



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CBM352 Human Assist Devices

UNIT-II CARDIAC ASSIST DEVICES

2.2 Intra-Aortic Balloon Pumping

Intra-Aortic Balloon Pumping (IABP) is a mechanical circulatory support device used to assist the heart in certain clinical situations, such as during cardiogenic shock, severe heart failure, or during high-risk cardiac procedures. It is a temporary form of mechanical support designed to improve coronary artery perfusion and reduce the workload of the heart.

Here's how Intra-Aortic Balloon Pumping works:

Placement: A specialized catheter with an inflatable balloon at its tip is inserted into the aorta, the large artery that carries oxygenated blood away from the heart. The catheter is usually introduced through the femoral artery in the leg and positioned in the descending thoracic aorta, just below the left subclavian artery.

Inflation and Deflation: The balloon is synchronized with the cardiac cycle. It inflates during the diastolic phase of the cardiac cycle (when the heart is at rest and filling with blood) and deflates just before the systolic phase (when the heart contracts). This inflation and deflation cycle is timed to augment the blood flow and reduce the workload on the heart.

Effects: Inflation of the balloon increases coronary artery blood flow and decreases afterload (the resistance the heart has to overcome during contraction), while deflation helps the heart pump blood more efficiently.

Intra-Aortic Balloon Pumping is a supportive measure and does not replace the heart's function. It is used as a temporary intervention to stabilize a patient's condition while

other treatments are implemented or to provide support during high-risk cardiac procedures.

It's important to note that while IABP has been widely used, its efficacy in improving outcomes in certain conditions has been debated, and newer mechanical circulatory support devices are being developed and researched. The choice of circulatory support depends on the specific clinical situation, and healthcare professionals will consider various factors to determine the most appropriate intervention for a given patient.

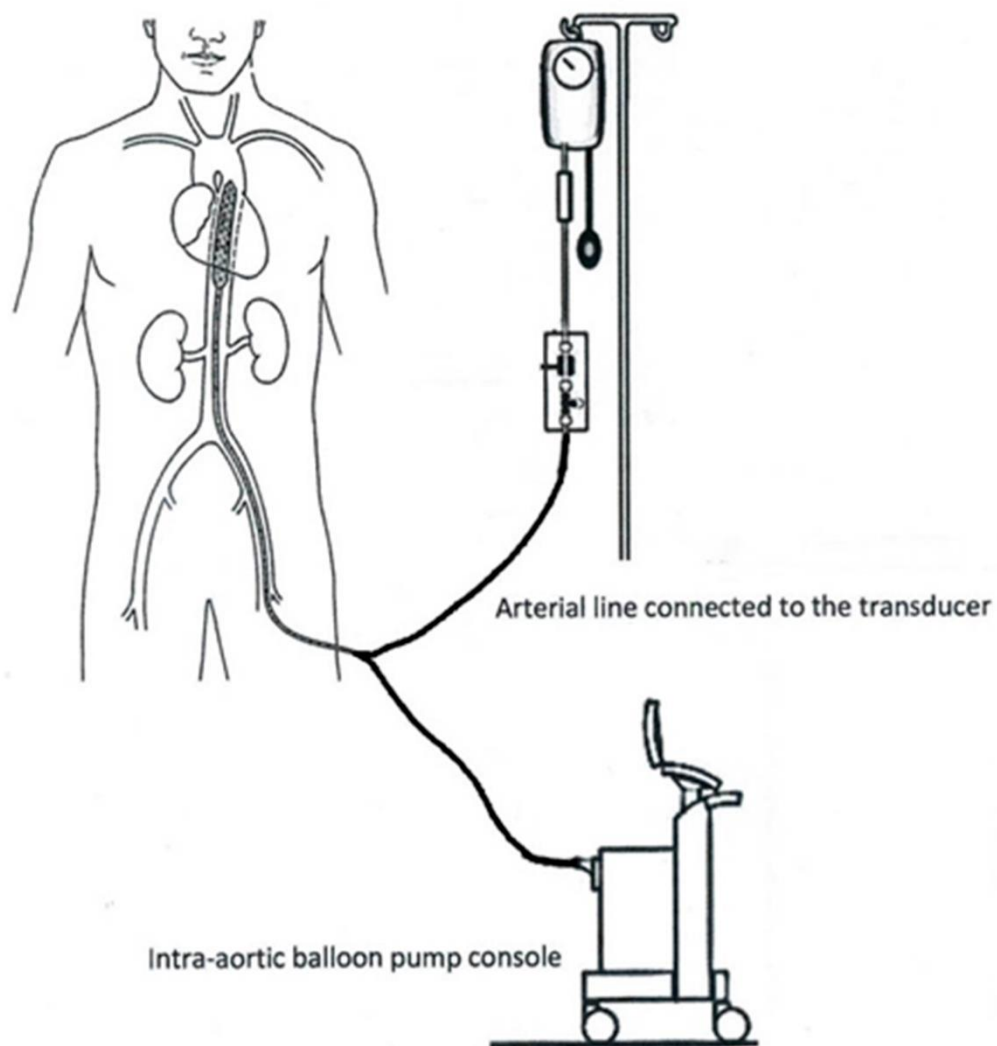


Fig. 2.2.1 Mechanical setup of the intra-aortic balloon pump

The IABP is used for an array of heart conditions, but mainly high-risk patients with acute myocardial infarction and in cardiogenic shock. Another popular condition for this form of treatment is high-risk that patients are undergoing artery bypass grafting surgery.

Working of IABP:

1. An intra-aortic balloon pump (IABP) is a type of therapeutic device. It helps heart pump more blood. You may need it if your heart is unable to pump enough blood for your body.
2. The IABP consists of a thin, flexible tube called a **catheter**. Attached to the tip of the catheter is a long balloon. This is called an intra-aortic balloon, or IAB. The other end of the catheter attaches to a computer console. This console has a mechanism for inflating and deflating the balloon at the proper time when your heart beats.
3. The heart pumps oxygenated blood and nutrients to all parts of your body. Blood leaves the heart through the arteries, the blood vessels that carry oxygenated blood. The outer walls of the heart also contain arteries. These are called the coronary arteries. Through these vessels, the heart receives the oxygen and nutrients it needs.
4. When the heart contracts, it sends blood out to the body. As it relaxes, blood flows into the coronary arteries to bring oxygen to the heart. An IABP allows blood to flow more easily into your coronary arteries. It also helps your heart pump more blood with each contraction.
5. The balloon is inserted into your **aorta**. The aorta is the very large artery leaving your heart. In many cases, this procedure is done through a small cut on the inside of your upper leg. Your healthcare provider will insert the balloon pump catheter into an artery in your leg. He or she will then guide it to your aorta.
6. From there, the IABP can start to do its work. The balloon is set to inflate when the heart relaxes. It pushes blood flow back toward the coronary arteries. They may not have been receiving enough blood without the pump. When the heart contracts, the balloon deflates. That allows the heart to pump more blood out to the body while using less energy. The device continues to inflate and deflate until it is removed.
7. An IABP is a short-term treatment. You may need it until your heart condition improves or until you can receive a more permanent treatment. Its use is rapidly growing. But it's not yet available at all medical centers.

Disadvantages of IABP

Disadvantages and risks of the IABP include the fact there is no direct increase in cardiac output; access site complications include limb ischemia, bleeding, pseudoaneurysm, and vascular trauma; admission to the intensive care unit (ICU) is required for the duration of therapy; it is dependent on electrocardiography.
