In their one year of existence, they have set up their own governance, fully participated in research collaborations, and furthered aims important to GRAPPA including education, career development, communication (web page, social media, annual newsletter), and more. Later in the meeting, a Networking Workshop was held for Y-GRAPPA.[3]

Drs. M. Elaine Husni, MD, MPH, and April Armstrong, MD, MPH, cochaired the 2022 Trainee Symposium, which led the agenda of the first full day of the meeting. Dr. Lihi Eder, MD, PhD, helped adjudicate submitted abstracts and led the poster tour at the symposium. A total of 43 abstracts were submitted, with the top 5 highest scoring abstracts selected for oral presentations, and 15 were assigned to poster presentations. Topics included basic/translational, clinical, and outcomes research.[4]

Recent basic science advances in psoriatic disease (PsD) presented included clinical applications of biomarkers and what the future of biomarkers for PsD may hold, challenges of developing biomarker research to the point of clinical utility, advances in total body–positron emission tomography/computed tomography imaging, and emerging concepts from single-cell studies in PsD.[5]

Important developments in current health perspectives as relates to PsO and PsA were presented. One session provided a global perspective on coronavirus disease 2019 (COVID-19) risk factors, treatments, vaccinations, and how COVID-19 affected patients with PsO and PsA.[6] Another session highlighted issues related to diversity, equity, and inclusion in people with PsD, specifically concerning sex and gender and their intersectionality with race and ethnicity in individuals with PsA.[7]

Project highlights included a presentation of the recently published treatment recommendations,[8] GRAPPA educational initiatives, and how axial involvement should be defined in patients with PsA. Clinical and molecular characteristics of axial PsA and a report on the Axial Involvement in Psoriatic Arthritis (AXIS) study were presented. The AXIS study has both high educational and high research value.[9]

Winners of past pilot awards were given time to present their research outcomes. Titles included the following: "Validating feasible composite disease activity measures for use in daily clinical practice in patients with PsA," "Therapeutic exploration of probiotic strain *L. reuteri* in Western diet–induced psoriatic skin inflammation," and "Can magnetic resonance imaging (MRI) differentiate patients with axial spondyloarthritis from patients with PsA with axial involvement?"[10]

Partner organizations reported on co-developed projects. For example, the International Dermatology Outcome Measures (IDEOM) initiative presented an update on their progress related to patient-centered outcome measures for PsO and PsA. This included presentations from the Musculoskeletal (MSK) Symptoms working group on the development of the IDEOM Musculoskeletal Questionnaire (IDEOM MSK-Q); progress of the integration of the Psoriasis Epidemiology Screening Tool (PEST) and Psoriatic Arthritis Impact of Disease (PsAID) questionnaires into the Epic electronic health record system; and development of the DermSat-7, a 7-item treatment satisfaction questionnaire specific for dermatological conditions.[11] The Outcome Measures in Rheumatology (OMERACT) PsA working group, which includes rheumatologists, dermatologists, methodologists, and patient research partners, provided updates on its work to evaluate composite outcome measures for PsA.[12]

Imaging workshops for use of ultrasound to identify early symptoms of PsO and PsA and MRI to evaluate the extent of peripheral enthesitis in patients with PsA were well attended.[13,14] Another important presentation was on the role of dermatologists in identifying PsA in patients with skin manifestations of PsO in order to more rapidly diagnose PsA and form a care team with rheumatologists. Screening with and without imaging, surveys of symptoms, and improving early recognition of PsA in patients with PsO were all considered crucial topics of focus now and into the future.[15]

A fun aspect of the annual meeting is the debates, which cover key aspects of ongoing discussions in the field of PsO and PsA. The debates at the 2022 meeting included "Can early aggressive treatment of PsO prevent PsA?" between Enrique Soriano and Alexis Ogdie[16]; "Interleukin (IL)-17 versus IL-23 inhibitors: which is better to treat patients with moderate-to-severe PsO and mild PsA in dermatology clinics?" between April Armstrong and Joseph Merola[17]; "Is axial PsA the same as ankylosing spondylitis with psoriasis: a debate" between Laura Coates and Atul Deodhar[18]; and "Advances and controversies in our understanding of guttate and plaque PsO" between Sam Hwang and James Krueger.[19]

A business meeting was held at the conclusion of the GRAPPA annual meeting, as well as meetings of the Collaborative Research Network[20] and the PRPN as a follow-up to their earlier meeting. The next annual GRAPPA meeting will be held in Dublin, Ireland, from July 13 to 15, 2023.

The articles reporting on all these excellent presentations have been compiled, edited by a professional editing company, and reviewed/approved by all authors and representatives appointed by the GRAPPA publishing committee.

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Advances and Controversies in Our Understanding of Guttate and Plaque Psoriasis

Kristina Callis Duffin[1], Sam T. Hwang[2], and James G. Krueger[3]

ABSTRACT. Acute guttate psoriasis (AGP) is considered an uncommon variant of psoriasis (PsO), characterized as a widespread eruption of erythematous, psoriasiform papules, and plaques on the trunk, extremities, and scalp. Predisposing factors include a family history of PsO, variation in the main PsO susceptibility gene *HLA-Cw*0602*, and previous infection with viruses or acute β-hemolytic *Streptococcus*. A program focused on controversies and recent advances in understanding AGP was presented at the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting. Topics included an overview of clinical presentation and natural history, predisposing genetic and environmental factors, and the recent molecular profiling that supports classification of AGP as a form of PsO. Early molecular profiling studies using proteomic signatures have suggested similarities between AGP and contact dermatitis, but recent studies using gene expression profiling and gene set enrichment scores demonstrate that AGP is more similar to chronic PsO. The expression of regulatory immune pathways seen with AGP suggests potential for early and sustained remission if the disease is suppressed by targeted treatments. Published case reports documenting clinical improvement of AGP with biologics that antagonize interleukin (IL)-12/23, IL-23, and IL-17 support the role of the IL-23/IL-17 axis in AGP, similar to that in PsO. Data supporting the use of antibiotics and other therapeutic agents for AGP are lacking, and randomized controlled trials are needed. Trial design for AGP is challenged by the low incidence, tendency for spontaneous remission, lack of validated end points, and the need for long-term follow up.

Key Indexing Terms: GRAPPA, guttate psoriasis, psoriasis, psoriatic arthritis

Introduction

Acute guttate psoriasis (AGP) is considered an uncommon variant of chronic plaque psoriasis (PsO), characterized as a widespread eruption of erythematous, psoriasiform papules, and plaques on the trunk, extremities, and scalp. The term "guttate" refers to the resemblance of lesions to droplets. In some countries like Korea, a guttate presentation may be synonymous with small plaque PsO.[1] The prevalence and incidence of AGP are unclear and vary greatly by study and by country.

AGP commonly presents in children and young adults, often as their first manifestation of psoriatic disease. It is also seen in individuals with chronic PsO. Although AGP and chronic PsO share many triggers, such as infection, stress, drugs, or therapeutic failures, the 2 strongest associations are family history of PsO and preceding infection. A case-control study of individuals with newly diagnosed AGP, including 73 cases and 430 controls aged ≥ 16 years showed that individuals with a family history of plaque PsO had a 7-fold risk of developing AGP (odds ratio 7.0, 95% CI 3.7-13.5).[2] Genetic studies have demonstrated that the main genetic risk variant for PsO, *HLA-Cw*0602*, is highly associated with AGP.[3-6]

A history of preceding acute upper bacterial or viral infections is among the strongest triggers of AGP. Respiratory infection is associated with a 7-fold increase in the risk of a first episode

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of AGP.[2] Most cases are associated with group A *Streptococcus pyogenes* infection, but coronavirus disease 2019 (COVID-19), coxsackie B, and other viral infections are also reported to trigger AGP.[7-9] The role of viral infection in PsO is not well elucidated. Several cohort studies have examined the relationship between streptococcal infection and AGP. In a 1992 series of 111 patients seen in the United Kingdom, 64 were diagnosed with AGP or guttate flare of chronic PsO.[10] Serologic evidence of recent streptococcal infection was present in 19 (58%), and *S. pyogenes* was isolated from 26% of the 33 patients with AGP.[10] Although 13 isolates of 10 different streptococcal serotypes were observed, there is no evidence that a specific serotype is associated with AGP.

Unlike most forms of chronic PsO, AGP is associated with spontaneous or long-term remission. A 1996 follow-up to Telfer et al's cohort study[10] suggested that the risk of developing chronic PsO following AGP was approximately 1 in 3.[11] The prognosis of AGP or guttate flare of chronic PsO differs by age, presence of family history, and presence of acute infection. A cohort of 82 patients in Korea with biopsy-proven guttate PsO and carefully documented disease course showed that patients with new-onset AGP mostly fell into 2 categories: those with favorable outcomes (complete involution of skin lesions and remissions lasting > 1 year) and those with less favorable outcomes (those with incomplete involution and progression into chronic PsO).[1] Patients with more favorable outcomes tended to have younger age of onset, preceding upper respiratory infection, and high antistreptolysin-O titers. Patients with less favorable outcomes often had a positive family history of plaque PsO and inadequate treatment in the course of their disease.

Pathogenesis

The fact that AGP may precede the development of chronic PsO and that some patients spontaneously remit has compelled researchers to examine the differences between AGP, chronic PsO, and other dermatoses like atopic dermatitis (AD). Studies over 2 decades have had varying and sometimes contrasting results. A 2005 proteomic study using samples from patients with AGP, chronic PsO, and allergic contact dermatitis to perform global protein expression and hierarchical cluster analysis suggested that AGP was more similar to contact dermatitis than chronic plaque PsO.[12] However, our present understanding of guttate PsO places AGP closer to PsO in the spectrum of psoriasiform dermatitis, where chronic plaque PsO and AD represent the 2 polar ends.[13,14]

Many studies have focused on elucidating possible differences between chronic PsO and AGP. A 2008 publication suggested that morphological differences between plaque PsO and AGP could be explained by differences in cytokine expression in serum and plaques.[15] However, a subsequent study by Roh et al[16] showed that circulating levels of interferon (IFN)-γ, interleukin (IL)-1RA, IL-2, IL-12p40, IL-17A, IL-22, and IL-23 in serum measured by ELISA did not distinguish guttate vs chronic plaque lesions. There were also no differences in expression levels of IL-1RA, IL-12p40, IL-17, IL-22, and IL-23 in the PsO tissue samples as measured by immunoblot analysis.[16] These findings are similar to more recent data where skin obtained from individuals with guttate PsO were compared to those with chronic PsO using histology, immunohistochemistry, gene expression analysis by microarray, quantitative real-time PCR, and signaling pathway analyses.[17] Histologically, guttate and chronic PsO specimens had typical features of chronic PsO, but the degree of acanthosis, diminished or absent epidermal granular layer, and the inflammatory infiltrate in the epidermis and dermis were more prominent in plaque PsO than in the AGP specimens. No significant differences in immunostaining patterns of *K16* and *S100A7* (psoriasin) differentiated the 2 phenotypes. Gene arrays and gene segregation analyses performed to compare the transcriptomes of large plaques, small plaques, and AGP showed that AGP aligns closely with chronic PsO and not AD.

With regard to alterations in immune system and immune signaling, Dr. Krueger's work has shown an overabundance of T regulatory cells (Tregs) in AGP. Despite this increase, IL-10, which is made by Tregs and affects immune suppression/homeostasis, was not proportionally increased. This is similar to the dysfunctional Tregs found in PsO vulgaris and the fact that Tregs are greatly expanded in PsO skin lesions compared to normal skin, but the level of IL-10 produced is not increased. Tregs also have upregulated expression of IL-17A in PsO, which likely indicates that they have been transformed into pathogenic type 17 T-cells with proinflammatory properties. Very little is known about Tregs in AGP; this warrants further study. Given the relatively high expression of regulatory pathways in AGP, it is worth considering the possibility that targeting certain immune cell populations that control cutaneous immune homeostasis at the right time could lead to remission or even cure AGP.

It is surprising that the largest producer of IL-10 in normal skin and PsO lesions is a BDCA-3+ dendritic cell (DC), which makes up about one-third of dermal DCs in normal skin. BDCA-3+ DCs are expanded in PsO vulgaris skin lesions, but IL-10 production is not correspondingly increased, much like with Tregs. Thus, there is likely dysfunction of the BDCA-3+ DCs as an additional immune defect that prevents resolution of T-cell driven immunity in common PsO. This DC subset has not been sufficiently studied in AGP, but one can speculate that these cells might be more functional in guttate disease leading to lesions spontaneously resolving in some patients. Interestingly, these DCs also express SOCS3, which is typically expressed at the junction of lesional and nonlesional skin and may be a factor in limiting the size or progression of a plaque.[18]

Treatment

High-quality data on therapeutic interventions for AGP are lacking and current data have largely been from observational studies. The current standard of care of guttate PsO includes topical agents for less severe cases and phototherapy (2017 National Institute for Health and Care Excellence [NICE] guidelines) or systemic agents for moderate-to-severe cases. No rigorous clinical trials have been performed to support therapeutic interventions. There are several published observational studies suggesting that antistreptococcal treatments may shorten the course of AGP or even lead to remission.

However, 2 2019 Cochrane reviews of both antistreptococcal and non-antistreptococcal therapy for AGP and plaque PsO found only 4 trials of AGP interventions. Evidence generated from these studies were considered of low quality because of small study sizes, lack of rigorous outcome measures, and potential biases.[19,20]

There are now several published case reports supporting targeting of the IL-23/IL-17 axis to treat AGP. Ustekinumab, guselkumab, risankizumab, and ixekizumab have all been associated with clearance and long-term, drug-free remission of AGP.[21-26] Researchers are interested in further investigating the therapeutic role of targeted biologic agents for AGP, as well as their potential for drug-free or long-term remission. It is possible that targeting the appropriate regulatory pathways early in the course of AGP could lead to healing immune dysregulation and promoting immune tolerance.

Many challenges exist around designing and conducting interventional randomized clinical trials for AGP. Defining the population is challenged by lack of confidence in differentiating AGP from early chronic PsO or small plaque PsO, especially in those who do not remit spontaneously. Recruitment of participants is difficult because of the low incidence of AGP, the seasonality of streptococcal pharyngitis, mask-wearing, the nature of presentation in a pediatric population, and the initial management in the primary care setting. There may be a reluctance by the general dermatology community to start a biologic during or immediately after acute infection. Similarly, there may be reluctance to use a therapy generally designed for long-term treatment for a condition that may spontaneously remit.

Determining the appropriate outcomes of a therapeutic agent for AGP is also a barrier to conducting rigorous clinical trials. There is no consensus on when primary and secondary clinical endpoints should be measured, and which physician- and patient-reported measures should be used. There are no physician- or patient-reported severity endpoints that have been rigorously validated in patients with AGP. Psoriasis Area and Severity Index (PASI) and body surface area are likely not going to reflect the true severity of disease, given the widespread nature of small lesions.

In summary, there are still many gaps in our understanding of AGP, including the role of Tregs and other inflammatory cell populations, cytokines, and chemokines in the development and propagation of AGP lesions. The role of acute bacterial and viral infections in AGP, as well as the role of antistreptococcal therapies, remains unclear. Compelling data support that AGP has many overlapping pathogenetic features with chronic PsO and that targeting the IL-23/IL-17 axis has potential to treat AGP. The epidemiology and relationship of AGP to the development of psoriatic arthritis is also unknown. The development of physician- and patient-reported outcome measures, consensus on clinical features that define AGP, inclusion of children in clinical studies, longitudinal tissue banking, and conducting robust translational research will be important to broaden our understanding of AGP in the context of clinical trials and registries.

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Can Early Aggressive Treatment of Psoriasis Prevent Psoriatic Arthritis? A Debate at the GRAPPA Annual Meeting

Enrique R. Soriano[1] and Alexis Ogdie[2]

ABSTRACT. In recent years, a number of studies have examined risk factors for development of psoriatic arthritis (PsA) among patients with PsO. Most recently, 5 studies have examined the effect of biologic therapy on the development of PsA. However, the results have been mixed, with 3 studies suggesting a lower risk for PsA among those using a biologic therapy and 2 suggesting a higher risk for PsA. At the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) meeting, Drs. Enrique Soriano and Alexis Ogdie conducted a debate to discuss the arguments for and against the use of biologic therapies in PsO for the purpose of preventing PsA.

Key Indexing Terms: arthritis, biological therapy, GRAPPA, psoriasis, psoriatic arthritis, risk factors

Introduction

Psoriasis (PsO) is a common skin condition among adults in the Western World, affecting 2% to 4% of adults in the United States. Approximately 25% of those patients will develop psoriatic arthritis (PsA) over the course of their lifetime.[1] Predisposing factors for development of PsA include obesity, persistent biomechanical stress, infections, and genetic factors.[2] Over time these factors may incite inflammation at the enthesis or in the synovial lining, initiating clinically imperceptible inflammation. A second hit, such as trauma or another infection, may further ignite the inflammation, bringing on clinically apparent PsA. A number of studies have examined risk factors for the development of PsA, including PsO severity.[1,2] Greater burden of skin disease is linked to greater burden of systemic inflammation, with worsening skin disease potentially triggering inflammatory disease in the synovium. In a previous prospective cohort study, PsO severity was associated with incident PsA in a dose-dependent fashion.[3] There are already important reasons to treat moderate-to-severe PsO, including improvement in quality of life and the hope of reducing the complications associated with prolonged systemic inflammation. The question remains, can treating PsO reduce the risk of developing PsA?

Over the past 1 to 2 years, there have been several publications examining the effect of treatment for PsO on the development of PsA. Some of these publications support the concept that treating PsO reduces the incidence of PsA. Other publications suggest an increased incidence of PsA among patients with PsO prescribed biologics.[4-8] During the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting, one of the debate sessions was dedicated to understanding the similarities and differences in these studies to elucidate the effects of therapy on the development of PsA. Herein, we summarize the arguments for each side.

Argument: Effective treatment of PsO reduces the risk for PsA

Dr. Enrique Soriano supported the idea that effective treatment of PsO with biologics can prevent the development of PsA.

The evidence to support this statement comes only from observational studies. Three of the Bradford Hill criteria[9] are of special importance to assess whether an observed association is likely to be causal in observational studies:

- consistency of findings,
- temporal sequence of association, and
- biological plausibility.

Up until now there are 4 retrospective cohort studies that have explored this association.[4-7] Three of them found a lower incidence of PsA in patients with PsO treated with biologics compared with those treated with topicals or phototherapy.[4,5,7] The fourth one, a very large study performed in the US, found that patients with PsO treated with biologics have an increased incidence of PsA.[6] In summary, although there is no consistency of findings, the data available support that PsA could be prevented by treating PsO.

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

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All these retrospective observational studies are subject to bias. The most likely biases are selection bias, confounding by indication, protopathic bias (related to the temporal sequence of association in the Bradford Hill criteria), survival bias, and assessment bias. When looking at the direction of these biases, they favor an increase on the incidence of PsA in patients receiving biologics. So, although likely to be present in all the studies, biases could explain an increase of PsA in patients treated with biologics found in the study by Meer et al[6] but are working against the prevention found in the other 3 studies.[4,5,7]

With regard to biological plausibility, it has been shown that asymptomatic enthesitis is frequent in patients with PsO (subclinical enthesitis),[10] that enthesitis is pathogenic and a risk factor for the development of PsA,[11-13] and that subclinical enthesitis could be effectively treated with biologics.[14] It is plausible to believe that the abrogation of enthesitis might prevent development of PsA. Skin inflammation triggers and activates inflammatory cells in joints and enthesis.[15] It is plausible that its effective reduction as achieved with biologics could decrease the incidence of PsA. There is no biologically plausible explanation, however, for the increased incidence of PsA in patients with PsO treated with biologics.

In summary, although there is no clear proof that treating PsO with biologics could decrease the incidence of PsA, the current evidence is stronger in favor of this argument. Randomized clinical trials in patients with PsO at high risk of developing PsA are needed to answer this question. In the meantime, although there is no indication to treat patients with PsO with biologics to prevent PsA, such treatment might be an additional gain for those patients in whom biologics are prescribed.[16]

Argument: Based on the available evidence, it remains unclear whether treatment of psoriasis with biologic therapy reduces the risk for PsA

If we were able to identify a person as having a risk for PsA, should we treat them with a more intensive therapy (eg, biologic therapy) to reduce this risk? Are the benefits of treatment greater than the risks associated with therapy? Although there is a new clinical trial now set to address this question,[17] all current data to address these questions are observational. The foundation of Dr. Alexis Ogdie's argument is that retrospective observational data are fraught with biases that inhibit our ability to draw firm conclusions.[18] Two such biases that likely play the biggest role are confounding by indication and protopathic bias (the latter also being a form of confounding by indication). Ideally, dermatologists and patients with PsO make therapeutic decisions together. Several factors determine the type of therapy prescribed, including body surface area of PsO, locations involved (eg, sensitive areas like the face and genital region), the emotional effect of skin disease on a patient, severity of fatigue or other symptoms attributed to the PsO, success and tolerance of prior therapy courses, comorbidities, patient and physician risk tolerance, and whether the patient has joint pain (eg, if the dermatologist has a suspicion that the patient has or is developing PsA). The latter is known as protopathic bias, that is, treating a patient for a presumed condition. None of these factors are directly measured in current observational studies, particularly within electronic health record (EHR) data. In addition to unmeasured confounding (and specifically confounding by indication), selection of patients for inclusion in an observational study can lead to substantial selection bias.[18]

In the section above, Dr. Soriano described the studies that suggest a reduced risk for PsA among patients with PsO. Dr. Ogdie presented 2 recent studies finding an increased risk for PsA among biologic users. We attribute these results to protopathic bias, meaning that they were prescribed the therapy because the dermatologist thought the patient may have PsA, and not because of a direct or causal effect of the biologics. The first study by Meer et al, using EHR data, found that patients with PsO treated with biologic therapies had a substantially increased incidence (77/1000 person-years [PY]) compared to patients who had not received therapy (6/1000 PY), those who received oral therapy (62/1000 PY), or those who received phototherapy (26/1000 PY).[6] The incidence varied among biologic therapies, with those prescribed an interleukin (IL)-12/23i with a lower incidence (47/1000 PY) than those prescribed a tumor necrosis factor inhibitor or IL-17i (83/1000 PY and 79/1000 PY, respectively). These differences persisted despite adjustment for confounders, use of a time-varying analysis, use of propensity score matching, and after several sensitivity analyses. Another study by Merola et al, found nearly identical results.[8] In Meer et al, the highest incidence of PsA was often found to be within 6 to 12 months after prescription of the biologic therapy or oral therapy, suggesting that patients were potentially being prescribed the therapy for presumed PsA and later receiving a formal diagnosis (ie, protopathic bias).[6] Because there was a reliance on codes, Dr. Ogdie also noted that dermatologists in the US rarely code for musculoskeletal symptoms or the diagnosis of PsA,[19] further explaining the potential for protopathic bias.

Drs. Ogdie and Soriano agreed that biologic plausibility exists for biologic therapy preventing onset of PsA but suggested that temporal association was not reliable in retrospective observational data. In addition, there remains risk for confounding by indication. Of the 3 small single-center studies supporting Dr. Soriano's argument, all had wide confidence intervals around the point estimate and, when propensity score matching was applied, the results of one of the studies flipped to suggesting increased PsA among those using a biologic therapy. Given the range of results among these 5 studies, Dr. Ogdie's conclusion was that the available evidence is insufficient to answer this question and that prospective studies, particularly randomized trials, are needed. There are many reasons to treat PsO with efficacious therapies but, although the evidence may be suggestive, we do not yet know that prevention of PsA is one of those reasons.

Conclusion

In summary, Drs. Soriano and Ogdie reviewed the available evidence of whether treatment of PsO affects development of PsA. Three studies suggest a reduced risk of PsA with more intensive therapy (ie, biologic therapy), whereas 2 studies suggest an increased risk for PsA among patients treated with biologic therapy.[4-8] The retrospective data available have greatly added to

our understanding of this topic. However, prospective observational studies and randomized trials are needed to fully address this question. In the meantime, both agreed that biologics should not be prescribed in patients with PsO with the only objective of preventing PsA.

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Interleukin (IL)-17 Versus IL-23 Inhibitors: Which Is Better to Treat Patients With Moderate-to-Severe Psoriasis and Mild Psoriatic Arthritis in Dermatology Clinics?

Rosario Agüero[1], Michael J. Woodbury[2], Kathryn Lee[3], Hanna J. Johnsson[4], Joseph F. Merola[5], and April W. Armstrong[6]

ABSTRACT. Interleukin (IL)-17 and IL-23 inhibitors are both approved for the treatment of moderate-to-severe plaque psoriasis (PsO), as well as psoriatic arthritis (PsA). In the absence of head-to-head studies, it is not clear which agent is better suited to treat patients with moderate-to-severe PsO and mild PsA. During the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) conference, Dr. April Armstrong and Dr. Joseph Merola debated which of these 2 biologic classes should be used in this patient population. Armstrong argued in favor of IL-17 inhibition, whereas Merola presented reasons for IL-23 inhibition. An overview of their main arguments is described in this manuscript.

Key Indexing Terms: arthritis, biological products, GRAPPA, interleukin inhibitors, psoriasis, psoriatic arthritis

Introduction

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) has a tradition of hosting stimulating and entertaining discussions where the debaters take 2 opposing positions to a controversial and clinically relevant question. At the 2022 meeting, the first debate asked the clinically important question: "[Interleukin] IL-17 versus IL-23 biologics: which is better to treat patients presenting with moderate-to-severe psoriasis and mild psoriatic arthritis in the dermatology clinics?" In this debate, Dr. April Armstrong argued for IL-17 inhibitors and Dr. Joseph Merola argued for IL-23 inhibitors as the preferred class of biologics. Below, we describe the evidence supporting their respective positions.

IL-17 inhibitors

IL-17 and IL-23 inhibitors are highly efficacious in treating moderate-to-severe psoriasis (PsO), but there is more clinical trial evidence demonstrating the therapeutic benefits of IL-17 inhibitors than IL-23 inhibitors in psoriatic arthritis (PsA), as outlined below.

Inhibition of radiographic progression of joint damage in PsA. IL-17 inhibitors inhibit radiographic progression of joint damage in PsA. The SPIRIT-P1 trial showed that both ixekizumab (IXE) and adalimumab significantly reduced radiographic progression of joint damage compared to placebo.[1] Similarly, 84% of patients with PsA treated with secukinumab (SEC) had no radiographic progression after 2 years.[2-5] Given the abundance of data, the radiographic response is documented on the US Food and Drug Administration labels for both SEC and IXE, yet is notably absent on the IL-23 inhibitor labels.[6-9]

Efficacy in very early and oligoarticular PsA. Evidence suggests that IL-17 inhibitors are effective in halting disease progression in early and oligoarticular PsA. In the Interception in Very Early PsA (IVEPSA) study, patients with PsO who had erosive or inflammatory changes on magnetic resonance imaging (MRI) or computed tomography but no clinical signs

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of arthritis at baseline were treated with SEC for 24 weeks. This led to a reduction in signs of joint inflammation, detected by MRI as well as a significant decrease in visual analog scores for pain and Psoriatic Arthritis Impact of Disease (PsAID) symptom scores.[10]

Approximately 50% of patients with PsA have involvement of 4 or fewer joints, which is known as oligoarticular PsA.[11,12] Although evidence for biologics in this form of the disease is limited, a study by Ogdie et al found that SEC improved physical function and disease activity in patients with 1 to 4 affected joints. Specifically, 43.5% of these patients achieved complete remission after receiving SEC compared to only 6.7% in the placebo group.[11] Additionally, these responses were sustained through week 52, demonstrating the durability of SEC's effects in oligoarticular PsA.

Efficacy in axial PsA. IL-17 inhibitors work well in axial PsA (axPsA). The Managing Axial Manifestations in Psoriatic Arthritis with Secukinumab (MAXIMISE) trial examined the efficacy of SEC in treating axPsA.[13] SEC was superior in improving Assessment of SpondyloArthritis international Society (ASAS) 20 scores after 12 weeks of treatment when compared to placebo. Given this data, IL-17 inhibitors were included in the 2021 GRAPPA treatment recommendations for axial disease.[14] Though there is some evidence based on posthoc analyses from guselkumab (GUS) trials suggesting that IL-23 inhibitors may be effective in treating axial PsA, it is important to note that the observed improvement in the outcome measures used (ie, Bath Ankylosing Spondylitis Disease Activity Index [BASDAI]) could reflect disease activities in other PsA domains. Overall, the IL-23 inhibitors lack the same quality of evidence as the IL-17 inhibitors, which directly demonstrated their efficacy in axial PsA in the MAXIMISE trial. For this reason, IL-23 inhibitors are not included in the list of recommended therapies for axial PsA in the GRAPPA 2021 guidelines.[14]

Analysis from the trials investigating GUS in patients who have had axial symptoms suggests that these agents might be effective in axial PsA. However, it is also possible that improvement in the outcome measures used (for example, BASDAI) could reflect disease activity in other PsA domains. Because these studies included primarily patients with active PsA, and these agents did not prove effective in axSpA, the evidence is currently too limited and conflicting such that these medications cannot be recommended for axial PsA at this time.

IL-23 inhibitors

Despite both treatments being efficacious in psoriatic disease, IL-23 inhibitors may be the preferred option over IL-17 inhibitors in patients with moderate-to-severe PsO and mild PsA, given multiple lines of evidence described below.

PsO efficacy and persistence. Although both IL-23 and IL-17 inhibitors are among the most efficacious biologics in moderate-to-severe PsO, there is growing evidence that IL-23 inhibitors are superior in durability of response.[15] The IMMerge trial comparing risankizumab (RZB) to SEC showed superior sustained Psoriasis Area and Severity Index (PASI) 90 scores of RZB at 52 weeks (142/164 [86.6%] vs 93/163 [57.1%]; $P < 0.001$).[16] Similarly, a sustained PASI90 to 172 weeks with RZB was shown in the LIMMitless trial.[17] The ECLIPSE trial comparing GUS to SEC showed superior sustained PASI90 of GUS at 48 weeks (451 [84%] vs 360 [70%]; $P < 0.0001$).[18] Moreover, the potential mechanistic benefits of IL-23 inhibition were shown through data on greater suppression of CD8+ resident memory T cells in patients treated with GUS compared to SEC.[19] In summary, there are reasons to believe that IL-23 inhibition may have superior long-term outcomes among patients with PsO.

PsA efficacy. IL-23 inhibitors have also been shown to be effective in PsA. The KEEPsAKE trials comparing RZB to placebo showed a greater proportion of patients using IL-23 achieving all primary endpoints as well as secondary endpoints, most notably the stringent composite low disease activity/remission endpoint, minimal disease activity (MDA), and that these responses increase over time to 52 weeks and beyond (week 24 patient global assessment of disease activity: odds ratio [OR] 2.0 [95% CI 1.5-2.7]; week 24 pain: OR 2.2 [1.6-2.9]; week 24 fatigue: OR 1.9 [1.4-2.5]).[20] In the DISCover trials comparing GUS to placebo, all primary endpoints were met, including a greater proportion of patients using IL-23 achieving American College of Rheumatology (ACR) 20/50/70 responses at week 24, in addition to key secondary endpoints, such as MDA (159 [64%] vs 81 [33%]; $P < 0.0001$).[21] A subset of patients in these trials was also determined to likely have axPsA (312 [28%]) based on an approach whereby patients (1) were identified by the investigator, (2) had BASDAI and spine pain ≥ 4, and (3) were diagnosed with sacroiliitis on imaging. Notably, this subset had clinically important improvement at week 24 in axial symptoms as measured by overall BASDAI and BASDAI without the peripheral joint pain question. Further dedicated studies in axPsA are ongoing.[22] In the setting of mild PsA where most patients will not have erosive, damaging disease, the relevance of radiographic inhibition remains unclear.

Safety, convenience, and tolerability. IL-23 inhibitors demonstrate additional qualities that make them a favorable option over IL-17 inhibitors. First, they have an excellent safety profile and are well tolerated by patients. Unlike IL-17 inhibitors, there is no increased risk of candidiasis or inflammatory bowel disease (IBD) flare risk.[23] Certain IL-23 inhibitors are even approved to treat IBD.[24] Second, they are more convenient with infrequent dosing (4-6 doses a year), no high burden loading doses, and no ongoing monitoring requirements. Importantly, convenience is strongly associated with adherence, which is critical for a chronic condition such as PsO.[25]

Conclusion

Several treatment options for patients with psoriatic disease exist. More studies are needed to determine the appropriate therapy for patients with certain disease phenotypes to optimize therapy.

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Is Axial Psoriatic Arthritis the Same as Ankylosing Spondylitis With Psoriasis: A Debate

Laura C. Coates[1] and Atul Deodhar[2]

ABSTRACT. During the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 conference, Drs. Laura Coates and Atul Deodhar debated whether axial psoriatic arthritis (axPsA) is the same as ankylosing spondylitis (AS) with psoriasis. Dr. Coates argued that AS represents a spectrum of disease and that axPsA can be considered within that spectrum. Dr. Deodhar argued that axPsA and AS are 2 different diseases, using construct, content, face, and criterion validity. Their main arguments are described in this manuscript.

Key Indexing Terms: ankylosing, arthritis, GRAPPA, psoriasis, psoriatic arthritis, spondylitis

Axial psoriatic arthritis is the same as ankylosing spondylitis with psoriasis

Dr. Laura Coates opened the debate by highlighting the longstanding practice of lumping and splitting in the field of spondyloarthritis (SpA). Related conditions with genetic and familial overlap include ankylosing spondylitis (AS), psoriatic arthritis (PsA), and reactive arthritis, and there has been debate whether to group them as 1 classification or divide them for clinical and research purposes. Professor Wright first developed clear classification criteria for PsA, differentiating PsA from rheumatoid arthritis (RA) and putting forth the concept of SpA as a group.[1]

Coates acknowledged some key differences in presentation between AS and PsA, as summarized in Table 1. However, in the last decade, the definition of axSpA has been widened significantly to include nonradiographic disease.[2] AS classification requires radiographic evidence of disease, but a significant proportion of patients with axSpA do not, and may never, show radiographic evidence of disease.[3] axSpA is characterized by inflammation in the spine and sacroiliac joints. Spinal inflammation is also a key feature of axial PsA (axPsA). Other classification criteria for axSpA and PsA also show significant overlap between these diseases. The Classification For Psoriatic Arthritis (CASPAR) criteria allow a diagnosis of PsA in patients who typically have inflammatory musculoskeletal disease, psoriasis (PsO), and 1 further feature (ie, negative rheumatoid factor, dactylitis, nail disease, new bone formation).[4] In axPsA, inflammatory spinal disease would be expected to be evident using imaging techniques. On the other hand, diagnosis of axSpA requires evidence of axial inflammation using imaging and the presence of 1 further SpA feature, which includes PsO.[2] In established disease cohorts of patients with axSpA and patients with PsA, overlap between these criteria is around 25% representing those patients with axPsA.[5]

If we include a wider definition of axSpA that encompasses those with and without radiographic disease, a demographic shift occurs with a more equal sex distribution and variable age at onset. Inclusion of nonradiographic disease as part of the axSpA spectrum means that many more similarities emerge when comparing axSpA and axPsA cohorts.[6] One key difference may be the prevalence of the *HLA-B27* gene. More than clinical diagnosis, in a large radiographic study, the presence of *HLA-B27* in patients with either axSpA or PsA was associated with higher severity of radiographic damage, more frequent syndesmophytes, and higher levels of symmetry in spinal disease.[7] Thus, it seems that there are more similarities in phenotype than differences when considering all of axSpA rather than just radiographic axSpA/AS.

There have been decades of debate about the similarities and differences in axSpA, but the advent of successful therapies has highlighted some differences in treatment responses. The SpA community was surprised when interleukin (IL)-23 inhibitors, already proven and licensed for PsO and PsA, showed negative results when used to treat AS. However, data from the gusel-

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Table 1. Construct validity that axPsA and AS are separate diseases.

	axPsA	AS
Onset of back pain	Variable, can be after age 45 yrs	Mostly before age 45 yrs
Sex, M:F	Slight male predominance	3:1
Age	Older	Younger
Inflammatory back pain, %	45-55	> 75
Phenotype	More peripheral disease (dactylitis, enthesitis)	Less peripheral disease
HLA-B27, %	45-55	> 80
Genetics	*HLA-B39, HLA-B38, HLA-B08, HLA-Cw07:02*	*HLA-B27*
Sacroiliitis	Less frequently bilateral	Usually bilaterally symmetric
Spine involvement: syndesmophytes	Without sacroiliitis in 1/3 (can be asymptomatic)	Usually sacroiliitis occurs first
Syndesmophytes	Para-marginal, chunky	Marginal, thin

AS: ankylosing spondylitis; axPsA: axial psoriatic arthritis; F: female; M: male.

kumab PsA studies created confusion. Posthoc analysis of the DISCOVER PsA trials of guselkumab examined the response in axial signs and symptoms of PsA. Patients with axial involvement defined by local imaging evidence of sacroiliitis were selected for this analysis, which showed a significant improvement in multiple axial outcomes.[8] Imaging was not centrally evaluated and the lack of classification criteria for axPsA made defining the cohort of axPsA within the peripheral PsA study difficult. Dr. Coates argued that the biggest issue with interpreting these results is the assumption that improvements in Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Ankylosing Spondylitis Disease Activity Score (ASDAS) indicate a reduction in spinal inflammation. All these patients had active peripheral arthritis, with many also having enthesitis, dactylitis, and skin disease. Previous studies have shown similar BASDAI scores in patients with or without axial involvement and that these scores correlate significantly with a patient global score.[9,10] Indeed, all the individual BASDAI questions have shown similar baseline disease activity levels and standardized response means after effective treatment in those with and without peripheral disease—even question 2, which specifically asks about spinal pain.[11] Therefore, the results of this analysis,[11] although encouraging, raise the concern that use of composite instruments that include nonaxial domains to measure response would perhaps indicate improvements in PsA symptoms even if the drug were not effective in the spine. This important context to the guselkumab data demonstrates the likelihood that response to medications in axSpA and axPsA is the same.

Dr. Coates summarized her arguments by highlighting that axSpA itself represents a spectrum of disease and that axPsA can be considered within that spectrum. When considering all patients with axSpA, rather than just those with AS (as in Table 1), there are more similarities than differences. Although some differences in clinical presentation are seen in cohort studies, all studies rely on a clinical diagnosis of either axSpA or axPsA, given the lack of a clear definition for axPsA. This introduces a misleading circular argument using the rheumatologist's initial opinion as a gold standard. That decision will be based on accepted features of PsA, such as peripheral arthritis, dactylitis, sex, and age. It is not surprising that these clinical features are identified as possible differences. Second, studies have highlighted the important role of *HLA-B27* across phenotypes of axSpA, suggesting that this may have a more important role in disease presentation. Finally, of key importance to the clinician are the implications for treatment. There is no substantial evidence of a differential treatment response between axPsA and other axSpA, although further studies are needed. International treatment recommendations for both PsA and axSpA recommend identical approaches to treatment, with extrapolation from axSpA studies supporting PsA recommendations.[12,13]

axPsA is a distinct disease from AS

Dr. Atul Deodhar set the stage for his portion of the debate by asking why it is important to split or lump axPsA and axSpA. This discussion depends upon the clinical scenario and is for practical clinical decision making. It may or may not be important in research into molecular pathophysiology, etiology, or for clinical trials. Dr. Deodhar quoted Professor John Moll from his seminal paper in 1974, which said, "A decade ago it was popular to support the school of 'lumpers' which considered rheumatoid arthritis as a nonspecific syndrome triggered by many diverse aetiological factors such as psoriasis, urethritis, or ulcerative colitis... recently the trend has changed in favor of the school of 'splitters' which regard all so-called variants of classical rheumatoid arthritis as discrete entities."[1] In fact, Dr. Deodhar argued that splitting has been instrumental in major breakthroughs in knowledge about arthritic diseases: first etiologically (eg, PsA is not simply RA plus PsO) and then in disease management (eg, IL-6 inhibitors and rituximab in RA vs IL-17 inhibitors and IL-23 inhibitors in PsA). Two examples of how splitting led to real progress in disease understanding followed. First, Moll et al initially lumped Whipple disease in their classification. However, when split from the group and studied as its own entity, Whipple disease was found to have its own etiology (*Tropheryma whipplei*), which led to a therapeutic approach (doxycycline) and cure.[1] Second, the 1990 American College of Rheumatology (ACR) classification criteria for vasculitis did not differentiate polyarteritis nodosa (PAN) from microscopic polyangiitis (MPA). However, differ-

ential treatment response changed this. PAN does not respond to rituximab, whereas MPA does. The 2022 ACR classification criteria now classify them as separate entities. As we become more "specialized" in our clinical knowledge, we move from being "lumpers" to being "splitters."

In quantitative research, we need to consider the validity of our concepts. Validity can also tell us how accurately a concept or method measures something. If a concept represents what it claims to represent, and the results closely correspond to real-world values, then it can be considered valid. We will use 4 types of validity measures to argue that axPsA and axSpA with PsO are separate conditions: construct validity, content validity, face validity, and criterion validity.

Construct validity examines whether a concept really represents the thing we are interested in studying. It is central to establishing the overall validity of a concept. Table 1 shows support for the construct validity that axPsA and AS with PsO are separate conditions.

Content validity assesses whether a concept is representative of all aspects of the construct. It must cover all relevant parts of the subject matter. Table 2 summarizes results from patients with PsA with and without axial involvement from the CorEvitas Registry data[14] as evidence of content validity that these are separate conditions.

Face validity shows how suitable the content seems to be on the surface. Face validity is similar to content validity but is a more informal and subjective assessment. Dr. Deodhar quoted 3 studies to show face validity of distinctions between diseases. The first 2 examples were that ustekinumab (an IL-12 and IL-23p40 subunit inhibitor) and risankizumab (an IL-23p19 subunit inhibitor) failed to treat AS.[15,16] The third example was that the posthoc analysis of patients with PsA with axial involvement who participated in the DISCOVER-1 and DISCOVER-2 studies indicated that the IL-23p19 subunit inhibitor guselkumab was effective on improved axial outcomes.[8]

Table 2. Patients with PsA with and without axial involvement have distinct demographics, underlying genetics, and symptoms according to content validity.[14]

	Axial Involvement, n = 192	No Axial Involvement, n = 1338	*P*
Age, yrs	50.4	54.4	< 0.001
HLA-B27+ (physician reported)	14	4	< 0.001
Depression	23	13	< 0.001
Biologic-experienced	73	60	< 0.001
Enthesitis	31	19	< 0.001
Moderate/severe BSA	43	32	0.005
MDA	30	46	< 0.001
TJC-68	5.2 (9.2)	3.5 (7.5)	0.004
Nail PsO, VAS (0-100)	11.4 (18.8)	6.5 (14.4)	< 0.001
BASDAI (0-10)	4.7 (2.5)	3.5 (2.5)	<0.001
BASFI (0-10)	3.8 (2.8)	2.5 (2.5)	< 0.001
ASDAS-CRP	2.2 (0.9)	1.9 (0.8)	0.001

Values are % or mean (SD) unless otherwise indicated. ASDAS-CRP: Ankylosing Spondylitis Disease Activity Score with C-reactive protein; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BSA: body surface area; MDA: minimal disease activity; PsA: psoriatic arthritis; PsO: psoriasis; TJC-68: tender joint count in 68 joints; VAS: visual analog scale.

Table 3. axPsA is distinct from AS according to criterion validity.[17]

	axPsA	AS	*P*
N	186	234	
Female	34	15	
HLA-B27	30.7	92.3	< 0.001
HLA-C01	5.9	31.6	< 0.001
HLA-C02	28	62	< 0.001
HLA-C06	36	8.6	< 0.001
Baseline serum IL-17A	Higher[a]	Lower	< 0.01
Baseline serum IL-17F	Higher[a]	Lower	< 0.001

Values are % unless otherwise indicated. [a] Comparable to patients with non-axPsA. AS: ankylosing spondylitis; axPsA: axial psoriatic arthritis; IL: interleukin.

Finally, criterion validity evaluates how well a concept can predict a concrete outcome, or how well the concept approximates the results of another test. Dr. Deodhar showed genetic and molecular comparisons of axPsA vs AS from the guselkumab (PsA) and ustekinumab (AS) studies[17] in Table 3.

These data show that adults with axPsA and AS exhibit different genetic risk factors and serum IL-17 levels, supporting the concept of distinct disorders.

Dr. Deodhar concluded that axPsA is a separate disease from AS with PsO, since the concept that these are distinct diseases meets construct, content, face, and criterion validity.

Rebuttals and voting

The debaters' playful jabs at each other during the debate were enjoyed by the audience. Both debaters were given 5 minutes for rebuttals, where similar points from the original debate were made. The audience was given a chance to vote on the 2 sides of the debate and favored the opinion that axPsA is a separate condition than AS with PsO.

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Advances in the Evaluation of Peripheral Enthesitis by Magnetic Resonance Imaging in Patients With Psoriatic Arthritis

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ABSTRACT. Enthesitis is a key disease manifestation in patients with psoriatic arthritis (PsA) that considerably contributes to pain, lower physical function, and reduced quality of life. Clinical assessment of enthesitis lacks sensitivity and specificity, and therefore better methods are urgently needed. Magnetic resonance imaging (MRI) allows detailed assessment of the components of enthesitis, and consensus-based validated MRI scoring systems exist. These include the Outcome Measures in Rheumatology (OMERACT) Heel Enthesitis MRI Scoring System (HEMRIS) method, which assesses the entheses of the heel region in a detailed manner, and the OMERACT MRI Whole-Body Score for Inflammation in Peripheral Joints and Entheses (MRI-WIPE) method, which provides an overall assessment of the inflammatory burden in the peripheral entheses and joints in the entire body using whole-body MRI. At an MRI workshop at the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 meeting in Brooklyn, the MRI appearances of peripheral enthesitis were described, as were the scoring methods. The utility of MRI for improved assessment of enthesitis was demonstrated with examples of patient cases. Clinical trials in PsA that evaluate enthesitis by MRI as a key endpoint should include the presence of MRI enthesitis as an inclusion criterion, and apply validated MRI outcomes to assess the effect of therapeutics on enthesitis are recommended.

Key Indexing Terms: arthritis, GRAPPA, magnetic resonance imaging, psoriasis, psoriatic arthritis, spondyloarthritis

Introduction

Enthesitis is a key disease manifestation in psoriatic arthritis (PsA)[1,2] that markedly contributes to pain, lower physical function, and quality of life in patients with PsA.[3] Enthesitis is not effectively examined clinically, where its presence or absence is determined mainly based on the presence or absence of local tenderness, with or without swelling.[4,5] Therefore, more objective methods are needed both for clinical trials and clinical practice.[6,7]

Magnetic resonance imaging of enthesitis

Magnetic resonance imaging (MRI) allows for sensitive evaluation of both joints and entheses in PsA and other types of spondyloarthritis (SpA).[5,7,8] Both MRI and ultrasonography visualize soft tissue inflammation and entheseal bone lesions, such as erosions and enthesophytes at entheses[8-12]; however, only MRI allows assessment of inflammation in bone, visualized as osteitis.[8,11,12]

Informed by a systematic literature review[11] that documented the lack of a comprehensive, validated scoring system, the Outcome Measures in Rheumatology (OMERACT) MRI in Arthritis Working Group, which has previously developed a method for scoring joint inflammation and damage in PsA,[13-15] has developed consensus-based definitions for enthesitis in patients with PsA and other types of SpA.[16] Through iterative exercises, the OMERACT Heel Enthesitis MRI Scoring System (HEMRIS) was developed, which scores the degree of enthesitis at the insertion of the Achilles tendon and plantar fascia by separately assessing intratendinous, peritendinous, and intraosseous components of entheseal inflammation, and structural changes comprising tendon thickening, enthesophyte formation, and bone erosion.[16] HEMRIS has high reproducibility for both inflammatory and structural changes, and high sensitivity to change for the inflammatory components, whereas clarification of the sensitivity to change of the structural damage components requires cohorts with longer follow-up than currently available.[16]

Subsequently, an atlas of the OMERACT HEMRIS was developed, which included descriptions of appropriate MRI sequences and imaging planes (Box 1, Part A) as well as detailed definitions and scoring instructions (Box 1, Part B). The atlas could be used as a guide when scoring Achilles tendon and plantar fascia enthesitis in future clinical cohorts and trials.[17] The reference images in the atlas can also be used to guide scoring of Achilles tendon and plantar fascia (plantar aponeurosis)

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enthesitis according to the OMERACT HEMRIS in clinical trials and cohorts in which MRI enthesitis is used as an outcome.

The only published randomized placebo-controlled enthesitis trial compared an interleukin-17 inhibitor with placebo in patients with PsA or axial SpA (axSpA) with clinical heel enthesitis. The study did not use a validated enthesitis MRI assessment system and presence of baseline MRI enthesitis was not mandatory, which may explain why no benefit of biological therapy on enthesitis was found.[18]

Whole-body MRI

Entheses and joints of the entire body can now be visualized by whole-body MRI (WB-MRI), a technique in rapid development.[19-23] The method was used initially to screen for bone marrow malignancies and systemic muscle diseases.[19] For small entheses and joints, WB-MRI still needs improved image quality and more validation before routine clinical use, but for larger entheses, such as in the heel, knee, and/or hip or pelvis region, image quality is sufficient for use in clinical practice and trials.[24-27] Several studies, mainly in axSpA, have shown decreases in inflammation with the use of biological therapies,[24,25,28-31] and a randomized placebo-controlled trial evaluating adalimumab documented a statistically significant reduction compared to placebo, as early as 6 weeks after treatment initiation.[30] A scoring method for WB-MRI (OMERACT MRI Whole-Body Score for Inflammation in Peripheral Joints and Entheses [MRI-WIPE]) has been developed and validated.[32,33] This system assesses synovitis and osteitis in 83 peripheral joints as well as

Box 1. OMERACT HEMRIS recommendations for MRI acquisition, definitions, and scoring of inflammatory and structural pathologies at the entheses (adapted from Box 1, Mathew et al[17]).

Part A. Core set of basic MRI sequences and imaging planes for MRI of the heel region.

MRI studies that intend to assess inflammatory and structural changes at entheses should include at least the following sequences:

- STIR/T2wFS images or, alternatively, gadolinium-enhanced T1-weighted fat-suppressed images
- T1-weighted images without gadolinium-contrast injection (not mandatory if only inflammation is being assessed)

Suggested imaging planes for the heel region:

- Achilles tendon – sagittal and preferably also axial
- Plantar fascia – sagittal and preferably also coronal

Part B. Definitions and grades of inflammatory and structural pathologies at the Achilles tendon insertion and the plantar fascia insertion to the calcaneum (adapted from Box 1, Mathew AJ et al[17]).

1. Intratendon/intrafascia hypersignal (STIR/T2wFS)

Definition: Signal characteristics consistent with increased water content/inflammation within the tendon/fascia, close to its insertion.[a]

Grades:

0: No intratendon/intrafascia hypersignal[a]
1: Minimal intratendon/intrafascia hypersignal spots[a] (≤ 25% of the tendon volume)
2: Moderate intratendon/intrafascia hypersignal[a] (> 25% and ≤ 50% of the tendon volume).
3: Severe intratendon/intrafascia hypersignal[a] (> 50% of the tendon volume).

[a] For Achilles tendon: From the tendon insertion up to 2 cm proximal to the posterosuperior corner of calcaneum on all the available images. For plantar fascia: From the fascia insertion up to 2 cm proximal to the anterior margin of the plantar tuberosity on all the available images.

2. Peritendon/perifascia hypersignal (STIR/T2wFS)

Definition: Signal characteristics consistent with increased water content/inflammation in the soft tissues surrounding the tendon or fascia, close to its insertion.

Grades:

0: No hypersignal[a]
1: Minimal[b] (or mild) focal hypersignal[a]
2: Moderate[b] hypersignal[a]
3: Severe[b] hypersignal[a]

[a] For Achilles tendon: From tendon insertion up to 2 cm proximal to the posterosuperior corner of calcaneum. For plantar fascia: From fascia insertion up to 2 cm proximal to the anterior margin of the plantar tuberosity on all the available images. [b] By comparison with reference images (see Mathew AJ et al[17]).

3. Achilles tendon/plantar fascia calcaneal BME

Definition: BME should be assessed in the bone from the entheseal insertion to a depth of 1 cm on all available images.

Grades:

The scale is 0-3, based on the proportion of bone with edema, compared to the "assessed bone volume," judged on all available images:

0: no edema
1: 1-33% of the bone is edematous (ie. BME occupying 1-33% of the assessed bone volume)
2: 34-66% of the bone is edematous
3: 67-100% of the bone is edematous

If the lesion is judged borderline (ie, 1 vs 2 or 2 vs 3), lesion intensity may be considered. For example, if a lesion is borderline between 1 (mild) and 2 (moderate), it may be scored 1 (mild) if not judged intense. Similarly, if a lesion is borderline between 2 (moderate) and 3 (severe), it may be scored 3 (severe) if judged intense.

Box 1. Continued.

4. Retrocalcaneal bursitis (only relevant at Achilles tendon insertion)
Definition: Signal characteristics consistent with increased water content/inflammation in an above-normal sized bursa.
Grades:

0: No hypersignal or maximal diameter of hypersignal in the shorter of 2 perpendicular dimensions to be < 0.25 cm
1: Maximal diameter of hypersignal in the shorter of 2 perpendicular dimensions to be ≥ 0.25 cm to < 0.5 cm
2: Maximal diameter of hypersignal in the shorter of 2 perpendicular dimensions to be 0.5 cm to < 1.0 cm
3: Maximal diameter of hypersignal in the shorter of 2 perpendicular dimensions to be ≥ 1.0 cm

5. Tendon/fascia thickening
Definition: Abnormal thickening of the tendon/fascia close to its insertion.[a]
Grades:

0: None
1: Mild[a,b]
2: Moderate[a,b]
3: Severe[a,b]

[a] For Achilles tendon: Maximally 2 cm proximal from the postero-superior corner of calcaneum. For plantar fascia: Maximally 2 cm proximal to the anterior margin of the plantar tuberosity. [b] By comparison with reference images (see Mathew AJ et al[17]).

6. Achilles tendon/plantar fascia calcaneal enthesophyte
Definition: Abnormal bone formation at the insertion of tendon/fascia into the bone.
Grades:

0: None
1: Small[a]
2: Medium-sized[a]
3: Large[a]

[a] By comparison with reference images (see Mathew AJ et al[17]).

7. Achilles tendon/plantar fascia calcaneal bone erosion
Definition: A sharply marginated bone lesion, with typical signal characteristics and a visible cortical break, located close to the tendon/fascia insertion.
Grades:

0: None
1: Small[a]
2: Medium-sized[a]
3: Large[a]

[a] By comparison with reference images (see Mathew et al[17]).

BME: bone marrow edema; HEMRIS: Heel Enthesitis MRI Scoring System; MRI: magnetic resonance imaging; OMERACT: Outcome Measures in Rheumatology; STIR: short-tau inversion recovery; T2wFS: T2-weighted fat suppressed.

soft tissue inflammation and osteitis at 33 entheses (grading 0-3 per joint or enthesis), and has good reliability and sensitivity to change.[33] A comparable OMERACT approach is currently being undertaken for detailed evaluation of entheses at the knee and the hip or pelvis.[34,35] Moderate to good reliability has been reported, and a reference image atlas is being developed.

Axial entheses (ie, in the sacroiliac joints, spine, and anterior chest wall) can be assessed by dedicated MRI.[36-41] This can now also be incorporated as part of a WB-MRI examination.[25,30] To reduce the time spent in the MRI unit, axial T1-weighted sequences may be omitted. This, however, hinders assessment of structural changes such as fat lesions and bone erosion. The ideal MRI protocol may vary from study to study and the main objectives of the study, as well as the speed and technical specifications of the MRI unit, should be taken carefully into consideration when planning the MRI sequences for a specific study.[32,42] Thus, the WB-MRI method is extremely promising in rheumatoid arthritis and axSpA but particularly in PsA, because of the diverse manifestations of psoriatic disease.[22,23,25,31,32] Regarding enthesitis specifically, WB-MRI can provide a measure of the global entheseal inflammatory burden in the entire individual patient with PsA.[22,43]

Conclusion

MRI allows detailed assessment of the components of enthesitis, and consensus-based validated MRI scoring systems exist, such as the OMERACT HEMRIS and the OMERACT MRI-WIPE methods. Clinical trials using MRI enthesitis as a key endpoint are recommended with the application of validated MRI outcomes and the presence of MRI enthesitis as an inclusion criterion. At an MRI workshop at the GRAPPA 2022 meeting in Brooklyn, the MRI appearances of peripheral enthesitis were described, as were the scoring methods. The utility of MRI for more effective assessment of enthesitis was demonstrated using examples of cases with enthesitis. The next steps are to apply these MRI techniques in further and larger clinical trials and cohorts of patients with PsA and thereby further develop and validate these MRI assessment systems.

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GRAPPA 2022 Patient Research Partners Network Update: Managing Growth

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ABSTRACT. Seven patient research partners (PRPs) attended the 2022 annual meeting of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) in person, the first in-person annual meeting since the start of the coronavirus disease 2019 (COVID-19) pandemic. The GRAPPA PRP Network remains engaged and committed to providing dedicated voices supporting delivery of the GRAPPA mission. This report provides a summary of the current activities of the GRAPPA PRP Network.

Key Indexing Terms: GRAPPA, patient participation, psoriasis, psoriatic arthritis, researcher-subject relations

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) Patient Research Partner (PRP) Network currently has 12 members from 7 countries with various backgrounds and careers who work to support the physicians, researchers, and scientists of the greater GRAPPA community. Many GRAPPA PRPs are also PRPs for other groups, such as Outcomes Research in Rheumatology (OMERACT), European Alliance of Associations for Rheumatology (EULAR), EULAR People with Arthritis and Rheumatism in Europe (PARE), International Dermatology Outcome Measures (IDEOM), National Psoriasis Foundation (NPF), International Consortium for Health Outcomes Measurement (ICHOM), Hong Kong Psoriatic Arthritis Association (HKPsAA), Foundation for Research in Rheumatology (FOREUM), as well as for organizations at the local level. Its members participate in most GRAPPA committees.

Brief history of the PRP Network governance

GRAPPA began a consistent collaboration with PRPs at the Toronto meeting in 2013, with increasing PRP representation at meetings and within GRAPPA projects.[1,2] Many of these PRPs remain with the PRP Network to date. With increasing complexity and depth of involvement, 4 PRPs created the PRP Governance Committee and then worked through network consensus to organize the network to its present-day configuration. This work was done in concert with the GRAPPA Executive Committee–PRP liaison at the time, in 2016. In December 2017, the GRAPPA PRP Network Policies and Procedures document was approved with consensus of all PRPs and by the GRAPPA Executive Committee (now Board). A year later, the PRP Handbook was completed, which includes many resources for PRP members.[1-4]

GRAPPA leadership retreat

The quinquennial GRAPPA leadership retreat was held before the 2022 annual meeting. Three PRPs attended to provide patient perspectives on the overall GRAPPA research, educational, and organizational goals for the next 5 years. The importance of involvement and collaboration with PRPs was recognized. The PRPs raised awareness that some GRAPPA research proposals would have been substantially strengthened with more engagement and input from PRPs.

Annual GRAPPA meeting 2022

Seven of the 12 PRPs attended the in-person GRAPPA 2022 annual meeting in Brooklyn, New York, USA, while the remaining attended via the online platform. Five of the 7 in-person attendees participated in panel discussions. Separate meetings with 2 members each of Young-GRAPPA and the current co-vice presidents of the Executive Committee's PRP liaisons (1 dermatologist and 1 rheumatologist) afforded the in-person and virtual PRP Network members the opportunity to express their own interests in future collaborations. The PRP Network was also able to outline their needs under the GRAPPA umbrella, which included improving communication, growing the network, and continuing involvement in projects to support the GRAPPA mission. Given the relatively small size of the PRP Network relative to the increasing number of GRAPPA projects, concerns regarding PRP overextension and the need to prioritize PRP participation to ensure incorporation of the patient perspective were discussed.

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

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Educational seminars and projects

The pandemic created many new opportunities for developing and sharing research using virtual platforms.[3] GRAPPA used the platforms by developing worldwide educational programs with various partners. PRPs proved invaluable in this collaboration. The programs have been successful and new topics continue to be created, funded, and presented, with the acknowledgment that PRP involvement will expand. These programs included the GRAPPA Spondyloarthritis Research and Treatment Network (SPARTAN) Global Education Virtual Series in 2021 and the Clinician and Patient Education Series (CAPES) of 2021/2022. GRAPPA PRPs also provide or have provided the patient perspective to numerous GRAPPA projects, including, but not limited to, the GRAPPA treatment recommendations 2021 update, Informatree.org, the Innovative Medicines Initiative (HIPPOCRATES), the Sex and Gender (SAGE) PsA study, the Diagnostic Ultrasound Enthesitis Tool (DUET) study, the GRAPPA/Assessment of SpondyloArthritis international Society (ASAS) Axial Involvement in Psoriatic Arthritis cohort (AXIS) study, the GRAPPA-OMERACT working group, the Slide Library project, and the Collaborative Research Network (CRN) working group.

Future plans

The GRAPPA PRP Network has had increasing opportunities for collaboration and involvement in research studies and educational efforts, which has included virtual presentations over the past few years. However, the PRP Network itself has not grown in membership and is attempting to better distribute the workload among current PRP members and to expand the network. A potential mechanism for expansion is the creation of a PRP recruiting committee to develop a comprehensive plan to recruit and screen potential PRPs for inclusion. The recruiting committee would focus on diversifying all aspects of the PRP Network to better represent the global community of people living with psoriatic disease. Once the plan is developed and agreed upon within the PRP Network, it will be presented to the GRAPPA Board for approval and thereafter codified in the PRP governing documents. Updates to the governing documents, including the Handbook, are also planned.

The GRAPPA PRP Network has continued to develop and evolve with GRAPPA, welcoming unprecedented involvement of PRPs to contribute to projects. As demand for PRP input within GRAPPA continues to increase, much effort continues to be put forth by the GRAPPA PRPs, in conjunction with GRAPPA leadership, to address the needs for PRP Network growth.

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Identification of Psoriatic Arthritis in Patients With Psoriasis

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ABSTRACT. People with psoriasis (PsO) are at increased risk of developing psoriatic arthritis (PsA). Screening patients with PsO for PsA may be helpful in diagnosing PsA early. Dermatologists play a role in assessing their patients with PsO for musculoskeletal symptoms and referring them to a rheumatologist for diagnosis and treatment.

Key indexing terms: arthritis, GRAPPA, psoriasis, psoriatic, psoriatic arthritis

A session on the need for the early diagnosis of psoriatic arthritis (PsA) in patients with psoriasis (PsO) was presented at the 2022 annual GRAPPA meeting. Early PsA diagnosis requires close collaboration between dermatologists, as PsO in most cases precedes the musculoskeletal (MSK) manifestations, and rheumatologists, who are usually responsible for the final diagnosis of PsA and treatment of the MSK manifestations.

Studies suggest that there may be a significant proportion of undiagnosed patients with PsA among those with PsO seen by dermatologists.[1,2] There is a relatively low level of awareness of PsA among people living with PsO.[3]

Several studies have demonstrated that delayed diagnosis of PsA results in poorer outcomes 8 to 10 years after diagnosis and treatment, including a higher risk of erosive disease and functional disability.[4,5]

Screening questionnaires completed by patients and asking about signs and symptoms of arthritis may be useful for identifying PsA in people already living with PsO. There are now a large number of similar screening questionnaires, including the Psoriasis Epidemiology Screening Tool (PEST), the Psoriatic Arthritis Screening and Evaluation (PASE), the Toronto Psoriatic Arthritis Screen version 2 (ToPAS 2), and the Early Arthritis for Psoriatic Patients (EARP), each of which ask slightly different questions. Studies have attempted to compare these and test their effectiveness.[6] Although these questionnaires have been shown to have limited sensitivity and specificity, they certainly provide some guidance about who may require a referral for rheumatology assessment. A combination of these screening questionnaires with other assessments or investigations may be able to improve their performance.

To date, there are no validated screening tools that require a physician's assessment to confirm the presence of signs and symptoms suggestive of PsA and no clinically applicable biomarkers available for screening.

Several risk factors have been identified for incident PsA, including severe PsO, psoriatic nail lesions, obesity, nonspecific MSK symptoms, and genetic factors.[7-9] Currently, there is no single tool that can incorporate this information and estimate the risk of developing PsA for an individual patient.

Dr. Lihi Eder presented results from the Prediction of Psoriatic Arthritis Tool (PRESTO) study that developed risk prediction models for PsA in patients with PsO. Data from the International Psoriasis and Arthritis Research Team (IPART) cohort in Toronto was analyzed. In this cohort, patients with PsO without arthritis at baseline from 2006 to 2019 were followed and their PsA status was assessed annually by a rheumatologist.[10] Risk prediction models for 1- and 5-year time periods were created. The models included a combination of patient reported outcomes (eg, pain, fatigue, stiffness), patient demographics (eg, age, sex), and PsO characteristics (eg, PsO severity, nail lesions). The accuracy of the models, as assessed by area under the curve (AUC), was reasonable with AUC of over 70% for both models and good model calibration. Additional work is underway to validate these models in external cohorts of patients with PsO.

The study showed that the development of PsA within clinically meaningful time frames can be predicted with reasonable accuracy for patients with PsO. These models offer opportunities for the screening of high-risk patients with PsO in clinic and research settings.[10]

Dermatologists are receiving the message that annual screening for PsA in patients with PsO is important, rather than only evaluating for PsA at the first visit with the patient. During the preparation for this symposium, a preliminary literature search using the term "screening of psoriasis patients for psoriatic arthritis" found 35 papers about screening patients with PsO for PsA in dermatology journals in several languages. Dermatologists are asking their patients about MSK symptoms

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so that the appropriate patients are referred to a rheumatologist. Some are asking several questions about symptoms of arthritis. Others are using screening tools. There is an awareness that even with identified MSK symptoms, the patient may not have PsA.

Dermatologists experience difficulties with adding screening to patient visits, including competing priorities during time-limited consultations; the need to prioritize dermatologic issues; the ability to diagnose the skin-related issue first if the diagnosis is unknown at a patient's first visit; a sense of being overburdened; uncertainty about whether a dermatologist should be ordering PsA diagnostic tests, such as radiographs, magnetic resonance imaging, or ultrasound; lack of clarity about which diagnostic tools should be used given their variety; and lack of access to a rheumatologist.

In summary, dermatologists are being asked to screen their patients with PsO annually for the development of incident PsA. The appropriate expectation seems to be knowing when to refer a patient to a rheumatologist rather than to diagnose and treat.

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Impact of COVID-19 on Patients With Psoriasis or Psoriatic Arthritis

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ABSTRACT. Given the impact of the coronavirus disease 2019 (COVID-19) on patients with psoriatic disease (PsD), a session was devoted at the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting to discussing the current understanding of the risk of severe COVID-19 in patients with PsD. The effects of PsD and its treatment on prevention and treatment of COVID-19 with vaccinations, antiviral drugs, and monoclonal antibodies were discussed. The session concluded with a presentation on the perspectives of patient research partners about their experiences with COVID-19.

Key Indexing Terms: arthritis, COVID-19, GRAPPA, psoriasis, psoriatic, vaccines

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), remains a global concern despite the development of vaccinations and antiviral drugs.[1] During the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting, Profs. Dafna Gladman and Kristina Callis Duffin moderated a session on COVID-19. During the session, Prof. Philip Mease discussed a study on the risk factors for severe COVID-19 outcomes, Prof. Peter Nash discussed antiviral therapy, and Prof. Vinod Chandran discussed vaccinations, following which Dr. Suzanne Grieb provided a patient perspective. These presentations are summarized here.

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

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Risk factors for severe COVID-19 outcomes: A study of immune-mediated inflammatory diseases, therapies, and comorbidities in a large US healthcare system

During the COVID-19 pandemic, patients with immune-mediated inflammatory diseases (IMIDs) and their clinicians often assumed that their disease or its therapy with immunomodulatory drugs made them more at risk for severe outcomes such as hospitalization or death. This assumption sometimes led to extreme isolation and decrease or cessation of immunomodulatory drugs. To test the validity of this assumption, a machine learning analysis of a large cohort of patients with IMID was undertaken.

Patients with IMIDs were identified from Providence St. Joseph Health, an integrated healthcare system that serves 7 states in the Western United States. The outcomes of hospitalization and death were assessed among patients with and without IMIDs. Two different periods were analyzed: March 2020 through December 2021 (pre-Omicron, Period 1) and January 2022 through April 2022 (Omicron predominant, Period 2). Use of immunomodulatory drugs was observed for 3 months prior to and up to the index date, which was when patients were diagnosed with COVID-19. Risk factor associations were estimated using 2 different machine learning techniques: multivariate logistic regression and extreme gradient boosting (XGBoost).

The Institute for Systems Biology, a Providence St. Joseph affiliate, accessed electronic records of the healthcare system, comprising over 9 million patients, including 270,000 with IMIDs. In period 1, over 1.4 million people without IMIDs were tested for SARS-CoV-2, of whom 11% were positive; of these, 13.9% were hospitalized and 3.1% died due to COVID-19. Of the 90,000 patients with IMID tested, 8% tested positive; of these, 13.8% were hospitalized and 3.8% died. In period 2,

among all patients, including those with IMIDs, the percentage testing positive increased but the percentage hospitalized and dying decreased, partly due to increased vaccination status and decreased viral virulence. The rates of hospitalization and death for non-IMID were 11.6% and 1.6% vs 14.5% and 2.5% for the IMID population, respectively. Age, sex, ethnicity, and race of patients in the 2 periods were similar. More patients were vaccinated and received booster doses in period 2; nonetheless, the majority of people testing positive in both periods were unvaccinated. Comorbidities noted included hypertension, obesity, coronary artery disease, heart failure, atrial fibrillation, diabetes, chronic kidney disease, chronic obstructive pulmonary disease, and malignancy. Multiple types of IMIDs were observed, the most common being psoriasis, rheumatoid arthritis, inflammatory bowel disease, and spondyloarthritides (SpA), including psoriatic arthritis (PsA). The most commonly used medications were corticosteroids, oral small molecules such as methotrexate, and tumor necrosis factor inhibitors (TNFi).

Multivariate logistic regression analysis demonstrated that in both periods, increasing age and the comorbidities noted above were associated with increased hospitalization and death. Being vaccinated and having received booster doses were associated with less hospitalization and death. Most IMIDs were not associated with hospitalization or death in either period, although SpA and Sjögren syndrome were associated with decreased mortality in period 2. Similarly, most IMID therapies were not associated with hospitalization or death in either period. In period 2, TNFi were associated with lower risk for death. XGBoost modeling revealed similar findings, that is, increased risk of hospitalization and death were associated with increasing age and the presence of comorbidities but not various IMIDs or their treatment, except as noted below. This model provided superior performance compared to multivariate logistic regression analysis, with area under the receiver-operating characteristic curve ranging between 0.74 and 0.91 for hospitalization, mechanical ventilation, and death. There was a weak association with death with rituximab (RTX) and Janus kinase (JAK) inhibitors in period 1, but this association was not present in period 2. Limitations of this study include absence of IMID disease severity characterization, lack of data on use of antiviral treatments, socioeconomic factors, and changes in standard of care treatment over time.

In this study, age and multiple comorbidities but not the IMID or its treatment with immunomodulatory medications were identified as risk factors for severe outcomes of COVID-19, whereas vaccination and booster status were strongly associated with decreased risk of hospitalization and death. These findings are important to convey to patients with IMID, as well as to clinicians, to avoid misconceptions about the risk of their disease or its treatment.

Antiviral drugs and immunocompromised patients: What should you know?

Immunomodulators and antivirals are used to treat high-risk patients who have been infected with SARS-CoV-2, and neutralizing monoclonal antibodies may prevent overt disease in high-risk patients once exposed or infected.

Oral nirmatrelvir/ritonavir and molnupiravir and intravenous (IV) remdesevir and strovimab are used for treatment of COVID-19. In a trial involving 2246 symptomatic, unvaccinated nonhospitalized adults at high risk of progression to severe COVID-19, treatment with nirmatrelvir/ritonavir significantly reduced risk of death or hospitalization compared to placebo when given within 5 days of symptom onset.[2] Dysgeusia and diarrhea are significant side effects. Drug interactions with statins, steroids, sedatives, anticoagulants, and antiarrhythmic drugs are of significant concern, and all prescribers must carefully evaluate for such drug interactions.[3] Some patients also experience rebound of COVID-19 symptoms 2 to 8 days after completing a 5-day course of nirmatrelvir/ritonavir.

Molnupiravir, a drug that inhibits RNA polymerase (RNAP), also reduces risk of hospitalization and death in high-risk subjects. In a study of 1433 nonhospitalized, unvaccinated adults with mild to moderate COVID-19 with at least 1 risk factor for severe COVID-19, molnupiravir treatment reduced the risk of hospitalization and death.[4] There are no known drug interactions. Thus, nirmatrelvir/ritonavir and molnupiravir may be used for outpatient therapy of COVID-19 in high-risk subjects, including those on immunosuppressive therapy.

IV remdesivir is a nucleotide prodrug of an adenosine analog that binds to the viral RNA-dependent RNAP and inhibits viral replication by terminating RNA transcription prematurely. Given early, remdesivir prevents progression to severe COVID-19.[5] Since it is administered intravenously, it is usually given to high-risk, hospitalized patients.

Neutralizing monoclonal antibodies tixagevimab/cilgavimab may be used as preexposure prophylaxis in high-risk patients who are at increased risk of poor vaccine response. They have also been shown to reduce risk of COVID-19, including for patients on immunosuppressants.[6] It is unclear how long the protection lasts. Elderly patients, those with obesity, or those on treatment with RTX may benefit. Sotrovimab is also a human neutralizing monoclonal antibody against SARS-CoV-2. This antibody was also shown to reduce risk of death in a trial of 1057 patients when treated within 5 days of symptoms in nonhospitalized, unvaccinated adults with a comorbidity.[7]

For the management of high-risk outpatients, oral nirmatrelvir/ritonavir may be most appropriate. In patients treated with RTX, combining monoclonal antibodies with nirmatrelvir/ritonavir may be appropriate. If there are contraindications to nirmatrelvir/ritonavir, treatment with monoclonal antibodies or molnupiravir may be considered. The response to novel variants of concern; duration of benefit; response in vaccinated, pregnant, or juvenile patients; and access remain significant concerns.

Immunity to SARS-CoV-2 mRNA vaccines in patients with IMIDs

Seroconversion rates after SARS-CoV-2 vaccination are lower in patients with IMIDs. A systematic literature review and metaanalysis showed that treatment with TNFi, anti-integrin, anti-interleukin (IL)-17, anti–IL-6, anti–IL-12/23 do not affect seroconversion rates, whereas anti-CD20 and anti–CTLA-4 result in poorer responses.[8] The Immune Response After

Covid-19 Vaccination During Maintenance Therapy in IMIDs (IMPACT) study group conducted a study involving 150 adult patients with IMIDs including psoriatic disease (PsD), with or without maintenance immunosuppressive therapies, who received BNT162b (Pfizer-BioNTech) and/or mRNA-1273 (Moderna) SARS-CoV-2 vaccines. Patients were included if they did not have prior COVID-19 infection and were not being treated with steroids or other vaccines. This study showed that antibody as well as T cell responses to SARS-CoV-2 were detected in all participants, increasing from dose 1 to dose 2 of the vaccine, with a decline 3 months later. There was greater decline in patients with IMIDs compared with healthy controls. Interestingly, antibody levels and neutralization efficacy against variants of concern were substantially lower in TNFi-treated patients than in healthy controls and were undetectable against Omicron by 3 months after dose 2.[9] Following a third dose of the vaccine, robust serological and cellular responses were observed within 2 to 4 weeks. The third dose rescued waning of T cell–mediated and antibody-mediated immunity and retained T cell immunity to Omicron B.1.1.529.[10]

Patient research partner perspective

To provide some patient perspective, Dr. Grieb sent her patient research partner (PRP) peers a survey to learn about their experiences, concerns, and desires for improved access to information. At the time she developed the questions, she did not know the specific topics that would be presented by others on the panel, so it was interesting that many of the concerns aligned with the topics discussed.

The first question was "Does the possibility of COVID-19 infection currently have an impact on your PsD care or overall health and emotional well-being? In what ways?" Overall, most of the PRPs did not feel that their care or overall well-being was still affected by the pandemic, largely because of vaccinations, although several of them were still very careful to wear masks and socially distance. One exception to this otherwise low impact was about emotional well-being. Several of the PRPs noted that the pandemic has been a challenge on their mental well-being. Although this is certainly true for people all around the world, this was highlighted because it is well known that the prevalence of depression among people living with PsD is higher than the general population.[11] It is important that clinicians understand this and begin to or continue to make discussions of mental health part of PsD care.

Two other questions asked were "What concerns do you currently have with respect to COVID-19 and your PsD?" and "What questions do you have or think researchers should investigate?" Many of these responses centered around medication. One concern was whether medication should be continued if patients get infected with SARS-CoV-2 and whether their medication would affect the course of COVID-19. Relatedly, are patients more vulnerable to SARS-CoV-2 infection around the time their biologic is administered? There were also concerns about the severity of COVID-19 for patients with PsA, particularly those who have additional risk factors such as obesity—how does the PsA affect this intersection of COVID and obesity? Finally, how does PsA and/or medication use influence the protection received from the vaccination and the patients' risk of long COVID?

Throughout the pandemic, the rapid discovery and sharing of information has been challenging and has created uncertainty among people about what to believe. When asked how doctors and researchers could effectively share updated information about COVID-19 and PsD, some of the PRPs recognized the importance of national and international organizations as trusted sources of information, but most wanted information directly from their provider. Importantly, there was a call for providers and/or clinics to be more proactive in sharing information. A desire stated by several PRPs was for a weekly or regular emails with research updates. While this, of course, can be challenging simply because of the time it takes to do this, the past 2 years have forced us all to approach things differently, enabling us to maximize opportunities for creative strategizing. So, whether clinics regularly share updated information with patients by email or some other means of consistent communication, the importance of the patients' trust in their providers as a source of information should be recognized and not downplayed.

Conclusion

In the session on COVID-19, a global panel discussed themes of concern for patients and clinicians. These included quantifying risk of adverse outcomes to infection with SARS-CoV-2 in patients with IMID, particularly those with PsD, and treatment of patients at risk of adverse outcomes and immune responses to vaccines. A survey of PRPs aligned with the topics discussed. Greater frequency and consistent communication of research results to patients was strongly recommended.

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GRAPPA 2021 Treatment Recommendations for Psoriatic Arthritis

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ABSTRACT. At the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting, the recently published new GRAPPA recommendations were presented and their unique characteristics highlighted, including their truly international approach, the inclusion of patient views from the very beginning, the representation by both rheumatologists and dermatologists, consideration of the diverse domains of psoriatic arthritis, and the inclusion of comorbidities to inform possible adverse events and their potential influence on treatment choices.

Key Indexing Terms: arthritis, GRAPPA, guidelines, psoriasis, psoriatic, psoriatic arthritis

During the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting, the most recent version of the evidence-based recommendations for the treatment of psoriatic arthritis (PsA), developed by GRAPPA members and patient research partners (PRPs), was presented.

Like previous versions of these recommendations, we used a domain-based approach. However, in contrast to the 2015 version,[1] the comorbidities group split into 2 different groups addressing related conditions and comorbidities. This allowed the inclusion of 2 additional PsA-related conditions into the key treatment algorithm: inflammatory bowel disease and uveitis, both of which can affect assessment and treatment choice. Again, a Grading of Recommendations Assessment, Development, and Evaluation (GRADE)-informed methodology was used to provide a transparent approach to grading the quality of evidence underpinning the recommendations.

These recommendations were recently published,[2] as well as systematic literature reviews that informed the recommendations in each one of the different domains (peripheral arthritis,[3] enthesitis,[4] dactylitis,[5] skin,[6] nails,[7] axial PsA,[8] PsA-related conditions,[9] and comorbidities[10]).

At the GRAPPA 2022 annual meeting, the unique characteristics of the GRAPPA recommendations were highlighted, including their truly international approach, the inclusion of patient views from the very beginning, the representation by both rheumatologists and dermatologists, consideration of the diverse domains of PsA, and the inclusion of comorbidities to inform possible adverse events and their potential influence on treatment choices.

GRAPPA recommendations have already aroused substantial interest in the medical community, with more than 9000 article views and 2400 full PDF downloads since their publication in August 2022. GRAPPA continues with the mission of disseminating the guidelines, and translations to Spanish and Portuguese are currently underway. The impact and utility of these translations will be evaluated and then translation to other languages will be considered. As in the previous iterations, a document specifically for patients is being prepared.

Many topics of the research agenda highlighted in the 2015 recommendations have been answered by GRAPPA investigators, but as expected, new research questions arose and were incorporated into the 2021 recommendations, with the conviction that they will be addressed by new research. The treatment recommendations for PsA are, and have been, one of the major contributions of GRAPPA to education and the improvement of knowledge about psoriasis (PsO) and PsA around the world, in accordance with the GRAPPA mission. Fortunately, research on the pathophysiology and the treatment of PsO and PsA continues at a good pace. New drugs are being tested in well-designed randomized clinical trials and are expected to be incorporated into the treatment options for our patients very soon. Recommendations will therefore need to be updated again in

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the near future, and GRAPPA is already working on the next version. None of this would have been possible without contributions of many GRAPPA members, PRPs, and methodologists, who worked tirelessly and efficiently to put all this information together. We thank them for their efforts, which resulted in the new update.

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Project Highlights From the GRAPPA 2022 Annual Meeting: Education Initiatives and Axial Involvement in Psoriatic Arthritis

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ABSTRACT. A core mission of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) is to provide education about psoriasis and psoriatic arthritis globally. This is a multifaceted endeavor involving in-person and virtual lectures, discussions, podcasts, and archived videos directed toward clinicians and researchers who are involved with psoriatic disease (PsD) care. In partnership with patient service leagues, we also aim to provide education to patients with PsD. At the 2022 annual meeting, an update of the ongoing and expected educational initiatives was presented. A project with a high educational and research value is the Axial Involvement in Psoriatic Arthritis (AXIS) cohort established in collaboration with the Assessment of Spondyloarthritis international Society (ASAS). Here we summarize the status of the project.

Key Indexing Terms: arthritis, education, GRAPPA, psoriasis, psoriatic arthritis, spine

Educational initiatives

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) has a core objective of offering comprehensive education on a global scale about psoriasis (PsO) and psoriatic arthritis (PsA). This mission encompasses a diverse range of initiatives such as in-person and virtual lectures, interactive discussions, podcasts, and archived videos, all tailored to healthcare professionals and researchers engaged in the field of psoriatic disease (PsD) care. Additionally, GRAPPA collaborates with patient service leagues to extend educational resources to individuals living with PsD. The GRAPPA education committee comprises 21 members, representing all parts of the world, both rheumatologists and dermatologists, 4 patient research partners (PRPs), and 2 members of the Young-GRAPPA (Y-GRAPPA) group. The co-chairs are Drs. Philip Mease (US), Philip Helliwell (UK), and Amit Garg (US). The committee oversees educational initiatives, aided by GRAPPA administrators Judi Pickell, Janine Kowack, and Annie Spangler. GRAPPA also conducts educational programs in collaboration with other associations and organizations, including Spondyloarthritis Research and Treatment Network (SPARTAN), Assessment of Spondyloarthritis international Society (ASAS), National Psoriasis Foundation (NPF), Spondyloarthritis Association of America (SAA), International Federation of Psoriasis Associations (IFPA), American College of Rheumatology (ACR), Pan American League Against Rheumatism (PANLAR), Asia Pacific League Against Rheumatism (APLAR), African League Against Rheumatism (AFLAR), as well as pharmaceutical companies. The majority of the initiatives undertaken in 2022, due to the pandemic, were either wholly virtual or hybrid

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(virtual and in-person), with programming supported by several technology companies.

As in previous years, GRAPPA conducted symposia on PsA and PsO as part of the following professional meetings: ACR (Philadelphia), PANLAR (Miami), and APLAR (Hong Kong). These were both in-person and hybrid events, with lectures by both international and regional faculty. The ACR symposium was presented in conjunction with SPARTAN and ASAS. "Year in Review" lectures on PsA and axial spondyloarthritis (axSpA) highlighted key clinical and basic science research topics. Other lectures focused on such topics as PsA treatment and axial PsA. Hundreds of clinicians attended. By conducting the symposia in a hybrid fashion, the attendance was greater than previous in-person only symposia. Prior to the APLAR meeting, members of the education committee met virtually with APLAR leaders to discuss and agree on making the GRAPPA symposium a regular occurrence at each APLAR meeting, similar to the way it has been with ACR and PANLAR. In 2022, a new partnership between the Indian Association of Dermatologists, Venereologists, and Leprologists (IADVL) and GRAPPA developed from a relationship between Dr. Garg, a US dermatologist and co-chair of the education committee, and Dr. Rashmi Sarkar, president of IADVL. IADVL is the largest association of dermatologists in India, many of whom provide care for patients with PsO and PsA. The inaugural virtual symposium was conducted on August 7, 2022, and involved both international and regional dermatologists and rheumatologists.

As in 2021, Pfizer awarded a substantial educational grant to a consortium of associations, including GRAPPA, SPARTAN, NPF, and SAA. The request for proposals was to supply educational content on PsA and axSpA to both clinicians *and* patients that is focused primarily on a US audience. To accomplish this, GRAPPA and SPARTAN partnered with NPF and SAA to conduct outreach to patients and clinicians. The following topics, not covered in the 2021 initiative, were included: pediatric PsA and spondyloarthritis (SpA); pain and fatigue in PsA and SpA; treatment update for PsA and SpA—all these topics were directed to clinicians and patients. The fourth topic, wellness/diet/exercise, was directed toward patients. All were conducted in the form of live webinars, which were also archived for subsequent viewing, and podcasts. Each included expert lectures as well as panel discussions with experts and PRPs. To date, these have been viewed and/or listened to by over a thousand clinicians and patients.

GRAPPA has partnered with individual pharmaceutical companies to conduct 1- to 2-day symposia in several parts of the world, either virtually or in-person with a hybrid format. These have taken place in India, China (Hong Kong), Taiwan, Kuwait, UK (Leeds), USA (Cleveland), UAE (Dubai), Saudi Arabia (Riyadh), and Italy (Milan and Naples). GRAPPA is currently partnering with several CME companies, including Medscape, Paradigm, and VuMedi, to provide content for broad clinician audiences that include rheumatologists, dermatologists, and primary care practitioners.

Representatives from the Y-GRAPPA group have participated in the education committee and are now involved with updating and maintaining the GRAPPA educational slide library. In this process, a Y-GRAPPA member is paired with a senior member.

GRAPPA is collaborating with Springer Publishing to update the GRAPPA PsA textbook. In a similar fashion as the updating of the slide library, Y-GRAPPA members and other junior associates will be paired with senior mentees to update each chapter.

GRAPPA has an ongoing relationship with Trifecta to make physical exam (skin and musculoskeletal) videos available.

A unique collaboration between GRAPPA and UCB began in 2022. Education specialists from UCB met with members of the GRAPPA education committee to create unique educational programming. In addition to providing educational content about PsD, the focus will also be on teaching empathic communication skills when interacting with patients. The point of this approach is to improve shared decision making in the clinic.

Looking forward to 2023, we anticipate an expanded number of educational opportunities, continuing in the formats described above and pushing into new virtual and hybrid symposia in various parts of the world, including several in South America. We also expect increased use of newer teaching methods such as podcasts, and new educational content, such as those resulting from the GRAPPA-UCB initiative. We are very grateful to have the support of an energetic and enthusiastic group of Y-GRAPPA members and PRPs.

Axial involvement in PsA

The debate on how axial involvement should be defined in patients with PsA and whether this condition is distinct from axSpA (with or without PsO) is still ongoing.[1,2] Some typical features of axial involvement in PsA have been described, but making a clear distinction between axial PsA and axSpA is not always straightforward due to the natural overlap of these conditions. Although some recently published studies have improved our understanding of this topic, there is currently no widely accepted definition and/or criteria for axial involvement in PsA. Further, only a few treatment studies have addressed patients with axial PsA specifically, thus contributing to some limitations when developing treatment recommendations for this patient group.[3] Therefore, there is an unmet need to establish a universally accepted definition or criteria for axial involvement in PsA.

Since 2019, GRAPPA and ASAS have been working together to develop classification criteria that will help identify a homogeneous subgroup of patients with axial involvement for research purposes. The Axial Involvement in Psoriatic Arthritis Cohort (AXIS) study[4] is an ongoing joint GRAPPA/ASAS project that aims to systematically evaluate the characteristics of axial involvement in patients with PsA. Drs. Dafna Gladman and Denis Poddubnyy are co-principal investigators of the study. The overall study coordination is in the hands of Dr. Murat Torgutalp. AXIS has been established as a multicenter, international, cross-sectional study involving more than 50 centers with expertise in axSpA and PsA. The study will enroll 400 patients who are required to fulfill the Classification Criteria for Psoriatic Arthritis (CASPAR), have a symptom duration of less than 10 years, and are not taking biologic/targeted synthetic

disease-modifying antirheumatic drugs (b/tDMARDs).[4] Participating clinicians are encouraged to include consecutive patients with recently diagnosed PsA. Included patients undergo clinical evaluation, laboratory and imaging procedures (radiographs and magnetic resonance images of sacroiliac joints and spine), and blood sample collection for HLA typing. The expert judgment on the presence or absence of axial involvement will be considered as the primary endpoint of the study.

The central reading of the images is performed by an imaging committee consisting of rheumatologists and musculoskeletal radiologists with expertise in PsA and axSpA (Torsten Diekhoff, Kay-Geert Hermann, Robert Lambert, Walter Maksymowych, Mikkel Østergaard, Xenofon Baraliakos). Ultimately, the central clinical committee (Filip van den Bosch, Dafna Gladman, Philip Mease, Denis Poddubnyy) will decide on the presence of axial involvement, considering all clinical, laboratory, and imaging information provided by the clinician and the imaging committee.

The study started in 4 countries in 2022 and the recruitment rate increased throughout 2022 as active centers steadily increased, with more than 100 patients recruited by the end of 2022. It is expected that patient recruitment will be finished by the end of 2023. The data analysis and the development of the draft classification criteria will be performed thereafter, with the input of the entire working group.

In summary, GRAPPA has continued to develop educational material in multiple formats for clinicians and researchers involved with PsD care. Partnership with patient service leagues has also allowed us to provide education to patients with PsD. Both the educational and research aims of GRAPPA are being enhanced through the AXIS cohort established in collaboration with ASAS. Further reports on these ongoing projects will be presented in future GRAPPA meetings.

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GRAPPA 2021 Pilot Grant Award Reports

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ABSTRACT. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) pilot grant awards help support young researchers starting their careers while also encouraging them to develop a focus on psoriatic disease. In this brief report, winners of the 2020 and 2021 awards present the results of their pilot projects.

Key Indexing Terms: arthritis, education, GRAPPA, medical, psoriasis, psoriatic arthritis

Introduction

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) pilot grants given annually support young medical or other researchers who wish to conduct focused and feasible projects relevant to the mission of GRAPPA. In keeping with best practice, when the work is completed, the awardees are invited to present their findings at the GRAPPA annual meeting. Herein are 3 short reports from previous awardees.

Validating feasible composite disease activity measures for use in daily clinical practice in patients with psoriatic arthritis (Fazira Kasiem, Marijn Vis, and William Tillett; 2021 awardees)

Psoriatic arthritis (PsA) is a heterogeneous, chronic inflammatory disease that can lead to progressive joint destruction and deterioration of functional status. PsA can have a negative effect on health-related quality of life and the ability to work.[1,2] Numerous disease activity measures have been developed previously; however, their feasibility in daily clinical practice remains questionable. Therefore, the 3-item visual analog scale (3VAS) and 4-item VAS (4VAS) were developed; these are shortened composite measures derived from the GRAPPA Composite Score (GRACE) measure.[3] This study aimed to validate the 3VAS and 4VAS measures in a population of newly diagnosed patients with PsA receiving usual clinical care.

Data were used from the Dutch Southwest Early PsA (DEPAR) study to test correlation with other measures, responsiveness, and discrimination. All components of the 3VAS (physician global assessment [PGA], patient global assessment [PtGA], patient skin) and 4VAS (PGA, PtGA, patient joint, patient skin) were scored on a 0-10 VAS.

In total, 629 patients were included; 51% (n = 318) male patients with a median (IQR) disease duration of 10.0 (IQR 3.6-32.6) months. According to the 3VAS and 4VAS, 70% and 68% of patients had moderate to high disease activity at baseline, respectively. When comparing low disease activity (LDA; including very low disease activity [VLDA]) of the 3VAS and 4VAS to minimal disease activity (MDA), approximately 2/3 of patients in LDA according to both VAS composite measures were also in MDA at 12 months. Both 3VAS (effect size [ES] = 0.48, standardized response mean [SRM] = 0.52) and 4VAS (ES = 0.48, SRM = 0.50) showed responsiveness similar to Disease Activity Index for Psoriatic Arthritis (DAPSA) and Disease Activity Score in 28 joints. Both measures had a strong correlation with DAPSA (r = 0.799- 0.8666), Psoriatic Arthritis Disease Activity Score (r = 0.8903-0.8922), and Routine Assessment of Patient Index Data 3 (r = 0.8434-0.9247).

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ERS has served as a research investigator and/or scientific adviser and/or speaker for AbbVie, Amgen, BMS, Janssen, Lilly, Novartis, Pfizer, and UCB. AWA has served as research investigator and/or scientific adviser to AbbVie, Almirall, Arcutis, Aslan, Beiersdorf, BI, BMS, EPI, Incyte, Leo, UCB, Janssen, Lilly, Mindera, Nimbus, Novartis, Ortho Dermatologics, Sun, Dermavant, Dermira, Sanofi, Regeneron, and Pfizer. The remaining authors declare no conflicts of interest relevant to this article.

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Both measures have promising performance characteristics, with strong correlations with existing composite measures and good discriminatory power. Recommended areas for additional research include further refinement of thresholds of meaning, testing feasibility of the 3VAS and 4VAS in daily practice, and testing longitudinal construct validity.

Therapeutic exploration of probiotic strain *Lactobacillus reuteri* in Western diet–induced psoriatic skin inflammation (Daisuke Yamada and Samuel T. Hwang; 2020 awardees)

The literature suggests that diet affects the severity and incidence of human psoriasis, but the mechanism remains unclear. We previously showed that changes in the gut microbiota due to Western diet (WD) enhanced inflammation in a mouse psoriasis model with interleukin 23 minicircle DNA (IL-23 MC).[4] As the literature suggests that certain probiotics may reduce inflammation, we hypothesized that specific probiotics may restore the dysbiosis observed in WD-fed mice. We performed the following experiments in standard C57BL/6 mice. Oral gavage of the probiotic *Lactobacillus reuteri* improved WD IL-23 MC–induced skin inflammation in the mouse model, but the mice had increased fatty liver compared to WD-fed mice not given *L. reuteri*. This suggests that liver changes may limit chronic use of *L. reuteri* to reduce inflammation.

Given these findings, we sought to restore dysbiosis with *L. plantarum,* another probiotic strain that has already been shown to attenuate weight gain. Neither WD IL-23 MC–induced skin inflammation nor intestinal inflammation was improved by *L. plantarum*. As we did not observe efficacy of *L. plantarum* in reducing WD IL-23 MC–induced inflammation, we tested the ability of *L. plantarum* to reduce inflammation in a mouse model fed WD alone to induce inflammation. Relatively low levels of skin inflammation were generated by WD alone (vs prior results) and the minor inflammation was not attenuated by *L. plantarum*. We investigated variables such as mice (single-nucleotide polymorphism difference), cage environment, and change in food, but we could not identify the exact cause of WD not causing as much inflammation as we reported previously.

In summary, specific probiotic strains such as *L. reuteri* can reduce WD IL-23 MC–induced skin inflammation, but can induce fatty liver. We continue to search for probiotics, either alone or in combination, that may reduce skin inflammation without significant adverse effects.

Can magnetic resonance imaging differentiate patients with axial spondyloarthritis from patients with PsA with axial involvement? (Josefina Marin, Natalia Rius, and Enrique Soriano; 2021 awardees)

It is unclear whether magnetic resonance imaging (MRI) appearances of spinal involvement differ between patients with axial spondyloarthritis (axSpA) and patients with axial psoriatic arthritis (axPsA).

The main objective of this cross-sectional study was to compare inflammatory changes at the spinal enthesis level between patients with axSpA and axPsA. Secondary objectives were to compare inflammatory and structural changes of the sacroiliac joints (SIJs) and spine, symmetry of inflammatory changes at the SIJs, and percentage of patients with isolated spinal involvement (spinal inflammatory changes without sacroiliac involvement) between patients with axSpA and axPsA, using MRI.

Patients (37 axSpA and 20 axPsA) underwent a full clinical evaluation and MRI of the SIJ and spine. Patients under biologic treatments were excluded. Patients with axPsA had more enthesitis (Maastricht Ankylosing Spondylitis Enthesitis Score ≥ 1 40% vs 6%; $P = 0.004$), higher mean BMI, and higher Bath Ankylosing Spondylitis Disease Activity Index than patients with axSpA. More patients with axSpA were HLA-B27 positive (67% vs 22%; $P \leq 0.01$) than patients with axPsA.

We found no differences in inflammatory changes in the spine as measured by the Canada-Denmark scoring system (CANDEN), in structural changes of the spine and SIJ as measured by the Spondyloarthritis Research Consortium of Canada (SPARCC) SIJ Structural Score (SSS) and by CANDEN, in asymmetry at the SIJ (radiograph and MRI), and in the prevalence of isolated inflammatory spinal involvement (21% SpA vs 43%: PsA; $P = 0.14$). However, there were some differences in inflammatory changes in the SIJ (81% SpA vs 55%: PsA $P \leq 0.03$) and a positive correlation between C-reactive protein and SSS in SpA ($r = 0.33$; $P = 0.049$).

Discussion

Here, the 3 GRAPPA pilot awardees have highlighted the value of the pilot awards by presenting informative data that help to build evidence in their respective disease areas. In the first study, data from an observational cohort supported the hypothesis that 3VAS or 4VAS measurements can be usefully applied in routine clinical care. In the second study, data showed that specific probiotic strains such as *L. reuteri* can reduce WD IL-23 MC–mediated skin inflammation. In the third study, preliminary analysis revealed more SIJ inflammatory changes and HLA-B27 positivity in axSpA as compared to axPsA. We encourage the sharing of results from these innovative studies and the further development of these types of important research questions.

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Diversity, Equity, and Inclusion: Sex and Gender and Intersectionality With Race and Ethnicity in Psoriatic Disease

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ABSTRACT. Sex (biological attributes associated with being male or female) and gender (sociocultural-driven traits and behaviors related to being a man or a woman) are emerging as important determinants of disease course and response to therapy in patients with psoriasis and psoriatic arthritis (PsA). Although psoriatic disease (PsD) is equally prevalent in men and women, the condition affects them in different and unique ways, giving rise to sex- and gender-related differences in clinical presentation, including baseline disease activity, disease course, and response to treatment. Better understanding of the roles sex and gender play in the development and evolution of PsD has the potential to improve patient care. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) continues its effort to highlight issues related to diversity, equity, and inclusion in people with PsD by dedicating a session during the annual meeting to sex and gender and their intersectionality with race and ethnicity in individuals with PsA.

Key Indexing Terms: gender identity, GRAPPA, psoriasis, psoriatic arthritis, sex, ethnicity

Diversity, equity, and inclusion: A patient perspective

At the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) annual meeting, a patient research partner (PRP) presented her personal perspective as a woman living with psoriatic arthritis (PsA). She indicated that personal and cultural biases need to be systematically removed to ensure diversity, equity, and inclusion (DEI) in healthcare delivery and research. Each person is different and often identifies in many ways. For example, depending on the moment, an individual could identify by sex, gender, race, family status (eg, wife, mother), profession, professional title and place of employment, education, country of birth, or as a GRAPPA PRP. To respect diversity, it should be remembered that disease presentations vary between each person, and available treatments may not always work for an individual. For example, there is evidence that women compared to men might have more disease activity, different disease manifestations, and worse outcomes.[1,2] Further, women have reported discrimination due to their sex when receiving health care.[3] To develop personalized treatments, at a minimum, all those involved have a responsibility to ensure that clinical studies include diverse individuals, that results are routinely reported for different aspects of diversity, and that healthcare delivery is optimized for people from all backgrounds.

Considerations for reporting race, ethnicity, sex, and gender in research

Dr. Alaina James presented on reporting of race, ethnicity, sex, and gender in research. Race is a classification of people based on phenotypic characteristics and is often defined and assigned by the dominant group to maintain systems of power (eg, Holocaust, slavery, caste). In comparison, ethnicity is membership in a group with shared culture, tradition, language, religion, and/or geographic area (Hispanic vs Non-Hispanic in US Census reporting, Asian ethnic groups, many minor groups).

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Race and ethnicity are social constructs, without scientific or biological meaning. Hence, reporting race and ethnicity, and social identities with sociodemographic factors and social determinants is appropriate. By collecting and analyzing racial and ethnic differences in studies, we may discover inequities and racism in health, health care, education, and research. By neglecting to report race and ethnicity in health research, we may overlook racialized health disparities and inequities. When reporting racial and ethnic differences, research teams should provide a balanced, evidence-based discussion of the effect of social determinants of health, institutional racism, and structural racism on each finding.[4]

Researchers should report the source (self-identified or documents) of racial and ethnic classification and the reason for reporting ethnicity in the study. When describing specific racial and ethnic categories, specific terms with disaggregated groups are preferred over collective terms like Other, Non-White, Minorities, Black Indigenous People of Color, Black Asian Minority Ethnic, or Skin of Color. When reporting race and ethnicity in text and tables, categories should be listed in alphabetical order.[5]

Sex is considered genetic, with genetic karyotypes of female, male, or intersex (Table), whereas gender is considered to be defined by behaviors, dress, mannerisms, roles, and relationships associated with an individual's sex and identity. Gender definitions may vary from society to society and may change over time. Gender is also a social construct, whereas sex is genetic and biologic. The Sex and Gender Equity in Research (SAGER) guidelines recommend reporting sex assigned/identified at birth and gender identity, the source of information (participant, physical exam, or genetic tests), and analysis of differences based on genes, sex hormones, and/or societal stratification.[6]

Sex and gender in axial spondyloarthritis and PsA

Dr. Irene van der Horst-Bruinsma presented on sex and gender differences in axial spondyloarthritis (axSpA) and PsA. In ankylosing spondylitis (AS), sex distribution is 70% men and 30% women, with men being diagnosed at a younger age than women. In contrast, nonradiographic axSpA is distributed equally across sexes. Women often experience longer delays in diagnosis and have higher Bath AS Disease Activity Index and Bath AS Functional Index scores. However, AS Disease Activity Score (ASDAS) tends to be similar in men and women. Women with axSpA also have more peripheral joint involvement, whereas men tend to have higher levels of C-reactive protein and greater radiographic damage progression.[7,8]

Table. Genetic karyotypes of male, female, and intersex.

Karyotype	Prevalence
XO	Roughly 1 in 2000 to 1 in 5000 people (Turner syndrome)
XX	Most common form of female
XXY	Roughly 1 in 500 to 1 in 1000 people (Klinefelter syndrome)
XY	Most common form of male
XYY	Roughly 1 out of 1000 people
XXXY	Roughly 1 in 18,000 to 1 in 50,000 births

Also consider mosaicism/gene expression.

PsA is distributed equally in men and women, with no differences in onset or time of diagnosis. Women have higher scores in measures of disease activity, physical dysfunction, and pain. Men have greater skin involvement, with higher Psoriasis Area and Severity Index scores and greater body surface area affected, more nail involvement, and greater axial involvement. Women have more tender and swollen joints as well as higher enthesitis scores.[1]

Acknowledging and continuing to learn about health disparities between men and women with regard to spondyloarthritis (SpA) and PsA is clinically important, particularly when studying treatments. Drugs are often tested preclinically in male mice and in early clinical trials in healthy men. There are usually no dosage corrections for body weight and gender—doses are typically calculated for a normal, healthy male of 70 kilograms.[9] There is also no sex correction in postmarketing studies. Work is being done to include more healthy females in early clinical trials.

A pooled data study was done looking at sex differences in men and women using etanercept to treat 1283 patients with SpA. Patients were stratified by sex and observed for baseline characteristics, drug efficacy, and discontinuation rates after 12 weeks. The study showed that ASDAS scores improved more significantly in male than female patients.[10] Efficacy differences between sexes in patients taking interleukin 17 inhibitors (IL-17i) were lower than with tumor necrosis factor inhibitors (TNFi) but showed slightly greater benefits in male individuals.[11,12]

When looking at data from patients with PsA, female patients also showed a lower response rate to TNFi compared to male patients and had higher disease activity scores and higher discontinuation rates.[13,14] Female patients have a higher burden of PsA after IL-17i or TNFi treatment and are more likely to discontinue treatment.[14,15] Much work remains to be done to learn about and correct for gaps between male and female patients with SpA and PsA, but perhaps future clinical trials should stratify for gender.

Sex- and Gender-Based Analysis of Effectiveness of Advanced Therapies in Psoriatic Arthritis (SAGE-PsA)

Although PsA is equally prevalent in men and women, the condition affects them in very different ways. Women living with PsA are less likely to achieve remission and tend to discontinue treatments earlier than men. Little attention has yet been given to understanding which sex- and gender-related mechanisms explain these disparities. Sex- and Gender-Based Analysis of the Effectiveness of Advanced Therapies in PsA (SAGE-PsA) is a GRAPPA-endorsed study that aims to fill some of these gaps in knowledge. Dr. Lihi Eder presented the proposed study on behalf of the SAGE-PsA group.

By adopting sex and gender lenses, the group aims to uncover mechanisms underlying these disparities. They plan a prospective multicenter study involving approximately 30 sites that represent high- and middle-income countries worldwide.

Patients with active PsA who plan to initiate 1 of 4 classes of advanced targeted therapies will be enrolled. Patients will be evaluated before and after initiating therapy to assess their

response. To separate the effects of sex and gender, researchers will consider attributes that represent both constructs in statistical analyses. Researchers will also assess whether age and ethnicity intersect with gender in terms of treatment response.

A survey was sent to GRAPPA members inviting interested sites to apply for participation. It is anticipated that recruitment for this study will start in 2023.

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GRAPPA 2022 Trainee Symposium: A Summary of Oral and Poster Presentations

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ABSTRACT. One of the highlights of the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) annual meeting was the trainee symposium. Dermatology and rheumatology trainees presented their research related to psoriasis and psoriatic arthritis. This report briefly reviews 5 oral presentations and 15 posters that were selected for this annual meeting. Topics include basic/translational, clinical, and outcomes research reflecting the spectrum of GRAPPA's effort and influence nationally and internationally in the area of psoriatic diseases.

Key Index Terms: arthritis, GRAPPA, psoriasis, psoriatic

Introduction

Prioritizing and supporting trainee research in psoriatic diseases (PsDs) is a cornerstone of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA). GRAPPA is committed to highlighting trainee research at its annual meeting. The GRAPPA 2022 annual meeting and trainee symposium were held in Brooklyn, New York. Over 40 abstracts were submitted from 14 countries, with the highest abstract submissions from Brazil, USA, and Germany. Abstracts were selected based on scientific merit and relevance to PsD research. Fourteen reviewers volunteered their expertise and time to peer review 43 abstracts, the top 5 highest scoring abstracts were allocated to oral presentations, and 15 were assigned to poster presentations.

Drs. M. Elaine Husni and April Armstrong co-chaired the 2022 trainee symposium. Dr. Lihi Eder helped adjudicate submitted abstracts and led the poster tour at the symposium. Overall, the trainee symposium's success allowed rheumatology and dermatology trainees to develop their research competency through the presentation and discussion of their work with GRAPPA members. Topics included basic/translational, clinical, and outcomes research reflecting the spectrum of GRAPPA's effort and influence nationally and internationally in PsDs.

Oral presentations

1. Advanced neural networks for classification of magnetic resonance imaging in psoriatic arthritis, seronegative, and seropositive rheumatoid arthritis, presented by David Simon from Erlangen, Germany

This study investigates the use of neural networks, which use hand magnetic resonance imaging (MRI) data to distinguish inflammatory patterns in 3 different patient cohorts: seropositive rheumatoid arthritis (RA), seronegative RA, and psoriatic arthritis (PsA). In addition, this study tests how patients with psoriasis (PsO) with subclinical inflammation fit into such patterns. The performance of the neural networks was assessed by the area under the receiver-operating characteristic curve (AUROC) with and without the presentation of demographic and clinical variables. Data were collected from T1 and T2 coronal and axial fat-suppressed contrast-enhanced (CE) and T2 fat-suppressed axial sequences. Results included MRI scans from 649 patients (135 seronegative RA, 190 seropositive RA, 177 PsA, 147 PsO) and showed AUROC was 75% for seropositive RA vs PsA, 74% for seronegative RA vs PsA, and 67% for seropositive vs seronegative RA. Patients with PsO were assigned mostly to PsA by the neural networks, suggesting that a PsA-like MRI pattern may be present early in the course of PsD. The study concluded that neural networks can be successfully trained to distinguish hand MRI inflammation related to seropositive RA, seronegative RA, and PsA.

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MEH has served as a research investigator, scientific adviser, and/or speaker to AbbVie, Amgen, Novartis, Lilly, Pfizer, BMS, UCB, and Janssen. RK received an early career development research grant from the National Psoriasis Foundation. AWA has served as a research investigator, scientific adviser, and/or speaker to AbbVie, Almirall, Arcutis, Aslan, Beiersdorf, BI, BMS, EPI, Incyte, Leo, UCB, Janssen, Lilly, Mindera, Nimbus, Novartis, Ortho Dermatologics, Sun, Dermavant, Dermira, Sanofi, Regeneron, and Pfizer. LE received research and educational grants from AbbVie, Pfizer, Janssen, Novartis, Eli Lilly, Sandoz, and Fresenius Kabi.

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2. Treat-to-target dose reduction and withdrawal strategy of tumor necrosis factor inhibitors in PsA and axial spondyloarthritis: A randomized, controlled, noninferiority trial, presented by Celia A.J. Michielsens from Nijmegen, the Netherlands

In this pragmatic open-label, randomized, controlled noninferiority (NI) trial, the treat-to-target (T2T) tapering strategies of tumor necrosis factor inhibitors (TNFi) were examined in patients with PsA and axial spondyloarthritis (axSpA) taking TNFi ≥ 6 months with stable low disease activity (LDA). The objective was to investigate whether a T2T strategy with tapering is noninferior to a T2T strategy without tapering. Study patients were randomized to a T2T tapering or no-tapering strategy in a ratio of 2:1 and followed up for 12 months. The T2T tapering strategy of TNFi was designed to balance the benefits of achieving and maintaining LDA with the potential risks associated with long-term TNFi use, such as infections and malignancies. Tapering consisted of 3 monthly tapering steps (66%, 50%, 0%), with reintensification in case of flare. The primary endpoint was the difference in the proportion of patients having LDA at 12 months, compared to a prespecified NI margin of 20%. The primary Bayesian analysis was adjusted for stratification factors (diagnosis and conventional synthetic disease-modifying antirheumatic drug [csDMARD] use). Secondary endpoints included the mean percentage daily defined dose (%DDD) at month 12, and mean 3-monthly disease activity and %DDD. Other endpoints included the proportion of patients discontinuing their TNFi and using concomitant medication. A total of 122 patients were included (n = 81 tapering [PsA, n = 42; axSpA, n=39]; n = 41 no-tapering [PsA, n = 22; axSpA, n = 19]). The proportions of patients in LDA at 12 months for the tapering and no-tapering groups were 69% and 73%, respectively, with an adjusted difference of 5% (Bayesian 95% credible interval: −10% to 19%), confirming NI. The mean %DDD was 53% and 91%, respectively, at month 12. At 12 months, 58 (72%) patients of the tapering group were successfully tapered, of whom 23 (28%) discontinued their TNFi. Start or escalation of concomitant medication was more frequent in the tapering group: csDMARDs (only for PsA): 1 (2%) vs 1 (5%; $P = 0.64$); nonsteroidal antirheumatic drugs (NSAIDs): 44 (54%) vs 10 (24%; $P = 0.002$); glucocorticoids (GCs): 24 (30%) vs 7 (17%; $P = 0.13$). The overall results suggest that T2T TNFi tapering is a viable approach for patients with stable LDA, as it was found to be noninferior to a T2T TNFi strategy without tapering. However, the tapering strategy was associated with higher use of NSAIDs, which has implications for long-term management. Overall, these findings provide important insights into the potential benefits and drawbacks of TNFi tapering in patients with PsA and axSpA.

3. Development of a biologic treatment decision algorithm according to peripheral T helper cell profile using a cytokine secretion assay: A proof of concept study, presented by Gizem Ayan from Ankara, Turkey

This translational study aims to develop a treatment decision algorithm by analyzing T cell phenotypes using the cytokine secretion assay. Nineteen patients (n = 8 initiated csDMARD, n = 11 started biologic DMARD [bDMARD]) recently diagnosed with PsA were included. Immunophenotype analysis was done using antihuman-CD3, CD4, and CD8 markers and the cytokine secretion assay (interferon [IFN]-γ, TNF-α, interleukin [IL]-22, and IL-17) from blood samples of all patients. Analysis was performed by flow cytometry using the BD-FACSCantoII instrument and FACS Diva (Becton Dickinson) software. Individual treatment decisions were made for the bDMARD group based on cytokine predominance. If TNF-α was more predominant than IFN-γ, then TNFi was used. If IFN-γ was more predominant, then an IL-17 or IL-12/23 inhibitor was chosen according to cytokine predominance. The algorithm was developed using the results of all patients; median values of IFN-γ, TNF-α, IL-22, and IL-17 cytokines specific to CD4+ and CD8+ cells were calculated. Results demonstrated that patients who initiated bDMARDs (female 72.8%, mean [SD] age 45.2 [14.5] years] had peripheral joint involvement (100%), enthesitis (72.8%), skin involvement (90.9%), nail involvement (63.6%), and axial disease (9.1%). In patients who were initiated on csDMARDs (female, 62.5%, mean [SD] age, 45.6 [12.1] years] had peripheral joint involvement (100%), enthesitis (18.2%), skin involvement (87.5%), and nail involvement (37.5%). The initial treatment decision for the bDMARD group was a TNFi in 10 patients and IL-12/23 inhibitor in 1 patient. When the final cytokine profiles were assessed, the distribution of cytokines was heterogeneous in both bDMARD and csDMARD arms. An algorithm was developed using the median percentages of particular cytokines. When the algorithm was applied to the bDMARD cohort, the treatment decision would have been TNFi, n = 5; IL-17 inhibitor, n = 5, and IL-12/23 inhibitor, n = 1. This new algorithm was developed using a T cell cytokine secretion assay that is more precise in showing the exact behavior of cells compared to the previous assessments that analyzed only cellular profiles.

4. Challenges in the management of PsA in Latin America: A systematic review, presented by Andre Lucas Ribeiro from Rio Grande do Sul, Brazil

In this systematic literature review, an international working group evaluated the management of patients with PsA in Latin America. The main objective was to identify the challenges associated with managing PsA in the region by highlighting one specific challenge or difficulty. All challenges were noted and categorized into domains. Data analysis was descriptive. The search strategy resulted in 1505 references. Fifteen studies (13,859 patients) were included in the final analysis: most were performed in Brazil (86.6%, n = 13), recruited patients on bDMARD therapy (80%, n = 12), and were from observational studies (100%, n = 15). Issues reported included the high incidence of opportunistic infections (described in 46.6% of publications, n = 7), nonadherence to therapy (20%, n = 3), discordance between patients and physicians regarding remission rates (13.3%, n = 2), low drug persistence (13.3%, n = 2), limited access to bDMARDs (13.3%, n = 2), issues related to the storage of biologic drugs (13.3%, n = 2), the elevated cost of natural

drugs (13.3%, n = 2), limited access to medical care (6.6%, n = 1), and diagnostic delay (6.6%, n = 1). The literature review identified similar challenges as those experienced by other centers of excellence. The objective of the study was to verify the generalizability of our results to other countries and other settings such as private clinics, small cities, and nonuniversity hospitals.

5. Screening for the early identification of axPsA in a cohort of Italian patients affected by PsO (ATTRACT): Preliminary results of a cross-sectional study, presented by Devis Benfaremo from Ancona, Italy

In this cross-sectional study, the Axial Psoriatic Arthritis Screening Ancona Italy (ATTRACT) study was used to evaluate whether a screening strategy focused on the dermatologic setting may improve diagnosis and classification of patients with axPsA for early identification. Patients with PsO are considered eligible for referral after the completion of the Italian version of the online self-referral tool (OSR). The OSR is a tool developed by the European Alliance of Associations for Rheumatology (EULAR) that allows primary care physicians to refer patients with rheumatic diseases to rheumatologists. Patients giving a positive answer to both questions of the entry criteria of chronic back pain features (duration > 3 months and age of onset < 45 years) are referred to the rheumatologist for clinical, laboratory, and radiological assessment. Two hundred nine patients (95 female (45.45%), mean [SD] age 53.19 [15.92] years) were evaluated jointly in an interdisciplinary dermo-rheumatologic clinic, and 205 completed the questionnaire. Regarding PsO, the mean body surface area was 3.83 (SD 6.37), the mean Psoriasis Area and Severity Index (PASI) was 3.48 (SD 5.41), and 71 (53.4%) patients presented onychopathy, with a mean Nail Psoriasis Severity Index score of 1.69 (SD 1.45). A total of 97 patients (47.3%) answered yes to both questions about chronic back pain. After rheumatologic evaluation, 41 patients among 53 who were reevaluated received a diagnosis of PsA. axPsA was diagnosed in 18 patients (34%; among them, 15 also with peripheral involvement). In conclusion, the study reported that chronic back pain was present in approximately half the outpatients with PsO. The easily applicable screening by the OSR resulted in a high proportion of patients diagnosed with axPsA.

Poster presentations

1. Early achievement of minimal disease activity in PsA is associated with long-term improvements in quality of life, presented by Selinde V.J. Snoeck Henkemans from Rotterdam, the Netherlands

The team previously showed that achieving minimal disease activity (MDA) in the first year after PsA diagnosis is associated with better quality of life (QOL). However, to investigate if a favorable prognosis lasts beyond the first year of PsA diagnosis, a new study was designed with up to 3 years follow-up. Newly diagnosed, DMARD-naïve patients with PsA (n = 243) with oligoarthritis or polyarthritis and at least 3 years of follow-up, participating in the Dutch Southwest Early PsA cohort (DEPAR), were enrolled. Out of these, 113 (47%) were classified as sustained MDA, 64 (26%) as nonsustained MDA, and 66 (27%) as no MDA. After 3 years of follow-up, 18%, 25%, and 31% of patients were on bDMARDs in the sustained MDA, nonsustained MDA, and no MDA groups, respectively. Failure to achieve MDA in the first year after PsA diagnosis is associated with worse QOL outcomes that persist over the years despite intensified treatment.

2. Correlation among gender, genital psoriasis, and sexual function in patients with PsO and PsA, presented by Lara Grazziotti Ceolin from Rio de Janeiro, Brazil

Ceolin and team designed an observational cross-sectional study to correlate gender, genital PsO, and sexual function in patients with PsO and PsA. One hundred twenty subjects, including 60 patients with PsO and 60 patients with PsA were enrolled, of whom 44 had genital lesions. The mean scores of the International Erectile Function Index (IEFI), Female Sexual Function Index (FSFI), and sexual quotient (SQ) were 18.05, 16.78, and 54.57, respectively. Also, SQ was positively correlated with both IEFI (+0.77, $r = 0.592$) and FSFI (+0.83, $r = 0.688$). In conclusion, this study confirmed sexual dysfunction in the majority of patients with PsO or PsA, regardless of gender. However, the presence of genital lesions did not correlate with the degree of sexual dysfunction.

3. Risk of nonalcoholic fatty liver disease in patients with chronic plaque PsO: An updated systematic review and metaanalysis of observational studies, presented by Francesco Bellinato from Verona, Italy

Given the association of chronic plaque PsO and the presence of nonalcoholic fatty liver disease (NAFLD), a systematic review and metaanalysis of observational studies was conducted to assess the association between PsO severity and/or PsA with risk of having NAFLD. PsO was found to be associated with prevalent NAFLD (pooled random effects odds ratio [OR] 1.96, 95% CI 1.70-2.26; $I^2 = 97\%$, $P < 0.01$). Also, patients with PsO with NAFLD had a higher mean PASI than those without NAFLD (pooled weighted mean difference: 3.93, 95% CI 2.01-5.84; $I^2 = 88\%$, $P < 0.01$). In conclusion, PsO was found to be associated with prevalent NAFLD, and this risk parallels the severity of PsO.

4. Evaluation of liver fibrosis using transient elastography in patients with PsO treated with methotrexate, presented by Mariana dos Santos Pereira from Rio de Janeiro, Brazil

Pereira and team used transient elastography (TE) to evaluate the presence of liver fibrosis in patients with PsO treated with methotrexate (MTX). TE is a widely used, reliable noninvasive method to estimate the degree of liver fibrosis. This study examined the correlation between changes in liver enzyme values and the BMI according to the TE results. In this cross-sectional observational study, conducted from July 2018 to August 2019, patients with PsO (age >18 yrs) treated with MTX or topical therapy but not using bDMARD therapies were included. All patients underwent a FibroScan (Echosens), with the Metavir score estimating the degree of liver fibrosis ranging from F0 to

F4. Results demonstrated no statistical significance between Metavir score and cumulative dose of MTX with regard to changes in liver enzymes ($P > 0.05$). However, there was a statistically significant difference between BMI and Metavir score ($\chi 2 = 16, 8$; $P = 0.01$). These findings concluded that obesity could be a risk factor for liver fibrosis and cumulative dose of MTX may not be as concerning; however, further research is needed.

5. Derivation and internal validation of a disease-specific cardiovascular risk prediction model for patients with PsA and PsO, presented by Keith Colaco from Ontario, Canada

Patients with PsD are known to have a high risk for cardiovascular (CV) disease. Colaco and team used and internally validated a 5-year disease-specific CV risk prediction model for patients with PsD. In this complete case analysis study, a total of 1336 patients (92% with PsA) were followed between 1992 and 2020. Participants from a longitudinal PsD cohort without a prior history of CV disease were analyzed. During a mean follow-up of 6.8 years, 6.4% of patients developed incident CV events. The discriminative ability of the base model (with traditional CV risk factors alone) was excellent, with an area under the curve of 85.5 (95% CI 81.9-89.1). However, the expanded model did not improve risk discrimination compared to the base model. Based on the results, traditional CV risk factors alone can effectively predict CV risk in patients with PsD. A risk score based on these factors performed well, indicating excellent discrimination between patients with and without a CV event.

6. Comorbidities in early PsA: Prospective METAPSA cohort, presented by Alla Ishchenko from Leuven, Belgium

Ishchenko and team investigated the presence of comorbidities and CV risk factors in newly diagnosed treatment-naïve adult patients with PsA. They also studied the significant factors contributing to the metabolic burden of these patients with early PsA (ePsA). In results, most ePsA were found to have oligoarticular disease, and 95% had mild skin involvement. The ePsA group had significantly higher BMI ($P = 0.006$) and obesity ($P = 0.01$) when compared to age- and gender-matched controls. Also, patients with ePsA had higher odds of having multiple (≥ 2) comorbidities (OR 1.9, 95% CI 1.2-3.0, $P = 0.007$) and multiple CV risk factors (OR 2.1, 95% CI 1.3-3.2, $P < 0.001$) than the controls. Further, dyslipidemia and metabolic syndrome prevalence were significantly increased in patients with ePsA than in controls. In conclusion, patients with PsA with higher comorbidities and CV burdens at the early stages of the disease may benefit from early concomitant treatment of comorbid metabolic disturbances, which constitutes an essential pillar in managing PsA.

7. Multispectral optoacoustic tomography for the noninvasive metabolic profiling of inflammation in synovitis and enthesitis, presented by Filippo Fagni from Erlangen, Germany

Fagni and team used multispectral optoacoustic tomography (MSOT), a noninvasive photoacoustic analysis of tissue chromophores, to explore the metabolic profiles of arthritis and enthesitis in patients with PsA or RA. All studied subjects underwent clinical, ultrasound (US), and MSOT examination of metacarpophalangeal joints and wrists and the entheses using standard protocols. In results, clinical as well as US-proven arthritis was associated with an increased hemoglobin signal (standardized mean difference [SMD] 0.35, 95% CI 0.14 to 0.57, $P = 0.005$), reduced oxygen saturation (SMD −0.47, 95% CI −0.68 to −0.25, $P < 0.001$), and reduced MSOT-derived tissue collagen (SMD −0.39, 95% CI −0.66 to −0.12, $P = 0.02$). Also, synovial hypertrophy was linked with an increased MSOT signal for lipid content in the joint (SMD 0.49, 95% CI 0.26 to 0.71, $P < 0.001$). Further, US-proven enthesitis was associated with increased signals for total hemoglobin (SMD 0.42, 95% CI 0.19 to 0.64, $P = 0.002$), oxygen saturation (SMD 0.72, 95% CI 0.25 to 1.19, $P = 0.03$) and collagen content (SMD 0.37, 95% CI 0.13 to 0.62, $P = 0.01$). In conclusion, synovitis and enthesitis differ at the clinical, anatomical, and functional levels, and exhibit different metabolic profiles as identified by MSOT technology.

8. An investigator-initiated trial of a polymeric emulsion of halobetasol propionate and tazarotene in the treatment of palmoplantar PsO, presented by Jenna Yousif from Michigan, USA

In previous reports, a novel polymeric emulsion lotion with a fixed combination of corticosteroid halobetasol propionate 0.01%/tazarotene 0.045% (HP/TAZ) was shown to significantly decrease PsO severity and affected surface area. This study was designed to examine the efficacy of polymeric emulsion HP/TAZ for palmoplantar PsO. The 21 patients with moderate-to-severe palmoplantar PsO who were enrolled applied HP/TAZ daily to affected areas and underwent disease assessment for 24 weeks. Among 21 patients, 5 (24%) achieved a palmoplantar PsO physician global assessment (ppPGA) of 0 or 1 after 24 weeks or last observation carried forward (LOCF). The mean ppPGA decreased significantly from baseline (3.57) to week 24/LOCF (2.38; $P < 0.001$). Median ppPGA at baseline and week 24/LOCF were 3.0 (IQR 1.0) and 2.0 (IQR 1.0), respectively, with a difference of 1.0 (IQR 1.0; 95% CI 1.0-2.0; $P < 0.001$). The authors concluded that HP/TAZ lotion might be effective for adults with moderate-to-severe palmoplantar PsO, possibly through increased penetration of topically applied medications.

9. Incidence of COVID-19 hospitalization in patients with PsO taking systemic immunomodulators, presented by Jonathan Koptyev from New York, USA

In this retrospective cohort study, Koptyev and team aimed to compare the risk of coronavirus disease 2019 (COVID-19)–related hospitalization according to immunomodulatory treatment type in patients with PsO. A total of 51,606 patients with PsO aged 18 to 88 years were enrolled. Crude cumulative incidence of COVID-19 hospitalization per 1000 patients with PsO was 3.4 in the biologic group, 9.5 in the traditional immunosuppressive group, and 3.9 in those receiving neither drug class. Also, the incidence was 4.7 and 14 per 1000 patients among the patients receiving TNFi and MTX, respectively. The risk of

COVID-19–related hospitalization for patients receiving any bDMARD was lower than that of patients receiving traditional immunosuppressives (relative risk [RR] 0.39, 95% CI 0.16-0.92), and those receiving neither drug class (RR 0.66, 95% CI 0.32-1.34). The adjusted RR was lower for patients using TNFi compared to MTX (0.39, 95% CI 0.14-1.06). The adjusted RR of hospitalization for MTX users was significantly higher compared to those receiving neither drug class (2.78, 95% CI 1.47-5.26). In conclusion, the use of traditional immunosuppressive medications, particularly MTX, was associated with a substantial increase in the COVID-19–related risk of hospitalization compared to those not receiving systemic treatments.

10. Biologic and targeted synthetic therapies in PsA and the risk of opportunistic infections, presented by Athanasios Vassilopoulos from Rhode Island, USA

Biologic and targeted synthetic therapies have been associated with an increased risk for opportunistic infections. This study calculated the incidence of opportunistic infections related to these therapies in PsA by reviewing randomized placebo-controlled trials categorized by the therapies' mechanisms of action. Forty-six studies retrieved from PubMed and Embase databases provided data on 11,652 patients on tested treatment regimens and 6425 receiving placebo. Treatment included TNFi in 17 studies, IL-17 inhibitors (IL-17i) in 8 studies, JAK inhibitors (JAKi) in 6 studies, IL-23i in 6 studies, phosphodiesterase 4 (PDE4) inhibitors in 6 studies, IL-12/23i (IL-12/23) inhibitors in 3 studies, and cytotoxic T lymphocyte associated antigen 4 immunoglobulin (CTLA4-Ig) in 3 studies. The highest incidence (1.10%, 95% CI 0.53-1.83) was among patients who received JAKi, and the incidence was statistically higher than the incidence of opportunistic infections among patients who received inhibitors of TNF, IL-12/23, IL-23, and PDE4. Herpes zoster was the cause of 82.7% of the opportunistic infections reported for JAKi. The second highest incidence reported was among those taking IL-17i, with all reporting mucocutaneous candidiasis. Overall, the incidence of opportunistic infections during 12 to 48 weeks of follow-up was low in every mechanism of action studied. No opportunistic infections were reported among participants receiving tyrosine kinase 2 (TYK2) inhibitors. JAKi therapies appeared to be more likely to cause opportunistic infections. Herpes zoster and mucocutaneous candidiasis were the most common opportunistic infections among patients receiving JAKi and IL-17i, respectively. Further studies regarding the incidence of uncommon opportunistic infections and especially those with a prolonged latent period are needed.

11. Immunoglobulins are upregulated in PsA skin lesions but not in PsO skin lesions, presented by Hanna Johnsson from Scotland, UK

In the GRAPPA trainee symposium in 2020, Johnsson and colleagues compared skin RNA sequencing and showed transcriptomic differences in skin homeostatic and immune pathways. The current project aimed to evaluate differences in immunoglobulin (Ig) gene expression. RNA sequencing data from paired lesional and uninvolved skin samples of patients with PsA and full-thickness skin biopsies from healthy controls (HCs) were analyzed using the pipeline Searchlight2. The findings were compared with skin sequencing data that has been published previously (GSE121212). All sequenced Ig genes were significantly upregulated in PsA lesions apart from the IgM heavy constant chain, which was unchanged, and the IgE heavy constant chain, which was downregulated. The IgG heavy constant gamma 4 (*IGHG4*) was significantly upregulated in PsO lesions. Moreover, the transcription factor POU2F1, which regulates Ig gene expression, was enriched in PsA lesions but not in PsO lesions. Overall, the data suggested the involvement of Ig gene expression in skin disease in patients with PsA but not in patients with PsO only.

12. What does worsening in Disease Activity Index for Psoriatic Arthritis categories mean for patients with PsA? An analysis of 222 patients, presented by Marlene Sousa from Paris, France

In this longitudinal study of 14 countries (Remission/Flare in PsA [ReFlaP] study), adult patients with PsA (> 2 years, seen twice approximately 4 months apart) were assessed for the association between a worsening in the Disease Activity Index for Psoriatic Arthritis (DAPSA) and the patient's judgment of disease worsening. Worsening in disease activity between the 2 visits was defined as transitioning to a more active category on DAPSA. This change was compared to (1) patient-perceived flare according to a patient-reported question: "At this time, are you having a flare of your PsA, if this means the symptoms are worse than usual?" and (2) a worsening according to the minimal clinical important difference (MCID) question. The agreement between definitions of worsening was calculated by frequency, Cohen κ, and prevalence-adjusted bias adjusted κ (PABAK). A total of 222 patients were analyzed: 127 (58.8%) were male, aged 53.5 (SD 12.3) years. On the first visit, disease activity was moderate: 35.9% had no current PsO skin lesions, mean tender joint count (TJC; 0-68) was 3.0 (SD 7.5), mean swollen joint count (SJC; 0-66) was 1.6 (SD 6.6), and mean DAPSA was 11.5 (SD 14.0). At 4.5 (SD 2.2) months' follow-up, the proportion of DAPSA worsening was 40.1% (95% CI 33.9-46.7; n = 89). Most of the changes corresponded to patients going from remission to LDA (n = 24, 27% of worsened patients) or from LDA to MDA (n = 24, 27%). Patient-reported flares were reported in 27% (95% CI 21.6-33.2; n = 60), and MCID worsening in 14% (95% CI 33.9-46.5; n = 31). Of the 89 patients who worsened in DAPSA categories, 41 (46.1%) had self-perceived flares, and 20 (22.5%) had worsened according to the MCID. Among patients who declined in the DAPSA category, the mean change in DAPSA was higher in patients with self-perceived flares (an increase of 22.2 [SD 15.0]) than in patients without self-perceived flares (an increase of 14.3 [SD 12.3]). Of 133 patients with no worsening according to DAPSA, 114 (85.7%) had no self-perceived flares and 122 (91.7%) had no MCID worsening. The PABAK coefficients between DAPSA and patient flare or MCID worsening were 0.34 (95% CI 0.21-0.46) and 0.40, and 0.16 (95% CI 0.05 to 0.27) and 0.28, respectively. The study concluded that in the patient group with the worsening DAPSA

category, only 46.1% reported themselves in a flare at the second visit and 22.5% declined by MCID. Agreements between DAPSA and patient flare or MCID were fair and poor, respectively.

13. Increased neutrophil frequency in lymph nodes of patients with PsA, presented by Janne Bolt from Amsterdam, the Netherlands

Bolt and team designed a study to test the hypothesis that activated neutrophils may be involved in the activation of IL-17–producing T cells during states of inflammation by interacting with tissue resident cells and immune cells. They studied the presence of neutrophils in lymph node (LN) biopsies of patients with PsA and compared their frequencies to patients with other types of inflammatory arthritis. Ten patients with PsA, 34 seropositive individuals at risk of developing rheumatoid arthritis, 26 anticitrullinated protein antibody (ACPA)-negative patients with RA, and 10 HCs underwent US-guided inguinal LN biopsy. As a result, significantly increased mRNA levels of Cathepsin G (CTSG), a neutrophil marker, were observed in patients with PsA when compared to the control group ($P = 0.02$). Immunohistochemistry showed that neutrophil marker CD15 is significantly increased in LN biopsies of patients with PsA compared to controls ($P = 0.008$). Preliminary flow cytometry analyses indicate a population of CD45+CD16+CD66b+ neutrophils in LN biopsies of patients with PsA and patients without RA risk. Overall, this study showed an increased presence of neutrophils in the LNs of patients with PsA when compared to controls.

14. Prevalence of scalp PsO and its possible association with joint involvement: A retrospective study of 1218 cases, presented by Mayara Hamilko de Barros from Rio de Janeiro, Brazil

This cross-sectional, retrospective study aimed to demonstrate the prevalence of scalp involvement in patients with PsO and its relation to joint impairment. A total of 1218 medical records of patients with PsO were analyzed. Scalp involvement was observed in 777 (64%) patients, of whom 396 (51%) were males and 381 (49%) were females. Scalp PsO was more likely in males (OR 1.49, 95% CI, 1.18-1.89, $P < 0.001$). From the 286 patients with joint involvement, 67% had scalp PsO, and from the 932 patients without joint involvement, scalp psoriasis was present in 63%, showing no significantly different probability of association (OR 1.19, 95% CI, 0.9-1.57, $P = 0.23$). In the group of patients undergoing systemic treatment, 373 (71%) had scalp involvement, compared to 404 (59%) patients under topical or phototherapy treatment, with a significant association probability (OR 0.59, 95% CI, 0.47-0.75, $P < 0.001$). In conclusion, scalp PsO did not present as a risk factor for joint involvement; however, it is associated with greater disease severity among men.

15. Adherence to GRAPPA 2015 treatment recommendations according to the presence of comorbidities in patients with PsA, presented by Agustina Alfaro from Ciudad Autónoma de Buenos Aires, Argentina

In this cross-sectional study, adherence to GRAPPA's 2015 treatment recommendations according to the presence of comorbidities was studied. The prevalence of comorbidities in patients with PsA and how the disease activity, functional capacity, and QOL influenced these patients were also measured. Adult patients with PsA (Classification Criteria for Psoriatic Arthritis [CASPAR] criteria) from the Psoriatic Arthritis Registry, IREP Argentina (RAPSODIA) cohort were included. Comorbidities were assessed by Rheumatic Disease Comorbidity Index (RDCI). Chi-square or Fischer, *t* or Mann-Whitney, ANOVA or Kruskal-Wallis tests, and multiple linear regression models were used. One hundred seventy patients (50% female, median age 56 years and disease duration 9.9 years) were included; 67.6% of patients with RDCI ≥ 1 were reported. Older patients (median 57 [SD 13] years vs 48 [SD 13] years, $P < 0.0001$) had a higher frequency of overweight or obesity (84.3% vs 67.3%, $P = 0.01$) and a poorer QOL (Psoriatic Arthritis Quality of Life [PsAQoL] median 7.6 [SD 6.6] vs 5.2 [SD 6.0], $P = 0.03$). Higher RDCI scores were observed in patients with pure peripheral involvement (median 1.6 [SD 1.6] vs 0.9 [SD 1.1], $P = 0.01$), in those not achieving MDA (median 1.7 [SD 1] vs 0.9 [SD 1], $P = 0.001$), in those using NSAIDs (median 1.8 [SD 1.7 vs 1.1 [SD 1.8], $P = 0.005$), and in those with functional disability. In the multivariate analysis, the presence of comorbidities (RDCI ≥ 1) was associated with older age (OR 1.06, 95% CI 1.03 to 1.09).

Contrary to GRAPPA recommendations, 70% of patients with heart disease were using NSAIDs, and 20% were using GCs. Also, 50% of patients with kidney disease used NSAIDs or MTX, and 28% of those with diabetes received GCs. Most patients with PsA presented with at least 1 comorbidity, which is more highly associated with older age. GRAPPA recommendations were not followed in a considerable number of patients.

Conclusion

The GRAPPA trainee symposium was well attended, and the trainees received meaningful feedback for their research projects. The scientific input yielded exciting discussions and suggestions for future research. The next GRAPPA trainee symposium will be held at the annual meeting in July 2023 in Dublin, Ireland.

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Report of the Skin Research Workgroups From the IDEOM Breakout at the GRAPPA 2022 Annual Meeting

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ABSTRACT. The International Dermatology Outcome Measures (IDEOM) organization presented an update on its progress related to patient-centered outcome measures for psoriasis (PsO) and psoriatic arthritis (PsA) at the 2022 annual meeting of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA). The Musculoskeletal (MSK) Symptoms working group presented an update on the development of the IDEOM Musculoskeletal Questionnaire (IDEOM MSK-Q). The IDEOM MSK-Q is a patient-reported outcome measure intended to capture MSK symptoms and describe their intensity and impact on health-related quality of life in patients with psoriatic disease. IDEOM also presented the progress of the integration of the Psoriasis Epidemiology Screening Tool (PEST) and Psoriatic Arthritis Impact of Disease (PsAID) questionnaires into the Epic electronic health record system. This will allow for automated PsA screening and symptom measurement in the hopes of improving disease detection and treat-to-target strategies. The Treatment Satisfaction working group discussed the development of the DermSat-7, a 7-item treatment satisfaction questionnaire specific for dermatological conditions. The DermSat-7 is currently being validated in a multicenter study of patients with PsO.

Key Indexing Terms: arthritis, GRAPPA, outcome assessment, psoriasis, psoriatic arthritis, dermatology

The International Dermatology Outcomes Measures (IDEOM) initiative

The International Dermatology Outcomes Measures (IDEOM) is a nonprofit organization with the mission to establish patient-centered measurements to enhance research and treatment for those with dermatologic disease.[1] The organization's stakeholders comprise a heterogenous group of patients, health economists, physicians, and representatives of regulatory agencies. IDEOM's goal is to develop validated outcome measures that can be applied to both clinical research and clinical practice to improve patient care. IDEOM is supporting multiple ongoing projects to advance outcome measurements in psoriasis (PsO), psoriatic arthritis (PsA), hidradenitis suppurativa, cutaneous T cell lymphoma, itch, vitiligo, alopecia areata, and actinic keratoses. At the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) annual meeting in Brooklyn, New York, IDEOM's Musculoskeletal (MSK) Symptoms, Psoriatic Disease, and Treatment Satisfaction working groups presented their research updates (Table).

Musculoskeletal Symptoms working group update

Drs. Joseph Merola and Lourdes Perez-Chada presented the status of the IDEOM Musculoskeletal Questionnaire (IDEOM MSK-Q). The IDEOM core domain set for PsO trials includes

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

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J.F. Merola and A.B. Gottlieb contributed equally as co-senior authors.

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Table. Workgroup updates from the 2022 IDEOM at the GRAPPA annual meeting.

Workgroup	Presenter(s)	Project(s)
Musculoskeletal (MSK) Symptoms	Joseph F. Merola, MD, MMSc Lourdes M. Perez-Chada, MD, MMSc	IDEOM MSK Questionnaire (IDEOM MSK-Q) Patient-reported outcome measure intended to capture MSK symptoms and describe their intensity and impact on health-related quality of life in patients with psoriatic disease
Psoriatic Disease	Alice B. Gottlieb, MD, PhD	Integration of the PEST and PsAID Questionnaires into Epic EHR-based, automated PsA screening and symptom measurement using PEST and PsAID scores to improve the rates of PsA detection and treatment-to-target
Treatment Satisfaction	April W. Armstrong, MD, MPH Vibeke Strand, MD	Dermatology Treatment Satisfaction Instrument (DermSat-7) 7-item questionnaire to assess patient satisfaction with their psoriasis treatment, currently being validated in a multicenter study of patients with psoriasis Psoriasis and Psoriatic Arthritis Treatment Satisfaction Instrument Instrument under development to assess patients' satisfaction with a therapy used to treat both their psoriasis and PsA

EHR: electronic health record; GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis; IDEOM: International Dermatology Outcome Measures; PEST: Psoriasis Epidemiology Screening Tool; PsA: psoriatic arthritis; PsAID: Psoriatic Arthritis Impact of Disease.

PsA symptoms as a core domain. A working consensus approach arrived upon by a Delphi consensus process recommends that subjects with PsO entering a clinical study without known PsA be administered a screening questionnaire. Those who screen positive or those with a prior rheumatologist diagnosis of PsA then receive a validated PsA symptom instrument (ie, 9-item PsA Impact of Disease [PsAID-9], or alternatively, Routine Assessment Patient Index 3 [RAPID3]). Although the proposed framework met an acute need, limitations existed, including (1) lack of sensitivity/specificity of the PsA screening instruments, and (2) the use of PsA-specific language in such instruments, leading to difficulties with implementation and data interpretation. In response, the MSK Symptoms working group has been actively involved in the development of the IDEOM MSK-Q, a measurement tool intended to capture pertinent MSK symptoms, measure their intensity, and describe the impact of these symptoms on health-related quality of life (HRQOL) in patients with psoriatic disease (PsD).

Early development consisted of an expert scientific committee using existing PsA patient-reported outcome measures (PROMs) to draft an initial 9-item questionnaire for use in patients with PsD. The content validity (ie, relevance, comprehensiveness, and comprehensibility) of this draft questionnaire was evaluated in a multiphase pilot testing study.[2] The first phase involved an online survey distributed to trained patient-research partners (PRPs) diagnosed with PsO and/or PsA (n = 15). The second phase involved a discussion of survey results with subsequent voting on steps toward improving the content validity of the instrument among PRPs, researchers, clinicians, and other stakeholders at the IDEOM 2021 annual meeting (n = 41). The third phase involved further content validity assessment through 3-step test interviews, involving think aloud and verbal probing techniques, among patients with PsO and/or PsA (n = 19). The fourth phase involved targeted questionnaire evaluation and modification at the IDEOM 2022 annual meeting by survey polling and live discussions with another diverse group of stakeholders (n = 22). Last, final interviews were conducted to verify that data saturation was met (n = 5).

Content validity assessment results were largely positive and constructive. Participants agreed that each item is relevant to the evaluation of MSK symptoms in PsD. Participants suggested improving comprehensiveness by including items concerning joint swelling and MSK symptom impact on family and/or social activities. Suggestions for general comprehensibility included reconsidering the questionnaire layout format, response options, and instructions. With regard to item-specific comprehensibility, participants noted areas for improvement in item wording, complex sentence structure, double-barreled questions, and limited examples. All these comments were addressed, and the instrument was modified accordingly. The resulting final IDEOM MSK-Q consists of 9 items assessing 3 constructs: MSK symptoms (pain, joint swelling, joint stiffness), impact of MSK symptoms (work and/or school activities; family, social and/or leisure activities; physical activity, sleep, emotional state), and fatigue.

Next steps for the IDEOM MSK-Q include field testing and further validation, followed by randomized controlled trials, longitudinal observational clinical studies, and dissemination into clinics. Potential benefits for the use of IDEOM MSK-Q in these settings are manyfold and include the following: application to and validation among patients with PsO with or without PsA; providing insights into the MSK symptom burden experienced in this population; informing our understanding of the PsO-to-PsA transition; facilitating the earlier detection of PsA; providing valuable data to inform future PsA efficacy trials; and providing potential early insights into how new PsO treatments may variably affect MSK symptoms in the context of interventional PsO trials and registries. Further, the MSK working group recognizes value in looking beyond plaque PsO and plans to explore the assessment of MSK symptoms among patients with pustular PsO, hidradenitis suppurativa, inflammatory bowel disease, autoinflammatory diseases including SAPHO (syno-

vitis, acne, pustulosis, hyperostosis, and osteitis) syndrome, and other pertinent conditions.

Psoriatic Disease working group update

Dr. Alice Gottlieb presented an update on the integration of the Psoriasis Epidemiology Screening Tool (PEST) and Psoriatic Arthritis Impact of Disease (PsAID) questionnaires into the Epic electronic health record (EHR) system. PsA is the major comorbidity of PsO and may result in progressive, disabling disease with permanent loss of function.[3] Though PsA affects one-third of patients with PsO, it frequently goes undiagnosed.[4] The average delay in diagnosis of PsA is 5 years from the time of symptom onset, and this delay results in increased MSK morbidity and disability for patients.[4,5] Because cutaneous PsO commonly precedes PsA by 10 to 12 years, dermatologists may be the healthcare providers best poised to diagnose PsA.[6] Thus, dermatologists can prevent disability and disease progression with earlier diagnoses and treatment initiation. Accordingly, dermatologists should screen their patients with PsO for PsA at every visit. To aid in the screening of PsA and the treat-to-target approach in the clinical practice setting, IDEOM provides a framework for the measurement of MSK symptoms in patients with PsO using PROMs.

According to IDEOM's suggested framework, all patients presenting with PsO should be administered a screening tool such as the PEST. Patients who are PEST positive with a score of ≥ 3 and patients who already have a rheumatologist-confirmed diagnosis of PsA should then be administered the PsAID-12 to assess disease control. The PsAID-12 is a 12-item questionnaire designed to assess impact of disease in PsA. A PsAID-12 score of ≤ 4 suggests an acceptable symptom state and indicates that the patient should be continued on their current treatment regimen. A score of > 4 suggests an unacceptable symptom state and warrants consideration of therapy modification or referral to/co-management with a rheumatologist.[7] Both the PEST and PsAID-12 are available free of charge on the GRAPPA app.

There are ongoing efforts to integrate the PEST and PsAID-12 into Epic at the Mount Sinai Health System in New York to allow patients to complete these questionnaires autonomously before seeing their healthcare providers. This EHR-based, automated PsA screening and symptom monitoring would follow the IDEOM MSK symptom framework. The data from these questionnaires will be collected within the Epic system and scores will be automatically generated, which will be readily available to healthcare providers when opening the patient chart, along with recommendations for subsequent steps and best practices. These recommendations will be based on the PEST and PsAID-12 scores and, in accordance with the IDEOM MSK symptom framework, may suggest referral to rheumatology, treatment modification, or continuation on the current treatment regimen.

The effectiveness of this program will be studied over the course of an 18-month period. To establish a baseline, the prevalence of PsO and PsA in the study population over the past 2 years will be retrospectively reviewed. Over the next 18 months of the study, detection rates of PsA as well as effectiveness of symptom management will be assessed for improvement compared to baseline.

Treatment Satisfaction working group update

Dr. April Armstrong presented progress in the validation of the Dermatology Treatment Satisfaction Instrument (DermSat). This PROM instrument was developed to evaluate patient satisfaction in clinics, clinical trials, and general research. The current instrument version was created for patients with PsO after identifying a core domain set to assess PsO in clinical trials.[8] A systematic literature review using the Consensus-Based Standards for the Selection of Health Measurement Instruments (COSMIN) guidelines was conducted to assess existing treatment satisfaction tools.[9] Eleven existing treatment satisfaction instruments were identified; however, none were consistent in reliability, content validity, structural validity, or responsiveness.[10] Subsequent nominal discussions with patients with PsO determined relevant items and ensured questions were relatable and understandable to patients. Following extensive cognitive evaluation by IDEOM stakeholders, the 7-question DermSat (DermSat-7) was created. The current instrument version asks patients about 1 skin medication used to treat 1 skin condition. Questions in the categories of effectiveness, convenience, and overall satisfaction are answered on a unipolar scale ranging from 1 = not satisfied to 5 = completely satisfied.

The DermSat-7 instrument is currently being validated in a multicenter study of patients with PsO across the University of Southern California, Brigham and Women's Hospital, and the Mount Sinai Health System. A minimum of 120 patients with PsO will be enrolled in the study to further assess the psychometric properties of the instrument. Participants complete a survey on day 1, consisting of demographic information in addition to 4 questionnaires: the 9-item Treatment Satisfaction Questionnaire for Medication (TSQM-9), the Dermatology Life Quality Index (DLQI), a patient global assessment of disease activity (PtGA), and the DermSat-7.[11] On day 1, investigators report their global assessment of a patient's disease activity (PGA), body surface area (BSA) involvement, and Psoriasis Area and Severity Index (PASI) scores. On day 14, patients complete the DermSat-7 questionnaire as well as a PtGA.

The instrument will be evaluated for known-groups validity, construct validity, test-retest reliability, and internal consistency upon completion of the multicenter study. To evaluate construct validity, we will test the a priori hypotheses about strength of correlation between the DermSat-7 score and scores of other existing instruments (TSQM-9, DLQI, PGA, and PASI). To test known-groups validity, patients will be grouped by their disease activity using PASI, BSA, and PGA scores to predict their DermSat-7 score. ANOVA analysis will then be performed to compare predicted with patients' actual DermSat-7 scores. Cronbach α will be used to assess internal consistency (ie, the degree to which scores of individual DermSat-7 items correlate with one another).[11] Intraclass correlation coefficient will be used to measure the instrument's test-retest reliability in subjects whose disease activity measured, as by the PtGA, has not changed between day 1 and day 14 surveys.

Drs. Vibeke Strand and April Armstrong also presented an update on IDEOM and GRAPPA's development of the Psoriasis and Psoriatic Arthritis Treatment Satisfaction Instrument. The instrument was developed to assess patients' satisfaction with a therapy used to treat both their PsO and PsA, given that recent studies suggest PsA occurs in approximately 30% of patients with PsO.[12] The instrument is based on the DermSat-7 questionnaire. In addition to the DermSat-7 questions on the treatment's ability to improve skin appearance and skin symptoms (eg, reduction in itch, pain, and/or stinging), the Psoriasis and Psoriatic Arthritis Treatment Satisfaction Instrument evaluates patients' satisfaction with a treatment's ability to treat their PsO, PsA, and both PsO and PsA; reduce PsA symptoms; and improve physical function related to PsA (eg, increased ability to use one's hands, walk, and/or climb stairs). During the Treatment Satisfaction working group session, nominal discussions with patients with PsO and PsA were held to refine the syntax of the initial draft, ensuring that questions are clear and applicable to patients. The next step in development is further evaluation of the proposed instrument by IDEOM physicians, methodologists, and patients.

Conclusion

Herein, we present research updates provided by IDEOM at the GRAPPA 2022 annual meeting. IDEOM's MSK Symptom working group presented the development of the IDEOM MSK-Q, a PROM intended to capture MSK symptoms and describe their intensity and impact on HRQOL in patients with PsD. Content validity was evaluated in a multiphase pilot testing study, which resulted in integration of received feedback and improvement of the original questionnaire. Next steps for the IDEOM MSK-Q include field testing and further validation. IDEOM also presented an update on the integration of the PEST and PsAID-12 questionnaires into the EHR system at the Mount Sinai Health System. Patients will be able to complete these questionnaires autonomously in their Epic patient portal, and their scores will automatically generate recommendations for next steps and best practices. This study will be launching soon and will assess whether this automated approach improves the rates of PsA detection and treat-to-target strategies. Last, IDEOM's Treatment Satisfaction working group presented the developments of their DermSat-7 instrument. This 7-item questionnaire to assess patient satisfaction with their PsO treatment is currently being validated in a multicenter study of patients with PsO across the University of Southern California, Brigham and Women's Hospital, and Mount Sinai Health System. Upon completion of the study, next steps will include evaluation of the instrument for known-groups validity, construct validity, test-retest reliability, and internal consistency. They also presented the status of the Psoriasis and Psoriatic Arthritis Treatment Satisfaction Instrument in development to assess patients' satisfaction with therapy used to treat both PsO and PsA.

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Developing Ultrasound Measures for the Early Diagnosis of Psoriatic Arthritis

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ABSTRACT. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) ultrasound (US) steering committee provided an update at GRAPPA's 2022 annual meeting on activities to enable earlier diagnosis of psoriatic arthritis. An update of the Diagnostic Ultrasound Enthesitis Tool (DUET) study included preliminary reliability results for US enthesitis elementary lesions. Common scanning pitfalls were reviewed. New projects included widening the scope of US beyond large entheses and validating small point-of-care US probes to evaluate enthesitis.

Key Indexing Terms: arthritis, early diagnosis, GRAPPA, psoriasis, psoriatic arthritis, ultrasonography

Introduction

At the 2022 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) annual meeting held in New York, the ultrasound (US) workshop reviewed preliminary reliability results from the Diagnostic Ultrasound Enthesitis Tool (DUET) study, reviewed common pitfalls encountered in submitted images, and outlined new projects to extend the use of US for early diagnosis of psoriatic arthritis (PsA).

Update on the DUET study

Enthesitis is a key feature in PsA and may be the initial site of musculoskeletal (MSK) inflammation in patients with PsA. US could improve the accuracy of clinical enthesitis assessment, but, at present, no consensus exists on a global sonographic enthesitis scoring method that can evaluate the extent of enthesitis at the patient level. The DUET project is a GRAPPA-supported study that involves 16 sites across the world. The study aims to develop a new sonographic enthesitis scoring system to help with the early diagnosis of PsA. The study involves a prospective collection of clinical and US data on patients with early PsA, psoriasis (PsO) without arthritis, and patients with noninflammatory MSK diseases without PsO.

The study achieved its first major milestone of recruiting over 50% of its target (219 out of the planned 400 patients). The efforts of investigators to recruit and scan patients are very much appreciated. Interim analysis of interrater agreement found moderate to substantial agreement for most sonographic elementary lesions among central readers. Interrater agreement was not influenced by most patients' characteristics apart from obesity, which may increase variability in scoring. These results were shared as an oral presentation at the American College of Rheumatology meeting in Philadelphia.[1] It is anticipated that the recruitment of study patients will be completed by July 2023.

Imaging optimization

Obtaining images with high fidelity is key to recognizing subtle features of enthesitis and improving reading reliability. Common pitfalls encountered in submitted images were reviewed at the meeting. Figure 1 illustrates the common greyscale, Doppler pitfalls identified, and potential solutions.[2,3]

New projects

A systematic literature review is ongoing to identify existing literature about which joints need to be scanned in psoriatic disease (PsD) using US, and the value of scanning the extraarticular structures in diagnosing PsA. This initiative is a collaborative effort of the GRAPPA US working group and Young-GRAPPA. In addition, in 2023, there will be a position paper on the current role of the US in PsD and the unmet needs among GRAPPA members. The position paper will be prepared using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) methodology, based on the ongoing literature review and a survey circulated among GRAPPA members.

The group is also working on the validation of a hand-held US device. The high cost of US machines has been identified as a major barrier to increasing the accessibility of US for patients with PsD. Hand-held US devices are increasingly used in other fields of medicine and provide an attractive solution for their higher affordability. Since the spectrum of PsD is wide, our group is currently doing the study to validate these hand-held US devices in comparison to the gold standard, high-end US machines, for their ability to visualize pathologies that are seen in different MSK structures (the joint, tendon, entheses, and nail)

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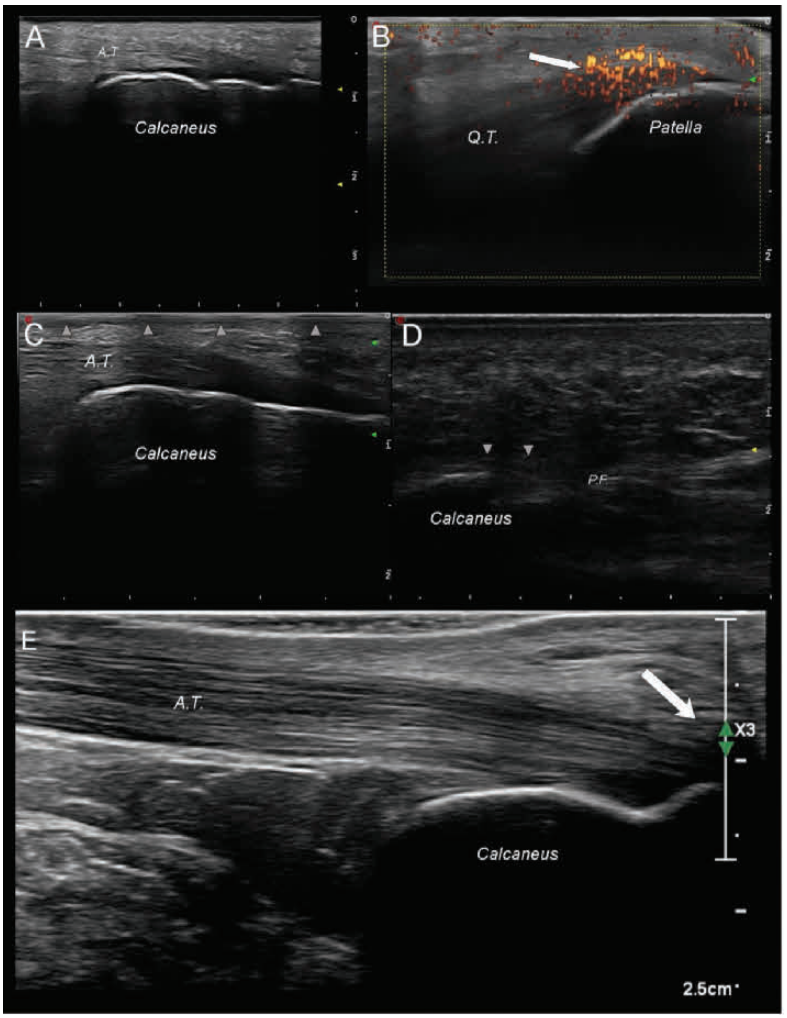

Figure 1. Examples of greyscale and Doppler pitfalls. (A) Depth set too deep in this scan of the Achilles enthesis. Optimizing depth to 2 cm would provide more details and resolution. (B) Flash artifact (arrow) produced by movement of the probe. Probe needs to be held stationary while capturing Doppler loop. (C) Probe defect resulting in fixed dropout of signal on every image (arrow heads) resulting in false hypoechogenic shadows. Probe needs to be replaced. (D) Frequency set too high, resulting in inadequate penetration to delineate the superficial boundary (arrow heads) of the plantar fascia as well as the enthesis. The heel has a thick layer of keratinized tissue. The area should be premoistened with gel, and low frequency settings should be used to image the plantar fascia. (E) Truncation (arrow) of the distal enthesis, resulting in low confidence in assessing presence of an enthesophyte. It is important to visualize the entirety of the enthesis—the distal portion of sites such as the Achilles enthesis often have small enthesophytes present. AT: Achilles tendon; PF: plantar fascia; QT: quadriceps tendon.

in PsA. We hope that, if validated, these more affordable tools will enable earlier and more accurate diagnosis of the inflammation within the PsD spectrum.

Conclusion

US is a promising tool to aid in the early diagnosis of PsA. The GRAPPA US group presented data to date in evaluating entheses as well as expanding its use to smaller entheses and joints. Handheld US devices are increasingly available but need to be validated in the detection of sonographic pathologies.

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Initiating Evaluation of Composite Outcome Measures for Psoriatic Arthritis: 2022 Updates From the GRAPPA-OMERACT Working Group

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ABSTRACT. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA)–Outcome Measures in Rheumatology (OMERACT) Psoriatic Arthritis (PsA) working group—comprising rheumatologists, dermatologists, methodologists, and patient research partners—provided updates at the GRAPPA 2022 annual meeting on its work to evaluate composite outcome measures for PsA. Ten composite outcome measures were considered. Initial steps were to define the population, the purpose of use, and the proposed pros and cons of the 10 candidate composite instruments for PsA. Preliminary Delphi exercises within the working group and GRAPPA stakeholders confirmed high priority for evaluating minimal disease activity (MDA); moderate priority for Disease Activity in PsA (DAPSA), American College of Rheumatology (ACR) response criteria, Psoriatic Arthritis Disease Activity Score (PASDAS), Composite Psoriatic Disease Activity Index (CPDAI), 3 visual analog scale (VAS), and 4VAS; and low priority for Disease Activity Score in 28 joints (DAS28), Psoriatic Arthritis Responder Criteria (PsARC), and Routine Assessment of Patient Index Data 3 (RAPID3). Further appraisal of candidate composite instruments is ongoing.

Key indexing terms: composite outcome measures, GRAPPA, outcome measures, physical function, psoriasis, psoriatic arthritis

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Introduction

Following the update of the core domain set for psoriatic arthritis (PsA) in 2016,[1] the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA)—Outcome Measures in Rheumatology (OMERACT) working group has been developing an outcome measurement set for important domains for clinical trials of PsA.[1] Over the years, several instruments have been fully/provisionally endorsed for some of the core domains (Table 1). This group aims to evaluate candidate composite outcome measures for PsA. This report summarizes the current plans to prioritize further evaluation of these composite outcome measures under the OMERACT filter 2.2 framework.[2]

Why do we need composite outcome measures for PsA?

Composite outcome measures allow the combination of outcomes measuring several domains of similar significance to clinicians and patients to generate a single score to give an estimated net clinical benefit of an intervention. Typically, the US Food and Drug Administration (FDA) defines "composite event endpoints" as the occurrence of any of the events from a prespecified list.[3] On the contrary, composite outcome measures have been commonly used for measuring the concept of disease activity in rheumatology, and are recognized by the European Medicines Agency guideline.[4] The potential benefits of using composite outcome measures include the potential to reduce the sample size and the duration of follow-up in clinical trials, thus avoiding statistical adjustment for multiple testing. Composite outcome measures also reduce the risk of underestimating disease through the measurement of multiple domains, as they incorporate patient and clinician perspectives and enhance face validity of the outcome measure.[5]

Recently, OMERACT has set forth a 4-step framework for the evaluation of composite outcome measures,[5] including choosing the domains to be combined, selecting high-quality instruments for the domains, weighing the domains in the composite, and finally putting the composite outcome measures through the OMERACT filter 2.2 to comprehensively appraise an outcome measure's validity of truth, discrimination, and feasibility.[2] Composite outcome measures were further subclassified by the OMERACT filter 2.2 into composite outcome domain and multioutcome domain measures, which can be conceptualized as categorical and continuous composite outcome measures, respectively.

Several existing composite outcome measures have been used in PsA clinical trials and longitudinal studies, yet consensus on which measure to use in different settings has not been reached.[6,7] Although there are emerging data supporting their psychometric properties,[8-11] none of the composite outcome measures have undergone comprehensive evaluation using the OMERACT filter. As OMERACT initiates new methodology guidance on evaluation of composites,[2,5] the use of composite outcome measures in PsA is being revisited.

The Composite Outcome Measures working group

A working group of 16 persons, including 11 rheumatologists, 1 dermatologist, 3 patient research partners (PRPs), and 1 methodologist was set up. The goal of the project is to develop recommendations on composite outcome measures for PsA to be used in clinical trials and longitudinal studies. The working group opted to evaluate existing composite outcome measures rather than developing a new instrument. The group may consider the latter if none fulfill the measurement requirements. To succeed, each of the candidate composite outcome measures should be evaluated in a specified population, for use in a well-defined context with an intended purpose.[2] There could be different composite outcome measures appropriate for different settings.

The candidate composite outcome measures

The working group selected 10 candidate composite outcome measures and carefully defined the population and context of use (Table 2; Supplementary Material, available with the online version of this article). Notably, none of the existing composite outcome measures encompass all components of the core domain set (Table 3). Some examples of composite outcome measures stratified according to domains, scoring, and weighting were illustrated during the GRAPPA annual meeting. The working group acknowledged the Psoriatic Arthritis Impact of Disease (PsAID)[12] as a composite outcome that measures the impact of PsA on multiple aspects of patients' lives. As the 12-item PsAID (PsAID12) has been endorsed by both GRAPPA and OMERACT as a measure of the health-related quality of life domain,[13] the working group decided not to include the PsAID in the present project.

The working group then conducted a preliminary Delphi exercise[14] in June 2022. For each composite outcome measure, participants rated (1) the agreement on the defined purpose of further evaluation and (2) the priority to be evaluated using the OMERACT filter on a scale of 1 to 9, with 1 to 3 as not important, 4 to 6 as important but not critical, and 7 to 9 as

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Table 1. Update on the overall project for core measurement set for PsA.

Core Domain	Core Instruments/Work Progress	Team Lead
MSK disease activity		
Peripheral joints[a]	Fully endorsed: SJC66/TJC68	YYL
Enthesitis[a]	Work on clinical enthesitis in progress	AO
	SLR on US enthesitis completed, development of new instrument required and in progress	LE
Dactylitis[a]	Work in progress	
Axial	Awaiting formal definition of axial involvement	
Skin	–	
Pain	–	
PtGA	–	
Physical function[a]	Provisionally endorsed: HAQ-DI, SF-36 PF	YYL
HRQOL[a]	Provisionally endorsed: PsAID	AMO
Fatigue[a]	Work in progress	AMO
Systemic inflammation	SLR completed, more data needed	LE
Structural damage[a,b]	SLR completed, more data needed	WT

[a] Prioritized domains. [b] This is not in the inner circle of core domain set but is required at least once in the development program of intervention. Team leaders: AO: Alexis Ogdie; AMO: Ana-Maria Orbai; LE: Lihi Eder; WT: William Tillett; YYL: Ying Ying Leung. HAQ-DI: Health Assessment Questionnaire–Disability Index; HRQOL: health-related quality of life; MSK: musculoskeletal; PsAID: Psoriatic Arthritis Impact of Disease; PsA: psoriatic arthritis; PtGA: patient global assessment; SF-36 PF: 36-item Short Form Health Survey, physical functioning domain; SJC66: swollen joint count in 66 joints; SLR: systematic literature review; TJC68: tender joint count in 68 joints; US: ultrasound.

critically important. A similar but more succinct Delphi exercise among broader GRAPPA stakeholders was conducted subsequently. Overall, 149 members responded (77.4% rheumatologists, 15.1% dermatologists, 2.7% PRPs, and 4.8% others). Following the Delphi exercise within the working group, ACR response criteria,[15] minimal disease activity (MDA),[16] and Disease Activity in PsA (DAPSA)[17] received a consensus rating as critically important to move forward; Psoriatic Arthritis Disease Activity Score (PASDAS),[18] Composite Psoriatic Disease Activity Index (CPDAI),[19] and 3 visual analog scale (VAS) or 4VAS[20] were important but not critical; and Disease Activity Score in 28 joints (DAS28),[21] Psoriatic Arthritis Responder Criteria (PsARC),[22] and Routine Assessment of Patient Index Data 3 (RAPID 3)[23] were rated low priority/not important to proceed with further evaluation. In contrast, in the Delphi exercise for GRAPPA stakeholders, only MDA received consensus rating as critically important (Table 2).

Patient perspective

It is important for patients to have a composite outcome measure that provides a reliable indicator of how they are doing. However, no existing composite outcome measure accounts for all domains in the core domain set that both patients and clinicians recognized as essential to include in all PsA clinical trials.[1] There are some additional points that would be important from the patient perspective. First, the composite outcome measures should be comprehensive, measuring as many domains as possible that are important to patients. Second, the measures should be disease specific. There are numerous composite outcome measures developed for other conditions that are still used in clinical trials for PsA and may not represent a match to the domains relevant to patients with PsA. Although a change toward using PsA-specific composite outcome measures may not be immediate, the conversation toward such a change should be continued. Third, composite outcome measures developed with patient participation should be encouraged. Some of the important domains to include were fatigue and skin disease activity.

In the question-and-answer session during the annual GRAPPA meeting in July 2022, PRPs once again echoed the importance of the comprehensiveness of composite outcome measures. It has been recognized that, at some point in time, patients may experience flares in some domains while experiencing improvement in other domains. Therefore, it may be useful to evaluate the changes in different domains in response to treatment to help select the best domains to be combined in the composite outcome measures. This is especially important for composite outcome measures used as responder criteria in trials.

Conclusion

The composite outcome measure working group has set the stage to re-evaluate the use of composite outcome measures in PsA. The preliminary Delphi exercise indicated a high priority for evaluating MDA among GRAPPA stakeholders, and moderate priority for DAPSA, ACR responder criteria, PASDAS, CPDAI, and 3VAS or 4VAS. Further evidence-based evaluation of composite outcome measures will follow to enable consensus in the selection of relevant composite outcome measures for use in PsA clinical trials.

Table 2. Defined purpose of use of candidate composite measures and results of Delphi exercises from working group and GRAPPA stakeholders.

Candidate Composite Measures	Defined Population	Purpose of Use	Working Group Votes[a], n = 13		GRAPPA Stakeholder Votes[a], n = 149
			Agreement[b] ≥ 7, %	Priority[b] ≥ 7, %	Priority[b] ≥ 7, %
ACR20/50/70	Patients with PsA with active disease	Used in RCTs as a primary efficacy responder index for peripheral arthritis	92.3	76.9	60.4
PsARC	Patients with PsA with active disease	Used in RCTs as an efficacy outcome responder index for peripheral arthritis	38.5	15.4	NA[c]
MDA/VLDA	Patients with PsA with active disease	Used in RCTs as a responder index for PsD to assess low disease activity/remission			
		In LOS, as a treatment target in clinical management	100	100	87.9
DAS28	Patients with PsA with active disease	Used in RCTs/LOS as a measure of disease activity in peripheral arthritis			
		Cut-offs can be used as responder index in RCTs or treatment targets in LOS	7.7	0	NA[c]
CPDAI	Patients with PsA with active disease	Used in RCTs or LOS as a measurement of disease activity	50	33.3	42.3
DAPSA/ cDAPSA	Patients with PsA with active peripheral arthritis	Used in RCTs or LOS as a measurement of peripheral arthritis disease activity			
		Cut-offs can be used as responder criteria in RCTs or treatment targets in LOS	76.9	83.3	68.5
PASDAS	Patients with PsA with active disease	Used in RCTs/ LOS as a measurement of PsD activity			
		Cut-offs can be used as responder index in RCTs or treatment targets in LOS	76.9	69.2	57.1
3VAS	Patients with PsA	Used in LOS/clinical practice as a measurement of PsD activity	61.5[d]	53.8[d]	45
4VAS					49.7
RAPID3	Patients with PsA	Used in RCTs/LOS/clinical practice, as a measurement of PsD activity	30.8	23.1	NA[c]

[a] Rated on a 1-9 scale (1-3 not important, 4-6 important but not critical, 7-9 critically important). [b] ≥ 70% of participants rating ≥ 7 would be considered agreement. [c] These composite outcome measures were excluded in the Delphi exercise for GRAPPA stakeholders. [d] 3VAS and 4VAS were voted together in all Delphi exercises. ACR20/50/70: American College of Rheumatology 20/50/70 responder criteria; cDAPSA: clinical DAPSA; CPDAI: Composite Psoriatic Disease Activity Index; DAPSA: Disease Activity Index for Psoriatic Arthritis; DAS28: Disease Activity Score in 28 joints; GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis; LOS: longitudinal observational studies; MDA: minimal disease activity; PASDAS: Psoriatic Arthritis Disease Activity Score; PsA: psoriatic arthritis; PsARC: Psoriatic Arthritis Responder Criteria; PsD: psoriatic disease; RAPID3: Routine Assessment of Patient Index Data 3; RCT: randomized controlled trial; VAS: visual analog scale; VLDA: very low disease activity.

Table 3. Mapping candidate composite measures to core domains for PsA.

		Core Domains for PsA										
		MSK Disease Activity				Skin	Pain	PtGA	HRQOL	Fatigue	Physical Function	Systemic Inflammation
		Arthritis	Enthesitis	Dactylitis	Axial							
COD	PASDAS	✓	✓	✓				✓			✓	✓
	DAPSA/cDAPSA	✓					✓	✓				✓
	DAS28	✓						✓				✓
	3VAS					✓		✓				
	4VAS	✓				✓	✓					
	RAPID3						✓	✓			✓	
	CPDAI	✓	✓	✓	✓	✓			✓		✓	
MOD	ACR20/50/70	✓					✓	✓			✓	✓
	MDA/VLDA	✓	✓			✓	✓	✓			✓	

ACR20/50/70: American College of Rheumatology 20/50/70 responder criteria; cDAPSA: clinical DAPSA; COD: composite outcome domain; CPDAI: Composite Psoriatic Disease Activity Index; DAPSA: Disease Activity Index for Psoriatic Arthritis; DAS28: Disease Activity Score in 28 joints; HRQOL: health-related quality of life; MDA: minimal disease activity; MOD: multioutcome domain; MSK: musculoskeletal; PASDAS: Psoriatic Arthritis Disease Activity Score; PsA: psoriatic arthritis; PtGA: patient global assessment; RAPID3: Routine Assessment of Patient Index Data 3; VAS: visual analog scale; VLDA: very low disease activity.

ONLINE SUPPLEMENT

Supplementary material accompanies the online version of this article.

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Young-GRAPPA (Y-GRAPPA) at the 2022 GRAPPA Annual Meeting: One Year in Y-GRAPPA. Where Do We Stand, Where Do We Go?

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ABSTRACT. Young-GRAPPA (Y-GRAPPA) was introduced at the 2021 Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) annual meeting. Here we present the 1-year progress of Y-GRAPPA and future plans of this enthusiastic group of young clinicians and early career researchers interested in psoriasis and psoriatic arthritis.

Key Indexing Terms: arthritis, GRAPPA, psoriasis, psoriatic, psoriatic arthritis, spondyloarthritis

Introduction

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) officially implemented Young-GRAPPA (Y-GRAPPA) at the Annual Meeting in 2021, thereby providing a great opportunity for young clinicians and early career researchers interested in psoriatic disease (PsD) to network with each other. Y-GRAPPA's visions were published in 2022.[1] Originally, Y-GRAPPA had approximately 50 members and 8 subgroup committees. A year later, Y-GRAPPA has increased to 100 members (56% female, 28% dermatologists, 72% rheumatologists) with representation from different parts of the world (Figure 1 and Figure 2). We present here a summary of our activities at the 2022 annual meeting, 1-year progress report, and future plans of each Y-GRAPPA subcommittee.

Y-GRAPPA at the GRAPPA annual meeting

Y-GRAPPA representatives participated in the GRAPPA executive retreat and provided the perspectives of the younger generation of GRAPPA members at the 2022 GRAPPA annual meeting and associated trainee symposium. A Y-GRAPPA networking event in an informal setting was also held. Y-GRAPPA and the patient research partners were introduced to each other and future possibilities for collaboration were discussed. Finally, a Y-GRAPPA information session was held adjacent to the

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LVM received speaker fees for educational purposes by Novartis. SH received speaker fees from AbbVie, Roche, BMS, Novartis, Amgen, Janssen-Cilag, Pfizer, and Biopas; adviser/consulting services fees from AbbVie, Janssen-Cilag, BMS, and Novartis; and research grants from GSK. FP received research support from Novartis, Eli Lilly, and UCB; and consultancy fees and fees from speakers bureaus from AbbVie, Amgen, BMS, Celgene, Hexal, Janssen, MSD, Novartis, Pfizer, Roche, and UCB. The remaining authors declare no conflict of interests relevant to this article.

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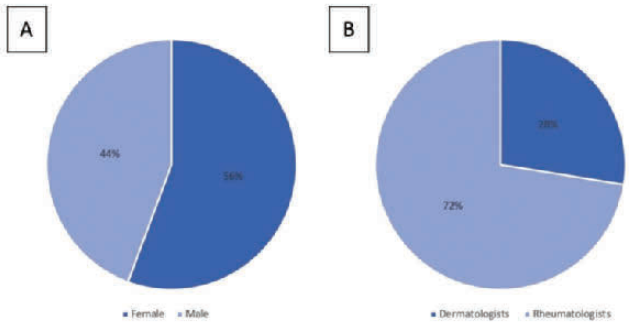

Figure 1. (A) Gender distribution and (B) dermatology/rheumatology distribution within Young-GRAPPA. GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

meeting, which included the presentation of 3 clinical cases of PsD that were difficult to manage; these cases were then intensively discussed by all participants. Afterwards, an interactive and vibrant discussion of future Y-GRAPPA plans and projects took place. Aspects of the discussed projects have already been put into practice, such as mentor-mentee meetings, social media accounts, and the initiation of a "Bring a Derm Friend" campaign. One goal within the next year is the development of Y-GRAPPA bylaws by the governance group. We will continue to encourage Y-GRAPPiAns to become active members of our subcommittees to enable us to achieve even more next year.

1. Governance group

Leader: David Simon (Rheumatologist, Germany)

Tremendous momentum has been gained in the multidisciplinary governance subgroup of Y-GRAPPA to create Y-GRAPPA bylaws, which will be finalized in the coming months, and to create an organizational base that meets the requirements of Y-GRAPPA's steering group. These requirements are to ensure transparent dovetailing between Y-GRAPPA and GRAPPA committees, to oversee the bylaws of the Y-GRAPPA organization, and to serve in an advisory capacity to young colleagues. This subgroup's function will benefit the successful interdisciplinary collaboration of Y-GRAPPA and GRAPPA and help ensure GRAPPA's continued success in delivering on its mission.

2. Education group

Leader: Gizem Ayan (Rheumatologist, Turkey)

The Y-GRAPPA education subcommittee had a fruitful first year, with contributions from both rheumatology and dermatology colleagues. The "Message to Young-GRAPPiAns" project aimed to increase the visibility for Y-GRAPPiAns both within GRAPPA and externally. Moreover, this project aimed to create an initial bond between Y-GRAPPiAns and senior GRAPPA members. The group successfully created 15 videos providing insights for career development within GRAPPA. They were presented at the annual meeting and distributed via social media and GRAPPA's website (www.grappanetwork.org). Next, the group focused on other education-related projects including the GRAPPA Slide Library update project. This project is an ambitious collaboration between the GRAPPA education committee (24 senior GRAPPA members) and 14 Y-GRAPPiAns to update and homogenize the existing slide deck to increase its accessibility, efficacy, and utility. The slide deck provides an overview on PsD and future aims are to translate the slides into various languages and update the deck regularly. Another project in partnership with the newsletter subcommittee is "Do Not Miss" pearls, which started with the newsletter reporting on the American College of Rheumatology (ACR) congress in 2022. This will be followed by a Virtual Congress Highlights session at the ACR meeting. Both "Do Not Miss" pearls and Virtual Congress Highlights will be generated for selected meetings each year going forward. A speaker inventory was created to provide Y-GRAPPA members with opportunities for active roles in sessions of GRAPPA-related events as speakers. Currently, 20 Y-GRAPPiAns have signed up and listed their interests, language skills, and areas of expertise.

3. Dermatology/rheumatology collaborative group

Leader: Dimitri Luz (Dermatologist, Brazil) and Hannah Jethwa (Rheumatologist, UK)

The dermatology/rheumatology collaborative group has played an important role in attracting younger members to GRAPPA through presence at events, such as the launch of Y-GRAPPA for dermatologists during the American Academy of Dermatology meeting, supporting GRAPPA at its 2022 annual meeting,

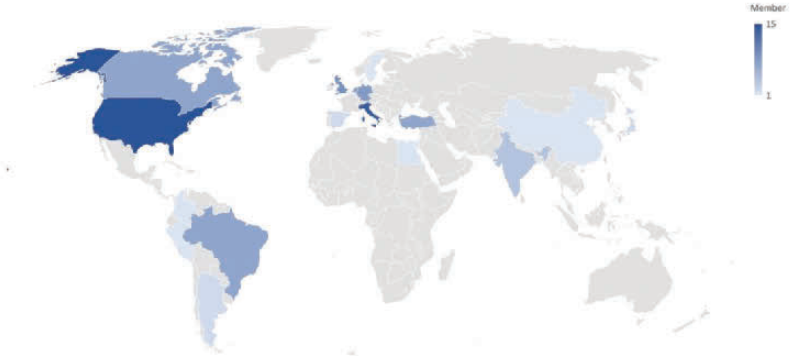

Figure 2. World map showing the distribution of current Young-GRAPPA members. GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

and presenting and discussing cases at the Y-GRAPPA session. We released the "Bring a Derm Friend" campaign to enhance networking between the specialties and increase the number of dermatologists in the Y-GRAPPA community. Bringing dermatologists closer to rheumatologists with future projects addressing PsD holistically is an ongoing aim. This subcommittee has also participated in the slide library update and the mentor-mentee meetings described above. We plan to organize multidisciplinary meetings to improve networking and clinical-radiological skills.

4. Research group

Leader: Rachel Grynszpan (Dermatologist, Brazil) and Michelle Mulder (Rheumatologist, the Netherlands)

The purpose of the research subgroup is to integrate Y-GRAPPA members into GRAPPA research project teams, with the aim to involve at least 1 Y-GRAPPiAn in all upcoming GRAPPA research projects. In addition, the research subgroup facilitates and encourages international research collaborations between Y-GRAPPA members and GRAPPA members, specifically between rheumatologists and dermatologists and across different geographical regions. We are exploring how to keep Y-GRAPPA members updated with the latest important publications about PsD. Last, the research group aims to support Y-GRAPPA members applying for fellowships. Early career dermatologists and rheumatologists will thereby have the opportunity to learn from experienced dermatologists and rheumatologists (ie, GRAPPA members) and exchange knowledge.

5. Website group

Leader: Roxana Coras (Rheumatologist, USA)

The website group has met twice to discuss potential design and content of the Y-GRAPPA website within the parent GRAPPA website. The GRAPPA website is also currently being updated with support from Y-GRAPPA. Y-GRAPPiAns will have opportunities to contribute to both websites. Y-GRAPPA members have emphasized the importance of open access to educational resources on the website. The next step is to create a proposal for the Y-GRAPPA website, with plans to launch the website early in 2023.

6. Social media group

Leader: Sebastián Herrera (Rheumatologist, Colombia)

In one year, the Y-GRAPPA social media group established a presence on Twitter, LinkedIn, Instagram, and YouTube, with plans to expand to other platforms to cover all the possible audiences interested in PsD. We are currently planning regularly scheduled releases of future content.

We have collaborated with the education and newsletter groups to distribute video interviews of GRAPPA members, "Do Not Miss" highlights from international meetings, and educational initiatives from GRAPPA and its partners.

We have had great support from Y-GRAPPiAns, GRAPPA members, and the executive committee, which has translated into high quality posts with active participation of senior GRAPPA members and the development of a standard operating procedure for social media posts.

7. Newsletter group

Leader: Hanna Johnsson (Rheumatologist, UK)

We circulated our first Y-GRAPPA newsletter in April 2022, introducing Y-GRAPPA and its subgroups. Since then, our biggest achievement was to coordinate the development of the GRAPPA newsletter following the 2022 annual meeting and trainee symposium. Y-GRAPPiAns collated contributions, wrote summaries, and worked with GRAPPA and its medical writer to ensure a timely newsletter distribution. As stated above, we also collaborated with the education group to prepare "Do Not Miss" highlights for the post-ACR newsletter.

In the next year, we look forward to keeping fellow Y-GRAPPiAns informed through regular newsletters, and to continue our collaboration with GRAPPA members to summarize the annual meeting and trainee symposium.

8. Networking group

Leader: Arani Vivekanantham (Rheumatologist, UK)

The first virtual mentor-mentee meeting was held with Prof. Laura Coates on September 12, 2022, with great success. Prof. Coates told us about her clinical academic career, including both the highlights and challenges that she has faced. We also received her invaluable advice for early career researchers and had a useful discussion about work-life balance. The event was very well received with gratitude for Prof. Coates' time and insights.

The second virtual mentor-mentee meeting was held with Prof. Joseph Merola on December 1, 2022, and offered the opportunity to learn from another successful clinical faculty academic, but now from a dermatological perspective.

We plan to continue to organize mentor-mentee meetings with a wide range of clinical academics in the field to foster opportunities for members of Y-GRAPPA to learn, collaborate, and network.

Conclusion

Y-GRAPPA has achieved remarkable growth and initiated numerous important projects since its inauguration a year ago, in collaboration with GRAPPA senior members, and we intend to keep up the excellent work in the coming year. Y-GRAPPA members from all over the world will work on dedicated projects to shape the future of both GRAPPA and Y-GRAPPA. We continue to invite more enthusiastic colleagues to join us!

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Proceedings of the Collaborative Research Network Meeting at the GRAPPA 2022 Annual Meeting

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ABSTRACT. At the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting, the Collaborative Research Network (CRN) met to present updates on several projects. These included the GRAPPA-Industry biomarker projects, Axial Psoriatic Arthritis Molecular and Clinical Characterisation Study, Axial Involvement in Psoriatic Arthritis Cohort (AXIS) study, and the Health Initiatives in Psoriasis and Psoriatic Arthritis Consortium European States (HIPPOCRATES). The meeting concluded with a discussion on pathways to further academia-industry collaboration.

Key indexing terms: biomarkers, GRAPPA, psoriasis, psoriatic, psoriatic arthritis, spondyloarthritis

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) Collaborative Research Network (CRN) held its meeting at the conclusion of the GRAPPA 2022 annual meeting in New York, USA. This meeting was organized and co-chaired by Dr. Vinod Chandran and Prof. Kurt de Vlam. Attendance was open to rheumatologists, dermatologists, patient research partners (PRPs), pharmaceutical industry representatives, and nonclinical scientists. Previous GRAPPA-CRN meetings had identified several unmet needs in psoriatic arthritis (PsA), with the aim of addressing these through research proj-

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ects. Updates on those research projects were presented and are described in this manuscript.

Goals for the GRAPPA-Collaborative Research Network 2022 annual meeting

Prof. Kurt de Vlam opened the session with a review of the mission of the GRAPPA-CRN group, which is to facilitate global collaborative psoriatic disease (PsD) research by fostering collaboration, cooperation, and competition among stakeholders worldwide. Several objectives of the GRAPPA-CRN group were discussed in the 2022 meeting, including (1) streamlining common longitudinal projects to address unmet needs; (2) devising standardized operating procedures (SOPs) for data harmonization; (3) development of a GRAPPA bioresource; (4) ensuring equitable distribution of research grants, updating categories, terms of reference, and eligibility criteria; (5) generating educational opportunities, such as grant writing workshops, and exchange programs for skills training, such as fellowships, both of which will serve as a platform for professional development and mentorship.

In line with discussions at the 2022 GRAPPA executive retreat, there was an emphasis on optimizing communication of research focused items through the official GRAPPA website (www.grappanetwork.org), including dissemination of opportunities for training, research projects, and careers, as well as highlighting results of GRAPPA projects to increase visibility and encourage further collaboration. Restructuring of the research committee within the GRAPPA organizational structure was outlined, including 2 co-chairs, 2 PRP members, 1 Young-GRAPPA research lead, and 10 members with even distribution in terms of specialty, gender, and background. Committee membership will be a 3-year term with maximum 1 renewal, with room to foster special interest groups and subcommittees, such as synovitis, pustular psoriasis (PsO), imaging, epidemiology, immunology, cardiovascular disease, bioinformatics, data science, pain, and fatigue.

Initiative updates

1. *GRAPPA-Industry biomarker project*. Prof. Stephen Pennington presented an update on the 2 GRAPPA-Industry initiatives,[1] including the GRAPPA-Atturos-Pfizer study, which aims to identify a biomarker of treatment response, as well as the GRAPPA-Atturos-Lilly study, which focuses on biomarkers of damage (PsA BioDAM). Both these studies use datasets from large phase III trials investigating tofacitinib and ixekizumab, respectively, for the treatment of active PsA.

The GRAPPA-Atturos-Pfizer study is a 2-year project comprising 3 parts: (1) a targeted evaluation of a panel of approximately 200 existing candidate biomarkers using multiple reaction monitoring (MRM) PAPRICA assay using samples from the Oral Psoriatic Arthritis Trial (OPAL), OPAL Broaden (ClinicalTrials.gov: NCT01877668), and OPAL Beyond (NCT01882439) studies (n = 1450); (2) a discovery study of novel serum protein candidate biomarkers using unbiased liquid chromatography-mass spectrometry/mass spectrometry (LC-MS/MS) on selected baseline samples (n = 96); (3) the development of an updated biomarker panel to include markers from PAPRICA evaluation and new markers from discovery, and the evaluation of the updated panel by MRM using OPAL samples (n = 1450). These processes are SOP-driven workflows with embedded quality assurance and quality control processes. Targeted MRM evaluation of 96 baseline samples with the PAPRICA assay was performed, with univariate analysis revealing 110 differentially expressed PAPRICA peptides between responders vs nonresponders ($P \leq 0.05$). Random forest multivariate analysis of normalized MRM data revealed a set of PAPRICA peptide signatures with the ability to differentiate between responders vs nonresponders, with area under the receiver-operating characteristic curve (AUC) of 0.822 and test accuracy of 73.2%. Discovery LC-MS/MS revealed 66 peptides representing 39 proteins that may act as potential peptide biomarkers for predicting response to treatment. From both analyses, a total of 181 candidate biomarker peptides corresponding to 106 proteins have been identified. MRM assays for these candidate proteins have been developed and MRM data acquired and analyzed. These data have been presented as a poster at European Alliance of Associations for Rheumatology (EULAR) 2022 and American College of Rheumatology (ACR) 2022,[2,3] with a manuscript in preparation. The next steps include statistical analysis to evaluate candidate protein biomarkers with clinical data.

The GRAPPA-Atturos-Lilly study is a 12-month project that aims to identify biomarkers associated with radiographic progression (damage). Progressors (n = 28) are defined as > 0.5 change from baseline according to the modified total Sharp score (mTSS) at 24 and/or 52 weeks; whereas nonprogressors (n = 55) are defined as < 0.5 change in mTSS at 24 and/or 52 weeks. The first stage involved LC-MS/MS for biomarker discovery. A total of 588 proteins were identified from a total of 21,940 peptides, of which univariate analysis revealed 74 peptides differentially expressed (ANOVA $P < 0.01$). Multivariate analysis by regularized random forest with bootstrap sampling used training dataset (90%) and testing dataset (10%). Fifteen peptides that best discriminate progressors and nonprogressors at baseline were identified and ranked by importance. This 15-peptide signature provides an AUC of 0.94 in the training samples and 0.76 in the test samples. Targeted evaluation with univariate statistical analysis revealed 4 significantly different peptides corresponding to 3 proteins. Multivariate random forest analysis revealed a 15-peptide signature with train AUC of 0.85 and test AUC of 0.84. Antithrombin III was identified in the protein discovery data signature and ranked first in importance in the PAPRICA 15-peptide signature. Nine clinical variables were evaluated, and C-reactive protein (CRP) ranked highest in random forest analysis. Multiple analyses of clinical data and peptide data were undertaken. Analysis of 15 peptide signature and CRP resulted in AUCs for the 16 variables, with 0.96 train and 0.84 test, compared with 0.85 train and 0.84 test for the PAPRICA 15 peptide signature alone. The results were presented at ACR 2021[3] and a manuscript is in preparation. Further evaluation of peptide signature requires access to additional sample cohorts for validation.

2. *Axial PsA Molecular and Clinical Characterisation Study*. Prof. Philip Mease provided an update on this study, which focuses on identifying liquid and tissue biomarkers that distinguish between patients with PsA with axial disease vs those without. Enrollment has begun for this study and 2 patients have been recruited at the Seattle site at the time of this meeting. The study, funded by Janssen, is designed to enroll 40 patients with PsA, wherein half of patients show evidence of axial involvement and half do not. The data are collected on enrollment and the study is cross-sectional in design. Included are patients with PsA who meet Classification for Psoriatic Arthritis (CASPAR) criteria, have disease duration of < 10 years, have active disease (including an active skin plaque for punch biopsy), and are treatment-naïve to biologic and targeted systemic disease-modifying antirheumatic drugs. Clinical data being collected include patient history, demographics, disease activity measures, patient-reported outcome (PRO) measures, plain radiographs (sacroiliac joints prone view, lumbar and cervical spine, hands, and feet) and magnetic resonance imaging (MRI; sacroiliac joints:T2-weighted, fat-saturated, and cervical thoracic and lumbar spines: T1 and T2 fat-saturated sagittal imaging). Synovial biopsy (50% of patients), skin biopsy (80% of patients), and stool samples are also being collected. Samples will be biobanked for phased analyses. The proposed molecular analyses include HLA genotyping, cytometry by time of flight on peripheral blood mononuclear cells (PBMC), synovial and skin biopsies, unbiased LC-MS/MS on serum samples for the discovery dataset, PBMC immunotyping, synovial and skin single cell transcriptomics and toponomics, and integrated stool microbiome, stool metabolome, and serum metabolome analyses. There is interest in multiple sites, including Canada (Toronto), USA (Seattle, San Diego, Davis, Rochester), Ireland (Dublin), UK (Cambridge), Belgium (Ghent), the Netherlands (Amsterdam), Germany (Frankfurt), Spain (Barcelona), and Italy (Rome).

The study committees include Philip Mease, Oliver FitzGerald, Vinod Chandran, and Niti Goel, with study coordination by Melissa McIlraith. Regulatory steps are being worked through at each investigative site, and a virtual investigators meeting is planned.

3. *Axial Involvement in Psoriatic Arthritis Cohort (AXIS) study*. Prof. Dafna Gladman provided an update on the Axial Involvement in Psoriatic Arthritis Cohort (AXIS) study,[4] which is a multicenter, multinational, cross-sectional study that aims to determine the frequency of axial involvement in PsA, focusing on inflammatory and structural changes on plain radiographs and MRI. Data collection includes clinical, laboratory, and imaging findings associated with the presence of axial involvement in PsA. Demographic data, clinical characteristics, physical examination, and PROs are being collected. Laboratory data include CRP and HLA genotyping (to be performed in Cambridge, UK). Local investigators evaluate for the presence of axial involvement based on clinical and imaging information, followed by further central review. The Central Clinical Committee will judge the presence of axial involvement based on available data. Currently, there are 56 participating centers across 19 countries, with funding agreements complete in 14 countries, covering 42 participating centers. A total of 25 patients have been recruited to date, with 7 datasets sent to central imaging review, of which 4 have been completed.

4. *Update on the Health Initiatives in Psoriasis and Psoriatic Arthritis Consortium European States (HIPPOCRATES)*. Profs. Stephen Pennington, Frank Behrens, and Oliver FitzGerald provided updates on the progress of the Health Initiatives in Psoriasis and Psoriatic Arthritis Consortium European States (HIPPOCRATES),[5] which is a research group that aims to address the unmet needs in PsA. The project currently encompasses 26 partners across 11 countries, with 5-year funding by the European Innovative Medicines Initiative (IMI). The objectives of HIPPOCRATES include using clinical imaging and multiomics strategies for the early diagnosis of PsA in patients with PsO, identification of patients prone to structural damage progression, and prediction of treatment response. There are plans for cluster analysis of immunome profiles using artificial intelligence (AI) methods, with design for deep clinical phenotype analysis in a building model (n = 6060) and validation group (n = 16,098). Imaging data will be analyzed with a discovery cohort (n = 850) and a validation cohort (n = 7169). These results will be incorporated into a machine learning model to build 3 AI-based risk scores to predict progression from PsO to PsA, rapid damage disease progression, and treatment response. This work is supported by the Fraunhofer Cluster of Excellence Immune-Mediated Diseases, which conducts transdisciplinary research using biotechnology. Deidentified datasets can be shared, with a library of liquid and tissue biopsies. This provides the option for ongoing data and sample collection from patients recruited to HIPPOCRATES and presents an opportunity for validation studies.

The objectives of HIPPOCRATES will be addressed through a number of work packages. Their progress is described below.

"Early Diagnosis of PsA" will aim to perform deep phenotyping of patients with PsO with musculoskeletal symptoms or imaging abnormalities to identify and validate factors, including clinical (PROs and clinical data), imaging (MRI, radiographs, high-resolution quantitative computed tomography, fluorescence optical imaging), cellular and molecular features (from liquid biopsy and tissue, including genetics, proteomics, lipidomics) to support a diagnosis of PsA. This diagnostic algorithm can be designed and validated, and may serve as a tool for general practitioners, dermatologists, and rheumatologists to facilitate early and definitive diagnosis of PsA.

The progress in the preparatory work includes establishment of 3 cross–work package working groups (including biomarker and imaging), with the aim of harmonizing clinical data, and a planned general assembly. The goal of the working groups includes identification of cohorts to prioritize -omics analysis within areas of genomics, single-nucleotide polymorphisms, epigenetics, proteomics, and metabolomics. All deliverables have been submitted and the first samples have been distributed to laboratories for molecular analysis. Other activities of the working groups include discussion of preanalytical considerations, sample mapping, workflows, and sample randomization.

For predicting PsA, biosamples from multiple psoriatic cohorts are collated to develop and validate an algorithm to predict PsA using clinical and biologic markers. Currently, the Biomarkers of Comorbidities (BioCOM) data is being transformed onto the Observational Medical Outcomes Partnership (OMOP) platform (www.ohdsi.org). Work is proceeding to include cohorts from Toronto and Nijmegen. In terms of progress on routine real-world datasets, approval has been granted from UK and Spain. A PhD student is drafting a systematic literature. HIPPOCRATES is also planning to recruit people with PsO for a large European cohort study (HIPPOCRATES Prospective Observational Study [HPOS]), which aims to identify clinical and molecular risk factors for developing PsA. For HPOS, a draft website has been developed in English (with capabilities to translate). Workshops were held in collaboration with PRPs, whereby questionnaires to be used in data collection were agreed upon, in addition to co-design of a participant feedback section. There is discussion about collaboration with Biomarkers and Stratification to Optimize Outcomes in Psoriasis (BSTOP) of King's College London (www.kcl.ac.uk/research/bstop). Links are being established with various groups for publicity at launch, including the European Umbrella Organization for Psoriasis Movements, International Federation of Psoriasis Associations, European Federation of Pharmaceutical Industries and Associations, members of HIPPOCRATES (in all countries), and journalists.

To develop a PsA prevention study, a study team established with patient preference research (PREFER) experts and PRPs based in the UK and the Netherlands will focus on prevention of progression to PsA from PsO. PREFER looks at how and when it is best to include patient preferences in decision making during the medical product life cycle. A recent systematic literature review on patient preferences in PsO will support this study. A threshold analysis is currently under way. Funding opportunities are being scoped for a future fellow to run discrete choice experiments.

With regard to joint damage, the primary objective of the ongoing observational Core Outcome Measures for Psoriatic Arthritis Clinical Trials (COMPACT) study is to identify features associated with the progression of structural damage and/or loss of function in PsA patients. Cohorts have been identified and prioritized for this study, with the protocol discussed and close to being finalized. This has been uploaded to the European Research and Project Office (EURICE) Expanding Platforms for Efficacious mRNA Therapeutics (EXPERT) platform and the next step is to submit to the ethics committee. A manuscript on the noninvasive metabolic profiling of inflammation in joints and entheses by multispectral optoacoustic tomography has been published.[6]

For identifying biomarkers of treatment response, cohorts (including study groups from Pfizer OPAL and Brepo-PsA randomized controlled trials) have been identified for discovery work. Medications that will be studied include those from tier 1 (methotrexate and tumor necrosis factor inhibitors) and tier 2 (interleukin 17 and Janus kinase inhibitors). Outcomes studied include composite indexes (Disease Activity Score in 28 joints, CRP, erythrocyte sedimentation rate, Disease Activity Index for Psoriatic Arthritis, Psoriatic Arthritis Disease Activity Score, Psoriatic Arthritis Response Criteria) and individual components of composite indexes. The next steps will focus on extreme phenotypes (eg, comparing remission vs nonresponse patient groups) and validation.

For data integration and analyses, HIPPOCRATES aims to ensure that data conform with preagreed formats, thereby allowing standardized analysis to be performed. Progress has been made to harmonize clinical cohort data to OMOP, Common Data Model, or Clinical Data Interchange Standards Consortium format, and uploaded to a secure data management system. There are ongoing discussions regarding data sharing and user agreements, primarily considering the General Data Protection Regulation (GDPR), with a data sharing agreement in final draft. The data access committee charter has been updated, data managers identified, and a glossary expert group established. These groups congregated in May 2022 to commence work on the HIPPOCRATES glossary, which will include a common set of terms to describe PsD.

The work of the HIPPOCRATES consortium has been communicated through an introductory publication in Nature Reviews Rheumatology.[5] Publications in progress include one on multiomics coordinated by Dr. Robert Gurke; and one on the clinical aspects of HIPPOCRATES by Profs. Pennington and FitzGerald. There are plans for a PRP-led paper on their contributions to HIPPOCRATES. Denis O'Sullivan and Maarten de Wit contributed to a podcast about their PRP involvement in HIPPOCRATES. Lars Werner presented on behalf of the HIPPOCRATES consortium at EULAR 2022.[7] Maarten de Wit chaired a session at EULAR 2022 titled "Enhancing research through patient involvement." Frances Mair will present an abstract accepted for presentation at the North American Primary Care Research Group (NAPCRG) 50th annual meeting scheduled in November 2022 in Phoenix, Arizona (unpublished).

Several challenges remain to deliver all elements of HIPPOCRATES. Internal issues include funding of certain components on HIPPOCRATES, including HPOS and technology platforms. Although there is sufficient funding for the initial components of the research, further funding is required for follow-up aspects. This offers an opportunity for a European Federation of Pharmaceutical Industries and Associations partner to join. Given the similar research objectives, a transatlantic collaboration with Elucidating the Landscape of Immunoendotypes in Psoriatic Skin and Synovium (ELLIPSS) might be a potential strategy to enhance the dataset with larger cohorts, with additional contributions from the research groups. This might include technical expertise from the HIPPOCRATES consortium and more tissue biopsy, spatial, or single cell omics and bioinformatics expertise from the ELLIPSS investigators. Data sharing agreements and different interpretations of General Data Protection Regulation (GDPR)/data protection have hampered progress. The coronavirus disease 2019 (COVID-19) pandemic has prevented face-to-face meetings, which poses difficulties engaging with consortium partners.

Pathways for alternative academia-industry collaborations

To wrap up this CRN meeting, Prof. Georg Schett discussed alternative pathways to collaboration between academia and industry. The declining investments in applied and basic research compared to product development by corporate institutions has led to corporations increasingly relying on academic research enterprises for basic and applied research.[8] The complementary expertise and strength between industry and academia has led to a rise in partnerships and publication output between academic institutions and industry, with both academic institutions and industry seeing mutually beneficial value in collaboration.

Prof. Schett also discussed Pasteur's quadrant, a classification of scientific research projects that optimizes the quest for fundamental understanding of scientific problems, with considerations for immediate societal use, exemplified by Louis Pasteur's research.[9] Given the highly specialized nature of research in the current era, it would be difficult for an individual researcher or corporation to be in the Pasteur's quadrant; academia-industry partnership may provide the venue for this. For such partnerships to be successful, 4 factors seem to be important: (1) societal impact, (2) a prior relationship, (3) shared interest and background in a specific research topic, and (4) long-term potential of the collaboration.[8] Advantages for academia to work with industry would include (1) better potential for societal impact, (2) better student opportunities and outcomes, (3) increased funding, (4) potential for economic development, and (5) the ability to use government programs for funding (the "triple helix" of university-industry-government innovation and entrepreneurship).

Industry-academia can come in many forms. A common form is a direct project-oriented collaboration, such as an investigator-initiated study funded by industry. Industry may also fund registries and foundations. A more collaborative model would involve developing jointly funded institutes, incubators, and spin-offs. Depending on the scope, partnerships may also involve governments and supranational organizations. Examples of successful partnerships include that between Oxford University and AstraZeneca, Coalition for Epidemic Preparedness Innovations, and Global Alliance for Vaccines and Immunization.

Prof. Schett also focused on the increasing reliance of large corporations to influence prescribing behavior of clinicians with the use of key opinion leaders (KOLs). The role of the KOLs, Prof. Schett argued, is aligned with the amplification goal of commercially driven interests rather than innovation and knowledge.[10,11] He therefore proposed developing a cadre of innovation and knowledge leaders (IKLs) who would be best suited for academia-industry interactions, leading to a long-term societal benefit.

Discussion

Despite the challenges of the pandemic, significant progress has been made since the creation of the GRAPPA-CRN. Data collection has been initiated for multiple biomarker research studies, as well as research initiatives focusing on axial disease. Ongoing engagement and involvement of PRPs has been a successful strategy to further research on PsA. The GRAPPA-CRN was conceptualized as a vehicle to facilitate high-quality academia-industry collaboration in PsD research and hopefully, the growth of IKLs to lead to improvements in long-term PsD outcomes.

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Novel Insights From Basic Science in Psoriatic Disease at the GRAPPA 2022 Annual Meeting

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ABSTRACT. Recent basic science advances in psoriatic disease (PsD) were presented and discussed at the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) 2022 annual meeting. Topics included clinical applications of biomarkers, what the future of biomarkers for PsD may hold, the challenges of developing biomarker research to the point of clinical utility, advances in total-body positron emission tomography/computed tomography imaging, and emerging concepts from single-cell studies in PsD.

Key Indexing Terms: biomarkers, positron emission tomography/computed tomography, GRAPPA, precision medicine, psoriasis, psoriatic arthritis

Introduction

One of the main objectives of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) is to maintain, nurture, and grow research in psoriatic disease (PsD). Each year, key advances in recent research are selected and presented at GRAPPA's annual meeting and this has consistently proven to be a popular agenda item. Profs. Vinod Chandran and Oliver FitzGerald selected research topics for presentation at the 2022 annual meeting. With the emerging Health Initiatives in Psoriasis and Psoriatic Arthritis Consortium European States (HIPPOCRATES) and Elucidating the Landscape of Immunoendotypes in Psoriatic Skin and Synovium (ELLIPSS) consortia (described below), it appeared timely to review biomarkers in PsD and with the provocative title, "If I Had a Billion Dollars—Basic Science: Biomarkers of Treatment Response." Prof. Stefan Siebert presented his vision for biomarkers in the clinic in 2030 and Prof. Stephen Pennington spoke about the challenges of getting to individualized diagnosis and treatment for PsD. In the second basic science session, advances in 2 cutting-edge technologies and their application to PsD were presented. Prof. Siba Raychaudhuri spoke about advances in total-body (TB) positron emission tomography (PET)/computed tomography (CT; TB-PET/CT) scanning in individuals with psoriatic arthritis (PsA), highlighting its potential use at the various stages of the disease. Prof. Wilson Liao then reviewed emerging concepts from single-cell studies in PsD.

Potential vision for biomarkers in the clinic in 2030

Prof. Siebert was tasked with outlining a potential vision for biomarkers in the clinic in 2030, with a view of stimulating and challenging current biomarker research in PsD.

Biomarkers have the potential to transform clinical care and outcomes for people with PsD. Technological advances and ongoing large, exciting collaborative initiatives in the European Union (HIPPOCRATES [https://www.hippocrates-imi.eu/] and Biomarkers in Atopic Dermatitis and Psoriasis [BIOMAP; https://www.imi.europa.eu/projects-results/project-factsheets/biomap] Innovative Health Initiative [IHI]/Innovative Medicines Initiative [IMI] consortia) and the United States (Accelerating Medicines Partnership [AMP] ELLIPSS [https://reporter.nih.gov/search/Xoc0EJCoYkq1iXS5py-xFg/project-details/10451910]) offer the hope that identifying clinically

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relevant and actionable biomarkers for PsD is within reach. Any biomarkers identified will need to be validated and overcome regulatory hurdles, in addition to convincing payers of their value.

For the true benefits of biomarkers to be realized, they must be integrated into clinical practice. In the current specialist rheumatology and dermatology clinic model, we see only brief cross-sectional snapshots of patients' conditions when they attend clinic, with limited information to fill in the large gaps between clinic visits. Although simply introducing hospital-based biomarkers into this same system will have undoubted benefits for patients, clinicians, and healthcare systems, this will not lead to the transformation required for these chronic conditions.

With advances in technology and the almost ubiquitous use of powerful smartphones in daily life, there are opportunities to remotely and routinely capture a range of clinically relevant patient-reported outcomes and information to give a far more complete picture of the current status and impact of these chronic conditions. Advances in wearables allow for continuous monitoring of clinically relevant measurements. Examples with clear relevance for PsD include "lab-on-skin" (to measure variables such as excreted drug levels, disease relevant metabolites, and markers),[1-3] smart insoles (gait speed, pattern, and strike pattern can provide information on lower limb musculoskeletal status), and home testing kits (eg, safety and adherence monitoring of therapies and inflammation markers).[4,5]

These advances and technologies, linked with advances in artificial intelligence (AI) and real-time analysis, provide opportunities to generate an unprecedented amount of data about patients and their conditions, but they also present significant challenges. Data literacy risks exacerbating health inequalities, and data ownership and privacy remain unresolved concerns. Traditionally, patient data have been held in hospital record systems, but in the future, it is likely that patients will hold their own healthcare data and records on their smartphones. Integrating evolving data from multiple external sources with clinical information held in electronic health records poses significant technical challenges.

Prof. Siebert's prediction is therefore that the future of biomarkers must be organized around the patient, and not centered on the hospital system or clinical team. This will require a major change in healthcare organization, culture, and funding. The importance of building trust and engagement with patients and their clinicians in the move to this new way of working was highlighted in the discussions from the floor following the presentation.

Getting to individualized diagnosis and treatment for psoriasis and PsA

Prof. Pennington reviewed the pathway from biomarker discovery to initial verification and large-scale validation, all essential steps to clinical utility. To date, the track record for the discovery of new molecular biomarkers and their subsequent successful translation to clinical utility has not been very impressive. It has been argued that this lack of success is due to many reasons but at least in part to the use of poorly collected and annotated clinical specimens for biomarker discovery, a fragmented approach to the biomarker road map from discovery through development to delivery for patient use, and too much emphasis on biomarker technologies rather than unmet clinical needs.[6,7] It has been suggested that a key to biomarker success may begin with identification and detailed assessment (by scientists, clinicians, and individuals with PsA) of the unmet real-world clinical needs for which the biomarkers will be used.[7] Arguably, such unmet needs should be validated by surveying the views/opinions of individuals and groups who are independent of those who identified the needs. Once confirmed in this way, the proposed intended use of biomarkers should then be used to guide the discovery and evaluation of candidate biomarkers so that they are fit for their purpose. In the recent past, biomarker discovery studies focused predominantly on 1 class of molecule/analyte, such as DNA, RNA, protein, or metabolite. The individual analytes were often investigated in relatively small studies of individual/single clinical cohorts. Increasingly, multiple omic technologies are being used to identify multianalyte biomarker signatures in multicohort studies (Table), with the intention that the signatures and associated algorithms will provide reliable and easy to interpret scores to support key patient management and treatment decisions.

HIPPOCRATES is an example of a multicenter and multiomic project. This European private-public consortium funded by the EU's IHI/IMI comprises 27 partners seeking to identify, evaluate, and validate multiomic biomarkers and diagnostic algorithms to address key unmet needs in PsD. This will be achieved through access to clinical samples with associated detailed clinical phenotypic data at an unprecedented scale. For example, a key unmet need in PsA is the identification of biomarkers and the development of tests to predict an individual's response to a particular treatment option now that an increasing number of treatment options are available. AI tools to analyze multiomics data for the purpose of developing predictive tests forms one important objective of the HIPPOCRATES. A further exciting opportunity for HIPPOCRATES lies in the planned implementation of a large-scale longitudinal study, the HIPPOCRATES Prospective Observational Study (HPOS), of patients with psoriasis (PsO), about 30% of whom will progress to PsA. HPOS has the potential to identify clinical and molecular risk factors for the early identification of PsA in individuals with PsO. This may lead to the exciting possibility of intervening earlier with increased treatment efficacy.

Pennington expressed the view that achieving biomarker success will likely require (1) continued and enhanced engagement with all stakeholders; (2) international collaborations; and (3) incentivization of participants, including appropriate career development rewards, for contributions that align with the objective of improving patient outcomes. Professional project management, financial management, marketing, and liaison with regulatory and legal agencies are also essential.

The HIPPOCRATES project with its emphasis on clinical and molecular biomarkers is complementary to the recently launched Foundation for the National Institutes of Health

Table. Multiomic studies in autoimmune diseases.

Disease Area	Comment
RA[23-29]	Molecular signatures for treatment response and selection, disease activity, prediction of imminent disease (eg, glycan profiles)
SLE[30-35]	Disease activity, lupus nephritis
Autoimmune liver disease[36-38]	Molecular diagnostics, risk stratification, prognosis
Celiac disease[39,40]	Exposome, microbiome, antibiotic exposure
IBD[41-43]	Screen to diagnose IBD
SS[44,45]	Transcriptome analysis, inflammation clusters, microbiome
Autoimmune diabetes[46-49]	Exposome, microbiome, disease prevention

Adapted from Choi et al.[50] IBD: inflammatory bowel disease; RA: rheumatoid arthritis; SLE: systemic lupus erythematosus; SS: Sjögren syndrome.

(FNIH) AMP Autoimmune and Immune-Mediated Diseases (AIM) project, which seeks to use omics technologies, including single-cell approaches, to inform a better understanding of PsD mechanisms. Collectively, there is great opportunity to affect outcomes in patients with PsD.

TB-PET/CT imaging: A tool for domain-based quantitative evaluation and monitoring of the inflammatory burden of PsA

In the second basic science session, Prof. Raychaudhuri reviewed the use of TB-PET/CT in individuals with PsA, highlighting its potential use at the various stages of the disease. TB-PET/CT is a novel imaging method that identifies the uptake of a PET radiotracer across the entire body in real time. When used with the radiotracer 18F-fluorodeoxyglucose (18F-FDG), the images provide standardized measures for tissue glucose metabolism, and hence the degree of inflammation.[8,9] The overall hypothesis of Prof. Raychaudhuri's studies have been that TB-PET/CT measures across the entire body will (1) offer a unique insight into systemic PsA inflammatory domains, and (2) provide biomarkers that will quantify the degree of inflammation and thus associate with PsA disease activity, such as with the Disease Activity Index for Psoriatic Arthritis (DAPSA).

Using pilot funding from the National Psoriasis Foundation, the merits of a TB-PET/CT scan to develop a diagnostic test for PsA were explored. The objective of the study was to identify and quantify the degree of inflammation and structural damage using TB-PET/CT imaging and correlate these data with the 5 clinical domains of PsA (arthritis, enthesitis, dactylitis, spinal, and nail inflammation).

TB-PET/CT data from 58 participants with arthritis were prospectively scanned and analyzed; the participants included those with PsA (n = 20), rheumatoid arthritis (RA; n = 18), and osteoarthritis (OA; n = 20). All participants underwent full rheumatological evaluation and a single-timepoint TB-PET/CT scan on the uEXPLORER scanner using 18F-FDG with one-fifth of the standard radiotracer dose. The degree of inflammation was assessed and quantified, and the pathologic predilection for anatomical domains of bones/ligaments of hands in PsA, RA, and OA was determined.

The overall uptake patterns and intensity differed in patients with PsA compared to patients with OA and patients with RA (Figure 1). Figure 1A and 1B show PET/CT images of the hands extracted from TB-PET/CT in PsA compared to RA demonstrating (1) asymmetry and (2) other characteristic pathologies, such as inflammation of the extensor tendon and distal interphalangeal joint in the left index along with nail matrix inflammation in PsA. The relative maximum standardized uptake value ($rSUV_{max}$) was significantly higher in participants with PsA compared to OA. There was a fair agreement (68%) between the DAPSA score and the PET measures, but 17% additional joints showed PET positivity compared to those detected to be inflamed through clinical evaluation.[10]

The results of Prof. Raychaudhuri's studies indicate that TB-PET/CT measures can identify and systemically differentiate the unique pathologies of PsA from RA and OA. Further, preliminary findings clearly demonstrate that TB-PET/CT imaging could identify/quantify the degree of inflammation of 5 clinical domains of PsA.

Compared to blood or genetic markers as diagnostic tools, TB-PET/CT imaging provides a promising tool using a

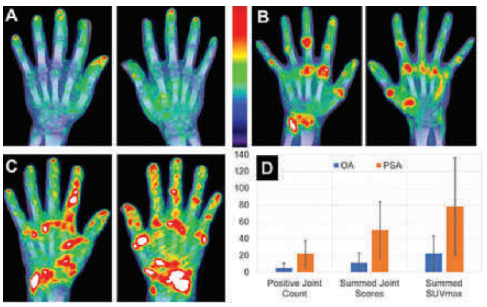

Figure 1. Peripheral arthritis evaluation using 18F-FDG PET/CT. Fused PET/CT scans of the hands of a participant with (A) OA, (B) RA, and (C) PsA. PET scans of PsA and RA showing extensive uptake (red to white) of the PET radiotracer, indicating inflammation. (D) Measures of joints showing positive PET features, their qualitative uptake (no, mild, moderate, or intense uptake), and their summed $rSUV_{max}$, a marker of relative glucose metabolism, hence inflammation in peripheral joints. CT: computed tomography; 18F-FDG: 18F-fluorodeoxyglucose; OA: osteoarthritis; PET: positron emission tomography; PsA: psoriatic arthritis; RA: rheumatoid arthritis; rSUVmax: relative SUV_{max}; SUV_{max}: maximum standardized uptake value.

domain-based quantitative evaluation to analyze the severity of PsA disease in a patient. In addition, TB-PET/CT imaging demonstrates potential for identifying underlying subclinical inflammatory pathology, further supporting its future role in early diagnosis at the transition point from PsO to PsA.

Single-cell studies in PsO and PsA: Emerging concepts

Prof. Liao reviewed emerging concepts from single-cell studies in PsO and PsA. Single-cell experimental techniques have enabled the high-resolution study of heterogeneous cell populations involved in health and disease.[11] Single-cell methods can more precisely study disease pathogenesis and mechanisms of treatment response or failure and have yielded significant insights in PsO and PsA.[12] Findings from 22 published single-cell studies, 18 studying PsO and 4 studying PsA, have yielded several emerging concepts.

First, a small cell subset relative to the total cell population can have a large effect in driving disease. In 2 single-cell RNA sequencing (scRNA-seq) studies, interleukin (IL)-17+ CD8+ T cells represented less than 3% to 20% of all CD8+ T cells found in PsO lesions, yet showed increased effector functions, highly expressed IL-17 signaling, and cytolytic pathways known to contribute to a proinflammatory state.[13,14] These Tc17 cells produced the highest levels of IL-17 and IL-23 membrane receptors out of all studied T cell subpopulations.[14]

Second, individual T cell clones may have an important role in driving disease. Using single-cell techniques comparing circulating immune cells with those in peripheral tissue, matching T cell clones can be identified. In PsA, clonally expanded memory CD4+ and CD8+ T cell subtypes were isolated in synovial fluid.[15]

Third, multiple heterogeneous cell types contribute to psoriatic pathogenesis, highlighting the complex network of immune dysregulation involved. Important cell types identified in single-cell studies include CD14+ dendritic cells and CCR1+ macrophages that produce IL-23A,[16] keratinocytes that produce IL-36,[17] and Mac-2 macrophages and vascular endothelial cells that produce chemoattractants and adhesion molecules.[18] These findings provide additional insights to PsO pathogenesis that expand beyond IL-23/IL-17 signaling.[19]

Fourth, disease-associated cell types can exhibit dynamic cell state transitions. Trajectory analysis revealed that innate lymphoid cells with quiescent or atopic dermatitis (AD)–like type 2 cytokine phenotype can shift toward a PsO-like type 17 phenotype following environmental triggers, highlighting the fluid nature of immune cell functions.[20]

Finally, machine learning models using single-cell data can help identify biomarkers for earlier disease detection and prediction of treatment efficacy. Two machine learning models built upon differential gene expression analysis results have allowed researchers to distinguish (1) patients with PsO and patients with PsA from peripheral blood samples with > 70% accuracy,[21] and (2) AD, PsO, and healthy skin to predict diagnosis and biologic treatment response.[22]

Prof. Liao concluded that ultimately, single-cell techniques can provide unparalleled insights into cell heterogeneity and the biological mechanisms driving PsO and PsA. It is anticipated that continued progress will enable improved diagnosis and treatment for PsD.

Discussion

It is clear from the session, "If I Had a Billion Dollars—Basic Science: Biomarkers of Treatment Response," that there are both huge challenges in bringing biomarkers from discovery to clinical utility and enormous potential for the use of validated biomarkers in routine clinical care. There are precedents for the use of biomarkers in other diseases, including other rheumatic diseases. Timely research in Europe and the US with the emerging HIPPOCRATES and ELLIPSS consortia and significant investment from industry partners will help focus research and clinical application in this important area.

Two exciting technological advances and their application to PsD were reviewed in the second basic science session. The impressive images obtained using TB-PET/CT suggest the potential to evaluate the severity of PsA disease with a domain-based quantitative evaluation, and to detect underlying subclinical inflammation in patients with PsO likely to transition to PsA. Finally, advances in single-cell techniques can be helpful in providing important insights into cell heterogeneity and the biological mechanisms driving PsD.

These 2 basic science sessions were very well received, generating lively discussion. The sessions concluded by looking forward to future research.

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Proceedings of the GRAPPA 2022 Executive Retreat

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ABSTRACT. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) leadership congregated for a strategic planning meeting before the 2022 GRAPPA annual meeting in New York, USA. Meeting aims were to review GRAPPA's performance in relation to its 2016 goals and identify successes and areas for further improvement, identify key GRAPPA priorities and activities for the next 5 years, and explore committee structures to best support these aims.

Key Indexing Terms: arthritis, education, GRAPPA, psoriasis, psoriatic arthritis, research

Introduction

The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) was established in 2003 following completion of the international collaborative project on the Classification Criteria for Psoriatic Arthritis (CASPAR).[1] The mission of GRAPPA is to increase awareness and early diagnosis of psoriatic disease (PsD), to develop and validate research assessment tools, and to synthesize the best current information regarding therapeutic approaches to provide treatment recommendations on an ongoing basis. GRAPPA aims to support education, training, and research through fostering inclusive multispecialty and multidisciplinary international collaboration between rheumatologists, dermatologists, basic scientists, allied health professionals, patient research partners (PRPs), and industry partners. GRAPPA leadership, including board members, steering committee members, and others in leadership roles congregated for a strategic planning meeting before the 2022 annual GRAPPA meeting in New York, USA. The objective of the current retreat was to review GRAPPA's performance in relation to its 2016 goals, identify successes and areas for further improvement, identify key GRAPPA priorities and activities for the next 5 years, and explore committee structures to best support these aims.

As part of the supplement series GRAPPA 2022, this report was reviewed internally and approved by the Guest Editors for integrity, accuracy, and consistency with scientific and ethical standards.

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Reflecting on achievements and areas for improvement in relation to 2016 goals

Six overarching themes were proposed as areas for improvement at the 2016 retreat.[2] To obtain feedback on progress on these themes, a survey was disseminated among GRAPPA members in leadership roles. Survey recipients (N = 35) were asked how

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well GRAPPA did with each theme as shown in Table 1. The scores reflected the opinion that although there are significant strengths in education and research, there are perceived requirements to further develop GRAPPA's organizational structure.

Research. Research has been an area of strength for GRAPPA over the years, with the establishment of a GRAPPA Collaborative Research Network (CRN) and the related research committee that has an advisory role in driving and supporting research within GRAPPA.[3] Specific tasks delegated to the research committee have included the organization of the trainee symposium and GRAPPA pilot grant awards. The CRN has worked to develop electronic case report forms for data entry and standard operating procedures for biomaterial collection, processing, storage, and transport to facilitate international collaboration. Involving multiple international cohorts with PsD through the CRN will catalyze scientific discovery as well as the development of new drugs and disease biomarkers. GRAPPA supports several ongoing research efforts in the areas of ultrasound and axial involvement in psoriatic arthritis (PsA), including the Diagnostic Ultrasound Enthesitis Tool (DUET) and Axial Involvement in Psoriatic Arthritis (AXIS) cohort studies.[4] GRAPPA also endorsed the Sex- and Gender-based Analysis of Effectiveness of Advanced Therapies in PsA (SAGE-PsA) study, which aims to fill gaps in knowledge on the differences in treatment course and outcome for women compared to men living with PsA.[5] In addition, 2 industry GRAPPA projects were initiated in 2020 focusing on the development of biomarkers, which include the Pfizer-GRAPPA project focusing on biomarkers for treatment response to tofacitinib in the Oral Psoriatic Arthritis Trial (OPAL) program; and the Lilly-GRAPPA project that focuses on biomarkers of radiographic damage based on data from the ixekizumab SPIRIT-P1 randomized controlled trial.[6] Establishing a GRAPPA bioresource remains a longer-term goal to support larger collaborative research activities. To help kick-start this concept, a study to identify molecular markers of axial involvement in PsA is in advanced planning and negotiations. Young investigators have also been provided with opportunities through GRAPPA pilot research funding to advance their careers and scientific knowledge. The potential of funding fellowships through research bursaries to promote more engagement in GRAPPA's research activities was discussed.

Education. GRAPPA has increased its presence internationally through education sessions in affiliation with larger meetings organized by the American College of Rheumatology (ACR), American Academy of Dermatology (AAD), European Alliance of Associations for Rheumatology (EULAR), the Asia-Pacific League of Associations for Rheumatology (APLAR), and 1 African League of Associations for Rheumatology (AFLAR) symposium. Individual country education sessions have also been supported by GRAPPA, such as symposia in India, where international GRAPPA faculty have collaborated with regional faculty, and GRAPPA workshops both in Europe and the Middle East.

Table 1. Overarching themes and GRAPPA strengths survey results.

Theme	Score[a]
Research	3.72
Education	3.71
Assessment and treatment recommendations	3.59
Professional development and networking	3.44
Collaboration	3.21
Organizational strength and communication	3.00

[a] Range: 0 = poor, 5 = best. GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

There have been significant achievements in the provision of educational activities from GRAPPA over the years, including global seminars delivered using a virtual platform. Particularly notable initiatives include the collaborative sessions with the Spondyloarthritis Research and Treatment Network (SPARTAN) and the National Psoriasis Foundation (NPF). The SPARTAN-GRAPPA symposium focuses on the understanding of epidemiology, genetics, pathophysiology, clinical features, assessment, and management of PsA and spondyloarthritis (SpA).[7] There have been multiple educational symposia from the SPARTAN-GRAPPA collaboration since 2016, including alongside ACR scientific meetings. GRAPPA and NPF also provide regular local education for rheumatologists, dermatologists, primary care physicians, and allied healthcare professionals.

Well-established online educational resources include the GRAPPA training in joint and skin assessment and musculoskeletal ultrasound training videos, which are used widely to instruct students, healthcare professionals, and researchers on the assessment of joints, spine, enthesitis, skin, and nails in people with PsD.[8] GRAPPA members have compiled an online slide library available to members, which includes concise summaries on clinical features, genetics, natural history and prognostic factors, pathogenesis, classification, outcome measures, and epidemiology of PsA. In addition, GRAPPA has developed a mobile application that supports patient assessment, including calculators for the minimal disease activity score, skin disease indices, and patient-reported outcome measures. These are available in a variety of languages.

Patient education initiatives include the development of a patient's guide, written by the PRPs based on the PsD guidelines released in 2015 and available on the GRAPPA website. A more recent initiative is the Clinician and Patient Education Series (CAPES), which provides updates for healthcare professionals on the management of adult and pediatric PsA and SpA, as well as a resource for patients and families. CAPES used a podcast and webinar format created through collaborations between GRAPPA, NPF, SPARTAN, and the Spondylitis Association of America (SAA).

Assessment and treatment recommendations. GRAPPA is a global leader in developing assessment criteria and producing treatment recommendations. GRAPPA and the Outcome Measures in Rheumatology (OMERACT) PsA working groups continue to establish core outcome measures through OMERACT consensus for both traditional randomized controlled trials but also observational studies. The focus of the working group would be to examine instruments and progress to reaching consensus

on best outcome measures in the 4 domains, which include musculoskeletal disease activity (enthesitis and dactylitis), fatigue, physical function, and structural damage.[9] Two measures were provisionally endorsed as composite measures for physical function at the 2020 GRAPPA meeting: the Health Assessment Questionnaire–Disability Index and the physical functioning domain in the 36-item Short Form Health Survey.[10] Consensus was reached at an earlier GRAPPA/OMERACT meeting on very low disease activity or minimal disease activity as the treatment target in PsA.[11]

The first GRAPPA treatment recommendations for PsA were assembled in 2009.[12] As a result of the rapid progress with PsA therapeutics, updated recommendations were developed in 2015[13] and 2021.[14] In each iteration, the latest high-quality data were excerpted from the medical literature, and a formal process was used to evaluate and synthesize the data into recommendations to be of value to healthcare providers and people with PsA. As the recommendations evolve, they have expanded to include additional domain groups and have sought to address important current considerations, such as the appropriate use of biosimilars.

Professional development and networking. The GRAPPA annual meeting provides a platform for both rheumatology and dermatology trainees to advance their professional development through interaction with the network of senior mentors who have a wealth of experience in clinical and academic domains related to PsD. The annual meeting provides an opportunity for trainees to present their research and receive feedback from other GRAPPA members. The meeting also provides a forum for clinicians and academics to establish and strengthen collaborative research connections, and for younger members to identify potential fellowship opportunities.

One goal identified at the 2016 leadership retreat was to increase engagement of young GRAPPA members who have completed formal rheumatology or dermatology training and to provide mentorship. The launch of Young-GRAPPA in 2021 has encouraged younger members to engage in ongoing GRAPPA activities and to collaborate on ideas and research with like-minded early career researchers and clinicians.

Collaboration. In addition to joint educational initiatives with disease-specific organizations, as discussed above, and also with the International Psoriasis Council (IPC), International Dermatology Outcome Measures (IDEOM), the European Academy of Dermatology and Venereology (EADV), and the Indian Association of Dermatologists, Venerologists, and Leprologists (IADVL), GRAPPA also has ongoing collaborative partnerships with international organizations in facilitating both research and educational activities including OMERACT, Assessment of SpondyloArthritis international Society (ASAS), SPARTAN, EULAR, ACR, APLAR, Pan American League of Associations for Rheumatology (PANLAR), and International League of Associations for Rheumatology (ILAR). Connecting with more international bodies outside of North America and Europe was suggested as an important step to further improve the reach of GRAPPA's education and research initiatives.

In addition, the Psoriasis and Psoriatic Arthritis Clinics Multicenter Advancement Network (PPACMAN) was established to optimize the clinical care of people with PsD through multidisciplinary collaboration, education, and innovative research.[15] PPACMAN has fostered the development of combined dermatology and rheumatology clinics, which not only allows accelerated management but also provides a platform for understanding effectiveness and barriers to multidisciplinary coordinated care, allowing access to shared data for research and establishment of resources to support clinicians setting up collaborative clinics. Regular updates on projects from PPACMAN have been presented at GRAPPA meetings.[16]

Organizational strength and communication. GRAPPA has achieved ongoing engagement and communication with interested stakeholders including healthcare professionals in specialized centers and the communities they serve. The official GRAPPA website has been the main platform for ongoing engagement. The current GRAPPA website is outdated, and improvements to the website are planned and should advance organizational strength and communication in the future.

The current GRAPPA membership comprises 585 rheumatologists, 253 dermatologists, 54 other healthcare professionals, 13 methodologists, 12 GRAPPA PRPs, 8 geneticists, and 3 radiologists. In addition, there are 193 corporate partners. Of the 87 new members in 2022, 46 joined as regular members and 41 as members of Young-GRAPPA.

GRAPPA has achieved significant growth and financial stability since inception, with a positive financial balance at present. Major sources of funding for research and educational activities include donations from large corporations and small companies. Some strategies for generating further sources of revenue include increasing the number of fundraising events, increasing philanthropic outreach, and raising awareness through the GRAPPA website and social media. A dedicated endowment fund is still a consideration to fund ongoing research and education activities. Other strategies in support of generating research funding discussed during the meeting include using networks through the CRN, increasing staffing support in finance, and employing dedicated grant writers and study coordinators.

One goal from the GRAPPA leadership retreat is to improve and clarify the organizational committee structure and responsibilities of members to fulfill the mission statement of GRAPPA more efficiently and effectively. The mission of GRAPPA is to increase awareness and early diagnosis of PsD, to develop and validate research assessment tools, and to synthesize the best current information regarding therapeutic approaches to provide treatment recommendations on an ongoing basis. The current GRAPPA organizational structure no longer meets the requirements for a large, multistakeholder organization with diverse research and educational activities. The current bylaws define the role of the board and the steering committee but fail to provide more detailed structural guidance to help support the diverse interests and requirements of its members. A more defined structure would allow for improved succession planning and better representation from different GRAPPA membership groups, including a balance of rheumatologists and

dermatologists, PRPs, global partners, and Young-GRAPPA members.

Looking forward: priorities and key activities

Key objectives from the 2016 retreat were reviewed.[2] Education, governance, and research were the key themes discussed in 3 working groups at the 2022 retreat as priority areas for further development and improvement over the next 5 years. Table 2 summarizes the priorities under these 3 domains and relevant activities. Deeper involvement of PRPs and Young-GRAPPA members in these activities was identified as important for addressing these priorities.

What do we want members, partners, and others to be noticing about GRAPPA? GRAPPA should continue to foster collaborations in research, group membership, and its reputation as a functional interdisciplinary international organization. Building recognition would involve organization of activities engaging important stakeholders, including PRPs, regulatory organizations, healthcare service providers and payers, international nongovernmental organizations, pharmaceutical industry representatives, and international clinical groups. GRAPPA should also continue to increase its presence at international dermatology and rheumatology meetings and conferences, as well as targeting the clinical needs of community-based dermatologists and rheumatologists.

What do we want people's perception of GRAPPA to be? GRAPPA strives to be a leading organization for research and education in PsD and professional and career development, and an organization that has a reputation for efficiently driving projects forward while minimizing bureaucracy. It encourages greater collaboration between basic scientists and clinical researchers, and leading the global clinical, translational, and basic research on PsD by adding value in emerging areas of unmet need. The organization also endeavors to have active involvement in communities where English is not the primary language. GRAPPA should continue to address areas considered priorities by patients and expand the involvement of PRPs both during the inception and preparation of research grant applications.

Evaluating GRAPPA's organizational structure

Organizational strength and communication was a theme identified from the survey of members as an area needing further improvement. Weaknesses within the current structure were identified, including poorly defined roles and responsibilities for members of the steering committee, lack of clarity in relation to reporting relationships, lack of defined purposes of each committee, and undefined terms of office. These were cited as potentially leading to poor decision making and lower-than-hoped-for engagement. It was also highlighted that initiatives

Table 2. Summary of priorities and key activities.

Priority	Key Activities
Research	Use the CRN committee to work toward validation of biomarkers, including publishing position papers on this matter and standard operating procedures on biomaterial collection Develop RAG to work with regulatory agencies toward the use of outcome measures and/or biomarkers in clinical care Propose criteria for GRAPPA fellowships (short- and longer-term) to encourage younger members to collaborate with field leaders within the GRAPPA membership with research focus on areas of need and underserved areas Conduct an epidemiological survey across the world (including using administrative databases) to better characterize the prevalence of PsO and PsA, the economic effect of PsD, and understanding outcomes in the context of patient diversity
Education	Development of an image library comprising photos (voluntary submission by GRAPPA members with credit given to image providers) and drawings (possible involvement of a graphic artist with copyright to GRAPPA) collated on the website as part of a slide set Delivery of congress pearls summaries of major conferences (AAD, SID, ACR, EULAR, and GRAPPA abstracts) as slides to be stored on the GRAPPA website (collated and selected by the education committee), as well as capturing highlights and interviews at conferences delivered to GRAPPA members by various media formats including podcast, digital newsletter, social media, and website Increase social media engagement by encouraging members to post interesting abstracts from conferences on appropriate platforms to generate interest, a process that would be guided by regulations and standard operating procedures Diversify and update training material by including more diverse populations in the training video and slide set project (including age, gender, race/ethnicity, comorbidities), as well as expanding delivery of materials to more regions and countries (including non-English content)
Governance	Reevaluate GRAPPA's mission statement by considering inclusion of research, assessment, education, clinical care, and professional development Include PRPs in updating the mission statement Define the overall organizational structure by reviewing and modifying, if necessary, the proposed organizational chart Define and refine committees (in terms of roles, responsibilities, leadership, election, and succession planning), while developing the policies and procedures of committees Rethink and redefine membership by reviewing bylaws and bringing proposals to the board and steering committees

AAD: American Academy of Dermatology; ACR: American College of Rheumatology; CRN: Collaborative Research Network; EULAR: European Alliance of Associations for Rheumatology; GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis; PRP: patient research partner; PsA: psoriatic arthritis; PsD: psoriatic disease; PsO: psoriasis; RAG: Regulatory Action Group; SID: Society for Investigative Dermatology.

would benefit from including more representation from outside of North America and Europe.

The aims of a GRAPPA organizational restructure would be to improve and increase engagement through the following:

- A more effective and efficient committee structure
- Clearer reporting relationships, where issues can be brought forward from committees to the GRAPPA board
- Definition of committee purpose, membership, and leadership; this will better permit succession planning and improve representation across membership groups
- Defined roles for each committee member.

The newly proposed structure as shown in the Figure includes an overarching GRAPPA board of directors comprising the current co-presidents (1 dermatologist and 1 rheumatologist), the past co-presidents (1 dermatologist and 1 rheumatologist) in an advisory capacity, and chairs for the areas of finance, education, research, and membership (2 co-vice presidents). The finance chair would be the treasurer secretary, whose role would be to manage committees including finance/development, corporate partner liaising, remuneration, and grants. The education chair would oversee activities of committees working on treatment recommendations, meetings, and publications (including textbook and slides). The research chair would manage the CRN, grant awards, trainee symposium, OMERACT, and imaging (MRI and ultrasound) committees. The membership chairs (co-vice presidents) would supervise membership, nominations/governance, PRPs, Young-GRAPPA, and GRAPPA EU.

The role of the board would be to approve recommendations that arise from the committees under the umbrella of each domain. Amendments to the GRAPPA bylaws would be required to reflect the newly proposed structure. Role descriptions for the chairs of education, membership, and finance would be important, whereby each committee would have terms of reference. The proposal incorporates consideration of co-chairs for each committee (1 rheumatologist and 1 dermatologist), whereas Young-GRAPPA and PRP representatives would be present in each subgroup headed by the chairs. Steering committee members would declare which committee they would like to join, while keeping numbers balanced.

One point uncovered during discussion was a risk for significant overlap between the board of directors and committee chairs, leading to potential confusion in terms of decision making. Defining roles and lengths of appointment with respect to each committee member, as well as having external advisers to the board (such as regulatory experts who are well versed in the nonprofit landscape and structure) may help address this issue. Ongoing regular meetings with steering committee members would be essential to communicate changes, increase engagement, and allow evolution of new ideas. Having at least 2 PRPs in formal committees will help ensure patient priorities are addressed. Placement of Young-GRAPPA members within committees will continue to integrate mentorship and enable succession planning.

In addition, it was suggested that regional representation for each part of the world might help encourage involvement from underrepresented geographic areas outside of North America and Europe. The potential for creating contractor or paid positions to oversee certain aspects of governance should be given consideration. External consultancy might also be sought to guide GRAPPA's restructuring.

Conclusions

Since GRAPPA's inception, it has grown in membership and flourished primarily by leading state-of-the-art education and research on PsD for both people living with PsD and healthcare professionals. Key priorities and activities going forward were proposed and discussed by attendees of the 2022 executive retreat and are reviewed in this manuscript. Organizational structure and communication were identified by GRAPPA general members as priorities for further development. Key action points from the retreat include the need to reflect on and implement organizational restructuring, increase communication to the membership, and increase inclusive representation to increase effectiveness of delivery of GRAPPA's mission.

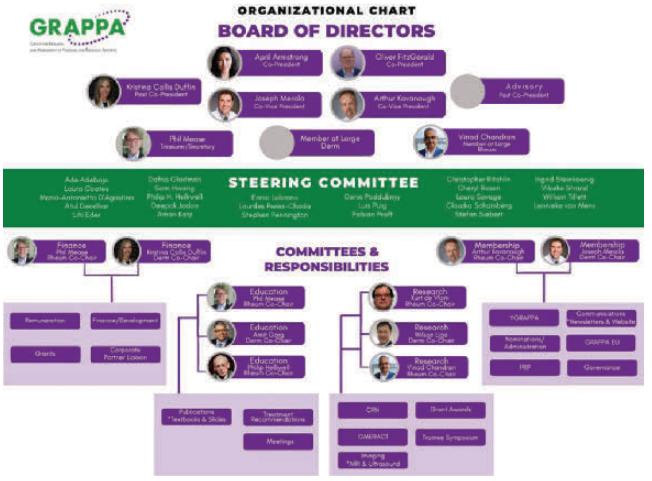

Figure. Proposed structure of GRAPPA. GRAPPA: Group for Research and Assessment of Psoriasis and Psoriatic Arthritis.

GRAPPA's mission and bylaws would in turn require review, and all changes should then be effectively communicated to both GRAPPA members and to the public.

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