

Year in Rheumatology 2021

John H. Stone, M.D., M.P.H.

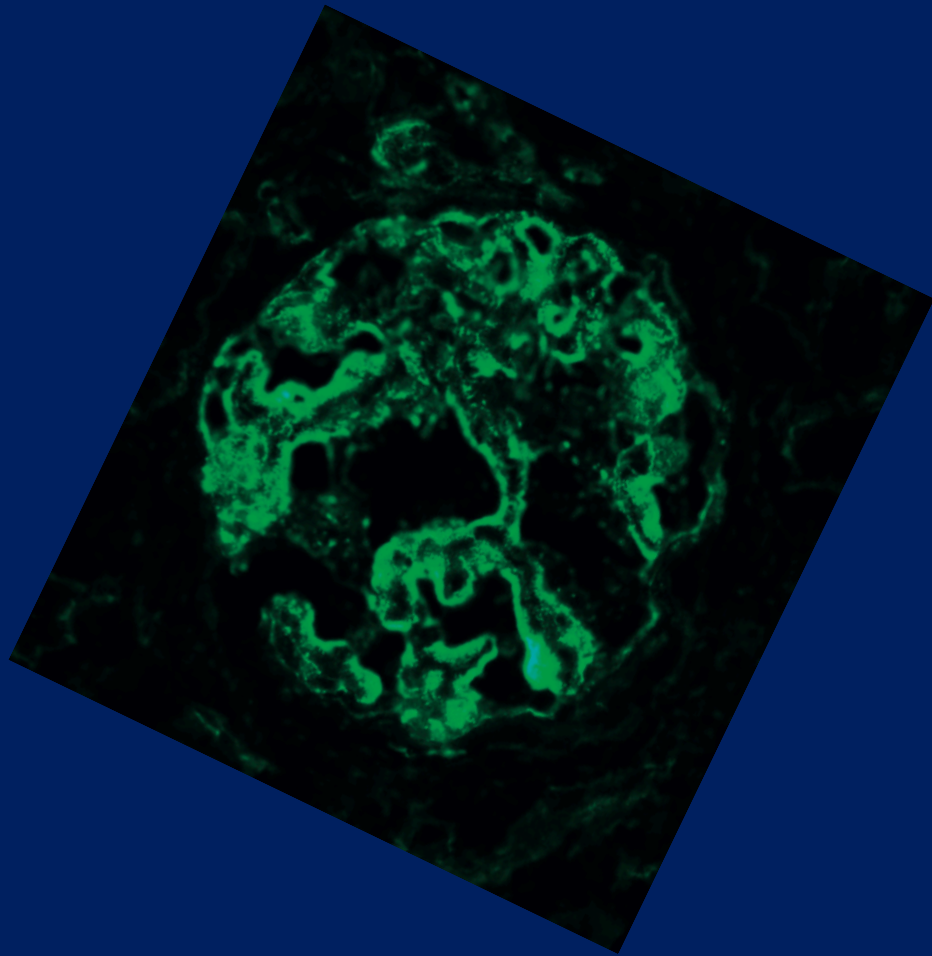
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The Edward A. Fox Chair in Medicine

Massachusetts General Hospital

Disclosures

- Chemocentryx
- Roche/Genentech
- Sanofi
- Bristol-Myers Squibb
- AstraZeneca
- Argenx
- AbbVie
- Q32BIO



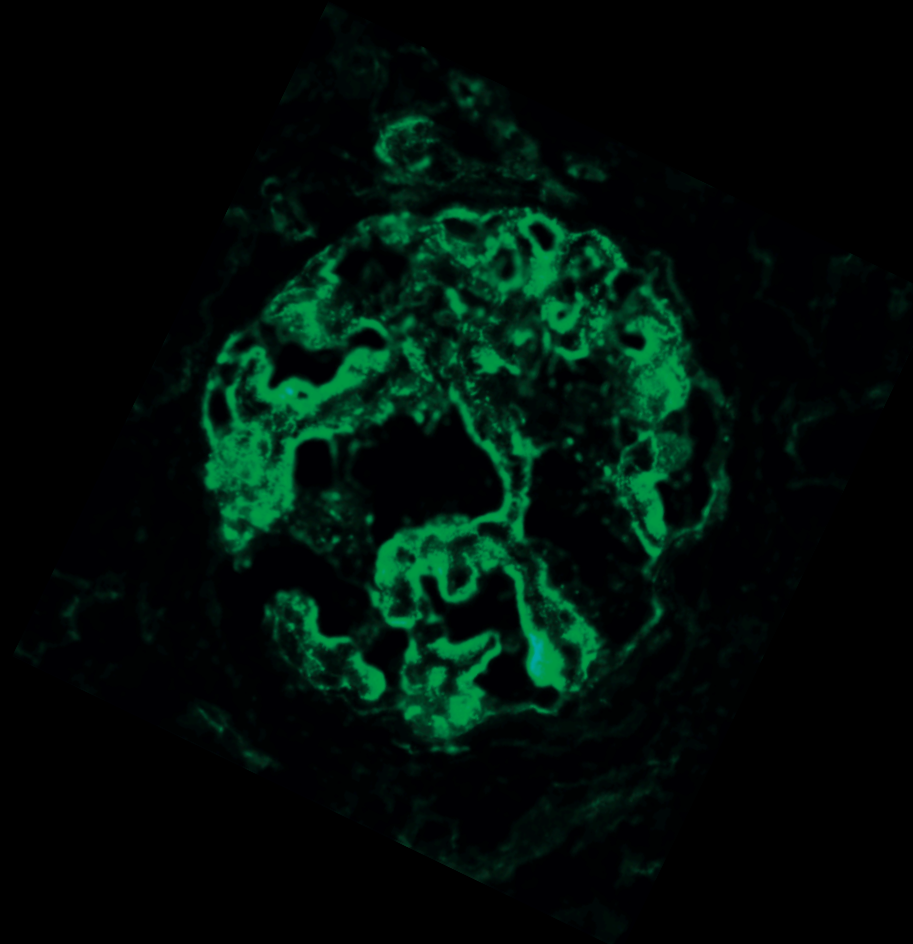
EURO2020







Lupus Nephritis



Lupus Nephritis

- 22% of patients still develop renal failure at 10 years.
- Encouraging data with B cell-targets (belimumab, obinutuzumab).
- Oral drugs: convenience, lower cost.
- Calcineurin inhibitors have long been used to treat lupus nephritis:
 - Tacrolimus.
- Main concerns:
 - increased risk of infection
 - absence of long-term safety and efficacy data.

Aurora borealis

Efficacy and safety of voclosporin versus placebo for lupus nephritis (AURORA 1): a double-blind, randomised, multicentre, placebo-controlled, phase 3 trial

Brad H Rovin, Y K Onno Teng, Ellen M Ginzler, Cristina Arriens, Dawn J Caster, Juanita Romero-Diaz, Keisha Gibson, Joshua Kaplan, Laura Lisk, Sandra Navarra, Samir V Parikh, Simrat Randhawa, Neil Solomons, Robert B Huizinga

FACT:

Early reduction in proteinuria is the single best predictor of improved long-term outcomes in LN

LN treatment guidelines target at least 25% proteinuria reduction within 3 months and at least 50% reduction by 6 months after

Only 40% of patients are unable to achieve these treatment targets with current therapeutic options, most of which are used off label

Voclosporin

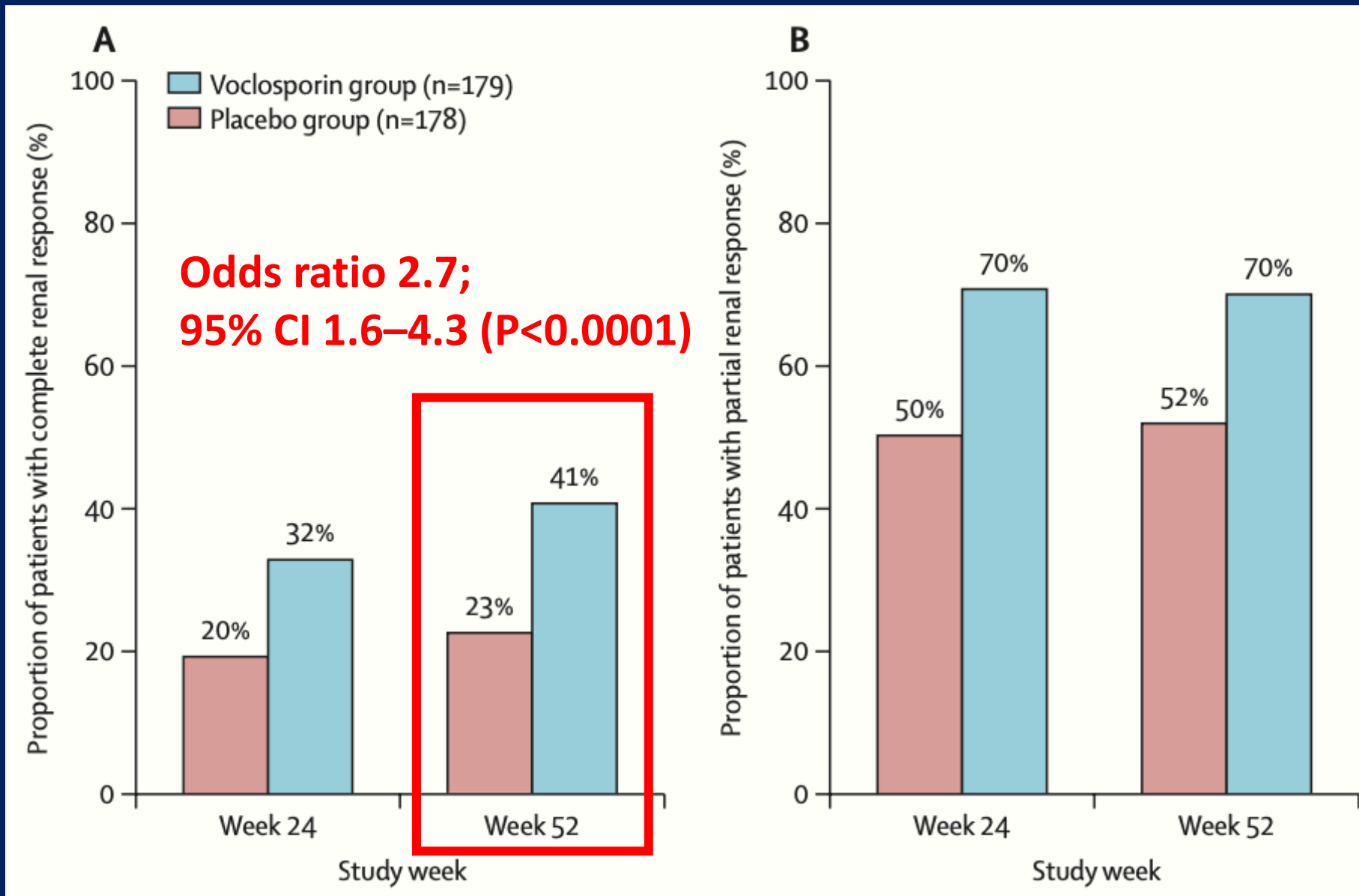
- **A novel calcineurin inhibitor**
- **Advantages:**
 - **No need for therapeutic drug monitoring**
 - **More lipid and glucose effects**
 - **Does not affect MMF concentrations**

AURORA Trial Design

- **142 sites, 27 countries**
- **Kidney biopsy within 2 years that showed class III, IV, or V**
- **Random assignment (1:1) to oral voclosporin (bid) or placebo**
- **All patients received MMF (1 g twice daily)**
- **Rapid glucocorticoid taper**

Primary Endpoint

- **Complete renal response at 52 weeks**
- **Definition: (a composite)**
 - **Urine protein creatinine ratio of 0.5 mg/mg or less**
 - **Stable renal function (defined as eGFR \geq 60 mL/min/1.73 m² or no confirmed decrease from baseline in eGFR of >20%)**
 - **No rescue medication**
 - **No more than 10 mg prednisone equivalent per day for 3 or more consecutive days or for 7 or more days during weeks 44 through 52**

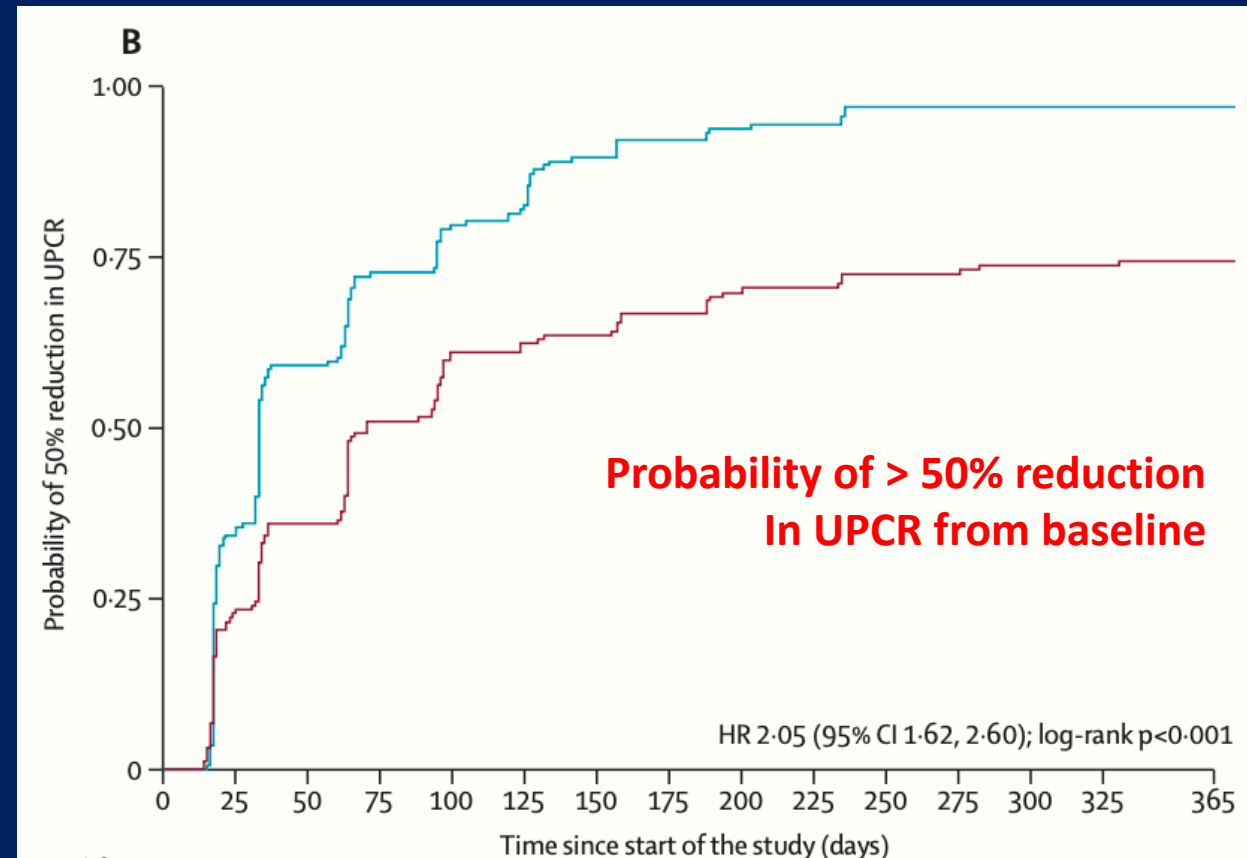
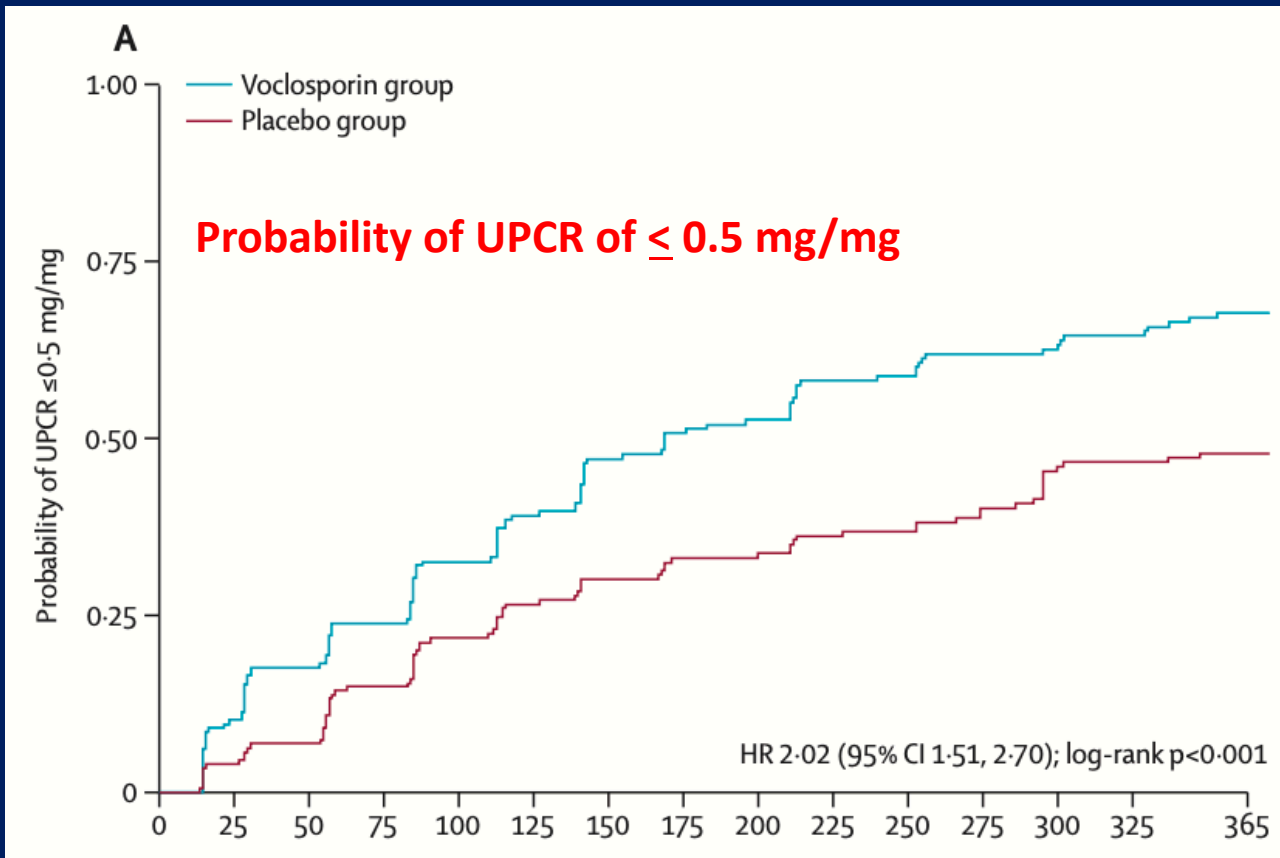


Complete and partial renal response endpoints (ITT population)



Secondary Endpoints:

	Voclosporin group (n=179)	Placebo group (n=178)	OR or HR (95% CI)	p value
Secondary endpoints				
Complete renal response at 24 weeks	58 (32%)	35 (20%)	OR 2.23 (1.34-3.72)	0.002
Partial renal response at 24 weeks	126 (70%)	89 (50%)	OR 2.43 (1.56-3.79)	<0.001
Partial renal response at 52 weeks	125 (70%)	92 (52%)	OR 2.26 (1.45-3.51)	<0.001

Achievement of Urine Protein:Cr ratio target



Subgroup Analyses: Primary outcome

		n (%)	Odds ratio (95% CI)	p value
Sex				
Female		313 (88)	2.5 (1.5-4.1)	<0.001
Male		44 (12)	4.2 (1.0-16.7)	0.043

Adverse Events

	Voclosporin group (n=178)	Placebo group (n=178)
Adverse event summary		
Adverse event	162 (91%)	158 (89%)
Serious adverse event	37 (21%)	38 (21%)
Serious adverse event of infections and infestations	18 (10%)	20 (11%)
Treatment-related serious adverse event	8 (4%)	8 (4%)
Adverse event leading to study drug discontinuation	20 (11%)	26 (15%)
Death*	1 (<1%)	5 (3%)
Treatment-related adverse event leading to death	0	0

Conclusion:

Voclosporin in combination with MMF and low-dose prednisone led to a superior complete renal response rate compared to MMF and low-dose prednisone alone, with a comparable safety profile.

R wrist monoarthritis in RA

Rituximab versus tocilizumab in anti-TNF inadequate responder patients with rheumatoid arthritis (R4RA): 16-week outcomes of a stratified, biopsy-driven, multicentre, open-label, phase 4 randomised controlled trial

Frances Humby, Patrick Durez, Maya H Buch, Myles J Lewis, Hasan Rizvi, Felice Rivellese, Alessandra Nerviani, Giovanni Giorli, Arti Mahto, Carlomaurizio Montecucco, Bernard Lauwerys, Nora Ng, Pauline Ho, Michele Bombardieri, Vasco C Romão, Patrick Verschueren, Stephen Kelly, Pier Paolo Sainaghi, Nagui Gendi, Bhaskar Dasgupta, Alberto Cauli, Piero Reynolds, Juan D Cañete, Robert Moots, Peter C Taylor, Christopher J Edwards, John Isaacs, Peter Sasieni, Ernest Choy, Costantino Pitzalis, on behalf of the R4RA collaborative group

- 40% of RA patients have poor clinical response (reasons unclear).
- B cell depletion works well for some patients.
- But more than 50% of patients with rheumatoid arthritis have low or absent CD20 B cells—the target for rituximab—in the main disease tissue (joint synovium).
- Peripheral blood biomarkers do not predict response to rituximab in practice.
- Hypothesis: IL-6 receptor inhibitor tocilizumab would be more effective.

Study Aim & Endpoints

- To compare the effect of tocilizumab with rituximab in RA patients who had had an inadequate responses to anti-TNF
 - Analysis stratified for synovial B-cell status.
- Powered to test the superiority of tocilizumab over rituximab in the B-cell poor population at 16 weeks.
- Primary endpoint:
 - 50% improvement in CDAI
 - Major Treatment Response defined as achievement of low disease activity
 - CDAI < 10

Design

- 48-week, multicenter, **open-label**, phase 4 RCT
- 19 sites, 5 countries (UK, Belgium, Italy, Portugal, and Spain)
- Patients \geq 18 years
- 2010 ACR/EULAR Criteria

Methods

- **Baseline synovial biopsy**
 - **Classified histologically as B-cell poor or rich.**
- **Classified further by RNA sequencing to ensure accuracy of the stratification of B-cell poor and B-cell rich patients**
- **Assigned randomly (1:1) centrally to receive RTX or IV TCZ**

Histology & RNA sequencing

- Histological classification of baseline synovial biopsy (Bcell poor, Bcell rich, germinal centre positive, or unknown)
- Semi-quantitative scoring to determine expression of CD20 B cells, CD3 T cells, CD138 plasma cells, and CD68 lining and sublining macrophages
- RNA sequencing:

Differences According to Histology

- At 16 weeks in the B-cell poor population
 - No difference in CDAI50% response between groups:
 - Rituximab group (17 [45%] of 38 patients)
 - Tocilizumab group (23 [56%] of 41 patients)
 - Difference 11% [95% CI: -11, 33], p=0.31

Differences According to RNA Seq classification

- 124 (77%) patients had RNA sequencing data available for analysis
 - 65 (52%) of whom were classified as B cell poor.
- CDAI50%
 - Rituximab group 12 [36%] of 33 patients
 - Tocilizumab group 20 [63%] of 32 patients (p=0.035)
- CDAIMTR
 - Rituximab group 4 [12%] of 33 patients
 - Tocilizumab group 16 [50%] of 32 patients (p=0.0012)

Results

	Histological classification		Unadjusted p value	RNA sequencing classification		
	Rituximab (n=38)	Tocilizumab (n=41)		Rituximab (n=33)	Tocilizumab (n=32)	Unadjusted p value
Primary endpoint*						
CDAI \geq 50% improvement at week 16	17 (45%)	23 (56%)	0.31	12 (36%)	20 (63%)	0.035
Supplementary endpoint*						
CDAI \geq 50% improvement and CDAI \leq 10.1 at week 16	9 (24%)	19 (46%)	0.035	4 (12%)	16 (50%)	0.0012
Binary secondary endpoints*						
CDAI \leq 10.1 at week 16	11 (29%)	19 (46%)	0.11	5 (15%)	16 (50%)	0.0036
DAS28-ESR \leq 3.2 at week 16	10 (26%)	18 (44%)	0.10	6 (18%)	17 (53%)	0.0032
DAS28-CRP \leq 3.2 at week 16	12 (32%)	19 (46%)	0.18	7 (21%)	16 (50%)	0.015
DAS28-ESR \leq 2.6 at week 16	6 (16%)	15 (37%)	0.037	3 (9%)	13 (41%)	0.004
DAS28-CRP \leq 2.6 at week 16	7 (18%)	13 (32%)	0.17	4 (12%)	10 (31%)	0.076
Moderate or good EULAR DAS28-ESR response at week 16	25 (66%)	36 (88%)	0.031	21 (64%)	30 (94%)	0.0053
Moderate or good EULAR DAS28-CRP response at week 16	22 (58%)	32 (78%)	0.054	18 (55%)	27 (84%)	0.015

Results

- Tocilizumab superior to RTX in CDAI50% improvement and in achievement of CDAI < 10 (low disease activity). This was NOT predicted by the histological B-cell classification.
- However, when classification was done with RNA sequencing, tocilizumab was superior to rituximab both for:
 - Primary outcome
 - Major treatment response
 - Secondary outcomes

Conclusions:

1. Tocilizumab was better in patients classified as B-cell poor according to the RNA sequencing.
2. The trial did not show that the B-cell depletion efficacy is higher in the B-cell rich population; however, the study was not statistically powered to show this.
3. Replication and validation of the RNA sequencing-based classification required.

Practical Implications:

- Not clear.
- We usually get to tocilizumab earlier, anyway.
- We know who would be a poor candidate for rituximab therapy...
- It is unclear who would be a GOOD candidate for rituximab compared with other biological agents and targeted synthetic DMARDs

JAMA | **Original Investigation**

Effect of Half-Dose vs Stable-Dose Conventional Synthetic Disease-Modifying Antirheumatic Drugs on Disease Flares in Patients With Rheumatoid Arthritis in Remission

The ARCTIC REWIND Randomized Clinical Trial

Siri Lillegraven, MD, MPH, PhD; Nina Paulshus Sundlisæter, MD, PhD; Anna-Birgitte Aga, MD, PhD; Joseph Sexton, PhD; Inge C. Olsen, PhD; Hallvard Fremstad, MD; Cristina Spada, MD; Tor Magne Madland, MD, PhD; Christian A. Høili, MD; Gunnstein Bakland, MD, PhD; Åse Lexberg, MD; Inger Johanne Widding Hansen, MD; Inger Myrnes Hansen, MD; Hilde Haukeland, MD; Maud-Kristine Aga Ljoså, MD; Ellen Moholt, RN, Msc; Till Uhlig, MD, PhD; Daniel H. Solomon, MD, MPH; Désirée van der Heijde, MD, PhD; Tore K. Kvien, MD, PhD; Espen A. Haavardsholm, MD, PhD

QUESTION:

Can conventional synthetic DMARDs be tapered for RA patients in sustained remission?

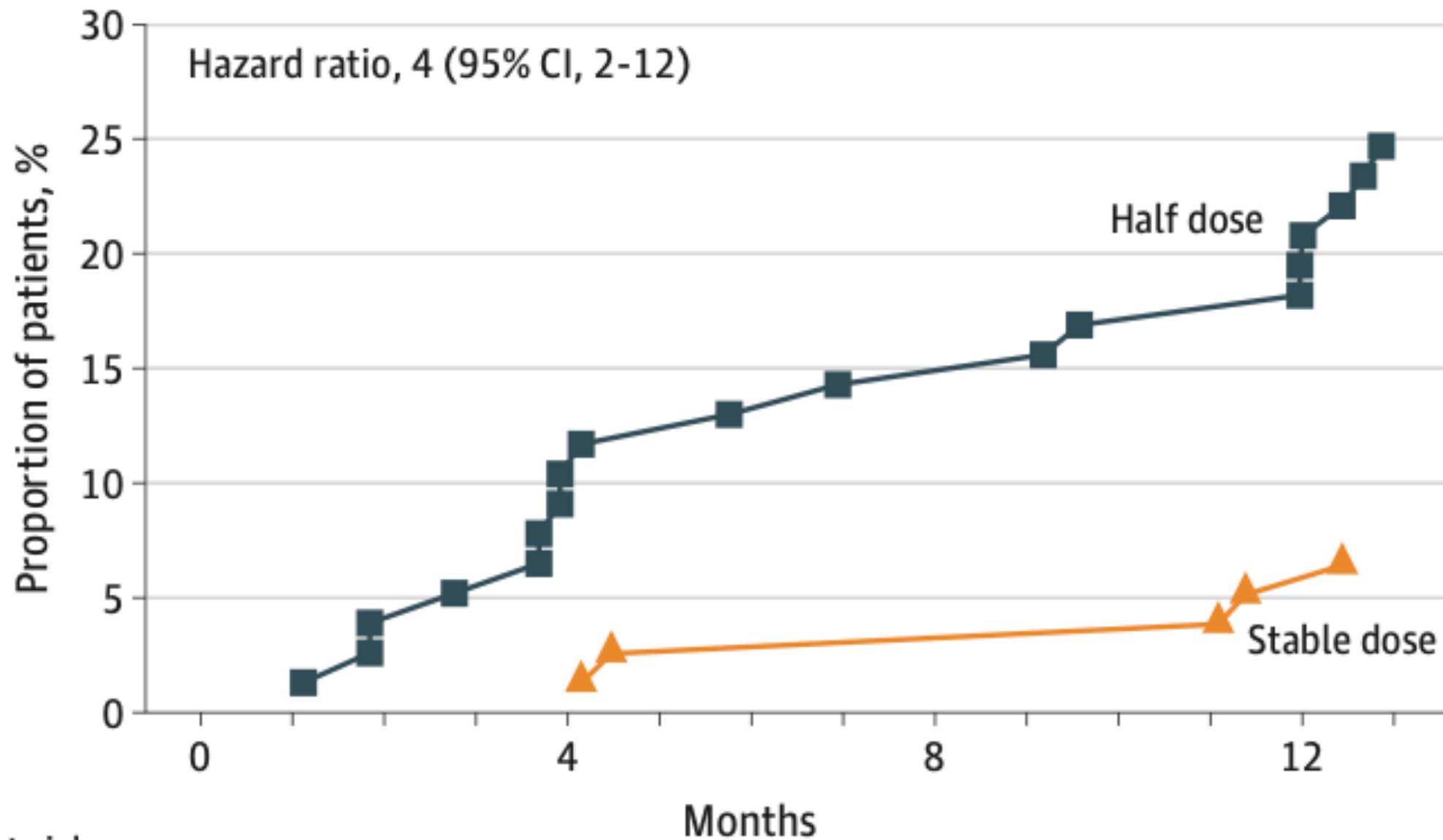
Design

- Multicenter, randomized, parallel, open-label noninferiority study conducted
- 10 Norwegian hospital-based rheumatology practices.
- 160 patients with RA in remission for 12 months on stable csDMARDs.
- Randomly assigned to half-dose csDMARDs (n = 80) or stable-dose csDMARDs (n = 80).

Results

- Flare occurred in:
 - 19 patients (25%) in the half-dose csDMARD group
 - 5 (6%) in the stable-dose csDMARD group
 - Risk difference, 18% [95% CI, 7%-29%]
- Adverse events:
 - 34 patients (44%) in the half-dose group
 - 42 (54%) in the stable-dose group, none leading to study discontinuation.
 - No deaths occurred.

Cumulative Flares



Conclusion

Cutting csDMARD therapies in half substantially increases the risk of flare.

The NEW ENGLAND
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ESTABLISHED IN 1812

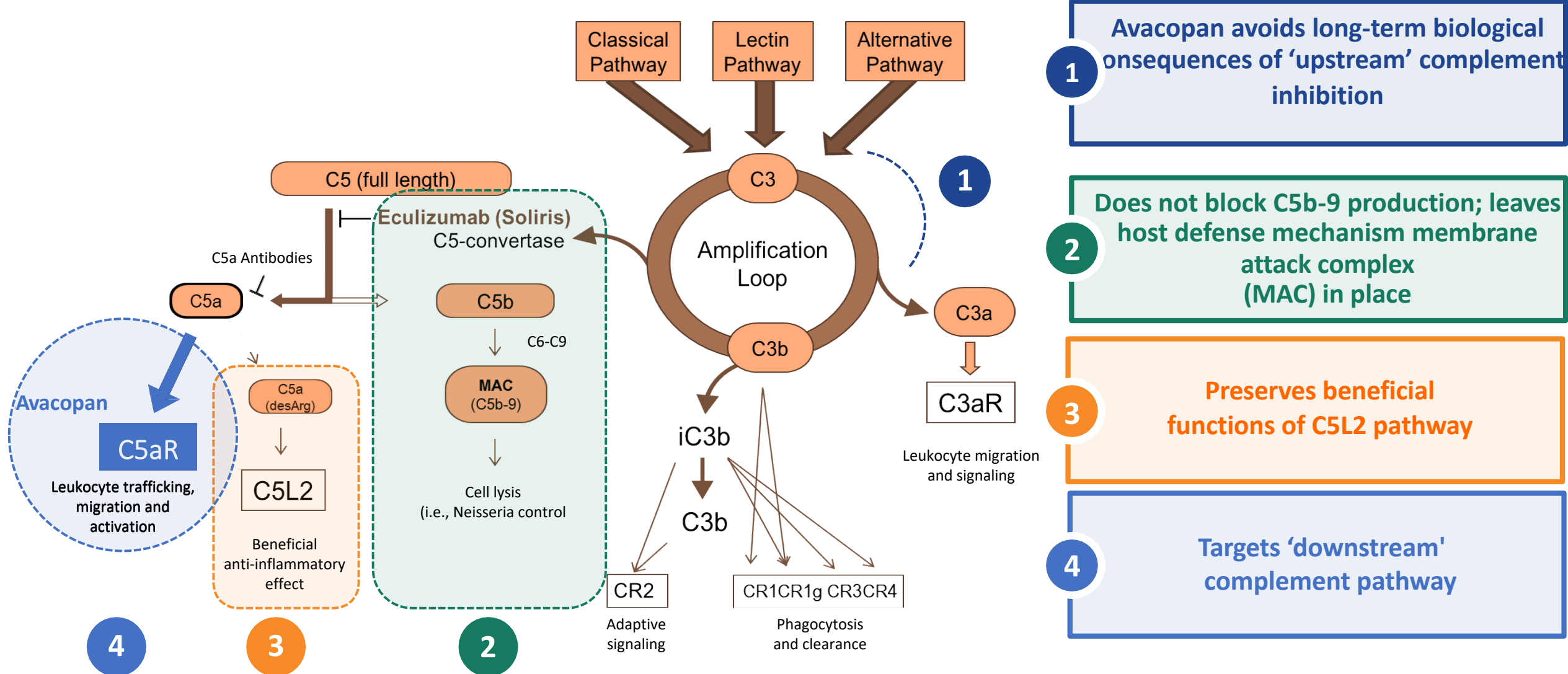
FEBRUARY 18, 2021

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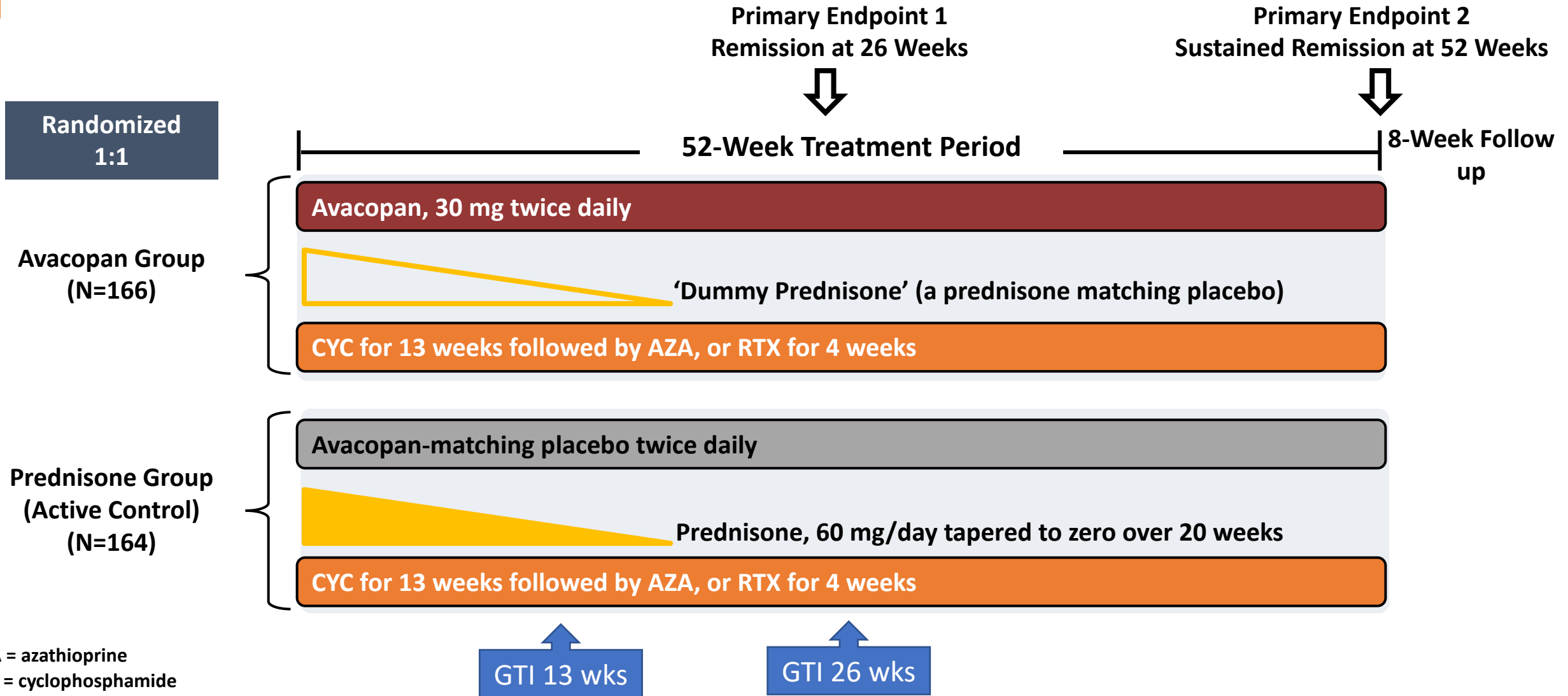
Avacopan for the Treatment of ANCA-Associated Vasculitis

David R.W. Jayne, M.D., Peter A. Merkel, M.D., M.P.H., Thomas J. Schall, Ph.D., and Pirow Bekker, M.D, Ph.D.,
for the ADVOCATE Study Group*

Avacopan: Highly Potent and Selective C5aR Inhibitor

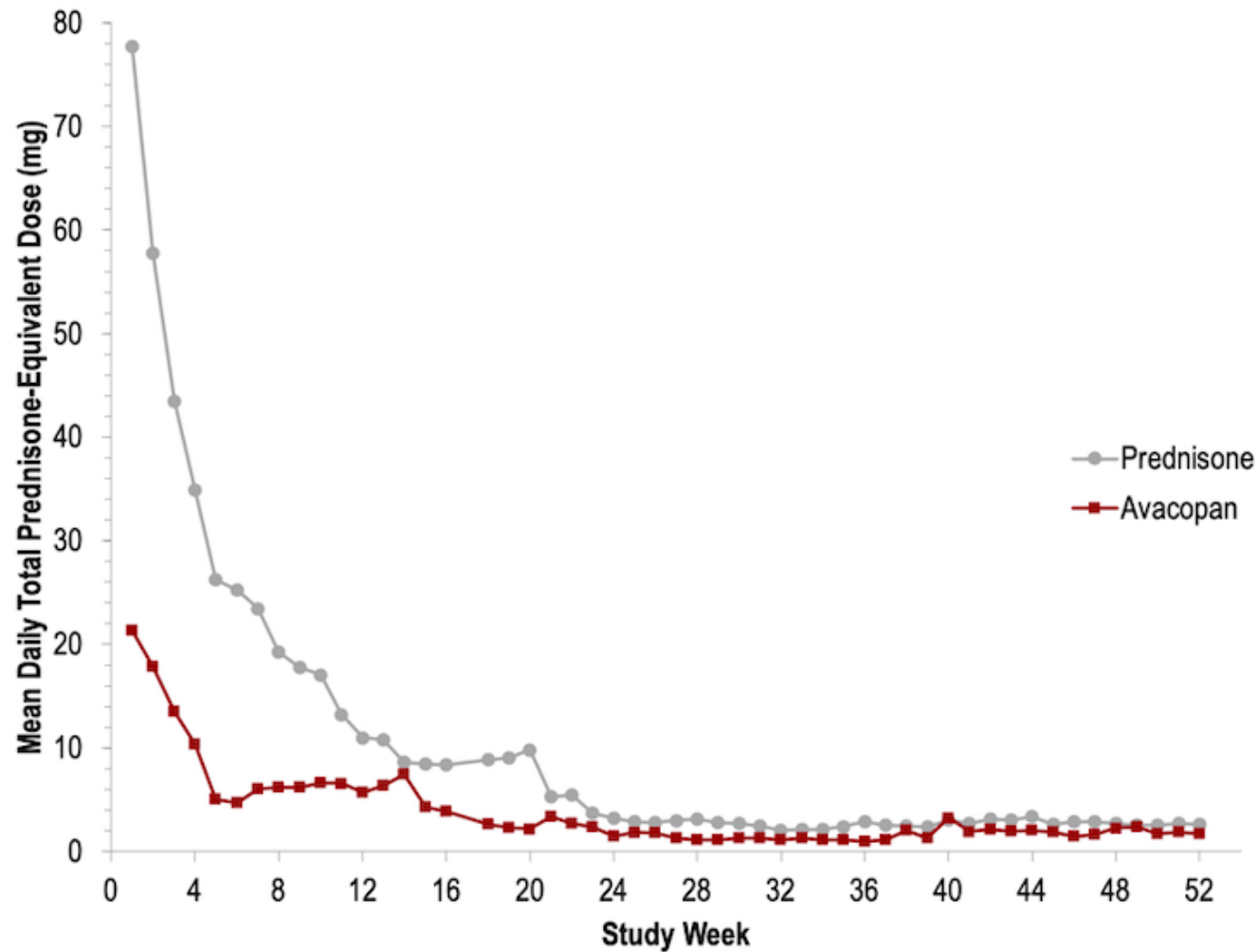


ADVOCATE Phase 3 Study Design



AZA = azathioprine
CYC = cyclophosphamide
RTX = rituximab

Figure S7. Mean Daily Total Prednisone-Equivalent Glucocorticoid Dose (in mg) by Study Week by Treatment Group



The weekly mean values were calculated based on all recorded systemic (oral or intravenous) glucocorticoid use by all patients in the respective treatment group at the start of each study week.

Avacopan group received 2/3 less prednisone

	Prednisone (N=164)	Avacopan (N=166)
Any Oral or IV Use (mg)* n (%)	164 (100.0%)	145 (87.3%)
total dose, mean \pm SD	3654.5 \pm 1709.83	1348.9 \pm 2040.29
daily dose, mean \pm SD	11.8 \pm 8.96	4.4 \pm 6.65

Primary Efficacy Endpoint at 26 weeks:
Non-inferiority

Avacopan group: 72.3%
Comparison group: 70.1%

GTI

A standardized, weighted instrument that measures CHANGE in steroid toxicity

GTI: Two scores & a catalogue

Cumulative Worsening Score
(CWS)

Aggregate Improvement Score
(AIS)

Specific List

9 health domains

- Body mass index
- Blood pressure
- Glucose
- Lipids
- ~~Bone mineral density~~
- Infection
- Steroid myopathy
- Skin toxicity
- Neuropsychiatric effects

Relevant.

Easy to measure.

Already collected, anyway.

Why these domains?

1. Common
2. Important
3. Likely to change

Specific List: Catalogue of Damage

1. Less common

2. Unlikely to change

3. Not easy to measure

EXAMPLES:

- Avascular necrosis
- Bone fracture
- Cataracts

Each Domain is weighted

DOMAIN: Glucose Tolerance	Weight
Increase in HbA1c AND increase in medication (WORSENING)	+44

Each CWS/AIS Domain is weighted

DOMAIN: Glucose Tolerance	Weight
Increase in HbA1c AND increase in medication (WORSENING)	+44
Increase in HbA1c OR increase in medication (WORSENING)	+32

Each CWS/AIS Domain is weighted


DOMAIN: Glucose Tolerance	Weight
Decrease in HbA1c AND decrease in medication (IMPROVEMENT)	-44

Each CWS/AIS Domain is weighted

DOMAIN: Glucose Tolerance	Weight
Decrease in HbA1c AND decrease in medication (IMPROVEMENT)	-44
Decrease in HbA1c OR decrease in medication (IMPROVEMENT)	-32

Improvement & Worsening Weighted Equally

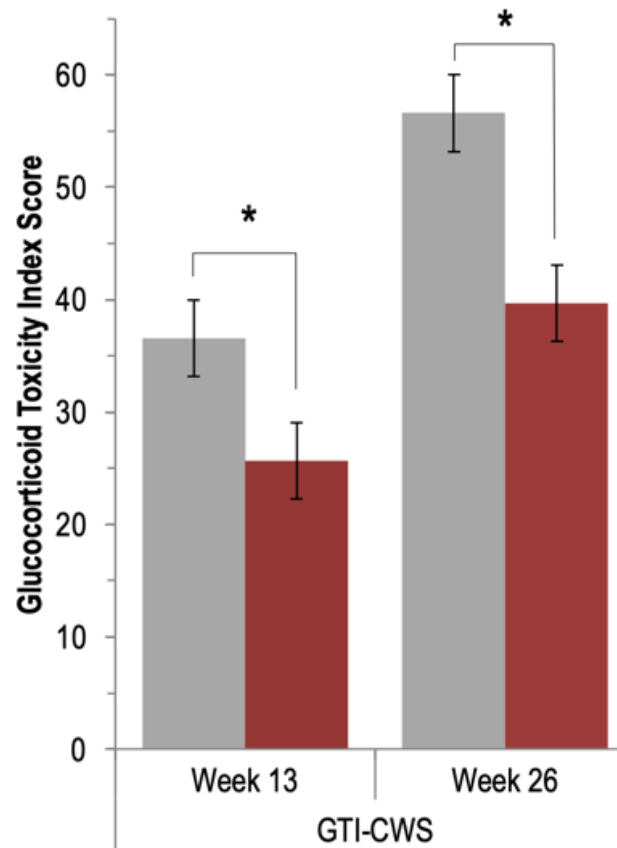
DOMAIN: Glucose Tolerance	Weight
Increase in HbA1c AND increase in medication (WORSENING)	+44
Increase in HbA1c OR increase in medication (WORSENING)	+32
NO SIGNIFICANT CHANGE	0
Decrease in HbA1c OR decrease in medication (IMPROVEMENT)	-32
Decrease in HbA1c AND decrease in medication (IMPROVEMENT)	-44



WORSENING SCORE (CWS)

- New toxicities added
- ALL toxicities retained – even if resolved

Figure S2. Glucocorticoid Toxicity Index



■ Prednisone
■ Avacopan

Worsening Score:

- $P = 0.01$ (13 weeks)
- $P = 0.0002$ (26 weeks)

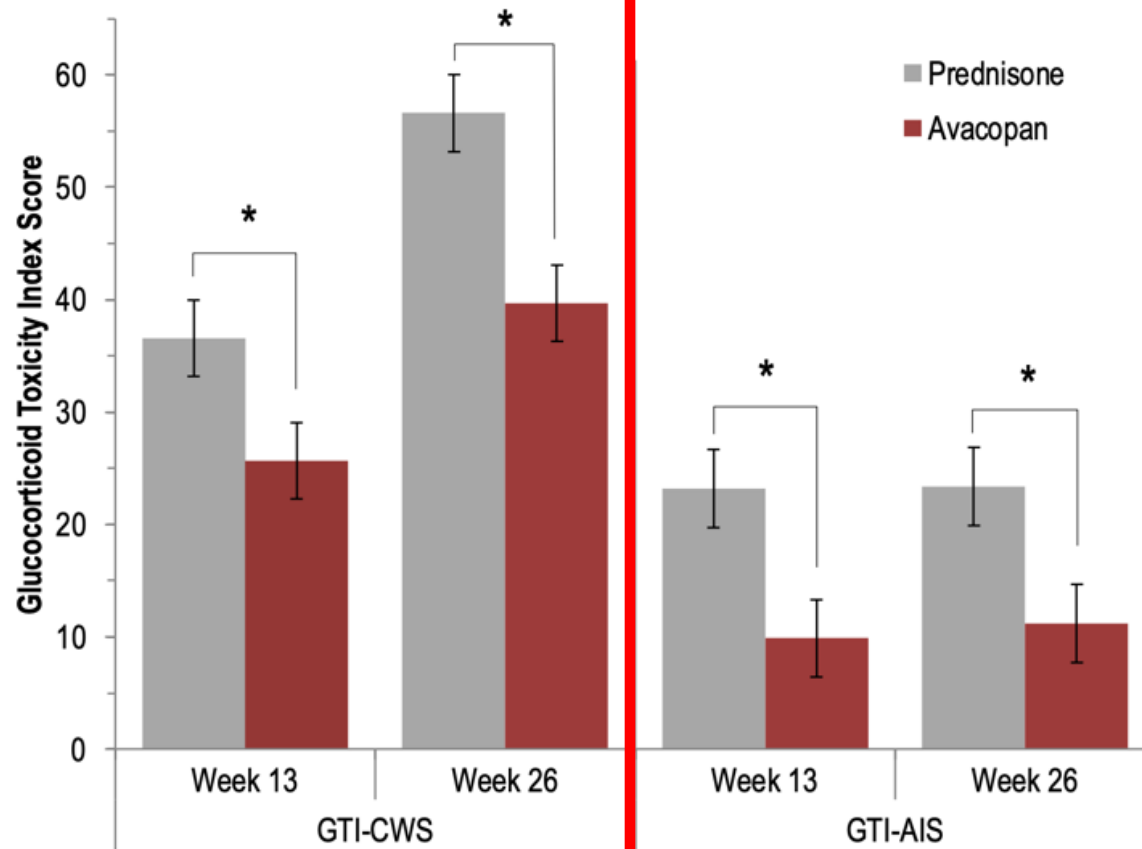
FACT

Many patients have baseline steroid toxicity

IMPROVEMENT SCORE (AIS)

- New toxicities added
- Resolved toxicities are removed

Figure S2. Glucocorticoid Toxicity Index



Improvement Score:

- $P = 0.003$ (13 weeks)
- $P = 0.008$ (26 weeks)

Minimum Clinically Important Difference (MCID)

Based on the standard error of measurement (SEM):

- smallest change likely to reflect a true difference.

510 clinical assessments (variety of inflammatory diseases) by 34 clinicians.

McDowell PJ et al. J Allergy Clin Pract. 2021 (Jan); 365-72 & supplement

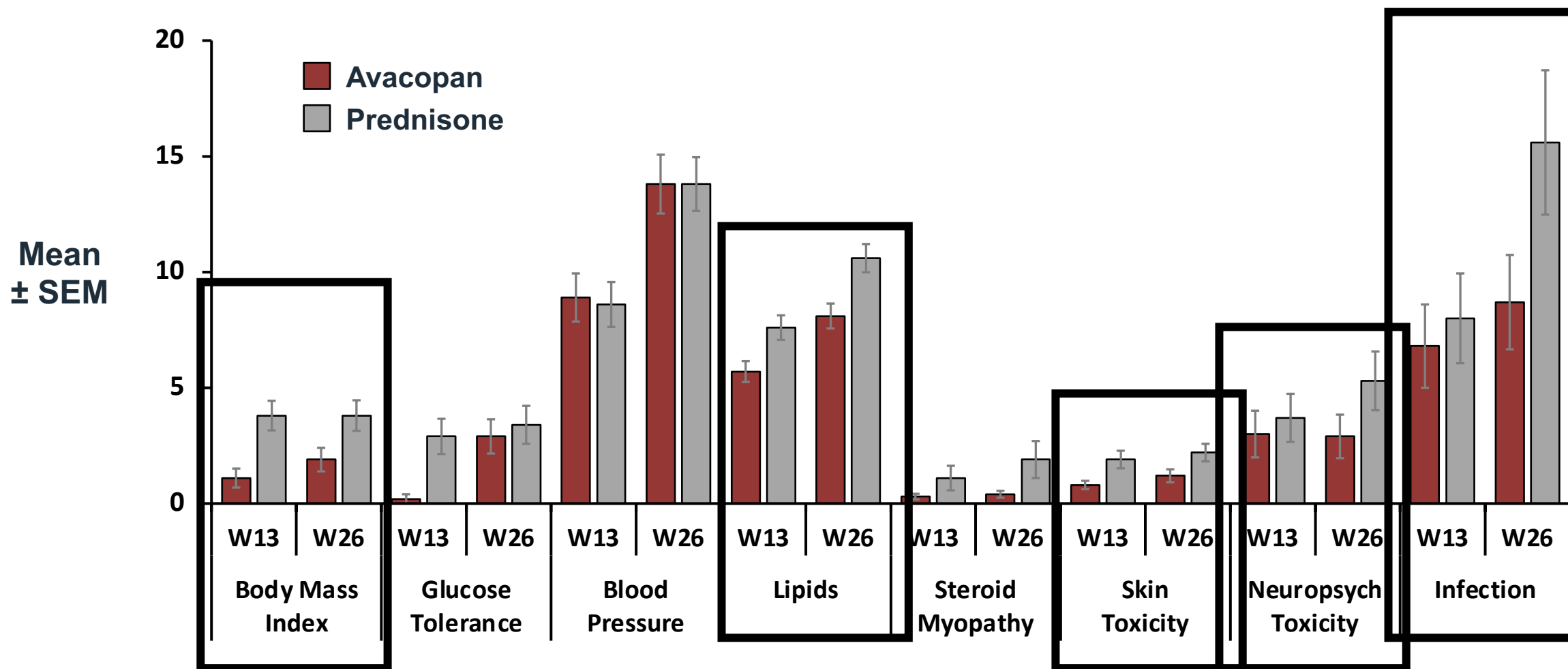
MCID = 10 points

Table 2. Primary and Key Secondary End Points.*

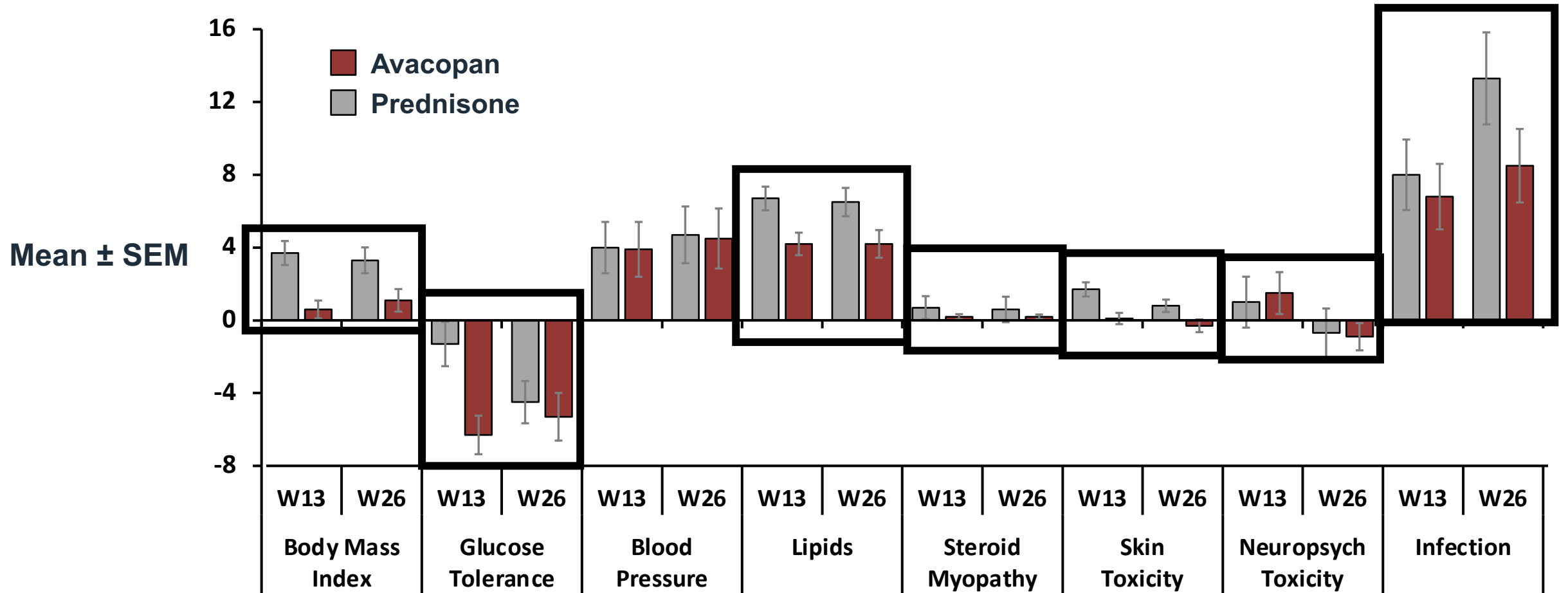
End Point	Avacopan (N=166)	Prednisone (N=164)	Difference (95% CI)
Primary end points			
Remission at wk 26 — no. (%) [†]	120 (72.3)	115 (70.1)	3.4 (−6.0 to 12.8) ^{‡§}
Sustained remission at wk 52 — no. (%) [¶]	109 (65.7)	90 (54.9)	12.5 (2.6 to 22.3) [‡]
Secondary end points			
GTI-CWS**	Cumulative Worsening Score		
Wk 13			
Patients evaluated	160	161	
Least-squares mean	25.7±3.4	36.6±3.4	−11.0 (−19.7 to −2.2)
Wk 26			
Patients evaluated	154	153	
Least-squares mean	39.7±3.4	56.6±3.4	−16.8 (−25.6 to −8.0)
GTI-AIS^{††}	Aggregate Improvement Score		
Wk 13			
Patients evaluated	160	161	
Least-squares mean	9.9±3.4	23.2±3.5	−13.3 (−22.2 to −4.4)
Wk 26			
Patients evaluated	154	153	
Least-squares mean	11.2±3.5	23.4±3.5	−12.1 (−21.1 to −3.2)

All GTI Domains performed well

GTI Cumulative Worsening Score: By Domain



GTI AGGREGATE IMPROVEMENT SCORE: BY DOMAIN



Lower Incidence of Glucocorticoid Toxicity in Avacopan Group

	Avacopan (N=166) n (%)	Prednisone (N=164) n (%)	Difference % (95% CI)
Any AE of glucocorticoid use*	110 (66%)	132 (81%)	-14.2 (-23.7, -3.8)
Cardiovascular	72 (43%)	85 (52%)	-8.5 (-19.2, 2.6)
Dermatological	14 (8%)	28 (17%)	-8.6 (-16.2, -1.0)
Endocrine / Metabolic	23 (14%)	48 (29%)	-15.4 (-24.3, -6.0)
Gastrointestinal	3 (2%)	4 (2%)	-0.6 (-4.6, 3.1)
Infectious	22 (13%)	25 (15%)	-2.0 (-9.9, 5.7)
Musculoskeletal	19 (11%)	21 (13%)	-1.4 (-8.7, 5.9)
Ophthalmological	7 (4%)	12 (7%)	-3.1 (-8.7, 2.1)
Psychological	27 (16%)	39 (24%)	-7.5 (-16.5, 1.3)

- Difference between groups mainly due to AEs of weight increased, insomnia, hyperlipidemia, adrenal insufficiency, blood glucose increased, and irritability

*Based on EULAR recommendations (van der Goes et al., 2010; Duru et al., 2013)

Summary of 26-Week Results

Selected phase III Advocate trial data

	Avacopan + Rituxan or cyclophosphamide	Glucocorticoid- based SoC	P for noninferiority	P for superiority
Remission at 26 weeks (%)	72.3	70.1	<0.0001	
Remission at 52 weeks (%)	65.7	54.9		0.0066
GTI cumulative worsening score	39.7	56.6		0.0002
GTI aggregate improvement score	11.2	23.4		0.0082

ORIGINAL ARTICLE

Trial of Upadacitinib and Adalimumab for Psoriatic Arthritis

Iain B. McInnes, F.R.C.P., Jaclyn K. Anderson, D.O., Marina Magrey, M.D.,
Joseph F. Merola, M.D., Yi Liu, M.D., Mitsumasa Kishimoto, M.D.,
Slawomir Jeka, M.D., Cesar Pacheco-Tena, M.D., Ph.D., Xin Wang, Ph.D.,
Liang Chen, M.S., Patrick Zueger, Pharm.D., Ph.D., John Liu, M.D.,
Aileen L. Pangan, M.D., and Frank Behrens, M.D.

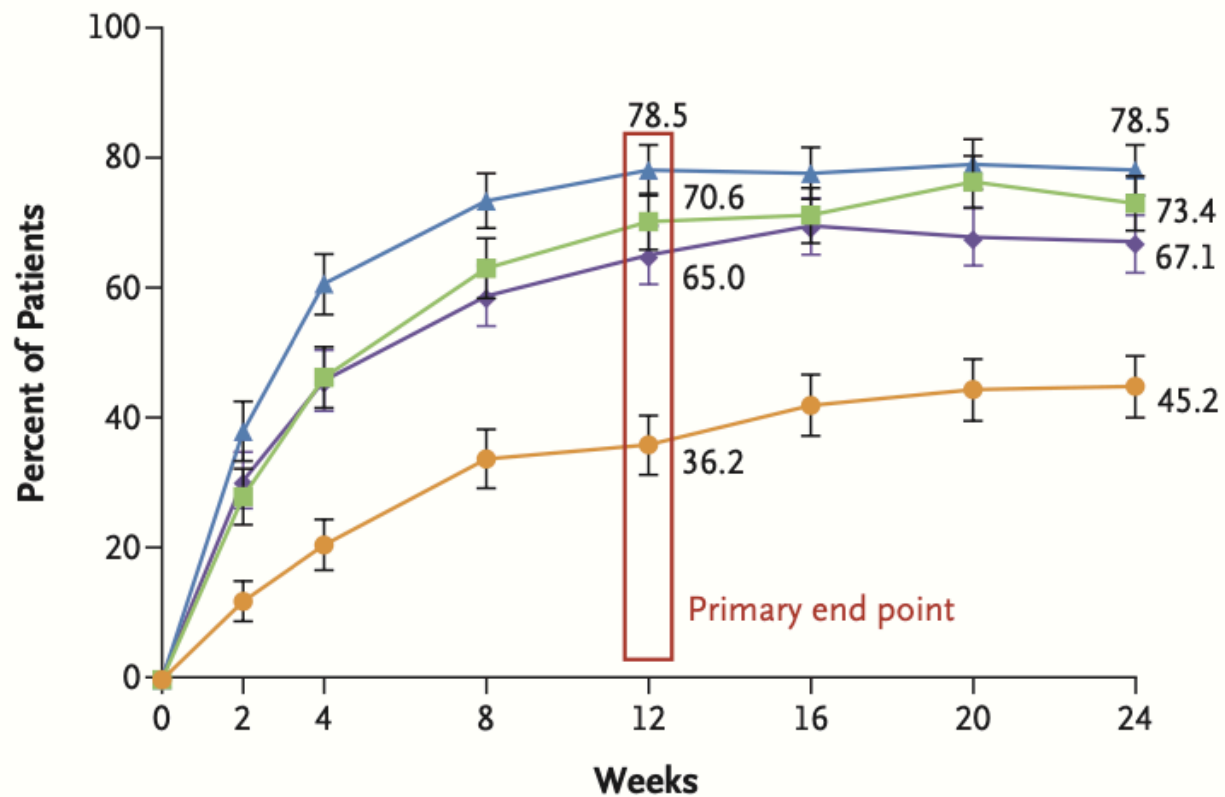
Design

- 24-week phase 3 trial
- Randomized 1:1:1:1:
 - Oral upadacitinib 30 mg daily
 - Oral upadacitinib 15 mg daily
 - Subcutaneous adalimumab 40 QOW
 - Placebo
- Primary endpoint: ACR20
- Secondary endpoints: ACR50, ACR70

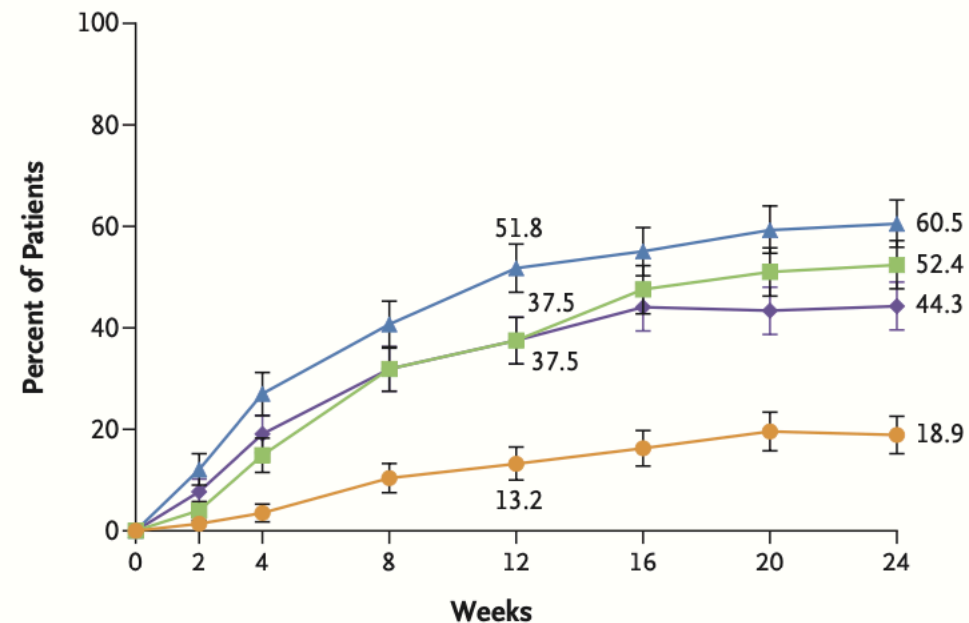
Outcomes

▲ Upadacitinib, 30 mg (N=423)
 ■ Upadacitinib, 15 mg (N=429)
 ◆ Adalimumab (N=429)
 ● Placebo (N=423)

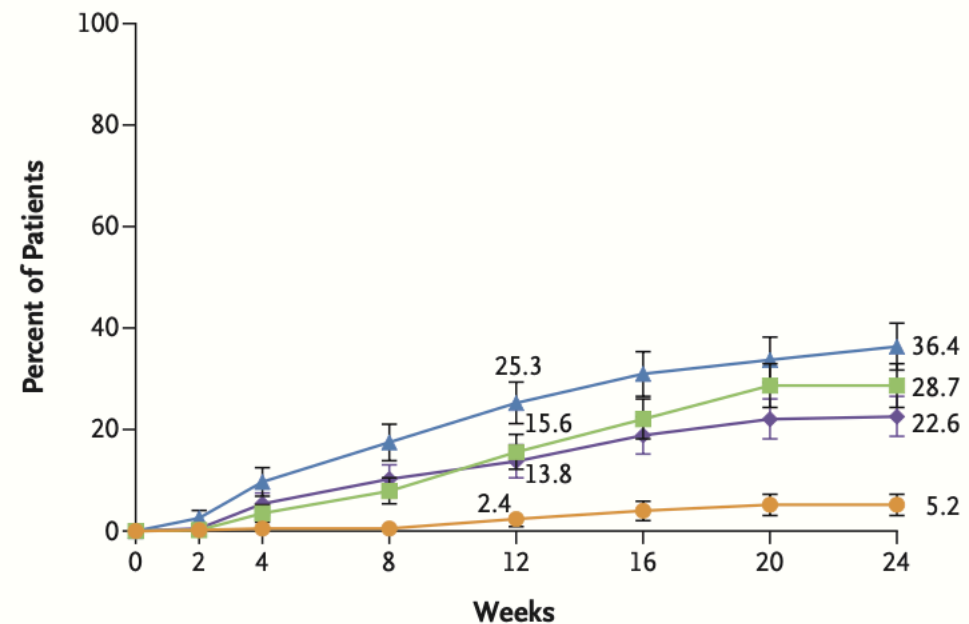
A ACR20 Response



B ACR50 Response



C ACR70 Response



Adverse Events

Table 3. Safety Summary through Week 24.*

Event or Variable	Upadacitinib, 15 mg (N=429)	Upadacitinib, 30 mg (N=423)	Placebo (N=423)	Adalimumab (N=429)
Patients with adverse events — no. (%)				
Any adverse event	287 (66.9)	306 (72.3)	252 (59.6)	278 (64.8)
Serious adverse event	14 (3.3)	26 (6.1)	13 (3.1)	16 (3.7)
Adverse event leading to discontinuation of placebo, upadacitinib, or adalimumab	13 (3.0)	21 (5.0)	13 (3.1)	22 (5.1)
Death	0	0	1 (0.2)	0
Infection	169 (39.4)	183 (43.3)	140 (33.1)	146 (34.0)
Serious	5 (1.2)	11 (2.6)	4 (0.9)	3 (0.7)
Opportunistic	1 (0.2)	2 (0.5)	0	0
Herpes zoster†	4 (0.9)	5 (1.2)	3 (0.7)	0

Conclusions:

- The percentage of patients with psoriatic arthritis who had an ACR20 response at week 12 was significantly higher with 15-mg or 30-mg upadacitinib than with placebo.
- The 30-mg dose but not the 15-mg dose was superior to adalimumab.
- Adverse events were more frequent with upadacitinib than with placebo.

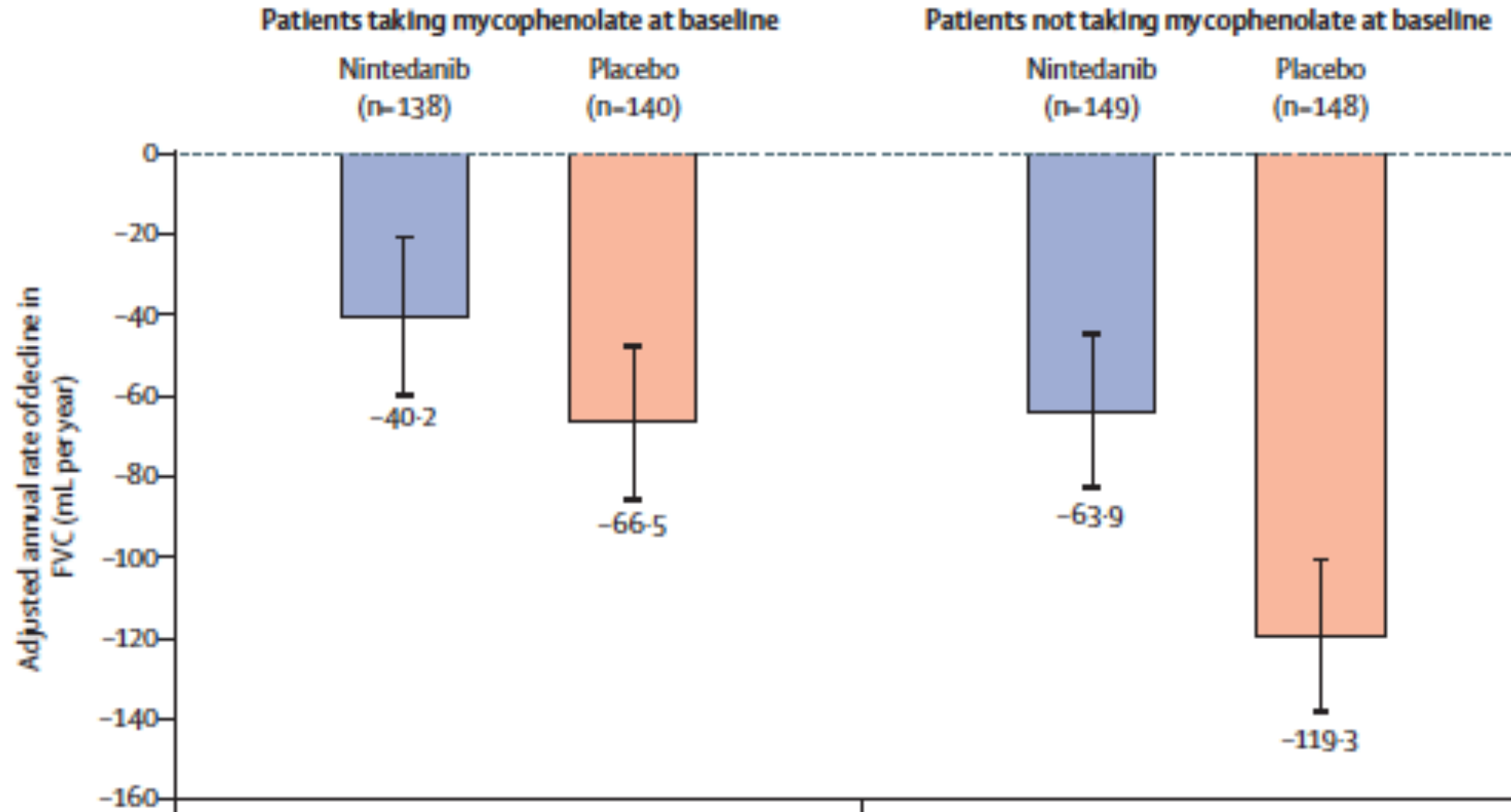
Efficacy and safety of nintedanib in patients with systemic sclerosis-associated interstitial lung disease treated with mycophenolate: a subgroup analysis of the SENSICIS trial

Kristin B Highland, Oliver Distler*, Masataka Kuwana, Yannick Allanore, Shervin Assassi, Arata Azuma, Arnaud Bourdin, Christopher P Denton, Jörg H W Distler, Anna Maria Hoffmann-Vold, Dinesh Khanna, Maureen D Mayes, Ganesh Raghu, Madelon C Vonk, Martina Gahlemann, Emmanuelle Clerisme-Beaty, Mannaig Girard, Susanne Stowasser, Donald Zoz, Toby M Maher, on behalf of the SENSICIS trial investigators†*

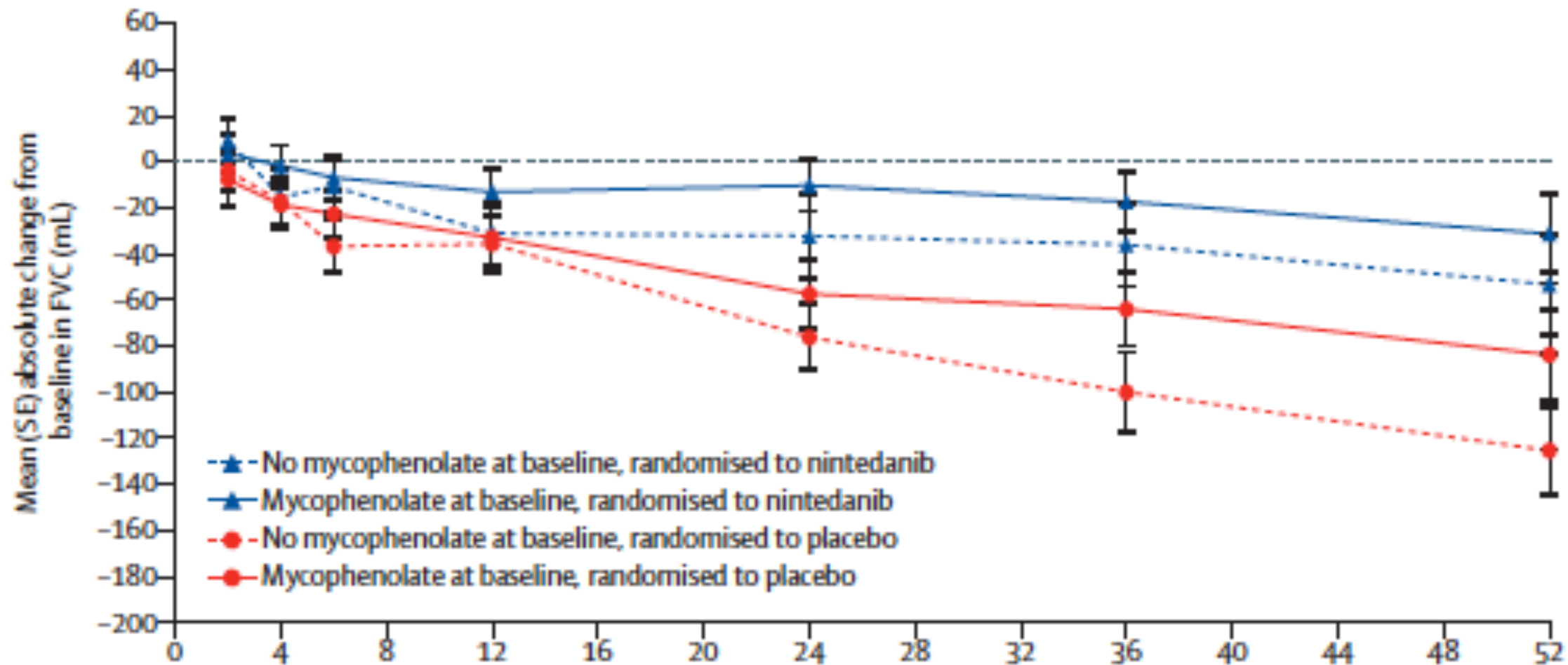
Design: the SENSICIS trial

- Randomized, double-blind, placebo-controlled trial
- Oral nintedanib 150 mg twice daily or placebo for at least 52 weeks
- Primary Endpoint: Rate of decline in FVC over 52 weeks by mycophenolate use at baseline.
- Post-hoc analysis: proportion of patients with an absolute decrease in FVC of at least 3.3% predicted at week 52.
- Annual rate of decline in FVC using a random coefficient regression model including anti-topoisomerase I antibody status, age, height, sex, and baseline FVC as covariates.

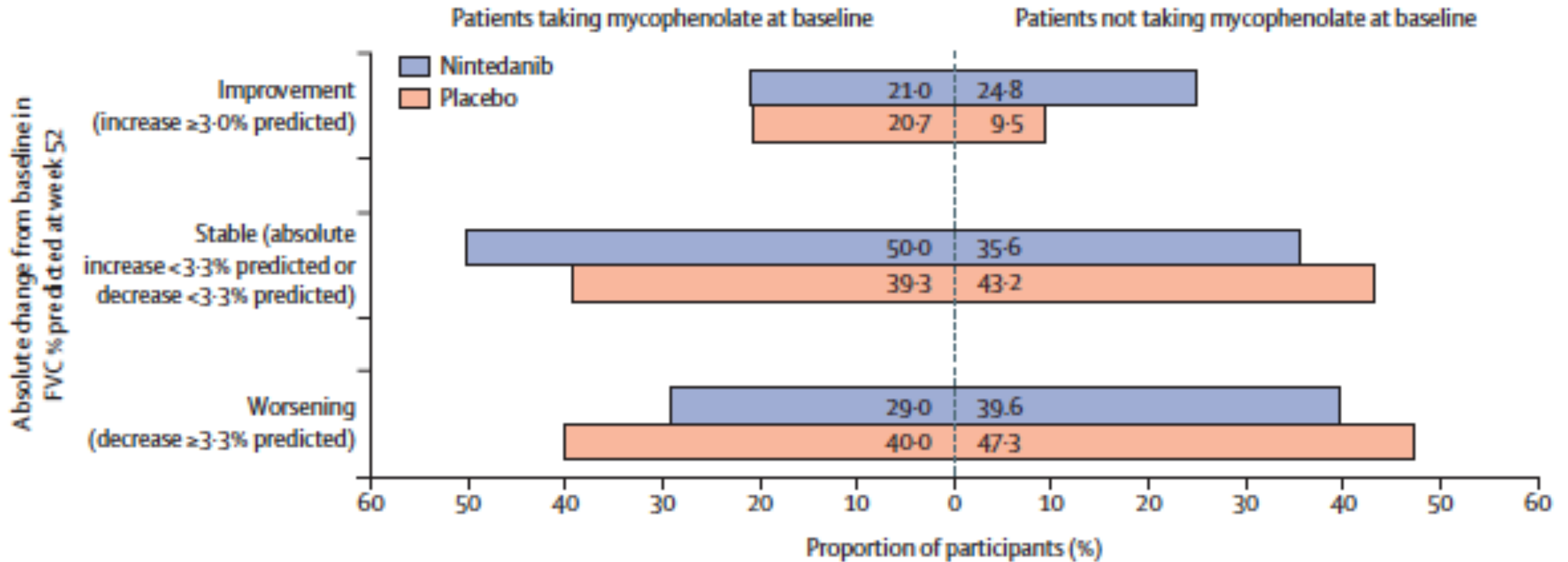
Adjusted Annual Rate of Decline in FVC



Mean Absolute Change from Baseline in FVC



Absolute Change in FVC % Predicted



Conclusions:

- Nintedanib reduced the progression of ILD with or without MMF in patients with SSc-ILD.
- The adverse event profile of nintedanib was similar in the subgroups by MMF use.
- Nintedanib and MMF are synergistic and safe.
- Initial combination therapy versus a sequential approach?

Summary of THE YEAR:

- Voclosporin + MMF is effective and safe in lupus nephritis
- RNA sequencing of synovial biopsies: glimpse of the future?
- Reducing csDMARDs during stable remission: generally a bad idea
- Avacopan illustrates strong potential role for complement inhibition in AAV
 - AND spares GC toxicity
- Upadacitinib underscores the role of JAKs in PsA
- Nintedanib + MMF is a hopeful step forward in SSc-ILD



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Avacopan for the Treatment of ANCA-Associated Vasculitis

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