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Myocardial Infarction

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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, Manmathan, & Wilkinson, 2017). The most common type of cardiovascular disease is coronary artery disease (Center for Disease Control and Prevention [CDC], 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 790,000 myocardial infarctions every year (CDC, 2017).
- Coronary artery disease is primarily considered a preventable condition (Stewart, Manmathan, & Wilkinson, 2017). As an intensive care unit nurse, and future APRN it is imperative to understand CAD and the associated risk factors to effectively care for and educate patients. Patient education is pivotal in reducing the incidence of myocardial infarction in the United States through risk factor modification.

Case Study

- A 57-year-old man presents to the emergency room with complaints 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 health history reveals the patient has type 2 diabetes mellitus, hypertension, and dyslipidemia. An electrocardiogram (ECG) is completed, which shows ST segment elevation in 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 prepping 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. (Davies, 2016).
- 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 vessel (McCance & Huether, 2018).
- Coronary artery disease is a narrowing of the coronary arteries, most commonly caused by atherosclerosis (Andrus 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-elevation MI (NSTEMI) or ST-elevation MI (STEMI). Both classifications have specific treatment guidelines that include antithrombotic therapy and PCI. Percutaneous coronary intervention includes angioplasty, stent placement, and thrombectomy.

- NSTEMI: plaque rupture/erosion with non-occlusive thrombosis
- STEMI: plaque rupture/erosion with occlusive thrombosis (Thygesen et al., 2018)

Significance of Pathophysiology

- Myocardial infarction is a time sensitive condition that requires intervention to restore coronary blood flow. The affected myocardium becomes cyanotic within 8 to seconds of decreased blood flow. ECG changes become visible within 30 to 60 seconds of hypoxia. After approximately 20 minutes of ischemia, cellular death occurs (McCance & Huether, 2018).
- The amount of damage to the myocardium depends on the location of the infarct and length of time before reperfusion (Davies, 2016).
- Potential complications of myocardial infarction include cardiogenic shock, heart failure, mitral valve regurgitation, ventricular septal rupture, dysrhythmias, pericarditis, 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, and how a MI can be prevented.

Modifiable Risk Factors

- Diabetes mellitus
 - Dyslipidemia
 - Hypertension
 - Overweight and obesity
 - Unhealthy diet and sedentary lifestyle
 - Smoking
- (Peate & Jones, 2014)

Non-modifiable Risk Factors

- Advanced age
 - Male gender
 - Family history
 - Race
- (Peate & Jones, 2014)

Signs & Symptoms

- Chest pain or discomfort
 - Pain characteristics vary among patients, and is frequently described as crushing, substernal pressure, or squeezing.
 - Radiation to the arm, shoulder, neck, or jaw is common, often to the left side.
- Dyspnea
- Fatigue
- Lightheadedness
- Pallor
- Diaphoresis
- Palpitations
- Nausea with possible vomiting
- Low grade pyrexia
- Hypotension or hypertension
- Atypical symptoms are often present in older people, women, and individuals with diabetes (Peate & Jones, 2014; McCance & Huether, 2018).

Diagnosis

According to the Fourth Universal Definition of Myocardial Infarction, a diagnosis of myocardial infarction is appropriate 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):

- Symptoms of myocardial ischemia
- Electrocardiographic changes indicating new or presumed new ischemia (ST-segment changes, T-wave changes or left bundle branch block)
- Development of pathological Q waves on electrocardiogram
- Imaging evidence of viable myocardium loss or new regional wall motion abnormality
- Coronary thrombus identified by angiography or autopsy (Thygesen et al., 2018)

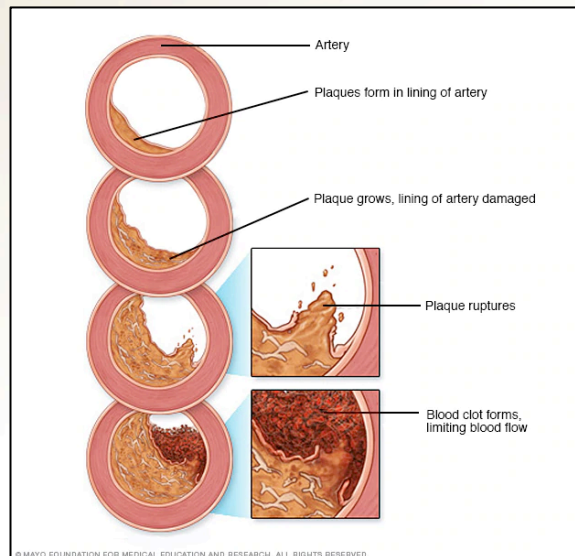


Figure 1. Development of atherosclerosis. (Mayo Clinic, 2019)

Treatment

- NSTEMI: administration of antiplatelet and anticoagulant, possible PCI (McCance & Huether, 2018)
- STEMI: early reperfusion therapy with administration of antiplatelet and anticoagulant, and PCI. If PCI is unavailable administration of a 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, respiration rate, 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 crackles, respiratory effort, and shortness of breath (Peate & Jones, 2014)
- Administration of medications, which could include antiplatelet therapy, anticoagulants, nitrates, diuretics, inotropes, and analgesics (Rollini & Angiolillo, 2015; Peate & Jones, 2014).
- Monitor PCI access site for complications such as bleeding, hematoma, pseudoaneurysm, 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, diet modification, 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 (Aroesty & Kannam, 2018).

Conclusions

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.

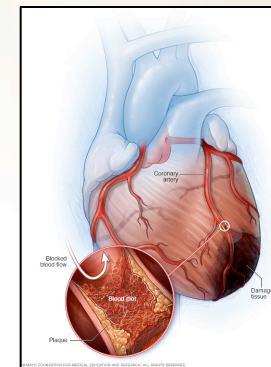


Figure 2. Myocardial infarction due to an occlusive thrombus (Mayo Clinic, 2018).

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