
MANAGEMENT OF AN INTRA-AORTIC BALLOON PUMP

“IT’S ON OR IT’S OUT”

There is a risk of clot formation and embolisation when the balloon is immobile. Never restart the balloon if it has been off for more than 30 mins and always check with perfusionists (x67264) or doctors before restarting.

RECORD ALL OBSERVATIONS ON THE CIS (ADVANCED CVS TAB)

THE PERFUSIONISTS WILL CHECK THE MACHINE TWICE DAILY AND ARE ALWAYS AVAILABLE FOR ADVICE. x67264 OR VIA SWITCH ON OOH

THE INTRA-AORTIC BALLOON PUMP MUST BE REMOVED BY A CARDIOTHORACIC SURGEON

OUT OF HOURS FIRST CONTACT SHOULD BE CARDIOTHORACIC SURGEON ON phone 62047

1. INTRODUCTION

The Intra-Aortic Balloon Pump (IABP) or intra-aortic counterpulsation device consists of a balloon which is inflated during diastole to increase coronary perfusion and then deflated during systole to decrease afterload. The primary goal of IABP treatment is to increase myocardial oxygen supply and decrease myocardial oxygen demand.

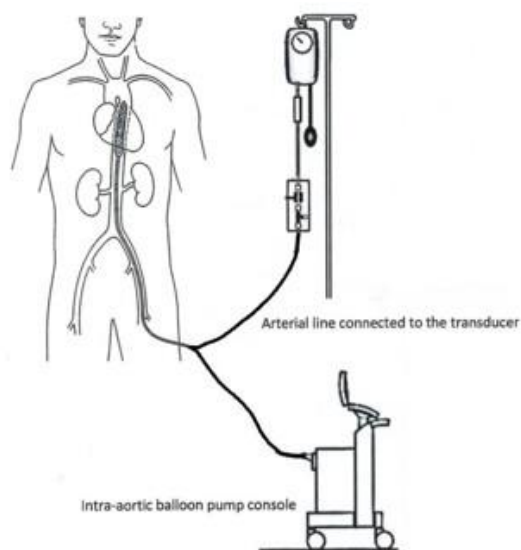
Indications

It is used in patients with a wide range of disorders that cause a low cardiac output and include:

- Haemodynamic support during and after Percutaneous Coronary Intervention (PCI)
- Unstable angina
- Cardiogenic shock
- Pre-operatively in high risk patients
- Mechanical complications post myocardial infarction
- Refractory left ventricular failure
- Cardiomyopathy
- Weaning from cardiopulmonary bypass

Insertion

The IABP is usually inserted percutaneously through the femoral artery and positioned in the descending thoracic aorta. Sheathless insertion is now more common. The catheter tip lies distal to the left subclavian artery and proximal to the renal arteries. On chest x-ray, the tip should be visible between the 2nd and 3rd intercostal space. See figure below.

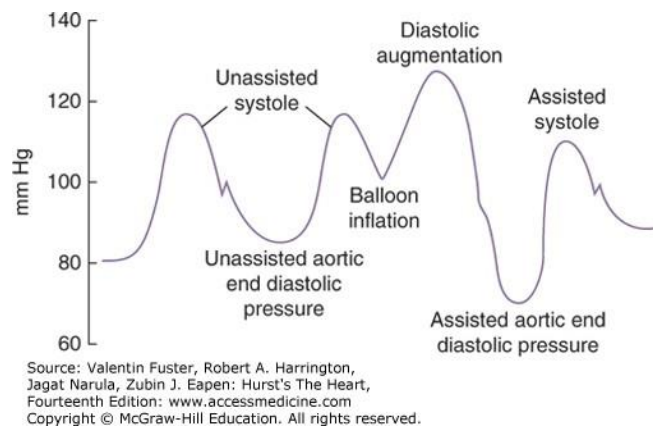


The size of the IABP catheter is dependent on patient's height to prevent occlusion of the renal and subclavian arteries. Inflation and deflation of the balloon catheter is timed to the cardiac cycle. The balloon is connected to a console that regulates the inflation or deflation of the balloon with the passage of helium gas; helium is used to inflate the balloon as it is easily dissolved in blood and prevents the risk of air emboli if the catheter ruptures.

The physiological effects are:

- Increases coronary artery perfusion
- Increases myocardial oxygen supply
- Decreases myocardial oxygen demand
- Decreases myocardial work by reducing afterload
- Increases diastolic blood pressure
- Decreases pulmonary artery pressure

When a patient is on an intra-aortic balloon pump the following waveform will be observed:



When balloon-assisted (augmented), the diastolic pressure should always be the highest pressure recorded on the waveform. This will ensure that the coronary arteries receive the maximum blood flow. The balloon-assisted systolic pressure should be lower than the patients non-assisted, systolic pressure due to the reduction in afterload.

Arterial pressure monitoring

The central lumen of the IABP catheter allows monitoring of the arterial pressure in the descending aorta during the cardiac cycle. When connected to a transducer it will display a continuous waveform; the transducer pressure bag should be inflated to 300mmHg to ensure optimal continuous flushing of the line. The cardiac perfusionists are available for advice on re-zeroing the transducer.

IABP triggering

The trigger is the way the IABP identifies the beginning of the cardiac cycle. There are 5 ways triggering may be achieved.

- ECG mode: Using the R wave on the ECG
- Pressure: Using the arterial pressure waveform. The pressure trigger mode may be advised in the event of the patient sustaining a cardiac arrest, since the IABP will trigger in response to CPR and will keep the balloon “moving” and allows the IABP to be used if spontaneous circulation is restored.
- Pacer V (ventricular)/AV(atrioventricular): Uses ventricular spike to trigger an event, is not an appropriate trigger for demand pacing
- Pacer A (atrial): Used when the patient has an atrial pacemaker. In this mode the R wave on the ECG is the trigger, the atrial pacer spikes are enhanced and rejected. Never used for patients who have a ventricular pacemaker.
- Internal: Allows a synchronous trigger set at 80 beats/min. The internal mode should never be used if a patient is generating a cardiac output.

Exceptions/ contraindications

- Severe aortic regurgitation
- Abdominal or aortic aneurysm
- Aortic stent
- Aortic dissection
- Severe calcific aorta-iliac disease
- Severe peripheral vascular disease
- Previous femoral-popliteal bypass or artificial grafts

Clinical Management

The aim of nursing management and intervention is to:

- Evaluate the patient’s response to therapy in relation to haemodynamic status, control of arrhythmias, systemic vascular perfusion and relief of cardiac symptoms
- To monitor the patient for the early signs of complications and intervene to prevent harm
- To ensure that the nurse is able to undertake appropriate troubleshooting of alarm situations and safe operation

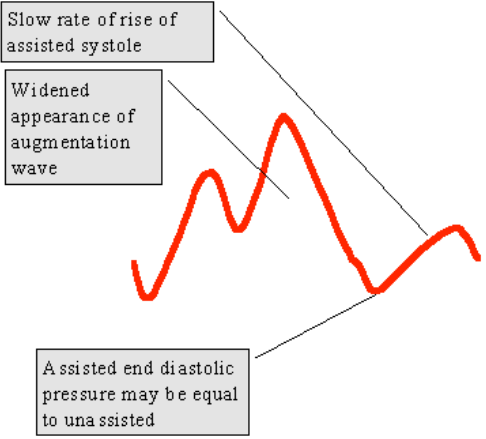
2. PROCESS

TROUBLESHOOTING

	Recommendation (Action)	Justification (Rationale)
1	Ensure the machine does not stop triggering	<p>Causes</p> <ul style="list-style-type: none"> • Cardiac arrest (loss of output → loss of trigger) EMERGENCY – check patient for signs of life. • Disconnection patient ECG dots, cables, leads – check connections <p><i>Cardiac arrest</i> turn balloon pump off unless medical staff advise otherwise. It is possible to press “semi-auto” button, change trigger to pressure, press “auto” button to time it with CPR.</p> <p>There is a risk of clot formation and embolisation when the balloon is immobile. Never restart the balloon if it has been off for more than 30 mins and always check with perfusionists (x4339)/doctors before restarting</p>
2	Monitor for limb ischaemia	<p>Check distal (pedal) pulses with doppler, foot colour, temperature, capillary refill</p> <ul style="list-style-type: none"> • Every 30 mins for the first 2 hours then • 2 hourly • Get senior help ASAP if you have any concerns • Observations should be more oZen if there are concerns • If the patient is awake sensation observations should be added

	Recommendation (Action)	Justification (Rationale)
3	Ensure the BP reading/trace is correct	<ul style="list-style-type: none"> • Level transducer to sternal notch • Ensure augmented diastolic is higher than systolic • Ensure trace is good (not damped). Damped trace indicates a blood clot DO NOT FLUSH, get help from perfusionist • If the trace is good, flush hourly to maintain patency
4	Do not allow the balloon catheter to become kinked	<ul style="list-style-type: none"> • Do not sit the patient >45° • Do not allow patient to flex leg
5	Monitor for potential bleeding from insertion site	<ul style="list-style-type: none"> • Patient will be on therapeutic heparin regime unless contraindicated • Monitor any anticoagulation therapy as per regime, check coagulation screen and platelets • Observe insertion site for bleeding / haematoma formation • Ensure the line is secured
6	Be vigilant for balloon leak	<ul style="list-style-type: none"> • IAB catheter 'gas leak' alarm may be triggered • Check for gas leak on screen / check helium level (icon on front right of screen) • Check connections, timing and augmentation. Press IABP fill for 3 seconds then press assist/standby to start pumping • Get help if this has not worked, may need to manually refill balloon • Monitor patient condition
7	Monitor for balloon rupture MEDICAL EMERGENCY Causes: restless patient, faulty balloon, damage by plaque or on insertion	<ul style="list-style-type: none"> • Check helium tubing for blood – could be just a few small dots of blood (that look like betadine) but this is significant. Check 1-2 hourly. If blood is observed turn off pump and get help immediately. Clamp gas tube. • Respond to persistent 'gas leak' alarm. • Monitor patient condition • Balloon will need to be replaced

	Recommendation (Action)	Justification (Rationale)
8	Check balloon catheter is inflating (augmentation)	<ul style="list-style-type: none"> • Check augmentation of balloon on screen (bottom leZ, all lights should come on during inflation) • Evaluate waveform for augmentation • Do not let balloon stay immobile for >30 mins. Never restart the machine (see risks above). Turn the machine off and get senior help, call perfusionists ASAP x4339
9	Check for balloon migration Tip of balloon should be at 2 nd /3 rd intercostal space, with lower end above the renal arteries	<ul style="list-style-type: none"> • Check position IABP on CXR. • Occluding renal arteries (downward displacement) check urine output hourly • Occluding leZ subclavian artery (upward displacement), check circulation to leZ arm hourly
10	Monitor for infection	<ul style="list-style-type: none"> • Monitor site for signs infection • Monitor temperature • Monitor WCC
11	Monitor for compartment syndrome	<ul style="list-style-type: none"> • Observe limb for swelling/hardness • Measure and record calf girth if concerned • Check urine function. Orange/brown coloured urine and rising creatinine may indicate rhabdomyolysis • Get senior medical advice promptly
13	Monitor for aortic dissection MEDICAL EMERGENCY	Observe for <ul style="list-style-type: none"> • intense pain in back or abdomen (ripping/tearing pain) • Increase in abdominal girth • Unequal or absent peripheral pulses, • Haemodynamic instability, • Drop in Hb

	Recommendation (Action)	Justification (Rationale)
14	<p>Check there is no late deflation of balloon</p> <p>ie the heart is trying to pump out and the balloon has not gone down fully</p> <p>EMERGENCY</p>	<p>This is a potentially dangerous timing error</p> <p>GET HELP IMMEDIATELY</p> <ul style="list-style-type: none">• Monitor patient condition for haemodynamic instability• Observe for signs of myocardial ischemia 

REMOVAL

Recommendation (Action)		Justification (Rationale)
1	Do not remove the IABP or sheath	The intra-aortic balloon and arterial sheath is removed by the cardiothoracic surgeons only . The heparin must have been stopped before removal, duration to be agreed with the surgeons at the time. The sheath can be removed with the patient supine or sitting up at about 30 degrees.
2	Surgeon to apply a FemoStop”	Hemostasis is achieved with use of a ‘FemoStop’ compression system or direct pressure by hand. If direct pressure by hand is used, the cardiothoracic surgeon will stay to do this. If the ‘FemoStop’ is used – they will apply this, remove the IABP and then leave the ITU nurse to manage the ‘FemoStop’ thereaZer: please see the attached ‘compression time’ guidance – which is also included in the ‘FemoStop’ pack**. Appendix 1
3	Confirm when the patient can sit up	Once hemostasis has been achieved – either by hand or with the ‘FemoStop’, the patient can begin to sit up again – the bedside nurse must confirm with the cardiothoracic surgeon as to how long the patient should be sat at 30 degrees/ be immobile, etc.
4	Compression times may need to be extended.	**care should be taken for patients on anticoagulant therapies or those with coagulopathies – the ‘FemoStop’ guidelines note that compression times may need to be extended slightly for some patients in these groups

3. RESOURCES

<https://lifeinthefastlane.com/cc/intra-aortic-balloon-pump/>

Overwalder PJ. Intra Aortic Balloon Pump (IABP) Counterpulsation. The Internet Journal of Perfusionists. 2000;1:(1) ([fulltext online](#))

Krishna M, Zacharowski K. Principles of Intra-Aortic Balloon Pump Counterpulsation. Cont Edu Anaesth Crit Care & Pain. 2009;9(1):24-28. [[Reference](#)]

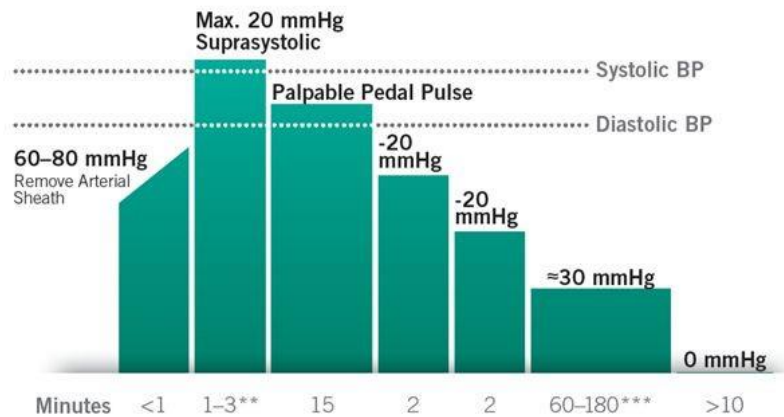
Maquet (2013) Learning resources <http://ca.maquet.com/clinician-information/e-learning-programs/>

Datascope's [IABP elearning modules](#)

Gomersall C. [Intra-aortic balloon pumping](#). 1999

APPENDIX 1 FEMOSTOP COMPRESSION GUIDELINES (INCLUDED IN THE PACK)

Compression Time Example*



* Found in the FemoStop Instructions for Use.

** After max three minutes: lower to mean arterial pressure. Check pedal pulse.

*** The length of compression depends on factors which vary, such as sheath size and anticoagulation status.