

Cardiology Update 2013, Davos, Switerland

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Management of CAD: Drugs, PCI or CABG?

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**University of
Zurich^{UZH}**

Disclosures

- Speaker honoraria:
 - Astra Zeneca, St. Jude Medical, Menarini



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Case: Mr. J. K. 68 years

Admission 11/2012

- COPD Gold IV
 - Former smoker (50 PY)
 - Diffuse lung emphysema
 - Scheduled for bilateral LVRS
- Psoriasis
- St. n. upper GI-bleeding 6/2009

Patient referred by his pneumologist for preoperative cardiological assessment

Case: Mr. J. K. 68 years

Present history:

Severely symptomatic in light daily activities, dyspnea attacks at rest

No regular exacerbations

Irregular O₂-concentrator use

Medication:

Symbicort TH 400 (Budesonide/Formoterol), Spiriva (Tiotropium bromide) 1x/d, Aspirin 100mg 1x/d, Pantoprazol 40mg irregularly

«By the way, I'm diabetic (diet treatment)...»

Case: Mr. J. K. 68 years

Clinical examination:

171cm, 61kg, RR 15/min (prolonged expiration), BP 120/80mmHg, HR 90%, SpO₂ 95%, clinical signs of emphysema, cardiac examination without pathological findings

Case: Mr. J. K. 68 years

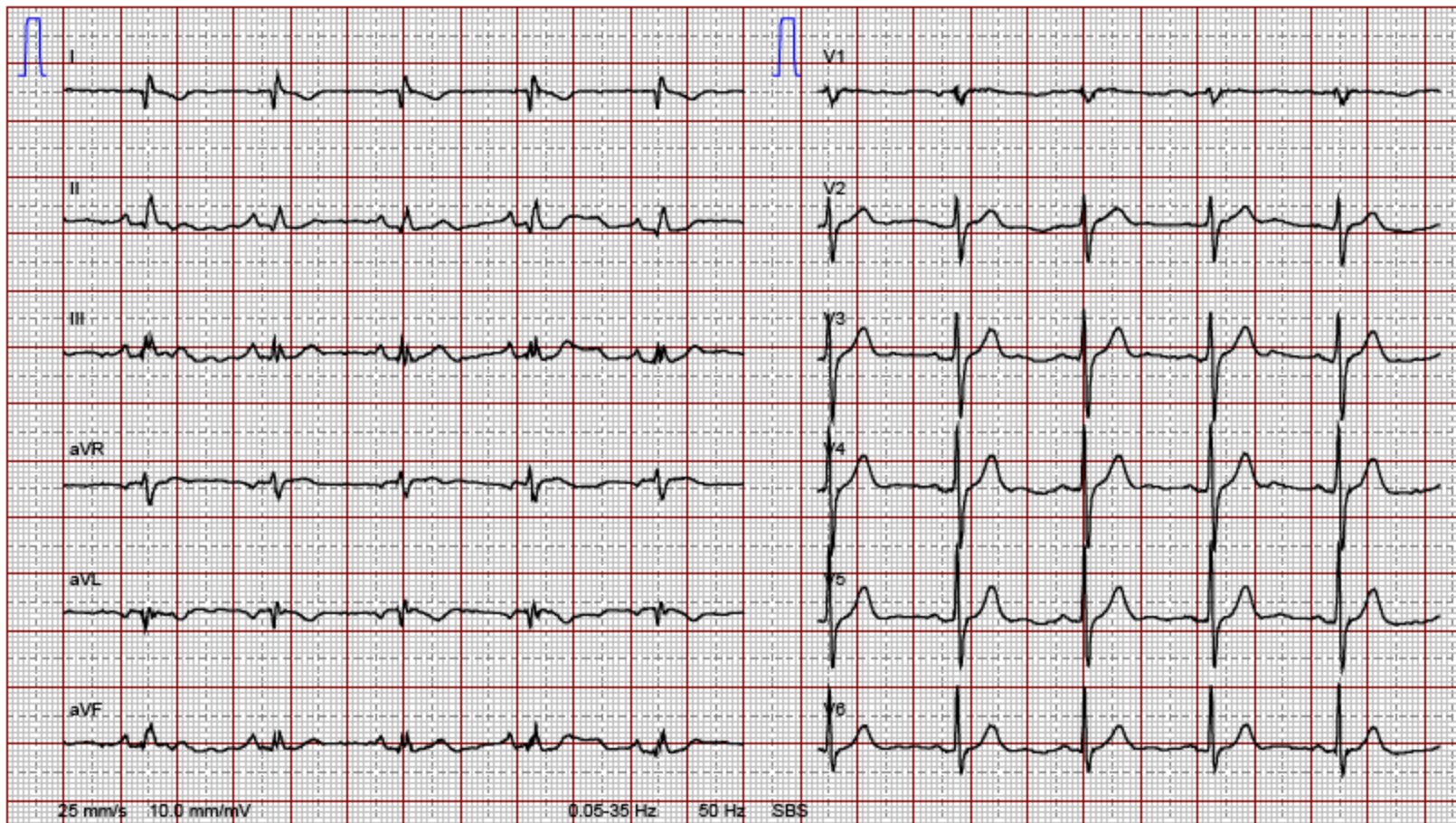
Laboratory testing:

Elektrolyt- und Wasserhaushalt			
Natrium	mmol/l	136 - 145	141
Kalium	mmol/l	3.3 - 4.5	3.9
Niere			
Harnstoff	mmol/l	2.86 - 8.21	4.2
Kreatinin	μmol/l	62 - 106	* 54
GFR nach CKD-EPI-Formel	ml/min		>90 (1)
Enzyme			
LDH (Laktat-Dehydrogenase)	U/l	240 - 480	340
AST(GOT)Aspartat-Aminotransferase	U/l	< 50	19
ALT(GPT)Alanin-Aminotransferase	U/l	10 - 50	16
GGT (γ-Glutamyltranspeptidase)	U/l	8 - 61	41
Alk. Phosphatase	U/l	40 - 129	56
Entzündung			
CRP (C-reakt. Prot.)	mg/l	< 5	1.0
Diabetes und Energiestoffwechsel			
Glucose spontan	mmol/l	< 11.1	8.9 (2)
HbA1c n.MGSP	%	4.8 - 5.9	* 6.0 (3)
HbA1c nach IFCC	mmol/mol	29 - 42	42

Blutstatus			
Hämoglobin	g/l	134-170	134
Hämatokrit	l/l	0.400-0.500	0.402
Erythrozyten	T/l	4.2-5.7	4.41
MCV	fL	80-100	91.2
MCH	pg	26-34	30.4
MCHC	g/l	310-360	333
Thrombozyten (automatisch)	G/l	143-400	243
Leukozyten	G/l	3.0-9.6	8.43
HAEMOSTASE UNTERSUCHUNGEN			
Globaltests			
Quick (automat) %	%	>70	109
INR %		<1.2	1.0

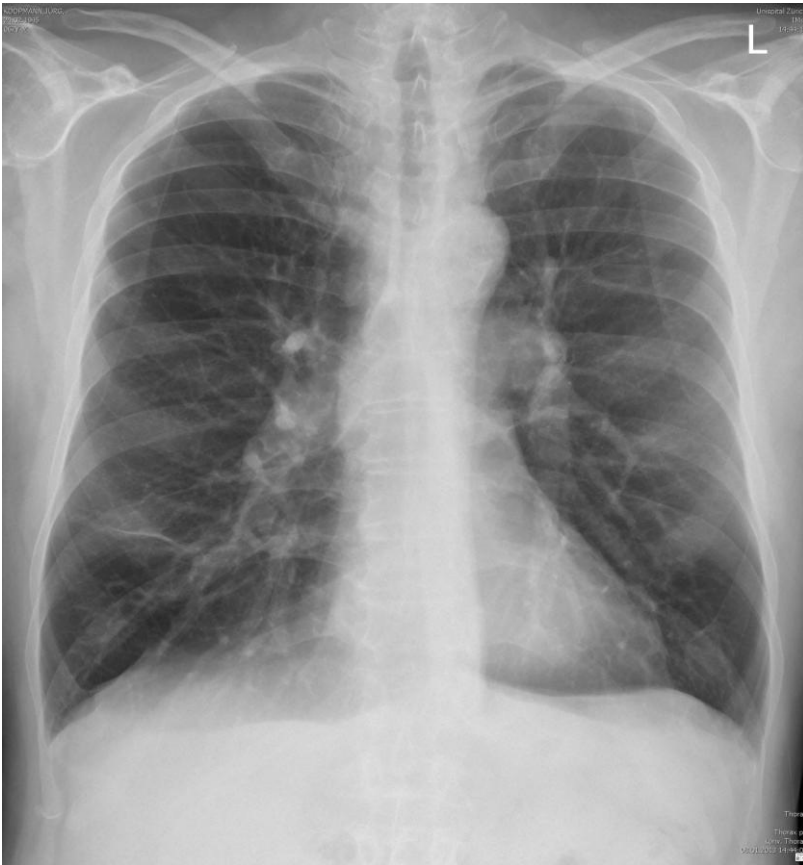
Case: Mr. J. K. 68 years

ECG:



Case: Mr. J. K. 68 years

Thorax Rx:

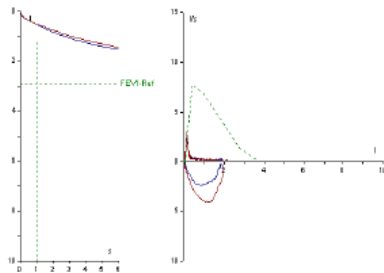


Case: Mr. J. K. 68 years

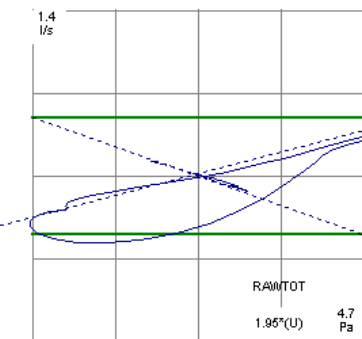
Lung function testing:

Lungenfunktion: Gesamtprotokoll

Spirometrie und Fluss/Volumen



Zeit	13:42			13:56			
Medikament				Ventolin 2 Hub			
Parameter	Einheit	Soll	Pre	% Soll	Post	% Soll	Pre
IVC	l	3.90	2.09	53			
ERV	l	1.03	1.24	121			
IC	l	3.06	0.84	28			
FVCex	l	3.77	1.92	51	2.15	57	12
FEV1	l	2.92	0.57	19	0.55	19	-2
FEV1/IVC	%	75	27	36			
FEV1/FVCex	%	75	29	39	26	34	-12
PEF	l/s	7.77	2.39	31	3.00	39	26
MEF75	l/s	6.92	0.38	5	0.31	5	-17
MEF50	l/s	4.05	0.29	7	0.23	6	-19
MEF25	l/s	1.38	0.20	14	0.13	9	-36
MEF25-75	l/s	3.14	0.23	7	0.18	6	-23



Bodyplethysmographische Resistance

RAWtot	kPa/l*s	0.30	1.95	651
sRAWtot	kPa*s	1.05	12.84	1218

Bodyplethysmographische Volumina

TGV	l	3.51	6.57	187
TLC	l	6.58	7.42	113
RV	l	2.48	5.33	215
TGV/TLC	%	58	89	153
RV/TLC	%	40	72	179

Case: Mr. J. K. 68 years

6min walking test:

375m (Borg 5)

SpO2 pretest 95%

SpO2 posttest 90%

HR pretest 88/min

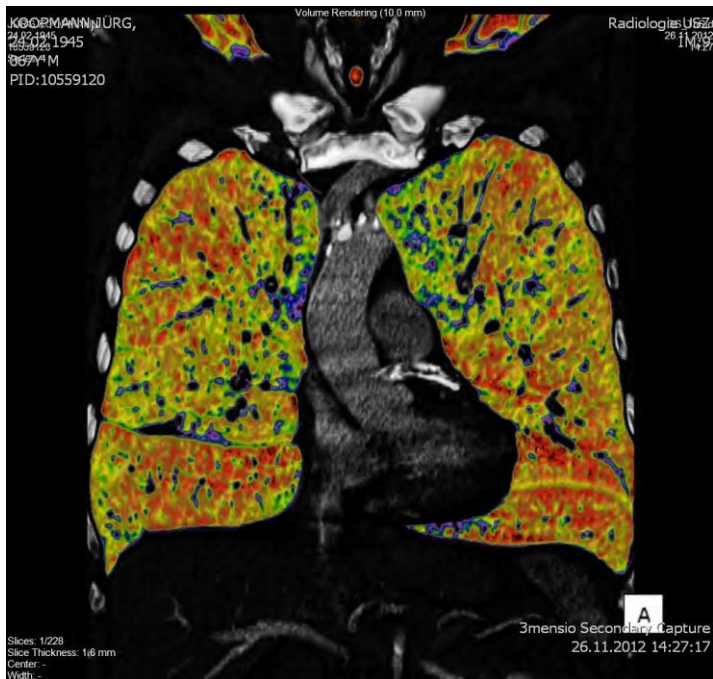
HR posttest 78/min

Case: Mr. J. K. 68 years

CT:

Homogeneous bilateral emphysema

Slightly dilated RV, dilated main pulmonary artery



Case: Mr. J. K. 68 years

Echo:

- Normal LVEF without regional wall motion abnormalities
- Normal RV-Function
- No valvular abnormalities
- dP RV/RA = 42mmHg

Case: Mr. J. K. 68 years

- ☐ Surgery not possible
- ☐ Proceed to surgery without further testing
- ☐ Exercise testing
- ☐ Non-invasive imaging
- ☐ Right Heart Catheterization
- ☐ Coronary Angiogram
- ☐ Gastroscopy

Case: Mr. J. K. 68 years

LVRS exclusion criterias:

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AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE VOL 184 2011

TABLE 1. ENROLLMENT CRITERIA

Inclusion Criteria

- History and physical examination consistent with emphysema
- CT scan evidence of bilateral emphysema
- Prehabilitation postbronchodilator TLC $\geq$ 100% predicted
- Prehabilitation postbronchodilator RV $\geq$ 150% predicted
- Prehabilitation FEV₁ (maximum of pre- and postbronchodilator values) $\leq$ 45% of predicted and, if age $\geq$ 70 yr prehabilitation, FEV₁ (maximum of pre- and postbronchodilator values) $\geq$ 15% of predicted
- Prehabilitation room air, resting PaCO₂ $\leq$ 60 mm Hg ($\leq$ 55 mm Hg in Denver)
- Prehabilitation room air, resting PaO₂ $\geq$ 45 mm Hg ($\geq$ 30 mm Hg in Denver)
- Prehabilitation plasma cotinine $\leq$ 13.7 ng/ml (if not using nicotine products) or prehabilitation arterial carboxyhemoglobin $\leq$ 2.5% (if using nicotine products)
- Body mass index $\leq$ 31.1 (males) or $\leq$ 32.3 (females) as of randomization
- Nonsmoker (tobacco products) for 4 mo before initial interview
- Approval for surgery by cardiologist if any of the following: unstable angina, left ventricular ejection fraction cannot be estimated from the echocardiogram, left ventricular ejection fraction $<$ 45%, dobutamine-radiolabeled cardiac scan indicates coronary artery disease or ventricular dysfunction, $>$ 5 premature ventricular beats/min (rest), cardiac rhythm other than sinus or premature atrial contractions noted during resting EKG, S₃ gallop on physical examination
- Completion of all prehabilitation assessments
- Judgment by study physician that patient is likely to be approved for surgery on completion of the rehabilitation program
- Completion of NETT rehabilitation program
- Completion of all postrehabilitation and all randomization assessments

Exclusion Criteria

- CT scan evidence of diffuse emphysema judged unsuitable for LVRS
- Previous LVRS (laser or excision)
- Pleural or interstitial disease that precludes surgery
- Giant bulla ($\geq$ one-third of the volume of the lung)
- Clinically significant bronchiectasis
- Pulmonary nodule requiring surgery
- Previous sternotomy or lobectomy
- Myocardial infarction within 6 mo of interview and ejection fraction $<$ 45%
- CHF within 6 mo of interview and ejection fraction $<$ 45%
- Uncontrolled hypertension (systolic $>$ 200 mm Hg or diastolic $>$ 110 mm Hg)
- Pulmonary hypertension: mean Ppa on right heart catheterization $\geq$ 35 mm Hg ($\geq$ 38 mm Hg in Denver) or peak systolic Ppa on right heart catheterization $\geq$ 45 mm Hg ($\geq$ 50 mm Hg in Denver); right heart catheterization is required to rule out pulmonary hypertension if peak systolic Ppa on echocardiogram $>$ 45 mm Hg
- Unplanned, unexplained weight loss $>$ 10% usual weight in 90 d before interview or unplanned, explained weight loss $>$ 10% usual weight in 90 d before interview
- History of recurrent infections with daily sputum production judged clinically significant
- Daily use of $>$ 20 mg of prednisone or its equivalent
- History of exercise-related syncope
- Resting bradycardia ($<$ 50 beats/min), frequent multifocal PVCs, or complex ventricular arrhythmia or sustained SVT
- Cardiac dysrhythmia that poses a risk to the patient during exercise testing or training
- Oxygen requirement during resting or oxygen titration exceeding 6 L/min to keep saturation $\geq$ 90%
- Evidence of systemic disease or neoplasia that is expected to compromise survival
- Any disease or condition that may interfere with completion of tests, therapy, or follow-up
- 6MWD $\leq$ 140 m postrehabilitation
- Inability to complete successfully any of the screening or baseline data collection procedures



Case: Mr. J. K. 68 years

CAD in LVRS?

Coronary Artery Disease in Patients Undergoing Lung Volume Reduction Surgery for Emphysema*

(CHEST 1997; 112:122-28)

*Robert Thurnheer, MD; Jörg Muntwyler, MD; Uz Stammberger, MD;
Konrad E. Bloch, MD, FCCP; Andreas Zollinger, MD; Walter Weder, MD; and
Erich W. Russi, MD, FCCP*

Coronary Angiography Findings and Left Heart Function in Asymptomatic Patients

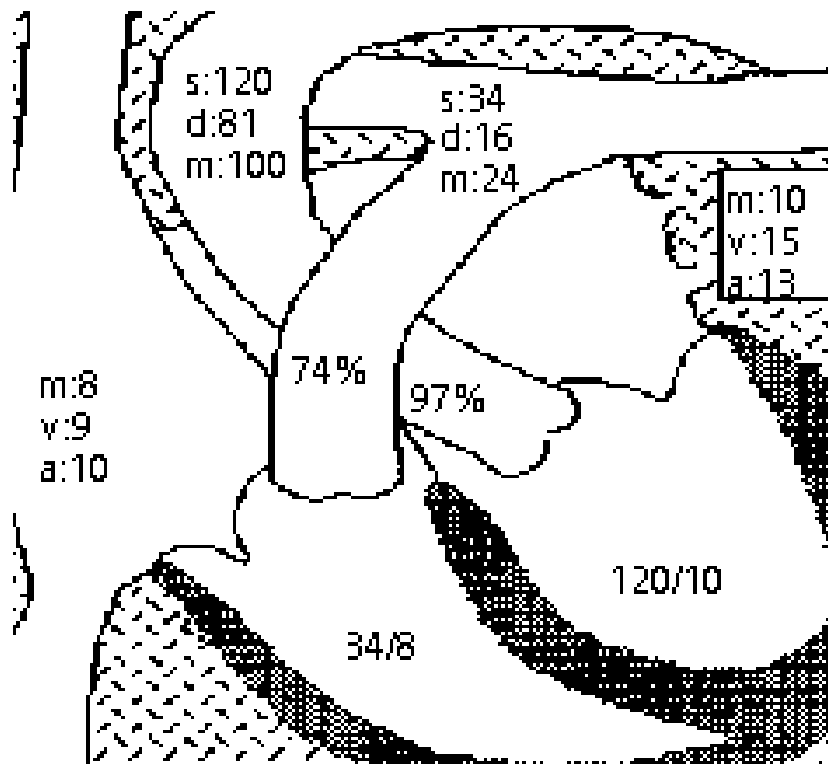
In 35 patients, no significant CAD was found, but 6 of 41 patients (15%) without a history of CAD were documented to have significant CAD by coronary angiography. All had an ejection fraction above 50% and a mean pulmonary capillary wedge pressure within the normal range (<15 mm Hg) as assessed by right and left heart catheterization (Table 1).



Case: Mr. J. K. 68 years

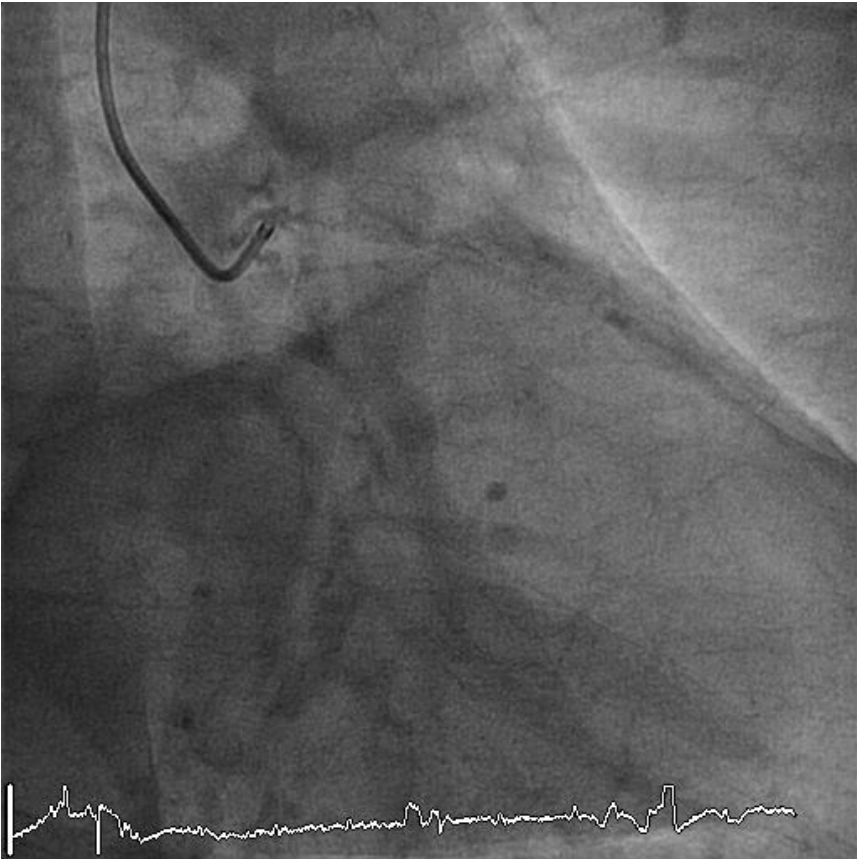
Cardiac Catheterization (Hemodynamics):

HMV: 5.1 l/min (Fick). CI: 3 l/min/m²



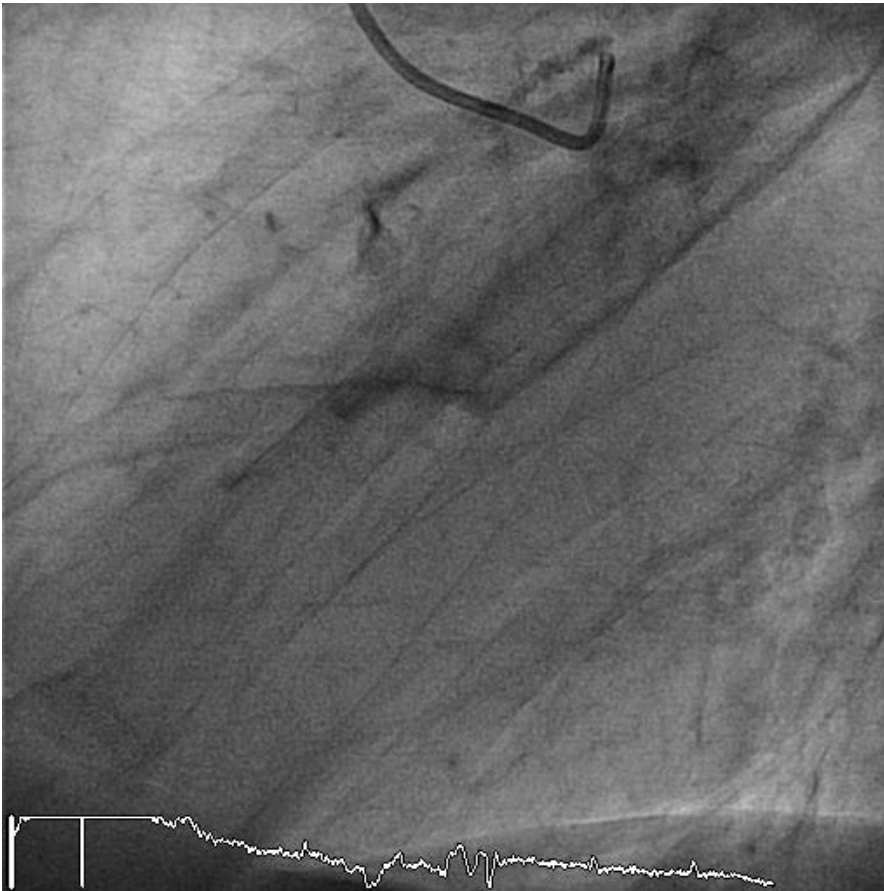
Case: Mr. J. K. 68 years

Cardiac Catheterization (Coronary Angiogram):



Case: Mr. J. K. 68 years

Cardiac Catheterization (Coronary Angiogram):



Case: Mr. J. K. 68 years

Another additional diagnosis....

Eingriff

PTEE und LTL (200 000E Urokinase) des akuten Verschlusses Tr.tibiofibularis, A.tib.ant und A.tib.post rechts

☐ PTA ☒ LTL ☒ PTEE ☐ Stent ☐ Stentgraft ☐ Atherektomie ☐ Drug-coated PTA ☐ DES ☐ REENTRY-DEVICE

Detaillierte Angaben zur Intervention

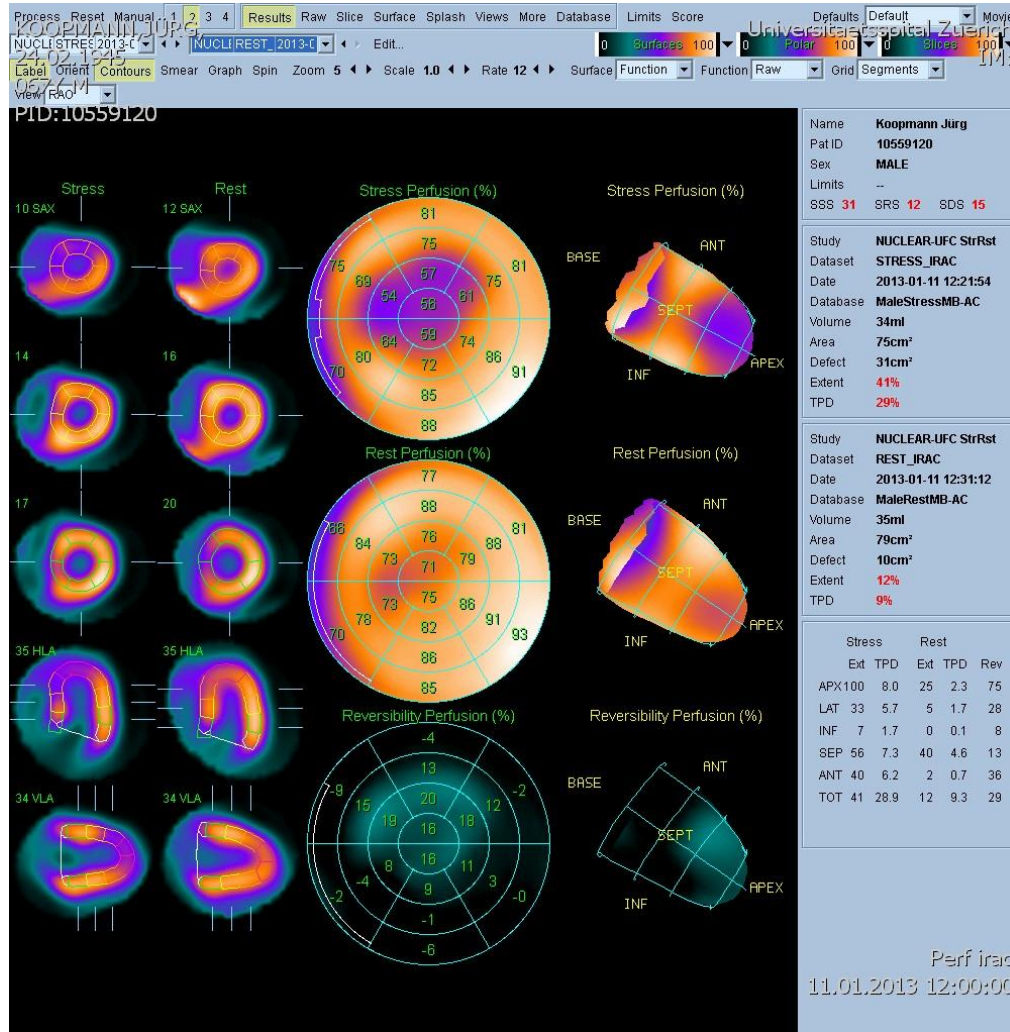
PTA = perkutane transluminale Angioplastie

PTEE = perkutane Thrombembolyse / LTL = lokale Thrombolyse / DES = drug eluting stent



Case: Mr. J. K. 68 years

SPECT:



Case: Mr. J. K. 68 years

LVRS Risks:

Major pulmonary and cardiovascular morbidity (assessed in the 30 d after LVRS) occurred in 29.8 and 20% of patients, respectively. Pulmonary morbidity was greater in older patients ($P = 0.02$), and those with lower FEV₁ ($P = 0.05$) or DL_{CO} (0.97; $P = 0.01$). Cardiovascular morbidity was higher with age (1.07; $P = 0.004$), use of oral steroids ($P = 0.04$), or in the presence of non-upper lobe-predominant emphysema ($P < 0.001$).

The National Emphysema Treatment Trial (NETT)

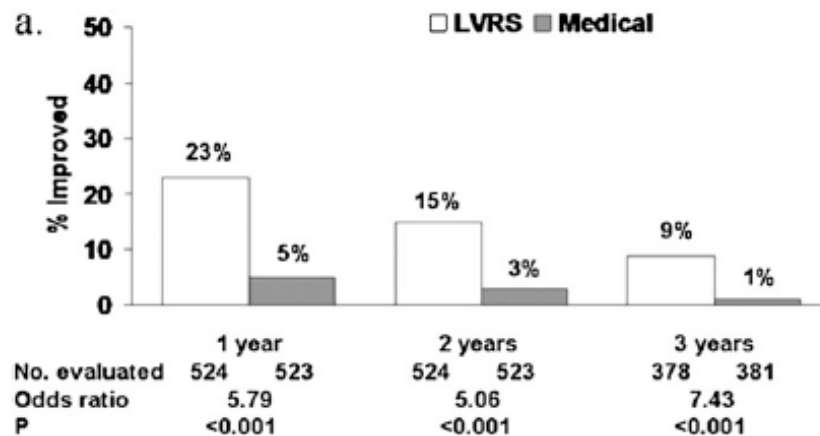
Part II: Lessons Learned about Lung Volume Reduction Surgery

Am J Respir Crit Care Med Vol 184, pp 881–893, 2011

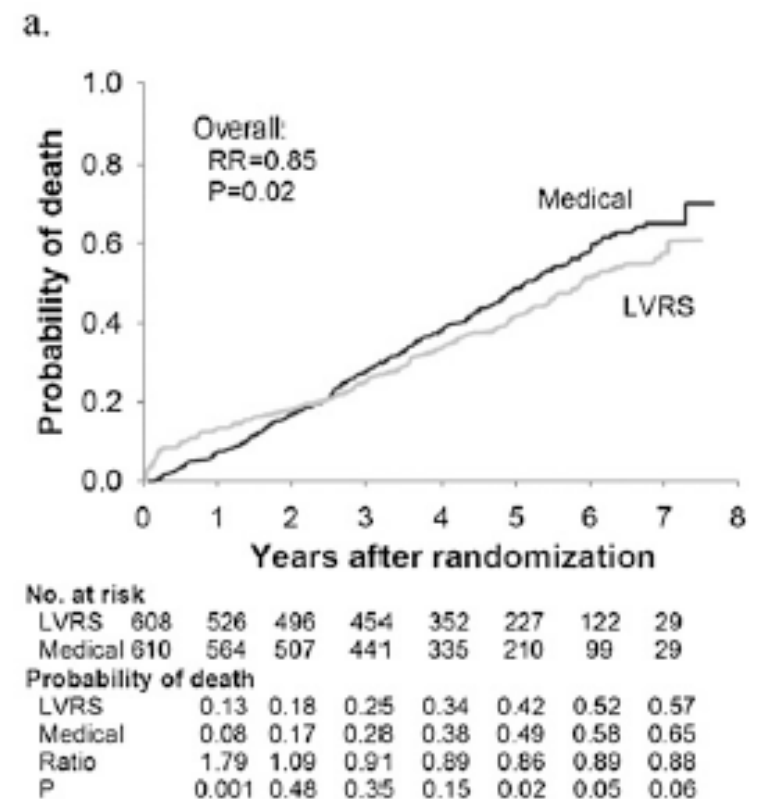
Case: Mr. J. K. 68 years

LVRS Benefits:

Exercise capacity improvement

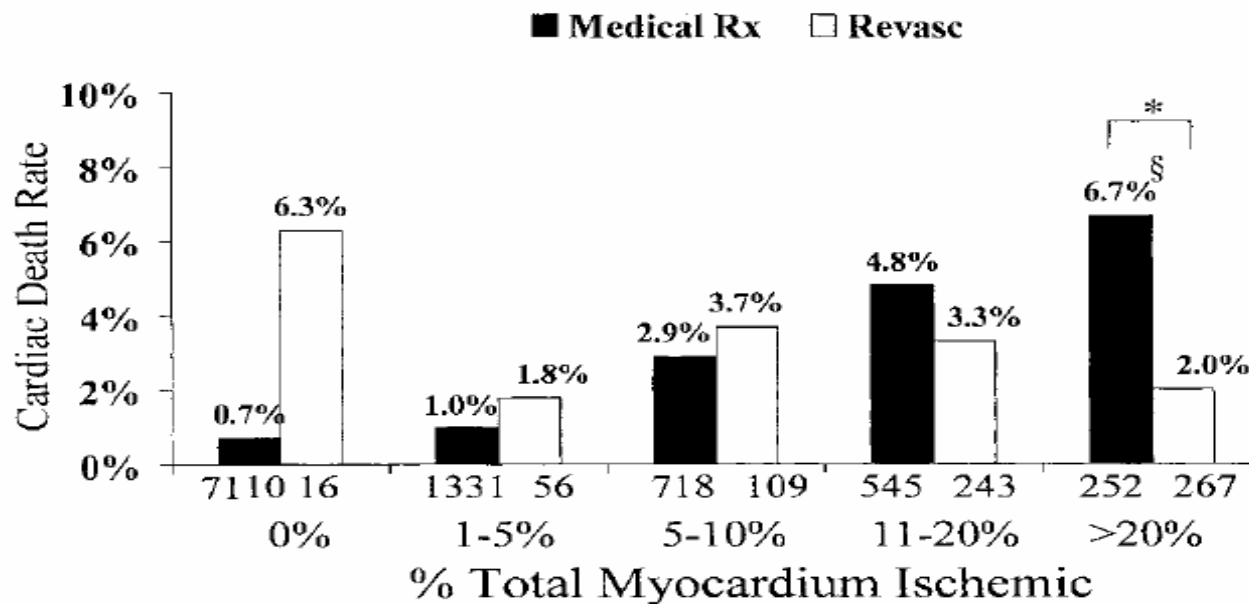


Survival



Case: Mr. J. K. 68 years

CAD Revascularization Benefits:



Hachamovitch et al., Circulation 1998; 97:535-43

Case: Mr. J. K. 68 years

- COPD Gold IV
 - Diffuse lung emphysema, scheduled for bilateral LVRS
 - mPAP=27mmHg
- Coronary Artery Disease
 - Mid-LAD-CTO, 50% stenosis of first marginal branch
 - >20% Ischemia (SPECT)
 - Normal LVEF, CI=3.0 l/min/m²
- Peripheral Artery Disease
 - Acute ischemic limb syndrome post angiography 11/12
- Diabetes mellitus Typ2
 - On diet
 - HbA1c 6.7%
- Psoriasis
- St. n. upper GI-bleeding 6/2009

Case: Mr. J. K. 68 years

- O Surgery not possible, OMT
- O Proceed to surgery on OMT
- O Full CABG pre LVRS
- O Full PCI pre LVRS
- O MIDCAB and OM-PCI (Hybridrevascularization) pre LVRS
- O Combined LVRS/CABG procedure
- O Revascularization post LVRS
- O Sildenafil

Thank You



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