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Short Communication

Spontaneous Multivessel Coronary Artery Dissection: Repeated Presentation in a Healthy Postmenopausal Woman

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Summary: Spontaneous coronary artery dissection is a rare cause of acute myocardial infarction which is infrequently diagnosed antemortem. Most previously reported cases were found in women of whom a significant proportion presented during pregnancy or the postpartum period. We describe the first antemortem case of spontaneous coronary artery dissection, unrelated to pregnancy or the postpartum state, which ultimately resulted in diffuse involvement of both the left and right coronary arteries over a period of 4 months. Pathophysiology and case management of this disorder are discussed.

Key words: coronary disease, dissection, myocardial infarction, surgery

Introduction

Spontaneous coronary artery dissection (SCAD) is a rare and usually catastrophic occurrence which is infrequently diagnosed antemortem. Since the first described case in 1931, over 150 cases, the majority in women, have been reported.[1–17] Despite this, definitive understanding of the pathophysiology remains unknown. We report the first antemortem case of bilateral multivessel SCAD unrelated to pregnancy or the postpartum state, which ultimately involved all three major coronary arteries over a period of 4 months. Pathophysiology and case management of SCAD are discussed.

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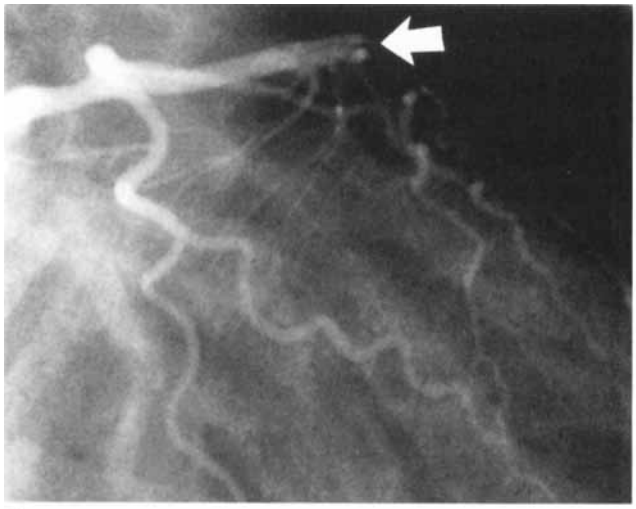
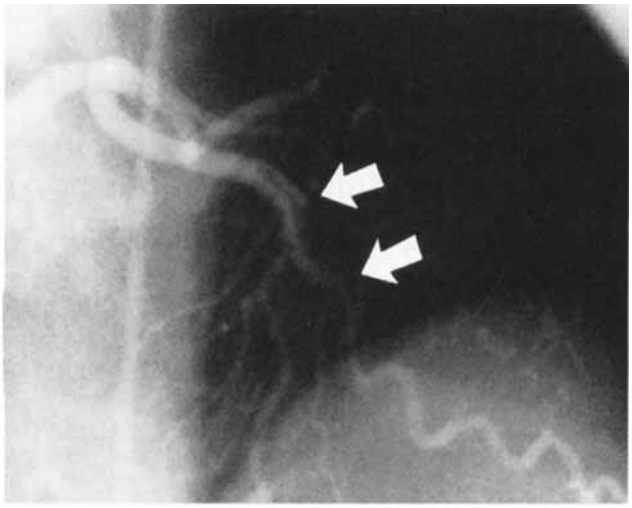
Case Report

A 41-year-old previously healthy Caucasian woman presented to a local emergency department because of a 5-day history of intermittent and severe anterior chest discomfort radiating into the neck and left arm. The patient's past medical history was significant for hypertension, hypercholesterolemia, and obesity, all of which were mild. She had no history of tobacco or illicit drug use and drank alcohol-containing beverages rarely. Other significant history included five previous pregnancies (gravid 5, para 1), with four first-trimester spontaneous abortions, then hysterectomy and bilateral oophorectomy at age 35 because of endometriosis. Family history was significant for a maternal history of systemic lupus erythematosis and fatal myocardial infarction at age 50. Medications on admission included pravastatin 20 mg and an estraderm patch (0.05 mg), both taken daily. On initial presentation, the patient was in obvious distress with complaints of chest discomfort, diaphoresis, and shortness of breath. Physical examination was free of significant abnormality. The electrocardiogram (ECG) revealed an acute anterior wall myocardial infarction. Given no known contraindications, the patient was treated with intravenous thrombolytic therapy (t-PA), nitroglycerin, and heparin. Creatine phosphokinase enzymes peaked at 2100 IU/l with positive MB fraction. The patient had an uncomplicated hospital course thereafter and underwent cardiac catheterization on Day 5.

Left ventricular angiography revealed severe anterolateral and apical hypokinesia with an overall ejection fraction of 45%. Coronary angiography demonstrated an extensive spiral dissection in the left anterior descending artery (LAD) originating before and extending into the first diagonal branch (Fig. 1A and B). The distal LAD after the diagonal appeared to be diffusely narrowed with luminal irregularities but without focal lesion. The left main, circumflex (Cx), and right coronary arteries (RCA) were smooth and normal (Figs. 1A, B, and C). Risk stratification was further assessed by the use of a low-dose dobutamine stress echo study which was interpreted as negative for ischemia. Based on this test result, the decision was made to manage the patient conservatively, and she was discharged on medical therapy consisting of captopril,



(A)



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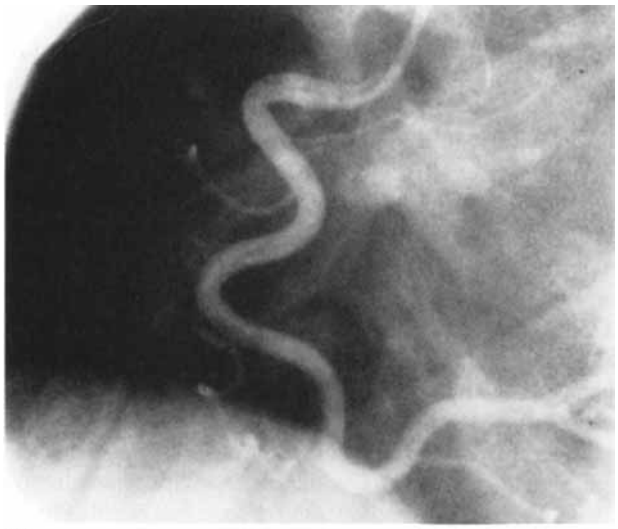

(C)

FIG. 1 (A–C) Left and right coronary arteriograms during the patient's initial presentation. (A) The circumflex appears smooth and normal, while a linear dissection is visualized in the left anterior descending originating just before a large septal branch (white arrow). (B) This dissection is seen to propagate in a spiral fashion into a large first diagonal branch (white arrows). (C) The right coronary is large, smooth, and normal in appearance.

metoprolol, and warfarin. Six weeks later she underwent radionuclide stress testing, once again interpreted as negative for significant ischemia. She remained asymptomatic over the ensuing months, then acutely represented to the emergency department with severe chest pain 4 months after her initial presentation. Physical examination was unremarkable. The ECG initially showed 1 mm ST-segment elevation inferiorly, which normalized after intravenous nitroglycerin and heparin. Creatine phosphokinase enzymes peaked at 980 with positive MB fraction. Repeat cardiac catheterization was performed on Day 3.

Left ventricular angiography revealed severe inferior hypokinesia in a segment previously demonstrated to be normal. Apical hypokinesia remained with improved function noted in the anterior and lateral segments. The overall ejection fraction remained stable at 45%. During performance of coronary angiography, the previously noted spiral dissection involving the LAD and first diagonal branch was still apparent but partially healed (Fig. 2A and B). The distal LAD was also improved, appearing enlarged and smooth. In the mid and distal Cx, previously normal, a long, abruptly narrowed segment suspicious for dissection was seen (Fig. 2A). Arising just before this segment, the second obtuse marginal branch was diffusely narrowed with subtotal occlusion in mid vessel. Collaterals were seen filling the distal RCA from the left coronary artery. Angiography of the RCA revealed a dissection in the distal vessel before its bifurcation into posterolateral and posterior descending branches with evidence of extension into both branches (Fig. 2C). The patient was then transferred to a tertiary center for coronary artery revascularization.

In view of the malignant pattern of spontaneous coronary artery dissection demonstrated in this patient, an extensive evaluation was undertaken to detect occult comorbid conditions related to the patient's presentation. Total cholesterol level on pravastatin therapy was 173 mg/dl. Complement levels were normal although sedimentation rate was moderately ele-

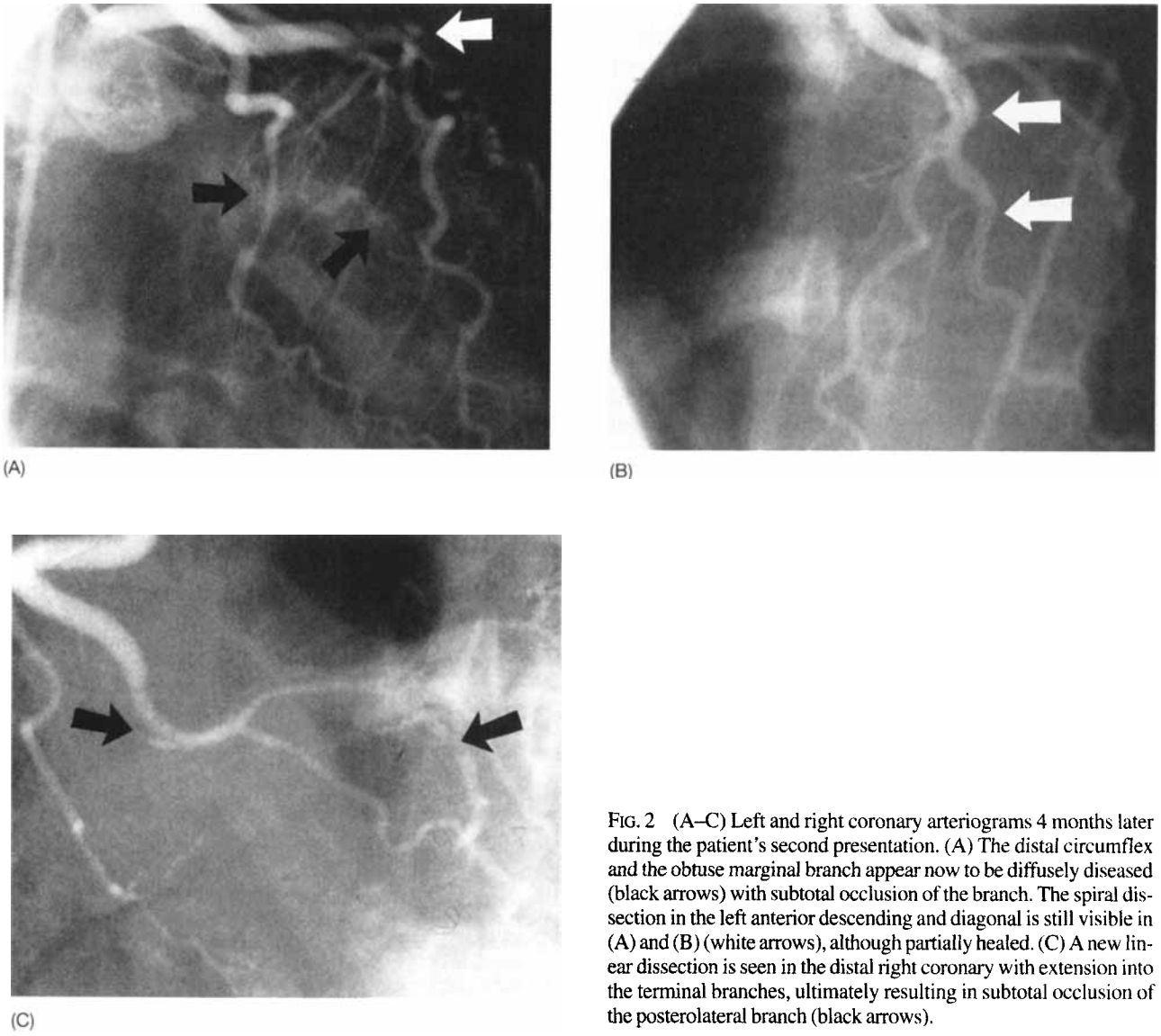

FIG. 2 (A–C) Left and right coronary arteriograms 4 months later during the patient's second presentation. (A) The distal circumflex and the obtuse marginal branch appear now to be diffusely diseased (black arrows) with subtotal occlusion of the branch. The spiral dissection in the left anterior descending and diagonal is still visible in (A) and (B) (white arrows), although partially healed. (C) A new linear dissection is seen in the distal right coronary with extension into the terminal branches, ultimately resulting in subtotal occlusion of the posterolateral branch (black arrows).

vated (55 mm/h, nl ≤25). Antiphospholipid syndrome was ruled out by serologic testing. Cardiolipin antibody and antinuclear antibody were negative, as was the work-up for hypercoagulable state. A right temporal artery biopsy was performed and no gross or histologic abnormalities were found. Magnetic resonance imaging of the aorta and aortic arch were normal. Total estrogen level was 55 pg/ml; 17-beta estradiol level was 24 pg/ml; and progesterone level was 23 ng/dl. These values were all low and consistent with postmenopausal state.

Persantine limited-stress thallium testing was performed revealing reversible ischemia in the anteroapical and inferolateral segments. The patient underwent coronary bypass surgery which was performed without complication. A left internal mammary artery graft was placed to the LAD and diagonal arteries, right internal mammary artery graft to the distal RCA, and saphenous vein grafts to the posterior descending and distal Cx arteries. At follow-up 36 months later, the patient is alive and free of cardiac symptoms.

Discussion

We present the first documented case of spontaneous triple-vessel coronary artery dissection unrelated to pregnancy or the postpartum state in a surviving patient. These spontaneous dissections occurred over a period of 4 months, first involving the LAD, then the Cx and RCA, and were found in a previously healthy 41-year-old Caucasian woman who had undergone hysterectomy and bilateral ovariectomy 5 years earlier. Estrogen and progesterone levels were consistent with postmenopausal state. Based on previous cases, our patient was an unlikely candidate for acute myocardial infarction caused by SCAD, yet, over a period of 4 months, she presented on two occasions with involvement of three separate coronary arteries, suggesting that the substrate for this catastrophic disorder persisted over time in her coronary vascular tree. This was unrelated to changing or excessive sex hormone levels or to hemodynamic stressors as speculated in other reported cases

where pregnancy or the postpartum state were underlying conditions.[2–5] Our patient had none of the other conditions previously reported in the setting of SCAD, including overt coronary atherosclerosis, collagen vascular disorders, aortic dissection, and recent trauma or heavy exercise.[3, 4, 6] Multivessel SCAD has been described in several previous cases, although only one with LAD, Cx, and RCA involvement has heretofore been reported.[4, 7, 8] The latter occurred in a postpartum woman who presented initially with involvement of both branches of the left coronary artery and later recurrence in the right coronary artery.[8] This patient ultimately required orthotopic heart transplantation and the explanted heart revealed fibromuscular dysplasia as the etiology of coronary dissections.

Spontaneous coronary artery dissection has been previously reported in over 150 cases with reported ages ranging from 18 to 77 years.[1–17] Only one third of cases were diagnosed antemortem. Approximately two thirds of reported cases were in women with a significant proportion occurring during pregnancy or the postpartum period. Because of this apparent predilection, the pathophysiology has been suggested to be related in some women to modification of the coronary vascular wall by elevated levels of progesterone or to excessive vascular wall shearing stresses encountered during pregnancy, labor, and delivery.[2–5, 9] Oral contraceptive use with a high estrogen-progesterone preparation was implicated in another case of SCAD diagnosed at autopsy.[10] Spontaneous coronary artery dissection has also been described in the setting of coronary atherosclerosis, Marfan's syndrome, Kawasaki's disease, sarcoidosis, fibromuscular dysplasia, aortic dissection, and recent chest trauma or heavy exercise.[3, 4, 7, 8, 11–14] At autopsy, extensive intramedial dissection has usually been observed. Pathologic examination reveals a plane of dissection occurring in the outer third of the media or between media and adventitia.[4] Infrequently though occasionally, intimal tears have been demonstrated postmortem. Some reports stress that this may require a tedious and time-consuming search with a significant degree of underreporting.[4, 13] Cystic medial necrosis has been demonstrated in a minority of patients.[6] Eosinophilic infiltration has also been reported and was proposed as a primary event leading to dissection, although other reports suggest that these infiltrates are a secondary inflammatory response.[6, 15]

As in our case, a number of reported cases had none of the known predisposing disorders.[3] Nontraditional risk factors for coronary atherosclerosis were not formally evaluated in our patient, nor, to our knowledge, have they been in any previous case of SCAD. Endothelial dysfunction and early coronary atherosclerosis may be inapparent by angiography and cannot be excluded completely. Finally, in some cases, the etiology is exceedingly difficult to diagnose antemortem because of the requirement for pathologic examination of tissue.[8]

Treatment of surviving patients with SCAD remains somewhat controversial, in part because the diagnosis cannot be made acutely unless immediate coronary angiography is performed. Thrombolytic therapy was successfully used in our case and several others but a case describing worsening clinical course after rt-PA was reported.[12, 16] Percutaneous interventions have been successfully reported, although detection of the true lumen may be technically challenging.[17] Similarly, although our patient and others have undergone successful coronary artery bypass surgery, identifying the true lumen for distal graft anastomoses may be difficult.[17]

At autopsy, the constant finding in SCAD appears to be extensive intramedial cleavage with or without a detectable component of intimal disruption; however, definitive understanding of the underlying pathophysiology remains undetermined. This is due in part to rareness of this disorder and to the fact that the majority of cases are diagnosed postmortem. We have demonstrated that this disorder can appear as a recurrent and progressive disease involving all major coronary arteries over a short period of time. Based on this and other reported cases of recurrent ischemia in surviving patients, we recommend aggressive treatment of this disorder to include consideration of immediate coronary angiography, if available; thrombolytic therapy, if not contraindicated by pregnancy or postpartum state; and interventional procedures or coronary bypass surgery as deemed appropriate based on case specifics.

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