SCA11

DEPRESSION AFTER CORONARY ARTERY BYPASS GRAFT SURGERY AND GENETIC VARIABILITY IN TWO SEROTONIN RELATED POLYMORPHISMS

Phillips-Bute B; Mathew J; Morris R; Podgoreanu M; Stafford-Smith M; Grocott H; Schwinn D; Blumenthal J; Newman M
Duke University, Durham, NC, USA

Introduction: Despite advances and improved outcomes following coronary artery bypass graft (CABG) surgery, postoperative depression remains a particularly devastating concern. Post CABG depression has been associated with both increased morbidity and mortality and decreased quality of life.1 Although depression has multiple complex causes, much evidence exists to implicate serotonin (a monoamine neurotransmitter) in the pathophysiology of the disease. The aim of this study is to assess the association between genetic variability in two serotonin-related gene polymorphisms (MAOA-uVNTR and 5HTTLPR) and postoperative depression in CABG patients.

Methods: 427 CABG patients (158 females) were genotyped for the two single nucleotide polymorphisms (SNPs) and assessed for depression using the Center for Epidemiological Studies – Depression Scale (CES-D) at baseline and at six-months and one year postoperatively. Logistic regression was used to assess the association between depressed patients (defined as CES-D score >= 16) and genotype. The sexes were combined for 5HTTLPR analysis but since MAOA-uVNTR is sex-linked, males and females were analyzed separately. Age and race were investigated as possible confounders of genotype and depression; $p<0.05$ was considered significant.

Results: Although neither SNP is associated with baseline depression, the 3/4 genotype of MAOA-uVNTR is associated with new-onset depression (OR: 6.56, 95% CI: 2.22-22.45; p=0.001) in females at one year follow-up (Figure 1). There is no MAOA-uVNTR effect in males. 5HTTLPR is not associated with new-onset depression (p=0.15), but is associated with all depression (chronic + new onset) at one year (OR: 1.95, 95% CI: 1.20-3.15; p=0.007). Genetic findings were not affected by adjusting for age and race.

Conclusion: This study identifies two serotonin-related genetic polymorphisms potentially useful in identifying patients who are at risk for depression after CABG surgery. An improved ability to anticipate postoperative depression could prove valuable as a tool for reducing adverse outcomes associated with CABG surgery.

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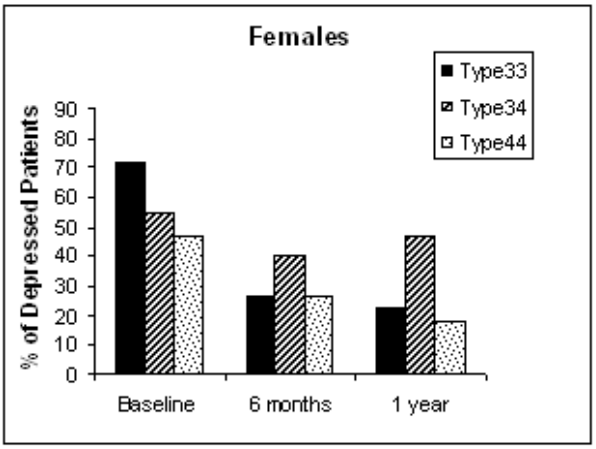

MAO-A genotypes and depression (CESD>=16)

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SCA12

EFFECTS OF CARDIOPULMONARY BYPASS AND ANEMIA ON RENAL GENE EXPRESSION

Darby P[1]; Briet F[2]; Harrington A[2]; Hare G[2]; Mazer D[2]
[1]St. Michael's Hospital, University of Toronto, Toronto, Ontario, Canada; [2]St. Michael's Hospital, Toronto, Ontario, Canada

Introduction: Renal failure (RF) is a serious complication of cardiopulmonary bypass (CPB). Post-CPB dialysis, required in 1-15% of patients, increases mortality more than 20-fold. Anemia, hypoxia, ischemia, and acute inflammation are potential mechanisms of RF. We investigated in rats the effect of CPB±anemia on renal cortex and medulla gene expression using microarray analysis.

Methods: With ACC approval, Sprague-Dawley rats were anesthetized with ketamine/xylazine, isoflurane, fentanyl, midazolam, and cisatracarium. Study animals underwent normothermic CPB for one hour with a neonatal membrane oxygenator. Sham animals had identical instrumentation but did not undergo CPB. 3 groups of animals were studied:sham, CPB, and Anemia-CPB. Target hemoglobin was 100g/L in sham and CPB, and 65g/L in the Anemia-CPB group. Animals were sacrificed the next day and total RNA from renal medulla and cortex was extracted. Gene expression was measured using Affymetrix GeneChip Rat 230.2. Data for each microarray was normalized to sham, log transformed, and filtered using GeneSpring. A 2-fold change in gene expression compared to sham was considered significant. GeneSifter was used for clustering and pathway analysis.

Results and Discussion: There were no significant differences between groups in physiologic variables, other than Hb. 18,000 genes were present, with 2-fold changes in 787 genes in cortex and 883 in medulla. Over 50% were involved in physiological processes: metabolism (195 vs 161 genes, cortex vs medulla), stress response (43,36), inflammation (11,10), and nitric oxide pathway (5,1). We focused on genes associated with hypoxia/ischemia, inflammation, and carbohydrate metabolism. Data in the table below are expressed as fold-change compared to sham (mean±SD). Endothelial nitric oxide synthase (eNOS) and extracellular superoxide dismutase (SOD3) were upregulated, suggesting increased hypoxia/ischemia-induced effects in medulla compared with cortex. However neutrophil gelatinase-associated lipocalin (NGAL), an early marker of ischemia-induced renal dysfunction was significantly down-regulated in all tissues. Upregulation of inflammation-related genes (tumor necrosis factor receptor-12 (TNFR-12) and ICAM-1) also occurred after CPB. Hexokinase 1, the first enzyme in glycolysis, was increased in renal medulla, while glucose 6-phosphatase, involved in glycogenolysis, was decreased, suggesting a metabolic response to reduced tissue oxygen delivery.

Conclusion: In this CPB model, there is altered expression of genes associated with hypoxia, ischemia, glucose metabolism and inflammation. 24 hours post-CPB, NGAL was downregulated. However, NGAL is upregulated at 2-6 hours, suggesting the importance of also investigating gene expression at earlier times. Further research to better define the time course of renal gene expression and protein products will enhance our understanding of the mechanism of renal dysfunction associated with CPB and anemia.

	RENAL CORTEX		RENAL MEDULLA	
	CPB	Anemia CPB	CPB	Anemia CPB
Hypoxia/Ischemia				
eNOS	0.79±0.01	0.84±0.05	1.84±0.23	1.23±0.21
SOD3	1.41±0.15	1.47±0.01	1.65±0.22	2.12±0.68
NGAL	0.26±0.06	0.45±0.41	0.50±0.45	0.79±0.69
Inflammation				
ICAM-1	2.59±0.10	1.34±0.11	1.31±0.09	1.08±0.28
TNF Receptor-12	4.11±2.36	1.42±0.02	3.35±1.67	2.14±0.62
Carbohydrate Metabolism				
Glucose 6-phosphatase	0.72±0.15	0.70±0.10	0.31±0.02	0.34±0.07
Hexokinase 1	0.61±0.08	0.47±0.03	1.84±0.10	2.08±0.41

SCA13

HIGH THORACIC EPIDURAL ANESTHESIA'S EFFECTS ON MYOCARDIAL BLOOD FLOW, OXYGEN CONSUMPTION, MYOCARDIAL WORK, AND MARKERS OF ISCHEMIA DURING CORONARY ARTERY BYPASS GRAFTING: A RANDOMIZED, CONTROLLED TRIAL

Hutcheson J[1]; Sonntag H[1]; Hill E[1]; Hanekop G[2]; Kazmair S[2]
[1]Medical University of South Carolina, Charleston, SC, USA;
[2]Georg-August University of Göttingen, Göttingen, LS, Germany

Introduction: While human studies with high thoracic epidural anesthesia (HTEA) in cardiac surgery have shown improved hemodynamics and catecholamine levels, there is no clear evidence for myocardial protection from ischemia.(1-2) We designed a randomized, controlled trial to test the hypothesis that high thoracic epidural anesthesia (HTEA) protects patients from myocardial ischemia by decreasing myocardial work, which correlates with reductions in myocardial blood flow (MBF), myocardial oxygen consumption (MVO2), and improved levels of ischemic markers.

Methods: Twenty Caucasian males with coronary artery disease scheduled for coronary artery bypass grafting (CABG) were randomized with IRB approval to receive either HTEA (T2-4) plus a standard general anesthetic for surgery (n = 10) or general anesthesia only (n = 10). All subjects received a pulmonary artery flotation catheter, a gas-tight coronary sinus catheter, and a left ventricular catheter with tip manometer. MBF was measured using an argon gas technique.(3) Hemodynamic and blood data were collected at five time points: 1) baseline; 2) after general anesthesia; 3) after HTEA dosed; 4) after sternotomy; and 5) after bypass. Epidurals were dosed with 8-10 cc of 0.5% bupivicaine.

We use generalized estimating equations (GEEs) to assess associations between trial arm and the outcomes MVO2, MBF, myocardial work (calculated as the product of HR, MAP and systemic vascular resistance), and markers of ischemia while controlling for other clinically significant variables. All models included time, treatment group, and their interaction, and subject's baseline outcome measure.

Results: Based on the GEE analyses, HTEA was associated with significant reductions in MBF, MVO2, and myocardial work. Specifically, significant percent reductions in MBF at corresponding time points for average subjects treated with an epidural were: time 3 = 24%, $p=0.0006$; time 4 = 41%, $p<0.0001$; and time 5 = 29%, $p<0.001$. Significant reductions in MVO2 were: time 3 = 34%, $p<0.001$; time 4 = 46%, $p<0.001$; and time 5 = 34%, $p<0.001$. Significant reductions in myocardial work were: time 3 = 25%, $p<0.001$; and time 4 = 31%, $p=0.0002$. We fit additional GEE models to investigate the association between markers for ischemia and treatment group over time. Treated subjects had significantly higher levels of hypoxanthine relative to controls immediately following HTEA dosing ($p=0.0003$).

Discussion: This is first study to quantify the effects of HTEA and directly measure MBF , MVO2, and markers of ischemia while controlling for physiologic determinants. Significant reductions in MBF, MVO2 and myocardial work during CABG suggest that epidurals play a role in reducing the myocardial workload, thereby decreasing the demand for blood and oxygen in patients with severe CAD. The highly significant difference in hypoxanthine levels when controlling for treatment further substantiate the myocardial protective effect of HTEA in cardiac surgery.

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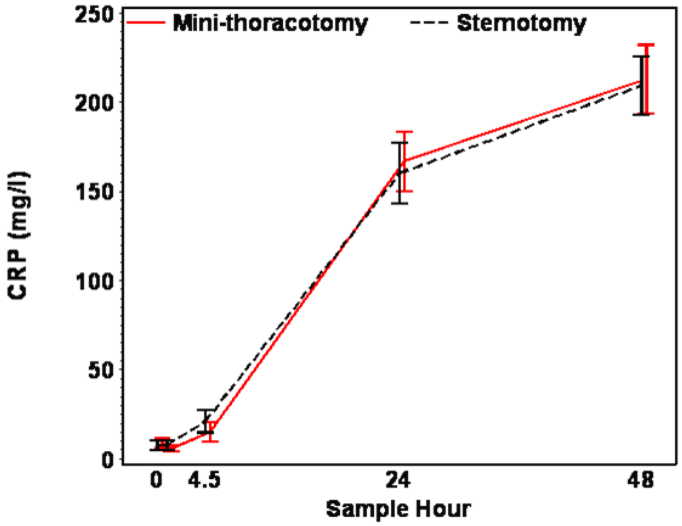
SCA14

THE INFLUENCE OF MINI-THORACOTOMY VS. MEDIAN STERNOTOMY ON THE INFLAMMATORY RESPONSE TO VALVE SURGERY

Szabo T; Mathew J; White W; Morris R; Newman M; Grocott H
Duke University Medical Center, Durham, NC, USA

Introduction: Cardiac surgery induces a pronounced systemic inflammatory response involving the release of cytokines. Both surgical trauma and cardiopulmonary bypass (CPB) can stimulate the release of these cytokines (1,2). In addition to having significant cardiovascular activity (by regulating nitric oxide homeostasis and mediating interactions between leukocytes and the endothelium), excessive release of cytokines has been associated with poor clinical outcomes including increased bleeding, prolonged respiratory support, greater capillary leak and decline in independent functioning (3). The purpose of this study was to compare the inflammatory response in patients undergoing valve surgery via either median sternotomy or a minimally invasive mini-thoracotomy approach.
Methods: After IRB approval, 49 patients undergoing valve surgery (9 aortic valve-, and 40 mitral valve repairs/ replacements) who had been enrolled in an unrelated prospective trial where serum cytokine levels were drawn were studied. The patients were divided according to surgical approach: median sternotomy (n=30) group and mini-thoracotomy (n=19) group. Blood samples for interleukin-6 (IL-6), IL-8 and CRP were drawn at baseline (prior to induction of anesthesia), at the end of CPB, then 4 and 24 hours after the end of CPB. Continuous variables were compared between the two treatment groups using Wilcoxon Rank Sum tests. Categorical characteristics were compared using an exact Pearson Chi-Square test. All analyses were performed using SAS statistical software version 9.1. A p-value of less than 0.05 was considered to be statistically significant.
Results: There were no significant differences in demographics or intraoperative characteristics between the two groups. In addition, there were no differences in IL-6, IL-8 and CRP levels between the two groups either (Table 1, Figure 1).
Conclusions: Our results indicate that the inflammatory response induced by minimally invasive mini-thoracotomy approach is of similar magnitude to the one that is elucidated by median sternotomy. This suggests that CPB itself has a larger influence on the inflammatory response than the trauma of the surgical approach.



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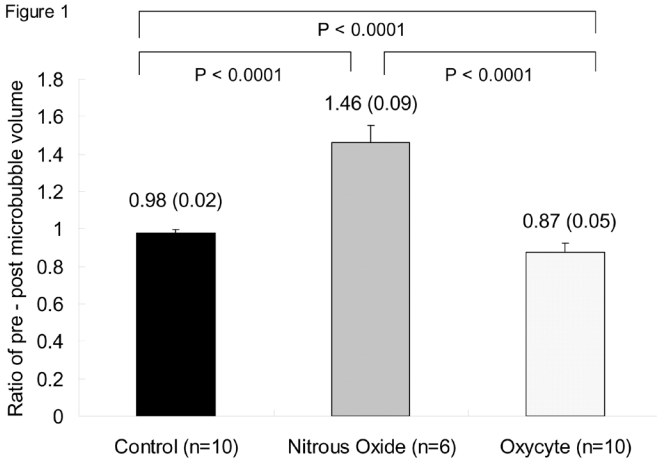
SCA15
REDUCTION IN MICROBUBBLE SIZE USING PERFLUOROCARBONS DURING CARDIOPULMONARY BYPASS IN THE RAT

Yoshitani K; Ma Q; de Lange F; Grocott H; Mackensen G
Duke University Medical Center, Durham, NC, USA

Introduction: Perfluorocarbon (PFC) emulsions are gas-dissolving agents that have been investigated as artificial oxygen carriers (1). Based on the high solubility of gases in PFC, they have also been tested in regard to their ability to treat the sequelae of cerebral gas embolism (2). Cerebral gas emboli are well documented during cardiopulmonary bypass (CPB) and are thought to contribute to adverse cerebral outcomes after cardiac surgery (3). This study was designed to test, whether PFC emulsions would reduce the volume of microbubbles within the CPB circuit.
Methods: Sprague-Dawley rats (400-450g) undergoing 60 min of normothermic non-pulsatile CPB were randomized to one of three groups. The PFC group (n=10) received a gas mixture of 60% O[SPCHAR(sub2)] , 36% N[SPCHAR(sub2)] and 4% CO[SPCHAR(sub2)] via the membrane oxygenator and 2.7g/kg (4.5 ml/kg) of PFC (Oxycyte, Synthetic Blood International, San Diego, CA) into the venous reservoir. The control group (n=10) received the same gas mixture but 4.5 ml/kg of 0.9% saline. Animals in the nitrous oxide group (serving as a positive control; n=6) were exposed to 60% O[SPCHAR(sub2)], 36% N[SPCHAR(sub2)]O and 4% CO[SPCHAR(sub2)] and 4.5 ml/kg of 0.9% saline during 60 minutes of normothermic CPB. At 10 min and 35 min of CPB, a gaseous microbubble (400µL of room air) was injected into a bubble chamber positioned on the venous side of the bypass circuit as previously described (4). After 20 minutes of equilibration time the microbubble was removed for volumetric analysis. Changes in microbubble size were compared using one way ANOVA and Bonferroni t-test as a post hoc comparison. Statistical significance was considered when $P < 0.05$.
Results: Changes in microbubble size during bypass were – 2 ± 2% in the control group, - 13 ± 5 % in the PFC group ($P < 0.0001$, PFC vs control), + 46 ± 9 % in the nitrous oxide group ($P < 0.0001$, nitrous oxide vs control; Figure 1).
Discussion: Consistent with its physicochemical properties, PFC caused a small but significant decrease in the volume of microbubbles present within the CPB circuit. Whether this effect is of sufficient magnitude to alter the clinical consequences of microbubble embolization remains to be determined.

Figure 1



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SCA16

DESFLURANE CAUSES MORE ARRYTHMIAS IN OPCAB THAN SEVOFLURANE

Noël M; Choucri E; Noiseux N; Olivier J; Le N; Hemmerling T
University of Montreal, Montreal, PQ, Canada

Purpose: This prospective, randomized and double-blind study compares the arrythmogenic effects of sevoflurane and desflurane in off-pump coronary artery bypass graft (OPCAB).
Methods: Forty patients undergoing coronary artery bypass graft (CABG) are included Anesthesia was induced by fentanyl 2-3 µg/kg, propofol 1-2 mg/kg, and maintained using either 1 MAC sevoflurane (N=20) or 1 MAC desflurane (N=20). Analgesia regimens consisted of high thoracic epidural analgesia (TEA) installed preoperatively and removed after 72 h. Patient were meant to be immediately extubated in the OR, followed by continuous ECG monitoring for 48 h. Arrythmic events were noted, as well as ischemic markers, cardiac function and hemodynamic stability during surgery. Patient data and arrythmogenic data were recorded and compared using Wilcoxon test or Fisher exact test, $P<0.05$.
Results: All patients were immediately extubated ; there was no difference in patient data between the two groups. (Table 1). There were significantly more patients with supraventricular tachycardias, atrial fibrillation and patients with immediate agitation after desflurane than sevoflurane (Table 2).

Conclusion: Sevoflurane and desflurane can both be used to ultra-fast track patients after OPCAB (immediate OR extubation). However, desflurane causes significantly more arrythmias than sevoflurane.

Table 1 : Demographic datas for surgeries

	Group 1 (n=20) 1 MAC sevoflurane	Group 2 (n=20) 1 MAC desflurane
Age (years)	61 (53-71 ; 41-78)	68 (58-76 ; 49-80)
Sex (m/f) [1]	12/8	17/3
Weight (kg)	73 (61-87 ; 46-111)	79 (70-88 ; 66-98)
Chirurgical time (min)	150 (137-172 ; 126-212)	160 (145-197 ; 130-265)
Numbers of aorto-coronary bypass	3 (2-4 ; 1-4)	3 (3-4 ; 2-6)
Ischemic time (min)	19,6 (17,3-19,9 ; 15,5-37,0)	21,3 (16,9-26,4 ; 10,6-42,7)
Extubation time (minutes)	11,5 (1,0-31,0 ; 8,0-18,3)	11,0 (6,5-19,0; 2,0-25,0)
Postoperatoire agitation [2]	1	6
Duration of hospitalization (days)	6 (5-7 ; 4-10)	6 (5-6,5 ; 4-16)
Ejection fraction (%)	60 (51-69 ;30-80)	56 (50-68 ; 35-77)

NB : Values are presented as median (25th percentile , 75th percentile , minimum and maximum)
[1] vs = 0.002 ; [2] vs = 0.015.

Table 2

	Group 1 (n=20) 1 MAC sevoflurane	Group 2 (n=20) 1 MAC desflurane
Atrial fibrillation [1]	1	5
Atrial flutter	0	0
Paroxysmal supraventricular tachycardia [2]	0	5
Ventricular tachycardia	0	0
Ventricular fibrillation	0	0
Bradycardia	4	3

SCA17

PLAQUE SCORE OF CAROTID ARTERIES AS A PREDICTOR OF SILENT CEREBRAL INFARCTION IN ELDERLY CORONARY SURGICAL PATIENTS

Baba T; Goto T; Maekawa K; Yoshitake A
Kumamoto Chuo Hospital, Kumamoto, Japan

Introduction: Silent cerebral infarctions (SCI) are common in elderly patients and are a risk factor for neurologic dysfunction as long with cerebrovascular disease (CVD), peripheral vascular disease (PVD) or abdominal aortic aneurysm (AAA). Carotid lesions are an indicator of systemic atherosclerosis. We examined the plaque score (PS) of carotid arteries as a predictor of SCI in patients undergoing coronary artery bypass grafting (CABG).

Methods: Data were collected prospectively on 633 CABG patients ([SPCHAR(ge)] 60 y) who underwent preoperative carotid ultrasonography, cerebral MRI and craniocervical MRA. PS was computed by summing the plaque thickness ([SPCHAR(ge)] 1.1 mm) at four locations in both carotid arteries and then classified into four groups: none, 0; mild, 1.1-5.0, moderate, 5.1-10.0: and severe, [SPCHAR(ge)] 10.1. SCI was defined that patients with infarctions on MRI had no previous CVD. Neuropsychological (NP) dysfunction was defined as a decrease in performance from baseline of at least 4 as measured on the Hasegawa dementia scale (HDS; score 0-30), a modification of MMSE, administered before surgery and postoperative day 7. The patients were divided into three groups: control (n=306); SCI (n=129); and high risk (CVD, PVD, AAA: n=198). We compared PS, risk factors, and the incidence of neurologic dysfunction among these 3 groups. In addition, the probability of SCI was calculated for each combination of risk factors.

Results: PS of the 3 groups were as follows: high risk, 9.0 ± 5.3; SCI, 7.1± 4.8; control, 5.4 ± 4.5 ($p<0.01$). Among the 3 groups, the SCI group had intermediate craniocervical and aortic atherosclerosis. The incidences of perioperative stroke were: high risk, 6.1%; SCI, 3.1%; control, 1.3%, and NP dysfunction was 12%, 9% and 4% ($p<0.05$). The percentage of patients with SCI increased as PS increased (7%, 27%, 35%, 39%). Univariate analysis revealed that 4 factors were correlated with SCI: PS [SPCHAR(ge)] 5.1, age [SPCHAR(ge)] 70 y, creatinine [SPCHAR(ge)] 1.9mg/dl and preoperative cognitive decline (HDS < 24). The probability of SCI in patients with no risk factors other than PS [SPCHAR(ge)] 5.1 was 0.28 and increased progressively to 0.83 with in presence of all 4 risk factors.

Conclusion: Patients with SCI were associated with systemic atherosclerosis and an increased risk of postoperative neurologic dysfunction. PS of the SCI group was high and would be useful to predict SCI when PS is combined with age, creatinine and cognitive decline.

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SCA18

ATRIAL NATRIURETIC PEPTIDE REDUCES MYOCARDIAL STUNNING IN RABBITS

Tse J; Moalem J; Davidov T; Scholz P; Weiss H
UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ, USA

Introduction: Natriuretic peptides have proven useful for the treatment of heart failure and may have some utility after myocardial ischemia(1,2). We tested the hypothesis that atrial natriuretic peptide (ANP) would decrease both the effects of myocardial stunning and oxygen consumption in rabbit hearts.
Methods: The study was approved by IACUC. An open-chest preparation was performed on 3 groups of anesthetized New Zealand white rabbits (2-3 kg) (9 Stunned-control, 8 Stunned-ANP-treated and 8 Non-stunned-ANP-treated). Myocardial stunning was induced by two consecutive 15 minute periods of the left anterior descending coronary artery (LAD) occlusion followed by 15 minutes of reperfusion. After the second reperfusion period, either ANP (0.2 mg) or lactated Ringers (0.2 ml) was injected into the left ventricular free wall, in the LAD distribution field, in three equal divided doses. Hemodynamic parameters measured included heart rate, aortic and left ventricular pressures, functional wall thickening (WT), delay of onset of WT, and rate of WT. Coronary blood flow (microspheres) and O2 extraction (microspectrophotometry) were used to determine myocardial O2 consumption. ANOVA was used for statistical analysis. A value of $p<0.05$ was accepted as significant. Data were presented as Mean±S.E.M.
Results: There were no significant differences in hemodynamic parameters between groups prior to treatment. Stunning lowered heart rate slightly in the stunned-control group (227± 7 beats/min to 201±6). Stunning and ANP lowered systolic (95±3 mm Hg to 82±3) and mean arterial pressures (73±2 to 66±2) slightly in the stunned-ANP treated rabbits. Arterial blood gases and pH were controlled and not different between groups before or after stunning. Figure 1 shows the effect of stunning and ANP on the time delay to the onset of contraction in the stunned segment. This parameter is derived from the time difference between the beginning of the rise of intraventricular pressure and the beginning of the increase in wall thickening of the studied left ventricular wall segment. In the stunned-control group, baseline delay to contraction was 25±7 msec, and this increased to 84±16 following stunning and vehicle administration. In the stunned-ANP group, baseline delay was 20±6 and increased slightly to 30±7 after stunning and ANP administration. Wall thickening decreased by approximately 30% with stunning and vehicle but only 8% in the stunned-ANP treated hearts. Stunning did not affect regional O2 consumption (6.0±1.1 stunned vs. 7.4±1.2 mlO2/min/100g non-stunned). ANP administration did not affect O2 consumption (7.3±1.7 stunned vs. 6.4±1.0 non-stunned).
Conclusion: The data showed that ANP greatly reduced the detrimental functional effects of myocardial stunning. However, ANP had no significant effects on regional oxygen consumption in stunned myocardium.
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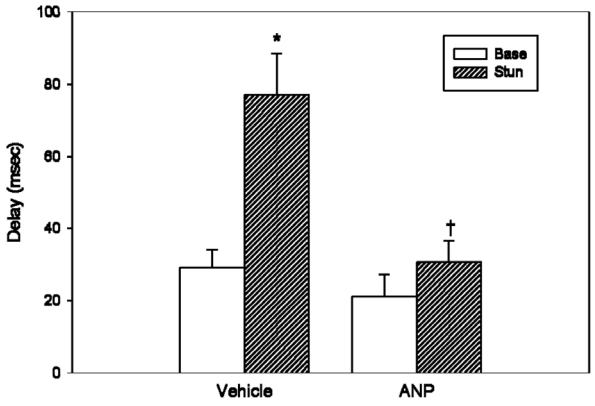

Figure 1: Effects of vehicle or ANP on the time delay (msec) to the onset of regional wall thickening after myocardial stunning (Stun).
* Significantly different from Base, $p<0.05$. † Significantly different from vehicle, $p<0.05$.

SCA19

THE EFFECT OF 6% HYDROXYETHYL STARCH 130/0.4 ON COAGULATION AND VOLUME EXPANSION IN OFF-PUMP CORONARY BYPASS GRAFT SURGERY: COMPARISON WITH 6% HYDROXYETHYL STARCH 200/0.5

Kwak Y; Na S; Shim Y; Shim J; Hong Y
Yonsei University College of Medicine, Seoul, Korea

Introduction: Hydroxyethyl starches (HES) are widely used as plasma substitutes in surgical patients, but they may cause coagulopathy when administered in large doses. Newly developed low molecular, low substituted HES such as 6% HES 130/0.4 and 6% HES 200/0.5 solutions were reported to have less effect on coagulation. This study was performed to compare immediate plasma substitution effect of 6% HES 130/0.4 with that of HES 200/0.5 solution and to investigate the impacts of both solutions on coagulation and their overall safety in off-pump coronary bypass graft (OPCAB) surgery.
Methods: With IRB approval, forty-eight patients undergoing OPCAB surgery were randomly divided into two groups, receiving 6% HES 130/0.4 (n = 24) or 6% HES 200/0.5 (n = 24) during perioperative period. To evaluate immediate plasma substitution effect of the both solutions, a 10 mg/kg of either 6% HES 130/0.4 or HES 200/0.5 was loaded after anesthesia. Up to 33 mg/kg of both the HES solutions were infused for volume replacement guided with cardiac index and pulmonary wedge pressure during the surgery and until 16 hrs thereafter. Volume requirements in excess of the maximum dose of HES solution were treated with crystalloid. Coagulation profiles, hemodynamic, hematological and biochemical variables were recorded serially after anesthesia, volume loading, and sternal closure, and 16 hrs after the operation Total amount of blood loss, infused colloid and blood products were measured.
Results: After volume loading, heart rate and cardiac index decreased in HES 200/0.5 group but not in HES 130/0.4 group, and greater oxygen delivery were noted in the HES 130/0.4 group compared to the HES 200/0.5 group (Table 1). The total amount of infused HES preparations, blood loss, and allogenic blood products were similar in both groups. Coagulation profiles and hemodynamic variables were not different between two groups throughout the study period. Biochemical variables were within normal limits in both groups.
Conclusion: As an immediate plasma substitute, HES 130/0.4 demonstrated better maintenance of cardiac index and oxygen delivery compared to HES 200/0.5. However, both HES 130/0.4 and 200/0.5 were equally efficient in point of maintaining plasma volume during and after surgery and have no significant effect on coagulation in patients undergoing OPCAB surgery.

Table 1. Changes in Hemodynamic Variables after HES Loading

	Group	Before loading	After loading
Heart rate (beats/min)	HES 200/0.5	63.1 ±8.4	56.2 ±3.4*
	HES 130/0.4	63.9 ±7.0	60.7 ±5.2†
MBP (mmHg)	HES 200/0.5	71.7 ±10.5	78.1 ±13.4
	HES 130/0.4	75.7 ±7.9	75.0 ±7.9
PCWP (mmHg)	HES 200/0.5	8.2 ±1.4	13.3 ±2.7*
	HES 130/0.4	7.3 ±0.6	14.2 ±2.6*
Cardiac index (L/min/m^2)	HES 200/0.5	2.7 ±0.5	2.6 ±0.3
	HES 130/0.4	2.9 ±0.5	3.1 ±0.4†
LVEDD (mm)	HES 200/0.5	32.4 ± 7.6	36.3 ± 5.4*
	HES 130/0.4	32.2 ± 6.7	36.6 ± 4.9*
O_2 delivery (ml O_2/min)	HES 200/0.5	831 ± 173	628 ± 133*
	HES 130/0.4	838 ± 209	784 ± 167†
PaO_2/FiO_2 ratio	HES 200/0.5	400 ± 82	401 ± 97
	HES 130/0.4	339 ± 89	401 ± 84
Hematocrit (%)	HES 200/0.5	38.2 ± 4.5	31.0 ± 4.4
	HES 130/0.4	37.3 ± 4.5	30.6 ± 5.4

Values are expressed as mean ±standard deviation.
* P < 0.05 versus before loading, †p < 0.05 HES 130/0.4 versus HES 200/0.5. MBP: mean blood pressure, PCWP: pulmonary capillary wedge pressure, LVEDD: left ventricular end diastolic diameter. Before loading: baseline value before loading 10 ml/kg of a HES solution after induction of anesthesia, after loading: 5 min after loading 10 ml/kg of HES.

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SCA20

DIFFUSION WEIGHTED MAGNETIC RESONANCE IMAGING AND NEUROLOGIC INJURY AFTER CARDIOVASCULAR SURGERY

Goto T; Maekawa K; Baba T; Yoshitake A
Kumamoto Chuo Hospital, Kumamoto, Japan

Introduction: Diffusion-weighted MRI (DW-MRI) detects ischemic lesions quantitatively within early several hours of onset and may provide clues on the association of ischemic lesions in the brain with emboli after cardiovascular surgery. We investigated whether preoperative DW-MRI abnormalities exist in systemic atherosclerosis and the risk factors for neurological dysfunction after cardiovascular surgery.
Methods: After institutional approval, we studied 74 patients undergoing elective cardiovascular surgery. All patients received preoperative DW-MRI, magnetic imaging and angiography (MRI, MRA) to detect cerebral ischemic changes, cerebral artery stenosis, carotid artery stenosis and intraoperative epiaortic ultrasonography to assess atherosclerosis in the ascending aorta. Four neurocognitive examinations were conducted preoperatively and 7 days after surgery. Postoperative neuropsychological (NP) dysfunction was defined as a 20% or greater decline from baseline on two or more tests. Patients with new postoperative neurological symptoms and positive findings on postoperative MRI or CT of the brain were examined by a staff neurologist to confirm perioperative stroke. The patients were divided into two groups according to the preoperative DW-MRI abnormalities: control (no DW-MRI abnormalities) and DW-MRI group (DW-MRI abnormal). We compared the incidence of stroke and systemic atherosclerosis between two groups using Chi squared and unpaired t-tests, with differences at $p<0.05$ considered statistically significant.
Results: Preoperative DW-MRI abnormalities were present in 6 patients of 74 patients (8.1%). Two of these patients (33%) had multiple lesions (>2). Most of these lesions were small and located in subcortical regions without overt clinical signs. We delayed elective surgery about 2 or 4 weeks and ruled out new infarctions in 2 patients: the latter had transient deficits after coronary angiography. Compared to controls, patients in the DW-MRI group were significantly more likely to have a history of cerebrovascular disease (50% vs. 13%), preoperative cerebral infarction (50% vs.22%) and cognitive decline (50% vs. 10%). The DW-MRI group tended to have severe carotid stenosis (33% vs. 7%) and severe aortic atherosclerosis (17% vs. 6%). There were no differences in NP dysfunction between the two groups (17% vs. 16%). Perioperative stroke occurred in both of DW-MRI and control groups (16.7% vs. 1.5%, p=0.147). The patient with a preoperative DWI abnormality developed intraoperative infarction due to expansion of preoperative new lesion in the left posterior limb of the internal capsule after off-pump CABG. The remaining patient with thrombocytosis in control group suffered a lacunar infarction 15 days after on-pump CABG and mitral valve replacement.
Conclusions: Patients with preoperative DW-MRI abnormalities are more likely to exhibit the comorbid conditions that best predict perioperative stroke after cardiovascular surgery, including history of cerebrovascular disease, preoperative cerebral infarctions and cognitive decline. Preoperative DW-MRI may useful to detect underlying embolic load of the brain in high-risk patients undergoing cardiovascular surgery.

SCA21

RETROGRADE RENAL PERFUSION WITH PERFLUOROCARBON EMULSION PROVIDING SYSTEMIC OXYGENATION IN A RABBIT MODEL

Ereth M, Humphreys M, Sebo T, Oliver Jr W, Nuttall G, Gettman M
Mayo Clinic College of Medicine, Rochester, MN, USA

Objective: Renal ischemia has been a focus of research for many years. The accepted practice of nephron sparing surgery has increased the importance of limiting ischemic insult to the kidney during vascular occlusion. The purpose of this project was to investigate a novel method of perfusing the kidney with an oxygenated perfluorocarbon emulsion (PFC) via retrograde access to the urinary collecting system.
Methods: This pilot study involved 38 New Zealand White rabbits and the oxygenation of a PFC, Oxygent™, as an alternative oxygen carrier. Each animal underwent abdominal exploration, left nephrectomy and right retrograde renal perfusion. Each animal's retrograde renal perfusion was randomized to be PFC, chilled PFC, normal saline, chilled saline or no perfusion. The kidney was exposed to an ischemic time of 40 minutes and the pelvic pressures were monitored throughout the perfusion. Each animal was survived for two weeks then sacrificed.
Results: The experiment demonstrated that the retrograde perfusion cohorts resulted in statistical improvements in histologic tubular damage, preservation of renal function and creatinine clearance, as well as increased systemic venous oxygenation compared to the sham cohort. No adverse effects were associated with the use of the PFC during the 2 week follow up period.
Conclusions: These preliminary results show the safety, feasibility, and potential benefit of retrograde renal perfusion with an alternative oxygenation carrier during times of renal ischemia. However, more study is required before widespread application of this novel technology.