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Case report

Tetramethylenedisulfotetramine intoxication presenting with de novo Status Epilepticus: A case series

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ABSTRACT

Tetramethylenedisulfotetramine (TETS), a neurotoxic rodenticide banned in China, has repeatedly been shown to kill healthy people. We report a series of nine people with TETS intoxication presenting with Convulsive Status Epilepticus (CSE) as the initial manifestation. Median duration of CSE after admission was 6 h. All had normal neuro-imaging but inter-ictal EEG showed bilateral epileptic waves. Despite aggressive anti-convulsive treatment, attempts at reducing TETS levels and supportive therapy, outcomes were poor. Multiple organ dysfunction syndrome (MODS) occurred in six people, of whom three died. TETS exposure should be part of the differential diagnosis in people presenting with unexplained SE in rural China, particularly if this occurs in family clusters. Over 14,000 cases of TETS intoxication occurred in China between 1 January 1991 and 31 December 2010, and 932 of these died. Cases were widely distributed throughout the country, occurring primarily in rural areas. CSE seems to be a frequent symptom of severe intoxication. There is, however, still a lack of information about the hazards of TETS and it is imperative that both the public and physicians are made aware of its risks and complications.

1. Introduction

Tetramethylenedisulfotetramine ($[C_4H_8N_4O_4S_2]$ TETS; Fig. 1) (Bowery and Dray, 1976), also known as tetramine or tetramethylenedisulphotetramine, is a lethal rodenticide commonly used in China despite its production and sale being banned there since 1991. The sale of TETS is still available on rural black market.

To date more than 2000 clinical reports of TETS intoxication, many of which concerned fatalities, have been published in Chinese-language academic journals. According to the most recent report of the Ministry of Public Health, in 2003, of 1316 people with TETS intoxication 121 (9.2%) died (Ministry of Health, 2003).

When TETS is accidentally consumed, people may present with epileptic seizures or even with Convulsive Status Epilepticus (CSE), a medical emergency. CSE has often been reported in Chinese journals but there are a few reports originating outside mainland China (Barrueto et al., 2003; Chau et al., 2005; Poon et al., 2005). Nevertheless, illegal importation into other countries has occurred, and illness resulting from its ingestion may be hard to diagnoses if TETS is not suspected as the cause (Poon et al., 2005). In one case from Hong Kong a fatal case of CSE was diagnosed as TETS intoxication after it was detected in blood and urine ante-mortem (Poon et al., 2005). Here, we describe nine people who presented with CSE as an initial manifestation of TETS intoxication.

2. Methods

From January 1996 to December 2010, we prospectively identified all people diagnosed with Status Epilepticus (SE) due to TETS exposure in the wards of the West China Hospital, the major teaching hospital of Sichuan University. All patients were seen at the Department of Neurology, the Emergency Department or the Neurological Intensive Care Unit. TETS intoxication was confirmed in all cases by gas chromatography (GC) as previously described (Zeng et al., 2006) at the local Centers for Disease Control and Prevention. We defined SE as a single seizure lasting for at least 30 min or intermittent seizure activity for 30 min without full return of consciousness (Gastaut, 1983; International League Against Epilepsy, 1993; Lowenstein et al., 1999; Working Group on Status Epilepticus, 1993).

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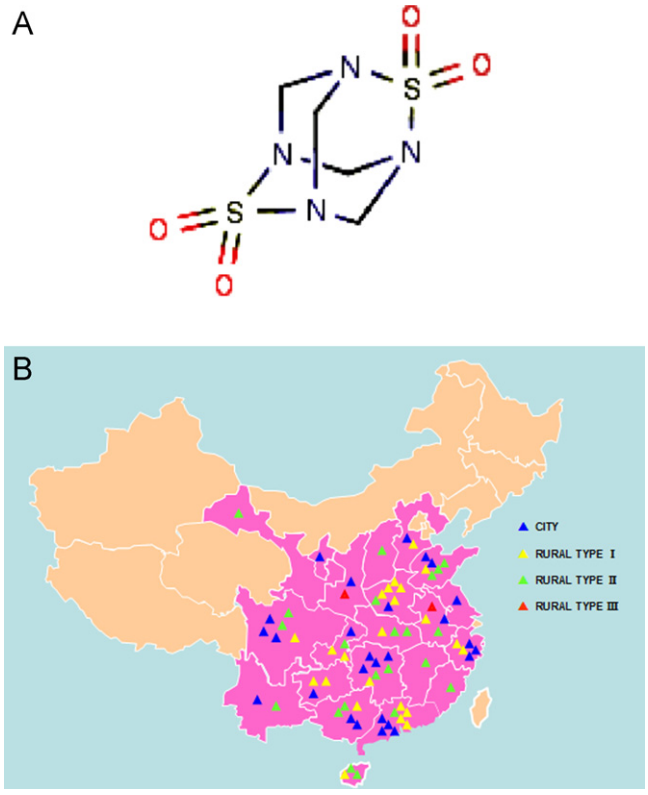

Fig. 1. (A) The structure of TETS. (B) Map of mass events with more than 20 cases occurred between January 1991 and December 2010.

3. Results

Nine people (five males) presented with CSE as the initial manifestation. The mean age was 29.3 years (range 7–59 years) and all originated from rural areas. Family clustering was noted as two affected family members within two separate family units, both of which were suspected to be the result of intentional use of TETS for criminal purposes (Cases 1 through 4). None had a previous history of epilepsy.

The median duration of CSE after admission was 6 h (range 3–27 h). Seven people had EEG recordings and these showed paroxysmal high amplitude unilateral or bilateral epileptic activity. Fig. 2 shows the inter-ictal EEG of one patient (Case 9). Neuro-imaging was normal in all cases.

An elevated white blood cell count and abnormal electrolyte levels were seen in seven people (Cases 1, 3–5, 7–9). An increased urinary protein, urea nitrogen and creatinine was seen in three (Cases 2, 5 and 8) while two (Cases 1 and 8) had liver dysfunction (increased transaminase levels). Two patients (Cases 2 and 7) were hypoglycaemic and one had cardiac failure (Case 5). All had metabolic acidosis.

To prevent brain edema mannitol was administered to all. Four required mechanical ventilation. For the control of SE, the initial treatment in all cases was diazepam (iv, 10–20 mg) to which none responded. This was followed by Phenobarbital (im, 200–300 mg per day), valproate (VPA, iv, 800–1200 mg per day), thiopental (iv, 0.1 g per time) and midazolam (iv, 50–120 mg per day). All six people who survived were kept on antiepileptic medications (VPA 0.5–1.0 g/LEV 1000–2000 mg per day) for three months, and at least one subsequently developed epilepsy. In the case with chronic epilepsy, VPA (1.2 g per day) and carbamazepine (CBZ, 0.4 g per day) were used, but follow up investigation indicated that the patient continued to experience seizures 3–7 times per month.

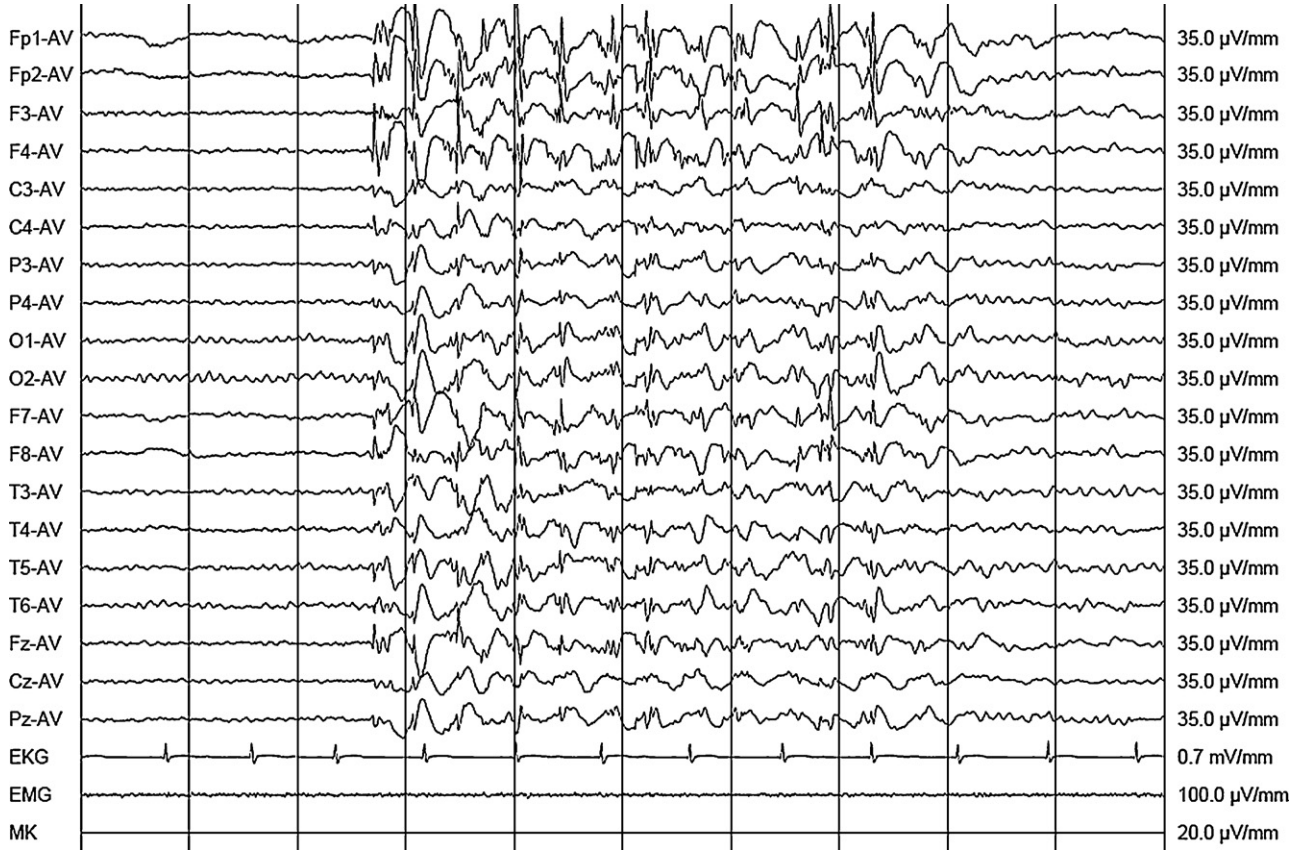

Fig. 2. Inter-ictal EEG (Case 9) showing bilateral generalized spike and slow wave discharges.