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CASE REPORT
Cardiovascular imaging

A 44-year-old man with recurrent ST-segment elevation: a case report of two presentations of Granulomatosis with Polyangiitis

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Background Granulomatosis with Polyangiitis (GPA) is a rare multi-system autoimmune disorder that may present with cardiac manifestations that are often under-recognized. In this report, we discuss a usual case of a patient who presented as a cardiac emergency with recurrent ST elevation and discuss the approach and management.

Case summary A 44-year-old man presented with two episodes of chest pain associated with ST-segment elevation on 12-lead ECG. Under investigation over the past several weeks for fatigue, nasal congestion, and red eyes, his first presentation was associated with widespread ST-segment elevation and an echogenic myocardium suggestive of myocarditis that was confirmed on cardiac MRI. A week later, the development of chest pain, antero-lateral ST elevation, and regional wall motion abnormalities suggested an acute coronary syndrome and he proceeded to primary percutaneous intervention that treated a lesion in the distal left anterior descending artery secondary to coronary arteritis. Diagnosed with GPA, he was started on immunosuppression and has had a resolution of his cardiac involvement at follow-up.

Discussion This case report describes an unusual case of myocarditis and coronary arteritis presenting acutely in the same patient and emphasizes the importance of considering systemic autoimmune conditions when encountering primarily cardiac presentations. Early recognition and diagnosis of cardiac involvement will improve the long-term outcomes in these patients.

Keywords Granulomatosis with Polyangiitis • Wegener's granulomatosis • Coronary arteritis • Myocarditis • Acute coronary syndrome • Case report

ESC curriculum 2.3 Cardiac magnetic resonance • 3.2 Acute coronary syndrome • 2.1 Imaging modalities • 3.4 Coronary angiography • 3.1 Coronary artery disease

Learning points

- Cardiac manifestations of Granulomatosis with Polyangiitis (GPA) are rare but associated with severe disease.
- The spectrum of cardiac involvement may include pericarditis, myocarditis, coronary arteritis, valvulitis, and arrhythmias.
- While there are no pathognomonic features of GPA on cardiac MRI, this modality was helpful to differentiate between acute myocarditis, myocardial infarction, and other differential diagnoses.

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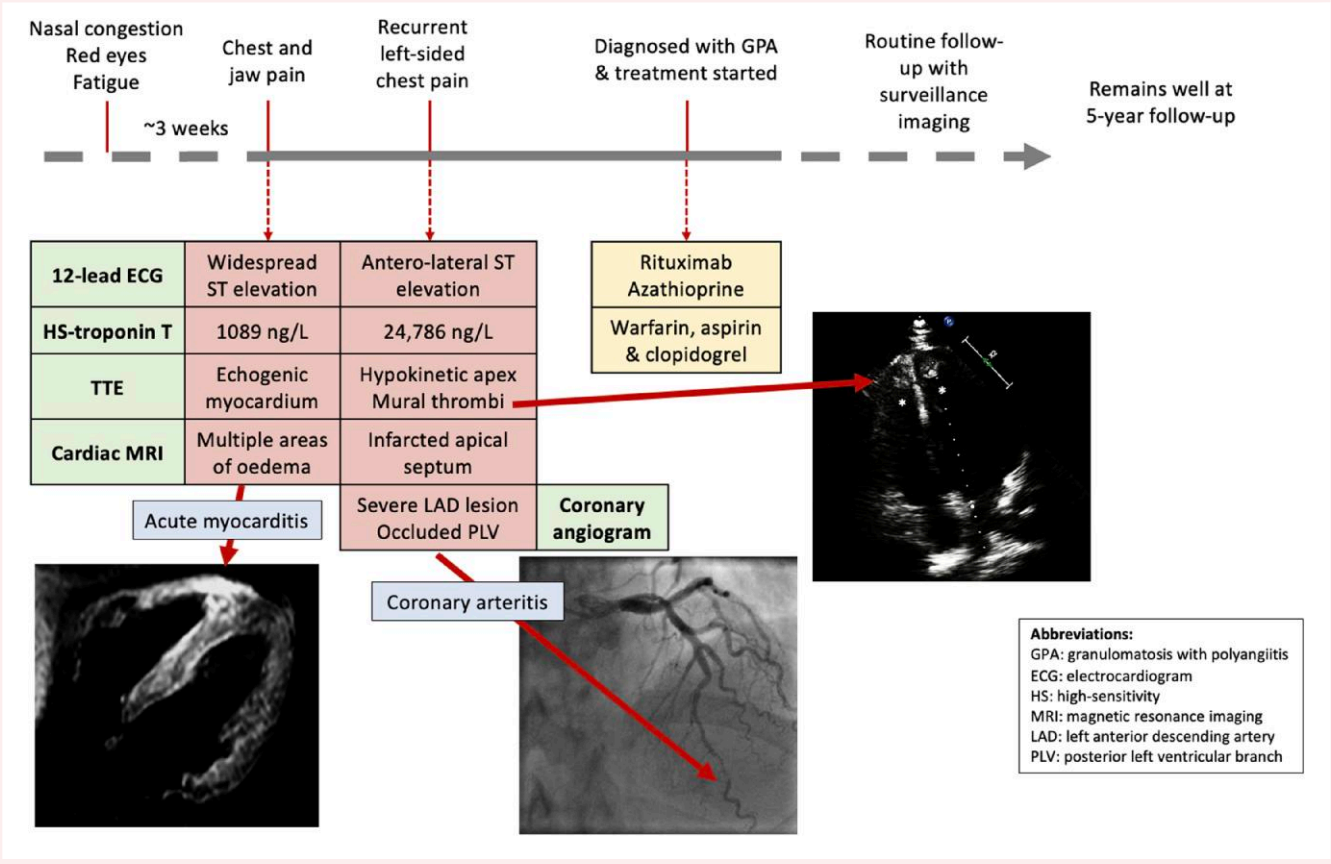
Introduction

Granulomatosis with Polyangiitis (GPA) is a systemic necrotizing vasculitis characterized by pulmonary and renal manifestations. Cardiac manifestations of GPA are important to recognize because they indicate the presence of severe inflammatory disease and the potential to develop cardiac complications. In this case report, we present an unusual case of a patient with recurrent chest pain associated with ST-segment elevation in a new presentation of GPA. Initially presenting with an acute myocarditis, he subsequently developed an acute coronary syndrome (ACS) secondary to coronary arteritis. We highlight the differences in presentation and treatment between the two episodes and emphasize the need to consider systemic autoimmune conditions when encountering acute cardiac presentations.

Summary figure



Case summary

A 44-year-old man developed sudden onset atypical chest and jaw pain with widespread ST elevation on 12-lead ECG (*Figure 1*). Otherwise fit and well, he was a non-smoker and had a normal CT coronary angiogram two years prior. Over the preceding several weeks, he had been investigated for fatigue, nasal congestion, and red eyes and CT imaging of his chest, abdomen, and pelvis had found pancreatic and pulmonary masses. A pulmonary biopsy had shown granulomata with acid fast bacilli for which anti-tuberculous therapy had been started. On examination, he was pyrexial but had a normal cardiac examination. Transthoracic echocardiography (TTE) showed normal left ventricular (LV) systolic function, no regional wall motion abnormalities but an echogenic myocardium (*Figure 2*). High sensitivity-troponin T at 12 h was 1089 ng/L (0–14). Given the strong initial suspicion of acute myocarditis, an urgent cardiac magnetic resonance (CMR) imaging scan was performed that demonstrated multiple focal areas of high signal intensity consistent with acute inflammation and confirming the diagnosis of acute myocarditis (*Figure 3A and B*). Focal round infiltrative lesions were also found in the basal antero-septum and mid/apical septum associated with oedema, fibrosis, and central necrosis (*Figure 3C*).

One week later, he developed recurrent left-sided chest pain with dynamic antero-lateral ST elevation (*Figure 4*) with runs of non-sustained ventricular tachycardia. High sensitivity-troponin T was 24 786 ng/L and C-reactive protein 186 mg/L. Transthoracic echocardiography revealed hypokinetic apical segments and the patient proceeded to emergent coronary angiography that revealed a severe (75% stenotic) lesion in the distal left anterior descending (LAD) artery (*Figure 5A*) and an occluded small calibre posterior left ventricular branch of the right coronary artery (RCA, *Figure 5B*). A drug-eluting stent was deployed in the distal LAD. A post-procedural TTE showed a mildly impaired LV systolic function [left ventricular ejection fraction (LVEF) 45%], apical akinesia, and left and right ventricular mural thrombi (see Supplementary material online, *Figure S1*). A repeat CMR showed an additional infarcted appearance of the apical septum (see Supplementary material online, *Figure S1*).

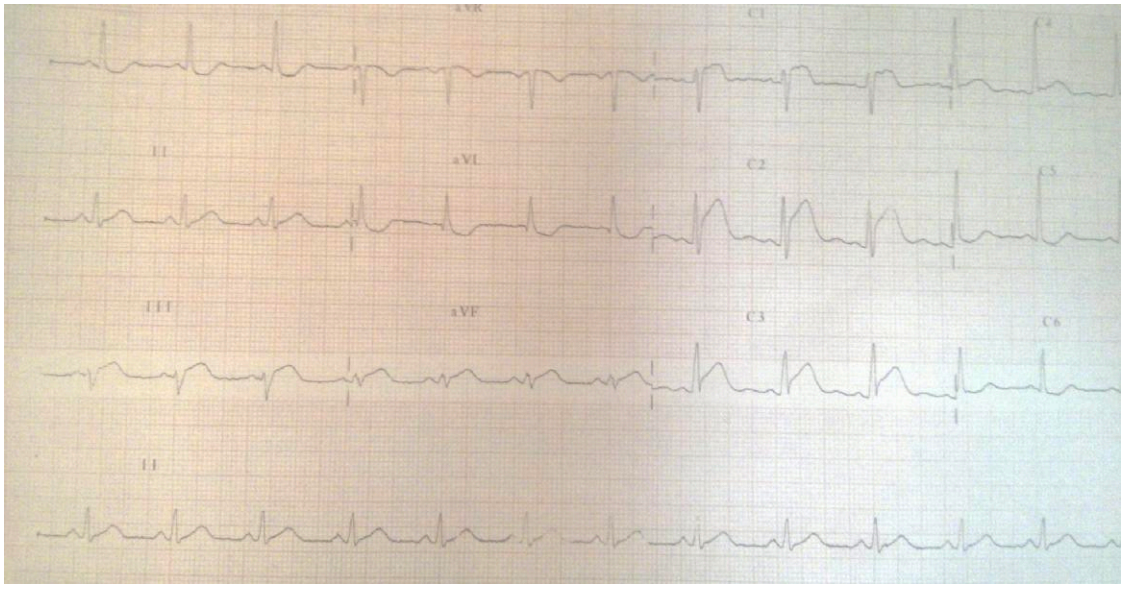


Figure 1 First episode of ST-segment elevation due to acute myocarditis. Twelve-lead ECG demonstrating widespread ST elevation with involvement of antero-lateral and inferior territories and preservation of R wave progression.

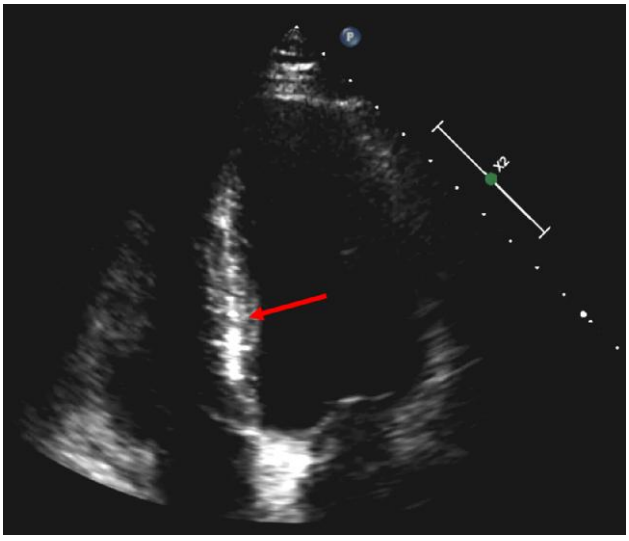


Figure 2 Transthoracic echocardiogram showing echogenic myocardium in the antero-septal wall (arrow).

Given the constellation of systemic symptoms, granulomata, and myocarditis, an autoimmune vasculitis was considered as a unifying diagnosis as well as the cause of his ACS. A positive ANCA with a raised Proteinase-3 (PR3) autoantibody titre confirmed the diagnosis of GPA with acute myocarditis and coronary arteritis. *Mycobacterium tuberculosis* PCR was negative, and anti-tuberculous therapy was discontinued.

The patient was commenced on rituximab and azathioprine that resolved his symptoms, inflammatory markers, and renal function. Triple therapy with warfarin, aspirin, and clopidogrel for 3 months was started (mural thrombi and recent stent), and he remained on warfarin and clopidogrel until complete resolution of thrombi was demonstrated on follow-up TTE. This also showed residual apical akinesia but a normal LVEF (66%). Thereafter, his warfarin was stopped and he continued on long-term clopidogrel. Annual CMR surveillance has shown normal LV volume and systolic function (LVEF 63%), no oedema but transmural apical fibrosis representing established infarction in the LAD territory. At 5-year follow-up, he remains well with no further major adverse cardiovascular events.

Discussion

Granulomatosis with Polyangiitis is an ANCA-associated necrotizing granulomatous vasculitis affecting small- to medium-sized vessels.

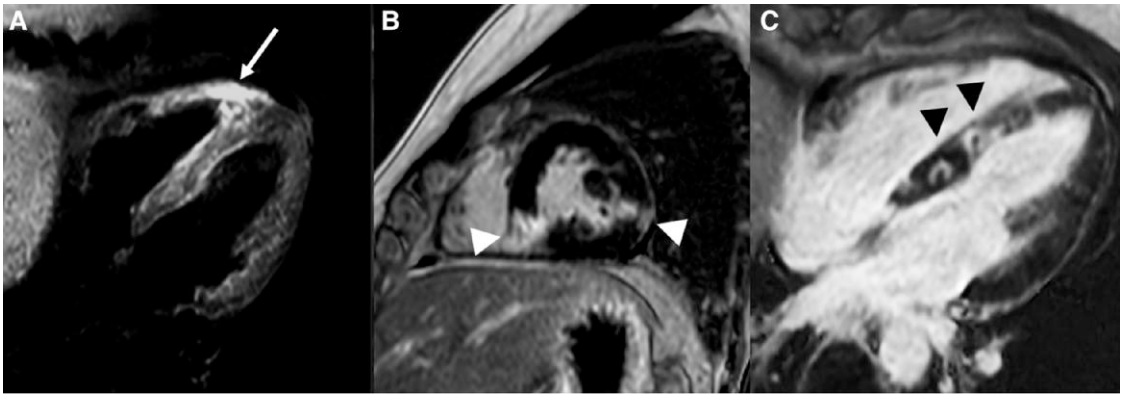


Figure 3 (*A*) Cardiac MRI (T2-STIR) demonstrating multiple focal areas of high signal consistent with acute inflammation and myocarditis (white arrow). (*B*) Late gadolinium enhancement (LGE) image confirming extracellular expansion in keeping with inflammation and oedema with (*C*) round lesions in the basal antero-septum and mid/apical septum associated with oedema, fibrosis, and central necrosis suspicious for necrotizing granulomata.

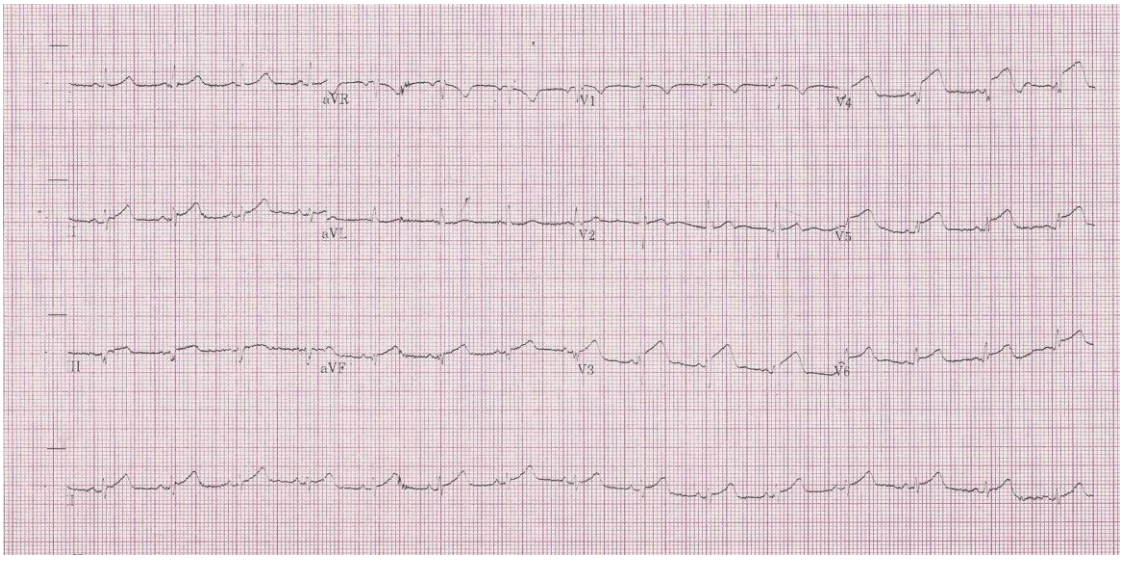


Figure 4 Second episode of ST-segment elevation due to ST elevation myocardial infarction. Twelve-lead ECG showing antero-lateral ST elevation with loss of R wave progression.

Rates of cardiac involvement vary but reports suggest that up to ~40% of cases of GPA may involve the heart.[1,2] The advent of increasingly sensitive imaging modalities such as CMR has increased the detection of sub-clinical disease (estimated at 61–73% of cases).[3–5] However, clinical cardiac disease is much lower estimated at 3–13% of cases.[6–8]

The spectrum of cardiac manifestations includes pericarditis (most commonly), myocarditis, coronary arteritis, valvulitis, and cardiac arrhythmias. Cardiac involvement is indicative of a severe pattern of systemic disease and is associated with a worse prognosis, even when asymptomatic.[9,10] Small studies have shown cardiac involvement to be associated with an increased mortality, poor response to immunosuppression, and increased risk of disease relapse.[4,11]

The importance of considering underlying systemic conditions when encountering primarily cardiac presentations should be emphasized. Analysis of the ECG was critical in differentiating between the two clinical syndromes. In the initial presentation of myocarditis, widespread ST elevation occurred in a non-coronary distribution with preserved R wave progression in the precordial leads. In the subsequent presentation with vasculitis, ST elevation was confined to the antero-lateral territories with loss of R wave progression. While there are no clear pathognomonic features of GPA on CMR, it was helpful to discriminate between the two pathophysiological mechanisms. T2-STIR imaging initially demonstrated multiple areas of high signal consistent with acute inflammation suggestive of myocarditis. Subsequently, the presence of late gadolinium enhancement (LGE) demonstrated apical scar representative of the subsequent ischaemic event. Cardiac magnetic resonance is also helpful in being able to distinguish from other differential diagnoses such as TB myopericarditis, which normally exhibits greater pericardial involvement, and cardiac sarcoidosis, where LGE is usually subepicardial or within the mid-wall and typically involves the basal

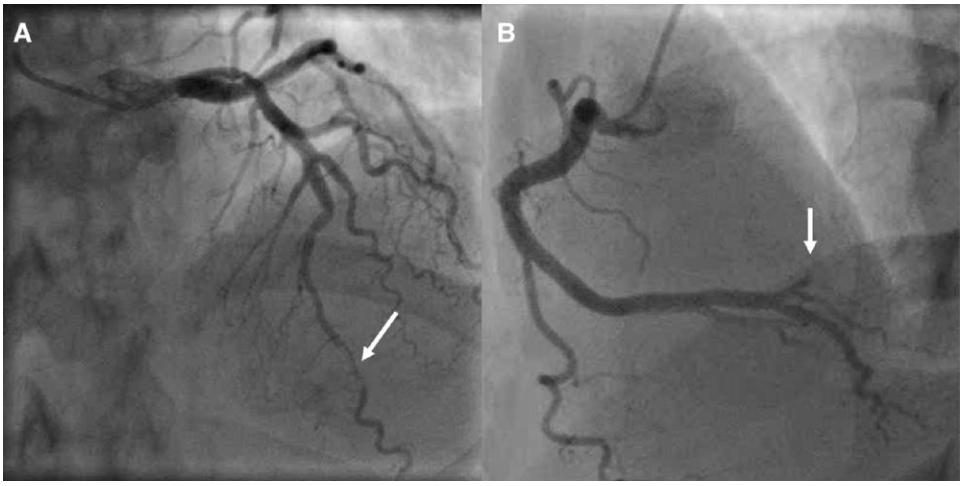


Figure 5 (*A*) Coronary angiography demonstrating severe stenosis in the distal LAD artery (white arrow) and (*B*) an occluded posterior left ventricular (PLV) branch (white arrow).

septum or inferolateral walls. Other cardiac imaging modalities for the detection of GPA and surveillance of disease activity include ^{18}F-fluoro-2-deoxyglucose positron emission tomography/computed tomography although evidence is currently limited to a handful of case reports.[12]

The management of myocarditis and coronary arteritis in this setting is not well defined but involves treating both the cardiac complications and the underlying systemic autoimmune disease. Our patient was treated in a conventional manner with ACE-inhibition and beta-blockade and had a good outcome from early percutaneous coronary intervention. Of note, an additional consideration of percutaneous revascularization in this situation is that the metallic stent may act as a focus for thrombosis or that in-stent restenosis may occur from aggressive neo-intimal proliferation and arterial inflammation.[13,14] Whether a stent-free approach may be appropriate in these situations remains to be determined. There are currently no specific recommendations for treating cardiac involvement in GPA but aggressive systemic immunosuppression is often given.[15] Remission is usually achieved with intravenous corticosteroids, cyclophosphamide, or methotrexate but plasma exchange or rituximab may be used in refractory cases. Long-term maintenance therapy is achieved with corticosteroids and azathioprine or methotrexate for a course of 24 months and monitoring of PR-3 titres. Repeat surveillance imaging, as in this case, may also be considered to monitor for resolution of cardiac manifestations.

Conclusion

We present an unusual case of recurrent ST elevation due to acute myocarditis and ACS from coronary arteritis in the same patient with a new diagnosis of GPA. Differences in ECG and echocardiography helped differentiate the immediate management, and CMR enabled distinction between the initial inflammatory process and subsequent infarct. A necrotizing granulomatous vasculitis of the small- to medium-vessels, GPA typically presents with pulmonary and renal manifestations. However, increasing evidence suggests that cardiac involvement is not uncommon and associated with a worse prognosis. Advances in cardiac imaging and a greater awareness of cardiac complications in systemic autoimmune disease will aid earlier diagnosis and improve the management and outcomes of these patients.

Lead author biography

Dr Kevin Cheng is a cardiology registrar at the Royal Brompton Hospital, London, and a BHF clinical research fellow at the National Heart and Lung Institute, Imperial College London. His research focuses on coronary artery disease, epicardial coronary and microvascular physiology assessment, and clinical trials investigating novel therapies for angina.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Consent: The authors confirm that written consent for submission and publication of this case report including the images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

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Data availability

All data are incorporated into this article and its online Supplementary material.

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