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Coronary Artery Disease

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Introduction

Coronary artery disease (CAD) is a highly prevalent disease in the United States population. U.S. healthcare cost related to CAD was over $326,000,000,000 annually in 2010. The cost is expected to rise 42% by 2040 (Odden, et al., 2011, p.829). CAD is a major burden for the U.S. healthcare system projected to worsen with the aging of the population.

Coronary artery disease directly impacts my current practice in the Cardio-Vascular Intensive Care Unit (CVICU). Working in the CVICU, a large percentage of the patient population has undergone Coronary Artery Bypass Grafting (CABG). CABG surgery is performed on patients who have developed CAD. Furthering my pathological knowledge of this disease state will improve the quality of education I can deliver to my patients. This project should also improve the level of care I deliver by deepening my insight into this disease.

Additionally, I have a strong family history of CAD, so it is of personal interest.

Signs and Symptoms

Coronary artery disease is a silent disease process until it progresses to a symptomatic stage. According to the National Heart, Lung and Blood Institute (2010), some people with CAD show no signs or symptoms until they are having a heart attack, arrhythmia, or heart failure. Other people develop signs and symptoms before they develop these related conditions. CAD causes myocardial ischemia, which can present as stable angina or precipitate angina.

Signs and symptoms of myocardial ischemia may include left sternal chest pain, chest tightness or pressure, shortness of breath, diaphoresis, and pallor (McCance & Huether, 2014, p.1154). After coronary artery disease has progressed; heart failure, arrhythmia, and myocardial infarction (heart attack) can cause more severe signs and symptoms. Myocardial infarction (MI) is a serious consequence of advanced CAD. The signs and symptoms of a heart attack include sudden crushing chest pain, described as “an elephant sitting on my chest” (McCance & Huether, 2014, p.1160).

Pathophysiology

Coronary artery disease is the result of atherosclerosis in the arterial vessels of the heart. Atherosclerosis is also responsible for renal artery stenosis, carotid artery stenosis, and lower extremity peripheral artery disease (Imnot et al., 2014). Atherosclerosis narrows the lumen of arterial vessels, leading to a decreased supply of oxygen and nutrition to the myocardium. The combination of blood flow and the resulting lack of oxygen and nutrients, leads to myocardial ischemia. If ischemia is prolonged or the blood vessel becomes totally occluded it can lead to acute coronary syndrome (McCance & Huether, 2014, p.1148).

The pathophysiological process of atherosclerosis is discussed in the development CAD. Listed are the pathophysiological steps leading to atherosclerosis as discussed by McCance and Huether (2014) on pages 1145-1147:

1. Low-density lipoprotein (LDL) accumulates within arterial vessel walls.
2. Injury occurs to the endothelium of the arterial vessel wall. Hypertension, diabetes mellitus, smoking, autoimmune response, and dyslipidemia contribute to this injury.
3. Contraction, the endothelial cells stop producing adequate amounts of vasodilator and anti-thrombotic cytokines.
4. Pro-inflammatory cytokines are released by damaged endothelial cell macrophage and leukocyte adherence to the endothelium.
5. Neutrophils release toxic oxygen radicals and enzymes that result in oxidative stress, causing LDL to oxidize, fibrinogen production, and a decrease in the circulating LDL levels force the body to pull the LDL out of fibrous plaques in the arterial walls. Plaque passivation is the process by which statins stabilize active plaques at risk for rupture (Pratka, 2000, p.43).

According to BBdins-Domingo (2016) "initial 80% of patients are identified using an index of low- to moderate-dose statins in adults aged 40 to 75 years without a history of CVD who have 1 or more CVD risk factors (diabetes, hypertension, and smoking) and a calculated 10-year CVD event risk of 10% or greater (B recommendation).” While the benefits of statins in the prevention of CAD has been well documented; research conducted by Ruthfield, Nowak, and Rich (2016) found that statin therapy did not significantly improve mortality in individuals over the age of 80 who were hospitalized with myocardial infarction.

Significance of Pathophysiology

Prevention of atherosclerosis should be the primary goal in the treatment of CAD. One of the most widely used medications in the prevention and treatment of CAD is HDL. HDL is a cholesterol particle that is involved in the synthesis of remnant, a precursor of sterols including cholesterol. By inhibiting this enzyme, cholesterol and LDL-cholesterol production is decreased. Statins also increase the number of LDL receptors on liver cells, which enhances the uptake and breakdown of LDL-cholesterol. Most of the effects of statins occur in the liver. Research has shown that elevated levels of total cholesterol, LDL-cholesterol, and apolipoprotein B are risk factors for developing cardiovascular disease.” (Anderson, Stewart, Thornton, Wilson, Monroe, & Laddapo, 2014). Developing better testing and treatment options could mitigate the future cost of this highly prevalent disease.

Implications for Nursing Care

Listed are the steps needed to reduce the risk of cardiac events (Pratka, 2000, p.43):

1. smoking cessation
2. hypertension control
3. regular physical activity
4. aggressive lowering of elevated low-density lipoprotein (LDL) values
5. losing weight
6. making healthier dietary choices

A study by Dmitrieva, & Dmitrieva (2013) found that elevated serum sodium levels, even within the normal range, is associated with vascular changes that facilitate CAD. U.S. Food and Drug Administration (2016) recommends 2300mg of sodium per day for U.S. adults and 1500mg per day for hypertensive and pre-hypertensive individuals.

Medication education is another important area of nursing care. Patients need to understand why they are taking their medications, and the importance these medications have in treating their condition. When patients do not understand why they are taking medications, they are more likely to stop taking them without consulting their provider.

Conclusion

Coronary artery disease affects millions of Americans. The consequences of untreated CAD can be detrimental to one’s quality of life. There are modifiable risk factors such as dyslipidemia, hypertension, and diabetes mellitus that should be controlled when possible. Lifestyle changes can also have a significant impact on the course of CAD. As healthcare providers, we should do our best to minimize the impact of coronary artery disease has on our patient population.

References

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