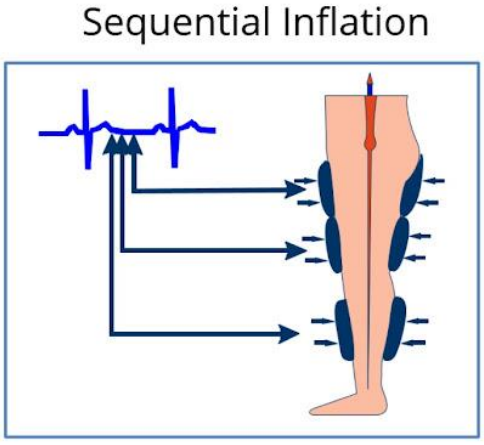
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CBM352 Human Assist Devices

UNIT-II CARDIAC ASSIST DEVICES

2.4 Principle of External Counter pulsation techniques

External Counter pulsation (ECP) is a non-invasive medical technique used to treat certain cardiovascular conditions, primarily angina pectoris (chest pain) and coronary artery disease. The principle of External Counter pulsation involves the application of external pressure to the lower extremities in a synchronized manner with the cardiac cycle. The technique aims to improve blood flow to the heart and enhance coronary perfusion.



Cuffs inflate sequentially at the onset of diastole from the calves, to the thighs, to the buttocks, increasing venous return and coronary perfusion.

Here's how External Counter pulsation works:

1. **Patient Setup**:

The patient lies on a treatment table, typically in a supine position (lying on the back).

Three sets of inflatable cuffs or pressure cuffs are wrapped around the patient's calves, lower thighs, and upper thighs or buttocks.

2. **Inflation and Deflation**:

The cuffs are connected to an ECP device, which is equipped with a control unit.

During the cardiac cycle, the cuffs inflate sequentially in a synchronized manner with the heart's relaxation phase (diastole). This occurs just after the heart contracts (systole).

The cuffs deflate just before the heart contracts again.

3. **Pressure Wave Propagation**:

The inflation of the cuffs generates a pressure wave that travels upward from the lower extremities toward the heart.

This pressure wave enhances blood flow in the arteries and veins of the legs, improving venous return.

4. **Diastolic Augmentation**:

During the deflation phase of the cuffs, there is a sudden decrease in pressure in the lower extremities.

This decrease in pressure creates a vacuum effect, which helps to draw blood back toward the heart.

The increased blood flow during diastole is believed to enhance coronary perfusion and oxygen supply to the heart muscle.

5. **Treatment Sessions**:

A typical course of External Counter pulsation involves multiple treatment sessions, usually administered over several weeks. Each session typically lasts around one hour, and patients may undergo a series of sessions.

The goal of External Counter pulsation is to reduce the workload of the heart, improve oxygen supply to the heart muscle, and alleviate symptoms such as chest pain. It is considered a non-invasive and relatively safe therapy. While ECP is not a cure for heart disease, it may provide symptomatic relief and improve the quality of life for certain patients. It is essential to note that the effectiveness of ECP can vary between individuals, and its use is typically recommended in specific clinical scenarios. Patients should consult with their healthcare providers to determine if External Counter pulsation is a suitable treatment option for their condition.

In the short-term, this method of therapy is thought to deliver more oxygen to the ischemic myocardium by increasing coronary blood flow during diastole, while at the same time reducing the demand for oxygen by diminishing the work requirements of the heart

Advantages of ECP Treatment:

- ✓ Improved Blood Flow: EECP promotes increased blood flow to the heart, enhancing oxygen delivery and nutrient supply to cardiac muscles.
- ✓ Non-Invasive: Unlike surgical interventions, EECP is a non-invasive outpatient treatment, reducing the risks associated with invasive procedures.
- ✓ Enhanced Quality of Life: Many patients report an improvement in their overall quality of life after undergoing EECP treatment, experiencing reduced symptoms like shortness of breath and chest pain.

ECP Treatment Disadvantages:

- ✓ Time Commitment: The duration of EECP sessions, typically lasting an hour, may pose a challenge for individuals with busy schedules
- ✓ Short-Term Side Effects: Some patients may experience mild side effects during or aftertreatment, including leg discomfort or fatigue.

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