

Title: EFFECTS OF ISOFLURANE ON HAEMODYNAMIC CHANGES FOLLOWING INFRARENAL AORTIC CROSS CLAMPING

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Introduction: Haemodynamic changes resulting from aortic cross clamping (AXC) are harmful in patients with impaired coronary perfusion (1). Isoflurane (I.), a major vasodilator agent with minimal depression of myocardial contractility, has been proposed to control intraoperative hypertension (2, 3). The aim of this work was to assess haemodynamic effects of I. administration during abdominal aortic reconstructive surgery.

Patients and Methods: After institutional approval and informed consent, 11 male patients (mean age: 67.5±9.8) who electively underwent infrarenal abdominal aortic surgery were studied. Exercise ECG or dipyridamole thallium myocardial perfusion scan were used preoperatively to diagnose ischemic heart disease. Anaesthesia was induced with fentanyl (5mcg/kg), pancuronium (0.1 mg/kg) and flunitrazepam (15 mcg/kg). Ventilation was controlled using a semi closed circle system with partial rebreathing. Anaesthesia was maintained with N₂O 70% in O₂, fentanyl (0.05 mcg/kg) and pancuronium as needed. We monitored heart rate (HR), ST changes (lead V₅), systemic systolic, mean (MBP) and diastolic blood pressures using a radial catheter, cardiac output (CO) by thermodilution technique, intracardiac filling pressures (PCWP, CVP), I. end-expiratory concentration and PECO₂ (Datex® Capnomac). Cardiac index (CI), systemic vascular resistance (SVR), rate-pressure product (RPP) and Buffington index (BI) were computed according standard formulae. Before AXC, I. was administered, and the inspiration concentration was titrated to reduce MBP by 20%. During AXC, it was adjusted to maintain MBP at the level observed before hypotension has been induced. Volume

replacement was guided on PCWP. I. administration was discontinued 2 min before aortic cross clamp release (AXCR). Data were collected after I. administration and before AXC (T0), 10 min after AXC (T1), before AXCR and after I. was discontinued (T2) and 3 min after AXCR (T3). Statistical analysis was by ANOVA followed by t-test for paired data. Significance was p<0.05.

Results: Pre-operative ischemic heart disease was detected in 5 patients. The control of hypertension was achieved in all patients. Haemodynamic data are shown on Table I. No hypertensive rebound occurred.

Table I: Haemodynamic parameters. (mean±SEM, *p<0.05 vs T0)

	T0	T1	T2	T3
HR (beats/min)	75.0±4.8	72.0±4.3	68.5±4.6 *	67.7±4.4 *
MBP (mmHg)	97±18	92±18	89±13 *	88±12 *
PCWP (mmHg)	11±8	12±10	12±6	13±5
CI (l/min/m ²)	3.3±0.8	3.4±0.9	3.7±0.8	4.0±0.8
SVR (U)	30.2±9.8	27.0±9.4	23.0±6.3 *	21.0±5.8 *
RPP	10350	9432	8500 *	8976
BI	1.29	1.27	1.28	1.31

One patient had a significant ST depression during AXC. None developed myocardial infarction and/or post-operative renal failure.

Discussion: This study showed that, during AXC, I. allows a rapid flexible control of sudden changes in blood pressure without affecting CI. Beneficial effects in preventing myocardial ischemia were an increase in anesthetic depth, no tachycardia, a decrease in left ventricular afterload and no elevation of PCWP. Evidence of perioperative myocardial O₂ imbalance (RPP, BI) was not detected. We conclude that I. is a simple and safe alternative to control haemodynamic changes during AXC.

References:

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Title: GROSS NEUROLOGIC OUTCOME IN CABG PATIENTS MANAGED WITH SINGLE OR MULTIPLE AORTIC CROSS-CLAMP: A PRELIMINARY RETROSPECTIVE ANALYSIS

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Coronary artery bypass grafting (CABG) is a commonly performed surgical procedure associated with a variable incidence of cerebral morbidity.^{1,2} Therefore, it is important to define those aspects of perioperative care that contribute to cerebral morbidity so that preventive or therapeutic measures can be taken to minimize adverse outcome. One aspect of perioperative CABG care that has not been examined in terms of effect on post-operative cerebral function is the surgical practice of cross-clamping the aorta. Generally, myocardial protection during CABG can be accomplished in one of two ways with regards to aortic cross-clamping; the aorta may be cross-clamped only once (SING X) and cardioplegia used to protect the heart, or, the aorta may be intermittently (MULT X) cross-clamped, thereby allowing the myocardium to be intermittently perfused. These two methods have never been compared with respect to neurologic outcome. Because both methods were commonly employed in our institutions, we have undertaken a retrospective analysis of neurologic outcome and cardiopulmonary bypass (CPB) variables in order to identify possible markers for neurologic morbidity when these two methods are used.

The records of 370 patients who underwent CABG surgery at either the University of California Medical Center (UCMC) or the La Jolla Veterans Hospital (LJVA) between July 1, 1985 and June 30, 1988 were examined. All patients received identical anesthetic care (e.g. high dose narcotic anesthesia, pulmonary artery catheterization), perfusion care (e.g. arterial filters, moderate hypothermia) and postoperative ICU care. Individual surgeons tended to use only one technique (e.g. MULT X) and operate at only one hospital. Neurologic outcome was ascertained from the discharge summary and included focal motor or sensory deficits and psychiatric disturbances such as alterations of mental status. The data were compared using the type of aortic cross-clamping (i.e. SING X or MULT X) as the independent variable. The patients exhibiting post-operative neurologic dysfunction were compared to the group as a whole for age, CPB time, and total X-clamp time. Data were grouped according to number of vessels grafted and analyzed for the incidence of neurodeficits in patients having 3 or 4 vessels grafted or in patients having 5 or more vessels grafted. Data were analyzed with either student's t-tests or chi-square depending on the nature of the data.

Patient characteristics for each group of patients are listed in Table 1. CPB times and total cross-clamp times were significantly longer in the SING X group compared to the MULT X group. The patients with post-operative neurologic deficits were older and had more vessels grafted. These patients also had longer CPB times and X-clamp times compared to those patients without neurologic deficits, but this was only apparent within the SING X group (Table 2). When analyzed according to number of vessels grafted, there was a greater number of neurologic deficits in the MULT X group

compared to the SING X group in patients having 5 or more vessels grafted. (Table 3).

Our data indicate that MULT X may be associated with reduced total CPB time as well as reduced cross clamp time compared to SING X. However, the patients in which the cross clamp was applied most frequently, i.e. MULT X, 5 or more vessels, had more neurologic deficits compared to the SING X patients also having 5 or more vessels grafted. This was despite CPB times being less in the MULT X, 5 or more vessel subgroup compared to the SING X, 5 vessel subgroup. Thus, it is possible that MULT X may be an independent risk factor for post CABG neurologic dysfunction, particularly if large numbers of vessels are grafted. Although data suggest that CABG patients in general may not benefit from barbiturate brain protection,³ identification of subgroups of CABG patients at increased risk for neurologic sequelae may be important in that indications for pharmacologic brain protection during CPB could potentially be extended to these patients.⁴

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Table 1. Patient Data. SING X vs. MULT X

	SING X	MULT X
Number of Pts.	167	203
Age (Years)	62±9.3	63±10
CPB Time (min)	127±46	103±42*
X Clamp Time (min)	70±30	42±19*
Neurodeficits (%)	6.39	6.9

* Denotes significant difference between groups. p < 0.05.

SING X Denotes Single Aortic Cross Clamp Group, MULT X Denotes Multiple Cross Clamp Group, CPB= Cardiopulmonary Bypass. All Data expressed as Mean±S.D.

Table 2. Neurodeficit Patient Data Compared to Non-Neurodeficit Patient Data

	Neurodeficit Patients		Non-Deficit Patients	
	SING X	MULT X	SING X	MULT X
Number of Pts.	9	14	157	188
Age	68±9*	68±11*	62±10	63±10
CPB Time	149±32*	125±46	112±41	102±41
Cross Clamp Time	89±40*	48±25	68±29	41±18
Number of Vessels	4.87±2.6	4.64±2.93	4.10±1.25	4.02±1.17

* Denotes significant difference between groups for each type of Cross Clamping (e.g. SING X Neurodeficit vs. SING X Non-Deficit) p < 0.05. CPB= Cardiopulmonary Bypass. All data expressed as Mean±S.D. SING X= Single Aortic Cross Clamp Group, MULT X= Multiple Aortic Cross Clamp Group.

Table 3. Neuro Deficit and CPB Time of Patients Having 3 or 4 Vessels and 5 or More Vessels Grafted

	3 and 4 Vessels		5 or More Vessels	
	SING X	MULT X	SING X	MULT X
Number of Patients	76	112	50	75
Neurodeficits	3	7	7	12
CPB Time (min)	120±55	98±45	117±55	112±37

* Denotes significant difference within vessel group, e.g. SING X MULT X within 5 or More Vessel Group. p < 0.05. CPB= Cardiopulmonary Bypass. All data expressed as Mean±S.D. SING X= Single Aortic Cross Clamp Group, MULT X= Multiple Aortic Cross Clamp Group.