Eccrine chromhidrosis: A case report and review of literature

Li-Na Xu, Jian-Jun Qiao, Hong Fang
From Department of Dermatology, The First Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou, China
Correspondence to: Hong Fang, Department of Dermatology, the First Affiliated Hospital, College of Medicine, Zhejiang University 79# Qingchun Road, Hangzhou - 310 003, China. E-mail: fanghongzy@zju.edu.cn
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ABSTRACT
Chromhidrosis is a rare disorder characterized by colored sweat and/or stained skin. Eccrine chromhidrosis is an orphan disease in which water-soluble pigments are excreted through the eccrine glands. This article provides a highly doubtful eccrine chromhidrosis case and the literature review for eccrine chromhidrosis. We recommend an investigative algorithm for dermatologists, hepatologist, and general practitioners to enhance diagnostic capability without mistake among similar and differential diseases. Most importantly, the exact etiology should be determined, which further decides the treatment plan. Systemic treatment of liver diseases or bacteremia was reported particularly effective. Results and prognosis were excellent and without recurrence.

Key words: Chromhidrosis, Colored sweat, Eccrine chromhidrosis

CASE REPORT
A 16-year-old girl presented with an orange stained undershirt, a 1-month history of diffused darkish ebony skin discoloration and colored fingernails. The orange discoloration was notable after exercise. Moreover, there was no notable medical history, and the patient denied occupational, environmental or habitual exposure to medication, cosmetics, or exogenous paint producing pigments.

Physical examination revealed an orange stained T-shirt (Fig. 1a), spots of the skin located on her abdomen and hind leg (Fig. 1b), and varying degrees of discoloration (orange) of her fingernails (Fig. 1c), which could not be removed by wet cotton swabs. The color of the urine, tears, saliva, and feces was all normal.

Laboratory examination was performed including blood, urine, liver, renal, thyroid, and tumor marker tests, all of which were normal except increased total bile acid 31 μmol/l (normal: 3.4–17.1 μmol/l), blood’s uric acid 370 μmol/l (normal: 178.4–297.4 μmol/l), and urobilinogen + , 34 μmol/l (normal: - or <16 μmol/l).

Abdominal ultrasonography of liver, gallbladder, spleen, and pancreas was normal. Dermoscopy showed darkish ebony pigment along the dermatoglyphic ridges of posterior shank skin (Fig. 2). Skin scraping/culture and biopsy were refused.

A follow-up in-depth history produced confirmation of a special fetish for takeaway food “bowel noodles.” Although lack of extraction of takeaway food and clothing by spectrophotometry to confirm causable pigment and additives, we proposed it to be eccrine chromhidrosis which turned normal completely in 4 months and no recurrence hitherto within 1.5 years.

DISCUSSION
The exact pathogenesis of eccrine chromhidrosis is still unclear. From our review of the literature, the most important cause of the eccrine chromhidrosis found was hyperbilirubinemia, followed by ingestion of drugs and food; there also exist two other reasons which are unknown. Etiology of eccrine chromhidrosis is listed in Table 1.
Disease-related eccrine chromhidrosis causes hyperbilirubinemia, which can be primary or secondary to cholangiocarcinoma [1], liver cirrhosis [2], drug-induced liver disease [3], and enterococcal bacteremia [4]. Progressive jaundice induced by advanced intrahepatic cholangiocarcinoma causes an elevated level of direct bilirubin which led to increased secretions of water-solute bilirubin from the eccrine glands [1]. A 6-month-old patient presented with drug-abused cholestasis accompanied with jaundice, presenting with high levels of direct bilirubin that was secreted through the eccrine gland. Moreover, biopsy results showed dilated eccrine pores and a positive Prussian blue stain [3]. Previous reports consider this bilirubin excretion by the eccrine glands as exceptional variants of eccrine chromhidrosis.

Drugs related to eccrine chromhidrosis include bisacodyl (dulcolax) and homeopathy drugs. Krishnaram et al. reported a case of yellow eccrine chromhidrosis induced by bisacodyl that was coated with highly water-soluble tartrazine [5]. Ghosh et al. reported a case of blue-green eccrine chromhidrosis with high blood copper and caused due to homeopathic medicine ingestion and later on returned normal after discontinuation of the drug [6].

A specific brand of tomato-flavored prepacked food was associated with red eccrine chromhidrosis [7]. Spectrophotometry identified that clothing and branded food extractions were revealed three water-soluble coloring food additives that were commonly included in prepacked fast foods: Tomato powder 04181 (H 3383), tomato powder 2148249 (H 3383), and paprika 03200 (H 3383) [7]. In the present case, our speculation was that bowel noodle takeout food-induced eccrine chromhidrosis might be possible; although pigments or additives were not detected.

An etiology of eccrine chromhidrosis has also been reported as idiopathic in several reported cases. Beer and Oakley reported a case of a 62-year-old woman who presented with 30 years complaint of a dark ebony discoloration that covered her axilla and stained her garments. She denied any history of dye/pigment exposure to drugs and foods and was without a significant medical history. She accepted Botox (50 units) for each axilla and significantly improved within 5 days. She was discharged on the 10th day [8]. Consequently, she returned for follow-up injections of Botox (100 units), twice in 1 year. The resolution of the symptoms by Botox supports the eccrine etiology; for this reason, the author suspected eccrine chromhidrosis as the underlying cause [8]. Botox was responsive to eccrine sweat glands and improved eccrine chromhidrosis after injection [9].

The clinical presentation could manifest as different colored sweat on various surfaces of the body. From our literature review, the color of eccrine chromhidrosis varied due to different primary causes and varied in the color discoloration from green, blue, yellow,
orange, and red to black. The clinical manifestations could be localized at the palmoplantar parts, fingertips, nails, thighs, face, or axilla. Moreover, it could also be generalized with solo discoloration of shirts and clothing. Besides the typical patches or staining of the skin, the symptom resembles eczema, pompholyx [2,10], and concomitant pityriasis rosea [10]; it can be easily misdiagnosed.

Histopathology examinations commonly revealed dilated intraepidermal eccrine ducts with associated amorphous pink material [10], which was located just in the stratum corneum where the bilirubin deposited [4]. Besides, the diseases in the setting of hyperbilirubinemia, other causality assessment also revealed amorphous agents within the eccrine glands, which were subsequently identified as copper [6]. Unlike apocrine glands involved in apocrine chromhidrosis, it is through that eccrine glands in eccrine chromhidrosis secrete pigments such as bilirubin, copper, and even unproven materials.

Investigation of complete blood count by blood routine and homogentisate should be examined to exclude bleeding diathesis and ochronosis, respectively. Abnormal serum iron, blood glucose, and liver function tests may suggest hemochromatosis. Biochemical function tests were used to detect blood total and direct bilirubin, markers of hyperbilirubinemia related to severe jaundice, high fever, cholangiocarcinoma, liver cirrhosis, drug-induced liver disease, or bacteremia. Spectrophotometer revealed highly raised copper in sweat, which was normal in the blood and urine [6]. High-performance liquid chromatography (HPLC) was performed to demonstrate tartrazine, coating over bisacodyl, which thereby confirmed the diagnosis of chromhidrosis [5]. Dermatoscopy was adopted to observe the discoloration of the skin, which revealed a green pigment predominantly on the ridges of the skin where eccrine glands opened [4].

Skin scraping/cultures should be identifiable using methods such as potassium hydroxide examination, Gram stain, and Wood’s light examination to distinguish from pseudochromhidrosis. Herein, we propose an investigative algorithm to diagnose this rare disease, as shown in Fig. 3.

It is, in fact, indispensable to first determine the etiology of a condition before selecting a treatment strategy. If diet source dyes and pigments seem doubtful, immediate discontinuation and further close observation should be performed. If a drug is suspicious, we

![Figure 3: Algorithm investigation of eccrine chromhidrosis](image-url)
might eliminate and/or reuse it again, and subsequently analyze the underlying agents by spectrophotometer or HPLC.

In terms of the reported cases related to diseases, the discolorations were all green and resulted from increased bilirubin that was excreted through the eccrine glands and mainly deposited on skin of the palms and soles. Cutaneous bilirubin excretion was considered as an exceptional variant of eccrine chromhidrosis related to hyperbilirubinemia secondary to cholangiocarcinoma, liver cirrhosis, drug-induced liver disease, and enterococcal bacteremia. When hyperbilirubinemia improved or was cured within 1 week–2 months, the fevers subsided, and the lesions faded or completely disappeared with or without sloughing of the skin.

In addition, not all cases related to hyperbilirubinemia involved reported positive bilirubin staining on Hall’s or Fouchet stain. Therefore, it is speculated that the bilirubin stain had not been optimized in the skin [4].

**CONCLUSION**

The exact etiology of chromhidrosis should be ascertained before treatment. As a special variant of eccrine chromhidrosis, cutaneous bilirubin excretion seems to be a sign of liver disease as, after control of these liver diseases, the lesions vanished. The use of food coloring and flavor-enhancing products added into takeaway foods (as seen in our case) should be used cautiously as it has a major health impact and a practical approach in the diagnosis of this condition would be necessary.

**REFERENCES**


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