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Efficacy and Safety of CT-P43, a Candidate Ustekinumab Biosimilar, in Moderate-to-Severe Plaque Psoriasis: 52-Week Results From a Randomised, Active-Controlled, Double-Blind, Phase III Study

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ABSTRACT

Equivalent efficacy—mean per cent improvement from baseline in Psoriasis Area and Severity Index (PASI) score at Week (W) 12 (primary endpoint)—was demonstrated between CT-P43, a candidate ustekinumab biosimilar, and reference ustekinumab. This study further evaluated the efficacy, pharmacokinetics, safety and immunogenicity of CT-P43 vs. reference ustekinumab, including after switching to CT-P43 from reference ustekinumab, in patients with moderate-to-severe plaque psoriasis. In this double-blind Phase III trial, patients were randomised (1:1) to treatment with subcutaneous CT-P43 or reference ustekinumab (45/90 mg [baseline body weight ≤ 100/> 100 kg]). At W16, patients receiving reference ustekinumab were re-randomised (1:1) to either continue this treatment or switch to CT-P43; CT-P43-treated patients continued CT-P43. Study medication was administered at W16 (after re-randomisation), W28 and W40. Secondary efficacy endpoints, pharmacokinetics, safety and immunogenicity were evaluated until W52. At W16, 502 patients were re-randomised ($n = 253$ continued receiving CT-P43; $n = 125$ continued receiving reference ustekinumab; $n = 124$ switched to CT-P43). Mean (standard deviation) PASI scores at W52 were similar across groups (continuing CT-P43: 1.44 [2.921]; continuing reference ustekinumab: 1.33 [3.070]; switched: 1.93 [2.966]). At W52, similar proportions of patients continuing CT-P43, continuing reference ustekinumab and switching achieved ≥ 75% improvement in PASI score ($n = 226$ [89.3%], 116 [92.8%] and 111 [89.5%]), static Physician's Global Assessment score of 0/1 ($n = 215$ [85.0%], 110

[88.0%] and 96 [77.4%]) and Dermatology Life Quality Index score of 0/1 ($n = 150$ [59.3%], 67 [53.6%] and 78 [62.9%]). Serum ustekinumab concentrations were comparable across groups. Proportions of patients experiencing treatment-emergent adverse events (TEAEs) were similar across groups; study medication–related TEAEs occurred in 14 (5.5%), 8 (6.4%) and 12 (9.7%) patients continuing CT-P43, continuing reference ustekinumab and switching, respectively. Switching did not increase antidrug antibody positivity. Results support the comparability of CT-P43 to reference ustekinumab. Efficacy was maintained after switching to CT-P43 from reference ustekinumab, without notable safety or immunogenicity findings.
Trial Registration: ClinicalTrials.gov identifier: NCT04673786

1 | Introduction

The monoclonal antibody ustekinumab targets the interleukin-12/23 p40 subunit; it is approved by the European Medicines Agency (EMA), as well as the US Food and Drug Administration (FDA), for indications including moderate-to-severe plaque psoriasis, active psoriatic arthritis and moderately to severely active Crohn's disease or ulcerative colitis in adults [1, 2]. Originator ustekinumab may not always be the most cost-effective biologic, and availability of biosimilars may lower costs and improve patient access to medication [3, 4]. Potential benefits of biosimilars are increasingly recognised [5–8], with ustekinumab biosimilars beginning to receive EMA and FDA approval [9–11].

CT-P43 is a candidate ustekinumab biosimilar that received approval from the EMA, FDA, Korean Ministry of Food and Drug Safety (MFDS), United Kingdom Medicines and Healthcare products Regulatory Agency (MHRA) and Health Canada in 2024 [12, 13]. A Phase III trial (NCT04673786), in patients who had moderate-to-severe plaque psoriasis, previously showed subcutaneous CT-P43 to be equivalent to European Union–sourced originator ustekinumab ('reference ustekinumab') for the primary study endpoint, mean per cent improvement in Psoriasis Area and Severity Index (PASI) score at Week 12, as well as for secondary efficacy endpoints, pharmacokinetics (PK), safety and immunogenicity up to Week 28 [14].

Here, findings up to the Week 52 end-of-study visit are reported for patients continuing CT-P43 or reference ustekinumab, or switching to CT-P43 from reference ustekinumab at Week 16.

2 | Patients and Methods

2.1 | Study Design

This was a randomised, active-controlled, double-blind Phase III study involving 34 centres across four countries (Estonia, Poland, the Republic of Korea and Ukraine). The full study design was previously reported [14]; briefly, randomised patients received CT-P43 or reference ustekinumab (1:1) on Day 1 of Treatment Period I (TPI). Study medications were administered by subcutaneous injection using a prefilled syringe, by unblinded study centre personnel. In TPI, study medication was administered at Weeks 0 and 4, with the dose defined by baseline body weight (45 mg for patients weighing ≤ 100 kg; 90 mg [two 45 mg doses] for patients weighing > 100 kg).

For Treatment Period II (TPII), patients initially assigned to receive reference ustekinumab during TPI were re-randomised (1:1) before dosing at Week 16, to either continue this treatment or switch to CT-P43, stratified by dose (45 vs. 90 mg) at this time point. To maintain blinding, patients receiving CT-P43 during TPI also underwent a randomisation procedure, but continued receiving CT-P43 throughout TPII. Other than predefined, unblinded staff (who administered study medication or were unblinded to facilitate reporting after the database was locked at Week 28), all investigators, patients and study personnel remained blinded until Week 52 (end of study). In TPII, study medication was administered at Weeks 16, 28 and 40, with dosage adjustments from TPI if body weight had significantly changed before the Week 16 dose. Following TPII, a 12-week follow-up preceded a Week 52 (end-of-study) visit.

The study was performed in accordance with Good Clinical Practice and the principles of the Declaration of Helsinki, adhering to all national, state, and local laws and regulations. The study protocol was prospectively approved by independent ethics committees or institutional review boards at each site. All patients provided written informed consent.

As the study coincided with the COVID-19 pandemic, several alternative measures and procedures were implemented in line with EMA [15] and FDA [16] guidance, to ensure patient safety. Additionally, owing to war in Ukraine, several alternative measures were introduced, with guidelines on exceptional allowances for study visit assessments in Ukraine developed based on EMA guidelines [17, 18], prioritising patients' safety and interests.

2.2 | Patients

Full eligibility criteria were previously reported [14]. Briefly, eligible adults (18–80 years of age [inclusive]) had moderate-to-severe plaque psoriasis diagnosed ≥ 24 weeks before initial dosing, with or without psoriatic arthritis. Moderate-to-severe plaque psoriasis was defined by a PASI score of ≥ 12, ≥ 10% body surface area involvement and a static Physician's Global Assessment (sPGA) score of ≥ 3. Key exclusion criteria included prior treatment with drugs targeting interleukin-12/23, including reference ustekinumab or candidate ustekinumab biosimilars, or ≥ 2 biologics approved for psoriasis treatment.

2.3 | Study Endpoints and Assessments

The primary study endpoint was mean per cent improvement from baseline in PASI score at Week 12; other endpoints and assessments were also previously described [14]. After Week 28, efficacy, PK and immunogenicity assessments were conducted at Weeks 40 and 52 (end of study). Secondary efficacy endpoints were assessed during TPII at Weeks 16 and 28, as well as at Weeks 40 and 52, and comprised absolute PASI scores; mean per cent improvement in PASI score from baseline; proportions of patients achieving improvements in PASI score from baseline of

≥ 50%, ≥ 75%, ≥ 90% or ≥ 100% (PASI 50/75/90/100, respectively); proportions of patients who had sPGA scores of clear (0) or almost clear (1); and change in Dermatology Life Quality Index (DLQI) from baseline. Blood samples were collected predose for PK assessment at Weeks 16, 28, 40 and 52, to measure serum ustekinumab concentrations; evaluate immunogenicity at Weeks 16, 28, 40 and 52; and measure antibody development, which considered both antidrug antibodies (ADAs) and neutralising antibodies (NAbs). To assess safety, treatment-emergent adverse events (TEAEs) were evaluated throughout, as previously described [14]. TEAEs of special interest were infections/serious infections (including tuberculosis, sepsis and other opportunistic infections), injection-site reactions (ISRs), hypersensitivity reactions and malignancies.

2.4 | Statistical Analysis

Sample size calculations and statistical analyses for the primary efficacy endpoint were published previously [14]. Briefly, a total sample size of 446 patients was planned to account for an expected 10% dropout rate. Based on FDA assumptions, a minimum of 400 patients was required to achieve ≥ 90% statistical power to demonstrate equivalence in mean PASI score improvement at Week 12, using a ±10% equivalence margin and a 90% confidence interval. In TPII, secondary efficacy, PK and safety endpoints were analysed in the modified intent-to-treat (mITT) set/full analysis set (FAS)—TPII subset, PK set—TPII subset and safety set—TPII subset, respectively. The mITT/safety set—TPII subsets included all patients who were randomised at Week 16 and subsequently received ≥ 1 full or partial study medication dose. The FAS/PK—TPII subsets included all patients who received ≥ 1 full study medication dose on or after Week 16 and, for the PK set—TPII subset, patients with ≥ 1 post-treatment PK measurement above the lower limit of quantification were included. Statistical analyses were performed using Statistical Analysis System (SAS) software (SAS Institute Inc., Cary, NC, USA) Version 9.4.

3 | Results

3.1 | Patient Disposition

The first randomisation of a study patient was on 11 January 2021, and the final Week 52 visit was on 12 May 2022. In total, 502 patients were assigned to receive study medication during TPII (continued receiving CT-P43: 253; continued receiving reference ustekinumab: 125; and switched to CT-P43: 124) (Figure 1). In TPII, 15 patients discontinued study medication and 14 terminated the study, both most commonly owing to patient withdrawal. Comparable proportions of patients completed TPII across groups (continued receiving CT-P43: 94.5%; continued receiving reference ustekinumab: 97.6%; and switched to CT-P43: 98.4%).

Previously reported baseline demographics and disease characteristics were similar for all the TPII groups [14]. It was recommended that any patient not achieving PASI 50 at Week 12 or PASI 75 at Week 28 discontinue the study, to protect against potential harm in the absence of clinically meaningful benefit; no patients discontinued study medication owing to poor response.

3.2 | Efficacy

Absolute PASI scores were similar between groups and were maintained from Week 40 to 52 (PASI scores at Weeks 40 and 52: continued receiving CT-P43: 1.09 and 1.44; continued receiving reference ustekinumab: 1.51 and 1.33; and switched to CT-P43: 1.38 and 1.93) (Figure 2). Improvements in PASI scores previously reported at Week 12 [14] were maintained up to Week 52 and were comparable across all groups (Figure 3). At Weeks 40 and 52, more than three-quarters of patients achieved PASI 50/75/90 (Table 1). The proportion of patients achieving these endpoints was similar across groups (PASI 50/75/90 at Week 52: continued receiving CT-P43: 93.3%/89.3%/79.4%; continued receiving reference ustekinumab: 94.4%/92.8%/81.6%; and switched to CT-P43: 96.0%/89.5%/76.6%).

According to the study protocol, patients not achieving PASI 50 at Week 12 or PASI 75 at Week 28 were recommended to discontinue treatment; however, investigators exercised their medical judgement to continue treatment in all cases. At Week 12, 17 patients did not achieve PASI 50: 9 patients (3.5%) in the CT-P43 group and 8 patients (3.2%) in the reference ustekinumab group. At Week 28, 23 patients did not achieve PASI 75: 7 patients (2.8%) in the continuing CT-P43, 8 patients (6.4%) in the continuing reference ustekinumab and 8 patients (6.5%) in the switching to CT-P43 group. Of the 17 nonresponders at Week 12, 10 (5 [2.0%] in the continuing CT-P43, 3 [2.4%] in the continuing reference ustekinumab and 2 [1.6%] in the switching to CT-P43 group) achieved PASI 75 at Week 52 (end of study).

While all patients were required to have an sPGA score ≥ 3 (moderate/severe) at baseline, > 80% of patients had sPGA scores of 0/1 by Week 40, with similar improvements across all groups (Table 1). This improvement was maintained to Week 52, albeit with a slightly numerically smaller proportion of patients who switched to CT-P43 achieving sPGA scores of 0/1 vs. the other groups.

From baseline DLQI of 11.9–13.2 [14], DLQI decreased by a mean > 8 in all groups at Weeks 40 and 52. Most patients had a DLQI of 0/1 across all groups (Table 1).

3.3 | PK

Serum concentrations at Weeks 40 and 52 were generally similar across groups, including after switching to CT-P43 from reference ustekinumab (Table S1). In a *post hoc* analysis, improvements in PASI score during TPII were generally similar between groups for each quartile of serum concentration (Table S2). PASI scores tended to improve by increasing serum concentration quartile during the latter part of the study.

3.4 | Safety

During TPII and the follow-up period, the administered dose of study medication at each visit was similar among the groups, as was the total number of doses received. Across TPI and TPII combined, proportions of patients receiving five doses were also similar among the groups.

During TPII and the subsequent follow-up, proportions of patients experiencing ≥ 1 TEAE were comparable for those continuing reference ustekinumab and those switching to CT-P43 (Table 2). TEAEs that investigators considered to be study

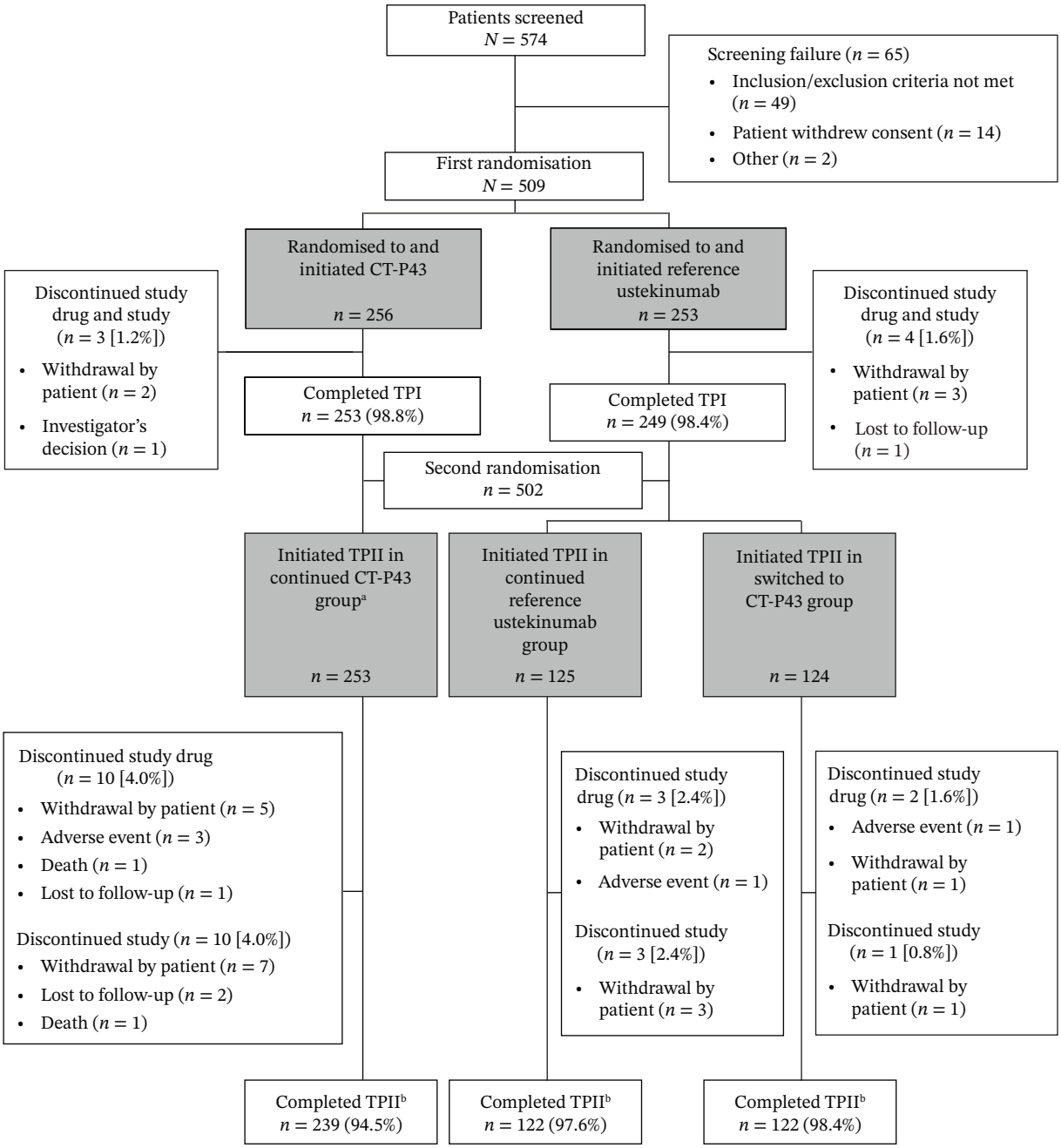

FIGURE 1 | Summary of patient disposition (intent-to-treat set).[a]One patient who received CT-P43 45 mg from Week 0 (with a baseline body weight of 97 kg) changed to 90 mg doses following the second randomisation at Week 16 (owing to a change in body weight to 111 kg). [b]Patients were counted as having completed the study if both study medication administration and the end-of-study visit were marked as complete in the electronic case report form. TPI/II, Treatment Period I/II.

medication related were reported in 34 (6.8%) patients overall (14 [5.5%], 8 [6.4%] and 12 [9.7%] in those continuing CT-P43, continuing reference ustekinumab and switching to CT-P43, respectively). TEAEs leading to study medication discontinuation were reported for 5 (2.0%) patients who continued receiving CT-P43 and 1 (0.8%) patient in each of the groups continuing reference ustekinumab and switching to CT-P43. Two TEAEs leading to both study medication and study discontinuation were considered study medication related by the investigators (headache in the group continuing CT-P43; hepatitis B DNA assay positive in the group continuing reference ustekinumab). One patient who continued receiving CT-P43 during TPII group died as a result of a myocardial infarction; the investigator did not consider this to be related to the study medication.

The majority of TEAEs during TPII and the follow-up period were grade 1/2 (mild/moderate, respectively) in intensity. Eleven (4.3%), seven (5.6%) and nine (7.3%) patients in the groups continuing CT-P43, continuing reference ustekinumab and switching to CT-P43, respectively, experienced grade ≥ 3 TEAEs (Table S3). COVID-19 was the most frequent TEAE across groups (continued receiving CT-P43: 13 [5.1%]; continued receiving reference ustekinumab: 11 [8.8%]; and switched to CT-P43: 7 [5.6%]; Table S4). Upper respiratory tract infection was reported

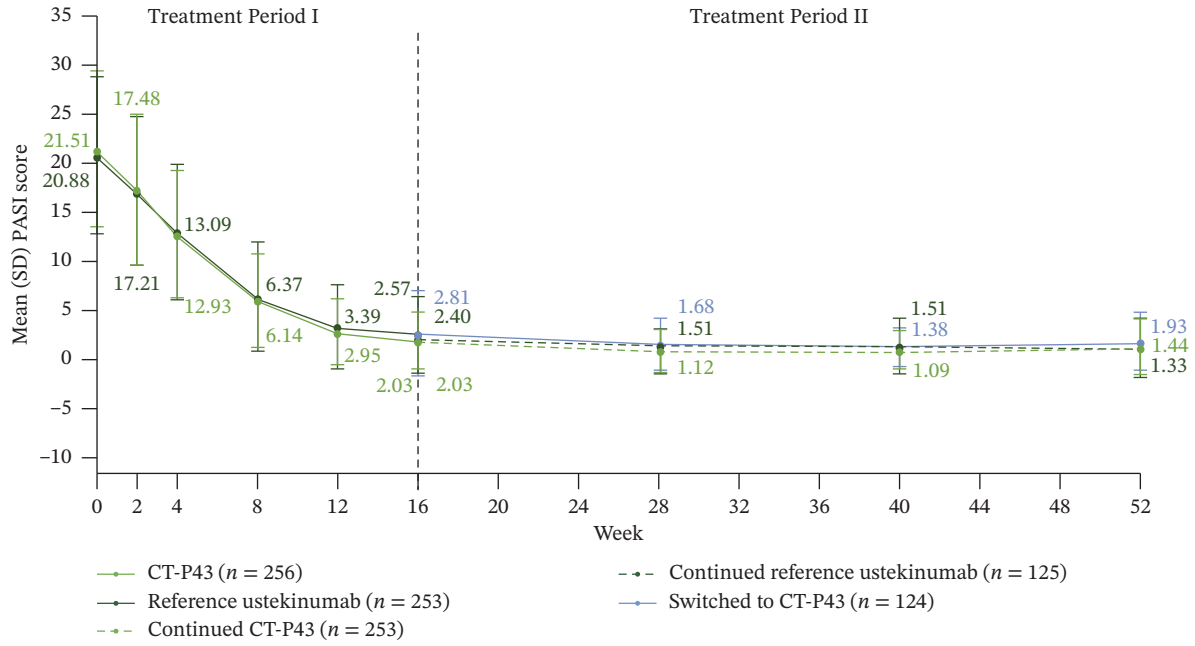

FIGURE 2 | Mean (SD) PASI scores from baseline until the end of study (mITT set/FAS and mITT set/FAS—TPII subset). FAS, full analysis set; mITT, modified intent-to-treat; PASI, Psoriasis Area and Severity Index; SD, standard deviation.

second most frequently overall (10 [4.0%], 4 [3.2%] and 7 [5.6%] patients, correspondingly). Latent tuberculosis was the third most common TEAE (7 [2.8%], 4 [3.2%] and 4 [3.2%]), due to positive interferon-γ release assay results following study protocol–mandated testing at Week 16. No active tuberculosis (including signs and symptoms) was reported.

For TEAEs of special interest, infections occurred at similar rates across groups, as did ISRs (Table 2). There was one case each of hypersensitivity reaction and malignancy (tubular breast carcinoma) in the group continuing CT-P43.

A total of 10 (2.0%) patients reported treatment-emergent serious adverse events (TESAEs), with proportions similar across groups (Table 2). Based on preferred terms, no TESAE was reported by > 1 patient. All TESAEs were considered unrelated to study medication, with the exception of one instance of grade 3 tubular breast carcinoma in a patient continuing CT-P43 (considered possibly related by the investigator). TESAEs considered unrelated to study medication were myocardial infarction, acute pancreatitis, tooth abscess and colon adenoma in the group continuing CT-P43; COVID-19, COVID-19 pneumonia and Guillain–Barré syndrome in the group continuing reference

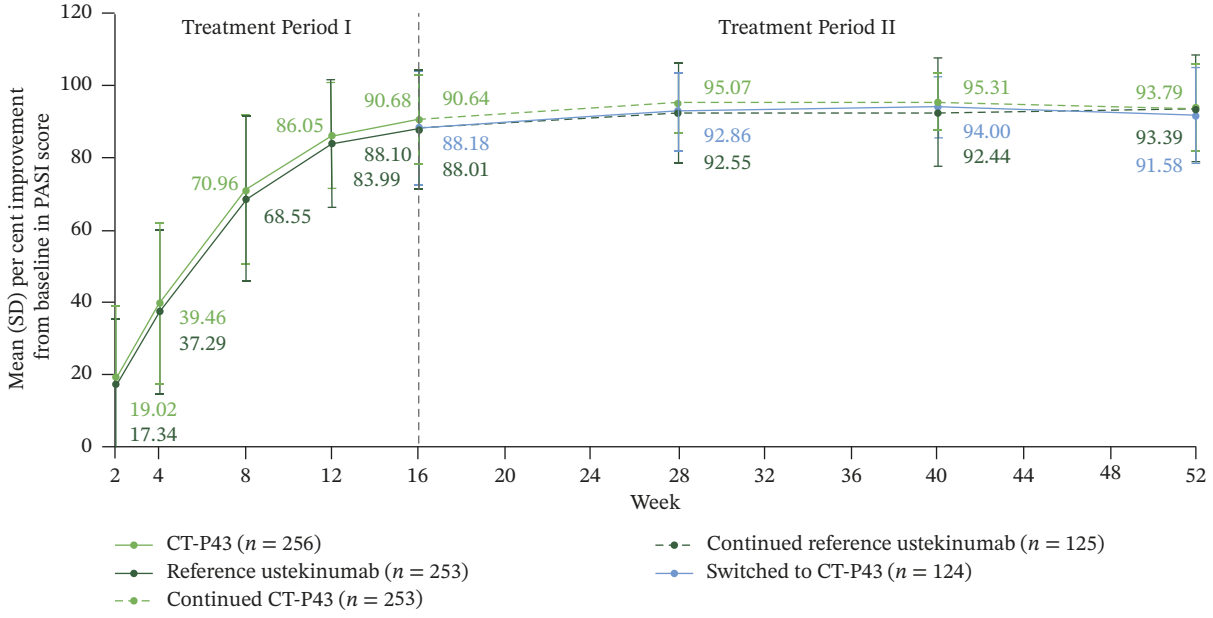

FIGURE 3 | Mean (SD) per cent improvement in PASI scores from baseline, through to the end of study (mITT set/FAS and mITT set/FAS—TPII subset). FAS, full analysis set; mITT, modified intent-to-treat; PASI, Psoriasis Area and Severity Index; SD, standard deviation.

TABLE 1 | Efficacy results at Weeks 40 and 52 for PASI response, sPGA scores and DLQI (mITT set/FAS—TPII subset).

	Continued CT-P43 ($n = 253$)	Continued reference ustekinumab ($n = 125$)	Switched to CT-P43 ($n = 124$)
Week 40			
PASI responders, *n* (%)			
PASI 50	246 (97.2)	120 (96.0)	123 (99.2)
PASI 75	238 (94.1)	116 (92.8)	119 (96.0)
PASI 90	202 (79.8)	95 (76.0)	102 (82.3)
PASI 100	125 (49.4)	53 (42.4)	46 (37.1)
Proportion of patients with clear (0) or almost clear (1) sPGA scores, *n* (%)	223 (88.1)	110 (88.0)	106 (85.5)
Change in DLQI from baseline			
n	246	124	123
Mean (SD)	−10.7 (7.05)	−8.6 (6.52)	−9.5 (6.64)
Proportion of patients with a DLQI of 0/1, *n* (%)	161 (63.6)	72 (57.6)	76 (61.3)
Week 52			
PASI responders, *n* (%)			
PASI 50	236 (93.3)	118 (94.4)	119 (96.0)
PASI 75	226 (89.3)	116 (92.8)	111 (89.5)
PASI 90	201 (79.4)	102 (81.6)	95 (76.6)
PASI 100	120 (47.4)	59 (47.2)	43 (34.7)
Proportion of patients with clear (0) or almost clear (1) sPGA scores, *n* (%)	215 (85.0)	110 (88.0)	96 (77.4)
Change in DLQI from baseline			
n	242	122	123
Mean (SD)	−10.5 (7.24)	−8.5 (7.17)	−9.2 (6.93)
Proportion of patients with a DLQI of 0/1, *n* (%)	150 (59.3)	67 (53.6)	78 (62.9)

Abbreviations: DLQI, Dermatology Life Quality Index; FAS, full analysis set; mITT, modified intent-to-treat; PASI, Psoriasis Area and Severity Index; PASI 50/75/90/100, Psoriasis Area and Severity Index 50/75/90/100% improvement from baseline; SD, standard deviation; sPGA, static Physician's Global Assessment; TPII, Treatment Period II.

TABLE 2 | Summary of TEAEs during TPII and the follow-up period (safety set—TPII subset).

	Continued CT-P43 ($n = 253$)	Continued reference ustekinumab ($n = 125$)	Switched to CT-P43 ($n = 124$)
Total number of TEAEs	143	83	100
Patients with ≥ 1 TEAE, *n* (%)	86 (34.0)	51 (40.8)	52 (41.9)
Related to study medication	14 (5.5)	8 (6.4)	12 (9.7)
Total number of TESAEs	5	3	2
Patients with ≥ 1 TESAE, *n* (%)	5 (2.0)	3 (2.4)	2 (1.6)
Related to study medication	1 (0.4)	0	0
Total number of TEAEs leading to study medication discontinuation	5	1	1
Patients with ≥ 1 TEAE leading to study medication discontinuation, *n* (%)	5 (2.0)	1 (0.8)	1 (0.8)
Related to study medication	1 (0.4)	1 (0.8)	0
Total number of TEAEs classified as infection	41	28	30
Patients with ≥ 1 TEAE classified as infection, *n* (%)	39 (15.4)	23 (18.4)	24 (19.4)
Related to study medication	7 (2.8)	5 (4.0)	5 (4.0)
Total number of TEAEs classified as injection-site reaction	1	0	2
Patients with ≥ 1 TEAE classified as injection-site reaction, *n* (%)	1 (0.4)	0	2 (1.6)
Related to study medication	0	0	2 (1.6)
Total number of TEAEs classified as hypersensitivity reaction	1	0	0
Patients with ≥ 1 TEAE classified as hypersensitivity reaction, *n* (%)	1 (0.4)	0	0
Related to study medication	1 (0.4)	0	0
Total number of TEAEs classified as malignancy	1	0	0
Patients with ≥ 1 TEAE classified as malignancy, *n* (%)	1 (0.4)	0	0
Related to study medication	1 (0.4)	0	0
Total number of TEAEs leading to death	1	0	0
Patients with ≥ 1 TEAE leading to death, *n* (%)	1 (0.4)	0	0
Related to study medication	0	0	0

Abbreviations: TEAE, treatment-emergent adverse event; TESAE, treatment-emergent serious adverse event; TPII, Treatment Period II.

ustekinumab; and nephrolithiasis and respiratory failure in the group switching to CT-P43.

With the exception of reductions in C-reactive protein, no notable differences were apparent in laboratory parameters in TPII to the end of study; all laboratory parameters, including C-reactive protein, were comparable across groups (data not shown). Most laboratory parameters had no grade, or were considered grade 1/2, as per the Common Terminology Criteria for Adverse Events. The most commonly reported grade ≥ 3 laboratory parameters during TPII and the follow-up period were neutrophil count decreased and hypertriglyceridaemia (4 and 3 patients, respectively; unrelated).

During the overall study period, the proportions of patients experiencing ≥ 1 TEAE were comparable between the CT-P43 and reference ustekinumab groups (137 [53.5%] and 140 [55.3%], respectively) (Table S5). The majority of TEAEs were grade 1/2 in intensity (53/60 [88.3%] related; 202/244 [82.8%] unrelated). Similar proportions of patients experienced grade ≥ 3 TEAEs across groups (Table S6). In all groups, the most frequently reported TEAE was COVID-19 (Table S7).

3.5 | Immunogenicity

During the overall study period, fewer patients in the CT-P43 vs. reference ustekinumab group had ADA-positive results (33 [12.9%] vs. 86 [34.0%]). After the single transition to CT-P43 from reference ustekinumab at Week 16, 27 (21.6%) and 25 (20.2%) of the patients continuing reference ustekinumab and switching to CT-P43, respectively, had ≥ 1 ADA-positive result until Week 52; 16 (12.8%) and 12 (9.7%) patients, respectively, also had ≥ 1 NAb-positive result (Table S8). Among patients with ADA-negative results before Week 16, similarly small proportions of those continuing reference ustekinumab and switching to CT-P43 had ADA-positive results (6 [6.8%] and 4 [4.7%], respectively) or NAb-positive results (7 [6.4%] and 3 [2.9%], respectively) during TPII.

Median ADA titres in TPII were generally similar between patients continuing CT-P43, continuing reference ustekinumab and switching to CT-P43 (Table 3). While mean ADA titres were consistently higher in those who continued receiving CT-P43, two such patients had exceptionally high ADA titres (≥ 21,870) from Week 12, possibly contributing to this finding. In a sensitivity analysis removing these outliers, the continued CT-P43 group no longer had consistently higher mean ADA titres than the other two groups (data not shown). These patients did not report any TEAEs related to immune response, including ISRs or hypersensitivity.

Ustekinumab serum concentrations for patients who were ADA positive were slightly lower than for those who were ADA negative, across treatment groups and regardless of dose (Table S9). There was a tendency for ustekinumab serum concentrations to be lower in high- vs. low-ADA titre subgroups, in a comparable manner across treatment groups and regardless of dose (data not shown).

Improvements from baseline in PASI scores in TPII were comparable between ADA-positive and ADA-negative subgroups in each group and similar across groups irrespective of ADA status (Table S10). There was no observed impact of ADA titre, with generally comparable results across treatment groups for all ADA titre subgroups (data not shown). There was no apparent relationship between the presence of ADAs and the occurrence of TEAEs, TESAEs, ISRs or hypersensitivity reactions (Table S11).

Post hoc analyses by NAb status appeared to show similar findings for PK, efficacy and safety as for ADA status, although small NAb-positive subgroup numbers limit data interpretation (data not shown). Serum concentrations were slightly lower in patients who were NAb positive than in those who were NAb negative, regardless of dose. PASI improvement was generally similar between NAb-positive and NAb-negative subgroups. There was no apparent relationship between presence of NAbs and TEAE occurrence.

4 | Discussion

Findings from TPII and the follow-up period support the comparability of CT-P43 and reference ustekinumab in patients with moderate-to-severe plaque psoriasis, for efficacy, PK, safety and immunogenicity, reinforcing efficacy equivalence previously demonstrated for the primary endpoint. Similar clinical outcomes were observed for patients continuing CT-P43 or reference ustekinumab throughout, or for those transitioning to CT-P43 from reference ustekinumab at Week 16, indicating that efficacy, PK (serum ustekinumab concentrations), safety and immunogenicity were not impacted by treatment switching.

Mean per cent improvement in PASI score from baseline was maintained up to Week 52; PASI score improvements and proportions of patients achieving PASI 50/75/90/100 at Week 52 were generally comparable among groups. Maintenance of PASI responses for up to 1 year aligns with long-term findings from studies with reference ustekinumab [19–24]. Some patients who did not initially respond at Week 12 showed improvement in PASI with continued treatment, suggesting that initial non-responders may show improvement with continued therapy. Proportions of patients reaching an sPGA score of 0/1 were generally similar between groups, and DLQI reductions from baseline and proportions of patients with DLQI of 0/1 in TPI were maintained across groups to Week 52. Importantly, during TPII, efficacy was maintained in patients switching to CT-P43 from reference ustekinumab, to a level comparable with continued CT-P43 or reference ustekinumab treatment. This aligns with findings for the licenced ustekinumab biosimilar AVT04 [22].

There were no notable differences in the incidence or nature of TEAEs between groups, and the safety profile for each group was in keeping with that established for reference ustekinumab [25, 26]. No notable or unexpected safety results were reported after patients switched to CT-P43 from reference ustekinumab. During TPII and the follow-up period, 189 (37.6%) patients experienced ≥ 1 TEAE, with comparable proportions of patients experiencing TEAEs across groups regardless of switching.

Proportionally fewer patients in the CT-P43 vs. reference ustekinumab group had ADA-positive results across the overall study period. A possible explanation for the lower incidence of ADA in the CT-P43 group is the absence of N-glycolylneuraminic acid (NGNA), likely due to the use of a Chinese hamster ovary cell line. In contrast, reference ustekinumab was produced using a murine Sp2/0 cell line, which can introduce NGNA, a potentially immunogenic nonhuman sialic acid. This may have contributed to increased ADA formation with reference ustekinumab, as similarly observed with other biosimilars [27].

TABLE 3 | Patients with ADA-positive status and ADA titres by TPII group (safety set).

	Continued CT-P43 ($n = 253$)	Continued reference ustekinumab ($n = 125$)	Switched to CT-P43 ($n = 124$)
Week 16			
ADA-positive, *n* (%)	26 (10.3)	27 (21.6)	34 (27.4)
Titre			
Mean (SD)	3773.1 (13,308.37)	803.3 (1929.30)	1450.6 (4020.33)
Median (IQR: Q1–Q3)	270.0 (90.0–810.0)	270.0 (30.0–270.0)	180.0 (30.0–810.0)
Week 28			
ADA-positive, *n* (%)	26 (10.3)	21 (16.8)	22 (17.7)
Titre			
Mean (SD)	23,946.9 (115,569.46)	10,678.6 (42,911.77)	2566.4 (6428.90)
Median (IQR: Q1–Q3)	270.0 (90.0–2430.0)	270.0 (90.0–270.0)	270.0 (90.0–810.0)
Week 40			
ADA-positive, *n* (%)	23 (9.1)	22 (17.6)	19 (15.3)
Titre			
Mean (SD)	26,270.9 (122,997.85)	9728.2 (41,842.58)	1302.6 (2669.50)
Median (IQR: Q1–Q3)	270.0 (90.0–810.0)	90.0 (90.0–270.0)	90.0 (90.0–270.0)
Week 52			
ADA-positive, *n* (%)	20 (7.9)	18 (14.4)	11 (8.9)
Titre			
Mean (SD)	266,223.0 (1,188,220.13)	4330.0 (15,390.71)	2457.3 (6475.63)
Median (IQR: Q1–Q3)	270.0 (180.0–810.0)	270.0 (90.0–270.0)	270.0 (90.0–810.0)

Abbreviations: ADA, antidrug antibody; IQR, interquartile range; Q, quartile; SD, standard deviation; TPII, Treatment Period II.

However, by Week 52, the proportions of patients who were ADA positive were similar in those who switched to CT-P43 and those receiving reference ustekinumab throughout—switching to CT-P43—did not lead to an increase in ADAs. Median ADA titres at Week 52 were similar between patients switching to CT-P43 and those remaining on reference ustekinumab. NAb results were also comparable across groups at Week 52. The impact of ADA incidence and titre on clinical outcomes was similar across groups; although antibodies to ustekinumab were associated with reduced serum concentrations, no significant impact on efficacy or safety was evident. In summary, these findings did not raise any immunogenicity concerns.

This study aimed to evaluate equivalence of CT-P43 to reference ustekinumab. It is important to conduct biosimilarity studies in sensitive analysis populations to detect potential differences from originator products [28, 29]. Given relatively large treatment effects observed in clinical studies evaluating reference ustekinumab treatment of adults with moderate-to-severe plaque psoriasis [19, 20], selecting this indication was a strength of the study. The single-switch design allowed investigation of potential clinical impacts of transitioning to CT-P43 from reference ustekinumab; however, multiple switches were not included.

As described previously [14], study limitations included being unable to blind staff administering study medication; however, they did not conduct study assessments. Given the study population, the generalisability of our results to patients with prior exposure to ≥ 2 biologics may require further investigation. Caution should be exercised when extrapolating our findings to patients with comorbidities or medical conditions other than those in the inclusion criteria. As with all research conducted in a controlled clinical trial setting, real-world variation, for example, in administration techniques or patient adherence, may impact the broader generalisability of our results.

The study coincided with the COVID-19 pandemic, necessitating several adjustments. Some changes in study visit schedules occurred, and a small number of patients missed visits; however, this did not significantly affect the observed clinical outcomes. Additionally, owing to war, 26 of 73 patients enrolled at sites in Ukraine (5.2% of all randomised patients [$N = 502$]) were unable to attend in-person end-of-study visits, instead completing efficacy and safety assessments via phone or video call, whereas 47 (9.4%) patients had in-person visits at Week 52. As the proportions of patients affected were balanced across groups, the impact on the results was considered minimal.

In conclusion, study results up to Week 52 provided further support for the comparability of efficacy, PK, safety and immunogenicity between CT-P43 and reference ustekinumab. Following a single transition to CT-P43 from reference ustekinumab at Week 16, similar efficacy results were observed relative to continued reference ustekinumab treatment, without notable safety or immunogenicity findings.

Author Contributions

Kim A. Papp contributed to the study design and data interpretation. Sunghyun Kim, Yunju Bae, Dabee Jeon, Jinsun Jung, Hyunseung Lee, Woori Ko and YeJin Kim contributed to the study design, data analysis and data interpretation. Janusz Jaworski, Bartlomiej Kwiek, Jakub Trefler, Anna Dudek, Jacek C. Szepietowski, Nataliya Reznichenko, Joanna Narbutt, Wojciech Baran, Joanna Kolinek, Stefan Daniluk, Katarzyna Bartnicka-Maslowska, Adam Reich and Yuriy Andrashko collected the data. Diamant Thaçi contributed to the study design. All authors reviewed the manuscript, provided approval of the final draft and agreed to be accountable for the accuracy and integrity of this article.

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Disclosure

All authors provided approval of the final draft.

Conflicts of Interest

Kim A. Papp has consulted for AbbVie, Acelyrin, Akros, Amgen, Arcutis, Bausch Health/Valeant, Boehringer Ingelheim, BMS, Can-Fite Biopharma, Celltrion, Dermavant, Dermira, Dice Pharmaceuticals, Eli Lilly, Evelo Biosciences, Forbion, Galderma, Incyte, Janssen, Kyowa Hakko Kirin, LEO Pharma, Meiji Seika Pharma, Mitsubishi Pharma, Novartis, Pfizer, Reistone, Sandoz, Sanofi-Aventis/Genzyme, Sun Pharma and UCB; has participated on speaker's bureau for AbbVie, Amgen, Bausch Health/Valeant, Eli Lilly, Galderma, Incyte, Janssen, Kyowa Hakko Kirin, Novartis and Sanofi-Aventis/Genzyme; has received investigator research grants from AbbVie, Acelyrin, Alumis, Amgen, Arcutis, Bausch Health/Valeant, BMS, Can-Fite Biopharma, Celltrion, Concert Pharmaceuticals, CorEvitas, Dermavant, Dermira, Dice Pharmaceuticals, Dice Therapeutics, Eli Lilly, Evelo Biosciences, Galderma, Horizon Therapeutics, Incyte, Janssen, Kymab, LEO Pharma, Meiji Seika Pharma, Nimbus Therapeutics, Novartis, Pfizer, Sanofi-Aventis/Genzyme, Sun Pharma, Takeda, Tarsus Pharmaceuticals, UCB and Zai Lab; has received honoraria from Dice Pharmaceuticals; has acted as a scientific officer for Akros, Arcutis, Can-Fite Biopharma, Dice Pharmaceuticals and Kyowa Hakko Kirin; has participated on steering committees for Can-Fite Biopharma, Novartis, Reistone and Sanofi-Aventis/Genzyme; and has participated on advisory boards for AbbVie, Amgen, Bausch Health/Valeant, BMS, Boehringer Ingelheim, Dermavant, Eli Lilly, Galderma, Incyte, Janssen, Novartis, Pfizer, Sandoz, Sanofi-Aventis/Genzyme, Sun Pharma and UCB. Bartlomiej Kwiek has received grants or contracts as a clinical study investigator for Almirall, Amgen, Arcutis Biotherapeutics, Aslan, BMSCelldex Therapeutics, Celltrion, Dermira, Galderma, Glenmark, Incyte, Janssen, LEO Pharma, Novartis, Pfizer, Regeneron and Samsung. Jacek C. Szepietowski has received consulting fees from AbbVie, LEO Pharma, Novartis, Pfizer, Sanofi-Genzyme, Trevi, UCB and Vifor; payment or honoraria for lectures, presentations, speaker's bureaus, manuscript writing or educational events from AbbVie, Almirall, Eli Lilly, Janssen, LEO Pharma, Novartis, Pfizer and Sanofi-Genzyme; support for conference participation from Novartis, Sanofi-Genzyme and UCB; other honoraria from Almirall, Amgen, AnaptysBio, BMS, Boehringer Ingelheim, Celltrion, Galapagos, Galderma, HELM, Incyte, InfraRx, Janssen, Kiniksa, LEO Pharma, MedImmune, Menlo, Merck, Novartis, Pfizer, Regeneron, Teva, Trevi and UCB; and is president of the Polish Dermatological Society. Adam Reich declares the role of Principal Investigator in clinical trials sponsored by AnaptysBio, Arcutis, Argenx, Celltrion, Drug Delivery Solutions, Eli Lilly, Galderma, Genentech, Incyte, InflaRx, Janssen, Kymab, LEO Pharma, Menlo, MetrioPharm, MSD, Novartis, Pfizer, Trevi, UCB and Viela Bio; and has received payment or honoraria as a speaker for AbbVie, Bausch Health, Bioderma, Celgene, Chema-Elektromet, Eli Lilly, Galderma, Janssen, LEO Pharma, medac, Novartis, Pfizer, Pierre Fabre, Sandoz and Trevi. Sunghyun Kim, Yunju Bae, Dabee Jeon, Jinsun

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Data Availability Statement

The data underlying this article will be shared upon reasonable request to the sponsor (Celltrion, Inc., 23, Academy-ro, Yeonsu-gu, Incheon, 22014, Republic of Korea; telephone number: +82 32 850 5000; email: contact@celltrion.com).

References

1. M. W. Teng, E. P. Bowman, J. J. McElwee, et al., "IL-12 and IL-23 Cytokines: From Discovery to Targeted Therapies for Immune-Mediated Inflammatory Diseases," *Nature Medicine* 21, no. 7 (2015): 719–729, https://doi.org/10.1038/nm.3895.

2. A. S. Chehad, N. Boutrid, and H. Rahmoune, "Ustekinumab in Dermatology: Approved Indications and Off-Label Uses," *Journal of Exploratory Research in Pharmacology* 8, no. 4 (2023): 323–341, https://doi.org/10.14218/jerp.2022.00044.

3. J. Barker, H. Baker, A. Nadeem, D. H. Gu, and G. Girolomoni, "Health Economic Assessment of Optimal Biological Treatment for Moderate-to-Severe Psoriasis," *Clinical Drug Investigation* 41, no. 11 (2021): 1011–1020, https://doi.org/10.1007/s40261-021-01089-4.

4. F. D'Amico, S. Bencardino, A. Gonçalves, et al., "Unlocking Hope: The Future of Ustekinumab Biosimilars in Crohn's Disease Treatment," *United European Gastroenterology Journal* 13, no. 2 (2025): 186–200.

5. H. Kim, R. Alten, L. Avedano, et al., "The Future of Biosimilars: Maximizing Benefits Across Immune-Mediated Inflammatory Diseases," *Drugs* 80, no. 2 (2020): 99–113, https://doi.org/10.1007/s40265-020-01256-5.

6. T. K. Kvien, K. Patel, and V. Strand, "The Cost Savings of Biosimilars Can Help Increase Patient Access and Lift the Financial Burden of Health Care Systems," *Seminars in Arthritis and Rheumatism* 52 (2022): 151939, https://doi.org/10.1016/j.semarthrit.2021.11.009.

7. T. K. Kvien, N. Betteridge, I. Brückmann, et al., "Beyond Cost: Observations on Clinical and Patient Benefits of Biosimilars in Real-World Settings," *BioDrugs* 39, no. 4 (2025): 537–553, https://doi.org/10.1007/s40259-025-00727-z.

8. S. Schreiber, L. Puig, J. Gonçalves, P. J. Mease, R. Panaccione, and P. Emery, "Critical Appraisal and Future Outlook on Anti-Inflammatory Biosimilar Use in Chronic Immune-Mediated Inflammatory Diseases," *Seminars in Arthritis and Rheumatism* 55 (2022): 152023, https://doi.org/10.1016/j.semarthrit.2022.152023.

9. H. A. Blair, "AVT04: An Ustekinumab Biosimilar," *Clinical Drug Investigation* 44, no. 7 (2024): 549–552, https://doi.org/10.1007/s40261-024-01375-x.

10. J. H. Cheon, B. Duk Ye, A. Armuzzi, et al., "The 'Totality of Evidence' and 'Extrapolation' of SB17, a Ustekinumab Biosimilar," *Expert Opinion on Biological Therapy* 25, no. 6 (2025): 615–632, https://doi.org/10.1080/14712598.2025.2508838.

11. I. N. Foltz, K. Gaida, H. Y. Wong, M. Ng, M. Busch, and J. L. Liu, "Assessing Functional Similarity of Biosimilar ABP 654 and Ustekinumab in Samples From Patients With Crohn's Disease," *Journal of Inflammation Research* 17 (2024): 10627–10640, https://doi.org/10.2147/jir.s478529.

12. Generics and Biosimilars Initiative, "Ustekinumab Biosimilars Yesintek, SteQeyma, and Otulfi Approved by FDA, EMA and Health Canada," (2025), https://www.gabionline.net/biosimilars/news/ustekinumab-biosimilars-yesintek-steqeyma-and-otulfi-approved-by-fda-ema-and-health-canada, Accessed 18 September 2025.

13. Ministry of Food and Drug Safety, "Steqeyma: Product Information," (2024), https://nedrug.mfds.go.kr/pbp/CCBBB01/getItemDetailCache?cacheSeq=202401434aupdateTs2025-01-22%2016:15:52.139b, Accessed 06 February 2025.

14. K. A. Papp, M. G. Lebwohl, D. Thaçi, et al., "Efficacy and Safety of Candidate Biosimilar CT-P43 Versus Originator Ustekinumab in Moderate to Severe Plaque Psoriasis: 28-Week Results of a Randomised, Active-Controlled, Double-Blind, Phase III Study," *BioDrugs* 38, no. 1 (2024): 121–131, https://doi.org/10.1007/s40259-023-00630-5.

15. European Medicines Agency, "Guidance on the Management of Clinical Trials During the COVID-19 (Coronavirus) Pandemic," (2022), https://health.ec.europa.eu/system/files/2022-02/guidanceclinicaltrials_covid19_en_1.pdf, Accessed 20 November 2023.

16. US Food and Drug Administration, "Conduct of Clinical Trials of Medical Products During the COVID-19 Public Health Emergency—Guidance for Industry, Investigators, and Institutional Review Boards," (2023), https://digirepo.nlm.nih.gov/master/borndig/9918351277706676/9918351277706676.pdf, Accessed 12 February 2024.

17. European Medicines Agency, "Points to Consider on the Impact of the War in Ukraine on Methodological Aspects of Ongoing Clinical Trials," (2022), https://www.ema.europa.eu/en/documents/scientific-guideline/points-consider-impact-war-ukraine-methodological-aspects-ongoing-clinical-trials_en.pdf, Accessed 20 November 2023.

18. C. Kurihara, F. P. Crawley, V. Baroutsou, et al., "The Continuation of Clinical Trials in Times of War: A Need to Develop Ethics and Situationally Adaptive Clinical Research Guidelines," *Frontiers of Medicine* 9 (2022): 966220, https://doi.org/10.3389/fmed.2022.966220.

19. C. L. Leonardi, A. B. Kimball, K. A. Papp, et al., "Efficacy and Safety of Ustekinumab, a Human Interleukin-12/23 Monoclonal Antibody, in Patients With Psoriasis: 76-Week Results From a Randomised, Double-Blind, Placebo-Controlled Trial (PHOENIX 1)," *Lancet* 371, no. 9625 (2008): 1665–1674, https://doi.org/10.1016/s0140-6736(08)60725-4.

20. K. A. Papp, R. G. Langley, M. Lebwohl, et al., "Efficacy and Safety of Ustekinumab, a Human Interleukin-12/23 Monoclonal Antibody, in Patients With Psoriasis: 52-Week Results From a Randomised, Double-Blind, Placebo-Controlled Trial (PHOENIX 2)," *Lancet* 371, no. 9625 (2008): 1675–1684, https://doi.org/10.1016/s0140-6736(08)60726-6.

21. A. Igarashi, T. Kato, M. Kato, M. Song, and H. Nakagawa, "Efficacy and Safety of Ustekinumab in Japanese Patients With Moderate-to-Severe Plaque-Type Psoriasis: Long-Term Results From a Phase 2/3 Clinical Trial," *Journal of Dermatology* 39, no. 3 (2012): 242–252, https://doi.org/10.1111/j.1346-8138.2011.01347.x.

22. S. R. Feldman, N. Reznichenko, F. Berti, et al., "Randomized, Double-Blind, Multicenter Study to Evaluate Efficacy, Safety, Tolerability, and Immunogenicity Between AVT04 and the Reference Product Ustekinumab in Patients With Moderate-to-Severe Chronic Plaque Psoriasis," *Expert Opinion on Biological Therapy* 23, no. 8 (2023): 759–771, https://doi.org/10.1080/14712598.2023.2235263.

23. C. Paul, C. E. M. Griffiths, P. C. M. van de Kerkhof, et al., "Ixekizumab Provides Superior Efficacy Compared With Ustekinumab Over 52 Weeks of Treatment: Results From IXORA-S, a Phase 3 Study," *Journal of the American Academy of Dermatology* 80, no. 1 (2019): 70–79.e73, https://doi.org/10.1016/j.jaad.2018.06.039.

24. A. Blauvelt, K. Reich, T. F. Tsai, et al., "Secukinumab is Superior to Ustekinumab in Clearing Skin of Subjects With Moderate-to-Severe Plaque Psoriasis Up to 1 Year: Results From the CLEAR Study," *Journal of the American Academy of Dermatology* 76, no. 1 (2017): 60–69.e69, https://doi.org/10.1016/j.jaad.2016.08.008.

25. European Medicines Agency, "Stelara: Summary of Product Characteristics," (2023), https://www.ema.europa.eu/en/documents/product-information/stelara-epar-product-information_en.pdf, Accessed 27 October 2023.

26. US Food and Drug Administration, "Stelara: Prescribing Information," (2023), https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/761044s009lbl.pdf, Accessed 28 October 2023.

27. V. Chow, D. T. Mytych, S. Das, and J. Franklin, "Pharmacokinetic Similarity of ABP 654, an Ustekinumab Biosimilar Candidate: Results From a Randomized, Double-Blind Study in Healthy Subjects," *Clinical Pharmacology in Drug Development* 12, no. 9 (2023): 863–873, https://doi.org/10.1002/cpdd.1301.

28. European Medicines Agency, "Guideline on Similar Biological Medicinal Products Containing Monoclonal Antibodies—Non-Clinical and Clinical Issues," (2012), https://www.ema.europa.eu/en/documents/scientific-guideline/guideline-similar-biological-medicinal-products-containing-monoclonal-antibodies-non-clinical_en.pdf, Accessed 30 October 2023.

29. US Food and Drug Administration, "Scientific Considerations in Demonstrating Biosimilarity to a Reference Product—Guidance for Industry," (2015), https://www.fda.gov/media/82647/download, Accessed 30 October 2023.

Supporting Information

Additional supporting information can be found online in the Supporting Information section. *(Supporting Information)*

Table S1: Serum ustekinumab concentrations (μg/mL) at Weeks 40 and 52 (PK set—TPII subset).

Table S2: Mean per cent improvement in PASI scores from baseline, by serum concentration (PK set—TPII subset).

Table S3: TEAEs of grade ≥ 3 intensity during TPII, by system organ class and preferred term (safety set—TPII subset).

Table S4: TEAEs reported for ≥ 3% of patients in any treatment group during TPII, by system organ class and preferred term (safety set—TPII subset).

Table S5: TEAEs during the overall study period, by TPI and TPII groups (safety set and safety set—TPII subset).

Table S6: TEAEs of grade ≥ 3 intensity during the overall study period, by system organ class and preferred term (safety set and safety set—TPII subset).

Table S7: TEAEs reported for ≥ 3% of patients in any treatment group during the overall study period, by system organ class and preferred term (safety set and safety set—TPII subset).

Table S8: Summary of immunogenicity findings at Weeks 40 and 52 by TPII group (safety set—TPII subset).

Table S9: Serum ustekinumab concentrations (μg/mL) in the TPII groups, by ADA status (PK set—TPII subset).

Table S10: Mean per cent change in PASI scores from baseline, in the TPII groups, by ADA status (mITT set/FAS—TPII subset).

Table S11: TEAEs during TPII, by ADA status (safety set—TPII subset).