

**Одна болезнь – два подхода**

## Больной Я, 71 года

- Обширное рубцовое поражение
- Достаточный объем жизнеспособного миокарда, гибернирующего на фоне “стволового” поражения
- Ожидаемый эффект реваскуляризации на сократимость ЛЖ

## Больной Т, 71 года

- Обширное рубцовое поражение
- Отсутствие признаков ишемии сохранного миокарда и отсутствие жизнеспособного миокарда в рубцовой зоне
- Реваскуляризация не окажет эффекта на сократимость ЛЖ

# Хирургическое лечение ИБС и ХСН у пациентов с низкой ФВЛЖ

## Исследования с 1993-2000гг показавшие эффективность КШ при ФВЛЖ≤35%

### Failure to Improve Left Ventricular Function After Coronary Revascularization for Ischemic Cardiomyopathy Is Not Associated With Worse Outcome

Habib Samady, MD; John A. Elefteriades, MD; Brian G. Abbott, MD; Jennifer A. Mattera, Craig A. McPherson, MD; Frans J Th. Wackers, MD

**Background**—Preoperative identification of viable myocardium in patients with ischemic cardiomyopathy is important because CABG can result in recovery of left ventricular (LV) function. However, the hypothesis improvement of LV function after CABG is associated with poorer patient outcome is untested.

**Methods and Results**—Outcome was compared in patients with ischemic LV dysfunction (LVEF ≤35%) with improvement in LVEF after CABG. Of 135 consecutive patients, 128 (95%) survived CABG and 104 (77%) had post-CABG LVEF assessment. Of these 104 patients, 68 (65%) had >0.05 increase in LVEF (group A), 35% had no significant change, or ≤0.05 decrease in LVEF (group B) compared with pre-CABG. Significant differences existed in age, gender, comorbidities, baseline symptoms, baseline LVEF, or its variables between groups A and B. Group A increased LVEF from  $0.24 \pm 0.15$  to  $0.39 \pm 0.1$  ( $P < 0.005$ ). LVEF did not change significantly postoperatively:  $0.24 \pm 0.05$  to  $0.23 \pm 0.06$  ( $P = NS$ ). Preoperative angina and heart failure scores were similar between the 2 groups. Survival free of cardiac death was similar (90% in group A and 94% in group B,  $P = NS$ ) at a mean follow-up of  $52 \pm 25$  months.

**Conclusions**—Lack of improvement of global LVEF after CABG is not associated with poorer outcome. Lack of improvement in ventricular function, protects against future infarction and death. (Circulation 1999;100:1398-1404.)

### Effect of Left Ventricular Volume on Results of Coronary Artery Bypass Grafting

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**S**election criteria to determine which patients with ischemic cardiomyopathy will benefit most from coronary artery bypass grafting (CABG) are poorly defined. It has been suggested that patients with both ischemic cardiomyopathy and significant left ventricular (LV) dilation have a poor outcome after surgical revascularization and should undergo transplantation instead. We retrospectively analyzed our series of CABG patients with ischemic cardiomyopathy to determine if preoperative LV dilation adversely impacted surgical revascularization.

Preoperative equilibrium radionuclide angiography constituted the study group. During the same period, 1,797 isolated CABG were performed at our institution, of which 12.9% (232) had a preoperative LV ejection fraction ≤30%. One hundred eighty-five CABG patients with ejection fractions ≤30% (79.7%) were not assessed by equilibrium radionuclide angiography and were not included in this study. Five patients who underwent associated procedures, such as aneurysmectomy or mitral valve repair, in addition to CABG, were excluded from analysis. E

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November 1, 1993:1411-7

1411

### Coronary Artery Bypass Grafting in Severe Left Ventricular Dysfunction: Excellent Survival With Improved Ejection Fraction and Functional State

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**Objectives.** The present study evaluated our experience with coronary artery bypass grafting in patients with severe left ventricular dysfunction.

**Background.** Despite the excellent prognosis of advanced ischemic cardiomyopathy, coronary artery bypass grafting in this setting remains controversial because of concerns over operative risk and lack of functional or survival benefit.

**Methods.** We analyzed the data of 83 consecutive patients (69 men, 14 women, aged 42 to 83 years (mean 66.8)) with a left ventricular ejection fraction ≤30% who underwent isolated coronary artery bypass grafting (without aneurysmectomy, valve replacement or other open heart procedures) performed by one surgeon during a 6-year period. The ejection fraction ranged from 10% to 30% (mean 24.6%). Preoperatively, 49% of patients had angina, 52% had congestive heart failure (17% with pulmonary edema) and 30% manifested significant ventricular arrhythmias. The mean number of grafts was 2.7/patient. The internal mammary artery was used in 82% of grafts to the left anterior descending coronary artery. The intraaortic balloon pump was required therapeutically (for angina or pump failure) in 19% of patients and was prophylactically placed preoperatively in another 43% of patients.

**Results.** The hospital mortality rate was 8.4% (7 of 83). The mortality rate was 3.3% (2 of 61) in those patients who did not require admission to an intensive care unit immediately before operation. Canadian Cardiovascular Society angina class improved postoperatively by 1.9 categories and New York Heart Association congestive heart failure class by 1 category. Left ventricular ejection fraction (assessed postoperatively in 68 of 76 hospital survivors) improved from 24.6% preoperatively to 33.2% postoperatively (36% increase) ( $p < 0.001$ ). At 1 and 3 years, respectively, all-cause survival was 87% and 80% and freedom from cardiac death was 89.8% and 84.5%.

**Conclusions.** In patients with coronary artery disease and advanced ventricular dysfunction: 1) coronary artery bypass grafting can be performed relatively safely; 2) good medium-term survival is attained; 3) improvement in left ventricular function can be documented objectively after bypass grafting; 4) quality of life is improved (as reflected by improvement in anginal and congestive heart failure status); and 5) the internal mammary artery can safely be used as a conduit. The use of coronary artery bypass grafting is encouraged for this group of patients and may provide a viable alternative to transplantation in selected patients. (J Am Coll Cardiol 1993;22:1411-7)

# Хирургическое лечение ИБС и ХСН у пациентов с низкой ФВЛЖ

## Исследования STICH и STICHES 2002-2012гг

THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

### Coronary-Artery Bypass Surgery in Patients with Left Ventricular Dysfunction

Eric J. Velazquez, M.D., Kerry L. Lee, Ph.D., Marek A. Deja, M.D., Ph.D., Anil Jain, M.D., George Sopko, M.D., M.P.H., Andrey Marchenko, M.D., Ph.D., Imtiaz S. Ali, M.D., Gerald Pohost, M.D., Sinisa Gradinac, M.D., Ph.D., William T. Abraham, M.D., Michael Yui, M.S., F.R.C.S., F.R.A.C.S., Dorairaj Prabhakaran, M.D., D.M., Hanna Szwed, M.D., Paolo Ferrazzi, M.D., Mark C. Petrie, M.D., Christopher M. O'Connor, M.D., Pradit Panchavinnin, M.D., Lilin She, Ph.D., Robert O. Bonow, M.D., Gena Roush Rankin, M.P.H., R.D., Robert H. Jones, M.D., and Jean-Lucien Rouleau, M.D., for the STICH Investigators\*

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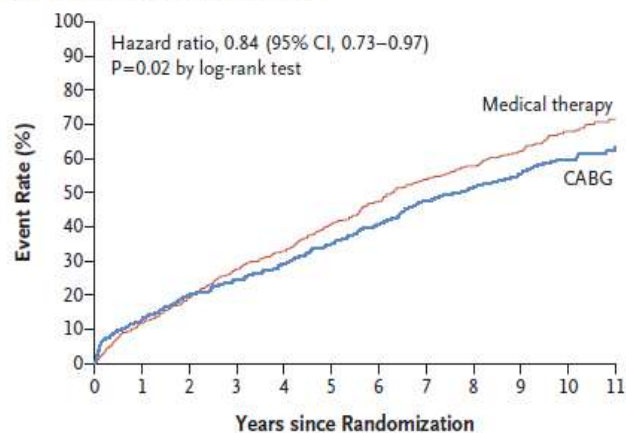
### Coronary-Artery Bypass Surgery in Patients with Ischemic Cardiomyopathy

Eric J. Velazquez, M.D., Kerry L. Lee, Ph.D., Robert H. Jones, M.D., Hussein R. Al-Khalidi, Ph.D., James A. Hill, M.D., Julio A. Panza, M.D., Robert E. Michler, M.D., Robert O. Bonow, M.D., Torsten Doenst, M.D., Mark C. Petrie, M.D., Jae K. Oh, M.D., Lilin She, Ph.D., Vanessa L. Moore, A.A.S., Patrice Desvigne-Nickens, M.D., George Sopko, M.D., M.P.H., and Jean L. Rouleau, M.D., for the STICHES Investigators\*

# Хирургическое лечение ИБС и ХСН у пациентов с низкой ФВЛЖ

## Исследование STICHES(10-летнее наблюдение)

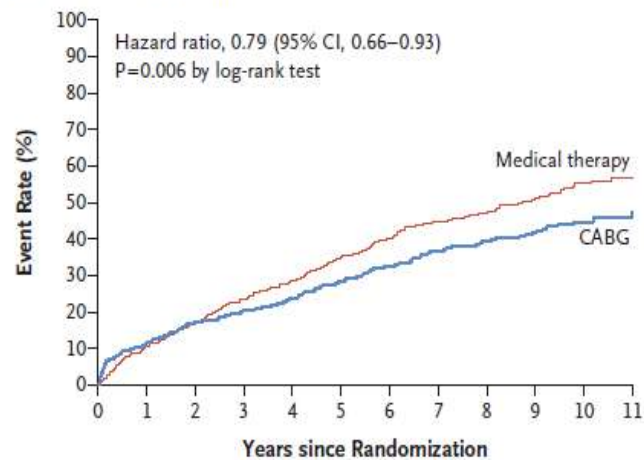
**A** Death from Any Cause (Primary Outcome)



No. at Risk

Medical therapy	602	532	487	435	404	357	315	274	248	164	82	37
CABG	610	532	487	460	432	392	356	312	286	205	103	42

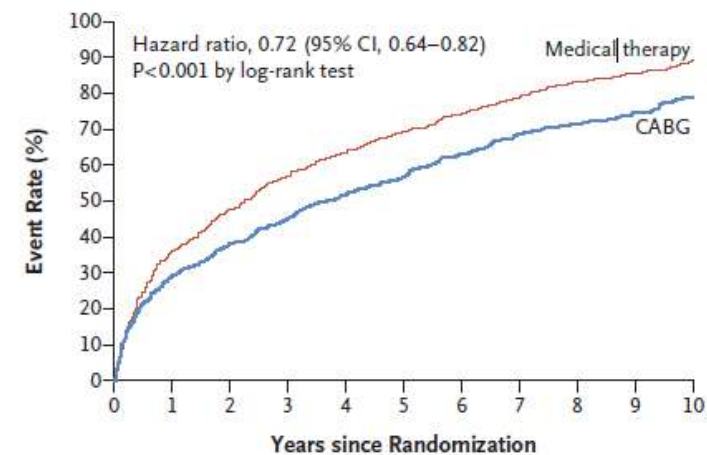
**B** Death from Cardiovascular Causes



No. at Risk

Medical therapy	602	532	487	435	404	357	315	274	248	164	82	37
CABG	610	532	487	460	432	392	356	312	286	205	103	42

**C** Death from Any Cause or Cardiovascular Hospitalization



No. at Risk

Medical therapy	602	385	314	259	219	185	152	123	98	57	19
CABG	610	431	376	334	293	259	218	184	166	106	43



# Диагностика жизнеспособного миокарда

- Должна проводиться у всех кандидатов на реваскуляризацию с низкой ФВЛЖ
- Нет единого мнения о методе выбора в диагностике жизнеспособного миокарда
- Перед АКШ предпочтительнее МРТ сердца с гадолинием, так как: относительно безопасно, позволяет не только качественно, но и количественно оценить жизнеспособный миокард

## Recommendations for non-invasive imaging in patients with coronary artery disease and heart failure with reduced ejection fraction

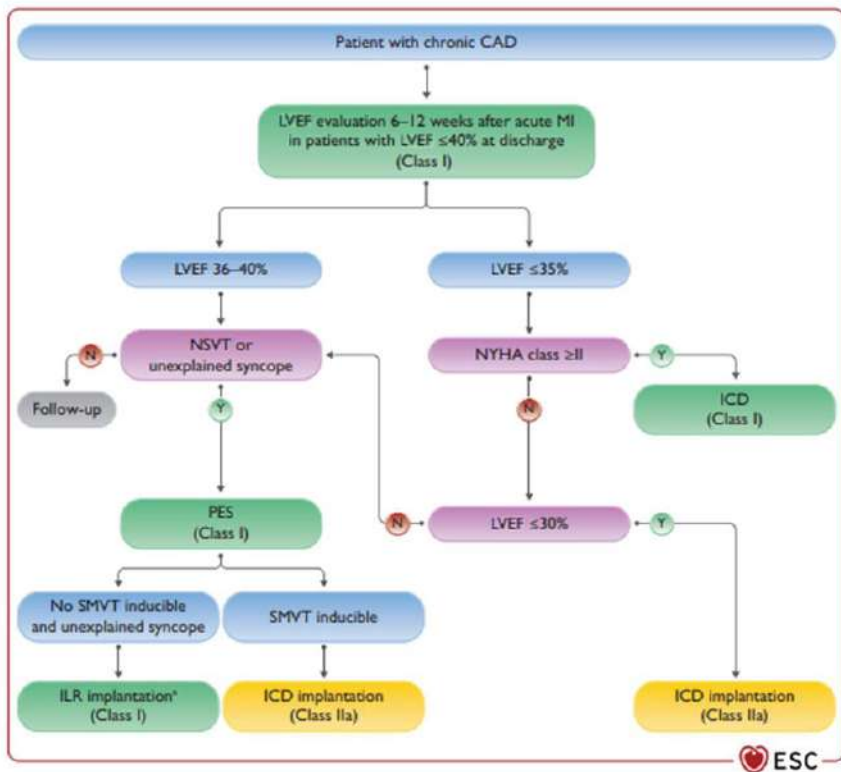
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Non-invasive stress imaging (CMR, stress echocardiography, SPECT, or PET) may be considered for the assessment of myocardial ischaemia and viability in patients with HF and CAD (considered suitable for coronary revascularization) before the decision on revascularization. <sup>9–11</sup>	IIb	B

2018 ESC/EACTS Guidelines on myocardial revascularization

# Профилактика внезапной смерти у пациентов с низкой ФВЛЖ

## 2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death

Developed by the task force for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death of the European Society of Cardiology (ESC)



### Recommendation Table 24 — Recommendations for risk stratification, sudden cardiac death prevention, and treatment of ventricular arrhythmias in chronic coronary artery disease

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Risk stratification and primary prevention of SCD</b>		
In patients with syncope and previous STEMI, PES is indicated when syncope remains unexplained after non-invasive evaluation. <sup>146,584</sup>	I	C
ICD therapy is recommended in patients with CAD, symptomatic heart failure (NYHA class II–III), and LVEF ≤35% despite ≥3 months of OMT. <sup>354,356</sup>	I	A
ICD therapy should be considered in patients with CAD, NYHA class I, and LVEF ≤30% despite ≥3 months of OMT. <sup>354</sup>	IIa	B
ICD implantation should be considered in patients with CAD, LVEF ≤40% despite ≥3 months of OMT, and NSVT, if they are inducible for SMVT by PES. <sup>355</sup>	IIa	B
In patients with CAD, prophylactic treatment with AADs other than beta-blockers is not recommended. <sup>556,578,579</sup>	III	A
<b>Secondary prevention of SCD and treatment of VAs</b>		
ICD implantation is recommended in patients without ongoing ischaemia with documented VF or haemodynamically not-tolerated VT occurring later than 48 h after MI. <sup>349–351</sup>	I	A
In patients with CAD and recurrent, symptomatic SMVT, or ICD shocks for SMVT despite chronic amiodarone therapy, catheter ablation is recommended in preference to escalating AAD therapy. <sup>471</sup>	I	B

### Recommendation Table 23 — Recommendations for risk stratification and treatment of ventricular arrhythmias early after myocardial infarction

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Risk stratification</b>		
Early (before discharge) assessment of LVEF is recommended in all patients with acute MI. <sup>567,568</sup>	I	B
In patients with pre-discharge LVEF ≤40%, re-evaluation of LVEF 6–12 weeks after MI is recommended to assess the potential need for primary prevention ICD implantation. <sup>568,573,574</sup>	I	C
<b>Treatment of VAs</b>		
Catheter ablation should be considered in patients with recurrent episodes of PVT/VF triggered by a similar PVC non-responsive to medical treatment or coronary revascularization in the subacute phase of MI. <sup>322</sup>	IIa	C

ICD, implantable cardioverter defibrillator; LVEF, left ventricular ejection fraction; MI, myocardial infarction; PVC, premature ventricular complex; PVT, polymorphic ventricular tachycardia; VA, ventricular arrhythmia; VF, ventricular fibrillation.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

**Figure 15** Algorithm for risk stratification and primary prevention of sudden cardiac death in patients with chronic coronary artery disease and reduced ejection fraction. CAD, coronary artery disease; ICD, implantable cardioverter defibrillator; ILR, implantable loop recorder; LVEF, left ventricular ejection fraction; MI, myocardial infarction; N, No; NSVT, non-sustained ventricular tachycardia; NYHA, New York Heart Association; PES, programmed electrical stimulation; SMVT, sustained monomorphic ventricular tachycardia; Y, Yes. <sup>a</sup>The 2018 ESC Guidelines for the diagnosis and management of syncope.<sup>1</sup>



# Профилактика внезапной смерти у пациентов с низкой ФВЛЖ



European Heart Journal (2021) 42, 3599–3726  
doi:10.1093/eurheartj/ehab368

ESC GUIDELINES

## 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

With the special contribution of the Heart Failure Association (HFA) of the ESC

### Recommendations for an implantable cardioverter-defibrillator in patients with heart failure

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Secondary prevention</b>		
An ICD is recommended to reduce the risk of sudden death and all-cause mortality in patients who have recovered from a ventricular arrhythmia causing haemodynamic instability, and who are expected to survive for >1 year with good functional status, in the absence of reversible causes or unless the ventricular arrhythmia has occurred <48 h after a MI. <sup>162–164</sup>	I	A
<b>Primary prevention</b>		
An ICD is recommended to reduce the risk of sudden death and all-cause mortality in patients with symptomatic HF (NYHA class II–III) of an ischaemic aetiology (unless they have had a MI in the prior 40 days—see below), and an LVEF ≤35% despite ≥3 months of OMT, provided they are expected to survive substantially longer than 1 year with good functional status. <sup>161,165</sup>	I	A

Downloaded from <https://academic.oup.com/eurh>

## 2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

Developed by the Task Force on cardiac pacing and cardiac resynchronization therapy of the European Society of Cardiology (ESC)

With the special contribution of the European Heart Rhythm Association (EHRA)

### Recommendation for patients with heart failure and atrioventricular block

Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
CRT rather than RV pacing is recommended for patients with HFrEF (<40%) regardless of NYHA class who have an indication for ventricular pacing and high-degree AVB in order to reduce morbidity. This includes patients with AF. <sup>183,190,196,268,313,323,357–359,361,362</sup>	I	A

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AF = atrial fibrillation; AVB = atrioventricular block; CRT = cardiac resynchronization therapy; HF = heart failure; HFrEF = heart failure with reduced ejection fraction (<40%) according to the 2021 ESC HF Guidelines;<sup>2,42</sup> NYHA = New York Heart Association; RV = right ventricular.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

### Recommendation for upgrade from right ventricular pacing to cardiac resynchronization therapy

Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
Patients who have received a conventional pacemaker or an ICD and who subsequently develop symptomatic HF with LVEF ≤35% despite OMT, and who have a significant <sup>c</sup> proportion of RV pacing, should be considered for upgrade to CRT. <sup>37,148,185,190,324–352</sup>	IIa	B

CRT = cardiac resynchronization therapy; HF = heart failure; ICD = implantable cardioverter-defibrillator; LVEF = left ventricular ejection fraction; OMT = optimal medical therapy; RV = right ventricular.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

<sup>c</sup>A limit of 20% RV pacing for considering interventions for pacing-induced HF is supported by observational data. However, there are no data to support that any percentage of RV pacing can be considered as defining a true limit below which RV pacing is safe and beyond which RV pacing is harmful.

### Recommendations for cardiac resynchronization therapy in patients in sinus rhythm

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>LBBB QRS morphology</b>		
CRT is recommended for symptomatic patients with HF in SR with LVEF ≤35%, QRS duration ≥150 ms, and LBBB QRS morphology despite OMT, in order to improve symptoms and reduce morbidity and mortality. <sup>37,39,40,254–266,283,284</sup>	I	A
CRT should be considered for symptomatic patients with HF in SR with LVEF ≤35%, QRS duration 130–149 ms, and LBBB QRS morphology despite OMT, in order to improve symptoms and reduce morbidity and mortality. <sup>37,39,40,254–266,283,284</sup>	IIa	B
<b>Non-LBBB QRS morphology</b>		
CRT should be considered for symptomatic patients with HF in SR with LVEF ≤35%, QRS duration ≥150 ms, and non-LBBB QRS morphology despite OMT, in order to improve symptoms and reduce morbidity. <sup>37,39,40,254–266,283,284</sup>	IIa	B
CRT may be considered for symptomatic patients with HF in SR with LVEF ≤35%, QRS duration 130–149 ms, and non-LBBB QRS morphology despite OMT, in order to improve symptoms and reduce morbidity. <sup>273–278,281</sup>	IIb	B

# ИКД и CRT у пациентов с LVAD

- У пациентов с уже имплантированным CRT-D существуют 2 тактики – с эксплантацией левожелудочкового электрода и продолжением бивентрикулярной стимуляции.
- Есть данные об отсутствии разницы в конечных точках (выживаемость, трансплантация сердца, жизнеугрожающие аритмии) у пациентов с CRT-D+LVAD и ИКД+LVAD [1].
- В другом исследовании у пациентов с LVAD и левожелудочковой стимуляцией наблюдали более высокую частоту возникновения мономорфной ЖТ в раннем послеоперационном периоде после имплантации LVAD [2].

1. *Continued versus Suspended Cardiac Resynchronization Therapy after Left Ventricular Assist Device Implantation. Henry Roukoz et al. Scientific Reports volume 10, Article number: 2573 (2020)*

2. *Association between biventricular pacing and incidence of ventricular arrhythmias in the early post-operative period after left ventricular assist device implantation. Andrew Chou MD et al. Journal of Cardiovascular Electrophysiology volume 33, Issue 5, Pages 1024-1031 May 2022*