SHORT REPORT

Electrocardiographic artefact mimicking arrhythmic change on the ECG

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Artefact on electrocardiograms is a source of potential misdiagnosis and may lead to patients' receiving unnecessary treatments. This article present two cases that illustrate this problem, and will briefly look at known internal and external causes of artefact.

CASE 1

A 78 year old woman underwent a routine 24 hour ECG as an outpatient, to investigate a series of collapses. She was asymptomatic throughout the test. Analysis of the trace revealed several episodes lasting up to 20 seconds, over a period of 90 minutes, which were interpreted as broad complex tachycardias (fig 1).

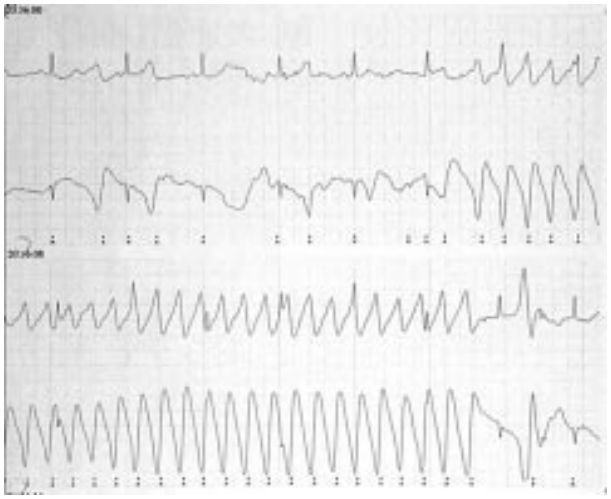

Figure 1 Normal QRS complexes can be seen superimposed upon artefactual waves at regular intervals.

The patient was admitted for five days under the care of a general physician, underwent a repeat 24 hour ECG—which was normal—and was given oral amiodarone. She remained well throughout the admission.

After discharge, she suffered another collapse, was admitted as an emergency for a further seven days and converted to sotalol. This caused symptomatic hypotension, and was changed to atenolol on the advice of a cardiology specialist.

She was then seen in outpatients, where on questioning recalled that she had been knitting and watching television during the period of time the ECG abnormalities were recorded. The arrhythmia has now been recognised as artefactual in origin.

She has since been found to suffer from carotid sinus hypersensitivity.

CASE 2

A 79 year old man presented to the accident and emergency department with symptoms of a chest infection. Past history included parkinsonism, angina, and chronic airways disease. The patient was alert and oriented, dyspnoeic, and pale. He was tachycardic at108 bpm radial, and blood pressure was increased at 168/108.There was no history of recent chest pain. An ECG performed in the emergency department, which was undergoing building work, revealed what was thought to be polymorphic ventricular tachycardia/torsades des points (fig 2).

Treatment with lignocaine (lidocaine) or magnesium was considered, but a specialist opinion was obtained first. The specialist recommended repeating the ECG before starting any treatment, and eventually a diagnosis of sinus rhythm was confirmed, although six ECGs were performed before sinus rhythm was convincingly demonstrated.

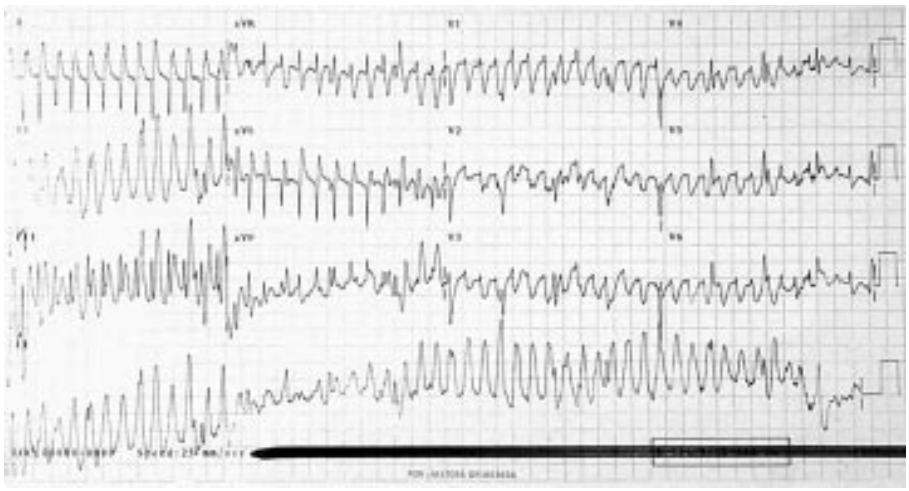

Figure 2 Normal QRS complexes can be seen superimposed upon artefactual waves, best seen in the chest leads.

DISCUSSION

Artefact is a not uncommon finding on electrocardiograms taken in outpatients, emergency departments, or intensive care settings. It can result from both internal and external sources. Artefact may mimic anything from arrhythmia to ischaemia.[1] On the basis of these changes, patients may receive unnecessary and potentially dangerous interventions, as illustrated in these cases.[1 2] It is usually possible to identify these false abnormalities through careful evaluation of both the patient and the ECG, and eliminate or compensate for the cause. An accurate ECG can usually then be obtained without subjecting the patient to the wrong treatment.

In general there are two sources of artefact: physiological and non-physiological. Physiological sources may entail muscular activity and patient motion, and these represent the most frequently encountered sources of artefact that mimic abnormality. Muscle contraction produces an electromyographic signal because of the flow of electrically charged ions, and these appear on an ECG as narrow, rapid spikes. These can mimic both atrial and ventricular rhythms.[3] Modern electrocardiographic monitors are able to filter these out in most cases.

Motion related change produces large swings in the ECG baseline, caused by position changes, coughing, or mobilisation. The effect originates from the lead contact with the skin, and even stretching the epidermis produces a detectable voltage change. This form of artefact cannot be filtered, and illustrates the importance of keeping the patient motionless during analysis.

Non-physiological sources most commonly involve 60 hertz interference from alternating current sources in the area, and is usually filtered out by the electrocardiographic machine. It can lead to a wide, indistinct baseline. Flow of electricity through appliances in the vicinity of the electrocardiographic machine, cables electrodes, and other components of the system may disrupt the signal.[4] Another source is cable and electrode malfunction, because of broken wires, loose connections, or inadequate electrode gel. These abnormalities can take many forms, and must be prevented by strict quality control measures. The accumulation of static electricity,[5] and prosthetic heart valve dysfunction[6] have also been described as sources of artefact.

A clinical correlation should always be sought between the electrocardiographic appearance and the patient's symptoms. In the first case this was not straightforward, as the suspected arrhythmia occurred out of hospital. However, the fact that she remained asymptomatic should have prompted a reappraisal, and a more detailed history before or during the initial admission, specifically including activities carried out during the 24 hour ECG, could have avoided the various treatments she received. The artefactual appearances were eventually attributed to her arm movements during knitting, and poor electrode placement by a junior electrocardiographer. She was also sat near a television set, which may have caused some electrical interference.

The second case was more straightforward, and the ECG appearances were attributed to a combination of the patients' parkinsonism, and building work, including drilling, in progress within the accident and emergency department at the time. Thus the patient was spared potentially dangerous medical treatments. Clinicians must remember to treat the patient, not the ECG.

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