

Apple Watch is useful in demonstrating coffee-triggered atrial fibrillation with a very short duration: a case report

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Background

Although there are many negative reports on coffee consumption and the occurrence of atrial fibrillation (AF), several factors are involved in the metabolism of caffeine, and it is possible that the response to caffeine changes with age. We present a case in which Apple Watch was useful in detecting very brief paroxysmal AF that was thought to be triggered by coffee consumption.

Case summary

The patient was a man in his early 60s. He often drank a cup of coffee after breakfast. At some point, after drinking coffee and commuting to work, he noticed palpitations. He got an Apple Watch, and when he recorded his electrocardiogram when the symptoms occurred, he found that he had AF. During the following month, the frequency of AF was examined in relation to whether coffee was consumed in the morning. Twenty days of 28 days, coffee was consumed, and of these, AF was observed on 8 days (40%). In the 8 days when he did not drink coffee, there was no AF. For the next 28 days, the coffee was changed to decaffeinated coffee and the frequency of AF was examined. AF was observed on 5 of the 24 days when decaffeinated coffee was consumed (21%). AF did not occur on the 4 days when decaffeinated coffee was not consumed.

Discussion

These results may indicate that AF was significantly more common on days when coffee was consumed. In the case of frequent but short-lasting AF, it is worth considering whether coffee consumption may be a trigger.

Keywords

Case report • Coffee • Caffeine • Atrial fibrillation • Ageing • Apple Watch

ESC curriculum

5.3 Atrial fibrillation • 8.5 Primary prevention

Learning points

- Apple Watch is very suitable for recording atrial fibrillation (AF), which occurs frequently but is of very short duration.
- In patients whose triggers for AF have not been identified, it may be possible to identify triggers by observing patients with and without triggers while using the wearable device for a period of time, as in this case.

Introduction

Although the relationship between alcohol intake and atrial fibrillation (AF) is widely recognized and guidance on sobriety is given, caffeine

intake from coffee and tea is often not given as much attention. Far from it, there have been reports that caffeine does not increase or on the contrary decrease AF.^{1–3} This may be because the effects of age and genetic predisposition on caffeine metabolism may be offset

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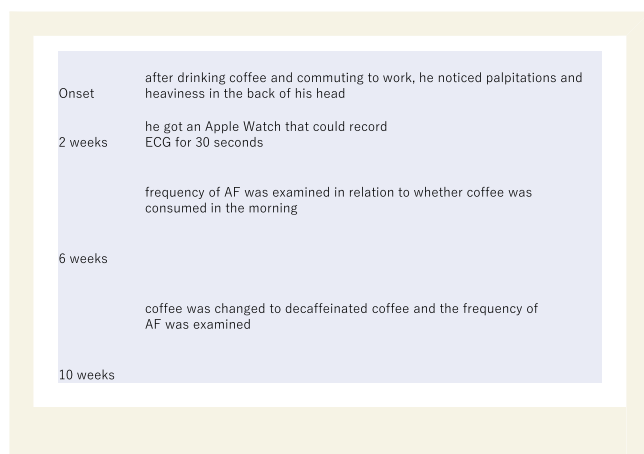
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in a population that includes a wide range of ages and ethnicities. The same may be true of studies that have examined the relationship between coffee consumption and the development of coronary artery disease, where some studies have found that coffee reduces the incidence of the disease, whereas others have found that it increases it.^{4–8} In addition, short-lasting paroxysmal AF can never be evaluated in a cohort study. I would like to report a case in which caffeine intake from morning coffee may have triggered the onset of AF.

Case presentation

The patient was a man in his early 60s. His medical history included no hypertension, no diabetes, and no dyslipidaemia. He had no history of smoking and was an occasional drinker of alcohol. There were no abnormalities on physical examination. He often drank a cup of coffee after breakfast. At some point, after drinking coffee and commuting to work, he noticed palpitations and heaviness in the back of his head. Blood pressure was measured several times when palpitations and a feeling of heaviness in the back of the head appeared, but none of the blood pressure readings were higher than 120/80 mmHg. The symptoms always subsided within 15–30 min. About half a month later, he got an Apple Watch that could record electrocardiogram (ECG) for 30 s. When the symptoms appeared, an ECG was recorded, and it showed AF (Figure 1). During the following month, the frequency of AF was examined in relation to whether coffee was consumed in the morning. Twenty days out of 28 days, coffee was consumed, and of these, AF was observed on 8 days (8/20, 40%). In the 8 days when he did not drink coffee, there was no AF. For the next 28 days, the coffee was changed to decaffeinated coffee, and the frequency of AF was examined. AF was observed on 5 of the 24 days when decaffeinated coffee was consumed (5/24, 21%). AF did not occur on the 4 days when decaffeinated coffee was not consumed. These results might indicate that AF was significantly more common on days when coffee was consumed (Figure 2). After that, the patient stopped drinking coffee in the morning and AF hardly occurred. This patient rarely drank coffee except in the morning. Therefore, it is not clear what happened in the afternoon.

Timeline



Discussion

There are only a few reports comparing caffeine metabolism in the elderly with that in the young. There is one small report that compared eight people with a mean age of 21 years with eight people with a mean age of 71 years, but in this report, there was no difference in caffeine metabolism between the two groups.⁹ However, as with many other drugs and supplements, the possibility that the response to the same amount of a substance may change with age cannot be ruled out. In other words, even if you drink the same amount of coffee, the blood concentration of caffeine tends to vary with age, and there is a high possibility that the effect will be enhanced.¹⁰ The Coffee And Real-time Atrial And Ventricular Ectopy (CRAVE) study was presented at the AHA meeting in November 2021 and has not shown a relationship between coffee consumption and AF. However, the CRAVE study was conducted in young volunteers (mean age: 38 years) and did not reveal a relationship between coffee intake and AF for middle-aged and older adults.

It should also be noted that there are individual and racial (genetic) differences in the activity of CYP1A2 that metabolizes caffeine and that there are large differences in the response of each individual to the same amount of caffeine intake.¹¹ In addition to alcohol, caffeine intake from coffee should also be considered as a trigger of AF as shown in this case. Particular attention should be paid to caffeine intake in middle-aged and elderly people.

About electrocardiogram application in Apple Watch

In Apple Watch, the crystal on the back and the electrodes in the Digital Crown work together with the ECG application to record an ECG similar to a Lead I ECG. By simply placing a finger on the Digital Crown while it is on the wrist, a 30 s ECG can be recorded and categorized as AF, sinus rhythm, low heart rate, high heart rate, or no judgement.

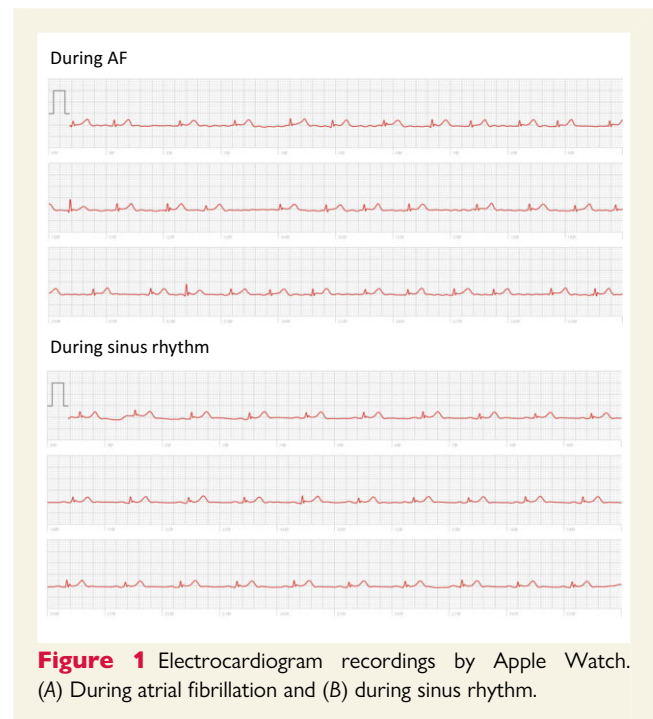
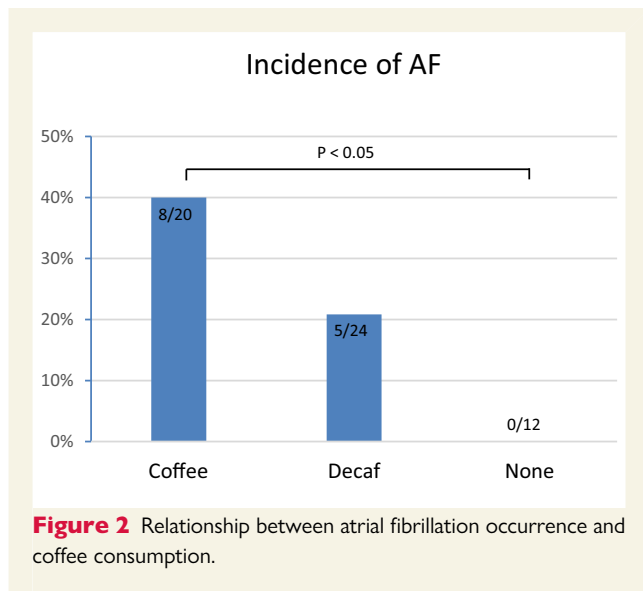


Figure 1 Electrocardiogram recordings by Apple Watch. (A) During atrial fibrillation and (B) during sinus rhythm.



All records are stored in the iPhone's Health Care application and can be exported as a PDF file for review by a physician. AF was reported to be diagnosable with a sensitivity of 96% and a specificity of 100% by referring to the PDF records.¹² Thirty-second ECGs can be recorded as soon as symptoms appear because Apple Watch is a wristwatch and can be always worn. Therefore, Apple Watch is very suitable for recording AF, which occurs frequently but is of very short duration. In addition to AF, the diagnosis of extrasystoles, which are common in daily life, can also be made accurately with Apple Watch by referring to the PDF recordings. The latest ESC guidelines state that the risk of thromboembolism is increased when the duration of subclinical AF is 5 min or longer, so it is extremely important to detect AF of short duration with wearable devices. In patients whose triggers for AF have not been identified, it may be possible to identify triggers by observing patients with and without triggers while using the wearable device for a period of time, as in this case.

Lead author biography



Akira Itoh graduated from the Faculty of Medicine, University of Tokushima, in 1984 and has been working at the National Cerebral and Cardiovascular Center since 1986. From 1994 to 1995, he worked as a research fellow at the Columbus Heart Center in Milan, Italy. From 1998 to 2013, he was the Director of Cardiology, Osaka City General Hospital. Since 2013, he has been the Chief of Cardiology at the HITO Medical Center.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author confirmed that written consent for submission and publication of this case report, including images, has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

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Data availability

The data underlying this article are available in the article and in its online supplementary material.

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