CHF Comorbid Conditions: Diabetes Mellitus (DM)

Pathophysiology
1. Myocardial changes seen in pts with DM
   - Higher left ventricular mass, wall thickness, arterial stiffness
   - Prolonged pre-ejection period, shortened ejection time
   - Abnormal diastolic function
     - Impaired relaxation / pseudonormal filling pattern
   - Decreased catecholamine stores
   - Impaired endothelium-dependent relaxation
   - Decreased glucose uptake
2. Relative risk of HF with DM
   - Men: 3.8
   - Women: 5.5
3. Worsening of heart failure predictors (DM independent of other risk factors)
   - Age
   - LVEF
   - DM
4. Women
   - More likely to have isolated diastolic dysfunction
5. Morbidity & mortality
   - Compare non-diabetics vs diabetics
     - More likely to be admitted for HF
     - Higher rates - 1 year cardiovascular mortality & mortality related to HF

Diagnostics
1. Historical factors of HF in diabetic pts
   - Age, duration of DM, insulin use, PVD, ↑ creatinine clearance, poor glycemic control, microalbuminuria
2. Testing
   - Elevated HbA1C assoc with ↑ HF risk
     - Each 1% incr of HbA1C = 8% incr risk of HF
     - HbA1C ≥ 10 has incr risk of HF of 1.56 vs HbA1C < 7

Therapeutics
1. See treatment of heart failure for complete recommendations
2. Diabetic pts with HF treated same as those without HF
3. Drugs with added benefits for pts with DM & CHF
   - Beta-blockers
     - Show significant survival benefit for pts with DM and those without (RR 0.77 and 0.65)
     - Carvedilol (combined non-selective beta-blocker and alpha adrenergic antagonist)
       - May improve survival in pts with HF
       - May have an advantage in pts with DM vs other beta-blockers\(^1\,^2\)
o **ACEi**
  - Show protective effects against HF
  - Benefits same (diabetic vs non-diabetic pts)
  - Ramipril (high-risk diabetic pts)
    - May impart an independent cardiovascular survival benefit
  - Combination Tx w/ARB may be more effective
  - Combination therapy of ACEi & ARB
    - No difference in outcome of death from CV causes, MI, stroke or hospitalization from heart disease
    - More adverse effects with combo therapy of ACEi & ARB
  - Ramipril (high-risk diabetic pts)
    - May impart an independent cardiovascular survival benefit

o **ARB**
  - Losartan - possible protective effect of in pts with CHF who also have DM II

4. Drugs to avoid with DM & CHF
  - **Thiazolidines** (eg, rosiglitazone, pioglitazone)
    - Retrospective cohort studies - Increased risk of HF
    - Can cause fluid retention, peripheral edema, worsening HF with pulmonary edema
    - Concomitant insulin therapy - Weight gain and fluid retention more common
      - Fluid retention is resistant to diuretics
      - But responds to therapy withdrawal
    - Absolutely contraindicated in pts with NYHA class III / IV HF
  - **Metformin**
    - Increased risk of potentially lethal lactic acidosis
      - Highest risk in presence of hemodynamic instability, renal insuff, liver dz, severe infection
      - Contraindicated in pts with HF requiring drug therapy

5. Surgical revascularization improves survival in diabetic pts
  - No difference in mortality in DM pts with TCA treatment vs CABG
  - No difference in mortality in DM pts with PTCA treatment vs CABG

Evidence-Based Inquiries
1. Is combining ACE inhibitors and ARBs helpful or harmful?
2. What is the most effective beta-blocker for heart failure?
3. Do anti-arrhythmics prevent sudden death in patients with heart failure?
4. Do TZDs increase the risk of heart failure for patients with diabetes?

References


Author: Gaurav Puri, MD, *Trillium Health Care, ON*

Editor: Edward Jackson, MD, *Michigan State University-Sparrow Hospital FPRP*