Case Report

Cardiac arrest identified by a chest CT scan in a patient with normal telemetry findings

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Article Info

Article history:
Received 2 March 2019
Revised 5 March 2019
Accepted 5 March 2019

Keywords:
Cardiac arrest
Chest CT scan
Telemetry findings
Pulseless electrical activity

Abstract

Early recognition of cardiac arrest has been linked traditionally to clinical signs and telemetry findings. Few case reports have presented normal telemetry findings in patients with cardiac arrest where a contrast enhanced CT scan of the chest was able to identify the diagnosis. The early recognition of a cardiac arrest whether by telemetry monitoring or CT scan is important to improve the clinical outcomes. This case report presents a patient who was hypertensive and unresponsive upon arrival to the emergency department. A chest CT scan to rule out aortic dissection showed no contrast in the pulmonary arteries, aorta, and the rest of the heart chambers although normal telemetry findings were present. Resuscitation was initiated, and patient survived with poor neurological recovery.

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Introduction

In-hospital cardiac arrest mortality remains high despite modest improvement in survival during the last decades [1]. Early recognition of cardiac arrest (CA) with prompt initiation of cardio-pulmonary resuscitation (CPR) in order to restore circulation leads to better outcomes [2]. While the vast majority of In-hospital Cardiac Arrest is detected by clinical signs or by means of telemetry monitoring, there are few reports of CA that were first detected by Computed Tomography (CT) scans.

Herein, we report 1 case of CA that was identified by contrast-enhanced CT of the chest in a patient with normal telemetry findings.

Case presentation

A 60-year-old African-American female with history of obesity, essential hypertension, and type 2 diabetes mellitus; was admitted to the Emergency Department after being found
unresponsive at home. Upon arrival, patient was unconscious, tachycardic with heart rate of 132/min, hypertensive with blood pressure of 204/157 mmHg, and had an agonal breathing. Neurological exam revealed fixed and dilated pupils, rightward gaze preference, and absence of pain response, cough, and gag reflex. A National Institutes of Health Stroke Scale score of 35 was calculated. She was immediately intubated and stroke code was activated followed by performance of a brain CT that revealed an acute large infarct in the right middle cerebral artery territory (Figs. 1A, B, and 2).

The presence of significant hypertension prompted to obtain a contrast-enhanced CT of the chest to rule out aortic dissection. Contrast material of 100 cc was injected for the study at a rate of 5cc/s. After 20 seconds of injection, the study was performed using the thinnest collimation available. Scanning was performed in a craniocaudal fashion after 20 seconds from the onset of injection. Images that were visualized on-site showed intravenous (IV) contrast in the superior vena cava, right atria, and inferior vena cava (IVC), but no contrast in the pulmonary arteries, aorta, and the rest of the heart chambers (Figs. 3 and 4). An immediate assessment revealed absence of carotid and femoral pulses at the time when cardiorespiratory monitor parameters were present including normal pulse oximetry saturation of 99% and third-degree atrioventricular block on monitor before entering into ventricular fibrillation. These findings in concordance with the absence of IV contrast in the heart chambers were considered as pulseless electrical activity. The patient became bradycardic,
Cardiac tamponade was made with third-degree atrioventricular block on monitor before entering into ventricular fibrillation.

CPR was immediately initiated and return of spontaneous circulation was achieved after 6 minutes. ECG confirmation was not needed as it would have caused a delay in the initiation of the Advanced Cardiovascular Life Support protocol. The patient was then transferred to the intensive care unit where she was initiated on vasopressors and started on hypothermia protocol. A poor neurological recovery was present and patient remained with ventilator-dependent respiratory failure, and was transferred to a long-term care facility after 1 month of being discharged from the hospital.

**Discussion**

Several CT findings have been described in patients with impending CA including reflux of IV contrast into the coronary sinus, great cardiac vein, superior mesenteric veins, hepatic veins, right renal vein along with nonopacification of the aorta and left cardiac chambers and dependent layering of venous reflux contrast or contrast-fluid level in the IVC [3–5]. The latter, sometimes referred as the “IVC level sign,” is perhaps the most commonly reported in the literature, but has also been reported in patients with low cardiac output or shock [3,4]. Interestingly, Wagner et al. [6] reported a case of severe valvular heart disease and left ventricular failure who had the “IVC level sign” without being in CA or state of shock [6]. Others like regurgitation of IV contrast to ascending lumbar vein, hemiazygous andazygous vein, dorsal veins, and pulmonary veins are less commonly reported in the literature [3,5,7,8]. Table 1 shows reports that identified CA initially based on CT scan of the chest along with a follow up on the patients reported.

In this case, we report a patient who presented with an acute ischemic right middle cerebral artery stroke who later developed CA that was first detected by the absence of contrast filling of the RV and left side heart chambers during the performance of a contrast-enhanced CT of the chest while having an unremarkable cardiorespiratory and oximetry monitoring. Our report challenges current in-patient monitoring practices as exemplified in this case as there was detected

**Fig. 3 – Non-beating heart.**
Axial contrast-enhanced CT of the chest showing an enhanced superior vena cava (SVC) with absence filling of the right ventricle suggestive of a nonbeating heart. Notice is made of a bilateral pleural effusions. (Color version of figure is available online.)

**Fig. 4 – A and B. Cardiac arrest.**
Coronal contrast-enhanced CT scan of the chest showing enhanced filling of the SVC, inferior vena cava (IVC), and the right atrium (RA) with no filling of the right ventricle (white arrows) and pulmonary artery. These findings are suggestive of cardiac arrest.
pulse oximetry with normal sinus rhythm throughout the performance of the study even in the complete absence of cardiac output as noted on CT examination. An oxygen saturation of 99% can be expected in the first few seconds following a CA considering the time to equilibration of oxygen saturation using pulse oximetry [9].

The lack of contrast filling of left heart chambers prompted immediate reassessment that revealed absence of carotid pulse followed by the presence of sinus bradycardia and that allowed us to timely start CPR for pulseless electrical activity with achievement of return of spontaneous circulation within 6 minutes of initiation of resuscitation maneuvers. Despite the unfortunate clinical features of presentation (a massive stroke by definition) that played a significant role in the poor neurological recovery of our patient, we believe that early recognition of CA on the CT resulted in a quick response and initiation of CPR that would have been delayed otherwise further increasing burden and likely resulting in worse overall clinical outcomes.

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