Absolute Coronary Flow Measurements

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Two-Compartment Model of the Coronary Circulation

The coronary angiogram detects only 5% of the total coronary tree.
Lack of Interest for the Microcirculation

Lack of Interest “Black Box”

Not visible and not measureable

New treatment modalities cannot be evaluated
What do we need to assess the microvasculature?

\[ \text{Resistance} = \frac{\Delta P}{\text{Flow}} \]

\[ \text{(mmHg/mL/s)} \]
Continuous Infusion: ACF

Constant Flow of injectate (mL)

Concentration (temperature) over time (g/mL/min)

To be known:
- Flow of the pump (20 mL/min)
- Proximal Temperature
- Distal Temperature

\[ Q = Q_i \times \frac{T_i}{T} \times 1.08 \]

Aarnoudse W et al J Am Coll Cardiol 2007;50:2294
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\[ Q = Q_i \times \frac{T}{T_i} \times 1.08 \]
Catheter for continuous saline infusion

- 4 side holes allowing optimal mixing of saline
- Minimal or no saline dripping through the distal port
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Continuous Infusion: ACF

\[ Q = Q_i \times \frac{T_b - T_i}{T_b - T} \times 1.08 \]

Start infusion (20 mL/min)

\[ Q = Q_i \times \frac{T_i}{T} \times 1.08 \]
Continuous Infusion: ACF
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Continuous Infusion: ACF

Q = 25 \times \left( \frac{7.1}{0.97} \right) \times 1.08 = 173 \text{ mL/min}
Absolute hyperemic coronary flow: 126 mL/min
Minimal myocardial resistance: 0.436 mm Hg/mL/min
Conclusion

Coronary thermodilution using a bolus injection allows the measurements of the mean transit time ($T_{mn}$, an index of coronary flow) and of IMR.

Coronary thermodilution by continuous infusion allows the measurement of absolute coronary blood flow and resistance.