

Lead, Mercury, and Arsenic Poisoning Due to Topical Use of Traditional Chinese Medicines

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ABSTRACT

BACKGROUND: Metal poisonings through a mucocutaneous route are reported rarely in the literature.

METHODS: We report 2 cases of heavy metal intoxication from inappropriate use of Chinese mineral medicines confirmed by toxicologic investigations.

RESULTS: A 51-year-old man developed perianal gangrene and a high fever after a 2-week anal use of hong-dan herbal mixtures for anal fistula. He presented gastrointestinal and constitutional symptoms, followed by skin rash, anemia, hair loss, peripheral neuropathy, and muscle atrophy. Elevated urine arsenic and mercury confirmed the heavy metal poisonings. The hong-dan mixture contained lead tetraoxide, arsenic, and mercury. He was treated with 2,3-dimercapto-1-propanesulfonic acid, with partial improvement, but peripheral neuropathy persists 4 years later. A 75-year-old man developed anorexia, weight loss, headache, dizziness, nausea, vomiting, constipation, weakness, and anemia after a 3-month use of an herbal patch for chronic leg ulcer. His blood lead concentration was 226 $\mu\text{g}/\text{dL}$, and the lead content of the herbal patch was 517 mg/g. Chelation with ethylene diamine tetraacetic acid and dimercaptosuccinic acid was followed by clinical recovery.

CONCLUSION: These cases documented serious systemic poisoning after the short-term use of traditional Chinese medicines containing heavy metals in damaged or infected tissue.

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KEYWORDS: Arsenic poisoning; Chinese mineral medicine; Dermal exposure; Heavy metals; Lead poisoning; Mercury poisoning; Peripheral neuropathy; Topical

Toxic metals (lead, mercury, and arsenic) have been banned from therapeutic use in Western countries, except arsenic for the treatment of hematologic malignancies.¹ However, toxic metals are found frequently in Chinese and Indian traditional medicine, both deliberately and as a contaminant. In traditional Chinese medicine, huang-dan (yellow lead, lead oxide) and hong-dan (red lead, lead tetraoxide) have been used for many centuries in treatment of ulcerative skin

disease or as a base for carrying other ingredients in herbal patch. Although they have been banned because of the toxic potential of lead, topical use of lead-containing paste still occurs sporadically by unlicensed therapeutics.

MATERIALS AND METHODS

We report 2 cases of toxic metal poisoning through inappropriate topical use of lead-containing herbal mixtures. Herbal history was collected, and toxicologic analyses confirmed the diagnosis.

Case 1: Arsenic and Mercury Poisoning With Anal Use of Herbo-Metallic Ointments

A 51-year-old man treated his anal fistula with herbo-metallic ointments. After 1 week, he developed a mild fever, anal pain, dizziness, a pruritic rash, and anorexia. After 2 weeks, he was admitted to the department of surgery with perianal gangrene and high fever. Physical examination showed skin rash, numb-

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ness and progressive weakness of extremities, and leg edema. Important laboratory results included serum potassium of 2.9 mmol/L, normocytic anemia with a hemoglobin level of 9.4 g/dL, and elevated C-reactive protein of 11.6 mg/dL (normal <0.5 mg/dL). He was treated with wound debridement and colostomy (**Figure 1**).

The initial nerve conduction study and electromyography disclosed partial conduction block, prolonged F-response of motor nerve, and reduced amplitude of sensory nerve. **Table 1** shows the findings from the serial nerve conduction studies.² Drug eruption and acute inflammatory demyelinating polyneuropathy were suspected on day 14. The numbness and limb weakness worsened despite treatment with antihistamine, topical steroid, vitamin B₁₂, and 6 sessions of plasmapheresis.

On the basis of the progressive numbness and tingling pain of the extremities, weakness, muscle atrophy, hair loss, and anemia, metal intoxication and peripheral polyneuropathy were suspected and the patient was transferred to the medicine service. The urine metal analyses on hospital day 21 showed an arsenic level of 541 $\mu\text{g/g}$ creatinine

(normal: <100 $\mu\text{g/g}$ creatinine) and mercury level of 5.8 $\mu\text{g/L}$ (normal: <5 $\mu\text{g/L}$). His blood lead level was 5.9 $\mu\text{g/dL}$ (normal: <10 $\mu\text{g/dL}$) and arsenic level was 6.5 $\mu\text{g/L}$ (normal: <18 $\mu\text{g/L}$). Chelating therapy with 2,3-dimercapto-1-propanesulfonic acid began on day 27. During

the 2,3-dimercapto-1-propanesulfonic acid therapy, the excretion peak of urine arsenic was 827 $\mu\text{g/g}$ creatinine and mercury was 291 $\mu\text{g/d}$ (normal: <15 $\mu\text{g/d}$). The electromyography and nerve conduction velocity studies on day 37 showed mixed axonal and demyelinating neuropathy with axonal features predominating.

The use of herb was traced in detail. The anal wound was disinfected with mercurochrome and sulfanilamide ointment first, and then herbal mixtures were applied to the anal wound by cotton swab. The prescription in the first week was gypsum, followed by a mixture of indigo naturalis, musk, and hong-dan. In the second week, the prescription was a mixture of tung oil and hong-dan, and a mixture of hong-dan and rice wine. Two red herbal ointments contained lead 166,700 ppm and mercury 24.5 ppm, and lead

CLINICAL SIGNIFICANCE

- In the practice of traditional Chinese medicine, huang-dan (lead oxide) and hong-dan (lead tetraoxide) are used topically for ulcerative skin disease.
- Although lead, arsenic, and mercury are well-known toxins, the potential hazard of topical absorption is less appreciated and the diagnosis is easily missed or delayed.
- Short-term use of medicines containing lead, arsenic, and mercury in damaged or infected tissue may cause severe systemic toxicities.



Figure 1 Clinical appearance of 51-year-old man with arsenic and mercury poisoning after use of herbo-metallic (lead, arsenic, mercury) mixtures through the anal route. (A), Anal wound after debridement on first hospital day; some residual orange ointment was still seen. Sole hyperkeratosis (B), hand atrophy (C), and lower limb atrophy (D) on hospital day 26.

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