98% ±2%，$P < 0.001$）。与无紫绀型患儿相比，紫绀型患儿其血管内皮生长因子（VEGF）、糖酵解酶、谷胱甘肽过氧化物酶（GPX）的表达均显著降低（$P < 0.05$），而胶原的表达有所增高（$P < 0.01$）。相关的基因表达与紫绀的严重程度，即术前血细胞比容呈负相关（$P < 0.01$），而与术前氧饱和度正相关（$P < 0.05$）。基因表达与紫绀的关系与手术时年龄无关。钙调节基因与缺氧的严重程度无关。血管源性、糖酵解和抗氧化基因低表达与术后乳酸浓度增高相关（$P < 0.05$）。结论 在 TOF 患儿中，RV 无法针对不断增加的缺氧而上调适应途径。这种 RV 早期的适应失败反应对长期 RV 功能的影响尚待进一步研究。

0024. Intraoperative red blood cell transfusion during coronary artery bypass graft surgery increases the risk of postoperative low-output heart failure

Surgenor S. D. / DeFoe G. R. / Fillinger M. P. et al. [Dr. S. D. Surgenor, Dartmouth-Hitchcock Medical Center, 1 Medical Center Dr, Lebanon, NH 03756, United States] – CIRCULATION 2006, 114/SUPPL. 1(I43 – I48)

BACKGROUND - Hemodilutional anemia during cardiopulmonary bypass(CPB) is associated with increased mortality during coronary artery bypass graft(CABG) surgery. The impact of intraoperative red blood cell(RBC) transfusion to treat anemia during surgery is less understood. We examined the relationship between anemia during CPB, RBC transfusion, and risk of low-output heart failure(LOF) . METHODS AND RESULTS - Data were collected on 8004 isolated CABG patients in northern New England between 1996 and 2004. Patients were excluded if they experienced postoperative bleeding or received ≥ 3 units of transfused RBCs. LOF was defined as need for intraoperative or postoperative intra-aortic balloon pump, return to CPB, or ≥ 2 inotropes at 48 hours. Having a lower nadir HCT was also associated with an increased risk of developing LOF(adjusted odds ratio, 0. 90; 95% CI, 0. 82 to 0. 92; P = 0. 016), and that risk was further increased when patients received RBC transfusion. When adjusted for nadir hematocrit, exposure to RBC transfusion was a significant, independent predictor of LOF(adjusted odds ratio, 1. 27; 95% CI, 1. 00 to 1. 61; P = 0. 047) . CONCLUSIONS - In this study, we observed that exposure to both hemodilutional anemia and RBC transfusion during surgery are associated with increased risk of LOF, defined as placement of an intraoperative or postoperative intra-aortic balloon pump, return to CPB after initial separation, or treatment with ≥ 2 inotropes at 48 hours postoperatively, after CABG. The risk of LOF is greater among patients exposed to intraoperative RBCs versus anemia alone.

冠状动脉搭桥术中输注红细胞增加术后低心排心力衰竭的风险

背景：体外循环（CPB）中的血液稀释性贫血与冠状动脉搭桥术（CABG）术中死亡率增高有关。术中输注红细胞（RBC）对治疗贫血的影响尚不清楚。作者评估了 CPB 中贫血、RBC 输注与低心排心力衰竭（LOF）风险的关系。方法和结果：资料来自于新英格兰北部 1996—2004 年 8004 例单一 CABG 病例，术后出血或输血≥3 U 者除外。LOF 的定义为术中或术后需应用主动脉内球囊反搏、重新 CPB 或 48 h 使用≥2 种正性肌力药物。最低 HCT 值较低也与 LOF 的风险增高有关（校正后 OR 0. 90，95% CI 0. 82 ~ 0. 92，$P = 0.016$），当患者接受 RBC 输注后其风险会进一步增高。对最低 HCT 值校正后，RBC 输注为 LOF 的显著独立预测因素（校正后 OR 1. 27，95% CI 1. 00 ~ 1. 61，$P = 0.047$）。结论 在这项研究中，作者观察了术中血液稀释性贫血及红细胞输注与 LOF 风险增加有关，LOF 的定义为术中或术后应用主动脉内球囊反搏、重新 CPB 或 48 h 使用≥2 种正性肌力药物。术中接受红细胞输注的患者其 LOF 风险较单纯贫血者明显增高。

0025. Coronary flow velocity pattern and coronary flow reserve by contrast-enhanced transthoracic echocardiography predict long-term outcome in heart transplantation

Tona F. / Caforio A. L. P. / Montisci R. et al. [Dr. F. Tona, Department of Cardiological, Thoracic, and Vascular Sciences, Centro V. Gallucci, University of Padova-Policlinico, Via Giustiniani, 2, 35128 Padova, Italy] – CIRCULATION 2006, 114/SUPPL. 1(I49 – I55)

BACKGROUND - We assessed coronary flow velocity pattern and coronary flow reserve(CFR) by contrast-enhanced transthoracic echocardiography(CE-TTE) as markers of major adverse cardiac events(MACE) related to cardiac allograft vasculopathy(CAV) after heart transplantation (HT) . METHODS AND RESULTS - Deceleration time of diastolic flow velocity(DDT) and CFR were measured in the left anterior descending coronary artery(LAD) by CE-TTE in 66 consecutive HT patients(follow-up 19 ± 5 months) . CFR was calculated as the ratio of hyperemic to

basal diastolic flow velocity. Angiographies were analyzed by a qualitative grading system; CAV was defined as changes grade II or higher. MACE were cardiac death, stent implantation, and heart failure. Patients with MACE had higher CAV incidence(P = 0.004) and grade(P = 0.008), shorter DDT(P = 0.006), and lower CFR(P = 0.008). A receiver-operating characteristic-derived DDT cutpoint ≤840 ms(area under the curve 0.793; P = 0.01) was 75% specific and 86% sensitive for predicting MACE, with positive predictive value(PPV) and negative predictive value(NPV) of 33% and 97%, respectively(P = 0.002). A CFR cutpoint of ≤2.6(area under the curve 0.746; P = 0.01) was 62% specific and 91% sensitive for predicting MACE(PPV = 32%, NPV = 97%) (P = 0.001). Patients with CFR ≤2.6 and patients with DDT ≤840 ms had a lower survival free from MACE(P = 0.006 and P = 0.009, respectively). By Cox regression, only a lower CFR predicted the risk of MACE(relative risk 3.1; 95% CI, 1.26 to 7.9; P = 0.01). CONCLUSIONS - In HT patients, shorter DDT and lower CFR by CE-TTE are reliable markers for CAV-related MACE. CFR is the main independent predictor of MACE.

应用对比增强经胸超声心动图测量冠状动脉血流速度和血流储备以预测心脏移植患者的长期预后

背景：应用对比增强经胸超声心动图(CE－TTE)测量冠状动脉血流速度和血流储备(CFR)，以之作为心脏移植术后与心脏移植物血管病(CAV)相关的主要不良心血管事件(MACE)发生的预测因素。方法和结果：在66例连续心脏移植患者(随访19±5个月)中，应用CE－TTE测量冠状动脉左前降支(LAD)的舒张期血流减速时间(DDT)和CFR。以舒张期流速最高值与基础值之比计算CFR。通过量化分级系统对血管造影结果进行分析；CAV定义为血管变化分级2级或更高。MACE是指心血管死亡、冠状动脉内支架置入和心力衰竭。发生MACE的患者有较高的CAV事件发生率(*P* = 0.004)及等级(*P* = 0.008)、较短的DDT(*P* = 0.006)和较低的CFR(*P* = 0.008)。受试者操作特征分析得出DDT界值为≤840 ms(曲线下面积0.793，*P* = 0.01)，预测MACE的特异性为75%，灵敏性为86%，阳性预测值(PPV)和阴性预测值(NPV)分别为33%和97%(*P* = 0.002)。CFR界值为≤2.6(曲线下面积0.746，*P* = 0.01)时预测MACE的特异性为62%，灵敏性为91%(PPV = 32%，NPV = 97%)(*P* = 0.001)。CFR≤2.6的患者和DDT≤840 ms的患者其无MACE生存率也较低(*P*值分别为0.006和0.009)。通过Cox回归分析显示，只有较低的CFR能够预测MACE风险(RR 3.1，95% CI 1.26～7.9，*P* = 0.01)。结论：在心脏移植患者中，用CE－TTE测得较短的DDT和较低的CFR是CAV相关性MACE的可靠标志。CFR是MACE的主要独立预测因素。

(0021～0025 朱启明 译 杜 媛 校)

0026. Flexible versus nonflexible mitral valve rings for congestive heart failure: Differential durability of repair

Spoor M. T. / Geltz A. / Bolling S. F. [Dr. S. F. Bolling, Section of Cardiac Surgery, University of Michigan, University of Michigan Hospitals, 1500 E Medical Center Drive, Ann Arbor, MI 48109－0348, United States] －CIRCULATION 2006, 114/SUPPL. 1(I67－I71)

BACKGROUND - Surgical intervention is playing an increasingly important therapeutic role in congestive heart failure(CHF) patients with ischemia and dilated cardiomyopathy. Their mitral regurgitation(MR) is a result of left ventricular(LV) geometrical distortion. The optimal type of ring for CHF patients with geometric ventricular-based MR is unknown. This study reviewed the results of flexible versus nonflexible complete mitral valve rings in CHF patients with geometric mitral regurgitation. METHODS AND RESULTS - Using a prospectively maintained database, patients undergoing mitral valve reconstruction (MVR) with either a flexible or nonflexible complete ring were identified on the basis of preoperative ejection fraction (EF) ≤30% and no primary mitral pathology. These 2 groups of CHF patients with severe geometric MR were then compared in terms of recurrent MR requiring reoperation. Between 1992 and 2004, 289 patients with EF ≤30%, received an undersized complete mitral annuloplasty ring as their MVR procedure. Of these, 170 patients had a flexible complete ring. In follow-up, 16 "flexible" patients (9.4%) required a repeat procedure for significant recurrent geometric MR and CHF(10 replacements, 3 re-repairs, 3 transplants). The average time to reoperation was 2.4 years. In contrast, 119 patients with an EF ≤ 30% received a MVR using an undersized nonflexible complete ring. Only 3 "non-flexible" patients required a repeat operation, MVR(1), and 2 patients required a transplant. The time to reoperation was 4.0 years. A significant difference in reoperation rates, for recurrent MR, between the 2 groups(P = 0.012). There were no differences between groups, in terms of age, ring size used, preoperative EF, LV size, MR grade, or New York Heart