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Myocardial Infarction

Sarah Robinson

Otterbein University, sarah.robinson@otterbein.edu

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Myocardial Infarction
Otterbein University, Westerville, Ohio
Sarah Robinson, BSN, RN, CCRN

Introduction
Cardiovascular disease is a term used to refer to pathologies affecting the structure and function of the heart and blood vessels (Stewart, Mattern, & Wilkinson, 2017). The most common type of cardiovascular disease is coronary artery disease (Center for Disease Control and Prevention, 2017a). A severe complication of coronary artery disease (CAD) is myocardial infarction (MI), commonly known as a heart attack (CDC, 2017). It is estimated that in the United States every 40 seconds a person suffers from a myocardial infarction, resulting in approximately 650,000 myocardial infarctions every year (CDC, 2017a). Coronary artery disease is primarily considered a preventable condition (Stewart, Mattern et al., 2017). As an acute care unit nurse, and future ARN it is imperative to understand CAD and the associated risk factors to effectively care for and educate patients. Patient education is critical in reducing the incidence of myocardial infarction in the United States, which is thought to risk factor modification.

Case Study
A 57-year-old man presents to the emergency room with complaint of great left chest pain and shortness of breath that started 30 minutes ago. The patient is pale and diaphoretic, and is now complaining of nausea. A electrocardiogram (ECG) is completed, which shows ST-segment elevations (leads II, III, and aVF). A hospital-wide STEMI alert is initiated, notifying the interventional cardiologist and cardiac cath lab. The emergency room staff begins preparing the patient for emergent percutaneous coronary intervention (PCI).

Underlying Pathophysiology
• The heart receives oxygenated blood from the aorta via the coronary arteries. Myocytes also known as muscle cells, require a continuous supply of oxygenated blood for proper functioning.
• Atherosclerosis is a process through which lipid laden macrophages accumulate within the arterial wall to form lesion called a plaque, resulting in thickening and hardening of the vessel (McCance & Huether, 2018). Coronary artery disease is a narrowing of the coronary arteries, most commonly caused by atherosclerosis (Mendis et al., 2015). Myocardial ischemia occurs when the coronary arteries are unable to deliver enough oxygen and nutrients to meet the demand of the myocardium (McCance & Huether, 2018). When ischemia to the myocardium is prolonged, myocardial infarction occurs resulting in irreversible damage and necrosis of the myocardium. Damage to the myocardium can result in abnormal electrical impulses, decreased contractility, and impaired ejection of blood into the pulmonary and/or systemic circulation (Davies, 2016). Myocardial infarction can be classified clinically as a non-ST-segment elevation MI (NSTE-AMI) or ST-segment elevation MI (STEMI). Both classifications have specific criteria that include antithrombotic and PCI. Percutaneous coronary intervention includes angioplasty, stent placement, and thrombolytic therapy.

• NSTE-ami: plaque rupture/narrowing with non-discrete thrombus
• STEMI: plaque rupture/narrowing with discrete thrombus

Signs & Symptoms
• Chest pain or discomfort
• Palpitations vary among patients, and is frequently described as crushing, substernal pressure, or squeezing.
• Radiation to the arms, neck, or jaw, or common to the left side
• Dyspnea
• Lightheadedness
• Pale, cool, diaphoretic
• Palpitations
• Nausea with possible vomiting
• Low grade pyrexia
• Hyperglycemia or hyperthermia
• Atypical symptoms are often present in older people, women and individuals with diabetes (Peate & Jones, 2014; McCance & Huether, 2018). Potentially complications of myocardial infarction include cardiogenic shock, heart failure, mitral valve regurgitation, ventricular septal rupture, dysrhythmias, pericarditis, and paralytic ileus (Davies, 2016). Understanding the pathophysiology of myocardial infarction provides nurses and healthcare providers with the knowledge necessary to educate patients on how to recognize signs and symptoms of a MI, how a MI can be prevented.

Modifiable Risk Factors
• Diabetes mellitus and prediabetes
• Hypertension
• Hypercholesterolemia
• Unhealthy diet and sedentary lifestyle
• Smoking

Non-modifiable Risk Factors
• Advanced age
• Male gender
• Family history
• Race

Blood test done, lining blood flow

Diagnosis
According to the Fourth Universal Definition of Myocardial Ischemia and Infarction, a diagnosis that requires intervention to restore coronary blood flow, the affected myocardium becomes cyanotic within 8 to 10 seconds of decreased blood flow, and changes become visible within 30 to 60 seconds of asphyxia. Approximately 20 minutes of ischemia, cellular death occurs (McCance & Huether, 2018). According to the basis of damage to the myocardium depends on the location of the infarct and length of time before restoration (McCance & Huether, 2018). Recognition of signs and symptoms is one of the following (Thygesen et al., 2018):• Symptoms of myocardial ischemia (Electrocardiographic changes new or presumed ischemia (ST-segment changes, T-wave changes or left bundle branch block))• Development of pathological Q waves on electrocardiogram• Imaging evidence of viable myocardium or no new regional wall motion abnormality• Coronary thrombus identified by angiography or autopsy

Treatment
• NSTE-ami: administration of antithrombotic and anticoagulant, possible PCI (McCance & Huether, 2018).
• STEMI: early reperfusion therapy with administration of antithrombotic and anticoagulant, and PCI. If PCI is unachievable, fibrinolytic (O’Gara et al., 2013).

Implications for Nursing Care
• Recognize signs and symptoms of myocardial ischemia and infarction
• Continuous monitoring for new ECG changes
• Frequent monitoring of BP, HR, rhythm, and SpO2
• Cardiac assessment for abnormal heart sounds (S3, S4), strength of pulses, presence of jugular venous distention, skin color and temperature (Peate & Jones, 2014)
• Pulmonary assessment for breath sounds, presence of cratters, respiratory effort, and shortness of breath (Peate & Jones, 2014)
• Administration of medications, which could include antithrombotic therapy, anticoagulants, nitrates, diuretics, vasodilators, and anesthetics (Rollins & Angello, 2015; Peate & Jones, 2014)
• Monitor PCI access sites for complications such as bleeding, hematoma, stent thrombosis, or periprocedural bleeding (O’Gara et al., 2013). Complications should be immediately reported to the healthcare team.
• Manage hematoma device or arterial sheath as indwelled.
• Patient education is essential for a patient who has been diagnosed with a myocardial infarction. Education should focus on how to take medications including why they were prescribed, medication, exercise, smoking cessation, and management of other risk factors. The patient should also be educated on cardiac rehabilitation programs and when to follow up with a physician (Ansony & Karren, 2016).

References

Myocardial infarction is a life threatening condition that requires early intervention. If coronary blood flow is not quickly restored, myocardial ischemia will progress to cell death and necrosis (Thygesen et al., 2018). Healthcare providers must be able to recognize the signs and symptoms of a myocardial infarction so early reperfusion therapy can be initiated to reduce morbidity and mortality.

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Conclusions
References (continued)

Figure 2. Myocardial infarction due to an occlusive thrombus (Mayo Clinic, 2018).

Figure 1. Development of atherosclerosis. (Mayo Clinic, 2019).