Smartwatch helps detects lung cancer: Using personal technology to advance healthcare

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Abstract

The prevalence of smartwatches and other wearable medical technology has been increasing yearly. These watches offer a sensitive tool for capturing cardiac dysrhythmias and can lead to patients seeking earlier medical advice. This case report highlights the importance of clinicians seeking and using the information provided by wearable medical technology which in this case resulted in both the timely treatment of non-sustained ventricular tachycardia and lung adenocarcinoma.

Keywords

Arrhythmias, Cardiovascular medicine, CLINICAL, lung cancer (respiratory medicine), Respiratory medicine, CLINICAL, cardiothoracic surgery, Surgery, CLINICAL, screening (epidemiology), Epidemiology, NON-CLINICAL

KEY MESSAGE

Smartwatches are a useful tool for non-invasive heart rate monitoring and can lead to incidental discoveries

CASE REPORT

A 58-year-old gentleman who was previously fit and well with no significant medical, smoking or family history, was alerted by his smartwatch that his heart rate was irregular and exceeding 180 beats-per-minute, he remained asymptomatic throughout. He subsequently presented to his GP, where he had a 12-lead electrocardiogram (ECG) which demonstrated tachycardia but no arrhythmias. His GP referred him to his local hospital for further investigations where he was admitted.

Whilst in hospital he received multiple ECGs and extended tracings which showed incomplete right bundle branch block, borderline broad QRS complexes and intermittent first-degree AV block (PR range 191–212), but did not capture a significant arrhythmia. He had an inpatient echocardiogram which showed good LV systolic function with some minor inferior wall hypokinesia. His right heart was mildly dilated, and there were no valvular defects. Using the results from his smartwatch, the cardiologist diagnosed non-sustained ventricular tachycardia and he subsequently had an Implantable Cardiac Defibrillator inserted. A post procedure Chest X-ray ruled out iatrogenic pneumothorax but this incidentally showed an abnormality in his right upper lung zone (Figure 1). A Computerized Tomography (CT) thorax demonstrated a 28 mm irregular lesion in the right upper lobe (Figure 2) and a Positron Emission Tomography scan revealed fluorodeoxyglucose (FDG) avid mediastinal and supraclavicular lymph nodes. He underwent an endobronchial ultrasound guided sampling of mediastinal lymph nodes, which showed non-necrotizing granulomatous inflammation. Biopsy of his tumour demonstrated non-necrotizing granulomatous inflammation with lepidic adenocarcinoma. Pre-operative lung function was preserved and CT head was negative for metastatic disease. His clinical staging for the right upper lobe lung cancer was cT1c N0 M0.

The patient was admitted to a thoracic surgical centre for a right video-assisted thoracoscopic upper lobectomy and lymph node dissection. The procedure was carried out, and other than a small prolonged air leak, the patient recovered well and was discharged home after drain removal on the 10th post-operative day. The upper lobe adenocarcinoma measured 35 mm and was staged as pT2a pN0 M0 with clear resection margins. The resected lymph nodes demonstrated features of sarcoidosis, explaining the FDG avidity. They went on to have an outpatient Cardiac MRI which showed no evidence of cardiac sarcoid.

Discussion

The prevalence of wearable medical technology has been steadily increasing yearly. The smartwatch is by far the most popular choice by consumers. These watches non-invasively monitor both heart rate and rhythm using photoplethysmographic signals. Studies have demonstrated smartwatches are able to monitor heart rhythms with surprising accuracy. The WATCH-AF trial
suggested that, when used appropriately, photoplethysmographic based smartwatches can accurately diagnose atrial fibrillation 96% of the time compared to a Cardiologist’s diagnosis. However, the trial also reported a high level of subject dropout related to insignificant signal quality. There are emerging case reports of smartwatches detecting other types of atrial and ventricular tachycardias, but thus far there are no reported cases of smartwatches leading to the incidental discovery of non-cardiovascular pathologies.

Clinicians need to be wary in fully trusting a device that is produced outside of the normally rigorous healthcare standards. Indeed, Perez et al. recently conducted a study of nearly 420,000 patients who wore a smartwatch over a median follow up of 117 days. 2161 patients were alerted to an irregular heart rhythm, of these only 450 returned ECG traces that could be analysed, and of these only 153 were found to have a confirmed arrhythmia.

Having said this, the benefit of offering a population, continuous non-invasive heart rate monitoring is clearly visible. Atrial fibrillation is the most common tachyarrhythmia and a main precipitant to thromboembolic strokes. Patients with atrial fibrillation suffer an estimated 3.7-fold increased risk of all-cause death compared with the general population. Up to 40% of atrial fibrillation is asymptomatic and thus early detection and management of this arrhythmia is clinically important.

Figure 1. Chest X-ray post ICD insertion showing coin shaped lesion in the mid-zone of the right lung.
In addition to the diagnostic potential smartwatches offer, as demonstrated in this case report, an alarming smartwatch is a trigger for new patient-doctor encounters. Ultimately any device that leads to further investigations or tests will increase the number of incidentally discovered pathologies. With an estimated 1 in 25 cancers diagnosed incidentally, smartwatches may contribute to detection of asymptomatic cancers and many other conditions.

CONCLUSIONS

Wearable medical technology represents a recent development that serves to bring continuous ECG monitoring to the masses. The delineation between watch and medical device can be difficult to determine, and if clinicians of the future are to fully trust smartwatches as a reliable diagnostic tool, more research is needed to determine the diagnostic accuracy of smartwatches ability to detect arrhythmias. Regardless of their diagnostic potential, smartwatches offer a useful early warning system for patients and will increase patients seeking earlier medical assistance.

This case report presents the first known case of a smartwatch assisting in the diagnosis of non-sustained monomorphic ventricular tachycardia and lung adenocarcinoma. For the patient described, it is likely without his smartwatch his lung adenocarcinoma would have continued to grow undetected, curative surgery may not have been an option, and the prognosis for him would have undoubtedly been poorer.

CONSENT STATEMENT: Patient involved in this case has given his informed consent for this case report to be published.

CONTRIBUTORSHIP STATEMENT: J.S and K.N conceived the presented idea and directed the project. A.C wrote the manuscript as presented with assistance from A.K. All authors discussed the results and contributed to the final manuscript.

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