

Objective Evaluation of Skin Sensitivity Across Fitzpatrick Skin Types

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ABSTRACT

Context: Skin sensitivity may be best defined as self-reported intolerance to application of skincare products. It is commonly believed that individuals with darker skin are generally less sensitive, while those lighter skin are more sensitive. However, there is little objective data correlating sensitivity with skin type or with objective measures of sensitivity.

Objective: This study assessed Fitzpatrick skin type and self-reported perception of skin sensitivity.

Design: A single-blinded, lactic acid sting test was performed on the medial cheeks, where patients were randomized to receive room temperature 10% lactic acid on the left or right cheek with water applied to the contralateral cheek as a control.

Outcome Measures: Stinging was assessed 1 minute after application of test solution to one cheek using a visual analogue scale (VAS).

Results: There was a statistically significant difference in self-reported skin sensitivity in patients with Fitzpatrick skin types 1–3 vs 4–6 (73.6% vs 46.5%; $P = 0.006$). Patients who had higher perceived sensitivity were more likely to have objectively measured sensitivity as well, across all skin types ($P < 0.01$). When stratified by skin type, a numerically higher percentage of subjects with Fitzpatrick skin types 1–3 experienced objective sensitivity compared to subjects with skin types 4–6 (45.6% vs 27.9; $P = 0.058$).

Conclusions: Patients with self-perceived skin sensitivity were more likely to develop objective stinging compared to those who did not report sensitivity. Skin sensitivity can occur across all skin types, and patients should be asked about self-perceptions of sensitivity as it is likely an indicator of true sensitivity.

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INTRODUCTION

“Sensitive skin” is commonly reported by many patients and influences decision making in skincare routines. Skin sensitivity is generally accepted to be a reduced tolerance to cosmetics and other topical skin care products.¹ Based on consumer surveys, it is estimated that 40% of the population believes that they have sensitive skin, and this number appears to be increasing in recent years.^{1,2} Typically lacking objective signs, skin sensitivity is usually a subjective finding by patients that is secondary to their own perceptions about their skin.^{3,4} The correlation between perceived sensitivity and objectively sensitive skin has not previously been evaluated. Furthermore, there is limited understanding of which skin types more commonly believe that they have sensitive skin.

The biological basis of skin sensitivity is thought to be the result of many factors. A thin stratum corneum, increased blood flow, and neuronal activation are thought to be major contributing factors.^{1,3,5} Studies looking at biophysical parameters of the skin reported trends towards increased transepidermal water loss and decreased capacitance in those with sensitive skin, indicating a possible barrier dysfunction.^{4,6} Fitzpatrick skin type has also been thought to be associated with subjective

perceptions of skin sensitivity objective measures.^{7,8} One study assessing patients with skin responses to irritants found that 85% of affected patients were white.⁹ Another study found differing symptomatology of skin sensitivity between ethnic groups, showing that Caucasian patients were significantly more likely to report visual effects (eg, redness), whereas African American patients were more likely to report sensory effects (eg, stinging).¹ However, other survey studies have shown similar rates of self-reported skin sensitivity across ethnic groups, and therefore the relationship between skin sensitivity and skin type remains unclear.^{10,11} There is data to suggest that there are biophysical differences in the skin among skin types, and the skin of African American individuals has a thicker stratum corneum and increased lipid content.^{11,12} Since there is limited research on the relationship between perceived skin sensitivity and skin type, it is unclear whether Fitzpatrick skin type truly plays a role in determining overall sensitivity.

A sting test using lactic acid solution (5% or 10%) is an effective way to create a non-damaging reaction on the face and is been widely accepted as a marker of skin sensitivity.⁴ Previous studies have shown significantly higher stinging scores in response to lactic acid in patients with sensitive skin, and that

skin pH values increase significantly faster following lactic acid application in patients with sensitive skin than in those without.^{3,4} Positive results on lactic acid sting tests have also been shown to correlate with self-reported skin sensitivity and with objective measures of stratum corneum function such as, transepidermal water loss.⁶ The goal of this study is to examine the relationship between subjective skin sensitivity and objectively measured skin sensitivity using the lactic acid sting test, and evaluate whether skin sensitivity varies according to Fitzpatrick skin type.

METHODS

Participants

100 participants took part in the study following informed consent. These patients were recruited on a volunteer basis from our dermatology clinic and waiting room. Exclusion criteria included a diagnosed facial skin disorder that would interfere with evaluation, a known allergy to lactic acid, the use of a topical retinoid or hydroxy acid within two weeks, and pregnant women. Participants were not remunerated for their participation in any way. Of the 100 participants, 70% were female and 30% were male. 57% were Fitzpatrick skin types 1–3 and 43% were Fitzpatrick skin types 4–6. All participants were over the age of 18.

Procedure

Patient skin type was assessed on the Fitzpatrick skin type scale. Scores range from 1–6, with scores of 1 indicating the palest skin tone with no inherent melanin pigmentation, and 6 indicating the darkest skin tone with a significant amount of melanin.⁸ Participants were then asked to report self-perceived skin sensitivity on a scale from 1 (none) to 5 (severe).

A single-blinded, lactic acid sting test was performed on the medial cheeks, where patients were randomized to receive room temperature 10% lactic acid on the left or right cheek with water applied to the contralateral cheek as a control using cotton tipped applicators. Static assessments of stinging were performed at 1 minute after application of test solution on the cheek using a visual analogue scale (VAS) (Appendix 1), on which participants were asked to indicate how much stinging they felt on a scale of 0 to 100. Solution was then rinsed off. The second solution was subsequently applied to the other cheek, after which the second stinging assessment was performed, using the same methods.

RESULTS

Of the 100 study participants, 62% reported having sensitive skin (defined as self-reported scores of 3–5), while 38% reported none or minimal sensitivity (self-reported scores of 1–2). Significantly more patients with Fitzpatrick skin types 1–3 reported sensitive skin, as compared to those with skin types 4–6 (73.6% vs 46.5%; $P=0.006$). Overall, on lactic acid assay, 38% of all participants demonstrated skin sensitivity. We defined

objectivity sensitivity as stinging to the acid above the mean stinging of all participants to water. When stratified by skin type, a numerically higher percentage of subjects with Fitzpatrick skin types 1–3 experienced objective sensitivity to the lactic acid compared to subjects with skin types 4–6, although this was just under the threshold for statistical significance (45.6% vs 27.9; $P=0.058$). Additionally, those who had higher perceived sensitivity were more likely to exhibit objective sensitivity ($P<0.01$). No statistical differences were observed in perceived or objective sensitivity when stratified by gender or ethnicity.

DISCUSSION

This study aimed to examine the relationship between skin sensitivity and skin type. We specifically looked at the difference in perceived sensitivity between across skin types as well as a correlation between perceived and objective skin sensitivity. We found that perceived skin sensitivity was more common in lighter skin types (Fitzpatrick 1–3) as compared to darker skin types (4–6). Furthermore, we found that patients' prior perceptions of their own skin sensitivity reflected what they reported on lactic acid testing in the study. In clinical practice, this implies that simply asking patients about their perceived skin sensitivity may be useful in selecting appropriate therapeutics and treatment regimens. This approach optimizes patient outcomes and makes the care process inherently more efficient.

The results also showed that more patients with lighter skin tones experienced stinging following lactic acid application as compared to those with darker skin tones, although not statistically significant. Given our small sample size, it is unclear whether this difference is real, and larger studies will be needed for further evaluation. Regardless, it is important to note that both subjective and objective skin sensitivity occurs across all skin types, and we cannot make assumptions about sensitivity based solely on Fitzpatrick skin type. Moreover, this study helps dispel myths that women's skin is more sensitive than men's and that sensitivity is more common in specific ethnic groups.

Our study is limited by the small sample size of 100 patients, primarily comprised of female patients, which may impact responses. Despite these limitations, this study demonstrates that skin sensitivity is common, and while it may occur more often in light skinned patients, it should be considered in patients of all skin types.

DISCLOSURES

Dr. Joshua Zeichner is a consultant for Abbvie, Dermira, Galderma, Johnson and Johnson, L'Oreal, Menlo Therapeutics, Ortho Dermatologics, Pfizer, Procter and Gamble, Regeneron, Sanofi-Genzyme, Sun Pharma, and Unilever.

Celina Dubin has no conflict of interests to declare. Drs Kimmel, Hashim, and Nia have no conflicts of interest to declare.

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Appendix 1. Post-test VAS Questionnaire

Init: _____ ID # _____

Date: _____

Post-test Questionnaire

Draw a vertical line across the present line to represent the degree of stinging you experienced on each side of your face:

Stinging on the
LEFT side:



Stinging on the
RIGHT side:



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