Chest pain in a young person is often caused by chest wall tenderness, associated with mitral valve prolapse, or attributed to psychologic factors. Ischemic cardiac pain may be overlooked because of its rare occurrence in this age group. A 35-year-old woman complained of substernal chest pressure precipitated by exertion and relieved by rest. The symptom had been noted for 15 years. Worsening of the symptom during dancing prompted her to seek medical advice. She had no other illnesses, was taking no medications, was a nonsmoker, and had no family history of coronary disease. Physical examination disclosed a grade 1 (on the basis of 1 to 6) systolic ejection murmur, an ejection click, and a grade 2 diastolic murmur. An exercise test produced symptoms at 4 minutes. Coronary arteriography showed the absence of a left coronary ostium and filling of the entire coronary system from the right ostial injection through collateral vessels from the right coronary artery. Surgical repair was recommended. Operative intervention showed a dysplastic bicuspid aortic valve with a membrane that covered the left coronary ostium. Excision of the membrane reestablished antegrade blood flow to the left coronary system. A follow-up exercise test revealed normal findings. Because chest pain in a young person is rarely ischemic in origin, benign or noncardiac causes are usually considered; however, if the history suggests ischemic pain, the possible presence of unusual cardiovascular abnormalities should not be disregarded.

Chest pain in young adults is not uncommon. This symptom, however, is frequently atypical in its relationship to exertion and its duration, and after a thorough evaluation, it is often found to be benign in nature—for example, related to costochondritis, chest wall tenderness, hyperventilation, anxiety, a pulmonary disorder, or mitral valve prolapse. In other cases, when the chest pain is unrelated to exertion, esophageal or coronary spasm are considerations. When the chest pain, however, has the characteristic features of angina pectoris—that is, precipitated by exertion and relieved by rest—further evaluation including exercise testing and coronary angiography may be warranted. The following case report describes a young woman with typical angina.

REPORT OF CASE
A 35-year-old woman had a 15-year history of gripping substernal tightness brought on by exertion and promptly relieved by rest. Because of her chest pain, she had learned to abstain from activities involving heavy exertion. Recently, she had begun taking dance lessons, and this activity precipitated the symptoms for which she sought medical advice. She had no other medical problems and was taking no medications. She was a nonsmoker and had no family history of coronary artery disease.

On physical examination, she was 157 cm tall and weighed 51 kg. Her pulse was 72 beats/min and regular, and the blood pressure was 120/80 mm Hg in the left arm and 118/78 mm Hg in the right arm. Findings on examination included a grade 1 (on the basis of 1 to 6) systolic ejection murmur heard along the left sternal border in association with an ejection click and a grade 2 decrescendo diastolic murmur heard along the
left sternal border. The results of the rest of the examination were normal.

Laboratory studies showed a normal complete blood cell count and blood chemistry results; the serum cholesterol was 198 mg/dl, and serum triglycerides were 40 mg/dl. Blood serology was nonreactive, and urinalysis revealed normal findings. A chest roentgenogram was normal. The electrocardiographic findings were normal, including a normal sinus rhythm (rate, 80 beats/min). A treadmill exercise test, performed with the Bruce protocol, was "positive" at 4 minutes with 2- to 3-mm ST segment depression in the inferolateral leads (Fig. 1) and associated with typical angina.

Because of her progressive symptoms and "positive" exercise test, the patient underwent cardiac catheterization, which revealed normal left ventricular size and function, an estimated ejection fraction of 70%, mild aortic regurgitation, and no substantial gradient across the aortic valve. During injection of contrast medium into the left coronary artery, the left coronary ostium could not be identified (Fig. 2). Injection into the right coronary artery demonstrated retrograde filling through collateral vessels of the entire left coronary system back to the left coronary ostium (Fig. 3). The contrast material then seemed to enter an apparent blind pouch in the aortic root, and delayed washout was noted on later films (Fig. 4). The coronary arteriograms suggested that the left coronary ostium was occluded by an abnormal aortic cusp or membrane.

Because of the evidence of ischemia and findings on coronary arteriography, a coronary artery surgical procedure was recommended. At the time of operation, the aortic valve was found to be bicuspid, with fusion of the right and left coronary cusps (Fig. 5). The two commissures opened to the annulus. The left coronary ostium was not visible; however, a probe passed retrograde through an incision in the left anterior descending coronary artery revealed the entry point of the left ostium in the aortic root close to the commissure between the noncoronary cusp and the left coronary cusp. The root was incised at this level into a sinus of the aortic root tissue,

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Fig. 1. Electrocardiographic tracings during rest (A) and during exercise (B) in 35-year-old woman with chest pain.

Fig. 2. Shallow left anterior oblique projection after attempted injection of contrast medium into left coronary ostium (arrowhead) of 35-year-old woman with chest pain.
Fig. 3. Shallow left anterior oblique projection (A) and right anterior oblique projection (B) of right coronary artery after injection of contrast agent, showing retrograde filling of left coronary system of 35-year-old woman with chest pain.

Fig. 4. Delayed film, shallow left anterior oblique projection, showing delayed emptying and "blind pouch" in area of left coronary ostium (arrowhead).

from which the coronary ostium exited. When this sinus was widely unroofed, a wide communication to the left coronary ostium was obtained. The left anterior descending arteriotomy wound was closed with use of a left internal mammary artery graft. The patient had an uneventful postoperative course. After return to normal activity, she had no further angina. Results of a follow-up stress test 3 months postoperatively were normal (Fig. 6).

DISCUSSION
Atherosclerotic coronary lesions in older patients are the most frequent cause of ischemic heart pain. In a young person who has exertional chest pain, cardiac abnormalities such as a hypertrophic cardiomyopathy as well as congenital and acquired nonatherosclerotic lesions of the coronary circulation should be considered. These lesions may be life threatening and many times are surgically correctable.²

An extensive list of nonatherosclerotic coronary lesions has been reviewed in detail by Baim and Harrison² and Cheitlin and associates³.
Congenital defects of the coronary circulation, mechanical insults to the coronary circulation, and coronary spasm may be suspected clinically, but in most cases a coronary angiogram is needed for diagnosis. Coronary lesions attributable to vasculitic diseases, irradiation, or accumulation of metabolic substances would more likely be suspected on the basis of the history or the presence of other malformations.

Isolation of a coronary artery ostium is rare. In this case and others previously described, this entity refers to the complete or near-complete covering over a normal coronary ostium by a membrane or valvular tissue, which prevents perfusion through the ostium. In most cases, such an abnormality has been associated with supravalvular aortic stenosis. Kurosawa and colleagues described a case of sudden death in a 16-year-old boy who had an abnormal quadricuspid aortic valve. The additional cusp had formed a dome over the ostium of the left coronary artery and had thereby isolated the ostium and caused ischemia. In addition to the case report, they reviewed the medical literature and found nine other similar cases. In most patients, isolation of a coronary artery by an adherent dysplastic aortic valve leaflet was associated with supravalvular aortic stenosis. Three patients had complete isolation of the left coronary artery, two had complete isolation of the right coronary artery, and four had incomplete isolation of either the left or the right coronary artery. All nine patients were 25 years old or younger and had complaints of exertional chest pain, dyspnea, and fatigue; sudden death was not a usual feature.

Line and colleagues described a case similar to ours in a 44-year-old man with dyspnea who was subsequently found to have aortic regurgitation. The coronary arteriogram disclosed an apparent abnormal cusp or membrane that covered and isolated the left ostium. Injection of

![Diagram of anatomic abnormality of aortic valve. Valve was bicuspid, and a membrane covered the left coronary ostium.](image1)

![Electrocardiographic tracings during rest (A) and during exercise (B) 3 months after surgical correction of occlusion of left coronary ostium in 35-year-old woman.](image2)
contrast material into the right coronary artery filled the entire left coronary system through collateral vessels. At operation, the valve was found to consist of two large cusps and one small rudimentary cusp that covered the left coronary ostium.

The cause of this unusual abnormality of the aortic valve leading to isolation of a coronary ostium is unclear. Most previously reported cases have been ascribed to congenital malformation of the aortic valve in association with supravalvular stenosis. Waxman and co-workers described a case of isolation of a coronary ostium not associated with supravalvular aortic stenosis and suggested that this abnormality may be a forme fruste of supravalvular aortic stenosis. In our patient and in others previously described, the onset of symptoms after childhood suggested an acquired lesion. Inflammation of the aorta or the aortic valve could be a setting in which a cusp could adhere to the aortic wall and cause obstruction of a coronary ostium. An alternative explanation is that the abnormality was present from birth, and in adulthood, myocardial demand exceeded the supply from collateral arteries.

**CONCLUSION**

In young patients who have chest pain, a thorough history should be elicited with ischemic cardiac pain in mind before such a symptom is dismissed as noncardiac and benign. If the history is consistent with myocardial ischemia, exercise testing and possibly coronary angiography are indicated to rule out unusual and potentially correctable cardiac abnormalities.

**REFERENCES**


