AN OVERVIEW ON ACUTE HEART FAILURE EXACERBATION

Objectives

■ Identify the process for diagnosing and treating acute exacerbation of systolic and diastolic heart failure.
■ Identify clinical indication and positive effects in the use of pharmacologic agents in treatment of acute exacerbation of CHF.
■ Identify strategies to improve patient outcomes and prevent hospital readmission.

Process to meet objectives

■ Presentation will discuss:
  1. Pathophysiology
  2. Diagnostic studies
  3. Interpretation of studies
  4. Presentation of case studies
Congestive Heart Failure

- Heart is unable to generate adequate cardiac output
- Causing inadequate perfusion of tissues
- Increasing diastolic filling pressure in one of both ventricles

Morbidity and Mortality

- 5.1 million people in the US with heart failure
- One in 9 deaths in 2009 included heart failure as a contributing cause
- Half of diagnosed cases die within 5 yrs of diagnosis
- Cost is $32 billion each year
- One million hospital admissions in 2010
- Most admissions were for ages 65 and older

Risk Factors

- Increasing age
- Hypertension
- Ischemic heart disease
- Obesity
- Diabetes
- Renal failure
Congestive Heart Failure Classifications

- Systolic heart failure
- Diastolic heart failure

Pathophysiology

Heart Failure Pathophysiology

- Myocardial injury → Reduced cardiac output
- Activates sympathetic nervous system
- Increased catecholamines and vasoconstriction
- Decreased blood pressure and heart rate

Decreased cardiac output

- Activates sympathetic nervous system
- Causing release in catecholamines and causing vasoconstriction
- Increasing afterload, blood pressure and heart rate
Renin-angiotension-aldosterone system

- Aldosterone release
- Release of angiotensin I & II
- Sodium retention, arginine vasopressin, endothelin & cytokines

Ventricular remodeling

- Hypertrophy and dilation of ventricles
- Genetically large cells
- Impaired contractility

Clinical symptoms

- Dyspnea
- Orthopnea, JVD
- Cough of frothy sputum (pulmonary edema)
- Fatigue
- Decrease in urine output
- Edema (cyanosis, inspiratory crackles, pleural effusions)
- Hypotension or hypertension, S3 gallop
Clinical work up

- Medical history and physical exam
- Echocardiography
- X-Ray
- EKG
- Labs: CMP, CBC, HFT, BNP, TSH, cardiac markers

Diagnostics/Radiology

- Bilateral pulmonary congestion
- Cardiomegaly
- Pulmonary venous hypertension
- Pleural effusions

Echocardiogram

- Dilated right ventricular chamber size
- Segmental wall motion abnormalities
- Paradoxical motion of the interventricular septum
- Measurement of ejection fraction (EF)
Laboratory findings
- Elevated BNP
- Elevated cardiac markers
- Elevated LFT
- Hyponatremia
- Elevated BUN and Creatinine

Treatment goals
- Aimed at interrupting the worsening cycle of decreasing contractility
- Increasing preload
- Increasing afterload
- Blocking the neurohormonal mediators of myocardial toxicity
- Symptom relief

Airway protection
- Supplemental Oxygen
- Non-invasive positive pressure ventilation
- Mechanical ventilation
Medication therapy

- Diuretics – Loop diuretics specifically
- Inotropic drugs (dobutamine, dopamine)
- ACE inhibitors
- Nitrates and recombinant BNP (improves preload and contractility)
- Beta blockers

Pharmacology

Diuretics
- Furosemide
- Bumex
- Spironolactone

Inotropes
- Dobutamine
- Dopamine
- Milrinone
- Digoxin

Vasodilators/Beta-blockers

- Nitrates
- Nitroprusside
- Natrecor

- Metoprolol
- Carvedilol
- Labetalol
Invasive treatments

- Hemodynamic monitoring
- Intra-aortic balloon pump counterpulsation
- Ventricular assist device

Performance improvement

- Identify patients admitted with congestive heart failure
- Start discharge planning on admission
- Follow guidelines
- Make sure all core medications are in place on discharge
- Patient education

Case Study

- 70 year old white female measuring 5 feet 4 inches tall who was a former heavy smoker. Presented to the ER with c/o progressively worsening breathlessness over 7 days. Now present at rest, with the onset of orthopnea, mildly productive cough, and wheezing for the past 2 days. She has a history of hypertension, chronic heart failure, and chronic obstructive pulmonary disease.
Differential diagnosis
- Pneumonia
- COPD exacerbation
- Acute coronary syndrome
- Pulmonary embolism
- Asthma

Clinical & Diagnostic Findings
- Last EF 47% 3 months ago
- VS: T 38.0, BP 160/100mm Hg, HR 95/min,
- Body weight was 165 pounds and had increased by 6 pounds since it was last measured 3 months ago.
- Labs: Elevated troponin I, BUN 57, WBC 12500, mildly elevated liver enzymes,
- CXR: Mild pulmonary vascular congestion with no infiltrates.
- EKG showed mild ventricular hypertrophy

Diagnosis and Treatment
- BNP level came back elevated at 650 pg/mL supporting diagnosis of acute CHF exacerbation
- She was placed on supplemental O2
- Started on NTG drip
- Started on intravenous Lasix
- Continued her home enalapril, bisoprolol, and triamterene
Outcome & discharge

- 5 days later patient was discharged and education was provided on:
  1. Rationale for pharmacologic therapy
  2. Importance of limiting sodium intake
  3. Importance of limiting her fluid intake
  4. Daily weight record keeping

Conclusion

- Although the management of acute congestive heart failure remains a big challenge, possessing the skills to rapidly recognize and treat acute congestive heart failure exacerbation has shown to decrease mortality and improve patient outcomes.

References