

Long-term use of triple antibiotic-induced black hairy tongue: A case report

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Abstract

Black hairy tongue is a rare condition, characterized by a black discoloration and hair-like structure appearing on the dorsal surface of the tongue. The mechanism of black hairy tongue remains unclear but could be predisposed by multiple factors. We described a case of a 53-year-old Chinese female with a diagnosis of bronchiectasis complicated with *Mycobacterium abscessus* infection, and a triple antibiotic regimen was prescribed for the infection. One month later, a black hairy tongue appeared. The clinical pharmacist was consulted to investigate the association of medication-related factors by the attending clinician, and the clinical pharmacist identified the potential cause and suggested an appropriate treatment for the black hairy tongue. The black hairy tongue disappeared and did not recur during subsequent treatment.

Keywords

Hairy tongue, *Mycobacterium abscessus* infection, triple antibiotic use, clinical pharmacist

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Introduction

Black hairy tongue (BHT) is an acquired, rare, benign condition, characterized by a black discoloration and hair-like structure appearing on the dorsal surface of the middle and posterior tongue. While black is the most commonly reported color, cases with brown, white, yellow, and green discoloration have also been documented.^{1–4} Although BHT is typically asymptomatic, patients often seek treatment because of cosmetic reasons. Some individuals may additionally experience halitosis, nausea, or a burning sensation.^{2,5} The prevalence of BHT varied geographically, ranging from 0.6% in Minnesota, USA to 11.3% in Turkey.^{6,7}

The precise mechanism underlying BHT development remains uncertain. Previous studies suggest that the use of certain antibiotics can lead to BHT by altering the intraoral environment and promoting the growth of porphyrin-producing chromogenic organisms and fungi, which contribute to discoloration. The hair-like structure developed from inadequate desquamation on the dorsal surface of the tongue, contributing to the accumulation of keratinized layers, further resulting in elongation of the filiform papillae and presenting a hair-like structure. However, the relationship between antibiotics and the elongation of filiform papillae has not been fully understood, and the elongation has been reported to be associated with smoking, oxidizing agents, and the use of several antibiotics.⁸

Antibiotics implicated in BHT include amoxicillin clavulanate, metronidazole, doxycycline, erythromycin, linezolid, tetracycline, moxifloxacin, and imipenem/cilastatin.^{1,5,9–13} However, it remains controversial for the development of BHT between the direct change to the intraoral environment or the alteration of filiform papillae to form a hair-like structure, thus collecting organisms and food debris. Besides, antipsychotics and anticholinergics such as benzotropine, clonazepam, olanzapine, glycopyrrolate,^{14–16} and so on, are also reported to be associated with BHT and might be the cause of xerostomia. Lifestyle factors including cigarette smoking, heavy black tea consumption, and poor oral hygiene have been identified as predisposing factors for BHT in a study involving 5150 Turkish patients.⁶

The first-line treatment for BHT involves discontinuing suspected medications and addressing predisposing factors while performing daily tongue cleaning with a toothbrush to facilitate the shedding of the dorsal surface. The topical use

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of 3% hydrogen peroxide and oral traditional Chinese medicine (TCM) such as compound liquorice tablets, smoked plum pills, and scouring rush are reported as therapeutic options, but there is controversy associated with the development of BHT.^{12,17–20} Second-line treatment options such as oral and topical retinoids and antifungal agents have been explored but lack well-established efficacy.^{10,11,21–23}

We present a case of BHT that was observed in association with the long-term use of a triple antibiotics' regimen. This case serves as an illustrative example, demonstrating the valuable contribution of clinical pharmacists in identifying potential causes and recommending appropriate treatments for such conditions, consequently providing a valuable reference for clinical pharmacists, highlighting their significant role as integral members of a comprehensive clinical care team and emphasizing their professional expertise.

Case

A 53-year-old Chinese female was referred to the respiratory medicine department with a diagnosis of bronchiectasis complicated by infection. She presented with severe coughing, profuse sweating, and pain in the bilateral ribs. She had had a history of recurrent coughing with a large amount of yellow purulent sputum but no identifiable cause and diagnosed for bronchiectasis 20 years ago. Four months prior to her admission, her symptoms worsened, characterized by an increased frequency of coughing with larger volumes of yellow, purulent sputum. *Mycobacterium abscessus* was suggested from both the results of a specimen culture in another hospital and the sputum specimen in our hospital. She refused hospitalization and sought treatment with TCM. However, after 2 weeks of TCM therapy without improvement in symptoms, she discontinued this approach. The patient denied any history of alcohol abuse, smoking, or regular consumption of tea or coffee. Furthermore, she had no past medical history of hypertension, coronary heart disease, diabetes, or other chronic conditions.

After admission, the infection department recommended a triple anti-infective treatment regimen of imipenem and cilastatin 1 g Q12H IV plus amikacin 750 mg once daily IV plus azithromycin 500 mg once daily PO and the attending clinician adopted it. One month later, the patient found black-brown discoloration presenting on the dorsal surface of the middle and posterior tongue when she was brushing her teeth. She reported no halitosis, trachyphonia, or nausea. There were no obvious abnormalities in blood routine and liver and kidney function, according to the laboratory test. A cultured result of a tongue swab reported *Candida albicans*. Nevertheless, antifungal therapy was not initiated due to the absence of symptomatic discomfort and the complexity introduced by the triple antibiotic regimen, as considered by the attending clinician.

An intraoral examination from the dentist discovered that the patient's tongue had a black-brown discoloration and

hair-like structure which thickened her tongue, but no limitation to the mucosa of dorsal tongue and tongue movement. BHT was considered by the dentist.

The clinical pharmacist received a consultation request from the attending clinician to investigate medication-related factors contributing to BHT and to study this condition further. Literature research indicated that the mechanism underlying BHT remains incompletely understood but is associated with various factors, including poor oral hygiene, radiation therapy, mouth dehydration, excessive coffee or tea consumption, smoking, antibiotics, and antipsychotics.²⁴ Moreover, oxidizing mouthwash or some TCMs are also reported to be linked to BHT.^{12,18–20}

The clinical pharmacist thoroughly reviewed the patient's medical history as well as current prescribed medications and conducted a detailed interview to gather additional information regarding her condition. The patient disclosed that she had been taking liquorice-containing tablets to relieve her cough as a part of her TCM prescription prior to hospitalization, however, it has been 3 months since she received TCM therapy. Considering the patient's diligent oral hygiene practices, hydration status, absence of alcohol abuse or smoking history, no habitual tea or coffee consumption, and no use of mouthwash or acceptance of antipsychotics or radiation therapy, coupled with the temporal correlation and combination of the tongue swab culture, the clinical pharmacist determined that the long-term use of a triple antibiotic regimen changed the intraoral environment in the patient's mouth, leading to the production of porphyrin from the proliferation of chromogenic organisms and fungus, presenting discoloration of the dorsal surface of her tongue. The precise mechanism underlying the presence of hair-like structures remains ambiguous, although their correlation with antibiotic usage has been reported in existing literature. This phenomenon hinders proper desquamation on the dorsal surface and leads to the elongation of piliform papillae on the tongue. Consequently, these altered structures serve as reservoirs for organisms, bacteria, and food debris accumulation, further contributing to discoloration.²⁵

As the necessity of her triple antibiotic regimen in treating *M. abscessus* infection and no systemic reaction were reported from the patient, the clinical pharmacist suggested no adjustment to her anti-infective regimen and advised the patient to clean her tongue every day with a soft-bristled toothbrush as well as maintain good oral hygiene. After that, the patient did not report any other reactions, and the black-brown color as well as the hair-like structure gradually disappeared and the tongue returned to its normal color and thickness within 1 week. Finally, during the subsequent treatment, the BHT did not recur any more. Two months later, as the symptom was improved, the patient decided to continue the treatment in Hong Kong and discharged from the hospital.

Discussion

The precise underlying mechanism of antibiotic-associated BHT has not been fully elucidated, and clinicians may attribute it to superinfection that arises during the clinical use of antibiotics. In addition to antibiotics, BHT can also be linked to coinfections with specific organisms such as *Candida albicans*, *Saccharomyces cerevisiae*, *Rhizopus nigricans*, *Aspergillus* and *Helicobacter Pylori*,^{5,24,26,27} and so on. The onset of BHT typically occurs 1–2 weeks after exposure to predisposing factors. Although there are reported cases, it is still uncommon for BHT to manifest after intravenous administration of antibiotics beyond a 4-week period.

The first-line treatment of BHT, in most cases, is a thorough and regular oral cleaning, followed by good oral hygiene. The use of mouthwash or TCMs has also been considered effective in treating BHT. However, there have also been reports suggesting that these treatments can cause or worsen BHT. For example, consumption of liquorice-containing substances and Chinese chives have been reported to cause or aggravate BHT.^{12,20} Some TCM remedies for BHT include dachengqi decoction (Rheum officinale, mirabilite, fruit of immature citron, magnolia officinalis), cinnamon, and the application on the tongue with coptis water solution in the ratio of 1:200,¹⁹ and so on; however, unlike Western medicine with clear pharmaceutical ingredients and standardized usage guidelines, TCM treatments for BHT often involve various herbal components with different decoction methods and timing controls. Consequently, it is challenging to identify specific components that are effective for this condition. As a result, there are no standard TCM prescriptions for the treatment of BHT. Furthermore, there is a scarcity of up-to-date reports on TCM therapy for BHT in China, making it difficult to conduct comprehensive studies on the use of TCMs in treating this condition.

The involvement of a clinical pharmacist is crucial and valuable within the clinical care team. Clinical pharmacists contribute to rational medication use, improved patient adherence, minimization of adverse reactions, and provision of professional knowledge during treatment, among other roles, as extensively demonstrated in previous studies.^{28–31} In this case, we present an illustrative example of how a clinical pharmacist contributed by identifying potential causes and recommended appropriate treatment for the patient's BHT. This highlights the importance of including a clinical pharmacist in the comprehensive clinical care team. The patient experienced only black-brown discoloration and hair-like structures on the dorsal surface of her tongue, without other clinical manifestations or systemic reactions related to BHT due to anti-infective treatment for *M. abscessus* infection. Therefore, considering the necessity of her triple antibiotic regimen, the clinical pharmacist advised against adjusting her anti-infective treatment and instead recommended maintaining good oral hygiene and regular brushing of the tongue.

Subsequently, the patient's BHT returned to its normal color and thickness and did not recur.

Conclusion

BHT is a rare and harmless condition that affects the tongue, and there are various factors that cause it, but antibiotic use is the most commonly reported. The recommended treatment is the regularly cleaning of oral cavity. Besides, TCM is also reported as an option to treat BHT, but reported controversial that TCM underlying BHT. Moreover, we presented an example for clinical pharmacist to assist clinician in solving problems during clinical practice, exhibiting the significant contribution of clinical pharmacist in a clinical care team, providing reference for clinical pharmacist participation in a clinical care team.

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Author contributions

Kin-Weng Sun reviewed medical records and drafted the article. Zhi-Cheng Yang provided the figure and reviewed the article. All authors have read and approved the final article.

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Ethical approval

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Informed consent

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