Myocardial Viability in a Patient with Systemic Lupus Erythematosus

Elisa Carla Hilgemberg, Ursula Cristina Barbosa de Almeida Daco Roessler, Larissa Ticiane Machado dos Santos, Alair Sarmet Damas, Claúdio Tinoco Mesquita

Hospital Universitário Antônio Pedro, Universidade Federal Fluminense (UFF), Niterói, Rio de Janeiro – Brazil

Introduction

Systemic lupus erythematosus (SLE) is a systemic autoimmune disease, resulting from immunologically mediated tissue damage, which is more common among fertile young women. Genetic, environmental and, possibly, infectious factors are involved in its genesis.[1]

Acute myocardial infarction (AMI) is an important cause of premature death in SLE patients, particularly in postmenopausal women. In these patients, the presence of coronary artery disease (CAD) cannot be predicted only by traditional risk factors and biomarkers, being an independent risk factor for coronary disease complications due to vasculitis, atherosclerosis or the presence of antiphospholipid antibodies.[2] We report the case of a patient with SLE, who presented AMI and atrioventricular block (AVB), in which myocardial viability research helped the clinical decision.

Case Report

A black 61-year-old female patient from Rio de Janeiro, diagnosed with SLE for 29 years, under clinical remission at the time of care. On March 6, 2017, she had a sudden syncope. When she regained consciousness, she reported precordial burning pain of 10+/10+ intensity, irradiating to the anterior cervical area and left shoulder, accompanied by cold sweating and dyspnea. She was taken to a polyclinic, where she was hospitalized for 2 days. No pharmacological or mechanical reperfusion therapies were administered. On March 8, 2017, she was transferred to the emergency room of our institution. She denied previous episodes of syncope, dyspnea or precordial pain. She regularly used azathioprine and hydroxychloroquine.

On physical examination at admission, her blood pressure was 130 x 70 mmHg, heart rate 80 bpm, respiratory rate 31 bpm, pathological jugular venous distension at 45º. Fine bilateral crackles in inferior thirds on pulmonary auscultation. No other semiological abnormalities were found.

Keywords

Lupus Erithematosus Systemic; Myocardial Infarction; Women; Atrioventricular Block; Diagnostic Imaging; Radionuclide Imaging.

Mailing Address: Elisa Carla Hilgemberg •
Rua Doutor Paulo César, 7, complemento 1.407, Icaraí. Postal Code 24220-401, Niterói, RJ – Brazil
E-mail: elisa.hilgemberg@gmail.com
Manuscript received April 17, 2018; revised April 24, 2018; accepted June 4, 2018.

DOI: 10.5935/2318-8219.20180033

Chest x-ray revealed enlargement of the cardiac silhouette, with bilateral pulmonary congestion (Figure 1). On electrocardiography, ST segment elevation in leads DII, DIII and aVF, and Mobitz I second-degree AVB. Laboratory tests evidenced elevation of necrosis markers: Creatine phosphokinase (CPK) 1433 U/L (26 to 192 U/L); creatinine kinase MB (CKMB) isoenzyme 91 U/L (7 to 25 U/L); and low-density lipoprotein (LDH) 1,228 U/L (81 to 234 U/L). Therapy with acetylsalicylic acid, clopidogrel, carvedilol and heparin was started.

On March 10, 2017, she was admitted to the cardiology ward for better risk stratification. She was hemodynamically stable and without precordial pain. On March 17, 2017, a nitrate scintigraphy was requested to assess myocardial viability, since the course to be taken would be influenced by the presence or absence of viable tissue. In this examination (Figure 2), a viable area of 17% was found and quantified by comparing early, redistribution and late two-dimensional reconstructions (polar map). Asynergic segments presenting increased intensity of the counts of at least 10%, after using nitrate in comparison with the basal value, were considered viable.[3] From this examination, it was also possible to calculate the left ventricular ejection fraction (48% at rest and 60% after nitrate), the total extent (27%) and the percentage of defect in the anterior descending (AD), circumflex (CX) and right coronary (RC) arteries. On March 22, 2017, coronary angiography was performed through the right radial artery, and left ventricular systolic dysfunction was found to be associated with severe obstruction of the right coronary artery. Angioplasty was performed by placing two conventional stents in the CD.

Two days after the procedure, the patient was discharged after receiving advice on lifestyle changes, associated with continued use of enalapril, simvastatin, acetylsalicylic acid, clopidogrel, hydroxychloroquine, and azathioprine. The patient remained under simultaneous follow-up at the outpatient clinic of Cardiology and Rheumatology of our institution, remaining asymptomatic after the intervention and without any other events after the procedure. Despite the clinical stability, control transthoracic echocardiogram performed in February 2018 did not show recovery of segmental or global contractile function compared to echocardiography prior to the procedure.

Discussion

In SLE, several antibodies have been correlated to a significant increase in endothelial apoptotic activity. Associated with the systemic inflammatory process, this increases the risk in these patients for the development of CAD. Although dyslipidemia secondary to the inflammatory process may be present, studies show that this is not the most important risk factor for cardiovascular diseases in SLE.[4] In a recent study, researchers from Denmark evidenced

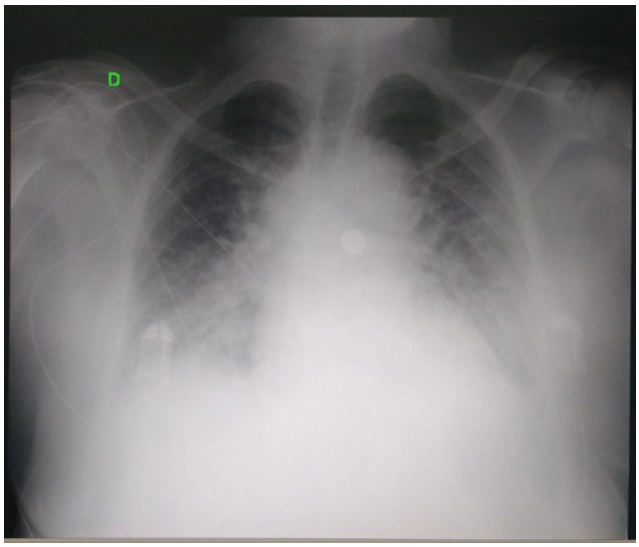

Figure 1 – *Chest x-ray revealing enlarged cardiac silhouette and bilateral pulmonary congestion.*

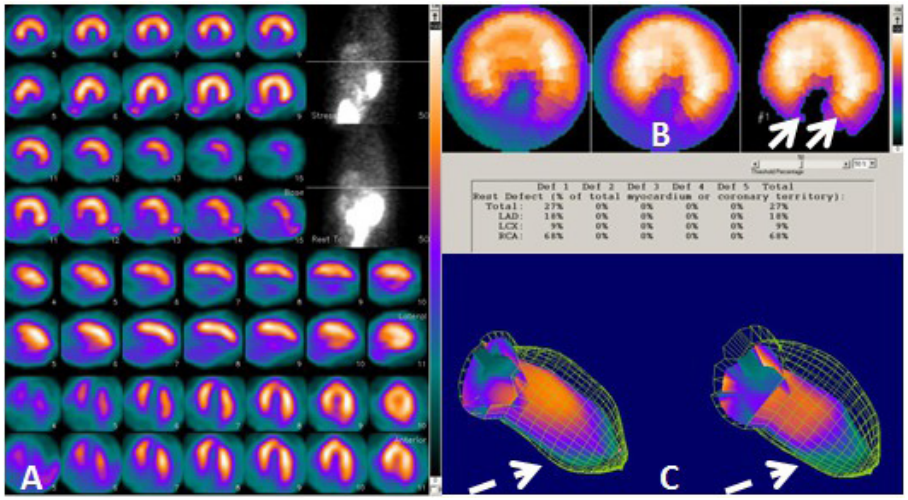

Figure 2 – *A: Myocardial perfusion at rest (first, third, fifth and eightth lines) and at rest after sublingual nitrate (second, fourth, sixth and eighth lines), demonstrating reversibility in the lateroapical, inferolateral (mid and basal) and inferosseptal (basal) segments of the left ventricle. B: The viable myocardium area was estimated at 17% (arrows). C: These areas had lower wall hypokinesia and reduced left ventricular myocardial thickening on the inferior wall (dashed arrows).*

the association between lupus nephritis and increased risk of AMI, demonstrating the importance of association with disease activity in this condition.[5]

The use of imaging methods in diagnosis and prognosis, assisting the management of patients with SLE, is a reason for intense study. In a recent review, Mavrogeni et al.[6] described that the use of myocardial perfusion scintigraphy is well established in patients with known SLE and CAD to assess the extent of ischemia and the need for coronary intervention,[6] as in this case. The patient concerned had a significant fixed perfusion defect area, however, due to the recent acute event, the presence of a viable myocardium was suspected. Adequate restoration of blood flow by revascularizing this viable myocardium greatly increases survival, as pointed out by Allman et al.[7], which showed almost 80% reduction in mortality.[7]

Myocardial scintigraphy using sestamibi-^{99m}Tc assists in the detection of viable tissues, acting as a combined tracer of perfusion and myocardial viability. It presents passive intracellular transport and uptake proportional to the regional blood flow. Administration of nitrates promotes regional vasodilation, increasing the bioavailability of this marker and test sensitivity.[8]

Another radiopharmaceutical drug used is thallium-201, an ion analogous to potassium, which is actively transported into the viable cell. In general, thallium-201 is more sensitive than sestamibi-^{99m}Tc, but its availability is lower and its physical characteristics, such as long half-life and low energy, make it a less frequent option.[9] The feasibility study can also be done from positron emission tomography with ^{18}F-FDG, a molecule analogous to that of glucose, which evaluates the presence of glycolytic metabolism by the viable myocardium. This technique is currently the most sensitive one for the identification of patients with potentially reversible dysfunctions but is still scarcely available in most services.[10]

Although the myocardial viability study is important in the therapeutic decision, as demonstrated in the case reported, its use is still controversial, and the presence of viable myocardium is not yet a primary indication for coronary artery bypass grafting.[3] This decision is still based on symptoms, coronary anatomy, left ventricular global and regional function, and evidence of ischemia. In a recent review, Ker et al.[3] pointed out the need and opportunity for new studies on myocardial viability, as although there are no definitive studies demonstrating the benefit of the myocardial viability study in changing the prognosis of patients, the theme is of great relevance.[3]

Therefore, in patients with SLE, the presence of CAD is well evaluated by scintigraphy. Despite controversy, scintigraphy proved to be an important tool for the diagnosis and therapeutic decision-making in patients such as the one reported. In cases with extensive non-reversible perfusion defects, the presence of myocardial viability should be investigated. Nitrate scintigraphy is a practical and sensitive practice to be used.

Authors' contributions

Research creation and design: Hilgemberg EC, Roessler UCBAD, Santos LTM, Damas AS, Mesquita CT; Data acquisition: Hilgemberg EC, Roessler UCBAD, Santos LTM; Data analysis and interpretation: Hilgemberg EC, Roessler UCBAD, Santos LTM, Damas AS, Mesquita CT; Manuscript writing: Hilgemberg EC, Roessler UCBAD, Santos LTM; Critical revision of the manuscript as for important intellectual content: Damas AS, Mesquita CT.

Potential Conflicts of Interest

There are no relevant conflicts of interest.

Sources of Funding

This study had no external funding sources.

Academic Association

This study is not associated with any graduate program.

References

1. Leal FP, Mesquita CT, Ferreira Jr DS, Azevedo JC, Mocarzel KSF, Miranda SM. Isquemia miocárdica extensa em mulher jovem com lúpus eritematoso sistêmico. Rev Bras Cardiol. 2014;27(4):276-9.
2. Mocarzel LO, Lanzieri PG, Montes RA, Gismondi RA, Mesquita CT. Lúpus eritematoso sistêmico: revisão das manifestações cardiovasculares. Int J Cardiovasc Sci. 2015;28(3):251-61.
3. Ker WD, Nunes TH, Nacif MS, Mesquita CT. Practical implications of myocardial viability studies. Arq Bras Cardiol. 2018;110(3):278-88.
4. Leuven SI, Franssen R, Kastelein JJ, Levi M, Stroes ES, Tak PP. Systemic inflammation as a risk factor for atherothrombosis. Rheumatology (Oxford). 2008;47(1):3-7.
5. Hermansen ML, Lindhardsen J, Torp-Pedersen C, Faurschou M, Jacobsen S. The risk of cardiovascular morbidity and cardiovascular mortality in systemic lupus erythematosus and lupus nephritis: a Danish nationwide population-based cohort study. Rheumatology (Oxford). 2017;56(5):709-15.
6. Mavrogeni S, Koutsogeorgopoulou L, Dimitroulas T, Markousis-Mavrogenis G, Kolovou G. Complementary role of cardiovascular imaging and laboratory indices in early detection of cardiovascular disease in systemic lupus erythematosus. Lupus. 2017;26(3):227-36.
7. Allman KC, Shaw LJ, Hachamovitch R, Udelson JE. Myocardial viability testing and impact of revascularization on prognosis in patients with coronary artery disease and left ventricular dysfunction: a meta-analysis. J Am Coll Cardiol. 2002;39(7):1151-8.
8. Smanio P, Schmidt A. Métodos de avaliação da perfusão miocárdica. Rev Soc Cardiol Estado de São Paulo. 2017; 27(2):150–62.
9. Fernandes H, Sousa A, Campos J, Patrício J, Oliveira P, Vieira T, et al. Avaliação da viabilidade miocárdica. Acta Med Port. 2011;24(Suppl 4):989-94.
10. Al Moudi M, Zhong-Hua S. Diagnostic value of ^{18}F-FDG PET in the assessment of myocardial viability in coronary artery disease: A comparative study with ^{99m}Tc SPECT and echocardiography. J Geriatr Cardiol. 2014;11(3):229-36.