

Carbon monoxide poisoning: an unusual cause of dizziness

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Abstract

Objective: We report an unusual case of dizziness caused by carbon monoxide poisoning.

Case report: A 55-year-old man was referred to an ENT surgeon with dizziness. The patient described vague, non-specific symptoms not consistent with a diagnosis of benign paroxysmal positional vertigo, labyrinthitis or Ménière's disease. It emerged later that the patient had been suffering from carbon monoxide poisoning from a leaky gas hot water boiler in his house. After having the boiler fixed, the patient's symptoms completely resolved.

Conclusion: When the more common causes of dizziness cannot be found, less common but important differential diagnoses, such as carbon monoxide poisoning, should be considered.

Key words: Carbon Monoxide Poisoning; Dizziness

Introduction

Dizziness is an imprecise term used by both patients and doctors when describing symptoms of vertigo, pre-syncope (feeling faint) or disequilibrium, or for non-specific feelings such as giddiness or light-headedness. Dizziness is a relatively common symptom presenting to the emergency department, general practitioner and ENT surgeon, with an estimated one year prevalence rate of 4.9 per cent.¹ The challenge to the medical practitioner is to distinguish between central and peripheral causes for the patient's symptoms, via a thorough history, examination and appropriate investigation.

Of particular interest to the ENT surgeon are the peripheral causes of vertigo, which include acute viral labyrinthitis, recurrent vestibulopathy, benign paroxysmal positional vertigo and Ménière's disease. Benign paroxysmal positional vertigo is estimated to have a one year prevalence rate of 1.6 per cent; surprisingly, Ménière's disease has a rate of around 0.5 per cent.¹ Central causes for vertigo include migraine, multiple sclerosis and cerebro-vascular accident.

When faced with a patient whose symptoms cannot be readily attributed to the more common causes of dizziness, it is important to remember less common, but still important, differential diagnoses.

Case report

A 55-year-old television lighting director presented to his general practitioner in October 2008 with a gradual onset of vague light-headedness and disorientation. This was a momentary sensation which recurred episodically and did not appear to be provoked by head movement or position. These non-specific symptoms were accompanied by a sensation of hyperventilation. There was never any nausea, vomiting or loss of consciousness, nor any true rotatory vertigo. The patient's symptoms slowly resolved by mid-November 2008 without any specific treatment.

The patient was then well until the end of December 2008, when he again began to experience minor episodes of disorientation and light-headedness, and had one episode of a sudden, severe sensation of rotation. He was subsequently referred to an ENT surgeon for further investigation.

The patient had noted faint, bilateral tinnitus although his hearing was unaffected. He was otherwise fit and well, and took no regular medication. He was a non-smoker but drank up to 30 units of alcohol per week. He described having been under some stress at work around the time of the onset of his symptoms.

Examination of the ears, cranial nerves and cerebellar function was unremarkable. Gait and heel-toe walking were normal; however, Romberg's test was very mildly positive, although Unterberger's test was negative.

Pure tone audiometry showed a slight, symmetrical, high frequency hearing loss with a dip at 4 kHz, which was presumed to be due to previous occupational noise exposure.

The patient was investigated with formal vestibular function testing and a magnetic resonance imaging brain scan. These were both normal.

In light of these vague, non-specific symptoms, a diagnosis of psychogenic vertigo was made, and no further follow up was undertaken.

Two months later, the patient e-mailed his ENT surgeon explaining that his gas hot water boiler had been discovered to have a leaky seal which was allowing small amounts of carbon monoxide to escape into the kitchen. He recalled that, around Christmas, all the windows and doors had been kept shut due to cold weather. Interestingly, he reported that his wife and son had been having similar non-specific symptoms, which were attributed to stress. The patient himself had subsequently noted that, in February, whilst he was working away from home for a week, his symptoms rapidly subsided but recurred soon after returning home. Before the boiler was repaired, the ambient carbon monoxide level in the home was recorded

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as 12 ppm. After repair, the symptoms experienced by the patient and his family improved greatly. Follow-up carbon monoxide readings were 0 ppm.

Discussion

What is carbon monoxide and what are the effects of poisoning?

Carbon monoxide is a colourless, odourless, poisonous gas which is produced by the incomplete burning of carbon-based fuels such as gas, coal, wood and oil.²

The effects of acute carbon monoxide poisoning are well known, and include headaches, nausea, confusion, coma and death. However, the clinical effects of chronic low level carbon monoxide poisoning are less well recognised, and are broad-ranging and rather non-specific. They include headache, dizziness, nausea and vomiting, and typically resolve once the poison is removed.^{3–5} It is important to appreciate that the effects of carbon monoxide poisoning can be delayed, presenting even months after initial exposure, as they are due not only to the level of exposure but also the duration of exposure.^{6,7}

How common is the problem?

According to Health and Safety Executive statistics, in the UK there are approximately 15 deaths per year from carbon monoxide poisoning, and significantly more cases of non-fatal poisoning.⁸ In the USA, acute carbon monoxide poisoning results in over 50 000 emergency department visits yearly, an incidence three to five times previous estimates.⁹ The incidence of long-term exposure is unknown.⁷

How does carbon monoxide cause poisoning?

Carbon monoxide functions as a neurotransmitter in physiological amounts, and at low levels may help regulate the inflammatory response. However, as the duration and level of exposure increases carbon monoxide produces toxicity, the exact mechanism of which is not fully understood.^{10,11} Carbon monoxide is known to produce hypoxia by shifting the oxygen dissociation curve to the left. Since the affinity of carbon monoxide for haemoglobin is 200 times that of oxygen, the formation of carboxyhaemoglobin occurs readily even at low exposure levels.^{3,12} Other postulated mechanisms include: an increase in 'oxidative stress' and the formation of oxygen free radicals, leading to neuronal necrosis; impairment of intracellular respiration; and propagation of the inflammatory response independent of the pathway producing hypoxia.^{7,13–15}

What levels are unsafe?

In 1987, the World Health Organization developed guidelines for carbon monoxide exposure, expressed at four averaging times: 100 mg/m³ (87.1 ppm) for 15 minutes; 60 mg/m³ (52.3 ppm) for 30 minutes; 30 mg/m³ (26.1 ppm) for 1 hour; and 10 mg/m³ (8.7 ppm) for 8 hours.¹⁶

It should be noted that these guideline values and time period weighted average exposures have been determined so that a maximum carboxyhaemoglobin level of 2.5 per cent is not exceeded in non-smokers (since cigarette smoke is known to contain carbon monoxide and is the main cause of elevated carboxyhaemoglobin levels in smokers).¹⁷

With reference to the above exposure guideline values, our patient was apparently exposed to carbon monoxide levels of 12 ppm in the home for prolonged periods,

making chronic, low level carbon monoxide poisoning the probable cause of his symptoms.

Managing carbon monoxide poisoning

The treatment of acute carbon monoxide poisoning includes high flow oxygen administration, clinical evaluation of the patient and venous blood gas measurement to establish carboxyhaemoglobin levels. Patients suspected of chronic exposure resulting in low level carbon monoxide toxicity should be tested for carboxyhaemoglobin, either via venous blood gas analysis or breath analysis. In practice, however, this simple test is hardly ever considered.¹⁸

• **Dizziness caused by chronic, low level carbon monoxide poisoning is an important differential diagnosis to consider when more common causes cannot be found**

Following appropriate treatment and recovery, the patient must be instructed to have all gas boilers, gas fires, chimneys or any other potential carbon monoxide sources professionally checked and repaired as necessary, and then serviced regularly. Carbon monoxide alarms or monitors must also be installed.

Carbon monoxide poisoning is probably an under-reported problem. It should be considered in the differential diagnosis of a dizzy patient in whom more common causes of dizziness cannot be readily identified.

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