Review

Clinical aspects of psoriatic arthritis: one year in review 2024

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ABSTRACT

Psoriatic arthritis is a very pleomorphic inflammatory disease characterised by its association with psoriasis and the development of a wide spectrum of comorbidities that can impact patients' prognosis and quality of life.

In recent years, several new drugs have been developed, showing significant efficacy in alleviating symptoms and signs, while maintaining a generally favourable safety profile. Despite these advancements, the management of PsA remains potentially suboptimal. Indeed, a percentage of patients do not respond to therapies, or they may improve only in limited outcomes, resulting in a challenge for the management of the burden of disease.

In this paper we reviewed the literature on PsA from January 1st 2022 to July 1st 2024.

Introduction

Psoriatic arthritis (PsA) is a very pleomorphic inflammatory disease, being characterised by a heterogeneous axial and peripheral musculoskeletal involvement, usually associated with different extra-articular inflammatory manifestations, in particular skin or nail psoriasis (PsO), inflammatory bowel disease, or acute anterior uveitis. Enthesitis and dactylitis stand out among its more typical and difficult to treat signs.

Following our regular annual reviews on different aspects of rheumatology (1-6), we here provide a critical digest of the recent literature on PsA from 2022 to the first half of 2024 (Medline search of articles published from January 1st 2022 to July 1st 2024). In particular, we performed an on-line search on MESH database, using as key terms "pathogenesis", "biomarker", "diagnosis", "diagnostic imaging", "drug therapy", "comorbidities", "mortality", "psychology", "therapy", "economics".

Imaging

Imaging techniques are crucial for PsA diagnosis and monitoring, since they can detect signs of both activity and damage, and evaluate drug efficacy.

Conventional radiology

Using conventional radiology (CR) of the spine and pelvis, a Belgian study, analysed the rate of damage accrual in PsA and axial (Ax) Spondyloarthritis (SpA) patients in a real-word setting. The authors observed that PsA patients had fewer syndesmophytes and lower values of the modified Stoke Ankylosing Spondylitis Spine Score (mSASSS) than ax-SpA patients. Interestingly, PsA patients tended to develop syndesmophytes mainly at their cervical spine, while in ax-SpA they were more equally distributed (7).

Ultrasound

Yen *et al*. confirmed the diagnostic power of ultrasound in detecting PsO patients who are in the preclinical phases of PsA, particularly when they have no symptoms of synovitis (8).

Several studies applied ultrasound (US) to evaluate enthesitis in PsA patients. It is interesting to note that power Doppler (pD) signal and bone erosions at enthesis were the most discriminative OMERACT lesions and were significantly associated with the development of ultrasound-detected joint erosive damage, thus enabling the identification of a more severe subset of PsA patients (9). Moreover, both the Madrid Sonographic Enthesitis Index (MASEI) and the Outcome Measure in Rheumatology (OMERACT) confirmed their sensitivity to change and showed an excellent level of reliability when applied to score enthesitis in SpA and PsA patients (10).

Using a seven-joint ultrasound score based on the presence of synovitis and tenosynovitis or paratenonitis scores

on grey-scale ultrasound, on pD ultrasound score and on erosion score, on the wrist, second and third metacarpophalangeal, second and third proximal interphalangeal joints and second and fifth metatarsophalangeal joints, Sapundzhieva *et al*. observed that this scoring system was able to distinguish between PsA and RA; in particular, PsA patients showed higher median scores of both grey-scale and PD tenosynovitis/paratenonitis (11).

Ultrasound was also helpful in nail evaluation. If Huang *et al*. observed that US-detected onychopathic changes were more frequent in PsO patients than PsA patients, Michelucci *et al*. showed that ultra-high frequency ultrasound seemed able to analyse both nail plate, nail bed and nail matrix thickness, together with nail insertion and nail matrix length, with clinical usefulness not only in real-time nail evaluation, but also in monitoring psoriatic onychopathy evolution after therapies (12, 13).

Magnetic resonance imaging

Considering scoring systems based on magnetic resonance imaging (MRI), Østergaard *et al*. confirmed a good level of sensitivity in detecting structural changes of the OMERACT PsA MRI Scoring system (PsAMRIS) in patients treated with abatacept, using different regimens (14). Another study by Gezer *et al*. on the SPARCC sacroiliac MRI scoring index showed its ability to highlight signs of both activity and damage, with erosions, fat metaplasia, backfill and ankylosis being the most frequent structural lesions in ax-PsA (15).

US, MRI and CR

Polachek and colleagues found a good-to-very-good agreement between US and MRI in detecting synovitis, flexor tenosynovitis and extensor paratenonitis; the agreement between US, CR and MRI was very good for erosions and good for bone proliferation, which more frequently detected by US or CR than MRI (16).

US and MRI diagnostic value in PsA patients was also confirmed for the evaluation of carpal tunnel syndrome, by measuring the cross-sectional area of the median nerve (17).

Nailfold capillaroscopy

Finally, Fukasawa *et al*. explored the utility of nailfold capillaroscopy in PsO and PsA patients. In particular, they observed that PsA was significantly associated with a higher prevalence of nailfold bleeding and enlarged capillaries. Moreover, they found that the development of these abnormalities in PsO patients were a predictor of PsA onset and their degree seemed proportional to disease severity and serum levels of TNF-α, IL-17A and IL-23 (18).

Take-home messages

- mSASSS application in CR showed that PsA patients develop syndesmophytes mainly at the cervical spine (7).
- US confirmed its central role in early and differential diagnosis of PsA and enabled the identification of more severe subsets of PsA (8, 11).
- US is able to completely assess enthesitis and is crucial for the evaluation of nail involvement (9, 10, 12, 13).
- The use of MRI as a tool to score both activity and damage of PsA was confirmed; furthermore, its application showed good sensitivity to change (14, 15).
- PsA patients may show altered capillaroscopy patterns, the severity of which seemed proportional to disease activity (18).

Clinimetrics

Disease activity indices are crucial for evaluating and follow-uping disease activity and damage and for monitoring therapeutic response in PsA. Kasiem *et al*. tested multi-dimensional visual analogue scale (VAS), respectively 3-item (physician global, patient global and patient skin) and 4-item (with the addiction of patient joint) in a cohort of patients with a recent diagnosis of PsA. They found strong correlation with already existent composite measures, in particular Disease Activity in PSoriatic Arthritis (DAPSA), Psoriatic Arthritis Disease Activity Score (PASDAS) and Routine Assessment of Patient Index Data 3 (RAPID3) (19).

In a prospective multicentre cross-sectional study, Proft *et al*. evaluated the performance of a timely available quick quantitative CRP assay to calculate DAPSA score (Q-DAPSA). The authors observed an almost perfect agreement with the conventional DAPSA in identifying different categories of disease activity; therefore, Q-DAPSA could be instrumental in optimising the treat-to-target assessment, both in clinical practice and in clinical trials (20).

An observational study in the Swiss Clinical Quality Management cohort confirmed how body mass index (BMI) may influence disease activity outcomes in PsA patients, showing that obesity was associated with a lower probability of achieving minimal disease activity (MDA) and remission; however, it did not seem to impact treatment persistence. In addition, the authors observed a significant overlapping between MDA and cDAPSA remission results across different patient groups based on their BMI value (21).

Perrotta *et al*. evaluated gender-related differences in MDA, DAPSA and Psoriatic Arthritis Impact of Disease (PsAID) results with respect to clinical remission in a multicentre cross-sectional study of longitudinal cohorts; clinical remission was judged from both the physician and patient perspectives. They found that DAPSA remission, with respect to physician-evaluated remission, was more sensitive and specific in female patients, thus confirming how different outcome indices may perform differently in the two sexes (22).

Applying DAPSA and MDA indices, Gratacós *et al*. highlighted that about 40% of Spanish patients with a diagnosis of PsA, followed in an outpatient rheumatologic setting, had an uncontrolled disease, thus stressing the need to optimise PsA patient assessment in clinical practice (23).

Take-home messages

- Multi-dimensional VAS agree with already validated composite measures of PsA activity (19).
- Q-DAPSA could optimise the treat-to-target PsA assessment (20).
- BMI could impact the achievement of MDA state and remission (21).
- DAPSA definition of remission was found to be more sensitive and specific in women (22).

Comorbidities

As previously described, PsA patients tend to present multiple comorbidities, with consequences on their prognosis and quality of life (QoL).

Many studies have addressed this aspect, with particular focus on cardiovascular (CV) comorbidities. A paper from Greece showed that there was a substantial overlap in prevalence between ankylosing spondylitis (AS) and ax-PsA patients (24). By analysing patients with an early diagnosis of PsA, Ishchenko *et al*. found that they were at higher risk of developing multiple CV risk factors than healthy controls, even independently of the duration of their skin PsO, thus concluding that the comorbidity burden of PsA patients is not only related to the chronic systemic inflammation due to a long-lasting autoimmune disease (25). By applying the triglyceride-glucose index in a cohort of PsA patients, Xie *et al*. found that it was significantly associated with carotid atherosclerosis, independently of both traditional CV risk factors and psoriatic-related risk factors, thus showing that it could be a specific biomarker of atherosclerosis in these patients (26).

Exploring genetic aspects, Queiro *et al*. observed that HLA-C*06 status seemed to correlate with a better cardiometabolic profile, lower waist circumference, less hypertension and a lower BMI (27).

In addition, focusing on obesity, a Turkish multicentre study found that it correlated with higher levels of PsA activity, worse QoL and a higher risk of developing depression and anxiety (28).

Interestingly, a higher risk of depression in PsA patients than in AS patients was highlighted by Fragoulis *et al*. (29). Moreover, Tabra *et al*. found that IL-23 levels directly correlated not only with PsA activity, but also with the risk of developing anxiety and depression (30).

Exploring psychiatric comorbidities in patients with juvenile PsA, Low *et al*. found that the presence of skin PsO on diagnosis was independently associated with a higher risk of depressive symptoms and with worse scores of parents' global assessment (31).

Finally, data from an Italian multicentre research group showed that pain catastrophising and a maladaptive cognitive style observed in patients with psychiatric disorders could compromise both the achievement of remission or low disease activity, regardless of inflammation and QoL outcomes (32).

Interestingly, Kavadichanda *et al*. observed that sarcopenia was significantly associated with a higher CV risk, thus underlining how body composition may influence patients' outcomes, reasonably in relation with the presence of ectopic adipose tissue in skeletal muscles. Therefore, a focused physical therapy to prevent sarcopenia could be added to the treatment of traditional CV risk factors and of PsA to prevent atherosclerosis in this group of patients (33).

Uveitis is the main extra-articular manifestations of ax-SpA, while its occurrence in PsA is considerably lower. Kougkas *et al*. observed that, in PsA patients, the presence of uveitis was associated with a family history of ax-SpA, an axial involvement at PsA diagnosis and with PsA disease duration. Interestingly, they also noted that, although uveitis was significantly more frequent in ax-SpA, the risk of developing subsequent ocular damage was significantly higher in PsA patients (34).

Take-home messages

- CV risk factors prevalence in early PsA seems to be independent of PsO duration (25).
- The triglyceride-glucose index could be a specific biomarker of atherosclerosis in PsA patients (26).
- HLA-C*06 status may protect PSA patients from CV risk (27).
- Depression seems more prevalent in PsA than in AS (29).
- IL-23 levels correlated directly with the risk of anxiety and depression (30).
- Sarcopenia in PsA patients appears to be associated with a significantly higher CV risk (33).
- The risk of ocular damage following uveitis seems higher in PsA than ax-SpA (34).

Quality of life

It is well known that PsA patients tend to have impaired QoL outcomes and different clinical variables could have an impact.

With the aiming of analysing more in depth the relationship between female sex and low QoL, Queiro *et al*. found that a higher HAQ score, a greater intensity of pain and differences in the level of physical activity and in joint involvement at disease diagnosis could potentially alter the outcomes of the disease impact on women (35).

Navarini *et al*. highlighted that a state of low or minimal disease activity and their persistence seemed to positively influence both the physical and mental components of PsA patients' QoL (36).

A recent cross-sectional observational multicentre study showed that a multimorbidity status negatively influenced physical function, while CV and psychiatric diseases worsened both physical, social and mental functioning in PsA patients (37).

To conclude, Cengiz *et al*. observed that a significant impairment of both physical and mental functioning in PsA patients could be related to the presence of nail PsO (38).

Take-home message

- A multimorbidity-status, CV and psychiatric diseases, and nail PsO have been shown as crucial determinants of an impaired QoL in PsA patients (35-38).

Therapy

As already discussed, the therapy of PsA has been sensitively improved in recent years. In this section we will present the more recent data on the efficacy and safety of currently available PsA treatments.

Anti TNF-a

TNFi have been the milestone of biological disease-modifying anti-rheumatic drugs (b-DMARDs) for the treatment of PsA; we will discuss below some of the data that emerged over the last two years.

The high retention rate (RR) of golimumab in PsA was confirmed also at five years in a multicentre study by Weinstein *et al*. (39). It appeared effective also in improving both disease activity and functional outcomes in PsA patients who had previously failed TNFi therapies (40).

Both golimumab and etanercept maintained their efficacy even after extending the dosing interval between their administrations, thus suggesting that this approach could reduce healthcare costs and improve patient benefit (41, 42). The utility of dosing anti-adalimumab antibodies for optimising treatment outcomes was confirmed by Jyssum *et al*. (43).

The study by Karadag *et al*. reinforced the view that TNFi were able to improve work productivity and reduce patients' impairment due to disease activity, thus assuring better QoL outcomes (44).

However, it should be noted that 30–40% of patients discontinued their first TNFi within the first 12 months, primarily due to a lack of efficacy or adverse event (AEs). In particular, Ørnbjerg *et al*. found that PsA patients who stopped TNFi due to inefficacy had a poorer response to subsequent treatments, while those who discontinued because of AEs might have better outcomes with a new TNFi. These findings highlighted the importance of tailoring treatment strategies also based on patients' previous treatment experiences, to improve individualised care (45).

Exploring the efficacy of TNFi-biosimilars, Müller-Ladner *et al*. reported that switching from adalimumab to its biosimilar SB5 did not significantly impact efficacy or safety in most patients, thus supporting the use of biosimilars as a cost-effective alternative (46).

IL-17 inhibitors

The IL17i class is a family of drugs with an established efficacy and good safety profile, broadly used in PsA treatment. Secukinumab and ixekizumab were the first drugs to be approved, with bimekizumab following thereafter.

Secukinumab

A number of industry-sponsored randomised clinical trials (RCT) confirmed the efficacy of secukinumab to control both synovitis, enthesitis, dactylitis and PsO. It was the first IL17i whose efficacy on synovitis and enthesitis was confirmed also applying US. (47, 48, 49, 50).

A *post-hoc* analysis of the MAXIMISE trial confirmed the efficacy of secukinumab in axial-PsA, highlighting that the presence of a nail PsO seemed to be a predictor of therapeutical response (51).

By maintaining PsA patients in a low disease activity state, it seemed also able to significantly limit the extent of structural damage (52).

In the last few years, a great deal of data has emerged on IL17i RR. Secukinumab showed very good results, with values of RR going from 73.2% at 12 months to 57% at 60 months. Cardiometabolic diseases and type 2 diabetes were significantly associated with higher values of RR, while the main reason for discontinuation was a lack of effectiveness, usually emerging in the first 6 months of therapy (53, 54). Interestingly, the RR in ax-PsA patients seemed to outperform both that of peripheral-PsA patients taking secukinumab and that of patients taking TNFi, irrespective of the disease subset (55).

Although the safety profile of secukinumab is known to be good, an analysis of PsA and AS Scandinavian patients showed a significant increase in hospitalisation rates due to infections in the first year of therapy, compared with adalimumab; however, a subsequent subanalysis attenuated these differences as the secukinumab cohort was more bDMARD-experienced and older (56).

Ixekizumab

The efficacy data for ixekizumab are also significant. Indeed, it seemed able to reduce cutaneous involvement independently of the severity of PsO and of previous courses of TNFi. Similarly, it improved the outcomes of axial involvement compared to placebo, with an early action and a relatively long-lasting effect (57, 58). An interesting targeted *post-hoc* analysis of a head-to-head RCT showed the superiority of ixekizumab over adalimumab in resolving the inflammation of both the "finger unit", a well-known hallmark of PsA, and of distal interphalangeal synovitis alone (59).

These data are also confirmed by the results of the SPIRIT-P1 and -P2 studies; Coates reported that the wide spectrum of efficacy of ixekizumab was independent of previous therapy with bDMARDs and of any association with methotrexate or other csDMARD; moreover, a reduction in the level of structural damage was also noted (60).

An Italian monocentric experience reported a RR of 43.8% at 38 months, with discontinuation related to both inefficacy and AE occurrence (never severe) (61).

Secukinumab and ixekizumab

Only few data on cycling between IL17i are actually available. Interestingly, Panagiotopoulos *et al*. showed that both peripheral, axial and skin outcomes could improve after the switch from secukinumab to ixekizumab in a significant percentage of patients and also the frequency of dactylitis and enthesitis decreased, thus suggesting that the cycling of IL17i could be effective, similarly to what already observe for TNFi in PsA patients (62).

Finally, focusing on a real-world setting, Joven *et al*. observed that secukinumab 150 mg was prescribed more frequently to those patients with a milder skin and joint involvement, while secukinumab 300 mg was used to treat more severe forms of PsA. Instead, patients taking ixekizumab were usually older, with a longer disease history, an active disease, more comorbidities and a higher rate of previous use of b/tsDMARDs compared to the other groups; they also showed higher rates of RR at 1 year (63).

Bimekizumab

Bimekizumab is a humanised monoclonal IgG1 antibody that selectively inhibits IL 17F and 17A; *in vitro* studies showed its higher efficacy in suppressing pro-inflammatory cytokines compared with the sole inhibition of IL 17A. Data from RCTs showed the efficacy of bimekizumab in joint and skin outcomes compared with placebo, in patients with PsA and inadequate response or intolerance to TNFi (64, 65). Bimekizumab safety profile was good and the most frequent AEs were SARSCoV2 infection, oral candidiasis (with mild or moderate severity), nasopharyngitis and urinary tract infections. The data on PsA patients naive to bDMARDs showed similar efficacy and safety (66, 67).

These efficacy and safety results were confirmed after 3 years of therapy, thus suggesting it could be a promising treatment option for patients with an active PsA (68, 69).

IL23 inhibitors

IL-23 has been shown to increase the expression of IL-17 and other pro-inflammatory cytokines, thus leading to tissue inflammation and injury. Therefore, targeting IL-23 could offer an effective strategy for managing the burden of PsA, potentially reducing disease activity and improving patient outcomes.

Guselkumab

Guselkumab is a fully human monoclonal antibody that selectively and specifically binds and inhibits the p19 subunit of IL23.

Coates *et al*. observed that guselkumab provided robust and sustained benefits across multiple PsA domains over 1 year for joint and cutaneous involvements, achieving a state of sustained low disease activity or remission (70). These results were confirmed also after 2 years of treatment, with additional data about enthesitis and dactylitis (71). Furthermore, it also showed a subsequent reduced radiographic progression over 2 years (72, 73). Guselkumab also seemed to improve QoL and work productivity of PsA patients (74, 75). Interestingly, guselkumab provided consistent pharmacodynamic effects in both biologic-naive and inadequate responder to TNFi PsA patients (76).

Strober *et al*. evaluated guselkumab safety in a large population of patients with PsA, observing a favourable profile, confirmed throughout long-term treatment and across different subgroups of PsA patients, independently of previous therapy with TNFi (77, 78).

Risankizumab

Risankizumab is a fully humanised immunoglobulin G1 monoclonal antibody which, similarly to Guselkumab, specifically inhibits IL-23 by binding its p19 subunit.

In a phase 3 RCT, risankizumab demonstrated greater efficacy compared with placebo in patients with active PsA, confirming these results across different subgroups, regardless of baseline demographics and disease characteristics, or concomitant and prior medication use (79-81).

Kristensen *et al*. evaluated the impact of risankizumab on HRQoL and observed greater improvements in both fatigue, pain and work productivity (82, 83).

Ustekinumab

Ustekinumab is a fully human IgG1 monoclonal antibody that targets the p40 subunit, shared by both IL-23 and IL-12. It was the first licensed non-TNFi bDMARD in PsO and PsA and showed efficacy in joints and skin PsA domains with a favourable safety profile.

The role of methotrexate in combination with ustekinumab in patients with PsA remains unclear. The MUST phase 3b trial highlighted that ustekinumab was an effective treatment independently of methotrexate use; furthermore, concomitant methotrexate treatment had no impact on ustekinumab immunogenicity in PsA (84, 85).

A *post-hoc* analysis of the PsABio study, as expected, showed a lower frequency of AEs in younger PsA patients; no clinically meaningful treatment response differences were observed based on patients' age, while persistence was numerically higher in patients over 60 (86). The PsABio real-world observational study also provided comparative data on ustekinumab and TNFi, showing similar data for both effectiveness, RR, safety and QoL outcomes, thus confirming that ustekinumab could be a viable long-term treatment option for PsA, with comparable persistence to TNFi in real-world settings (86, 87).

Evaluating the tolerability and comparative effectiveness, no decisive differences between drugs were observed, in particular, based on the data of the PIPA cohort, TNF-inhibitors (TNFi), IL17-inhibitors (IL17i) and IL23-inhibitors (IL23i) may all be considered equally effective in the treatment of patients with PsA (88).

Apremilast

The phosphodiesterase 4 inhibitor apremilast was the first oral tsDMARD approved for PsA.

Data from a multicentre observational prospective study underlined the efficacy of apremilast in treating early forms of PsA in biological naive patients, improving both disease activity, extra articular manifestations and patient-centred outcomes, in association with a generally favourable tolerability profile (90). These results are consistent with a drug RR of about 60% after 3 years of therapy, as assessed in an Italian observational study (91). When compared to methotrexate, no significant differences emerged in terms of efficacy and safety (92). Real word data confirmed these results (93).

JAK-inhibitors

- Tofacitinib

Tofacitinib is the first Janus kinase (JAK) inhibitor approved for PsA treatment; therefore, in recent years, much evidence has emerged regarding its efficacy and safety.

Recently, a *post-hoc* analysis of three RCTs showed that gender did not seem to impact tofacitinib efficacy, safety and RR. These data were reinforced by a real-world experience, confirming that tofacitinib RR was not influenced by gender, disease duration and comorbidities (94). Both the data from the RCTs and clinical practice showed that tofacitinib was able to effectively control enthesitis, regardless its severity or type of involvement, with an early action and low rates of relapse rate or *de novo* occurrence (95). To complete the efficacy profile of tofacitinib, we report the results of a *post-hoc* analysis of RCTs, showing good efficacy also in reducing non-inflammatory residual pain, with a subjective improvement comparable to adalimumab (96).

- Upadacitinib

Upadacitinib is a JAK inhibitor with a good selectivity for JAK1 and it is the latest tsDMARD to be approved for the treatment of PsA. The RCTs showed early efficacy in all the domains of the disease, with an acceptable safety profile. An open-label extension study, performed in a cohort of patients with an insufficient response to TNFi or other bDMARDs showed that the benefits of upadacitinib were maintained up to

152 weeks, both for peripheral and axial joint outcomes, skin outcomes and composite measures. No major safety issues emerged, but a trend towards a slight increase in AEs was noted for 30 mg daily (97, 98). Similarly to tofacitinib, also upadacitinib has been associated to an early reduction of the principal pain outcomes (99). Finally, the safety profile of the drug was thoroughly investigated; the analysed data showed that the most common AE was upper respiratory tract infections. Interestingly, the rate of major adverse CV events and venous thromboembolism was similar between upadacitinib and active comparators in PsA (100).

Take-home messages

TNFi

- Golimumab confirmed its high RR at 5 years (39).
- Golimumab and etanercept maintained their efficacy even by delaying the frequency of administration (41, 42).
- TNFi are able to improve QoL outcomes in PsA (44).
- 30–40% of PsA patients discontinue TNFi due to lack of efficacy or AE occurrence (45).

IL17i

- Secukinumab confirmed its efficacy in controlling PsA activity across joint and cutaneous domains and showed good values of RR (47-50, 53-55).
- Secukinumab use seemed significantly associated with reduced development of structural damage (52).
- Ixekizumab also confirmed a wide spectrum of efficacy in PsA, with a superiority to adalimumab in resolving inflammation of the "finger-unit" (57-60).
- The cycling of IL17i could be effective in selected PsA patients (62).
- Efficacy and safety data of bimekizumab suggest it is a promising treatment option for active PsA (64-69).

IL23i

- Guselkumab showed a good efficacy in joint and skin domains, with reduced radiological progression; these results are related with subsequent improvements in QoL outcomes and work productivity (70-76).
- Guselkumab seemed to have a generally favourable safety profile (77, 78).
- Risankizumab too could be a good option for active PsA; similarly to guselkumab, its use was associated with improvements in both HRQoL and work productivity (79-83).
- Ustekinumab showed comparable efficacy and safety profile as TNFi, with similar improvements in HRQoL outcomes (86, 87).
- No significant differences in tolerability and efficacy were observed between TNFi, IL17i and IL23i in PsA patients (88).

Apremilast

- Apremilast showed efficacy and acceptable tolerability in PsA patients, with good values of RR (90, 91).

JAK-inhibitors

- Tofacitinib can effectively control enthesitis (95).
- Tofacitinib and upadacitinib are able to reduce the principal pain outcomes of PsA patients (96, 99).
- The rate of major adverse CV events and venous thromboembolism was similar between upadacitinib and active comparators in PsA (100).

Artificial intelligence

In the last few years, a variety of different algorithms of AI have been used to examine the clinical aspects of PsA. Throughout the application of machine learning (ML) in patients with a recent-onset PsA, it was found that global pain, impact of disease, patient global assessment of disease and physical function were the variables with the greatest predictive ability for the MDA state; in particular, pain and physical functioning seemed to have a major bearing on disease burden (101).

ML algorithms were also used to evaluate those parameters more closely associated with remission achievement in PsA patients treated with secukinumab. The authors found that baseline DAPSA, fibromyalgia and axial disease were associated with a significantly lower probability of achieving remission (102).

Neural networks (NN) were applied to hand MRI scans of patients with PsA, seropositive and seronegative rheumatoid arthritis. This technique showed good efficacy in differentiating these conditions. In particular, patients with PsO were mostly assigned to the PsA group, thus highlighting that a PsA-like MRI pattern could be noted early in PsA patients (103).

NN were also used to create a prediction model able to identify patients with PsO at high risk of PsA, thus facilitating an early diagnosis, with the subsequent prevention of damage accrual (104).

Finally, analysing data from the DISCOVER-1 and -2 RCT by using ML techniques, Richette *et al*. identified 8 different clusters of PsA, with well distinct characteristics with regard to demography, clinical aspects and response to therapy (105).

Although all these data on AI are preliminary, they emphasise the usefulness and power of these algorithms in the study of PsA and it can be easily predicted that they will be applied more and more in future studies.

Take-home message

- Both Ml and NN techniques could have a role in optimising diagnosis and clinical management of PsA (101-105).

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