

Case Study on Congestive Heart Failure

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Abstract-- Objective-- To describe a case of congestive heart failure.

Clinical presentation and interventions-- A 65 year old female was admitted to a tertiary care hospital with complaints of progressive increase in breathlessness and edema on lower extremities and fatigue over the previous three weeks. She reported history of chest pain and nocturnal dyspnea. Her serum electrolytes were critically deranged; Potassium (K⁺) 1.31 mmol/L, and Calcium (Ca⁺⁺) level was 5.3 mmol/L cholesterol LDL 159 mg/dl, HDL 123 mg/dl, Ejection Fraction and **CK-MB** creatine kinase MB were 35% and 27.36 U/L respectively. Provisional diagnosis of congestive heart failure was made and patient was treated with Angiotensin converting enzyme (ACE) inhibitors, beta blockers, digoxin and diuretics.

Conclusion-- Physicians were clinically diagnosed the condition as congestive heart failure based on the laboratory investigations.

Key words-- Congestive heart failure, nocturnal dyspnea, ejection fraction, CK-MB creatine kinase, Echocardiography, Angiography.

1 Introduction

Aging of the population and extension of the lives of the patients with cardiovascular diseases (CVD) by modern therapeutic innovations has led to an increasing prevalence of heart failure (HF) (Noor, et al., 2012). The frequency of congestive heart failure is increasing in the population because people are getting older. CHF is considered as serious condition with a poor prognosis. In mild to moderate CHF mortality is 50%, and in severe CHF mortality is more than 60%. The mortality associated with CHF is high (Martensson, Karlsson, & Fridlund, 1998).

CHF is a significant health problem for women, particularly elderly women. The risk factors for heart failure appeared to be different in women than in men, with hypertension and diabetes playing a greater role in women (Johnson, 1994).

Heart failure (HF) is a major and growing public health problem in the United States. Approximately 5 million patients in this country have HF, and over 5,50,000 patients are diagnosed for the first time each year (American Heart Association, 2002). The

disorder is the primary reason for 12 to 15 million office visits and 6.5 million hospital days each year (O'CONNELL, J. B. (1994). From 1990 to 1999, the annual number of hospitalizations has increased from approximately 810 000 to over 1 million for HF as a primary diagnosis and from 2.4 to 3.6 million for HF as secondary diagnosis (Chen, Eagle, Gilbert, Koelling, & Lubwama, 2004).

Heart failure is a complex clinical condition that can result into any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or expel blood. The serious indicators of HF are dyspnea and fatigue, which may limit exercise tolerance and fluid retention that may lead to pulmonary congestion and peripheral edema. Both abnormalities can impair the functional capacity and quality of life of affected individuals. Some patients have exercise intolerance but little evidence of fluid retention, whereas others complain primarily of edema and report few symptoms of dyspnea or fatigue. Owing to all of the patients do not have volume overload at the time of initial or subsequent evaluation. The term "heart

failure” is preferred over the older term “congestive heart failure.” (Hunt, et al., 2009).

One of the classical definitions says “HF is a pathophysiological state in which an abnormality of cardiac function is responsible for the failure of the heart to pump blood at a rate adequate with the requirements of the metabolizing tissues or does so only at elevated filling pressures”. (Braunwald, 1992). Most common symptoms of HF are dyspnea, symptoms related to fluid retention, palpitation and fatigue. Dyspnea initially maybe exertion, but can worsen to present as paroxysmal nocturnal dyspnea (PND) or orthopnea or dyspnea at rest. Palpitations can be due to tachycardia, dilated heart or can be due to arrhythmias like atrial fibrillation or ventricular arrhythmias. Fatigue is due to low cardiac output. Low cardiac output can also manifest as reduced urine output and also lethargy and mental slowing (Guha, et al., 2018).

A widespread series of cardiac conditions, systemic diseases and hereditary defects, can result in HF. Patients with HF can have mixed etiologies, which are not mutually exclusive, and HF etiologies vary significantly between high-income and developing countries (Baldasseroni, et al., 2004 Yusuf, et al., 2014). HF has an estimated 17 primary etiologies, as determined by the Global Burden of Disease Study (Hawkins, et al., 2009).

2 Case report

Table 1: Clinical laboratory investigation reports

Parameters	Results	Normal range
CK-MB creatine kinase MB	27.36 U/L	0.0-24.0 U/L

A 65 year old female was admitted from home to a tertiary care hospital with complaints of progressive increase in breathlessness, chest pain, and edema on lower extremities, nocturnal dyspnea and fatigue over the previous three weeks.

One week earlier to her visit to tertiary care hospital, patient visited the primary care hospital also private clinic with similar complaints and was primarily diagnosed her condition as congestive heart failure.

No treatment was started immediately and the physician advised the patient undergo clinical laboratory tests including X-ray, electrocardiogram (ECG), blood tests includes serum electrolytes (serum sodium potassium, calcium etc.) cardiac enzymes (CK-MB creatine kinase MB) troponin I), thyroid stimulating test (TSH), kidney function test (RFT's) cholesterol levels , ejection fraction (EF), brain natriuretic peptide test (BNP).

After evaluating the reports physician treated the patient with Angiotensin converting enzyme (ACE) inhibitors (for example, Altace, Capoten, Vasotec), beta blockers, digoxin (Lanoxin); and diuretics.

On reporting in the tertiary care hospital, with persistent symptoms, the patient undergone various clinical laboratory investigations on the recommendation of the physician and results of various labs were shown in the table 1. The physician conditionally diagnosed the condition as congestive heart failure.

(CK-MB)		
HDL cholesterol	123 mg/dl	60 mg/dl
LDL cholesterol	159 mg/dl	60-130 mg/dl

Sodium (NA ⁺)	178 mmol/L	135-145 mmol/L
Potassium (K ⁺)	1.31 mmol/L	3.5-5.5 mmol/L
Magnesium (Mg ⁺⁺)	0.8 mg/dl	1.9-2.5 mg/dl
Calcium (Ca ⁺⁺)	5.3 mmol/L	8.8-10.6 mmol/L
Chloride (Cl ⁻)	84 mmol/L	96-106 mmol/L
HCO ₃ ⁻	31 mmol/L	21-29

		mmol/L
B-type natriuretic peptide (BNP)	>600 pg/ml moderate HF	<100 pg/ml >900 pg/ml severe HF
Ejection Fraction	35 %	50-70% 41-49% borderline

3 Discussion

Congestive heart failure (CHF) is a complex clinical syndrome, characterized by multiple metabolic alterations, including those related to plasma electrolytes. Hyponatremia, hypokalemia, and hypomagnesemia are the most common electrolyte disorders of CHF, predominantly in patients in more advanced and refractory stages of the condition. Except as a complication of therapy (e.g., diuretics), these electrolyte disturbances are not commonly encountered in mild to moderate ventricular dysfunction (systolic or diastolic) and reasonably compensated cardiac failure. (Dei Cas, Leier, & Metra., 1995).

Here in this case the patient observed symptoms of nocturnal dyspnea due to difficulty in breathing, swelling on feet and legs due to sodium retention. The report of serum electrolytes, cardiac enzymes and cholesterol levels, ejection fraction of blood and B-type natriuretic peptide (BNP) reveals the evidence of congestive heart failure. Patient's electrolytes were significantly deranged BNP level in blood and cholesterol levels were higher than normal.

Natriuretic peptides synthesized and released from heart are sensitive to other biological factors, such as age, sex, weight, and renal function (Chertow, Stevenson & Weinfeld, 1999). Higher levels give support to a diagnosis of abnormal ventricular function or hemodynamics causing symptomatic HF (Maisel, 2001). Trials with these diagnostic markers suggest use in the urgent-care setting, where they have been used in combination with clinical evaluation to differentiate dyspnea due to HF from dyspnea of other causes (Alderman, et al., 1983), and suggest that its use may reduce both the time to hospital discharge and the cost of treatment (Mueller, 2004).

There were many participating factors and etiologies that caused CHF, systematic diseases and hereditary defects mainly attributed. To evaluate further causes of CHF echocardiography and angiography is recommended. The routine use of echocardiography in the cardiovascular evaluation increases the possibility of identifying cardiac diseases that may cause sudden death (Maron., 2002) The American Heart Association formerly projected a

protocol including physical examination and medical history taking. However, it was unable to clinically detect serious cardiovascular diseases although, it seemed to be cost effective and easy to administer on a large scale (, Fagnani, Maffulli, Pigozzi&Spataro,. 2003).

For the patients with congestive heart failure it is important to limit the amount of fluids you drink and eat plenty of fresh fruits and vegetables. The amount of fluid can vary and your doctor will let you know how much you should be drinking in a day. The extra fluid may make it very hard to breathe and it may be life-threatening and require hospitalization. So, low-sodium and fluid are a vital part of the treatment for CHF.

Conclusion

In this case physicians were clinically diagnosed the condition as congestive heart failure based on the laboratory investigations. The some causes/etiology of congestive heart failure was known and to evaluate further cardiac issues echocardiography and angiography is recommended.

4 References

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