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Effect of filgotinib on health-related quality of life in active psoriatic arthritis: a randomized phase 2 trial (EQUATOR)

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Abstract

Objective. To examine the effects of filgotinib, an oral, selective Janus kinase 1 inhibitor, on health-related quality of life (HRQoL) using the Psoriatic Arthritis Impact of Disease (PsAID)9 questionnaire in active PsA.

Methods. Patients were randomized 1 : 1 to filgotinib 200 mg or placebo once daily for 16 weeks in EQUATOR, a multicentre, double-blind, phase 2 randomized controlled trial. HRQoL was assessed with PsAID9 at Weeks 4 and 16. Change from baseline in total and individual domain scores, plus the proportions of patients achieving minimal clinically important improvement (MCII; $\geqslant$3 points) and patient-accepted symptom status (PASS; score $<$4), were evaluated. Correlation with the 36-item short-form health survey (SF-36) was investigated.

Results. One hundred and thirty-one patients were randomized to filgotinib or placebo. Filgotinib effects on PsAID9 were observed from Week 4. At Week 16, mean (S.D.) change from baseline in PsAID9 was −2.3 (1.8) and −0.8 (2.2) for filgotinib and placebo, respectively (least-squares mean of group difference −1.48 [95% CI −2.12, −0.84], $P < 0.0001$), with significant improvements in all domains *vs* placebo. Significantly more patients on filgotinib achieved MCII (group difference 25.4% [95% CI 8.92, 39.99], $P = 0.0022$) and PASS (group difference 29.6% [95% CI 10.65, 45.60], $P = 0.0018$) at Week 16 *vs* placebo. Similar improvements in SF-36 were observed, with moderate to strong negative correlation between PsAID9 and SF-36.

Conclusion. Filgotinib significantly improved HRQoL *vs* placebo in patients with active PsA, as measured by PsAID9. To our knowledge, EQUATOR is the first randomized controlled trial to evaluate PsAID9.

Trial registration. ClinicalTrials.gov, https://clinicaltrials.gov/ct2/show, NCT03101670.

Key words: clinical trials and methods, DMARDs, outcome measures, quality of life, psoriatic arthritis

Rheumatology key messages

- Psoriatic Arthritis Impact of Disease (PsAID)9 is a validated PsA health-related quality of life instrument.
- Filgotinib significantly improved HRQoL in active PsA in the EQUATOR study, as measured by PsAID9.
- Filgotinib significantly improved PsAID9 total and individual domain scores from Week 4 *vs* placebo.

Introduction

Psoriatic arthritis (PsA) is an inflammatory musculoskeletal disease associated with skin and nail psoriasis [1]. PsA can affect health-related quality of life (HRQoL) in a number of ways, including through the impact of symptoms and limitations in physical and social functioning and work capacity [2]. Improvement in HRQoL is therefore an important treatment outcome for patients with PsA. To date, patient-reported outcomes (PROs)

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developed for other diseases, such as rheumatoid arthritis, or generic measures, including the 36-item short-form health survey (SF-36), have primarily been used to assess HRQoL in PsA [3]. Although SF-36 captures information on both physical and mental health components and demonstrates responsiveness to treatment [4, 5], it is not specific for PsA, the questionnaire is lengthy and the scoring algorithm complex.

The PsA Impact of Disease (PsAID) is a PRO developed specifically for use in PsA, in collaboration with patients and with support from the EULAR. During its development, patients with PsA were asked to identify areas of their health that were impacted by the disease and to prioritize them according to impact level [6]. Thus, PsAID measures components of HRQoL perceived to be the most relevant to patients with PsA, including pain, skin problems and fatigue [6]. Two versions of the PsAID questionnaire, PsAID9 and PsAID12, were developed in parallel and correlate well with each other (PsAID12 contains three further questions in addition to those included in PsAID9; comparison shows that similar information is obtained from both questionnaires at the group level) [6]. Both have demonstrated good longitudinal construct validity, reliability and interpretability [7], and demonstrate very similar test–retest reliability (intraclass correlation coefficient 0.94–0.95) and internal consistency (Cronbach's α 0.93–0.94) [6]. In 2018, the OMERACT initiative provisionally endorsed PsAID12 as the first core PRO instrument for measurement of PsA-related HRQoL in randomized controlled trials (RCTs) [8, 9]. However, PsAID data from RCTs investigating drug efficacy are still lacking.

Filgotinib is an oral, selective inhibitor of Janus kinase 1 (JAK1) under development for the treatment of a range of inflammatory disorders, including PsA, rheumatoid arthritis, ankylosing spondylitis and ulcerative colitis. By selectively inhibiting the JAK1 signalling protein, filgotinib reduces the activity of several inflammatory cytokines and chemokines involved in the pathogenesis of these diseases, as demonstrated in preclinical models [10, 11]. This has translated to a reduction in the signs and symptoms of rheumatic diseases in clinical trials [12–14]. The phase 2 EQUATOR study demonstrated significant improvements across several disease domains in 131 patients with active PsA treated with filgotinib 200 mg compared with placebo, including peripheral arthritis, psoriasis, enthesitis and composite disease scores. The study met its primary endpoint of a significant improvement in ACR20 response rates at Week 16 (filgotinib 80% *vs* placebo 33%; treatment difference 47% [95% CI 30.2, 59.6], $P < 0.0001$). Improvements in PROs relating to physical functioning, fatigue and pain were also observed, and filgotinib was well tolerated [12].

Here, we further evaluate the effect of filgotinib *vs* placebo on HRQoL in patients who participated in the EQUATOR study, as measured by PsAID9. To our knowledge, EQUATOR is the first RCT to report drug efficacy in HRQoL using PsAID9, thus also providing valuable information on the use of PsAID9 in this setting. Given that PsAID9 data have not been reported from prior drug efficacy RCTs in PsA, we also evaluate the effect of filgotinib *vs* placebo on HRQoL as measured by SF-36, and provide a comparison of the values obtained using both instruments.

Methods

Study design and patients

Details of the EQUATOR study (ClinicalTrials.gov identifier: NCT03101670) have been described previously [12]. Briefly, in this multicentre, double-blind, placebo-controlled, phase 2 study, patients with active PsA (defined as at least five tender and five swollen joints) were randomized 1 : 1 to receive filgotinib 200 mg (Gilead Sciences, Inc., Foster City, CA, USA) or matching placebo once daily for 16 weeks. Patients were assessed at Day 1, at Weeks 1, 2, 4, 8, 12, 16 and at a follow-up visit at Week 20 or 4 weeks following the last dose of study drug. The protocol was reviewed and approved by the central or individual independent ethics committees in each participating country. All patients provided written informed consent before participation.

Assessments and endpoints

HRQoL was assessed by determining the change from baseline in PsAID9 and SF-36 scores (with a 1-week recall period) at Weeks 4 and 16. Data were collected using an electronic touchscreen version of the questionnaire prior to other study-related procedures at each study visit. The PsAID9 uses a numerical rating scale (NRS; range 0–10; Supplementary Material, Appendix A: The PsAID9 Questionnaire section, available at *Rheumatology* online) to measure nine components of HRQoL relevant to patients with PsA [6]. Individual items are prioritized according to the importance of the health domain each represents. The weight of each domain is taken into account in the total PsAID score, which is calculated as follows: (pain NRS value $\times$ 0.174) + (fatigue NRS value $\times$ 0.131) + (skin problems NRS value $\times$ 0.121) + (work and/or leisure activities NRS value $\times$ 0.110) + (functional capacity NRS value $\times$ 0.107) + (discomfort NRS value $\times$ 0.098) + (sleep disturbance NRS value $\times$ 0.089) + (coping NRS value $\times$ 0.087) + (anxiety, fear and uncertainty NRS value $\times$ 0.085). A higher PsAID score indicates a greater impact of the disease and poorer PsA-related HRQoL. Reported endpoints include the mean change from baseline in PsAID9 total and individual domain scores at Weeks 4 and 16, the proportions of patients achieving a minimal clinically important improvement (MCII; defined as a change of three or more points; only for patients with a baseline score $\geqslant$3), and the proportion of patients achieving a patient-accepted symptom status (PASS; defined as a PsAID9 score below 4; only for patients with a baseline score $\geqslant$4) at Weeks 4 and 16 [6].

The SF-36 (version 2) consists of 36 questions in eight health domains. The eight domain scores are summarized as the Physical Component Summary (PCS) and the Mental Component Summary (MCS) [5]. The PCS is computed by applying positive coefficients to the physical

health domains (physical function × 0.42, role physical × 0.35, bodily pain × 0.32, general health × 0.25 and vitality × 0.03), and negative coefficients to the mental health domains (social functioning × −0.01, role emotional × −0.19, mental health × −0.22). Comparatively, the MCS uses positive weights for vitality (× 0.24), social functioning (× 0.27), role emotional (× 0.43) and mental health (× 0.49), and negative weights for physical function (× −0.23), role physical (× −0.12), bodily pain (× −0.10) and general health (× −0.02) [15]. Scores were standardized to a scale of 0–100; higher scores indicate better HRQoL [4]. Subjects with MCS and PCS scores above 50 (in those subjects with a baseline score <50) were classed as reaching PASS. MCII for both MCS and PCS was defined as a change of 2.5 or more points for patients with a baseline score ⩽97.5. Key endpoints included mean change from baseline in PCS, MCS and in the eight individual domain scores at Weeks 4 and 16.

Statistical analysis

As previously described, the study sample size was calculated to be sufficient to detect a treatment difference for ACR20 response rates at Week 16 (i.e. the primary endpoint) [12]. All analyses were performed on the full analysis set, which included all randomized patients who received at least one dose of study drug. An analysis of covariance (ANCOVA) model was used to analyse changes from baseline, with treatment, baseline value and stratification factors used at randomization as fixed effects. Adjusted least-squares (LS) means and 95% CIs within each treatment group and difference between treatment groups were obtained from the ANCOVA model. Missing values for change from baseline endpoints were imputed using the last observation carried forward (LOCF) method. Proportions of PsAID9 responders were compared between groups using the Cochran-Mantel-Haenszel test, controlling for randomization stratification factors, and summarized with a point estimate and 95% CIs using the Newcombe method. Missing data for response endpoints were handled using the non-responder imputation method. Pearson's correlations were calculated to investigate the relationship between the change from baseline in PsAID9 and SF-36 PCS and MCS scores at Weeks 4 and 16. A correlation coefficient of 0.40–0.59 was considered as moderate, and a coefficient of 0.60–0.79 was considered as strong [16]. SAS® software, version 9.4 (SAS Institute Inc., Cary, NC, USA) was used to perform all statistical analyses.

Results

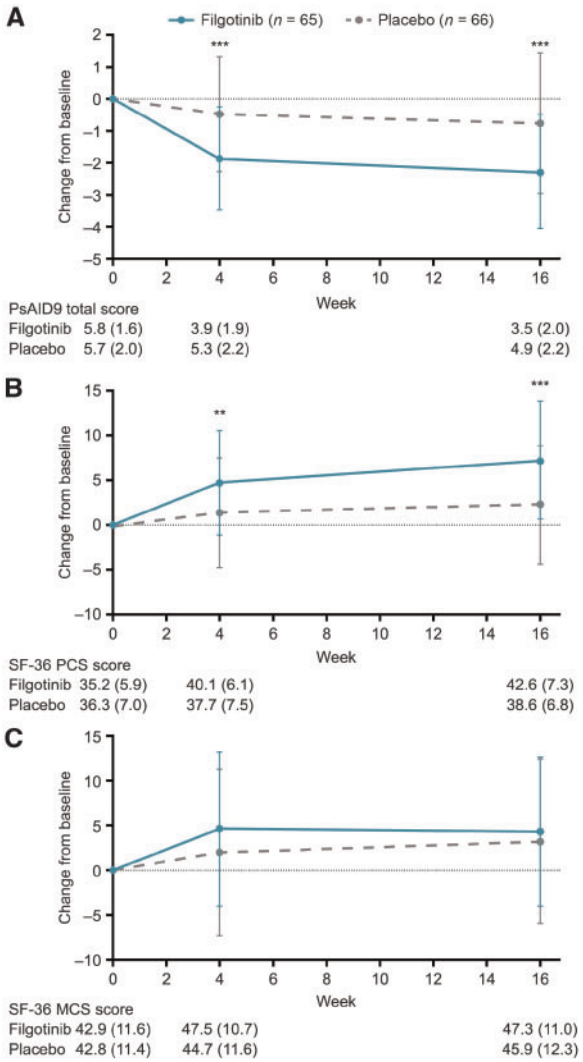
Patients

Of the 131 patients enrolled in the study, 65 were randomized to receive filgotinib 200 mg and 66 to receive placebo once daily. Demographics and baseline disease characteristics, which have been reported in detail previously [12], were generally balanced across treatment groups and consistent with PsA populations in other PsA studies. A total of 20 patients (filgotinib 11/65 [17%]; placebo 9/66 [14%]) had received prior anti-TNF-α therapy. Mean (S.D.) PsAID9, SF-36 PCS and MCS scores at baseline were similar between the filgotinib and placebo groups, respectively (PsAID9: 5.8 [1.6] *vs* 5.7 [2.0]; SF-36 PCS: 35.2 [5.9] *vs* 36.3 [7.0]; SF-36 MCS: 42.9 [11.6] *vs* 42.8 [11.4]).

PsAID9

All patients provided evaluable data for PsAID9. Filgotinib significantly improved PsAID9 total score compared with placebo. Mean change (S.D.) from baseline in PsAID9 at

Fig. 1 Change from baseline in (**A**) PsAID9 total, (**B**) SF-36 PCS and (**C**) SF-36 MCS scores (LOCF; FAS)



Data shown are mean (S.D.). $^{**}P < 0.01$, $^{***}P < 0.001$ (between-group differences, calculated from an ANCOVA model). ANCOVA: analysis of covariance; FAS: full analysis set; LOCF: last observation carried forward; MCS: Mental Component Summary; PCS: Physical Component Summary; PsAID: Psoriatic Arthritis Impact of Disease; SF-36: 36-item short-form health survey.

Table 1 Change from baseline in PsAID9 total and individual domain scores (LOCF; FAS), standardized response mean (LOCF; FAS) and proportion of patients achieving MCII and PASS (NRI; FAS) at Week 16

	Filgotinib (*n* = 65)	Placebo (*n* = 66)	Treatment difference[a]	*P*-value[b]
PsAID9 total score	−2.3 (1.8)	−0.8 (2.2)	−1.48 (−2.12, −0.84)	<0.0001
Pain	−2.9 (2.2)	−0.9 (2.6)	−1.75 (−2.45, −1.05)	<0.0001
Fatigue	−2.3 (2.0)	−0.8 (2.7)	−1.45 (−2.18, −0.73)	<0.0001
Skin problems	−2.1 (2.4)	−0.4 (2.6)	−1.68 (−2.40, −0.95)	<0.0001
Work and/or leisure activities	−2.4 (2.3)	−0.9 (2.9)	−1.51 (−2.30, −0.73)	0.0002
Functional capacity	−2.4 (2.1)	−0.7 (2.7)	−1.61 (−2.35, −0.87)	<0.0001
Discomfort	−2.4 (2.3)	−1.1 (2.6)	−1.36 (−2.11, −0.61)	0.0005
Sleep disturbances	−1.9 (2.4)	−1.0 (2.9)	−1.28 (−2.10, −0.46)	0.0025
Coping	−2.1 (2.3)	−1.1 (2.5)	−1.12 (−1.85, −0.40)	0.0025
Anxiety, fear, uncertainty	−1.8 (2.4)	−0.8 (2.4)	−0.95 (−1.71, −0.18)	0.0155
Standardized response mean	−1.3	0.4	–	–
	Filgotinib (*n* = 61)	Placebo (*n* = 58)	Treatment difference[c]	*P*-value[d]
Proportion of patients achieving MCII[e], %	42.6	17.2	25.4 (8.92, 39.99)	0.0022
	Filgotinib (*n* = 54)	Placebo (*n* = 50)	Treatment difference[c]	*P*-value[d]
Proportion of patients achieving PASS[f], %	55.6	26.0	29.6 (10.65, 45.60)	0.0018

Data shown are mean (S.D.), unless otherwise indicated. [a]Filgotinib *vs* placebo. LS mean of group difference (95% CI). [b]Between-group *P*-value was calculated from an ANCOVA model on the changes from baseline per visit, with treatment, baseline values and randomization stratification factors. [c]Filgotinib *vs* placebo. Difference (95% CI). [d]Between-group *P*-value was calculated from Cochran-Mantel-Haenszel test controlling for randomization stratification factors. [e]MCII defined as a change of $\geqslant$3 points; only for patients with a baseline score $\geqslant$3. [f]PASS defined as total score of <4; only for patients with a baseline score $\geqslant$4. ANCOVA: analysis of covariance; FAS: full analysis set; LOCF: last observation carried forward; LS: least-squares; MCII: minimal clinically important improvement; NRI: non-responder imputation; PASS: patient-acceptable symptom state; PsAID: Psoriatic Arthritis Impact of Disease.

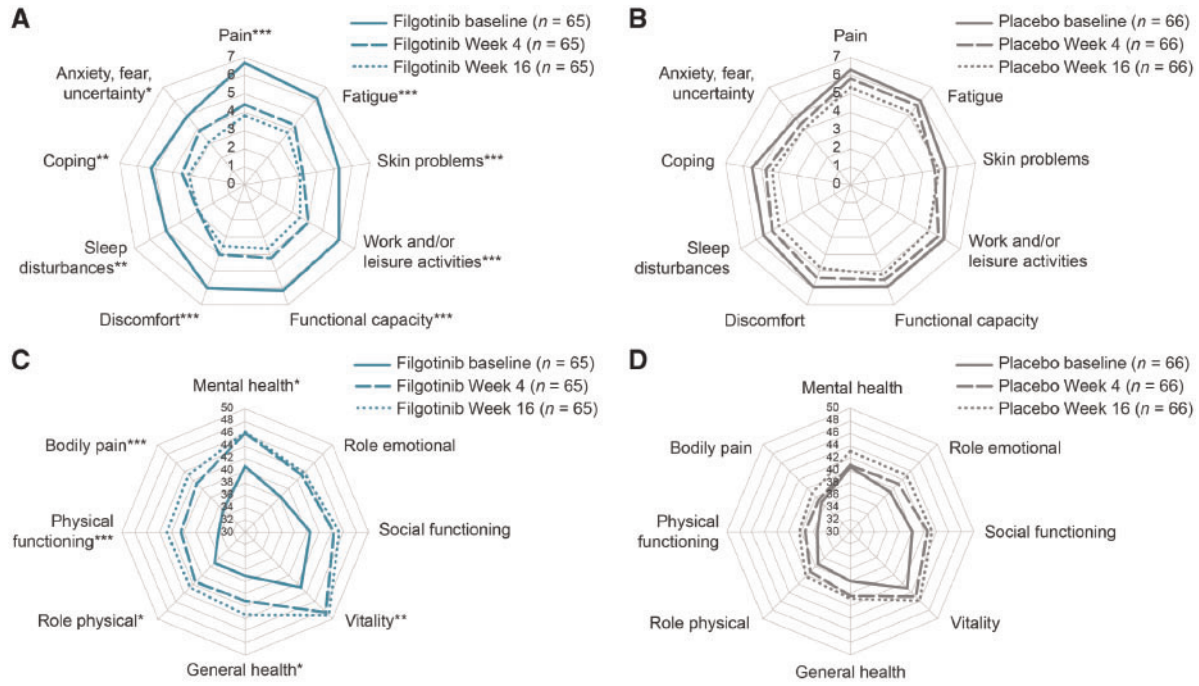
Week 4 was −1.9 (1.6) and −0.5 (1.8) in the filgotinib and placebo groups, respectively (LS mean difference −1.45 [95% CI −2.02, −0.89], $P < 0.0001$), and at Week 16 was −2.3 (1.8) and −0.8 (2.2), respectively (−1.48 [95% CI −2.12, −0.84], $P < 0.0001$) (Fig. 1A). Significant improvements were observed in all individual PsAID domains at Week 16, and in all but one domain (anxiety, fear, uncertainty) as early as Week 4 (Table 1 and Supplementary Table S1, available at *Rheumatology* online; Fig. 2A and B). Absolute PsAID9 total and individual domain scores at Week 4 and 16 are shown in Supplementary Table S2, available at *Rheumatology* online.

Significantly more patients receiving filgotinib achieved MCII in PsAID9 total score compared with placebo at Week 4 (26.2% *vs* 8.6%, respectively; treatment difference 17.6% [95% CI 3.87, 30.76]; $P = 0.0076$) and at Week 16 (42.6% *vs* 17.2%; treatment difference 25.4% [95% CI 8.92, 39.99]; $P = 0.0022$) (Fig. 3A and B). This also held true if alternative MCII definitions (of a change of $\geqslant$1.25 or $\geqslant$3.6 points) were used (Fig. 3A and B). In addition, a greater proportion of patients on filgotinib achieved PASS in PsAID9 at both Week 4 (42.6% *vs* 16.0%; treatment difference 26.6% [95% CI 9.07, 41.89]; $P = 0.0019$) and Week 16 (55.6% *vs* 26.0%; treatment difference 29.6% [95% CI 10.65, 45.60]; $P = 0.0018$), compared with placebo (Fig. 3C; Table 1).

SF-36

Filgotinib significantly improved the SF-36 PCS score compared with placebo at Weeks 4 and 16 (Table 2 and Supplementary Table S3, available at *Rheumatology* online). Mean change (S.D.) from baseline at Week 4 was 4.9 (5.9) and 1.5 (6.2) in the filgotinib and placebo groups, respectively (LS mean difference 3.08 [95% CI 1.14, 5.02], $P = 0.0021$), and at Week 16 was 7.4 (6.6) and 2.4 (6.6), respectively (4.67 [95% CI 2.58, 6.76], $P < 0.0001$) (Fig. 1B). Significant improvements were observed in all individual SF-36 physical health domains at Week 16, and in all but one domain (general health) as early as Week 4 (Table 2 and Supplementary Table S3, available at *Rheumatology* online; Fig. 2C and D). No significant improvement was observed in the SF-36 MCS score in the filgotinib group compared with placebo at Weeks 4 or 16 (Table 2 and Supplementary Table S3, available at *Rheumatology* online; Fig. 1C). Significantly more patients receiving filgotinib achieved MCII for PCS compared with

FIG. 2 Mean absolute scores in individual domains of PsAID9[a] (**A** and **B**) and SF-36[b] (**C** and **D**) (LOCF; FAS)



[a]Higher PsAID9 scores are worse and correspond to poorer PsA-specific HRQoL. [b]Higher SF-36 scores correspond to better HRQoL. *$P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ (between-group differences in change from baseline scores at Week 16, calculated from an ANCOVA model). ANCOVA: analysis of covariance; FAS: full analysis set; HRQoL: health-related quality of life; LOCF: last observation carried forward; PsAID: Psoriatic Arthritis Impact of Disease; SF-36: 36-item short-form health survey.

placebo at Week 4 (60.0% *vs* 36.4%; treatment difference 23.6% [95% CI 6.52, 38.60], $P = 0.0081$) and Week 16 (75.4% *vs* 39.4%; treatment difference 36.0% [95% CI 19.20, 50.03], $P < 0.0001$). Significantly more patients achieved PCS PASS at Week 16 in the filgotinib *vs* placebo groups (17.2% *vs* 6.3%; treatment difference 10.9% [95% CI −0.66, 22.52], $P = 0.0471$; Table 2). No statistically significant treatment differences were seen for MCII in MCS or for MCS PASS rates (Table 2). Absolute PCS, MCS and individual SF-36 domain scores at Weeks 4 and 16 are shown in Supplementary Table S4, available at *Rheumatology* online.

Correlation between PsAID9 and SF-36

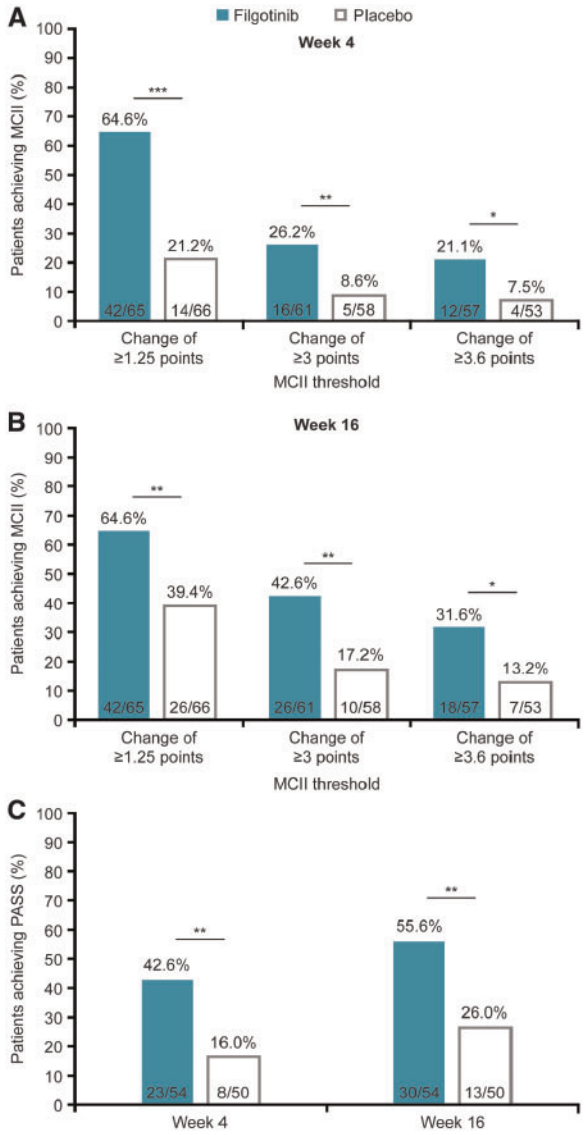
Moderate to strong negative, statistically significant correlations were observed between PsAID9 and both SF-36 PCS and MCS scores at Weeks 4 and 16 in both treatment groups (Fig. 4; at Week 16, the Pearson's correlation coefficient for SF-36 PCS and PsAID9 was −0.63 [$P < 0.0001$] for filgotinib and −0.63 [$P < 0.0001$] for placebo. For MCS and PsAID9, correlation coefficients were −0.60 [$P < 0.0001$] for filgotinib and −0.41 [$P = 0.0009$] for placebo). The standardized response mean for filgotinib was numerically greater, but not statistically significant, for PsAID9 than for SF-36 PCS or MCS scores (Tables 1 and 2 and Supplementary Table S5, available at *Rheumatology* online).

Discussion

Compared with placebo, filgotinib significantly improved HRQoL in patients with active PsA in the phase 2 EQUATOR study, as measured by PsAID9. This is in line with the primary clinical outcomes of the study [12]. Improvements in the PsAID9 total score and in all individual domains were evident by Week 16 (the primary study assessment timepoint), and in eight of the nine individual domains as early as Week 4 (the earliest assessment timepoint). This suggests that, in this study, filgotinib had a rapid effect on the multiple aspects of HRQoL that are relevant to patients with active PsA. Various values have been proposed to define a MCII for PsAID9 [17]. Therefore, the proportion of responders were presented based on three thresholds (a change of $\geqslant 1.25$, $\geqslant 3$ or $\geqslant 3.6$ points). The proportion of responders varied depending on the definition used but was consistently greater in filgotinib-treated patients than in the placebo group. Further research is required to confirm the most appropriate threshold value to use for PsAID9.

The PsAID9 domain that was not significantly improved at Week 4 (anxiety, fear, uncertainty) may

FIG. 3 Proportions of patients achieving (**A**) MCII[a] in PsAID9 score at Week 4, (**B**) MCII[a] in PsAID9 score at Week 16 and (**C**) PASS[b] in PsAID9 score at Week 4 and 16 (NRI; FAS)



[a]MCII defined as a change $\geqslant 1.25$, $\geqslant 3$ or $\geqslant 3.6$ points. [b]PASS defined as total score <4. $^{*}P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$ (between-group differences in MCII or PASS, calculated from Cochran-Mantel-Haenszel test). FAS: full analysis set; MCII: minimal clinically important improvement; NRI: non-responder imputation; PASS: patient-acceptable symptom state; PsAID: Psoriatic Arthritis Impact of Disease.

take longer to show improvement than musculoskeletal disease manifestations and impact. Although improvements in all SF-36 physical health domains were noted at Week 16 with filgotinib *vs* placebo, there was no significant improvement in the SF-36 MCS score. This is not unusual, however, as the negative weighting of the physical health components makes it more difficult to show change in the MCS score [15]. Another potential contributing factor is the study powering and sample size; these were calculated for the primary efficacy endpoint (ACR20 response rate at Week 16) only. In addition, we found that the standardized response mean for filgotinib was numerically greater for PsAID9 than SF-36, possibly suggesting that PsAID9 is more sensitive to change than SF-36 scores.

A limitation of the current study is the mixed population of anti-TNF-α therapy-naïve and exposed patients, although this is reflective of the population encountered in usual clinical practice. Unfortunately, the relatively small sample sizes in each of these subgroups meant that analysis according to prior anti-TNF-α therapy exposure was not feasible. The number of subjects is in line with what would be expected in a phase 2 study of this nature, and the study population was consistent with that of other studies in patients with PsA, with respect to baseline HRQoL [6, 17–19]. LOCF was used to impute missing data, hence further analyses might be needed to understand the impact of missing data on PsAID9.

To our knowledge, EQUATOR is the first RCT from which PsAID9 efficacy data have been reported, thus providing key information regarding the potential utility of this disease-relevant PRO. Improvements in PsAID9 total score for filgotinib *vs* placebo were reflected in improvements in each individual PsAID9 domain by Week 16. We have also shown that PsAID9 correlates well with both physical and mental health components of the generic SF-36 survey in this setting. The correlation was stronger and more linear with PCS *vs* MCS, possibly reflecting better alignment of domain content and weighting between PsAID9 and PCS. This concurs with observations from validation studies of the PsAID questionnaires [6, 17]. In these studies, which involved patients across multiple centres and countries [20], individual PsAID domains were found to correlate strongly with relevant clinical outcomes and PROs, i.e. the fatigue domain correlates with scores from the Functional Assessment of Chronic Illness Therapy-Fatigue tool and the skin domain with Dermatology Quality of Life Index, with PsAID9 and PsAID12 performing similarly [17]. In a *post-hoc* analysis of a preliminary PsAID validation study, PsAID domains had stronger correlations with patient-perceived global assessments than with other PROs or physician-based assessments [18]. The 9- and 12-item PsAID questionnaires have comparable correlation with other measures of health status [6].

The importance of patient involvement in the management of disease is widely recognized as a means of empowering patients and improving both outcomes and the quality of care [21, 22]. Assessing PROs, such as HRQoL, in addition to acute disease activity measures is essential to fully appreciate the true impact of disease and can aid the clinical decision-making process [23]. Similarly, collection of HRQoL data in clinical trials of drugs in development for the treatment of PsA is essential

Table 2 Change from baseline in SF-36 scores (LOCF; FAS), standardized response mean (LOCF; FAS) and proportion of patients achieving MCII and PASS (NRI; FAS) at Week 16

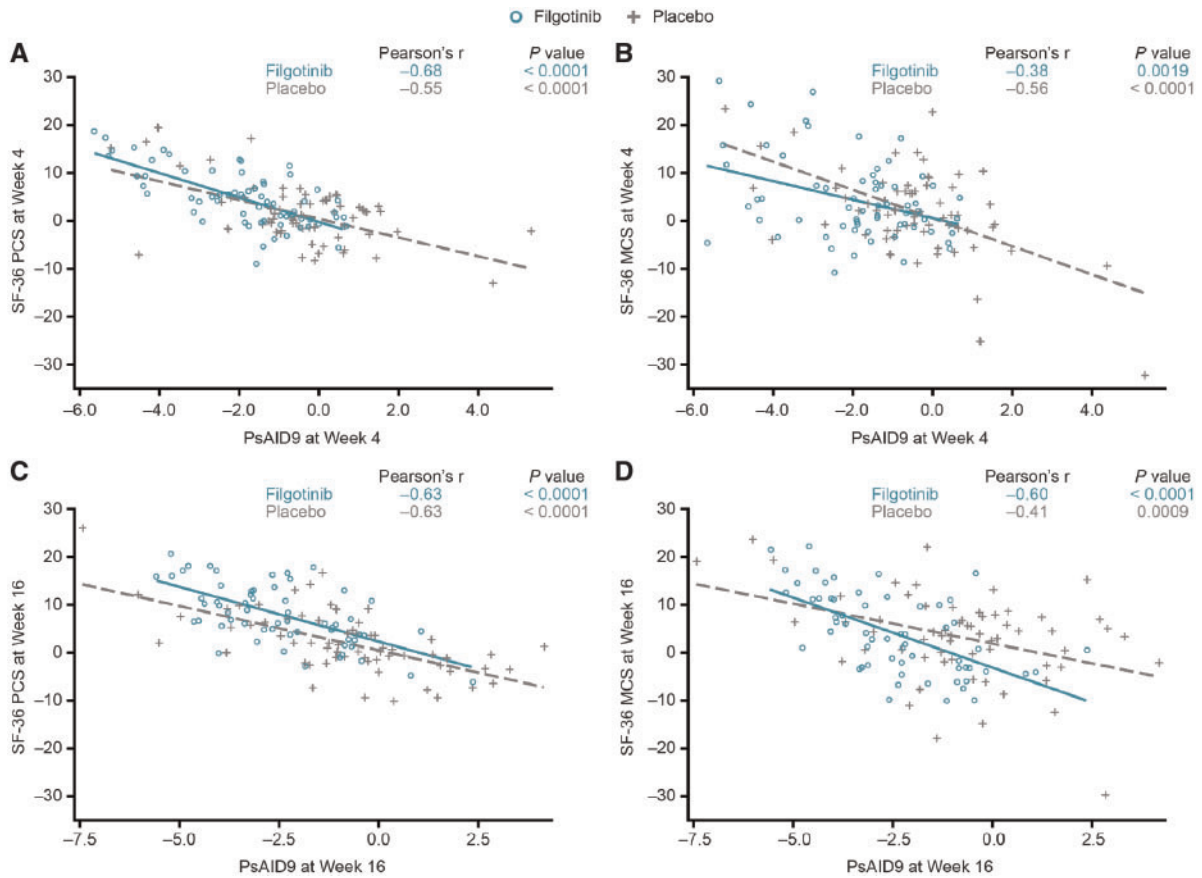
	Filgotinib ($n = 65$)	Placebo ($n = 66$)	Treatment difference[a]	*P*-value[b]
PCS	7.4 (6.6)	2.4 (6.6)	4.67 (2.58, 6.76)	<0.0001
MCS	4.3 (8.3)	3.2 (9.2)	1.19 (–1.67, 4.04)	0.4128
General health	5.8 (7.3)	2.8 (6.3)	3.00 (0.68, 5.32)	0.0118
Role physical	5.6 (6.7)	3.0 (6.4)	2.60 (0.56, 4.65)	0.0131
Physical functioning	8.4 (7.2)	3.0 (7.9)	5.15 (2.69, 7.62)	<0.0001
Bodily pain	8.0 (7.2)	2.0 (7.6)	5.15 (2.97, 7.33)	<0.0001
Vitality	6.3 (7.7)	2.9 (7.2)	3.35 (0.92, 5.77)	0.0072
Mental health	5.5 (7.5)	2.6 (8.6)	2.96 (0.32, 5.60)	0.0283
Role emotional	5.5 (10.8)	4.1 (9.8)	1.18 (–1.95, 4.31)	0.4559
Social functioning	4.8 (9.2)	3.0 (9.1)	1.94 (–0.72, 4.59)	0.1516
Standardized response mean				
PCS	1.1	0.4	–	–
MCS	0.5	0.3	–	–
Proportion of patients achieving MCII[e], %			Treatment difference[c]	*P*-value[d]
PCS	75.4	39.4	36.0 (19.20, 50.03)	<0.0001
MCS	49.2	60.6	–11.4 (–27.41, 5.53)	0.2607
Proportion of patients achieving PASS[f], %			Treatment difference[c]	*P*-value[d]
PCS	17.2	6.3	10.9 (–0.66, 22.52)	0.0471
MCS	28.3	29.8	–1.5 (–19.44, 16.59)	0.9879

Data shown are mean (S.D.), unless otherwise indicated. [a]Filgotinib *vs* placebo. LS mean of group difference (95% CI). [b]Between-group *P*-value was calculated from an ANCOVA model on the changes from baseline per visit, with treatment, baseline values and randomization stratification factors. [c]Filgotinib *vs* placebo. Difference (95% CI). [d]Between-group *P*-value was calculated from Cochran-Mantel-Haenszel test controlling for randomization stratification factors. [e]MCII for both MCS and PCS was defined as a change of 2.5 or more points, for patients with a baseline score $\leqslant$97.5. [f]PASS for both MCS and PCS was defined as a MCS/PCS score above 50 (in those subjects with a baseline score <50). ANCOVA: analysis of covariance; FAS: full analysis set; LOCF: last observation carried forward; LS: least-squares; MCII: minimal clinically important improvement; MCS: Mental Component Summary; NRI: non-responder imputation; SF-36: 36-item short-form health survey; PASS: patient-acceptable symptom state; PCS: Physical Component Summary.

to confirm that improvements in clinical endpoints translate to improvements in patient well-being. Research into the best way to assess these factors is still required [2, 24]; however, PsAID may potentially provide the means to do so. PsAID9 assesses the impact of multiple disease domains (pain, fatigue, skin and physical function) that are included in OMERACT's PsA Core Domain Set, which aims to standardize the measurement and reporting of outcomes across PsA clinical studies [24, 25]. PsAID9 also assesses the impact of disease on emotional and participation factors, which have been identified by patients as important components of HRQoL, although not currently part of the Core Domain Set [24, 26, 27]. The assessment of multiple patient-relevant HRQoL domains in one PRO using only nine questions is a key advantage to PsAID9, making its use more feasible in trials and clinical practice than more complex generic tools, such as SF-36. The electronic touchscreen version of PsAID, which was used in this trial, has shown a high degree of correlation to the pencil and paper version. It was also preferred by patients and took less time to complete than the pencil and paper version [19]. Such innovations may further facilitate the incorporation of PsAID into future trials and clinical practice.

In conclusion, to our knowledge the phase 2 EQUATOR study is the first RCT in patients with active PsA to report PsAID9 data. Filgotinib significantly improved total scores and scores in each of the nine PsAID9 domains, *vs* placebo, in patients with active PsA and effects were seen from Week 4. Significantly more patients achieved PsAID9 MCII and PASS at Week 16 with filgotinib *vs* placebo. These data also support the use of PsAID9 in measuring

Fig. 4 Correlation between change from baseline in PsAID9 and SF-36 at Weeks 4 (**A** and **B**) and 16 (**C** and **D**) (FAS)



MCS: Mental Component Summary; PCS: Physical Component Summary; PsAID: Psoriatic Arthritis Impact of Disease; r: correlation coefficient; SF-36: 36-item short-form health survey.

patient-relevant HRQoL domains in PsA clinical studies. A long-term, open-label extension of EQUATOR is ongoing (NCT03320876).

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Supplementary data

Supplementary data are available at *Rheumatology* online.

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