

Lead pencil: a case of intractable abdominal pain secondary to lead poisoning

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Ayurvedic medicine has long been practised among Indian and Nepalese cultures dating back to 2500 BC, with China being the first to utilise gold in preparations.¹ It is suggested that up to 80% of the Indian population have used Ayurvedic preparations.² Unfortunately, with decreased accessibility to pure Ayurvedic products, secondary to illegality of some base ingredients such as opioid-like substances but also due to scarcity, we are seeing increasing rates of metal toxicity around New Zealand, as substitutions for colloidal gold and other ingredients are being made. Lead toxicity is systemic poisoning by a non-biodegradable metal, primarily inhaled or consumed and digested, leading to symptoms associated with neurocognitive disease, renal impairment and haematological disease.³⁻⁴ Haematologically, lead can interfere with enzyme function, leading to altered heme synthesis and thus anaemia. From a neurological perspective, synaptic pruning is impaired, leading to cognitive and behavioural changes, but in more extreme cases can lead to seizures and coma.⁵ Lead competes with uric acid in the proximal tubules, causing increased urate concentrations and alterations in renal function and uric acid excretion.^{3,6} The gastrointestinal symptoms of pain and constipation are not well understood.³

Case presentation

Mr X, a 30-year-old Indian male, presented to the emergency department with a 5-day history of abdominal pain and constipation. He was reviewed the day prior and discharged with a disimpaction regime before re-presenting with severe abdominal pain and vomiting. Medically, he was previously fit and well, with no surgical history. He had recently relocated from India 8 months prior, was working as a cleaner and had a past history of intravenous heroin use. He had no sick contacts. History and examination were difficult to obtain secondary to pain despite significant

opiate administration. Observations remained normal throughout his admission. Hypertension was not a feature of his presentation. His abdomen was soft, but globally tender with no guarding or peritonism. On digital rectal examination there were neither impacted stools nor evidence of blood on the glove.

Biochemical analysis revealed a normocytic anaemia, with normal iron profile and a stable haemoglobin when compared to the day prior. The blood film showed basophilic stippling and giant platelets. He had mildly elevated inflammatory markers, and a lactate of 2. There were no other biochemical anomalies. A computed tomography (CT) scan was performed by emergency department staff, which reported colitis, likely in keeping with Crohn's disease, and commented on hyperdense material in the colon consistent with oral contrast. A surgical referral was made. These findings, however, did not appear to align with the patient's presentation, and the distal colonic oral contrast was not in keeping with the timing of scan and bowel transit time, with no documentation of contrast being administered the day prior.

With the inability to control pain with intravenous opioids, Mr X commenced on a trial of intravenous ketamine under the anaesthetic team. The on-call surgeon was approached for consideration of explorative laparotomy; however, given the absence of an absolute indication for surgery, a referral to medicine was made for abdominal pain with presence of anaemia without evidence of gastrointestinal bleeding i.e., porphyria, haemolytic anaemia, sickle cell anaemia. The trial of ketamine failed to gain adequate pain control, and the patient was escalated to the intensive care unit (ICU).

Repeated questioning led to eventual disclosure of alternative Ayurvedic medication use. Swarna Bhasma, a preparation made by a friend in India, had been consumed over a period of months for improved sexual stimulation. This disclosure led to investigation of heavy metal levels, with the

lead level returning at 5.57umol/L (normal range <0.24umol/L) and other metals within normal ranges. Treatment for lead toxicity was initiated following discussion with the toxicologist at the New Zealand National Poisons Centre. Mr X completed 5 days of IV chelation and was started on bowel decontamination, which was not tolerated well. This involved nasogastric feeding of Glyco-*prep* at a set rate. The patient remained in the ICU for 5 days due to the difficult pain management. He was stepped down to oral chelation after 5 days on the ward and diazepam weaning. Lead levels had returned to normal prior to discharge from hospital; however, there was ongoing heavy metal pooling in the caecum on abdominal X-ray due to incomplete bowel decontamination. Mr X was discharged into the community on day 10 of admission with follow-up bloods and appointment, alongside red flag advice for return to hospital. This is interesting given the half-life of blood lead is approximately 25 days. Five months later, Mr X re-presented with acute psychosis and recent methamphetamine use, but no further self-reported ingestion of lead. Abdominal X-ray showed hyperdense material in the ascending and transverse colon, and gastric antrum and lead levels suggestive of toxicity at 4.12umol/L. He was intubated secondary to encephalopathy and combativity and remained so for the majority of his stay, with multiple failed sedation holds. He underwent endoscopy, bowel irrigation and IV chelation (3g/24hours Edetate calcium disodium infusion) to ensure clearance. He was then switched to Succimer oral chelation under guidance from toxicology.

Discussion

Ayurveda is a traditional alternative medicine practice that is utilised heavily within Indian culture.⁷ Therapies are based around herbal and mineral compound preparations, sometimes including metal substances, in order to treat a range of common and chronic issues ranging from constipation and asthma to erectile dysfunction and cancer.⁸ The overall Ayurvedic philosophy dates back over 2,000 years and ultimately relates to aligning the living and non-living via the five elements of the universe, with disease occurring when there is an imbalance.⁹ The evidence base for Ayurveda is somewhat limited with respect to outcomes; however, studies have assessed the utility of metals in medicine, with *Rasashastra*, a subdivision of Ayurvedic practice, focussing

innately on the collaboration of metals and minerals with herbal therapy.^{2,7} Colloidal gold nanoparticles have been studied and are suggested to increase cellular uptake by encapsulation of active drugs.¹⁰⁻¹¹ In recent times preparations have been found to consist of lead, arsenic and mercury, all toxic substances to humans, with Saper et al. concluding 20% of Ayurvedic medicines found in a Boston store contained potentially toxic lead, mercury or arsenic levels.² Previous studies depict significant rates of contaminants of the three aforementioned metals in Ayurvedic medicines, with 35–40% of 6,000 listed Ayurvedic medicines consciously containing a metal component.² A Medsafe New Zealand press release in March 2024 noted eight recent cases of lead poisoning from Ayurvedic medicines. There are currently no approved Ayurvedic medicines listed in New Zealand.¹²

Swarna Bhasma, also known as gold Bhasma, is a traditional Ayurvedic medicine often administered orally with honey, ghee or milk and used in the treatment of a variety of disorders including asthma, arthritis and diabetes.¹³ It contains nanoparticles of colloidal gold. The therapeutic benefits of gold in medicinal preparations date back as far as 2500 BC in Indian, Arabic and Chinese literature.¹ Uptake of gold particles is via the small intestine. When analysed microscopically, they did not cause complement activation and did not disrupt platelet function. They were capable of absorption via tight junctions to enter the systemic circulation.^{3,13}

Kamini and Barshasha are opioid-containing preparations of Ayurveda, often containing opium. These substances were made prescription only and illegal for importation, supply and possession under the *Misuse of Drugs Act 1975*.¹⁴ Lane (2020) describes case studies of 10 men with previous opium and opioid use taking exceedingly high doses of the substances and being unable to reduce due to effects of withdrawal. They were admitted into the Auckland Opioid Treatment Service and started on opioid substitution therapy.¹⁴ Swarna Bhasma, the Ayurvedic medicine in question, also has analgesic properties when assessing its indications. Given Mr X's background of heroin use, the role of Ayurveda in opioid and drug dependency is considered alongside Mr X's selected use for it.

While previously associated with remnant stripping and flakes from residential buildings decorated in lead-based paint, crumbling and settling into dust and soils or occupational

exposure, there have been increased cases of lead being a contaminant or alternative used in metal-based traditional medicines.^{3,15-16} The effects of lead poisoning are vast and have an effect on most of the bodily systems. Of note are cognitive impairment, seizures, coma, abdominal pain, infertility and impaired haemoglobin production.^{4,5,6,13} Lead binds to red blood cells once absorbed and is distributed to the bone and soft tissues. Prior to the advancements in modern medicines and the introduction of chelating agents, death by lead toxicity was around 65%. This is now less than 5%; however, significant continued morbidity can be associated with the early effects of toxicity such as cardiovascular problems and seizure disorders.^{4,17}

Medical treatment of lead toxicity involves removal of exposure source, whether that be ingestion, environmental or occupational, and judicious contamination, chelation and supportive cares.¹⁸ The role of chelation is debated in papers as to its efficacy in long-term reduction in lead levels, with Succimer showing only transient improvement in children.^{19,20} Anecdotally, it may

reduce mortality in those with encephalopathy; therefore, chelation can be initiated with the discretion of toxicologist input on a case-by-case basis.¹⁸ While symptoms should dissipate post-removal of exposure and reduction in lead levels, neurocognitive symptoms may lag due to delayed excretion from the central nervous system.

Given the rise in cases of lead toxicity due to Ayurvedic medicine use, physicians worldwide need to remain cognisant in and have an underlying suspicion for lead poisoning in cases of unexplained normocytic anaemia. Given low public awareness, and relative difficulty to ascertain ingredients in supplements and preparations, there is a risk of incidental heavy metal exposure. This also highlights the importance of involving public health to exclude alternative causes of lead exposure. Therefore, when amidst a diagnostic conundrum, with symptoms not aligning with investigations, the importance of a multidisciplinary approach and lateral thought processes is imperative to ascertain causality given the implications both medically and surgically.

COMPETING INTERESTS

Nil.

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