

Cardiology Conference Questions

A. The Normal P-V Loop

1. Draw a normal P-V loop with the following parameters:
EDV = 100 ml
EF = 50%
Systemic BP = 120/80
2. Draw the lines that represent contractility (E_{es}) and afterload (E_a)
3. Approximately, what is the value of E_{es} and E_a in the diagram?

B. Preload

Assuming no changes in contractility or afterload, append to the above graph the P-V loops that would result from the following:

1. administration of a liter of intravenous fluid
2. moderate hemorrhage
3. How does the systemic BP change in the above two conditions?
4. Derive the Starling relationship from the above 3 P-V loops
5. How would the Starling relationship be different if derived using a S-G catheter?

C. Contractility

Beta blockers depress contractility.

1. Demonstrate this effect compared to the normal P-V loop.
2. What happens to systemic BP? SV? EF?
3. Derive the resultant Starling relationship
4. If IV fluids are administered in order to restore SV to normal, what happens to EDP?

D. Afterload

Frustrated with an unrelenting stuffed nose, a cold sufferer uses a whole bottle of Neosynephrine (an alpha adrenergic agonist—causes vasoconstriction and therefore an increase in TPR) at one time.

1. Draw the resultant P-V loop.
2. What happens to BP? SV? EF?
3. Show the effect on the Starling Relationship
4. Can the Starling relationship distinguish changes in contractility *versus* changes in afterload?

E. Heart Rate

1. If pacing wires are attached to the heart so that heart rate could be increased without any changes in preload, contractility, or TPR, what would happen to SV? Show this effect on the P-V diagram.

F. Diastolic dysfunction

One type of Diastolic Dysfunction is the ventricle that has trouble relaxing.

1. Draw the resultant P-V loop, assuming the preload volume, contractility, and afterload don't change.
2. What happens to SV? EF? BP?
3. How would it be different if, instead of preload volume remaining constant, preload pressure remained constant?
4. Draw the resultant Starling relationship.
5. Draw the Starling relationship derived from a S-G catheter.

G. Regional dysfunction

A large region of the left ventricle loses its ability to contract. This can occur as a result of inadequate blood flow and resultant myocardial ischemia and infarction.

1. What happens to this region of the ventricle during diastole and systole?
2. How does this impact on overall ventricular function (i.e. EDPVR and Ees)?
3. In time, this region of dead muscle is replaced with stiff, non-compliant scar tissue.
4. What happens to this region during diastole and systole?
5. How does this impact on overall ventricular function (i.e. EDPVR and Ees)?

H. Exercise

During exercise, the following changes in cardiac function occur:

- Increased preload
- Increased contractility
- Decreased Afterload
- Increased HR

1. Compare the normal P-V loop with the loop that occurs during exercise.