INTRODUCTION. Patients with ischemic heart disease benefit from nitroglycerin (NTG) by reduced myocardial oxygen demand and possibly improved blood flow to ischemic areas. Following aortic crossclamping, graft flow is determined by myocardial function, which depends on satisfactory myocardial perfusion. NTG infusion increases Q during CPB. However, continuous NTG during CPB only retrograde flow to the proximally unattached graft has been measured; flow either remained constant or increased. The purpose of this study was to investigate the effects of a systemic NTG infusion on Q, collateral perfusion, and myocardial ischemia during CPB. The advantages of studying Q during CPB were 1) NTG effects could be evaluated immediately after revascularization during the critical reperfusion period, and 2) the vented left ventricle provided constant preload and afterload to facilitate constant myocardial oxygen demand. Thus, Q and myocardial oxygen supply could be evaluated more accurately.

METHODS. All 10 patients studied were undergoing elective aortic coronary bypass surgery (informed consent and institutional approval were obtained). Fentanyl and metocurine were supplemented with diazepam or halothane. After aortic cross clamp release the ascending aortic pressure tracing confirmed the vented aortic arch was not ejecting. Proximal vein anastomosis and systemic rewarming were completed. Arterial blood gases and electrolytes were normal. Perfusion pressure was mean ascending aortic blood pressure (BP). An electromagnetic flow probe measured Q in the graft to the left anterior descending artery. Leads II and V5 of the electrocardiogram (ECG) were recorded at 25 mm/sec with amplitude 1 mv = 10mm. After confirming stable BP, Q and ECG in a control period of 2-3 minutes NTG 0.5 ug/kg/min was infused in the venous circulation of the CPB pump. When the change in Q was stabilized, typically after 3-5 minutes of NTG, simultaneous BP and HR were measured. Control and NTG data were analyzed with the paired Student's t-test. ECG ST segments during NTG were compared to control for significant changes ( > 1 mm).

RESULTS. For all patients average control Q was 87.3 ml/min. The average change in Q during NTG was a decrease of 7.4% from control (p < 0.02). Figure 1 shows Q for individual patients. The percent Q decrease was similar over a wide range of control flows. Average control 1) BP was 55 mmHg (range 45-75) and 2) HR was 75/min (range 58-92). BP and HR changes during NTG were not significant (p > 0.05). ST segments during NTG did not change significantly from control.

DISCUSSION. This study indicates Q decreases with continuous systemic NTG in the vented heart on CPB. Since HR, preload and afterload remained constant and contractility was unlikely to have changed, myocardial oxygen demand remained constant. Since there was no ECG evidence for a change in the balance of myocardial oxygen supply and demand, decreased Q implies NTG increased the blood flow via native collateral vessels or previously stenosed coronary arteries or both. Although Q decreased slightly, further study is indicated to determine if NTG is beneficial to global myocardial perfusion immediately after revascularization.

REFERENCES.

![Figure 1. Effect of NTG on Q in Individual Patients](image-url)