Title: CORRELATION OF ESOPHAGEAL, RECTAL AND PULMONARY ARTERY TEMPERATURE MEASUREMENT DURING RAPID EXTRACORPOREAL COOLING

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Introduction. Many different sites of temperature monitoring are routinely used, the validity and correlation of each monitoring site with respect to the others and "core" temperature having been previously investigated. However, there is little objective data concerning the period of greatest rate of temperature change.

This study examines the relationship of three commonly used monitoring sites: Esophageal [E], Rectal [R] and Pulmonary Artery [PA] in cardiac surgical patients undergoing rapid extracorporeal cooling in the interval between initiation of complete cardiopulmonary bypass [CPB] and cross clamping of the aorta.

Methods. Ten adult patients [M=5, F=5] aged 51.8 ± 22.84 years whom were scheduled for proceedures requiring complete CPB with rapid extracorporeal cooling were selected at random. Surgical proceedures anticipated were valve replacement [n=4], coronary artery bypass grafts [n=4] or both [n=2]. Premedication, induction, intubation and initial maintainance techniques were those usually used by the responsible anesthesiologist. All patients recieved d-tubo curare 15 mg. and thiamylal 2 mg/kg immediatly upon initiation of CPB. Routine monitoring includes E and R temperature probes, and a Swan-Ganz PA catheter for which informed consent was obtained.

Mon-A-therm 9F E/R temperature sensors were placed 10 cm into the rectum and 30 cm from the incisors respectively. A 93A-831H-7.5 F Edwards Laboratory thermodilution Swan-Ganz catheter was introduced percutaneously via the right internal jugular vein and advanced until a pulmonary capulary wedge pressure tracing was obtained. The catheter was then withdrawn slightly and the pressures reconfirmed. E and R temperatures were displayed on a Mon-A-Therm 6500 dual channel self calibrating module, PA temperature on an American Edwards 9520A Cardiac Output Computer.

Simultaneous E, R and PA temperatures were observed during the first 30 minutes post catheter placement to confirm comparative values that were consistant with previously published reports. Room temperature change was less than 0.2°C during the data collection period for all patients.

Recording of temperature values, at 60 second intervals, commenced with the initiation of CPB and cessation of mechanical ventilation. Data collection terminated with cross clamping of the aorta. Simple linear regression analysis was used to obtain slopes and correlations [r]. A p value > 0.05 was considered significant.

Results. Average duration of the study period and the changes in temperature for each measurement site are presented in table 1. The PA site shows the greatest absolute change [5.72 ± 2.12°C] and rate of change as compared with the E [5.02 ± 1.33] and R [1.12 ±0.81] values. Using the PA value as a reference standard to compare E and R rates of measured change, [see table 2] the comparison of E vs PA [r^2] was 0.841 while the R vs PA and R vs E values were 0.085 and 0.106 respectively. $p > 0.001$ in all series.

Discussion. This data confirms that the PA site is themost responsive and R the least responsive to change during rapidly induced extracorporeal hypotheria. As there is no one true core temperature, the responsiveness of each monitoring site is dependant on regional tissue perfusion and proximity to the source of heat gain/loss. With heat loss from ventilation eliminated, the E temperature probe provides a relatively responsive, accurate assessment of central venous temperature changes as compared with the PA values due to its proximity to the right side of the heart.

R temperature measurement exhibits a much greater lag in reflecting central temperature change and is not suitable for monitoring situations in which there are large changes of temperature over a short period of time.

References.

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TABLE 1

Duration and Degree of Cooling [°C]

DURATION	E	R	PA
9.7±4.35 min	5.02±1.33°C	1.12±0.81°C	5.72±2.12°C

TABLE 2

SLOPE	r	r^2	p
E=0.700 PA + 10.33	0.841	0.707	<0.001
R=0.083 PA + 32.33	0.292	0.085	<0.001
R=0.112 E + 31.32	0.326	0.106	<0.001