

# CONGESTIVE HEART FAILURE

- Five millions Americans have CHF
- 550,000 New cases every year
- 800,000 Patients with CHF hospitalized every year
- 250,000 die every year
- 50% Patients die with in five years
- 150% increase in the last 20 year
- 2.6% total population has this disease
- Incidence and associated morbidity and mortality is expected to increase in future

# Congestive Heart Failure

Two types

1. High output failure

-Increased demand

2. Low output failure

- Systolic dysfunction

- Diastolic dysfunction

- Mixed

# Congestive Heart Failure

## Определение

### Systolic HF

Желудочки неспособны обеспечить кровоток к тканям в покое и при обычной нагрузке вследствие анатомических или функциональных аномалий

### Diastolic HF

Это легочный венозный застой как результат нормальной или близкой к норме [  $EF > 40\%$  ] левожелудочковой систолической функции

# Congestive Heart Failure

## Две теории возникновения

1. Старая теория -- Нарушение насосной функции
- 2 Новая теория– Нейро-гормональная теория как нарушение баланса между сердечной недостаточностью и уровнем:

- Endothelin
- Norepinephrine
- Renin

# Congestive Heart Failure

## Факторы, влияющие на исход:

- Возраст
- Расовая принадлежность
- Пол

### 1. Возраст (частота)

- 1 or less in 50 year or younger
- 5% in 50 - 70 years
- 10% in over 70 years
- 15% in over 80 years

# Congestive Heart Failure

## 2. Расовая принадлежность

- Higher incidence in blacks
- 3.5% in black men
- 3.1% in black woman
- 2.3% in white man
- 1.5% in white woman
- HF in black men = poor prognosis

## 3. Пол

- Higher prevalence in men 70 years and younger
- Higher prevalence in women 70 years and older

# Congestive Heart Failure

## Стоимость

- \$ 21- 50 billions/ year
- 1/3 cost on outpatient care
- 2/3 cost on hospital care
- Care of CHF - 3 times for cancer  
- 2 times for MI
- Average cost of CHF / admission = \$ 8000

# Heart Failure Congestive

- **Смертность**

One year mortality = 17%

Two year mortality = 30%

Three year mortality = 56%

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- *Причины:*

- *Неадекватное лечение*

- ACE ингибиторы должны быть назначены 100% больным CHF, однако в действительности:

Cardiologists = 80%

Internists = 71%

FP = 60%

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# Congestive Heart Failure

## Этиология систолической (Systolic) HF

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- CAD is most common
  - Produces **Ischemic** cardiomyopathy
- Hypertension 2nd common
- Non ischemic Cardiomyopathy
  - Commonest is idiopathic dilated

## Другие причины:

### *Cardiac*

- Valvular HD
- Myocarditis
- Pericardial disease
- Arrhythmias

Этиология:

## ***Noncardiac***

- Alcohol/Thiamine Deficiency
- Diabetes mellitus
- Infection
- Shock
- Pregnancy
- Pulmonary Embolism
- Anemia
- Drugs
- Hyper or hypothyroidism
- Pulmonary hypertension
- Infiltrative diseases like-
  - Sarcoidosis
  - Hemochromatosis
  - Amyloidosis
  - TB
  - Tumors

# Congestive Heart Failure

Этиология:

## Diastolic HF

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- Most common
  - CAD
  - Hypertension
- Others
  - Diabetes mellitus
  - Aortic stenosis
  - Hypertrophic cardiomyopathy
  - Infiltrative cardiomyopathy

# Congestive Heart Failure

- **Патофизиология:**
- Основы ухудшения функции левого желудочка связаны с увеличением:
  - Norepinephrine
  - Angiotensin
  - Aldosterone
- Их уровень связан с плохим прогнозом
- Снижение этих гормонов уменьшает смертность

# Congestive Heart Failure

## Оценка:

- History and physical exam
- CAD risk factor evaluation
- Previous studies
- Determination of co-morbid conditions
- Laboratory studies

# Congestive Heart Failure

## История

- Careful history is very important
  - Ask for if they have or have had any conditions like CAD, HTN, Thyroid disease, DM, MI
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## Признаки HF

- Быстрая утомляемость?
- Чрезмерные физические нагрузки?
- Легко ли поднимаешься на один этаж?
- Отеки и избыточная потливость ?
- Одышка?

# Congestive Heart Failure

## Functional status:

- Соответствие шкале NYHA
- Ежегодная проверка

Class1: **No** limitation of physical activity. Ordinary activity does not cause undue fatigue, dyspnea, or anginal pain

Class2: **Slight** limitation of physical activity. Ordinary physical activity results in symptoms

Class3: **Marked** limitation of physical activity.  
Comfortable at rest, but less than ordinary activity causes symptoms

Class4: Symptoms present even at rest.

# Symptoms

- Два основных симптома вследствие застоя жидкости:
  - Одышка
  - Отек
  - Асцит
- 2. Вследствие снижения минутного кровотока
  - Слабость

# Physical finding

- S3
  - associated with atrial pressure  $>20$  mm and increased ventricular end diastolic pressure  $>15$  mm
- Decreased cardiac output
  - Sinus tachycardia
  - Peripheral vasoconstriction
  - Decreased CO is suspected when pulse pressure is  $<25$  mm
- Pulsus paradoxus – a sign of severe LV dysfunction
- Volume overload
  - pulmonary congestion, JVD and edema

# Physical finding

- Ventricular Enlargement
- Pulmonary HTN

# Congestive Heart Failure

## Lab studies

- CBC
- Chemistry profile
- Fasting lipid profile
- Urinalysis
- ECG
- Chest X-Ray
- Magnesium, Calcium, Phosphorus Selenium, Thiamine
- TSH
- Urine drug screen
- Ferritin
- Albumin

# Congestive Heart Failure

## Diagnostic Evaluation needed for:

- Determine the type of cardiac dysfunction
- Find correctable causes of HF
- Determine prognosis
- Guide treatment

## Further work up needed in:

- All patients with suspicion or Diagnosis of CHF should have ECHO done
- If ECHO results are inconclusive, order MUGA scan
- For patients with the risk factors but no angina:
  - Non invasive testing like treadmill test, stress ECHO

# Congestive Heart Failure

## Cardiac cath. for patients with:

- Angina
- Known large area of ischemia
- Hibernating myocardium
- Unexplained HF

**CABG in multivessel disease with decreased systolic function leads to decreased mortality and significantly improves symptoms of angina and HF**

# Congestive Heart Failure

## Ambulatory rhythm monitoring:

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- When rhythm disturbance suspected in HF
- Sudden death due to arrhythmias is major cause of mortality in HF
- Many studies have shown that ICD provides a major survival advantage in symptomatic or inducible ventricular arrhythmias with or without HF

# Congestive Heart Failure

## Other Studies

- Serum level of Atrial natriuretic peptide {ANP}, Brain natriuretic peptide {BNP}, norepinephrine and other neurohormones are elevated in HF
- ANP and BNP may predict prognosis and used in many centers to monitor patients with HF

# Congestive Heart Failure

## Treatment

- ACEI/ARB
- BETA BLOCKERS
- DIURETICS
- ALDACTONE
- DIGOXIN
- New hormonal inhibitors
- Antiplatelets
- Anticoagulants
- Non pharmacological treatment

# Congestive Heart Failure

## ACE inhibitors

- ACE inhibitors modify neurohormonal activity in HF by inhibiting:  
Angiotensin 1  $\longrightarrow$  Angiotensin 2
- This leads to
  - Peripheral vasodilation
  - Decreased afterload
  - Decreased BP
- This leads to down regulation of sympathetic NS -- improves baro receptor function

# Congestive Heart Failure ACEI/ARBs

## Mortality benefits of ACE inhibitors in major trials

<i>Trial Name</i>	<i>Study Group</i>	<i>Drug studied</i>	<i>All cause mortality reduction</i>
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CONSENSUS	253 Pts., NYHA 2&3	Enalapril Vs placebo	27%
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SOLVD	2,569 Pts. NYHA 2,3&4	Enalapril Vs placebo	16%
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V-HeFT 2	804 Pts. NYHA 2,3&4	Enalapril Vs hydralazine plus ISDN	28%
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SAVE	2,231 post-MI pts. with EF 40%	Captopril Vs placebo	19%
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# Congestive Heart Failure

In pooled studies of HF, overall reduction in all cause mortality =23%

This benefit extends to:

- Ischemic and non ischemic cardiomyopathy
- Symptomatic and non symptomatic LV dysfunction

Addition to survival benefits ACEI:

- Improve symptoms
- Increase exercise capacity
- Decrease No. of hospitalization
- Increase EF
- Decrease recurrent MI

# Congestive Heart Failure

## Doses

ATLAS study was conducted for optimal dose of  
ACEI

Lisinopril --- Two groups

Low dose      2.5---5mg/day

High dose     32.5--35 mg/day

# Congestive Heart Failure

Both groups achieved similar improvement of:

- Symptoms
  - Functional class
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But group with high dose has:

- 12% lowers relative risk of death or hospitalization
- 24% fewer hospitalizations with HF

Results of ATLAS study suggest:

1. High dose of ACEI independent of symptomatic relief or hemodynamic effects as long as tolerated
2. Low dose if hypotension, renal insufficiency or hyperkalemia

# Congestive Heart Failure

Most expert agree that

- ACEI should be first line therapy
- ARBS if ACEI not tolerated
- Combination in patients not fit for Beta-blockers

# Congestive Heart Failure

## Beta blockers

We know that increased Sympathetic activity in HF --- Increase in circulating norepinephrine ---- stimulation of alpha and beta-receptors. This chronic elevation causes-

- Myocyte necrosis
- Progressive LV dysfunction

# Congestive Heart Failure

## **15 trials have shown that beta-blockers**

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- Reduce all cause mortality by 32%
- Reduce combined risk of death due to CHF by 37%
- Reduce hospitalization by 37%
- Increase ejection fraction by 29%
- Improve symptomatic and functional class
- Well tolerated in all studies
- Discontinuation rate 9 to 15%

**As with ACEI, reduction of mortality  
appears to be dose related**

# Congestive Heart Failure

## Mortality benefits of beta blockers in major trials

<i>Trial name</i>	<i>Study group</i>	<i>Drugs studied</i>	<i>All cause mortality reduction</i>
US Carvedilol HF Study	1,094 Pts. NYHA 2,3, or 4 CHF	Carvedilol vs placebo	65%
CIBIS-2	2,647 Pts. NYHA 3 or 4 CHF	Bisoprolol vs placebo	34%
MERIT-HF	3,991 Pts. NYHA 3 or 4 CHF	Metoprolol XL Vs placebo	34%

# Congestive Heart Failure

Beta blockers:

- Прямое, а не симптоматическое лечение
- Эффект не зависит от этиологии CHF и возраста
- Подавляет нейро-гормональный каскад
- Показаны при всех случаях хронической симптоматической HF

# Congestive Heart Failure

## Criteria for Beta Blockers:

- LV systolic dysfunction
- Ejection Fraction < 40%
- Mild to moderate impairment in functional capacity
- NYHA class 2 and 3, even 4
- Optimal and stable circulation
- No C/I to beta blockers

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Нет необходимости в назначении Beta-Blockers:

- HF без LV недостаточности
- Нестабильная гемодинамика
- Если используются i.v. инотропные препараты (дигоксин)
- NYHA class 4

# Congestive Heart Failure

## Doses of Beta blockers

Drug	Starting dose	Target dose	Cost
<i>Coreg</i>	3.125 mg/day	25 to 50 mg twice	\$93
<i>Lopressor</i>	12.5 mg/day	50 to 100 mg b.i.d.	\$42
<i>Toprol XL</i>	12.5 mg/day	200 mg/day	\$52
<i>Bisoprolol</i>	1.25 mg/day	10 mg/day	\$35

**Beta-blockers должны назначаться в максимально переносимых дозах**

# Congestive Heart Failure

## Steps in management of side effects:

<b>Problem</b>	<b>step1</b>	<b>step2</b>	<b>step3</b>
Symptoms of vasodilation	Decrease Diuretic dose	Decrease vasodilator dose	Decrease Beta-blocker dose

Symptoms of fluid retention	Increase diuretic dose	Decrease beta-blocker dose	
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Symptomatic bradycardia	Check dig. level and adjust dose	Decrease beta-blocker dose	
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# Congestive Heart Failure

## Aldosterone Antagonists

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- назначают при NYHA 3-4, то есть при появлении признаков вторичной правожелудочковой недостаточности

# Congestive Heart Failure

**«RALES» study has shown significant survival benefits in patients with NYHA 3&4 who are pretreated with ACEI**

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1663 Patients either received aldactone [25-50 mg] or placebo stopped early because:

- Significant reduction in the risk of death
- Slow progression of HF
- Significant reduction in the risk of death
- Improved functional class

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- Currently Aldactone therapy should be considered in all patients with **severe** symptomatic HF in absence of significant renal impairment and hyperkalemia
- Role of aldosterone antagonists in patients with **mild** HF or those being treated with beta blockers is currently unknown

# Congestive Heart Failure

## Hydralazine and Isosorbide dinitrate

- Combination decreased mortality in HF
- Decreased mortality by 25% in one study
- Patient who cannot tolerate beta-blockers should be given this combination
- Used individually don't decrease mortality
- Tolerance is an issue

## Doses

- Isosorbide dinitrate [Isordil] --- 20-80 mg tid or qid
- Hydralazine [Apresoline]
  - 10 mg tid Initially
  - Increase to 25-100 mg tid

# Congestive Heart Failure

## Digoxin

- 6800 Patients studied ---Digoxin Vs Placebo

## Digoxin:

- Did not reduce overall mortality
- Decreased rate of hospitalization, both overall and CHF
- Effective for treating symptoms of CHF in absence of dysarrhythmia
- Increased functional capacity in NYHA 2&3
- Dose : 0.125-0.25 mg

# Congestive Heart Failure

## Diuretics:

- \* Mainstay of symptomatic treatment of CHF
- \* Short-term studies have shown that diuretics:
  - Improve symptoms of sodium and water retention
  - Increase exercise tolerance
  - Increase cardiac function regardless NYHA class
  - No data available to support decrease in mortality or morbidity
  - Tolerance could be problem, try to change diuretic every year
  - Renal insufficiency--use loop diuretics
    - Lasix 20--320 mg qd -qid
    - Bumex 1-8 mg qd or divided doses
    - Aldactone synergistic with loop diuretics

# Congestive Heart Failure

## Antiplatelets and anticoagulants

Risk of thromboembolism in HF = 1.6 to 3.2% / year

But routine anticoagulation is not recommended yet

Helpful in HF and:

- Atrial fibrillation
- Mitral regurgitation
- LV thrombus visualized by echo
- Anterior MI
- Severe dilated cardiomyopathy [EF < 20%]

Not helpful in patients with HF and sinus rhythm

# Effects of different drugs

Drug    Symptoms    Exercise tolerance    Survival    Hospitalization

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*Diuretics*    Improved    Improved    Unknown    Unknown

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*ACEI*    Improved    Improved    Improved    Decreased

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*BB*    Improved    Equivocal    Improved    Decreased

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*Digoxin*    Improved    Improved    No effect    Decreased

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# Congestive Heart Failure

## Non pharmacological treatment:

### Dietary sodium restriction

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- No studies to show morbidity and mortality effect
- Minimizes doses of HF drugs
- Restrict sodium to 4 mg / day

### Exercise training

#### Moderate exercise training:

- Improves quality of life
- Decrease mortality in stable chronic HF

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### Recent studies have shown:

#### Moderate exercise on stationery bike for 2-3 hrs./week:

- Decreases mortality
- Decrease hospital admissions by 4-14 months

# Congestive Heart Failure

Препараты с невыявленной эффективностью:

## Calcium channel blockers

- не уменьшают смертность , необходимость повторной госпитализации и качество жизни и даже иногда ухудшают прогноз.

# Congestive Heart Failure

## Diastolic HF :

- Goal of therapy is to slow the rate to allow time for ventricular filling
- **Take off digoxin and ACEI**
- Beta blockers
  - Inderal 60-80 mg tid or qid
  - Lopressor 50-100 mg bid
  - Timolol 10 mg bid
  - Atenolol 50 mg bid or 100 mg qd
- Calcium Channel blockers
  - Cardizem - Initially 60 mg tid
    - Go to 360 mg qd
  - Verapamil - 60 mg tid initially
    - Increase to 480 mg in 3 divided doses

# Congestive Heart Failure

## Follow up:

### Contact frequency

- Each 3-6 months if stable on medications > one year
- Increase frequency as needed if change in symptoms or medication

### Every visit

- Interval history
- Symptoms like PND, DOE, Orthopnea, edema
- Weight
- Blood pressure/Pulse
- Medication review
  - Instructions to Avoid NSAIDS
  - New prescription from other physicians
- Tobacco use
- NYHA class

# Выводы

1. По-прежнему, хроническая сердечная недостаточность – убийца №1.
2. Ранняя диагностика с применением современных неинвазивных и инвазивных методов обследования в сочетании с правильным лечением систолической и диастолической дисфункции сердца безусловно улучшают прогноз и качество жизни.
3. Ведущиеся в настоящее время исследования в области ангио- и миогенезиса ( в том числе, применение стволовых клеток) призваны решающим образом изменить первый вывод!