

APPENDIX A

Clinical Protocols for the Prevention and Management of Post-Inflammatory Hyperpigmentation

The protocols listed deliver a structured approach to assessing patients at risk for post-inflammatory hyperpigmentation (PIH), reducing preventable inflammation, and managing PIH when it occurs. Clinical decisions should be individualized based on the patient's Fitzpatrick skin type, skin pigmentation, degree of inflammation, treatment history, and risk factors.

A1. PIH Prevention Protocol

Step 1: Assessment of Patient Risk

Before treatment initiation or performing an aesthetic procedure, the nurse practitioner should:

1. Determine the patient's Fitzpatrick skin type and understand that patients with skin types III–VI are at increased risk.
2. Review the patient's history of PIH following conditions and treatments such as acne, dermatitis, burns, trauma, or aesthetic procedures.
3. Assess for active acne, dermatitis, infection, irritation, or skin barrier disruption.
4. Examine the skin for existing epidermal, dermal, or mixed pigmentation.
5. Consider the anticipated depth and degree of inflammation associated with the anticipated treatment.

Step 2: Control Active Inflammation

1. Treat underlying inflammatory skin conditions promptly.
2. Delay elective aesthetic procedures when significant inflammation, irritation, or skin barrier disruption is present.
3. Avoid manipulation of inflammatory lesions.
4. Minimize the duration and severity of inflammation to reduce prolonged melanocyte stimulation and pigment deposition.

Step 3: Carefully Choose Procedures and Opt for Conservative Settings

1. Select the least aggressive treatment that can achieve the desired clinical outcome.
2. Consider the patient's Fitzpatrick skin type, history of PIH, baseline pigmentation, and treatment tolerance.
3. Use conservative procedural settings, particularly in patients with darker skin types or a history of PIH.
4. Avoid unnecessarily aggressive laser treatments, chemical peels, or microneedling procedures that may produce excessive inflammation.
5. Reassess the skin before each subsequent treatment and modify the treatment plan when persistent inflammation or pigmentary changes are present.

Step 4: Provide Education and Postprocedural Care

1. Provide written instructions to reduce irritation and protect the treated skin.
2. Reinforce adherence to the recommended postprocedure skincare regimen.

3. Instruct the patient to avoid picking, scratching, or otherwise manipulating the treated area.
4. Educate the patient to report persistent erythema, irritation, or early pigmentary changes.
5. Arrange timely follow-up for patients who are at increased risk of PIH.

Step 5: Monitor for Pigmentary Changes

At each follow-up visit, the nurse practitioner should:

1. Evaluate for persistent inflammation or for new pigmentation.
2. Record details of the pigment, including color, distribution, borders, severity, and suspected depth.
3. Initiate early management upon PIH identification.
4. Delay or modify additional procedures if active inflammation or worsening pigmentation becomes present.

A2. PIH Management Protocol

Step 1: Identify and Treat the Underlying Cause

1. Determine whether the PIH followed an inflammatory condition, trauma, burns, or an aesthetic procedure.
2. Treat ongoing inflammatory conditions before starting corrective therapies, such as hydroquinone, which can be irritating.

3. Identify products or procedures that may be causing inflammation and discontinue or modify them as needed.
4. Educate patients on the importance of avoiding manipulation of the affected area.

Step 2: Determine the Probable Depth of Pigmentation

Clinical presentation	Probable classification	Expected clinical response
Tan to dark brown lesions with defined borders	Epidermal PIH	Typically more responsive to topical therapies and may show improvement within weeks to months
Gray, blue-gray, or slate-colored lesions with diffuse borders	Dermal PIH	Persist for months to years and respond slowly or incompletely to topical therapies
Combined brown and gray pigmentation	Mixed PIH	Variable response that may require prolonged and conservative management

Step 3: Treatment Selection According to Pigment Depth

For epidermal PIH:

1. Consider topical therapies that reduce melanin production, promote cellular turnover, and/or reduce inflammation.
2. Treatment options include hydroquinone, topical retinoids, niacinamide, and tranexamic acid.

3. Combination topical therapy, such as retinoids and/or niacinamide with hydroquinone, may be considered when clinically indicated.
4. Hydroquinone should be used only for a limited duration and under medical supervision due to risks of irritation, sensitization, and exogenous ochronosis.
5. Continuously monitor treatment-related irritation, which can worsen PIH.

For dermal or mixed PIH:

1. Educate patients that improvement may be gradual, and PIH may persist for months to years.
2. Prioritize controlling inflammation and preventing additional pigment deposition.
3. Recognize that topical therapies may result in a slow or incomplete response.
4. Avoid aggressive corrective procedures that could cause further inflammation and worsen pigmentation.

Step 4: Consider Procedural Intervention Cautiously

1. Superficial chemical peels, conservative laser treatments, or microneedling may be considered for select patients.
2. Evaluate Fitzpatrick skin type, skin pigmentation depth, PIH severity, previous treatment response, and history of procedure-related pigmentation.
3. Use conservative treatment settings and gradually escalate treatment only when clinically appropriate.

4. Avoid procedural treatment when there is active inflammation or a disruption of the skin barrier.
5. Inform patients that aesthetic procedures might improve PIH, but there is a risk they might induce or worsen it, especially in patients with darker skin types.

Step 5: Evaluate Treatment Response

At each follow-up visit, the nurse practitioner should:

1. Evaluate changes in color, distribution, borders, and severity or pigmentation.
2. Assess for irritation, persistent inflammation, or worsening pigmentation.
3. Review therapy adherence and tolerance, along with daily sun protection use.
4. Modify or discontinue treatments that cause significant irritation or worsened pigmentation.
5. Reinforce realistic expectations, especially regarding dermal PIH, which may require prolonged management.

Clinical Considerations

These protocols are intended to support clinical assessment and decision-making and should not replace individualized evaluation. Treatment selection should be individualized and consider pigment depth, inflammation severity, Fitzpatrick skin type, patient history, contraindications, and treatment tolerance.