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Received: 28 March 2022 | Revised: 11 July 2022 | Accepted: 15 July 2022

DOI: 10.1111/jocd.15249

JCD Journal of Cosmetic Dermatology WILEY

ORIGINAL ARTICLE

Efficacy and tolerability of a novel skin cream for improving periocular rhytids and dryness

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Funding information
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Abstract

Objective: A novel topical cream was developed to address the appearance of aging periorbital skin. The goal of this study was to evaluate the efficacy and tolerability of this product (Total Eye® Firm & Repair Cream; Colorescience, Inc., Carlsbad, CA) for improving periorbital wrinkles, dryness, laxity, and dark circles.

Methods: This 8-week open-label trial enrolled subjects 35–65 years old seeking periocular rejuvenation ($N = 25$; 22 female, 3 male). The product was applied each morning and evening after facial cleansing. Study endpoints were changes in Investigator Clinical Grading and Eye Appearance Assessments, Subject Self-assessment Questionnaires, and tolerability after 4 and 8 weeks of treatment.

Results: Among subjects completing the study ($n = 23$), all (100%) showed some global improvement at Weeks 4 and 8 and almost half (48%) achieved moderate or marked improvement. Improvements were observed for all parameters and were most pronounced for wrinkles, laxity, and dark circles. Improvements for laxity and dryness were significant by Week 4 and for dark circles by Week 8. At Week 8, subjects agreed or strongly agreed that the product made their eyes feel more hydrated (100%), look and feel healthier (95%), and increased confidence in their eye appearance (91%). The product was well-tolerated.

Limitations: Modest number of subjects and open-label study design.

Conclusion: Twice-daily Total Eye® Firm & Repair Cream improved the overall appearance of the periorbital area. The product was well-tolerated and most treated subjects were satisfied with their results. The product is a viable option for treating periorbital wrinkles and laxity and should be considered a safe and effective skincare option.

KEYWORDS
aging skin, clinical trial, periorbital rejuvenation, safety and tolerability

1 | INTRODUCTION

Unwanted changes in the appearance of our skin are an unavoidable part of aging. It is generally accepted that these changes are due to the effects of both intrinsic and extrinsic factors.[1] Intrinsic factors include age-related decreases in keratinocytes and fibroblasts with corresponding decreases in collagen and proteoglycan production, and increased expression of matrix metalloproteinases, which increases the production of damaging reactive oxygen species.[2] Extrinsic factors include ultraviolet radiation, smoking, and other environmental insults. These can also result in free-radical formation, mitochondrial dysfunction, and DNA damage affecting biological processes such protein synthesis.[3,4] Together, these factors cause pigmentary changes as well as structural changes to the

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extracellular matrix of the skin resulting in wrinkles, dryness, loss of elasticity, laxity, and rough texture.[5]

While aging affects skin in all anatomic areas, there are special concerns with skin of the periorbital areas, such as eyelid skin folds and lower lid bags. Additionally, as dynamic wrinkles result from repeated contracture of the periocular musculature,[6] the area around the eye is typically the first area to show signs of facial aging with the occurrence of so-called crow's feet.[7]

The psychosocial effects of aging skin have been reported to include social anxiety and isolation[8] and can substantially affect overall psychological well-being.[6] Consequently, a wide range of treatments have been developed for rejuvenating the periocular area. Upper eyelid ptosis can be corrected with blepharoplasty,[9] volume depletion may benefit from dermal fillers,[10] and the use of toxins can improve the appearance of wrinkles.[11] While these treatments have beneficial results, all are also associated with potentially undesired effects. Consequently, many patients are seeking non-invasive options[12,13] and a home-based therapy is highly desirable. Due to the prevalence of eye concerns and the large volume of available over-the-counter periorbital skin care options, it is important that products are backed by clinical studies that support their efficacy and safety.

A novel topical cream was developed to address the appearance of aging periorbital skin (Total Eye® 3-in-1 Renewal Therapy. Colorescience, Inc.). Formulated with chemical-free sunscreens[14] and active ingredients, this product provides immediate visible correction of periocular blemishes, protection against environmental insults, and ongoing skin rejuvenation with continued use. To assess its short- and long-term effectiveness, Total Eye was introduced to patients with concerns over their eye appearance ($N = 90$) by dermatologists during a variety of multicenter in-office dermatology visits (Unpublished Data on file. Colorescience®, Inc.). Patients applied the product twice-daily for 4 weeks. Digital images were obtained prior to initial product application, immediately following application of Total Eye, and after 4 weeks of use.

Prior to treatment, nearly all patients (92%) reported significant concerns about the appearance of their eyes with 86% feeling self-conscious about going out in public. Additional specific concerns included dark circles (86%), skin laxity (86%), puffiness (84%), skin dryness (81%), and crow's feet (80%). Most patients (92%) expressed concerns over more than one eye appearance issue with a mean of 3.5 concerns per patient.

Immediately after applying Total Eye, almost all patients (97%) reported the appearance of the eye area was improved their eyes looked more rested and youthful (95%), and they felt more confident (94%). After 4 weeks of use, 95% of patients reported improvements in eye concerns including dark circles (95%), skin laxity (93%), skin hydration (92%), puffiness (89%), and crow's feet (86%). Patients also reported their eyes looked and felt rejuvenated (97%) and nearly all patients wished to continue using Total Eye (97%).

Based on these encouraging but unpublished results, the objective of the following open-label study was to evaluate the efficacy and tolerability of a similar product (Total Eye® Firm & Repair Cream; Colorescience, Inc.) for improving periorbital wrinkles, dryness, laxity, and dark circles when applied twice-daily for 8 weeks.

2 | METHODS

2.1 | Subjects

Healthy male and female subjects, 35–65 years old, who were seeking periocular rejuvenation were enrolled. Specifically, subjects were seeking improvement of periocular wrinkles, dryness, dark circles, and skin laxity. Subjects agreed to forgo other aesthetic eye treatment including neuromodulators, dermal fillers, lasers, and other energy-based treatments, microneedling, and chemical peels during the duration of this study. Study exclusion criteria included the use of professional eye skin care products within the past 30 days; allergy or hypersensitivity to any ingredients in the test product; autoimmune disease; active milia and/or syringoma; active (flaring) skin disease such as atopic dermatitis, eczema or facial acne; periorbital plastic surgery or ablative laser resurfacing within the past year; any of the following eye treatments within the past 6 months: neuromodulators, dermal fillers, semi- or non-ablative lasers, or other energy-based device treatments such as high-frequency ultrasound, radiofrequency, or similar devices; microneedling, chemical peels or facials (use of these on the lower third of the face was acceptable); pregnancy, planned pregnancy, or nursing during the study.

2.2 | Test Product

The product had undergone prior dermatology and ophthalmology testing and was deemed hypoallergenic and safe for contact lens wearers and for use around the eyes, including eye lids and above the brow bone. The product ingredients are provided in Table 1.

2.3 | Procedure

Each morning and evening, subjects removed any eye makeup and washed the facial area with a bland non-active cleanser that did not contain alpha-hydroxy acid, beta-hydroxy acid, or any other active skin-care ingredient. Subjects were permitted to use professional or over-the-counter skin care products on other areas of their face but not to the periocular treatment area. Subjects applied 1/2 pump of the study product to the tips of their ring fingers, tapped both fingers together to evenly distribute the product, and applied three dots of the product to the lower eyelid area from the medial canthus to the lateral canthus and the upper eyelids, gently tapping the product to blend from the lash line to the eyebrow. Following product application, subjects were permitted to apply a sunscreen as directed by the investigator.

TABLE 1 Study product ingredients.[a]

Water/aqua, glycerin, glyceryl stearate, squalane, isopropyl isostearate, *Limnanthes alba* (meadowfoam) seed oil, polymethylsilsesquioxane, cetearyl alcohol, panthenol, caffeine, *Hippophae rhamnoides* fruit oil, *Albizia julibrissin* bark extract, sea water, ammonium acryloyldimethyltaurate/VP copolymer, acrylates/C10-30 alkyl acrylate crosspolymer, sorbitol, tocopheryl acetate, sodium hydroxide, ethylhexylglycerin, *Dunaliella salina* extract, betaine, *Asparagopsis armata* extract, sodium phytate, *Opuntia ficus-indica* stem extract, hydrolyzed algin, *Ascophyllum nodosum* extract, sodium hyaluronate, palmitoyl tripeptide-5, pantolactone, citric acid, *Tremella fuciformis* sporocarp extract, sucrose, *Jania rubens* extract, darutoside, tocopherol, phenoxyethanol, potassium sorbate, sodium benzoate.

[a]International Nomenclature of Cosmetic Ingredients (INCI).

Prior to subsequent clinic visits, subjects cleansed their faces and removed all makeup at least 30 min prior to arrival and refrained from any activities that could increase body temperature or induce sweating, such as drinking hot beverages, smoking, eating spicy food, or exercising at least 1 h prior to each visit. Subjects acclimated to ambient temperature and humidity conditions of the clinic for at least 15 min prior to any evaluation procedures. Digital images of each subject included two sets of left, right, and center views, one set with subject eyes opened and the other set with subject eye closed (VISIA®. Canfield, Inc.).

2.4 | Investigator assessments

The investigators graded the severity of periorbital wrinkles, hydration, firmness/laxity, and dark circles of each subject during the Baseline and Weeks 4 and 8 clinic visits using the Investigator Clinical Grading and Assessment (Table 2). For each subject, the investigators calculated a Global Improvement Score for eye areas at Weeks 4 and 8 based on one of the following possible scores: 0, worse; 1, no improvement; 2, mild (25%) overall improvement; 3, moderate (50%) improvement; or 4, marked (75%) overall improvement. The Investigator Eye Appearance Assessment rated changes in the appearance of the periorbital area was based on 11 eye appearance descriptors. Objective tolerability was clinically graded by the investigators which focused on the presence erythema, edema, dryness, and scaling (Table 3).

2.5 | Subject assessments

At Baseline and Weeks 4 and 8, each subject completed a Sponsor-provided self-assessment questionnaire regarding the following qualities using yes/no answers: lines, wrinkles, dark circles, skin dryness, crepey skin, skin laxity, and other concerns. Subjects were also queried about which of these eye concerns were most bothersome. The extent to which these symptoms bothered the respondents was assessed using a 3-point Likert scale items: Mildly Bothered, Somewhat Bothered, and Very Bothered. Self-consciousness regarding the appearance of the eye was also assessed using 3-point Likert scale items Mildly Self-conscious, Somewhat Self-conscious, or Very Self-conscious.

Subjects were also asked to respond with the 4-point Likert scale Strongly Agree, Agree, Disagree, or Strongly Disagree to 13 statements about the results of their twice-daily product use at Weeks 4 and 8. To determine treatment satisfaction, subjects were asked whether they would continue to use the study product and if they would recommend the product to others. Subjective tolerability was determined by subject reports of burning and stinging (Table 4).

TABLE 2 Investigator clinical grading assessments.

Wrinkles	0, None. No wrinkles at the treatment area
	1, Mild. Slight, but definite wrinkles at the treatment area
	2, Moderate. Definite wrinkles at the treatment area
	3, Severe. Marked wrinkles at the treatment area
Dryness	0, None. No dryness of the treatment area
	1, Mild. Slight, but definite dryness of the treatment area
	2, Moderate. Definite dryness of the treatment area
	3, Severe. Marked dryness of the treatment area
Laxity	0, None. No laxity at the treatment area
	1, Mild. Slight, but definite laxity at the treatment area
	2, Moderate. Definite laxity at the treatment area
	3, Severe. Marked laxity at the treatment area
Dark circles	0, None. No dark circles at the treatment area
	1, Mild. Slight, but definite dark circles at the treatment area
	2, Moderate. Definite dark circles at the treatment area
	3, Severe. Marked dark circles at the treatment area

2.6 | Statistical analysis

The median and interquartile range were used to summarize the findings. Friedman's analysis of variance was used to assess the effect of treatment on investigator and subject clinical grading. Post hoc pairwise comparisons were performed using Wilcoxon signed-rank test for paired data.

2.7 | Ethics

The protocol and related materials used in this study were approved by a commercial institutional review board (WCG IRB). Each subject provided informed consent prior to participating in any study-related

TABLE 3 Investigator tolerability assessments.

Erythema	0, none/No erythema of the treatment area
	1, Mild. Slight, but definite redness of the treatment area
	2, Moderate. Definite redness of the treatment area
	3, Severe. Marked redness of the treatment area
Edema	0, None. No edema/swelling of the treatment area
	1, Mild. Slight, but definite edema of the treatment area
	2, Moderate. Definite edema of the treatment area
	3, Severe. Marked edema of the treatment area
Dryness	0, None. No dryness of the treatment area
	1, Mild. Slight, but definite dryness of the treatment area
	2, Moderate. Definite dryness of the treatment area
	3, Severe. Marked dryness of the treatment area
Scaling	0, None. No scaling of the treatment area
	1, Mild. Barely perceptible, fine scales in limited areas of the treatment area
	2, Moderate. Fine scaling generalized to all areas of the treatment area
	3, Severe scaling and peeling of skin over all areas of the treatment area
Burning	0, None. No burning of the treatment area
	1, Mild. Slight burning sensation of the treatment area; not really bothersome
	2, Moderate. Definite warm, burning of the treatment area that is somewhat bothersome
	3, Severe. Hot burning sensation of the treatment area that causes definite discomfort and may interrupt daily activities and/or sleep
Stinging	0, None. No stinging of the treatment area
	1, Mild. Slight stinging sensation of the treatment area; not really bothersome
	2, Moderate. Definite stinging of the treatment area that is somewhat bothersome
	3, Severe. Marked stinging sensation of the treatment area that causes definite discomfort and may interrupt daily activities and/or sleep

activities conforming to Title 21 Code of Federal Regulations 50.25.[15] A photograph release was also obtained from each subject.

3 | RESULTS

Among enrolled subjects ($N = 25$), two did not complete the Week 8 assessment, one was lost to follow-up, and one was disqualified for noncompliance. The demographic and baseline characteristics of the enrolled subjects are shown in Table 5. The study was completed by 21 women and two men.

3.1 | Investigator assessment results

Investigator Global Rating Scale results for wrinkles, dryness, laxity, and dark circle severity are summarized in Table 6. Changes in the Global Rating Scale across clinic visits are summarized in Table 7. Improvements were seen in all parameters and were most pronounced for wrinkles, laxity, and dark circles, with laxity and dryness showing statistically significant improvement by Week 4 and continuing through Week 8, while improvement in dark circles reached statistical significance by Week 8.

Global Improvement Score Rating at Weeks 4 and 8 indicate almost half (48%) of subjects achieved moderate or marked overall improvement, and it is worth noting that all (100%) subjects showed at least some global improvement. There were no non-responders. The overall percent improvement further increased at Week 8 (26.1%), indicating ongoing treatment response.

The results of the Investigator Assessment of Eye Appearance are shown in Table 8. Improvements in the overall appearance of the periorbital area were demonstrated at Week 4 and further improvements noted in ten of the 12 parameters between Weeks 4 and 8, also demonstrating overall improvement in the overall appearance around the eye with continued use. Representative pre- and post-treatment images are shown in Figures 1–4.

3.2 | Subject Assessment Results

The results of the Subject Baseline Self-Assessment are summarized in Table 9. Responses to the questionnaire indicate loss of firmness (76%) and dark circles (68%) were the most reported concerns reported by respondents. Other concerns included lines (68%), wrinkles (60%), and crepey skin (40%). A similar pattern was observed for bothering symptoms. The most bothering symptoms were loose skin (48%) and dark circles (48%), followed by wrinkles (40%) and lines (28%). Other concerns reported by the respondents were bags ($n = 1$), upper eyelid skin starting to droop ($n = 1$) and puffiness ($n = 2$). Subject Self-Assessment results also revealed 36% of subjects were self-conscious about their eye appearance and 48% were somewhat bothered, 16% were very self-conscious and 20% were very bothered.

A significant correlation was observed between the degree of self-consciousness and how much the respondents are bothered by the symptoms ($r = 0.672$, $p < 0.001$). Most subjects (56%) reported looking older than their actual age and the same number (56%) reported always looking tired. Other reported comments were "I feel like I look tired if I do not wear any under-eye concealer," "I look older without makeup," "my eyelids are starting to droop and it makes me look old," "I feel I can look better," and "I purchased an eye cover-up to help with the dark circles."

Mean Subject Questionnaire Responses are shown in Table 10. The subject responses were based on a 4-point Likert scale of strongly agree, agree, disagree, and strongly disagree. Mean scores indicated numeric improvement in all response categories. At Week 8, the following proportion of subjects agreed or strongly agreed that the study product:

TABLE 4 Subject Tolerability and overall subject satisfaction.

	Week 4 $n = 25$	Week 8 $n = 22$
Mild burning sensation of the treatment area	1 (4.0%)	2 (9.1%)
Mild stinging sensation of treatment area	3 (12.0%)	2 (9.1%)
Moderate itching of the treatment area	1 (4.0%)	0
I would recommend the study product to others	—	20 (90.1%)
I will continue to use the study product	—	21 (95.5%)

TABLE 5 Demographics and baseline characteristics.

	n (%)
Mean age (SD), years	48.2 (8.43)
Gender	
Female	22 (88.0)
Male	3 (12.0)
Fitzpatrick skin type	
II	13 (52.0)
III	8 (32.0)
IV	2 (8)
V	2 (8)
Self-reported race/ethnicity	
African American	2 (8.0)
Asian	1 (4.0)
Caucasian	13 (52.0)
Hispanic/Latino	8 (32.0)
East Indian	1 (4.0)

TABLE 6 Investigator global assessment scale for wrinkles, dryness, laxity, and dark circles.

	None	Mild	Moderate	Severe
Wrinkles, %				
Baseline	0	48.0	36.0	16.0
Week 4	4.0	48.0	36.0	12.0
Week 8	8.7	56.5	21.7	3.0
Dryness, %				
Baseline	16.0	76.0	8.0	0
Week 4	72.0	24.0	4.0	0
Week 8	73.9	21.7	4.3	0
Laxity, %				
Baseline	0	36.0	48.0	16.0
Week 4	12.0	32.0	44.0	12.0
Week 8	13.0	34.8	39.1	13.0
Dark circles, %				
Baseline	4.0	32.0	48.0	16.0
Week 4	4.0	32.0	44.0	20.0
Week 8	8.7	43.5	39.1	8.7

- *"made my eyes feel more hydrated/less dry"* (100%)
- *"made my eyes look and feel healthier"* (95%)
- *"made me feel more confident about the overall appearance of my eyes"* (91%)
- *"improved the firmness in my upper eyelids"* (82%)
- *"made my eyes look refreshed and rejuvenated"* (82%)
- *"made my eyes look younger"* (77%)
- *"improved the overall appearance of my eye areas"* (77%)

Further, 82% of subjects who had concerns about firmness and laxity experienced improvement, including in the upper eyelids and 87% of subject who had concerns about lines and wrinkles agreed they experienced improvement. Nearly all subject (96%) indicated they would continue to use the product and 91% would recommend the product to others.

3.3 | Tolerability

Investigator Tolerability Assessments revealed no evidence of irritation or observable skin changes. Subject-reported adverse events and overall subject satisfaction are summarized in Table 10. Mild burning was reported at Weeks 4 ($n = 1$, 4.0%) and Week 8 ($n = 2$, 9.1%) and mild stinging sensation was reported in Week 4 ($n = 3$, 12%) and Week 8 ($n = 2$, 9.1%). One subject (4.0%) reported itching at Week 4. There were no reports of milia and no subjects withdrew from the study due to tolerability.

4 | DISCUSSION

Based on the encouraging results of a previous unpublished study, the objective of this open-label study was to evaluate the efficacy and tolerability of a rejuvenating skin cream for improving periorbital wrinkles, dryness, laxity, and dark circles when applied twice-daily for 8 weeks.

The Total Eye® Firm & Repair Cream formulation was intended to provide several benefits targeting the visible signs of aging including skin laxity, the appearance of lines and wrinkles, including crow's feet, dark circles, and dryness. The product is available in a moisture-rich cream and can be used twice-daily to address these common eye concerns.

TABLE 7 Improvement in investigator global rating scale scores.

	Baseline	Week 4	Week 8	Week 4 vs. Baseline	Week 8 vs. Baseline
Wrinkles	2.0	1.0	1.0	*NS*	$p = 0.07$
Dryness	1.0	0.0	0.0	$p < 0.001$	$p < 0.001$
Laxity	2.0	2.0	2.0	$p = 0.039$	$p = 0.039$
Dark circles	2.0	2.0	1.0	NS	$p = 0.046$

Abbreviation: *NS*, not significant.

TABLE 8 Investigator assessment of eye appearance.

"Subject's eyes…	Week 4	Week 8
look refreshed and rejuvenated."	9 (36.0)[a]	11 (47.8)[c]
look and feel healthier."	9 (36.0)[a]	11 (47.8)[c]
look younger."	8 (32.0)[a]	8 (36.4)[d]
appear more hydrated/less dry."	10 (43.5)[c]	13 (56.5)[c]
show improvement in the appearance lines/wrinkles."	11 (44.0)[a]	12 (52.2)[c]
show improvement in the appearance of deep lines."	3 (13.0)[c]	3 (13.6)[d]
show improvement in overall eye skin firmness."	8 (32.0)[a]	10 (43.5)[c]
eyelid skin appears firmer."	8 (32.0)[a]	9 (39.1)[c]
eyelids appear more lifted."	6 (25.0)[b]	7 (31.8)[d]
show improvement in the appearance of dark circles."	2 (8.0)[a]	4 (17.4)[c]
overall eye appearance is improved."	10 (40.0)[a]	12 (52.2)[c]

Note: Each response = *n* (%).

[a]$n = 25$.

[b]$n = 24$.

[c]$n = 23$.

[d]$n = 22$.

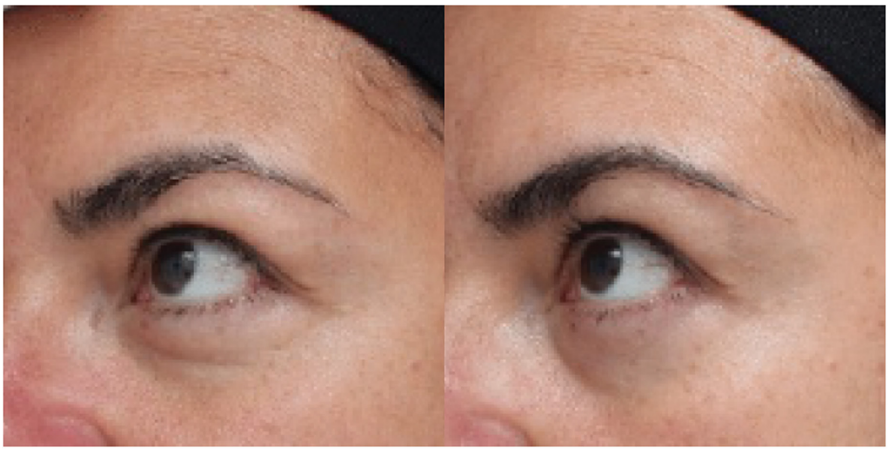

FIGURE 1 Pre- and Post-Treatment Bare Skin Images. This is a 49-year-old female subject at Baseline (left) and after 8 weeks of treatment (right).

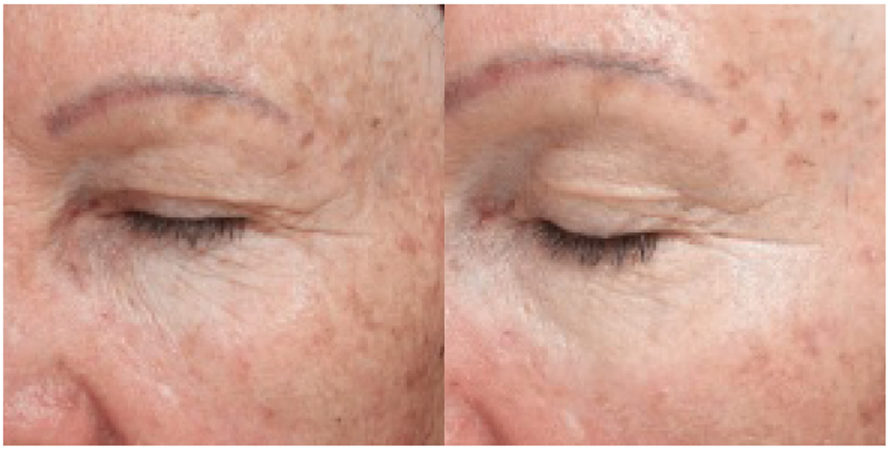

FIGURE 2 Pre- and Post-Treatment Bare Skin Images. This is a 62-year-old female subject at Baseline (left) and after 8 weeks of treatment (right).

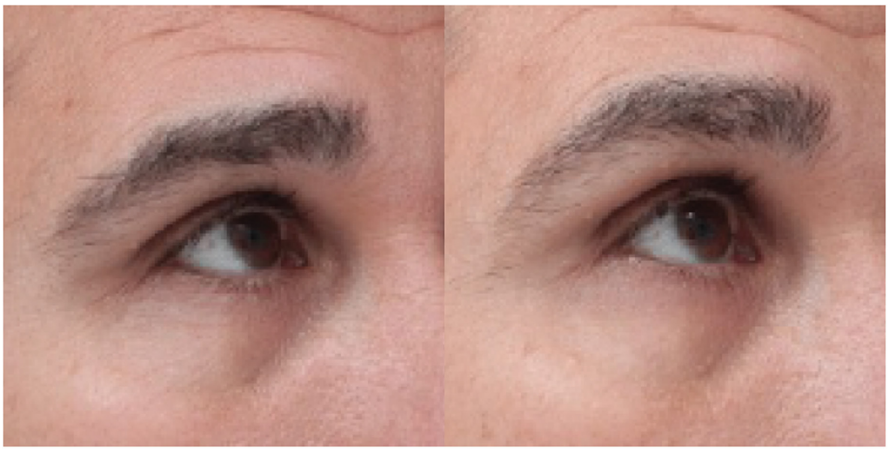

FIGURE 3 Pre- and Post-Treatment Bare Skin Images. This is a 44-year-old male subject at Baseline (left) and after 8 weeks of treatment (right).

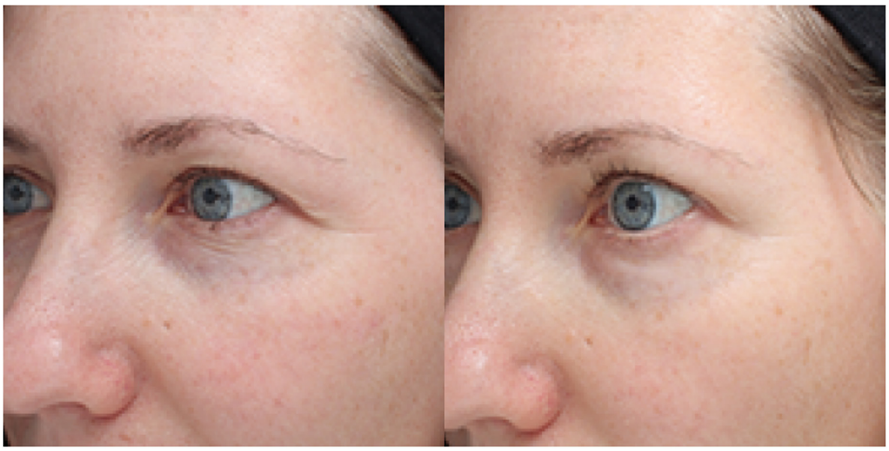

FIGURE 4 Pre- and Post-Treatment Bare Skin Images. This is a 38-year-old female subject at Baseline (left) and after 8 weeks of treatment (right).

TABLE 9 Subject baseline self-assessment.

Eye concerns, %		Bothering symptoms, %	
Lines	68.0	Lines	28.0
Wrinkles	60.0	Wrinkles	40.0
Dark circles	68.9	Dark circles	48.0
Dryness	24.0	Dryness	16.0
Crepey skin	40.0	Crepey skin	16.0
Skin laxity	76.0	Skin laxity	48.0
Other concerns[a]	20.0	Other concerns	16.0

[a]Other concerns were puffiness ($n = 2$), bags ($n = 1$), and drooping eyelids ($n = 1$). Bothering symptoms were bags ($n = 3$), puffy eyes ($n = 3$), and upper eyelid drooping ($n = 2$).

Improvements at Week 8 following twice-daily use of Total Eye® Firm & Repair Cream were greatest for wrinkles, laxity, and dark circles and dryness based on the Investigator Global Rating Scale with dryness achieving statistical significance. Based on Global Improvement Scores Assessments, subjects achieved improvements in most parameters at Week 4 with additional improvements at Week 8, suggesting the potential ongoing improvement with continued use. Similarly, the Investigator of Eye Appearance Assessment revealed improvements in the overall appearance of the periorbital area at Weeks 4 with most (10 of 12) parameters continuing to improve with continued use through Week 8.

Responses to the Subject Baseline Self-Assessment questionnaire indicate enrolled subjects had significant concerns regarding their periorbital appearance prior to treatment, including loss of firmness, dark circles, lines, wrinkles, and crepey skin. A similar pattern was observed for those parameters subjects found to be most bothering. At baseline, more than 50% of subjects were self-conscious about their appearance and were bothered by it. Following treatment, the mean Subject Questionnaire Responses indicated improvement across all periorbital parameters, with six of the 13 responses (43%) achieving statistical significance.

Both investigators and subjects found Total Eye® Firm & Repair Cream to be well-tolerated. Observations by the investigators revealed no objective evidence of redness, swelling, or other skin changes. Mild burning and stinging were reported in three and two subjects at Weeks 4 and 8, respectively, and one subject reported itching at Week 4; however, no subjects discontinued use of Total Eye® Firm & Repair Cream due to minor discomfort and all symptoms resolved without treatment. A majority of subjects were satisfied with the product, would continue to use the product, and would recommend the product to others.

Total Eye® Firm & Repair Cream is a safe and effective skincare option for treating periorbital wrinkles, dryness, laxity, and dark circles and should be considered before more invasive alternatives.

TABLE 10 Mean subject questionnaire responses, *n* (%).

	Baseline	Week 4	Week 8	
"The study product…	*N* = 25	*N* = 22	*N* = 22	*p*-value
made my eyes look refreshed and rejuvenated."				
Strongly agree	1 (4.0)	1 (4.65)	8 (36.4)	0.027
Agree	19 (76.0)	17 (77.3)	10 (45.5)	
Disagree	5 (20.0)	4 (18.2)	4 (18.2)	
Strongly disagree	0	0	0	
makes my eyes look and feel healthier."				
Strongly agree	1 (4.0)	1 (4.55)	9 (40.9)	0.006
Agree	19 (76.0)	16 (72.7)	12 (54.5)	
Disagree	5 (20.0)	5 (22.7)	1 (4.6)	
Strongly disagree	0	0	0	
made my eyes look younger."				
Strongly agree	0	0	5 (22.7)	0.030
Agree	15 (60.0)	13 (59.1)	12 (54.5)	
Disagree	10 (40.0)	9 (40.9)	4 (18.2)	
Strongly disagree	0	0	1 (4.6)	
made my eyes feel more hydrated/less dry."				
Strongly agree	7 (28.0)	7 (31.8)	11 (50.0)	*NS*
Agree	16 (64.0)	13 (59.1)	11 (50.0)	
Disagree	2 (8.0)	2 (9.09)	0	
Strongly disagree	0	0	0	
reduced the appearance of lines/wrinkles around my eyes."				
Strongly agree	2 (8.0)	2 (9.1)	7 (31.8)	*NS*
Agree	12 (48.0)	10 (45.5)	9 (40.9)	
Disagree	11 (44.0)	10 (45.5)	6 (27.3)	
Strongly disagree	0	0	0	
reduced the appearance of deep lines around my eyes."				
Strongly agree	1 (4.0)	1 (4.6)	5 (22.7)	*NS*
Agree	9 (36.0)	8 (36.4)	7 (31.8)	
Disagree	13 (52.0)	11 (50.0)	10 (45.5)	
Strongly disagree	2 (8.0)	2 (9.09)	0	
improved the skin firmness around my eyes."				
Strongly agree	2 (8.0)	2 (9.09)	5 (22.7)	*NS*
Agree	13 (52.0)	11 (50.0)	12 (54.5)	
Disagree	10 (40.0)	9 (40.9)	5 (22.7)	
Strongly disagree	0	0	0	
improved the skin firmness of my upper eyelids."				
Strongly agree	5 (20.0)	5 (22.7)	9 (40.9)	*NS*
Agree	11 (44.0)	9 (40.9)	9 (40.9)	
Disagree	9 (36.0)	8 (36.4)	4 (18.2)	
Strongly disagree	0	0	0	
improved the appearance of wrinkles in my upper eyelids."				
Strongly agree	4 (16.0)	4 (18.2)	9 (40.9)	*NS*
Agree	11 (44.0)	9 (40.9)	7 (31.8)	
Disagree	10 (40.0)	9 (40.9)	6 (27.3)	
Strongly disagree	0	0	0	

TABLE 10 (Continued)

	Baseline	Week 4	Week 8	
"The study product…	*N* = 25	*N* = 22	*N* = 22	*p*-value
improved the appearance of dark circles around my eyes."				
Strongly agree	0	0	4 (18.2)	0.025
Agree	9 (36.0)	8 (36.4)	11 (50.0)	
Disagree	15 (60.0)	13 (59.1)	5 (22.7)	
Strongly disagree	1 (4.0)	1 (4.6)	2 (9.1)	
improved the overall appearance of my eye areas."				
Strongly agree	3 (12.0)	3 (13.6)	8 (36.4)	0.052
Agree	13 (52.0)	11 (50.0)	12 (54.5)	
Disagree	9 (36.0)	8 (36.4)	2 (9.1)	
Strongly disagree	0	0	0	
made me feel more confident about the overall appearance of my eyes."				
Strongly agree	1 (4.0)	1 (4.6)	7 (31.8)	0.011
Agree	14 (56.0)	12 (54.5)	13 (59.1)	
Disagree	10 (40.0)	9 (40.9)	2 (9.1)	
Strongly disagree	0	0	0	
improved the appearance of puffiness in the eye area."				
Strongly agree	3 (15.0)	3 (17.6)	7 (31.%)	*NS*
Agree	5 (25.0)	4 (23.5)	5 (22.7)	
Disagree	11 (55.0)	9 (52.9)	10 (45.5)	
Strongly disagree	1 (5.0)	1 (5.9)	0	

Abbreviation: *NS*, not significant.

Limitations of this study include a modest number of enrolled subjects and an open-label study design.

5 | CONCLUSION

A novel topical cream has been developed for the treatment of periorbital wrinkles, dryness, laxity, and dark circles. When applied twice-daily for 8 weeks, study investigators reported significant improvements in wrinkles, dryness and laxity at Week 4 and all parameters at Week 8. Additional improvement between Week 4 and Week 8 suggested possible ongoing improvement with continued daily use. Mean subject questionnaire scores showed numeric improvement for all responses of which many (43%) achieved significance. Both investigators and subjects reported Total Eye® Firm & Repair Cream to be well-tolerated and a majority of the subjects were satisfied with their results. Total Eye® Firm & Repair Cream is a viable option for treating periorbital wrinkles, dryness, laxity, and dark circles and should be considered a safe and effective skincare option.

AUTHOR'S CONTRIBUTION

All authors have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; were involved in revising and critically reviewing the manuscript for important intellectual content; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

ACKNOWLEDGMENT

The authors acknowledge the editorial assistance of Carl S. Hornfeldt, PhD, Apothekon, Inc., during the preparation of this manuscript and data analysis by Ahmed M. Kamel, MSc, Clinical Pharmacy Department, Cairo University, Cairo, Egypt.

FUNDING INFORMATION

This study was sponsored by Colorescience, Inc., Carlsbad, CA.

CONFLICT OF INTEREST

The authors have nothing to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request; however, there are no additional data from this study.

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How to cite this article: Calkin JM, Boudreaux AA, Taylor B. Efficacy and tolerability of a novel skin cream for improving periocular rhytids and dryness. *J Cosmet Dermatol*. 2022;00:1-10. doi: 10.1111/jocd.15249