EXERCISE

1. MUSCLE BLOOD FLOW
2. CARDIAC OUTPUT
3. BLOOD PRESSURE
MUSCULAR BLOOD FLOW

1. BLOOD FLOW DURING EXERCISE
2. CIRCULATORY REAJUSTMENT DURING EXERCISE
3. EFFECTS OF MASS SYMPATHETIC DISCHARGE
CADIAC OUTPUT

1. MEAN CIRCULATORY FILLING PRESSURE
2. DECREASE THE RESISTANCE IN THE ACTIVE MUSCLES
BLOOD FLOW DURING EXERCISE

Effects of muscle exercise on blood flow in the calf of a leg during strong rhythmic contraction. The blood flow was much less during contractions than between contractions. (Adapted from Barcroft and Dornhorst: J Physiol 109:402, 1949.)
BLOOD PRESSURE

\[ P = F \times R \]
Normal coronary blood flow

• The resting coronary blood flow = 225 ml/min
• In strenuous exercise = increase three to four folds.
CORONARY BLOOD FLOW DURING CARDIAC CYCLE
Epicardial Vs. subendocardial blood flow
Control of coronary blood flow

- Metabolic regulation
- Nervous control
Metabolic regulation

• Blood flow through coronary system is regulated almost entirely by local arterial vasodilatation in response to cardiac muscle need for nutrients.

Increased contraction

Increase in rate of coronary blood flow
METABOLIC REGULATION

• Oxygen demand.

• Vasodilator substances:
  • Adenosine.
  • Potassium ions.
  • Hydrogen ions.
  • Carbon dioxide.
  • Bradykinin.
  • Prostaglandins.
Nervous control

- Direct effect:
- Direct action of Ach and Nepi on coronary vessels.

Vascular dilatation
β receptors

Sympathetic transmitter

Vascular constriction
α receptors
NERVOUS CONTROL

- **Indirect effect:**
  - Symp stimulation $\rightarrow$ HR & contractility $\rightarrow$
  - Rate of metabolism.
  - activity $\rightarrow$ local blood flow regulatory mechanisms $\rightarrow$ blood flow increases.