CASE REPORT

Outbreak of thallium poisoning among Iraqi patients

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Received 10 March 2010; accepted 30 March 2010
Available online 28 December 2010

KEYWORDS
Thallium poisoning; Iraqi patients

Abstract Background: Thallium is the most suitable agent for criminal poisoning of human beings as it is tasteless and odorless. It is usually associated with typical clinical features, mainly dermatological and neurological manifestations.

Objective: To report an outbreak of thallium poisoning in Iraq and to review the literatures.

Patients and methods: This descriptive study was conducted in the Department of Dermatology-Baghdad Teaching Hospital from February 2008 to April 2008. Twenty-two patients with thallium poisoning were seen in the Poisoning Consultation Center during this period and thallium in urine has been measured using the colorimetric method and was positive in all of them.

We had the opportunity to see five cases referred for skin manifestations. Detailed history was done regarding all demographics points related to this poisoning. Full clinical examination was performed looking for skin manifestations, and other systemic involvements were also assessed.

Results: Five male patients with thallium poisoning were evaluated. Their ages ranged from 10 to 32 years with a mean of 24 years. All patients gave history of eating cakes laced with thallium. The dermatological findings were mainly anagen hair loss in diffuse and patchy pattern which affected the scalp and limbs. Also dusk ecchymotic red rash dermatitis-like picture was observed on the face, especially periorial region and dorsum of hands and legs. Neurological manifestations consisted of...
1. Introduction

Thallium is a heavy metal that has the qualities of a perfect criminal poison. Its salts are tasteless, odorless, dissolve completely in liquids, are rapidly absorbed, and defy detection on routine toxicological screens. Thallium has been the agent of choice in several criminal poisonings (John Peter and Viraraghavan, 2005; Desenclos et al., 1992; Meggs et al., 1994).

According to Mulkey and Oehme (1993), thallium levels in normal human and animals are <1 ppb in blood and urine, and <10 ppb in tissues.

Elimination of half-life of thallium is long, due to its large distribution volume. The estimated half-life in humans is reported between 1 and 3 days after low doses and between 1 and 1.7 days under clinical therapy after ingestion or exposure by a possible lethal dose. Other groups have reported an elimination of half-life between 8 and 30 days. Minimum lethal dose (LDL0) of thallium in humans is also highly variable. Average lethal dose for thallium sulfate has been reported from 10 to 15 mg/kg (Galvan-Arzate and Santamaria, 1998).

Thallium poisonings are generally due to ingestion of the salts, but cases of inhalation of dusts or fumes from smelting, skin absorption and even from sniffing contaminated cocaine have been reported (Baldwin and Marshall, 1999; Insley et al., 1986). It is used in the manufacture of electronic components, optical lenses, semiconductor materials, alloys, gamma radiation detection equipment, imitation jewelry, artist’s paints, low temperature thermometers, and green fireworks (Baldwin and Marshall, 1999).

In some parts of the world it is still used for killing rodents and this may lead to inadvertent ingestion by humans (Moore et al., 1993). Thallium poisoning is rare in the Western societies. It has occasionally been the tool for murder (Rusyniak et al., 2002).

In October 1988, five of seven members of a Florida family were poisoned with thallium, constituting the largest outbreak of acute thallium poisoning in the United States since thallium was banned as a rodenticide in 1972 (Desenclos et al., 1992).

An outbreak of thallium poisoning was reported in Baghdad in February 2008 where members of the Iraqi Air Force Club and some of their children were poisoned by cake laced with thallium. Two of the children died (BBC News).

Its toxic effect is due to its ability to inhibit a number of intracellular potassium-mediated processes and ligand formations with protein sulphydryl groups, inhibition of cellular respiration, interaction with riboflavin and riboflavin-based cofactors, and distribution of calcium homeostasis (John Peter and Viraraghavan, 2005; Galvan-Arzate and Santamaria, 1998).

The diagnosis of thallium poisoning is not very easy and requires chemical analysis to confirm it. Emsley (1978) mentioned that a person in the UK poisoned eight people and two of them died (John Peter and Viraraghavan, 2005). Demonstration of the presence of thallium in urine is the best diagnostic procedure available (Galvan-Arzate and Santamaria, 1998).

Thallium remains a means of criminal poisoning and should be considered in any patient with a rapidly progressing peripheral neuropathy with or without alopecia (Rusyniak et al., 2002).

Short-term exposure to thallium may induce hair loss, skin lesions, and damage to the nervous system (Galvan-Arzate and Santamaria, 1998; Kuo et al., 2005; Prick, 1979; Lu et al., 2007). The clinical features of short-term thallium intoxication include the gastrointestinal symptoms of nausea, vomiting, stomatitis, and diarrhea, followed by severe painful dyesthesia and paresthesia in the distal limbs, erythematous rashes in the cheeks and perioral region, and hyperkeratosis with loss of hair in the subacute stage (Desenclos et al., 1992; Meggs et al., 1994). In the long-term, complete hair loss and severe polyneuropathy have been noted. The severity of dermatological pictures is supposed to be related to the severity of thallium intoxication (Lu et al., 2007).

The combination of rapid, diffuse alopecia and neurological and gastrointestinal disturbance is pathognomonic for thallium toxicity. The hair mount, showing a tapered or bayonet anagen hair with black pigmentation at the base, may be highly diagnostic before the onset of alopecia (Feldman and Levisohn, 1993).

The present work is designed to report an outbreak of thallium poisoning among Iraqi patients and to review the literatures.

2. Patients and methods

This case descriptive study was carried out in the Department of Dermatology and Venereology-Baghdad Teaching Hospital between February 2008 and April 2008.

Twenty-two patients with thallium poisoning were seen in the Poisoning Consultation Center during this period and thallium in urine has been measured using the colorimetric method and was positive in all of them.

We had the opportunity to see five cases referred for skin manifestation. Detailed history and clinical examination were recorded regarding the following points: age, sex, mode of intake, and patients presenting complaint; time of onset and full dermatological examination were performed looking for skin manifestation, and other systemic involvements were also assessed. The ethical approval was performed by the scientific committee of the Scientific Council of Dermatology and Venereology-Iraqi Board for Medical Specializations.

3. Results

Five male patients with thallium poisoning were evaluated. Their ages ranged from 10 to 32 years with a mean of 24 years.
All patients gave a history of eating a cake and then they developed the immediate onset of signs and symptoms of thallium intoxication including: nausea, vomiting and diarrhea (for one patient it was a bloody diarrhea), followed by mental and peripheral neurological complaints, and within two weeks they developed skin manifestations, mainly severe hair loss in diffuse and patchy forms, affecting mainly scalp and body hair.

Clinical findings including dermatological data were as follows:

Anagen hair loss was obvious for all the patients; it started in the second and third week, it was diffuse and patchy, involving mainly the scalp and the lower limbs. The hairs were easily plucked and they were in typical anagen phase. Microscopically the roots were pigmented having anagen features.

While erythematous lesions appeared in two patients in the first week, it was dermatitis-like picture ecchymotic dusky red in color that covered the face especially around the mouth and the limbs, mainly on the dorsa of both hands simulating horse shoe appearance (Figs. 1 and 2).

Intertrigo was seen in one patient involving the groins which simulated tinea cruris, but scraping test for fungal infection was negative. Also acneiform rash of the face appeared in one patient.

The neurological findings were observed as peripheral neuropathy with marked leg and foot tenderness and paresthesia which developed within 2-4 days of thallium intoxication.

Muscular weakness was noted in most of the patients especially of the lower limbs.

Psychiatric findings were seen in patients, mainly in the form of personality changes, depression and apathy; while others presented with anxiety and acute agitation.

One child patient was accidentally given 100 mg (t.d.s) oral zinc sulfate as it was considered a case of zinc deficiency before the definite diagnosis of thallium poisoning was established. Surprisingly he improved markedly within few days especially regarding the horse shoe like rash on the dorsa of his hands and neuromuscular involvement and the treatment was kept for two weeks and no relapse appeared after that (Figs. 3a and 3b).

4. Discussion

The International Program on Chemical Safety (IPCS) of the World Health Organization (1996) has produced a detailed Environmental Health Criteria Monograph on thallium. The
monograph concludes that in the general population, the total intake of thallium has been estimated to be less than 5 μm/day, mostly from foodstuffs, and that this does not constitute a threat to health (John Peter and Viraraghavan, 2005).

Thallium poisoning is rare in the Western countries and could be used as a tool for murder, but the largest outbreak of acute thallium poisoning was reported in the United States where five of seven members of Florida family were poisoned since thallium was banned as a rodenticide in 1972.

Thallium is commonly used in Iraq as rat poison but the medical literatures were lacking of any record of sporadic cases or outbreaks of poisoning.

Most recently as a result of occupation and war, thallium was used as a chemical poison for mass killing mainly for political reasons as in the February 2008 outbreak of thallium poisoning which occurred mainly among members of the Iraqi air force club and some of their children were poisoned by cake laced with thallium and two of the children died (BBC News). Thereafter followed by a sequence of 22 cases seen by the Poisoning Consultation Center, Medical City Teaching Hospital, and we are lucky to evaluate five cases that were referred to the skin department.

The skin and neurological findings were the dominant pictures.

The skin manifestations were very characteristic of thallium poisoning, especially severe anagen alopecia and dermatitis-like pictures. These features had been similarly reported and are so characteristic that can lead to the right diagnosis. Other diagnosis might be mistaken for thallium poisoning, such as acquired zinc deficiency, pellagra and erythema multiforme (Sharquie).

One case that improved dramatically after treatment with oral zinc sulfate needs thinking regarding the mechanism of action, and further animal study is strongly recommended.

As thallium is tasteless and colorless, it can be used as a chemical weapon especially when it is freely available in the market as a rat poison. So thallium poisoning seems to appear more in wars and in a bad political situation like what is happening in Iraq.

So any patient with skin and neurological problems that appear as acute state should be diagnosed thallium poisoning unless proven otherwise.

Accordingly thallium as a rat poison should be considered as chemical weapon and should be banned as rodenticide from markets.

In conclusion outbreak of thallium poisoning is now occurring in Iraq, killing many people mainly for political reasons. It gives characteristic skin manifestations that are very helpful for diagnosis. So, thallium should be banned as a rodenticide and it is better to let rats run free than to kill human beings.

References


