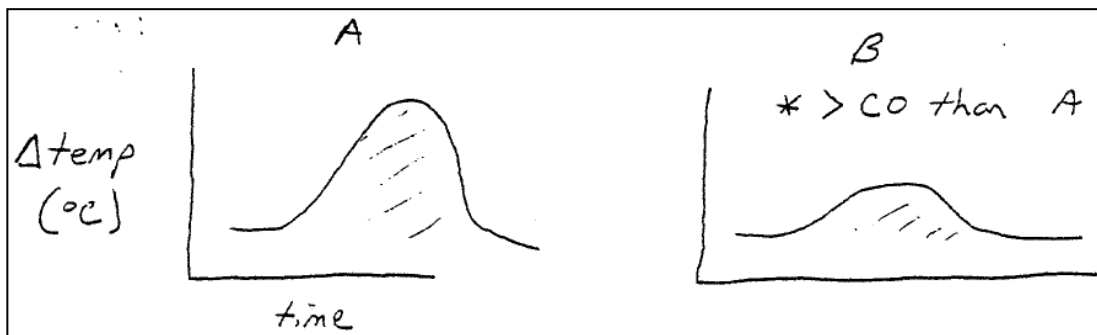


Errors of Thermodilution Cardiac Output Measurements

Anesthetic Pearls: Anesthetic Implications of Thermodilution Cardiac Output Devices

- Saline or dextrose (10 ml) may be used as injectate (similar specific gravity and specific heat).
- Room temperature (<24°C) or cold injectate may be used. Better signal if the injectate (<24°C) to noise (patient temp, 36°C) ratio is colder.
- Constant (**K**): depends on size, make, and type of catheter (luminal size and flow characteristics).
- Approximately 20 cm between injectate port and blood mixing at tip of pulmonary artery catheter.
- Area under “change in temperature” versus “change in time” curve **inversely proportional to C.O.**



- Make measurement at same time in respiratory cycle (end-expiration).
- Errors of 10-20% even in best of hands (do “3” measurements within 10% of each other and average).
- **Anything that results in "less cold" reaching thermistor tip causes “overestimation of CO”**
 - a. smaller injectate volume
 - b. indicator that is too warm (>24°C)
 - c. thrombus on thermistor tip
 - d. partial "wedging" of catheter
- **Potential sources of error in Thermodilution measurement:**
 1. <10 ml injectate (↑ CO)
 2. >10 ml injectate (↓ CO)
 3. L-R Shunt (↑ CO)
 4. R-L Shunt (↓ CO)
 5. Respiratory variation, timing of respiratory cycle (best if measured during end-expiratory phase when mechanically ventilated; however may use any phase of respiratory cycle if always consistent when being measured)
 6. Injection takes longer than 4 seconds
 7. Wedged Catheter (damped PA trace) unreliable (blood not getting past thermistor tip)
 8. Catheter looped in RV unreliable (need ~20 cm between injectate and mixing)
 9. Tricuspid and Pulmonic Valvular Regurgitation (theoretically produces recirculation of blood in the right heart with broad / low-amplitude curves and increased artifact)
 10. Arrhythmias
 11. Repetitive measurements without allowing time for temperature to equilibrate (~90 seconds)