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Lesson of the week

Mercury poisoning after spillage at home from a sphygmomanometer on loan from hospital

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Be aware of the potential for toxicity of mercury spilled from broken medical equipment

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When patients are managed at home, they or their carers have to operate medical equipment. This case report highlights important educational and environmental health aspects of issuing hospital equipment for home use, a practice that is likely to become more common in the future. We describe a 9 year old boy who had neurological and renal complications after mercury spillage from a sphygmomanometer three months after it had been provided by the hospital for monitoring blood pressure at home. The family were unaware of the potential risks of mercury exposure before the patient became acutely ill.

Case report

A 9 year old boy presented to his local hospital with a three week history of abdominal pain, constipation, lethargy, limb pain, and unsteadiness. Physical examination showed mild facial weakness, areflexia, ataxia, and impaired sensation and led to a provisional diagnosis of Guillaine-Barré syndrome. The boy's constant restlessness was considered strange, but his mother described him as hyperactive and regarded this behaviour as normal. It was noted, however, that his handwriting and schoolwork had deteriorated over the preceding month.

Features of encephalopathy accompanied by peripheral neuropathy led to a suspicion of heavy metal poisoning. No history of likely exposure to lead could be found; there was no lead piping or paint at home. Further inquiry revealed that the patient's sibling had undergone renal transplantation as a result of nephrotic syndrome, and the family had been provided with a mercury sphygmomanometer for home blood pressure monitoring. Three months before presentation, our patient had dismantled the sphygmomanometer in his bedroom—spilling mercury on his bed and carpet—and had played with it for a day or two before informing his mother. Attempts had been made to dispose of the mercury by vacuuming, and then by flushing it down the toilet.

The suspected diagnosis of mercury poisoning was confirmed by the finding of a serum mercury concentration of 1000 nmol/l (normal reference value <30 nmol/l). The boy was referred to a tertiary paediatric centre for further management. By now he was unable to pick up objects or to feel them in his hand. Physical examination showed that he was ataxic and areflexic and was exhibiting intermittent aggression and a fluctuating level of consciousness. He was started on sodium-(2,3)-dimercaptopropane-(1)-sulphonate (DMPS), a chelating agent which binds mercury and allows it to be excreted via the kidneys. This is given by intravenous infusion in a reducing dose over four days and is followed by oral treatment until the patient's clinical condition and results of laboratory investigations have improved. Our patient was treated for a total of 18 days; his serum mercury concentrations and urinary mercury excretion during treatment are shown in the table.

Other family members were investigated and were also found to have raised serum mercury concentrations, but in none were these high enough to necessitate treatment. Mercury was not detected in the patient's cerebrospinal fluid, but the protein concentration was very high at 1.9 g/l.

The boy developed hypertension. This was refractory to initial treatment and required an

Serum mercury concentrations and urinary mercury excretion in patient with mercury poisoning

Day	Serum mercury (nmol/l)	Urinary mercury excretion (nmol/mmol creatine)
1	500	173
4	285	650
9	256	241
21	160	223
29	83	24

intravenous infusion of labetalol, with oral captopril, nifedipine, and atenolol before it was controlled. The hypertension settled with time and he was weaned off all antihypertensive drugs without long term complications.

The occupational health department found very high atmospheric concentrations of mercury in the boy's bedroom, particularly around the carpet. Bedding, carpets, and clothing had to be destroyed, as did the vacuum cleaner. A mercury vapour absorbing filter system was installed and used continually in the room for three months, after which mercury vapour concentrations were undetectable.

The patient made a slow neurological recovery. It took six months for him to return to his premorbid state. His behavioural problems persisted, and inquiries at school showed that he had longstanding problems. Indeed, the psychological services had been considering a diagnosis of attention deficit hyperactivity disorder—arguably a contributory factor to the initial dismantling of the sphygmomanometer. Further psychological assessment after recovery was not possible because the boy failed persistently to attend follow up appointments at hospital and at school.

Discussion

This is an unusual case which presented a number of diagnostic, therapeutic, and management difficulties. Mercury is found not only in sphygmomanometers but also in thermometers and weather barometers, and many homes possess these. Even a small amount of mercury, such as that from a thermometer, can result in mercury poisoning, especially in children.[1] Throughout the years, children—and particularly boys—have played with metallic mercury with no apparent ill effect. We believe that the design of modern homes, with fitted carpets, insulation, and poor ventilation, contributes to the more effective and prolonged dispersal of mercury vapour within the building. Vacuum cleaners have also been implicated in spreading contamination and recontaminating buildings through a reservoir of mercury in the dust bag and hosing.[2,3] Mercury spillage should be treated with extreme caution: a vacuum cleaner should never be used, and advice should be sought immediately from the local environmental health department. Our hospital has reviewed its policy on medical equipment issued for home use, and revised procedures for mercury spills have been drawn up.

Clinical management is straightforward once the diagnosis is suspected, and the chelation regimen described above is recommended. Hypertension may be difficult to control initially,[4,5] but should resolve eventually, as should the neurological complications.

Mercury poisoning was common in the 19th century. It was a known occupational hazard in some industries such as hat making—from which the term "mad as a hatter" originates. However, doctors today will rarely see a case of mercury poisoning, and the public and health professionals are often unaware of the toxicity of mercury and other heavy metals. Heavy metal poisoning should be considered in neurological cases with encephalopathy and unusual clinical signs.

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An occupational hazard

A patient's choice

He would always say it was an occupational hazard. From the age of 16, Norman helped freight goods across the deepest seas this world has to offer. He did it with friends and an awful lot of alcohol. *Cheap* alcohol.

During his leave he would stay with his sister (my mother) and her family (the rest of us). In all the years he lived with me, I never once saw him drunk. Locally, his tolerance for it was legendary.

One morning he came downstairs and announced to us that he was jaundiced. I was a second year medical student, and not a very good one. The family looked at me, eagerly awaiting some words of Hippocratic wisdom. "You're yellow," I said. They still looked at me. "I mean, you know, you're jaundiced," I said. They continued to look at me. I got a little nervous as I tried to think why people became jaundiced. "It could be something to do with your liver, I think."

After a lot of head shaking and mumblings about the cost to the taxpayer of a university education, they decided to call the doctor. He came, suggested a diagnosis of hepatitis, and admitted him to hospital. For the first month after his discharge, Norman was the only man in the Argyll and Sutherland Highlander Inn drinking Guinness mixed with equal amounts of tonic water. "Medicinal," he would say, as he ordered his ninth.

For him, this was temperance. I continued my medical education and, I hope, got a little better at it. He resumed his deep sea voyages with the Merchant Navy and also his heavy drinking. He died suddenly, three years back, when his oesophageal varices burst. The hospital doctors had told him to stop drinking, but he had comprehensively ignored them.

For my uncle, life without drink was no life at all. He drank heavily from the age of 16 until two weeks before his 60th birthday, the day he died. He led an interesting life, visiting and drinking in parts of the world that I never knew existed. He was unmarried and left no children. It runs against much of what I feel as a doctor, but I admire him for his refusal to listen. Informed, he made his choice. And a patient's choice, no matter how damaging it seems to those who see only the small picture, should always be respected.

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