

# Intra Aortic Balloon Pump

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# Why IABP?

- Increase myocardial oxygen delivery
- Reduce myocardial oxygen consumption by reducing cardiac work
- Increase cardiac output

# Indications

- Acute myocardial infarction
- Refractory LV failure
- Cardiogenic shock
- Refractory ventricular arrhythmias
- Acute MR and VSD
- Cardiomyopathies
- Catheterization and angioplasty
- Refractory unstable angina
- Cardiac surgery
- Weaning from cardiopulmonary bypass

# Contraindications

- Aortic regurgitation
- Uncontrolled sepsis
- Aortic dissection
- Abdominal aortic aneurysm
- Chronic end-stage heart disease with no anticipation of recovery

# Principle of counterpulsation

- Balloon placed in aorta
- Inflated during diastole and deflated during systole
- Balloon inflation causes volume displacement during diastole leading to increased coronary blood flow and potential improvement in systemic perfusion.

# IABP components

- 2 major components:
  - (i) a double-lumen 8.0–9.5 French catheter with a 25–50 ml balloon attached at its distal end (balloon sized so when inflated it fills 80%-90% of aortic diameter).
  - (ii) a console with a pump to drive the balloon.
- The balloon is inflated with helium driven by the pump. Helium is used because its low density facilitates rapid transfer of gas from console to the balloon. It is also easily absorbed into the blood stream in case of rupture of the balloon.

# IABP insertion

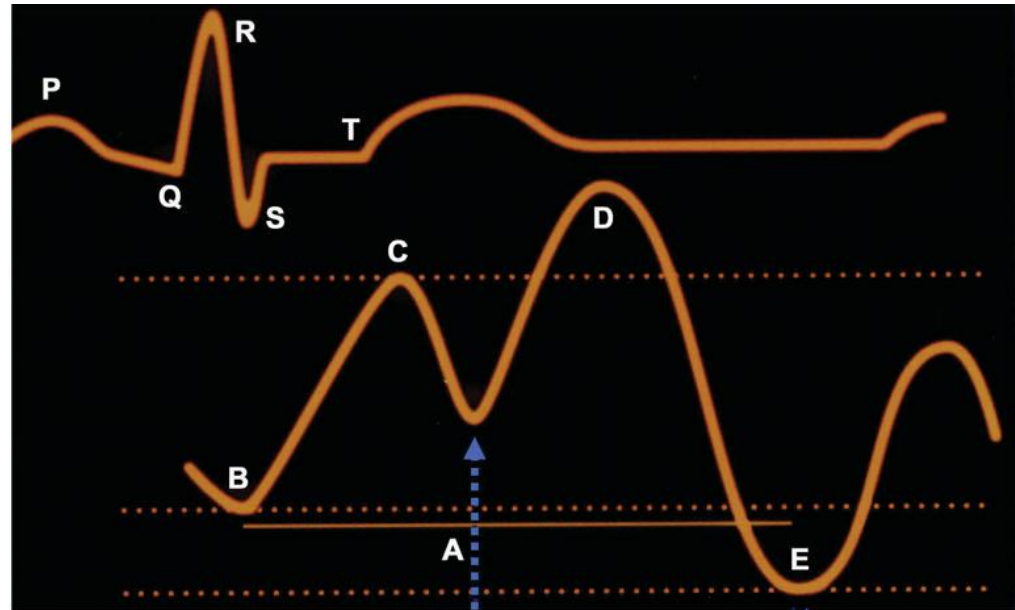
- The IABP catheter is inserted percutaneously into the femoral, subclavian, axillary, brachial, or iliac artery by a Seldinger technique.
- Balloon catheter is advanced, into the descending thoracic aorta, with its tip 2 to 3cm distal to the origin of the left subclavian artery.

# IABP triggering

- ECG or arterial pressure used to time inflation and deflation.
- The balloon inflates with the onset of diastole, which corresponds with the middle of the T-wave. The balloon deflates at the onset of LV systole and this corresponds to the peak of the R-wave.



- A = One complete cardiac cycle
- B = Unassisted aortic end-diastolic pressure
- C = Unassisted systolic pressure
- D = Diastolic augmentation
- E = Reduced aortic end-diastolic pressure
- F = Reduced systolic pressure

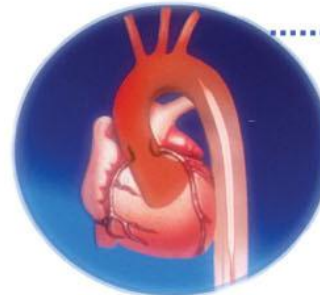


## Inflation

At the onset of diastole, IAB inflation occurs, giving rise to sharp 'V' on arterial waveform.

### Effect:

- Increased coronary perfusion



## Deflation

Occurs at end of diastole before systole resulting in reduction of aortic end-diastolic and systolic pressures.

### Effects:

- Decreased afterload
- Decreased cardiac work
- Decreased myocardial oxygen consumption
- Increased cardiac output

### Please Note:

- R-wave deflation may provide more effective support for patients experiencing arrhythmias

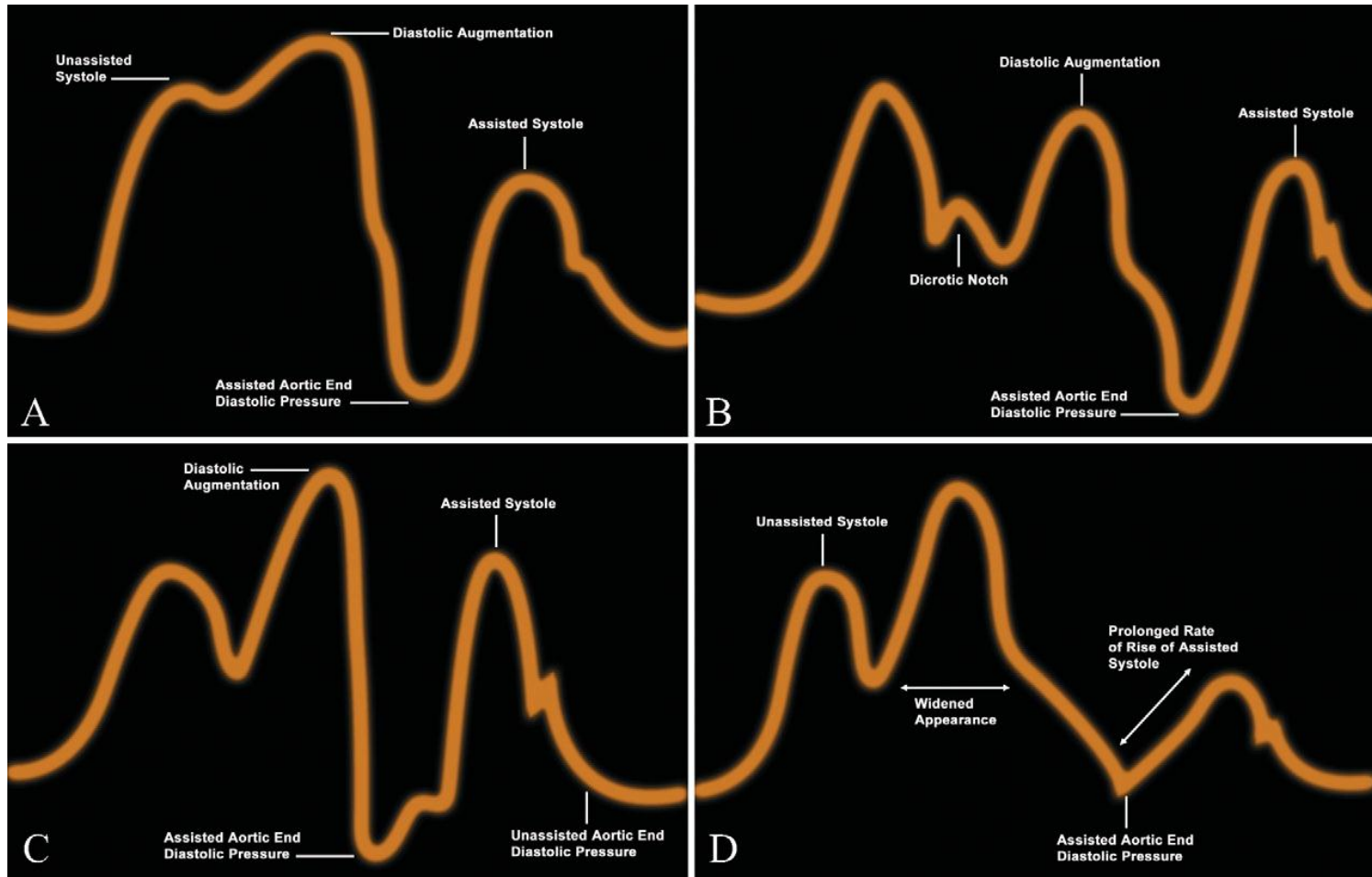
# Summary of haemodynamic effects of IABP therapy

- Aorta; decrease systolic pressure, increase diastolic pressure
- Left ventricle; decrease systolic pressure, end-diastolic pressure, volume and wall tension
- Heart; decrease afterload and preload, increase cardiac output
- Blood flow; increase coronary blood flow

# Weaning from IABP

- Once inotrope requirements are minimal (can increase inotropic support if needed)
- Gradual wean over 6-12 hours
- Wean by either reducing ratio of augmented to non augmented cycles or reducing balloon volume.

# Wrong timing .....



# Final thoughts

- Decreased urine output after the insertion of IABP can occur because of juxtarenal balloon positioning.
- Haemolysis from mechanical damage to red blood cells can reduce the haematocrit by up to 5%.
- Suboptimal timing of inflation and deflation of the balloon produces haemodynamic instability.
- An IABP is thrombogenic; always anticoagulate the patient.
- Never switch the balloon off while in situ.