

Acute myocardial infarction at 25 years of age

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A 25-year-old black woman was found to have systemic hypertension when she was 18 years of age. She had 2 children in her early 20s; during both pregnancies, her blood pressure was extremely high, and both children were delivered early because of the hypertension. At age 24 she discontinued her antihypertensive medicines for unclear reasons. About 48 hours before hospital admission, she experienced various types of substernal chest pain, which occasionally radiated to her arms. In the emergency department, her blood pressure was 240/130 mm Hg and her serum troponin was 2.7 mg/mL. The electrocardiogram showed tall T waves anteriorly but no Q waves or S-T segment changes. The drug screen was positive for marijuana but negative for cocaine. She stated that she had never used cocaine but often used marijuana. She smoked about 20 cigarettes a day and was not aware of ever having her blood cholesterol tested. Her mother had diabetes mellitus and high blood pressure. Her father had died at age 51 of acute myocardial infarction.

When admitted to the ward, the patient's blood pressure was 140/90 mm Hg. She weighed 252 pounds and was 63 inches tall (body mass index 44 kg/m²). Her lungs were clear. No precordial murmurs or abnormal sounds were heard.

The cardiac silhouette on chest radiograph was of normal size. The lung fields were clear. On chest computed tomography, the aorta appeared to be of normal size, and no dissection was present. The serum alanine aminotransferase was 33 U/L; aspartate aminotransferase, 61 U/L; and alkaline phosphatase, 73 U/L. The serum total protein was 7.8 g/dL; albumin, 3.1 g/dL; and globulin, 4.7 g/dL. The urine was negative for glucose, but a trace of protein was present. The serum total cholesterol was 375 mg/dL; the low-density lipoprotein cholesterol, 311 mg/dL; the high-density lipoprotein cholesterol, 47 mg/dL; the very-low-density lipoprotein cholesterol, 17 mg/dL; and the triglycerides, 83 mg/dL. The erythrocyte sedimentation rate was 89 mm/hour.

Cardiac catheterization during her first day in the hospital disclosed a large left main coronary artery, which contained a narrowing in its most distal portion, a relatively normal left anterior

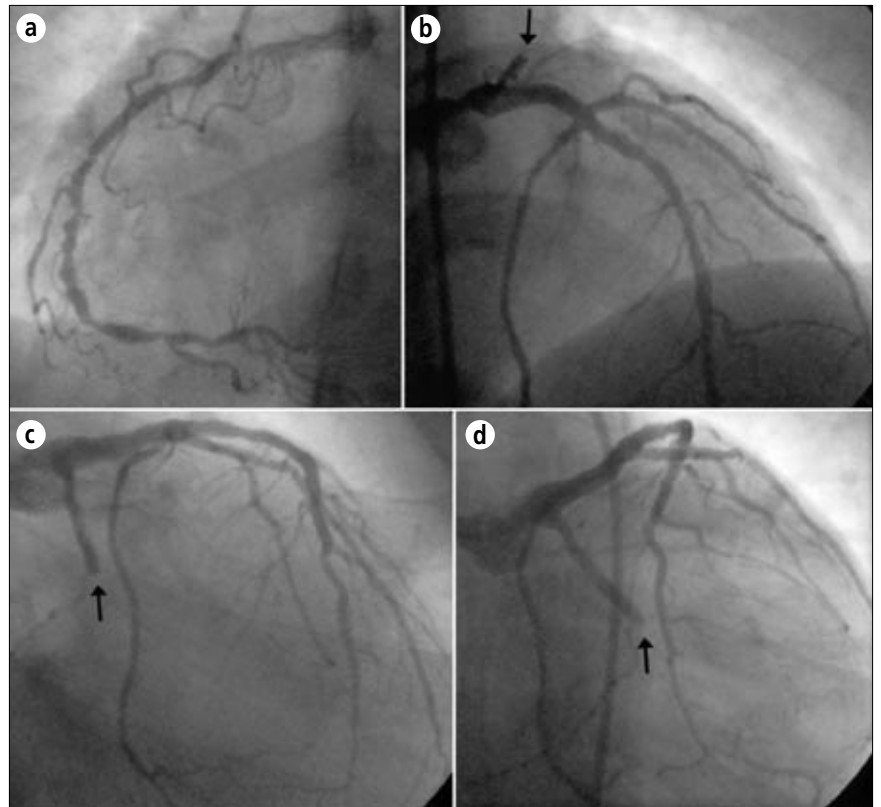


Figure. Coronary angiograms in the patient described. (a) Right coronary artery with numerous narrowings. (b, c, d) Injection of contrast material into the left main coronary artery showing total occlusion of the left circumflex (arrow) and multiple lesser narrowing in the left anterior descending artery.

descending artery, and a totally occluded left circumflex coronary artery. The right coronary artery was the dominant one, and its interior lining was "ragged" with narrowing >90% in diameter. The distal left circumflex artery was filled by collaterals from the distal right coronary artery (Figure). A left ventricular angiogram showed the posterobasal portion of the left ventricular wall to be akinetic and the other portions of the left ventricular wall to contract well. The ejection fraction was estimated to be 50%.

During the cardiac catheterization, the totally obstructed obtuse marginal branch of the left circumflex coronary artery

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was opened and then 2 stents were placed in it. The patient was subsequently discharged, but about 1 month later, chest pain recurred and she was rehospitalized. Cardiac catheterization again showed the left circumflex artery to be completely closed. It was not possible to open the total occlusion at the site of the stents. Additionally, a new narrowing was found in the left anterior descending coronary artery, and intravascular ultrasonic imaging showed it to be a 70% cross-sectional area narrowing. She also had evidence of severe narrowing by atherosclerotic disease of both the common and external iliac arteries and the femoral arteries bilaterally.

About a month later, she underwent an off-pump coronary bypass grafting procedure with a right internal mammary artery to the posterior descending branch of the right coronary artery and a left internal mammary artery to the left anterior descending coronary artery. Since the operation in March 2003, she has done remarkably well. Her chest discomfort has vanished, and she is now working full-time again.

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The frequency of acute myocardial infarction in persons ≤ 45 years of age is relatively uncommon, particular in women. The *Table* lists publications describing patients ≤ 45 years of age with acute myocardial infarction (1–22). Excluding the 3 studies limited to women (2, 11, 16), acute myocardial infarction occurred in 303 women (11%) and in 2488 men (89%) ≤ 45 years of age. Of the 303 women, only 5 (2%) were stated to be ≤ 25 years of age.

The hitherto described patient clearly had heterozygous familial hypercholesterolemia but also had systemic hypertension and diabetes mellitus and was a relatively heavy cigarette smoker. Additionally, she was obese. Nevertheless, acute myocardial infarction in the 20s is extremely rare. A number of studies have demonstrated that the number of atherosclerotic risk factors in young patients with acute myocardial infarction is considerably larger than in older patients with acute myocardial infarction (1–22). Additionally, coronary angiography in the younger patients compared with the older ones has shown less severe coronary narrowing, a lower frequency of death during the acute event, and a better prognosis with fewer long-term atherosclerotic events (3–16, 18, 21, 22). The present patient was unusual in this regard because of the extensive amount of coronary narrowing in all of her major coronary arteries.

Although a number of reports are available describing young patients with acute myocardial infarction, few focus exclusively on women. A most useful report was by Arnold and Moodie (11) in 1993. These authors described 32 women ≤ 30 years of age referred to the Cleveland Clinic for evaluation of coronary artery disease. Of the 32 patients, 22 had had an acute myocardial infarction. Although it was not possible to separate the findings in these 22 patients, serum cholesterol data (available in 28 of the 32

Table. Reported frequency of myocardial infarction in women ≤ 45 years of age

Reference	First author	Year of publication	Age (years) for inclusion	Number of patients	Number (%) of women	Number of women ≤ 25 years
1	Roth	1967	≤ 40	53	2 (4%)	1
2	Jick	1978	≤ 45	83	83 (100%)	0
3	Benacerraf	1978	≤ 35	20	4 (20%)	2
4	Glover	1982	≤ 35	120	10 (8%)	?
5	Uhl	1983	< 40	165	10 (6%)	0
6	Puel	1983	< 35	22	2 (9%)	?
7	Hoit	1986	< 45	203	16 (8%)	?
8	Kaul	1986	< 40	101	3 (3%)	?
9	Weinberger	1987	< 30	30	4 (13%)	0
10	Klein	1987	< 40	85*	13 (15%)	0
11	Arnold	1993	≤ 30	32	32 (100%)	2
12	Chouhan	1993	< 35	62	1 (2%)	0
13	Badui	1993	≤ 40	142	18 (13%)	0
14	Negus	1994	≤ 40	129	11 (9%)	?
15	Teng	1994	< 40	17	3 (18%)	0
16	Zimmerman	1995	≤ 35	210	210 (100%)	?
17	Barbash	1995	≤ 40	269	27 (10%)	?
18	Füllhaas	1997	≤ 40	75	11 (15%)	?
19	Doughty	2002	≤ 45	102	26 (25%)	?
20	Ranjith	2002	≤ 45	245	39 (16%)	0
21	Cole	2003	< 40	843†	94 (11%)	?
22	Fournier	2004	≤ 40	108	9 (8%)	?

*Acute myocardial infarction in 59.

†Acute myocardial infarction in 451.

patients) disclosed mean fasting serum total cholesterol levels of 259 ± 78 mg/dL (range 155–500), mean low-density lipoprotein levels of 178 ± 64 mg/dL (range 120–305), triglyceride levels of 164 ± 86 mg/dL (range 44–465), and mean high-density lipoprotein levels of 49 ± 15 mg/dL (range 29–78). These mean values, of course, were similar to those in the patient described herein. Additionally, 9 of the 32 patients (28%) had juvenile diabetes mellitus, 12 (38%) had systemic hypertension, 23 (72%) smoked, and 9 (28%) used oral contraceptives. Fourteen patients (44%) had angiographic “single-vessel” coronary disease, 14 (44%) had multivessel involvement, and 4 (13%) had angiographically normal coronary arteries. Left ventricular dysfunction was documented in 27 (84%) of the 32 patients. Five patients (16%) died during the 3-month to 20-year follow-up (mean 10 years).

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