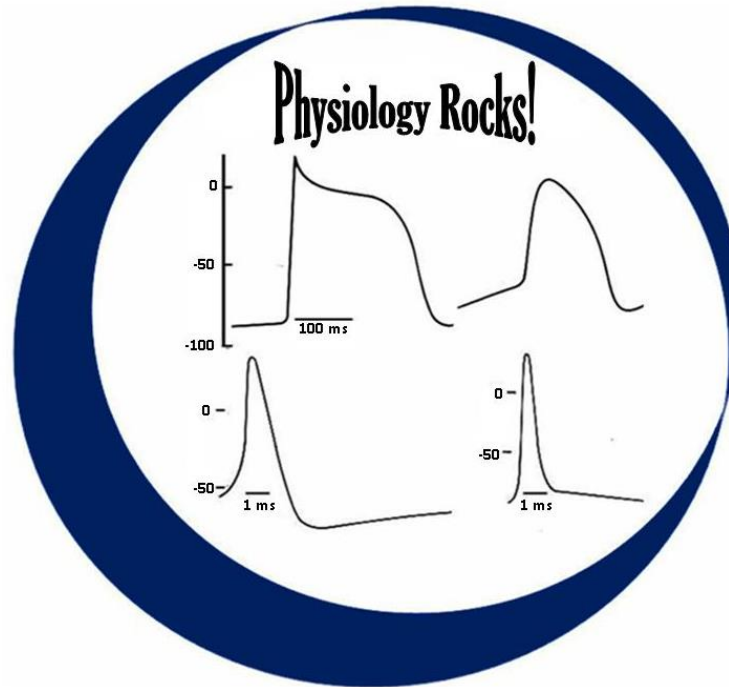


Lecture 31

Cardiovascular Applications



HN Mayrovitz PhD
mayrovit@nova.edu
drmayrovitz.com

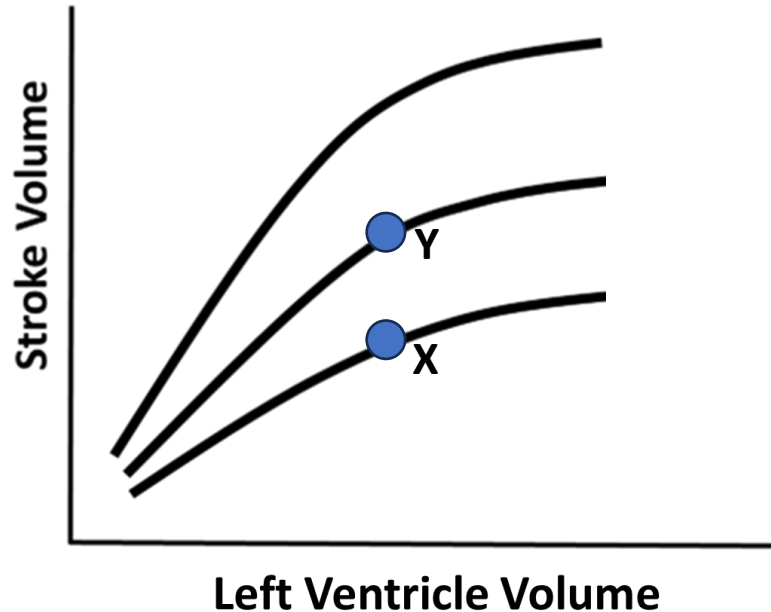
A 68-year-old male presents complaining of periodic headaches that seem to be getting more frequent. He also complains about some occasional tingling in his left leg starting around the ankle. He undergoes a series of hemodynamic measurements while at rest in a supine position. These same measurements were made on this patient 20 years ago. Considering this patient at age 68 compared to age 48, which of the following statements is supported by the data in the table?

	Age 48	Age 68
LV systolic pressure (mmHg)	133	153
Ascending aorta systolic pressure (mmHg)	131	151
Brachial artery systolic pressure (mmHg)	130	150
Brachial artery diastolic pressure (mmHg)	70	90
Dorsal pedal artery systolic pressure (mmHg)	135	155
Stroke volume (ml)	100	100
Heart rate (beats/minute)	70	68
LV end diastolic volume (ml)	120	120
LV end diastolic pressure (mmHg)	5.3	7.3
Body surface area (m ²)	1.8	2.1
Descending aorta compliance (ml/mmHg)	2.0	1.7

Statement	yes	no	reason
He has developed peripheral arterial disease (PAD)			
His mean arterial pressure (MAP) has increased			
His cardiac output (CO) has increased			
His cardiac index (CI) has increased			
His total peripheral resistance (TPR) has increased			
His arterial pulse wave velocity (PWV) has increased			
He has developed isolated systolic hypertension			
He has developed evidence of a stiffening of his LV			
He has developed evidence of an aortic valve stenosis			

Which of the following will move point X to point Y?

- A. A saline infusion to increase ventricular preload
- B. A drug that increases afterload
- C. A drug that increases ventricular contractility
- D. A drug that increases heart rate
- E. A drug that decreases heart rate to reduce oxygen demand

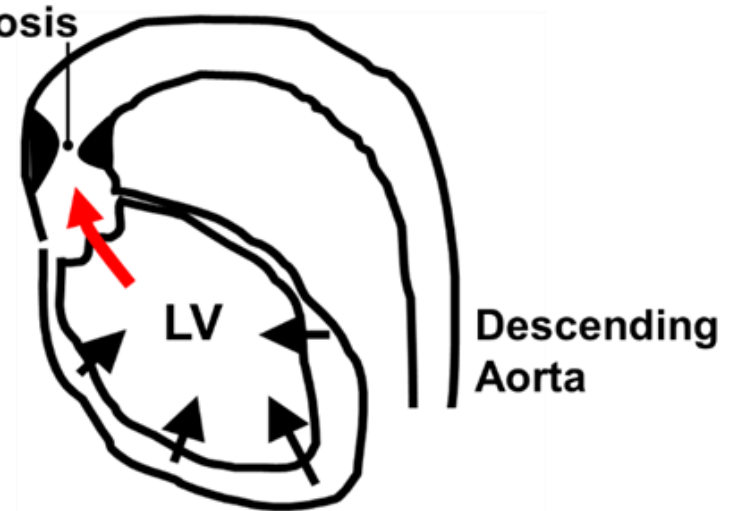


A 43-year-old male has a body mass index (BMI) of 23 Kg/m^2 and a body surface area (BSA) of 2.0 m^2 . He presents to the emergency department (ED) with a feeling of chest pressure. An echocardiogram indicates that his stroke volume is 70 ml, and his EKG indicates a resting heart rate of 100 beats/minute. His cardiac index in liters/m^2 is closest to which of the following values?

- A. 1.5
- B. 2.0
- C. 3.0
- D. 3.5
- E. 5.0

A 79-year-old male is diagnosed with a stenosis in his ascending aorta that reduces the cross-sectional area of the artery by 65%. The stenosis is imaged approximately as shown in the figure.

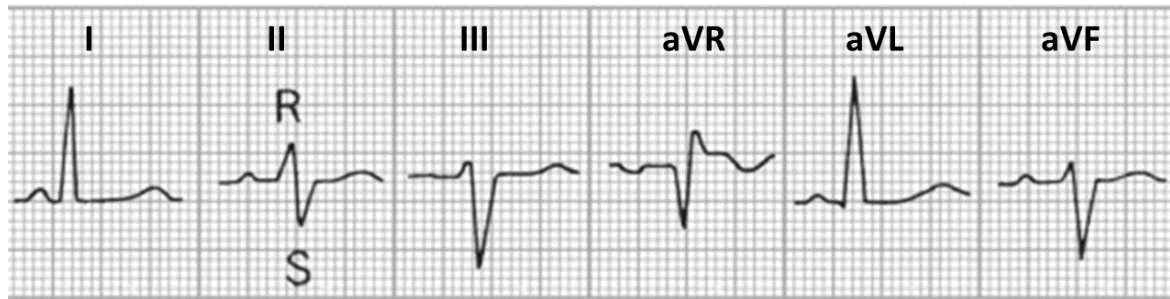
Thermodilution measurements show that his cardiac output is not changed by the stenosis. Considering the region now occupied by the stenosis, compared to the same region absent such a stenosis, which of the following changes occurs?



- A. Pressure in his descending aorta is decreased
- B. Pressure in his left ventricle is decreased
- C. Blood velocity is decreased
- D. Reynolds number is decreased
- E. The pressure gradient is decreased

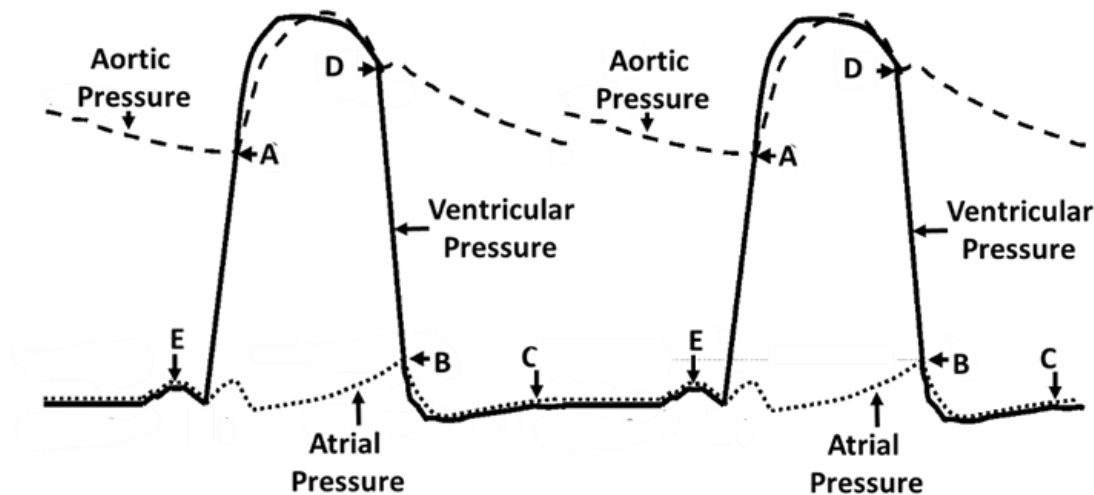
The figure below shows one wave for each of the leads from a patient's EKG. For this EKG the mean electrical axis is most perpendicular to which one lead?

- A. I
- B. II
- C. III
- D. aVL
- E. aVF



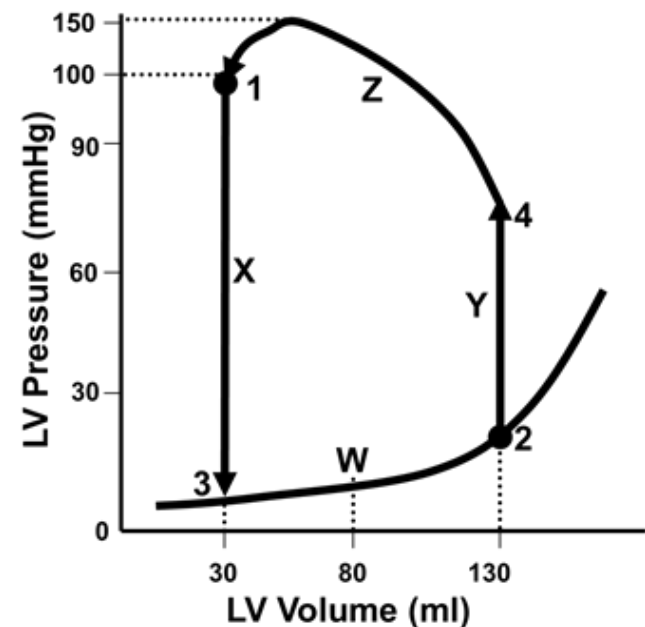
A 62-year-old female had a bout of chest discomfort along with pain in her jaw. She was admitted to a cardiac unit for hemodynamic measurements. Two cycles of her pressures are shown in the figure below. If she had a significant mitral valve regurgitation problem, at which point would pressure most likely be abnormally elevated?

- A. A
- B. B
- C. C
- D. D
- E. E



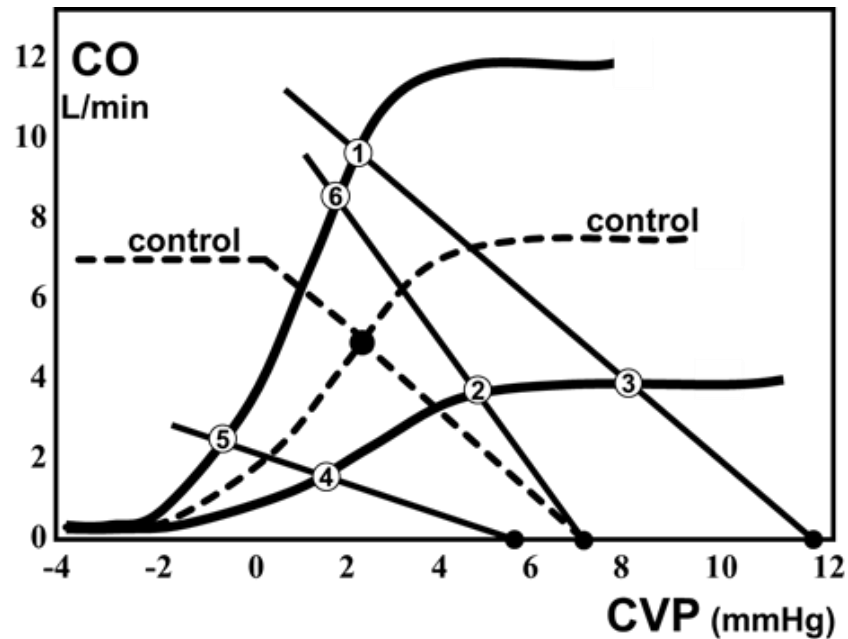
The figure below shows a left ventricular pressure-volume loop for a healthy 23-year-old female medical student who is thought to be normal with respect to cardiovascular functions. However, she has been complaining of light-headedness when she climbs steps. She was evaluated by a cardiologist who detected a slight murmur. An echocardiogram was done that revealed she had a significant aortic stenosis. Which one of the following best describes an aspect of her condition?

- A. She has isolated systolic hypertension
- B. Her arterial systolic blood pressure is about 150 mmHg
- C. Her arterial diastolic pressure is close to 100 mmHg
- D. Her murmur would occur during segment Z
- E. Her murmur would occur during segment Y



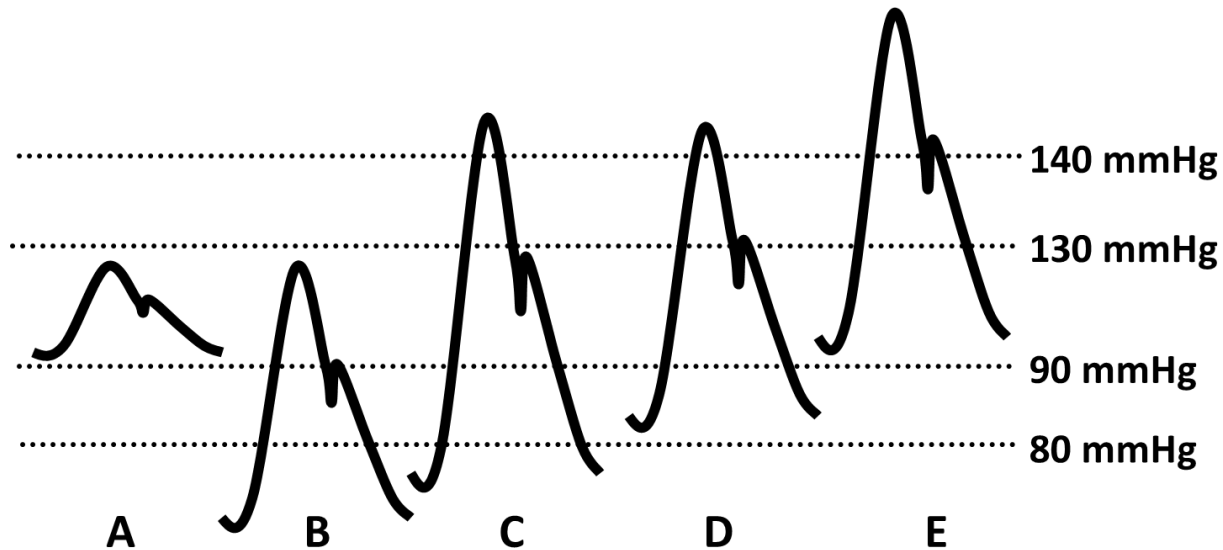
The figure below shows a hypothetical male patient's cardiac and vascular function curves and their operating point before a change occurs (control dashed line). He then has an MI and subsequently gets a whole blood Transfusion of two liters. What is the new operating point after the MI and the Intervention?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5



Blood pressure recordings of five patients are shown in the figure below. The cardiac output (CO) of each patient was measured using thermal dilution. It was found that each patient's CO was the same. Which patient has the greatest TPR?

- A. A
- B. B
- C. C
- D. D
- E. E



End Lecture 31