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CASE REPORT

Unexpected Repigmentation of Vitiligo Universalis Following Hemodialysis Initiation: A Rare Case Report and Literature Overview

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Abstract: Vitiligo is a chronic skin depigmentation disorder affecting 0.2–1.8% of the global population, with a significant prevalence in Saudi Arabia. Although not life-threatening, it severely impacts the quality of life and psychological well-being of patients. We report a rare instance of hemodialysis-induced skin repigmentation involving a 25-year-old woman with vitiligo universalis.

Keywords: hemodialysis, repigmentation, vitiligo, vitiligo universalis

Introduction

Vitiligo is an acquired, chronic skin depigmentation disorder affecting approximately 0.2–1.8% of the global population.[1] In Saudi Arabia, dermatologists frequently encounter vitiligo patients, with 40% reporting 5–10 cases per week and 12.6% encountering more than 10 cases weekly.[2] Although not life-threatening, vitiligo significantly impacts patients' quality of life and psychological well-being.[3] The exact pathogenesis of vitiligo remains uncertain, with genetic, immunological, and neurological factors potentially contributing to its development.[4] Alterations in humoral or cellular immunity targeting melanocytes, leading to their absence, have been proposed as a common cause.[5] Vitiligo has an unpredictable clinical course; depigmentation may remain stable or progress slowly over time. Vitiligo universalis (VU) is a clinical variant characterized by widespread generalized involvement of the vitiliginous skin.[1]

To the best of our knowledge, only two previous cases have reported the spontaneous repigmentation of vitiligo universalis following the initiation of hemodialysis. In this article, we explore a unique case of a patient with stable vitiligo universalis for more than 14 years who unexpectedly experienced repigmentation shortly after the initiation of hemodialysis (HD).

Case Presentation

A 25-year-old Saudi woman, previously diagnosed with vitiligo universalis and systemic lupus erythematosus, presented with nephrotic syndrome. The patient had been undergoing hemodialysis (HD) three times weekly for six months prior to her visit to the dermatology clinic. At the clinic, she reported the development of new brown spots (Figure 1). She had been diagnosed with vitiligo at the age of 10, and the condition had progressed over the last three years, eventually involving more than 95% of her body surface area (BSA). For the past 15 years, the patient remained fully depigmented until November 2018 when HD was initiated due to worsening lupus nephritis. In the subsequent weeks following the commencement of HD, she noticed new areas of pigmentation emerging on her face, arms, thighs, abdomen, and back. After 11 months of continuous HD, the patient returned for further evaluation as the repigmentation continued to increase, showing resistance to topical depigmentation cream (Figure 2).

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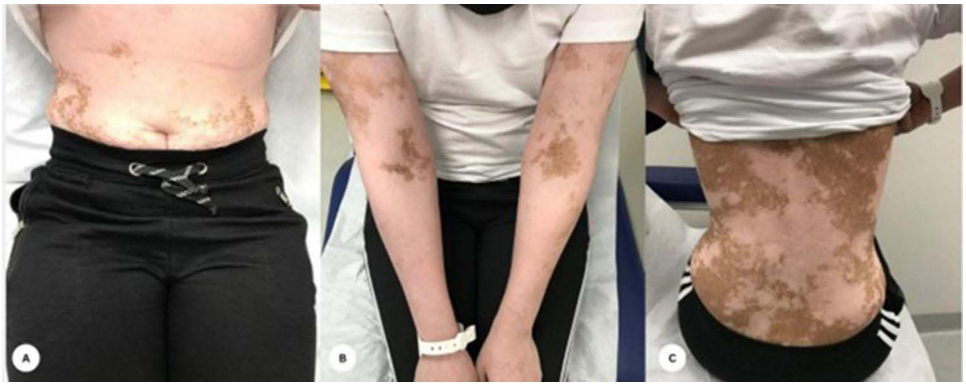

Figure 1 (**A**–**C**) The patient exhibits signs of skin repigmentation following 73 sessions of hemodialysis, mainly on the back, abdomen, and arms.

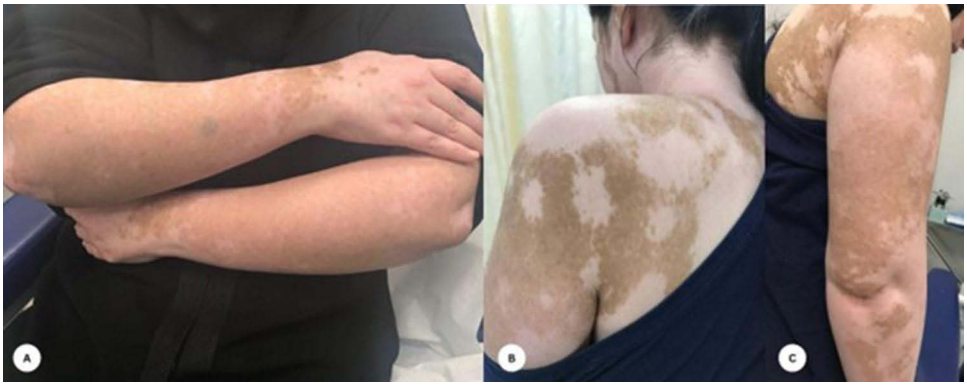

Figure 2 (**A**–**C**) Further signs of growing skin repigmentation on the forearms, and shoulders following 132 sessions of hemodialysis.

The patient was receiving thyroxine 150 mg, nifedipine 60 mg, and prednisolone 5 mg, and she denied any other significant changes around that time. Upon physical examination, complete repigmentation was observed over the bilateral thighs and back, and to a lesser extent over the face, abdomen, and arms. Repigmentation occurred on more than 70% of the BSA compared to the 5% BSA before HD initiation.

Discussion

The unexpected repigmentation observed in our patient with long-standing vitiligo universalis following the initiation of hemodialysis (HD) presents a rare and intriguing clinical phenomenon. While cutaneous abnormalities are commonly associated with end-stage renal disease (ESRD) and HD, including half-and-half nails, pruritus, xerosis, and skin hyperpigmentation, the phenomenon of repigmentation in vitiligo universalis is exceptionally rare.[6] The incidence of acquired perforating dermatoses increases with HD, and few reports on metastatic calcinosis cutis and calciphylaxis have been documented.[7] To our knowledge, this case represents one of the very few instances documented in the literature, providing a unique opportunity to explore potential mechanisms and contribute to the understanding of this rare occurrence.

The exact pathogenesis of vitiligo remains elusive, involving complex interactions between genetic, immunological, and neurological factors. The primary mechanism is believed to be the immune-mediated destruction and absence of melanocytes, the cells responsible for pigment production in the skin.[4] This autoimmune hypothesis is supported by the association of vitiligo with other autoimmune disorders, as seen in our patient with systemic lupus erythematosus. Repigmentation can primarily occur from hair follicles in vitiligo vulgaris. These follicles contain a substantial reservoir of melanocytic cells that can migrate and repopulate the epidermis.[8] The stable nature of vitiligo universalis,

characterized by extensive depigmentation, typically poses a significant therapeutic challenge, with repigmentation being a rare and uncommon clinical outcome.

After reviewing the literature, we found only two instances of hemodialysis-induced repigmentation in vitiligo universalis. Farahbakhsh et al reported a case involving a 60-year-old African American woman with stable vitiligo universalis for over 20 years, who experienced spontaneous repigmentation after initiating HD. Biopsies revealed basal hypermelanosis and an increased density of melanocytes at the dermo-epidermal junction, suggesting that melanocyte functionality can be reactivated under certain conditions.[9] Similarly, Rekik et al documented a case of a 45-year-old woman with stable vitiligo universalis who developed diffuse hyperpigmented macules after beginning HD, further supporting the potential link between HD and melanocyte reactivation.[10] With further literature search, the phenomenon of vitiligo universalis repigmentation has been also documented in cases other than hemodialysis as a trigger. Two notable cases include repigmentation observed under chemotherapy for colon cancer and another under oral corticosteroid therapy combined with cyclophosphamide for pemphigus vulgaris.[11,12] Such cases emphasize the complexity of VU's pathophysiology and suggest avenues for further research into therapeutic mechanisms that might influence melanocyte activity and skin pigmentation restoration.

A study by Moon et al explored the impact of different dialysis modalities on skin hyperpigmentation in ESRD patients. They found that patients undergoing high-flux hemodialysis (HF-HD) and haemodiafiltration (HDF) showed significant improvements in skin pigmentation, attributed to the enhanced removal of middle-molecular-weight substances that may stimulate melanogenesis.[13] These findings suggest that the dialysis process itself, particularly the type of dialysis, may play a role in modulating skin pigmentation. Moreover, a study conducted in August 2000 by Tobin et al challenges the widely held belief that melanocytes are completely absent in the lesional skin of long-standing vitiligo. By demonstrating the presence of melanocytes in these areas, the researchers suggest that these cells may retain the potential to regain functionality.[14]

The repigmentation following hemodialysis observed in this case of vitiligo universalis is an intriguing phenomenon, and while the exact mechanism remains speculative, there are several factors related to HD that could explain this outcome. These factors center around immune modulation, in which patients with vitiligo often exhibit heightened immune responses, where autoreactive T-cells target and destroy melanocytes. By removing inflammatory mediators and normalizing immune responses, HD may reduce this autoimmune activity, thereby allowing melanocytes to survive and function, contributing to repigmentation.[13,15] Secondly, hemodialysis, particularly high-flux HD (HF-HD) and hemodiafiltration (HDF), is effective in clearing middle-molecular-weight substances, such as β2-microglobulin, cytokines, and other uremic toxins that can have immunosuppressive or pro-inflammatory effects. These substances, when accumulated in the blood, may impair melanocyte function or induce immune-mediated destruction of melanocytes. Studies have shown that better clearance of such molecules through HD correlates with improved skin pigmentation outcomes, suggesting that this removal might help restore normal melanocyte activity.[13] Hemodialysis also has positive effects on microcirculation, which is often impaired in patients with end-stage renal disease. Improved blood flow may support the migration and proliferation of melanocytes from hair follicles to the depigmented skin areas, leading to repigmentation. As noted in a review by Avermaete et al, microangiopathic changes are frequently observed in dialysis patients, and improvements in these microcirculatory conditions could aid in the delivery of essential nutrients and oxygen to the skin, promoting melanocyte survival.[15] Our case adds to the limited body of evidence, and to our knowledge, it represents the third reported instance globally and the first in the Middle East, highlighting the potential for repigmentation in patients with vitiligo following HD.

Conclusion

The unexpected repigmentation of vitiligo universalis following the initiation of HD highlights a rare and poorly understood phenomenon. While the exact mechanisms remain speculative, the enhanced removal of middle-molecular-weight substances, melanocyte reactivation, and immunomodulation are possible contributing factors. Further research is needed to determine the precise pathways involved and to explore the potential therapeutic implications for patients with vitiligo undergoing dialysis.

Data Sharing Statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Statement of Ethics

Ethical approval is not required for this study in accordance with local or national guidelines.

Declaration of Patient Consent

Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

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Disclosure

The authors declare that there are no conflicts of interest.

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