Clinical Observation

Mercury is usually added to skin-lightening products due to its whitening effect. The Food and Drug Administration (FDA) limits the amount of mercury in cosmetics to trace amounts under 1 ppm. Nevertheless, many cosmetics contain mercury above 1000 ppm to increase the whitening effect. In a group of special patients in the study, pain, renal damage, and neuropsychiatric symptoms were the cardinal symptoms observed.

The present study included 16 female patients diagnosed with chronic mercury intoxication at the First Affiliated Hospital of Zhengzhou University from 2009 to 2017. The age of these patients ranged from 19 to 50 years. All the 16 patients had a flexuose treatment experience, slow onset, and a hidden history that contributed the delayed diagnosis. There was no history of exposure to mercury in their work, but all of them had a history of using skin-lightening products, which had immediate and dramatic whitening effects. The chief complaint was miserable pain, and limb, head, abdomen, or lumbosacral pain was poorly responsible for nonsteroidal anti-inflammatory drugs, anti-epileptic drugs, and serotonin-norepinephrine reuptake inhibitors. According to the World Health Organization visual analog scale ranking, 0 referred to no pain and 10 referred to baryodynia. The pain of these 16 patients was rated between 4 and 7. Renal damage was another characteristic, in which six of all the patients presented with proteinuria. In addition, all patients had varying degrees of irritability, insomnia, dreams, depression, anxiety, and memory loss. Furthermore, five patients presented with eyelid, tongue, or limb tremors, while three patients presented with gingivitis.

The 24-h urine mercury content of these patients was within 0.037–0.170 mg/L (normal value, <0.010 mg/L). In one skin-lightening product sample, the mercury concentration was found to be 19,742 ± 379 ppm, which is 19,000 times higher than the FDA limit. The electromyography examination was normal in 11 patients, while it was abnormal in five patients; and slow sensory nerve conduction velocity and reduced amplitude were mainly observed. Moreover, the brain magnetic resonance imaging and lumbar puncture of seven patients with headache were normal. Hamilton Depression Scale-17 (HAMD-17, normal value <7 points) scores were within 9–20 points [Supplementary Table 1]. All patients received intravenous sodium dimercaptopropane sulfonate at 0.125 g/d and other symptomatic treatments.

Mercury ions replace tyrosinase enzyme anions, which inhibit the formation of melanin and produce the whitening and anti-freckle effects. Some products are added with the mercury content, which exceeds bid badly in thousands or even millions of times, in order to make the lightening effect remarkable. The long-term usage of these unqualified products would induce chronic mercury poisoning.

The common symptoms of chronic mercury poisoning are irritability, tremor, and gingivitis, while the onset of pain is rare. Furthermore, it has been reported that it causes memory loss, dizziness, insomnia, dreams, edema, proteinuria, abdominal pain, nausea, hyperthyroidism, and abortion. Studies on mercury poisoning, which leads to peripheral nerve damage, are rare. Patients in the present study prominently presented with renal damage, neuropsychiatric symptoms, and limb pain, which was rarely reported in previous studies.

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complained of pain, but rarely referred to limb weakness. Distal extremity hypoalgesia was not observed, and all patients had no severe central nervous system symptoms, such as lags in response, seizures, confusion, difficulty in swallowing, glossolalia, deafness, narrow field of vision, strabismus, or photophobia, which were similar with Minamata disease.[2]

Mercury damages the nerves in several ways: it interferes with membrane and receptor functions, and neurotransmitter transport and metabolism; it interrupts cytoskeletal proteins, and interferes with axoplasmic flow and signal transduction; it interferes with cell respiration, energy metabolism and others.[3] Among the 16 patients, six patients presented with proteinuria, but without edema. After 3–5 courses of chelation treatment, urine mercury returned to normal levels. Then, after approximately 4–8 weeks, pain was alleviated, urine protein was negative, and HAMD scale scores returned to normal.

Unqualified products that contain toxic substances such as mercury are not rare. These substances usually damage the nervous and renal systems. Hence, history taking is all important, and mercury chelation treatment should be given after diagnosis as soon as possible. Furthermore, the public should be warned about this danger.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients/patients’ guardians have given their consent for their images and other clinical information to be reported in the present study. The patients/patients’ guardians understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Supplementary information is linked to the online version of the paper on the Chinese Medical Journal website.**

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**Conflicts of interest**

There are no conflicts of interest.

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| Case | Age (years) | Latency from using the product to symptom onset (weeks) | Avenue of purchase | Main symptoms | Accompanied symptoms and signs | VAS ranking | Urine mercury | EMG | HAMD score |
|------|-------------|--------------------------------------------------------|--------------------|---------------|--------------------------------|-------------|---------------|-----|------------|
| 1    | 36          | 4                                                      | Online             | Headache, back pain | Hypomnesia, insomnia, irritability, often cries | 6           | 0.160 mg/L.  |     |            |
| 2    | 33          | 6                                                      | Online             | Pain in the four limbs, abdominal pain | Eyelid tremor, finger tremor, irritability, distraction, renal damage | 6           | 0.140 mg/L.  |     |            |
| 3    | 30          | 9                                                      | Online             | Pain in the four limbs | Both hand tremor, distracted, insomnia, renal damage | 7           | 0.170 mg/L.  |     |            |
| 4    | 37          | 13                                                     | Beauty shop        | Headache and pain in the four limbs | Insomnia, gingivitis | 5           | 0.110 mg/L.  |     |            |
| 5    | 40          | 5                                                      | Beauty shop        | Foot pain | Difficulty in falling asleep, distracted | 5           | 0.090 mg/L.  |     |            |
| 6    | 19          | 7                                                      | Online             | Lumbosacral pain, abdominal pain | Eyelid tremor, lingual tremor, hand tremor, insomnia, gingivitis, renal damage | 6           | 0.150 mg/L.  |     |            |
| 7    | 39          | 10                                                     | Online             | Pain in the four limbs | Difficulty in falling asleep | 4           | 0.057 mg/L.  |     |            |
| 8    | 35          | 6                                                      | Store              | Headache and pain in the four limbs | Renal damage, insomnia | 6           | 0.120 mg/L.  |     |            |
| 9    | 29          | 8                                                      | Store              | Pain in the four limbs | Insomnia, distracted | 4           | 0.080 mg/L.  |     |            |
| 10   | 36          | 5                                                      | Store              | Pain in both lower extremities, lumbosacral pain | Insomnia, distracted, hypomnesia, irritability | 6           | 0.130 mg/L.  |     |            |
| 11   | 32          | 7                                                      | Online             | Pain in both lower extremities and abdominal pain | Renal damage | 4           | 0.106 mg/L.  |     |            |
| 12   | 27          | 5                                                      | WeChat shop        | Pain in both lower extremities and abdominal pain | Lingual tremor, hand tremor, insomnia, gingivitis, irritability | 6           | 0.120 mg/L.  |     |            |

*Contd...*
| Case | Age (years) | Latency from using the product to symptom onset (weeks) | Avenue of purchase | Main symptoms | Accompanied symptoms and signs | VAS ranking | Urine mercury | EMG | HAMD Score |
|------|-------------|--------------------------------------------------------|--------------------|---------------|-------------------------------|-------------|---------------|-----|------------|
| 13   | 42          | 8                                                      | Beauty Shop        | Headache and pain in the four limbs | Limb tremor, hypnonesia, insomnia, irritability, renal damage | 6           | 0.110 mg/L    | Normal | 24         |
| 14   | 41          | 12                                                     | Online             | Pain in the four limbs | Difficulty in falling asleep, irritability | 4           | 0.076 mg/L    | Normal | 16         |
| 15   | 50          | 11                                                     | Store              | Headache, pain in the four limbs | Hypnonesia, insomnia, irritability | 5           | 0.130 mg/L    | Normal | 15         |
| 16   | 33          | 12                                                     | Online             | Pain in both lower extremities and abdominal pain | Irritability, insomnia, renal damage, hypnonesia | 6           | 0.110 mg/L    | Conduction velocity of the bilateral tibial and sensory nerve was slower, and the amplitude decreased | 24         |

VAS: Visual analog scale; EMG: Electromyography; HAMD: Hamilton Depression Scale.