CASE REPORT

Hypertension induced by liquorice tea

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SUMMARY

A 45-year-old woman presented to her general practitioner with a 4-month history of hot flushes, sweating and headaches. On examination, she was found to be hypertensive, and blood tests revealed mild hypokalaemia. While awaiting the results of further investigation into the cause of her elevated blood pressure, the patient conducted her own research and identified liquorice tea as the potential cause of her symptoms. The patient had been drinking up to six cups of liquorice tea per day as a substitute for caffeinated tea and fruit-based infusions. The patient immediately stopped consuming the drink and within 2 weeks her symptoms, hypertension and hypokalaemia had entirely resolved.

BACKGROUND

Liquorice is a popular ingredient used in a variety of food products, particularly confectionary and beverages. Long recognised as a cause of hypertension, excessive consumption of liquorice products can produce a clinical picture similar to that of primary hyperaldosteronism. While regulations require liquorice products to be labelled with a warning that excessive consumption should be avoided in patients with hypertension, the safe limits of ingestion are ill defined and not widely publicised. With the increasing perception of herbal beverages as a healthier alternative to caffeinated drinks, clinicians need to be continually vigilant of the impact that dietary choices may have on patient health. In particular, excessive consumption of liquorice tea and confectionary should be remembered as a potential cause of unexplained hypertension.

CASE PRESENTATION

A 45-year-old woman presented to her general practitioner with a history of hot flushes, night sweats and headaches. These symptoms had started over the preceding 4 months. The patient suspected that her symptoms were due to the onset of menopause as her periods had also become lighter. She had a medical history of asthma and polycystic ovarian syndrome, but was otherwise well. She had never smoked and her only medications were inhalers for asthma.

Physical examination was normal with the exception of an elevated blood pressure of 162/82 mm Hg. Perimenopause was suspected as the cause of the patient's symptoms, however, in view of her raised blood pressure, further investigations were initiated.

INVESTIGATIONS

Blood tests demonstrated mild hypokalaemia (potassium 3.3 mmol/L). All other blood results including full blood count, liver function and thyroid function tests were within normal limits. Follicle-stimulating hormone and luteinising hormone levels were within the premenopausal range. A 12-lead ECG was normal and repeat blood pressure measurement confirmed ongoing hypertension; 150/80 mm Hg.

In view of the combination of raised blood pressure and hypokalaemia, primary hyperaldosteronism was suspected. Ambulatory blood pressure monitoring and repeat biochemistry blood tests were arranged.

OUTCOME AND FOLLOW-UP

While awaiting further investigation, the patient began to conduct her own research into possible causes of her symptoms. The only recent change in lifestyle identified by the patient was a switch from caffeinated and herbal tea to liquorice tea, prompted by a drive to reduce her overall caffeine consumption and improve her dental health. Consequently, over the preceding 12 months she had been consuming up to six cups of liquorice tea per day. On reading Internet articles linking liquorice to hypertension, the patient immediately stopped drinking the tea. On review 2 weeks later her symptoms had completely settled. Repeat blood pressure measurement was 128/84 mm Hg and her hypokalaemia had resolved.

DISCUSSION

Liquorice is the root of the plant *Glycyrrhiza glabra*, which has been cultivated for human consumption by societies around the world for generations. The main flavour of liquorice is derived from anethole, a compound with an aroma reminiscent of anise. The natural sweetness of liquorice accounts for its popularity as a base for confectionary and beverages, and derives from the bioactive component of the root, glycyrrhizin (glycyrrhizic acid). Glycyrrhizin has been estimated to be up to 50 times as sweet as sugar.¹

Liquorice mediates its effect on blood pressure via the action of glycyrrhizin on the kidney. In recent years, this mechanism has become understood in more detail.

Sodium and water homeostasis within the kidney is largely influenced by mineralocorticoid hormones, in particular aldosterone. Aldosterone binds to mineralocorticoid receptors in the distal tubules of the kidney, promoting sodium and water resorption into the blood and potassium excretion into the urine.

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The steroid hormone cortisol has an equal affinity for the mineralocorticoid receptor and circulates in concentrations up to 100 times that of aldosterone. To regulate this effect, the enzyme 11 β -hydroxysteroid dehydrogenase type 2 (11 β -HSD2), present in the distal tubules of the kidney, metabolises cortisol to cortisone, which does not bind to the mineralocorticoid receptor, thereby preventing overstimulation.²

Glycyrrhizin is an inhibitor of 11 β -HSD2 and prevents the conversion of cortisol to cortisone in the distal tubule. Cortisol is therefore free to bind to the mineralocorticoid receptor in abundance, inducing a syndrome of apparent mineralocorticoid excess with an increase in blood volume, hypertension and hypokalaemia.³

A history of liquorice consumption alone is usually sufficient to establish the diagnosis of toxicity, however, this is not always available. Indeed, the degree of hypokalaemia can be severe enough to cause life-threatening arrhythmia⁴ or even paralysis.⁵ In cases where no history can be obtained, normal or low levels of aldosterone and renin will distinguish liquorice toxicity from hyperaldosteronism.

Experimental studies have shown that the rise in blood pressure caused by liquorice follows a linear dose–response relationship. Doses of as little as 75 mg of glycyrrhizin (equivalent to 50 g of standard liquorice confectionary) given daily for a

Learning points

- ▶ The effect of liquorice on blood pressure should be kept in mind when diagnosing and managing hypertension.
- ▶ Excessive consumption of liquorice tea can induce hypertension in previously normotensive patients, and present with a clinical picture similar to primary hyperaldosteronism.
- ▶ Although foodstuffs containing liquorice in the UK are required to carry a warning, glycyrrhizin levels may vary considerably between products and therefore safe limits of consumption may be difficult to estimate.
- ▶ With an increasing range of herbal preparations available for consumption, a dietary history remains as important as ever; food products that are often perceived by patients to have benefits to health and well-being, may actually have powerful and unintended harmful effects.

2-week period have been shown to cause a significant increase in systolic blood pressure.⁶

Quantifying the exact glycyrrhizin content of individual liquorice products, in particular beverages, can be difficult, however. In a survey of 33 brands of liquorice tea, the mean glycyrrhizin content was found to be 126 mg/L (range 2–450 mg/L). A cup of liquorice tea with a volume of 250 mL could therefore be expected to contain, on average, approximately 31.5 mg of glycyrrhizin.⁷

The European Scientific Committee on Food advises that regular glycyrrhizin doses of 100 mg/day present a risk to health, and advocate a safe average daily intake of no more than 10 mg/person/day. This is an amount equivalent to less than half a cup of liquorice tea or just 6 g of liquorice confectionary daily.⁸ Our patient was thus unwittingly consuming daily volumes of liquorice tea containing up to 190 mg of glycyrrhizin—well in excess of the recommended limit—for a significant period of time.

In the UK, the Food Standards Agency currently requires that any beverage containing more than 50 mg/L of glycyrrhizin carry a warning that states “contains liquorice—people suffering from hypertension should avoid excessive consumption.”⁹ However, as is evident from this case and other reports involving confectionary,^{10 11} liquorice can also induce hypertension in normotensive subjects, and the definition of excessive consumption is not clear. This may lead to a false sense of security among healthy individuals such as our patient, who may not consider themselves to be at risk of developing hypertension.

The effect of liquorice on blood pressure has been previously reported. We feel, however, that this case serves as an important reminder to clinicians for the need to remain vigilant to the possibility of liquorice products, including tea, being the cause of raised blood pressure, particularly when associated with hypokalaemia.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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Patient's perspective

- ▶ Having been told by my dentist that fruit teas were helping to erode my tooth enamel, and as I was keen to reduce my caffeine intake, I decided to give liquorice tea a try. Being in my final year at university with a dissertation to write I probably consumed more than usual, averaging around 4–6 cups per day, and had been consuming the tea for about a year.
- ▶ After several months of hot flushes, short but powerful bursts of nausea and terrible headaches, I came to the conclusion I was likely to be perimenopausal. This seemed to fit my symptoms and my mother went through the menopause at a similar age. Having never smoked, only a social drinker, exercising several times a week and someone who has always been proactive in maintaining a healthy lifestyle, I couldn't really think of anything else it might be.
- ▶ I was devastated to be told that I had high blood pressure. Having always suffered from low blood pressure I was scared at this significant change in my health. None of the risk factors fitted and I was keen to identify what the trigger was. The only change I could identify was the tea. When I found the articles on the internet linking it to high blood pressure I threw the rest of the bags in the bin and immediately stopped taking it. The small print states not advised for people with hypertension but of course I had always had low blood pressure. I later learned that in some countries people with low blood pressure are given small amounts of liquorice tea to keep their blood pressure up.
- ▶ Nowhere on the tea does it state the maximum number of cups to drink; what is excessive consumption? As there is limited information on this I don't know if I've had any lasting effects on my body by drinking the tea on a daily basis for over a year. The fact that I consumed liquorice tea for health reasons is not lost on me.

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