Episode 52: Diastolic Heart Failure with Todd Dorman

On this episode: Dr. Jed Wolpaw and Todd Dorman

In this episode, episode 52, I welcome Dr. Todd Dorman to the show. Dr. Dorman is a professor of anesthesiology here at Johns Hopkins, is the Vice Chair for Critical Care, and is the immediate past president of the Society of Critical Care Medicine (SCCM). Dr. Dorman and I discuss diastolic heart failure or heart failure with preserved ejection fraction (HFPEF), how it differs from systolic heart failure or heart failure with reduced ejection fraction (HFREF), how it presents, and how to manage it perioperatively.

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Terminology

1:00 – 4:49

- ~20 years ago, diastolic heart failure started being acknowledged; heart failure grouped into:
  - Diastolic heart failure → preserved function
  - Systolic heart failure → reduced function
- ~10 years ago, classification changed to:
  - Heart failure preserved ejection fraction aka HFpEF
  - Heart failure reduced ejection fraction aka HFrEF
- Knowing the difference is important because they differ in:
  - Etiology & physiology
  - Intermediate and long term outcome different
    - HFrEF has lower mortality rate → 5 year survival is ~30% lower at 50%
  - Clinical presentation
    - HFrEF: progression of pulmonary edema over period of time
    - HFpEF: tend to present with acute decompensation; flash pulmonary edema
  - Treatment strategies

Ejection Fraction

4:50 – 7:22

- Ejection fraction = stroke volume / end diastolic volume (EDV)
  - In chronic state, ejection fraction changes is because of changes in EDV
  - Cardiac output wants to stay the same → stroke volume stays the same
  - If ejection fraction is lower, think heart is dilated
  - If ejection fraction is higher, think heart is hypertrophied to maintain stroke volume
- Volume overload → ventricles dilate
- Pressure overload → ventricles hypertrophy

Diagnosis

7:23 – 15:47

- Clinical exam:
  - Extra heart sounds: S4 → hypertrophy and/or S3 gallop → dilated
  - Heaves
  - PMI displaced
- Echocardiography:
  - HFrEF: dilated ventricle, dyskinesia/squeeze abnormality
  - HFpEF: used to look at E/A, but now E/e'
    - **E/A:** normally, E > A; but in HFpEF, E is smaller, and rely more on A
      - E signal = passive filling → valve opens, blood rushes in
      - A signal = atrial contraction
    - **E/e'**: measure relaxation at tissue and valve levels and find difference → larger the difference, the worse the diastolic dysfunction
    - Elevated EF → 60-80%; two causes for elevated EF → 1) increased catecholamines or 2) diastolic dysfunction

Management Principles

15:48 – 25:57

- Manage three areas: 1) heart rate; 2) preload; and 3) afterload
- **Preload:** HFpEF and HFrEF require close to normal preload (relative euvolemia)
    - HFpEF → functioning at near cavity obliteration
        - If lower preload, compromise stroke volume and thus cardiac output
    - HFrEF → can't squeeze more out, so if lower preload, also drop stroke volume
        - Aim for euvolemia to 5-10% drier side
- **Heart Rate:** aim for normal
    - HFpEF → want HR to be normal to ↓ allowing enough time for ventricles to fill
        - SVT will compromise ventricular filling even more as atrial kick is lost
    - HFrEF → want HR to be normal or slightly ↑
        - Eg. think of patient with aortic insufficiency
- **Afterload:** acutely, afterload is more important for HFrEF
    - HFrEF → afterload needs to be ↓
        - Ventricle is weak and if afterload is increased, heart will fail even more
        - May vasodilate them to improve cardiac output, but no absolute target
            - Patients auto regulate → aim for within 10 to 20% of normal MAP
    - HFpEF → less important in acute phase as heart could squeeze against it
        - Chronically, ↓ afterload to reduce remodeling of ventricles

Medication Therapy

25:58 – 35:07

- HFrEF: may need inotropes (eg. epinephrine, dobutamine, milrinone)
    - Intraoperatively, may be important because patients might be getting negative inotropes in the operative room
    - In the ICU, case dependent as patient's endogenous catecholamines may be elevated
        - Vasodilators may be useful
    - Milrinone is more beneficial with problems in RV + PA pressures
        - Improvement in R side, R to L blood flow
        - May have to add something to correct systemic vasodilation
- HFpEF: may need lusitropy meds to make heart relax better
    - Lusitropes eg. beta blockers and calcium channel blockers
    - Choosing vasopressor for HFpEF patients is a complex decision
        - Consider norepinephrine
            - If not using central line, ensure using peripheral concentrations of the drug and have infiltration protocols (eg. phentolamine syringes); in intra- and post-operative settings