

A 50-year-old female, diabetic patient with chest pain and dizziness

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Article Info

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Presentation of Case

Dr. Dharmendra Joshi (Resident): A 50-year-old female got admitted on June 18, 2019 with complaints of central chest pain for three years and dizziness for the last two months. The chest pain was compressive in nature, moderate to severe in intensity and radiating to the medial side of the left upper limb and neck. It used to get aggravated during exertion and initially relieved by taking rest but later she had to take medicine to relieve the chest pain. The pain was not associated with meal, palpitation, dyspnoea, cough or fever. She also complained of dizziness and easy fatigability while walking for the last two months. But she never suffered syncope or loss of consciousness. She had developed non-ST elevated myocardial infarction about three months back. She was known as a case of hypertension and diabetes mellitus under medications for the last ten years. She had no other known chronic illness like bronchial asthma, bleeding dyscrasias and had never undertaken any major surgical procedure.

Her general examinations revealed otherwise normal finding except she had pale complexion with moderate anemia and her pulse was 55 per min, regular but low volume. Her blood pressure was recorded (160/60 mmHg). All the systemic examinations viz cardiovascular, respiratory, abdominal and central nervous systems revealed normal findings. Then she was further investigated with routine and specific investigations (Table I). All preoperative laboratory investigations, chest X-ray, electrocardiography, echocardiography and coronary angiography were performed. Hemoglobin level was 7.6 g/dL which was corrected to 11.6 g/dL by blood transfusion (2 units) before operation. Her fasting blood sugar was within normal limit with antidiabetic medications. She had also urinary tract infection as revealed by urine examination which was treated preoperatively. The chest X-ray was normal. ECG showed complete heart block with left bundle branch block (Figure 1) but echocardiography finding was normal with 65% left ventricular ejection fraction. Coronary angiography diagnosed the case as triple vessel coronary artery disease (Table II).

Based on the history, physical examinations and investigation findings, we would like to draw a provisional diagnosis.

Provisional Diagnosis

Triple vessel coronary artery disease with complete heart block

Differential Diagnosis

Angina pectoris

Dr. Redoy Ranjan (Assistant Professor): The pathophysiology of angina pectoris is myocardial ischemia resulting from an imbalance between blood supply and oxygen demand of myocardium. Typical clinical features of angina pectoris include retrosternal chest discomfort which may be described as compressing, heaviness, squeezing, burning or choking sensation. Some may complain of frank pain lasting for just about 1-5 min, which may be localized in the epigastrium, neck, jaw, back or shoulders and precipitated by some sort of exertions and relieved by rest or medication (nitroglycerin) and the intensity of pain is constant with respiration, cough or posture change.

The clinical examinations of the patients with angina pectoris may be normal. However, some patients may show positive Levine test and signs of diffuse atherosclerosis due to abnormal lipid metabolism. Chest X-ray may be normal but the patients with previous myocardial infarction, ischemic cardiomyopathy, pericardial effusion, etc. may show cardiomegaly. Recently, graded exercise stress testing is utilized widely along with ECG, echocardiography or myocardial perfusion scintigraphy. Coronary artery calcium scoring by fast computer tomography may be employed in selected cases. The diagnostic test is coronary angiography which helps to assess the anatomic extent and measure the severity of coronary artery disease.¹

Myocarditis

Dr. Md. Ata Ullah (Medical Officer): Myocarditis is a challenging differential diagnosis because it quite well resembles an acute coronary



Table I

Laboratory data

Variables	Findings	Reference range
Hemoglobin (g/dL)	7.6	11.5-16
Total count (x10 ⁹ /L)	11.0	4.0-11.0
Differential count		
Neutrophil (%)	62	40-70
Lymphocyte (%)	33	20-40
Monocyte (%)	3	02-08
Eosinophil (%)	2	01-07
Basophil (%)	0	00-01
ESR (mm in 1st hour)	81	00-15 (f)
ABO	"A" Positive	
VDRL	Non-reactive	
HBsAG	Negative	
Anti-HCV	Negative	
Anti-HIV	Negative	
Bleeding time (min)	3 min 30 sec	2-7 min
Clotting time (min)	5 min 30 sec	6-9 min
Serum creatinine (mg/dL)	1.1	0.5-1.3
Serum bilirubin (total) (mg/dL)	0.4	Adult up to 1.1 mg/dL
Serum aspartate transaminase (U/L)	44	14-63
HbA1c (%)	6.0	<6.1
TSH (uIU/mL)	0.50	0.3-4.5
International normalized ratio	1.08	

syndrome including an ST-segment elevation myocardial infarction. Easily available tests like echocardiography and cardiac serum biomarkers may be normal and even if abnormal, it is not reliable with enough specificity to differentiate acute coronary syndrome and myocarditis. If coronary angiography shows no atherosclerotic stenosis or occlusions, an endomyocardial biopsy could be the gold standard to diagnose myocarditis. However, it could not be used in all patients because of its invasiveness and limited sensitivity. Nuclear techniques may be used with high sensitivity but limited specificity for the diagnosis of myocarditis. However, it is not easily available and there are risks of radiation. Cardiac magnetic resonance is currently one of the safe non-invasive modalities for diagnosis of myocarditis, even in patients with an acute coronary syndrome like presentation and normal coronary angiography finding, because it can identify alternative etiologies and detect myocardial edema, hyperemia, necrosis and fibrosis in a safe and reproducible fashion.²

Bradycardia and other forms of heart block

Dr. Sanjoy Saha (Consultant Anesthesiologist): The sinus rhythm with a rate of less than 60 beats per min is called sinus bradycardia, with uniform and normal P wave, PR interval and PP intervals. The sinus bradycardia may be normal in some individuals like highly trained athletes may have a normal heart rate of 30-40 beats/min, due to increased vagal tone. Bradycardias may be either regular or irregular. First and third-degree heart blocks usually show regular bradycardia. Electrophysiologically, first-degree heart block may be defective in anywhere among the atrial fibers, the AV node or the His-Purkinje system.

Second-degree heart block is usually presented with an irregular rhythm. However, some of the patients may sometimes have a regular rhythm as well. It can be classically categorized into two types viz Mobitz Type I and II. ECG of second-degree AV block may reveal normal P waves and QRS complexes but the QRS complexes are not regularly followed by some P waves. It indicates that atrial impulses are not reaching ventricles. However, the dropped beat may be observed when PR interval progressively lengthens until an atrial impulse failed to reach the ventricle which represents a non-conducted P wave.

Third-degree heart block is also known as complete heart block and it usually has regular rhythm with ECG showing constant PP and RR intervals, but variable PR intervals. In complete heart block, the atrial pacemaking may be from SA node or ectopic which could be tachycardic or bradycardic while the lower pacemaking may be junctional or ventricular. The width of QRS complexes and ventricular contraction rates are determined by the location of

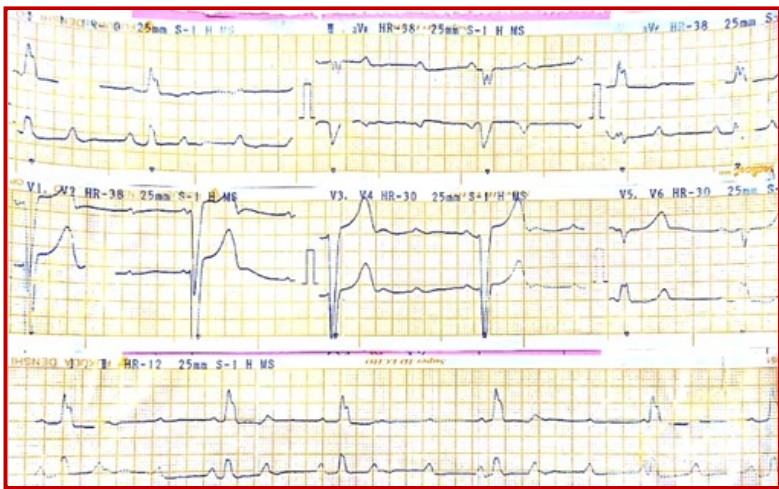


Figure 1: ECG of the patient showing complete heart block with left bundle branch block

Table II

Coronary angiogram findings

Vessels	Findings
Left main	Normal
Left anterior descending	70-75% lesion at distal part
Left circumflex	80-85% osteo-proximal lesion. Narrow caliber vessel with 70-75% lesion at mid part
Right coronary artery	Dominant vessel. 85-90% lesion at mid part with distal chronic total occlusion
Left internal mammary artery	Normal

lower pacemaker. [3-7, 20, 21](#)

Gastrointestinal disorders

Dr. Joshi: There are many common gastrointestinal conditions that may be present as acute coronary disease like acute cholecystitis, acute pancreatitis, perforated peptic ulcer, hiatal hernia, esophageal diseases, cardiac spasm and splenic flexure syndrome. Among all these differential diagnoses, acute pancreatitis may be challenging to be ruled out while considering coronary artery disease. Both of them may be presented with shock, with or without pain and similar ECG. The splenic flexure syndrome is quite straight forward in diagnosing but it can sometimes mimic pain of acute myocardial infarction, which can be ruled out by normal ECG and characteristic X-ray findings.⁸

Dr. Joshi's Diagnosis

Triple vessel coronary artery disease with complete heart block

Discussion

Dr. Ranjan: How will you then proceed with your diagnosis?

Dr. Joshi: In spite of enhancement in the management of coronary artery disease, complete heart block seems to continue to complicate acute myocardial infarction. Huge improvement in the management of second- and third-degree heart block can be observed with the data that it was recorded about 5 to 7% (with acute myocardial infarction) and 28% (inferior myocardial infarction) during the prethrombolytic era while it was dropped to 6.9% with inferior myocardial infarction in the thrombolytic era. Different risk factors have been advocated for its occurrence, major of them includes age, female sex, smoking, hypertension, and diabetes.^{9,10} Many patients with coronary artery disease with complete heart block may be asymptomatic but usually present with the history of myocardial infarction and dizziness, syncope, central compre-

ssive or squeezing type of chest pain radiating to neck, epigastrium or left side of arm. The physical findings may be normal or the patients may have regular or irregular heartbeat with bradycardia of variable rate depending on the type of heart block. The case should be further evaluated with different investigation modalities.^{11,12,19}

Dr. Ullah: What investigation modalities will you choose to confirm your diagnosis?

Dr. Ranjan: With the fact that coronary artery disease and heart block can be asymptomatic, the diagnosis of the diseases may be sometimes difficult. When the patient with risk factors present with typical signs/symptoms of chest pain or exercise intolerance, weakness, dizziness, angina, and/or syncope, certain investigations may play a vital role in the diagnosis like standard 12 lead ECG, Holter ECG or external loop recorder or implantable loop recorder, and electrophysiology study.¹³⁻¹⁵ Conventional or computer tomography coronary angiogram generally provides the definitive diagnosis of coronary artery disease. Simple 12 Lead ECG and coronary angiography are usually enough for the diagnosis of typical cases of heart block and coronary artery disease respectively.¹⁵⁻¹⁷

Dr. Saha: What are the treatment plans for this case?

Prof. Asit Baran Adhikary: It is very important to understand the coronary arterial supply along with the conduction system of the heart during medical or surgical management of coronary artery disease complicated by AV block. An understanding of associated structures and their connection along with their blood supply provides general management plan for the patient. SA node is supplied by sinus nodal artery (right coronary artery 60%, left circumflex artery 40%), AV node is supplied by AV nodal artery (posterior descending artery (of right coronary artery) 90%, left circumflex artery 10%).^{3,14}

It is generally seen that heart block complicating coronary artery disease is usually resolved spontaneously or with revascularization within days or weeks. However, about under 10% of the cases may require permanent pacemaker placement. So, if the AV block is reversible, permanent pacemaker placement is not recommended as it has no outcome benefits. Even in the cases of heart block with anterior myocardial infarction with a large area of myocardial necrosis and new-onset bundle branch block has no proved benefit of pacemaker placement. However, complete heart block with inferior myocardial infarction is the indication for permanent pacing if it is not resolved by revascularization.^{13,18,23}

So, we are proposing the placement of temporary pacemaker preoperatively, followed by revascularization by off-pump coronary artery bypass graf-

ting.

Dr. Joshi: Why do you propose the placement of preoperative temporary pacemaker in this case?

Dr. Ullah: Pacemaker is implanted to treat bradyarrhythmias, tachyarrhythmias, some types of syncope and heart failure in the later stages. The main deciding factor for pacemaker implantation is the presenting symptom of bradyarrhythmia or tachyarrhythmia. Symptomatic bradycardia leads to the development of syncope, dizziness and confusion due to reduced cerebral blood flow.^{18, 22}

Our patient was having symptoms of complete heart block. So, we consider to keep temporary pacemaker *in situ* while doing off-pump coronary artery bypass grafting for prevention of complications like sudden cardiac arrest during operation as we are proposing off pump coronary artery bypass grafting.

Dr. Ullah: What are the complications we should keep in mind for this patient?

Dr. Ranjan: During off-pump coronary artery bypass grafting complicated by complete AV block, there are a few major complications that may need to be tackled. It may be difficult to achieve adequate exposure of the anastomotic site because of restrained cardiac motion. Myocardial protection may be compromised due to unforeseen ischemia. It is necessary to displace the heart or compress the ventricular wall properly and various techniques for smooth coronary blood supply are adopted while performing the anastomoses. Hence, severe hemodynamic deterioration, transient impairment of cardiac pump function and newly onset intraoperative acute myocardial infarction should be anticipated by surgeons and anesthetist. All preparation to convert the off-pump coronary artery bypass grafting into on-pump coronary artery bypass grafting should be taken if it is indicated by sustained ventricular fibrillation or cardiovascular collapse.²⁴⁻²⁶

Prof. Adhikary: What are the points to be considered intra-operatively from the anesthetic point of view?

Dr. Saha: Like the surgeons, anesthetists should also consider a few major issues during off pump coronary artery bypass grafting complicated by AV block. It is better to anticipate beforehand that it could be difficult to maintain hemodynamic stability while coronary arteries are assessed and anastomoses are done. The management of intraoperative myocardial ischemia when coronary flow must be interrupted to some extent during grafting may be another challenge. Recent researches indicate volatile anesthetics during such operation as it is found to be more cardioprotective against ischemia. Anesthetists and surgeons must work as a team during off-pump coronary artery bypass

grafting surgery, keeping in mind other's constraints.²⁷⁻³⁰ From the anesthetic point of view, just like other cardiovascular surgeries, we should take optimal precaution and planning. Proper monitoring of the patient throughout the procedure, adequate heparinization, acidosis and the other parameters should be considered. All the medicines that may cause further bradycardia should be stopped preoperatively and continuous monitoring of the heart rate and functionality of the temporary pacemaker should be made certain throughout the procedure.

Dr. Ranjan: How was the immediate post-operative period?

Prof. Adhikary: We kept the temporary pacemaker *in situ* up to 5th post-operative day. When the bradycardia gradually improved, we considered about the removal of temporary pace-maker. However, we continued to keep the right ventricular epicardial pacing wire *in situ* up to 7th post-operative day but it was not required. Later the patient developed sinus rhythm. So, it was also removed and the patient was discharged on 8th post-operative day with proper treatment and advice.

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