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Periprocedural Skincare for Nonenergy and Nonablative Energy-Based Aesthetic Procedures in Patients With Skin of Color

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ABSTRACT

Background: Anti-aging facial procedures with nonenergy and nonablative energy devices are increasingly popular among patients with skin of color (SOC). Algorithms have addressed the measures to reduce the side effects related to aesthetic procedures, but few focus on SOC patients and periprocedural integrating skincare.

Methods: Eight dermatologists from Brazil, Canada, South Africa, Mexico, and the USA participated in a meeting and an online follow-up to develop an algorithm for periprocedural skincare for nonenergy and nonablative energy-based facial aesthetic procedures in patients with SOC. A Delphi method was used to develop this algorithm and integrate information from the literature with panels' clinical experience and opinion, resulting in the current algorithm.

Results: The algorithm has five sections, starting with a medical history and skin examination, followed by pretreatment measures beginning 2–4 weeks before the procedure, then measures on the day of the procedure, aftercare 1–7 days after the procedure, and follow-up care 1–4 weeks after the procedure and ongoing.

Conclusions: This algorithm provides guidelines for treatment optimization of non-energy, non-ablative energy-based devices for SOC patients. It also provides physicians with skincare recommendations pre-, peri-, and post-aesthetic procedures.

1 | Introduction

Demographic shifts and advances in minimally invasive and nonablative technologies have opened aesthetic procedures to a larger patient population [1]. Over the past two decades, the patient population undergoing cosmetic procedures has become

increasingly diverse and includes a growing proportion of patients that have skin of color (SOC) [1, 2].

Fitzpatrick skin phototype (SPT) was developed to assess the photosensitivity to ultraviolet light and initially included SPT I to IV, whereas phototypes SPT V and VI were added later

Abbreviations: AzA, azelaic acid; HA, hyaluronic acid; HOCl, hypochlorous acid; KA, kojic acid; PA, pigment alterations; SC, stratum corneum; SOC, skin of color; SPF, sun protection factor; SPT, fitzpatrick skin phototype; TXA, tranexamic acid.

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to include individuals with brown or black skin color [3]. Healthcare providers often use SPT as a proxy for skin tone and predictor of responses to laser and other procedures, which was not the original intent. Notwithstanding the limitations of Fitzpatrick's SPT (including its subjectivity and potential lack of correlation with treatment responses) and numerous proposals for alternative skin classification systems, SPT continues to be the most widely used system by dermatologists globally. The term SOC is used to describe the skin characteristics of the diverse range of populations who self-identify as non-white; patients with SOC generally fall within the SPT range of III-VI [4]. The majority of published cosmetic procedure data in SOC involves patients of East Asian descent with SPT III and IV. By contrast, there is minimal data involving populations with SPT V and VI [5–9].

Photoaging tends to be delayed in SOC, but uneven skin tone and post-inflammatory pigment alterations (PA), including hyperpigmentation and hypopigmentation, are major concerns [10–13]. Aesthetic interventions in SOC require greater attention to risk of pigment alterations and propensity for hypertrophic/keloidal scarring [2]. Periprocedural skincare has been shown to improve outcomes and patient satisfaction with aesthetic procedures [12, 14, 15].

The current algorithm aims to provide clinicians with periprocedural adjunctive skincare recommendations for SOC patients receiving skin rejuvenation treatments with nonenergy-based treatments (e.g., chemical peels, injectables) or nonablative energy devices to optimize outcomes, prevent sequelae, reduce recovery time, and improve comfort.

2 | Methods

The algorithm used a modified Delphi approach, which aims to obtain consensus among experts through multiple rounds of iterative processes. Through this, an algorithm is developed with input from the expert panel and current literature review.

2.1 | Literature Review

Prior to the panel meeting, a structured literature review was conducted by AA and Hinke Andriessen (HA) on December 20–22, 2023, selecting best-practice approaches for periprocedural skincare for nonenergy device, injectable, and nonablative energy-based aesthetic facial procedures in patients with SOC. Inclusion criteria were English language clinical studies on humans, guidelines, algorithms, and reviews with current best-practice literature on peri-procedure measures and skincare in SOC* individuals treated with injectables** or nonablative energy devices*** published from 2010 to January 2024. Excluded were articles that did not deal with pre-/post procedural skincare for individuals with SOC, treated with injectables nonablative energy devices, and published in a language other than English.

Search terms used for injectables, nonenergy devices, and nonablative devices were divided into three groups.

Group 1: SOC* patients treated with injectables**/chemical peels**/fillers** AND hyperpigmentation OR post-inflammatory hypopigmentation AND.

Group 2: *Energy***/laser*** treatment AND wound healing OR hyperpigmentation OR hypopigmentation OR pigmented scars OR melasma.

Group 3: *SOC ** *** AND sunscreen OR skincare OR *combined with skincare OR hypochlorous acid OR topical hydroquinone OR topical tranexamic acid OR topical kojic acid OR niacinamide OR combinations.

Titles and abstracts were reviewed and then articles. Searches on PubMed and Google Scholar (secondary source) conducted for group 1 and group 2 yielded 178 papers on nonenergy and injectable treatments [62] and 85 on nonablative energy treatments. After excluding 31 papers (duplicates, not reporting on skincare), 147 remained that mainly discussed reduction of adverse events after procedures.

Searches on PubMed and Google Scholar (secondary source) for group 3 yielded 45 papers on SOC patients receiving facial treatment with nonenergy and injectable treatments, nonablative energy devices, and integrated skincare. After excluding 15 papers (duplicates, not reporting on skincare or SOC), 30 remained that mainly discussed dyschromia and melasma treatments combined with energy device treatment. The papers included 17 small clinical studies on topical agents combined with energy device treatments and 13 reviews on skincare and topicals combined with laser treatments or periprocedural use (Figure 1). AA and AFA drafted an algorithm based on the results of the literature searches.

2.2 | Role of the Panel

The panel comprised eight dermatologists from Brazil, Canada, South Africa, Mexico, and the USA. The international panel has extensive experience with medical aesthetic non-energy and energy-based procedures and has numerous publications on best practices in skin-of-color patients.

During the face-to-face meeting on March 8, 2024 in San Diego, after presentations of literature summaries, the panel worked in small groups to discuss and adapt the first draft of the algorithm. They then reconvened into a plenary group to customize the final algorithm and to reach a unanimous consensus ($\geq 80\%$ [7/8]) through blinded reiterations and votes. Preparation of the manuscript was done online.

3 | Results

The algorithm has five sections, starting with a medical history and skin examination, followed by pretreatment measures beginning 2–4 weeks before the procedure, then measures on the day of the procedure, aftercare 1–7 days after the procedure, and follow-up care 1–4 weeks after the procedure and ongoing (Figure 2).

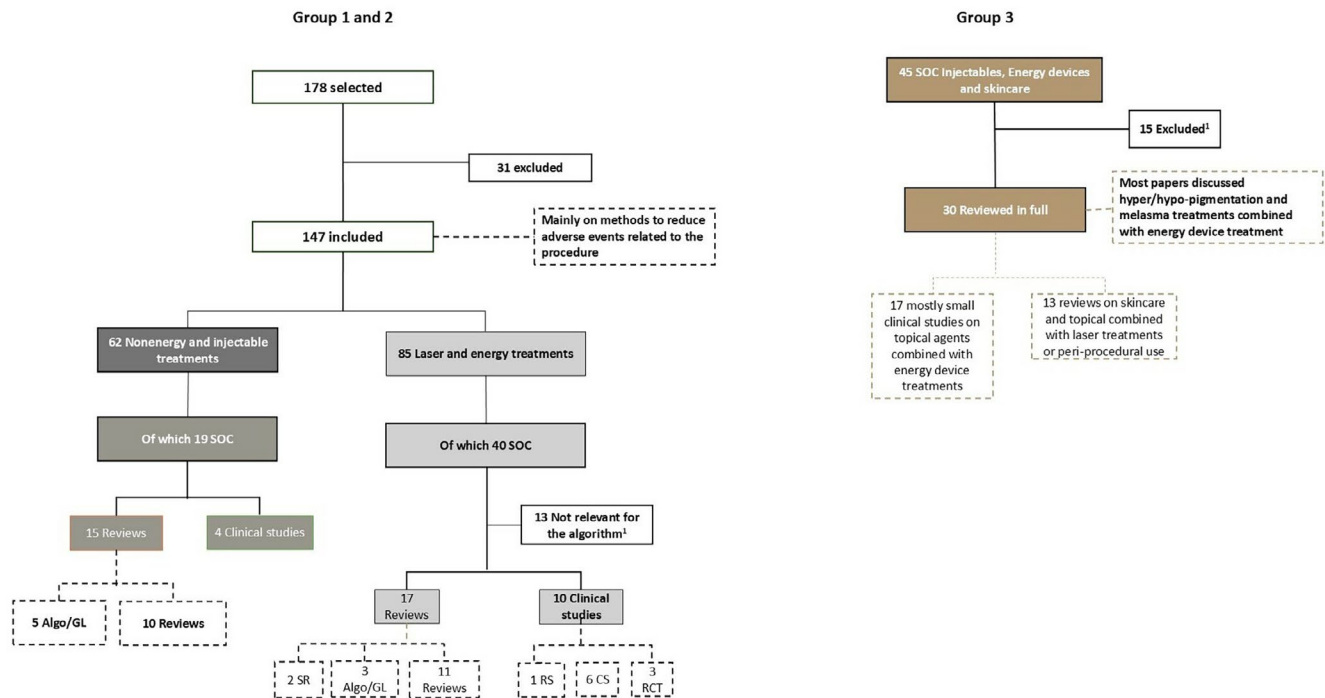


FIGURE 1 | Structured literature search results. Algo, algorithm; CS, cross-sectional studies; GL, guidelines; MA, meta-analysis; RCT, randomized controlled trials; RS, retrospective studies; SR, systematic reviews. ¹Excluded: Not including injectables, nonablative laser, periprocedural skincare, SOC patients. Due to a lack of clinical studies on periprocedural skincare in SOC patients, no grading was done.

3.1 | History and Skin Examination

Patients' motivation and expectation for aesthetic procedure should be appropriately explored prior to each procedure to ensure satisfactory outcomes [14, 15]. Baseline photographs are recommended by the panel, followed by a detailed discussion about side effects and potential sequelae [14, 15]. The patient's medical history is evaluated before an aesthetic procedure can be deemed safe. Medical conditions, medications, dietary supplements, and drug or topical product allergies are detailed. Patients with SOC may have distinct aesthetic concerns and have a higher risk of procedure-associated sequelae, such as PA, hypertrophic scars, and keloids [5–11, 14, 15].

Patient response to previous facial antiaging treatments is also taken into consideration specifically their response to dermabrasion, chemical peels, and laser treatments [14, 15]. The panel agreed that skin examination includes scars, as patients with hypertrophic scars, keloids, or PA will need periprocedural cosmetic measures to reduce the risk of these complications [14, 15].

3.2 | Pretreatment 2–4 Weeks Before the Procedure

Skin barrier-related parameters evaluating transepidermal water loss (TEWL) and tape-strippings to compare skin barrier strength showed low maturation and relatively weak skin barriers in East Asian and White women when compared to African-Americans, who had low ceramide levels and high protein cohesion in the SC [16]. The differences in skin barrier properties may explain the increased skin reactivity observed in East Asians and the high prevalence of xerosis in black skin [16].

The panel recommended a gentle cleanser and moisturizer at all times [14, 15]. Proper skincare should be formulated with ingredients to improve stratum corneum (SC) hydration and restore skin barrier function [14, 15]. Lower pH (<6.5) skincare promotes SC acidification, accelerates barrier recovery, and maintains barrier homeostasis [14, 15]. A cleanser should be fragrance and soap-free and have a near-physiological skin pH (<6.5), and for those with acne, oil-free and non-comedogenic skincare should be used [14, 15]. Patients with SOC may require nuanced approaches to skincare due to potential racial/ethnic variations in physiologic and cultural factors related to skin hydration and its impact [16–19]. Cultural norms related to cleansing and moisturization differ across diverse populations and need to be considered when offering skincare recommendations [10].

Depending on the patient's skin condition, topical products containing vitamin C, E, or polyphenols may be beneficial to reduce inflammation and PA [20]. Adjunctive or combined topicals may enhance aesthetic procedure outcomes (such as hyaluronic acid, botanicals, lipids or niacinamide) and may improve skin condition [16, 20–22].

Sun exposure is a significant contributor to PA. Despite the importance of sunscreen, there are few commercially available sunscreens designed for SOC, and finding a cosmetically elegant sunscreen for a SOC patient is challenging. A report indicated that people with SOC are less likely to use sunscreen and receive sunscreen recommendations from a dermatologist [17]. Broad-spectrum, preferably tinted sunscreen, rich in antioxidants and free radical quenchers with a sun protection factor (SPF) of ≥ 50 is recommended for at least 4 weeks before the aesthetic procedure and is to be continued for ongoing protection [18]. Patients

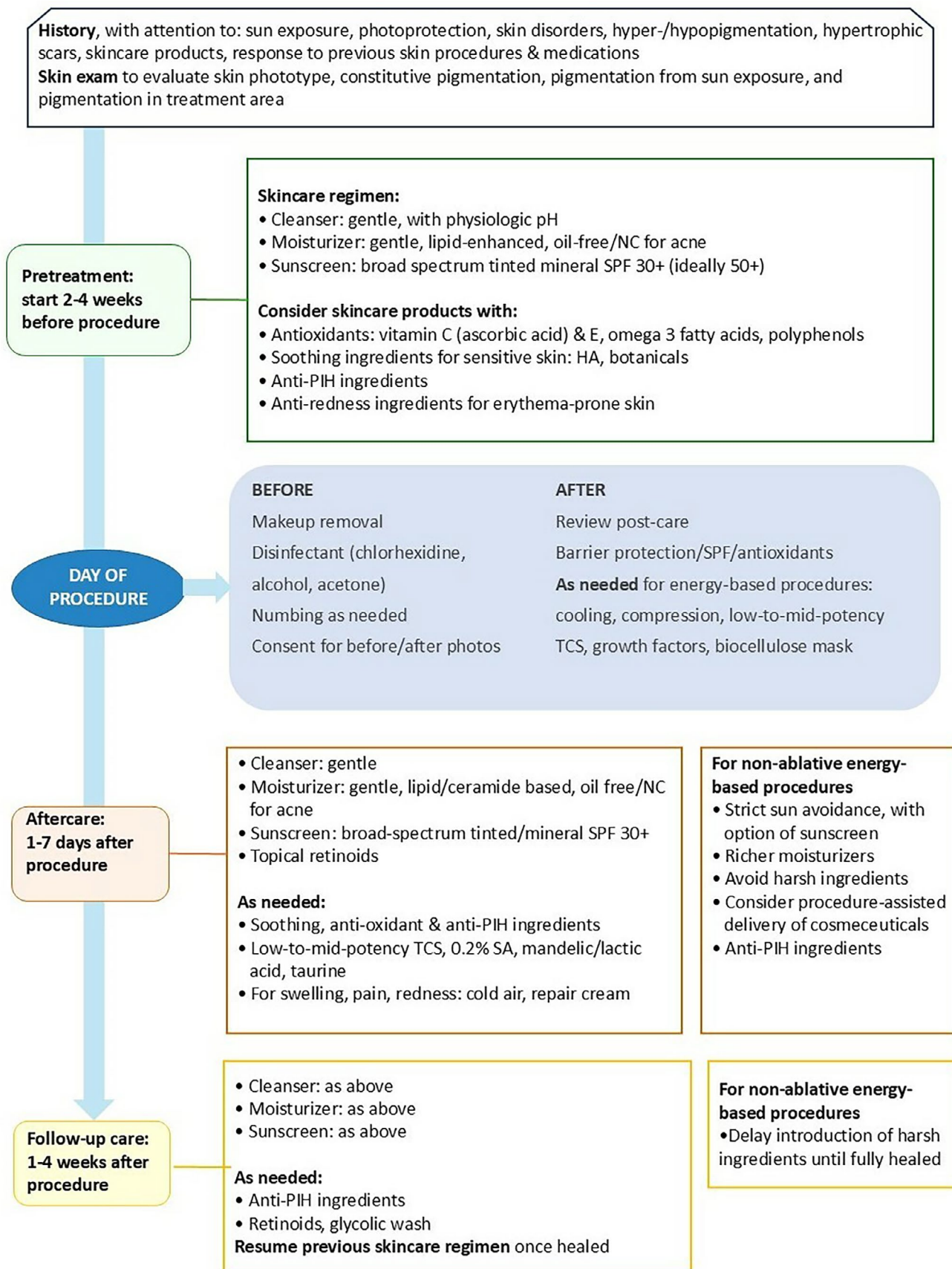


FIGURE 2 | Periprocedural skincare for nonenergy and nonablative procedures in patients with skin of color. HA, hyaluronic acid; NC, noncomedogenic; PIH, post-inflammatory hyperpigmentation; SA, salicylic acid; TCS, topical corticosteroids.

who demonstrate PA in response to procedures or trauma can be treated for two or more weeks before the procedure [5, 6, 10–15, 17]. Topicals containing antioxidants, free radical quenchers, and tranexamic, kojic, azelaic, and glycolic acids to prevent PA may be beneficial [2, 10, 23–27]. A survey completed by 56 dermatologists and surgeons showed that topical hydroquinone for SOC was the preferred choice for PA prevention, together with diligent physical block sunscreen use (SPF of ≥ 50) and strict sun avoidance [25]. However, members of the panel did not routinely recommend hydroquinone for SOC due to a lack of evidence and geographic variations in regulatory factors related to hydroquinone (Table 1) [14, 15].

In general, patients are recommended to withhold anti-inflammatory drugs, topical retinoids, and tobacco for days or weeks prior to and after procedures to reduce bleeding and allow for wound healing [14, 15].

3.3 | Day of Treatment

3.3.1 | Injectable and Nonenergy Treatments

There is no significant risk for PA or scar formation after dermal filler injections in SOC patients [11]. Mild and transitory adverse events may occur, such as edema, tenderness, erythema, bruising, and pain at the injection site [11]. When treating SFT IV, V, and VI, it is important to recognize differences in adverse events that may be experienced. Higher rates of PA have been reported in darker skin phototypes undergoing soft tissue fillers [11] and chemical peels [11].

3.3.2 | Nonablative Laser Treatment

The rising popularity of cutaneous lasers as an accepted anti-aging therapy for all SPT has increased the demand [1, 5, 6, 9]. SOC is at a heightened risk for PA post-procedure through three main mechanisms: (1) Increased incidental energy absorption by melanin in the skin, (2) melanocyte lability leading to

postinflammatory hyperpigmentation or hypopigmentation, and (3) loss of pigment secondary to deleterious effects of the laser leading to decreased melanin production and melanocyte populations and subsequent hypopigmentation [5, 6, 9, 25–30]. With optimal device selection, appropriate parameters, and pre-/post-treatment precautions, laser and light-based treatments for hair removal, PA, skin resurfacing, and skin tightening can be used safely in patients with SOC [31]. Most data on lasers and light treatments in non-white skin involve patients of East Asian ethnicity (e.g., Korean, Japanese, Chinese, Thai) [5, 6, 9, 15, 27, 28]. There is a lack of studies involving individuals of African ancestry or those with SPT V or VI. Careful selection of device and treatment parameters is required to minimize complications [27–30].

3.4 | Skin Preparation

The first step in skin preparation is universal removal of makeup and skin cleansing [14, 15]. Optimal cleaning agents include isopropyl alcohol, chlorhexidine, or hypochlorous acid (HOCl). Isopropyl alcohol is inexpensive and easy to obtain; however, it is flammable and can irritate the skin. Chlorhexidine is an effective cleanser but can be toxic to the eyes and ears [14, 15]. Stabilized HOCl is highly active against bacteria, viruses, and fungal organisms without the oto-or ocular toxicity of chlorhexidine [32].

Pain management can be customized as needed at the discretion of the treating physician [14, 15].

3.5 | Aftercare 1–7 Days After Treatment

There is an increased risk of PA with serial and fast injections and hypersensitivity to hyaluronic acid [11]. Avoid PA using low-risk injection methods, such as slow injection times and threading versus serial puncture [14]. If PA occurs, the panel recommends a combination of topical lightening agents (tranexamic, kojic, azelaic, and glycolic acids or chemical peels, preferably salicylic

TABLE 1 | Advisors' preferred pre-/postprocedure skincare approaches.

Pre-procedure	Post-procedure
Gentle cleanser Moisturizer, ideally with niacinamide Sunscreen (usually physical)	Continue skincare and sunscreen
Antioxidants: Topical non-esterified, acidic vitamins C, non-esterified vit E, D-alpha tocopherol, mineral selenium	Continue topicals at the discretion of the physician.
Consider risks/benefits and utility of topical retinoids, e.g., in some instances, pretreatment with topical retinoids may be recommended (for greater efficacy with resurfacing). In contrast, in others, they are discontinued (e.g., prior to a superficial chemical peel in SOC)	Patients return to retinoid within a week Glycolic acid for more sensitive patients Phyto gel to reduce inflammation For mechanical microneedling procedures, no post-procedure products (except cleanser and moisturizer) for 24h to avoid contact dermatitis
Natural lighteners, anti-erythema ingredients, humectants Consider hydroquinone or non-hydroquinone skin-lightening agents for higher-risk procedures (no consensus)	Consider hydroquinone or non-hydroquinone skin-lightening agents for higher-risk procedures (no consensus)

acid or glycolic acid) and consistent mineral sunscreen use and sun avoidance [19, 23, 24]. If Hyaluronidase may be used to resolve PA related to a severe complication of a hyaluronic acid filler (e.g., vascular occlusion or inflammatory nodules) [14, 15]. Occasionally, PA may be the result of hemosiderin deposition in which Nd-Yag lasers would need to be considered for clearance [14, 15].

Adverse reactions may be reduced by prompt epidermal cooling, providing pauses between laser passes to reduce bulk heating, as well as ice packs to the affected areas (Table 2) [25, 27, 29–31, 33, 34]. Reduction of inflammation using topical corticosteroids

post-treatment may be considered when significant post-procedure erythema or edema is noted [33, 35].

3.6 | Follow-Up Care 1–4 Weeks After Treatment

Patients should be counseled to continue using gentle skin-care and adequate sunscreen (SPF > 50) for a few weeks post-procedure [14, 15, 17, 18]. Concurrent skincare regimens with neuromodulator injections have been shown to reduce improve outcomes in facial lines, pigmentation, and skin texture when compared to neuromodulator alone (Table 3) [16, 20–23]. An

TABLE 2 | Considerations and approach to optimize energy treatment outcomes in SOC.

Consideration	Approach	References
Skin containing high amounts of melanin absorbs energy more efficiently than fair skin, but the absorption coefficient of melanin decreases markedly as wavelengths become longer.	Minimize risks with proper wavelength selection.	[20, 38–40]
Shorter wavelengths increase the risk of permanent PA and scarring due to melanin acting as a competing chromophore.		
Longer wavelengths penetrate more deeply into the dermis with less tissue damage and are not efficiently absorbed by melanin but may create skin inflammation, leading to PA.		
Patients with SOC require more conservative treatment.	Use lower fluences and longer pulse duration.	[20, 38–40]
A more conservative approach is needed for procedures such as laser hair removal and resurfacing.	Treatments require a greater number of sessions.	[20, 38–40]
Control and reduce skin heating and resultant skin injury.	Apply epidermal cooling with slower treatment speeds and pauses between passes.	[20, 38–40]

Abbreviations: PA, pigmentary alterations; SOC, skin of color.

TABLE 3 | Clinical evidence on Injectables and nonenergy treatment skincare approaches.

Type of treatment and skincare	References
Neuromodulator injections, HA filler, and HA skincare repeated combination treatment achieved greater change in global facial aesthetic appearance than monotherapy.	Cartier et al., 2020 [16]
HA filler and neurotoxin injections combined with a topical skin treatment regimen leads to improvement in skin quality and aesthetic appearance.	Dayan et al. 2018 [20]
Neuromodulator injections, a hydroquinone skincare regime, and daily topical retinoids improved signs of photoaging.	Schlessinger et al. 2018 [21]
Combining neuromodulator injections for antiaging treatment with skincare containing retinol adenosine and HA optimized total treatment outcomes.	Ascher et al. [22]
Niacinamide inhibits melanosome transfer to keratinocytes and may be combined with TXA. Pre-procedure and follow-up skincare with niacinamide, KA, AzA, and TXA-containing skin care may be recommended to improve outcomes.	Hollinger et al. 2018 [19]
A randomized, double-blind, vehicle-controlled study showed improvement in irregular facial hyperpigmentation [30]	Lee Do et al. 2014 [23]
KA is a radical oxygen scavenger and inhibits tyrosinase. A study compared a combination of topical KA and glycolic acid with topical hydroquinone 4% and found superior results for the KA and glycolic acid product.	Drealos et al. 2010 [24]

Abbreviations: AzA, azelaic acid; HA, hyaluronic acid; KA, kojic acid; TXA, tranexamic acid.

expert consensus on periprocedural integrated skincare for non-invasive energy-based device aesthetic procedures in clinical practice in China recommended skincare to improve skin condition and to reduce PA [36].

Few studies show whether PA can be minimized after facial energy-based treatment. In a split-face study of 40 Asian patients with SPT IV, short-term use of post-procedure topical corticosteroids reduced the risk of postinflammatory hyperpigmentation following fractional CO₂ laser for acne scars [35]. Topical corticosteroids-treated sites showed significantly reduced proinflammatory hyperpigmentation a few months later compared to the non-treated sites [35].

Energy-based device facial treatment may be combined with pre-procedure topical antioxidants (15% vitamin C serum, 10% vitamin C serum, and botanical serum) to optimize treatment outcomes [31, 34, 36–40]. A split-face study conducted in Brazil, the UK, and the US, treating the whole face with fractional laser comparing topical vitamin C, vitamin E, and ferulic acid serum post-laser for 7 days compared to vehicle showed the regime promoted tissue healing and was well tolerated [38].

A South Korean prospective split-face study (N=25) on laser-assisted (low-fluence Q-switched 1064-nm Nd:YAG) treatment delivery for melasma used a topical facial serum containing 3% tranexamic acid, 1% kojic acid, and 5% niacinamide on one half of the face versus laser alone on the other half. After five sessions at 2-week intervals, the topical treatment side showed more improvement than the side without skincare [39]. Another small South Korean study using a formulation of vitamins C, E, and ferulic acid as an adjunct to Q-switched 1064-nm Nd:YAG laser facial treatment showed that the topical antioxidants may improve laser treatment outcomes and is safe and well-tolerated (Table 4) [40].

3.7 | Integrating Skincare Into Practice

Integrating periprocedural skincare for facial nonenergy and nonablative energy-based procedures in patients with SOC is beneficial as it enhances treatment outcomes and patient experience and may reduce downtime. Choosing the correct skincare depends on the patient and treatment factors, and the product should be customized to the patient's cultural preferences. Educating clinicians and patients on suitable skincare and giving out samples for patients to test cosmetic acceptability and preference may enable an informed choice and avoid disappointment. Various skincare products have multiple and synergistic benefits that may suit patients' requirements.

3.8 | Limitations

The algorithm recommendations presented were created from expert opinion and current literature. While alternatives exist for periprocedure skincare, the proposed algorithm provides a set of best practices developed by a panel of expert clinicians and supported by evidence in the literature.

4 | Conclusions

SOC aesthetic procedures require specific skills in an experienced provider to provide high quality, aesthetic outcomes. The algorithm presented a stepwise process for optimal periprocedural skin care in patients with SOC who undergo facial aesthetic procedures with injections, nonenergy, and nonablative energy procedures. Periprocedural integrated skin care with gentle cleansers, moisturizers, photoprotection, antioxidants, botanical serum, and, where appropriate anti-PA agents may help improve treatment outcomes in SOC patients.

TABLE 4 | Clinical evidence on laser pre-/postprocedure skincare approaches in SOC.

Type of treatment and skincare	Region/ Country	Result	Reference
1444-nm nonablative fractional diode laser ex vivo uptake in human donor skin. Pre-procedure topical antioxidants (15% vit C serum, 10% vit C serum, Botanical serum).	China	Enhanced vitamin C uptake was 10 and 21 times, and botanical serum was 6 times compared to controls.	Wang et al. 2022 [37]
Prospective, single-arm split-face, double-blind, controlled pilot study (N=15) with moderate (Glogau scale 3) photodamage. Whole-face fractional ablative laser. Topical vitamin C, vitamin E, ferulic acid serum post-laser treatment topical 15% vit. C, 1.0% Vit. E, and 0.5% ferulic acid serum for 7 days compared to vehicle.	Brazil, UK, US	The topical treatment regimen compared to the vehicle after fractional laser correlated with wound healing and tolerated well.	Waibel et al. 2015 [38]
Prospective split-face study (N=25) on laser-assisted (low-fluence Q-switched 1064-nm Nd:YAG) treatment delivery for melasma. Topical facial serum containing 3% TXA, 1% KA, and 5% niacinamide on one half of the face versus laser alone on the other half.	South Korea	Five sessions at 2-week intervals. Topical facial serum is safe and effective when combined with laser to treat melasma.	Park et al. 2021 [39]
Single-blinded, prospective, randomized split-face study (N=18, aged 26–53 years). Combination of vitamins C, E, and ferulic acid antioxidant formula as an adjunct to Q-switched 1064-nm Nd:YAG laser treatment.	South Korea	Adjuvant skincare treatments with antioxidants may improve laser treatment outcomes and are safe and well-tolerated.	Kim et al. 2020 [40]

Abbreviations: HA, hyaluronic acid; KA, kojic acid; TXA, tranexamic acid.

Author Contributions

All authors (A.F.A., A.A., R.A.B., V.B.C., L.R.G., R.G.B., L.N., and M.L.) contributed to developing the manuscript, reviewing this work, and agreeing with the content.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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