CASE REPORT

Silent myocardial infarction secondary to cardiac autonomic neuropathy in a patient with rheumatoid arthritis

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SUMMARY

An 83-year-old female patient with rheumatoid arthritis and hypertension presented to the emergency department with fever and chills of 1 day duration. On examination, temperature was 100.9 F, heart rate 111/min and she had orthostatic hypotension. Laboratory tests showed elevated blood urea nitrogen and white cell count. The patient underwent treatment for symptomatic urinary tract infection and while her fever and leucocytosis resolved, tachycardia persisted. An EKG done showed T inversions in leads II, III, arteriovenous fistula, V2 and V3. Troponin-I was elevated. Nuclear stress test revealed apical wall motion abnormality confirming myocardial infarction. Ewing's tests were carried out at bedside and these diagnosed severe autonomic neuropathy. Rheumatoid arthritis can cause cardiac autonomic neuropathy from chronic inflammation. This case entails the importance of assessing and detecting cardiac autonomic neuropathy in chronic inflammatory conditions, and the need to be cautious of acute coronary events in these patients, even for minimal or no symptoms.

BACKGROUND

Rheumatoid arthritis (RA) is a chronic inflammatory disease of unknown aetiology, primarily affecting the musculoskeletal system. It also has effects on other organ systems due to the chronic systemic inflammation that ensues. Coronary artery disease (CAD) due to the accelerated atherosclerosis is one of the leading causes of death in this population.[1] Patients with RA and acute coronary syndrome also have increased short-term mortality and poorer outcomes compared to the general population.[2] Use of supraphysiological doses of glucocorticoids, non-steroidal anti-inflammatory drugs and particularly cyclooxygenase-2 inhibitors increases the cardiovascular risk. Cardiac autonomic neuropathy (CAN) is a well-described phenomenon among patients with diabetes mellitus where the autonomic innervation to the heart gets damaged, predisposing to silent myocardial ischaemic events. CAN, although not very well studied, has been observed in patients with inflammatory arthritis like RA[3] and systemic lupus erythematosus, and results in fatal coronary events. It is important that physicians be cognisant of CAN while dealing with patients with RA, as is done for patients with diabetes mellitus, since silent myocardial infarctions may have higher mortality due to delay in diagnosis.

CASE PRESENTATION

Eighty three-year-old Caucasian female patient presented to the emergency department with symptoms of fever and chills of 1 day duration. She had no chest pain, cough, shortness of breath or abdominal pain, but had mild burning sensation on urination. Her medical history included RA and hypertension. Although she had joint pains for 2 years, she was diagnosed with RA only a year ago and had been started on weekly 7.5 mg of methotrexate, which controlled her arthritis symptoms. Her blood pressure had been stable with hydrochlorothiazide 25 mg daily. Physical examination was significant with a temperature of 100.9 F, heart rate of 111/min and orthostatic hypotension with a systolic blood pressure gradient of 18 mm Hg. Patient appeared dehydrated, and detailed system examination only showed painless joint deformities in fingers of both hands. Blood work showed a total white cell count of 13 000/L (normal: 3000–11 000/L) and blood urea nitrogen (BUN) of 24 mg/dL (normal: 5–21 mg/dL). As a result of her elevated heart rate and BUN, advanced age and comorbidities, she was admitted to the hospital and given intravenous hydration and antibiotics. The following morning, her tachycardia persisted and an EKG was carried out which showed T-wave inversions in leads II, III, arteriovenous fistula, V2 and V3. Troponin level at that time was 1.4 ng/mL (normal: 0.4–0.80 ng/mL). Serial troponins drawn 6 hours apart showed an initial rise to 2.0 ng/mL, but later trended downwards. A diagnosis of silent septal and inferior wall non-ST elevation myocardial infarction was made. A subsequent cardiac nuclear stress test was performed to assess the extent of myocardial involvement and presence of any reversible ischaemia. The test showed a large apical infarct. However, there were no areas of reversible ischaemia, and considering the patient's advanced age and honouring her wishes, coronary catheterisation was not attempted.

DIFFERENTIAL DIAGNOSIS

Ewing's battery of tests were carried out in the hospital to diagnose and assess severity of autonomic neuropathy. This was performed before starting β-blockers, and the results in our patient are listed in table 1. One heart rate test abnormality or two borderline test results suggest early CAN, while abnormality in two or more heart rate tests is a definite diagnosis of CAN.

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Table 1 Ewing's battery of tests to assess cardiac autonomic neuropathy

Test	Result	Normal (borderline)
Heart rate variation to valsalva (baseline to valsalva)	1.13 (ratio)	≥1.21 (1.11–1.20)
Heart rate variation on deep breathing (expiration to inspiration)	7 bpm	≥15 (11–14)
Blood pressure response to sustained grip (before to after)	8 mm Hg	≥16 (11–15)
Heart rate response from supine to standing position (R-R interval change in response to change in position from supine to standing)	0.72 (ratio)	≥1.04 (1.01–1.03)
Blood pressure response to standing up from supine position (supine to standing)	24 mm Hg	≤10 (11–29)

TREATMENT

The above table shows that three heart rate tests were abnormal and one blood pressure test was borderline in our patient, which indicated severe CAN. She was started on optimal medical management for her cardiac ischaemia with aspirin 81 mg daily, lisinopril 20 mg daily, metoprolol 50 mg twice daily and atorvastatin 40 mg at bedtime. Her tachycardia resolved. She was later discharged to a subacute rehabilitation centre and advised to follow-up with the resident's outpatient clinic and cardiologist.

OUTCOME AND FOLLOW-UP

On 3-month follow-up at the outpatient clinic, the patient did not have any new EKG changes.

DISCUSSION

Cardiovascular diseases in patients with RA have been well described in literature. Although our patient had other risk factors like hypertension and advanced age, which increased her risk of CAD, RA should also be considered as an independent risk factor. The 5-year survival rate of patients with severe RA is similar to someone with a three-vessel coronary disease.[4] This relation between the two diseases is believed to be due to the systemic inflammation and associated endothelial damage in RA leading to accelerated atherosclerosis and CAD. Although the effect of RA on autonomic nervous system has been described, it has not been well studied. Although 24–100% of patients with RA have been reported to have some degree of autonomic neuropathy in various studies, the cause is again hypothesised to be the neurotoxic effect of chronic systemic inflammation associated with RA and the side effects of medications used in treatment. Autonomic nervous system dysregulation manifests as disproportionate vascular dynamics and impaired heart rate control. Furthermore, most of the symptoms in an acute myocardial infarction are mediated by autonomic nervous system and CAN and can, hence, lead to asymptomatic or silent myocardial infarctions. In the above case, concurrent occurrence of CAN due to patient's RA and the CAD, possibly secondary to her advanced age, hypertension and RA, has led to silent myocardial infarction. On Ewing's battery of tests, three heart rate tests were abnormal and one blood pressure test was borderline in our patient, which indicates severe CAN.[5] There is no correlation between the RA disease duration and occurrence of CAD or CAN. As in the case described above, CAN may occur at an early point of the disease. Since silent myocardial infarction is often at times a fatal event, early detection of CAN in patients with RA and high suspicion for cardiac events in this population is very important.

Learning points

- Cardiac autonomic neuropathy (CAN) is a complication of rheumatoid arthritis (RA) due to the toxic effect of systemic inflammation on the autonomic nerves. This can lead to silent myocardial infarctions.
- RA is a significant risk factor for coronary artery disease (CAD) due to the systemic inflammation and the associated endothelial damage. Acute coronary syndrome may also be more severe in patients with RA compared to the general population.
- There is no correlation between the onset of RA and the onset of either CAD or CAN. Hence it is very important to screen patients with RA for CAN using Ewing's battery of tests.
- Ewing's battery of tests is a bedside test sequence which help in detecting and assessing severity of coronary autonomic neuropathy in patients with diabetes,[6] inflammatory conditions such as RA, systemic lupus erythematosus, amyloidosis, etc. It should be performed in patients with RA, especially those people at risk of CAD due to other independent risk factors, to help assess risk of developing acute coronary events with minimal or no symptoms. We suggest screening at initial encounter and yearly assessment although so far no recommendations are in place.
- A low threshold should be maintained in performing cardiac evaluation using EKG, echocardiogram and stress tests in patients with RA suspected of CAD even when symptoms are minimal, non-specific or absent.

Competing interests None declared.

Patient consent Obtained.

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