Title: ARE POST CORONARY ARTERY BYPASS PATIENTS STILL AT RISK?

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Introduction. There are over 100,000 coronary bypass procedures performed annually in the USA, and many of these patients require unrelated surgery later on. However, the adequacy of the renewed coronary blood flow has never been documented. The purpose of this study was to examine the global and regional myocardial blood flow and metabolism under basal and stressed conditions both before and soon after coronary bypass surgery in order to evaluate the risk of cardiac complications in revascularized patients during subsequent anesthesia and surgery.

Methods: Twenty patients scheduled for elective coronary artery bypass surgery were studied with their informed consent and the approval of the Institutional Review Board. The patients were receiving beta blockers and had ejection fractions of over 0.5. All had occlusive involvement of the left anterior descending coronary artery and at least two other vessels. A Baim coronary sinus thermodilution atrial pacing catheter was used to measure global blood flow in the coronary sinus (CSBF) and regional blood flow in the great cardiac vein (GCVBF). Blood samples were collected simultaneously from the coronary sinus, great cardiac vein and radial artery for the determination of oxygen and lactate contents. Myocardial oxygen consumption (MVO_2) and lactate extraction (LE) were calculated using standard formulae. Heart rate, arterial and pulmonary artery pressures, cardiac output, and the electrocardiograph were recorded. Initial measurements were made prior to anesthesia. Values were obtained both with and without atrial pacing, up to a maximally tolerated rate or 140 beats/min. One day after coronary bypass surgery the basal and paced measurements were repeated. Statistical comparisons of the data obtained before and after surgery were done by analysis of variance; P < 0.05 was considered significant.

Results: The hemodynamic and metabolic parameters are listed in the table. Prior to surgery, the maximum achieved pacing rate was 125 ± 3 beats/min and in every patient this was associated with an S-T segment depression of 1 mV or more. With induced myocardial ischemia, even though both global and regional coronary blood flow increased, CI did not. There was an increase in PAWP and diminished lactate extraction. Moreover,

ten patients demonstrated global and seven regional lactate production.

One patient suffered a myocardial infarction during surgery. He demonstrated lactate production and ECG changes the next day even under basal conditions. In all others global and regional myocardial blood flow increased following surgery and was further increased during pacing. Furthermore, the revascularized patients were able to sustain a significantly higher HR and CI without an increase in PAWP. None developed S-T segment depression and either global or regional lactate production.

Conclusion: We have documented that unless a patient suffers a perioperative myocardial infarction, coronary bypass surgery results in an absolute increase in global and regional myocardial blood flow. More important, during pacing the flow increases even further and myocardial ischemia can no longer be induced. The revascularized heart is thus better able to withstand stressful conditions and the patient coming for future surgical procedures should do so at a reduced risk for cardiac complications. Follow-up studies are planned to determine the persistence of this improvement.

Hemodynamic and Metabolic Parameters under Basal and Paced Conditions both Before and After Surgery (n = 20)

	BEFORE SURGERY		AFTER SURGERY	
	Basal	Paced	Basal	Paced
HR (beats/min)	67±4	125±3 †	88±2 *	138±1 *†
MAP (mm Hg)	96±5	103±3	95±2	97±4
PAWP (mm Hg)	11±1	14±1 †	10±1	11±1 *
CI (l/min/m²)	3.2±.2	3.5±.1	3.7±.1*	4.3±.2*†
CSBF (ml/min)	130±9	189±10†	182±9 *	230±10*†
GCVBF (ml/min)	64±7	92±7 †	85±5 *	113±6 *†
$CSMVO_2$ (ml/min)	12±1	17±1 †	12±1	16±1 †
$GCVMVO_2$ (ml/min)	7±1	10±1 †	7±1	9±1 †
CSLE (mmol/l)	8±2	-5±4 †	18±4 *	18±8 *
GCVLE (mmol/l)	5±1	-2±3 †	12±3 *	12±3 *

Values represent mean ± SEM, *P < 0.05 before versus after surgery, †P < 0.05 basal versus paced.