

Heart Failure Causes

Hypertension and Ischemic Coronary Heart Disease

1. Heart Failure occurs when there is ANY damage to the heart muscle
2. **Most common cause of diastolic heart failure:**
 - a. **Hypertension**
 - i. Hypertension forces the heart to work harder
 - Hypertension increases afterload
 - ii. Heart must contract harder to compensate
 - iii. Left ventricle thickens from contracting harder
 - This causes remodeling/heart shape changes
 - iv. The remodeling starts the heart failure cycle
3. Other causes:
 - a. Ischemic coronary artery disease/Myocardial infarction
4. Goal: reducing their modifiable risk factors for coronary artery disease
 - a. **Modifiable risk factors (things you can control):**
 - i. **Hypertension management**
 - ii. **Cholesterol management**
 - iii. **Hyperglycemia and diabetes management**
 - iv. **Obesity reduction**
 - v. **Physical inactivity**
 - vi. **Reducing alcohol abuse**
 - vii. **Avoiding tobacco and illicit drug abuse**
 - b. **Non-modifiable risk factors (things you can't control)**
 - i. **Advanced age**
 - ii. **Gender**
 - iii. **Genetics**
 - iv. **Co-existing medical problems:**
 - Chronic kidney disease
 - Sleep apnea
 - Race
 - Ethnicity
 - Socioeconomic factors
5. Patients need **AGGRESSIVE** treatment if they have a myocardial infarction
 - a. Goal is to prevent beginning this heart failure cycle
 - b. **Prevent left ventricular remodeling with:**
 - i. **Beta blockers**
 - ii. **ACE inhibitors**

Heart Valve Disease

1. Heart VALVE disease can also damage the heart and cause heart failure
2. Damage to a heart valve causes the heart to work extra hard to maintain cardiac output

Other Causes of Heart Failure

1. Thyroid disease
2. Alcohol abuse
3. Infections
4. Tachyarrhythmias
5. Sleep apnea
6. Toxins
 - a. Chemotherapy
 - b. Illicit drugs
 - c. Poisons
 - d. Cardiomyopathy

Cardiomyopathy: Heart Shapes Changes

1. Cardiomyopathy:
 - a. When the heart is in an ABNORMAL and DYSFUNCTIONAL SHAPE
 - b. Cardiomyopathy can cause heart failure
2. Causes of Cardiomyopathy:
 - a. Injury to the heart (remodeling)
 - b. Genetics (congenital)
3. Types of cardiomyopathies:
 - a. Dilated Cardiomyopathy
 - b. Hypertrophic Cardiomyopathy
 - c. Restrictive Cardiomyopathy
 - d. Tako-Tsubo Cardiomyopathy

Dilated Cardiomyopathy

1. Dilated cardiomyopathy causes the ventricle chamber to dilate
 - a. Ventricle is thin
 - b. Contractions are very weak
 - c. **Can cause systolic failure (heart failure with a reduced ejection fraction)**
2. Most common type of cardiomyopathy
3. Very prognosis
4. Complications:
 - a. Mitral regurgitation
 - i. Left ventricle dilates so much that the mitral valve pulls apart
 - ii. Mitral valve can no longer close all the way
 - b. Heart rhythm changes
 - i. Ventricular dilation changes the electrical pathways
 - c. Sudden Cardiac death
 - i. Very high risk when ejection fraction is very low

Hypertrophic Cardiomyopathy

1. Hypertrophic cardiomyopathy causes the ventricle chamber to shrink
 - a. Ventricular muscle is very thick
 - b. Contractions stay strong
 - i. Ejection fraction is normal

HEART FAILURE: CAUSES

- ii. Ventricular muscle cannot fully relax between contractions
 - iii. Less room in ventricle to fill with blood
 - iv. Cardiac output is low
 - c. Can cause diastolic failure (heart failure with a preserved ejection fraction)
2. More rare than dilated cardiomyopathy
3. Half of occurrences are due to genetics
 - a. Can cause SUDDEN DEATH in young kids who are athletes
4. Hypertrophic cardiomyopathy is the most common cause of sudden death IN young athletes
 - a. A short diastole time is very dangerous
 - i. When the heart rate increases, diastole time decreases
 - ii. The small ventricular cavity has even less time for blood to fill the ventricles to fill
 - iii. Cardiac output declines the most when the heart rate increases
5. Sometimes this hypertrophy can become obstructive
 - a. The thick septal wall can bulge and block the aortic valve
 - b. Blood has a difficult time exiting the left ventricle through the aortic valve
6. How Hypertrophic Cardiomyopathy causes sudden cardiac death:
 - a. Very low cardiac output reduces blood available to flow through the coronary arteries
 - b. Coronary arteries not getting enough oxygenated blood affects cardiac rhythm
 - i. Can cause ventricular dysrhythmias like fatal Ventricular Tachycardia
7. Childhood hypertrophic cardiomyopathy:
 - a. Kids might not know they have this condition until they start doing some more extreme form of exercise
 - b. During a pediatrician appointment, **a systolic murmur during a valsalva maneuver** may be detected
 - i. An echocardiogram would confirm the diagnosis of hypertrophic cardiomyopathy
8. Treatment:
 - a. **Goal: increase diastole time!**
 - i. This **maximizes filling time** for the ventricle as much as possible
 - ii. Medications to prevent heart rate acceleration:
 - Beta blockers
 - Calcium channel blockers
 - b. Goal: Stop Ventricular Tachycardia if it starts!
 - i. Amiodarone
 - ii. An implanted ICD and pacemaker
 - c. Goal: reduce obstruction (for obstructive hypertrophic cardiomyopathy)
 - i. Surgery to cut away obstructive piece

- Ventricular septal myectomy
- A piece of septum is physically cut away to reduce symptoms of obstruction

Restrictive Cardiomyopathy

1. Extremely rare
2. Very poor prognosis
3. Restrictive cardiomyopathy causes the ventricle to become very, very stiff (brick wall)
 - a. Ventricle cannot expand or stretch during diastole
 - i. Impairs diastole causing diastolic failure
 - ii. Decreases cardiac output
4. Cardiac output is “fixed”
 - a. Cardiac output cannot increase with exercise
 - b. During exercise, patients have symptoms of poor cardiac output
 - i. Tired and
 - ii. S.A.D.
 - Syncope (lightheaded, dizzy, faint)
 - Angina
 - Dyspnea
5. Causes of restrictive cardiomyopathy
 - a. Idiopathic (most common)
 - b. Scar tissue build up in the myocardial wall
 - i. Scar tissue makes the ventricle stiff and less flexible
 - ii. Scar tissue disorders:
 - Amyloidosis
 - Sarcoidosis

Takotsubo Cardiomyopathy: “Broken Heart Syndrome”

1. Cause:
 - a. Extreme stress
 - i. Overactive sympathetic nervous system causes chronic release of catecholamines (norepinephrine and adrenaline)
 - ii. The heart in overdrive can cause ventricular remodeling
2. Nick-named “broken heart syndrome”
 - a. Often diagnosed in spouses who are going through the emotional stress of LONG-TERM bereavement when their loved one dies