

## Thallium Poisoning Case report

Basim Attallah Alabdily

M.B.Ch.B, D.C.H, C.A.B.P Chief of Pediatrics Dept. Fallujah Hospital

### Introduction:

Thallium is a heavy metal that is used in the manufacture of electronics, alloys, and glass. In clinical practice, thallium is used as a radioactive tracer in heart scintigraphy to detect myocardial ischemia<sup>1,2</sup>.

Thallium and its salts are highly toxic; however industrial safety guidelines exist in the workplace. Accidental poisoning has become rare in the domestic setting since the 1970s, when thallium-based rodenticides were banned in many countries. The majority of reported cases of thallium poisoning in the past two decades has been caused by deliberate poisoning<sup>1</sup>.

### Case Report:

A 4.5 years old boy from alzeedan (a village located just to the east of Fallujah ) presented to me with a chief complaint of generalized weakness for 40 days duration .

His condition started 40 days before admission as progressive weakness of both upper & lower limbs after an attack of gastroenteritis, leading to ataxic gait & then inability to walk, tremor and behavioral changes.

His condition associated with progressive hair loss started after 2 weeks of his illness involving a part of scalp then all scalp hair & apart of eye brow.

### Physical Examination:

The patient looks ill , sad , uncooperative , alopecia of all scalp hair & lateral part of eye brow , mild pallor , no jaundice , PR = 105 beat / min. , RR = 30/ min. Temp. = 37.3 C, B.P = 90/60, no organomegaly , no lymphadenopathy

### Neurological examination:

He is conscious but uncooperative , unsteadiness in posture with ataxic gait , intention tremor ,absence of tendon reflexes of both limbs , difficult to evaluate sensation (because the patient was uncooperative) , normal cranial nerves , normal visual acuity , normal fundoscopic examination.



Picture ( 1 ) the patient try to stand alone with help of his relative .



Picture (2) almost always depressed & crying boy His mother helped him to sit upright position



Picture 3



Picture 4 : complete alopecia &amp; greenish discoloration of hair roots



Picture 5: he tries to walk with sad looking, but with ataxic gait &amp; easy fall to ground.

### Investigations:

- CBC : Hb 10.3 gm/dl , wbc 8500 , platelets 250000/ cc , blood film normochromic normocytic & no abnormal cells , Bone Marrow aspirate examination was normal result . CSF fluids cells = 0 , proteins = 35mg/ dl , sugar = 40 mg/dl , RBS = 90mg/dl.
- Chest X-ray was normal, CT of Brain also normal.
- Nerve conduction study shows : polyneuropathy mostly due to toxic material as reported by Dr. Safa'a Alshammary ( specialist in Physiology of CNS )
- 24hr URINE FOR THALLIUM was detected by the lab of center of toxicology in medical city (Baghdad) by atomic absorption photospectrometry

The normal level is less than 5 mcg/L.

### Diagnosis: Thallium Poisoning

#### Source of the Poison

His family attribute the poisoning of their boy to the Pollution of small river near their house by the poison because they give history of death of one boy after swimming

in this canal after an attack of acute GE , also our patient swimmied in same canal , so they think that this is the source of the poisoning .

We couldn't take a sample from that canal at that time because it was a risky area (Battles region).

### Treatment:

After Diagnosis is confirmed proper antidote is used which is (potassium ferric hexacyanoferrate) capsules in a dose of 8 capsules in 2 divided doses (daily for 2 weeks ) + IV fluids+ multivitamins + psychological support<sup>3</sup>.

### Response

The patient get good improvement of mood, behavioral stabilization, Gait became more stable, appetite improved. Discharge home after 1 week with good general condition.

On follow up after few weeks the patient's hair started to reappear with normal distribution & complete recovery without any deficit.





Picture 6: Patient after complete recovery.



Picture 7: is taken on follow up visit after 2 months with his family.

## Discussion

Thallium poisoning may occur via oral ingestion, inhalation of contaminated dust, or dermal absorption. The exact mechanism of thallium toxicity is unclear; however, it may impede the proper functioning of sodium-potassium ATPase for which thallium has a significantly greater affinity than potassium. Because of its similarity in charge and ionic radius to potassium, thallium is able to enter cells, inhibit Na-K-ATPase, and interfere with

energy production at essential steps in glycolysis, the Krebs cycle, and oxidative phosphorylation<sup>4</sup>.

Normal accepted serum level of thallium near zero 0.07 mol/L<sup>1</sup>.

The lethal dose of thallium is approximately 15-20 mg/kg; however, significant toxicity and death may occur with smaller amounts. Thallium poisoning more commonly occurs after oral

ingestion. Thallium is rapidly distributed intracellularly throughout all body tissues.

Thallium follows a 3-phase toxicokinetics : first intravascular distribution, 2nd CNS distribution, and 3rd elimination. In the first 4 hours following exposure, thallium is rapidly distributed to the blood and to well-perfused organs such as the kidney, liver, and muscle.

Over the next 4-48 hours, thallium is distributed into the CNS.

The elimination phase begins about 24 hours after ingestion. Thallium is primarily eliminated through excretion into the feces (51.4%) and the urine (26.4%). The high concentrations of thallium found in the kidney (>5.5 times more than other tissues) result from renal filtration with approximately 50% reabsorbed in the kidney tubules. Elimination is slow with an elimination half-life of 3-30 days, varying with the dose and chronicity of the exposure. Because of this prolonged elimination phase, thallium may act as accumulative poison<sup>5</sup>.

The mortality rate for acute thallium toxicity has been reported as 6-15%; among survivors, 33-50% have neurologic or ocular sequelae.

Thallium can be lethal to humans. The lethal dose for humans is 15-20 mg/kg (around 1g for a 70-kg person). Nonfatal effects occur below this dose. However, it is conceivable that even smaller doses can still cause fatality (minimal reported dose was 8 mg/kg). In addition, some of the

treated patients survived exposure up to 28 mg/kg<sup>1</sup>.

### Conclusion

That lucky boy was complaining from a serious undiagnosed disease , so many investigations were done for him before coming to us without reaching to proper Dx , that series of his illness does not go with any organic disease except of poisoning of heavy metals that the most acceptable one was the most rarer one is thallium which is discover in this lucky boy in spite of no obvious history of ingestion of such material. He is treated successfully without any deficit.

### References

1. <http://emedicine.medscape.com/article/821465-overview> .
2. LaDou J. Metals. In: *Occupational and Environmental Medicine*. 2nd ed. 1997:429-30
3. Hoffman RS. Thallium toxicity and the role of Prussian blue in therapy. *Toxicol Rev*. 2003;22(1):29-40
4. Hasan M, Ali SF. Effects of thallium, nickel, and cobalt administration of the lipid peroxidation in different regions of the rat brain. *Toxicol Appl Pharmacol*. Jan 1981;57(1): 8-13.
5. Hultin T, Näslund PH. Effects of thallium (I) on the structure and functions of mammalian ribosomes. *Chem Biol Interact*. May 1974;8(5):315-28.