NOTABLE CASES

Extracorporeal membrane oxygenation in fulminant myocarditis complicating systemic lupus erythematosus

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A 24-year-old woman with systemic lupus erythematosus developed cardiac failure and cardiogenic shock that failed to respond to both high-dose inotrope therapy and the insertion of an intra-aortic balloon pump. Circulatory support with extracorporeal membrane oxygenation facilitated cardiac recovery, either spontaneously or assisted by steroid therapy. ***(MJA 2002; 176: 374-375)***

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE) is an autoimmune disease of unknown aetiology. Clinically, it may present with systemic symptoms (eg, malaise, fever, anorexia), arthritis, photosensitivity, or organ injury (eg, glomerulonephritis). Myocarditis occurs in up to 10%[1] of patients with SLE, but severe cardiac failure is very uncommon. We report our clinical experience of fulminant cardiac failure complicating SLE.

Clinical record

A 24-year-old Vietnamese woman with intermittent haemoptysis was investigated as an outpatient. Culture of early-morning sputum was negative for tuberculosis, and a computed tomography (CT) scan of her chest showed right middle-lobe consolidation with no perihilar lymphadenopathy. Bronchoscopy showed active bleeding from the middle lobe of the right bronchus. Bronchial washings were negative for mycobacteria on acid-fast stain and culture, and no abnormal cells were found. Full-blood examination showed no abnormality; in particular, she did not have anaemia or lymphopenia. The erythrocyte sedimentation rate was mildly elevated at 29 mm/h (normal range, 0–15 mm/h) and rheumatoid factor was elevated at 30 kIU/L (normal range, 0–20 kIU/L). The presumptive diagnosis at this time was low-grade pneumonia.

Subsequent investigations revealed a positive antinuclear antibody titre of > 1:1280 (normal,< 1:160), with a speckled pattern. As there was also a past history of Raynaud's phenomenon, small-joint hand arthritis and intermittent pleuritic chest pain, she was referred for rheumatological opinion.

Two months after the onset of haemoptysis and before she could attend her rheumatology appointment, she presented to our emergency department feeling unwell, with a history of four days of fever, lethargy, dyspnoea, non-productive cough, nausea, vomiting and diarrhoea. Physical examination showed sinus tachycardia (130 beats/minute), a systolic blood pressure of 95 mmHg, cool peripheries and a dry tongue. Her jugular venous pulse was not visible. She was tachypnoeic (respiratory rate, 24 breaths/min), but auscultation of her chest showed no abnormality. She was given 1.5 L of normal saline intravenously over one hour for presumed dehydration.

Subsequently, her condition deteriorated, with respiratory distress and pink, frothy sputum, and a chest x-ray revealed acute pulmonary oedema. Short runs of ventricular tachycardia were noted on her monitor. Electrocardiography showed sinus rhythm, right-axis deviation, Q waves in leads V1–V3, I and aVL, with high take-off in the ST segment in V1–V3. In subsequent ECGs, there was no evolution of the ST-segment change, indicating active myocardial ischaemia was unlikely. The level of cardiac troponin I was elevated at 9.6 μg/L (normal, < 0.04 μg/L). Her lymphocyte count was low at 0.81 x 10^9/L (normal, 1.0–4.0 x 10^9/L). The working diagnosis at this stage was acute heart failure secondary to a myocardial process such as acute myocarditis or valvular heart disease.

Because of her respiratory distress, intubation was required and during this procedure her blood pressure fell further to 75/50 mmHg. Inotrope support was commenced with adrenaline at 10 μg/min. Urgent echocardiography confirmed severe global reduction in both left and right ventricular systolic function. Neither ventricle was dilated. There were no significant valvular abnormalities. A small pericardial effusion was present with no evidence of cardiac compression.

Over the next two hours, despite an increasing inotrope infusion rate and insertion of an intra-aortic balloon pump, she had a low mean arterial pressure of 62 mmHg (generally, > 65–70 mmHg is required for major organ perfusion) and a low cardiac index of 2.1 (normal range, 2.5–3.6 $L.min^{-1}.m^{-2}$) (cardiac index = cardiac output per body surface area). She had no urine output. She was then placed on to extracorporeal membrane oxygenation (ECMO), and intravenous methylprednisolone (250 mg daily) was commenced.

Over the next 24 hours, she developed

- acute renal failure — serum creatinine concentration peaked at 625 μmol/L (normal range, 40–120 μmol/L);
- ischaemic hepatitis — alanine transaminase level peaked at 3528 U/L) (normal range, 7–56 U/L); and
- coagulopathy — international normalised ratio (INR), 3.4 (normal range, 1.0–1.2); activated partial thromboplastin time (APPT), 44 s (normal range, 23–34 s); platelet count, 270 x 10^9/L (normal range, 150–450 x 10^9/L); fibrinogen level, 2.2 g/L (normal range, 1.5–4.0 g/L). Consequently, endomyocardial biopsy was not performed.

After institution of ECMO, her condition stabilised and four days later she was able to be weaned off both ECMO

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and inotrope support. Renal and liver function returned to normal.

Repeat echocardiography performed 10 days after admission showed a marked improvement in left ventricular systolic contraction, which was now only mildly reduced globally. Right ventricular function was normal.

Other relevant test results are shown in the Box. Based on these results and the patient's clinical presentation, the rheumatologist diagnosed SLE. She was prescribed prednisolone (50 mg daily), azathioprine (50 mg daily), hydroxychloroquine (200 mg twice daily) and bone protective agents including alendronate sodium (70 mg once a week), calcium carbonate (600 mg at night) and ergocalciferol (1000 units daily). She was discharged 17 days after admission to a rehabilitation hospital and a week later she returned home. Six weeks after her emergency department presentation, she returned to work.

Results of immunological investigations

Tests	Results	Reference range
Antinuclear antibodies	Positive (>1:1280 titre), speckled pattern	<1:160 titre
Anti-dsDNA	4 IU/mL	0–7 IU/mL
Antibodies against extractable nuclear antigens		
Anti-La	Positive	
Anti-Ro	Positive	
Anti-RNP	Negative	
Anti-Sm	Negative	
Anti-Jo	Negative	
Anti-Scl-70	Negative	
IgG anticardiolipin antibody	2.7	1.0–9.0
IgM anticardiolipin antibody	1.0	0.4–5.0
Lupus anticoagulant antibody	Negative	

Discussion

Acute myocarditis with severe cardiac failure and shock is a rare manifestation of SLE, with only a few cases reported.[2-4] To our knowledge, this is the first in which ECMO was used and the patient survived. This case emphasises the importance of aggressive circulatory support to keep the patient alive and allow time for the potential recovery of the myocardium, either spontaneously or with corticosteroids.

The reported use of ECMO support has predominantly been for postcardiotomy cardiogenic shock,[5] and in cardiogenic shock related to acute myocardial infarction[6] and acute myocarditis.[7,8] Although the reported benefits of ECMO in these small studies vary considerably, for any patient to survive cardiogenic shock refractory to inotrope and intra-aortic balloon pump, with ECMO support, is a significant result.

ECMO provides a bridge to recovery or to a decision about either heart transplantion or a ventricular-assist device. Partial or complete recovery of the myocardium in acute myocarditis with shock while receiving ECMO may be spontaneous or possibly facilitated by immunosuppressive therapy.[7]

The use of corticosteroid and other immunosuppressive therapy in acute myocarditis is controversial. A randomised trial,[9] which studied patients with histological evidence of myocarditis and an ejection fraction less than 45%, did not find that prednisolone with either cyclosporin or azathioprine for 24 weeks improved ejection fraction or survival. However, a more recent trial[10] found a significant improvement in ejection fraction and clinical status at two years in the group treated with three months of prednisolone and azathioprine. An immunohistological marker (upregulation of human leukocyte antigen [HLA]) was used on biopsy specimens to identify chronic myocarditis. Compared with histology alone, this marker selected a more homogeneous group of patients with inflammatory cardiomyopathy caused by active immune processes who may respond better to immunosuppression.[10]

There have been anecdotal reports of improvement in symptoms,[2,3] and in left ventricular function,[4] with the use of corticosteroids or immunoglobulins[11] in severe cardiac dysfunction caused by SLE-related myocarditis. There is also some evidence of a better transplant-free survival in patients with fulminant, rather than non-fulminant, myocarditis if circulatory support was provided when they were critically ill.[12] This suggests that more severe myocardial disease is associated with potentially greater reversibility of myocardial impairment.

With the possibility of improvement, either spontaneously or with immunosuppressive therapy, it would be prudent to implement aggressive circulatory support with ECMO for patients with cardiogenic shock due to fulminant myocarditis who have failed to respond to inotrope support and intra-aortic balloon pump therapy.

Competing interests

None declared.

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