Variant Angina Culminating in Coronary Thrombosis and Myocardial Infarction*

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A patient with variant angina is described who developed inferior wall myocardial infarction in the midst of recurrent episodes of rest angina associated with inferior lead ST elevations. Coronary arteriography within six hours of onset of persistent chest pain demonstrated right coronary thrombotic occlusion which was lysed by intracoronary streptokinase and revealed an underlying non-critical coronary stenosis.

Coronary vasospasm has been implicated in the pathogenesis of coronary artery thrombosis and subsequent infarction. Plaque rupture or prolonged stasis facilitating thrombus formation have been postulated as the mechanisms through which vasospasm results in infarction.1,2 Arteriographic demonstration of new vessel occlusion in patients with variant angina following myocardial infarction suggests that vasospasm contributed to thrombus formation.3 However, arteriographic study of a patient with variant angina in the midst of acute infarction has not been reported previously. We report a case of a patient with variant angina culminating in acute infarction who underwent coronary arteriography within six hours following onset of symptoms.

**Case Report**

A 62-year-old man developed new onset rest angina three days prior to admission. On the day of admission, a prolonged episode of angina occurred and persisted for 90 minutes until sublingual nitroglycerin was given en route to the hospital.

The patient was admitted to the CCU where over the next 24 hours serial electrocardiograms demonstrated persistent T wave inversions in leads 3 and aVF (Fig 1A). Serial CPK, SGOT and LDH levels remained normal. Nitroglycerin ointment and oral isosorbide dinitrate were begun. He remained symptom-free until the evening of the 12th hospital day when he developed nitroglycerin-responsive rest angina associated with marked inferior lead ST elevations. Over the next eight hours, multiple brief episodes of symptomatic and asymptomatic inferior ST elevations were noted (Fig 1B). A continuous intravenous nitroglycerin drip was begun at an infusion rate of 100µg/min. Four hours later, an episode of rest angina with inferior ST elevations occurred but failed to respond to sublingual nitroglycerin or intravenous nitroglycerin administered as a bolus. The persistent ST elevation and chest pain indicated an inferior infarction was evolving.

![Figure 1. A. Baseline 12-lead electrocardiogram with inferior repolarization abnormalities. B. Inferior ST-segment elevation with reciprocal lateral changes recorded during episode of chest pain which returned to baseline following sublingual nitroglycerin. Electrocardiogram at onset of infarction was identical, but failed to respond to nitrates. C. Immediate post-streptokinase tracing showing less ST elevation, but appearance of inferior Q waves.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21307/ on 06/25/2017)
DISCUSSION

Most pathologic studies have found a 90 percent or greater incidence of coronary thrombosis in cases of transmural infarction. Coronary angiography during the early hours of infarction frequently demonstrates total occlusion of the vessel supplying the infarcting region. DeWood et al found an 87 percent incidence of total occlusion and a 10 percent incidence of subtotal (95 percent or greater) occlusion within the first four hours from onset of symptoms. Importantly, thrombus was recovered by Fogarty catheterization at the time of emergency coronary bypass grafting in 88 percent of the patients with angiographically demonstrated intraluminal thrombus. These observations are consistent with the pathologic data which point to a frequent association of coronary thrombosis with myocardial infarction.

Oliva and Breckenridge have suggested that coronary vasospasm may result in damage to atheromatous plaques with subsequent platelet activation and thrombus formation. Maseri and colleagues suggested that prolonged spasm could result in stasis with subsequent thrombus formation and infarction. Importantly, a high incidence of infarction is reported in persons with coronary vasospasm. Prinzmetal et al, in their original description, noted that 12 of 32 patients developed infarction. More recently, a longterm study of patients with coronary vasospasm found that 32 of 135 patients (23 percent), followed-up over a period of four years, developed myocardial infarction. Each of these studies documented that the site of myocardial infarction in patients with coronary vasospasm corresponded to the electrocardiographic region demonstrating transient ST segment alterations during anginal episodes.

In an attempt to evaluate the role of vasospasm in infarction, intracoronary nitroglycerin has been administered to patients during the early hours of infarction. Oliva and Breckenridge demonstrated improved distal coronary flow beyond sites of occlusion in six of 15 patients (40 percent) undergoing early angiography who were given intracoronary nitroglycerin and suggested that vasospasm may contribute to myocardial infarction. Recently, larger series of patients have undergone angiography in conjunction with administration of intracoronary nitroglycerin and streptokinase. Unlike Oliva and Breckenridge, these investigators found restoration of blood flow following intracoronary nitroglycerin to be very infrequent. A response to nitroglycerin was seen in only three of 29 in the series of Rentrop et al, and in only two among 20 of Ganz et al, and 41 cases of Mathey and colleagues. These studies suggest that vasospasm is only occasionally operative in acute infarction.

Maseri and associates found evidence of thrombotic material overlying atheromatous lesions at autopsy in two patients with coronary vasospasm and suggested that vasospasm resulted in coronary thrombosis. Holmes and coauthors described arteriographic evidence of coronary thrombi in 16 patients with unstable angina.

Figure 2. A. Initial LAO right coronary angiogram demonstrating occlusion of mid vessel. B. RAO right coronary injection 15 minutes after beginning streptokinase infusion showing re-established flow and thrombus fragment from site of occlusion which was seen to move distally on cineangiogram. C. Final RAO angiogram with 50 percent stenosis at site of previous occlusion.

The patient was considered a candidate for investigational intracoronary streptokinase and after informed consent was obtained, the patient was taken to the cardiac catheterization laboratory. Right coronary angiogram was performed and revealed an occlusion of the mid vessel (Fig 2A), which failed to respond to a 200,000 U bolus of intracoronary nitroglycerin. Intracoronary infusion of streptokinase was then begun at a rate of 4,000 IU/min. The time elapsed between onset of ST elevation and start of infusion was six hours. Repeat angiography at 15 minutes after infusion demonstrated fragmentation of intraluminal thrombus with restoration of distal flow (Fig 2B). Streptokinase was continued for 75 additional minutes. Final angiography revealed a 50 percent narrowing at the site of previous occlusion (Fig 2C). Following catheterization, continuous infusion heparin and oral nifedipine were begun. Post infusion electrocardiogram documented evolving inferior Q waves (Fig 1C) and a peak CPK of 1,400 IU/L was recorded. No further episodes of chest pain or ST elevation were noted during the remainder of the hospitalization.
The present case is unique in that thrombosis was angiographically demonstrated during the midst of acute infarction in a vessel which had recently undergone episodes of reversible vasospasm. Although we did not demonstrate vasospasm angiographically before infarction, or attempt to provoke vasospasm following thrombolysis, the multiple episodes of rapidly reversible nitrate-responsive inferior wall ST segment elevation, coupled with the presence of an underlying noncritical stenosis, provides strong circumstantial clinical evidence of vasospasm, although transient occlusion by platelet thrombi could conceivably present similarly. Interestingly, we were unable to uncover evidence of persistent vasospasm using nitroglycerin administered into the occluded vessel. This observation suggests that failure of an intracoronary vasodilator drug to restore blood flow at the time of angiography does not exclude earlier vasospastic contribution to development of coronary thrombosis. The frequency with which vasospasm is an important precipitating event in coronary thrombosis remains to be determined. It may be a more frequent feature than the arteriographic studies done during the early hours of infarction would suggest, since, as our case illustrates, vasospasm may no longer be evident by the time coronary arteriography is undertaken.

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REFERENCES

Adverse Effects of Atropine on the Sinus Node in Familial Amyloid Polyneuropathy*  

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Electrophysiologic studies were performed in a 33-year-old man with familial amyloid polyneuropathy (FAP) before and after administration of atropine, 1 mg intravenously. Atropine induced prolongation of the sinus node cycle length, sinoatrial conduction time, and sinus nodal recovery time. These findings indicate that the therapeutic doses of atropine may be useless or potentially detrimental for bradycardic rhythms or sinoatrial conduction disturbances in some patients with FAP.

The abnormalities of cardiac rhythm, conduction disturbances, and arterial hypotension have been frequently reported as the involvements of the cardiovascular system in familial amyloid polyneuropathy (FAP), which is a hereditary disease characterized mainly by sensorimotor polyneuropathy with or without autonomic dysfunction. For a correct diagnosis and treatment of cardiac arrhythmias in FAP, the assessment of the effects of the altered autonomic nervous system on the cardiac conduction system (CCS) may be important, since the CCS is greatly influenced by the autonomic nervous system. In this report, we investigated the effects of atropine on the CCS in a patient with FAP in Arah, Japan.

CASE REPORT
A 33-year-old man was admitted on May 27, 1980, to the Kumamoto University Hospital complaining of diarrhea, weight loss, and paresthesia in his legs. He had a family history of disorders similar to FAP. On admission, he was emaciated. The pulse rate was 80/min and regular. The blood pressure was 120/72 mm Hg in the supine position. There were muscular weakness and atrophy in both the distal and proximal portions of the extremities. Sensations to touch, pain, and temperature were disturbed bilaterally on the legs. Sural nerve biopsy specimens showed amyloid deposition around the nerve fibers. The ECG revealed a prolonged PR interval of 0.23 sec and nonspecific abnormalities in ST segment and T wave. Electrophysiologic studies were performed using a multichannel oscilloscope.

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