Surgical Management of Spontaneous Coronary Artery Dissection

Spontaneous coronary artery dissection, which causes acute coronary syndrome and can result in sudden death, is rare; but its true incidence is underestimated, since most patients die suddenly, without diagnosis. The aim of this study was to show the importance of prompt diagnosis and treatment.

In reviewing the records of 5,000 consecutive patients who underwent coronary angiography between January 2001 and August 2006, we found 6 cases of spontaneous coronary artery dissection (an incidence rate of 0.12%). Five patients presented with left main coronary artery dissection and 1 patient, with right coronary artery dissection.

Angioplasty with stenting failed in the patient with right coronary artery dissection. Coronary artery bypass surgery was performed in all patients. The patient with right coronary artery dissection died of sepsis on the 30th postoperative day. The other 5 patients (83.3%) are still free of symptoms, and they had negative results on stress tests at the 6- and 12-month follow-up visits after coronary artery bypass surgery.

The clinical presentation of spontaneous left main coronary artery dissection was similar to that of atherosclerotic disease. However, early diagnosis of spontaneous coronary artery dissection by means of coronary angiography is of paramount importance, because urgent coronary artery bypass grafting can be lifesaving. (Tex Heart Inst J 2008;35(4):402-5)

Spontaneous coronary artery dissection (CAD), which causes acute coronary syndrome and can result in sudden death, is a rare event. Spontaneous coronary artery dissection has been observed in 3 groups of patients: patients with coronary artery disease, young women during peripartum, and patients with idiopathic disease and no obvious associated factors. The pathogenesis of spontaneous CAD is still unclear.

The clinical presentation of left main coronary artery (LMCA) dissection may be similar to that of a patient with atherosclerotic disease of the LMCA. Early diagnosis and urgent coronary artery bypass grafting (CABG) is lifesaving in patients with LMCA dissection. In this retrospective study, we present an account of our management of spontaneous CAD, and we review the medical literature in order to investigate the potential causes and optimal treatments of this condition.

Patients and Methods

We reviewed, for spontaneous CAD, 5,000 consecutive coronary angiograms that had been recorded between January 2001 and August 2006. Of these, we were able to diagnose 6 cases of spontaneous CAD. Four patients were women and 2 were men. Their ages varied from 35 to 61 years. The patients and their clinical features are shown in Table I.

Clinical presentation took the form of acute coronary syndrome in all patients. One patient had unstable angina pectoris, and the other 5 had experienced myocardial ischemia and acute ST-segment elevation in the anterior leads.

Five patients were hypertensive. Furthermore, diabetes mellitus and hypercholesterolemia were found in 2 patients. Coronary angiography showed LMCA dissection in these 5 patients, together with coronary atherosclerotic changes (Fig. 1).

One of the 4 female patients had no additional risk factor for ischemic heart disease. Two women had only hypertension as a risk factor (Table I). None of the patients had connective-tissue disorder or any history of oral contraceptive administration. Three of the women were multiparous. Coronary angiography showed LMCA dissection in the youngest woman (Fig. 2).
In all patients, medical treatment—including the administration of unfractionated heparin and a β-blocker—was the initial step. Cardiac catheterization was performed in all acute coronary syndrome patients within 4 hours of their arrival at the hospital.

In our 5 patients who presented with LMCA dissection, the lesion caused acute anterior myocardial ischemia. One of them (Patient 3, Table I) experienced severe hemodynamic deterioration during cardiac catheterization; CABG was performed immediately after angiography. The other 4 patients with LMCA dissection were stable and underwent CABG within 24 hours of coronary angiography.

The patient with right coronary artery (RCA) dissection (Patient 1, Table I) presented with myocardial infarction and ST-segment elevation, but her hemodynamic status was stable. Because angioplasty and stenting failed in this patient, CABG was performed immediately after angiography. Use of an intra-aortic balloon pump was not required, because CABG was performed immediately after angiography.

### Results

All 5 patients with LMCA dissection underwent CABG. Additional aortic valve replacement was done in the patient with aortic stenosis. All 5 patients are still free of symptoms, and their stress tests at the 6- and 12-month follow-up visits after CABG were negative.

In the patient with RCA dissection, the left coronary artery system was normal. The RCA system was dominant. Total occlusion occurred when the operator attempted to pass the lesion with the guidewire. The patient’s hemodynamic status deteriorated, and bypass surgery was performed immediately. In the early postoperative period, there was no hemodynamic problem; however, the patient died of sepsis on the 30th postoperative day.

### Discussion

The 1st spontaneous CAD case was published in 1931,3 and a total of 152 such cases had been described in the medical literature through 2002.4 However, the true number of cases is no doubt much higher, due to the frequency with which spontaneous CAD leads to sudden death without diagnosis.5 De Maio and colleagues5 were the 1st to describe 3 different groups of patients with spontaneous CAD: patients with underlying coronary atherosclerosis, women in the 3rd trimester of pregnancy or the early postpartum period, and patients with idiopathic disease.

Atherosclerosis is one of the main risk factors for spontaneous CAD. Hering and co-authors6 reported atherosclerotic plaque rupture in 35 of 42 spontaneous CAD patients.

Three patients in our series had multiple risk factors for atherosclerosis, such as hypertension, diabetes mel-

### TABLE I. Clinical and Other Characteristics of the Patients

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AS = aortic stenosis; AVR = aortic valve replacement; CABG = coronary artery bypass grafting; CAD = coronary artery disease; Cx = left circumflex coronary artery; D1 = 1st diagonal artery; DM = diabetes mellitus; HC = hypercholesterolemia; HT = hypertension; LAD = left anterior descending coronary artery; LMCA = left main coronary artery; RCA = right coronary artery; STEMI = ST-segment elevation and myocardial ischemia; USAP = unstable angina pectoris
Spontaneous coronary artery dissection accounts for up to one third of myocardial infarctions during pregnancy and post partum. More than two thirds of patients with spontaneous CAD present in the postpartum period, usually within 2 weeks of delivery. Multiparity and advanced age have been found to be associated with spontaneous CAD. Arterial wall changes occur under hormonal influence during pregnancy. These include smooth muscle proliferation, impaired collagen synthesis, and alterations in the protein and acid mucopolysaccharide content of media.

Other possible risk factors include Marfan syndrome, Ehlers-Danlos syndrome, systemic lupus erythematosus, polyarteritis nodosa, hypereosinophilic syndromes, and Kawasaki disease. Spontaneous coronary artery dissection can also be associated with the use of cocaine, cyclosporine, and oral contraceptives. Our patients had no connective-tissue disorders or history of oral contraceptive administration.

However, there are several reports of spontaneous CAD among previously healthy people who had no apparent risk factors. Shear stress, with or without angiographically proven coronary plaques, is a possible explanation. This hypothesis is supported by several reports of spontaneous CAD in young to middle-aged people, occurring during or after such heavy exercise as aerobic exercise, running, weightlifting, baseball-playing, or even prolonged sneezing.

The clinical presentation of spontaneous CAD may vary from unstable angina to myocardial infarction. The left anterior descending coronary artery is the artery most often involved (in about 75% of cases), whereas LMCA and multivessel dissection occur in 24% and 40% of cases, respectively. Most patients with LMCA dissection sustain myocardial infarction (vs only 50% of patients with RCA dissection). In our series, 5 patients had LMCA dissection (83%), and 1 had RCA dissection (17%).

What constitutes optimal management for spontaneous CAD is controversial. The decision to intervene surgically or per catheter depends on the clinical presentation, the patient’s hemodynamic state, the site and extent of the dissection, and the number of vessels involved. Stable patients with spontaneous CAD that is limited to a single coronary artery dissection usually have a favorable long-term outcome and are candidates for conservative medical management. Thrombolytic therapy is controversial. Thrombolysis might dissolve the compressing intramural clot but might also expand the hematoma and thereby proliferate the dissection. Stenting seems to be an attractive option, for it can yield very good long-term results in symptomatic patients who have localized dissections. Coronary artery bypass grafting should be performed in patients with main stem or multivessel involvement or in those with hemodynamic instability. The cause of idiopathic spontaneous CAD—after such predisposing factors as hypertension, collagen disorders, intense physical effort, and contusive chest trauma have been eliminated—is still in debate. We recommend prompt coronary angiography in all acute coronary syndrome patients. Thrombolytic therapy may lead to myocardial ischemia and to worsened clinical status in patients who have coronary artery dissection. For young, healthy women who display symptoms of acute coronary syndrome, spontaneous CAD should be included in the differential diagnosis. Angiography and early intervention are essential in the treatment of these patients. Angioplasty and stenting may be preferred in single-vessel dissection. Finally, CABG should be performed in patients who have LMCA or multivessel dissection or who have undergone stenting without success.
References