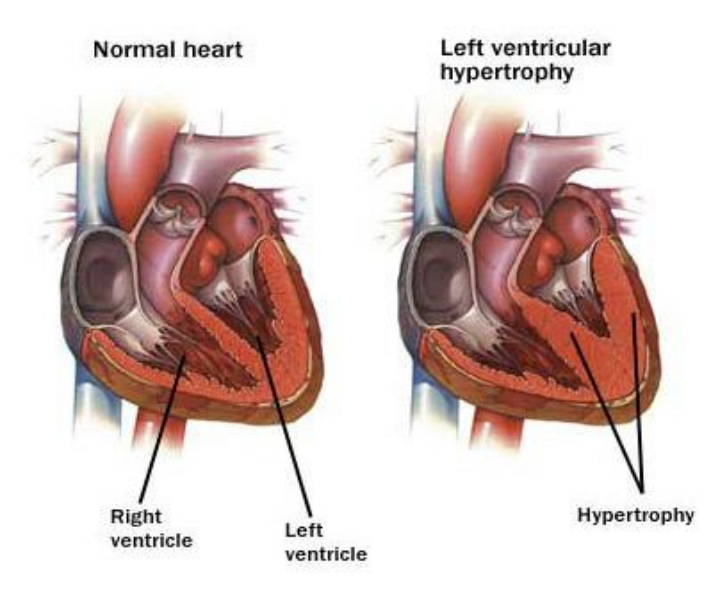
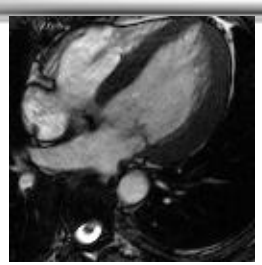
Left Ventricular Hypertrophy



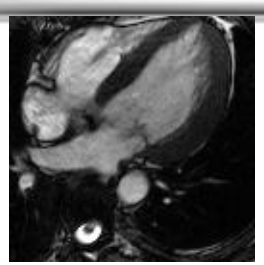
Eric Sparks



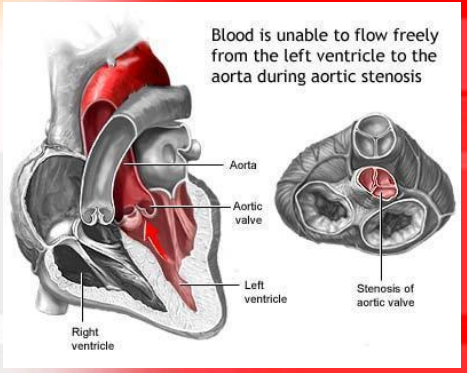
Left Ventricular Hypertrophy (LVH)

Description:

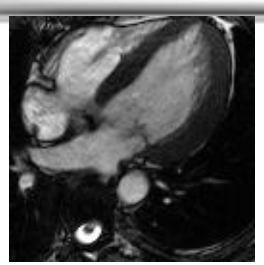
- Left Ventricular Hypertrophy- is an enlargement of the muscle tissue in the left ventricle.
- Occurs when the heart has to work harder than normal.
- Usually occurs gradually over time.



Risk Factors



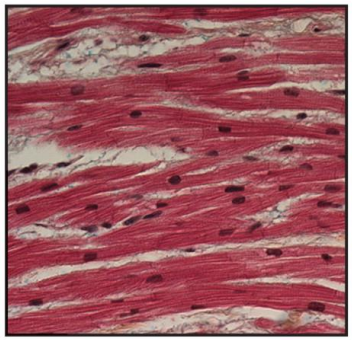
- High Blood Pressure- >140/90 mmHg.
- Aortic valve stenosis- narrowing of aortic valve.
- Exercise- aerobic and anaerobic exercise cause the heart to work harder and lead to LVH in some individuals.
- Hypertrophic cardiomyopathy- myocardium becomes thickened.
- Myocardial fibrosis-manifested from diastolic dysfunction
- Many other conditions-(example dialysis, aging)



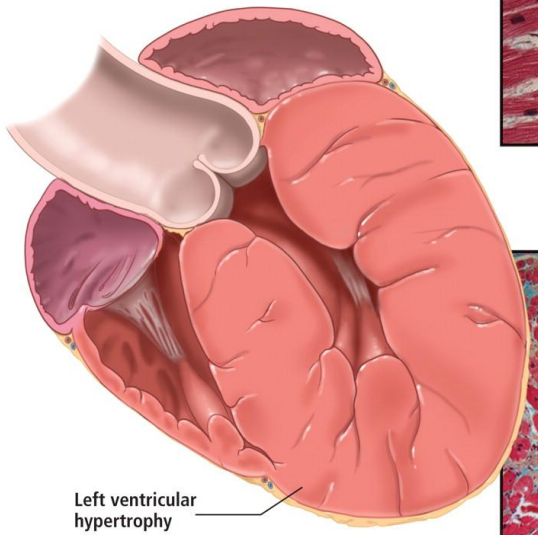
Myocardial Fibrosis

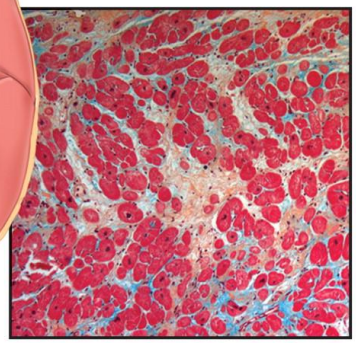
Left ventricular hypertrophy and fibrosis

Left ventricular hypertrophy (LVH) is a response to a chronically increased workload on the heart. A key component is myocardial fibrosis, which has been linked to the renin-angiotensin-aldosterone system. This observation may explain why angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers are among the most potent agents for treating LVH.



Normal





Myocardial fibrosis

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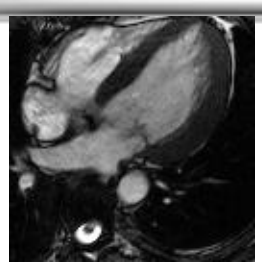
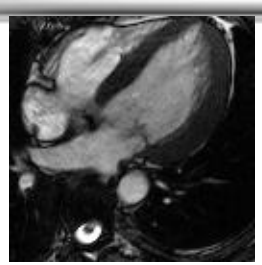
BAUML M A , UNDERWOOD D A Cleveland Clinic Journal of Medicine 2010;77:381-387



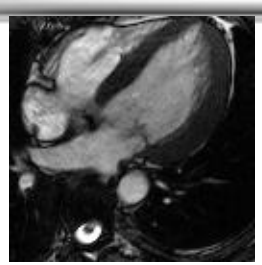
Symptoms

- No signs/symptoms (during early stages)
- SOB (shortness of breath)
- Feeling of fluttering, rapid heartbeats, or palpitations.
- Dizziness
- Fatigue quickly during activity
- Fainting



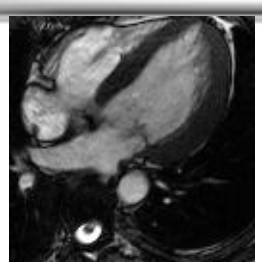
What occurs when one has LVH?

- The heart weakens.
- Stiffening and the loss of elasticity occurs.
- Heart compresses its own blood vessels (coronary arteries) and may restrict its own supply of blood.



Complications

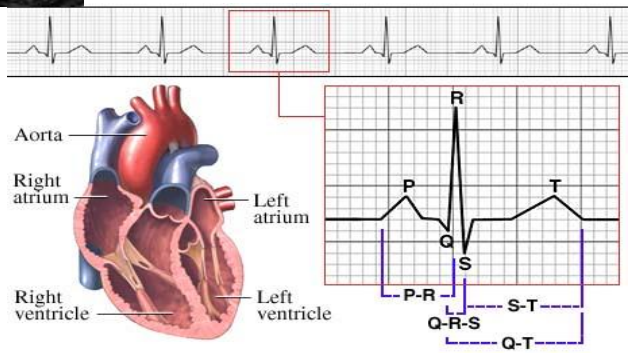
- Stroke volume will decrease (amount of blood pumped per beat).
- Arrhythmia (abnormal heart rhythm).
- Ischemic heart disease (decreased supply of O_2 to the heart).
- Heart Attack
- (CHF) congestive heart failure
- Sudden Death

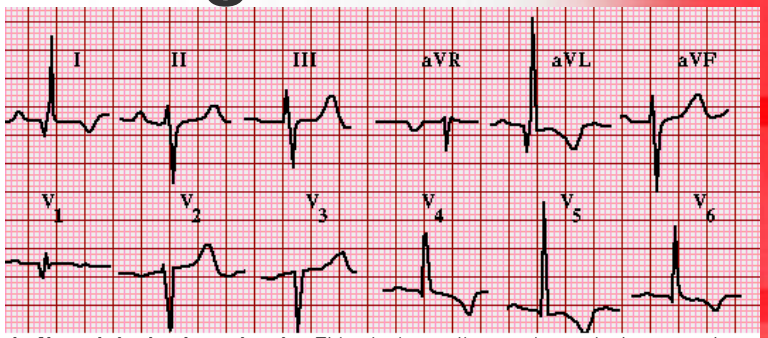


Tests

- There are a few different tests that are performed to diagnose left ventricular hypertrophy (LVH):
- **Electrocardiogram**
- **Echocardiogram**
- **MRI**

Electrocardiogram





Left ventricular hypertrophy This electrocardiogram demonstrates several features of left ventricular hypertrophy: the QRS complex is slightly widened due to an intraventricular conduction delay; there is left axis deviation; there is ST depression and inverted T waves noted in several leads; several voltage criteria are met, including an R wave in aVL which is greater than 18 mm (in this case 20 mm).

Criteria:

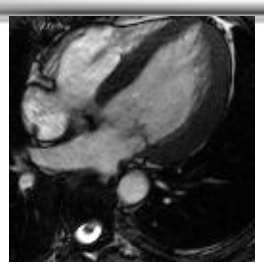
Increased limb lead QRS voltage: R in lead I plus S in lead III greater than 25 mm.

Increased precordial QRS voltage: S in lead V1 plus R in either V5 or V6 greater than 35 mm.

Typical ST and T abnormalities: ST depression or T wave inversion (or both) in the “lateral” leads (I, L, V4-V6)

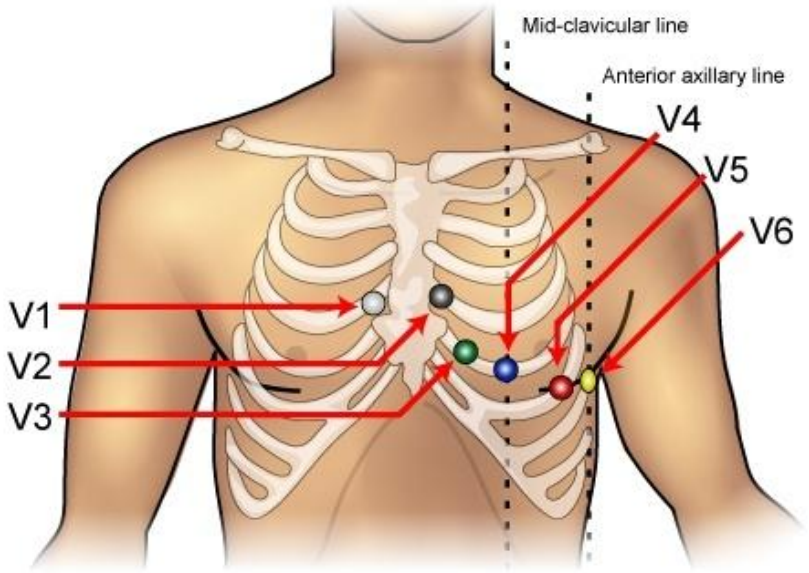
Large leftward voltage: R wave in lead L greater than 11 mm.

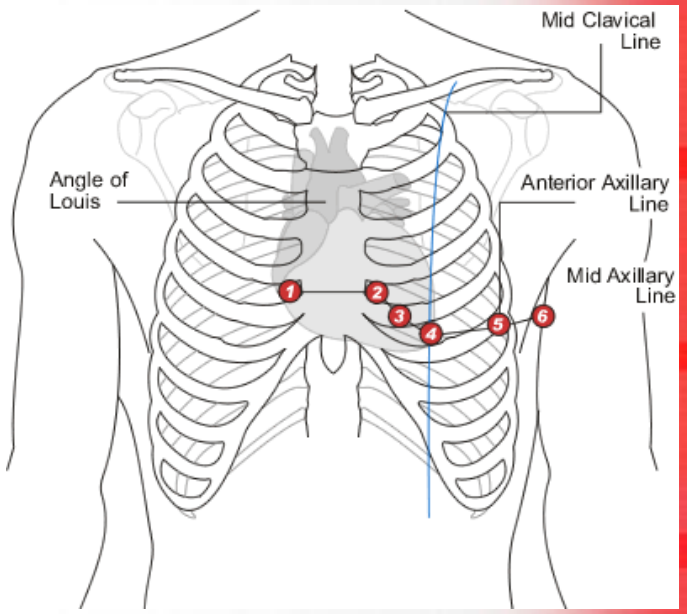
Left atrial enlargement: Wide (greater than 0.11 msec) P wave.

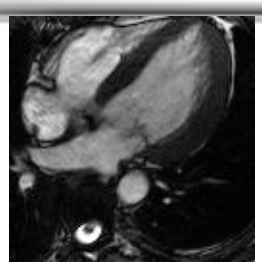


Electrocardiogram

- V1 and V6 refer to the placement of the electrodes during testing.



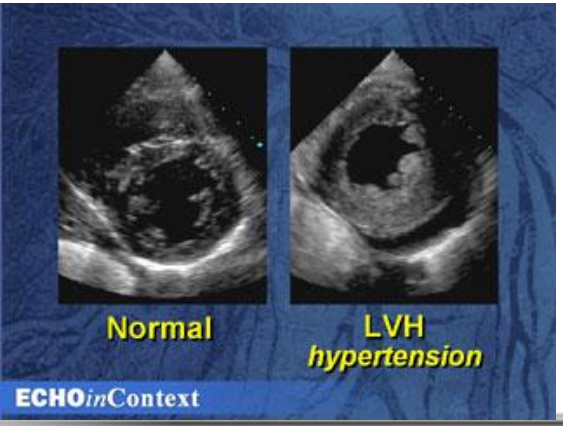


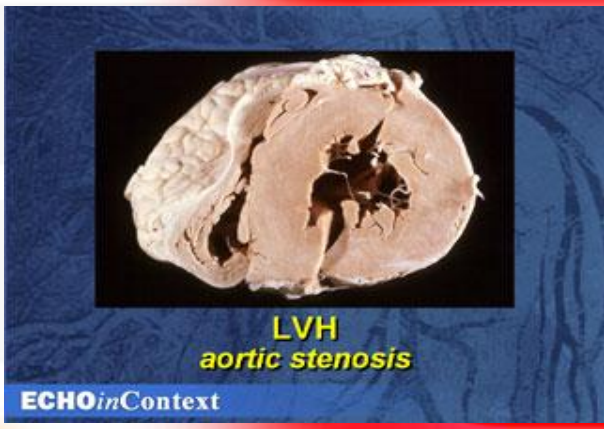


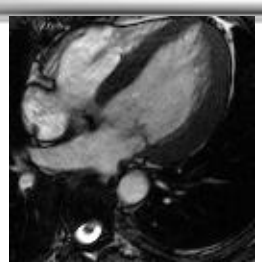
Echocardiogram

- Primary tool used to diagnose LVH.
- Estimates left ventricle volume and mass.
- Formula for estimating the volume:

$$Volume = \frac{5}{6} Area * Length$$

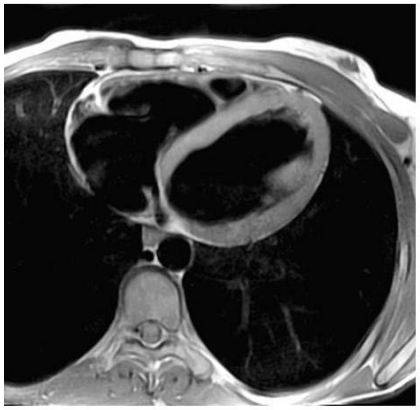




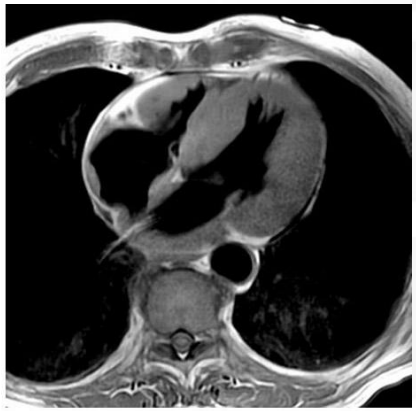


Cardiac **M**agnetic **R**esonance **I**maging

- Gold standard test for LVH
- Expensive
- Precisely estimates left ventricular mass and able to determine if other abnormalities exist.

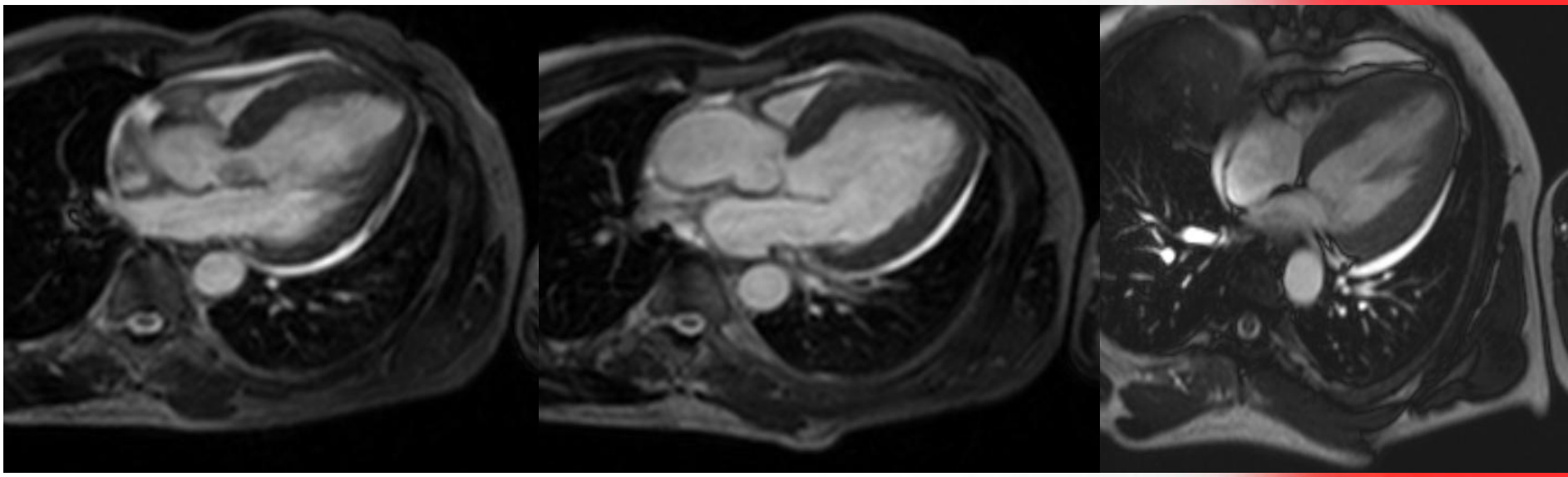


Normal Heart

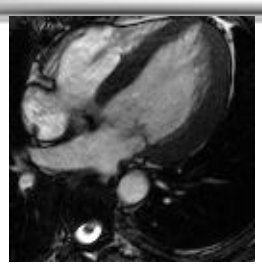


Left verntricular hypertrophy

Cardiac MRI

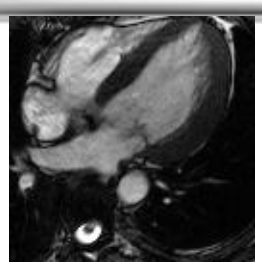


Significant concentric left ventricular wall thickening with septal involvement.



Treatment

- Research shows low Albumin levels make LVH progress faster. Eat more protein.
- Angiotensin II receptor blocker or angiotension-converting enzyme inhibitor (ACE).
- Suatained reduction in high BP is essential for regression of LVH.
- Sodium restriction in diet may also lead to regression in LVH.



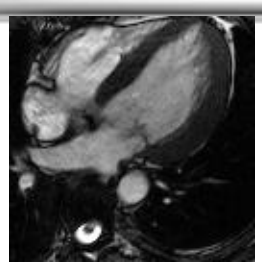
Exercise induced left ventricular hypertrophy

- Chronic exercise leads to cardiac hypertrophy (athletic heart).

  Athletic heart has increases in:

- LV chamber size
- Wall thickness
- mass

- Helps satisfy the increased cardiac demands placed during exercise.

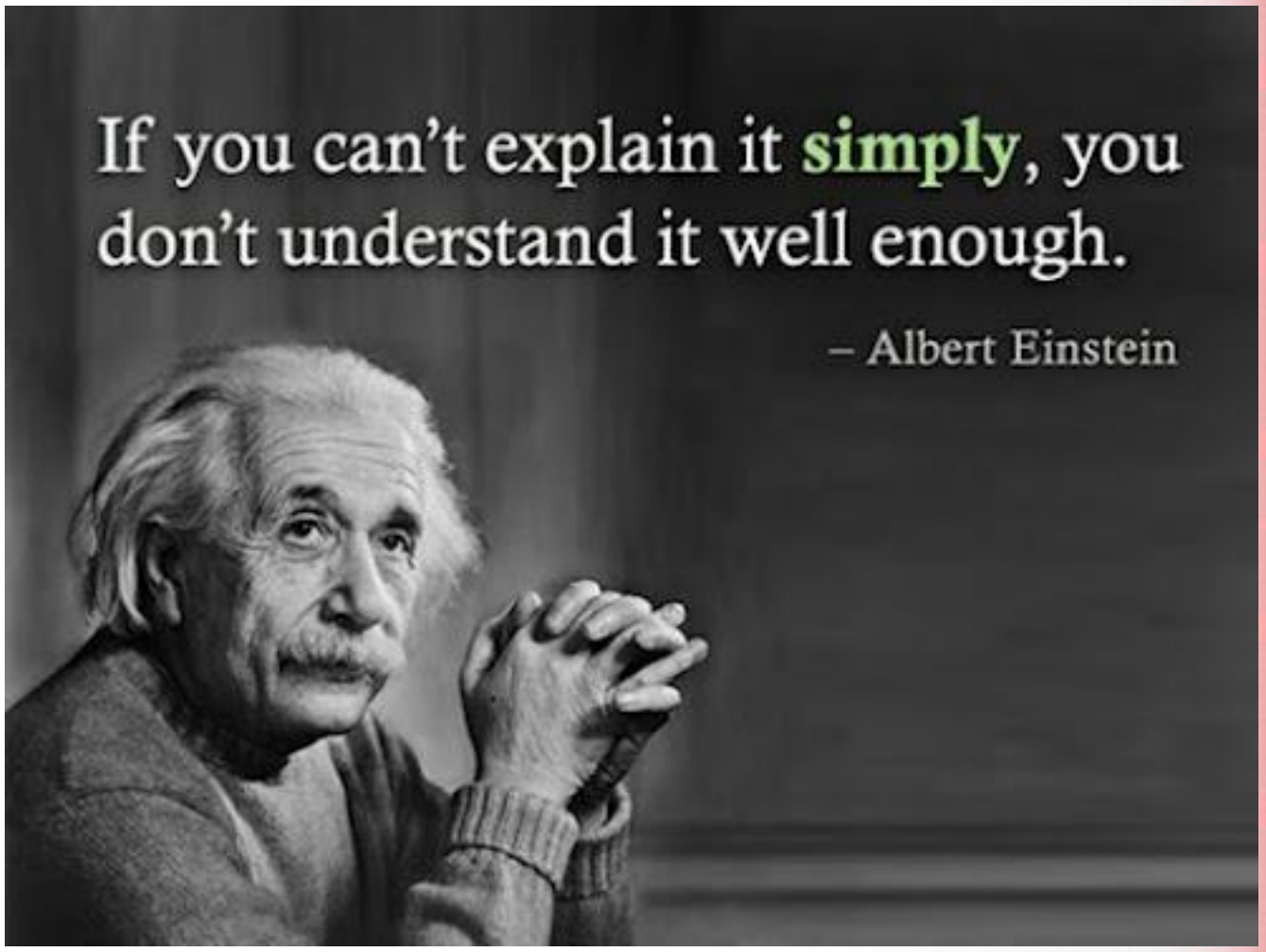


Research

- Growth Hormone shows beneficial effects on the remodeling process in a well-established model of large Myocardial Infarction in rats. Also improvement in systolic and diastolic function.
- Effects of 4-weeks of resistance training in rats showed significant reduction in resting blood pressure and development of cardiac hypertrophy.

  Eccentric left ventricle hypertrophy commonly seen with response to aerobic exercise.

  Concentric left ventricle hypertrophy is commonly seen with resistance exercise.


If you can't explain it simply, you don't understand it well enough.
– Albert Einstein

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LVH ECG

Lead ECG Ventricular Hypertrophy

Understanding Heart Disease