Focused Cardiac Ultrasound for the Detection of a Ventricular Aneurysm

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Supervising Section Editor: Rick McPheeters, DO
Submission history: Submitted June 15, 2011; Revision received September 14, 2011; Accepted December 19, 2011
Reprints available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.2011.12.6832
[West J Emerg Med. 2012;13(4):326-328.]

INTRODUCTION

Left ventricular aneurysm (LVA) is a rare and dangerous disease process, for which rapid diagnosis can expedite further evaluation and treatment. Here we present the first case of LVA detected by focused cardiac ultrasound in a case of a patient with electrocardiographic findings consistent with a ST elevation myocardial infarction.

CASE REPORT

A 60-year-old male with a history of asthma and diabetes mellitus presented to the emergency department (ED) with two weeks of worsening cough, shortness of breath and wheezing. He reported bilateral lower extremity swelling, orthopnea, paroxysmal nocturnal dyspnea, fatigue, dyspnea on exertion and subjective fevers. He denied chills, chest pain, nausea and vomiting. The patient was unaware of any history of cardiac disease and denied smoking or recreational drug use.

Physical examination on presentation to the ED revealed an uncomfortable appearing male in mild distress. The patient's initial vital signs were: heart rate 112 beats per minute, blood pressure 133/83 mmHg, respiratory rate 17, temperature 99.1°F (37.3°C), and oxygen saturation 97% on room air. He was noted to have 10 cm of jugular venous distension and bilateral pitting edema to his knees. His cardiovascular exam revealed a normal S1 and S2, and a loud S3 with no audible murmurs. The patient's lung examination was significant for crackles in all lung fields, mild end-expiratory wheezing and no accessory muscle use. Neurologic and abdominal examinations were normal.

His electrocardiogram (ECG) was significant for ST segment elevation in leads V1 through V4 consistent with an anteroseptal infarct, age undetermined (Figure 1). Chest radiograph was significant for costophrenic angle blunting and hilar prominence bilaterally (Figure 2). No old studies were available for comparison, leading the emergency physician

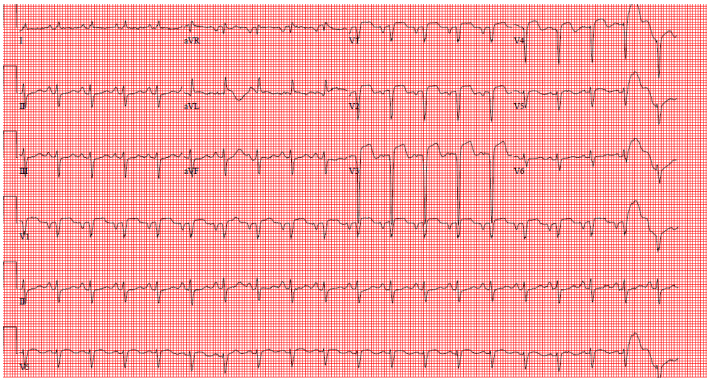

Figure 1. Electrocardiogram on arrival demonstrates Q waves and ST elevation in leads V1-V4.

(EP) to activate the process for urgent PCI (percutaneous coronary intervention).

While cardiology was consulted, the EP performed a bedside focused cardiac ultrasound using a 5-1 MHz phased array transducer (Philips HD11XE, Andover MA) showing reduced left ventricular contractility, as well as thinning and dilation of the anterior left ventricular wall, consistent with an aneurysm of the left ventricle. (Figure 3). An apical 4 chamber view noting thinning and poor contractility of the distal left ventricle. The proximal ventricle are not thinned and demonstrate normal contractility (Video-online only).

Point-of-care laboratory results returned during cardiology consultation. Troponin I was <0.01 ng/ml, myoglobin was 280 ng/ml [normal<106 ng/ml] and B-type natriuretic peptide was 1152 pg/ml [normal<100 pg/ml]. Based on the ECG and ED ultrasound findings, the consulting cardiologist concluded that the ST elevation was related to a recent anteroseptal myocardial infarction resulting in the left ventricular aneurysm. The patient was not transferred directly to the cardiac catheterization lab given his history and focused cardiac ultrasound results, and instead was treated with optimal medical therapy. During the hospital course, the

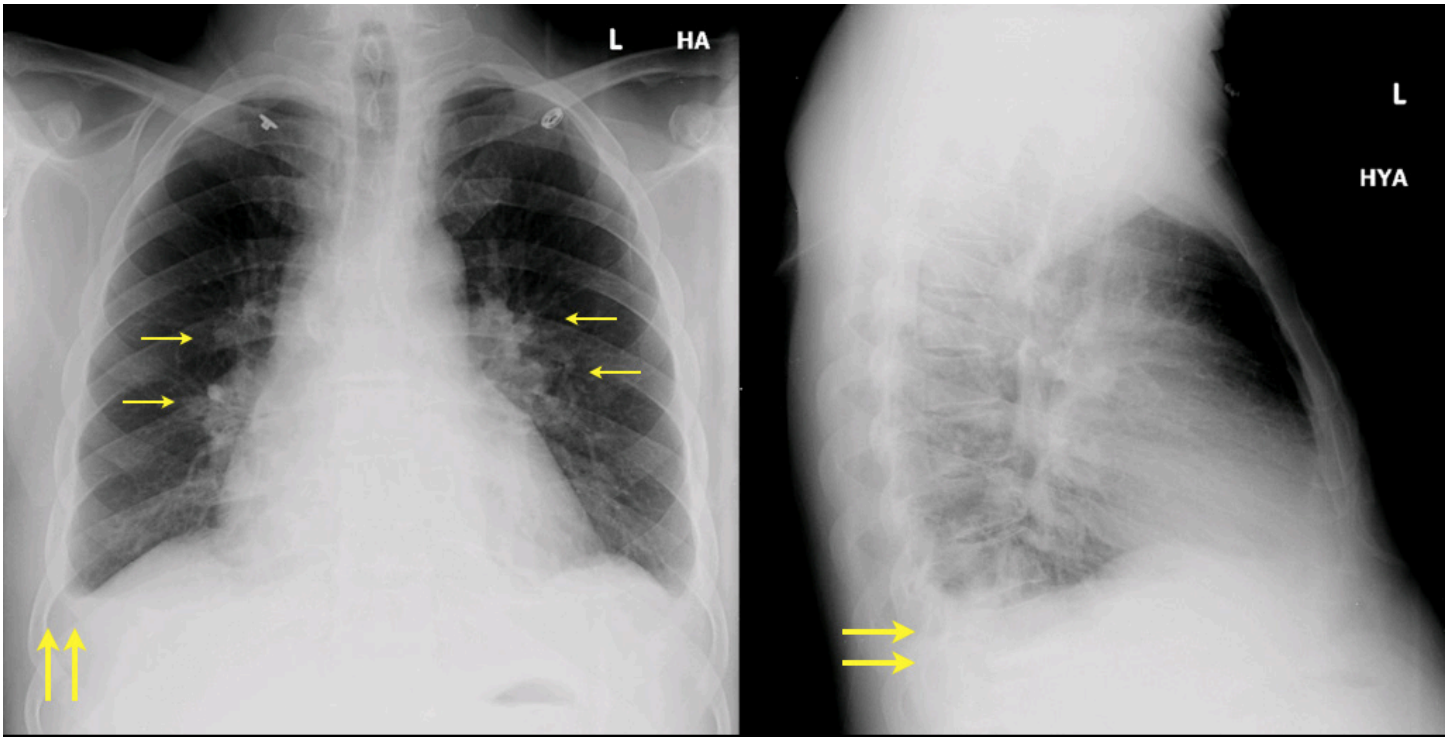

Figure 2. Portable anteroposterior chest radiograph reveals blunting of the costophrenic angles (thick arrows) and hilar prominence bilaterally (thin arrows).

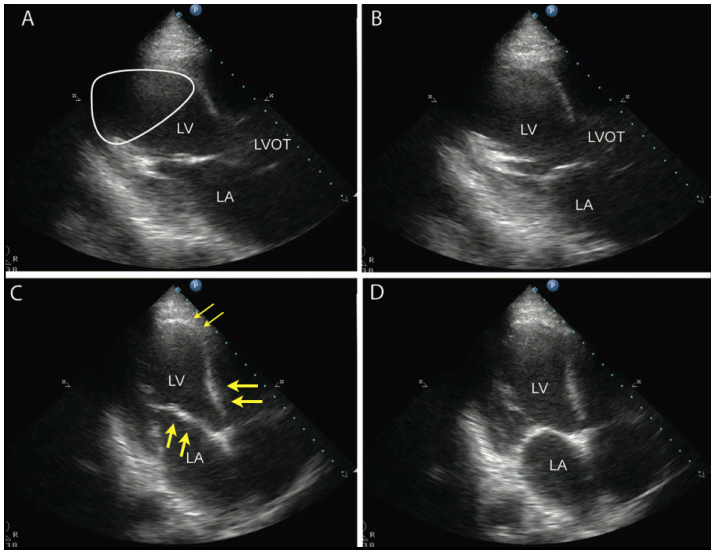

Figure 3. A, Parasternal long, diastole. Left ventricular aneurysm (white line). B, Parasternal long, systole. C, Apical four view, diastole. D, Apical four view, systole. Note the thinned myocardium and broad neck present in both echocardiographic views during systole and diastole.

patient's troponin level never increased. A comprehensive echocardiogram confirmed the ED findings of a ventricular aneurysm.

DISCUSSION

Left ventricular aneurysm (LVA) is a rare but potentially life-threatening condition that can initially present to the EP. A LVA, or "true aneurysm," is described as a localized area of dyskinetic myocardium that bulges outward during both systole and diastole. It is typically located on the anterior wall in the territory of the left anterior descending artery. It occurs in 5% of patients with a recent ST-segment elevation myocardial infarction,but has also been reported in patients with hypertrophic cardiomyopathy and Chagas disease.[1-3]

Patients will typically present to the ED with chest pain, difficulty breathing or a clinical picture consistent with congestive heart failure. Rapid diagnosis in the ED has traditionally centered on a history of recent MI and ST-segment elevation (STE) on an ECG.[4,5] However, both clinical presentation and ECG findings in the ED are often mistaken for other more common disease processes, making the diagnosis of this rare entity difficult.

Focused cardiac ultrasound in the ED has been useful in estimating left ventricular contractility, and in identifying the presence of a pericardial effusion and right ventricular enlargement.[6] With increased integration of bedside ultrasound in the practice of emergency medicine, more clinicians will be identifying pathologic states that were once only in the domain of other subspecialties. Here we present the first reported case where focused cardiac ultrasound was used in the ED to rapidly diagnosis a symptomatic LVA. Rapid visualization of the myocardium can help identify a patient with chest pain and STE who may not need PCI emergently. Chest pain is a Class I indication for comprehensive echocardiography when myocardial ischemia/infarction are considered and the ECG is non-diagnostic.[7,8] However, evaluation of wall thickness

and segmental wall motion analysis are some of the more challenging aspects of echocardiography, and as a result recent guidelines recommend that cardiologic consultation and comprehensive echocardiography are indicated for confirmation of suspected left ventricular aneurysm on ED focused cardiac ultrasound.[6]

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Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources, and financial or management relationships that could be perceived as potential source of bias. The authors disclosed none.

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