Electrocardiogram Artifact in Catheterization Laboratory Setting Mimicking Ventricular Fibrillation: Stay Vigilant

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ABSTRACT

Electrocardiogram (ECG) is a reliable tool in the initial diagnostic workup of patients presenting to the Emergency Department (ED). However, it is not totally free of interference from artifacts due to various causes such as positional changes during capture, muscle contractions, limb tremors, etc. Such artifacts can have disastrous complications if they mimic arrhythmias and are treated as such. This case report describes two such patients in the catheterization laboratory (Cath lab) setting who developed ECG changes mimicking ventricular fibrillation. The first patient was shivering upon arrival to the Cath lab and developed ECG changes that were initially thought to be ventricular fibrillation. The patient received 2 DC shocks as a consequence. The ECG changes reflected artifacts caused by shivering and muscle activity. The second patient had similar changes induced by triggering the contrast injector during his coronary angiogram. These cases highlight the importance of staying vigilant for causes of artifacts in asymptomatic, hemodynamically stable patients, especially in Cath lab areas, where rapid management response is expected for optimal patient care.

Key words: Electrocardiogram artifact, ventricular fibrillation, arrhythmia

INTRODUCTION

The importance of clinically correlating findings recognized on electrocardiogram (ECG) is always underestimated. It is prudent to be aware of the common physiological and non-physiological causes of artifacts, which may lead to incorrect ECG interpretation as life-threatening arrhythmias with potentially hazardous improper management.

We report two such cases below. Patients were incorrectly labeled as ventricular fibrillation due to ECG artifacts.

CASE PRESENTATIONS

Case 1
A 60-year-old gentleman presented to the Emergency Department (ED) with a picture of anterolateral ST elevation myocardial infarction. The catheterization laboratory (Cath lab) was activated for primary percutaneous coronary intervention (PCI).

On arrival to the Cath lab, his physical examination was unremarkable except for constant shivering. After attaching the cardiac monitor electrodes to the patient, he was noted to have bizarre-shaped wide QRS complexes [Figures 1 and 2], which was suggestive of ventricular fibrillation. Immediately, he was given one DC shock, which was repeated after the persistence of the noted rhythm. On careful review, the patient was conscious and responding, which was not consistent...
with persistent ventricular fibrillation. The bizarre rhythm disappeared upon adjusting the leads and warming the patient with blankets.

**Case 2**
A 51-year-old male patient came with typical chest pain to the ED. Initial ECG recording showed a normal sinus rhythm with significant ST-segment elevation in the anterolateral leads. He was otherwise hemodynamically stable, and the remainder of his examination was unremarkable. He was immediately shifted in stable condition to the Cath lab for primary PCI, where a proximal LAD culprit was identified after contrast injection via right radial approach. However, on flushing the system through the automated injector, the ECG rhythm would change to a wide complex irregularly irregular pattern mimicking ventricular fibrillation, as illustrated in Figure 3. This ECG pattern was reproducible upon multiple trials of saline flushing. The patient was thoroughly assessed and found to be alert, oriented, with a good conscious level and a normal hemodynamic state. Hence, no DC shocks were given, and the ECG pattern attributed to an artifact due to the injector. The remainder of the PCI with drug-eluting stenting went uneventful with no subsequent recurrence of a similar ECG pattern.

**DISCUSSION**
Electrocardiographic (ECG) artifacts can be produced by various causes that may generate recordings mimicking supraventricular and ventricular tachyarrhythmias. These include body motion artifacts, muscle tremors, and electrical or mechanical interference from other equipment. Based on these changes, patients may receive unnecessary and potentially dangerous interventions.

It is usually possible to recognize these false abnormalities through mindful evaluation of both the patient and the ECG, which requires vigilance and a high index of suspicion, especially in the acute setting. However, at times, dilemmas may arise when the cause of artifacts may not be fully evident as the reported case of an ECG artifact mimicking polymorphic ventricular tachycardia caused by building repair work which was resolved simply be repeating serial ECG’s since the patient was asymptomatic and hemodynamically stable, finally demonstrating a normal rhythm.[1]

Various ECG changes caused by artifacts have been described. The most common is large swings seen due to motion artifacts, which may be caused by body position changes or coughing during ECG capturing.

Skeletal muscle tremors are known to frequently cause ECG abnormalities that may mimic various types of arrhythmias. Muscle contraction produces

![Figure 1: Case 1 - ECG leads connected to catheterization laboratory monitor showing irregular wide complex tachyarrhythmia mimicking ventricular fibrillation rhythm](image1)

![Figure 2: Case 1: Normal sinus rhythm is shown after adjusting the ECG leads](image2)

![Figure 3: Case 2: Catheterization laboratory monitor showing ECG artifacts mimicking ventricular fibrillation upon flushing the system through the automated injector](image3)
an electromyographic signal because of the flow of electrically charged ions. These may appear on an ECG as narrow, rapid spikes that can mimic narrow complex tachycardia.[2]

Other examples include an ECG suggestive of ventricular tachycardia, which was reported in a patient with high-amplitude left upper extremity tremor.[3] Tremor-induced artifacts mimicking atrial flutter has also been reported in patients with parkinsonian tremor.[4,5]

CONCLUSION

The possibility of an artifact causing ECG findings should be considered in an otherwise asymptomatic patient who is hemodynamically stable. Vigilance must be practiced when acting upon bizarre rhythms on cardiac monitoring, especially in the Cath lab setting, where apprehension and expectations of a fast reaction time to unstable rhythms might prevail over sound clinical judgment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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