SHORT REPORT

Erosion of nails following thallium poisoning: a case report

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This case report describes a patient with thallium poisoning caused by repeated exposure to low doses of thallium. Alopecia and nail changes were the most prominent features of this case. There was dystrophy of nails in the form of whitish lunular stripes. This is the first report of complete erosion of proximal parts of nails following thallium poisoning. This case is the first report of thallium poisoning from India occurring from repeated low dose exposure.

Thallium is a toxic heavy metal, which was accidentally discovered by Sir William Crookes in 1861 by burning the dust from a sulphuric acid industrial plant.¹ It is silvery white in colour in its pure state, and is more toxic than lead and as toxic as arsenic. It is well absorbed by any route, including skin. In blood, about 70% of it is bound to red cells; it is mainly excreted by the kidneys.² Poisoning by thallium causes a variety of symptoms ranging from tachycardia, hypotension, and gastroenteritis to polyneuropathy, alopecia, and dystrophy of nails.³ Thallium can cross the placental barrier and may cause fetal toxicity.⁴ The triad of gastroenteritis, polyneuropathy, and alopecia has been regarded as the classic syndrome of thallium poisoning.⁵ Thallium poisoning, not only from contaminated food^{6,7} or drink,⁸ but also from occupational exposure,⁹ has been reported from different parts of the world. In cases of chronic poisoning, symptoms are similar but in general milder than in cases of acute intoxication.¹⁰ With respect to changes of the nails, dystrophy has been shown by the appearance of white lunular stripes (Mee's stripes).¹¹ In this paper we not only report a case of poisoning occurring from repeated exposure to low doses of thallium, but also describe the first case of complete erosion of proximal parts of nails following thallium poisoning. This is the first report of its kind from India.

CASE REPORT

Three families residing side by side in a village, purchased a bag (large pack) of wheat from a shop for their common use. They started consuming the wheat, and from the third day onwards started to suffer from the symptoms of thallium poisoning. All 26 members (12 male and 14 female) from these three families who consumed wheat suffered from the features of thallium poisoning. No other members of the community were affected. The affected villagers suffered mainly from the following symptoms: headache (92.3%), falling out of scalp hair (84.6%), abdominal pain (61.5%), vertigo (42.3%), lethargy (42.3%), tingling and numbness (38.5%), sleep disturbances (26.9%), backache (19.2%), tremor (15.4%), joint pains (15.4%), frequent loose motions (15.4%), constipation (11.5%), hypersensitivity to sunlight (11.5%), melaena (7.7%), and itching of skin (7.7%). Other prominent effects have been alopecia (57.7%), easily pluckable body hairs (7.7%), erosion of fingernails from the proximal end (73.1%), and whitish lunular stripes in the

fingernails (11.5%). The only common factor among the three affected families has been the consumption of same wheat.

With this background, we present a case in which the features of thallium poisoning, including changes in scalp hairs and fingernails have been very prominent. A 26 year old female (height 154 cm, weight 38 kg) consumed contaminated wheat for 15 days and presented with the features of thallium poisoning. On the fourth day of consumption of contaminated wheat she started suffering from headache, sleeplessness, lethargy, and abdominal pain. Three days later she started to have muscle cramps in her legs, joint pain, backache, and tingling and numbness in her fingers. A feeling of extreme lethargy prevailed. After a further five days, falling out of scalp hairs was noticed. It was only on the 15th day of consumption that wheat was suspected to be the causative factor, and only then was its consumption discontinued.

Falling out of scalp hairs continued and alopecia was noticed at the centre of scalp on the 20th day (see fig 1). Over the next 20 days, an almost circular alopecia of approximately 5 cm radius was formed in the central part of the scalp. By this time hair on the other parts of the scalp also became scanty. Seven days after this, regeneration of hair in some parts of scalp was visible. On the 18th day changes in the nails were noticed. Initially whitish spots were observed in the proximal part of the nails. Subsequently, the nails started eroding and the proximal parts were completely eroded over a period of three weeks (see fig 2).

On the 21st day, after examination, no major findings were observed except for epigastric tenderness, alopecia, and nail changes. Her heart rate was 80 beats/min and blood pressure was 100/60 mm Hg. An ECG revealed no abnormality. Biochemical analysis of blood collected on the 21st day revealed increased serum alkaline phosphatase (200 units/l). SGPT (26.5 units/l) and SGOT (31.6 units/l) were within normal limits. Serum calcium (0.97 mmol/l) was lower than normal; serum sodium (135.7 mmol/l) and serum potassium (4.63 mmol/l) were normal.

Blood, hair, and urine samples collected on the 21st day were analysed for thallium content using cyclic voltametry for blood and hair samples, and inductive coupled plasma atomic emission spectrometry for urine samples. Thallium levels in blood and hair samples were 0.1206 ppm and 0.0459 ppm respectively. In the urine sample, the level of thallium was 30 ppb. These levels of thallium were higher than the reported background thallium concentrations found in blood,^{12,13} urine,¹⁴ and hair.¹⁵ The levels were also higher than the recommended normal levels which are <2 ppb, <5 ppb, and 5–10 ppb in blood,¹⁶ urine,¹⁶ and hair¹⁷ respectively.

DISCUSSION

Thallium poisoning was suspected in this patient from the presence of symptoms and signs suggestive of thallium poisoning. Subsequently, the finding of significant levels of thallium in blood, urine, and hair samples confirmed it to be

Main messages

- Clinicians should be aware that acute nail changes, including erosion, may occur as a useful sign in cases of thallium poisoning.

a case of thallium poisoning. Although the subject was an agricultural worker by occupation, no occupational exposure to any agricultural chemical was possible as there had been no agricultural activity for the past six months due to drought in the area. Although we could not collect wheat samples for analysis in order to confirm the presence of thallium, wheat intake was suspected as the only probable cause of poisoning on the basis of circumstantial evidence obtained from epidemiological investigation. The only common factor in the three affected families was consumption of same wheat. They were all consuming wheat from the same bag, at which time they started suffering from symptoms of thallium poisoning.

As thallium compounds are frequently used as rodenticides for storage of wheat, poisoning of the subject by thallium compounds from the contaminated wheat was very likely. There was probably a repeated low dose exposure from daily intake of contaminated wheat. No acute life threatening condition had occurred. On the contrary, a subacute course was observed in this case of poisoning. This case presented

Figure 1 Falling out of scalp hair following thallium poisoning (photograph taken on 21st day).

Figure 2 Erosion of proximal parts of nails following thallium poisoning (photograph taken on 37th day).

Policy implications

- Use of thallium compounds as rodenticides should be discontinued wherever possible.

with the usual features of thallium poisoning already described in the literature. The only striking difference was the features of the fingernails. Effects of thallium poisoning on nails has been reported in the form of dystrophy shown by the appearance of white lunular stripes (Mee's stripes). However, in this case the nail changes started with whitish spots in the proximal part of the nails and ultimately ended with complete erosion of the proximal parts of the nails over a period of three weeks. However, this may have occurred as a severe form of beau's line.¹⁸ Microbiological examination of samples taken from the nails did not show any evidence of infection. The woman was neither on chemotherapy nor did she have any history of chemotherapy. Results of the biochemical analysis showed effects on the liver in the form of increased alkaline phosphatase. Another significant finding in this case was lowering of serum calcium. Exposure to thallium chloride has caused fall in concentration of trace elements including copper, zinc, iron, and calcium in plants.¹⁹ In this case, we have found similar results with serum calcium in a human subject.

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