Acute Myocardial Infarction in an Adolescent Female with Normal Coronary Arteries

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ABSTRACT

Acute myocardial infarction may occur in young people with angiographically normal coronary arteries but the pathophysiology of this condition remains unknown. The possible mechanisms underlying myocardial infarction with normal coronary arteries are coronary vasospasm, thrombosis, embolization or minimal atherosclerosis. Smoking is an important predisposing risk factor for myocardial infarction in the presence of normal coronary arteries. We describe a case of acute myocardial infarction in a adolescent female who had normal coronary arteries according to multislice computed tomography coronary angiography results.

Key words: Acute myocardial infarction, normal coronary arteries.

INTRODUCTION

Acute myocardial infarction may also occur when the coronary arteries are normal or nearly normal. It affects primarily younger persons. Myocardial infarction with normal coronary arteries is likely the result of multiple pathophysiologic mechanisms. These mechanisms include in situ thrombosis or embolization with subsequent clot lysis and recanalization, coronary artery spasm, and vascular endothelial dysfunction, per se or combined. There is strong evidence to suggest that smoking is an important predisposing risk factor for myocardial infarction in the presence of normal coronary arteries (1).

CASE REPORT

A 17- year- old female was brought to emergency department with severe substernal chest pain. There was no history of diabetes mellitus, hypertension, hypercoagulable states, or hypercholesterolemia. She smoked 10 cigarettes a day and there was family history of premature coronary artery disease. She denied any illicit drug

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use including cocaine. During the physical examination the patient was in distress as a result of severe chest pain. Cardiovascular examination revealed no abnormal heart sound, gallop, or murmur. The initial electrocardiogram revealed sinus rhythm with ST-segment elevation in inferolateral leads (Figure 1). She was treated with low-molecular-weight heparin, aspirin, metoprolol and nitroglycerin. The patient became free of chest pain and remained hemodynamically stable. The ST- segment elevation on electrocardiogram resolved, and the serial electrocardiograms revealed the changes consistent with the evolving inferolateral infarction (Figure 2). The occurrence of myocardial infarction was confirmed by elevation of serum cardiac markers, including serum creatine kinase, creatine kinase- MB isoenzyme, and cardiac troponin T (Table 1). All other laboratory tests including serum cholesterol and triglyceride, screening tests for autoimmune disorders, C-reactive protein, sedimentation, blood counts, liver function tests, and kidney function tests were in normal limits. The normokinesis of all wall motion has been shown by echocardiography, with normal left ventricular function. 64-slice multislice computed tomography coronary angiography (Philips Brilliance) was performed on one day after her myocardial infarction, and it revealed completely normal coronary arteries and normal sys-

tolic function (Figure 3,4). She was discharged on the five day with a drug regimen of aspirin.

DISCUSSION

Although the majority of the cases of acute myocardial infarction is caused by atherosclerotic coronary artery disease, acute myocardial infarction can occur in people with coronary arteries that appear normal or nearly normal in an angiography (2). The pathogenetic mechanism of myocardial infarction in patients with normal arteries remains unknown. A single etiology for myocardial infarction with normal coronary arteries does not exist. The possible mechanisms causing myocardial infarction with normal coronary arteries are coronary vasospasm, coronary thrombosis, hypercoagulable states, coronary embolism and coronary trauma (3). Although myocardial infarction with normal coronary arteries has been reported with many other conditions, a strong association with cigarette smoking has been demonstrated. It has been shown that there is increased platelet consumption in young smokers without clinical evidence of coronary artery disease (1).

Coronary artery spasm has been shown to cause myocardial infarction in patients with normal coronary arteries. Vasospasm can cause vascular endothelial
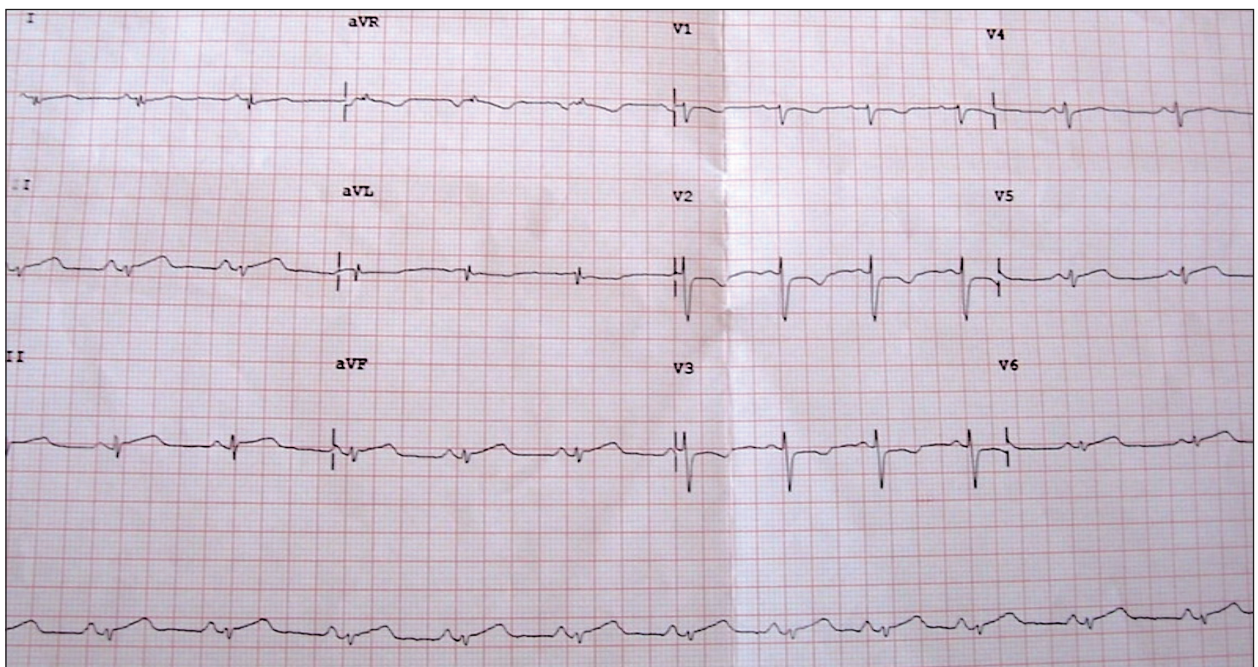

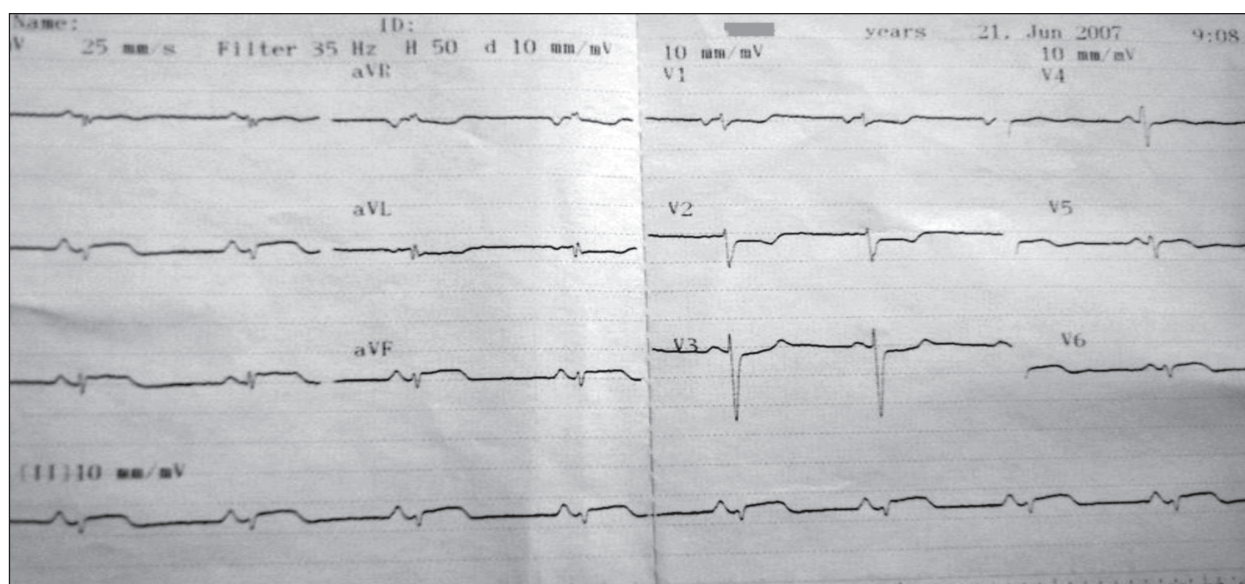*Figure 1. ECG showing D2-D3-aVF-V5 and V6 ST- segment elevation.*

Figure 2. ECG showing changes consistent with the evolving inferiolateral infarction.

Table 1. Serum cardiac marker values.			
Days	*CK (U/l)*	*MB-CK (U/l)*	*Troponin T (ng/ml)*
1. Day	1279	153	5.51
2. Day	1039	102	6.12
3. Day	830	92	4.30
4. Day	420	50	3.48
5. Day	52	12	0.043

injury leading to platelet aggregation and coagulation system activation with resultant thrombosis and myocardial infarction (4,5). Cocaine use is associated with various cardiac complications including myocardial infarction. Cocaine use results in acute myocardial infarction by various mechanisms including coronary vasospasm and hypercoagulability (6). Amphetamine and marihuana use can result in myocardial infarction but the data are limited (7).

Disorders of the coagulation system should be considered when any suspicion of idiopathic thrombosis or embolism appears possible, including a protein C, protein S and antithrombin III deficiency (8). Spontaneous coronary artery dissection is a rare cause of acute myocardial infarction in young women (9). Myocardial bridging is usually asymptomatic, but has been related to acute myocardial infarction in patients as young as 15 years in the absence of

risk factors for coronary artery disease and without evidence of coronary atherosclerosis. Coronary artery embolism secondary to infective endocarditis is a well known etiologic factor in the production of acute myocardial infarction in the presence of normal coronary arteries (10).

In our case, the multislice computed tomography coronary angiography demonstrated normal coronary arteries. Multislice computed tomography coronary angiography (MSCT) is a highly accurate, noninvasive imaging technique for the diagnosis of coronary artery disease (CAD); in particular, the negative predictive value of MSCT approaches 100%, allowing CAD to be ruled out (11,12). MSCT coronary angiography provided independent prognostic for predicting cardiac events. Patients with completely absent CAD on MSCT coronary angiography had an excellent prognosis (13).
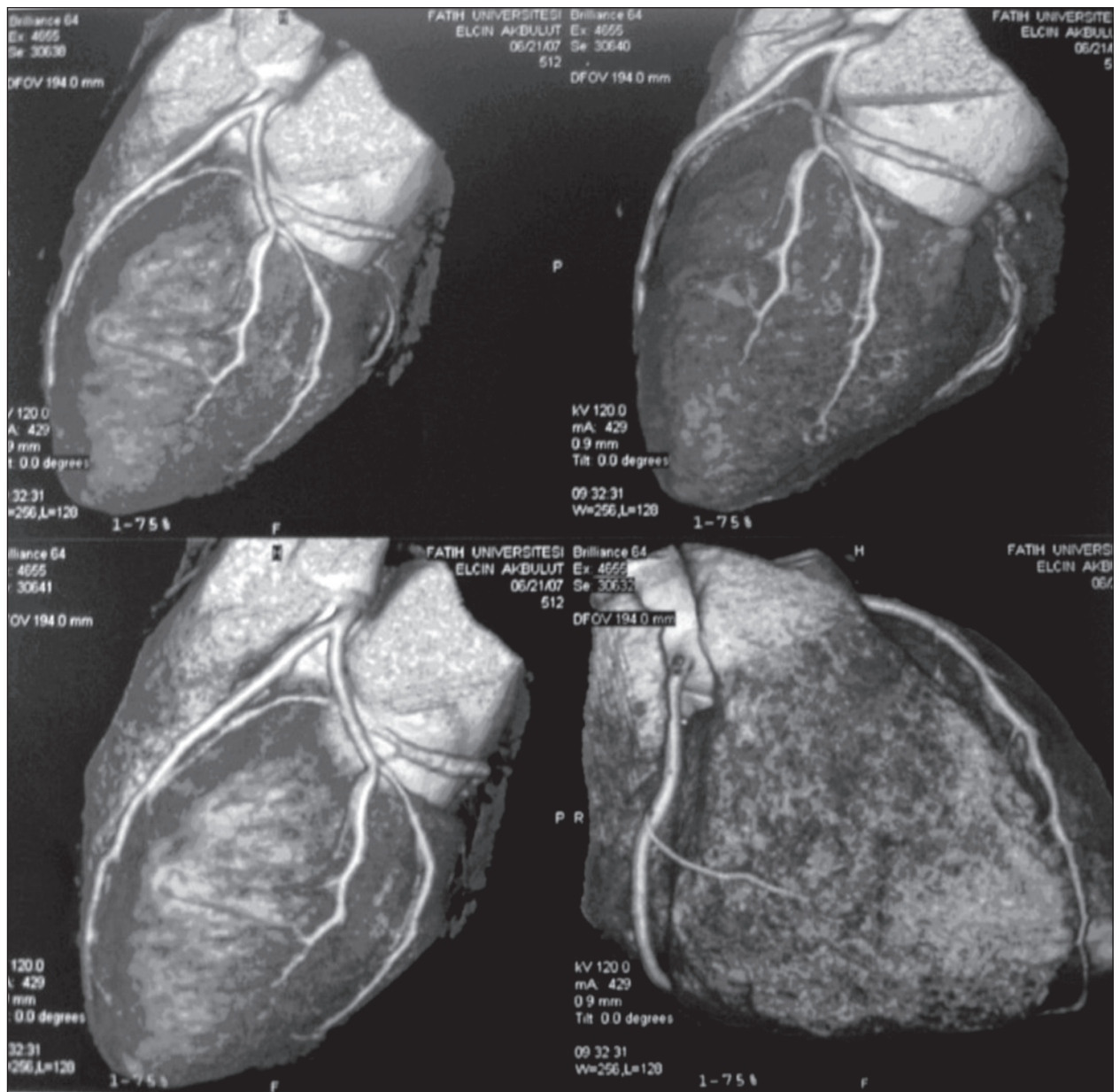
Figure 3. *64-slice multislice computed tomography coronary angiography showing normal coronary arteries.*

Acute plaque complications occur abundantly on minor stenosis more than severe stenosis (14). Invasive coronary angiography is far from being the ideal technique to evaluate the type of atherosclerosis most commonly to acute plaque complications. Alternative techniques are now in search for identifying plaques at risk of rupture. MSCT is feasible to assess coronary plaques with considerable high accuracy (15). İnvasive coronary angiography is not routinely offered in all the younger patients as a significant proportion tend to have normal coronary arteries. The higher risk patients should be referred to the specialists to assess the need for early coronary angiography and intervention (16). The prognosis of patients with normal coronary arteries following myocardial infarction has been reported as generally favourable with an 85-96% survival rate (17).

In conclusion, coronary artery spasm related to endothelial effects of cigarette smoking is a possible
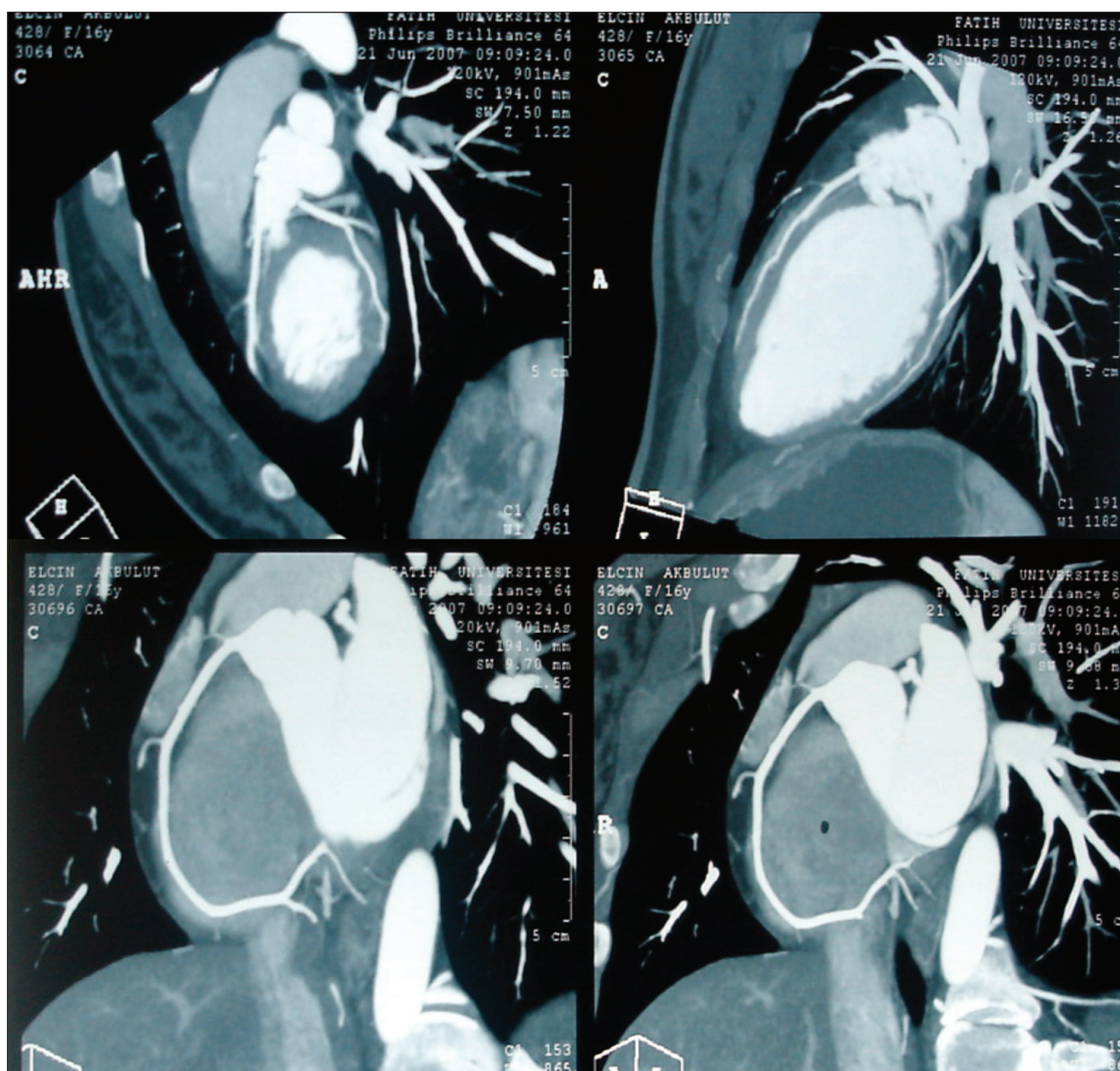
Figure 4. 64-slice multislice computed tomography coronary angiography showing normal coronary arteries.

mechanism of acute myocardial infarction. In young adults smoking may be thought as a predisposed factor. Patients with acute myocardial infarction and normal coronary arteries have usually been reported to have an excellent prognosis. İnvasive coronary angiography may not be offered as a routine choice in all the affected patients because of increased chances of finding a normal coronary artery. MSCT can be prefrred in young patients with normal coronary arteries suffering from myocardial infarction.

Summary Sentence

Acute myocardial infarction may occur in young people with angiographically normal coronary arteries but the pathophysiology of this condition remains unknown. Smoking is a commonly identified risk factor in young patients, suffering from myocardial infarction with normal coronary arteries. MSCT can be used as an alternative first-line imaging modality for the diagnosis of acute myocardial infarction in young patients thought to have normal coronary arteries.

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