

Congestive Heart Failure: Review Questions

Beth R. Malasky, MD, FACC

QUESTIONS

Choose the single best answer for each question.

Questions 1–5 refer to the following case study.

A 22-year-old firefighter presents at a cardiology clinic with dyspnea on exertion. He reports that he has trouble keeping up with his squad and can no longer carry his 40-lb pack. He reports 2 months of nocturnal cough, a 10-lb weight loss, and fatigue. He denies any history of smoking, and he drinks 2 to 3 six-packs of beer daily on weekends.

He presented 3 weeks ago to a primary care clinic, where he was told he had pneumonia and asthma. He was started on antibiotics and a β -agonist but still does not feel well.

- Which of the following findings is the least specific in making a diagnosis?
 - Elevated jugular venous pulsation (JVP)
 - Pulsus alternans
 - Wheezing
 - S₃ gallop
 - Cephalization on chest radiograph
- Physical examination reveals decreased breath sounds one third of the way up the lung field on the right side and crackles half way up on both sides. He has JVP to the angle of the jaw, hepatojugular reflux, and 2+ pitting edema to the knees. He has a grade 2–3/6 systolic murmur along the left sternal border and apex radiating to the axilla. He is diagnosed with congestive heart failure (CHF). What laboratory test would have been helpful in confirming the etiology of this patient's symptoms?
 - Total bilirubin
 - C-reactive protein
 - Troponin I
 - Creatinine
 - B-type natriuretic peptide (BNP)
- Which test would provide the most information to assess his condition?
 - Electrocardiogram
 - Arterial blood gas analysis
 - Echocardiogram
 - Chest radiograph
 - Pulmonary function tests
- The patient has 4-chamber dilatation with a left ventricular ejection fraction of 15%. He has moderate mitral regurgitation and moderate tricuspid regurgitation, with an estimated pulmonary artery pressure of 70 mm Hg. He has a moderate pleural effusion, elevated liver function tests, hypokalemia, and hypomagnesemia. His blood pressure is 115/60 mm Hg, his heart rate is 110 bpm, his respiratory rate is 30 breaths/min, and his oxygen saturation on room air is 88%. You decide to admit the patient. Initial therapy should include all of the following EXCEPT:
 - Intravenous loop diuretics
 - Angiotensin-converting enzyme (ACE) inhibitor
 - Digoxin
 - β -Blocker
 - Electrolyte replacement
- All of the following statements regarding β -blocker therapy in the treatment of heart failure are correct EXCEPT:
 - β -Blockers are classified based on their receptor specificity and are not uniform as a class of drugs
 - β -Blocker therapy results in greater improvements in ejection fractions among those with nonischemic cardiomyopathy compared to ischemic cardiomyopathy

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Dr. Malasky is Clinical Assistant Professor at the University of Arizona Health Sciences Center, Tucson, AZ.

- (C) β -Blocker therapy should be initiated only when the patient is euvolemic
- (D) β -Blocker therapy should not be initiated in patients with severe class IV CHF
- (E) β -Blocker therapy may result in improved left ventricular function without improvement in exercise tolerance

EXPLANATION OF ANSWERS

1. **(C) Wheezing.** Wheezing is a nonspecific finding that results from increased airway reactivity. It may occur from bronchospasm related to reactive airway disease or from stretching of the bronchioles caused by congestion related to fluid and pressure build-up. Patients with CHF may develop wheezing, referred to as cardiac asthma, which then resolves with diuresis. An elevated JVP indicates elevated right heart pressures, which correlate with left-sided filling pressures. Pulsus alternans is a finding of varied intensity of the arterial pulse and is related to severe impairment of systolic function. Third heart sounds result from resistance to early diastolic filling of the ventricle and are related to increased pressure or wall thickness. An S_3 gallop predicts a poor outcome. Cephalization on chest radiograph indicates engorgement of the pulmonary vasculature due to elevated pressures in the right heart.
2. **(E) B-type natriuretic peptide.** The patient has numerous specific findings indicating that he is in heart failure. This case does not require any laboratory test to confirm the diagnosis, but the diagnosis is not so clear in many cases. Previously, this patient was mistakenly treated for pneumonia. The recent development of an inexpensive and sensitive assay for BNP, a peptide released from ventricular myocardium in response to volume or pressure overload, has been useful in diagnosing patients with dyspnea in emergency rooms. Total bilirubin is often elevated from hepatic congestion in CHF, but this finding is nonspecific. C-reactive protein level is also a nonspecific finding and may be elevated in the absence of CHF. Troponin I, a cardiac-specific protein released from injured myocytes, can be elevated in CHF but also may rise in myocardial infarction, pulmonary embolus, and with other cardiac injuries; it is not a specific or sensitive marker for CHF.
3. **(C) Echocardiogram.** Of the tests listed, the one that would provide the most information in this patient is echocardiography.¹ This test allows assessment of the size and function of the heart chambers, the

morphology and function of the heart valves, congenital anomalies, and diastolic function. Echocardiography also allows hemodynamic estimates of stroke volume, pulmonary artery pressure, right atrial pressure, and left atrial pressure (a surrogate for left ventricular diastolic pressure). General practitioners underutilize this modality and often do not evaluate left ventricular function in patients with a diagnosis of CHF.

4. **(D) β -Blocker.** β -blocker therapy is now a mainstay of treatment for CHF.² However, β -blocker therapy initially worsens left ventricular function and should not be initiated until the patient is euvolemic. Intravenous diuresis is often needed for the decompensated patient because gut edema decreases the absorption of oral medications. ACE inhibitors are a required component of therapy and unequivocally improve survival in CHF patients.³ Digoxin does not improve survival but does decrease symptoms and reduces rehospitalization rates. Frequent monitoring and aggressive replacement of potassium and magnesium is essential to minimize the risk of ventricular arrhythmias.
5. **(D) β -Blocker therapy should not be initiated in patients with severe class IV CHF.** Recent data from the Copernicus trial revealed a significant decrease in mortality with use of carvedilol in patients with class IV heart failure. Subgroup analysis of a much smaller population from the MERIT trial showed mortality benefit from metoprolol tartrate in this patient group. Since β -blockers have different receptor affinities, they cannot be considered interchangeable as a pharmacologic class for the treatment of CHF.

REFERENCES

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