CASE REPORT

Giant Coronary Aneurysm in a Patient with Systemic Lupus Erythematosus

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Abstract

Coronary aneurysm is rare in SLE and confirmation of etiology is usually made at postmortem examination. We encountered a giant aneurysm with multiple stenotic segments of the coronary arteries in a patient with SLE who had previous history of AAA/TAA. Resection of the aneurysm and coronary artery bypass graft were successfully performed. Histology of the coronary arterial wall showed severe damage of the media with inflammatory cell infiltration, indicating that the aneurysm was caused by arteritis. The aneurysm may have developed during the long course of inactive stage of SLE, emphasizing the need for screening of coronary lesions in the management of SLE.

Key words: systemic lupus erythematosus, arteritis, multi-row detector computed tomography

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Introduction

Patients with systemic lupus erythematosus (SLE) sometimes develop cardiac complications, such as Libman-Sacks endocarditis, myocarditis and epicarditis. However, coronary arterial complications in such patients are rare (1-3). For example, coronary aneurysm is rare and noted in only 0.15-4.9% of patients undergoing coronary angiography (4). Coronary aneurysms are usually asymptomatic and found incidentally on echocardiography or angiography. Here, we report a patient with SLE, who presented with multiple aneurysms in the aorta [reported by Washiyama et al (5)] and coronary arteries. The coronary aneurysm doubled in size in two years even when immunological markers indicated inactive SLE. Examination of the resected coronary aneurysm indicated that the etiology was arteritis-related, although it was not clear if the latter was caused by SLE or Takayasu arteritis. Since coronary arteritis can cause morbid complications, we recommend careful screening and follow up of coronary arteries in patients with SLE.

Case Report

A 31-year-old woman, non-smoker, and with no history of Kawasaki disease was diagnosed at the age of 11 with SLE based on leucopenia, malar rash, arthritis, pericardial fluid and proteinuria/hematuria. Steroid pulse therapy was introduced at 12 years of age based on the identification of diffuse proliferative lupus nephritis (class IV) on histopathological examination of a renal biopsy. Since that time, she was treated with various doses of prednisolone ranging from 60 to 5 mg/day, with or without azathioprine, and that treatment was continued for 20 years. She noticed a pulsatile abdominal mass at the age of 23, which was diagnosed as an abdominal aortic aneurysm, and treated by implantation of a bifurcated graft. At the age of 26, she underwent surgery for abdominal aneurysm in the vicinity of the proximal anastomosis (5). At 29 years of age, a thoraco-abdominal aneurysm was found and grafted. Because immunological mark-

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ers were well controlled, oral prednisolone was gradually tapered to 5 mg/day by the age of 27. However, renal dysfunction progressed gradually and she was admitted to our hospital at 31 years of age for management of renal failure.

On admission, physiological examination revealed a height of 136 cm, body weight of 31 kg, body temperature of 36.6℃ and blood pressure 180/110 mmHg under cilnidipine 10 mg/day without a significant difference between the right and left arms, and no bruit was heard over the subclavian arteries. Laboratory investigations showed leukocyte count of 8900/μL, hemoglobin 9.0 g/dL, hematocrit 29.0%, platelet count 10.5×10^4/μL, blood urea nitrogen 88.7 mg/dL, serum creatinine 4.34 mg/dL, total cholesterol 310 mg/dL, triglyceride 96 mg/dL, fasting plasma glucose 86 mg/dL, HbA1c 5.3%, CRP 0.6 mg/dL, total protein 6.0 g/dL, albumin 3.1 g/dL, C, 63 mg/dL, C, 11 mg/dL and CH₅O 46 U/mL, anti-nuclear antibody negative, anti-DNA antibody 5.4 IU/mL (normal range <6 IU/mL), LE-test negative, anticardiolipin antibody 8> U/mL, anti-β2 glycoprotein-I antibody 1.2> U/mL, proteinase-3-antineutrophil cytoplasmic antibody (ANCA) 10> EU, myeloperoxidase-ANCA 10> EU. Urine gave a + for protein, 2+ for blood; the sediment contained 5 to 10 red cells and a few hyaline cast per high-power field. A chest radiograph showed cardiomegaly and pulmonary congestion with a cardiothoracic ratio of 67%. ECG showed heart rate 89/min, normal sinus rhythm, right axis deviation, and no ST-T abnormality. Echocardiography showed normal systolic function of the left ventricle without asynergy, ejection fraction 86%, and no evidence of pericardial effusion. However, it detected a cystic lesion at the level of the right atrium (Fig. 1). Magnetic resonance imaging (MRI) also showed the same lesion, protruding into the right atrium, with interior blood flow (Fig. 2A). Coronary angiography revealed that the lesion was a giant aneurysm of the right coronary artery (RCA) measuring 50 mm in diameter, and another small (6 mm in diameter) aneurysm of the circumflex branch (CX) associated with multiplestenotic segments in the left anterior descending (LAD) coronary artery (Fig. 3).

A review of all previous heart imaging studies showed a 25-mm right coronary aneurysm on MRI taken two years earlier (Fig. 2B), indicating that the aneurysm doubled in size in two years. We selected surgical resection for the coronary aneurysm, because giant coronary aneurysm is thought to rupture.

The right coronary aneurysm was resected surgically and the RCA was reconstructed with end-to-end anastomosis. The left internal thoracic artery (LITA) was anastomosed to LAD. Aneurysm of CX was left untreated because it was not considered critical at this stage.

Macroscopically, the size of the right coronary aneurysm was 50 mm in diameter without any internal thrombus formation. The aneurysm wall was relatively stiff and both the interior and exterior surfaces of the aneurysm wall were smooth. Figure 4 shows photomicrographs of the aneurysmal wall. The interior and exterior surfaces of the vascular wall were relatively regular and plaque formation was not

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**Figure 1.** Transthoracic echocardiographic view at the level of the right atrium showing a cystic lesion (Cy).

**Figure 2.** (A) Magnetic resonance imaging (MRI) before surgery shows a coronary aneurysm (arrow) protruding into the right atrium. The aneurysm measured 50 mm in diameter. (B) MRI of the right coronary aneurysm taken 2 years before surgery. The aneurysm measured 25 mm in diameter.
Figure 3. Selective arteriograms of right (A: top panel) and left (B: bottom panel) coronary arteries. (A) Note the giant coronary aneurysm (arrowhead) measuring 50 mm in diameter, without any interior thrombus. (B) Note the small aneurysm (arrowhead; 6 mm in diameter) in the circumflex branch and also the presence of multiple stenotic segments in the left anterior descending coronary artery.

Figure 4. (A) The wall of the coronary aneurysm shows relatively regular surfaces of the adventitia and intima. Note also neovascular formation (arrows) with inflammatory cell infiltration (arrowheads) around the adventitia. Inflammatory cells (asterisks) are also found in the media. Hematoxylin and Eosin staining. Magnification, ×100. B: Smooth muscle cells are thin and sparse. Elastic fibers can hardly be seen, which are replaced by collagen fibers. Elastica Van Gieson staining. Magnification, ×100. C: Small calcifications (arrows) are found in the media, which are surrounded by inflammatory cells. Hematoxylin and Eosin staining. Magnification, ×400.

Although hyalinosis around the intima was evident, there was no inflammatory cell infiltration (Fig. 4A). Angiogenesis with formation of new blood vessels of various diameters was observed around the adventitia, surrounded by mononuclear inflammatory cells, including plasma cells and lymphocytes. Smooth muscle cells were thin and sparse and replaced by collagen fibers (Fig. 4B). Calcification surrounded by inflammatory cells also existed around the media and adventitia (Fig. 4C).

A cardiovascular hemodynamic study after operation showed a stable state and hemodialysis was well tolerable. Three years after operation, multi-row detector computed tomography (MDCT) (Fig. 5) demonstrated good patency of the RCA without any aneurysms. In the left coronary artery,
Figure 5. Multi-row detector CT images taken 3 years after vascular surgery. (A) RCA (right coronary artery) shows good patency and no recurrence of the aneurysm. LITA (left internal thoracic artery) is anastomosed to LAD (left anterior descending coronary artery). (B) A small aneurysm (arrow) is observed in CX (circumflex branch); its size remains unchanged relative to that before surgery (see Fig. 3B).

Table 1. Summary of Published Reports of Coronary Scurryms in SLE

<table>
<thead>
<tr>
<th>Ref #</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Location</th>
<th>Symptoms</th>
<th>Kidney</th>
<th>Arteritis</th>
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<tr>
<td>present case</td>
<td>31</td>
<td>F</td>
<td>RCA, CX</td>
<td>none</td>
<td>+</td>
<td>+</td>
</tr>
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<td>(2)</td>
<td>22</td>
<td>F</td>
<td>LAD</td>
<td>AMI</td>
<td>ND</td>
<td>+</td>
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<td>AMI</td>
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<tr>
<td>(1)</td>
<td>55</td>
<td>M</td>
<td>CX</td>
<td>AMI</td>
<td>+</td>
<td>-</td>
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<tr>
<td>(16)</td>
<td>29</td>
<td>F</td>
<td>RCA, LAD, CX</td>
<td>AMI</td>
<td>ND</td>
<td>ND</td>
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<tr>
<td>(17)</td>
<td>22</td>
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<td>LAD, CX</td>
<td>AMI</td>
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<tr>
<td>(18)</td>
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<td>RCA</td>
<td>back pain</td>
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<tr>
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<td>CX</td>
<td>AMI</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>(20)</td>
<td>26</td>
<td>F</td>
<td>RCA, LAD</td>
<td>none</td>
<td>+</td>
<td>ND</td>
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<tr>
<td>(21)</td>
<td>37</td>
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<td>RCA</td>
<td>AMI</td>
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<td>AMI</td>
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<tr>
<td>(22)</td>
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<td>M</td>
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<td>RCA</td>
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<td>AP</td>
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<td>AMI</td>
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<td>RCA</td>
<td>AMI</td>
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<tr>
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<td>26</td>
<td>F</td>
<td>ND</td>
<td>ND</td>
<td>+</td>
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</table>

LAD; left anterior descending, RCA; right coronary artery, CX; circumflex branch, AMI; acute myocardial infarction, AP; angina pectoris, kidney; renal involvement, ND; no description provided.

LITA to LAD was patent, and the same small aneurysm was detected in CX, though its size was not different from that measured before surgery. She continues to do well under hemodialysis with stable SLE activity at 4 years after vascular surgery and remains under close cardiovascular follow-up.

Discussion

Here, we report a SLE patient with a giant aneurysm and multiple stenotic segments in coronary arteries. The aneurysm developed while immunological markers of SLE showed good control of disease activity. To our knowledge, only 16 cases with coronary aneurysms in SLE have been reported (Table 1). The mean age of these patients was 29.0 years (range, 14-55 years) and 14 cases were female. Among the 16 cases, 9 had kidney involvement (i.e., proteinuria/hematuria, renal failure). Most cases (13 cases) were symptomatic with ischemic heart diseases due to distal coronary artery embolization or co-existent coronary stenosis (acute myocardial infarction, 11 cases, angina pectoris, 1 case). Of note, coronary aneurysm or coronary arteritis was found in some cases despite the well-controlled SLE activity, as in the present case (6, 7). Treatment of arteritic coro-
nary aneurysm included immunosuppression by corticosteroid together with cyclophosphamide, or occlusion by stenting. The present case was the first to be treated surgically for coronary aneurysm, with a favorable clinical course.

Steroid use and hyperlipidemia are noted to accelerate premature coronary artery disease (CAD). Recent evidence also suggested that chronic kidney diseases (CKD) is a risk factor for CAD (8). Advanced atherosclerotic vascular lesion in these conditions is believed to be related to the formation of CAD. In fact, 9 out of 17 cases had nephritis in previous reports of aneurysms in SLE (Table 1). However, the pathology of the coronary aneurysm in the present case did not show any apparent atherosclerotic change even though our patient had a long history of steroid use, elevated cholesterol level and end-stage renal disease, suggesting these factors might not have contributed to the progression of aneurysms in our patient.

Takayasu arteritis is a condition that affects the aorta and its main branches, and is associated with coronary arteries in 9-11% of the cases (9-11). Two cases of Takayasu arteritis with coronary aneurysm have been reported (12, 13). Suzuki et al (13) reported a case with extensive destruction of the media, which was replaced by hypocellular dense scarring fibrosis. The histopathological findings of the present case were similar to those reported by Suzuki et al. (13), except for inflammatory cell infiltration in our case. Washiyama et al (5) reported the histopathological findings of abdominal aortic aneurysm of this patient, which were similar to those of coronary aneurysm, and resembled those of Takayasu arteritis. Although Takayasu arteritis is also known to occur in SLE, the diagnosis of Takayasu disease could not be confirmed based on the clinical features in our case. This patient had neither claudication of the extremities, blood pressure difference more than 10 mmHg in systolic pressure between the arms nor bruit over subclavian arteries during long course of history.

Among the 17 SLE cases of coronary aneurysms listed in Table 1, aneurysms were attributable to arteritis in 11 cases. Histopathology of the aneurysm in our case indicated inflammatory cell infiltration and calcification in the media and adventitia, strongly suggesting arteritis as the underlying etiological mechanism. Korbet et al (7) reported deposition of immunoglobulins and complement factors throughout the media between smooth muscle cells in arteritic coronary lesions of a SLE patient. Immunostaining for IgG, IgA, IgM, C3, C4 and C1q in the aneurysmal wall was negative in our case (data not shown), as shown in Fig. 4, alterations of the vascular structure in this patient were too severe to detect any immunoreactants.

Previous reports showed severe inflammation of abdominal aneurysm wall from patients with SLE (14, 15) as seen in the present case. All specimens of abdominal and thoraco-abdominal aortic aneurysms of our patient, which were obtained surgically 8, 5 and 2 years previously, showed the presence of inflammation, evidenced by medial hypertrophy, vascularization, disappearance of smooth muscle cells and the infiltration by mononuclear inflammatory cells, clearly indicating the persistence of inflammation in the aorta. Although atherosclerosis or fragility of connective tissue due to long term steroid use as well as arteritis/arteritis by SLE are considered as a cause of aortic aneurysm formation in patients with SLE, long-term inflammation of aorta/arteries seems to cause serial aneurysmal formation in these patients.

There were multiple stenotic lesions of LAD in the present case. In this regard, two case reports described the coexistence of stenotic lesions together with coronary aneurysm (6, 16). We have no information regarding whether these lesions came from arteritis or not. However, given the existence of arteritis in the aneurismal wall, it is reasonable to consider the same etiology in these lesions. Careful follow-up for stenotic lesions is also needed.

In conclusion, we reported a giant coronary aneurysm and stenosis in a patient with SLE. Although both SLE and Takayasu arteritis cause arteritis, SLE was strongly suspected as a cause of aneurysm in this patient. Coronary arteritis may be found, irrespective of SLE disease activity, and silently develop like in our case. Careful screening and follow up of the coronary lesions in patients with SLE is needed.

References


