Congestive Heart Failure: Therapeutics - Chronic CHF

General

1. Treat coexistent conditions: HTN, DM, CAD, AFib
2. See also specific tx considerations for
    - CHF & HTN
    - CHF & diabetes
    - CHF & renal failure

Systolic Dysfunction

Medications

1. ACEi: decr. mortality, ischemic events, hospitalizations; delay onset of symptomatic heart failure
    - First choice
    - Initiate with low dose, Eg Lisinopril 2.5-5.0 mg QD
    - Titrate to higher doses as tolerated (e.g. Enalapril 20 mg bid, Captopril 50 mg tid. Lisinopril 20-40 mg/day)
    - Use in all pts except angioedema, anuric renal failure, pregnant
    - Caution: SBP < 80 mm Hg, Cr > 3.0 mg/dL [265.2 umol/L], bilateral renal artery stenosis, potassium > 5.5 mEq/L [5.5 mmol/L]
    - May be less effective in African -Americans
    - Combination Tx w/ARB may be more effective
2. ARB: likely to be beneficial, evidence mixed; use if ACEi intolerant
    - Combination Tx w/ACEi may be more effective
    - Same precautions as with ACE-Is
    - Starting dose: candesartan 4-8 mg QD, losartan 25-50 mg QD, valsartan 20-40 mg BID
    - Titrate to higher doses as tolerated (e.g. candesartan 32 mg QD, losartan 50-100 mg QD, valsartan 160 mg BID)
3. Beta-blockers:
    - Decr. mortality, hospitalizations
    - Use with ACEi, start with low dose Eg, Bisoprolol 1.25 mg QD, Carvedilol 3.125 mg BID, Metoprolol XR 12.5-25 mg QD[1]
    - Titrate every 1-2 weeks to max effective dose (eg, Metoprolol XR 200 mg QD, Carvedilol 25-50 mg BID, Bisoprolol 10 mg QD)Carvedilol and metoprolol are the most effective beta- blockers
4. Can cause hypotension, fluid retention, AV block, fatigue[1]
5. Diuretics: decr. volume overload, incr. exercise tolerance[1]
    - Loop diuretics: Eg furosemide 20-40 mg QD or BID max 600 mg/d ,Torsemide 10-20 mg QD or BID, max 200 mg/d, Bumetanide 0.5-1.0 mg QD or BID, max 10 mg/d
    - Thiazide diuretics: Eg hydrochlorothiazide 12.5-100 mg qD PO
        - Mild heart failure, HTN, add if refractory to loop diuretics
    - Use in all pts with current or history of fluid retention; use with ACE-I and beta-blockers
    - Use with concomitant restriction of Na to 3-4 g/day[1]

- Check potassium levels 2-8 wks after start Rx
- If sulfa allergy:
  - Amiloride, eplerenone, ethacrynic acid, spironolactone, and triamterene do not have a sulfonamide group therefore are safe
  - Evidence is contradictory as to whether a history of allergy to sulfonamide antibiotics increases risk of subsequent allergic reactions to commonly used sulfonamide-containing diuretics (carbonic anhydrase inhibitors, loop diuretics, and thiazides)

6. Digoxin: improves sx, quality of life, exercise tolerance
   - Consider use if sx despite ACE-I, beta-blocker, diuretic
   - No need for loading dose; start at 0.125-0.25 mg PO qd[1]
   - Maintain serum digoxin concentration between 0.5-0.8 ng/mL
   - Only approved inotrope
   - Decrs. hospitalizations but not overall mortality
7. Spironolactone: decrs. mortality in NYHA Class IV pts on ACE[1]
   - 25-100 mg/d PO qD or div BID
   - Potassium < 5.0 mEq/L [5.0 mmol/L] and Cr < 2.5 mg/dL [221 umol/L] to start
   - Can cause gynecomastia
   - Avoid if pt already on ACE-I and ARB[1]
8. Eplerenone: decrs. mortality in pts with recent MI, LV dysfunction[1]
   - 25 mg PO QD to start, max 50 mg BID
9. Hydralazine and Isosorbide Dinitrate: Decr. Mortality in African-Americans when added to standard background therapy[5]
   - Can be substituted for ACE-I or ARB (hypotension, hyperkalemia, renal insufficiency); however, no trials done specifically in this group[1]
   - Hydralazine:
     - 10-50 mg IM, 10-20 mg IV q4-6 hr, 10-50 mg PO QID
   - Isosorbide dinitrate
     - 10-20 mg PO TID-QID
10. Amiodarone: may reduce mortality; evidence weak
11. Antiarrythmics: except for amiodarone and dofetilide, adversely affect survival; use amiodarone to suppress arrhythmias
12. NSAIDS: Incr. exercise tolerance and nocturnal dyspnea
13. Nutritional Supplements may be effective: Coenzyme Q10, carnitine, taurine, antioxidants
    - ACC 2009 guidelines state nutritional supplements not recommended[1]
    - Herbal: hawthorn extract: can be added to conventional treatment to relieve sx of NYHA I-III CHF (SOR A)[7]

Anticoagulation

1. Warfarin: A. Fib or prior history of embolic event[1]
2. Aspirin: role in CHF unclear; may be assoc with incr hospitalizations; may attenuate effect of ACE-Is[1]

Non-Drug Interventions

1. Implantable defibrillators: recommended with persistent low EF despite optimal pharm therapy with good expectation for >1 yr survival Cardiac resynchronization (biventricular pacing or atriobiventricular pacing)
    - EF <= 35%, QRS duration > 120 ms, sinus rhythm, NYHA class III or class IV sxs with walking despite optimal med management (SOR:A)[8]
    - EF <= 35%, QRS > 120ms, atrial fib, and NYHA class III or ambulatory class IV sxs despite optimal med mgmt (SOR:B)[8]
    - EF <= 35%, NYHA class III or ambulatory class IV sxs despite optimal med mgmt who have recurrent need for ventricular pacing (SOR:C)[8]
2. Low salt diet: prevents exacerbations
    - No independent decr. morbidity / mortality
    - No evidence favoring 2, 3, or 4 g of Na/day
3. Exercise: improves quality of life, decrs. cardiac events & admissions, may improve mortality[1]
    - Recommend in conjunction with drug therapy in pts who are able[1]
4. Driving
    - Impairment of consciousness assoc/ with any heart dz needs further evaluation
        - Complete restriction of driving for at least 6 mos

Diastolic Dysfunction Medications

1. Meds based on co-morbidities
    - Beta-blockers and ACE-I if recent or remote MI
    - ACE-I if comorbid LVH and HTN
    - ARBs if intolerant of ACE-I and meet criteria
    - Goal: control causative etiologies
    - No meds reduce mortality or hospitalizations
2. Evidence supports[1]
    - Control SBP and DBP
    - Control ventricular rate in atrial fibrillation, maintaining sinus rhythm might help symptoms
    - Control pulmonary congestion and peripheral edema with diuretics
        - Use caution may overly decrease preload
    - Coronary revascularization in pts with CAD where ischemia is judged to have adverse effect
    - Specific meds
3. ACEi: control HTN, no RCTs[9]
4. ARB: use to control HTN[8]
5. BBlkr: control HTN, no RCTs[10 11]
    - Improves survival post-MI
6. Diuretics: control HTN
    - Use caution as may overly decr. preload
7. CCB: use to control HTN[12]
    - May improving filling time
8. Aldosterone antagonist:[13]
    - Possible improved myocardial function
9. Digoxin: no role in diastolic heart failure[14]

Procedures

1. Positive inotropic intravenous therapy, hemofiltration, mechanical circulatory support, cardiac transplantation
2. Surgical approaches rapidly evolving , esp over last 10-15 yrs:[1]
    - Coronary revascularization.
    - Reconstructive cardiac surgery, particularly modified Dor procedure;
        - Batista procedure largely abandoned
    - Mitral valve repair
    - Left ventricular aneurysmectomy
    - Left ventricular assist devices (LVADs) as bridge to heart transplantation or as permanent circulatory assistance: destination therapy
3. Transplantation indications:[1]
    - Repeated hospitalizations for HF
    - Escalation in intensity of medical therapy
    - VO2 Max
        - Reproducible VO2 max < 14 mL/kg/ min (normal >=20 mL/kg/min) relative indication
        - V02 max <10 mL/kg/min stronger indication
    - Refractory cardiogenic shock
    - Continued dependence on intravenous inotropes
    - Ischemic heart disease
        - Severe symptoms of ischemia that limit routine activity, not amenable to revascularization (absolute indication)
    - Recurrent unstable angina not amenable to other intervention (relative indication)
4. Recurrent symptomatic ventricular arrhythmias refractory to all therapies
5. Cardiac resynch: improves outcomes in pts with wide QRS, moderate heat failure (MIRACLE trial)

Follow-Up

1. Regular f/u with PMD, cardiologist
    - Outcomes improved with cardiologist involvement[15]
2. Appropriate diet, nutrition
3. Frequent review of meds / herbals for interactions
4. Pneumovax, flu shot
5. Monitor Dz progression, treatment
6. Discuss advance directives before severely ill

Evidence-Based Inquiries

1. Is combining ACE inhibitors and ARBs helpful or harmful?
2. How effective are beta-blockers in the treatment of congestive heart failure?
3. What is the most effective beta-blocker for heart failure?
4. Do anti-arrhythmics prevent sudden death in patients with heart failure?
5. Does a low-salt diet reduce morbidity and mortality in congestive heart failure?
6. How soon should serum potassium levels be monitored for patients started on diuretics?

7. Does furosemide decrease morbidity or mortality for patients with distolic or systolic dysfunction?
8. Does digoxin decrease morbidity for those in sinus rhythm with heart failure?
9. How effective are ACE inhibitors and ARBs in the treatment of systolic heart failure?
10. Is there evidence to support the use of coenzyme Q10 to improve outcomes in patients with known heart disease?
11. Which diuretics are safe and effective for patients with a sulfa allergy?
12. Should you restrict your cardiac patient from driving?
13. What is the best management strategy for patients with renal failure and volume overload who are unresponsive to loop diuretics?

References

1. Hunt SA, Abraham WT, Chin MH, et al. 2009 focused update incorporated into the ACC/AHA 2005 Guidelines for the Diagnosis and Management of Heart Failure in Adults: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines: developed in collaboration with the International Society for Heart and Lung Transplantation. Circulation 2009;119(14):e391-479.
2. Packer M, Poole-Wilson PA, Armstrong PW, et al. Comparative effects of low and high doses of the angiotensin-converting enzyme inhibitor, lisinopril, on morbidity and mortality in chronic heart failure. Circulation 1999;100:2312-8.
3. Exner DV, Dries DL, Domanski MJ and Cohn JN. Lesser response to angiotensin-converting enzyme inhibitor therapy in black as compared with white patients with left ventricular dysfunction. N Engl J Med 2001;344(18):1351-7.
4. Rathore SS, Curtis JP, Wang Y, et al. Association of serum digoxin concentration and outcomes in patients with heart failure. JAMA 2003;289(7):871-8.
5. Taylor AL, Ziesche S, Yancy C, et al. Combination of isosorbide dinitrate and hydralazine in blacks with heart failure. N Engl J Med 2004;351(20):2049-57.
6. Tavazzi L, Tognoni G, Maggot's AP, et al. Effect of n-3 polyunsaturated fatty acids in patients with chronic heart failure (the GISSI-HF trial): a randomised, double-blind, placebo-controlled trial. Lancet 2008; 372:1223-30.
7. Dahmer S, Scott E. Health effects of hawthorn. Am Fam Physician 2010;81(4):465-8,469.
8. Russel SD. Beyond Angiotensin-Converting Enzyme Inhibitors and Beta-Blockers: Nonpharmacologic Therapy for Chronic Heart Failure. Adv Stud Med 2006;6(1): 16-23
9. Klingbeil, AU, Schneider, M, Martus, P, Messerli, FH. A meta-analysis of the effects of treatment on left ventricular mass in essential hypertension. Am J Med 2003; 115:41.
10. Poulsen, SH, Jensen, SE, Egstrup, K. Effects of long-term adrenergic beta-blockade on left ventricular diastolic filling in patients with acute myocardial infarction. Am Heart J 1999; 138:710.
11. Flather, MD, Shibata, MC, Coats, AJ, et al. Randomized trial to determine the effect of nebivolol on mortality and cardiovascular hospital admission in elderly patients with heart failure (SENIORS). Eur Heart J 2005; 26:215.

12. Setaro, JF, Zaret, BL, Schulman, DS, et al. Usefulness of verapamil for congestive heart failure associated with abnormal left ventricular diastolic filling and normal left ventricular systolic erformance. Am J Cardiol 1990; 66:981.
13. Mottram, PM, Haluska, B, Leano, R, et al. Effect of aldosterone antagonism on myocardial dysfunction in hypertensive patients with diastolic heart failure. Circulation 2004; 110:558.
14. Ahmed, A, Rich, MW, Fleg, JL, et al. Effects of digoxin on morbidity and mortality in diastolic heart failure: the ancillary digitalis investigation group trial. Circulation 2006; 114:397.
15. Indridason, OS, Coffman, CJ, Oddone, EZ. Is specialty care associated with improved survival of patients with congestive heart failure?. Am Heart J 2003; 145:300

Authors: Jeffery Lanier, MD, Emily Clay, MD, & Terry Newton, MD, *Martin Army FMR, Ft. Benning, GA*

Editor: Kara Cadwallader, MD, *Rural FMR of Idaho*