2010b(10)/1997a(8): Discuss the factors that influence coronary blood flow
General: Heart mm is supplied by the coronary circulation.
- Lead off from the aortic root → drain in coronary sinus/RA
- Resting coronary blood flow = 250ml/min (5% CO)
Coronary aa blood flow:

\[
\text{CorBF} = \frac{\text{CorPP}}{\text{CorVasRes}}
\]

Determinants of coronary blood flow
Coronary perfusion pressure (CorPP)
- Driving pressure for the coronary circulation

\[
\text{CorPP} = \text{aortic diastolic pressure} - \text{LV diastolic pressure (or RAP)}
\]

CorPP is a Starling Resistor mechanism
- Dependent on:
  o Arterial pressure
  o Intraventricular pressure
  o Coronary sinus / RAP
- Different for left and right sides of the heart
  o Left coronary aa supplies left heart & septum → high intraventricular pressures (1° determinant of CorPP)
    ▪ Most flow occurs during diastole
    ▪ Flow is rate dependent → i.e. ↑HR → ↓diastolic time → ↓CorBF
  o Right coronary artery supplies right side of heart & part of septum → lower intraventricular pressures
    ▪ CorPP never 0
    ▪ Flow occurs throughout cardiac cycle (mostly during diastole)
- Both LVDP and RAP are <<< aortic diastolic pressure
- Therefore, CPP ~ aortic diastolic pressure
CorPP changes during systole and diastole (phasic)

**Left Ventricle**

\[
\text{Systole} \quad \text{CorPP} = \text{aortic systolic P} - \text{LV systolic P} \\
= 120 - 120 \\
= 0\text{mmHg (this is merely a snap shot in time. See below for flows.)}
\]

\[
\text{Diastole} \quad \text{CorPP} = \text{aortic dias P} - \text{LV dias P} \\
= 80 - 5 \\
= 75\text{mmHg}
\]

**Right Ventricle**

\[
\text{Systole} \quad \text{CorPP} = \text{aortic sys P} - \text{RV sys P} \\
= 120 - 25 \\
= 75\text{mmHg}
\]

\[
\text{Diastole} \quad \text{CorPP} = \text{aortic dias P} - \text{RV dias P} \\
= 80 - 5 \\
= 75\text{mmHg}
\]

Coronary vascular resistance

By Amanda Diaz
Poiseuille-Hagan equation for resistance:
\[ R = \frac{8\eta l}{\pi r^4} \]
where \( R \) = resistance, \( \eta \) = viscosity, \( l \) = length, \( r \) = radius

Altering radius of vessels can ↓ resistance in order to improve blood flow

Local metabolic control
- ↑ metabolite production → vasodilation of coronary vessels via release of vasoactive substances (1° NO, prostacyclin)
  - In response to ↑ pCO₂, ↑ K⁺, ↑ H⁺, ↓ pH, ↓ pO₂, adenosine
  - This is most important controlling factor of vessel size
- α-receptors are present in coronary aa, however SNS activated vasoconstriction is largely overridden by the production of vasodilator substances leading to overall dilation

Myogenic control
- reflex dilation with ↓ MAP
- reflex constriction with ↑ MAP

Extravascular Pressure
- **Starling Resistor mechanism**
- Calibre of vessels ↓ with ↑ intraventricular pressure which compresses the vessels overlying it → interrupt flow

Left ventricle receives > blood flow than RV 2° ↑ mm mass