Thallium poisoning outbreak with suspected criminal intent in Spain. An emerging problem in Europe?

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Summary

Background: Thallium is a highly toxic heavy metal whose use is very limited in our environment, nowadays. It is used in different industries and as a component for rat poisoning.
Methods: Three cases of thallium poisoning in patients from Pakistan living in Barcelona are described. This was reported to the Public Health Agency of Barcelona (ASPB) in March 2012.
Results: All of the three cases had malaise with vomiting and abdominal pain, marked alopecia, pain and tenderness in lower limbs, loss of function due to pain, back pain, and paresthesia in the hands. The attack rate was 33%. Possible causes of this poisoning were accidental exposure to insecticide or intentional poisoning.
Conclusions: All of the three cases were consistent with thallium poisoning. However, since it is not a condition of high frequency of occurrence in Spain, these cases may have gone unnoticed.

Key words:
Blood Poisoning.
Criminal behaviour.
Epidemiology. Outbreak.
Thallium. Toxicology.

Brote de intoxicación por Talio con sospecha de intenciones criminales en España. ¿Un problema reemergente en Europa?

Resumen

Fundamentos: El talio es un metal pesado altamente tóxico actualmente su uso es muy limitado en nuestro entorno. Es usado en la industria y su uso generalizado es como componente de veneno para ratas.
Métodos: Presentamos un estudio descriptivo de un brote de intoxicación por talio en Barcelona. Describimos tres casos de pacientes procedentes de Pakistán que vivían en Barcelona. Dichos casos fueron reportados a la Agencia de Salud Pública de Barcelona (ASPB) en Marzo del 2012.
Resultados: Los tres casos presentaron malestar general, acompañado de vómitos y dolor abdominal, así como una marcada alopecia, dolor e hipersensibilidad en extremidades inferiores, impotencia funcional por dolor, dolor de espalda y parestesia en las manos, La tasa de ataque fue del 33%. Entre las posibles causas de la intoxicación se consideró una exposición accidental a insecticida o una intoxicación intencional (criminal).
Conclusión: Los tres casos fueron compatibles con intoxicación por talio, sin embargo debido a que la intoxicación por talio no es una patología frecuente en España, dichos casos podrían haber pasado desapercibidos.

Palabras clave:
Brote. Intoxicación por talio.
Intenciones criminales.

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Introduction

Thallium is one of the most toxic heavy metals[1] and its use is very restricted. It is used in the eyeglass industry, and semiconductors[2]. In aesthetics, it has been used in hair removal creams, and in medicine, for treatment of syphilis and gonorrhea, and currently as a contrast agent in radiology[3]. It is also used as an active ingredient in pesticides.

The World Health Organization has not recommended its use since 1973[1], and in some countries, like Spain, its use is banned due to many cases of thallium poisoning (TP), whether accidental or criminal[4]. Currently, it is still used in developing countries and China. In the United States, there are approximately 20 cases of TP reported annually[5].

Thallium salts are colorless, odorless, and tasteless[6]. Cases have also been reported resulting from herbal products contamination and during drug inhalation[7].

After TP, Thallium can be detected in all organs because it is easily distributed throughout the body[8]. This fact and the extensive enterohepatic recirculation, makes the half-life of elimination range between 10 to 15 days[9].

TP in acute cases is characterized by gastrointestinal symptoms while in chronic poisoning cases neurological symptoms dominate[10]. Therefore, the differential diagnosis of TP includes: Guillain-Barré syndrome, botulism, lead or arsenic poisoning[11], Parkinson's and choreoathetosis[12]. Another symptom is alopecia. In this study an outbreak during 2012 with three cases of TP among Asian immigrants living in Barcelona (Spain) are described.

Material and Methods

Description of cases

Case notification of intoxication

On March 2012, the notification from the Hospital del Mar in Barcelona, for a probable case of TP was received at Epidemiology Service, Public Health Agency of Barcelona.

Case 1: 12 year old girl

On March 9th 2012, a patient went to the Emergency Room (ER) with clinical symptoms, which had begun three days earlier, with malaise, vomiting and abdominal pain, pain and tenderness in the lower limbs and loss of function due to that sort of pain. She also had pain in the vertebral and paravertebral lumbar region (L1), paresthesia in their hands, and difficulty for opening the eyes.

The patient developed tetraparesis accompanied by respiratory failure, requiring admission to the intensive care unit (ICU) the 9th day of admission, for respiratory support with hemodialysis, forced diuresis and Prussian blue administration 1g every 8 hours via nasogastric tube. After 15 days of hospital admission, she presented alopecia. After 21 days of admission, the patient evolved better and was withdrawn from hemodialysis. After 26 days of admission she was extubated and discharged three weeks later. At discharge, she presented neurological sequelae that required admission to a rehabilitation center.

Probable diagnosis of an atypical case of Wilson's disease was considered, or the beginning of conversion disorder (CD).

However, during hospitalization of Case 1, the mother, who was hospitalized in Pakistan with a similar presentation, was diagnosed with TP. Pakistani doctors suggested to the medical team in Barcelona to perform a measurement of thallium in blood. Blood and Urine tests confirmed the TP.

She was given Prussian blue 1g every 8 hours and hemodialysis. After 15 days in hospital, she presented with alopecia.

Finally, her condition improved. She was discharged three weeks later.

Case 2: 38 year old woman, case 1 mother and case 3 wife

In August 2011, while living in Barcelona, the patient began a presentation characterized by malaise, vomiting, abdominal pain and chest pain as well as marked tenderness of the lower limbs, walking difficulty and alopecia of the entire scalp. She went to the ER several times. Several doctors in Barcelona examined her without getting clear about any diagnosis. The doctors in Barcelona also considered a possible conversion disorder (CD).

The mother traveled to Pakistan and she was diagnosed with TP there. High levels of thallium were detected in the urine (Table 1). At discharge she had neurological sequelae that required admission to a rehabilitation center.

Case 3: Male 44, case 1 father and case 2 husband

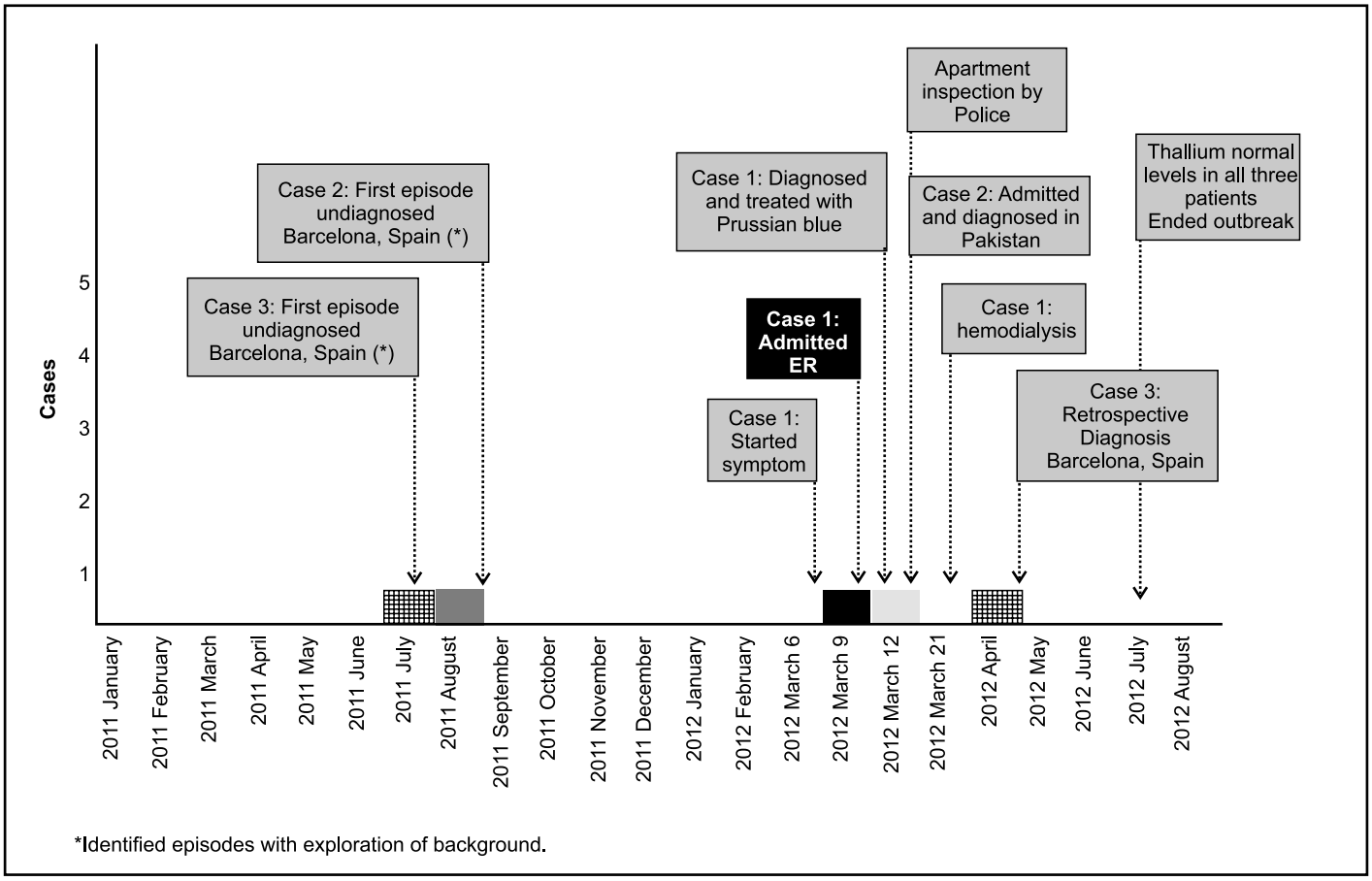
The patient reported that in July 2011 he presented clinical symptoms lasting for about 15 days, characterized by tightness across the chest, abdominal pain, very intense pain in the lower limbs, and alopecia of the scalp. The patient was evaluated without providing definitive diagnosis and he recovered without sequelae. After the news on his wife's TP diagnosis in Pakistan he underwent toxicology blood tests, which revealed normal thallium levels (Table 1 and Figure 1).

Table 1. Thallium concentration in blood and urine in all three cases tested. Barcelona, Spain 2012.

Data	Type of Sample	Values in cases		
		Case 1	Case 2	Case 3
March/09/2012	Urine Blood	11400 mcg/L 180 mcg/L	-	-
March/12/2012	Urine Blood	1914 mcg/L -	- -	- < 2 mcg/L
March/16/2012	Urine	-	-	46 mcg/L
March/20/2012	Urine Urine (Pre dialysis)	4100 mcg/L 4965 mcg/L	- -	- -
March/21/2012	Urine (Pos dialysis) Blood	890 mcg/L -	- < 0,5 mcg/L	- -
April/03/2012	Urine	96 mcg/L	34 mcg/L	-
May/11/2012	Urine	25 mcg/L	-	-
Jun/05/2012	Urine Blood	46 mcg/L -	263 mcg/L < 0,5 mcg/L	53 mcg/L -
July/02/2012	Urine	-	24 mcg/L	-

Blood: Toxic Dose: 80 mcg/L / severe poisoning: 300 mg/L; Urine Toxic Dose: 500 mcg/L / severe poisoning: 7000 mcg/L.

Figure 1. Graphic description of thallium poisoning outbreack in March 2012, Barcelona Spain.



The study identified other two likely exposed children in the family, which despite being asymptomatic, the urine samples showed high levels of thallium without reaching toxicity ranges.

Investigation measures and control

A total of 3 of 9 persons were probably exposed in the same household (attack rate 33%).

The Pakistani family, formed by the couple, the child affected and two children of 13 and 11 years old, shared an apartment in *the inner city* with 4 other people: from China (2), Romania and Spain.

In epidemiological surveys, it appeared that the Pakistani man shared the apartment with other people and was the owner of a small bar. He had personal relationship problems with the Chinese lady.

The police suspected the use of thallium with criminal intent, and the police found traces of thallium in two bottles of water in the house[13]. The Chinese woman was arrested as the alleged person responsible for the poisoning and was incarcerated[14], establishing a gag order, thus limiting further epidemiological research.

Discussion

The first case was a clinical presentation characteristic of TP[14]. However, it was not diagnosed early despite having been evaluated by several doctors. Probably it was because the characteristics of TP depend on the dose, route of administration, individual susceptibility, and the initial treatment[14]. Moreover, TP can show with varied symptoms[15], sometimes nonspecific and accompanied by gastrointestinal symptoms, high blood pressure, tachycardia and persistent weakness[7], neuropsychiatric disorders such as agitation, depression, paranoia, and psychosis[1,7,16], which probably led doctors to diagnose conversion disorder (CD) in cases 1 and 2.

Prussian blue is considered the treatment of choice for acute episodes of TP[17,18]. The effective use of dialysis has also been prescribed, like in case 1, to decrease levels of thallium in urine[19]. Some authors recommend the use of dialysis within the first 48 hours after exposure[20]. However, others authors believe that the use of Prussian blue and hemodialysis are associated with a better treatment outcome[20].

The delayed diagnosis for the two adults was between 6 and 7 months. This can be explained, because thallium poisoning is an uncommon condition in European casuistry[4]. On the other hand, a Pakistani doctor quickly diagnosed TP, because of his experience with that issue in his country. It contributed to early diagnosis of case 1 (7 days). In short, three clinical cases compatible with thallium intoxication have been investigated. However, dealing with a disease virtually unknown in Spain, it holds back the diagnosis and requires collaboration of Pakistani doctors who diagnosed the mother, case 2.

Despite the difficulty of diagnosis due to the non-specific symptoms, it is essential that doctors always suspect thallium and other possible poisonings at clinical level. To really clarify whether we are facing with an emerging problem in Europe, it is also of public interest to report these thallium poisoning outbreaks due to the wider range of uses and customs given from global immigration. Eventually, it could occur in Barcelona and Europe more often.

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