CASE REPORT

Hypokalaemia and drinking green tea: a literature review and report of 2 cases

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SUMMARY

We report the association between excessive consumption of green tea and hypokalaemia in an Oriental couple. Both patients were asymptomatic and the abnormal electrolyte level was only detected on routine blood tests. When they were advised to reduce the consumption of green tea, the abnormally low potassium level was reversed. We have not found such an association reported in the medical literature. The health benefits of green tea consumption are well publicised but the potential side-effects of overconsumption are less well known. We would like to report this association to alert clinicians about this potentially serious complication. This is especially relevant for those who are also taking prescribed medications that can lower potassium levels and/or sensitise patients to potential harm from hypokalaemia.

BACKGROUND

The potential health benefits of drinking green tea are well publicised in the media and some evidence is also reported in the medical literature.¹ Epidemiological studies have reported that regular green tea consumption reduces the risk of gastrointestinal, hepatocellular and lung cancers.²⁻³ Some epidemiological studies have even reported a dose dependent benefit after finding that those who are higher consumers (more than 5 cups a day) have a lower risk of cardiovascular and cerebrovascular disease compared to those who drink less than three cups or who are non-consumers.⁴

The potential adverse reactions of drinking excessive amounts of green tea, however, are less well recognised. We report on the cases of an oriental couple living in South London found to be hypokalaemic on a primary care routine health check. Both patients were asymptomatic but had low serum potassium levels. In one, there may have been an underlying predisposition as he was on a diuretic. When both patients heeded advice to reduce their consumption of green tea, their serum potassium levels normalised without any other intervention.

We have not found any other reports of this association between green tea overconsumption and hypokalaemia.

CASE PRESENTATION

Case 1: A 73-year-old man of Chinese extraction, with hypertension, was invited to his general practitioner's surgery for a routine health check. His regular medication included amlodipine 5 mg, lisinopril 10 mg and bendroflumethiazide 2.5 mg daily

to control his blood pressure, and 40 mg atorvastatin for hypercholesterolaemia. He was otherwise fit and well, and taking neither herbal nor complementary medications. He did not drink alcohol and was a non-smoker. The patient regularly drank eight 300 mL glasses of green tea a day.

Case 2: A 67-year-old woman of Vietnamese extraction, the wife of the man in case 1, was known to have diet-controlled diabetes. She was also known to be hypertensive and was prescribed amlodipine 5 mg and lisinopril 20 mg daily. She has mild hypercholesterolaemia controlled with simvastatin 20 mg. While investigating her husband's hypokalaemia, it transpired that she also was a heavy consumer of green tea. Every time her husband made a glass of green tea for himself, he would also prepare an identical glass for her. She also was a non-smoker and did not drink alcohol. She was taking no other herbal medicine nor did she use supplements.

INVESTIGATIONS

These results were found by coincidence during a routine health check for new patients in a general practice.

Case 1: On routine blood tests, serum potassium was found to be 3.1 mmol/L.

Case 2: Serum potassium was found to be 3.2 mmol/L on routine blood tests.

DIFFERENTIAL DIAGNOSIS

Hypokalaemia is a common adverse effect of bendroflumethiazide therapy, due to its action on the sodium-chloride transporter in the renal tubules and consequent effect on the sodium-potassium exchange mechanism. However, we were unable to explain the cause of hypokalaemia in case 2.

TREATMENT

Case 1: The patient was advised to discontinue bendroflumethiazide. He also halved his consumption of green tea and alternated each glass of tea with a glass of water.

Case 2: This patient was also advised to reduce her consumption of green tea in the same way as her husband.

OUTCOME AND FOLLOW-UP

Case 1: Repeat bloods 1 month later found serum potassium to be 4.4 mmol/L.

Case 2: Repeat bloods 1 month later found serum potassium to be 3.7 mmol/L.

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DISCUSSION

When searching through possible causes for these results, it was the daughter of the couple who observed that her parents each drank up to 2.5 L of strongly-brewed Vietnamese green tea per day. Both patients had been drinking identical quantities of green tea for over 40 years. When questioned about this, they said that their high level of consumption was because of the perceived health benefits of drinking green tea.

Drinking excessive amounts of green tea has been reported to cause symptomatic hypokalaemia in those taking concomitant medications. There is a report available in abstract of a 49-year-old Japanese man who developed hypokalaemic myopathy after consuming large quantities of green tea alongside chronic consumption of a cold remedy.⁵ This effect was attributed to caffeine, which is present in high concentrations in green tea and has been shown to induce hypokalaemia.⁶

Green tea extracts have also been consumed for possible health benefits, especially in promoting weight loss. This was reported to induce hepatitis and liver failure. We have not found any reported cases of hypokalaemia from green tea overconsumption alone. In the first case, some of the electrolyte imbalance may have been due to bendroflumethiazide. However, the second patient was taking neither bendroflumethiazide nor any other medications that are reported to induce hypokalaemia.

Drinking green tea is widely credited with benefits such as weight loss, cancer prevention and cerebrovascular and cardiovascular prevention. These potential benefits have led to the marketing of green tea and its extracts. However, meta-analyses of the causal relationship of green tea and these benefits have been inconclusive.⁷⁻⁹

A number of food and food supplements, namely liquorice, part of the group, Glycyrrhizin compounds, can cause hypokal-

aemia due to pseudoaldosteronism.¹⁰⁻¹⁴ Green tea, however, contains mainly caffeine, theobromine and other theophyllines as well as a number of polyphenols including catechins.¹⁵ Although the actual cause is not known, it is possible that the hypokalaemic effect of green tea may be induced by theophyllines. The Oriental method of brewing tea, where the leaves are retained within the brew, may potentiate this effect. Theophyllines are thought to affect sodium/potassium ATPase leading to extracellular hypokalaemia.¹⁶

Contributors KAH identified the patients in the general practice environment. SJK interviewed the patients and accessed their blood test results with their permission, and wrote the case report with CK. CK contributed to interviewing the patients and writing and editing the case report.

Competing interests None declared.

Patient consent Obtained.

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Learning points

- When investigating electrolyte imbalances, clinicians should always be wary of dietary influences.
- We would like to draw attention to hypokalaemia as a potential side effect of green tea overconsumption either on its own or with prescribed medications.
- Before green tea can be safely labelled as a 'health food', more research should be conducted into the potential side effects of excessive consumption.

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