

Intra Aortic Balloon Pump (IABP) in Critical Care

Aim: To provide guidance on safe, continued nursing care of a patient with a balloon pump in ICU

Scope: All adult patients in critical care, who have been admitted with an IABP. The insertion of a balloon pump device, adjustment of machine settings and management of specific complications are beyond the scope of this SOP.

Patient admitted to ICU with IABP in place

Initial Assessment

Patient

- Chest x-ray if required to check position
- Inspect insertion site
- Assess peripheral pulses of 4 limbs every 15mins for the 1st hour, every 30 minutes on 2nd hour, then hourly.
- Assess lower limbs for colour, temperature and capillary refill time.
- Place saturation probe on the left hand.

Device

- Check arterial wave form and ECG trace
- Check adequate trigger, timing, frequency and ratio set with medical team
- Check console alarms, IAB lines, pressure bag and helium tank
- Anticoagulation for IABP is not required (consultant discretion).

Safe Nursing Care

- Use strict aseptic technique when redressing or manipulating line
- Notify medical team of any changes on assessment/monitoring
- **Keep affected leg in extension- do not raise head of bed beyond 45 degrees**
- **The moving/non-compliant patient may displace the IABP**
- **NEVER leave the balloon pump on standby (unless immediately removing)**

Regular Monitoring

Patient

- Hourly monitor BP, augmented pressure, urine output
- Hourly assess both pedal and radial pulses, insertion site
- Daily ECG and coagulation screen

Device

- Hourly check of arterial trace and ECG, triggers, timings, frequency and ratio set
- Regular check of pressure bag, IABP lines and helium tank

Beware Complications of IABP

- **Limb Ischaemia:** absent peripheral pulses, coolness and discoloration
- **Balloon Misplacement/Migration:** absent left upper limb pulse, urine output less than 0.5ml/kg/hr, presence of blood in urine
- **Gas or Clot Embolus:** console alarm, sudden patient instability
- **Balloon Leak:** blood or brown flecks on IABP lines, console alarm
- **Bleeding from insertion site**

Removal of Intra-Aortic Balloon Catheter

Preparation

- Removal should be performed by a competent and suitably trained person
- If anticoagulated for IABP, stop 1-4 hours before removal
- Check clotting screen- if abnormal, discuss with medical team before proceeding
- Press STANDBY on IABP
- Disconnect IAB catheter from IAB pump
- With aseptic technique, remove dressings and sutures

Insertion Sheath In Place

- Loosen the sheath seal from the hub with a twist
- Pull just the catheter and stop once resistance is felt
- Apply pressure just below the insertion site
- Remove insertion sheath and IAB catheter as a single unit
- **Do not try to pull the IAB catheter through the sheath**

No Insertion Sheath

- Apply pressure just below the insertion site
- Remove the IAB catheter
- If any unexpected or excessive resistance **stop removal** and seek senior/expert intervention

After Removal of Device

- Apply pressure to puncture site for 30 minutes with compressive dressing or Femostop®
- For management and removal of Femostop® please refer to Critical Care Support to Cardiac Catheter Laboratory SOP
- Maintain patient in supine position with affected leg extended for 6-8 hours
- Perform hourly check of pedal pulses, colour and temperature of both legs until 24 hours post-removal

References

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Guidance Notes for IABP in ICU

supporting notes for IABP SOP dated 16 Jun 16

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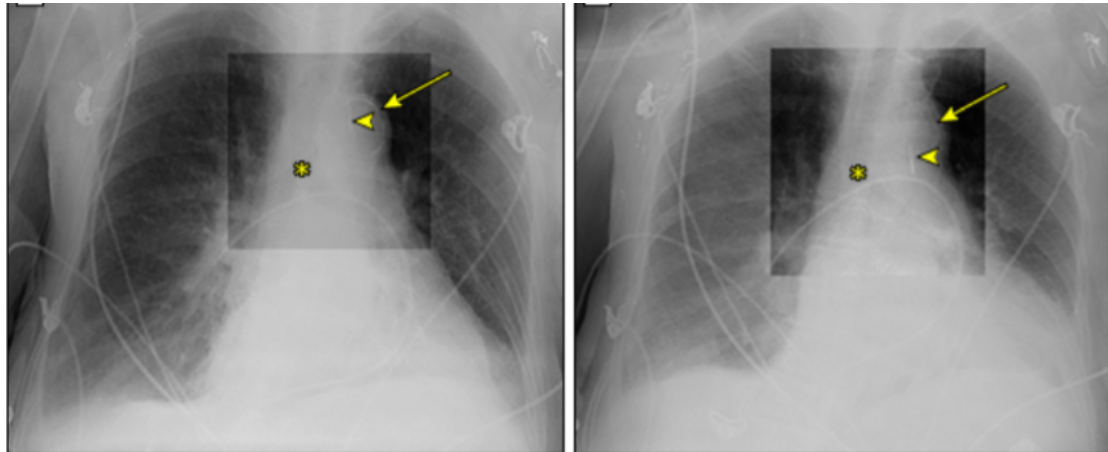
Special circumstances

Complications to be aware of

Correct positioning of IABP

- CXR – should be done **daily** to check position

Radiopaque tip of IABP (arrow head) should be at the level of the carina (star) and at least 2cm below aortic knob (arrow). (see diagram left too high, right appropriately placed).



Evidence of IABP migration/risk of migration

- Decreased urine output may suggest distal catheter migration and obstruction of renal arteries.
- Decreased Peak augmented pressure may suggest distal catheter migration.
- Loss of left radial pulse suggested proximal catheter migration and subclavian artery migration. The saturation probe should be on left hand for the same reason.
- Abdominal distension, bloody stools or abdominal hypertension suggests mesenteric ischaemia.
- Evidence of excessive movement of patient. Patient should be compliant with treatment or adequately sedated.

Action may need to be repositioned – call DCCQ consultant +/- advice from cardiology consultant. Is it still required? Can it come out?

Is the triggering adequate?:

Inflation and deflation should coincide with closing and opening of aortic valve respectively.

- Electrocardiography Trigger is the preferred trigger mode and in general the most reliable. IABP inflation should be triggered by middle of the T wave (diastole). Deflation will occur at the peak of R wave corresponding with systole.
- This mode is less reliable during poor ECG quality or arrhythmias.
- Pressure Trigger mode is used when ECG mode has failed. Inflation is just after the dicrotic notch and deflation just before systolic upstroke. This mode is less reliable with poor arterial trace.

Modes of operation:

The timing of the IABP is not always ideal. This sometimes needs to be adjusted.

The trigger can be “automatic”, the computer sets trigger source, computer sets inflation and deflation times. Trigger automatically searches for most optimal source if initial trigger is not detected.

The Trigger can also be “semi automatic” the operator sets the source, operator sets initial inflation and deflation times. Computer will determine subsequent timing intervals. This should only be done by DCCQ or Cardiology consultant.

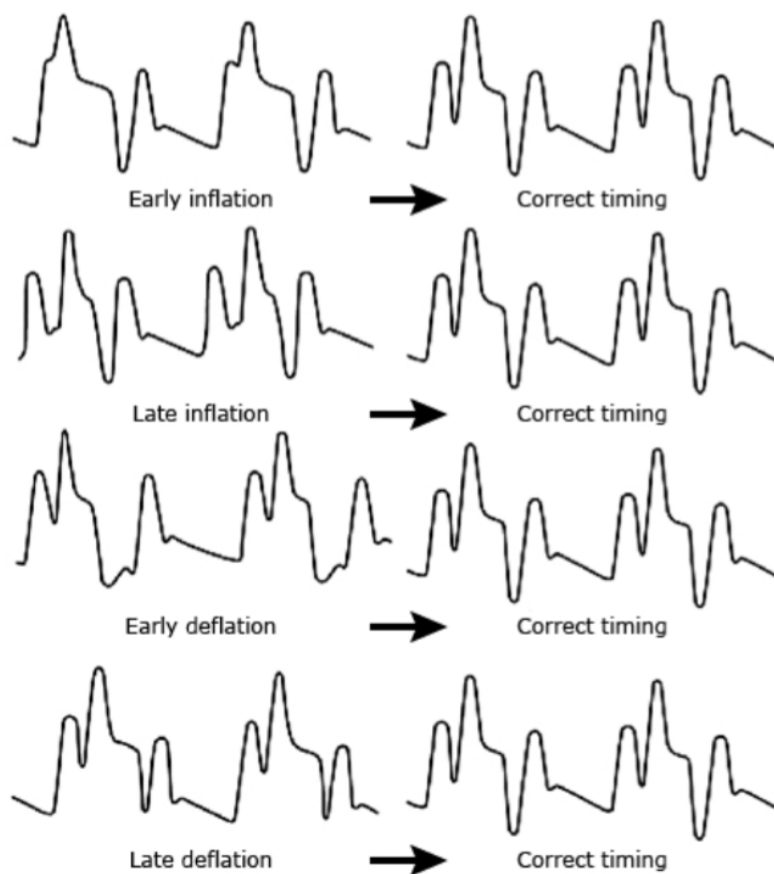
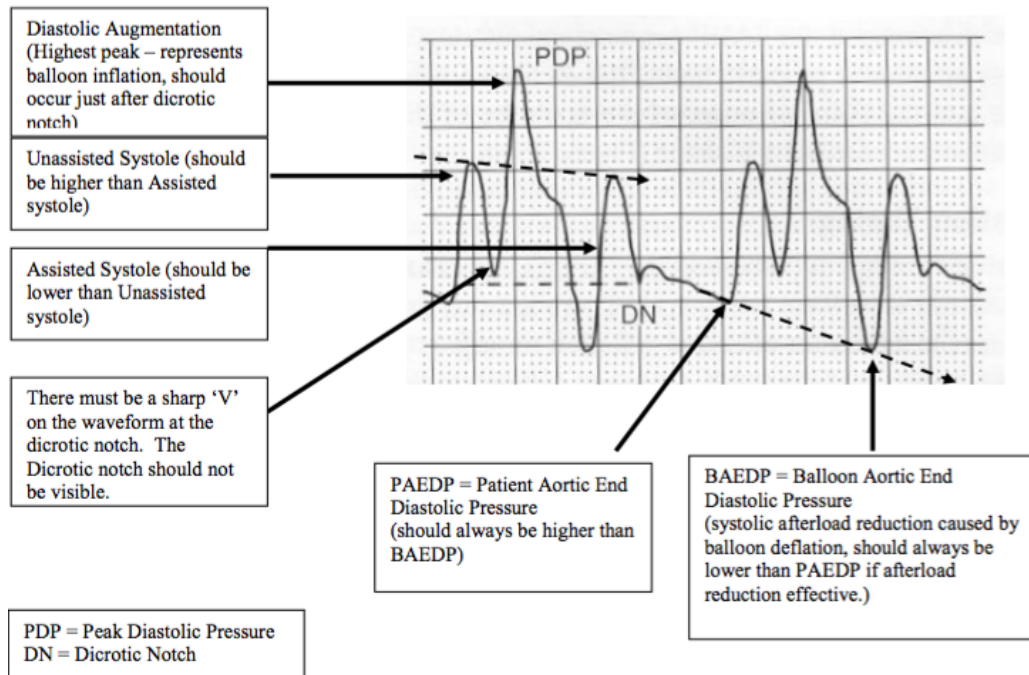
Assessing the timing of the IABP inflation and deflation:

This is assessed in the 1:2 mode (so augmented pressures can be compared with non augmented pressure). This should be done by DCCQ registrars and above only.

If timing is found to be inadequate the DCCQ consultant or senior registrar may choose to alter it. As described below.

The inflation point is moved rightwards until it occurs late in diastole and the dicrotic notch is revealed. The inflation timing is moved progressively earlier in the cardiac cycle until the dicrotic notch just disappears .

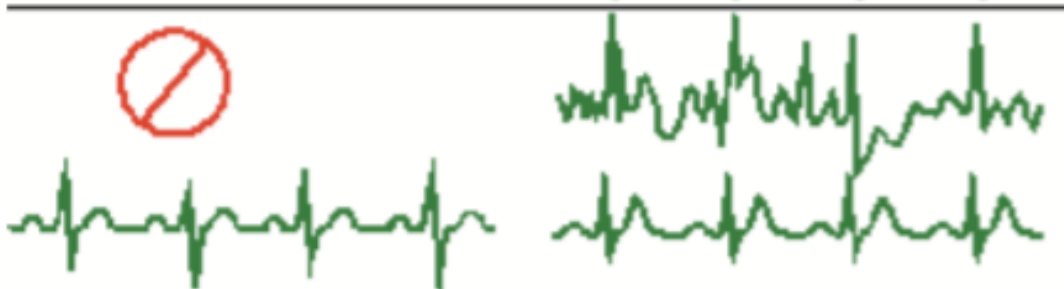
The deflation point is moved leftward (earlier) then moved slowly rightward (later in cardiac cycle) until the end diastolic pressure dips 10-15mmHg below the patient's unassisted diastolic pressure.



Selecting the correct lead:

- Select the lead that gives the largest R wave and minimizes the P and T wave.
- Avoid biphasic leads as the pump may not recognize its trigger point consistently.
- Set the ECG gain so the R wave is tall enough to be seen, but not so tall as the pump triggers of the P or T wave
- Double pumping may occur with artifact.

Good Complex Choices



Potential Problem Complexes

Special circumstances

Dysthrymias with IABP:

- Patients with tachycardia, augmentation can be hindered by insufficient balloon filling time. If IABP augmentation is necessary, treatment should be aimed at slowing the heart rate.
- AF – set to AF trigger mode if present which will deflate when R wave is sensed despite R-R variability. DO WE HAVE THIS MODE.....

Evidence of balloon rupture:

- Suggested by blood in helium tubing
- Intra aortic balloon failure
- Sudden patient instability
- Console alarm

Actions – support haemodynamics, stop IABP, clamp helium line to prevent gas embolism and prepare to remove balloon.

IABP during CPR:

- The IABP does not need to be disconnected during defibrillation (but staff should be clear of the IABP and console).
- Set the IABP to pressure trigger as an arterial waveform should be generated during CPR. If the console does not recognize the arterial pressure tracing the compressions may not be adequate. If it continues to fail to trigger it may be placed in standby for duration of the arrest but for no longer due to risk of thrombosis.

Anticoagulation:

- There is a risk of clot formation around the balloon in the aorta and systemic embolization.
- There are no standardized recommendations for anticoagulation patients with IABPs, assuming IABP is not left in 1:3 mode or less for longer than 20 mins.
- The IABP should NOT be left in standby unless it is being removed. Animal studies have shown the clot formation when left deflated for 20mins
- Whether to anticoagulate should be left up to the DCCQ consultant. Default position should be not to anticoagulated. A lower rate of thrombosis and embolism has not been demonstrated when heparin anticoagulation is used, although the risk of bleeding is substantially increased). Other reasons for anticoagulation should be considered such as pulmonary embolism, dilated cardiomyopathy or valve replacements. Individualized antithrombotic treatment for each patient should be considered.

Weaning:

Identifying patients ready to ween:

Little or no pharmacological inotropic support (or significant reduction)

Check heart function on TTE or TOE

Down trending lactate

Strategy to ween:

Ween from 1:1 to 1:2 to 1:3 over 30 mins to a few hours. **Once at 1:3 assess haemodynamics for not longer than 20mins.** Plan to remove if acceptable.

Decision for removal of IABP should be taken by DCCQ consultant or Cardiologist.

Miscellaneous

IABP transducer line is **NOT** to be used for blood sampling, as occlusion of the lumen may occur, nor is it to be used as an infusion port. It should be zeroed once per shift and re- levelled to mid chest point after position change

Complications to be aware of with IABP

Vascular	IABP Related
Ischemia • Visceral (bowel, renal) • Extremity • Compartment syndrome • Spinal cord Ischemia • Cerebrovascular accident	Balloon rupture (secondary to calcified plaques) • Gas embolism • Hematological • Hemolysis • Thrombocytopenia
Arterial injury • Dissection • Aneurysm/pseudoaneurysm • Laceration • Hemorrhage • Hematoma	Balloon entrapment
Cardiac tamponade	Infection/sepsis
Thrombosis	
Accidental femoral vein cannulation	