Short Communication

Postpartum Dissection of the Left Main Coronary Artery

IAN S. ROGERS, M.D., M.B.A., MICHAEL J. RINALDI, M.D., FACC,* CHESTER B. HUMPHREY, M.D., FACS, FACC, FCCP,†
WILLIAM E. BODEN, M.D., FACC,‡ JAMES E. DOUGHERTY, M.D., FACC, FACP§

Department of Medicine, Boston University Medical Center, and Boston University School of Medicine, Boston, Massachusetts;

*Division of Cardiology, Department of Medicine, and †Division of Cardiothoracic Surgery, Hartford Hospital, Hartford, and

Department of Surgery, University of Connecticut School of Medicine, Farmington; ‡Division of Cardiology, Hartford Hospital,

Hartford, and University of Connecticut School of Medicine, Farmington; §Division of Cardiology, Department of Medicine, Hartford

Hospital, Hartford, and Department of Medicine, University of Connecticut School of Medicine, Farmington, Connecticut, USA

Summary: Peripartum coronary artery dissection is rare, but it is an increasingly recognized risk to women of childbearing age. Literature reviews reveal that about 80% of the population with spontaneous coronary artery dissections (SCAD) are female, and approximately 25–33% of cases occurred while the woman was pregnant or in the peripartum phase. Most cases have presented within 2 weeks of delivery. The left anterior descending is the most commonly affected vessel. The etiology is poorly understood, but many reports suggest that SCAD occurs as a result of protease release secondary to an eosinophilic vasculitis resulting in vessel lysis. Many investigators have examined the correlation between peripartum SCAD and estrogen levels; however, case studies have shown conflicting results regarding estrogen levels as the putative causative factor. Optimal treatment remains controversial. Presently, stenting appears to be best employed in the patients who have single-vessel dissection not involving the left main coronary artery (LMCA). Surgical revascularization via coronary artery bypass graft remains the optimal therapy in patients whose dissection involves the LMCA, in patients with concurrent multi-vessel dissection, and in patients with disease refractory to medical management. It is important to consider coronary artery dissection in the differential of any young woman who presents with signs or symptoms consistent with acute coronary syndrome, particularly if she is peripartum. Furthermore, once suspected, it is imperative that a definitive diagnostic study, that is, coronary angiography, be completed prior to the initiation of treatment whenever possible.

Key words: coronary artery dissection, postpartum, peripartum, spontaneous

Introduction

There has been an ever-increasing effort in recent years to study, publicize, and manage both the risk factors and the clinical expressions of atherosclerotic heart disease in women. While peripartum coronary artery dissection is rare, it is an increasingly recognized risk to women of childbearing age. The etiology is poorly understood, and optimal treatment remains controversial. We present the case of a 37-year-old woman who developed left main coronary artery (LMCA) dissection 8 days post partum and received prompt diagnosis followed by coronary artery bypass graft (CABG) surgery. The pathophysiology, clinical presentation, and therapeutic options are reviewed.

Case Report

A 37-year-old woman, gravida 2 para 2, was recovering successfully at home 8 days status-post uncomplicated vaginal delivery of her second child, except for minor lochia since the delivery. On postpartum Day 8, while breast feeding, she developed a sudden onset of chest pain which radiated into her back and left arm, associated with diaphoresis and moderate dyspnea.

The patient's medical history was largely unremarkable with no prior surgical history. There was no family history of Marfan syndrome, sarcoidosis, connective tissue disorders, or vasculitides, but family history was significant for maternal hypertension, heart disease, and hypercholesterolemia. The patient's first pregnancy 4 years earlier resulted in a full-term, uncomplicated vaginal delivery. The patient's only medication was fluoxetine 20 mg daily, and she reported no allergies. Her social history was unremarkable for alcohol, tobacco, or illicit drug use.

The patient was immediately transported to the Emergency Department of the region's only level I trauma center, bypassing her community hospital at her insistence. On ini-

Address for reprints:

James E. Dougherty, M.D., FACC, FACP
Consulting Cardiologists, P.C.
85 Seymour Street, Suite 719
Hartford, CT 06106, USA
e-mail: Jdoughe@harthosp.org

Received: July 25, 2005

Accepted with revision: October 11, 2005

FIG. 1 The initial 12-lead electrocardiogram upon presentation. An acute and extensive anteroseptal and lateral infarction with reciprocal changes is identified.

FIG. 2 This figure demonstrates the postsurgical electrocardiogram. The acute injury current has resolved, R-wave progression has normalized, and evidence for a modest focal-lateral infarction is evident.

tial presentation, the patient continued to report left-sided chest pain radiating to her back and left arm with moderate dyspnea. On physical examination, she was diaphoretic and in moderate distress. She was afebrile, with a blood pressure 106/65 mmHg, heart rate 76, and respiratory rate 18. Examination of the neck revealed no jugular venous distension. Cardiac examination revealed normal heart sounds without murmurs, rubs, or gallops. Lungs were clear to auscultation bilaterally. The abdomen revealed no organomegaly, and extremities were cool distally, but without cyanosis or edema.

Laboratory studies showed a normal blood count and serum electrolytes. Cardiac biomarkers were abnormal, including a creatine kinase (CK) of 331U/l, CK cardiac index of 6.9 ng/ml, and troponin-I of 0.16 ng/ml. Chest x-ray was unremarkable. Electrocardiogram (ECG) revealed normal sinus rhythm with ST-segment elevation in the anterior precordial and lateral leads with reciprocal changes in the inferior leads (Figs. 1, 2). Intravenous heparin and oral aspirin therapy was initiated promptly.

The patient was emergently transferred to the cardiac catheterization laboratory. Based upon her presentation and ECG findings, postpartum coronary artery dissection was suspected prior to the procedure. Ventriculography revealed extensive apical and apical-septal akinesis as well as moderate anterolateral and inferior hypokinesis and an ejection fraction of 40%. Coronary angiography revealed a spiral dissection in the patient's LMCA extending down the left anterior descending (LAD) coronary artery (Figs. 3, 4). There was significant involvement to the level of the second diagonal branch. The patient's left circumflex and dominant right coronary arteries (RCA) were normal.

In view of extensive dissection involving the LMCA, LAD, and anterior descending diagonal branches, the patient was taken emergently to the operating room for CABG surgery where she received saphenous vein grafts to the obtuse marginal branch of the circumflex coronary artery and a sequential graft to the second diagonal branch and distal LAD coronary artery. The LAD was not ligated proximally. The patient tolerated the procedure well, recovered uneventfully, and was dis-

FIG. 3 Cine coronary angiography via the femoral approach demonstrates a left main ostial injection with appropriate dye reflux. A large dissection blush is evident proximal to the bifurcation of the left main and left anterior descending coronary vessel. The vessel is patent with dye well visualized in the left anterior descending and circumflex vessels.

FIG. 4 A different projection again clearly demonstrates a left main blush consistent with coronary dissection. The catheter remains well positioned at the ostium of the left main coronary artery.

charged on aspirin, atenolol, and ramipril. The patient's long-term recovery was otherwise without incident and she has done well to date.

Discussion

The first case of spontaneous dissection of the coronary arteries was reported by H.C. Pretty in the *British Medical Journal* in 1931.¹ Although it has been 75 years since this initial report, spontaneous coronary artery dissection (SCAD) remains a rarely reported phenomenon. A 1999 review of the literature by Elming and Kober identified only 142 cases of SCAD as of that time.² This suggests that the incidence is greatly underreported since it appears that many of these diagnoses were made post mortem.³ Mortality estimates associated with SCAD range between 49 and 69%,^{4–6} and sudden death has been noted to be the first manifestation of disease in about 25% of these patients.⁷

Coronary artery dissection can be classified into three overall categories according to its etiology:⁸ (1) spontaneously in patients with atherosclerotic coronary disease; (2) as an iatrogenic complication of percutaneous coronary intervention (PCI); and (3) as idiopathic SCAD due to such conditions as Marfan syndrome, systemic lupus erythematosus (SLE), and vasculitides, including Churg-Strauss syndrome and hepatitis C virus-related cryoglobulinemia.^{9,10}

Of note, it appears that about 80% of the population with SCAD are female and approximately 25–33% of the cases occurred while the woman was pregnant or in the peripartum phase;¹¹ most cases presented within 2 weeks of delivery. The most commonly affected vessel was the LAD coronary artery. In contrast, SCAD in men most commonly involves the RCA, and there is usually evidence of atherosclerosis.¹² Although less common, dissection involving multiple vessels has been reported, including at least two case reports of spontaneous dissections of all three coronary arteries.^{13,14}

Pathophysiologically, SCAD is believed to occur secondary to hemorrhage into the outer portion of the tunica media, with the vessel lumen ultimately becoming compressed as the media fills with blood. There have been case reports of SCAD in which the media is intact, but bleeding from the vaso vasorum or an intimal flap was suspected.^{3,15} A true pattern of cystic medial necrosis has rarely been described as the cause of SCAD.¹⁶ Many reports have documented a diffuse adventitial and periadventitial inflammatory reaction, almost always consisting of eosinophils, which has led to the hypothesis that SCAD occurs as a result of protease release secondary to an eosinophilic vasculitis resulting in vessel lysis. Robinowitz *et al.* have also suggested that this lysis could perhaps result in SCAD when combined with vasospasm.¹⁷

The unusually high incidence of coronary artery dissection in the peripartum period has naturally led many investigators to examine the correlation between the physiologic changes in pregnancy, hormonal levels, and SCAD. Case studies of SCAD have shown conflicting results regarding estrogen levels as the putative causative factor. Several investigators have

sought to correlate estrogen and progesterone levels with SCAD. Azam *et al.* postulated that since the largest group experiencing coronary dissection are women in the peripartum period, it is likely that hyperestrogenism could be the culprit.¹⁸ Black *et al.* described the case of a 39-year-old woman who had a spontaneous dissection of the LAD after taking estrogen-containing oral contraceptive pills for 17 years, as well as the case of a man with hepatic cirrhosis (a hyperestrogenic state) who developed coronary dissection.¹⁹ By contrast, Slight *et al.* reported that estrogen was found to have suppressive effects on vascular smooth muscle activity^{20,21} and that myocardial ischemia was more likely to present at a time when estrogen levels are low. This suggests that low estrogen states such as the postpartum period and during menstruation predispose women to SCAD.²²

Since SCAD and pregnancy by definition involve premenopausal women, it is important to consider coronary artery dissection in the differential diagnosis of any young woman who presents with signs or symptoms consistent with acute coronary syndrome. This suspicion should be heightened further if a woman is peripartum. Furthermore, once suspected, it is imperative that a definitive diagnostic study, that is, coronary angiography, be completed prior to the initiation of treatment whenever possible. On angiography, dissection is indicated by the presence of extraluminal radiolucent contrast after wash-out of dye from the remainder of the vessel, although the dissection may be obscured by significant narrowing of the true lumen.^{23,24} A radiolucent intimal flap may rarely be seen.

In cases where clinical suspicion for SCAD is high, but the angiogram is normal or equivocal, intravascular ultrasound (IVUS) may be helpful. Auer *et al.* recently reported the diagnosis of SCAD involving the LMCA in a 36-year old woman who had a normal coronary arteriogram.²⁵ On IVUS, dissection and intramural hematoma were identified. This proved to be a case in which intramural hematoma in the arterial wall resulted in compression of the true lumen, falsely producing a normal appearing cineangiogram. Vilke *et al.* similarly reported the case of a 34-year old woman 12 weeks post cesarean section who had two negative angiograms before IVUS revealed an LMCA dissection with an in situ thrombus at the bifurcation of the left main artery and the LAD.²⁶

The clinical importance of a prompt and accurate diagnostic study is particularly significant when creating a treatment plan for a patient with coronary artery dissection. The literature contains case reports of successful treatment with systemic thrombolysis, percutaneous coronary intervention (PCI) (with or without stenting), and CABG surgery. Systemic thrombolysis may successfully lyse a thrombus that has formed within a false lumen, achieving abatement of the dissection. However, lysis can exacerbate hemorrhage from the vaso vasorum, resulting in further compression of the true lumen and thus compound the dissection.^{27,28} As such, PCI or CABG should be considered the most appropriate treatment.

Presently, stenting appears to be best used in patients who have single-vessel dissection that does not involve the LMCA. Many cases have reported successful outcomes after stenting of the left circumflex and right main coronary arteries, but re-

ports that describe successful stenting of the LAD are rare.^{29–33} Surgical revascularization via CABG remains the optimal therapy in patients whose dissection involves the LMCA, in patients with concurrent multivessel dissection, and in patients with disease refractory to medical management.^{3, 8, 14, 34} Selected left main dissections may ultimately prove amenable to PCI as overall experience accrues with left main stenting.

Conclusion

As this patient was able to present to a hospital with readily available catheterization and cardiothoracic surgical resources, the diagnosis was quickly established and definitive surgical management was promptly undertaken. Spontaneous coronary artery dissection remains underrecognized, its etiology poorly understood, and its optimal management ill defined. As such, it is imperative that SCAD be considered in the differential diagnosis of young women, particularly those who are peripartum and who present with signs or symptoms suggestive of acute coronary syndrome. Finally, it is essential that these patients receive prompt evaluation in a tertiary facility equipped with experienced interventional and cardiothoracic resources.

Acknowledgement

The authors would like to thank Roger A. Mennett, M.S., Unit Leader, Cardiovascular Data Management Center, Hartford Hospital, Hartford, CT for his technical assistance and support. A special thank you to Vera A. Mason, Consulting Cardiologists, PC, Hartford, CT for her transcription and editorial assistance. Additional editorial support was greatly appreciated by Kathryn M. Kircher, The Henry Low Heart Center, Hartford Hospital, Hartford, CT.

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