CASE REPORT

False detection of atrial fibrillation in children by a blood pressure monitor with atrial fibrillation detection function

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SUMMARY

A sphygmomanometer that can detect atrial fibrillation may help to identify asymptomatic patients who might benefit from anticoagulation. Its performance in young people has not been reported. In a school project measuring blood pressure in 60 normal healthy male teenagers (age range 13–18 years; mean±SD 15.0±1.5 years), a Microlife BPA200 blood pressure monitor indicated atrial fibrillation in 11 participants (18%). These participants did not have any personal or family history of heart disease. They had sinus arrhythmia and had significantly lower systolic and diastolic blood pressure, body mass index and waist circumference (all *p* values <0.05). In young people, atrial fibrillation is very uncommon and false positives are likely. To avoid unnecessary alarm and referrals, this function is best turned off in young patients.

BACKGROUND

Hypertension and atrial fibrillation are two important causes of stroke, the risk of which can be reduced by treating hypertension and by anticoagulation.

However, both conditions are often completely asymptomatic and therefore screening for them in the community is advocated.¹ While hypertension can be readily detected using a sphygmomanometer, detection of atrial fibrillation is not as easy. Palpation of the radial pulse can often miss atrial fibrillation, and performing 12-lead ECG in general practice is costly and time-consuming. There are now home blood pressure monitors that can measure blood pressure and detect atrial fibrillation at the same time.^{2–5} It is detected using an algorithm that analyses the intervals between pulses. High sensitivity (97–100%) and specificity (89%) have been claimed.^{2–3} It is hoped that this type of machine would allow the opportunistic detection of hypertension and atrial fibrillation in the general population.^{1–2} In this report, we raise the possibility that the atrial fibrillation detection method will cause a high rate of false positives in young people, in whom sinus arrhythmia,⁶ which is normal and physiological, may be wrongly detected as atrial fibrillation, which is rare in young people and has an incidence of 1 in 1000 in people under the age of 55.⁷

Figure 1 The pulse of three young participants that was detected as atrial fibrillation by the Afib software.

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CASE PRESENTATION

A school project was carried out in September and October 2014, to measure the blood pressure of 60 normal healthy male teenagers (age range 13–18 years; mean $\pm$ SD 15.0 $\pm$ 1.5 years) at a boarding school in Kent. Blood pressure was measured three times after resting for at least 5 min, using an automated oscillometric sphygmomanometer (Microlife BPA200, Microlife Corp, Taipei, Taiwan) in accordance with the manufacturer's instructions.⁸ The machine gives a readout for the average heart rate, systolic and diastolic blood pressure. During cuff deflation, pulse intervals are measured and the symbol 'Afib' is displayed if pulse irregularity beyond a certain threshold is detected by the software 'Afib'. The device has a measurement range of 20–280 mm Hg for blood pressure and 40–200 bpm for the pulse rate. It has a stated accuracy of within $\pm$ 3 mm Hg and has been clinically validated using the British Hypertension Society protocol. In our study, one participant had an average blood pressure in the hypertensive range (140/90 mm Hg), although only 34 participants (57%) had an average blood pressure below 120 mm/80 mm Hg. Unexpectedly, the machine determined that 11 participants (18%) had atrial fibrillation. ECG was not available and so the rhythm was studied using an application (Cardiograph 3.0, MacroPinch Ltd, Bulgaria) downloaded to a mobile phone.⁹ It records the pulses of a finger placed over the camera lens of a mobile phone and displays a tracing of the pulses (figure 1). These 11 participants had no personal or family history of heart disease, and did not differ from the other 49 participants in age ($p=0.10$), pulse rate ($p=0.18$) or hours of exercise per week ($p=0.31$). Indeed, as expected of people with high heart rate variability, these participants had significantly lower systolic blood pressure ($p=0.005$), diastolic blood pressure ($p=0.044$), body mass index ($p=0.007$) and waist circumference ($p=0.024$).

DISCUSSION

Although the atrial fibrillation detection algorithm has been validated in over 1500 participants in Europe and America,^{2–5} there is no published information on its performance in young people.¹ As the prevalence of atrial fibrillation is exceedingly low in young people,⁷ a specificity of 89% yields more false positives than true positives. Sinus arrhythmia is common in children and usually disappears in adulthood. It persists in physically fit adults. Interestingly, the 11 participants tested positive were not significantly younger or fitter (no difference in pulse rate or hours of exercise per week), but they were leaner and had lower blood pressures. False-positive detection of atrial fibrillation in the young or fit may, therefore, ironically indicate good cardiovascular health. More research is needed to refine the algorithm for atrial fibrillation detection in home blood pressure monitors and to establish its utility in young people.

Learning points

- ▶ The National Institute for Health and Care Excellence has recommended using a blood pressure monitor with atrial fibrillation detection for opportunistic detection of atrial fibrillation during diagnosis and monitoring of hypertension in medical clinics.
- ▶ We found that a home blood pressure monitor with atrial fibrillation detection function gave false-positive results in a proportion of healthy teenagers.
- ▶ The false positives are likely to cause alarm and anxiety in the patient and family, and result in unnecessary referrals to cardiology for Holter monitoring.
- ▶ Until the positive predictive value is known, users should be advised to turn off this function when the person undergoing the measurement is young.

Contributors AJC designed the project, recruited the participants, and obtained and summarised the data. BMYC advised on project design and carried out advanced data analysis. Both authors contributed to the writing of the manuscript.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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