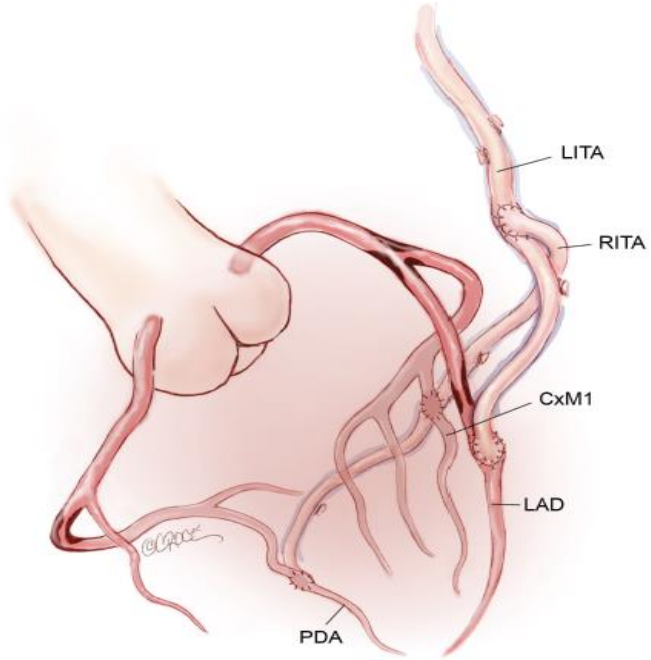
Wann Bypass-OP:

Neue Techniken, wie läuft eine OP ab?



Publikumsveranstaltung “Herzinfarkt – was jetzt?“

Hassina Baraki

Klinik für Herzchirurgie

Arlesheim, 18 April 2026

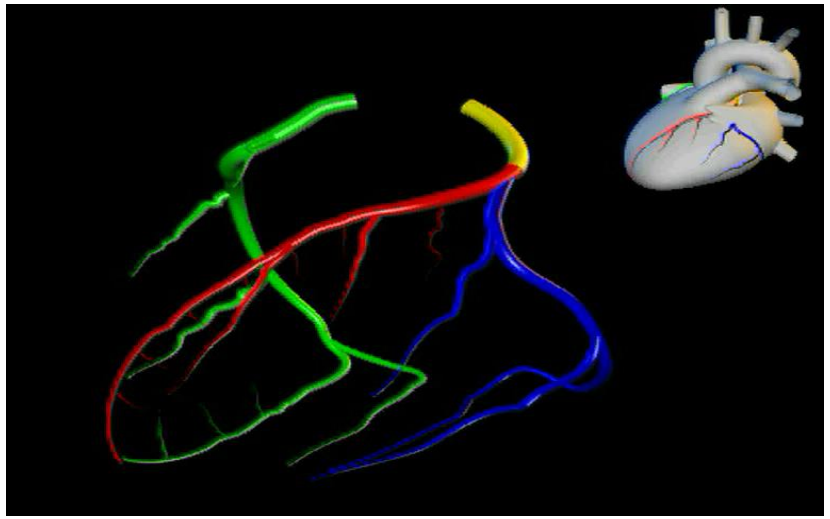
Universitätsspital Basel

Ziel einer Koronarrevaskularisation

- Behandlung der Symptome
- Vorbeugung eines Herzinfarkts
- Lebensverlängerung
- Verbesserung der Lebensqualität

Wer profitiert von einer Bypassoperation?

- Hauptstammstenose
- 3-Gefäß-KHK (Syntax > 22)
- 3-Gefäß-KHK mit Diabetes mellitus
- Schlechte Pumpfunktion < 35%
- Rezidivstenose nach Stent
- Hohe Wahrscheinlich einer inkompletten Revaskularisation bei PCI
- Indikation für weitere Herzeingriffe (Aorta ascendens, Herzklappen,....)



ESC European Society of Cardiology European Heart Journal (2018) 00, 1–96 doi:10.1093/eurheartj/ehy394 ESC/EACTS GUIDELINES

2018 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on myocardial revascularization of the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)

ESC European Society of Cardiology European Heart Journal (2024) 45, 3415–3537 https://doi.org/10.1093/eurheartj/ehae177 ESC GUIDELINES

2024 ESC Guidelines for the management of chronic coronary syndromes

Developed by the task force for the management of chronic coronary syndromes of the European Society of Cardiology (ESC)

Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS)

Randomisierte Studien Bypass versus PCI

Coronary surgery provides better survival than drug-eluting stent: A pooled meta-analysis of Kaplan–Meier-derived individual patient data

Stefano Urso, PhD,[a] Rafael Sadaba, PhD,[b] Jesús María González-Martín, PhD,[c] Víctor Dayan, PhD,[d] Eliú Nogales, MD,[e] María Ángeles Tena, MD,[a] Cipriano Abad, PhD,[a] and Francisco Portela, PhD[a]

4975 patients CABG
4992 patients PCI/DES

8 RCTs, 10 years
Kaplan-Meier derived individual data
Overall mortality

Study	Events	PCI Time	Events	CABG Time	IRR	95%-CI	Weight
VETERANS	21	143.53	5	138.13	4.04	[1.52; 10.72]	1.1%
FAME	12	742.52	7	719.37	1.66	[0.65; 4.22]	1.2%
FREEDOM	159	4742.95	112	4589.36	1.37	[1.08; 1.75]	18.4%
EXCEL	119	4266.54	89	4253.12	1.33	[1.01; 1.75]	14.3%
SYNTAX	303	7433.42	264	7502.92	1.16	[0.98; 1.37]	39.5%
NOBLE	54	2811.38	50	2815.05	1.08	[0.74; 1.59]	7.3%
PRECOMBAT	42	2665.16	40	2653.74	1.05	[0.68; 1.61]	5.7%
BEST	90	3929.84	88	4014.65	1.04	[0.78; 1.40]	12.5%
Random effects model	**800**		**655**		**1.21**	**[1.09; 1.35]**	**100.0%**

Heterogeneity: $I^2 = 29\%$, $\tau^2 < 0.0001$, $P = .20$
Test for overall effect: z = 3.65 ($P < .01$)

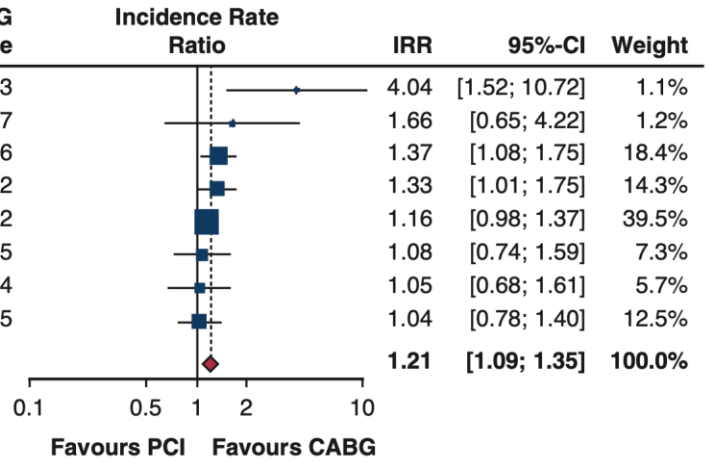
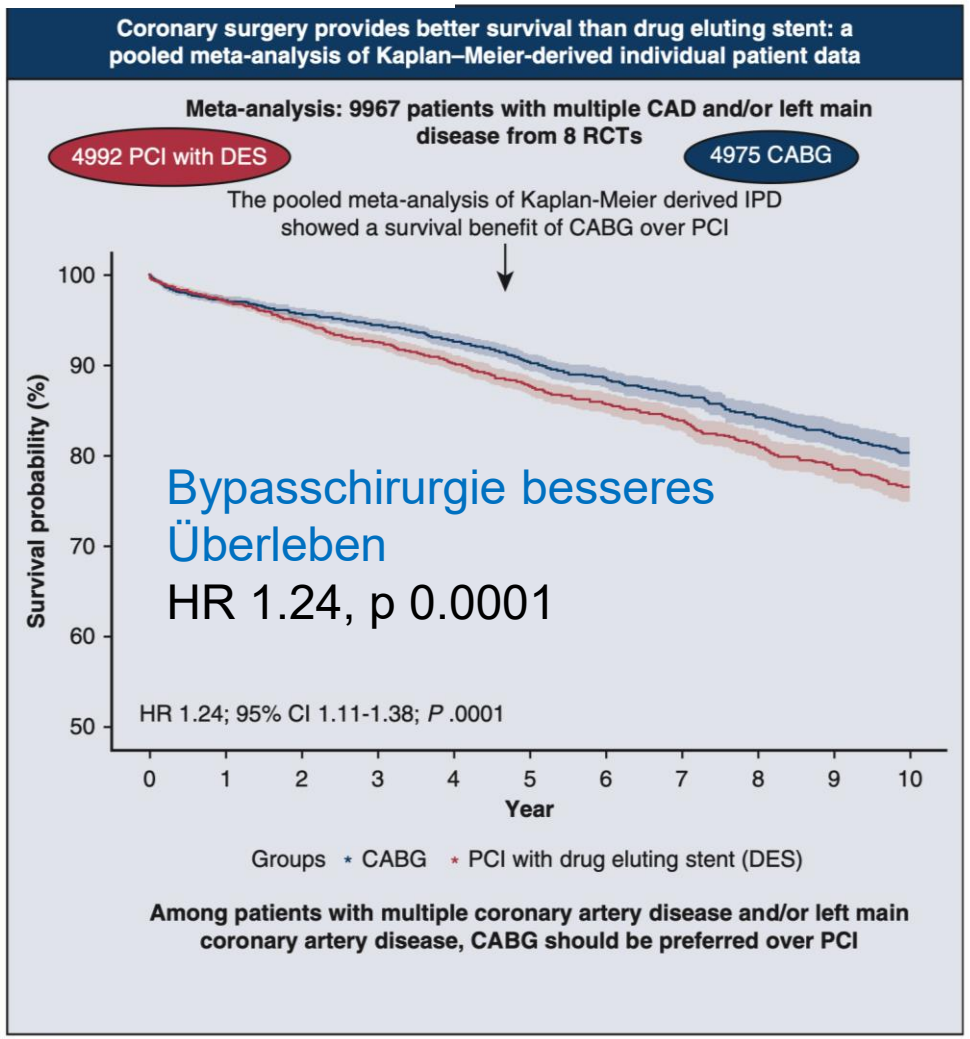


FIGURE 2. Forest plot of survival analysis. *PCI*, Percutaneous coronary intervention; *CABG*, coronary artery bypass grafting; *IRR*, incidence rate ratio; *CI*, confidence interval.



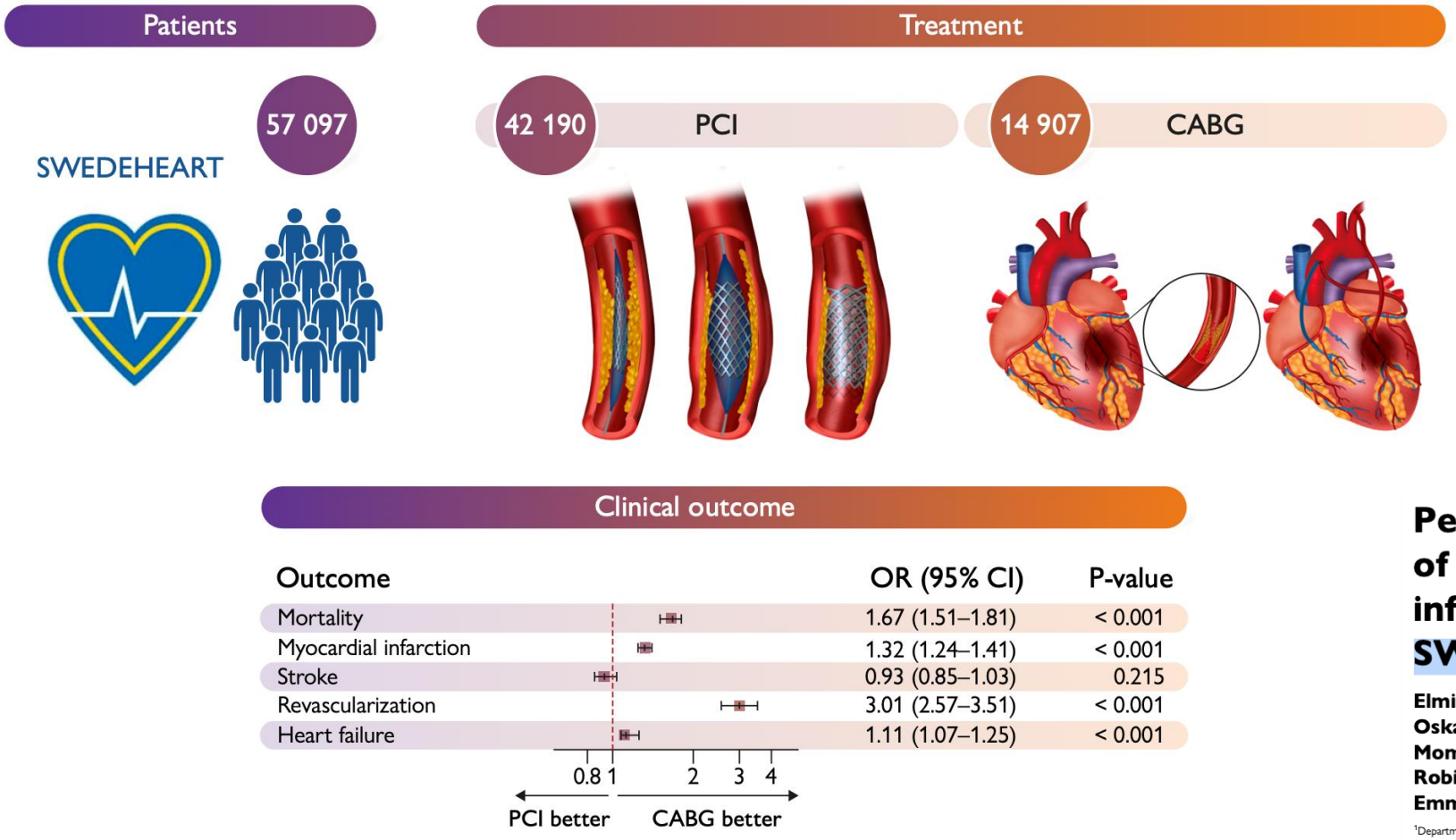
JTCVS

@AATSJournals

The Journal of Thoracic and Cardiovascular Surgery, June 2024

FIGURE 5. Kaplan–Meier estimates with 95% CI of the probability of all-cause mortality. *CAD*, Coronary artery disease; *RCT*, randomized controlled trial; *PCI*, percutaneous coronary intervention; *DES*, drug-eluting stent; *IPD*, individual patient data; *CABG*, coronary artery bypass grafting; *HR*, hazard ratio; *CI*, confidence interval.

SWEDEHEART Register



NSTEMI
Multivessel disease
2005-2022
All cause mortality

ESC European Society of Cardiology
European Heart Journal (2025) **46**, 518–531
https://doi.org/10.1093/eurheartj/ehae700

Percutaneous vs. surgical revascularization of non-ST-segment elevation myocardial infarction with multivessel disease: the SWEDEHEART registry

Elmir Omerovic [1,2,*], Truls Råmunddal[1,2], Petur Petursson [1,2], Oskar Angerås [1,2], Araz Rawshani [1,2], Sandeep Jha[1,2], Kristofer Skoglund [1,2], Moman A. Mohammad [3], Jonas Persson [4], Joakim Alfredsson [5,6], Robin Hofmann [7], Tomas Jernberg [4], Ole Fröbert[8,9], Anders Jeppsson [2,10], Emma C. Hansson[2,10], Göran Dellgren [2,10], David Erlinge[3], and Björn Redfors [1,2]

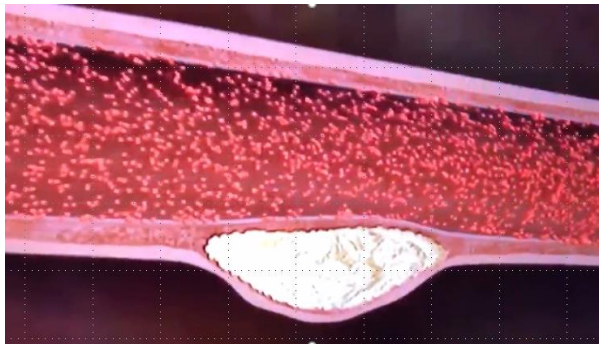
[1]Department of Cardiology, Sahlgrenska University Hospital, Gothenburg, Sweden; [2]Department of Molecular and Clinical Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [3]Department of Cardiology, Clinical Sciences, Lund University, Skåne University Hospital, Lund, Sweden; [4]Karolinska Institutet, Department of Clinical Sciences, Danderyd University Hospital, Division of Cardiovascular Medicine, Stockholm, Sweden; [5]Department of Health, Medicine and Caring Sciences, Linköping University, Linköping, Sweden; [6]Department of Cardiology, Linköping University, Linköping, Sweden; [7]Department of Clinical Science and Education, Division of Cardiology, Karolinska Institutet, Södersjukhuset, Stockholm, Sweden; [8]Department of Clinical Medicine, Faculty of Health, Aarhus University, Aarhus, Denmark; [9]Department of Cardiology, Örebro University Hospital, Örebro, Sweden; and [10]Department of Cardiothoracic Surgery, Sahlgrenska University Hospital, Gothenburg, Sweden

Received 27 July 2024; revised 16 August 2024; accepted 27 September 2024; online publish-ahead-of-print 27 November 2024

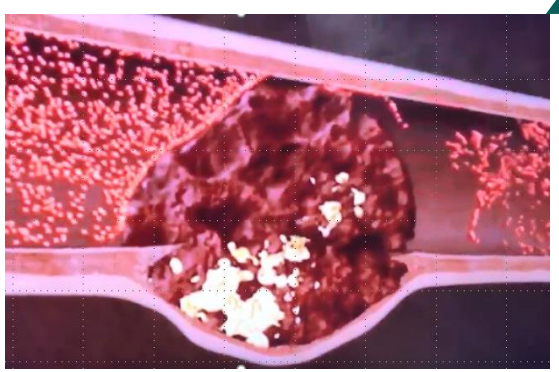
2005-2022: NSTEMI und Mehrgefäss-KHK

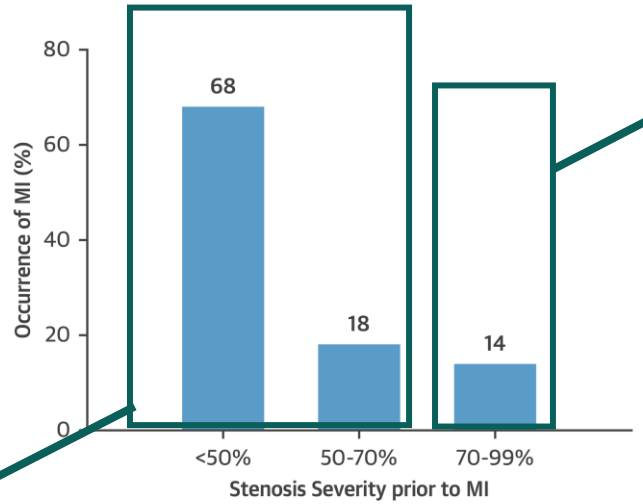
Koronare Herzerkrankung

Nicht-obstruktive KHK

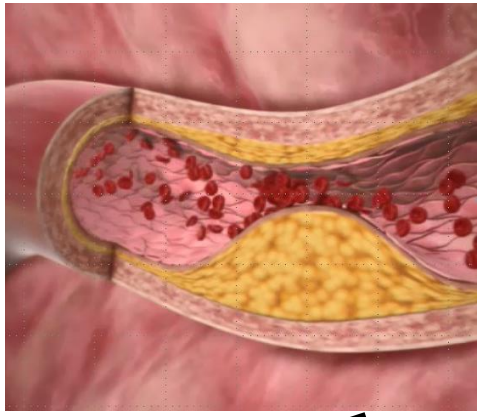


Plaque Ruptur

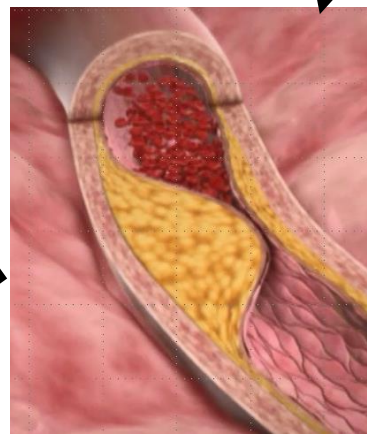




Obstruktive KHK



Progression

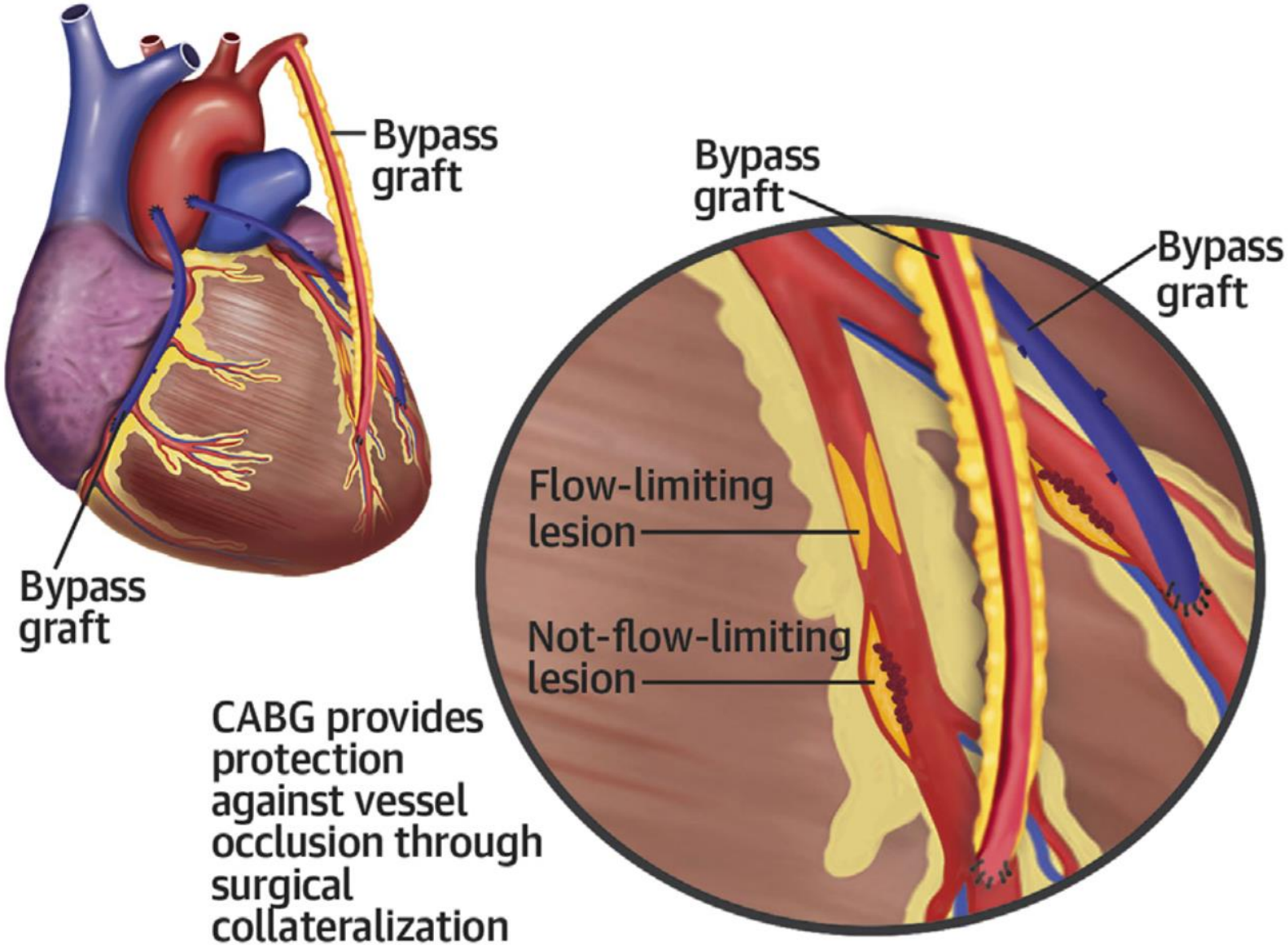


Symptome

Herzinfarkt

Doenst et al. JACC 2019
Doenst and Sigusch JTCVS 2020

Bypasschirurgie = Revaskularisation durch Kollateralisierung



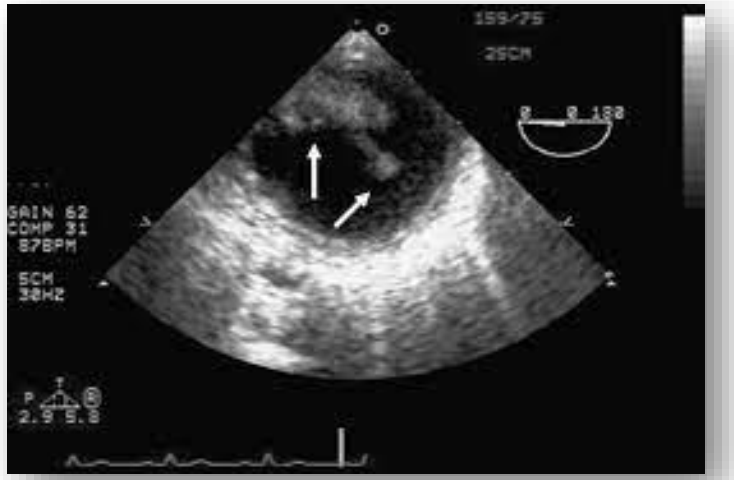
Doenst et al. JACC 2019

Unsere Patienten…

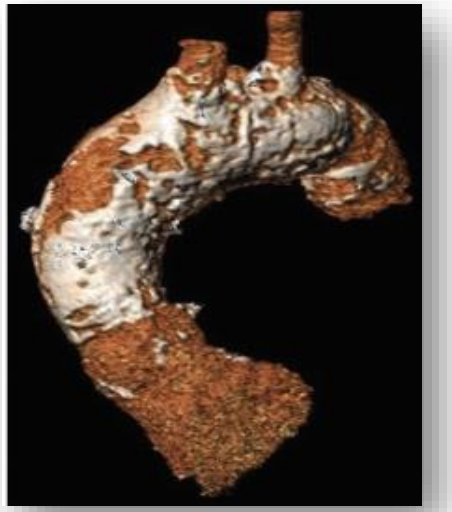
Wichtig: biologisches Alter, Komorbiditäten, „Gebrechlichkeit“ des Patienten, Lebenserwartung, physischer Zustand, psychischer/kognitiver Zustand

Voruntersuchungen

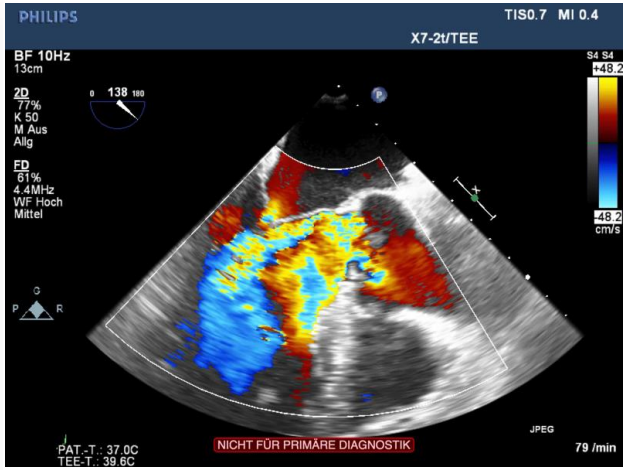
- Echokardiographie
- „Gebrechlichkeitstests
- Kognitive Tests
- Ultraschall Carotiden
- CT-Thorax (Verkalkungen der Aorta)



Epiaortic Sonography: soft Plaques



Computertomographie



Echokardiographie

Vorbereitung vor dem Eingriff

Aufklärung und Risiko-einschätzung

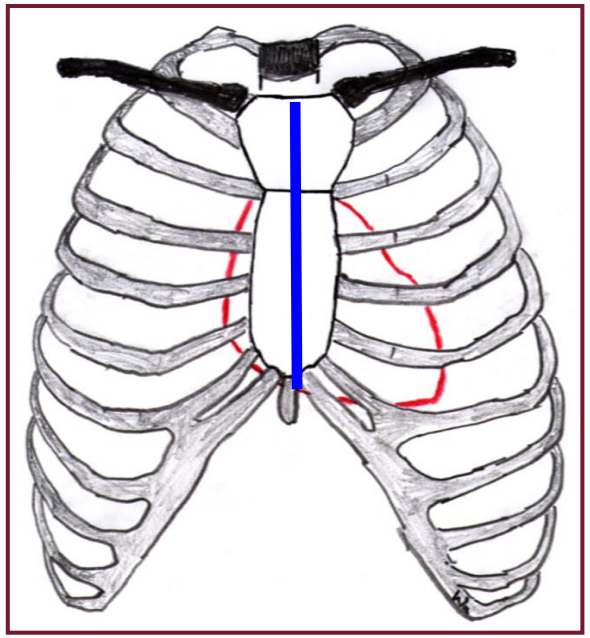
Gedanken + Gefühle des Patienten ansprechen

Erwartungen des Patienten optimieren

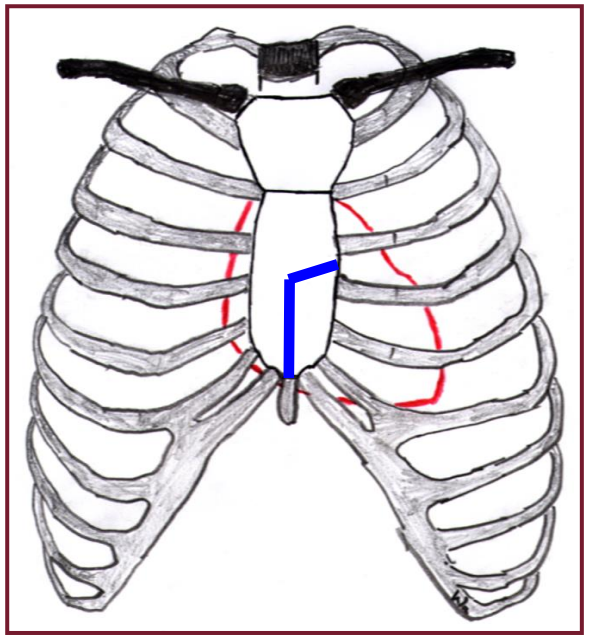
„Aktionsplan”

Salzmann et al., Curr Cardiol Rep . 2020 Oct 10;22(12):172.

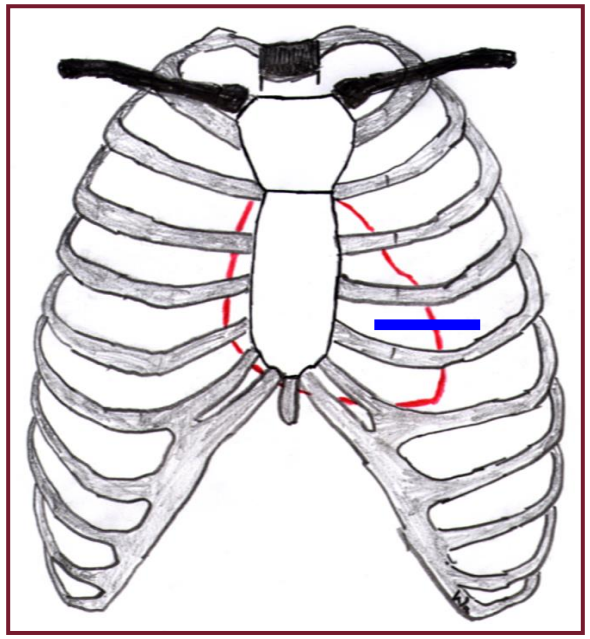
Chirurgischer Zugang



Sternotomie



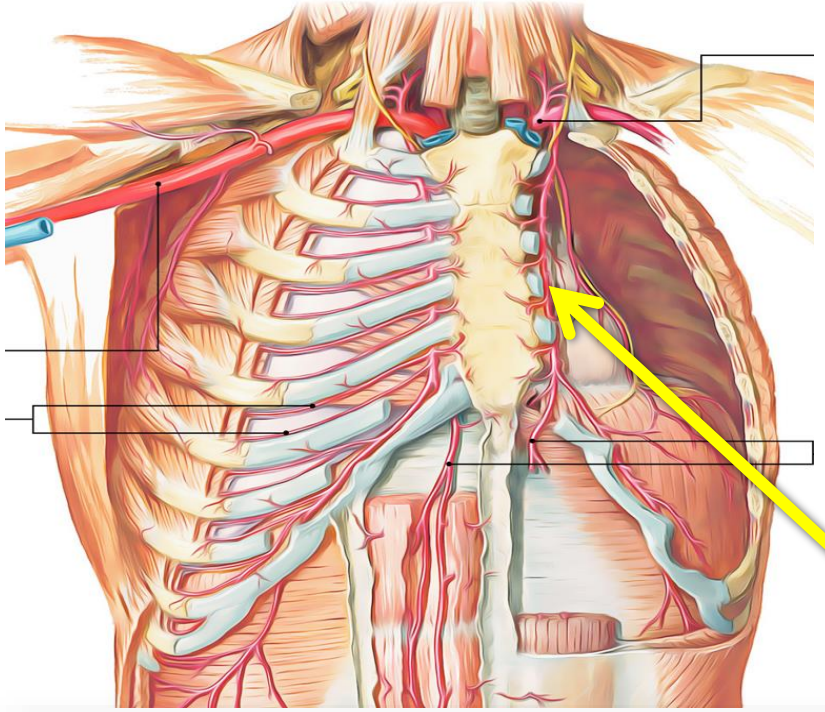
Mini-Sternotomie

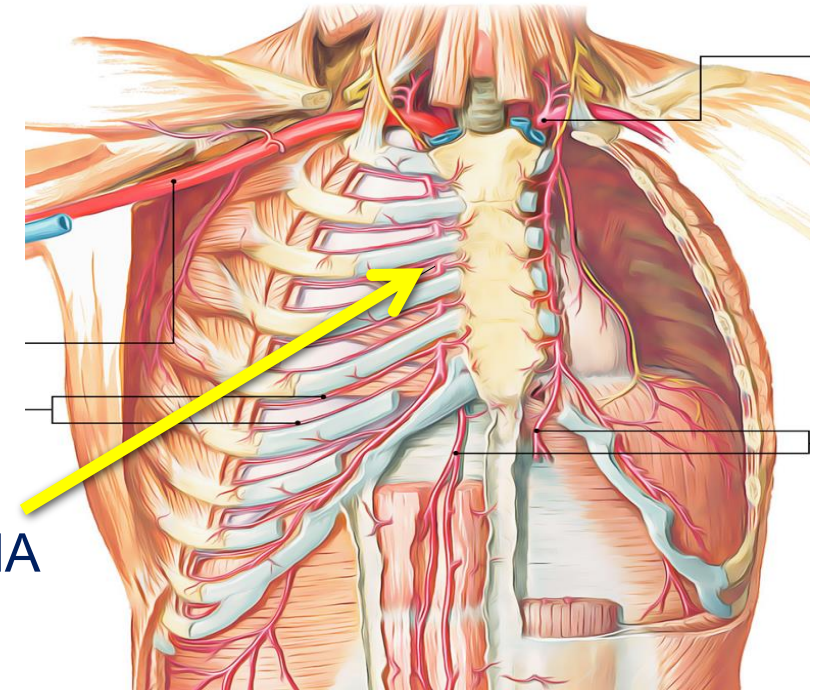


Mini-Thorakotomie

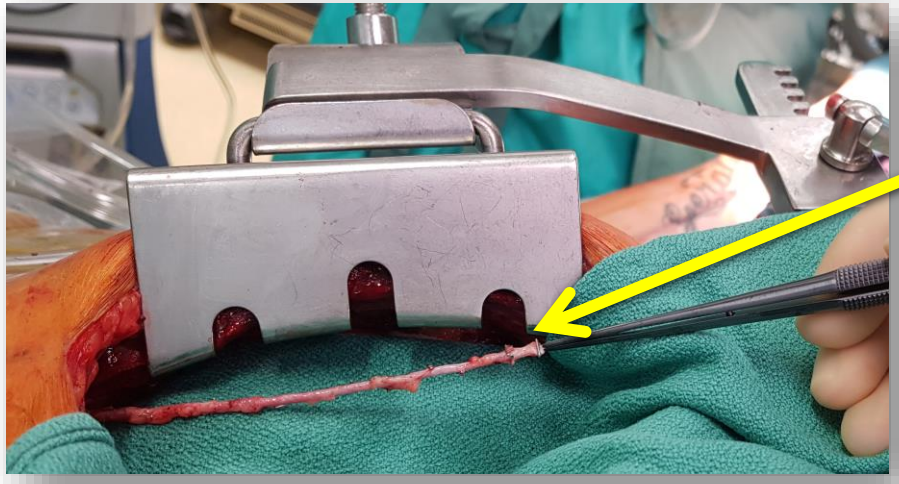
Mertes et al., Anaesth Crit Care Pain Med . 2022 Jun;41(3):101059.

Bypassmaterial: Brustwandarterien





RIMA

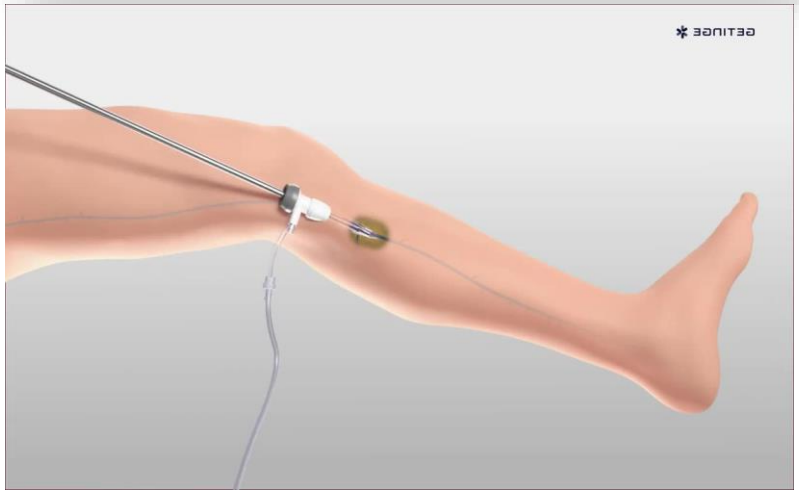


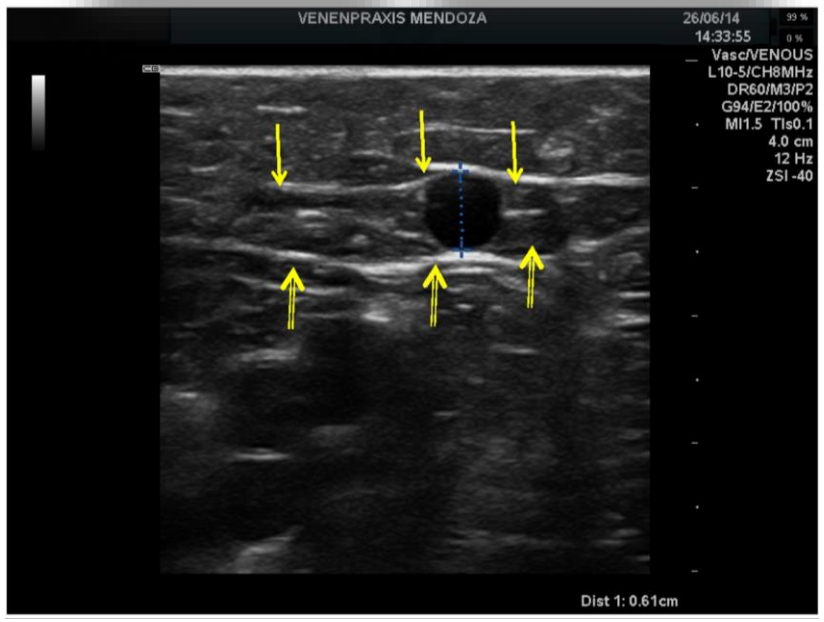
LIMA

Cave: sternale Wundheilungsstörung

- Diabetes mellitus
- Lungenerkrankungen
- Adipositas
- Einnahme von Cortison

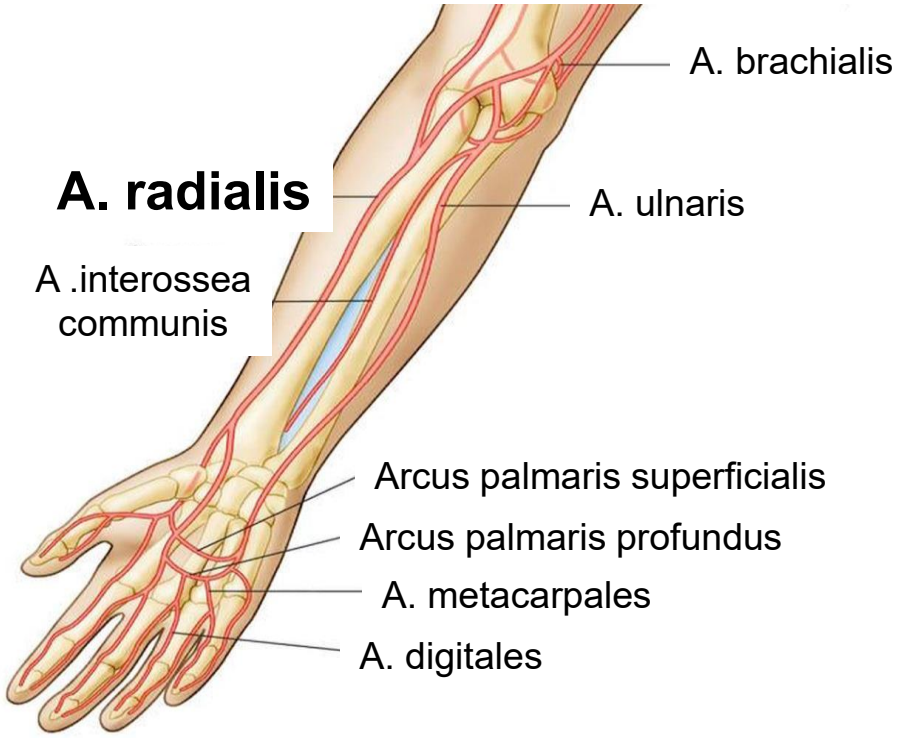
Bypassmaterial: Vena saphena magna





https://www.der-niedergelassene-arzt.de/fileadmin/user_upload/zeitschriften/vasomed/Artikel_PDF/2016/01-2016/Mendoza.pdf

Bypassmaterial: Arteria radialis

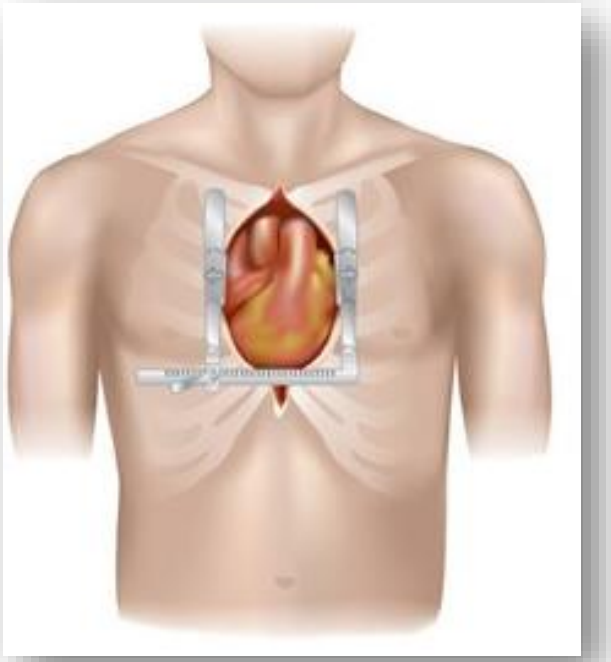


https://www.quizover.com/anatomy/section/arteries-serving-the-upper-limbs-by-openstax
https://www.earthslab.com/anatomy/superior-epigastric-artery/

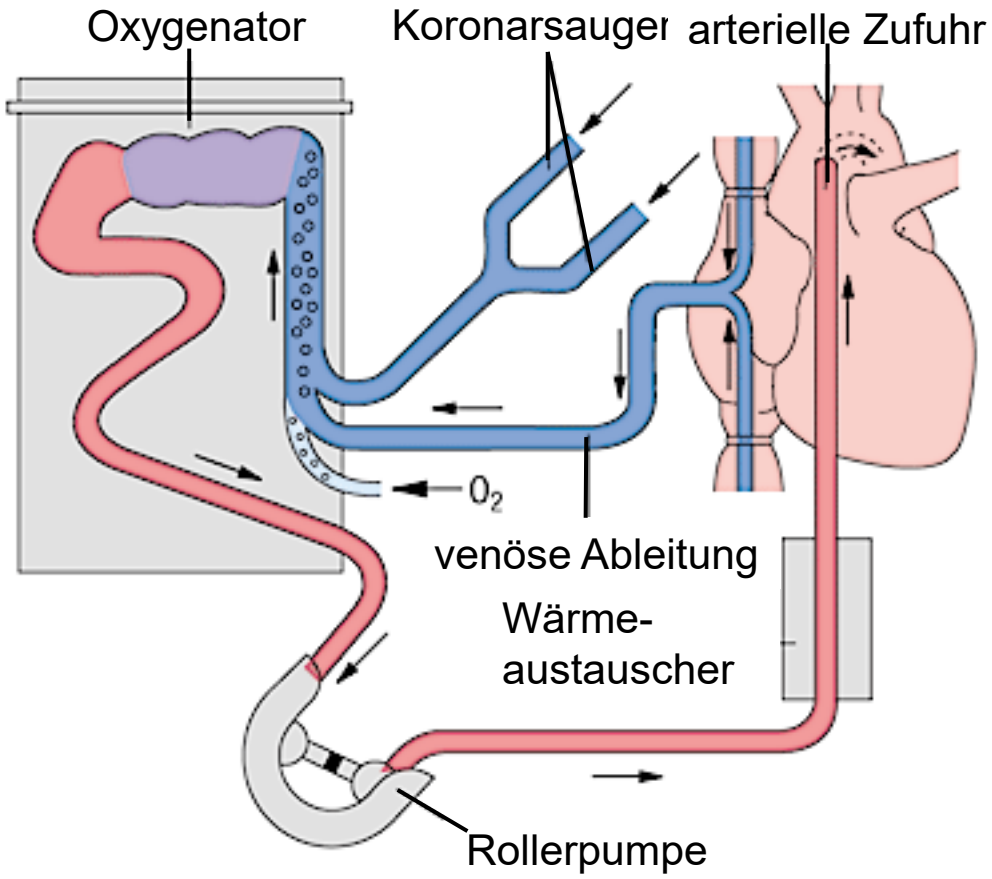
Mobus Dupuytren

Dialyse-Shunt

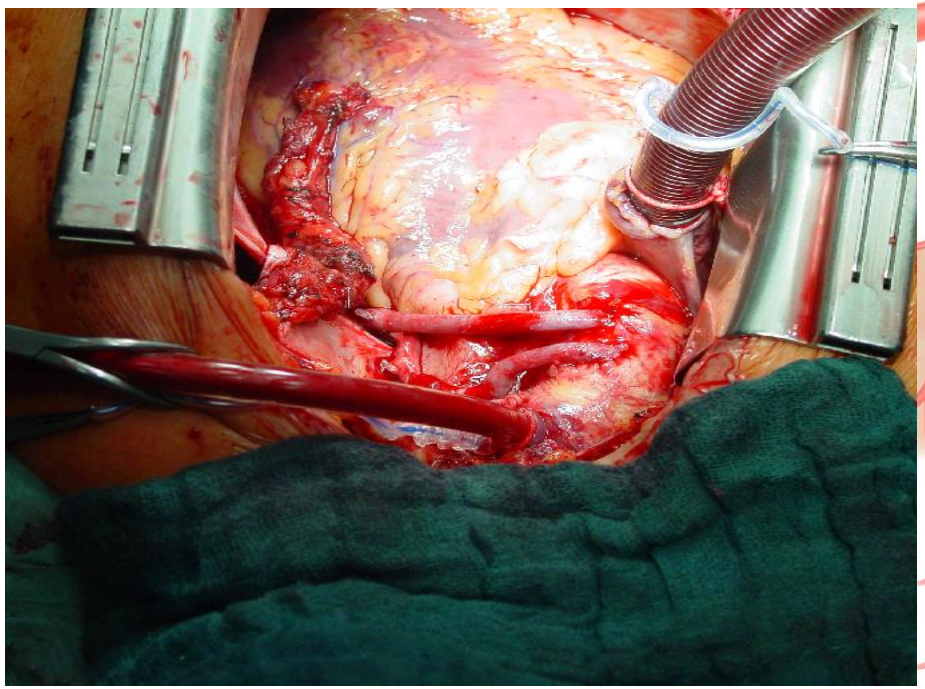
Herzlungenmaschine

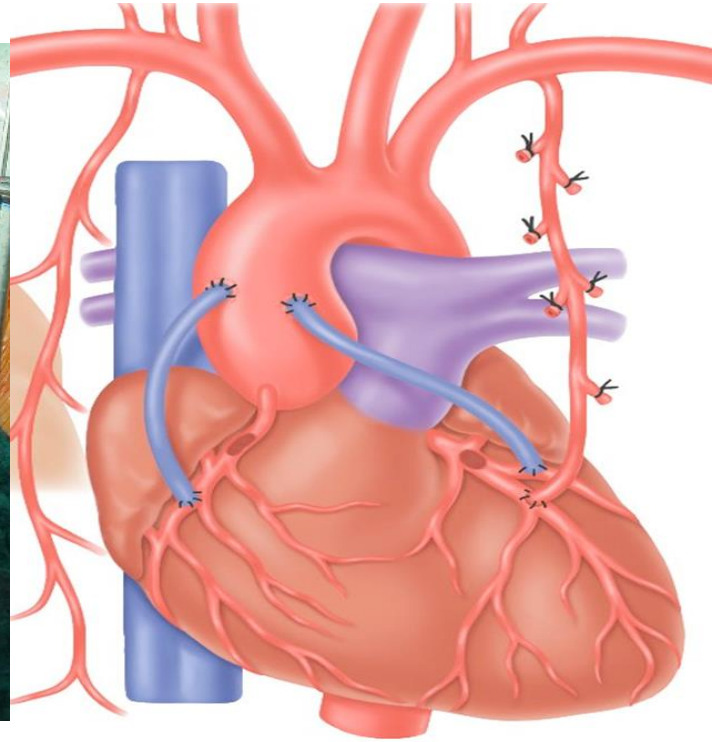


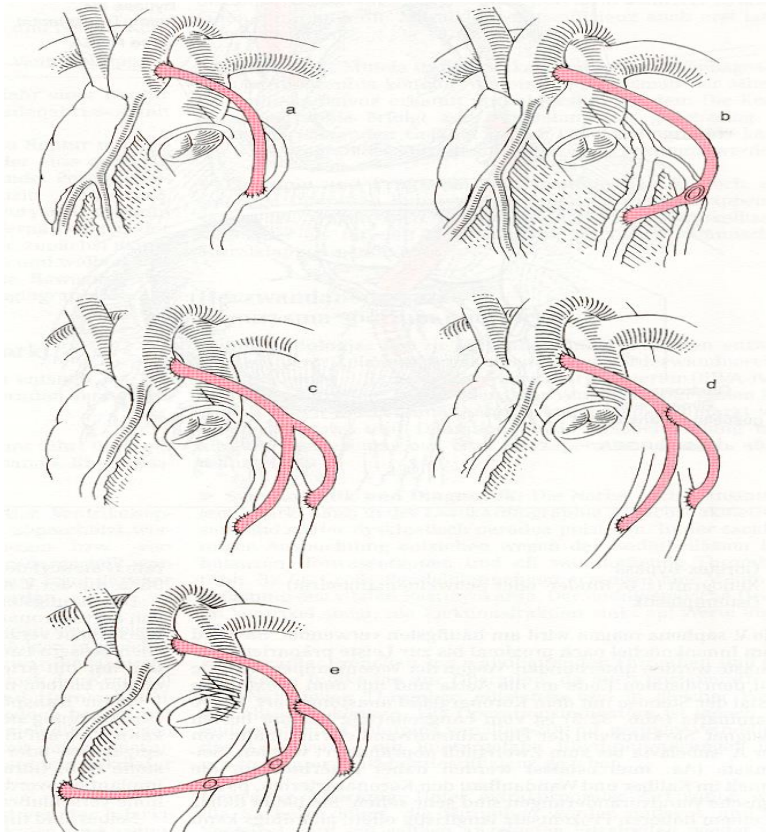
Herzlungenmaschine:
Quantum, Spectrum Medical



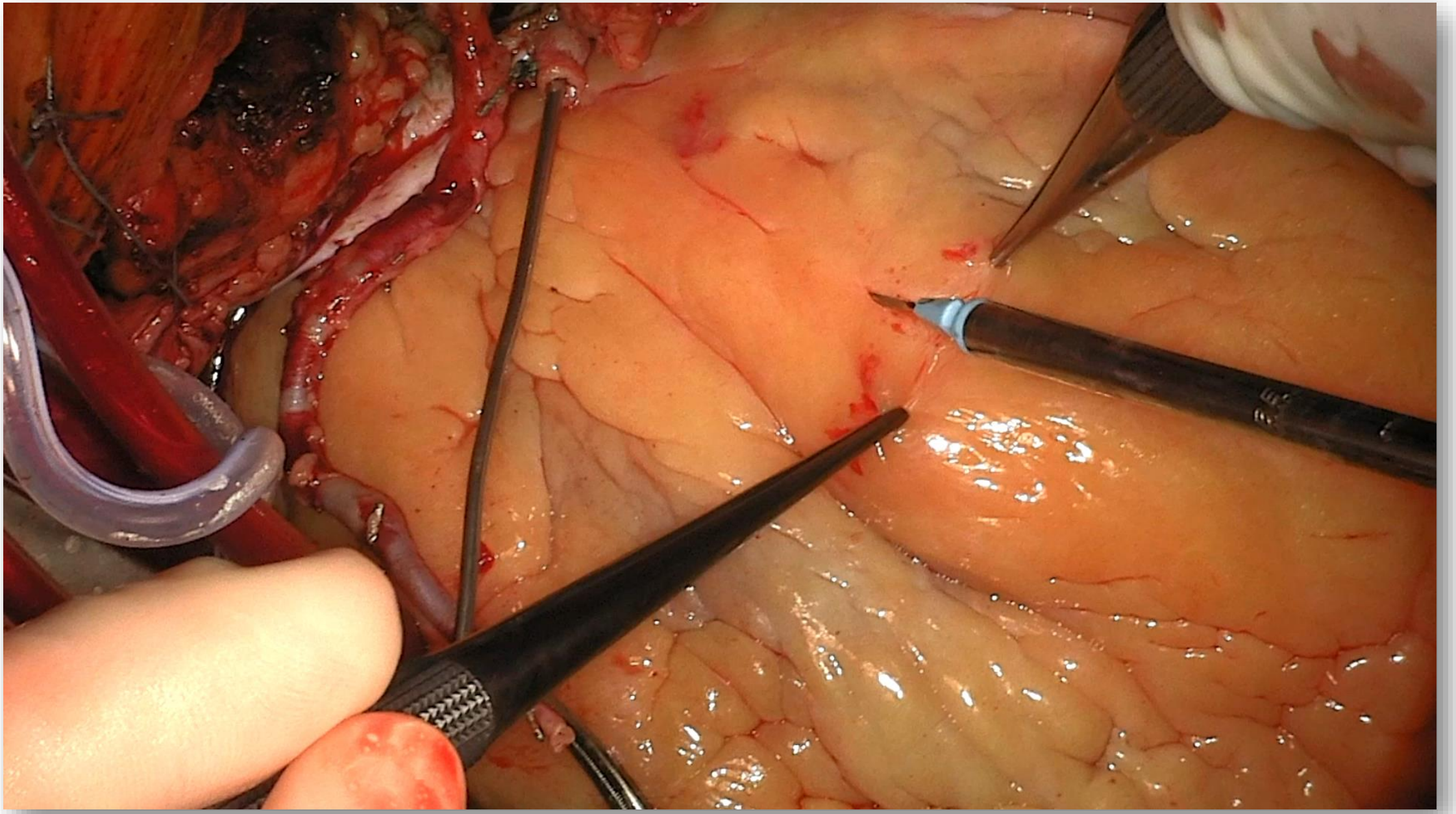
Konventionelle Bypasschirurgie



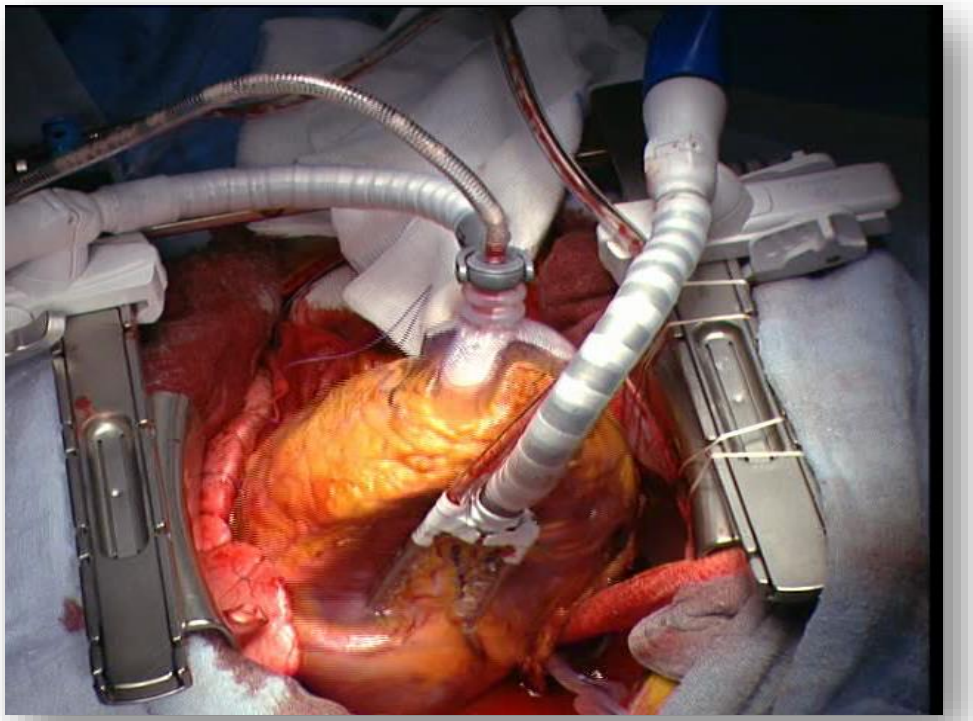


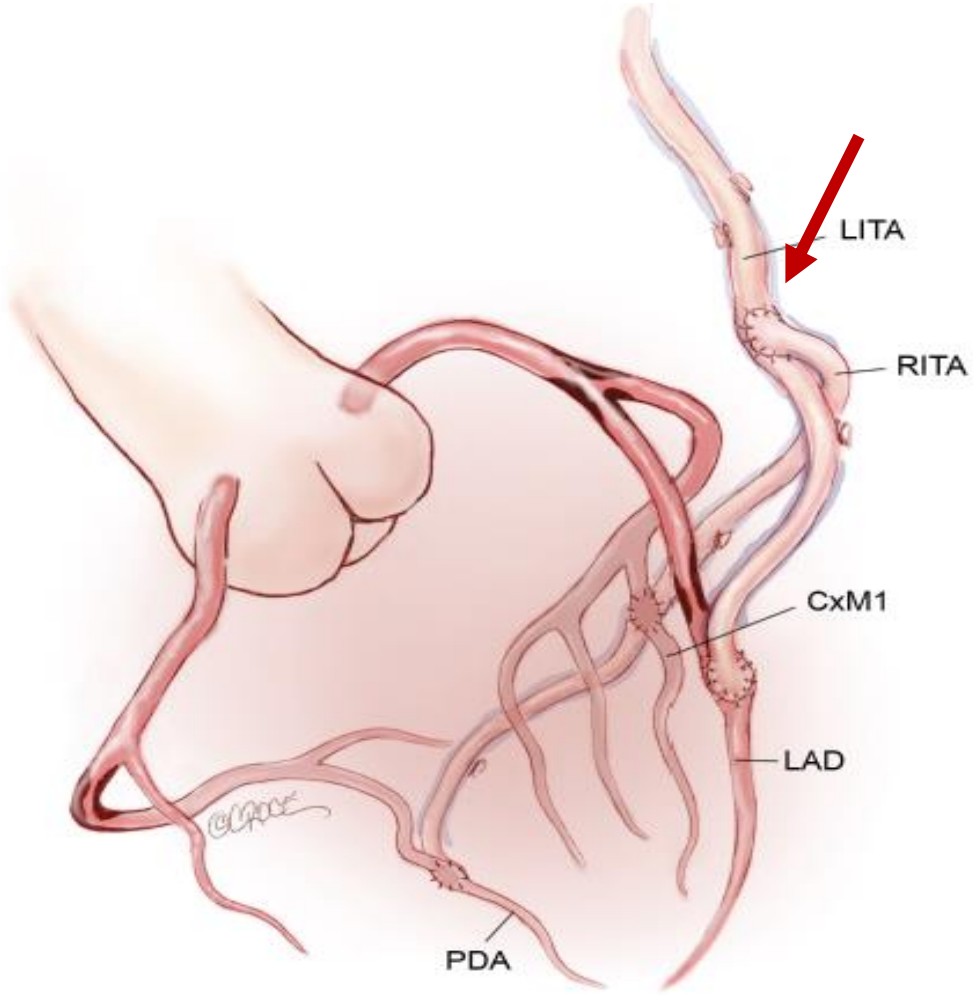


Bypassoperation an der Herzlungenmaschine



Off Pump Coronary Artery Bypass (OPCAB)

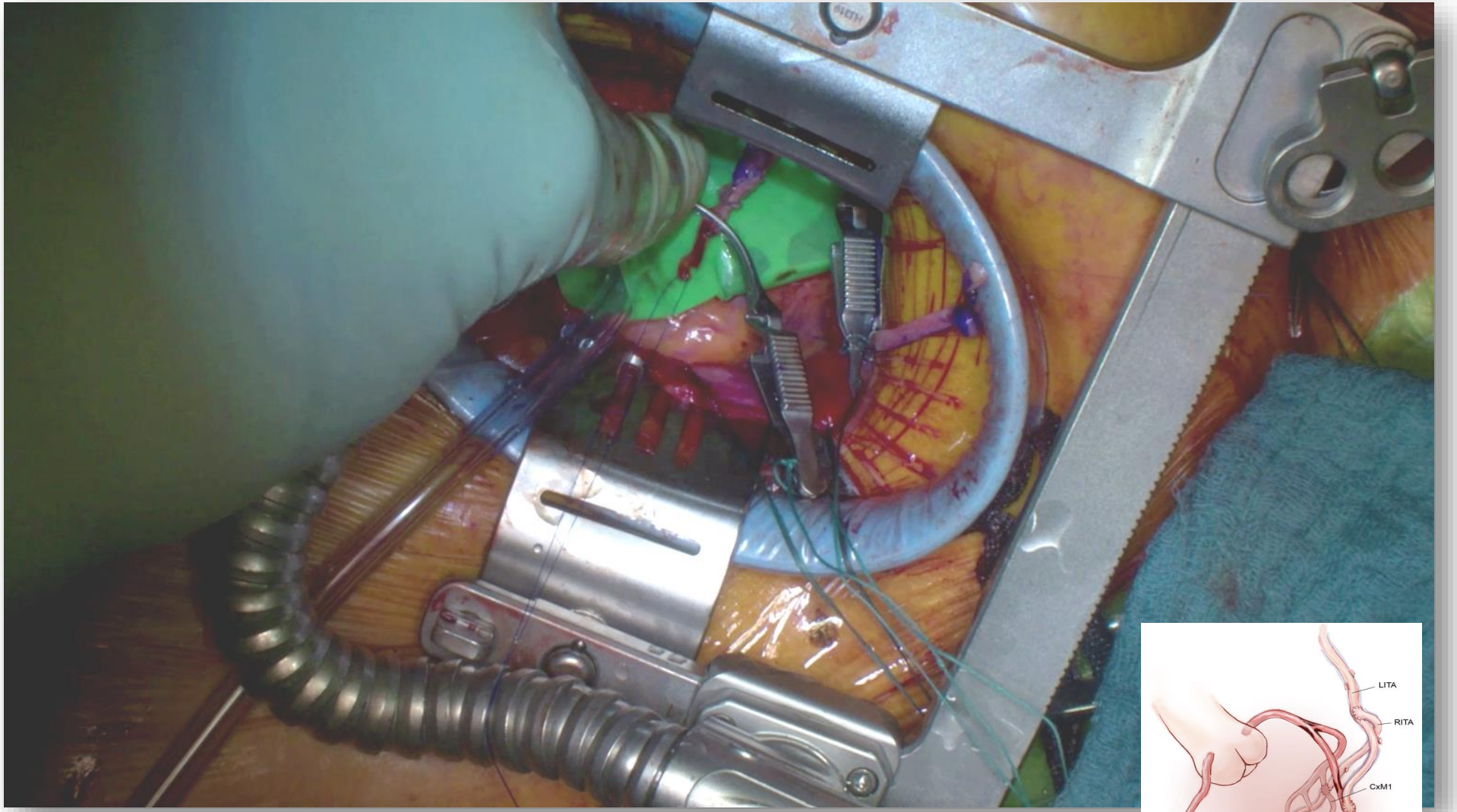


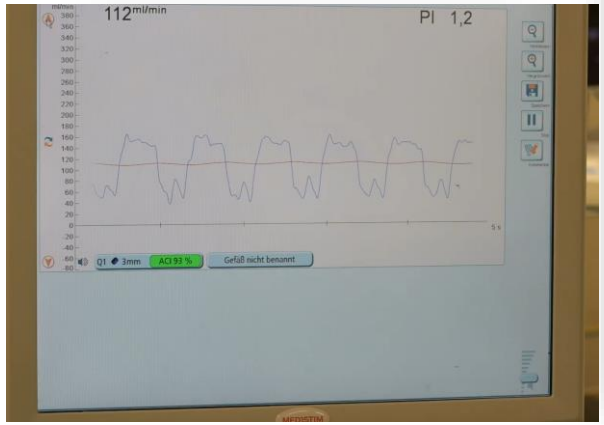


Vorteile bei OPCAB:

- weniger Entzündungsreaktion
- geringeres Schlaganfallrisiko

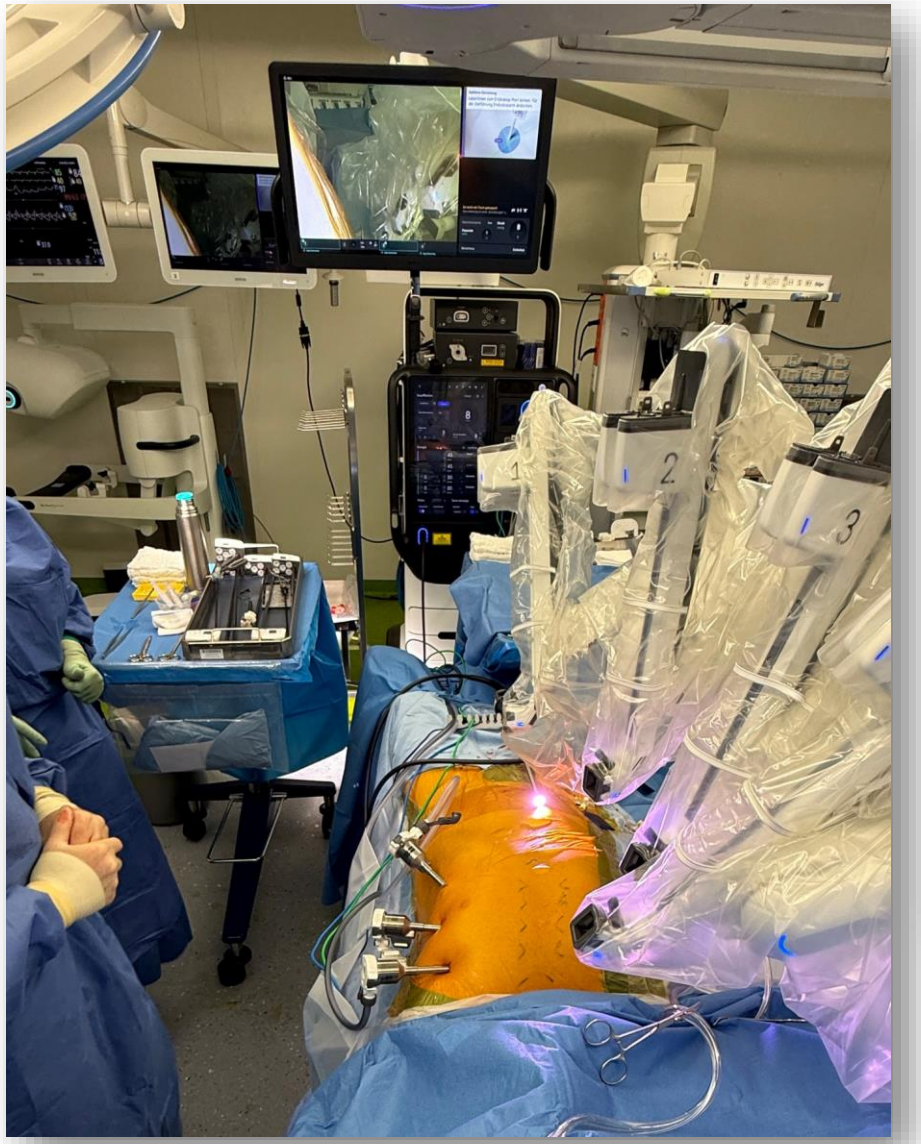
Multivessel MIDCAB





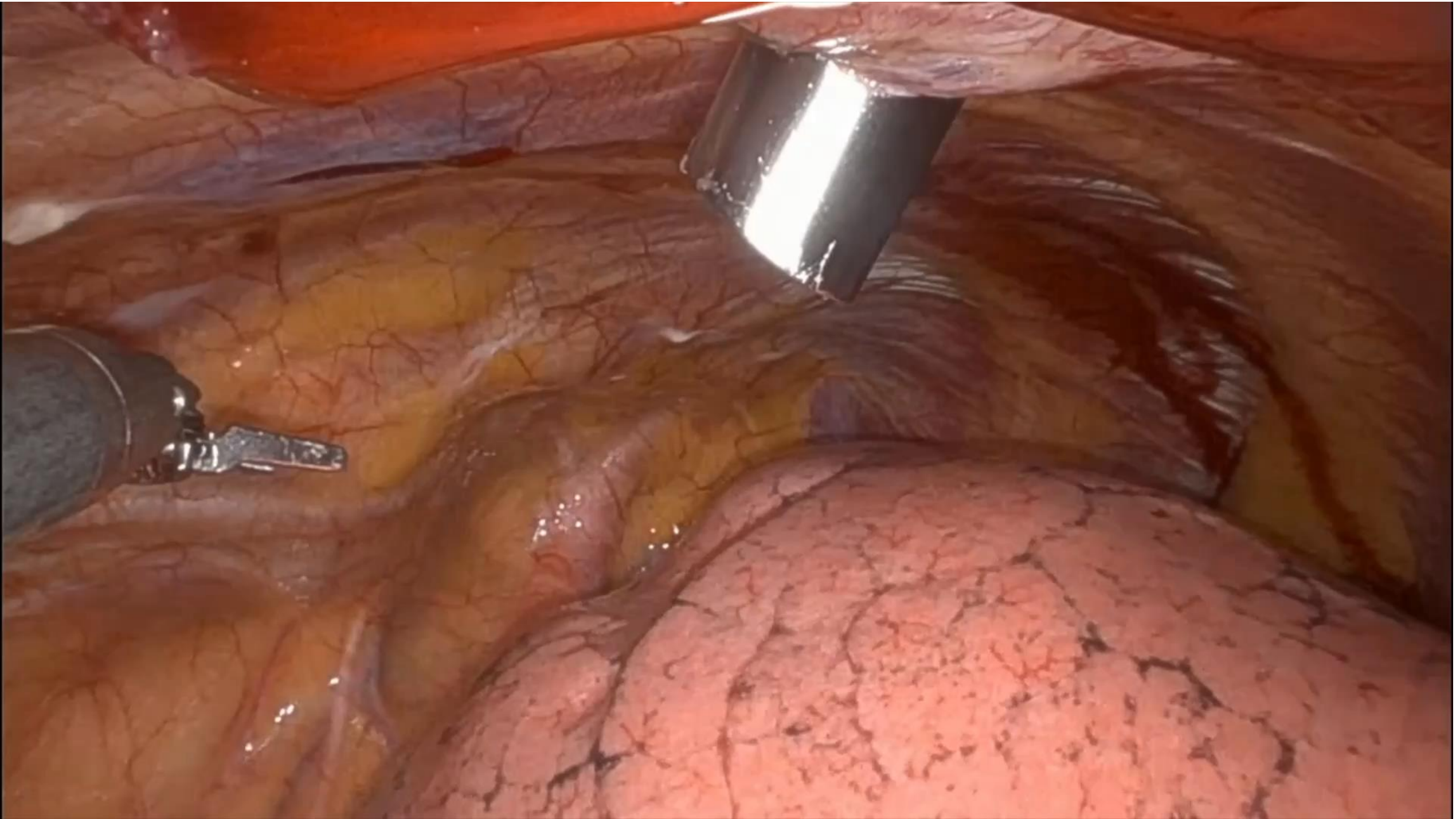
Intraoperative Flussmessung

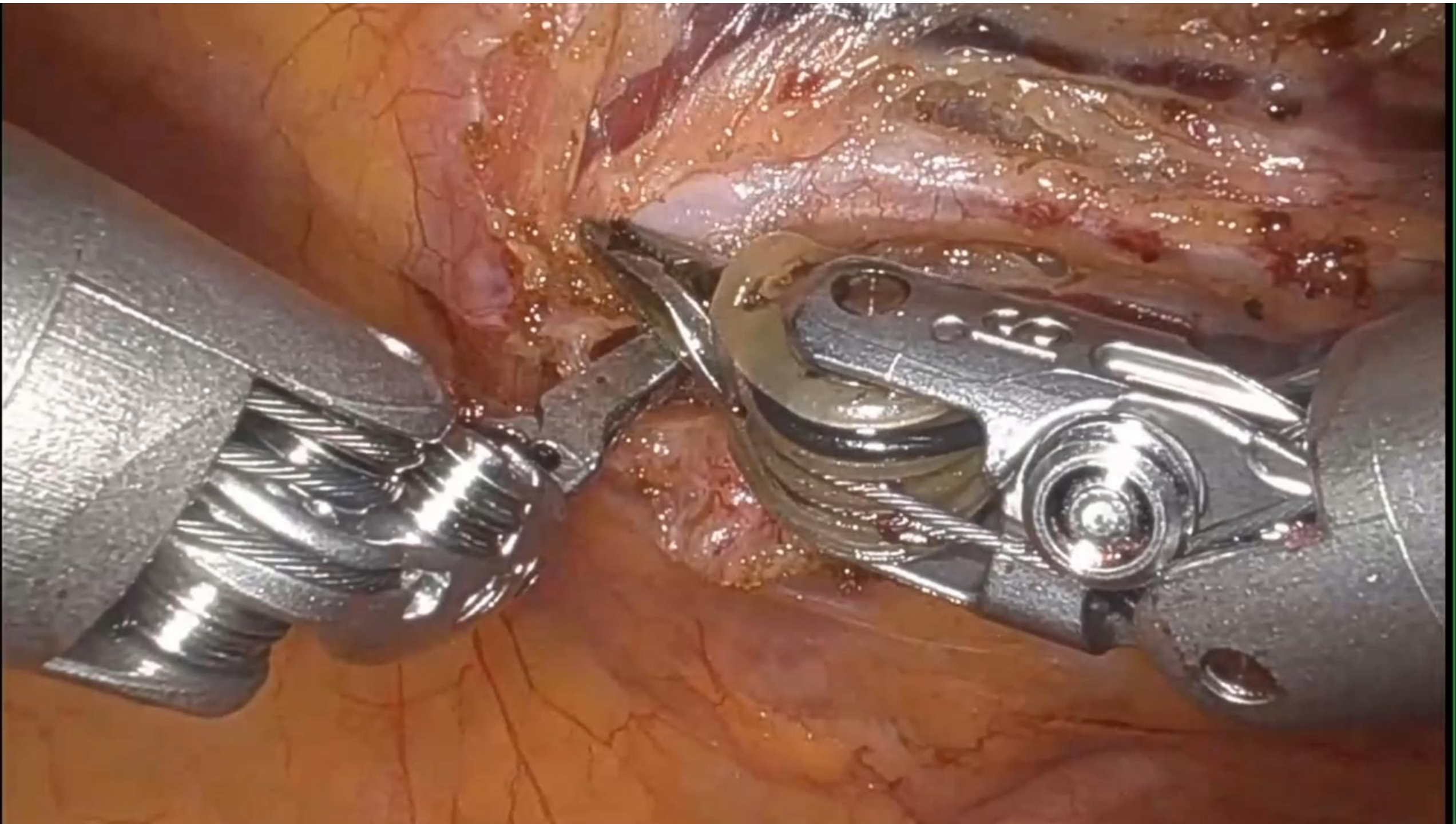
Robotisch assistierte Bypasschirurgie

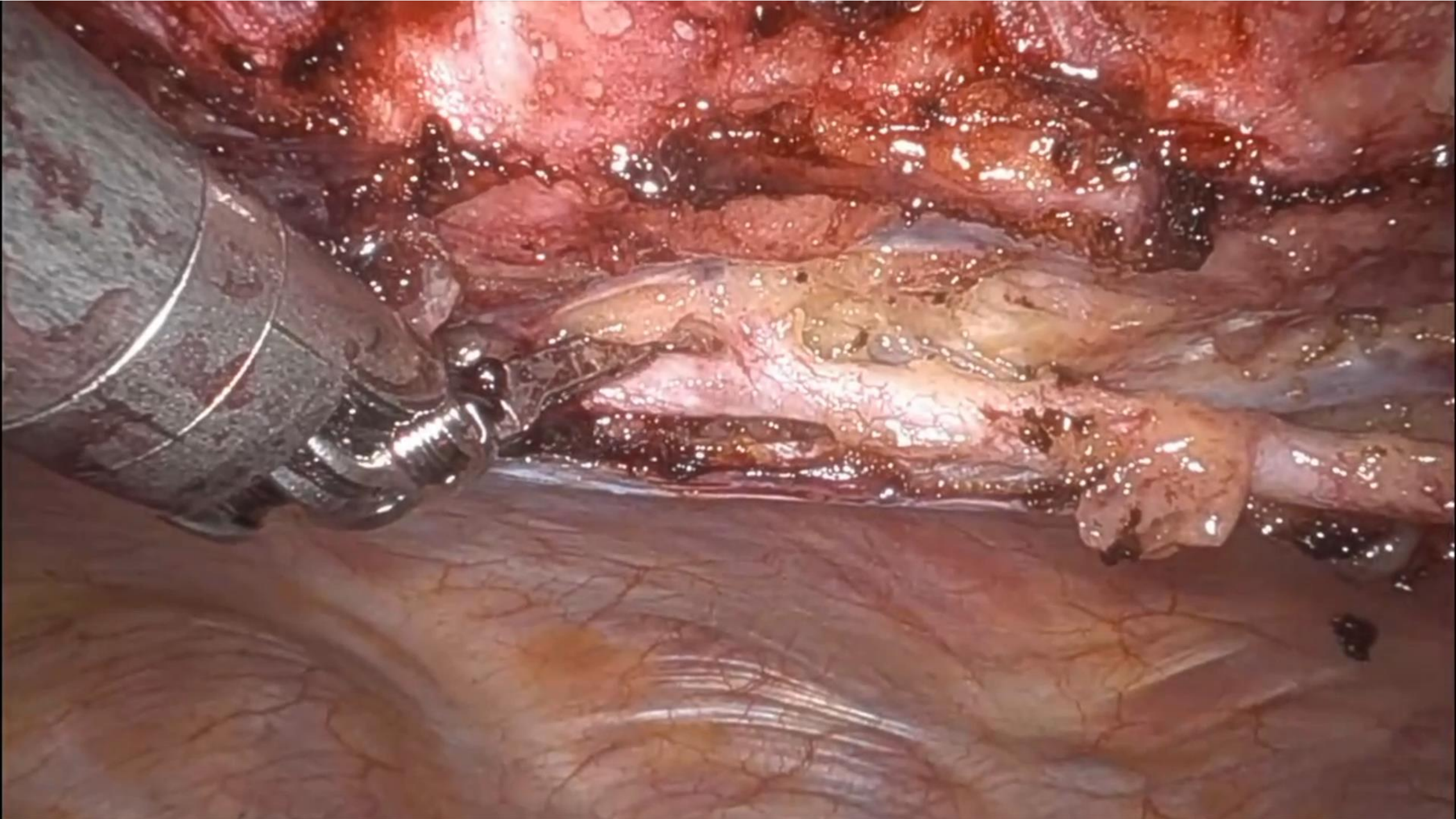


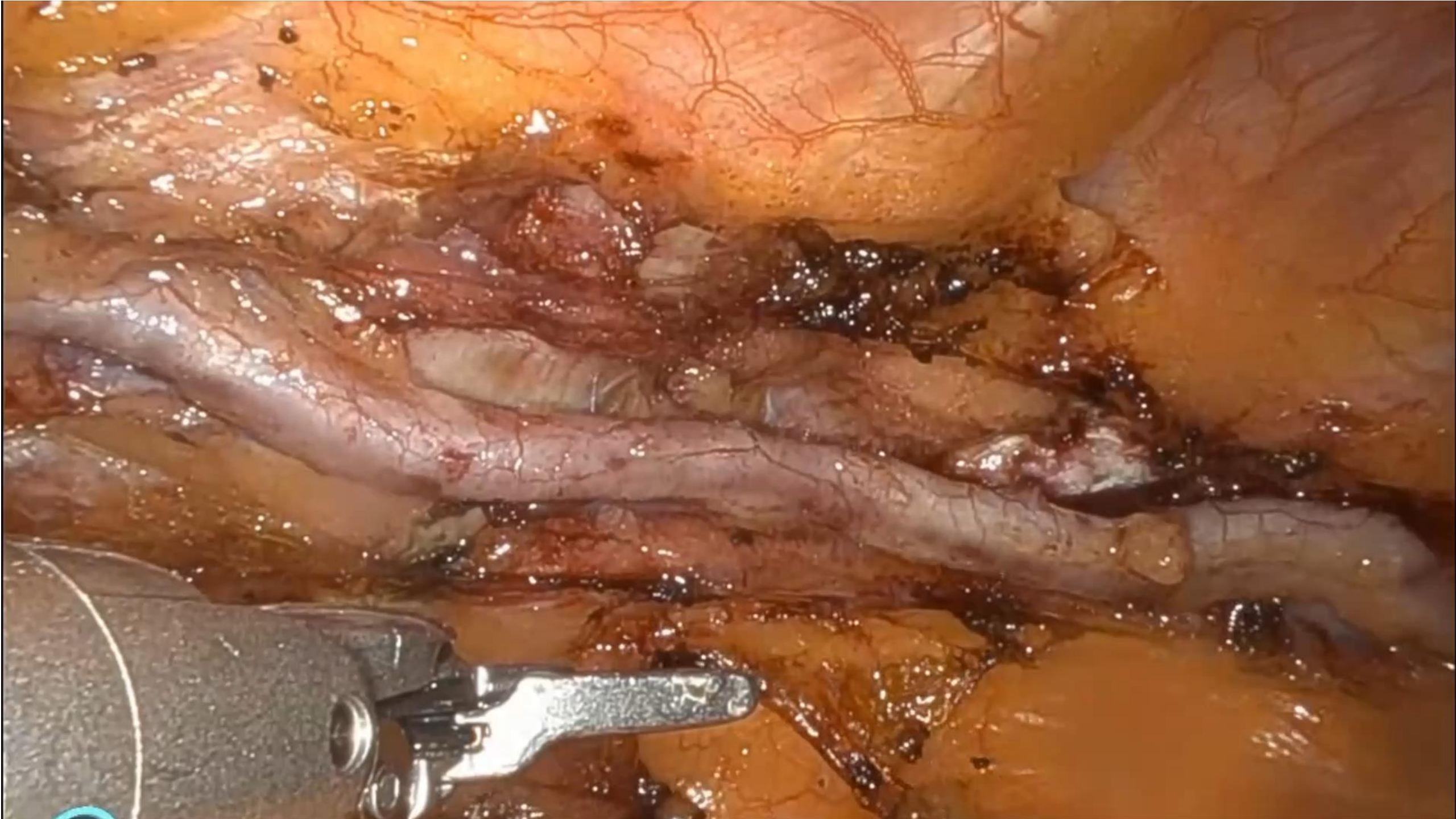
Da Vinci 5 (Intuitive)

Robotisch assistierte Bypasschirurgie

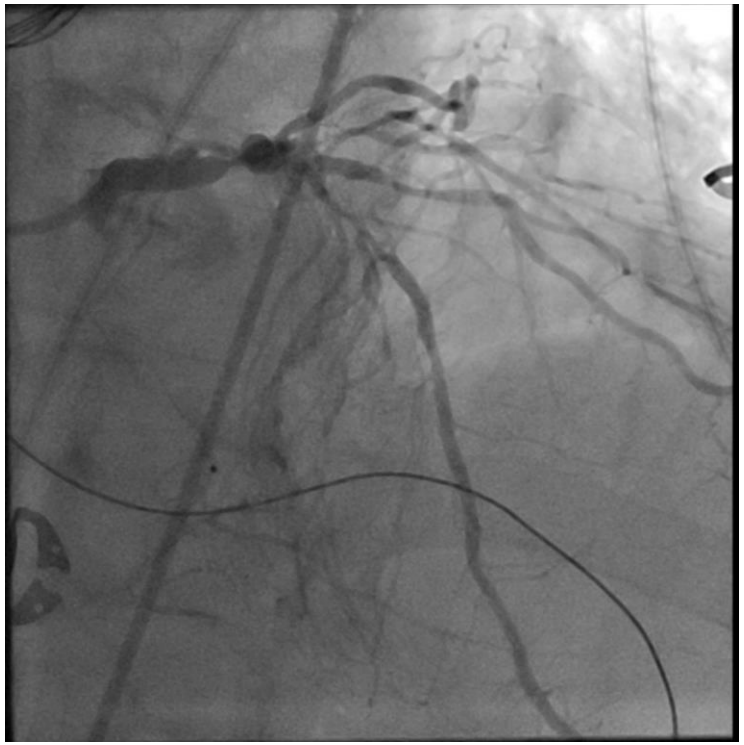






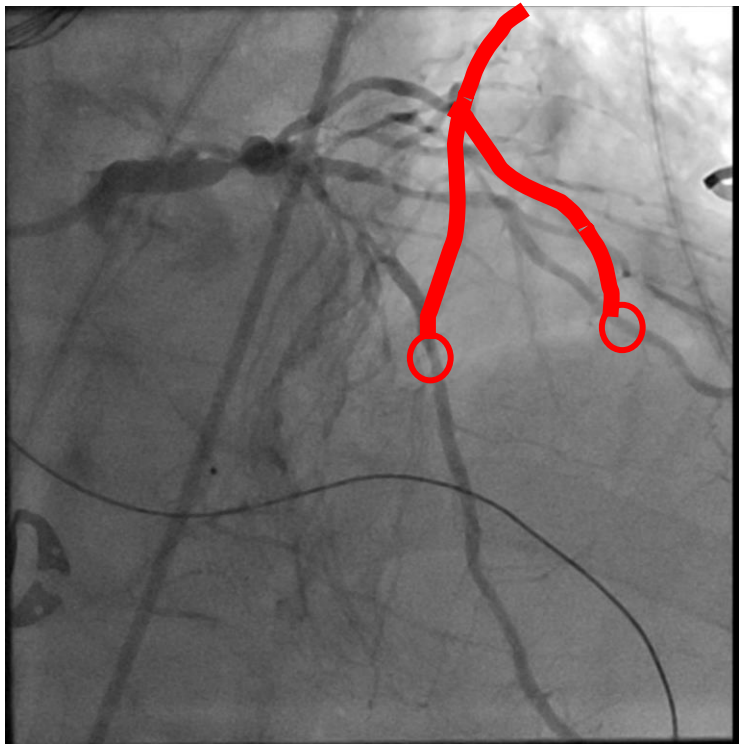


Robotisch assistierte Bypasschirurgie



- 82 jähriger Patient
- Z.n. 10 min erfolgreicher Reanimation bei Kammerflimmern
- Multiple Rippenbrüche

Robotisch assistierte Bypasschirurgie



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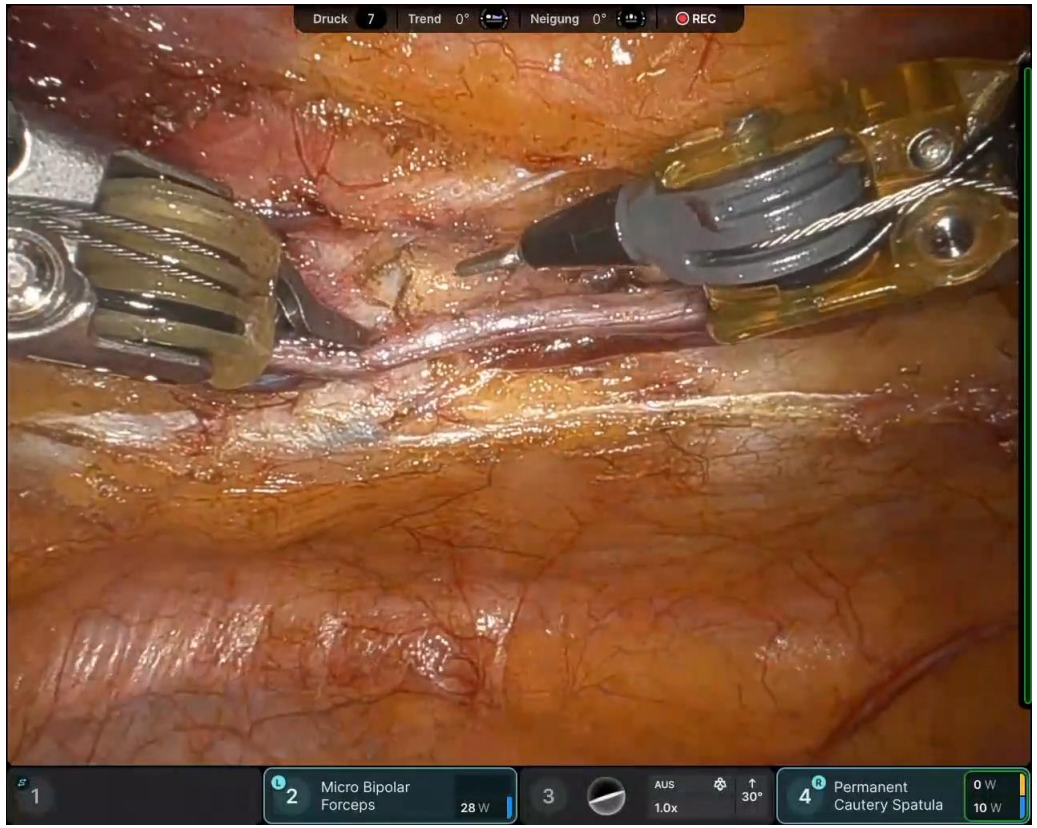
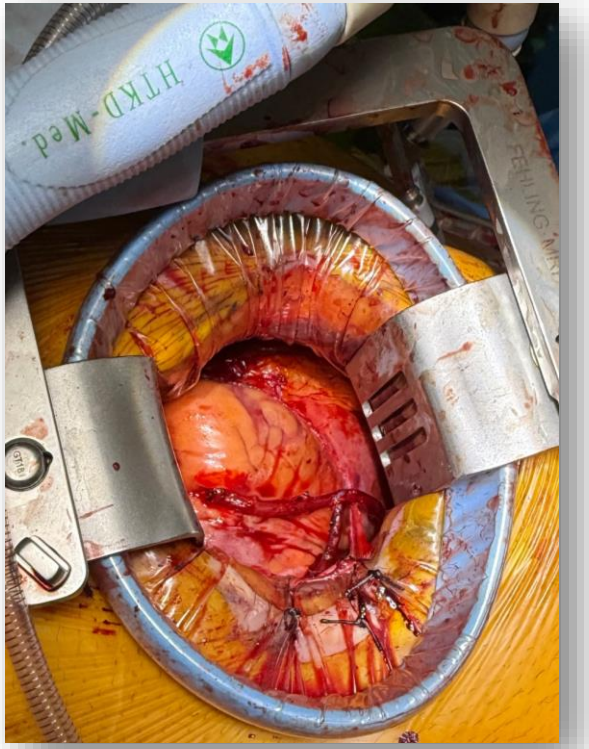
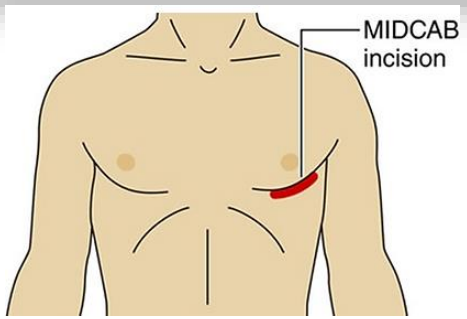


Da Vinci 5 (Intuitive)





Komplikationen bei Bypasschirurgie

	OPCAB (%)	HLM (%)
Sterblichkeit	1,2	1,94
Herzinfarkt	2,16	4,56
Schlaganfall	0,65	0,92
Nierenfunktionsstörung	0,83	1,21

Kowalewski M, et al.: Safety and efficacy of miniaturized extracorporeal circulation when compared with off-pump and conventional coronary artery bypass grafting: evidence synthesis from a comprehensive Bayesian-framework network **meta-analysis of 134 randomized controlled trials involving 22 778 patients**. Eur J Cardiothorac Surg. 2016 May;49(5):1428-40.

Original Article

Innovations
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DOI: 10.1177/15569845231164374
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Postoperative Day 1 Discharge After Robotic Totally Endoscopic Coronary Bypass: The Ultimate in Enhanced Recovery After Surgery

Sarah Nisivaco[1], MD, Brooke Patel[1], APN, Charocka Coleman[1], APN, Hiroto Kitahara[1], MD, Gianluca Torregrossa[1], MD, and Husam H. Balkhy[1], MD

Variable	Whole cohort ($N = 720$)
Postoperative BTF use	69 (9.6)
Chest tube drainage total, mL	581 ± 325
Extubation within 6 h	595 (83)
ICU length of stay, days	1.25 ± 0.64
Hospital length of stay, days	2.35 ± 0.89

Zusammenfassung

- Die moderne koronare Chirurgie bietet individuelle Konzepte unter Berücksichtigung von Komorbiditäten des Patienten sowie der Prognoseabschätzung.
- Neben dem perioperativen Ergebnis muss auch der Langzeitverlauf berücksichtigt und mit dem Patienten ausdrücklich kommuniziert werden.
- Eine Bypass-Operation sollte bei komplexen Fällen der koronaren Herzkrankheit sowie bei Patienten mit Diabetes mellitus und Drei-Gefäß-Erkrankung bzw. distaler Hauptstammstenose bevorzugt werden.
- Roboter assistierte arterielle Techniken ohne Einsatz der Herzlungenmaschine sollten möglichst bevorzugt werden.

Vielen Dank für Ihre Aufmerksamkeit

Herzchirurgie USB
24h Hotline
+41 61 265 76 51

Universitätsspital Basel

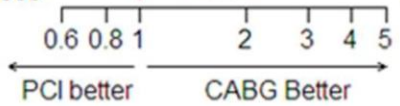
SWEDEHEART Register

17 Jahre Follow-Up,

>50.000 Patienten

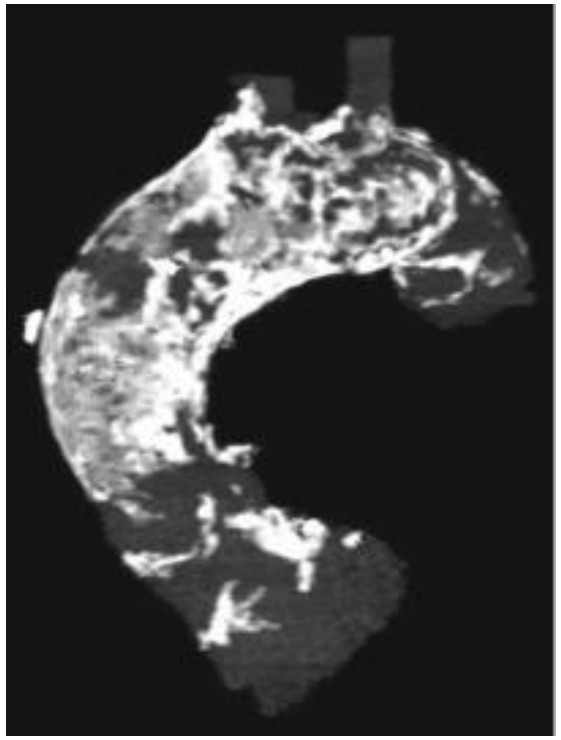
Fazit: Die koronare Bypass-Operation ist bei Patienten mit NSTEMI mit einem geringeren Risiko für Sterblichkeit, Herzinfarkt, erneute Revaskularisation und Herzinsuffizienz verbunden, insbesondere in Hochrisiko-Subgruppen.

Subgroup	CABG	PCI	OR (95% CI)	P-value
All Patients	14907	42190	1.67 (1.51-1.81)	<0.001
Age				<0.001
>70	7948	20730	1.37 (1.23-1.52)	
≤70	6959	21460	1.92 (1.75-2.10)	
Sex				0.724
Male	11844	31443	1.59 (1.38-1.84)	
Female	3063	10747	1.69 (1.55-1.85)	
Diabetes				0.328
Yes	3486	8247	1.68 (1.54-1.84)	
No	10295	29671	1.61 (1.42-1.84)	
Severity of CAD				<0.001
2-VD	1642	25237	1.10 (0.92-1.33)	
3-VD	7459	13000	1.62 (1.46-1.79)	
LM	5388	3874	2.18 (1.88-2.53)	
Ejection fraction (%)				<0.001
≥50	9059	23638	1.28 (1.16-1.42)	
35-50	2381	6103	1.47 (1.25-1.72)	
<35	1863	4245	2.19 (1.84-2.62)	
Time period				0.042
2005-2010	6380	15015	1.53 (1.38-1.72)	
2011-2016	5113	15367	1.85 (1.64-2.07)	
2017-2022	3414	11808	1.73 (1.37-2.18)	

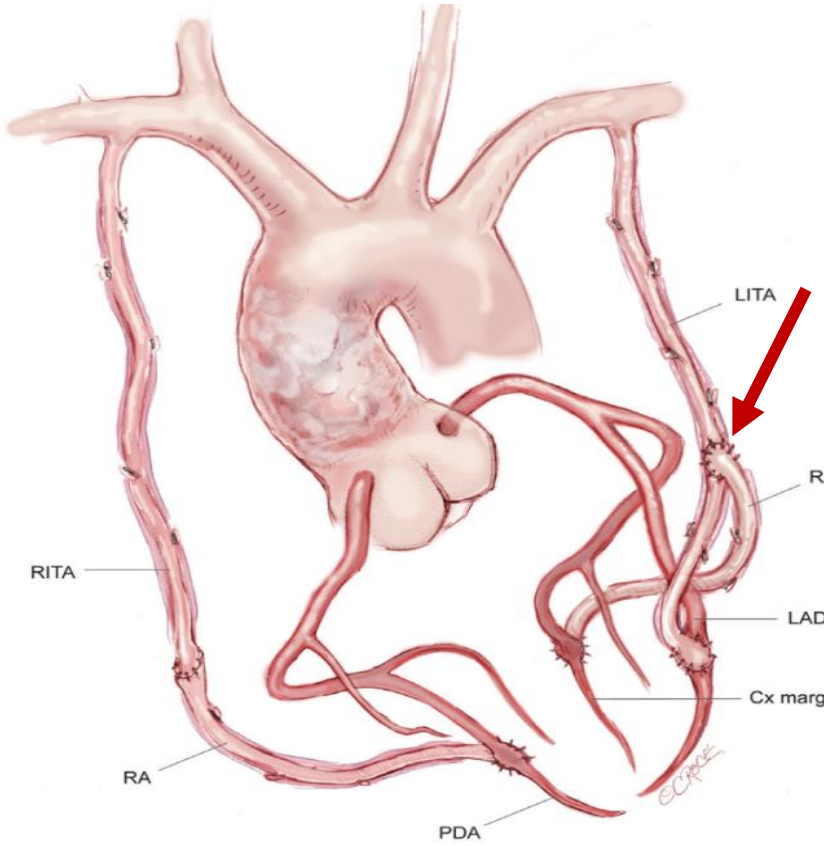


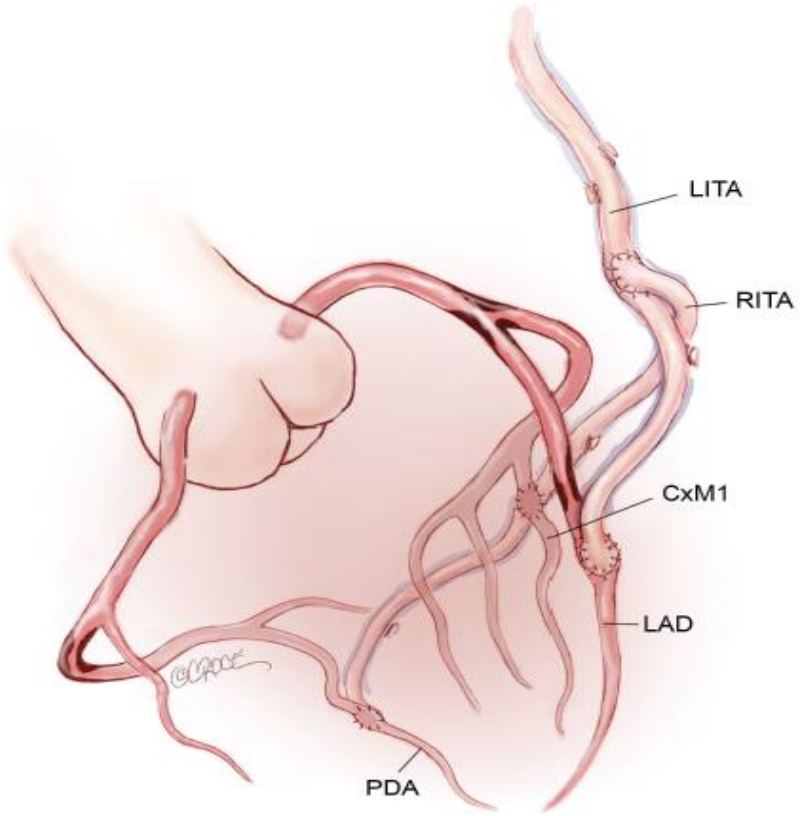
ESC European Society of Cardiology
European Heart Journal (2025) **46**, 518–531
https://doi.org/10.1093/eurheartj/ehae700

„No Touch Aortic“ Technik



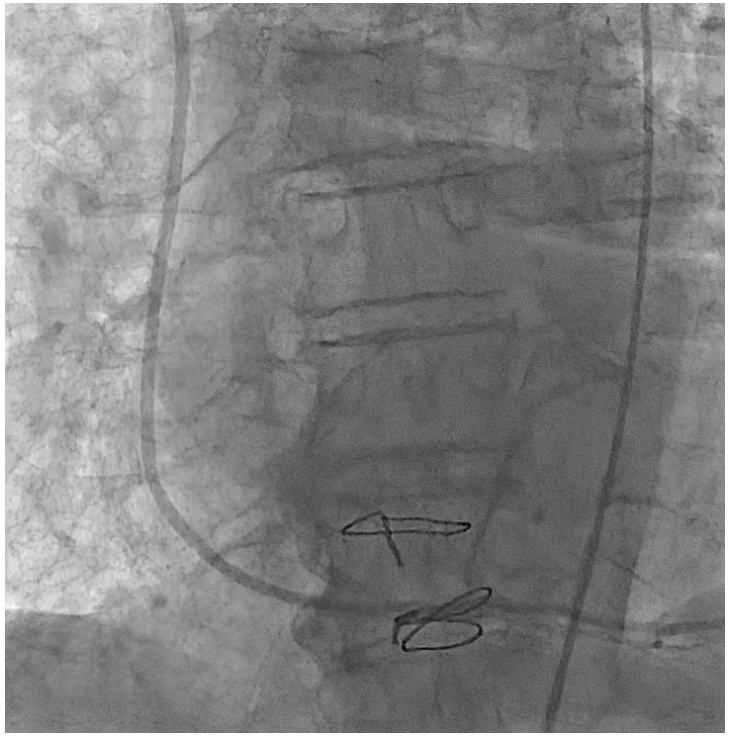
Aortenverkalkung





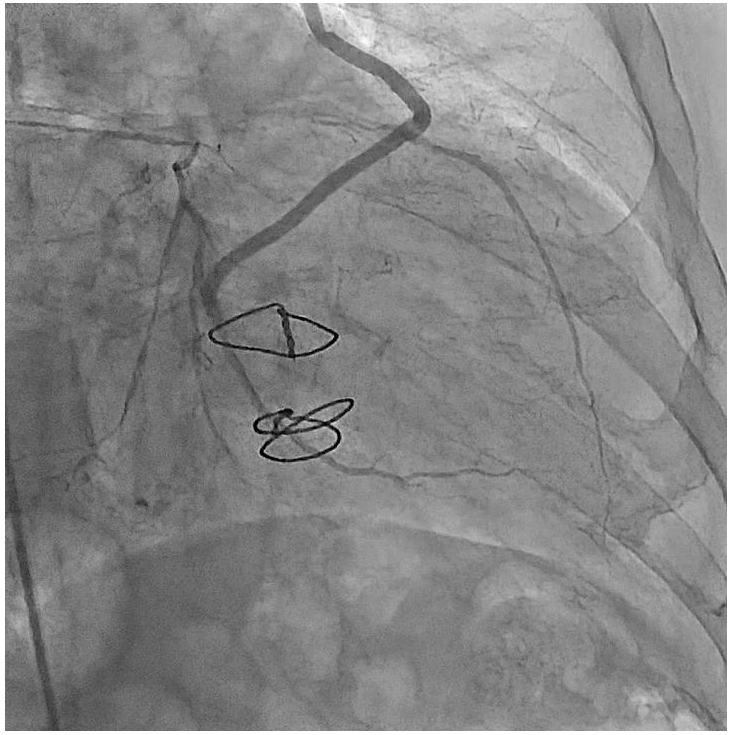
„No Touch“ Aortic

Angiographie 15 Jahre nach Bypassoperation



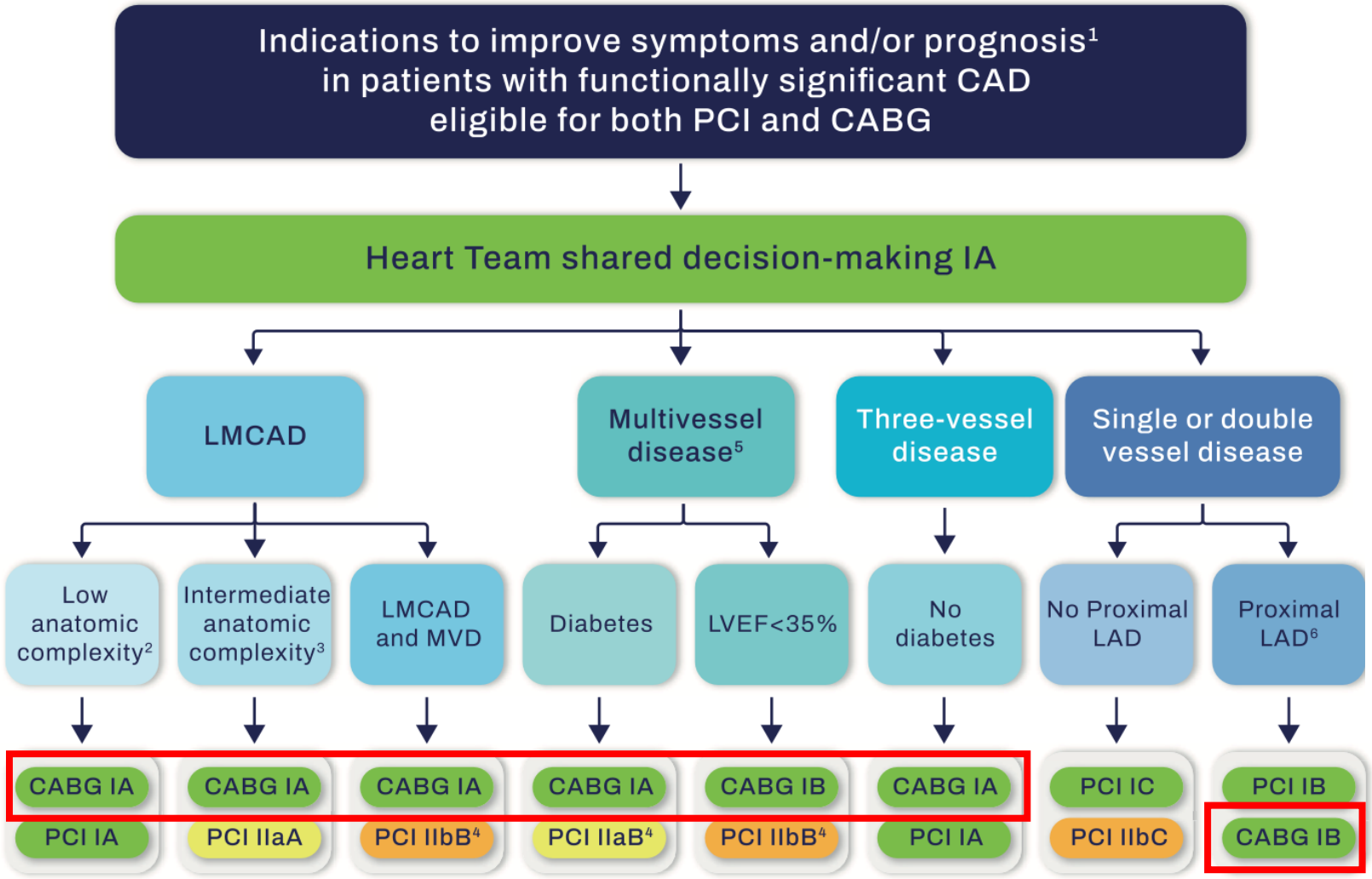
RIMA - RIVPO

LIMA - RIVA



Radials jump - D1 und OM

Wann operieren?



ESC European Society of Cardiology
European Heart Journal (2018) 00, 1–96
doi:10.1093/eurheartj/ehy394
ESC/EACTS GUIDELINES

2018 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on myocardial revascularization of the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)

ESC European Society of Cardiology
European Heart Journal (2024) 45, 3415–3537
https://doi.org/10.1093/eurheartj/ehae177
ESC GUIDELINES

2024 ESC Guidelines for the management of chronic coronary syndromes

Developed by the task force for the management of chronic coronary syndromes of the European Society of Cardiology (ESC)

Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS)

Doenst et al., European Journal of Cardio-Thoracic Surgery 2024, 66(4), ezae360