IJD Case Report

UV-Exposed nail discoloration following the use of over-the-counter vitamin C-containing skin care, mimicking oil-drop pigmentation in a psoriasis patient

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Yellowish nail discoloration has a wide range of differential diagnoses. It may be associated with infectious or non-infectious etiologies, but discoloration can also result from the consumption or topical application of natural or synthetic compounds found in additives. This case report demonstrates that, in a patient with psoriasis, yellowish nail discoloration can be caused by over-the-counter vitamin C-containing skincare products, in addition to psoriasis exacerbation. A 24-year-old woman presented with yellow-orange discoloration of the fingernails that began two months prior and worsened over the last month. The discoloration was more prominent on the right hand and fluctuated, appearing lighter at night. Physical examination revealed yellow-orange discoloration extending from the distal nail plate to the perionychium of digits I-IV on the right hand and digits II-III on the left hand. Neither onychodystrophy nor nail pitting was observed. The patient had a history of psoriasis and psoriatic arthritis, which were re-evaluated due to recurring joint pain. After five weeks of treatment with 5 mg methotrexate, the discoloration did not fully resolve. A review of her skincare routine revealed that she had been using a new over-the-counter vitamin C-containing facial cream for six months. She applied the cream using her fingertips, predominantly the second to fourth fingers of the right hand. One week after discontinuing the vitamin C cream, the discoloration disappeared, with no onychodystrophy noted, as confirmed by dermoscopy performed by a dermatologist. Nail discoloration due to skincare product application should always be considered a potential benign cause. Recognizing such conditions requires a thorough review of the skincare routine, especially by dermatologists, to identify possible active ingredients or vehicles responsible for the discoloration.

Keywords: nail discoloration, vitamin C, skin care, psoriasis, over-the-counter, cosmetics

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INTRODUCTION

Nail discoloration has a broad possible differential diagnosis, ranging from local to systemic pathologies. Specific color changes correspond to different potential diagnoses [1,2]. Yellowish nail discoloration may be associated with both infectious and non-

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infectious causes. Among infectious etiologies, fungal infections—caused by dermatophytes or Candida species—are the most common, aside from *Pseudomonas* infection. Non-infectious causes are often related to autoimmune disorders such as psoriasis or rheumatoid arthritis; however, discoloration may also result from the consumption of natural or synthetic compounds found in additives. Additional physical examination findings can include onycholysis, brittleness, pitting, nail ridging, disrupted nail growth, or nails that appear macroscopically normal without dystrophy [3]. Yellow nail syndrome (YNS) is another differential diagnosis characterized by (1) slow-growing, hard, yellow dystrophic nails, (2) lymphedema, and (3) respiratory tract disease [4].

However, some discolorations are not related to any diseases but are caused by external or environmental factors, either systemically or through local exposure. Several medications, such as isotretinoin and cetuximab, have been reported to cause yellowish discoloration. While several compounds are well-established culprits for yellow to orange nail discoloration—such as beta-carotene, acetone, tobacco, sulfur, and curcuma—others are sometimes overlooked [3]. In dermatology, these discolorations are classified as drug-induced nail diseases. They occur when a medication alters nail growth or structure, resulting in changes to the shape (deformity), composition or texture (dystrophy), abnormalities of the surrounding tissue (paronychia), and pigmentation or discoloration of the nail. These conditions can present with a wide variety of clinical manifestations. A typical feature is that the manifestations are dose-related and gradually disappear after drug withdrawal. Some of these alterations are asymptomatic and cause only cosmetic issues, whereas others may be accompanied by pain and discomfort, impairing manual activities or even ambulation [5].

Here, we report a case involving a young adult female psoriatic patient who presented with yellowish nail discoloration initially treated as nail psoriasis; however, no complete resolution was achieved. It was later determined that the discoloration was caused by her use of vitamin C-containing skincare products over the past six months.

CASE PRESENTATION

A 24-year-old female presented with yellow-orange discoloration of the fingernails that began two months ago and worsened over the past month. The discoloration was uneven on each nail, more prominent on the right hand, and fluctuated, appearing lighter at night. It originated in the distal part of the nails, not from the nail fold. The discoloration was located in the nail plate and progressed forward with nail growth. Although the affected nail was removed, the discoloration persisted in the exact area where it initially appeared. The precise onset of the discoloration was unknown because it had been masked by nail art applied two months before the first noticeable change. The patient reported no local pain or itching.

She has a history of psoriasis and psoriatic arthritis, with the last documented medication use two years ago, consisting of on-demand topical corticosteroids and etoricoxib, without any use of disease-modifying antirheumatic drugs (DMARDs).

Within the last two weeks, she experienced mild pain and joint stiffness in the back, which worsened at night, while hand joint stiffness was more prominent in the morning. She denied any specific stressors (physical or psychological), nail polish application after symptom onset, and consumption of foods high in beta-carotene. However, she routinely applied apricot oil to her nails.

On physical examination, yellow-orange discoloration was observed on the distal nail plates extending to the perionychium of digits I–IV on the right hand and digits II–III on the left hand. Neither onychodystrophy nor nail pitting was noted. Onychomadesis and onycholysis were absent. Additionally, minimal erythematous plaques with silver scaling were found on the extensor surfaces, with a total body surface area (TBSA) involvement of less than 1%.

Her psoriasis and psoriatic arthritis were re-evaluated. Minimal psoriatic plaques were observed; however, her joint pain intensified. She was advised to take etoricoxib to alleviate the pain. After two weeks, her pain was not fully relieved, and discoloration was noted. Subsequently, she was started on 5 mg of methotrexate (MTX) per week, which resulted in significant improvement in pain and slight improvement in discoloration. She continued with 5 mg MTX for one week, increased to 7.5 mg for two weeks, and then 10 mg for one week. Each MTX dose was followed the next day by 1 mg of

folic acid. Unfortunately, the discoloration did not improve significantly, and complete resolution was not achieved; therefore, MTX was discontinued.

After reviewing her skincare routine, it was discovered that she had been using a new over-the-counter (OTC) vitamin C-containing facial cream for six months. She had never used this product before, nor had she regularly used vitamin C serum or its derivatives. She applied the cream using used her fingertips, predominantly the second to fourth fingers of her right hand. Yellowish discoloration was also observed on the cream box, displaying a gradient similar to that found on her nails. The doctor then recommended discontinuing the skincare product. One week after stopping the vitamin C cream, the discoloration disappeared, and no onychodystrophy was noted, as confirmed by dermoscopy performed by a dermatologist (Figure 1). The progression of the nail condition is shown in Figure 2.

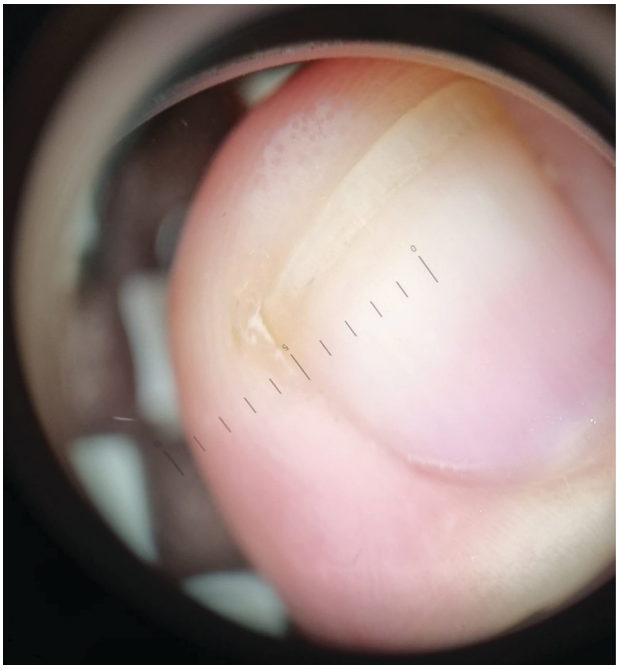

Figure 1. Dermoscopy of the nail one week after discontinuation of vitamin C shows a normal appearance.

Ethical considerations

Written informed consent for the publication of this case report has been obtained from the patient.

DISCUSSION

In this case, the patient was suspected of having new-onset nail psoriasis, as her chief complaint was preceded by relapsing arthralgia and psoriasis. Psoriatic arthritis is classified as a severe form of psoriasis and is commonly accompanied with nail psoriasis. At the time of examination, the patient denied using nail polish, recent contact with synthetic or natural color additives, smoking, and excessive consumption of beta-carotene–rich foods. Her regular medications were also reviewed, but none indicated a potential cause.

Methotrexate was introduced and works by inhibiting folic acid synthesis, exerting both antimitotic and anti-inflammatory effects. In our case, a notable improvement in discoloration was observed after the

Figure 2. Progression of nail discoloration: (A) Before methotrexate (MTX) administration, note the discoloration predominantly on the distal portions of the nails, almost exclusively on the 2nd to 4th digits; (B) During MTX administration, starting at 5 mg/week (July 13, 2024) and tapered to 10 mg/week within one month (last dose August 11, 2024), slight improvements were noted, though no complete resolution occurred; (C) Two weeks after vitamin C discontinuation, no yellowish discoloration remained.

first dose of MTX (5 mg). However, this response was not sustained. After the third dose (7.5 mg), discoloration reappeared the day following folic acid consumption. Similar phenomena occurred after the fourth (7.5 mg) and fifth doses (10 mg). Although the worsening of discoloration was not as severe as the initial presentation, it raised suspicion of another coexisting condition. This was not considered worsening or resistant psoriasis, as the patient reported slight improvement in the pitted toenails after MTX treatment.

After reevaluation, the patient reported that she had recently been using a vitamin C-containing skincare product, which she had not mentioned previously. Noticing a similar yellowish discoloration on the skincare box, we hypothesized that the nail discoloration might persist due to constant exposure to vitamin C from the skincare product, which is easily oxidized by UV light. We then conducted a simple UV-exposure oxidation test on the suspected skincare product and observed a color change similar to the nail discoloration. UV exposure can cause vitamin C (ascorbic acid) to convert into dehydroascorbic acid (DHAA), which imparts a yellow appearance [6]. The concentration of vitamin C in the product is moderate (12.5%). Studies have shown that a concentration of at least 8% is required for clinically significant effects, while concentrations above 20% generally do not increase efficacy [7,8]. Along with increased sensitivity to sunlight due to MTX consumption, the discoloration became more prominent. Moreover, the patient did not wash her hands after applying the skincare product, which may have led to the accumulation of deposits. The MTX treatment was appropriate, given the high likelihood that the initial condition also involved nail psoriasis. The skincare box includes a precaution stating that, as a high-dose vitamin C product, it can darken after exposure to light or air. However, there is no direct evidence that it causes discoloration of the skin or nails. For experimental purposes, we applied a fingertip unit of the cream onto a cotton sheet, placed it outdoors under sunlight exposure for 28 days, and monitored the color changes (Figure 3).

The chief complaint of yellowish nail discoloration (xanthonychia) has several differential diagnoses, including direct exposure to substances, drug-induced causes, infections, and systemic diseases. We have summarized recent differential diagnoses from the latest case reports, literature, and publications related to the clinical presentation of xanthonychia (Table 1).

CONCLUSION

Nail discoloration resulting from skincare application should always be considered a potentially benign cause. Recognizing these conditions requires a thorough review of the skincare routine, particularly by dermatologists, to identify possible active ingredients or vehicles responsible. For OTC skincare products, information regarding the risk of staining should be clearly provided.

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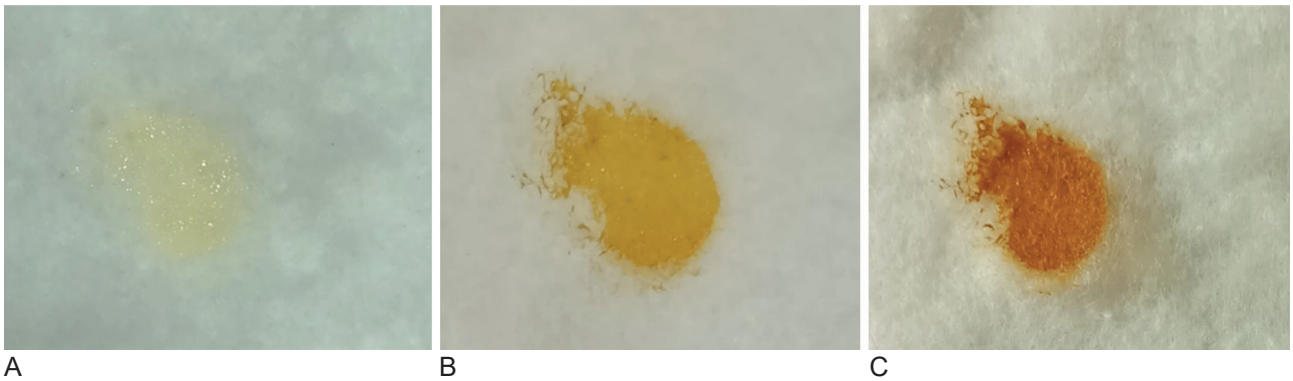
Authors' contributions

KT: Conceptualization, writing—original draft, data curation, project administration; **KK:** writing—original draft; YI**:** writing—review and editing, supervision.



A B C

Figure 3. Changes in staining on a cotton sheet after skin care application under sunlight exposure: (A) pale yellow on day 0; (B) orange on day 14; and (C) brownish on day 28.

Table 1. Differential diagnosis of yellow nail discoloration

Differential diagnosis	Color	Location	Nail Dystrophy	Others
Yellow nail syndrome [9]	Yellow discoloration (It varies from pale yellow to dark green)	Diffuse involvement of both fingernails and toenails	• Irregular, hard, thick, dystrophic nails • Slow-growing nail • Brittle	Accompanied by the presence of lymphedema and pulmonary disease, especially chronic cough followed by pleural effusion Affects adults over the age of 50 years
Nail psoriasis [10]	Yellow to red discoloration. 'Salmon patch' or 'Oil drop' sign	Discoloration spots appear from the middle part to the perionychium	Nail pitting, onychomadesis, trachyonychia, onycholysis, and subungal hyperkeratosis	Nail psoriasis is found in approximately 40% of psoriasis patients. Up to 80% of individuals with nail psoriasis also have psoriatic arthritis
Diabetic yellow nail syndrome [3]	Yellow-orange discoloration	Distal nail plate	Normal nail morphology and growth	Present in the late stages of diabetes
Pseudomonas aeruginosa infection [3]	Yellow-green discoloration	Vary, but commonly arise from the proximal or lateral parts of the nail bed	Corresponding to the paronychia	Opportunistic infections occur in diabetic or immunosuppressed patients
Natural compound-associated nail discoloration [3,11] a. Tobacco b. Turmeric c. Beta-Carotene	a. Yellow to brown discoloration b. Yellow-orange discoloration c. Yellow-orange discoloration	a. Gradient, with saturation in the distal part of the nail plate b. Diffuse into the nail plate and adjacent skin* c. Diffuse from the nail bed to the nail plate	a. Hard and gritty nail b. - c. -	a. Found in heavy smokers b. After preparing the cooking spice c. Due to excessive consumption of beta-carotene-rich foods
Synthetic compound-associated nail discoloration [3,11,12] a. Acetone b. Vitamin C	a. Yellow-orange discoloration b. Yellow-orange discoloration	a. Mid-distal nail plate* b. Distal nail plate, generally on digits II–IV of the dominant hand*	a. - b. -	a. Due to the intensive use of acetone for removal b. Occurs after UV exposure on nails with a high concentration of absorbed vitamin C
Drug-induced nail discoloration [3,13] a. Systemic isotretinoin b. 5-Fluorouracil c. Cetuximab	a. Yellowish discoloration b. Yellow discoloration (topical 5-FU) to dark discoloration (systemic 5-FU) c. Yellowish discoloration	a. Proximal nail plate b. Diffuse on the nail plate c. Distal nail plate	a. Usually presents with scaling of the cuticle and eponychium, along with increased nail growth b. Onychomadesis, transverse band onycholysis, and dystrophy c. Periungual granulation tissue, onycholysis, and brittleness	a. May be observed in patients undergoing acne treatment b. Topical 5-FU affects only the local area, whereas systemic 5-FU may cause serpentine hyperpigmentation c. May present with intense pain
Onychomycosis [3,14]	White-yellow-greenish discoloration	May arise from the distal to the proximal nail plate	Thick, hard, and brittle, with variations of onycolysis and dystrophy	KOH 30% examination is needed for further evaluation.

*Consistently appertain to the exposed area.

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