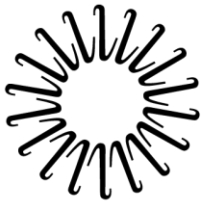
Congestive Heart Failure



Lifespan Cardiovascular Institute

Rhode Island Hospital • The Miriam Hospital
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The Center For Cardiac Fitness

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Congestive Heart Failure

- The number one reason for hospital admissions of adults in the United States.
- The number one consumer of Medicare dollars.
- Predictions for the future suggest it will continue to be the most important problem facing older adults far into the future.

Congestive Heart Failure: Definition and Symptoms

- Definition: The inability of the heart to meet the metabolic (bloodflow) demands of the body at normal “filling pressures.”

- Diminished bloodflow causes symptoms of fatigue, especially with physical activity.

- Elevated pressures in the heart contribute to fluid retention in the lungs, abdomen and legs.

Function of the Heart

- The heartbeat, or cardiac cycle, has two phases
  - Systole – pumping the blood to the body
  - Diastole – receiving blood from the veins in preparation for the next beat

- In congestive heart failure, both phases are often abnormal
  - Systolic dysfunction – diminished amount of forward flow
  - Diastolic dysfunction – blood can't get into the heart normally in preparation for the next beat

What Causes Heart Failure?

Low Ejection Fraction:

- "Systolic Dysfunction" or "Weak Hearts"
  - Heart attacks
  - Poorly controlled high blood pressure
  - Viruses
  - Heart valve problems (leakiness or blockage)
    - Inherited and genetic diseases
  - Toxins – alcohol (excessive), cocaine, some chemotherapeutic drugs.
  - Unknown

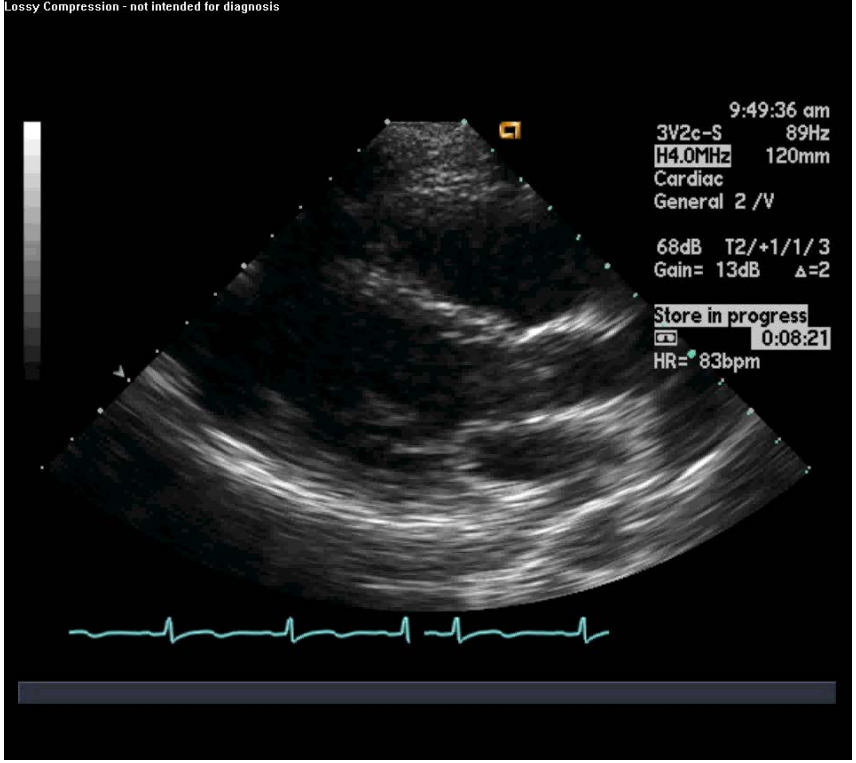
Normal Ejection Fraction:

- "Diastolic Dysfunction" or "Stiff Hearts"
  - High blood pressure
  - Aging
  - Diabetes
  - Epidemic in elderly women

Progressive Heart Failure

Ventricular Remodeling

A. ISCHEMIC B. IDIOPATHIC DILATED C. HYPERTENSIVE



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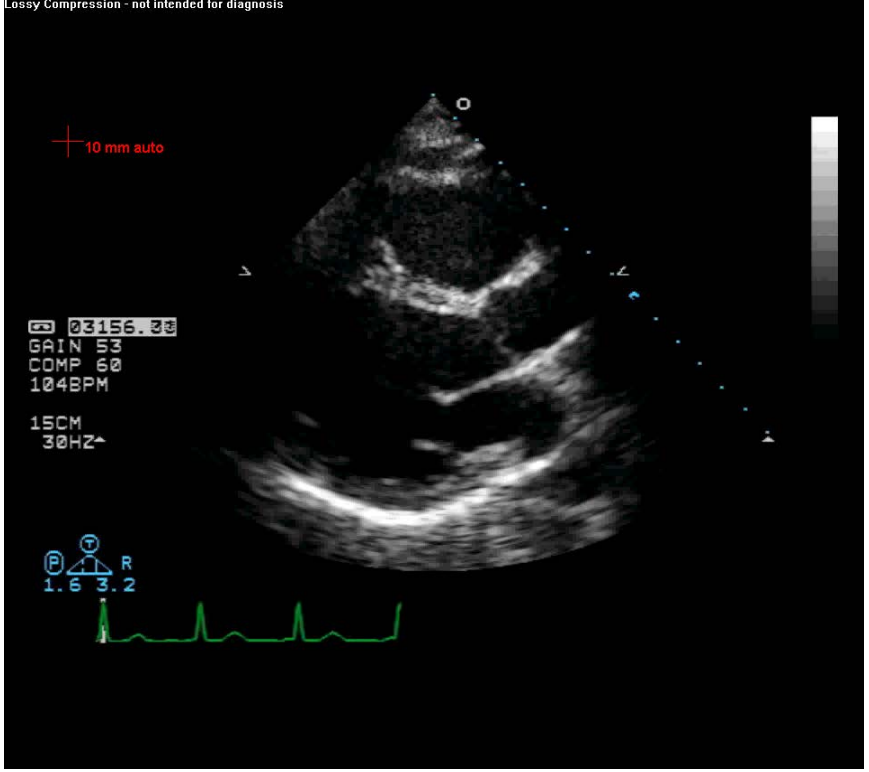

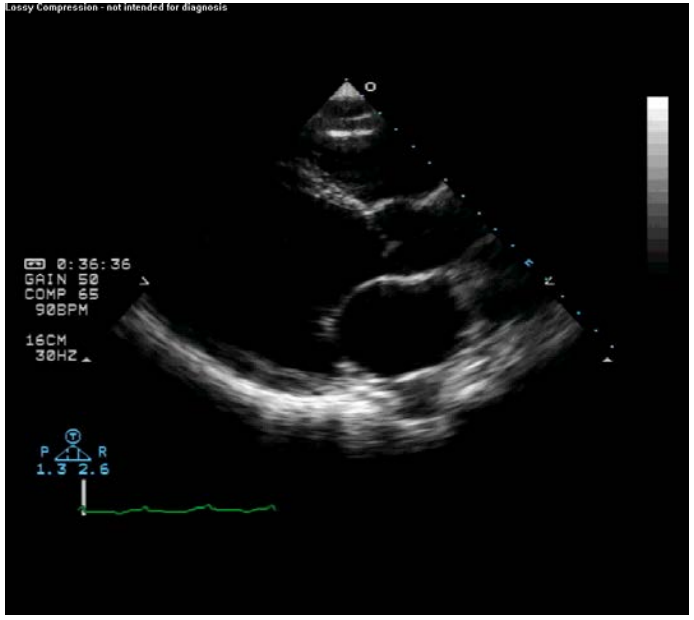

? THERAPY

REMODELING

Prevention is rationale of modern HF therapy

Results of Cardiac Dysfunction

- Consequences of systolic dysfunction
  - Dimished flow of blood out of the heart to the body
    - Causes symptoms of fatigue and tired muscles
    - “Tricks” the body into thinking you’re dehydrated

- Consequences of diastolic dysfunction
  - Elevation of the pressure of the blood needed to fill up the heart for the next heartbeat
    - High pressure causes “congestion”
    - Fluid in lungs causes shortness of breath
    - Fluid in the rest of the body causes swelling

The Body's Response to Heart Failure

- The kidneys see low blood flow and think you're dehydrated
  - In response, urine output drops to conserve water
  - This makes fluid retention much worse
- The nervous system sees low blood flow and begins a stress response
  - Blood vessels constrict, making it harder for the heart to pump out blood
  - The brain tells the heart to beat harder and faster, which places more of a burden on the heart

The Body's Response to Heart Failure

- The stress response of the body to the failing heart involves production of many chemicals.
  - These chemicals may make the situation a bit better temporarily, but in general are toxic to the heart and blood vessels and in time make the situation worse.

- The heart enlarges and becomes weaker. Other organs also begin to fail.
  - Patients become swollen, short of breath, and very limited in their ability to do any physical activity.

What to Do?

- Modern therapy of heart failure involves blocking the toxic chemicals from further damaging the cardiovascular system.

- Relief of swelling and shortness of breath is also important, by using water pills to counteract the kidney's tendency to retain salt and water.
  - Low sodium diet is essential.

Blocking Toxic Chemicals

- Effects of Angiotensin II
  - Constrict blood vessels
  - Make kidneys retain fluid
  - Cause enlargement of the heart
  - Promote blocked arteries

- Angiotensin Converting Enzyme Inhibitors (ACE Inhibitors) block production of this chemical and all of these bad effects.

Types of ACE-Inhibitors

- Captopril
- Enalapril
- Lisinopril
- Ramipril
- Quinapril
- Trandolapril
- Fosinopril
- ARB's an acceptable alternative
  - End in "-artan" (ie losartan)
  - More expensive but don't cause cough

- Side Effects
  - Cough
  - Problems with potassium
  - Kidney problems
  - Rare serious allergy

- Benefits far outweigh risk
  - Decrease death by 30%

Beta-Blockers

- Norepinephrine is essentially adrenaline
- Is released by the nervous system into the heart as a stress response to make it beat harder and faster
  - Unfortunately is has detrimental effects
    - Constricted blood vessels
    - Increased workload of heart
    - Death of heart cells
    - Progressive pumping dysfunction
  - Beta-blockers can prevent these harmful effects

Beta-blockers

- Carvedilol
- Metoprolol
- Bisoprolol
- Propranolol
- Atenolol
- Nadolol

- Side Effects
  - Fatigue
  - Shortness of breath
  - Worse fluid retention
  - Depression
  - Nightmares
  - Male sexual dysfunction

- Benefits far outweigh risks
  - 35% reduction in death risk

Relief of Fluid Retention

- Water pills counteract tendency of kidney to retain water

- By getting rid of fluid, pressures in heart fall and symptoms of congestion improve
  - Less swelling
  - Less shortness of breath

Diuretics

- Furosemide
- Torsemide
- Bumetadine
- Ethacrynic Acid
- Zaroxolyn

- Spironolactone – diuretic and blocks a harmful chemical

- Side Effects
  - Dehydration
  - Kidney problems
  - Potassium problems

- Benefits far outweigh risks
  - For many with heart failure, life is barely livable without diuretics

Control of Fluid Retention

- In addition to diuretics, dietary control of sodium intake is essential
  - Sodium must be diluted in water in the body
  - By taking sodium, you increase blood volume
    - Kidney is normally able to get ride of extra salt water, but in patients with heart failure, the kidney mistakenly holds onto salt and water.
    - Diuretics “trick” the kidney into getting rid of salt and water more normally.

Control of Fluid Retention

- Amount of fluid retained generally related to amount of sodium taken in
  - Sodium intake tends to vary from day to day
  - Therefore, dosage of diuretic often needs to vary from day to day
- The daily weight is the best way for patients to estimate their amount of fluid retention
  - As more fluid is retained, weight will increase
- Patients need to feel empowered and comfortable with increasing their diuretic dose if their weight increases to get rid of excess fluid

Digoxin

- Helps the heart beat more strongly
- Blocks harmful chemicals
- Makes people feel better and decreases hospitalizations in heart failure
  - Does not save lives but still an important part of heart failure treatment

Other Therapies

- Defibrillators
  - Annual risk of sudden death is approximately 2-3% with ejection fraction less than 35%
  - Defibrillators can take away this risk
  - They do not make one feel better or improve heart function
- Biventricular Pacemakers
  - Heart contraction is often dyssynchronous (or discoordinated) with heart failure
  - Multiple lead pacemakers can re-synchronize (or re-coordinate) heart motion and improve heart failure symptoms and survival

Other Therapies

- Bypass surgery, angioplasty or stenting if blocked artery is a major cause of the heart failure syndrome
- Valve repair or replacement (most often mitral or aortic) if blocked or leaky valve is a major cause
- Cardiac transplantation in selected patients

Exercise

- Exercise therapy essential for patients with heart failure
  - Improves quality of life and sense of well being
  - Improves efficiency of the cirulatory system
  - Decreases hospitalization
  - Probably decreases death rates
- Gone are the days of “bedrest” or major activity limitations for people with cardiac disease
- Best done (at least initially) with professional supervision

Conclusions

- Heart Failure is a major health problem
- It causes fatigue, shortness of breath and swelling
- Without treatment, it tends to get worse over time as the body reacts to the heart failure state
- By interrupting the body's response to heart failure, it can be effectively treated
- Lifestyle changes (reduced sodium intake and regular exercise) are as important as any medication or procedure in treating the disease