Operative Myokardrevaskularisation im akuten Myokardinfarkt - Sinn oder Unsinn?

Situationen und potentielle Vorteile für ein operatives Vorgehen

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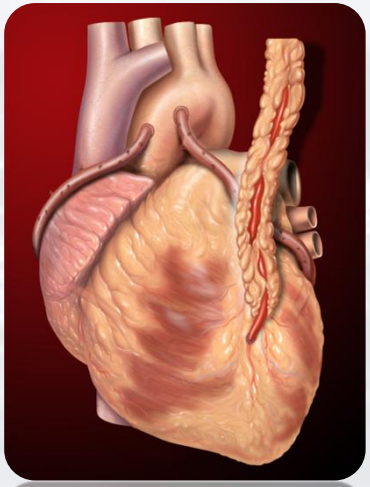
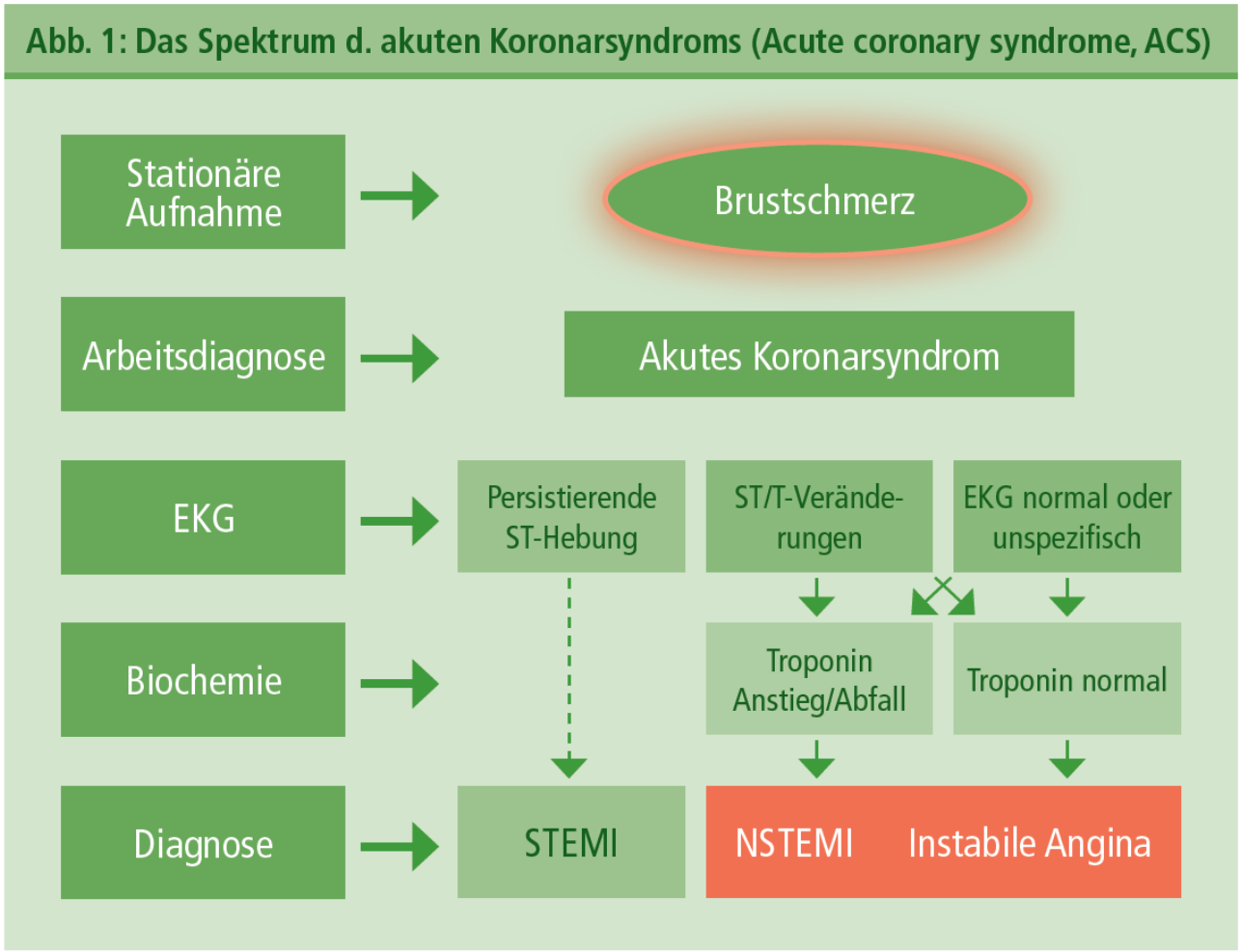


Klinik und Klassifikation des akuten Koronarsyndroms



ESC/DGK Pocket Guidelines 2011

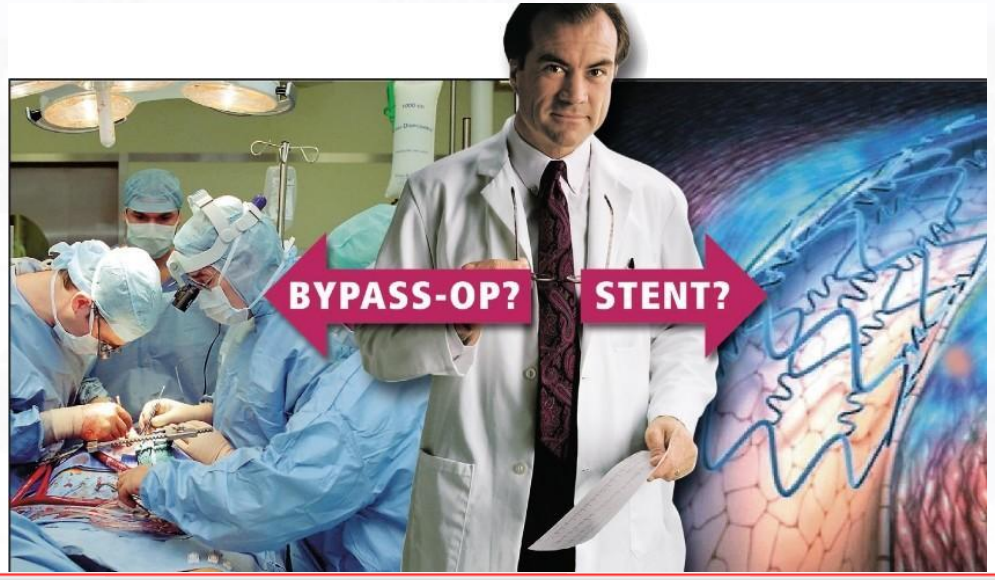
Akutes Koronarsyndrom

↓

Umgehende Koronardiagnostik

↓

Primäre Revaskularisationstrategie?



European Heart Journal (2014) **35**, 2541–2619
doi:10.1093/eurheartj/ehu278

ESC/EACTS GUIDELINES

2014 ESC/EACTS Guidelines on myocardial revascularization

STEMI

"Delays in the timely implementation of reperfusion therapy are key issues in the management of STEMI, since the greatest benefit gained from reperfusion therapy occurs within the first 2–3 hours of symptom onset. The aim is to provide optimal care while minimizing delays, in order to improve clinical outcomes"

European Heart Journal (2014) **35**, 2541–2619
doi:10.1093/eurheartj/ehu278

ESC/EACTS GUIDELINES

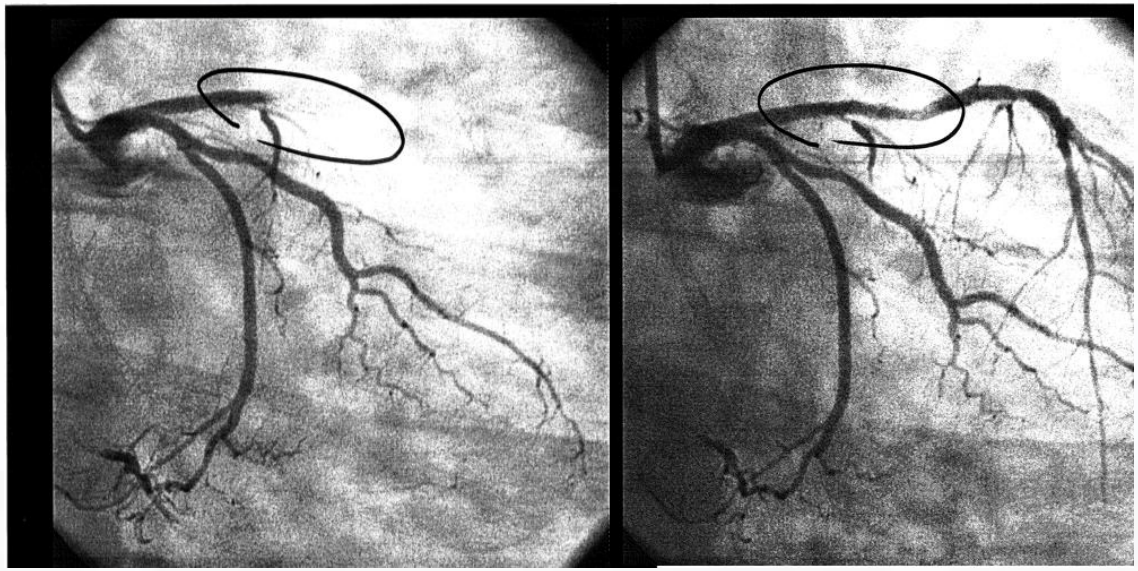
2014 ESC/EACTS Guidelines on myocardial revascularization

NSTE-ACS:

“Patients at very high risk (as defined above) should be considered for urgent coronary angiography (in less than 2 hours). In patients at high risk, with at least one primary high-risk criterion, an early invasive strategy within 24 hours appears to be the reasonable timescale. In lower-risk subsets […] the invasive evaluation can be delayed without increased risk but should be performed during the same hospital stay”

Was tun?

Realität



“Culprit-lesion PCI is usually the first choice in most patients with NSTE-ACS and multivessel disease“

2014 ESC/EACTS Guidelines on myocardial revascularization. Eur Heart J. 2014

European Heart Journal (2014) **35**, 2541–2619
doi:10.1093/eurheartj/ehu278

ESC/EACTS GUIDELINES

2014 ESC/EACTS Guidelines on myocardial revascularization

“There are no specific RCTs comparing PCI with CABG in patients with NSTE-ACS.

In all trials comparing an early invasive with a late strategy, or an invasive with a medical management strategy, the decision on whether to perform CABG or PCI was left to the investigator’s discretion.”

2014 ESC/EACTS Guidelines on myocardial revascularization. Eur Heart J. 2014

Surgical Versus Percutaneous Revascularization for Multivessel Disease in Patients With Acute Coronary Syndromes

Analysis From the ACUITY (Acute Catheterization and Urgent Intervention Triage Strategy) Trial

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Alexandra J. Lansky, MD,* Giora Weisz, MD,* Eugenia Nikolsky, MD,*
Michael Argenziano, MD,* Matthew R. Williams, MD,* Antonio Colombo, MD,†
Philip E. Aylward, MB, ChB, PhD,‡ Gregg W. Stone, MD*

Ben-Gal et al. Surgical Versus Percutaneous Revascularization for Multivessel Disease in Patients With ACS (ACUITY registry). JACC Cardiovasc Interv. 2010

Akutes Koronarsysndrom

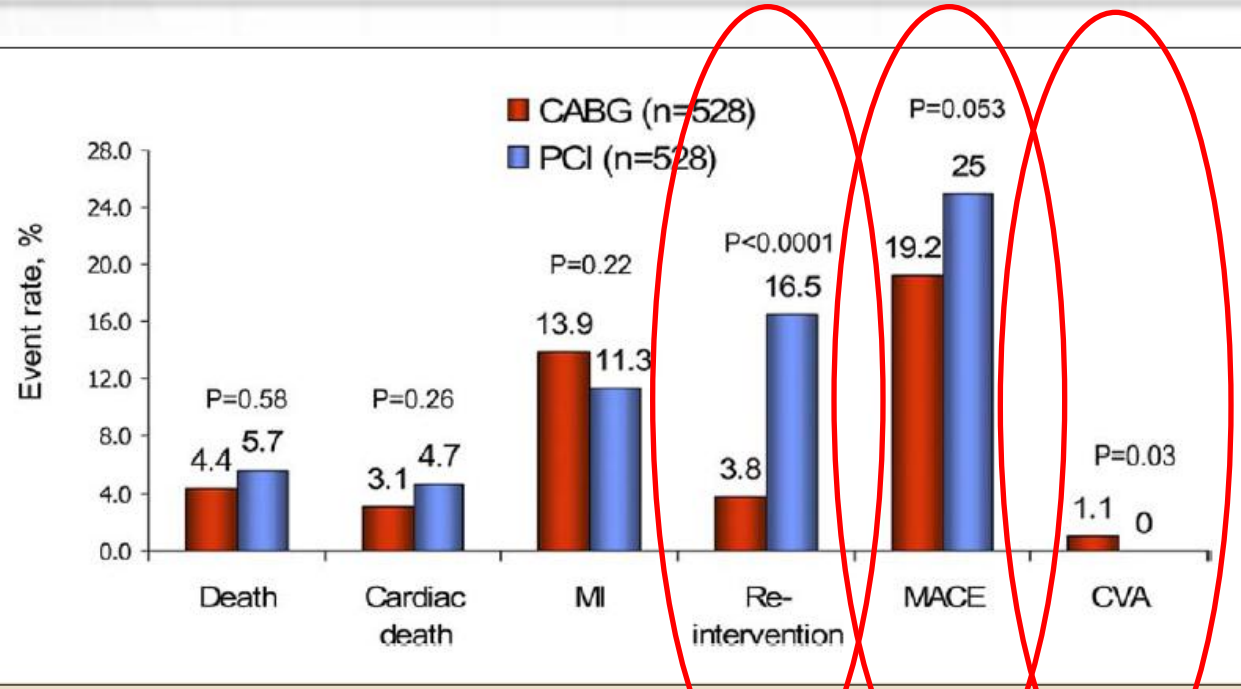


Figure 1. 1-Year Outcomes (%) for Propensity-Matched PCI and CABG Patients

CABG = coronary artery bypass grafting; CVA = cerebrovascular accident; MACE = major adverse cardiac events; MI = myocardial infarction; PCI = percutaneous coronary intervention.

The ACUITY trial was a prospective open-label randomized multicenter trial that compared 3 different antithrombotic regimens for patients presenting with moderate- and high-risk ACS and treated with an early invasive management strategy. n= 13,819

Ben-Gal et al. Surgical Versus Percutaneous Revascularization for Multivessel Disease in Patients With ACS (ACUITY registry). JACC Cardiovasc Interv. 2010

Situation 1:

Z.n. PCI der „culprit lesion“, stabiler Patient

Revaskularisationsstrategie bei Vorhandensein weiterer signifikanter Stenosen?

ACS

↓

Primary culprit-lesion PCI

↓

Stabilized patient

↓

Staged treatment (PCI or CABG) as recommended in patients with SCAD

„In stabilized patients, the choice of revascularization modality can be made in analogy to patients with SCAD"

Cave:

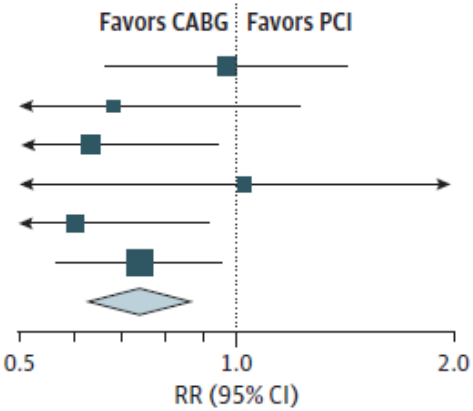
"there are no prospective studies comparing culprit-lesion PCI with early CABG. The strategy of multivessel PCI for suitable significant stenoses—rather than PCI limited to the culprit lesion—has not been evaluated in an appropriate, randomized fashion."

2014 ESC/EACTS Guidelines on myocardial revascularization. Eur Heart J. 2014

Mortalität

Figure 3. Mortality According to Treatment Arm

Source	Statistics for Each Study RR (95% CI)	Z Value	P Value	Death/Total CABG	PCI
ARTS[10,11]	0.97 (0.66-1.43)	-0.16	.87	46/584	48/590
MASS II[6]	0.67 (0.37-1.23)	-1.29	.20	16/203	24/205
SoS[2,15]	0.63 (0.41-0.95)	-2.23	.03	34/500	53/488
CARDia[7]	1.02 (0.39-2.69)	0.05	.96	8/242	8/248
SYNTAX multivessel[9,12]	0.60 (0.39-0.92)	-2.36	.02	31/547	52/548
FREEDOM[16]	0.73 (0.56-0.95)	-2.31	.02	86/947	118/953
Meta-analysis	**0.73 (0.62-0.86)**	**-3.69**	**<.001**	**221/3023**	**303/3032**



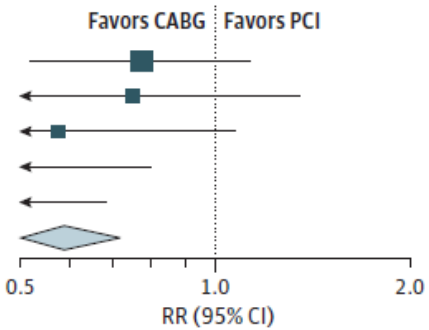
Total number of patients, 6055 (I^2 = 0% for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Sipahi et al. CABG vs PCI and Long-term Mortality and Morbidity in Multivessel Disease. Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era Intervention and Long-term Mortality and Morbidity in Multivessel Disease. JAMA Intern Med. 2014

Myokardinfarkt

Figure 4. Myocardial Infarctions (MIs) According to Treatment Arm

Source	Statistics for Each Study RR (95% CI)	Z Value	P Value	MI/Total CABG	PCI
ARTS[10,11]	0.77 (0.52-1.15)	-1.26	0.21	39/584	51/590
MASS II[6]	0.75 (0.41-1.35)	-0.96	0.34	17/203	23/205
CARDia[7]	0.57 (0.31-1.08)	-1.73	0.08	14/242	25/248
SYNTAX multivessel[9,12]	0.46 (0.27-0.80)	-2.77	0.01	18/547	39/548
FREEDOM[16]	0.49 (0.35-0.68)	-4.23	<.001	48/947	99/953
Meta-analysis	**0.58 (0.48-0.72)**	**-5.17**	**<.001**	**136/2523**	**237/2544**



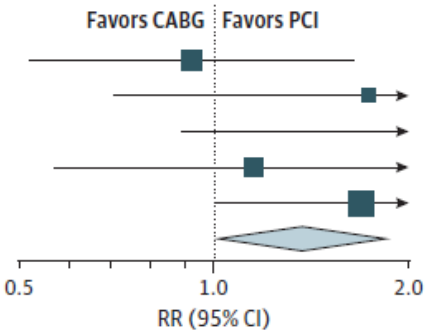
Total number of patients, 5067 (I^2 = 8.02% for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Sipahi et al. CABG vs PCI and Long-term Mortality and Morbidity in Multivessel Disease. Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era Intervention and Long-term Mortality and Morbidity in Multivessel Disease. JAMA Intern Med. 2014

Schlaganfall

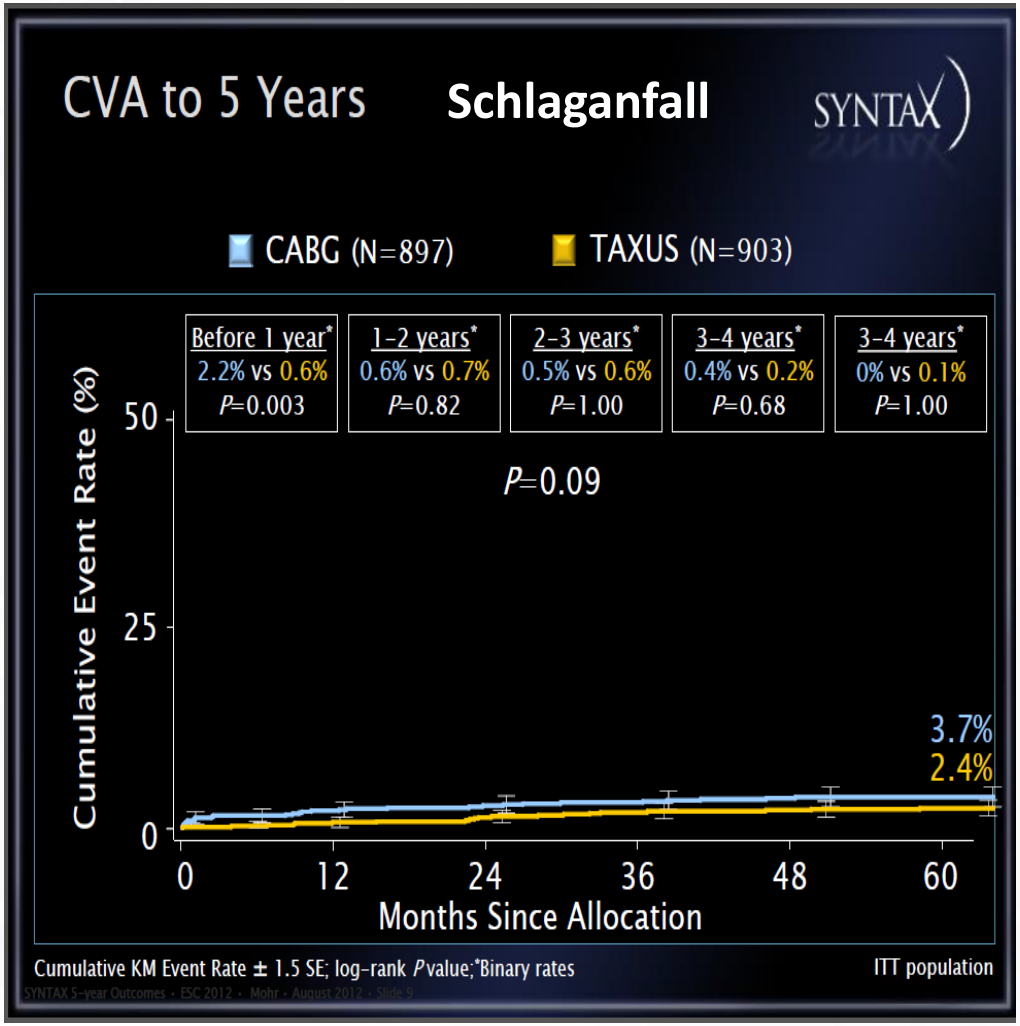
Figure 5. Strokes According to Treatment Arm

Source	Statistics for Each Study			Stroke/Total	
	RR (95% CI)	Z Value	P Value	CABG	PCI
ARTS[10,11]	0.92 (0.52-1.65)	-0.27	0.79	21/584	23/590
MASS II[6]	1.73 (0.70-4.31)	1.18	0.24	12/203	7/205
CARDia[7]	7.17 (0.89-57.87)	1.85	0.06	7/242	1/248
SYNTAX multivessel[9,12]	1.14 (0.56-2.32)	0.38	0.71	16/547	14/548
FREEDOM[16]	1.69 (1.01-2.85)	1.98	0.05	37/947	22/953
Meta-analysis	**1.36 (0.99-1.86)**	**1.91**	**0.06**	**93/2523**	**67/2544**



Total number of patients, 5067 (I^2 = 24.9% for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Sipahi et al. CABG vs PCI and Long-term Mortality and Morbidity in Multivessel Disease. Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era Intervention and Long-term Mortality and Morbidity in Multivessel Disease. JAMA Intern Med. 2014



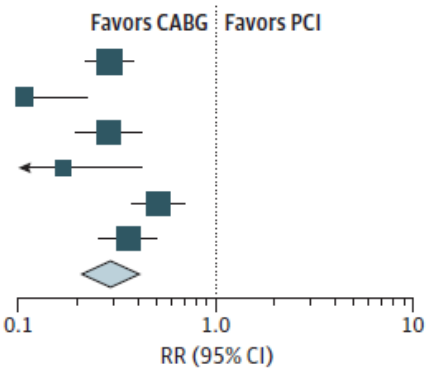
Syntax Studie

Mohr F,
EACTS 2013

Erneute Revaskularisation

Figure 6. Repeat Revascularizations According to Treatment Arm

Source	Statistics for Each Study: RR (95% CI)	Z Value	P Value	Repeat Revascularization/Total: CABG	PCI
ARTS[10,11]	0.29 (0.22-0.39)	-8.45	<.001	53/584	182/590
MASS II[6]	0.11 (0.05-0.23)	-5.80	<.001	7/203	66/205
SoS[2,15]	0.29 (0.20-0.43)	-6.26	<.001	30/500	101/488
CARDia[7]	0.17 (0.07-0.43)	-3.72	<.001	5/242	30/248
SYNTAX multivessel[9,12]	0.52 (0.38-0.70)	-4.23	<.001	55/547	106/548
FREEDOM[16]	0.37 (0.26-0.51)	-5.83	<.001	43/947	118/953
Meta-analysis	**0.29 (0.21-0.41)**	**-7.00**	**<.001**	**193/3023**	**603/3032**



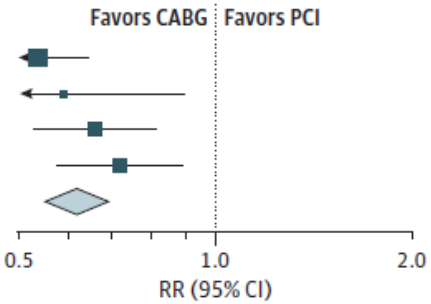
Total number of patients, 6055 (I^2 = 75.6% for the random effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Sipahi et al. CABG vs PCI and Long-term Mortality and Morbidity in Multivessel Disease. Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era Intervention and Long-term Mortality and Morbidity in Multivessel Disease. JAMA Intern Med. 2014

„Major Adverse Cardiovascular and Cerebrovascular Events“

Figure 7. Major Adverse Cardiovascular and Cerebrovascular Events (MACCE) According to Treatment Arm

Source	Statistics for Each Study RR (95% CI)	Z Value	P Value	MACCE/Total CABG	PCI
ARTS[10,11]	0.53 (0.45-0.64)	-6.95	<.001	132/584	250/590
CARDia[7]	0.59 (0.38-0.90)	-2.44	.01	28/242	49/248
SYNTAX multivessel[9,12]	0.65 (0.53-0.81)	-3.83	<.001	103/547	158/548
FREEDOM[16]	0.71 (0.57-0.89)	-2.95	<.001	112/947	158/953
Meta-analysis	**0.61 (0.54-0.68)**	**-8.55**	**<.001**	**375/2320**	**615/2339**



Total number of patients, 4659 (I^2 = 33.0% for the fixed effects model). CABG indicates coronary artery bypass graft; PCI, percutaneous coronary intervention; RR, risk ratio; for expansion of all study name acronyms, see the cited references.

Sipahi et al. CABG vs PCI and Long-term Mortality and Morbidity in Multivessel Disease. Meta-analysis of Randomized Clinical Trials of the Arterial Grafting and Stenting Era Intervention and Long-term Mortality and Morbidity in Multivessel Disease. JAMA Intern Med. 2014

Summary/recommendation: CABG vs. PCI in SCAD

	CABG	PCI
Two-vessel CAD with proximal LAD stenosis	A	A
Three-vessel CAD with low CAD burden (i.e., three focal stenosis, low SYNTAX score)	A	A
Three-vessel CAD with intermediate to high CAD burden (i.e., multiple diffuse lesions, presence of CTO, or high SYNTAX score)	A	U
Isolated left main stenosis	A	U
Left main stenosis and additional CAD with low CAD burden (i.e., one to two vessel additional involvement, low SYNTAX score)	A	U
Left main stenosis and additional CAD with intermediate to high CAD burden (i.e., three vessel involvement, presence of CTO, or high SYNTAX score)	A	I

Figure 5. Method of Revascularization of Multivessel Coronary Artery Disease

A = appropriate; CABG = coronary artery bypass grafting; CAD = coronary artery disease; CTO = chronic total occlusion; I = inappropriate; LAD = left anterior descending artery; PCI = percutaneous coronary intervention; SYNTAX = Synergy Between PCI With TAXUS and Cardiac Surgery; U = uncertain.

ACCF/SCAI/STS/AATS/AHA/ASNC/HFSA/SCCT 2012 Appropriate Use Criteria for Coronary Revascularization Focused Update. JACC 2012

Summary/recommendation: CABG vs. PCI in SCAD

Recommendation for the type of revascularization (CABG or PCI) in patients with SCAD with suitable coronary anatomy for both procedures and low predicted surgical mortality

Recommendations according to extent of CAD	CABG		PCI		
	Class[a]	Level[b]	Class[a]	Level[b]	Ref[c]
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	108,135,137
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B	17,134,170
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B	17
Left main disease with a SYNTAX score >32.	I	B	III	B	17
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B	17,157,175,176
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B	17,157,175,176
Three-vessel disease with a SYNTAX score >32.	I	A	III	B	17,157,175,176

CABG = coronary artery bypass grafting; LAD = left anterior descending coronary artery; PCI = percutaneous coronary intervention; SCAD = stable coronary artery disease.
[a]Class of recommendation.
[b]Level of evidence.
[c]References.

2014 ESC/EACTS Guidelines on myocardial revascularization. Eur Heart J. 2014

Situation 2:

Z.n. PCI der „culprit lesion“, stabiler Patient

falls ACVB indiziert – wann?

Timing der ACVB-OP nach akutem Koronarsyndrom

JACC: CARDIOVASCULAR INTERVENTIONS
VOL. 3, NO. 4, 2010

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DOI: 10.1016/j.jcin.2010.01.012

Timing of In-Hospital Coronary Artery Bypass Graft Surgery for Non–ST-Segment Elevation Myocardial Infarction Patients

Results From the National Cardiovascular Data Registry ACTION Registry–GWTG (Acute Coronary Treatment and Intervention Outcomes Network Registry–Get With The Guidelines)

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Tracy Y. Wang, MD, MHS,‡ Eric D. Peterson, MD, MPH,‡ Matthew T. Roe, MD, MHS,‡
Elizabeth M. Holper, MD, MPH,* on behalf of the CRUSADE and
ACTION Registry–GWTG Participants

Dallas, Texas; and Durham, North Carolina

Timing der ACVB-OP nach akutem Koronarsyndrom

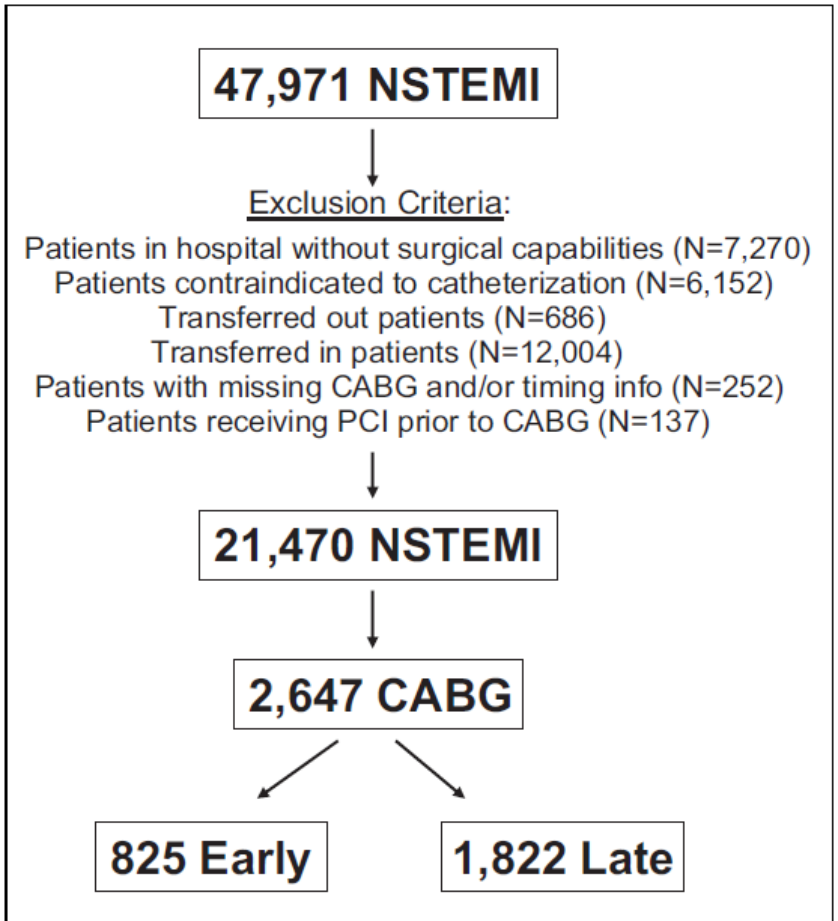


Figure 2. Patient Criteria for Timing of CABG in ACTION Registry–GWTG

GTWG = Get With The Guidelines; other abbreviations as in Figure 1.

<48 Std.

>48 Std.

Parikh SV et al. Timing of in-hospital coronary artery bypass graft surgery for non-ST-segment elevation myocardial infarction patients results from the National Cardiovascular Data Registry ACTION Registry
JACC Cardiovasc Interv. 2010

Timing der ACVB-OP nach akutem Koronarsyndrom

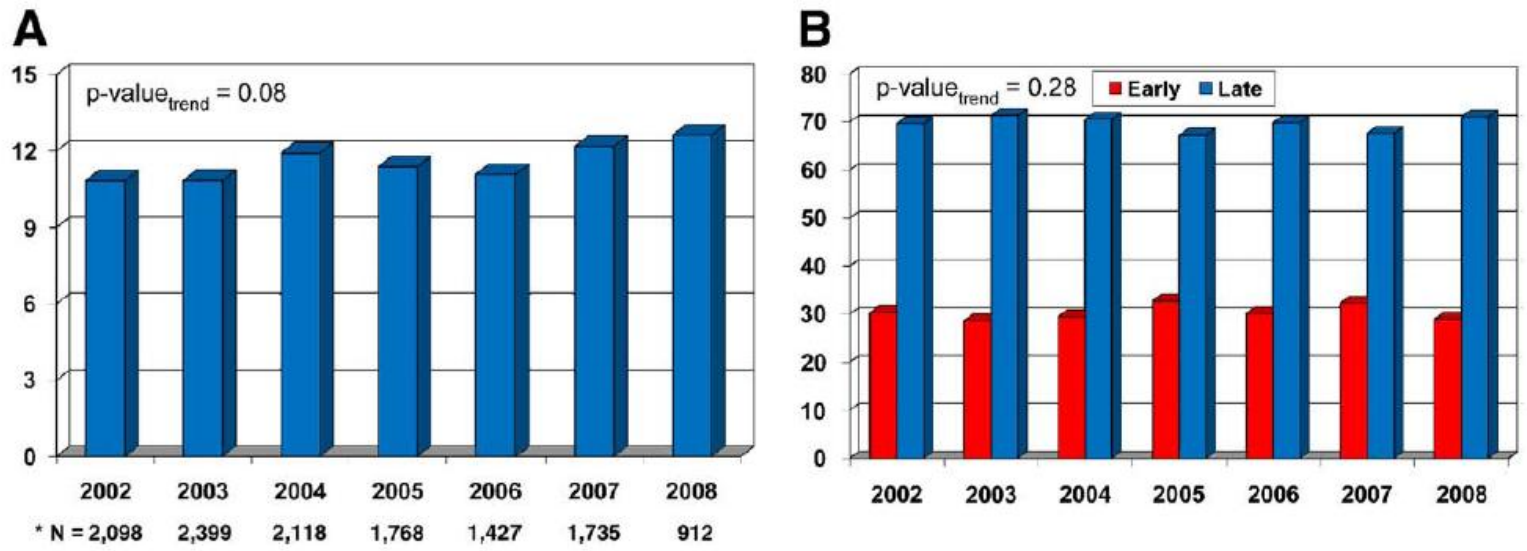


Figure 3. Rate of In-Hospital CABG by Year of Presentation and by Timing in the CRUSADE and ACTION Registries

(**A**) Rate of in-hospital CABG by year of presentation in the CRUSADE and ACTION registries. (**B**) Rate of in-hospital CABG by timing in the CRUSADE and ACTION registries. *N = number of patients undergoing in-hospital CABG. Abbreviations as in Figure 1.

In-hospital CABG rates after NSTEMI did not change significantly from 2002 to 2008 (ptrend 0.08), ranging between 11% and 13% (Fig. 3A).
There was also no significant difference in the mean proportion of patients undergoing early (30.4%) or late (69.7%) CABG across time (Fig. 3B).

Parikh SV et al. Timing of in-hospital coronary artery bypass graft surgery for non-ST-segment elevation myocardial infarction patients results from the National Cardiovascular Data Registry ACTION Registry
JACC Cardiovasc Interv. 2010

Timing der ACVB-OP nach akutem Koronarsyndrom

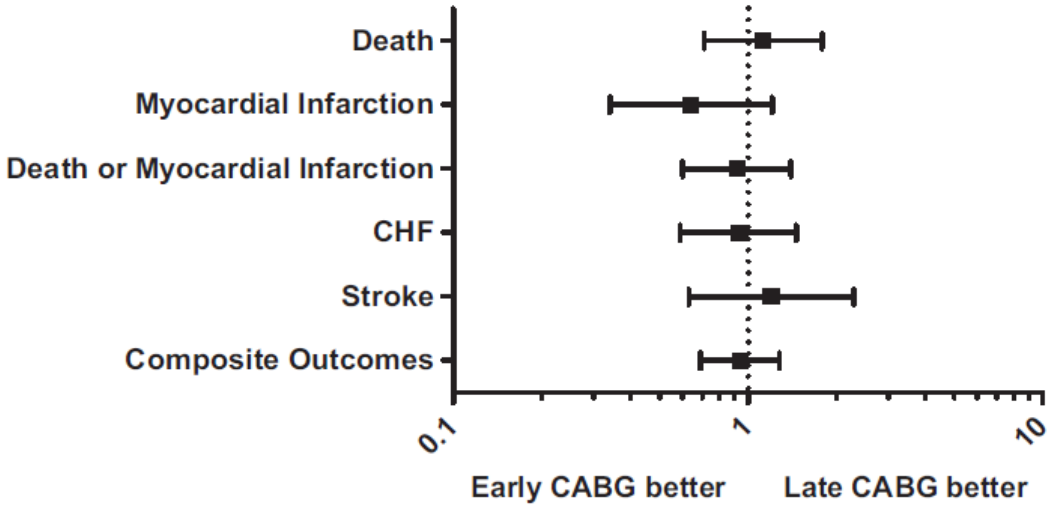


Figure 5. Adjusted Odds Ratios and 95% Confidence Interval for In-Hospital Outcomes for Early CABG (vs. Late CABG)

*Composite outcomes = death, myocardial infarction, congestive heart failure, or cardiogenic shock. CABG = coronary artery bypass graft surgery; CHF = congestive heart failure.

In-hospital mortality:

3.6% vs. 3.8%

(adjusted odds ratio: 1.12, 95% confidence interval: 0.71 to 1.78)

Composite endpoint (death, myocardial infarction, congestive heart failure, or cardiogenic shock):

12.6% vs. 12.4%

(adjusted odds ratio: 0.94, 95% confidence interval: 0.69 to 1.28)

were similar between patients undergoing early versus late CABG.

Parikh SV et al. Timing of in-hospital coronary artery bypass graft surgery for non-ST-segment elevation myocardial infarction patients results from the National Cardiovascular Data Registry ACTION Registry JACC Cardiovasc Interv. 2010

European Heart Journal (2014) **35**, 2541–2619
doi:10.1093/eurheartj/ehu278

ESC/EACTS GUIDELINES

2014 ESC/EACTS Guidelines on myocardial revascularization

"As there is no randomized study comparing an early with a delayed CABG strategy, **the general consensus is to wait 48–72 hours in patients who had culprit-lesion PCI and have residual severe CAD**. In registries, unadjusted and adjusted analyses showed no difference in outcomes between patients undergoing early (≤48 hours) or in-hospital late (>48 hours) surgery, although CABG was delayed more often in higher-risk patients, suggesting that timing might be appropriately determined by **multidisciplinary clinical judgement**.

When there is continuing or recurrent ischaemia, ventricular arrhythmias, or haemodynamic instability, **CABG** should be performed **immediately**.

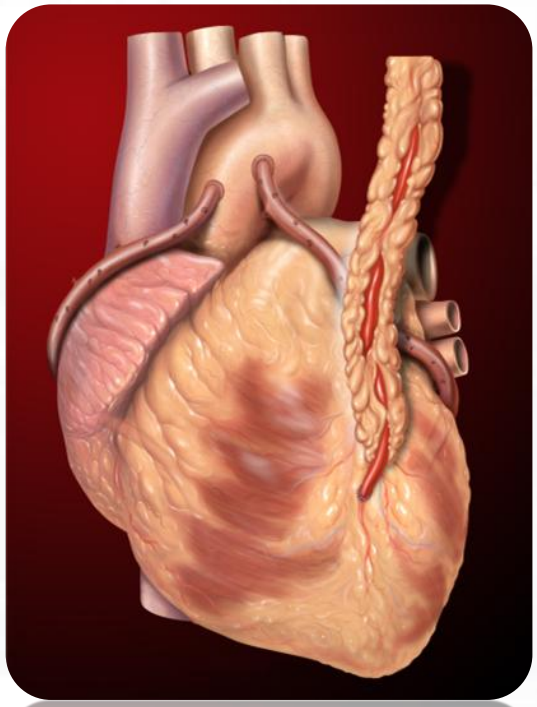
Patients with LM or three-vessel CAD involving the proximal LAD should undergo surgery during the same hospital stay."

Situation 3:

PCI der „culprit-lesion“ nicht möglich

Revaskularisationsstrategie?

PCI der „culprit-lesion“ nicht möglich:



ACVB falls operabel

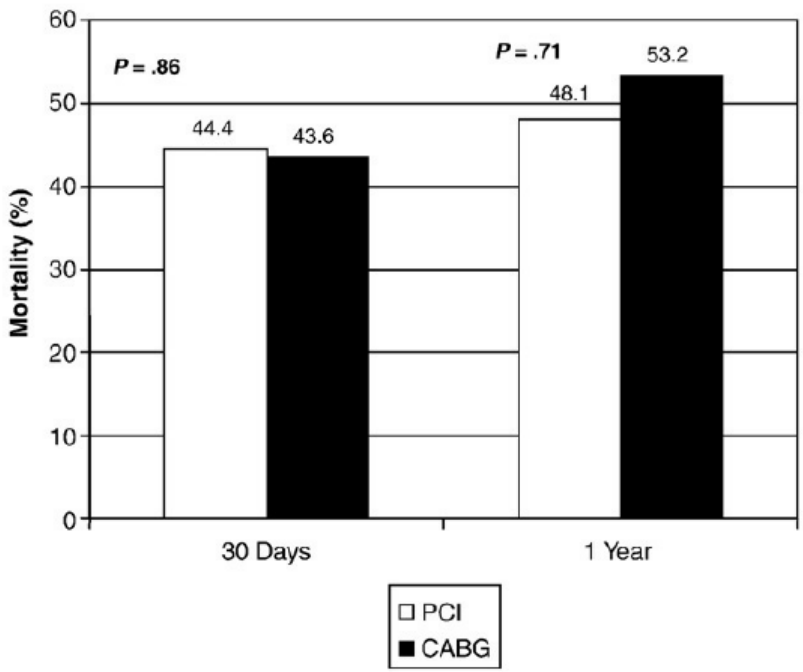
2014 ESC/EACTS Guidelines on myocardial revascularization. Eur Heart J. 2014

Situation 4:

ACS, instabiler Patient, kardiogener Schock

Akutes Koronarsyndrom und kardiogener Schock: SHOCK trial

Figure 1



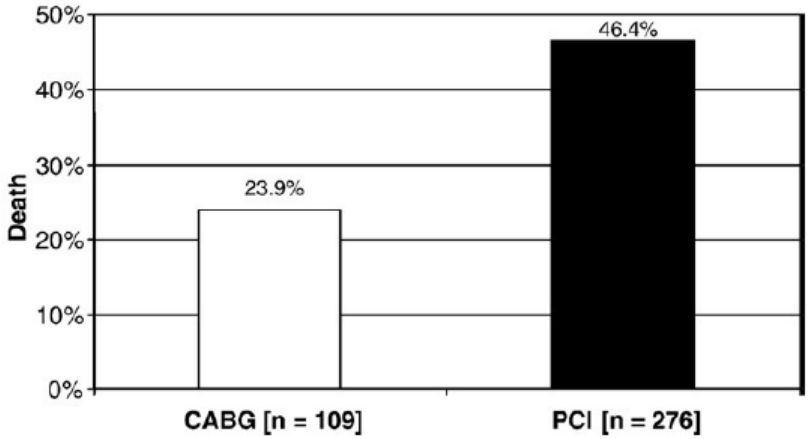
Thirty-day and 1-year mortality based on type of urgent revascularization in the SHOCK trial.

SHOCK trial: 152 patients randomly assigned to early revascularization, PCI (n = 81) or CABG (n = 47) was performed in 128 patients with left ventricular failure resulting in shock.

Mehta et al. PCI or CABG for cardiogenic shock and multivessel coronary artery disease? Am Heart J 2010

Akutes Koronarsyndrom und kardiogener Schock: SHOCK Register

Figure 2



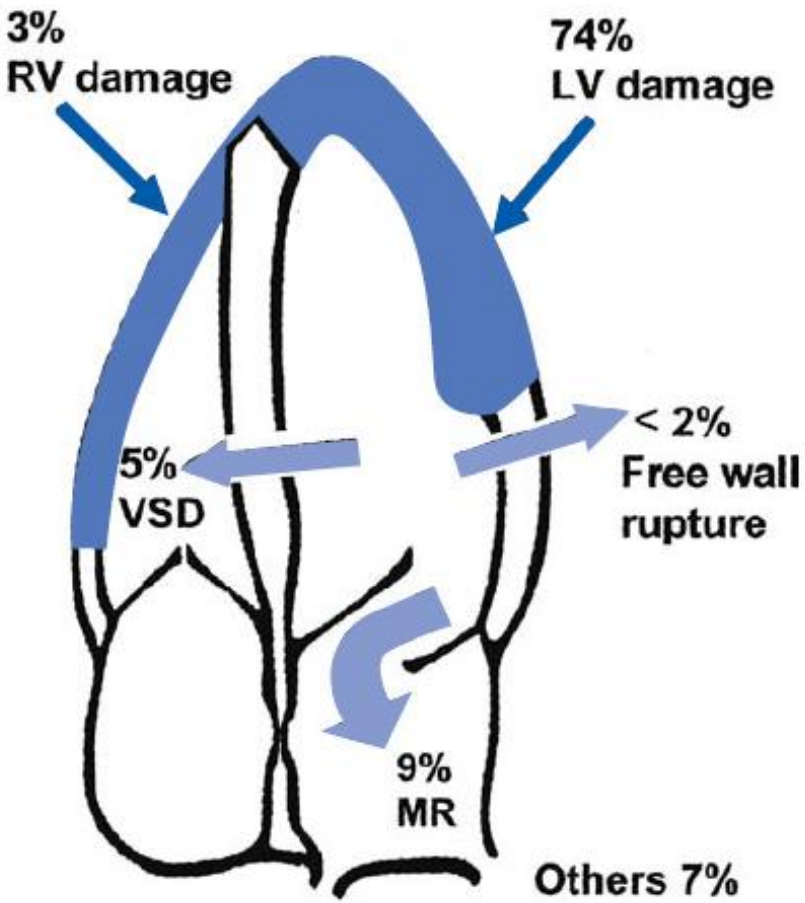
In-hospital mortality based on type of urgent revascularization in the SHOCK registry.

In-hospital mortality with single-vessel disease was similar in both groups (33.3% [CABG] vs 32.9% [PCI]) but was significantly lower for the CABG group in patients with 2-vessel (17.7% [CABG] vs 42.2% [PCI], P = 0.025) and 3-vessel (29.6% [CABG] vs 59.4% [PCI], P <0.0001) CAD. Thus, in-hospital mortality remained stable in patients who had CABG, whereas it increased in the PCI cohort as the number of diseased vessels increased.

Situation 5:

ACS + mechanische Infarktkomplikation

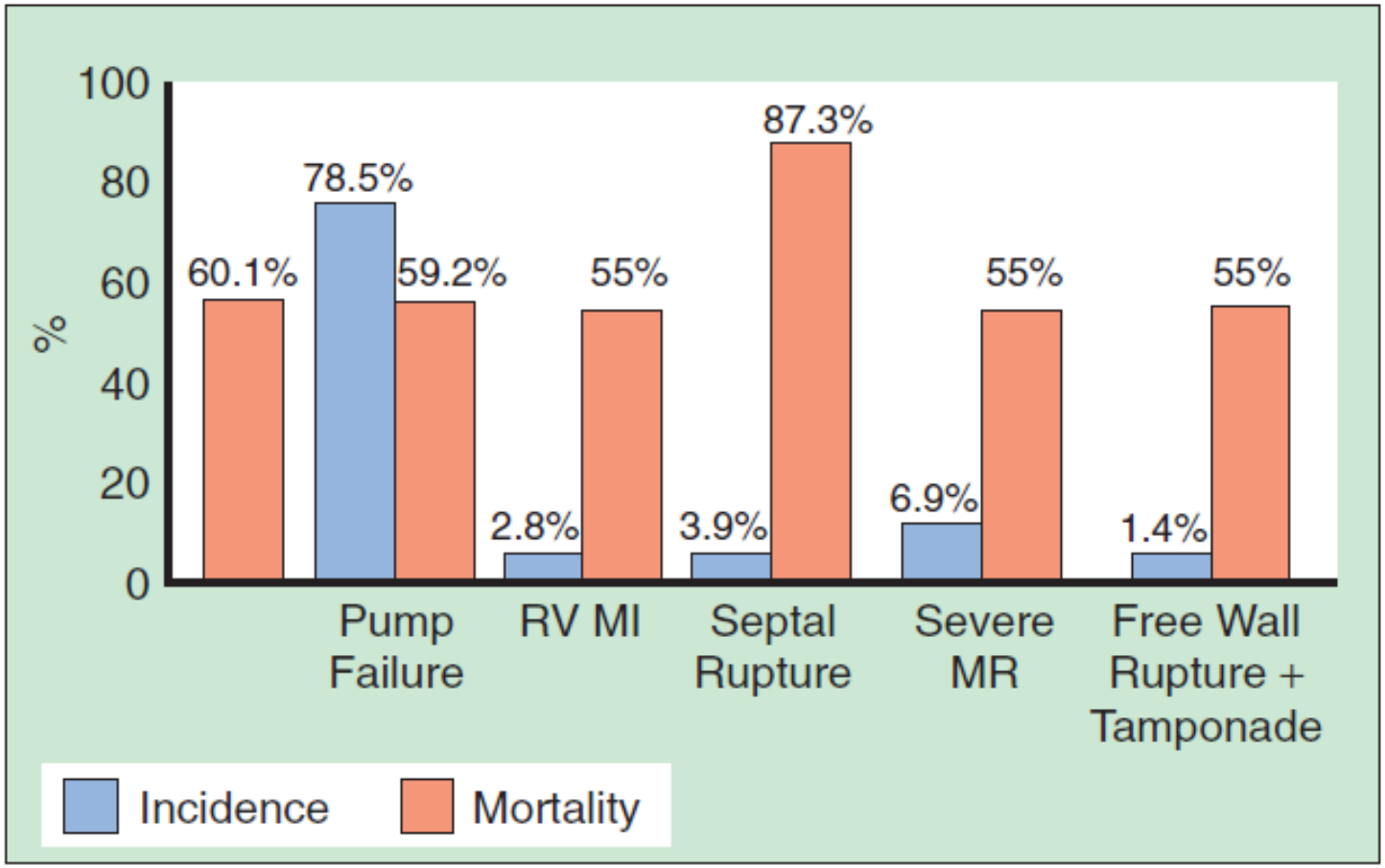
Inzidenz mechanischer Infarktkomplikationen



aus: Davis CH: Revascularization for cardiogenic shock. Q J Med 2001

Mechanische Infarktkomplikationen

Inzidenz und Mortalitätsraten mechanischer Infarktkomplikationen



aus: Hochman et al. JACC 2000

Mechanische Infarktkomplikationen: VSD

Ventrikelseptumruptur/Infarkt-VSD

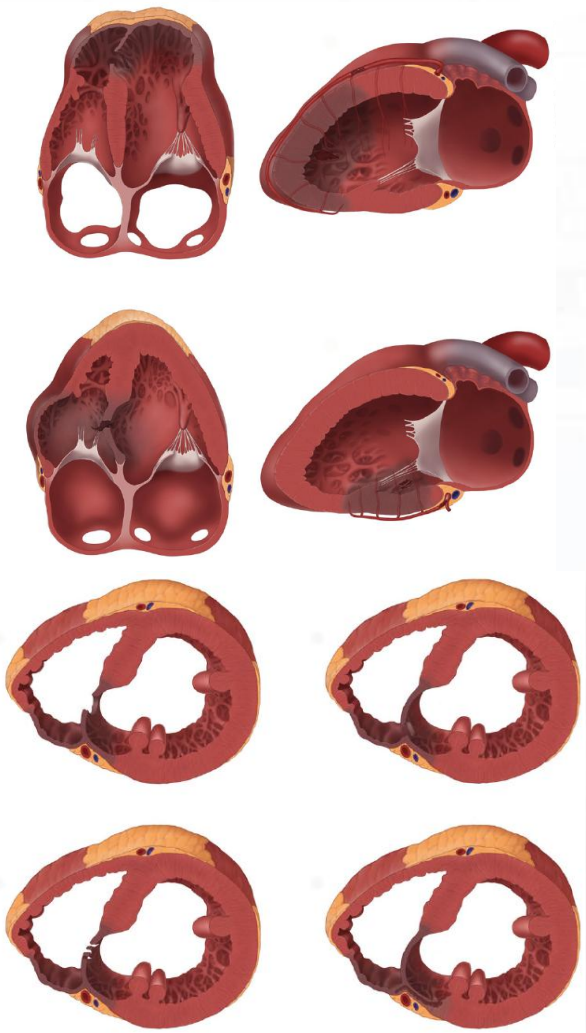
Epidemiologie/zeitl. Verlauf:
0,2 (GUSTO I)-3,9% (SHOCK registry) der Patienten mit AMI, biphasischer Häufigkeitsgipfel: innerhalb von 24 Stunden, 3-5 Tage nach Infarkt, bis zu 14 Tage nach Infarkt, früher bei Patienten nach Thrombolyse

Risikofaktoren: großer Infarkt, Alter, weibl. Geschlecht, single vessel disease, schlechte Kollateralisierung

Lokalisation:
Apical: anterior/LAD MI
Multiple VSDs in 40%
Basal: inferior MI/RCA
Direkt/einfach vs. komplex

Klin. Symptomatik hängt von der Größe des VSDs und damit Links-Rechts-Shunts ab

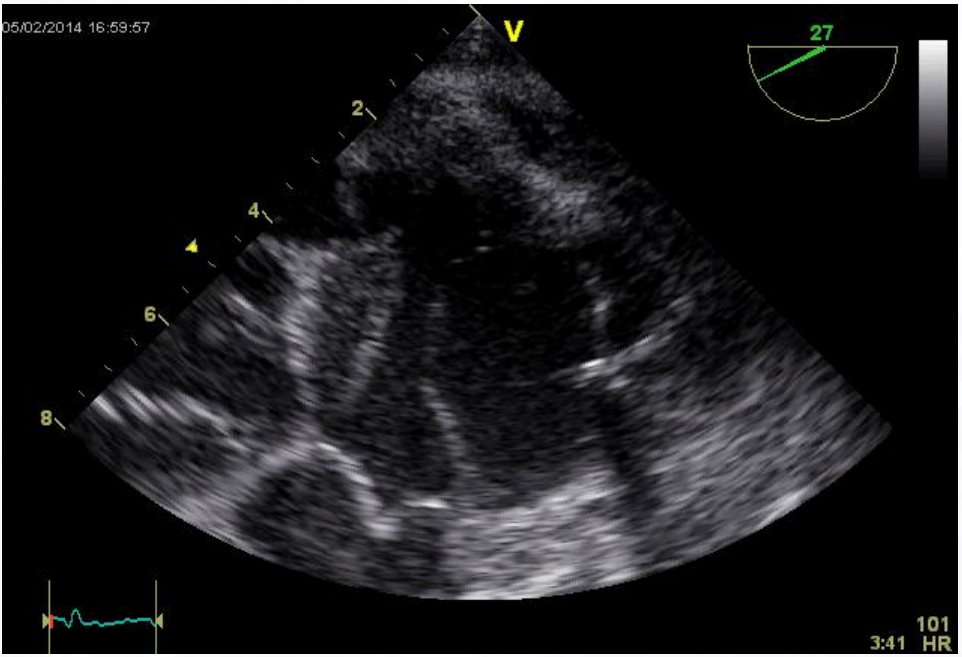
Therapie: Vasodilatatoren, IABP, Nachlastsenkung, chirurgische Korrektur

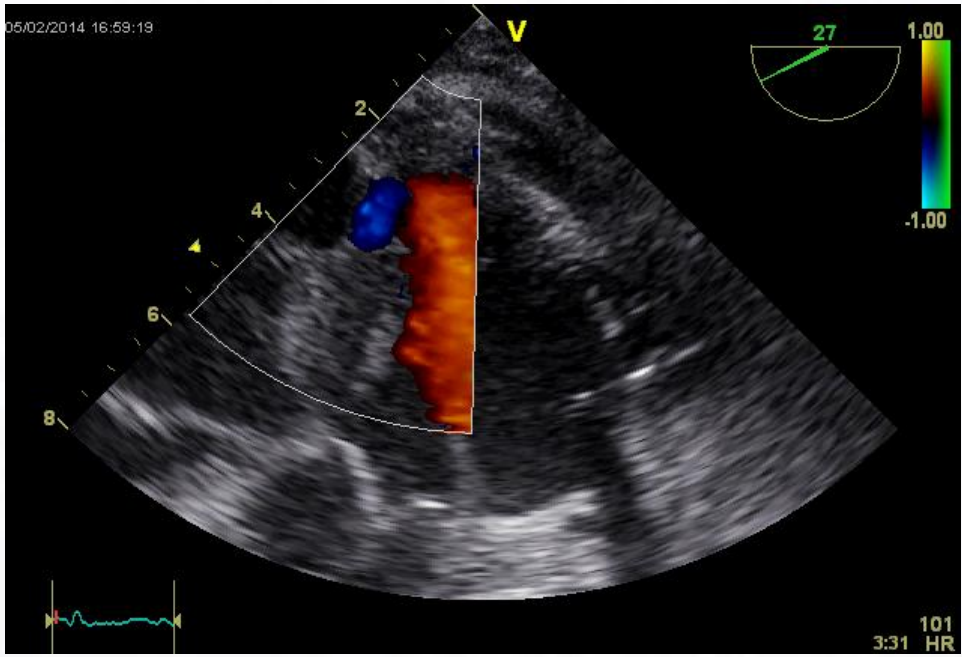


Anteroapikal
LAD

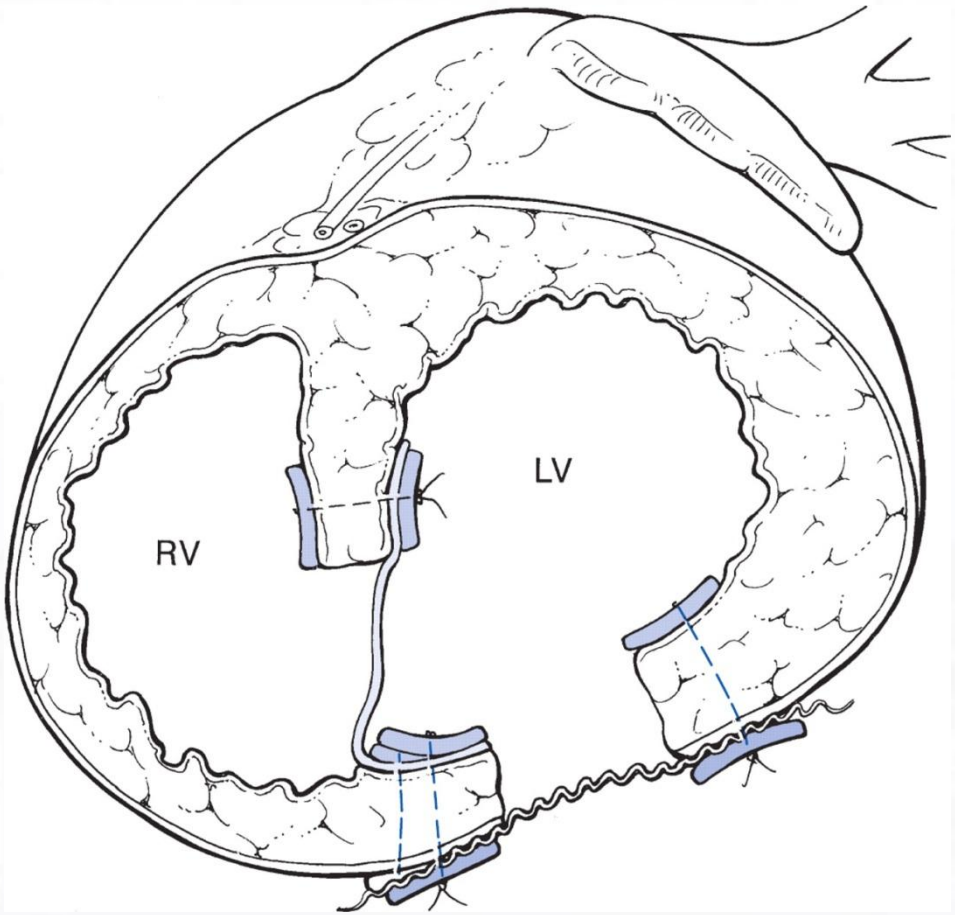
Posterobasal
RCA
RCx

Mechanische Infarktkomplikationen: VSD



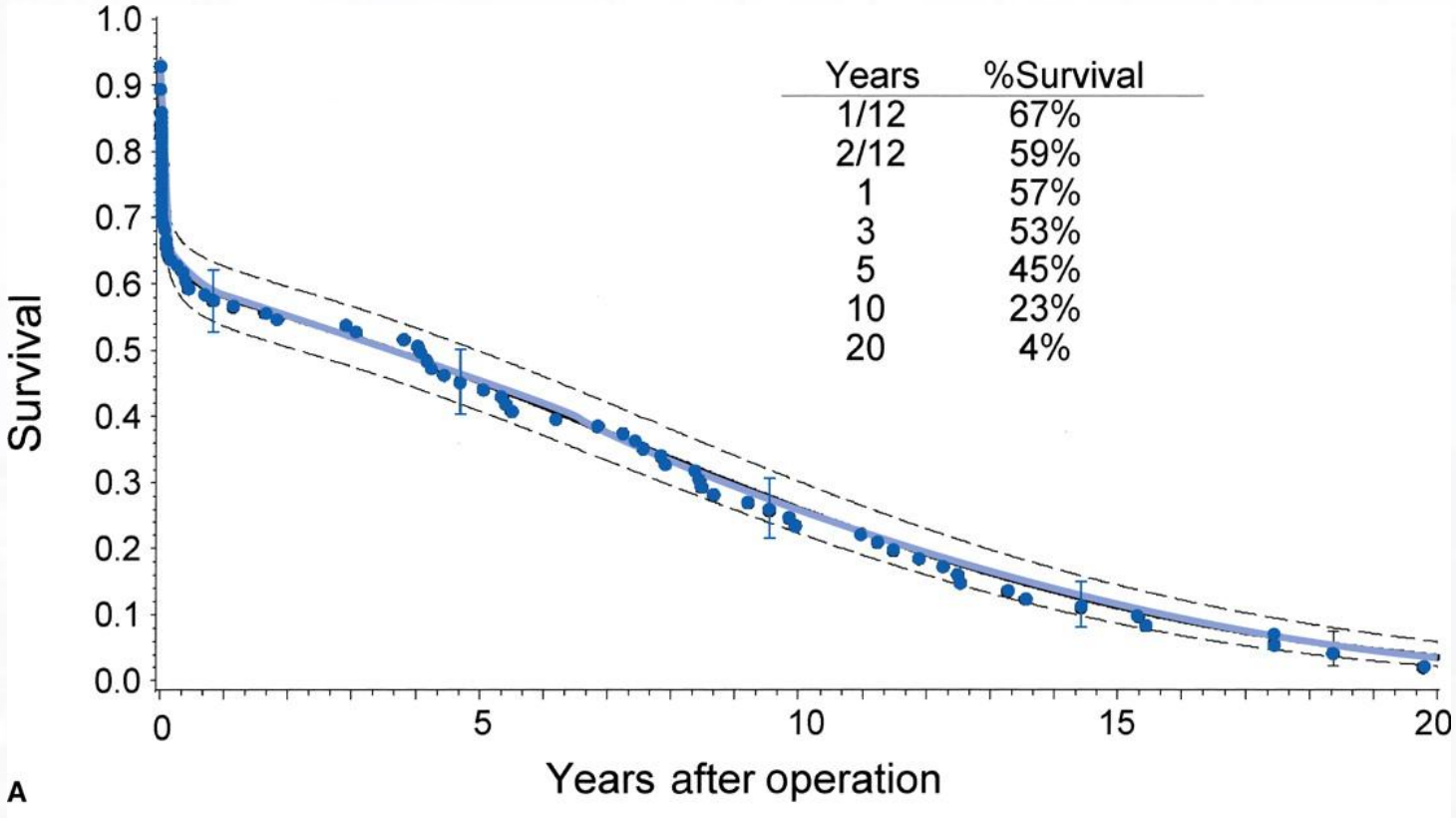


Mechanische Infarktkomplikationen: VSD



aus: Lawrence Cohn. Cardiac Surgery in the Adult. Fourth Edition. McGraw-Hill 2011

Mechanische Infarktkomplikationen: VSD

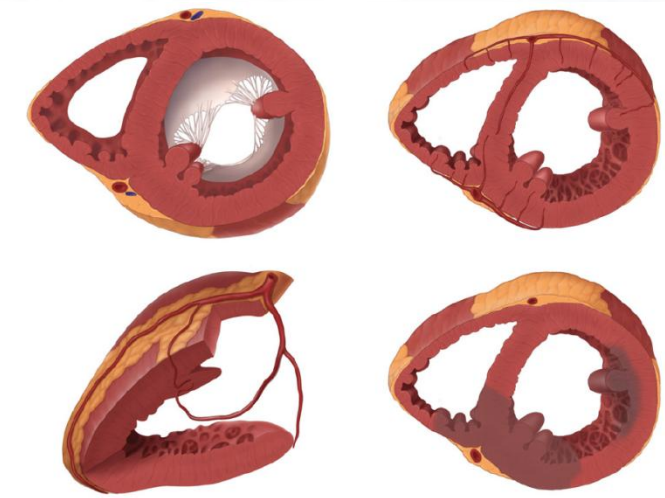


Years	%Survival
1/12	67%
2/12	59%
1	57%
3	53%
5	45%
10	23%
20	4%

aus: Lawrence Cohn. Cardiac Surgery in the Adult. Fourth Edition. McGraw-Hill 2011

Mechanische Infarktkomplikationen: akute Mitralklappeninsuffizienz

Akute Mitralklappeninsuffizienz nach Infarkt/Papillarmuskelabriss



Epidemiologie:
1% der Patienten mit MI. Biphasischer Häufigkeitsgipfel: innerhalb von 24 Stunden, typischerweise 3-5 Tage nach Infarkt

Risikofaktor: v.a. inferiorer MI

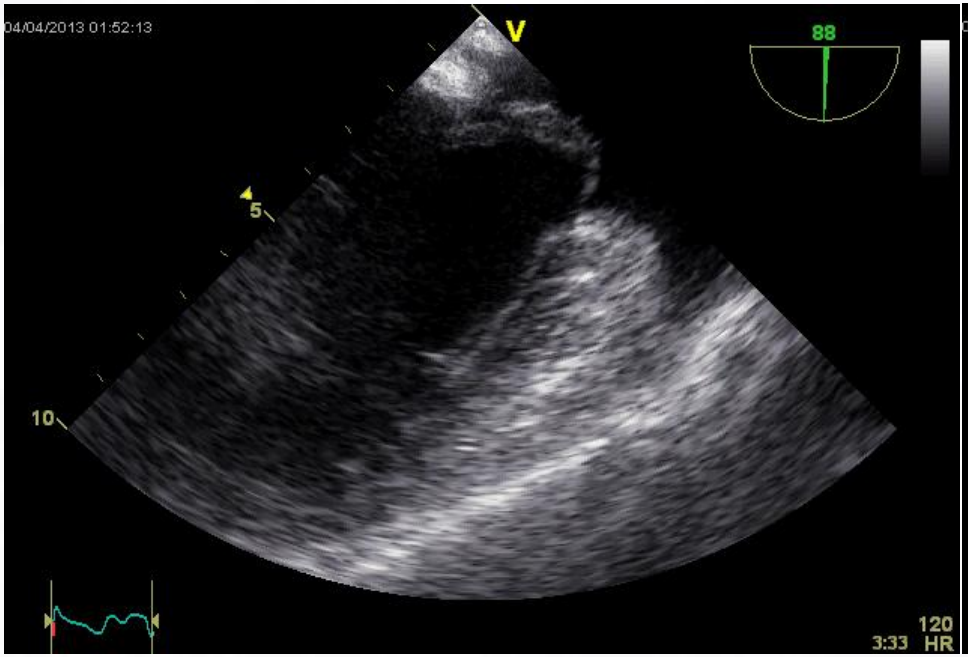
Lokalisation/Formen
- Postero-medialer Papillarmuskel (RCA+ RCX): 75%
- Antero-lateraler Papillarmuskel (LAD): 25%
- Partieller (2/3) >> Kompletter Abriss (1/3)

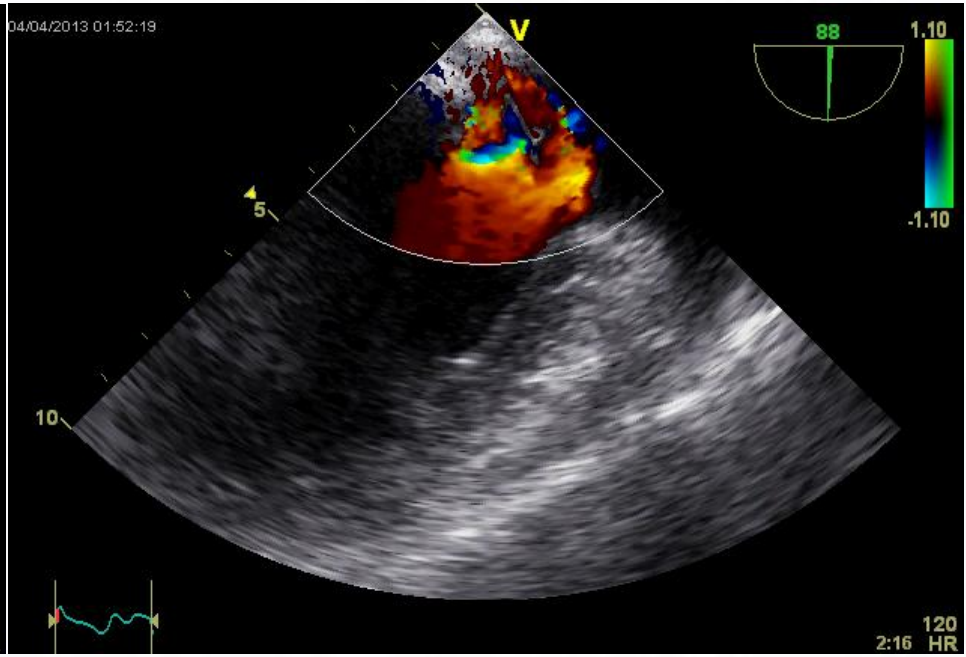
Schwere der Mitralinsuffizienz
- Ausmaß des Papillarmuskelabriss (partiell/komplett) bestimmt das Maß der hämodynamischen Instabilität.
- Grad der hämodynamischen Instabilität ist maßgeblicher Outcome-Prädiktor.

Therapie: Mitralklappenrekonstruktion/-ersatz

Mechanische Infarktkomplikationen: akute Mitralklappeninsuffizienz

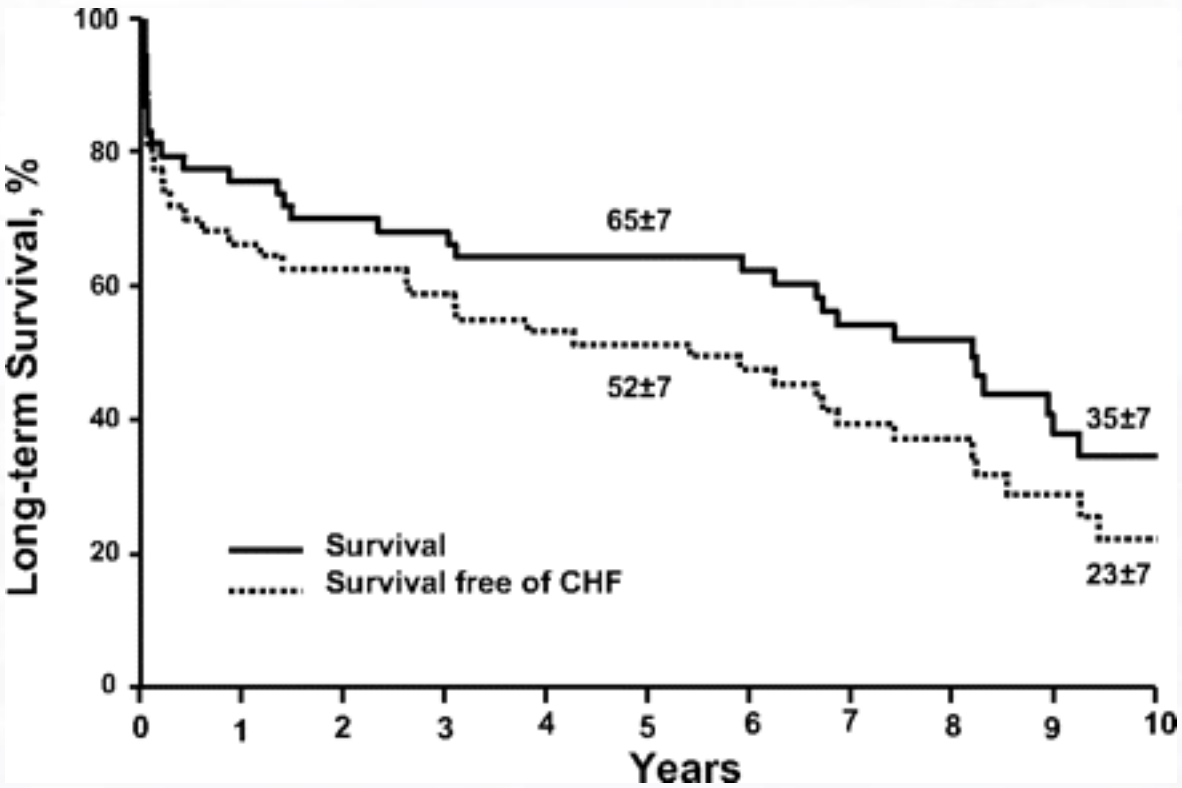
Infarktassoziierter Papillarmuskelabriss und akute MI





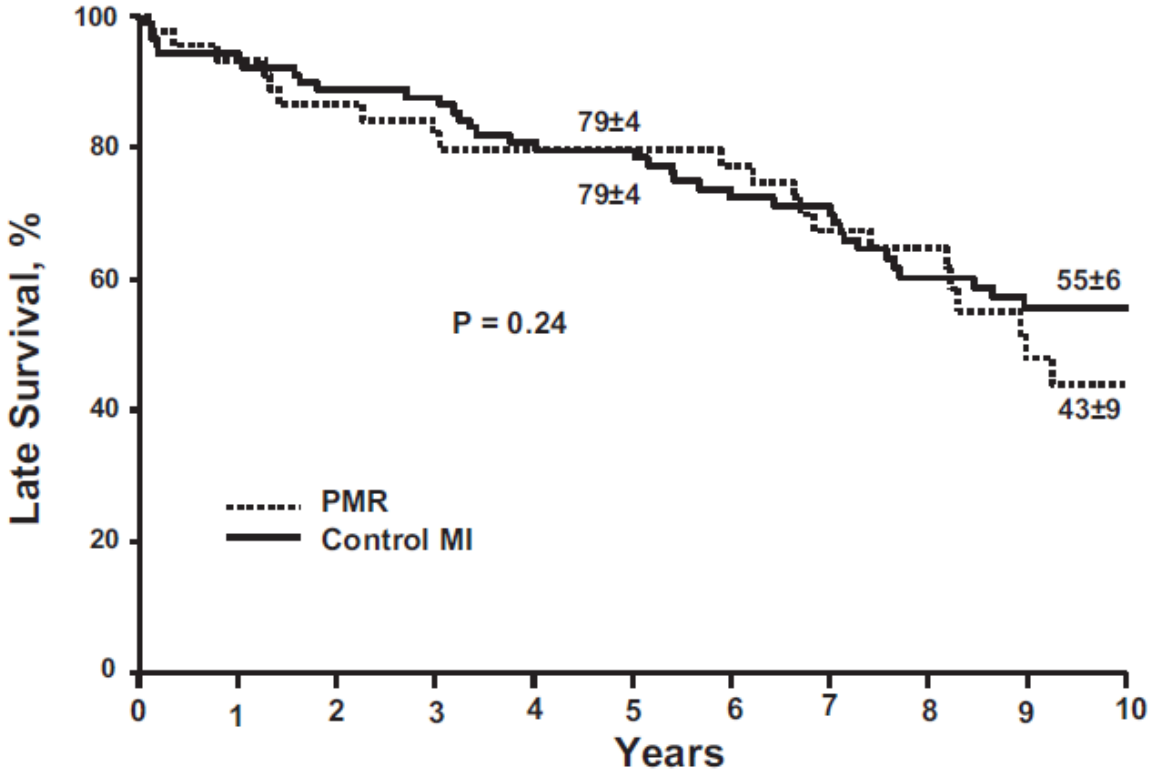
Mechanische Infarktkomplikationen: akute Mitralklappeninsuffizienz

Clinical Outcome After Surgical Correction of Mitral Regurgitation Due to Papillary Muscle Rupture



Russo et al. Clinical Outcome After Surgical Correction of Mitral Regurgitation Due to Papillary Muscle Rupture Circulation 2008

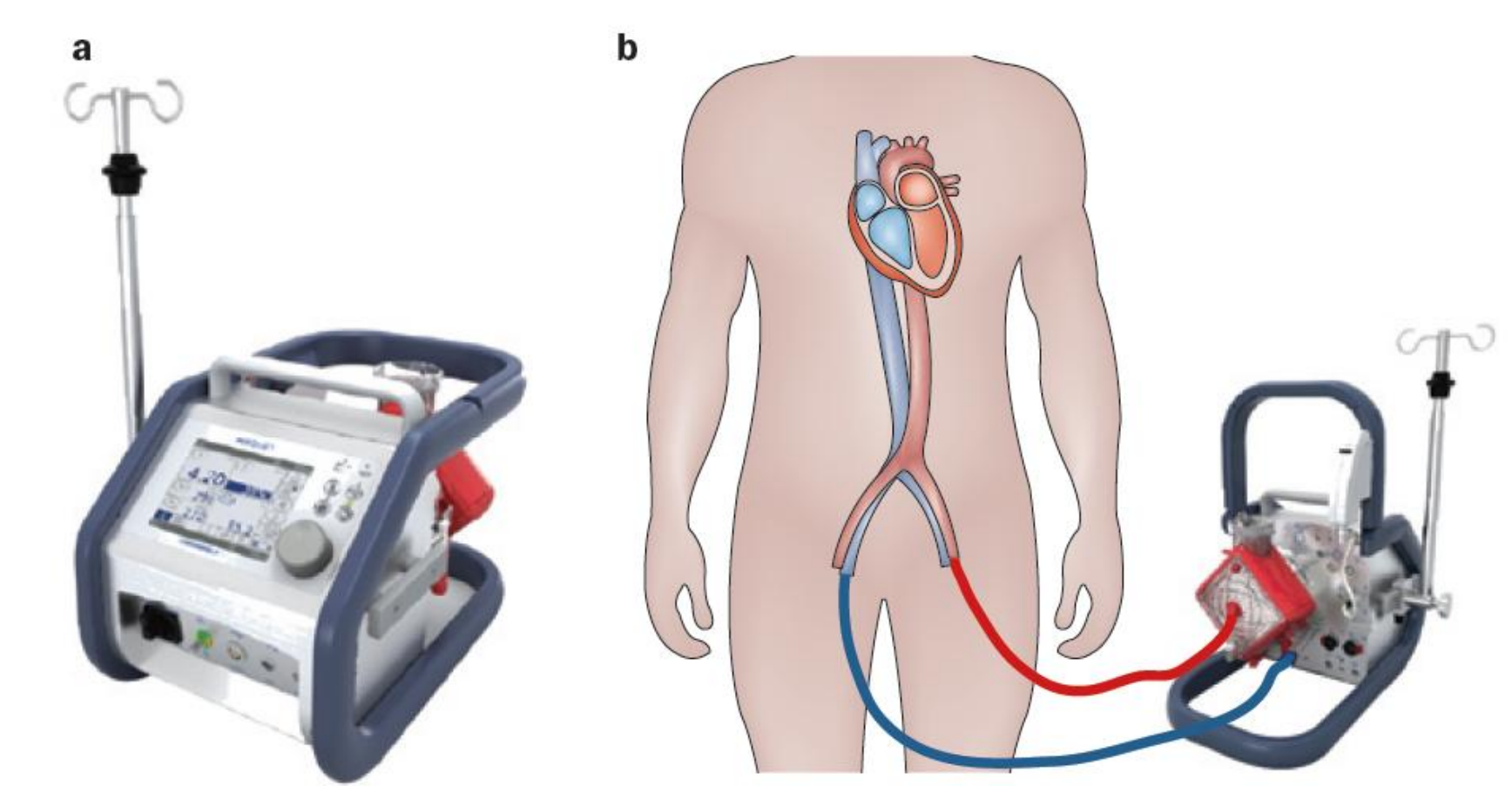
Mechanische Infarktkomplikationen: akute Mitralklappeninsuffizienz



outcome of 44 operative survivors of PMR surgery compared with that of 88 propensity-matched patients with first MI diagnosed in the community who had survived the first 30 days after MI

Russo et al. Clinical Outcome After Surgical Correction of Mitral Regurgitation Due to Papillary Muscle Rupture Circulation 2008

ECMO



Westaby S et al. Cardiogenic shock in ACS. Part 2: Role of mechanical circulatory support. Nat Rev Cardiol. 2012

Assist Devices

1. Generation

Extrakorporal + RVAD

Intrakorporal

2. Generation

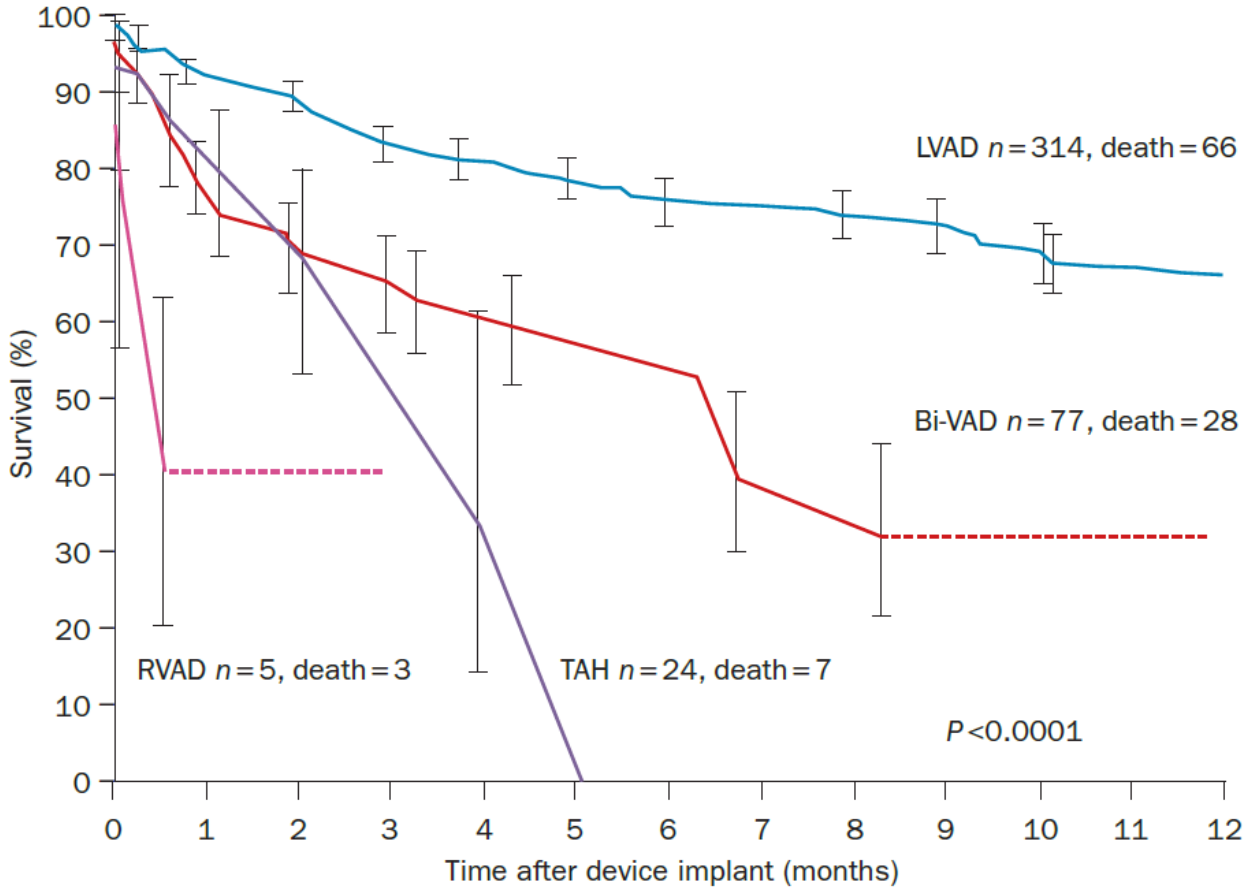
3. Generation

A B C D

Voss et al. CardioVasc 2013

Mechanische Infarktkomplikationen: Linksherzversagen

Assist Devices



Westaby S et al. Cardiogenic shock in ACS. Part 2: Role of mechanical circulatory support. Nat Rev Cardiol. 2012

Zusammenfassung

ACS

instab. Angina/NSTE-ACS

STEMI-ACS

Koronardiagnostik

Akut PCI

Culprit-Läsion

unpassende PCI-Anatomie
nicht erfolgreiche PCI
instabil + mech. Komplikation

asymptomatisch/stabil

Recommendations according to extent of CAD	CABG		PCI		
	Class[a]	Level[b]	Class[a]	Level[b]	Ref[c]
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	108,135,137
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B	17,134,170
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B	17
Left main disease with a SYNTAX score >32.	I	B	III	B	17
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B	17,157,175,176
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B	17,157,175,176
Three-vessel disease with a SYNTAX score >32.	I	A	III	B	17,157,175,176

SYNTAX SCORE

Boston Scientific

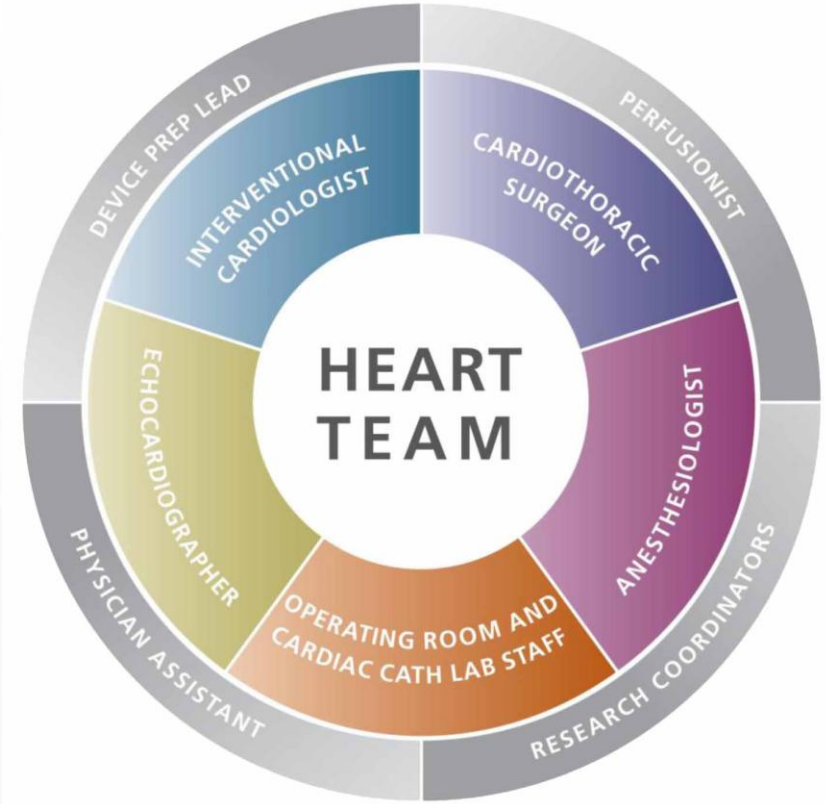
CARDIALYSIS

staged PCI

staged CABG

Notfall-OP

Zusammenfassung



Interdiszplinäre Zusammenarbeit
für einen patienten-zentrierten Entscheidungsprozess