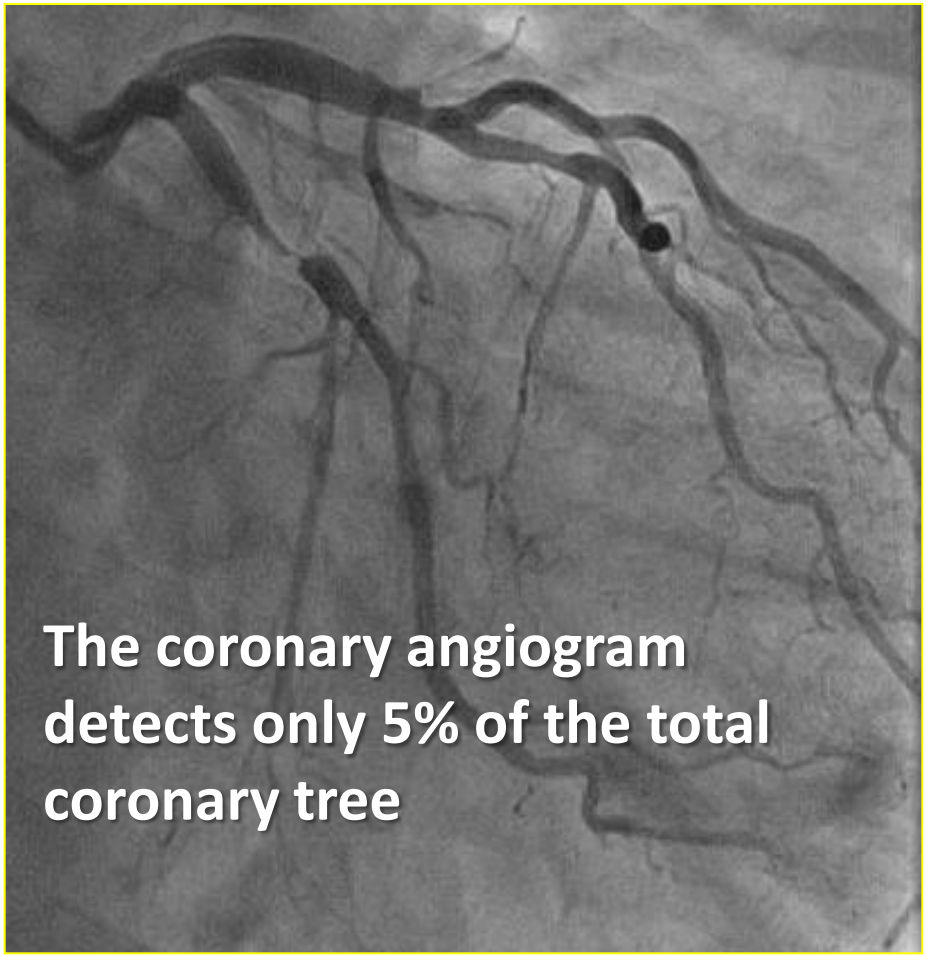
Cardiovascular Center Aalst

Absolute Coronary Flow Measurements

Bernard De Bruyne
Cardiovascular Center Aalst
Belgium

Cardiovascular Center Aalst

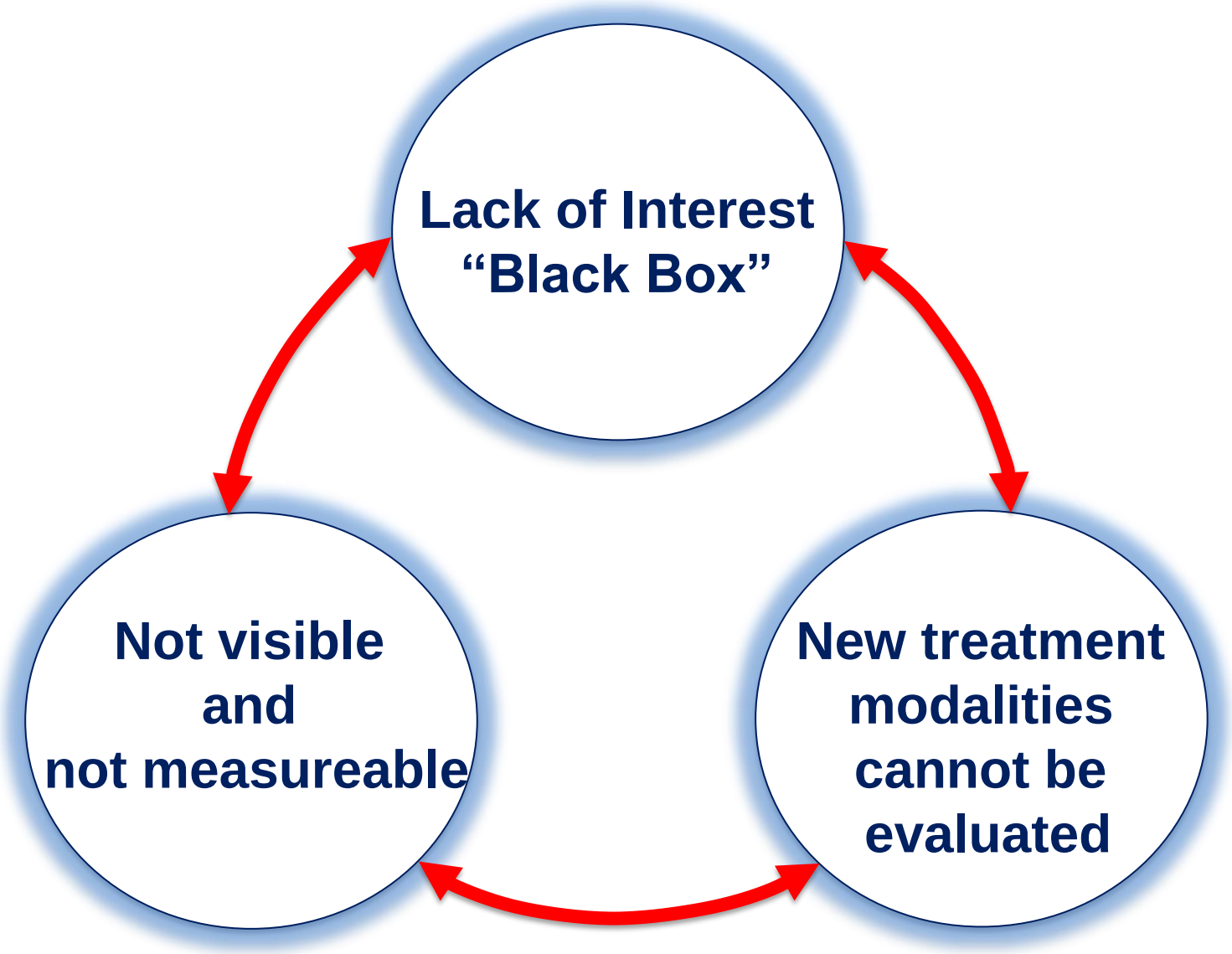
Two-Compartment Model of the Coronary Circulation



www.cardio-aalst.be

Cardiovascular Center Aalst

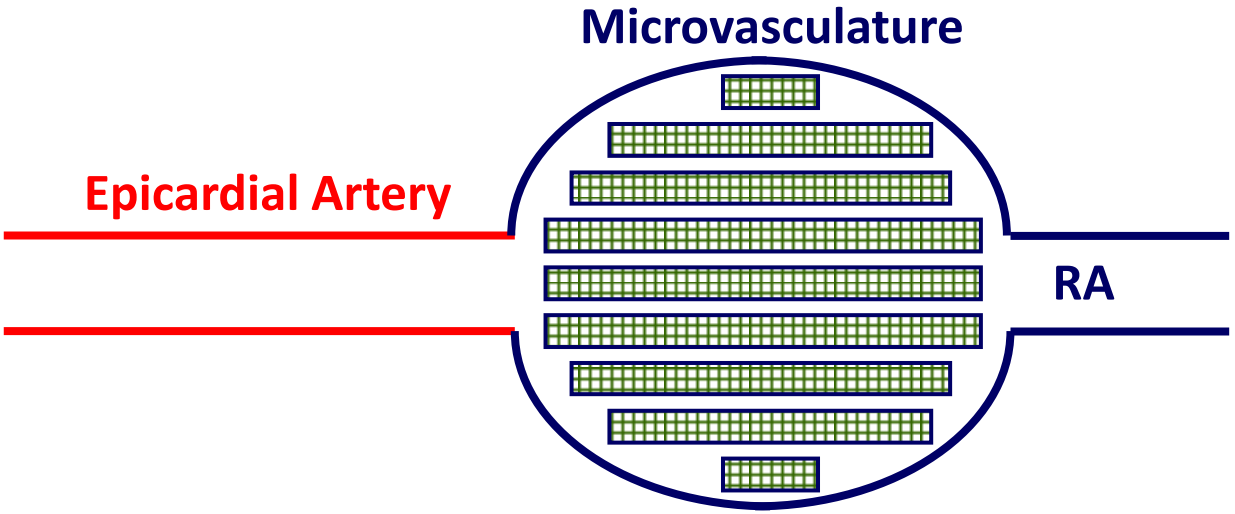
Lack of Interest for the Microcirculation



www.cardio-aalst.be

Cardiovascular Center Aalst

What do we need to assess the microvasculature ?

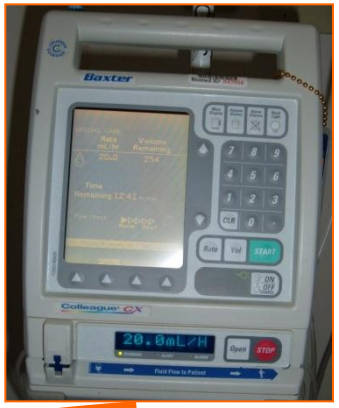


www.cardio-aalst.be

$$\text{Resistance} = \frac{\Delta P \text{ (mm Hg)}}{\text{Flow (mL/s)}}$$

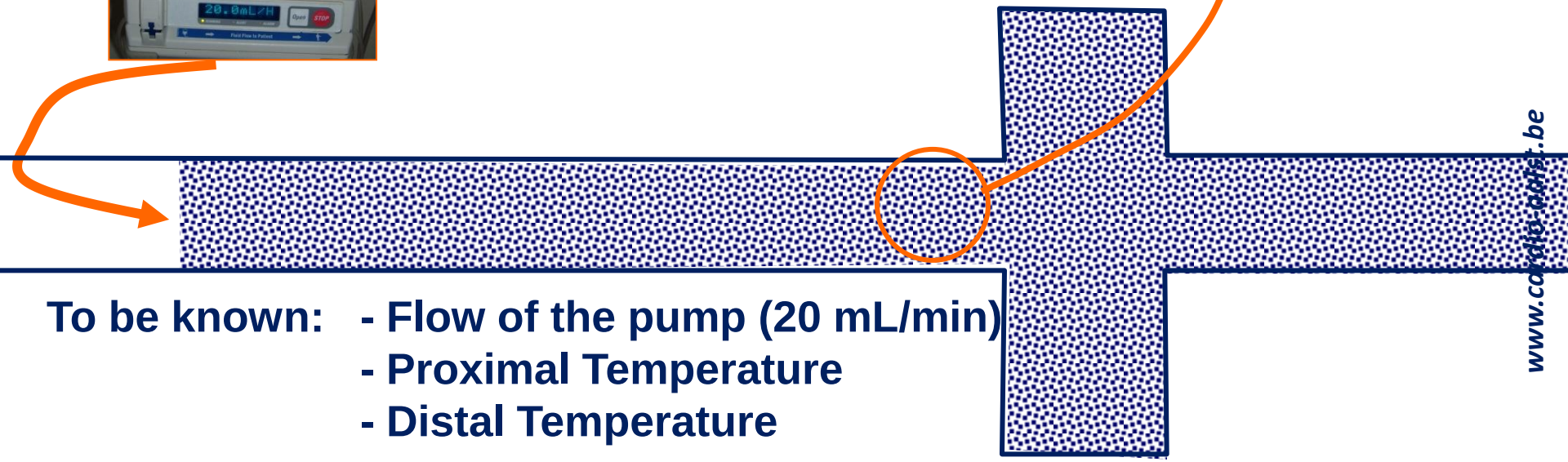
(mmHg/mL/s)

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

Cardiovascular Center Aalst

Continuous Infusion: ACF

Constant Flow of injectate (mL)

Concentration over time (g/mL/min)

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

$$Q = Q_i \times \frac{T_i}{T} \times 1.08$$

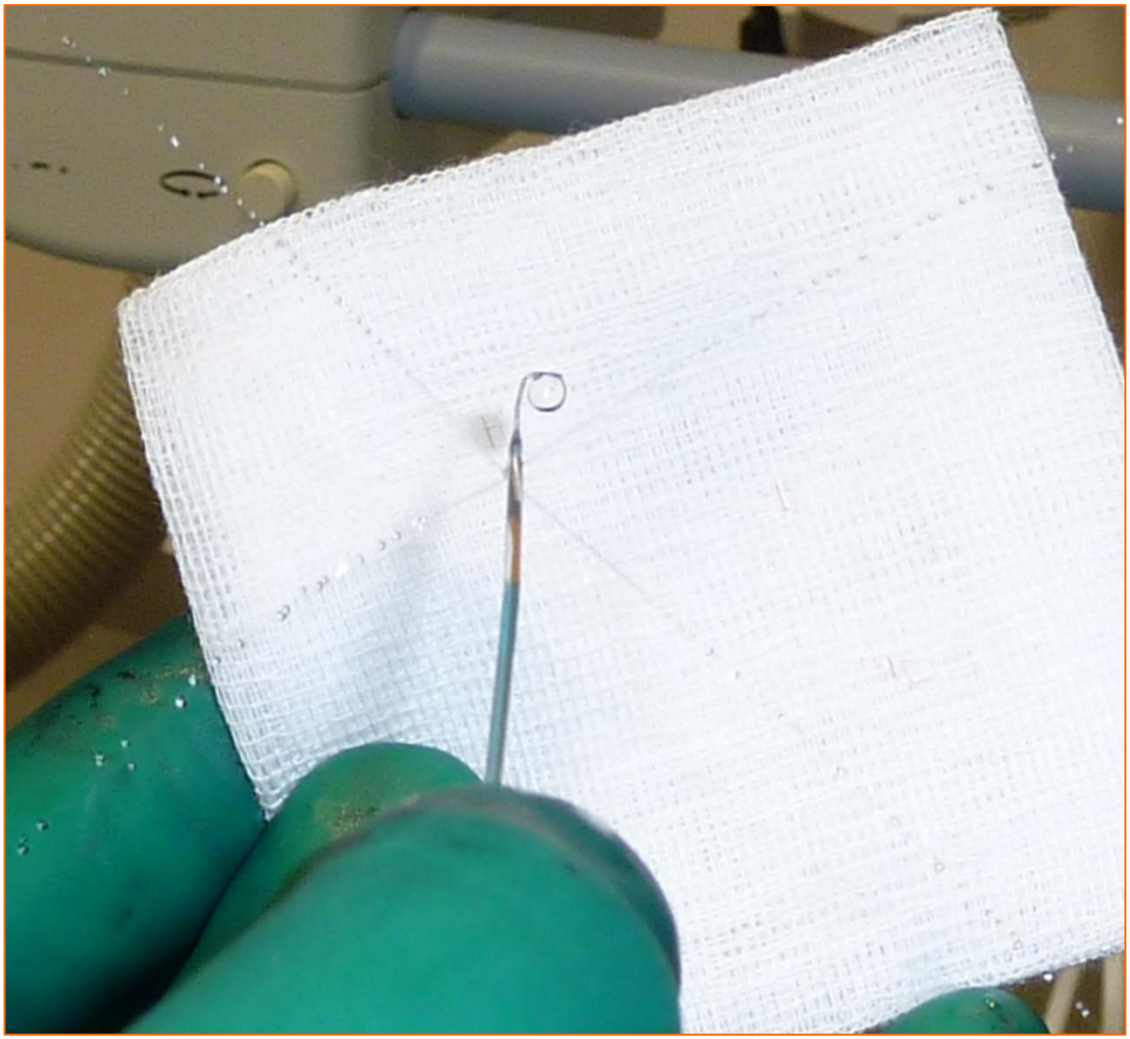
www.cardio-aalst.be

Aarnoudse W et al J Am Coll Cardiol 2007;50:2294

Cardiovascular Center Aalst

Catheter for continuous saline infusion

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



www.cardio-aalst.be

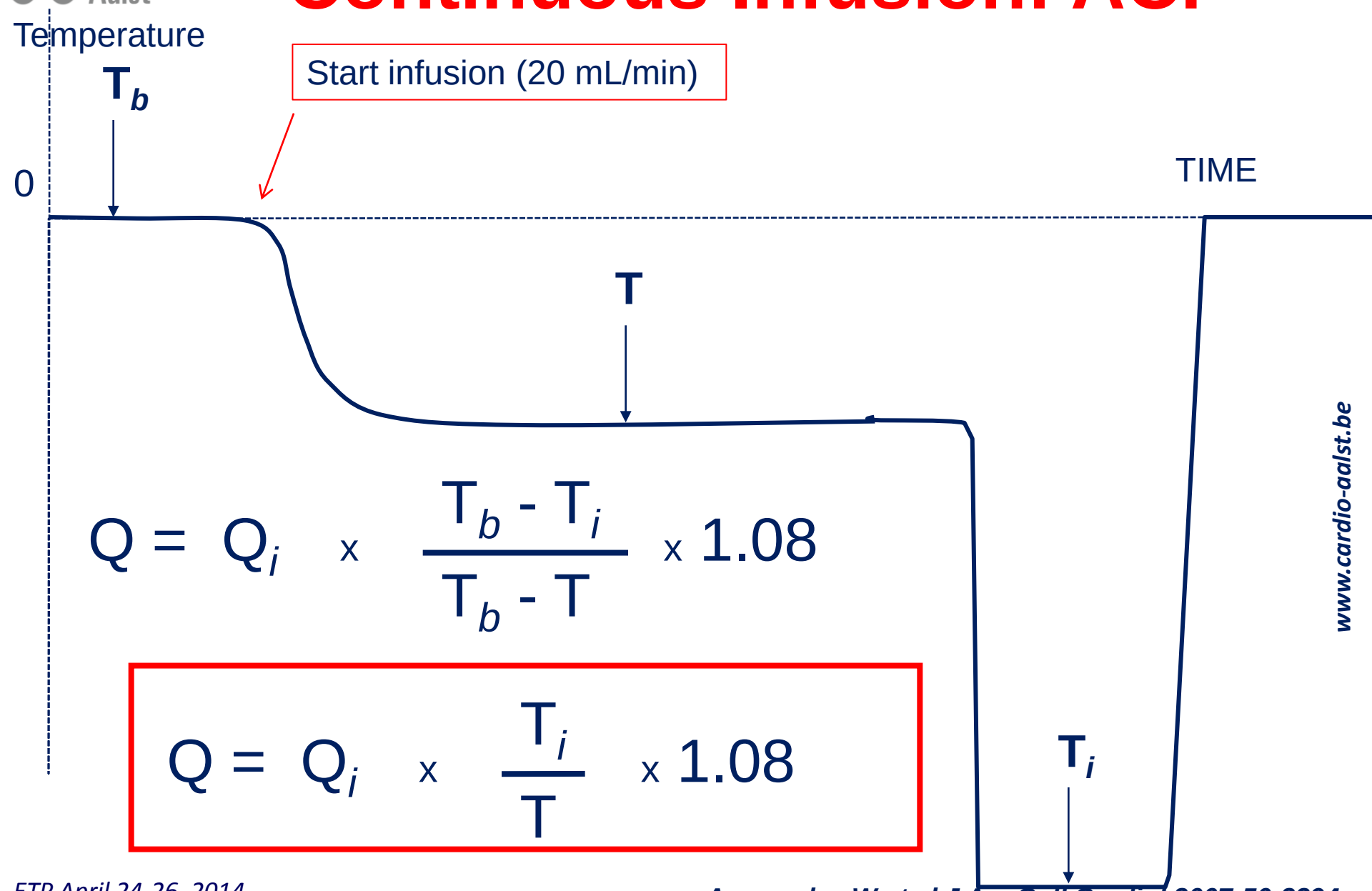
Cardiovascular Center Aalst

Catheter for continuous saline infusion

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

www.cardio-aalst.be

Continuous Infusion: ACF



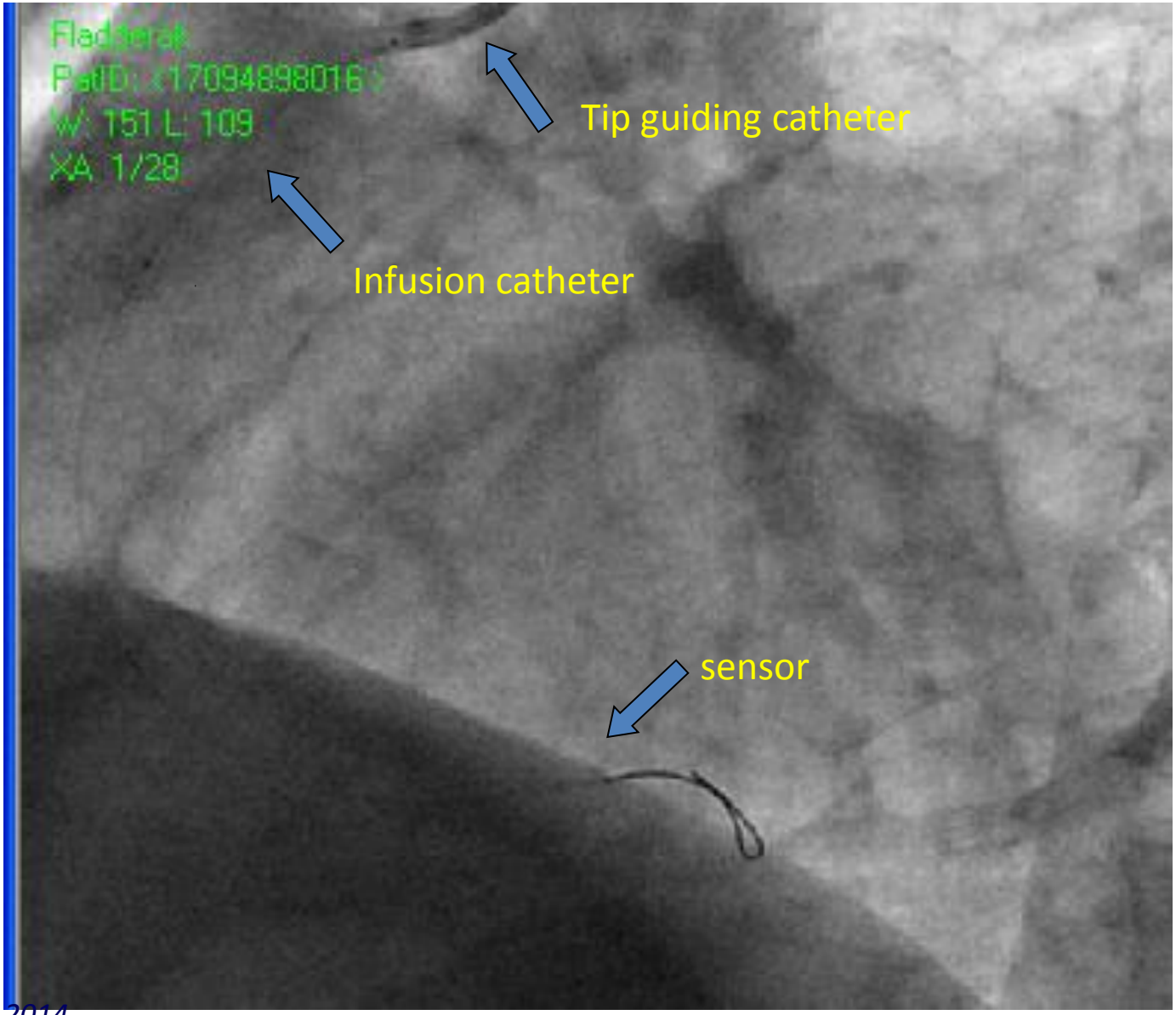
$$Q = Q_i \times \frac{T_b - T_i}{T_b - T} \times 1.08$$

$$Q = Q_i \times \frac{T_i}{T} \times 1.08$$

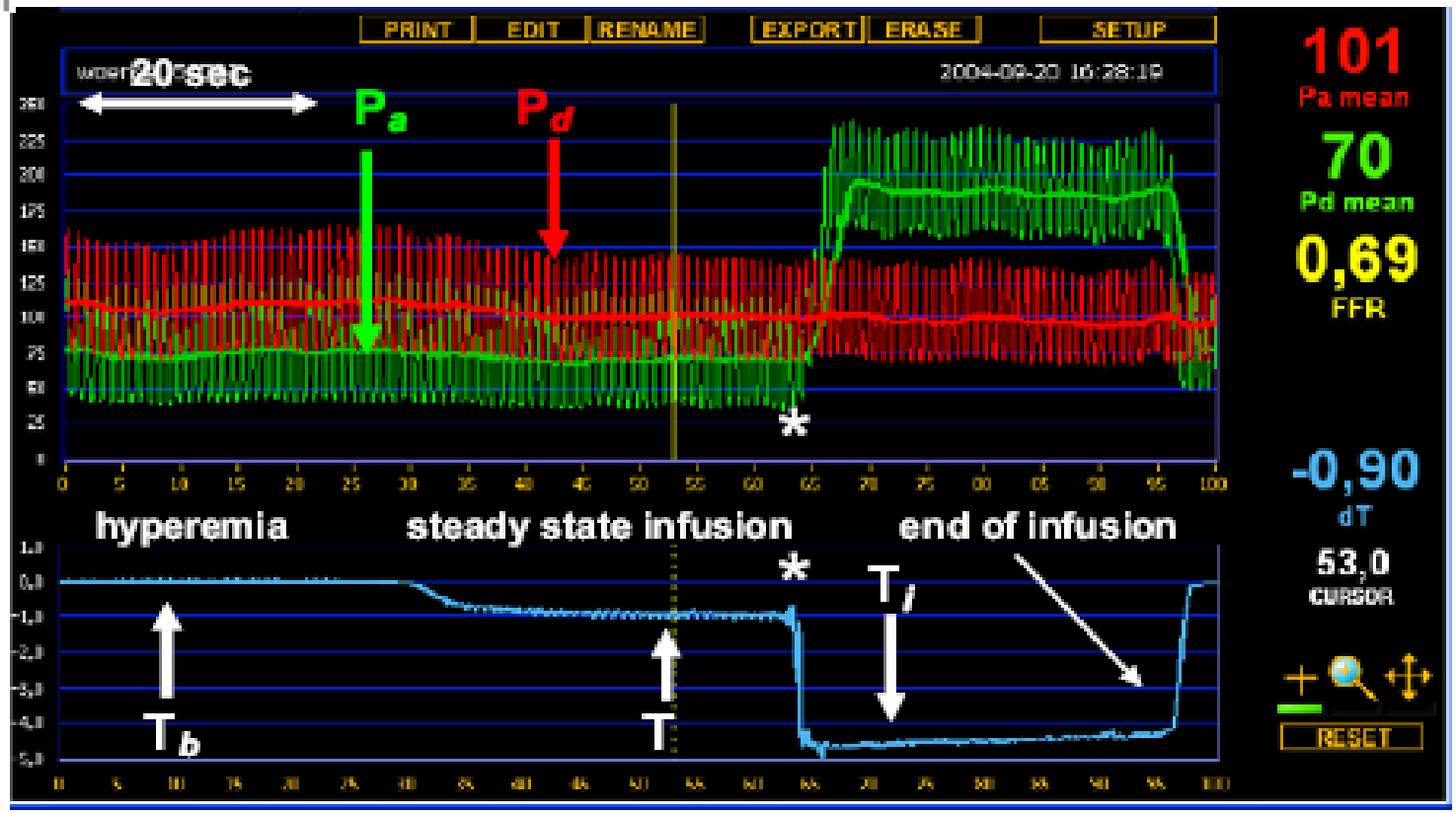
Aarnoudse W et al J Am Coll Cardiol 2007;50:2294

Cardiovascular Center Aalst

Continuous Infusion: ACF



Cardiovascular Center Aalst



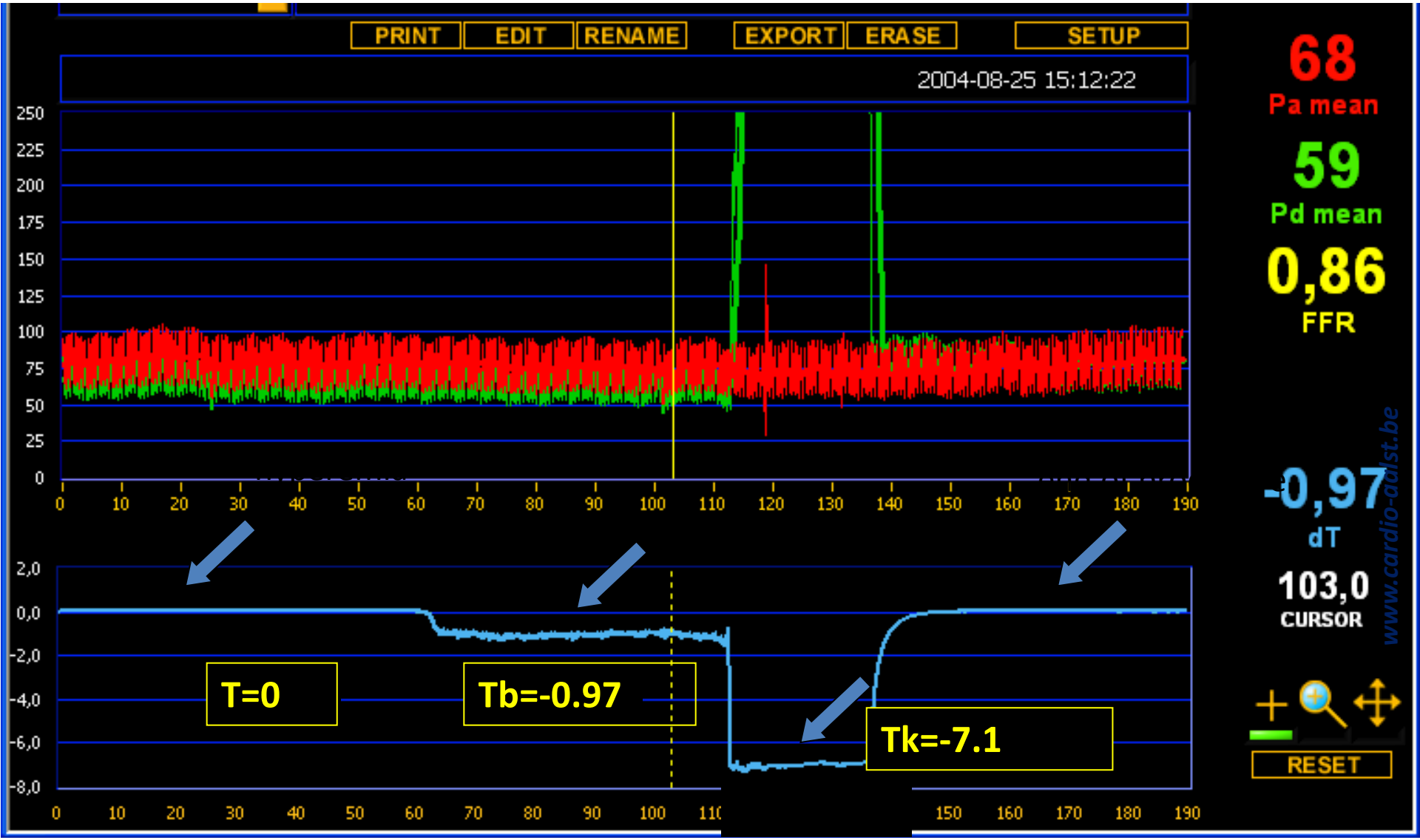
$$Q = Q_i \times \frac{T_b - T_i}{T_b - T} \times 1.08$$

$$Q = Q_i \times \frac{T_i}{T} \times 1.08$$

www.cardio-aalst.be

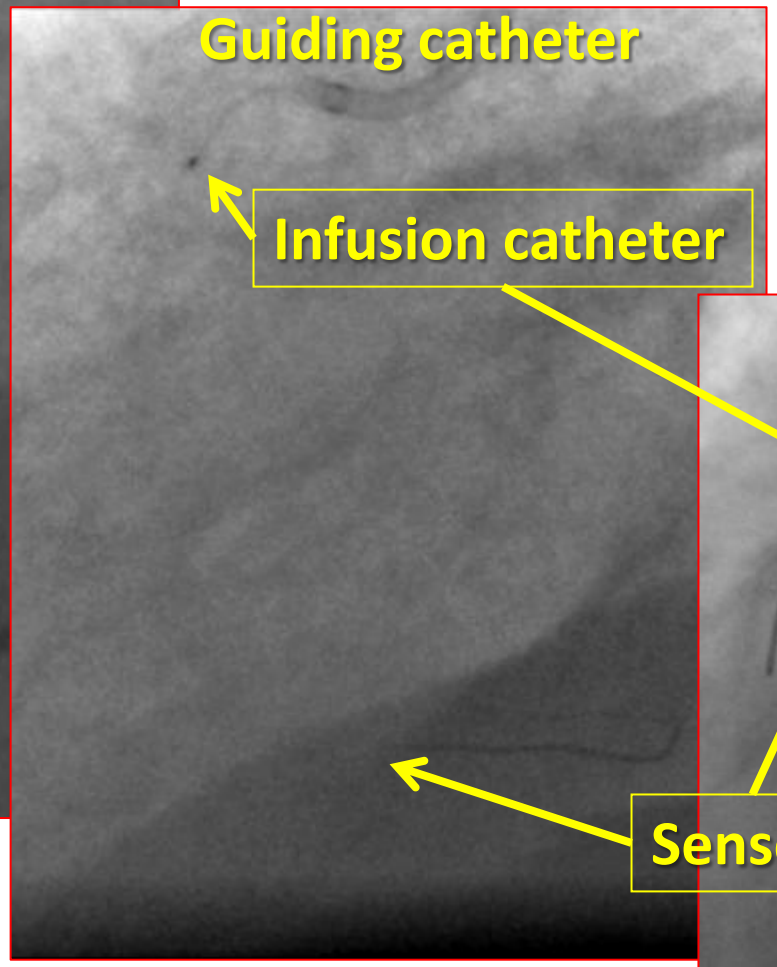
Cardiovascular Center Aalst

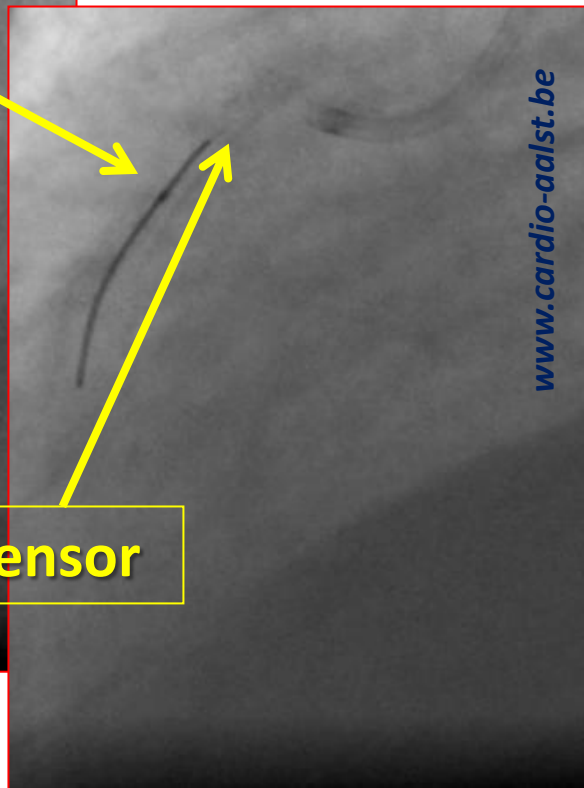
Continuous Infusion: ACF



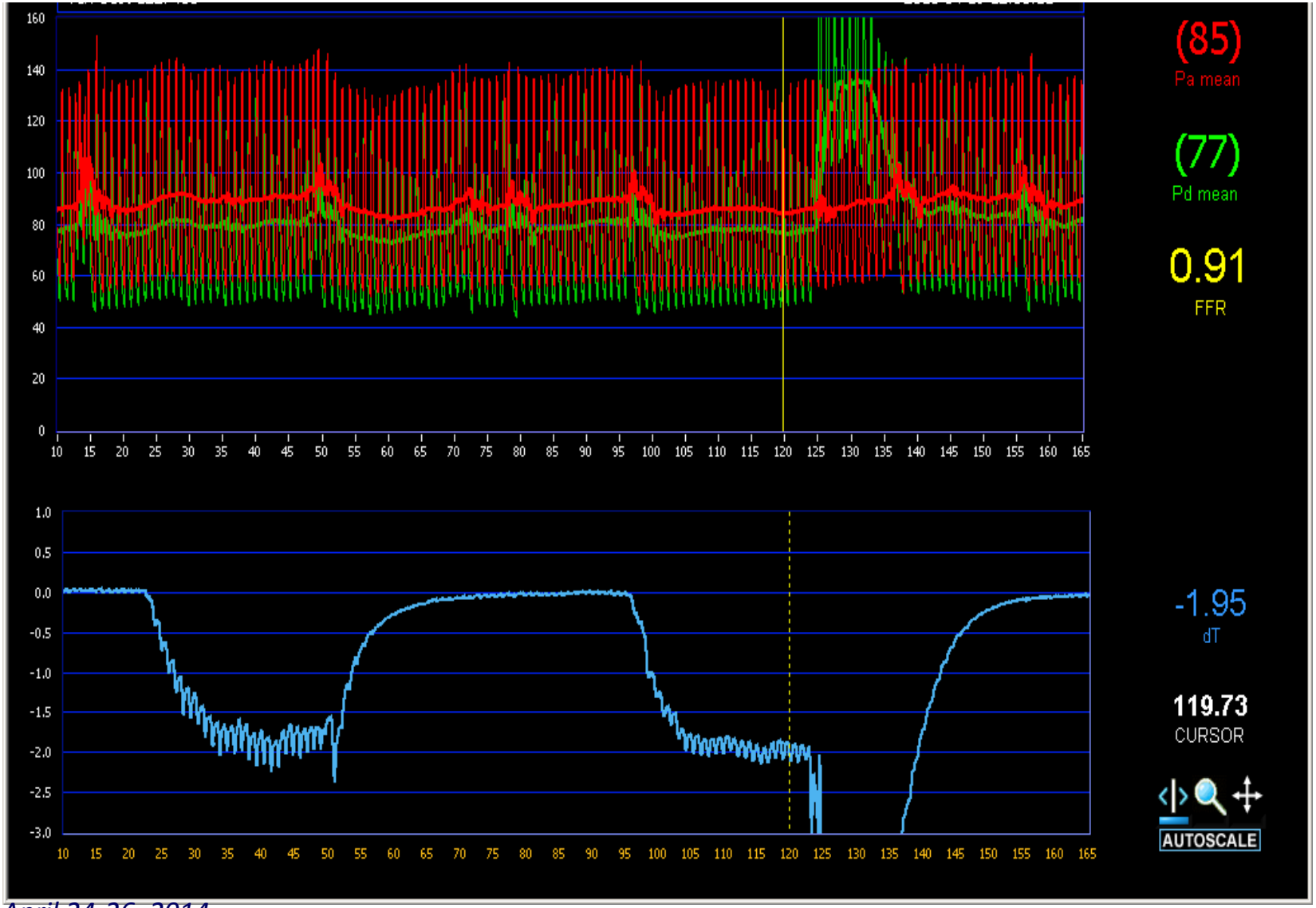
Q = 25 x (7.1 / 0.97) x 1.08 = 173 mL/min

Cardiovascular Center Aalst



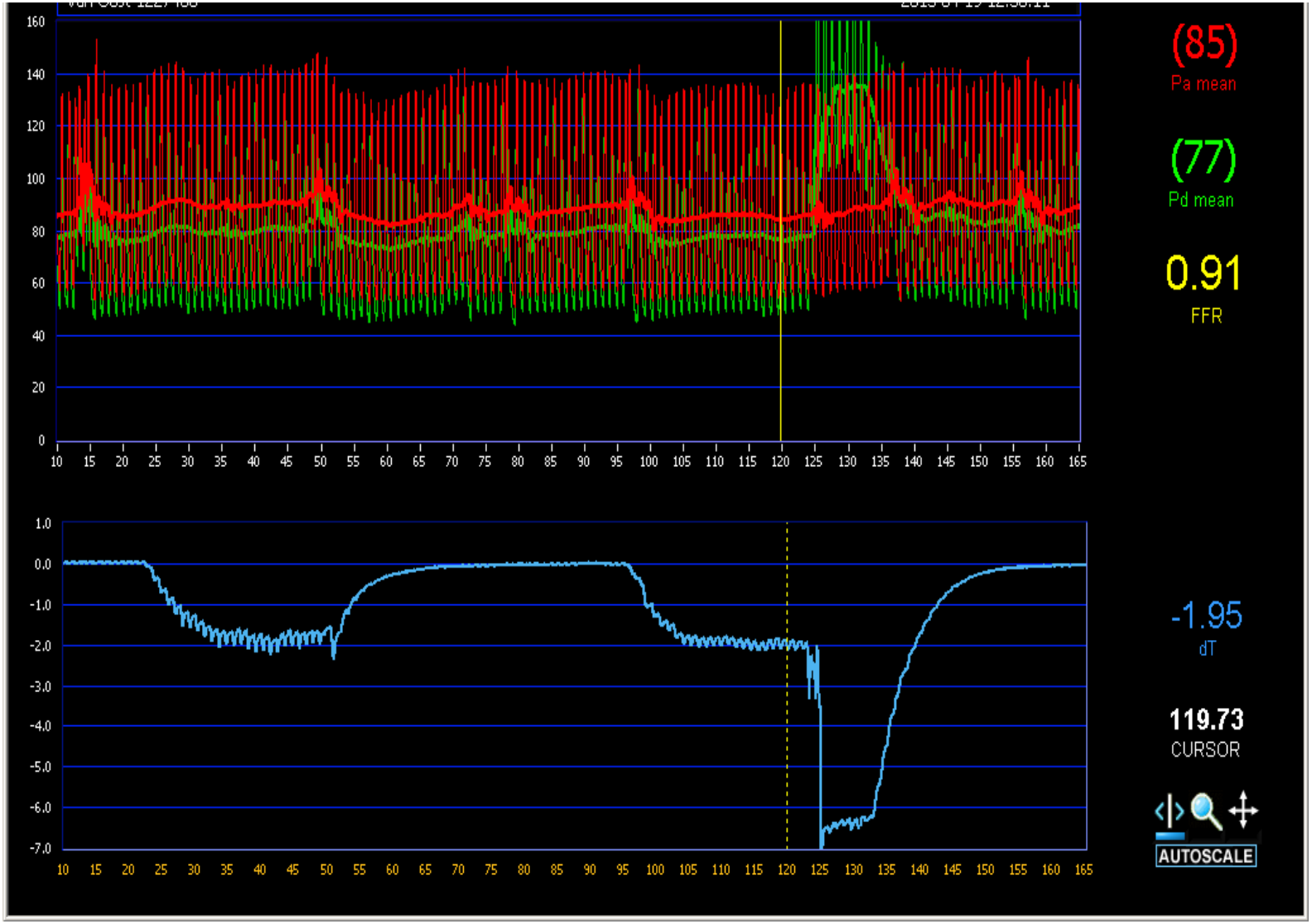


Cardiovascular Center Aalst



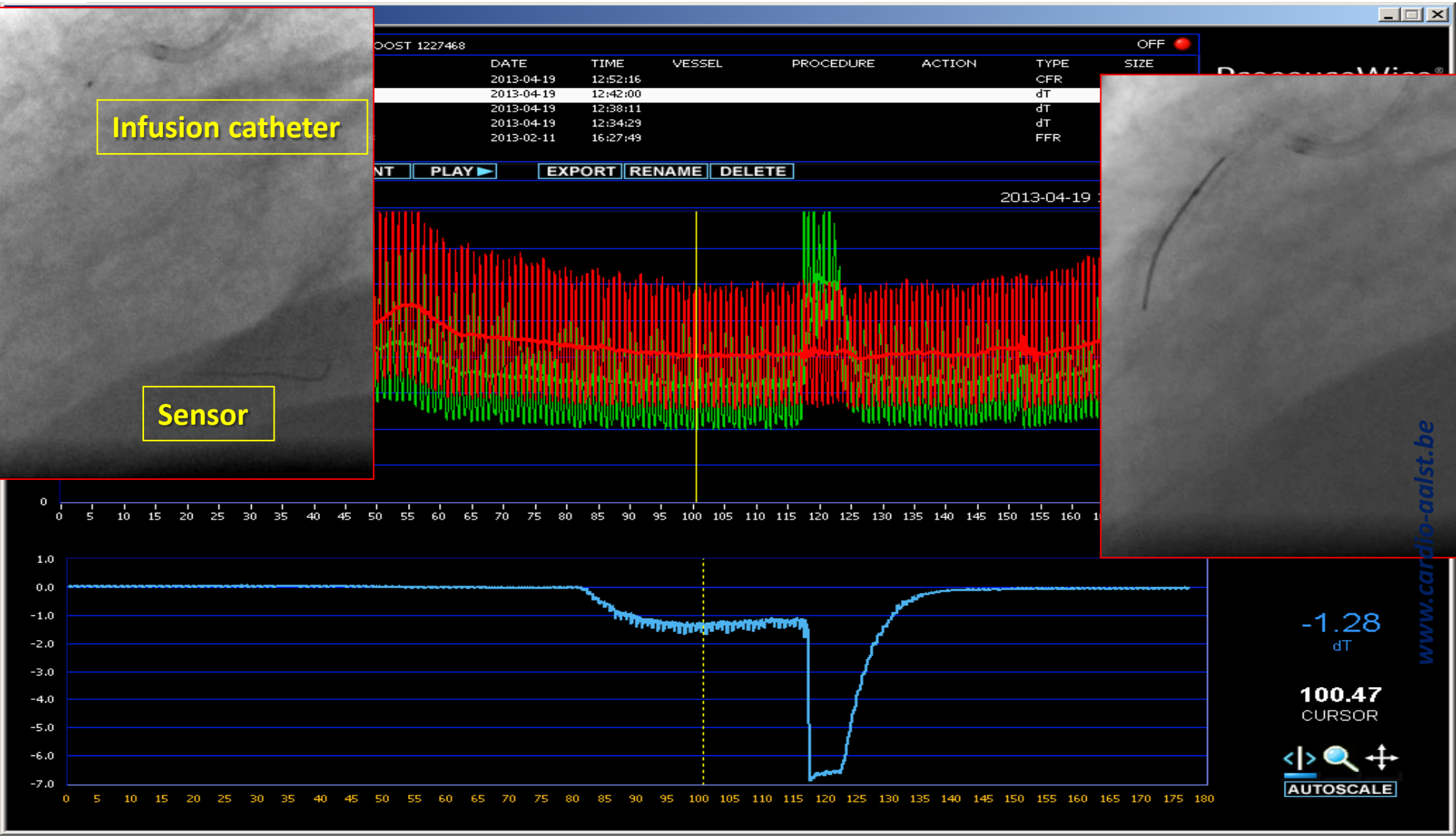
www.cardio-aalst.be

Cardiovascular Center Aalst



www.cardio-aalst.be

Cardiovascular Center Aalst



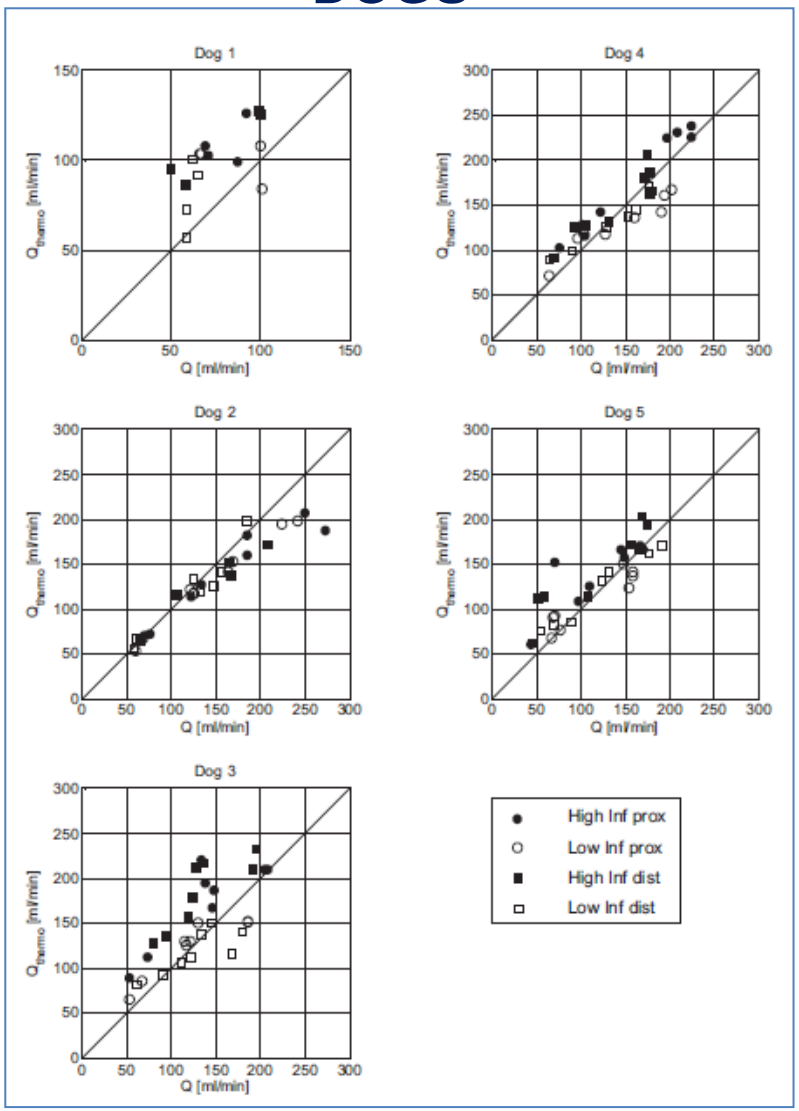
Absolute hyperemic coronary flow: 126 mL/min

Minimal myocardial resistance: 0.436 mm Hg/mL/min

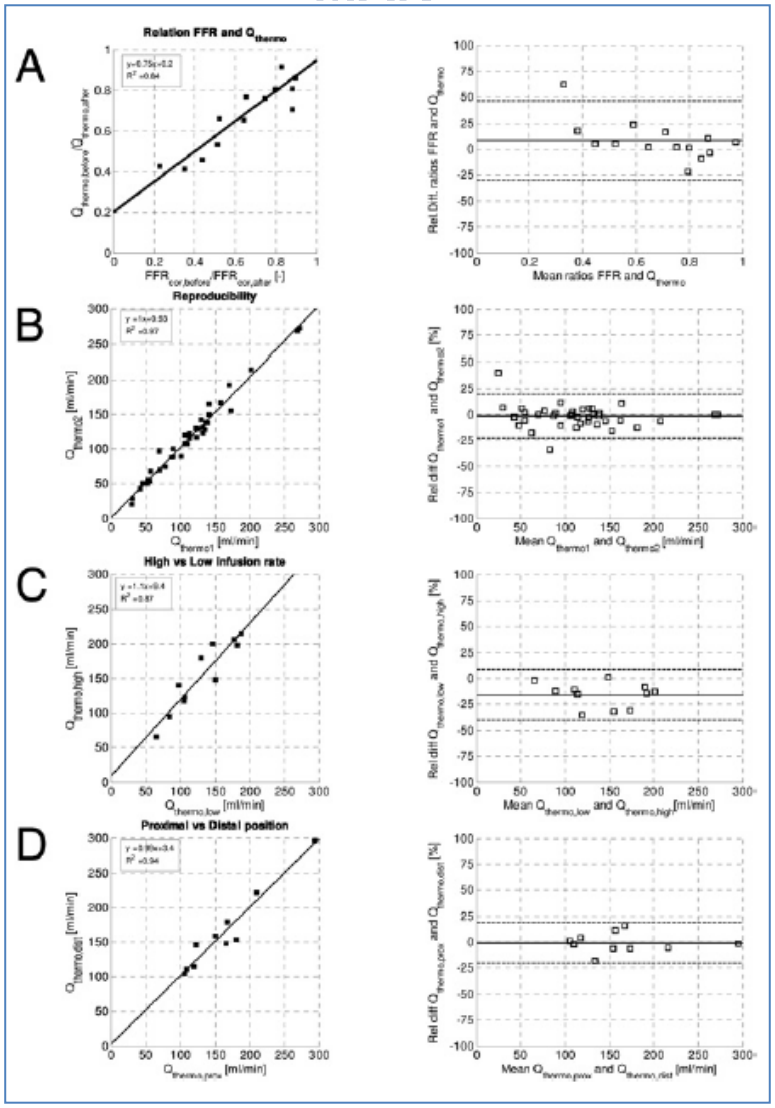
Cardiovascular Center Aalst

ACF: Validation Studies

DOGS



MAN



www.cardio-aalst.be

Aarnoudse W et al J Am Coll Cardiol 2007;50:2294

Cardiovascular Center Aalst

Conclusion

Coronary thermodilution using a bolus injection allows the mesurements 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