ORIGINAL RESEARCH

The Role of High-Resolution Imaging in Predicting Dermatological Outcomes in Psychiatric Patients with Stress-Induced Skin Disorders

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ABSTRACT
Aim: This study aims to evaluate the role of high-resolution imaging in predicting dermatological outcomes in psychiatric patients with stress-induced skin disorders. The objective is to analyze the correlation between imaging parameters, such as skin thickness and vascular density, with the severity of dermatological and psychiatric symptoms. **Material and Methods:** A prospective study was conducted on 100 patients aged 18–65 years diagnosed with stress-induced skin disorders, including psoriasis, atopic dermatitis, and chronic urticaria, alongside psychiatric comorbidities like anxiety and depression. High-resolution imaging techniques—dermoscopy, high-frequency ultrasound (20 MHz), and MRI—were employed to assess skin changes, while validated tools (HAM-A and PHQ-9) measured psychiatric symptoms. Disease severity was evaluated using PASI for psoriasis and EASI for atopic dermatitis. Imaging findings were analyzed in correlation with clinical and psychiatric parameters over a 12-month period, with a significance threshold set at $p < 0.05$. **Results:** The most common psychiatric comorbidity was anxiety (55%, $p = 0.01$), followed by depression (40%). High-resolution imaging revealed increased skin thickness in 60% of patients ($p = 0.02$), increased vascularity in 50%, and inflammatory markers in 65%. Significant reductions in PASI scores for psoriasis (40% to 30%; $p = 0.04$) and improvements in psychiatric symptoms (HAM-A from 21 ± 6 to 15 ± 5; $p = 0.001$; PHQ-9 from 18 ± 7 to 12 ± 5; $p = 0.02$) were observed. Imaging findings showed significant correlations with both dermatological ($r = 0.45–0.52$) and psychiatric severity ($r = 0.38–0.48$). **Conclusion:** High-resolution imaging is a valuable tool in predicting dermatological outcomes and monitoring disease progression in stress-induced skin disorders. It provides objective insights into the interplay between dermatological and psychiatric symptoms, facilitating an integrated, multidisciplinary approach to patient care. Imaging-guided assessments enable personalized treatment strategies and improve outcomes in these complex conditions.
Keywords: High-resolution imaging, stress-induced skin disorders, psychiatric comorbidities, dermatological outcomes, psychodermatology.

INTRODUCTION
Stress-induced skin disorders are a unique subset of dermatological conditions that arise or are exacerbated due to psychological stress. These disorders, such as psoriasis, atopic dermatitis, and chronic urticaria, not only manifest with physical symptoms but also have significant psychosocial implications. The relationship between the mind and skin is well-documented, with the skin acting as both an organ of perception and expression, reflecting the emotional state of an individual. Psychological stress triggers a cascade of physiological responses, including the activation of the hypothalamic-pituitary-adrenal axis and the release of inflammatory mediators, which can exacerbate existing skin conditions or even trigger new ones. This bidirectional relationship between psychological stress and skin health creates a significant burden on

patients, affecting their quality of life and mental well-being.[1]High-resolution imaging has emerged as a valuable tool in the evaluation and management of various dermatological conditions. Advances in imaging technology, such as dermoscopy, high-frequency ultrasound, and magnetic resonance imaging (MRI), allow for the non-invasive visualization of skin structures with exceptional clarity. These modalities enable the detection of subtle changes in the skin's morphology, vascularity, and inflammatory status, which may be indicative of disease progression or response to treatment. Moreover, high-resolution imaging offers an objective approach to monitoring skin disorders, minimizing reliance on subjective clinical assessments.The integration of imaging technology into the management of stress-induced skin disorders offers significant potential. Patients with these conditions often present with overlapping features of dermatological and psychiatric symptoms, creating diagnostic and therapeutic challenges. High-resolution imaging can provide insights into the structural and physiological changes associated with stress-related dermatological conditions, thereby aiding in early diagnosis, disease monitoring, and treatment planning. By correlating imaging findings with clinical and psychiatric parameters, clinicians can adopt a more holistic approach to patient care, addressing both physical and psychological aspects of these complex disorders.[2] Psychiatric comorbidities are frequently observed in patients with stress-induced skin disorders, further complicating their management. Conditions such as anxiety, depression, and stress-related disorders often coexist with dermatological symptoms, creating a vicious cycle where psychological distress exacerbates skin conditions and vice versa. For instance, patients with psoriasis often experience significant psychological distress due to the visibility and chronic nature of the condition, which in turn can worsen the disease through stress-induced immune responses. Similarly, individuals with chronic urticaria may develop anxiety related to unpredictable flare-ups, further aggravating their symptoms. Addressing the psychiatric components of these disorders is therefore essential for achieving optimal treatment outcomes.High-resolution imaging not only enhances the understanding of the pathophysiology of stress-induced skin disorders but also provides a means of evaluating the efficacy of therapeutic interventions. For example, imaging can reveal changes in skin thickness, vascular density, and inflammatory markers in response to treatment, allowing clinicians to objectively assess the impact of both dermatological and psychiatric therapies. Additionally, imaging findings can serve as predictive markers of disease progression, enabling personalized treatment strategies tailored to the individual needs of patients.[3] The predictive value of high-resolution imaging in stress-induced skin disorders extends beyond dermatological outcomes. By capturing physiological changes associated with psychological stress, imaging modalities can also provide insights into the interplay between mental health and skin health. For instance, neuroimaging techniques such as functional MRI can help identify alterations in brain activity associated with stress and its impact on the skin. Such interdisciplinary approaches highlight the potential of imaging technology to bridge the gap between dermatology, psychiatry, and radiology, fostering a comprehensive understanding of psychodermatological disorders.[4] The integration of high-resolution imaging into clinical practice also has implications for patient education and engagement. Visualizing the underlying mechanisms of their conditions can help patients better understand the role of stress in their skin health and the importance of adhering to treatment plans. Additionally, imaging results can serve as tangible evidence of treatment efficacy, reinforcing the benefits of both dermatological and psychiatric interventions. This can be particularly empowering for patients, fostering a sense of control over their health and improving treatment adherence.[5] Despite its potential, the use of high-resolution imaging in stress-induced skin disorders is still in its infancy, with several challenges to address. The interpretation of imaging findings requires expertise, and the cost of advanced imaging technologies may limit their accessibility in certain settings. Furthermore, the correlation between imaging parameters and clinical outcomes is not always straightforward, necessitating further research to establish standardized protocols and criteria for interpretation. Interdisciplinary collaboration between dermatologists, psychiatrists, and radiologists is essential to overcome these challenges and unlock the full potential of imaging in the management of psychodermatological conditions.[6] High-resolution imaging represents a promising tool for predicting dermatological outcomes in psychiatric patients with stress-induced skin disorders. By providing objective insights into the structural and physiological changes associated with these conditions, imaging can enhance diagnosis, monitoring, and treatment planning. Moreover, its ability to correlate physical findings with psychological parameters highlights the importance of an integrated approach to patient care. As research in this field continues to evolve, the role of high-resolution imaging in psychodermatology is likely to expand, offering new opportunities for improving patient outcomes and advancing our understanding of the intricate relationship between the mind and skin.

MATERIAL AND METHODS

This prospective study included 100 patients aged 18–65 years diagnosed with stress-induced skin disorders, such as psoriasis, atopic dermatitis, and chronic urticaria, who exhibited psychiatric comorbidities, including anxiety, depression, or stress-related disorders. Patients were recruited from the

Dermatology and Psychiatry outpatient clinics of a tertiary care hospital over a period of one year. Inclusion criteria required patients to have a confirmed diagnosis of both a dermatological condition and a psychiatric disorder, with stress identified as a significant contributing factor. Exclusion criteria included patients with severe systemic diseases, pregnancy, or those undergoing treatment for malignant skin conditions.

High-resolution imaging techniques, including dermoscopy, high-frequency ultrasound (20 MHz), and, where applicable, MRI scans, were employed to assess skin structure, vascularity, and other pathological features. Baseline imaging was conducted for all participants at enrollment, and follow-up imaging was performed at 3-month intervals over a period of one year to evaluate changes in dermatological outcomes. Imaging parameters were standardized, and radiologists and dermatologists interpreting the results were blinded to the patients' psychiatric profiles to minimize bias.

Psychiatric evaluation was performed using validated tools, including the Hamilton Anxiety Rating Scale (HAM-A) and the Patient Health Questionnaire-9 (PHQ-9), to quantify levels of anxiety and depression. The severity of dermatological conditions was assessed using disease-specific scoring systems, such as the Psoriasis Area and Severity Index (PASI) for psoriasis and the Eczema Area and Severity Index (EASI) for atopic dermatitis. Patients were treated according to standard clinical guidelines, with dermatological and psychiatric treatments tailored to their individual needs.

The primary outcome was the correlation between imaging findings, such as skin thickness, vascular density, and inflammatory markers, and changes in the severity of dermatological conditions over time. Secondary outcomes included the association between imaging parameters and psychiatric scores, as well as the predictive value of imaging in determining dermatological outcomes based on initial findings. Statistical analysis was performed using SPSS software, with a significance threshold set at $p < 0.05$. Data were analyzed using correlation and regression analyses to explore relationships between imaging, psychiatric, and dermatological parameters. Ethical approval was obtained from the institutional review board, and all participants provided written informed consent prior to enrollment.

RESULTS
Table 1: Baseline Characteristics of Patients
The study included 100 patients, with the majority (50%) aged 31–50 years. The youngest group (18–30 years) accounted for 35% of patients, while the oldest group (51–65 years) represented 15%. The gender distribution was slightly skewed toward females (58%) compared to males (42%), with no statistically significant gender difference ($p = 0.19$). Among dermatological conditions, psoriasis was the most prevalent (40%), followed by atopic dermatitis (35%) and chronic urticaria (25%). Psoriasis showed a significant association with the studied variables ($p = 0.04$), suggesting that it may be more strongly linked to stress and psychiatric factors than other skin conditions.

Table 2: Psychiatric Comorbidities Distribution
Anxiety disorder was the most common psychiatric comorbidity, affecting 55% of patients, and this association was statistically significant ($p = 0.01$). Depression and stress-related disorders were observed in 40% and 45% of patients, respectively, without significant differences. However, 25% of patients had multiple psychiatric conditions simultaneously, which showed a significant association ($p = 0.03$). These results emphasize the strong link between stress-induced skin disorders and psychiatric comorbidities, particularly anxiety.

Table 3: Imaging Findings at Baseline
High-resolution imaging revealed that increased skin thickness was present in 60% of patients, which was significantly associated with disease severity ($p = 0.02$). Increased vascularity was detected in 50%, and inflammatory markers were identified in 65%, although these findings did not reach statistical significance. Normal imaging results were observed in only 25% of the sample. These results suggest that high-resolution imaging parameters, particularly skin thickness, may serve as critical indicators of disease severity in patients with stress-related skin disorders.

Table 4: Dermatological Severity at Baseline and After 12 Months
At baseline, 40% of psoriasis patients had severe disease (PASI ≥10), which improved to 30% after 12 months, showing a significant reduction ($p = 0.04$). For atopic dermatitis, baseline severity (EASI ≥10) decreased from 35% to 25%, while chronic urticaria showed a reduction in severity from 25% to 20%. However, these changes were not statistically significant. These findings highlight the effectiveness of treatment in reducing dermatological severity, particularly in psoriasis, over the study period.

Table 5: Psychiatric Score Improvements Over Time
Psychiatric evaluations revealed significant improvements in anxiety and depression scores over 12 months. The mean Hamilton Anxiety Scale (HAM-A) score decreased from 21 ± 6 to 15 ± 5, with a highly significant p-value of 0.001. Similarly, the mean PHQ-9 depression score reduced from 18 ± 7 to 12 ± 5, with a significant p-value of 0.02. These results demonstrate that appropriate psychiatric interventions, combined with dermatological treatments, significantly improve psychological well-being in patients with stress-related skin disorders.

Table 6: Correlation Between Imaging Findings and Severity Scores

The correlation analysis showed that imaging findings were significantly associated with both dermatological and psychiatric severity scores. Skin thickness demonstrated moderate positive correlations with dermatological (r = 0.45, p = 0.01) and psychiatric severity (r = 0.38, p = 0.01). Vascular density was also significantly correlated with dermatological (r = 0.50, p = 0.03) and psychiatric severity (r = 0.42, p = 0.03). Inflammatory markers showed the strongest correlations with both dermatological (r = 0.52) and psychiatric severity (r = 0.48), with a p-value of 0.02. These findings underscore the utility of high-resolution imaging in predicting disease severity and psychiatric impact in patients with stress-induced skin disorders.

Table 1: Baseline Characteristics of Patients

Variable	Number (n=100)	Percentage (%)	p-value
Age Group (years)			
- 18–30	35	35%	0.23
- 31–50	50	50%	
- 51–65	15	15%	
Gender			
- Male	42	42%	0.19
- Female	58	58%	
Dermatological Diagnosis			
- Psoriasis	40	40%	0.04*
- Atopic Dermatitis	35	35%	
- Chronic Urticaria	25	25%	

Table 2: Psychiatric Comorbidities Distribution

Comorbidity	Number (n=100)	Percentage (%)	p-value
Anxiety Disorder	55	55%	0.01*
Depression	40	40%	
Stress-Related Disorders	45	45%	
Multiple Psychiatric Conditions	25	25%	0.03*

Table 3: Imaging Findings at Baseline

Parameter	Number (n=100)	Percentage (%)	p-value
Increased Skin Thickness	60	60%	0.02*
Increased Vascularity	50	50%	
Inflammatory Markers Detected	65	65%	
Normal Imaging Results	25	25%	0.15

Table 4: Dermatological Severity at Baseline and After 12 Months

Condition	Baseline Severity (n=100)	Improved After 12 Months (%)	p-value
Psoriasis (PASI ≥10)	40%	30%	0.04*
Atopic Dermatitis (EASI ≥10)	35%	25%	
Chronic Urticaria	25%	20%	

Table 5: Psychiatric Score Improvements Over Time

Psychiatric Parameter	Baseline (Mean ± SD)	12 Months (Mean ± SD)	p-value
Hamilton Anxiety Scale (HAM-A)	21 ± 6	15 ± 5	0.001*
PHQ-9 (Depression Score)	18 ± 7	12 ± 5	0.02*

Table 6: Correlation Between Imaging Findings and Severity Scores

Imaging Parameter	Dermatological Severity (r-value)	Psychiatric Severity (r-value)	p-value
Skin Thickness	0.45	0.38	0.01*
Vascular Density	0.50	0.42	0.03*
Inflammatory Markers	0.52	0.48	0.02*

DISCUSSION

The findings of this study highlight significant interactions between dermatological outcomes, psychiatric comorbidities, and high-resolution imaging parameters in patients with stress-induced skin disorders. The age and gender distribution

observed in this study align with earlier findings by Kim et al. (2019), who reported that stress-induced dermatological conditions, particularly psoriasis and atopic dermatitis, are most prevalent in middle-aged individuals (30–50 years) and slightly more common in females (54%) compared to males (46%).[7] Our study observed a similar trend, with 50% of patients aged 31–50 years and 58% female, although the gender difference was not statistically significant (p = 0.19). Additionally, psoriasis was the most frequent dermatological diagnosis in our cohort (40%), consistent with Gupta et al. (2021), who found that psoriasis is strongly linked to stress due to its immune-mediated pathogenesis.[8]Anxiety disorder was the most common psychiatric comorbidity in this study, affecting 55% of patients (p = 0.01), followed by depression (40%) and stress-related disorders (45%). This is in agreement with Picardi et al. (2016), who observed that 53% of patients with chronic skin disorders experience anxiety and 40% suffer from depression.[9] Furthermore, 25% of our patients had multiple psychiatric comorbidities, emphasizing the complex interplay between psychiatric and dermatological conditions, as highlighted in a systematic review by Dalgard et al. (2018).[10] Their findings support the hypothesis that psychological distress exacerbates skin conditions through a feedback loop involving inflammation and stress hormones.Our study demonstrated that 60% of patients had increased skin thickness, a finding significantly associated with disease severity (p = 0.02). Similarly, increased vascularity was detected in 50% of patients, and inflammatory markers were observed in 65%. These imaging findings align with the results of Berardesca et al. (2020), who used high-resolution ultrasound to demonstrate increased dermal thickness and vascular dilation in patients with atopic dermatitis.[11] Additionally, our study's identification of inflammatory markers in 65% of patients is comparable to Lee et al. (2017), who reported elevated cytokine levels in 62% of patients with stress-related dermatological conditions.[12]The significant improvement in psoriasis severity (from 40% to 30%; p = 0.04) observed in our study is consistent with results from a clinical trial by Finlay et al. (2019), which reported a 25% reduction in PASI scores following combined dermatological and psychological interventions.13 Improvements in atopic dermatitis (35% to 25%) and chronic urticaria (25% to 20%) were less pronounced and not statistically significant, similar to findings by Yosipovitch et al. (2020), who highlighted the chronic nature of these conditions and their variable response to therapy.[14]The significant reduction in anxiety (HAM-A: 21 ± 6 to 15 ± 5; p = 0.001) and depression scores (PHQ-9: 18 ± 7 to 12 ± 5; p = 0.02) underscores the efficacy of integrated care. These findings are consistent with Janowski et al. (2014), who demonstrated that cognitive-behavioral therapy and stress management significantly reduced

psychiatric symptomatology in patients with psychodermatological conditions. Our results further validate the importance of addressing mental health in dermatological treatment.[15]The moderate correlations between skin thickness and both dermatological severity (r = 0.45, p = 0.01) and psychiatric severity (r = 0.38, p = 0.01) reflect the close interplay between physiological and psychological factors in stress-induced skin disorders. Vascular density (r = 0.50, p = 0.03) and inflammatory markers (r = 0.52, p = 0.02) were also significantly associated with disease severity, consistent with the findings of Cheng et al. (2021), who highlighted the role of imaging biomarkers in tracking disease progression and treatment response in psychodermatology.[16]

CONCLUSION

This study highlights the critical role of high-resolution imaging in predicting dermatological outcomes in psychiatric patients with stress-induced skin disorders. Imaging parameters such as skin thickness, vascular density, and inflammatory markers showed significant correlations with disease severity and psychiatric comorbidities, providing objective insights into disease progression. The significant improvement in both dermatological and psychiatric outcomes over 12 months underscores the importance of an integrated, multidisciplinary approach. High-resolution imaging not only facilitates precise monitoring but also enables personalized treatment strategies, bridging the gap between dermatology, psychiatry, and radiology to improve patient care.

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