CASE REPORT

Is follow-up echocardiogram mandatory after a STEMI?

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Summary

Current guidelines do not advise follow-up echocardiograms after ST-segment elevation myocardial infarction (STEMI), unless the left ventricular ejection fraction is ≤40%. We present an interesting case of left ventricular pseudo-aneurysm – diagnosed 6 months after index STEMI presentation. Follow-up echocardiogram was performed in her case, due to jaw pain during routine haemodialysis. The patient was successfully treated with percutaneous closure device. This case raises the question of whether echo follow-up should be routinely advised after STEMI – even in those with minimal cardiac symptoms.

Key Words

- left ventricular pseudo-aneurysm
- LV aneurysm
- aneurysm
- post STEMI echo
- 2D echocardiography

Learning points:

- Patients with left ventricular pseudo-aneurysm can be haemodynamically stable and may not always be in extremis.
- Left ventricular pseudo-aneurysm can develop months after ST elevation myocardial infarction.
- In patients re-presenting with cardiac symptoms after ST elevation myocardial infarction, a repeat echocardiogram should be considered.
- In patients suffering ST elevation myocardial infarction, it is reasonable to consider repeat echocardiography even with mild LV dysfunction, especially with late presentation or disproportionately high biomarkers.

Background

In current clinical practice, follow-up echocardiograms are performed after an ST elevation myocardial infarction (STEMI) only if the left ventricular systolic function is severely impaired. The European Society of Cardiology (ESC) guidelines recommend performance of pre-discharge echocardiography in all STEMI patients. Thereafter, re-evaluation is recommended at 6–12 weeks on optimal medical therapy in those with an LVEF below 40% (1). We present a case that highlights the need to consider follow-up echocardiogram even when the left ventricular systolic function is only mild to moderately impaired, if the patient has any cardiac symptoms. Furthermore, this case recapitulates the fact that pseudo-aneurysms can be minimally symptomatic.

Case presentation

A 69-year-old Caucasian woman with past medical history of stage-5 diabetic nephropathy on haemodialysis, hypertension and stroke was admitted with infero-posterior STEMI in July 2017. Primary percutaneous

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coronary intervention was performed to right coronary artery with one bare metal stent. There was no undue delay in treatment, with acceptable symptom onset to balloon time of 146 min. Her maximal Troponin-I was 61,000 ng/mL (normal range <40). Echocardiogram showed mild left ventricular systolic impairment with an ejection fraction of 45% due to hypokinesis of inferior and posterior walls with normal right ventricular size and function. Further inpatient course was uneventful and was discharged on day 4.

Four months after the index presentation, she was readmitted to the hospital with acute onset of jaw pain while on haemodialysis. She was haemodynamically stable with no acute ECG changes and her Troponin levels were not elevated. Due to her stable clinical state and as the baseline investigations were normal, mechanical complications of STEMI were not suspected. Furthermore, as it was 4 months after STEMI, temporally, a mechanical complication was not thought as the cause of her symptoms. She was discharged with a plan for outpatient echo, primarily to reevaluate the left ventricular function. She continued to undergo routine haemodialysis as an outpatient, with no significant haemodynamic compromise. However, she did notice new breathlessness on moderate exertion (New York Heart Association Grade 2).

Investigation

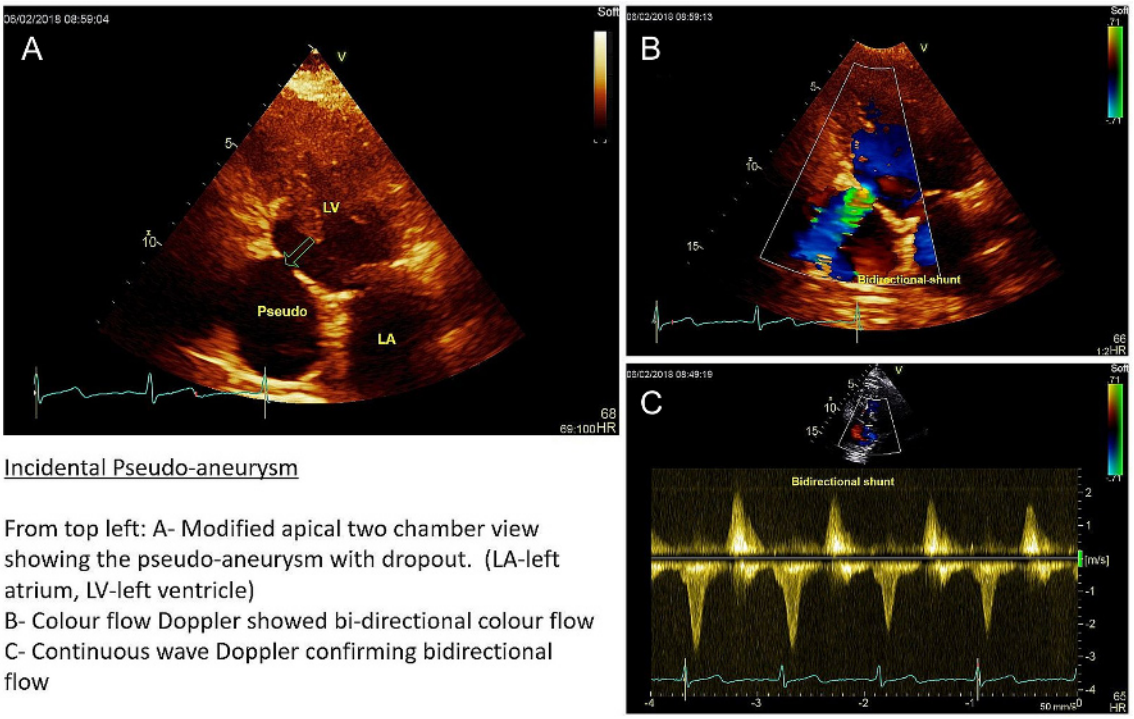
Echocardiogram performed 2 months after the second admission (and 6 months after index STEMI) surprisingly showed a basal inferior wall pseudo-aneurysm, with myocardial rupture sealed by pericardium (Fig. 1).

Treatment and outcome

She underwent percutaneous closure of the pseudo-aneurysm which resulted in improvement in breathlessness and echocardiogram showing gross reduction in blood flow into the pseudo-aneurysm (Fig. 2). The left ventricular ejection fraction improved from 50% pre-closure of pseudo-aneurysm to 61% post closure (Simpson's biplane).

Discussion

The current incidence of free wall rupture after myocardial infarction is less than 1%, but is responsible for 15% of all deaths (1, 2). In total, 90% of myocardial ruptures happen during the first 2 weeks after acute myocardial infarction (3). The incidence has gradually



Incidental Pseudo-aneurysm

From top left: A- Modified apical two chamber view showing the pseudo-aneurysm with dropout. (LA-left atrium, LV-left ventricle)
B- Colour flow Doppler showed bi-directional colour flow
C- Continuous wave Doppler confirming bidirectional flow

Figure 1
Modified two-chamber view showing the pseudo-aneurysm with dropout. Color flow and Doppler showed the shunt was bi-directional.

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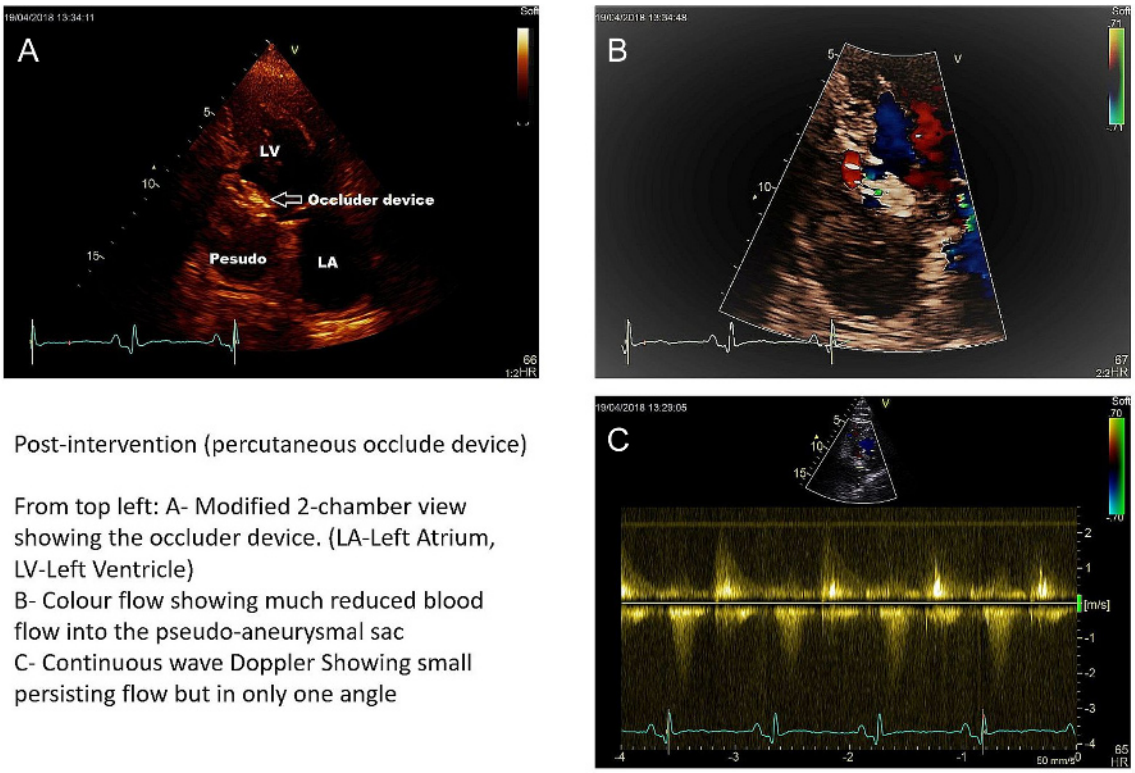

Figure 2
After insertion of percutaneous occlusion device, there was a gross reduction of flow into the pseudo-aneurysm.

fallen due to introduction of reperfusion strategies – thrombolysis in the 1990s and widespread introduction of primary percutaneous coronary intervention in the 2000s and also better pharmacotherapy (2, 4). Primary percutaneous coronary angioplasty after acute myocardial infarction restores coronary patency more frequently that thrombolysis and, hence, reduces the incidence of free wall rupture (5). Advanced age, lower body weight, female sex, transmural infarction, late or no reperfusion, first myocardial infarction, anterior or inferior location of myocardial infarction and late presentation after chest pain onset are risk factors of myocardial rupture (2, 4, 6, 7). Mortality following free wall rupture is over 75% (4). While complete free wall rupture causes sudden death by cardiac tamponade, an incomplete rupture can occur if thrombus and/or pericardium seals the ventricular perforation (3). Most common symptoms following the development of pseudo-aneurysm are congestive heart failure, chest pain and breathlessness (8). Syncope due to arrhythmias or low cardiac output has also been reported as primary complaints (9). In one series, 12% of those with pseudo-aneurysm were asymptomatic (8). Narrow aneurysm entrance followed by a large sac is typical of pseudo-aneurysm (9). Cardiac surgery is the common treatment option. Surgical ventricular repair with pericardial patch is usually attempted if the patient is relatively stable (1), but survival after surgery is poor (10). One-year mortality after surgery and conservative treatment for pseudo-aneurysm were 23% and 48%, respectively (8).

Haemodialysis is known to cause several cardiovascular complications including myocardial ischaemia, hypotension and arrhythmias even in those patients with good left ventricular function (11). It is remarkable that our patient could undergo several months of haemodialysis with left ventricular pseudo-aneurysm, without major haemodynamic compromise. We evaluated the risk of surgical vs percutaneous closure in our patient. With her comorbidities of end-stage renal failure and stroke, surgical closure was felt to be high risk. After discussion with regional expert, she was transferred as inpatient for percutaneous device closure. The procedure was successful with resolution of breathlessness, and the patient was doing well at follow-up at 30 months.

The current ESC-STEMI of 2017 guidelines suggest a follow-up echocardiogram 6–12 weeks after discharge, only if the initial left ventricular function is poor (≤40%) (1). Our case highlights the need for a rethink on this.

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Further, the case highlights the point that patients with sealed myocardial rupture can be haemodynamically stable. Our center treats approximately 350 STEMI patients per annum. We have not audited our re-admission rates but, from modern data, this is about 20% in the first-year post STEMI (12). This will add approximately 70 more scans, which will be an additional strain to our outpatient echo waiting list; however, it could be valuable in identifying late mechanical complications in minimally symptomatic patients.

Hence, we believe that, even in those patients with minimal cardiac symptoms post STEMI, further interrogation with echocardiogram should be strongly considered.

Patient's perspective

I started feeling breathless a couple of months after my heart attack. I had to be readmitted as I had jaw/neck pain during a dialysis session. I also noticed breathlessness on walking. Since I had my closure device, I felt much better from breathlessness.

Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

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Patient consent

Written informed consent for publication was obtained from the patient.

Author contribution statement

Dr Sathish Kumar Parasuraman is the first author and helped in image collection. Mrs Janaki Srinivasan diagnosed the pseudo-aneurysm and co-authored the case. Dr Paul Broadhurst was the treating cardiologist and also proofread the article.

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