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 $\geq$ 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]

- **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[7]
  - Combination Tx w/ARB may be more effective
  - Combination therapy of ACEi & ARB[3,4]
    - 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[3,4]
- ARB
  - Losartan - possible protective effect of in pts with CHF who also have DM II[5]

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[6]
   - 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

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