Donepezil overdose secondary to use of a smart home device for medication reminders

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Introduction

Donepezil is used to treat mild to moderate dementia in Alzheimer's disease. Even though it is a relatively safe medication, important cardiac side effects of the medication include bradycardia, atrioventricular block and sinoatrial block. Medication errors lead to adverse drug events and can result in patient harm. Many of these events are avoidable as they are often a result of human error, but the increased use of technology in healthcare leads to other causes of medication errors.

Discussion

Donepezil is a reversible inhibitor of acetylcholinesterase and is used in patients with mild to moderate dementia in Alzheimer's disease. It has well-known cardiac side effects including dizziness, bradycardia, atrioventricular block and sinoatrial block (Joint Formulary Committee, 2018). Donepezil is a well-tolerated medication and reviews of its use in Alzheimer's disease have found small benefits in terms of cognition and the ability to perform activities of daily living (Birks and Harvey, 2018; Atri, 2019). The National Institute for Health and Care Excellence (2018) has recommended its use as monotherapy in mild to moderate dementia.

Case report

A 78-year-old Caucasian woman presented to the emergency department with vomiting and multiple episodes of unwitnessed syncopal episodes. She denied any prodromal symptoms and there was no post-ictal phase, tongue biting or incontinence. Her past medical history included early Alzheimer's dementia, hypertension and hypercholesterolaemia. Her medications on admission included bendroflumethiazide 2.5 mg, atorvastatin 40 mg and donepezil 10 mg. She lived alone and was fairly independent with activities of daily living. On admission, her 12-lead electrocardiogram demonstrated sinus bradycardia with a heart rate of 40 beats per minute (bpm) (Figure 1). Blood tests, including electrolytes and thyroid function tests, were all within normal limits and no postural blood pressure deficit was noted.

While she was in the emergency department she had another syncopal episode. Cardiac monitoring during this time showed a heart rate of 20 bpm (Figure 2). Medical staff witnessing the episode documented that the patient was pale, sweaty and lost consciousness for 20 seconds. She was not given any treatment and recovered from the episode spontaneously. She was urgently reviewed by the cardiology team and moved to the coronary care unit for closer observation.

Further questioning revealed that she had recently been started on donepezil and was sure that she had taken an extra dose of this in the last 24 hours. She put this mistake down to her new smart home device Alexa (Amazon Echo), which she used to remind her to take her medication. Unsure of whether she had already taken her medication for the day, the patient proceeded to take a second dose of donepezil. The device had been incorrectly set up to give twice-daily reminders rather than the required once-daily dosing.

Donepezil was withdrawn from her regular prescriptions. The 12-lead electrocardiogram was repeated over the course of the day and following morning showed resolution of bradycardia with a rate of 65 bpm. She was monitored for a further 12 hours and then discharged home. She had a 24-hour electrocardiogram as an outpatient and this was normal, showing no episodes of bradycardia or pauses. She was then followed up in the cardiology clinic and has been well since her admission to hospital, with no episodes of collapse or pre-syncope.

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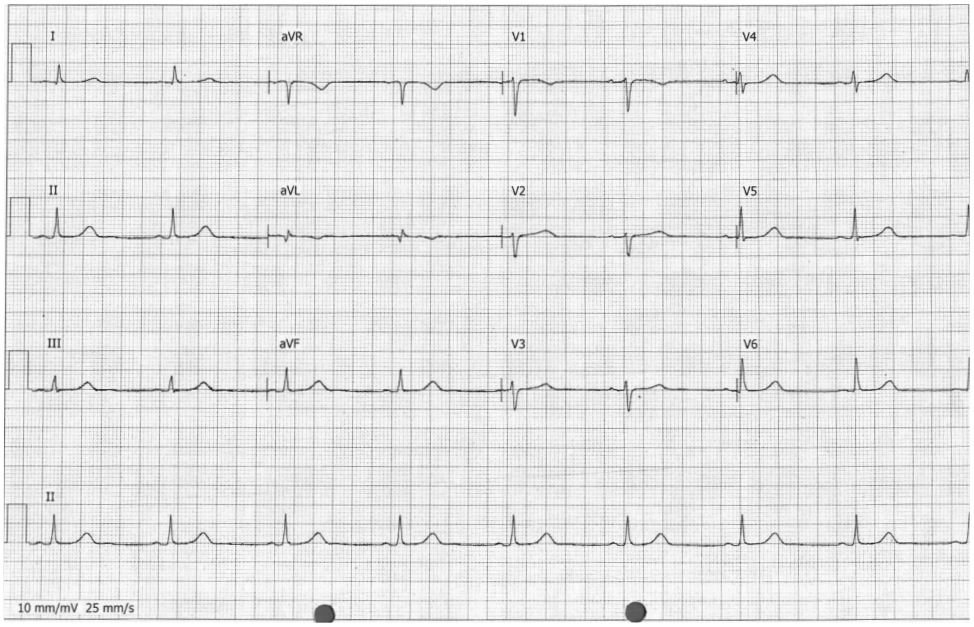

Figure 1. 12-lead electrocardiogram on admission showing sinus bradycardia with a heart rate of 40 beats per minute.

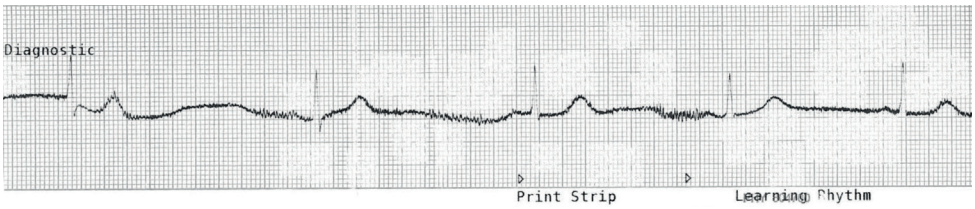

Figure 2. Cardiac monitoring during a syncopal episode in the emergency department. Telemetry shows sinus bradycardia with a heart of 20 beats per minute.

Medication errors leading to adverse drug reactions are common and are responsible for patient harm, leading to hospitalisation, increased healthcare costs and even death (Assiri et al, 2018). It has been estimated that 5% of all hospitalisations are related to adverse drug reactions, with half of these admissions being preventable (Assiri et al, 2018). The adverse drug reactions of donepezil have been documented previously (Shepherd et al, 1999; Hernandez et al, 2009), but not in such unusual circumstances.

The use of technology and 'voice-controlled intelligent personal assistants' have been a hot topic in healthcare. Studies have shown that smart home devices such as Amazon Echo and Google Home can benefit patients by offering support and advice (Choi et al, 2018; O'Brien et al, 2020). They have been used for entertainment, as they can play music, but also as support, with individuals mentioning that the devices have provided them 'someone to talk to' (Smith et al, 2020). They have also been used for practical tasks such as setting a reminder to take medication.

Smart home devices are usually set up using manuals or phone apps, which may be difficult to operate for an older patient, especially one with dementia. As seen in this case, the reminder to take the medication had been set up incorrectly, leading to an adverse drug reaction.

The use of these smart home devices can have many benefits; however, their usefulness depends on their accurate set up. As healthcare becomes more 'digitalised' the use of smart home devices is likely to increase. It is important for clinicians to recognise that these devices have their own dangers, and need to be used with caution, especially by patients with dementia.

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Learning points

- Donepezil is used to treat mild to moderate dementia in Alzheimer's disease.
- With an ageing population, smart home devices can be used in a variety of ways for support, as well as for practical uses such as setting reminders to take medications.
- Medication errors can occur if the prompts from a smart home device are set up incorrectly and therefore they need to be set up with care and after appropriate training.

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