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Myocardial Infarction
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Introduction
• Cardiovascular disease is a term used to refer to pathologies affecting the structure and function of the heart and blood vessels (Stewart, 2017). The most common type of cardiovascular disease is coronary artery disease (Center for Disease Control and Prevention, 2017).
• A serious 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 150,000 myocardial infarctions every year (CDC, 2017). Coronary artery disease is primarily considered a preventable condition (Stewart, 2017; Wilkinson, 2014). As an intensive care unit nurse, and future ARNP it is imperative to understand CAD and the associated risk factors to effectively care for and educate patients. Patient education is crucial in reducing the incidence of myocardial infarction in the United States and high risk factor modification.

Case Study
A 57-year-old man presents to the emergency room with complaint of chest pain and shortness of breath that started 30 minutes ago. The patient is pale and diaphoretic, and is now complaining of nausea. A history of myocardial infarction pattern type 2 diabetes mellitus, hypertension, and hyperlipidemia. An electrocardiogram (EKG) is completed, which shows ST-segment elevation myocardial infarction (STEMI). The patient is taken emergently to the cardiac 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. (Huether, 2018).
• Atherosclerosis is a process through which lipid-laden macrophages accumulate within the arterial wall to form a lesion called a plaque, resulting in thickening and hardening of the arterial wall (McCance & Huether, 2018).
• Coronary artery disease is a narrowing of the coronary arteries, most commonly caused by atherosclerosis (Andrus, 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 circuitry (Stewart, 2017).

Significan t Pathophysiology
• Myocardial infarction is a time point in the timeline of treatment that requires intervention to restore coronary blood flow. The affected myocardium becomes cyanotic within 8 to 10 seconds of decreased coronary blood flow. When approximately 20 minutes of ischemia, cardiac death occurs (McCance & Huether, 2018). It is important to delay the administration of medication to the myocardium depending on the location of the infarct and length of time before reperfusion (Stewart, 2017). Possible complications of myocardial infarction include cardiogenic shock, heart failure, mitral valve regurgitation, ventricular septal rupture, dextrocardia, participation, and sudden death (O’Gara et al., 2013). Understanding the pathophysiology of myocardial infarction provides nurses and healthcare providers with the knowledge required to educate patients on how to recognize signs and symptoms of a MI, how a MI can be prevented.

Modifiable Risk Factors
• Diabetes mellitus (type 1 and type 2)
• Hypertension
• Hyperlipidemia
• Obesity
• Unhealthy diet and sedentary lifestyle

Non-modifiable Risk Factors
• Age
• Male gender
• Family history
• Race

Signs & Symptoms
• Chest pain or discomfort
• Fatigue or weakness
• Shortness of breath
• Nausea with possible vomiting
• Low grade pyrexia
• Hypotension or hypertension
• Altered mental status

Diagnosis
According to the Fourth Universal Definition of Myocardial Infarction (McCance & Huether, 2018), a myocardial infarction is a condition when there is acute myocardial injury detected by a rise and/or fall of cardiac troponin (cTn) values with at least 1 value above the 99th percentile upper reference limit (URL), and clinical evidence of acute myocardial ischemia as evidenced by at least one of the following (Thygesen et al., 2018): (1) Symptoms of myocardial ischemia (Electrocardiographic changes new or presumed new ischemia (ST-segment changes, T-wave changes or left bundle branch block) (2) Imaging evidence of viable myocardium or new or regional wall motion abnormalities (3) Coronal thrombus identified by angiography or autopsy (Thygesen et al., 2018).

Treatment
• NSTE-: administration of antplatelet and anticoagulants, possible PCI (McCance & Huether, 2018)
• STE: early reperfusion therapy with administration of antplatelet and anticoagulant, and PCI if ICD is unresponsive to anticoagulant therapy

Implications for Nursing Care
• Recognize signs and symptoms of myocardial ischemia and infarction
• Continuous monitoring for new ECG changes
• Frequent monitoring of BP, HR, oxygen saturation, and SpO2
• Cardiac assessment for abnormal heart sounds (S3, S4), strength of pulses, presence of jugular venous distension, skin color and temperature (Peate & Jones, 2014)
• Pulmonary assessment for breath sounds, presence of crackles, respiratory effort, and shortness of breath (Peate & Jones, 2014)
• Administration of medications, which could include antithrombotic therapy, anticoagulants, nitrates, diuretics, and vasodilators (Peate & Angiolillo, 2015; Peate & Jones, 2014)
• Monitor PCI access site for complications such as bleeding, hematoma, aneurysm, or retroperitoneal bleeding (O’Gara et al., 2013). Complications should be immediately reported to the healthcare provider
• Manage hemostasis device or arterial sheath as indicated
• 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, modification, exercise, smoking cessation, and management of risk factors. The patient should also be educated on cardiac rehabilitation programs and when to follow up with a physician (Anesy & Karmann, 2016).

References

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

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

Figures (continued)