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Personalized Management for EGFRI-Induced Skin Xerosis and Pruritus in NSCLC: A Randomized Trial of a Targeted Repair Balm versus an Emollient 'Plus'

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Abstract

Purpose

Dermatologic toxicities, specifically xerosis and pruritus, frequently complicate epidermal growth factor receptor inhibitor (EGFRI) therapy for non-small cell lung cancer (NSCLC), undermining quality of life and treatment adherence. Comparative evidence guiding topical management is lacking. This trial compared two topical regimens to evaluate a symptom-driven, personalized approach to supportive care.

Methods

In this randomized, evaluator-blinded trial, 130 NSCLC patients with EGFRI-induced xerosis were assigned to one of two 8-week regimens: Group A applied a targeted repair balm to a designated site plus a whole-body emollient 'plus' elsewhere, while Group B applied only the whole-body emollient 'plus' globally. Outcomes included objective skin parameters at a designated site, clinician-rated xerosis/pruritus (CTCAE v5.0), and patient-reported outcomes.

Results

Among 113 analyzed participants, both interventions significantly improved all objective parameters at the designated site (dermascope score, stratum corneum hydration, skin pH; all $P < 0.001$). Severe (Grade 3) xerosis decreased approximately three-fold in both groups. Itch intensity decreased markedly ($P < 0.001$). A key differential effect emerged: Group A reported significant reduction in itch duration ($P < 0.001$), an effect absent in Group B. Subgroup analysis suggested this pruritus-specific benefit was particularly evident in patients receiving third-generation EGFR-Protein Kinase Inhibitors (TKIs).

Conclusion

The whole-body emollient 'plus' effectively improves EGFRI-induced skin barrier parameters. The addition of the targeted repair balm alleviates localized pruritus, particularly reducing its duration, a finding especially relevant for patients on third-generation TKIs. These findings support a symptom-driven, personalized approach to supportive skin care during EGFRI therapy, which can improve patient comfort and promote treatment adherence.

Clinical trial registration

This study was registered with the Chinese Clinical Trial Registry (https://www.chictr.org.cn/) on Nov. 21st, 2023. The registration number was ChiCTR2300077833.The Public title was: A study to evaluate

the effectiveness and safety of efficacious skin care products in the amelioration of targeted drug-related adverse skin reactions in oncology patients.

Introduction

Epidermal growth factor receptor inhibitors (EGFRIs) represent a cornerstone therapy for advanced non-small cell lung cancer (NSCLC), offering substantial improvements on survival and quality of life [1, 2]. This therapeutic class, which includes tyrosine kinase inhibitors (TKIs) such as erlotinib, gefitinib and osimertinib, as well as monoclonal antibodies such as cetuximab and panitumumab, targets the EGFR, which is frequently dysregulated in cancer. However, this therapeutic benefit is frequently offset by dermatologic adverse events, affecting the vast majority of patients [3]. Among these, xerosis and pruritus are particularly common, with reported incidences of approximately 49% and 57%, respectively [4]. Although rarely life-threatening, these conditions cause substantial patient discomfort, psychosocial distress, and may compromise treatment adherence and dose intensity, potentially undermining oncological outcomes [5].

The pathogenesis of EGFRI-induced skin toxicity is multifaceted, arising from direct inhibition of EGFR signaling in keratinocytes. This disruption impairs epidermal proliferation, differentiation, and barrier function, leading to increased transepidermal water loss and skin fragility [6]. Subsequently, this compromised barrier often triggers an inflammatory cascade, characterized by the release of cytokines and chemokines that both perpetuate skin damage and directly activate sensory nerves to provoke pruritus [7–9]. Moreover, when the EGFR signaling pathway is inhibited, patients become susceptible to pathogenic bacteria, such as *Staphylococcus aureus*. The resulting inflammation further inhibits epidermal differentiation and exacerbates keratinocyte damage, leading to eczema-like skin reactions [10]. This pathophysiology suggests that effective management may need to address both barrier repair and inflammatory suppression.

Current clinical guidelines for managing EGFRI-induced xerosis and pruritus primarily recommend general supportive measures, including emollients, topical corticosteroids, and antibiotics [1, 2]. Although certain patient populations, including Asian populations, may exhibit heterogeneous clinical presentations that vary according to skin sensitivity and other confounding factors, there is a broad consensus in the clinical and research community that dermocosmetics should be utilized either as monotherapy or as adjuvant agents to enhance conventional medical treatments and minimize EGFRI-associated cutaneous adverse events [11]. Yet, a clear evidence gap exists: there is a lack of comparative data to guide the choice between different topical strategies, particularly those with distinct mechanistic rationales. Should therapy focus primarily on repairing the epidermal barrier disrupted by EGFR inhibition, or more directly target the subsequent inflammatory cascade that drives symptoms like pruritus?

To address this evidence gap and provide actionable guidance for clinical practice, we conducted a randomized controlled trial comparing two targeted topical therapeutic approaches: a localized targeted

repair balm formulated with anti-inflammatory and antipruritic components (panthenol, madecassoside, and tribioma), and a whole-body emollient 'plus' designed to restore the physical skin barrier and skin microbiome [12, 13]. We hypothesized that the targeted repair balm would demonstrate superior efficacy in alleviating pruritus, while the barrier-focused whole body emollient 'plus' would better improve overall skin hydration. The findings from this study aim to offer evidence-based, actionable recommendations for optimizing supportive skin care regimens, thereby enhancing the quality of life and treatment adherence among patients undergoing EGFRI therapy.

Methods

Study Design and Participants

This single-center, randomized, evaluator-blinded, controlled trial was conducted at the Department of Integrative Medicine Oncology, China-Japan Friendship Hospital, between November 2023 and January 2025. The study enrolled 130 patients with advanced NSCLC who were receiving EGFRI therapy (TKIs or monoclonal antibodies) and had developed clinically significant xerosis (CTCAE v5.0 grade ≥ 1). Eligible participants were randomized to one of two topical intervention groups.

Key inclusion criteria were: 1) histologically confirmed NSCLC; 2) active treatment with an EGFRI; 3) presence of EGFRI-associated xerosis (CTCAE v5.0 grade ≥ 1); 4) age 18–85 years; and 5) provision of written informed consent. Key exclusion criteria included: 1) severe bleeding diathesis or uncontrolled systemic infection; 2) known hypersensitivity to topical study agents; 3) severe comorbid conditions; 4) participation in another drug trial within 4 weeks; or 5) any condition that, in the investigator's judgment, could compromise safety or protocol compliance.

The study protocol was approved by the Ethics Committee of the China-Japan Friendship Hospital (Approval No. 2023-KY-192), conducted in accordance with the Declaration of Helsinki and registered with the Chinese Clinical Trial Registry (ChiCTR2300077833). All participants provided written informed consent.

Randomization and Interventions

Eligible participants were randomly assigned to either Group A or Group B using a standardized randomization protocol. Group A (Targeted Repair Balm arm) applied the targeted repair balm (containing panthenol, madecassoside, and tribioma) twice daily to a predefined evaluation area on the medial shank. This evaluation area was exclusively treated with the targeted repair balm throughout the study period. Participants in Group A were permitted to use the whole-body emollient 'plus' (containing shea butter, niacinamide, *Aqua Posae Filiformis*, and thermal spring water) on all other areas of dry skin, with the explicit exclusion of the predefined shank evaluation zone. Group B (Whole-Body Emollient 'Plus' arm) applied the whole-body emollient 'plus' twice daily to their entire body, including the predefined medial shank evaluation area.

All participants received standardized instructions on the frequency and amount of product application. Adherence was monitored through participant diaries and product weights returned at each visit. Outcome assessors responsible for all objective and clinician-reported measurements were blinded to group allocation.

Outcome Assessments

Assessments were conducted at baseline (week 0) and at weeks 2, 4, 6, and 8. The assessments included objective skin measurements, clinician-reported outcomes and patient-reported outcomes. Firstly, objective skin parameters were measured at the medial shank using a DermaLab Combo device, including stratum corneum hydration (WCSC) and skin pH. Xerosis severity was additionally assessed via a standardized dermascope scores. The evaluation site for all objective measures was the predefined medial shank. Secondly, clinician-reported xerosis and pruritus severity were graded according to the Common Terminology Criteria for Adverse Events Version 5.0 (CTCAE 5.0). Finally, patient-reported outcomes included the Dermatology Life Quality Index (DLQI), individual-rated numerical score for itch intensity, a categorical scale for itch duration, and a 5-point Likert scale assessing satisfaction with xerosis and pruritus relief at week 8. Outcome assessors collecting objective and clinician-reported data were blinded to group allocation.

Statistical Analysis

Missing data were handled using Multiple Imputation by Chained Equations (MICE). A sensitivity analysis was performed by repeating the primary analyses on the complete dataset without imputation to verify the robustness of the findings.

Continuous variables are presented as mean ± standard error, and categorical variables as frequencies or percentages. Normality was assessed using the Shapiro-Wilk test. Between-group comparisons used ANOVA/chi-square test for parametric data and Mann-Whitney U/Kruskal-Wallis tests for non-parametric data. Within-group changes for non-parametric data were analyzed with the Wilcoxon signed-rank test. Longitudinal repeated-measures data were analyzed using linear mixed-effects models. Correlations were assessed using Spearman's rank correlation.

All analyses were performed in R (version 4.3.0). A two-sided P-value < 0.05 was considered statistically significant. Subgroup analyses were exploratory, and corresponding P-values were not adjusted for multiple comparisons and should be interpreted with caution.

Results

Participant Flow and Baseline Characteristics

Of the 130 patients enrolled, 113 completed the study and were included in the analysis (Fig. 1). During the trial, 16 participants withdrew consent due to personal reasons and one patient died from cancer progression, an event determined unrelated to the study interventions. All 113 analyzed participants presented with xerosis at baseline, and 88% (99/113) reported concomitant pruritus at baseline. Demographic and clinical characteristics were comparable between Group A and Group B, with no significant differences in age, sex, objective skin measurements, clinician-rated scores, or patient-reported outcomes (Table 1). Patients were categorized by their specific EGFRI medication: third-generation TKIs (n = 70), first- or second-generation TKIs (n = 24), or monoclonal antibodies (n = 19). While baseline dermascope scores differed by medication categories (*P* = 0.01) (**Table S1**), these categories were balanced between the two intervention groups (Table 1).

Table 1
The characteristics of the study population at baseline and week8.

	GroupA (n = 60)	**GroupB (n = 53)**	***P*-value**
Baseline (week0)			
Age (years)	62.4 (11.3)	63.5 (10.8)	0.67
Sex			
Men	15 (25%)	20 (38%)	0.16
Women	45 (75%)	33 (62%)	
Medication Type			
Third-generation TKIs	40 (67%)	30 (56%)	0.53
First/Second-generation TKIs	11 (18%)	13 (25%)	
Monoclonal Antibodies	9 (15%)	10 (19%)	
Dermascope Score	5.3 (2.8)	4.7 (3.1)	0.15
WCSC (microSiemens)	26 (20)	33 (38)	0.48
pH	5.56 (0.60)	5.31 (0.53)	0.05
Xerosis Grade (CTCAE V5.0)			
Grade 1	1 (2%)	1 (2%)	0.48
Grade 2	15 (25%)	19 (36%)	
Grade 3	44 (73%)	33 (62%)	
Pruritus Grade(CTCAE V5.0)			
Grade 0	3 (6%)	5 (11%)	0.54
Grade 1	9 (17%)	8 (18%)	
Grade 2	24 (44%)	22 (49%)	
Grade 3	18 (33%)	10 (22%)	
DLQI	3.2 (5.7)	4.0 (6.0)	0.48
Itch Intensity score	5.8 (2.8)	5.4 (2.8)	0.46
Itch Duration score			

Data are presented as mean (standard deviation) except for qualitative variables, which were expressed as n (%). TKIs: Tyrosine Kinase Inhibitors; WCSC: Water Content Stratum Corneum; DLQI: Dermatology Life Quality Index.

	GroupA (n = 60)	GroupB (n = 53)	*P*-value
Baseline (week0)			
Grade 0	3 (6%)	6 (13%)	0.42
Grade 1	28 (52%)	25 (56%)	
Grade 2	14 (26%)	7 (16%)	
Grade 3	9 (17%)	7 (16%)	
Last follow-up (week8)			
Dermascope Score	1.8 (2.6)	1.6 (1.6)	0.79
WCSC (microSiemens)	44 (30)	69 (66)	0.07
pH	5.35 (0.55)	5.06 (0.53)	< 0.01
Xerosis Grade (CTCAE V5.0)			
Grade 1	15 (25%)	24 (45%)	0.07
Grade 2	30 (50%)	18 (34%)	
Grade 3	15 (25%)	11 (21%)	
Pruritus Grade (CTCAE V5.0)			
Grade 0	12 (22%)	7 (16%)	0.32
Grade 1	22 (41%)	24 (54%)	
Grade 2	11 (20%)	11 (24%)	
Grade 3	9 (17%)	3 (7%)	
DLQI	2.0 (4.0)	1.8 (3.1)	0.97
Itch Intensity Score	2.8 (2.7)	2.7 (2.4)	0.92
Itch Duration Score			
Grade 0	14 (26%)	7 (16%)	0.22
Grade 1	32 (59%)	29 (64%)	
Grade 2	3 (6%)	7 (16%)	
Grade 3	5 (9%)	2 (4%)	

Data are presented as mean (standard deviation) except for qualitative variables, which were expressed as n (%). TKIs: Tyrosine Kinase Inhibitors; WCSC: Water Content Stratum Corneum; DLQI: Dermatology Life Quality Index.

	GroupA (n = 60)	GroupB (n = 53)	*P*-value
Baseline (week0)			
Xerosis Grade Change			
Grade change = 0	26 (43%)	19 (36%)	0.74
Grade change = 1	22 (37%)	21 (40%)	
Grade change = 2	12 (20%)	13 (25%)	
Pruritus Grade Change			
Grade change = 0	22 (41%)	21 (47%)	0.79
Grade change = 1	18 (33%)	15 (33%)	
Grade change = 2	14 (26%)	9 (20%)	

Data are presented as mean (standard deviation) except for qualitative variables, which were expressed as n (%). TKIs: Tyrosine Kinase Inhibitors; WCSC: Water Content Stratum Corneum; DLQI: Dermatology Life Quality Index.

Objective Skin Parameters Improved with Both Interventions

All objective skin measurements were performed at the predefined evaluation site on the medial shank. Both topical regimens resulted in significant, time-dependent improvement in objective skin parameters over 8 weeks (Fig. 2), with no statistically significant differences observed between groups.

Dermascope-assessed xerosis severity decreased significantly from baseline to weeks 2,4,6 and 8 (all $P < 0.001$; Fig. 2A and 2E), while WCSC increased progressively overtime (all $P < 0.001$; Fig. 2B), confirming enhanced skin hydration. A statistically significant positive correlation was observed between improvement in dermascope scores and increased hydration (Spearman's $\rho = 0.22$, $P = 0.03$; **Fig. S1C**). Reductions in skin pH were also observed in both groups over the study period (baseline vs. Weeks 2, 4, and 8; all $P < 0.05$; Fig. 2C). Linear mixed-effects models further confirmed significant temporal effects for all evaluated objective skin parameters (**Table S2**).

Clinician-Rated and Patient-Reported Symptom Relief

Clinician assessments (CTCAE v5.0) mirrored the objective improvements. The proportion of patients with Grade 3 xerosis decreased approximately threefold in both groups (Group A: 73% to 25%; Group B: 62% to 21%; Fig. 3A), with a corresponding increase in patients with mild (Grade 1) symptoms. For pruritus, Grade 3 symptoms decreased by twofold in Group A (33% to 17%) and threefold in Group B (22% to 7%; Fig. 3B). A clinically meaningful improvement, defined as ≥ 1-CTCAE grade reduction, was

achieved by 57% of Group A and 65% of Group B for xerosis, and by 59% of Group A and 53% of Group B for pruritus. Among patients with both symptoms at baseline, 79% improved in at least one parameter.

Patient-reported outcomes confirmed these benefits. Itch intensity scores decreased significantly in both groups at all timepoints (all $P < 0.001$; Fig. 2D; **Table S2**). Notably, Group A (targeted repair balm+whole body emollient 'plus') demonstrated a significant shift toward shorter itch duration ($P < 0.001$), a change not observed in Group B (Fig. 3E). At week 8, approximately 70% of patients in both groups reported high satisfaction (Likert score ≥ 4; Fig. 3F) with relief of xerosis or pruritus, and satisfaction scores for the two symptoms relief were correlated ($\rho = 0.47$, $P < 0.001$; **Fig. S1C**).

Correlation Analysis Validate Assessment Methods

Correlation analyses supported the validity of the assessment tools (**Fig. S1**). At baseline, clinician-rated xerosis and pruritus were correlated with each other ($\rho = 0.38$, $P < 0.001$) and with objective measures (e.g., higher pH and lower hydration were associated with worse symptoms). Clinician-rated pruritus showed strong correlation with patient-reported itch intensity ($\rho = 0.72$, $P < 0.001$) and duration ($\rho = 0.65$, $P < 0.001$). Improvements in week 8 outcomes (e.g., improvements in clinician-rated outcomes, reduced dermascope score, increased hydration, lower pH) were internally consistent (**Fig. S1C**).

Subgroup Analyses Reveal Differential Pruritus Benefit

Subgroup analyses stratified by age (≤ 67 vs. >67 years), gender, and baseline xerosis severity (Grade 2 vs. 3) demonstrated broadly consistent treatment effects (**Tables S3-S5;** Fig. 4, S2, S3). The clinical benefit was most pronounced in patients with severe (Grade 3) baseline xerosis, as well as in male and older patients.

Given the baseline differences in xerosis severity across medication categories, we further analyzed the largest subgroup: patients receiving third-generation TKIs (n = 70). Both interventions improved objective parameters and xerosis grades (Fig. 3C; **Table S6**, **S7**). However, pruritus-specific outcomes favored Group A (targeted repair balm+whole body emollient 'plus'). In this subgroup, Group A showed significant improvement in clinician-rated pruritus grades and patient-reported itch duration, while Group B did not (Fig. 3D and 3G). Consequently, patient satisfaction with pruritus relief was higher in Group A (74% vs. 56% reporting high satisfaction; Fig. 3H).

Sensitivity Analysis

A sensitivity analysis was conducted by repeating the primary analyses on the dataset without imputation. The results were virtually identical to those obtained from the imputed dataset, confirming the robustness of our findings (**Table S8** and **S9**).

Discussion

Our randomized controlled trial demonstrates that structured topical therapy is highly effective in managing EGFRI-induced xerosis and pruritus in patients with NSCLC. The central finding is that while both topical strategies produced significant improvements, they exhibited distinct efficacy profiles. At the predefined evaluation area where interventions were directly compared, both the target repair balm (Group A) and the whole-body emollient 'plus' (Group B) performed equally well in restoring objective skin parameters. However, at the patient level, where Group A used a combination of targeted balm plus whole-body emollient and Group B used the whole-body emollient alone, the combination strategy, conferred a unique advantage in alleviating the subjective burden of itch, particularly by shortening its duration.

This efficacy divergence aligns with the distinct mechanistic actions of the two formulations, each addressing a different facet of the dual pathophysiology of EGFRI-induced cutaneous toxicity. The whole-body emollient (Group B), containing shea butter and *Aqua Posae Filiformis*, functions as a barrier-centric therapy. Shea butter provides potent occlusion that reduces transepidermal water loss, while *Aqua Posae Filiformis* has been shown to restore a healthy skin microbiome, reinforce innate immune defenses, and reduce colonization by pro-inflammatory pathogens [14, 15]. This formulation directly counteracts the primary structural defect induced by EGFRIs—impaired keratinocyte function leading to a compromised epidermal integrity, aberrant corneocyte desquamation, and reduced sebum production—thereby explaining its strong efficacy in improving stratum corneum hydration [6].

In contrast, the targeted repair balm, containing panthenol and madecassoside, represents a more anti-inflammatory and neurosensory-focused approach. Panthenol, a precursor to pantothenic acid, functions as a humectant and possesses well-documented anti-inflammatory properties, promoting epidermal regeneration and reducing transepidermal water loss [9, 16, 17]. More critically, madecassoside, a triterpenoid from *Centella asiatica*, is a potent modulator of oxidative stress and inflammatory cascades [18]. Its documented activity against key pruritogenic cytokines and neurogenic inflammation may directly interrupt the itch-scratch cycle [19–21], providing a compelling mechanistic basis for the significant reduction in itch duration reported by patients in Group A, an effect not observed in Group B.

Our correlation analyses further elucidated the pathophysiology of EGFRI-induced xerosis. The dermoscopy score is defined as the summation of five distinct cutaneous components: scaling, erythema, capillary prominence, ulceration, and crusting. Notably, the total dermoscopy score exhibited a strong positive correlation with inflammatory features, specifically erythema ($\rho = 0.83$, $P < 0.001$) and capillary prominence ($\rho = 0.74$, $P < 0.001$), whereas only a weak correlation was observed with scaling ($\rho = 0.27$, $P < 0.001$). This differential pattern indicates that the clinical manifestation of "dryness" in EGFRI-induced xerosis is predominantly driven by underlying inflammatory processes and microvascular alterations [10, 22]. Compared with clinician-derived grading systems, dermoscopy scores provide a more nuanced and objective evaluation by quantifying sub-clinical inflammatory features that are pathophysiologically fundamental to EGFRI-induced xerosis.

The interrelationships between skin-barrier parameters and clinical symptoms delineate a coherent pathophysiological model. Higher stratum corneum water content was associated with a more acidic skin pH, and both were correlated with less severe xerosis and pruritus. This is biologically plausible: an acidic "acid mantle" is essential for lipid-processing enzymes and regulated corneocyte desquamation, both fundamental to barrier integrity [23]. EGFRI-impaired keratinocyte function likely disrupts this acidification, leading to an elevated pH, diminished hydration (lower WCSC), and activation of pruritogenic proteases and cytokines [24, 25]. This creates a vicious cycle where barrier breakdown and inflammation perpetuate both objective signs of xerosis and subjective symptoms of pruritus. The strong correlations between clinician-rated pruritus and patient-reported itch intensity ($\rho = 0.72$) and duration ($\rho = 0.65$) further affirm the clinical relevance of this model and demonstrate that the assessed outcomes robustly capture patient's symptom.

The most immediate clinical implication of our findings is a pragmatic, symptom-driven approach to supportive care (Fig. 5). For predominant, generalized xerosis, a comprehensive barrier-focused emollient (as in Group B) should be recommended as foundational, whole-body therapy for all patients initiating EGFRIs. For intrusive, persistent pruritus, a targeted anti-inflammatory agent (as used in Group A) should be added to, or used in, specific areas to break the itch-scratch cycle. This stepped, combination approach is critical for proactive management, which can prevent dose reductions and non-adherence to life-prolonging EGFRI therapy [2, 5, 26]. Our exploratory analysis, showing a pronounced pruritus benefit with the combination strategy in patients receiving third-generation TKIs, underscores that this added benefit is clinically relevant in a major patient subgroup.

Several limitations of our study should be acknowledged. The single-center design and modest sample size may affect the generalizability. The distinct product formulations and application strategies made participant blinding impossible, potentially introducing expectation bias. Thus, while the site-specific comparison was controlled, the patient-level comparison reflects a pragmatic comparison of two management strategies (combination vs. emollient alone). Additionally, the 8-week follow-up period does not address long-term durability of benefits. Finally, the promising findings from our exploratory subgroup analyses require validation in larger, prospective, multi-center studies.

In conclusion, this randomized controlled trial provides high-quality evidence that structured topical management is effective against EGFRI-induced skin toxicity. The whole-body emollient ‘plus’ forms an effective foundation, normalizing barrier parameters. The addition of a targeted repair balm to this foundation provides significant added benefit for itch, particularly in patients on third-generation TKIs. These findings illuminate a practical path toward personalized supportive care within the evolving landscape of precision oncology and support a symptom-driven approach to improve patient comfort and treatment adherence.

Declarations

Author Contributions

Conceptualization: Yong Cui, Huijuan Cui, Zhong Shen, Xuejiao Song; Methodology: Xuejiao Song, Chengxu Li, Jingkai Xu, Xianbo Zuo; Investigation and Data Curation: Huijuan Cui, Xuejiao Song, Xiaojia Zhang, Jungang Yang, Xiaoli Ning, Lingfan Jiang, Ziyuan Tian, Jiahui Han, Zining Xu, Yuqi Gu, Yulei Shen, Chengxu Li; Formal analysis and Visualization: Xuejiao Song, Jingkai Xu, Xianbo Zuo; Writing-original draft: Xuejiao Song; Writing-review & editing: Shangwen Sun, Zhong Shen, Yijie Zheng, Claire Huguet, Delphine Kerob, Yong Cui; Resources: Shangwen Sun, Zhong Shen, Huijuan Cui, Yong Cui; Supervision and Project administration: Shangwen Sun, Zhong Shen, Chengxu Li, Yong Cui; Funding acquisition: Yong Cui.

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Conflict of Interest

All authors declare no conflicts of interest.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Clinical trial registration

This study was registered with the Chinese Clinical Trial Registry (https://www.chictr.org.cn/) on Nov. 21st, 2023. The registration number was ChiCTR2300077833.The Public title was: A study to evaluate the effectiveness and safety of efficacious skin care products in the amelioration of targeted drug-related adverse skin reactions in oncology patients.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the China-Japan Friendship Hospital (Approval No. 2023-KY-192) and conducted in accordance with the Declaration of Helsinki. Prior to any procedures, participants were provided with detailed information, including the study's purpose, procedures, potential risks and benefits, and the right to withdraw at any time. All participants had sufficient time to consider the information and ask questions. All participants provided written informed consent.

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Figures

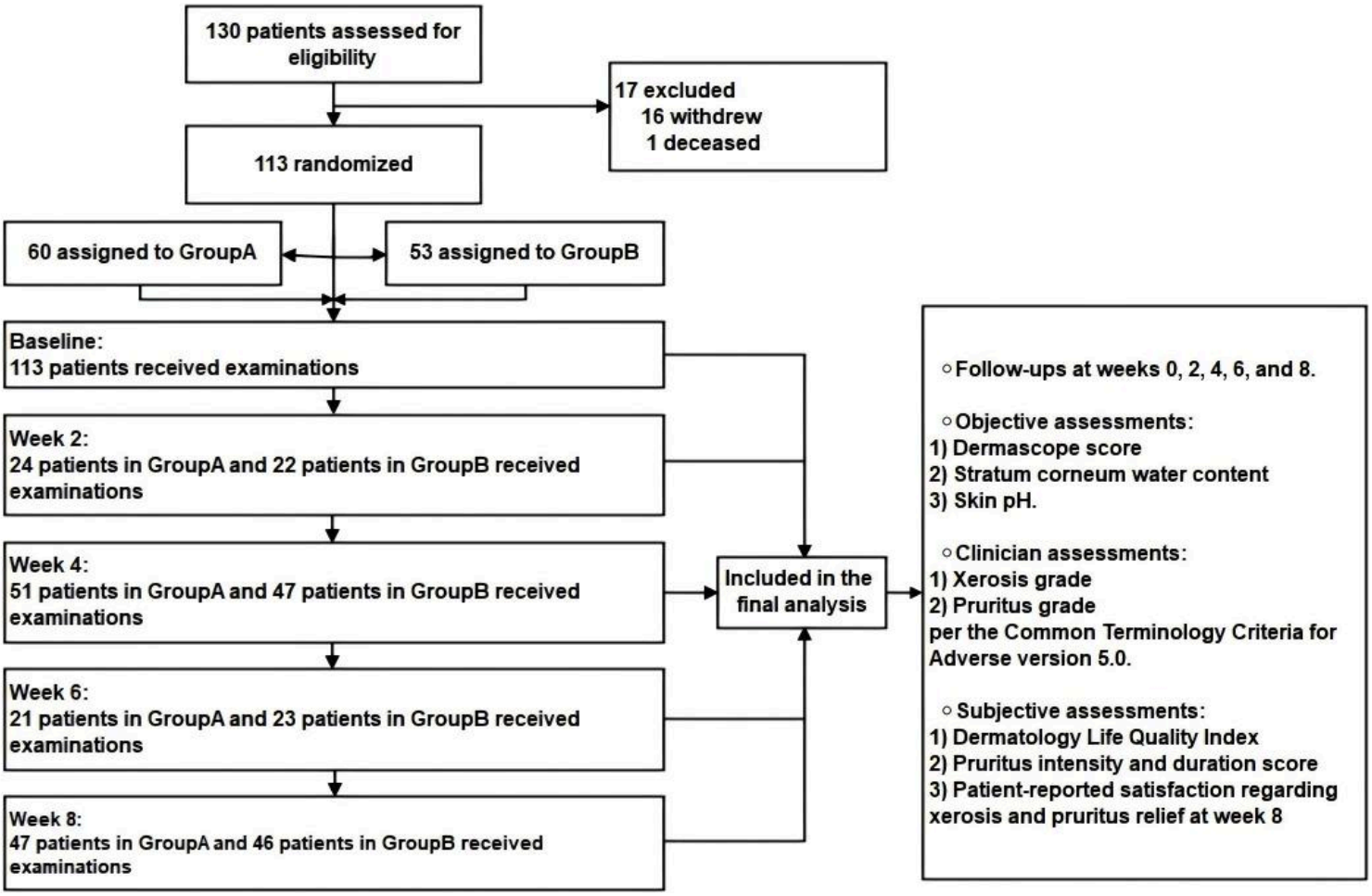


Figure 1

Study flowchart.

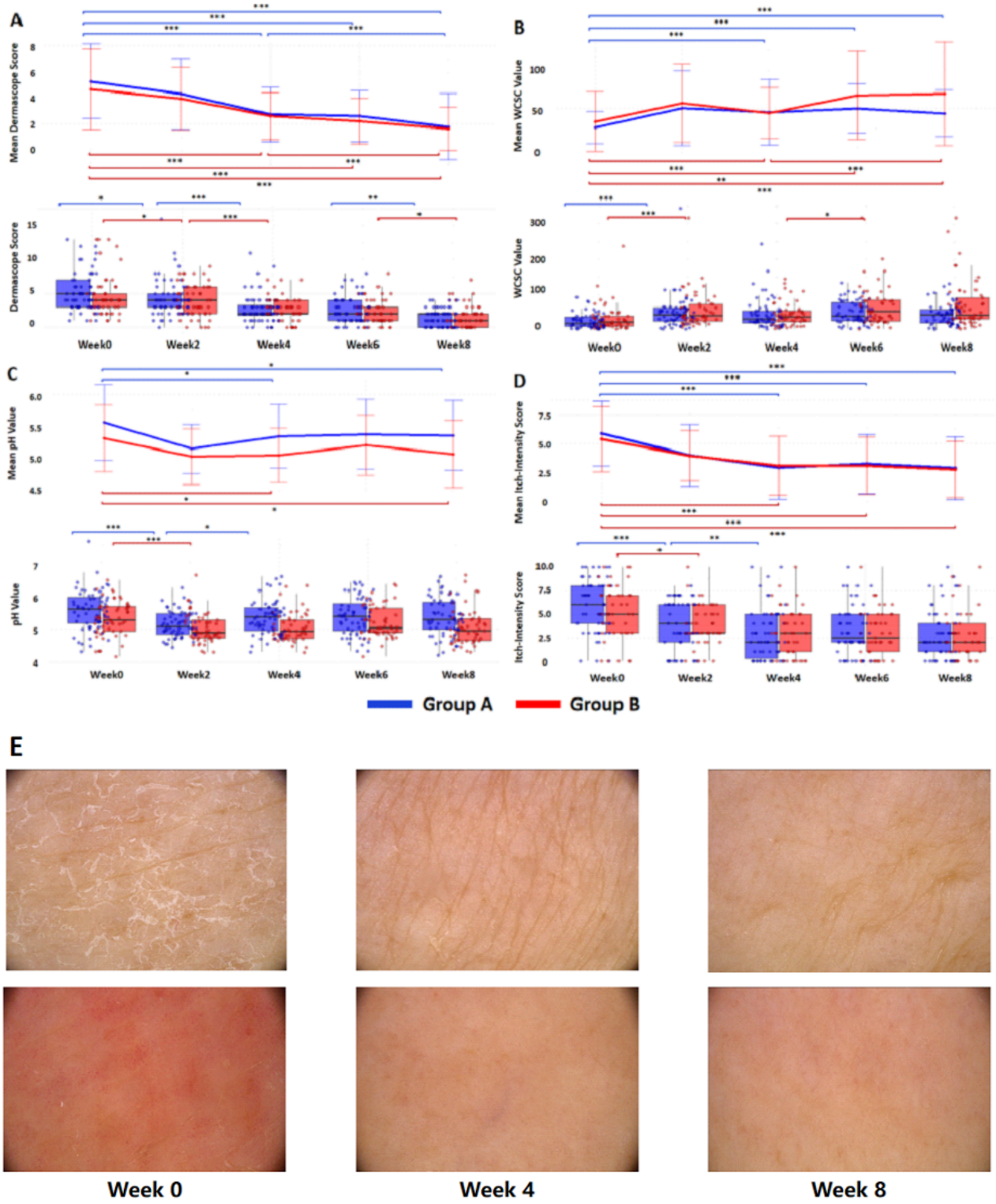


Figure 2

Longitudinal changes in objective skin parameters, patient-reported itch intensity, and dermoscopic examination of xerosis.

(A) Dermascopic xerosis severity score. (B) Stratum corneum water content (WCSC). (C) Skin pH. (D) Patient-reported itch intensity score. (E) Representative dermoscopic images under non-immersed

(upper panel) and immersed (lower panel) conditions at baseline, Week 4 and Week 8, showing fading erythema, reduced vascular prominence, and resolution of scaling.

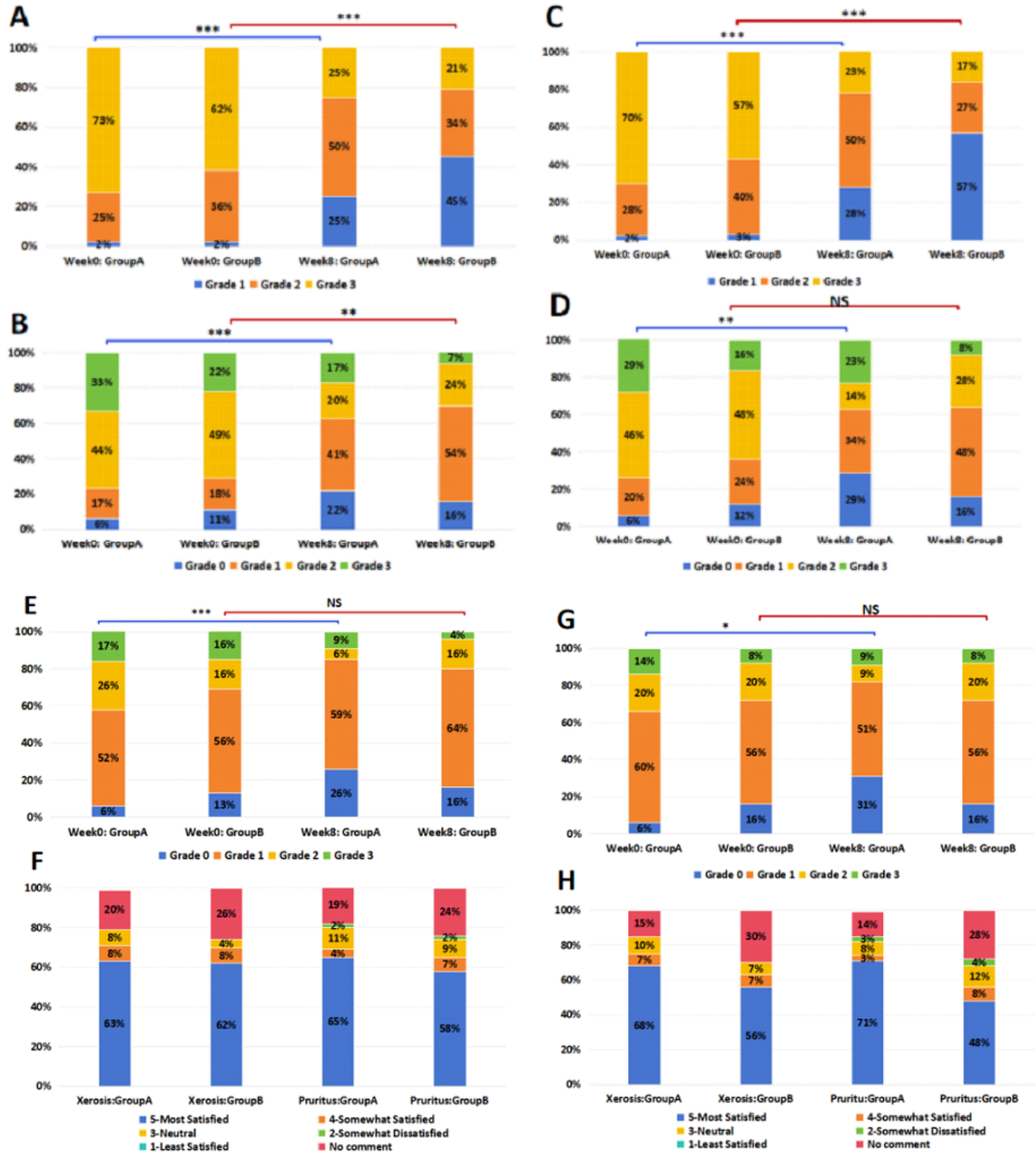


Figure 3

Distribution of clinician-rated xerosis and pruritus grades (CTCAE v5.0), patient-reported itch-duration grades and satisfaction scores for the overall study population and for the subgroup receiving

third-generation TKIs.

The distribution of clinician-rated xerosis (A) and pruritus grades (B) for the whole study population. The distribution of clinician-rated xerosis (C) and pruritus grades (D) for the subgroup receiving third-generation TKIs. The distribution of patient-rated itch-duration grade (E) and satisfaction score (F) of the whole study population. The distribution of patient-rated itch-duration grade (G) and the satisfaction score (H) of the subgroup treated with third-generation TKIs.

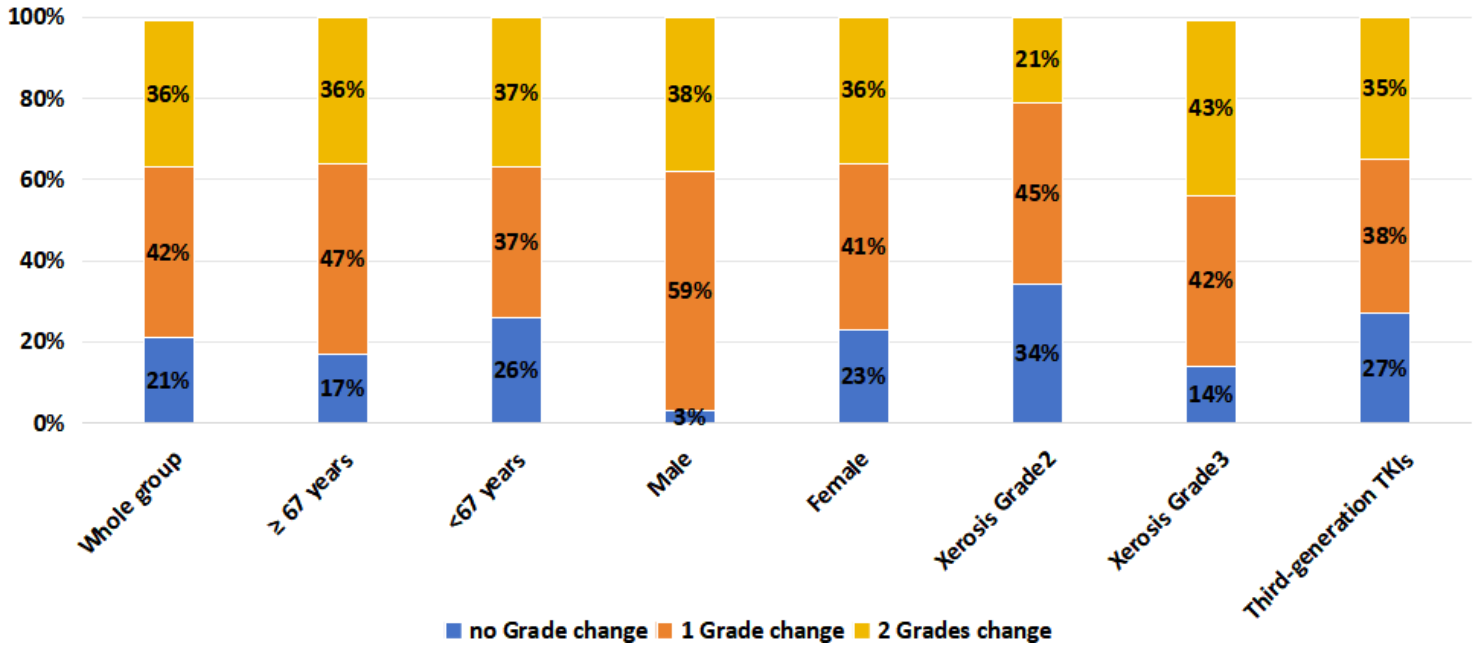


Figure 4

Treatment response based on changes in clinician-rated xerosis and pruritus grades from baseline to Week 8.

no Grade change: no improvement in either xerosis or pruritus grade; 1 Grade change: improvement of ≥1 grade in either xerosis or pruritus; 2 Grades change: improvement of ≥1 grade in both xerosis and pruritus.

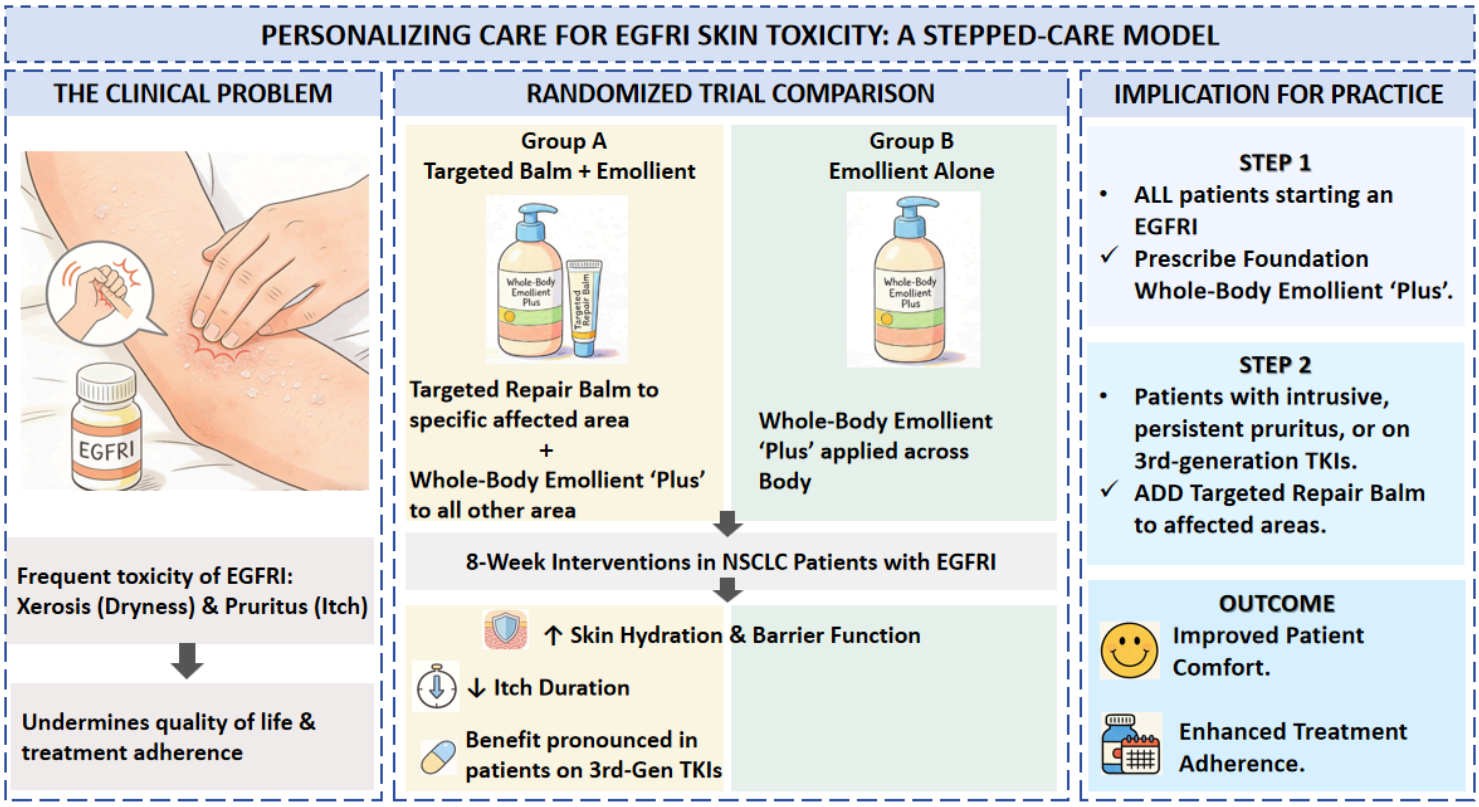


Figure 5

Graphical summary of this study.

Supplementary Files

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- 20260226SupplementaryFigures.pdf
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