

Case Study: Congestive Heart Failure

Your Name

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Abstract

In the present investigation, a brief description of the anatomy and physiology of the cardiovascular system will be made, based on a case study of congestive heart failure. The document will discuss how the disease occurs considering the patient's history and symptoms, and then develop a care plan that will include nursing interventions, a monitoring plan, and evaluation of the results.

The clinical case to be discussed is the following: *CB is a 57-year-old male presents to your clinic for cough for past two months. States he has been having some shortness of breath when going up stairs. Denies any fevers or congestion, denies any chest pain or recent travel outside US. Patient states he does smoke 1/2 to 1 ppd for the past 30 years. Patient does have history of HPTN and Hyperlipidemia which are controlled with medication. VS 130/78; rr 18; pulse ox 96%, hr 88.* Based on the above, a review of the literature will be carried out to respond to the case of CB and outline the steps to follow for its treatment.

Case Study: Congestive Heart Failure

In the clinical case discussed about CB, a 57-year-old man, who has been presenting a clinical characterized by cough for the last two months and the appearance of difficulty breathing when climbing the stairs, has made him seek medical advice with regarding to his current condition. During the interrogation, he stated that he had not suffered any kind of chest pain or that he had traveled abroad in the past few months. He has a clinical history of smoking, high blood pressure and hyperlipidemias that he claims to control with the use of medications. In the case description, no family history data is specified.

Based on the symptoms and the medical history presented, it is probable that this patient suffers from congestive heart failure, a cardiovascular pathology that occurs as a result of a functional or structural disorder of the heart that affects ventricular filling and the power with which it is ejects blood into the systemic circulation (Malik, Brito & Chhabra, 2019). For this reason, in this document the physiological and pathophysiological aspects of the cardiovascular system will be discussed.

Normal Function and Structure of the Cardiovascular System

The cardiovascular system is comprised of the heart, which is connected to the system of blood vessels that form a completely closed circuit where blood circulates. There are three types of blood vessels: The arteries, which make up a distribution system, are responsible for carrying oxygenated blood from the heart to peripheral tissues; The blood capillaries, which behave like an exchange system, in charge of promoting the exchange of nutrients between tissues and blood; The veins act as a collecting system, which is in charge of collecting all the waste and returning the blood to the heart to be oxygenated again; Finally, there are the lymphatic vessels that act as an accessory collecting system that is responsible for collecting waste and particles that were not able to capture the veins (Silverthorn, 2018).

The heart is a driving organ that acts like a pump, ejecting blood into the distribution system. Anatomically it is divided into four chambers: Two ventricles, responsible for providing the force to propel blood and two atria that serve as priming pumps to fill the ventricles. The heart has several types of tissues: the myocardium, which is a layer of muscle tissue that contracts to produce ejection; specialized tissue, which has automatic structures that are capable of generating their own action potentials, and the connective tissue that forms the atrio-ventricular (AV) valves and the sigmoid or semilunar valves (Silverthorn, 2018).

The phenomena that occur from the beginning of one heartbeat to the start of another, is known as the Cardiac Cycle. At the start of a normal cardiac cycle the AV valves are open, and the ventricles begin to fill, then a contraction of the atria occurs, and this completes filling of the heart. When the ventricles are filled, the AV valves close, and the ventricle closed, starting to contract with the blood inside, increasing the pressure inside it. The increase in pressure causes the semilunar valves to open and there is an ejection of 70 to 80 ml of blood that goes into the systemic circulation. When the pressure inside the ventricle decreases, the semilunar valves close and the ventricle is closed again, until the pressure in the atria causes the AV valves to open, and the cycle begins again (Silverthorn, 2018).

Dysfunctions of the Cardiovascular System

In congestive heart failure, over-activation of adaptive mechanisms is what causes a deficit in cardiac output. As an initial response to thickening of the ventricular wall, myocytic hypertrophy, apoptosis death, and regeneration are generated. These processes cause an eccentric-type structural remodeling, leading to a decrease in cardiac output and with it a response of vascular and neuro-humoral mechanisms (Malik, Brito & Chhabra, 2019).

Because of the remodeling, a decrease in the stimuli received by the carotid baroreceptor occurs, causing activation of the sympathetic nervous system, which will increase the release

of adrenaline causing an increase in heart rate and inotropism, generating myocardial toxicity. On the other hand, the Renin-Angiotensin-Aldosterone system will also be activated, which will produce an increase in vasoconstriction, the massive release of angiotensin II causing an increase in afterload, and the aldosterone secretion causes an increase in preload. The activation of the mechanisms is what generates a negative remodeling and causes the appearance of symptoms (Malik, Brito & Chhabra, 2019).

Epidemiologically, this pathology occurs more frequently in elderly patients, with cardiovascular comorbidities such as arterial hypertension, pulmonary hypertension, atrial fibrillation and coronary heart disease. It is also frequent in patients with diabetes, chronic kidney disease, anemia and obstructive pulmonary disease (Lopes, Ribeiro, Graça, et al. 2020). Other important factors that can lead to the appearance of the disease are obesity, smoking and hyperlipidemias (Norhammar, Johansson, Thrainsdottir & Rydén, 2016).

Labs and Diagnostic Tests Ordered

As in all clinical cases, to make a good diagnosis it is necessary to carry out a complete anamnesis, which can provide relevant data about the patient, which is documented in the clinical history and a complete physical examination is carried out with special emphasis on the system affected, in order to obtain as much information as possible about the patient. Subsequently, paraclinical tests may be requested, which in the case of congestive heart failure include:

An echocardiogram, which is the most frequently used method to determine the existence of congestive heart failure, since it allows evaluating and documenting the ventricular ejection fraction. In addition, other variables are evaluated, such as the existence of any structural abnormality, such as the existence of ventricular hypertrophy or dilation of the atria. It also allows the study of the existence of any functional abnormality, such as changes

in the mitral inflow or in the speed of the pulmonary artery (Norhammar, Johansson, Thrainsdottir & Rydén, 2016).

On the other hand, to confirm the pathology, a chest X-ray can be requested, which allows detecting congestive heart failure and its complications such as a pleural effusion (Ngo, 2018). The most found findings are the existence of a cardiac-thoracic width greater than 50%, the cephalization of the pulmonary vessels, the presence of pleural effusions and the appearance of the Kerley B lines (Malik, Brito & Chhabra, 2019).

In case of obtaining a positive result on chest radiography and not having access to an echocardiogram, an evaluation of the B-type natriuretic peptide in serum may be requested, since it has a sensitivity greater than 95% and allows confirming the diagnosis (Ngo, 2018). The amount of natriuretic peptide in plasma increases massively when there is an increased load on the atria and ventricles. For this reason, it is that they are so useful when diagnosing congestive heart failure (Norhammar, Johansson, Thrainsdottir & Rydén, 2016).

Nursing Interventions

In congestive heart failure, nursing interventions are mainly aimed to acting as counselors and educators for patients. The role of nursing is to teach patients to understand the disease, what are its causes, what are the signs and symptoms, what may be possible complications, what to do to avoid them or what to do if they suspect that they are suffering from any. It is also important that nurses prepare patients to return to their normal activities, teaching them the importance of following a healthy lifestyle, such as avoiding risk factors such as smoking, excessive alcohol consumption or not losing weight (Ramadhani, Liu, Jing et al. 2019).

On the other hand, nursing also has a fundamental role in the development of plans that allow promoting patient adherence to treatment to guarantee its effectiveness and safety, in order to obtain better results (Ramadhani, Liu, Jing, et al. 2019). Therefore, it is not enough

to explain to the patient how often the medicine should be taken, but it is also necessary to explain with which drinks they can take them, if they should take them before or after eating, if they should take them strictly at a certain time of the day or if the food delays or neutralizes its effect. Only in this way can positive results be guaranteed.

In addition, it is important that the nurses make a constant follow-up and monitoring the progress of the patients, in order to prevent complications and reduce the risk of death.

Clinical follow-up by nurses to patients with heart failure has been shown to be associated with a better survival rate and to promote early detection of complications (Savarese, Lund, Dahlström, & Strömberg, 2019).

Discussion

In this case study, a review of the physiology and pathophysiology of the cardiovascular system was conducted with respect to congestive heart failure that occurs as a result of over-activation of normal regulatory mechanisms.

It was possible to determine that the appearance of the pathology is related to risk factors such as hypertension, smoking, and obesity mainly. The diagnosis of the disease is mainly clinical, but there are some diagnostic methods such as echocardiogram, chest x-ray and serum natriuretic peptide that can help confirm the diagnosis.

As the disease is related to risk factors related to an unhealthy lifestyle, nursing interventions become important to control the disease. The role of nursing in disease management is educational to teach the patient about their disease, counseling to raise awareness in society and the patient, and lastly, monitoring and supervision to ensure that patients are kept healthy.

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