TITLE: BLOOD FLOW IS INVERSELY RELATED TO PULMONARY VASCULAR RESISTANCE IN PATIENTS WITH A LEFT VENTRICULAR ASSIST DEVICE

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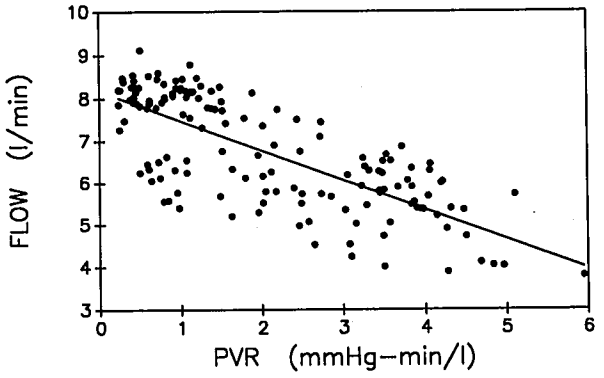
Introduction: A mechanical left ventricular assist device (LVAD) can be used to support patients with cardiac failure awaiting heart transplantation[1]. LVAD output depends upon flow to the LVAD; thus inadequate right ventricular (RV) performance may limit LVAD output. RV flow may be adversely affected by high pulmonary vascular resistance (PVR). In this study we examined the relationship of LVAD output to PVR.
Methods: With approved informed consent, 10 patients who received a Novacor LVAD were studied. Pulmonary artery pressure (PAP, mmHg), maximum left ventricular pressure (LVPMX), left ventricular end diastolic pressure (LVEDP), right atrial pressure (RAP), and LVAD flow (F, l/min) were measured on a beat-to-beat basis and were averaged for 2 hour intervals. PVR (mmHg-min/l) was calculated as (PAP-LVEDP)/F.
Results: F was the entire flow through the left side of the circulation because the left ventricular pressure was always less than aortic pressure and the aortic valve remained closed. Overall linear regression (N=151) was F=8.2-0.70PVR with r=-0.75. For individual patients, this comparison yielded $|r|>0.7$ for 6 of 10 patients. F increased with increasing LVPMX and LVEDP. There was little relationship between F and RAP.
Discussion: The inverse relationship between F and PVR may occur because the RV is limited in its ability to generate high pressure. Thus, increasing PVR results in reduction in RV output and F. Recruitment of pulmonary vessels reducing PVR with increasing F is unlikely over this range of F (3.8-9.1). Efforts to reduce PVR and enhance RV function may increase F in patients with LVADs.
References:

1. Starnes VA, et al: Isolated left ventricular assist as bridge to cardiac transplantation. J Thorac Cardiovasc Surg 96:62,1988



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TITLE: PREDEPOSITED AUTOLOGOUS BLOOD USE REDUCES FREQUENCY OF HOMOLOGOUS BLOOD TRANSFUSION WITHOUT HEMODYNAMIC COMPROMISE IN CARDIAC SURGERY PATIENTS

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Introduction: Preoperative blood donation has been estimated to avoid homologous transfusion in 68% of surgical patients. (1) Theoretically, predonation may decrease preoperative hematocrit, thereby reducing blood viscosity and systemic vascular resistance index (SVRI) which increase the heart's metabolic load. Therefore, in cardiac surgery patients, the safety of this practice is questionable. This study attempts to resolve this issue.

Methods: Retrospectively we analyzed the records of 74 randomly selected cardiac surgery patients. Group I (35 patients who had electively predeposited blood) and Group II (39 patients who had no preoperative blood deposit) patients had undergone elective myocardial revascularization in the six months before data collection. All patients received a high dose narcotic anesthetic technique and were monitored invasively with a pulmonary artery and intra-arterial catheter. The SVRI is recorded routinely and is derived from standard formulae with an on-line computer (Space Labs cardiac monitor). Predeposited autologous blood was collected according to standards established by the American Association of Blood Banks (AABB). (2)

The following data were collected: Prebypass Hct. and SVRI; number of homologous and autologous units of blood transfused during the hospital admission; discharge hematocrit. The two groups were compared using the student's t test for paired data.

Results: There was a significant difference in age between the groups; Group I being younger than Group II (58.9 ± 10.1 yrs. vs. 65.7 ± 9.58 yrs.; p< .01). Group I patients predonated 119 units of blood or 3.37 units/patient (range 2-4 units). a) Effect of predonation on frequency of homologous transfusion. 3 of 35 patients (8.5%) in group I received homologous transfusion in addition to their autologous reserve. In contrast, 23 of 39 (53.9%) in group II received homologous blood. b) Effect of predonation on Hct and SVRI. Hct prior to surgery was lower for Group I than Group II: 36.2 ± 3.8 vs. 39.9 ± 3.8 (p=<.005). However, no difference in SVRI was found: 2073.6 ± 568.6 in Group I vs. 2013.85 ± 466 in Group II (p=>.1) Hct prior to discharge was higher for Group I than Group II: 37.5 ± 5 vs. 31.14 ± 4.2 (p<.005). Group I received 108 units of autologous and 6 units of homologous blood, whereas Group II received 47 units of homologous blood. All patients in Group I were transfused (3.25 units/patient), whereas only 54% of Group II received blood (2.06 units/patient). Even when non-donors were transfused, their discharge Hct was lower than Group I: 30.7 ± 4.28 vs. 37.57 ± (p=<.05).

Discussion: This study demonstrates that predeposited autologous blood minimizes the frequency of homologous blood transfusion in patients undergoing elective myocardial revascularization. A 6 fold reduction in frequency; i.e., 53.9% to 8.5% was possible. It also shows that predepositing autologous blood is of no hemodynamic consequence provided blood collection adheres to AABB regulations. The data shows that younger patients avail themselves of the predonation program more often than older patients; also that it was effective in ensuring a near normal Hct upon discharge.

References: 1. NEJM. 316; 517-520
2. Standards for Blood Banks and Transfusion Services, pp. 40-41.