

Am Heart J (2004);148:727-32

Impact of preoperative intravenous nitroglycerin on in-hospital outcomes after coronary artery bypass grafting for unstable angina

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BACKGROUND: Intravenous nitroglycerin (NTG) is an effective therapy for unstable angina (UA), but it may induce endothelial dysfunction and impair vascular nitric oxide signaling. We sought to determine whether preoperative intravenous NTG administration alters in-hospital outcomes in patients undergoing coronary artery bypass grafting (CABG) for UA. **METHODS AND RESULTS:** All in-hospital patients with Canadian Cardiovascular Society class IV angina who had isolated CABG between March 1995 and July 2002 at two Canadian centers were identified (n = 3976). Of these, 2506 were not receiving intravenous NTG and 1470 were receiving intravenous NTG at the time of CABG. Outcomes assessed were in-hospital mortality (IHM), intraoperative or postoperative aortic balloon pump use, perioperative myocardial infarction, prolonged (> or =24 hours) ventilation (p-vent), and a composite outcome, defined as any one or more of the above. Unadjusted IHM (5.9% vs 4.2%, P =.02), p-vent (22.2% vs 10.5%, P =.0001), and composite outcome (26.5% vs 15.2%, P =.0001) were higher in patients receiving intravenous NTG. Logistic regression showed that preoperative intravenous NTG was not an independent predictor of composite outcome (OR, 1.1; P =.49) or IHM (OR, 0.94; P =.69). Propensity score analysis was used to match two subgroups of patients (group 1, intravenous NTG, n = 1176; group 2, no intravenous NTG, n = 1176) on multiple factors. After adjustment with the propensity score, preoperative intravenous NTG use had no significant effect on any of the outcomes assessed. **CONCLUSIONS:** Despite its potential to induce endothelial dysfunction and impair vascular nitric oxide signaling, preoperative intravenous NTG administration is not associated with altered in-hospital outcomes after CABG for UA.

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Am J Cardiol (2004);94:627-31

Comparison of three-year outcomes after coronary stenting versus coronary artery bypass grafting in patients with multivessel coronary disease, including involvement of the left anterior descending coronary artery proximally (a subanalysis of the arterial revascularization therapies study trial)

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The long-term effect of stents in patients with multivessel disease involving the proximal left anterior descending artery was investigated. At 3 years, there was no difference in the combined incidence of death, stroke, and myocardial infarction in either group, but the need for repeat revascularization was more frequent in the group with stenting than in the group with coronary artery bypass grafting.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15342295

Circulation (2004);110:II13-7

Long-term outcome of isolated coronary artery bypass surgery in patients with severe left ventricular dysfunction

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BACKGROUND: Coronary artery bypass grafting (CABG) is indicated in patients with coronary artery disease and impaired ventricular function. However, earlier studies have suggested that prognosis of patients with severe left ventricular dysfunction is extremely poor. We used the APPROACH registry to derive contemporary estimates of prognosis associated with CABG for this high-risk patient population. **METHODS AND RESULTS:** The study group consisted of 7841 patients who had isolated CABG in the province of Alberta, Canada between 1996 and 2001. Patients with markedly reduced left ventricular function (ejection fraction [EF] <30%, Lo EF, n =430) were compared with those with moderate reduction in ventricular function (EF 30% to 50%, Med EF, n =2581) and those with normal left ventricular function (EF >50%, normal [NI] EF, n=4830). The operative mortality was higher in the patient group with Lo EF (4.6%) compared with Med EF and NI EF groups (3.4% and 1.9%, respectively, P<0.001). At 5 years, survival was 77.7% for Lo EF patients compared with 85.5% and 91.2% for Med EF and NI EF patients, respectively (P<0.001). After controlling for other independent variables, the adjusted hazard ratio for death was 1.98 (95% CI, 1.49 to 2.62) for Lo EF relative to NI EF. The mortality rate at 1 year was significantly lower for Lo EF patients who underwent CABG than it was for nonrevascularized Lo EF patients (risk-adjusted odds ratio, 0.36; 95% CI, 0.24 to 0.55). **CONCLUSIONS:** In the modern era of cardiac surgery, CABG can be performed in Lo EF cases with an acceptable perioperative mortality risk. Our estimate of 5-year survival in this high-risk group is better than previously reported in the literature from earlier periods.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364831

Circulation (2004);110:II36-40

Long-term patency of internal mammary artery bypass grafts: relationship with preoperative severity of the native coronary artery stenosis

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BACKGROUND: Internal mammary artery conduits (IMA) have an excellent long-term patency rate. Nevertheless, graft closure does occur and significantly limits future revascularization options. We sought to investigate the relationship between the long-term patency of IMA with clinical and angiographic parameters. Particularly, the preoperative degree of stenosis of the relevant bypassed coronary vessel was assessed to analyze the importance of chronic competitive flow on the arterial graft closure rate. **METHODS AND RESULTS:** Consecutive patients in whom occlusion of at least 1 IMA had been documented at angiography (OCC group) were compared with a group of patients with patent IMA grafts (PAT group). The degree of stenosis in the native coronary artery on which the IMA was placed was analyzed by off-line quantitative coronary angiography. Multivariate stepwise logistic regression was used to identify independent clinical and angiographic predictors of occlusion. The OCC group comprised 96 patients (67+/-10 years) with 103 native bypassed arteries analyzed. The PAT group comprised 127 patients (69+/-8 years) with 170 native bypassed arteries

analyzed. Both groups were similar except for gender (42% versus 32% female; $P=0.04$), height (166 \pm 8 versus 169 \pm 8 cm; $P=0.006$), minimum lumen diameter (0.76 \pm 0.7 versus 0.51 \pm 0.5; $P=0.001$), and diameter stenosis of the native artery (73 \pm 25% versus 84 \pm 16%; $P<0.0001$) in OCC versus PAT, respectively. In the multivariate analysis, only percent diameter stenosis was an independent and statistically significant predictor for graft patency. Among IMA placed on coronary arteries with a diameter of stenosis $<50\%$ ($n=28$), the occlusion rate was very high (79%). CONCLUSIONS: The degree of stenosis in the native vessel is a major predictor of internal mammary artery bypass graft patency. The association between nonsignificant stenosis of the native artery and high occlusion rate of the arterial bypass conduit raises concerns about the use of IMA in the treatment of native vessels with only mild or moderate stenosis.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364835

Circulation (2004);109:1079-81

Choosing between percutaneous coronary intervention and coronary artery bypass grafting for patients with multivessel disease: what can we learn from the Arterial Revascularization Therapy Study (ARTS)?

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Catheter Cardiovasc Interv (2004);61:528-36

Can percutaneous coronary interventions reduce death and myocardial infarction in stable and unstable coronary disease?

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Catheter Cardiovasc Interv (2004);63:184-91

Percutaneous coronary intervention or bypass surgery in multivessel disease? A tailored approach based on coronary pressure measurement

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The optimal revascularization strategy, percutaneous coronary intervention (PCI) or coronary artery bypass graft surgery (CABG), for patients with multivessel coronary artery disease (MVD) remains controversial. The aim of the present study was to compare the long-term outcomes after selective PCI of only hemodynamically

three vessels or in two vessels including the proximal left anterior descending (LAD) artery, CABG was performed (CABG group). If only one or two vessels were physiologically significant (not including the proximal LAD), PCI of those lesions was performed (PCI group). Of the 150 patients, 87 fulfilled the criteria for CABG and 63 for PCI. There were no significant differences in the angiographic or other baseline characteristics between the two groups. At 2-year follow-up, no differences were seen in adverse events, including repeat revascularization (event-free survival 74% in the CABG group and 72% in the PCI group). A similar number of patients were free from angina (84% in the CABG group and 82% in the PCI group). Importantly, the results in both groups were as good as the surgical groups in previous studies comparing PCI and CABG in MVD. In patients with multivessel disease, PCI in those with one or two hemodynamically significant lesions as identified by an FFR < 0.75 yields a similar favorable outcome as CABG in those with three or more culprit lesions despite a similar angiographic extent of disease.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15390344

Catheter Cardiovasc Interv (2005);64:45-52

Directional coronary atherectomy plus stent implantation vs. left internal mammary artery bypass grafting for isolated proximal stenosis of the left anterior descending coronary artery

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The aim of this study was to compare the short- (< 30 days) and long-term (>= 30 days) clinical outcomes of left internal mammary artery bypass grafting (LIMA-LAD) and directional coronary atherectomy plus stent implantation (DCA + stent) in the treatment of isolated proximal left anterior descending coronary (LAD) lesions. One hundred and twenty-six patients underwent LIMA-LAD and 132 consecutive patients underwent DCA + stenting. The primary endpoint was the incidence of short- and long-term major adverse cardiac events (MACE); the secondary endpoints included any periprocedural events and long-term target vessel revascularization (TVR). We found no significant between-treatment difference in the occurrence of short-term MACE, and the long-term MACE rate per 100 person-years was 3.0 in the LIMA-LAD group and 4.6 in the DCA + stent group. After 5-year follow-up, 79% of the patients in the DCA + stent group and 89% of those in the LIMA-LAD group were still MACE-free. The risk of any periprocedural events was six times lower in the DCA + stent group, and the risk of TVR was six times higher. We conclude that both procedures lead to good short- and long-term follow-up results in isolated proximal LAD disease. As fewer periprocedural events and more TVRs occur after DCA + stenting than after LIMA-LAD, they can be considered valuable alternatives to each other. Catheter Cardiovasc Interv 2005;64:45-52. (c) 2004 Wiley-Liss, Inc.

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Circulation (2004);109:2290-5

Propensity analysis of long-term survival after surgical or percutaneous revascularization in patients with multivessel coronary artery disease and high-risk

features

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BACKGROUND: Although most randomized clinical trials have suggested that long-term survival rates after percutaneous coronary intervention (PCI) or surgical multivessel coronary revascularization (CABG) are equivalent, some post hoc analyses in high-risk groups and adjustment for severity of coronary disease have suggested higher mortality after PCI. **METHODS AND RESULTS:** We studied 6033 consecutive patients who underwent revascularization in the late 1990s. PCI was performed in 872 patients; 5161 underwent CABG. Half the patients had significant left ventricular dysfunction or diabetes. Propensity analysis to predict the probability of undergoing PCI according to 22 variables and their interactions was used. The C-statistic for this model was 0.90, indicating excellent discrimination between treatments. There were 931 deaths during 5 years of follow-up. The 1- and 5-year unadjusted mortality rates were 5% and 16% for PCI and 4% and 14% for CABG (unadjusted hazard ratio, 1.13; 95% CI, 1.0 to 1.4; $P=0.07$). PCI was associated with an increased risk of death (propensity-adjusted hazard ratio, 2.3; 95% CI, 1.9 to 2.9; $P<0.0001$). This difference was observed across all categories of propensity for PCI and in patients with diabetes or left ventricular dysfunction. Other independent predictors of mortality ($P<$ or $=0.01$ for all) were renal dysfunction, age, diabetes mellitus, chronic lung disease, peripheral vascular disease, left main trunk stenosis, and extent of coronary disease (Duke angiographic score). **CONCLUSIONS:** In patients with multivessel coronary artery disease and many high-risk characteristics, CABG was associated with better survival than PCI after adjustment for risk profile.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15117846

Circulation (2004);110:II27-35

Single versus multiple internal mammary artery grafting for coronary artery bypass: 15-year follow-up of a clinical practice trial

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BACKGROUND: The long-term clinical advantages of using routine multiple internal mammary artery (IMA) grafts for coronary artery bypass (CAB) are not clear. This study was designed to test the hypothesis that multiple IMA grafts would provide better 15-year outcomes when compared with single IMA and vein grafts. **METHODS AND**

complete prognostic picture, and the subgroups were potentially comparable at baseline. In all 3 analyses, single and multiple groups were statistically similar with respect to baseline, operative, and immediate postoperative variables. Early IMA patency was 98.5% (333/338 grafts patent), validating the quality of IMA procedures. Unadjusted and adjusted 15-year outcome analyses for I, II, and III for death, myocardial infarction, percutaneous coronary intervention, redo coronary bypass, and the composite of all events identified multiple versus single as a significant predictor of outcome for the composite end point in adjusted analysis III (hazard ratio=0.808; 95% CI, 0.689 to 0.948; P=0.009), because of a 5% to 10% absolute reduction in each of the outcome variables at 15 years. Moreover, >50% reduction in reoperation rate was observed at 15 years in every analysis. CONCLUSIONS: At 15-year follow-up, multiple IMA grafting was associated with a 19.2% adjusted risk reduction in death and cardiac events, caused by decreases in all adverse end points and fewer reoperations. These data indicate that the clinical advantages of maximizing IMA conduits are significant. Based on this information, it is suggested that multiple IMA grafting to 2 coronary systems should be applied liberally to patients with noncardiac risk profiles predictive of long-term survival.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364834

Am J Cardiol (2004);94:1414-7

Comparison of late (four years) functional health status between percutaneous transluminal angioplasty intervention and off-pump left internal mammary artery bypass grafting for isolated high-grade narrowing of the proximal left anterior descending coronary artery

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In a 4-year follow-up study, we compared functional health status (FHS) in patients randomized to surgery (n = 51) or angioplasty (n = 51) for an isolated narrowing of the proximal left anterior descending coronary artery. FHS was assessed with the Short Form-36 and the Minnesota Living with Heart Failure questionnaires. Although the occurrence of angina (p = 0.036) and major adverse cardiac and cerebrovascular events (p = 0.02) was significantly higher 4 years after angioplasty, FHS did not differ between treatments and was comparable to a healthy reference population.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15566914

Circulation (2004);110:e340-437

ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery)

K. A. Eagle, *et al.*

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15466654

Circulation (2004);110:1168-76

ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery)

K. A. Eagle, *et al.*

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15339866

J Am Coll Cardiol (2004);44:1146-54, e213-310

ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: summary article. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery)

K. A. Eagle, *et al.*

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15337239

Chest (2004);126:487-95

Quality of life after coronary artery bypass graft: results from the POST CABG Trial

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OBJECTIVES: The POST CABG (Post Coronary Artery Bypass Graft) Trial showed that aggressive lowering of low-density lipoprotein (LDL) cholesterol levels reduced the progression of atherosclerosis in saphenous vein grafts. In the extended follow-up phase, aggressive lowering of LDL cholesterol levels was associated with reduced rates of clinical events. Low-dose anticoagulation therapy did not reduce the progression of atherosclerosis. We conducted this analysis to determine the effects of both lipid-lowering and low-dose anticoagulation therapy on health-related quality of life (HRQL). **DESIGN:** Randomized clinical trial, factorial design. **SETTING:** Outpatients in five tertiary care medical centers. **PATIENTS:** A cohort of 852 patients enrolled in the POST CABG Trial completed an HRQL questionnaire at baseline, and at the year 2 and year 4 follow-up visits. **INTERVENTION:** Aggressive LDL cholesterol lowering vs moderate LDL cholesterol lowering, and low-dose warfarin vs placebo.

MEASUREMENTS: Domains included emotional status, basic physical and social functioning, perceived health status, symptoms of pain, a variety of physical symptoms, and global life satisfaction. **RESULTS:** Overall, there were no indications of systematic differences among treatment groups for any of the HRQL parameters at baseline, year 2, or year 4. **CONCLUSIONS:** These data indicate that patients did not experience detrimental or beneficial effects on HRQL parameters while receiving LDL cholesterol-lowering therapy that had demonstrable benefits for treatment of atherosclerosis.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15302735

Chest (2004);125:2196-205

Neurological complications after coronary artery bypass grafting related to the

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STUDY OBJECTIVES: Neurologic disorders belong among the most serious complications of cardiac surgery. We tested the hypothesis that combinations of hemodynamic events from apparently normal cardiopulmonary bypass (CPB) procedures are related to the development of postoperative neurologic complications and affect the impact of common clinical risk factors. **DESIGN:** Retrospective study. **SETTING:** Cardiothoracic surgery department in a university hospital. **METHODS AND PATIENTS:** A multivariate statistical procedure (ie, cluster analysis) was applied to a data set of automatically recorded perfusions from 1,395 patients who had undergone coronary artery bypass grafting. One-way analysis of variance was used to select five parameters with the strongest significant correlation to postoperative neurologic complications for further cluster analysis. The dependencies in the clusters were tested against common clinical risk factors. To our knowledge, this is the first study of its kind. **RESULTS:** The following five parameters emerged for cluster analysis: mean arterial pressure (MAP); dispersion of MAP; dispersion of systemic vascular resistance; dispersion of arterial pulse pressure; and the maximum value of mixed venous saturation. Using these parameters, we found four clusters that were significantly different by CPB performance (first cluster, 389 patients; second cluster, 431 patients; third cluster; and fourth cluster, 229 patients). The frequency of postoperative neurologic complications was 0.3% in the first cluster and increased to 3.9% in the fourth cluster. Importantly, the impact of common clinical risk factors for postoperative neurologic complications was affected by the performance of the CPB procedure. For example, the frequency of neurologic complications among patients with cerebrovascular disease in their medical history was 22% in the fourth cluster, whereas it was zero in the second cluster. **CONCLUSIONS:** This study shows that apparently normal CPB procedures affect the impact of common clinical risk factors on postoperative neurologic complications. Patients who underwent CPB procedures with large fluctuations in hemodynamic parameters particularly showed an increased risk for the development of postoperative neurologic complications.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15189942

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Long-term patency of saphenous vein and left internal mammary artery grafts after coronary artery bypass surgery: results from a Department of Veterans Affairs Cooperative Study

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OBJECTIVES: This study defined long-term patency of saphenous vein grafts (SVG) and internal mammary artery (IMA) grafts. **BACKGROUND:** This VA Cooperative Studies Trial defined 10-year SVG patency in 1,074 patients and left IMA patency in 457 patients undergoing coronary artery bypass grafting (CABG). **METHODS:** Patients underwent cardiac catheterizations at 1 week and 1, 3, 6, and 10 years after CABG. **RESULTS:** Patency at 10 years was 61% for SVGs compared with 85% for IMA grafts

($p < 0.001$). If a SVG or IMA graft was patent at 1 week, that graft had a 68% and 88% chance, respectively, of being patent at 10 years. The SVG patency to the left anterior descending artery (LAD) (69%) was better ($p < 0.001$) than to the right coronary artery (56%), or circumflex (58%). Recipient vessel size was a significant predictor of graft patency, in vessels >2.0 mm in diameter SVG patency was 88% versus 55% in vessels ≤ 2.0 mm ($p < 0.001$). Other positive significant predictors of graft patency were use of aspirin after bypass, older age, lower serum cholesterol, and lowest Canadian Functional Class ($p < 0.001$ to 0.058). CONCLUSIONS: The 10-year patency of IMA grafts is better than SVGs. The 10-year patency for SVGs is better and the 10-year patency for IMA grafts is worse than expected. The 10-year patency of SVGs to the LAD is better than that to the right or circumflex. The best long-term predictors of SVG graft patency are grafting into the LAD and grafting into a vessel that is >2.0 mm in diameter.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15582312

Catheter Cardiovasc Interv (2005);64:75-81

Percutaneous coronary intervention with drug-eluting stent implantation vs. minimally invasive direct coronary artery bypass (MIDCAB) in patients with left anterior descending coronary artery stenosis

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The aim of this study was to assess the effects of percutaneous coronary intervention with drug-eluting stents (DESs) versus minimally invasive direct coronary artery bypass (MIDCAB) surgery in the management of patients with proximal left anterior descending (LAD) coronary artery stenosis. Until recent years, despite the advantages of percutaneous transluminal coronary angioplasty (PTCA) with bare metal stent implantation, such as shorter hospital stays and recovery time, MIDCAB showed better results with regard to the need for repeated intervention in the target vessel than PTCA with proximal LAD lesions. Symptomatic patients ($n = 189$) were randomly assigned to DES group ($n = 119$) and MIDCAB group ($n = 70$). Patients with an isolated high-grade lesion (stenosis of $\geq 70\%$ of the luminal diameter) in the proximal LAD coronary artery (from the ostium to the first diagonal branch) were included in this study. During the 6-month follow-up period, 1.7% ($n = 2$) in the DES group needed repeated revascularization procedures for target lesion revascularization compared with 5.9% ($n = 4$) in the MIDCAB group ($P = 0.196$). The rates of death and myocardial infarction were similar in both groups [DES 0.0% ($n = 0$) vs. MIDCAB 2.9% ($n = 2$), $P = 0.135$; DES 1.7% ($n = 2$) vs. MIDCAB 2.9% ($n = 2$), $P = 0.627$; respectively] during 6 months of follow-up. In-hospital length of stay was significantly shorter in the DES group compared

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Catheter Cardiovasc Interv (2004);62:453-60

Acute and long-term clinical and angiographic outcomes of coronary stenting using Palmaz-Schatz stent and ACS Multi-Link stent

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Acute and long-term (≥ 3 years) outcomes of coronary artery stenting using Palmaz-Schatz and Multi-Link stent implantations between November 1995 and October 1999 were analyzed. There were 655 Palmaz-Schatz stent implantations in 577 lesions on 477 patients (group A) and 428 Multi-Link stent implantations in 381 lesions on 326 patients (group B). The baseline characteristics were similar in the two groups. Group B had more complex lesions, longer stenotic lesions, and larger reference vessel sizes than group A. However, both groups had a similar in-hospital cardiac events. Four hundred and two patients with 488 lesions in group A and 260 patients with 307 lesions in group B underwent a 6-month follow-up coronary angiography. The restenotic rate per lesion was 16% in both groups ($P = 0.872$). A 3-year angiographic follow-up was performed in 262 patients of group A (301 lesions) and 139 patients of group B (162 lesions), and restenosis was noted in only 3 patients (1.36%) in group A and 5 patients (4%) in group B, in which the lesion was patent at the 6-month angiographic follow-up. Significant increase in minimal luminal diameter was noted from 2.23 ± 0.66 mm at 6 months to 2.33 ± 0.64 mm in group A ($P < 0.01$), and insignificant increase from 2.23 ± 0.77 to 2.28 ± 0.82 mm was noted in group B ($P = 0.27$). No differences were noted between the two groups in mortality, reinfarction, recurrent angina, target lesion angioplasty, or elective coronary artery bypass surgery during a follow-up period of 60 ± 3 months. Forty-five patients (9.4%) in group A and 18 patients (5.5%) in group B received additional stenting procedures for newly developed lesions. The overall cardiac event-free survival was 66% in group A and 72% in group B ($P = 0.844$). In conclusion, the procedural success rate, in-hospital morbidity, 6-month angiographic results, and long-term (≥ 3 years) clinical and angiographic outcomes were similar with coronary stenting using either Palmaz-Schatz or Multi-Link stent. The stented lesions were stable; however, late regression of minimal luminal diameter was noted in both groups, and progression of atherosclerotic change in the nonstented site was noted during long-term follow-up. Catheter Cardiovasc Interv 2004;62:453-460. Copyright 2004 Wiley-Liss, Inc.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15274153

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Using the risk of restenosis as a guide to triaging patients between surgical and percutaneous coronary revascularization

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BACKGROUND: Coronary artery bypass graft (CABG) and percutaneous coronary

revascularization (PCI) are strategies for treating coronary disease. Because the principal limitation of PCI is restenosis, CABG might be favored for those at high risk for restenosis. Using a clinical risk score for predicting restenosis, we examined whether patients with higher risks for restenosis were preferentially referred for CABG.

METHODS AND RESULTS: A procedural registry of 2320 revascularization patients from whom data on procedure type, demographics, comorbid conditions, health status, vessel anatomy, and outcomes were taken was analyzed. Patients were classified and scored into 3 categories of restenosis risk ranging from 11% to 44%, as defined by 8 preprocedural characteristics. The objective of this study was to describe referral patterns between PCI and CABG in each category of risk. 2060 patients underwent nonemergent revascularization. 1404 of the patients underwent PCI and 656 were treated with CABG. Among the patients at low and intermediate risk for restenosis, twice as many were referred to PCI. Among those at the highest risk, 3-times as many were referred to PCI, resulting in a significant trend for those with the higher risks of restenosis to be preferentially referred to PCI ($P=0.015$). Similar results were seen when the analysis was restricted to only those with multivessel disease. **CONCLUSIONS:** Patients at higher risk for restenosis were being preferentially treated with PCI as opposed to CABG. These results may have implications for reevaluating current patterns of triaging patients between PCI and CABG, and for the use of drug-eluting stents within PCI patients.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364838

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A randomized comparison of off-pump and on-pump multivessel coronary-artery bypass surgery

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BACKGROUND: The effect of the use of coronary-artery bypass surgery without cardiopulmonary bypass and cardiac arrest ("off pump") on graft patency remains uncertain. We undertook a prospective, randomized, controlled study to compare graft-patency rates and clinical outcomes in off-pump surgery with conventional, "on-pump" surgery. **METHODS:** We randomly assigned 50 patients to undergo on-pump coronary-artery bypass grafting and 54 to undergo off-pump surgery. Surgical and anesthetic techniques were standardized for both groups. Clinical outcomes and troponin T levels were measured. Three months later, the patients underwent coronary angiography, including quantitative analysis. **RESULTS:** The mean age of the patients was 63 years, and 87 percent were men. The on-pump group received a mean of 3.4 grafts, and the off-pump group 3.1 ($P=0.41$). There were no deaths. There was no significant difference in the median postoperative ud 50 3, an3.5(LTME1(stl(3.7.6-3 a.4062))TJ-T.3(at

randomized study, off-pump coronary surgery was as safe as on-pump surgery and caused less myocardial damage. However, the graft-patency rate was lower at three months in the off-pump group than in the on-pump group, and this difference has implications with respect to the long-term outcome.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14702424

Circulation (2004);110:1141-4

Effect of diabetes and associated conditions on long-term survival after coronary artery bypass graft surgery

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BACKGROUND: The effects of diabetes on short-term results of coronary artery bypass graft (CABG) surgery are known, but less is known about the long-term effects of diabetes and diabetic-related sequelae for patients undergoing this surgery. We studied the 10-year survival of nondiabetic and diabetic patients undergoing CABG surgery.

METHODS AND RESULTS: A prospective regional cohort study was conducted of 36,641 consecutive isolated CABG patients in northern New England from 1992 through 2001. Patient records were linked to the National Death Index to assess mortality. There were 154,140 person-years of follow-up and 5779 deaths. Kaplan-Meier techniques were used. Survival was stratified into three categories: no diabetes, diabetes without peripheral vascular disease and renal failure, and diabetes with peripheral vascular disease and/or renal failure. The overall annual incidence rate of death was 3.7 deaths per 100 person-years. Annual incidence rates for nondiabetic subjects and diabetic subjects were similar: 3.1 deaths per 100 person-years and 4.4 deaths per 100 person-years, respectively. The annual incidence rate for diabetic subjects with renal failure, peripheral vascular disease, or both was 9.4 deaths per 100 person-years. The log-rank test showed that the survival curves were significantly different ($P < 0.001$).

CONCLUSIONS: Patients that have diabetes without the sequelae of renal failure and/or peripheral vascular disease have long-term survival similar to but slightly less than patients without diabetes who undergo CABG surgery. Survival of CABG surgery patients with diabetes is greatly affected by associated comorbidities of peripheral vascular disease and renal failure. This knowledge may help guide the patient as well as the cardiologist and cardiac surgeon in making appropriate decisions in these critically ill patients.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364836

Circulation (2004);109:887-92

Coronary bypass surgery performed off pump does not result in lower in-hospital morbidity than coronary artery bypass grafting performed on pump

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BACKGROUND: There is increasing evidence that cardiopulmonary bypass (CPB) may be responsible for the morbidity associated with coronary artery bypass grafting (CABG)

surgery. Recent developments in cardiac stabilization devices have made CABG without CPB feasible. However, there is conflicting evidence to date from published trials comparing outcomes between CABG performed with and without CPB, with some trials indicating an advantage to the avoidance of CPB and others showing little benefit. METHODS AND RESULTS: In a single-center randomized trial, 300 patients requiring CABG surgery at a single institution were prospectively randomized to have the procedure performed with CPB (n=150) or on the beating heart (n=150). Exclusion criteria for the trial included emergency procedure, concomitant major cardiac procedures, ejection fraction <30%, and reoperation. In-hospital outcomes were analyzed on an intention-to-treat basis. A mean of 3.0±0.9 grafts were performed in the CPB group compared with 2.8±0.9 grafts in the beating-heart group (P=0.06). There were no significant differences between the CPB group and the beating-heart group in mortality (0.7% versus 1.3%; P=1.0), transfusion (8.7% versus 9.3%), perioperative myocardial infarction (0.7% versus 2.7%; P=0.37), permanent stroke (0% versus 1.3%; P=0.50), new atrial fibrillation (32% versus 25%; P=0.20), and deep sternal wound infection (0.7% versus 0%; P=1.0). The mean time to extubation was 4 hours, the mean stay in the intensive care unit was 22 hours, and the median length of hospitalization was 5 days in both groups (P=NS). CONCLUSIONS: In contrast to published trials, we were unable to demonstrate any advantage with CABG performed without CPB in terms of patient morbidity. Excellent results can be obtained with either surgical approach.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14757693

Circulation (2004);109:1114-20

Three-year outcome after coronary stenting versus bypass surgery for the treatment of multivessel disease

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BACKGROUND: The primary results of Arterial Revascularization Therapy Study reported a greater need for repeated revascularization after percutaneous coronary intervention with stenting (PCI). However, PCI was less expensive than coronary artery bypass grafting (CABG) and offered the same degree of protection against death, stroke, and myocardial infarction. METHODS AND RESULTS: Patients with multivessel disease (n=1205) were randomly assigned to either CABG or PCI and followed up for up to 3 years. Survival rates without stroke or myocardial infarction were similar in each group at 1 year and 3 years (90.5% versus 91.4% for PCI versus CABG at 1 year and

infarction are identical in both groups, and the cost/benefit ratio of stenting is determined primarily by the increasing need for revascularization in the PCI group.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14993134

J Am Coll Cardiol (2004);43:337-42

Impact of delays to cardiac surgery after failed angioplasty and stenting

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OBJECTIVES: This study was designed to determine the likelihood of harm in patients having additional delays before urgent coronary artery bypass graft (UCABG) surgery after percutaneous coronary intervention (PCI). **BACKGROUND:** Patients who have PCI at hospitals without cardiac surgery have additional delays to surgery when UCABG is indicated. **METHODS:** Detailed chart review was performed on all patients who had a failed PCI leading to UCABG at a large tertiary care hospital. A prespecified set of criteria (hemodynamic instability, coronary perforation with significant effusion or tamponade, or severe ischemia) was used to identify patients who would have an increased likelihood of harm with additional delays to surgery. **RESULTS:** From 1996 to 2000, 6,582 PCIs were performed. There were 45 patients (0.7%) identified to have UCABG. The demographic characteristics of the UCABG patients were similar to the rest of the patients in the PCI database, except for significantly more type C lesions (45.3% vs. 25.0%, $p < 0.001$) and more urgent cases (66.6% vs. 49.8%, $p = 0.03$) in patients with UCABG. Myocardial infarction occurred in eight patients (17.0%) after UCABG, with a mean peak creatine kinase of 2,445 \pm 1,212 IU/l. Death during the index hospital admission occurred in two patients. Eleven of the 45 patients (24.4%) were identified by the prespecified criteria to be at high likelihood of harm with additional delays to surgery. The absolute risk of harm is approximately one to two patients per 1,000 PCIs. **CONCLUSIONS:** Approximately one in four patients referred for UCABG would be placed at increased risk of harm if delays to surgery were encountered.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15013111

N Engl J Med (2004);351:2262-4

Prolonging patency--choosing coronary bypass grafts

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15564542

Circulation (2004);109:810-2

On-pump and off-pump bypass surgery: tools for revascularization

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14981010

Circulation (2004);110:II1-6

On-pump versus off-pump coronary artery bypass surgery in a matched sample of women: a comparison of outcomes

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BACKGROUND: Women have consistently higher mortality and morbidity than men after coronary artery bypass grafting (CABG). Whether elimination of cardiopulmonary bypass and performance of coronary artery bypass grafting off-pump (OPCAB) have a beneficial effect specifically in women has not been defined. **METHODS AND RESULTS:** From January 1998 through March 2002, 21 902 consecutive female patients at 82 hospitals underwent isolated CABG, as reported in an administrative database. Propensity score computer matching was performed based on 13 variables representing patient characteristics and preoperative risk factors to correct for and minimize selection bias. A total of 7376 (3688 pairs) women undergoing CABG surgery were able to be successfully matched. In a propensity score computer-matched cohort, multivariate logistic regression (odds ratio) revealed that women undergoing on-pump surgery had a 73.3% higher mortality ($P=0.002$) and a 47.2% higher risk of bleeding complications ($P=0.019$). **CONCLUSIONS:** In a retrospective analysis of women undergoing CABG, computer-matched to minimize selection bias, off-pump surgery led to decreased mortality and morbidity including bleeding complications.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364829

Jama (2004);291:1821-2

Beat goes on in "off-pump" bypass surgery: surgeon experience may be key to best outcome

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15100183

Jama (2004);291:195-201

Procedural volume as a marker of quality for CABG surgery

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CONTEXT: There have been recent calls for using hospital procedural volume as a quality indicator for coronary artery bypass graft (CABG) surgery, but further research into analysis and policy implication is needed before hospital procedural volume is accepted as a standard quality metric. **OBJECTIVE:** To examine the contemporary association between hospital CABG procedure volume and outcome in a large national clinical database. **DESIGN, SETTING, ANDy fob**

CABG procedural volume and all-cause operative mortality (in-hospital or 30-day, whichever was longer). RESULTS: The median (interquartile range) annual hospital-isolated CABG volume was 253 (165-417) procedures, with 82% of centers performing fewer than 500 procedures per year. The overall operative mortality was 2.66%. After adjusting for patient risk and clustering effects, rates of operative mortality decreased with increasing hospital CABG volume (0.07% for every 100 additional CABG procedures; adjusted odds ratio [OR], 0.98; 95% confidence interval [CI], 0.96-0.99; P =.004). While the association between volume and outcome was statistically significant overall, this association was not observed in patients younger than 65 years or in those at low operative risk and was confounded by surgeon volume. The ability of hospital volume to discriminate those centers with significantly better or worse mortality was limited due to the wide variability in risk-adjusted mortality among hospitals with similar volume. Closure of up to 100 of the lowest-volume centers (ie, those performing < or =150 CABG procedures/year) was estimated to avert fewer than 50 of 7110 (<1% of total) CABG-related deaths. CONCLUSION: In contemporary practice, hospital procedural volume is only modestly associated with CABG outcomes and therefore may not be an adequate quality metric for CABG surgery.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14722145

Jama (2004);291:1841-9

Off-pump vs conventional coronary artery bypass grafting: early and 1-year graft patency, cost, and quality-of-life outcomes: a randomized trial

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CONTEXT: Previous trials of off-pump coronary artery bypass (OPCAB) have enrolled selected patients and have not rigorously evaluated long-term graft patency. A preliminary report showed OPCAB achieved improved inhospital outcomes, similar completeness of revascularization, and shorter lengths of stay compared with conventional coronary artery bypass grafting (CABG). OBJECTIVE: To assess graft patency, clinical and quality-of-life outcomes, and cost among patients while in the hospital and at 1-year follow-up. DESIGN, SETTING, AND PATIENTS: Randomized controlled trial of patients unselected for coronary anatomy, ventricular function, or comorbidities between March 10, 2000, and August 20, 2001, at a US academic center. A total of 200 patients were enrolled; 3 patients were withdrawn after randomization for mitral valve repair or replacement. Follow-up was complete for 197 patients at 30 days; 185 at 1 year. INTERVENTIONS: One surgical session consisting of elective OPCAB or CABG with cardiopulmonary bypass. The surgeon had extensive experience performing off-pump surgery; patients were subsequently managed by blinded protocols. MAIN OUTCOME MEASURES: Coronary angiography documented graft patency prior to hospital discharge and at 1 year; health-related quality of life; and cost of the index and subsequent hospitalization(s). RESULTS: Graft patency was similar for OPCAB and conventional CABG with cardiopulmonary bypass at 30 days (absolute difference, 1.3%; 95% confidence interval [CI], -0.66% to 3.31%; P =.19) and at 1 year (absolute difference, -2.2%; 95% CI, -6.1% to 1.7%; P =.27). Rates of death, stroke, myocardial infarction, angina, and reintervention were similar at 30 days and 1 year. There were no

significant differences in health-related quality of life. Mean total hospitalization cost per patient at hospital discharge was 2272 dollars (95% CI, 755 dollars-3732 dollars) less for OPCAB (P =.002) and 1955 dollars (95% CI, -766 dollars to 4727 dollars) less at 1 year (P =.08). CONCLUSIONS: In this randomized single-surgeon trial among unselected patients with angiographic follow-up, OPCAB achieved similar graft patency in the hospital and at 1 year. Cardiac outcomes and health-related quality of life at 30 days and 1 year were similar and patients incurred a lower cost. OPCAB may provide complete revascularization that is durable and cost-effective.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15100202

J Am Coll Cardiol (2004);43:557-64

A comparison of short- and long-term outcomes after off-pump and on-pump coronary artery bypass graft surgery with sternotomy

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OBJECTIVES: This study was designed to compare in-hospital mortality and complications and three-year mortality and revascularization for off-pump and on-pump coronary artery bypass graft (CABG) surgery after adjusting for patient risk.

BACKGROUND: The use of off-pump CABG surgery has increased tremendously in recent years, but little is known about its long-term outcomes relative to on-pump CABG surgery, and most studies have been very small. **METHODS:** Short- and long-term outcomes (inpatient mortality and complications, three-year risk-adjusted mortality, and mortality/revascularization) were explored for patients who underwent off-pump CABG surgery (9135 patients) and on-pump CABG surgery (59044 patients) with median sternotomy from 1997 to 2000 in the state of New York. **RESULTS:** Risk-adjusted inpatient mortality was 2.02% for off-pump versus 2.16% for on-pump (p = 0.390). Off-pump patients had lower rates of perioperative stroke (1.6% vs. 2.0%, p = 0.003) and bleeding requiring reoperation (1.6% vs. 2.2%, p < 0.001) and higher rates of gastrointestinal bleeding, perforation, or infarction (1.2% vs. 0.9%, p = 0.003). Off-pump patients had lower postoperative lengths of stay (median 5 days vs. 6 days, p < 0.001). On-pump patients had higher three-year survival (adjusted risk ratio [RR] =1.086, p = 0.045) and higher freedom from death or revascularization (adjusted RR = 1.232, p < 0.001). When analyses were limited to 1999 to 2000, the two-year adjusted hazard ratio for survival pcratOff-p for 0.05-4.5(al)6cw5.9f&lvz-5.1

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OBJECTIVES: A simple risk score on admission to estimate the likelihood of in-hospital coronary artery bypass graft surgery (CABG) might be useful in selecting patients for early clopidogrel therapy. **BACKGROUND:** Routine early use of clopidogrel in patients with unstable angina (UA) and non-ST-segment elevation myocardial infarction (NSTEMI) is associated with increased risk of bleeding in patients who undergo early CABG. **METHODS:** The test cohort utilized to derive the score was the 2,220 patients with UA/NSTEMI enrolled in the Treat Angina with Aggrastat and Determine Cost of Therapy with an Invasive or Conservative Strategy-Thrombolysis in Myocardial Infarction-18 (TACTICS-TIMI-18) trial. Patients who underwent CABG after randomization during index hospitalization were identified and were compared with patients who did not undergo in-hospital CABG. **RESULTS:** Overall, 362 patients (16.3%) underwent CABG during the index hospitalization. Patients with a history of prior CABG (n = 484) were significantly less likely to undergo in-hospital CABG (odds ratio [OR], 0.34). Five additional variables independently associated with CABG were identified: elevated troponin (OR, 3.9), prior stable angina (OR, 1.8), ST-segment deviation ≥ 0.5 mm (OR, 1.7), male gender (OR, 1.6), and history of peripheral arterial disease (OR, 1.6). A CABG risk score was generated by assigning numerical values to each of the variables based upon these odds ratios. Coronary artery bypass surgery rates increased significantly with increasing risk scores (6.2% for a risk score < 3.0 , 21.9% for 3 to 5, and 54.6% for > 5.0). The association of the risk score with CABG was highly significant ($p < 0.0001$, c-statistic 0.72). The association remained significant in the validation cohorts from TIMI-11B trial and TIMI-III registry.

CONCLUSIONS: Among patients with UA/NSTEMI, a novel risk score based on admission clinical variables can be used to estimate the likelihood of CABG. These data may assist in the identification of patients who might derive optimal benefit from early initiation of clopidogrel therapy.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15312862

Am J Cardiol (2004);94:118-20

Outcome of percutaneous coronary intervention versus coronary bypass grafting for patients with low left ventricular ejection fractions, unstable angina pectoris, and risk factors for adverse outcomes with bypass (the AWESOME Randomized Trial and Registry)

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The recently concluded Angina With Extremely Serious Operative Mortality Evaluation (AWESOME) was a randomized clinical trial of percutaneous coronary intervention versus coronary bypass graft surgery among patients with medically refractory ischemia who were at high risk for coronary bypass graft surgery because of $>$ or $= 1$ risk factors that included severely reduced left ventricular (LV) function, defined as LV ejection fraction $< 35\%$. This study reports the outcome of patients with LV ejection fraction $< 35\%$ in the randomized clinical trial and the physician-directed and patient choice registries of the AWESOME study.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15219521

Am J Cardiol (2004);93:959-62

Minimally invasive coronary artery bypass grafting versus stenting for patients with proximal left anterior descending coronary artery disease

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The purpose of this study was to compare the clinical outcomes of stenting and minimally invasive coronary artery bypass grafting (MIDCAB) in patients with proximal left anterior descending (LAD) coronary artery disease. The Patency, Outcome, Economics of Minimally invasive direct coronary bypass (POEM) study demonstrated that MIDCAB had similar safety and long-term efficacy for LAD revascularization compared with conventional coronary artery bypass grafting. Although LAD stenting is superior to conventional balloon angioplasty, whether it is comparable to MIDCAB is not known. We identified a matched population of 429 consecutive patients with 1-vessel disease who underwent elective proximal LAD stenting and compared their clinical outcomes with those of the 152 patients in the MIDCAB group of the POEM study. The in-hospital event rate was similar in both groups, except for a shorter length of hospital stay with LAD stenting compared with MIDCAB (2.68 vs 4.07 days, $p < 0.0001$). At 6-month follow-up, the incidence of death and Q-wave myocardial infarction or that of cerebrovascular accident was not significantly different between these 2 groups. However, target vessel revascularization was significantly higher with LAD stenting than MIDCAB (13.3% vs 6.6%, $p = 0.045$). In the subgroup of patients without diabetes, all clinical events were similar in both groups, and the benefit of a shorter hospital stay associated with stenting was maintained. Compared with MIDCAB, LAD stenting is associated with higher repeat revascularization rates but offers the advantage of shorter hospitalization. For nondiabetics with proximal LAD disease, stenting may be the revascularization strategy of choice.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15219521

PATIENTS: 988 patients with multivessel disease. **INTERVENTIONS:** CABG and stent assisted PCI. **MAIN OUTCOME MEASURES:** Initial hospitalisation and one year follow up costs. **RESULTS:** At one year mortality was 2.5% in the PCI arm and 0.8% in the CABG arm ($p = 0.05$). There was no difference in the composite of death or Q wave myocardial infarction (6.9% for PCI v 8.1% for CABG, $p = 0.49$). There were more repeat revascularisations with PCI (17.2% v 4.2% for CABG). There was no significant difference in utility between arms at six months or at one year. Quality adjusted life years were similar 0.6938 for PCI v 0.6954 for PCI, Delta = 0.00154, 95% confidence interval (CI) -0.0242 to 0.0273). Initial length of stay was longer with CABG (12.2 v 5.4 days with PCI, $p < 0.0001$) and initial hospitalisation costs were higher (7321 pounds sterling v 3884 pounds sterling for PCI, Delta = 3437 pounds sterling, 95% CI 3040 pounds sterling to 3848 pounds sterling). At one year the cost difference narrowed but costs remained higher for CABG (8905 pounds sterling v 6296 pounds sterling for PCI, Delta = 2609 pounds sterling, 95% CI 1769 pounds sterling to 3314 pounds sterling). **CONCLUSIONS:** Over one year, CABG was more expensive and offered greater survival than PCI but little added benefit in terms of quality adjusted life years. The additional cost of CABG can be justified only if it offers continuing benefit at no further increase in cost relative to PCI over several years.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15201249

Jama (2004);292:1961-8

Outcomes of percutaneous coronary interventions performed at centers without and with onsite coronary artery bypass graft surgery

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CONTEXT: An ongoing debate focuses on whether institutions should perform percutaneous coronary interventions (PCIs) without an onsite coronary artery bypass graft (CABG) surgery program. **OBJECTIVE:** To compare patient outcomes following PCI at US institutions performing this procedure without and with onsite cardiac surgery. **DESIGN, SETTING, AND PATIENTS:** Medicare hospital (part A) data were used to identify PCIs performed on fee-for-service Medicare enrollees ($n = 625,854$) aged at least 65 years at acute care facilities between January 1, 1999, and December 1, 2001. Hospitals without and with onsite cardiac surgery were identified based on the presence of claims for CABG surgery. Patients were characterized as undergoing primary/rescue PCI, defined as an emergency procedure performed on the same day of admission for an acute myocardial infarction (MI), vs all other PCIs. **MAIN OUTCOME MEASURES:** Post-PCI CABG surgery and combined in-hospital and 30-day mortality. **RESULTS:** A total of 178 hospitals performed PCIs without onsite cardiac surgery and 943 hospitals performed PCIs with onsite cardiac surgery. Patients undergoing PCIs in hospitals without onsite cardiac surgery were similar to those with onsite cardiac surgery with respect to age, sex, race, and measurable comorbidities; however, patients undergoing PCIs in hospitals without onsite cardiac surgery were more likely to have a primary/rescue PCI (22.0% vs 5.6%, $P < .001$). Patients undergoing PCIs in hospitals without cardiac surgery were more likely to die (6.0% vs 3.3%; adjusted odds ratio [OR], 1.29; 95% confidence interval [CI], 1.14-1.47; $P < .001$). After accounting for baseline

differences, mortality for patients with primary/rescue PCI was similar in institutions without and with cardiac surgery (adjusted OR, 0.93; 95% CI, 0.80-1.08; P =.34). However, for the larger non-primary/rescue PCI population, mortality was higher in hospitals without onsite cardiac surgery (adjusted OR, 1.38; 95% CI, 1.14-1.67; P=.001). This increase in mortality was primarily confined to hospitals performing 50 or less Medicare PCIs per year. CONCLUSIONS: Percutaneous coronary interventions in hospitals without onsite cardiac surgery are often performed for reasons other than immediate treatment of an MI and are associated with a higher risk of adverse outcomes. Policies aimed at increasing access to primary/rescue PCI through promoting PCI in hospitals without cardiac surgery may inadvertently lead to an overall increase in mortality related to PCI.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15507581

Circulation (2004);110:3418-23

One-year coronary bypass graft patency: a randomized comparison between off-pump and on-pump surgery angiographic results of the PRAGUE-4 trial

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BACKGROUND: Off-pump coronary bypass surgery has become a widely used technique during recent years. However, limited data are available with regard to 1-year patency of bypass grafts implanted on the beating heart in unselected consecutive bypass surgery candidates. The aim of this study was to compare 1-year angiographic patency of bypass grafts done on the beating heart (off pump) with those done classically (on pump). METHODS AND RESULTS: The PRAGUE-4 trial randomized 400 consecutive nonselected cardiac surgery candidates into group A (on pump; n=192) and group B (off pump; n=208). One-year follow-up coronary angiography was done in 255 patients. The arterial graft patency after 1 year was 91% in both groups. Saphenous graft patency was 59% (on pump) versus 49% (off pump; P=NS). Saphenous graft patency per patient was lower in the off-pump group: 0.7 patent anastomosis per patient versus 1.1 patent anastomosis in the on-pump group (P<0.01). There were 46% on-pump patients with all grafts patent versus 52% off-pump patients (P=NS). Grafts anastomosed distally to collateralized chronic total occlusions of native coronary arteries remained patent in 100% on the left anterior descending artery compared with 23% on other arteries (P<0.0001). CONCLUSIONS: The patency of arterial coronary bypass grafts done on the beating heart is excellent and equal to grafts done on pump. The off-pump procedure in the unselected patient population results in fewer patent saphenous grafts per patient.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15557371

Circulation (2004);110:784-9

Is the impact of hospital and surgeon volumes on the in-hospital mortality rate for coronary artery bypass graft surgery limited to patients at high risk?

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BACKGROUND: Restriction of volume-based referral for CABG surgery to high-risk patients has been suggested, and earlier studies have reached different conclusions regarding volume-based referral for low-risk patients. **METHODS AND RESULTS:** Patients who underwent isolated CABG surgery in New York from 1997 through 1999 (n=57 150) were separated into low-risk and moderate-to-high-risk groups with a predicted probability of in-hospital death of 2% as the cutoff point. The provider volume-mortality relationship was examined for both groups. For annual hospital volume thresholds between 200 and 600 cases, the adjusted ORs of in-hospital mortality for high-volume to low-volume hospitals ranged from 0.45 to 0.77 and were all significant for the low-risk group; for the moderate-to-high-risk group, ORs ranged from 0.62 to 0.91, and most were significant. The number needed to treat at higher-volume hospitals to avoid 1 death was greater for the low-risk group (a range of 114 to 446 versus 37 to 184). As the annual surgeon volume threshold increased from 50 to 150 cases, the ORs for high- to low-volume surgeons increased from 0.43 to 0.74 for the low-risk group; for the moderate-to-high-risk group, ORs ranged from 0.79 to 0.86. Compared with patients treated by surgeons with volumes of <125 in hospitals with volumes of <600, patients treated by higher-volume surgeons in higher-volume hospitals had a significantly lower risk of death; in particular, the OR was 0.52 for the low-risk group. **CONCLUSIONS:** For both low-risk and moderate-to-high-risk patients, higher provider volume is associated with lower risk of death.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15302792

Circulation (2004);109:1489-96

Improved survival with radial artery versus vein conduits in coronary bypass surgery with left internal thoracic artery to left anterior descending artery grafting

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BACKGROUND: Given its proven survival benefit, left internal thoracic artery to left anterior descending (LITA-LAD) grafting has become a fundamental part of CABG. This grafting also led to increased use of other arterial conduits, of which the radial artery is most popular. Whether radial grafting improves survival beyond that achieved by LITA-LAD alone is not known. **METHODS AND RESULTS:** We compared 6-year outcomes in propensity-matched CABG-LITA-LAD patients (925 each) divided into those with > or =1 radial grafts and those with vein-only grafting. Matched patients had essentially identical demographics, comorbidities, coronary disease, and operative data. Perioperative outcomes, including death (radial, 11 [1.2%]; vein, 10 [1.1%]), were similar for the 2 groups. Cumulative 0- to 6-year survival was better for radial patients (risk ratio, 0.675), particularly after 3 years (P<0.03). Six-year survival in vein (86.8%) and radial (92.1%) patients indicated 67% greater overall vein mortality. Incidence rates of radial and vein repeated catheterization (190 of 925 [20.5%] versus 199 of 925 [21.5%]) and revascularization (8.8% versus 8.5%) were similar. Angiography data in restudied symptomatic patients showed a trend for greater radial patency. Vein failure (66 of 161 [41%]) was significantly worse than radial failure (46 of 157 [29.3%]) in patients receiving both types of grafts (P=0.039). **CONCLUSIONS:** Using radial as a

second arterial conduit in CABG-LITA-LAD as opposed to vein grafting improves long-term outcomes as a result of decreased late deaths, especially after the third postoperative year.

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