TITLE: INTRAOPERATIVE ANAPHYLAXIS TO LATEX: AN IDENTIFIABLE POPULATION AT RISK

AUTHORS: BM Braude, MB, FRCPC, M Gold , MD, FRCPC, JS Swartz, MD, FRCPC, J Dolovich, MD, FRCPC, B Shandling, MB, FRCSC

AFFILIATION: Departments of Anesthesia, Pediatrics (Division of Immunology) and Surgery, The Hospital for Sick Children, University of Toronto, Toronto, Ontario M5G 1X8 and Department of Pediatrics, McMaster University, Hamilton, Ontario, Canada

Latex has been identified as the causative agent in several reports of anaphylaxis during surgery.[1-3] We have defined a group of pediatric patients who, because of their exposure to latex products as part of their routine care, represent a special population at increased risk for life-threatening intraoperative allergic reactions.

All patients who developed perioperative allergic reactions during the period July 1987 to September 1989 were evaluated. Hospital records from July 1985 to July 1987 were reviewed, and one additional patient was identified. The nature and onset of all allergic reactions were documented. The medical and atopic histories including sensitivity to latex were reviewed. All patients underwent skin prick testing (SPT) and intradermal testing to anesthetic agents and antibiotics as indicated. SPT was performed to common inhalant allergens and latex antigen. Serologic tests included total IgE levels and radioallergosorbent testing (RAST) for latex sensitivity.

Fifteen patients (6 females and 9 males) aged 2 to 15 years experienced 19 allergic reactions. Each child had either spina bifida or congenital urologic abnormalities and was exposed to latex products such as catheters and gloves on an intermittent basis. Atopy was not a feature of this group, but 7 patients had localized eczema, urticaria or angioedema on contact with rubber gloves or toy balloons. Eleven of the 19 reactions were anaphylactic; 8 reactions manifested with bronchospasm or hypotension, with or without urticaria. Reactions occurred 40-290 minutes after induction.

Only SPT to latex antigen was positive in all patients. The IgE latex RAST showed significantly higher binding ($p<0.00001$) by the patients' sera (range 9-59%; mean 29.9% ± SD 14.5) than the control sera (range 3-11%; mean 5.8% ± SD 2.4).

The study identifies a specific group of pediatric patients at risk for latex anaphylaxis. We recommend increased awareness of latex sensitivity in this high risk population.

References

1. Slater JE. N Engl J Med 1989, 320:1126-30
2. Gerber AC et al. Anesthesiology 1989,71:800-2
3. Leynadier F et al. Anaesthesia 1989, 44:547-50

TITLE: CEREBRAL BLOOD FLOW AND METABOLISM ARE INDEPENDENT OF PUMP FLOW RATE DURING HYPOTHERMIC CARDIOPULMONARY BYPASS IN CHILDREN.

AUTHORS: FH Kern MD, WJ Greeley MD, RM Ungerleider MD, TJ Quill MD, B. Baldwin CRNA, LR Smith PhD, & JG Reves MD.

AFFILIATION: Depts. Anesthesiology, Surgery & Pediatrics, The Duke Heart Center, Duke Univ. Med. Center, Durham, N.C. 27710

Introduction: Traditional management of cardiopulmonary bypass (CPB) in children maintains pump flow rates (PFR) at 150 ml/kg/min in the newborn, 100ml/kg/min in infants and young children and 2.5 l//m^2/min in older children and adolescents. These recommendations are based on maintaining adequate systemic perfusion, as measured by acid-base balance during moderate hypothermic cardiopulmonary bypass(hCPB).[1] In adults it has been shown that cerebral blood flow(CBF) is independent of PFR.[2] In children, the effects of altering PFR on CBF and cerebral metabolic rate for oxygen ($CMRO_2$) are unknown. This study evaluated the effect of altering PFR on CBF and $CMRO_2$ in children during hCPB.

Methods: After IRB approval and informed parental consent 20 pediatric patients undergoing CPB for repair of congenital cardiac defects were studied. Ages ranged from 3days-13yrs. Anesthetic management consisted of midazolam 0.1-0.4mg/kg, sufentanil 5-20mcgs/kg and pancuronium. CBF was measured using $Xenon^{133}$ clearance methodology, as previously described.[3] In 14 patients, a retrograde internal jugular venous catheter was placed and advanced to the jugular bulb. A-V O_2 content differences were measured and A-V O_2 extraction and $CMRO_2$, were calculated. CBF, $CMRO_2$ and O_2 extraction were measured at two different pump flow rates during steady state hypothermia. PFR was altered by randomly increasing or reducing the revolutions per minute of the roller pump on the extracorporeal circuit. Flow rates were reduced to a minimum of 30% of calculated flow or until systemic acidosis ensued. Flow rates were increased to a maximum of 30% above calculated or as allowed by acceptable inflow line pressure or surgical conditions. Nasopharyngeal temperature(NPT), $PaCO_2$ and hematocrit (HCT) were kept constant during measurement periods. CBF and CMRO2 were compared to PFR using paired T-tests with significance assumed at a P value < 0.05.

Results: There was no significant difference with respect to NPT, CO_2, or HCT during CBF measurements.(table) The relationship between PRF and CBF is depicted in the figure. As can be seen, there was no association between changes in PFR & CBF. Similarly, $CMRO_2$ and O_2 extraction were also independent of PFR down to a flow of 30ml/kg/min during hCPB. Although metabolism was significantly higher during moderate hCPB, alterations in PFR did not significantly impact on cerebral metabolism. In the deep hypothermic subgroup there is a suggestion of flow dependant metabolism.

Conclusions: Our data demonstrate that: 1) in neonates, infants and children CBF is independent of PFR reduced to 30% of calculated flow. This is consistent with earlier reports in adult patients undergoing CPB.[2] 2) $CMRO_2$ and O_2 extraction are also independent of alterations in pump flow rates reduced to 30% of calculated. We speculate that hCPB significantly reduces cerebral metabolic rate so that cerebral perfusion is adequate even with 60% reduction in PFR. This study suggests that in terms of CBF and cerebral metabolism, brief periods of PFR reduction (as is commonly seen during CPB in children) may be well tolerated.

	All Patients		Moderate Hypothermic Pts		Deep Hypothermic Pts	
	LOW PFR	HIGH PFR	LOW PFR	HIGH PFR	LOW PFR	HIGH PFR
Temp(°C)	23±4.5	23±5.0	28±0	28±0	19.5±1.8	19.5±1.3
MAP(mmHg)	36±12	50±11*	36±9	49±9*	36±14	43±17
$PaCO_2$(mmHg)	35±5	36±6	38±3	35±3	34±5	37±6
PaO_2 (mmHg)	223±57	245±68	225±55	241±72	222±58	248±65
HCT(%)	21±3	21±4	21±3	22±2	21±3	21±4
PFR(ml/kg/min)	62±22	93±37*	67±28	105±27*	54±14	95±20*
CBF(ml/min/100gm)	17±8.8	20±10	20±5.8	28±10	14±10	17±6.8
$CMRO_2$(ml/min/100gm)	0.48±0.38	0.57±0.41	0.63±0.18	0.80±0.67	0.35±0.35	0.45±22
O_2 EXTRACTION(%)	27±16	30±13	28±14	26±10	24±12	30±12

*p<0.01, high vs low

References:
1. BJAnes 46:425, '74. 2. Ann Thorac Surg 38:592-600, 1984. 3 Circulation.1989;80(Suppl I):209- 215.