

Thoraxanestesi/ intensivvård

Anestesi vid hjärtkirurgi

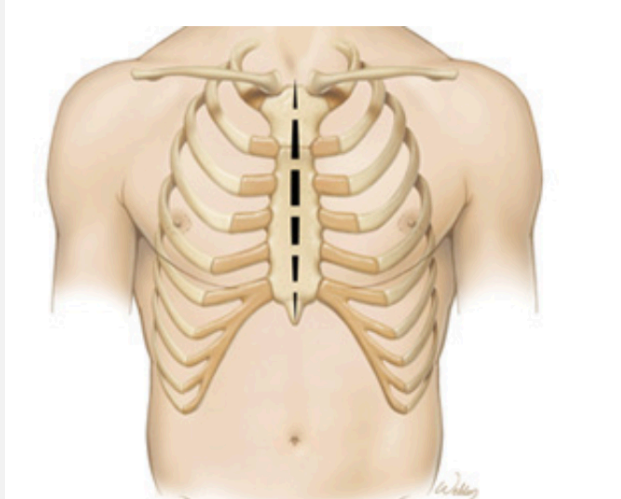
Martin Slettengren
Thoraxanestesi Karolinska
20191004

martin.slettengren@sll.se

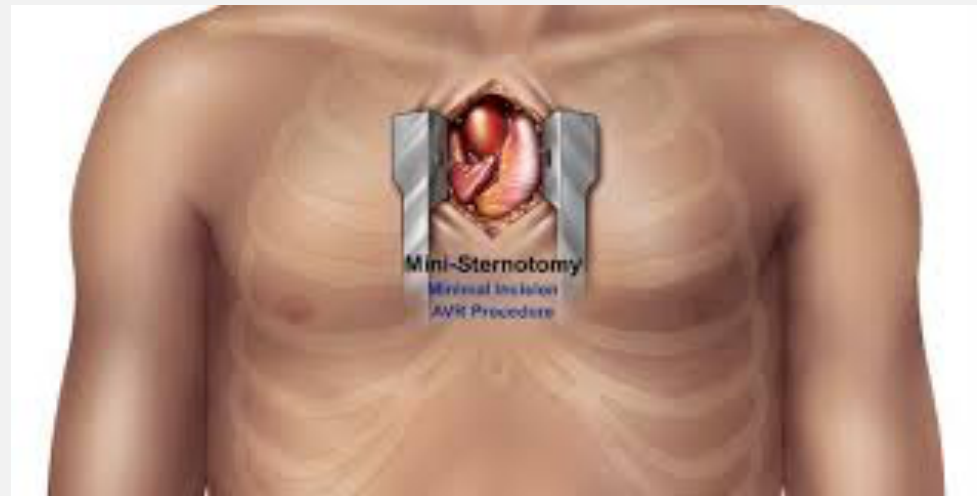


Hur tar sig kirurgen in till hjärtat?

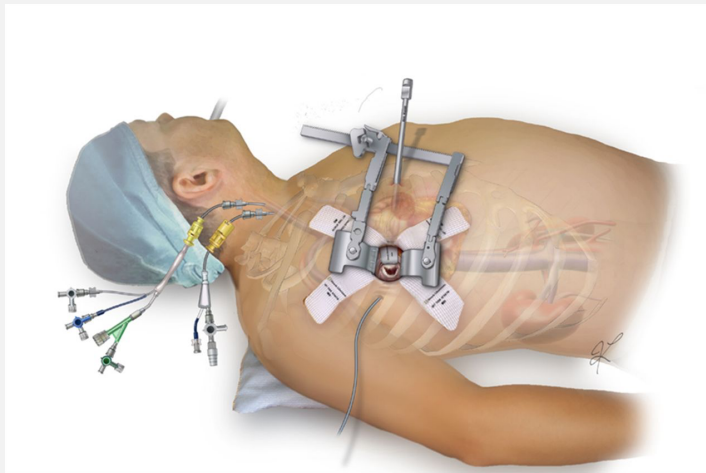
Median sternotomi



Ministernotomi



Thorakotomi



Clamshell (trauma)



Standardsåg

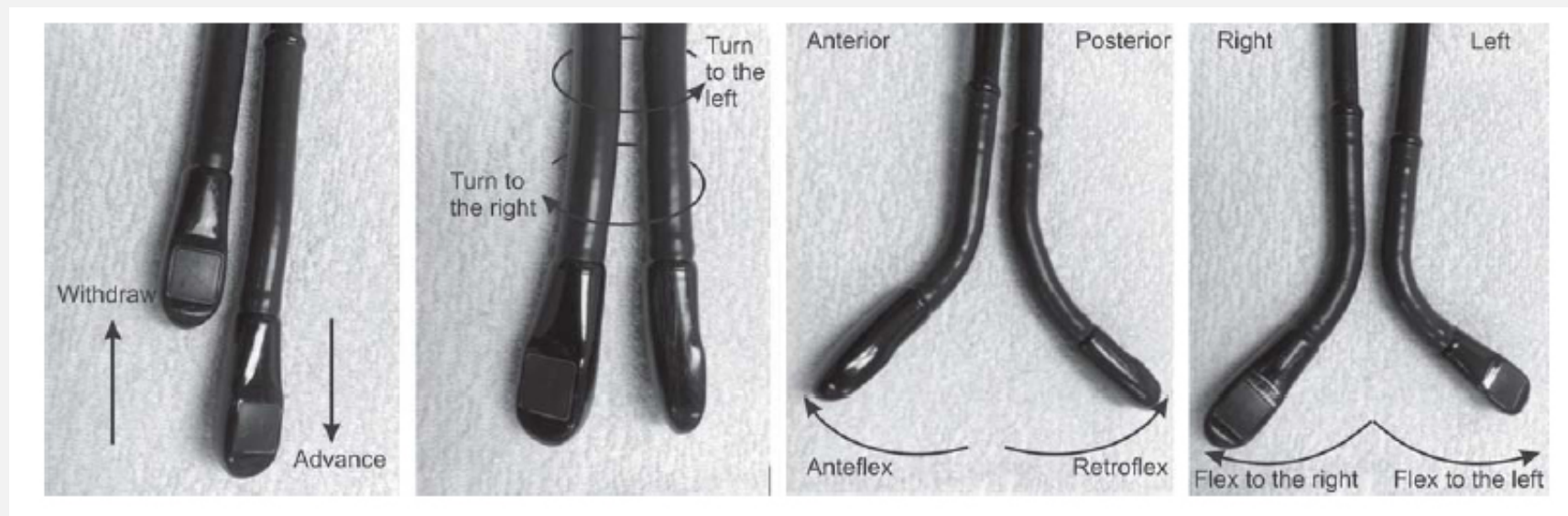
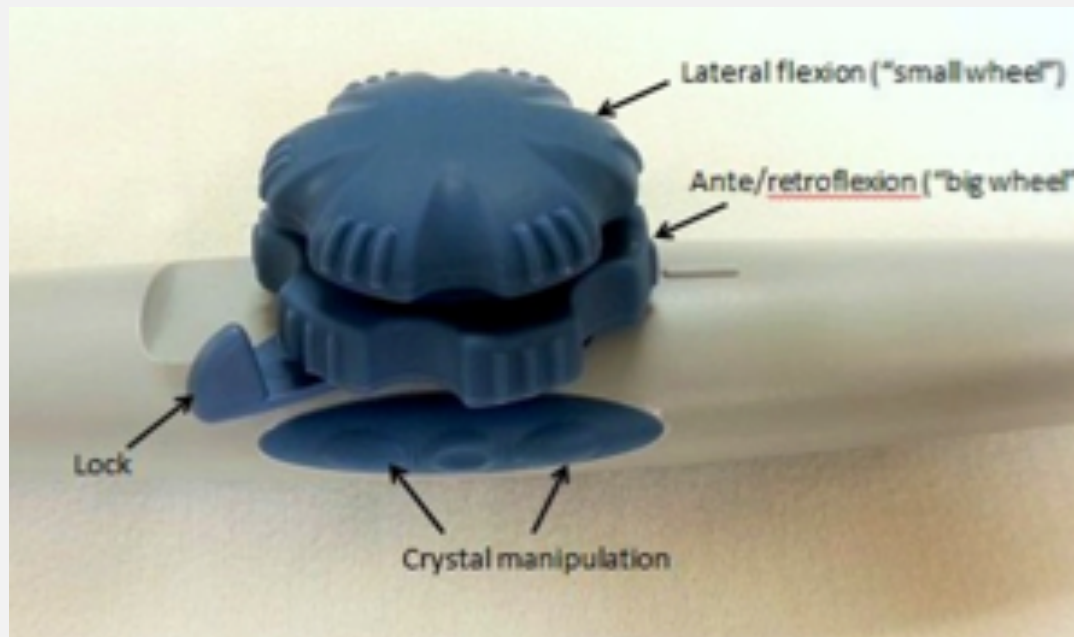
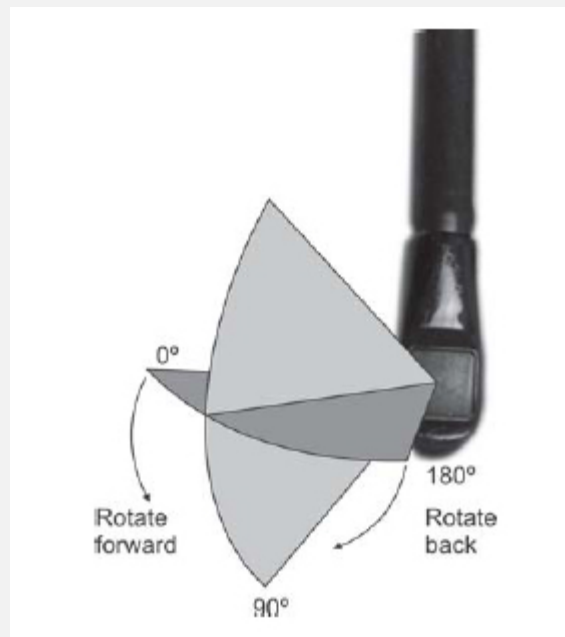


Oscillerande såg



Transesofagealt eko (TEE)





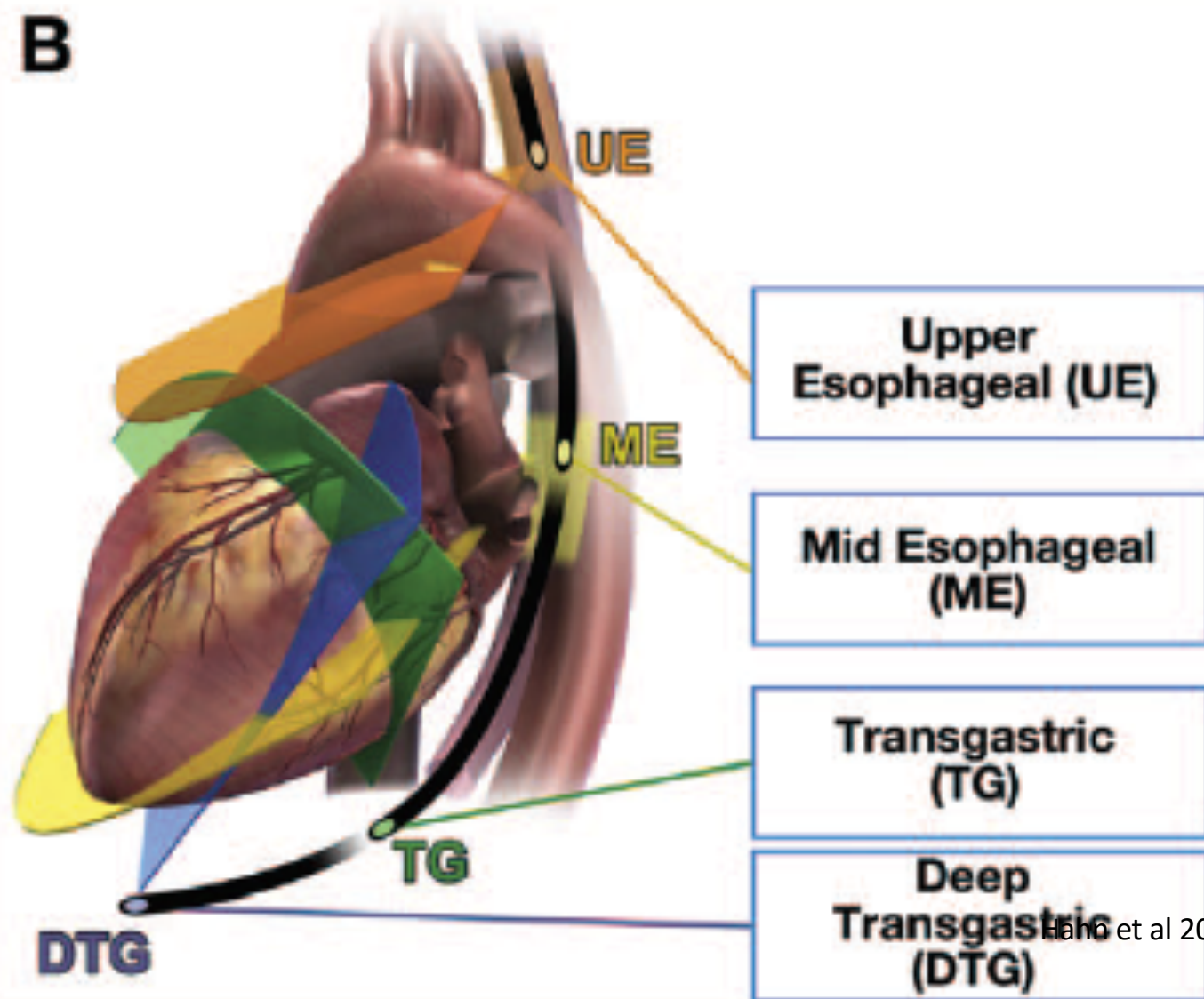
Varför perioperativ TEE?

- Bekräfta och förfinna preoperativ diagnos
- Upptäcka och diagnosticera ev ny patologi
 - tex: tät AS, PFO, förmakstromb, uttalad aortaskleros
- Anpassa planen för anestesi/kirurgi
 - 7% av 12 566 perop TEE påverkade kirurgin

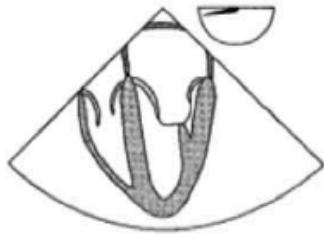
(Eltzschig et al. Impact of intraoperative transesophageal echocardiography on surgical decisions in 12,566 patients undergoing cardiac surgery. *Ann Thorac Surg.* 85 (3): 845-852 2008)

- Bedöma resultatet av kirurgin

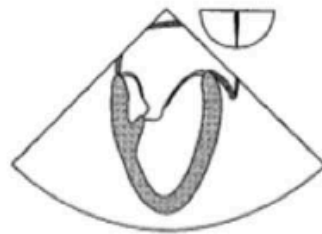
B



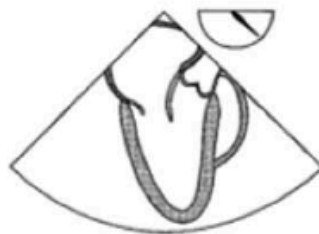
11 Basic Views



A. ME Four Chamber



B. ME Two Chamber



C. ME LAX



D. ME Asc Aortic LAX



E. ME Asc Aortic SAX



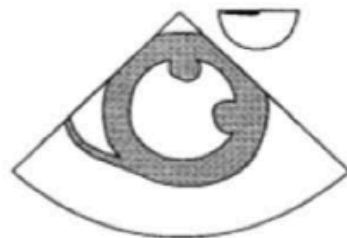
F. ME AV SAX



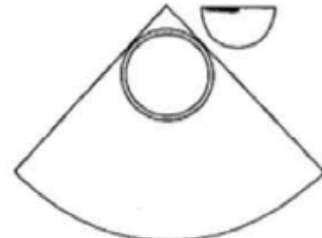
G. ME RV Inflow-Outflow



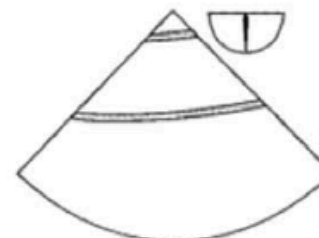
H. ME Bicaval



I. TG Mid SAX



F. Desc Aortic SAX



G. Desc Aortic LAX

Indikationer

Table 4 General indications for TEE

General indication	Specific examples
1. Evaluation of cardiac and aortic structure and function in situations where the findings will alter management and TTE is non-diagnostic or TTE is deferred because there is a high probability that it will be non-diagnostic.	a. Detailed evaluation of the abnormalities in structures that are typically in the far field such as the aorta and the left atrial appendage. b. Evaluation of prosthetic heart valves. c. Evaluation of paravalvular abscesses (both native and prosthetic valves). d. Patients on ventilators. e. Patients with chest wall injuries. f. Patients with body habitus preventing adequate TTE imaging. g. Patients unable to move into left lateral decubitus position.
2. Intraoperative TEE.	a. All open heart (i.e., valvular) and thoracic aortic surgical procedures. b. Use in some coronary artery bypass graft surgeries. c. Noncardiac surgery when patients have known or suspected cardiovascular pathology which may impact outcomes.
3. Guidance of transcatheter procedures	a. Guiding management of catheter-based intracardiac procedures (including septal defect closure or atrial appendage obliteration, and transcatheter valve procedures).
4. Critically ill patients	a. Patients in whom diagnostic information is not obtainable by TTE and this information is expected to alter management.

Kontraindikationer

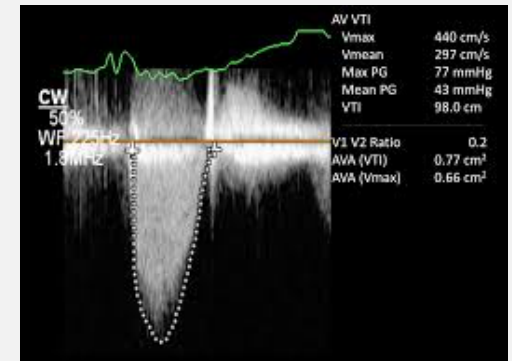
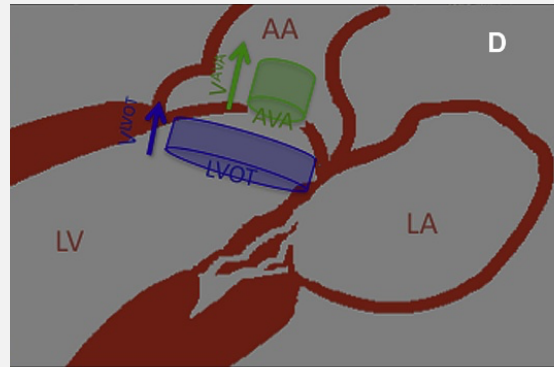
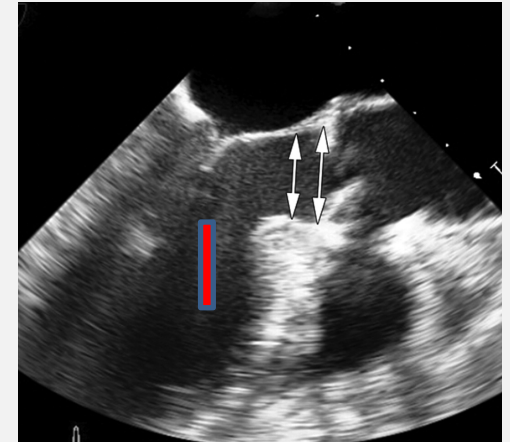
- Esofagusstriktur
 - Esofagusatresi
 - Tid esofaguskirurgi
-
- Försiktighet: hiatusbråck, tid gastric banding/bypass

Komplikationer

- Direkt trauma på luftväg och esofagus
 - Blödning esofagus
 - Larynxdiskomfort
 - Dysfagi
 - Bakteremi
 - Stämbandsparalys
 - Tandskada
 - Esofagusperforation
- Indirekta effekter
 - Hemodynamisk effekt av probe-manipulering (vagala)
 - **Distraheras från patienten**

Beräkna Cardiac Output (CO)

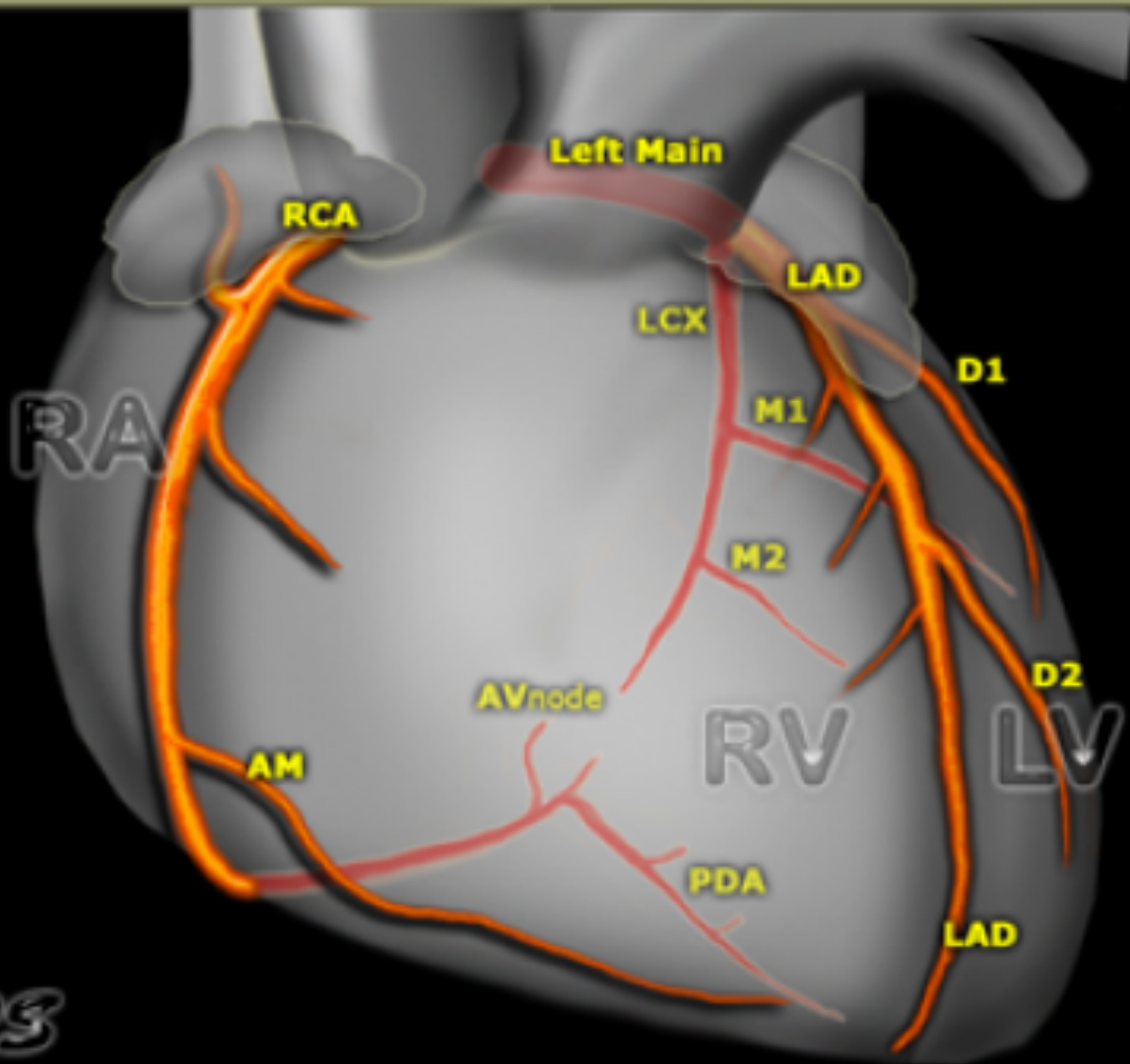
- Mät LVOT area: $\text{Area} = \pi r^2$ (r = diam/2 (cm))
- Mät LVOT VTI med PW
- $\text{SV} = \text{Area} \times \text{VTI}$
- $\text{CO} = \text{SV} \times \text{HF}$



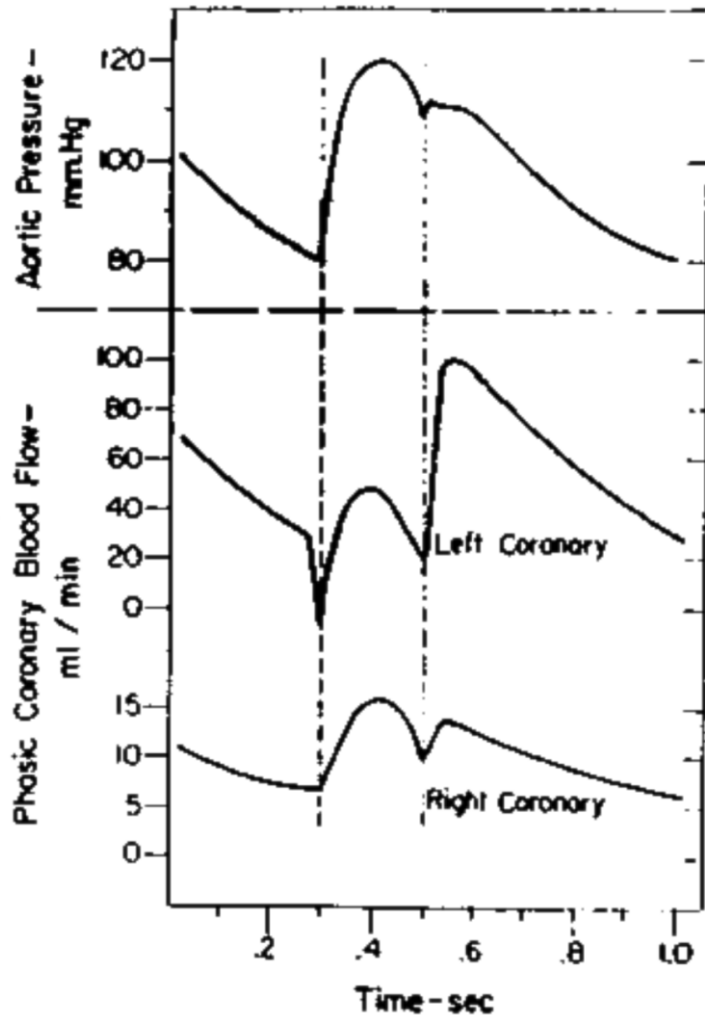
CAVE:

- Mätfel kommer upphöjas till 2. Normal LVOT diam 1,8-2,7 cm
- 10° vinkelfel vid dopplermätning över LVOT gör mätningen osäker
- Arean förändras under systole, ej helt rund (ellipsoid)
- Förutsätter laminärt flöde

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Coronarperfusion



- RCA + LAD
- Vä kranskärl: diastole (120 ml/min)
- Hö kranskärl: systole + diastole (50 ml/min)

CABG vs. PCI

ESC/EACTS Guidelines

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

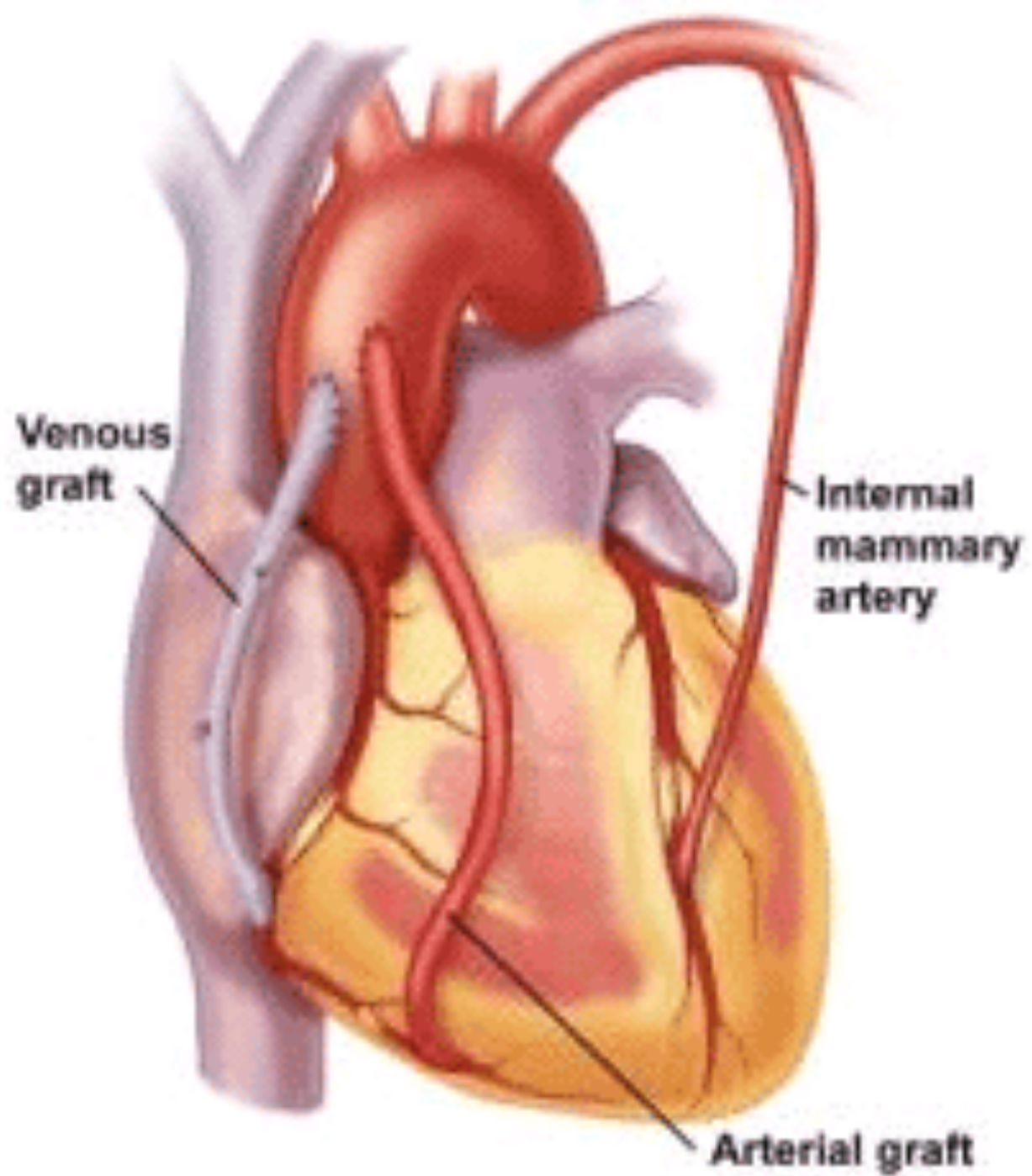
Recommendations according to extent of CAD	CABG		PCI		Ref ^c
	Class ^a	Level ^b	Class ^a	Level ^b	
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	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.

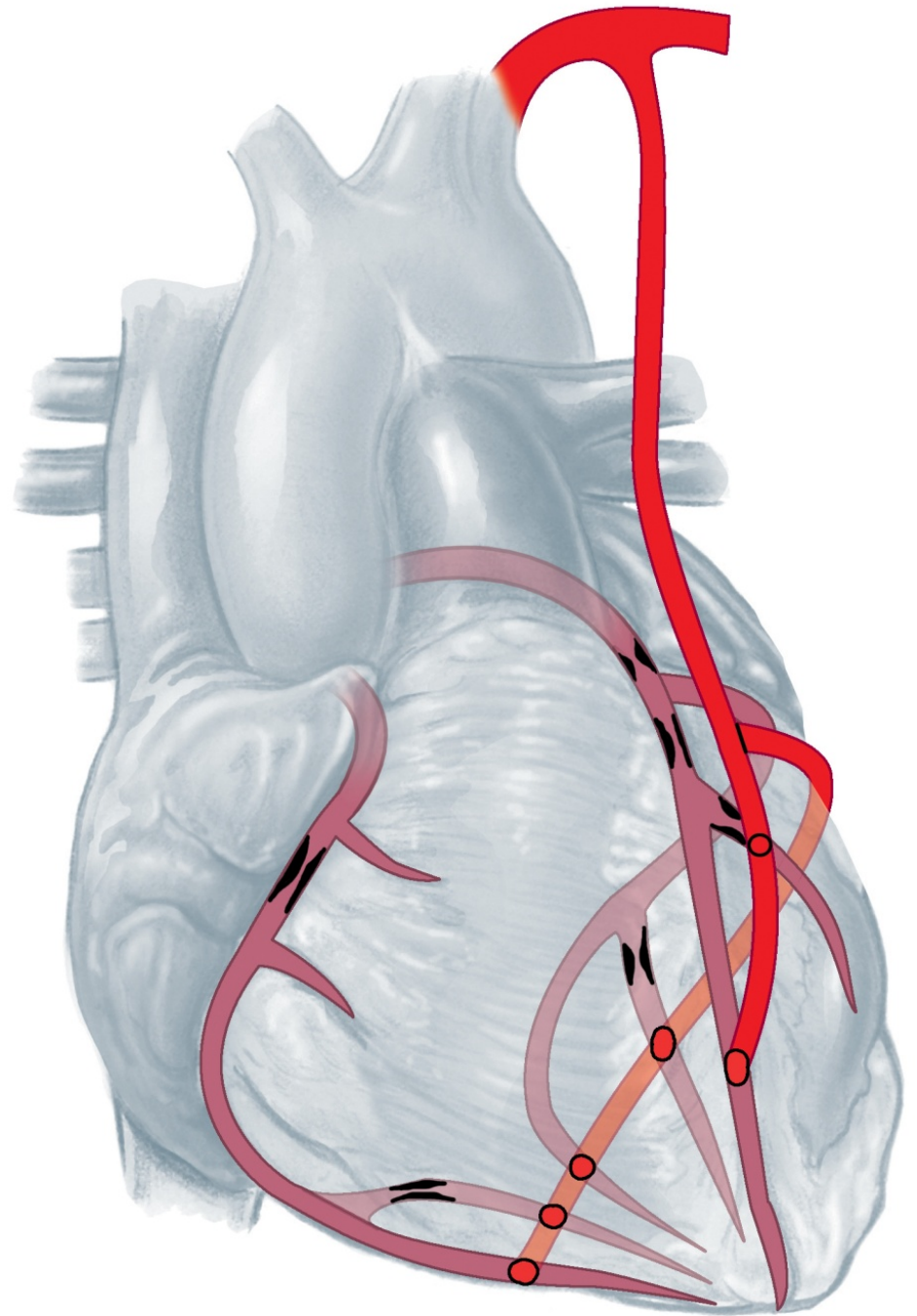
^aClass of recommendation.

^bLevel of evidence.

^cReferences.



T-graft



Underhåll – gas eller TIVA?

2017 EACTS Guidelines on perioperative medication in adult cardiac surgery

Miguel Sousa-Uva* Stuart J Head Milan Mилоjevic Jean-Philippe Collet Giovanni Landoni Manuel Castella Joel Dunning Tomás

Author Notes

European Journal of Cardio-Thoracic Surgery, Volume 53, Issue 1, 1 January 2018, Pages 5–33, <https://doi.org/10.1093/ejcts>

Published:

06 October 2017

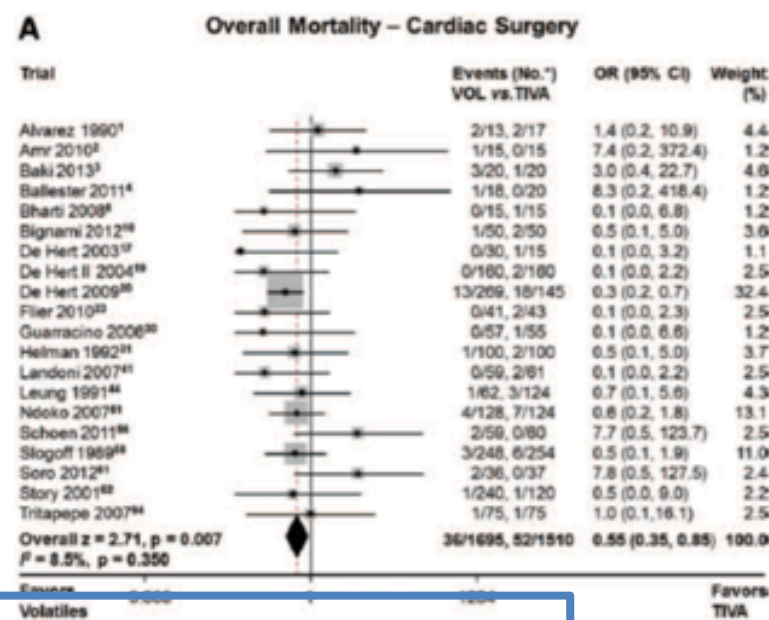
Recommendations	Class ^a	Level ^b	Ref ^c
Multimodal analgesia is recommended over single-technique analgesia.	I	B	[269]
It is recommended that adult patients undergoing cardiac surgery undergo routine assessment of pain presence and severity for optimal analgesia.	I	B	[268, 269]
It is recommended that an anaesthesia plan including a halogenated agent (isoflurane, desflurane or sevoflurane) is used in CABG patients.	I	B	[256, 257]

Effects of Volatile Anesthetics on Mortality and Postoperative Pulmonary and Other Complications in Patients Undergoing Surgery

A Systematic Review and Meta-analysis

Christopher Uhlig, M.D., Thomas Bluth, M.D., Kristin Schwarz, M.Sc., Stefanie Deckert, M.Sc., Luise Heinrich, M.Sc., Stefan De Hert, M.D., Ph.D., Giovanni Landoni, M.D., Ary Serpa Neto, M.D., Ph.D., Marcus J. Schultz, M.D., Ph.D., Paolo Pelosi, M.D., F.E.R.S., Jochen Schmitt, M.D., Ph.D., Marcelo Gama de Abreu, M.D., M.Sc., Ph.D., D.E.S.A.

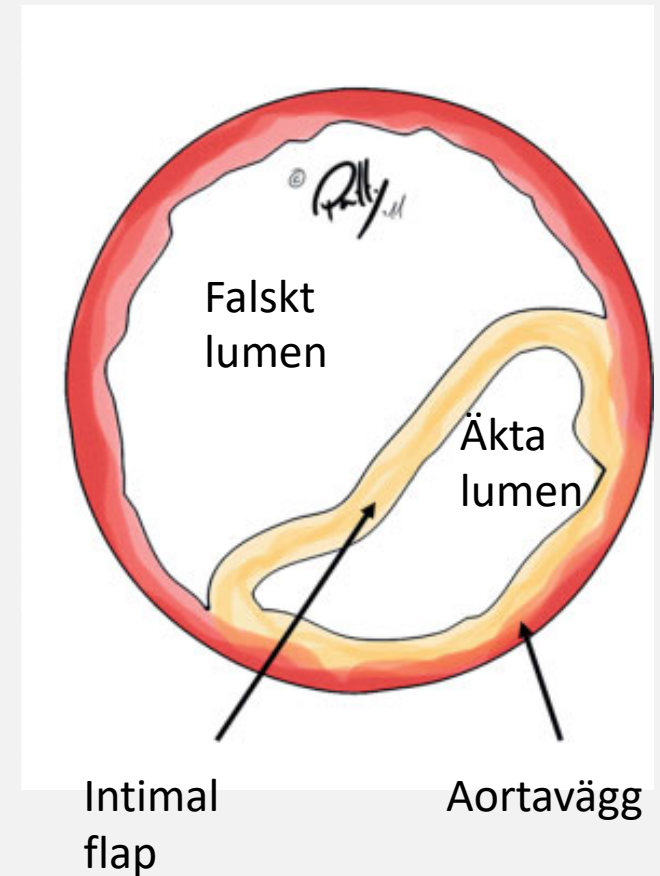
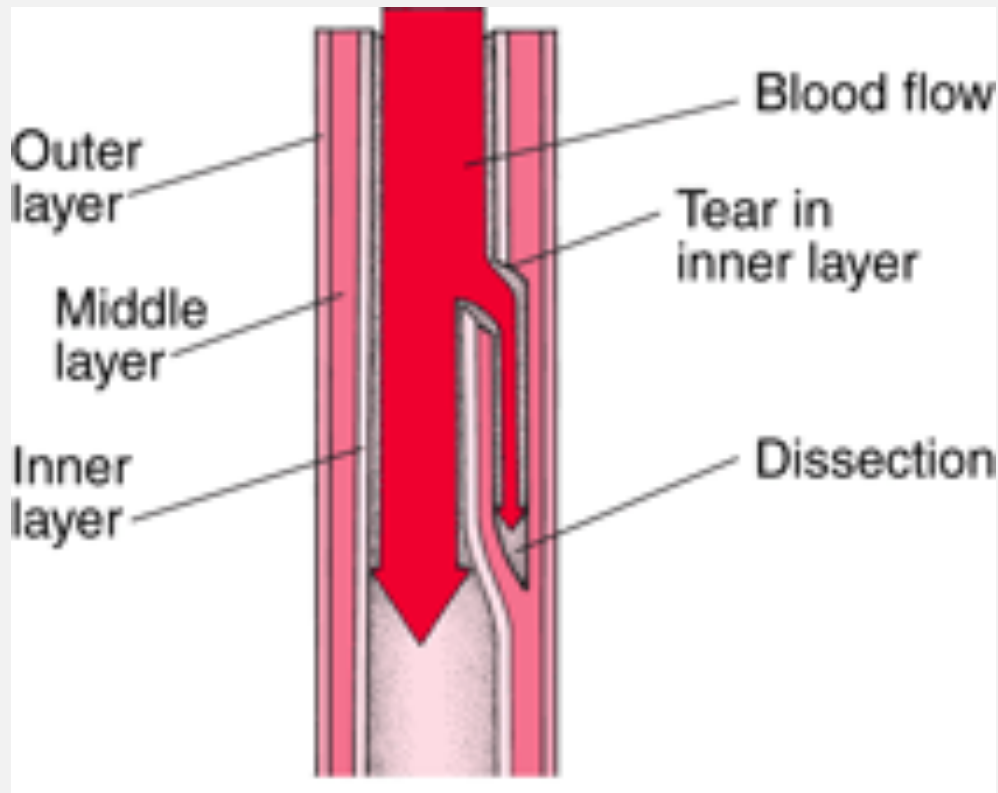
Anesthesiology 2016



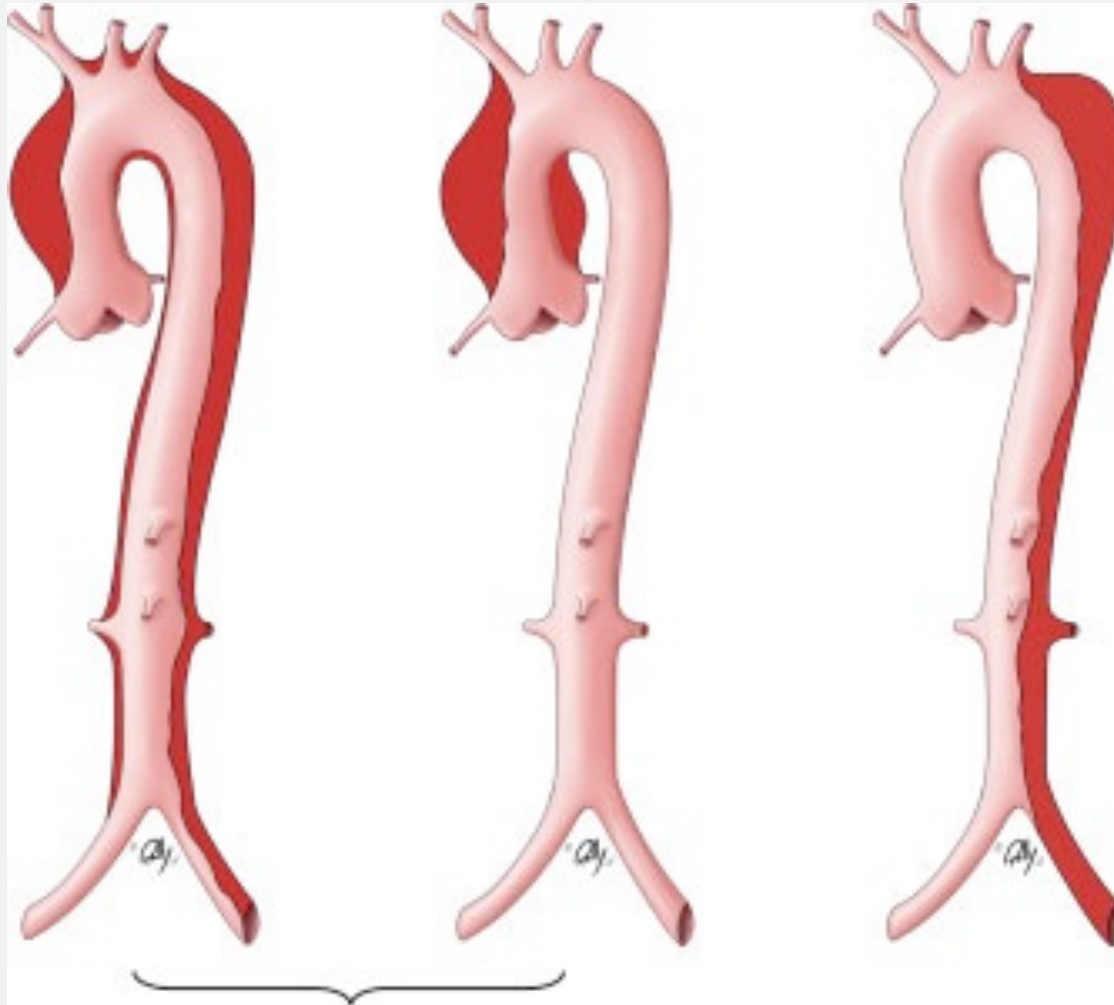
Conclusions

In cardiac, but not in noncardiac, surgery, compared to TIVA, general anesthesia with volatile anesthetics was associated with major benefits in outcome, including reduced mortality, as well as lower incidence of pulmonary and other complications.

TypA-dissektion - patofysiologi



Klassifikation



Stanford
DeBakey

I

A

II

B

III

Risikfaktorer/Orsaker

- Hypertoni (2/3)
- Ålder (>70 år)
- Man > kvinna
- Ateroskleros, hyperlipidemi
- Rökning
- Bindvävssjukdomar (tex Marfans, Ehlers-Danlos syndrom)
- Inflammatoriska sjd (tex Takayasu, jättecellsarterit, RA)
- Kongenital hjärtsjd (BAV, coarctatio aortae)
- Inflammatoriska/infektiösa vaskulopatier
- Trauma (trubbigt våld)
- Iatrogena orsaker tex kanylering, cross-clamping, angiografi
- Graviditet
- Emotionell stress, fysisk aktivitet
- Droger (tex kokain, amfetamin)
- Toxisk: bakteriell och fungal aortitis, tex Syfilis
- Aortaaneurysm

Handläggning

Akut till thoraxop!

Blodtryckskontroll: Mål SAP 100, puls 60-80.

Smärtlindring med tex lite fentanyl + morfin

Blodgrp/BAS-test – beställ blod (tex 4 E-konc, 4 plasma)

Neurostatus, bukstatus, extremitetsstatus före sövning.

CT: Är ljumskärLEN dissekerade? HalskärLEN? Laddar njurarna kontrast? Blodförsörjning till inre bukorgan?

Artärnål x 2

Externa deff-plattor

NPH och blåstemp vid arrest

CVK 4-lumen/PA-introducer/ev CDK

Blodgas, koagulationsstatus, njurprover

Blodtryckssänkning

- Trandate (Labetalol)
 - Kombinerad beta- och alfablockare (3:1)
 - 10-20 mg bolus, infusion 1 mg/min
 - CAVE stor AI
- Nitropress
 - 0,5-1 ug/kg/min
 - CAVE reflextakykardi
- Breviblock (Esmolol)
 - Betablockare, selektiv B1-blockare
 - Kort halveringstid, lättstyrd $T_{1/2} = 2 \text{ min}$
 - 5-25 mg bolus, infusion 25-300 ug/kg/min
- Ca-blockare

Nedsövning

Jämför med akut SAH, preeklampsi... Take it easy!

Överväg RSI.

Adekvat sömndjup innan intubation.

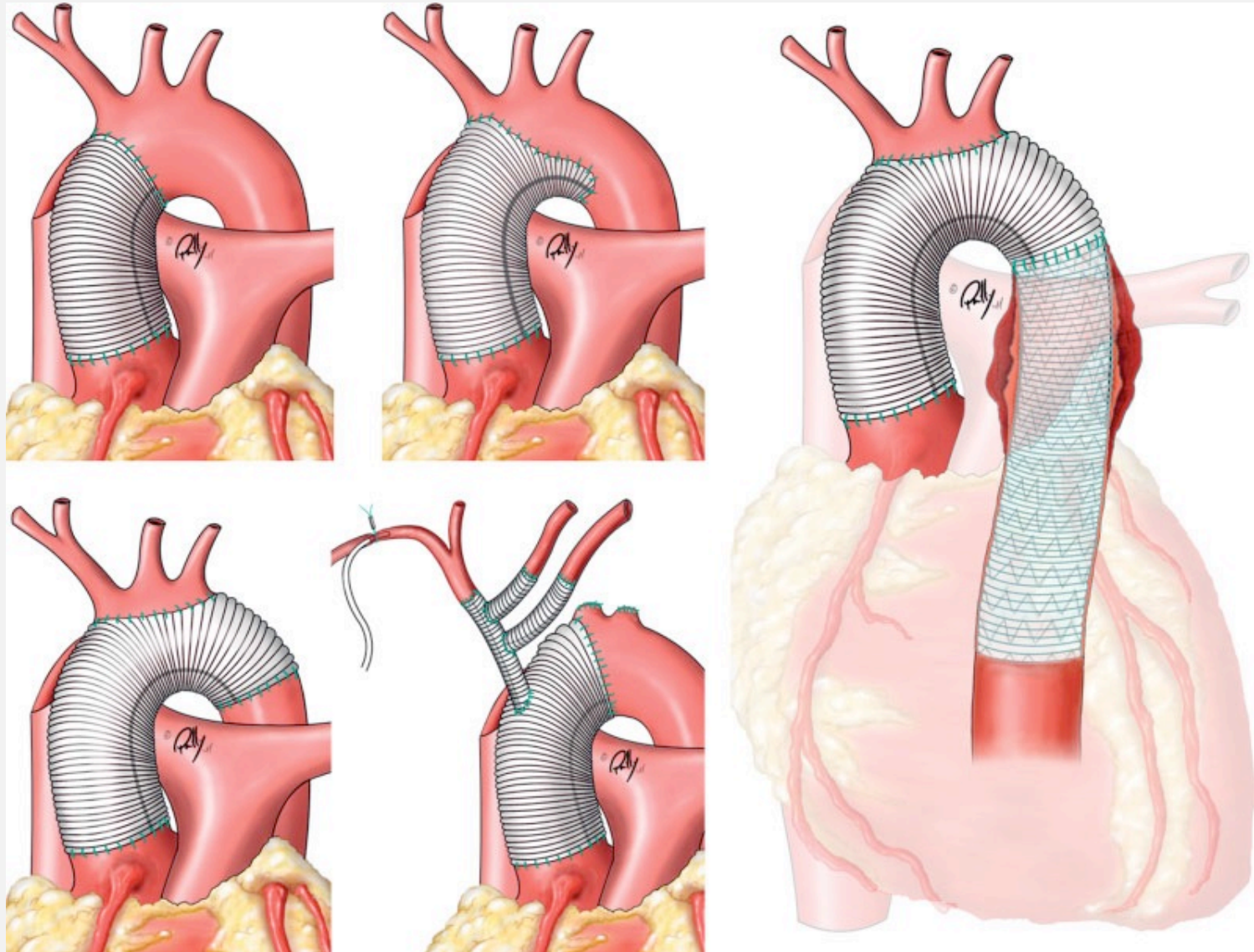
Xylocainspray på stämband.

Ketalar + Esmeron om instabil.

Midazolam+Fentanyl högdos.

Nitropress och NA-infusion kopplade.

Kirurgi



Pulmonell hypertension

Definitions

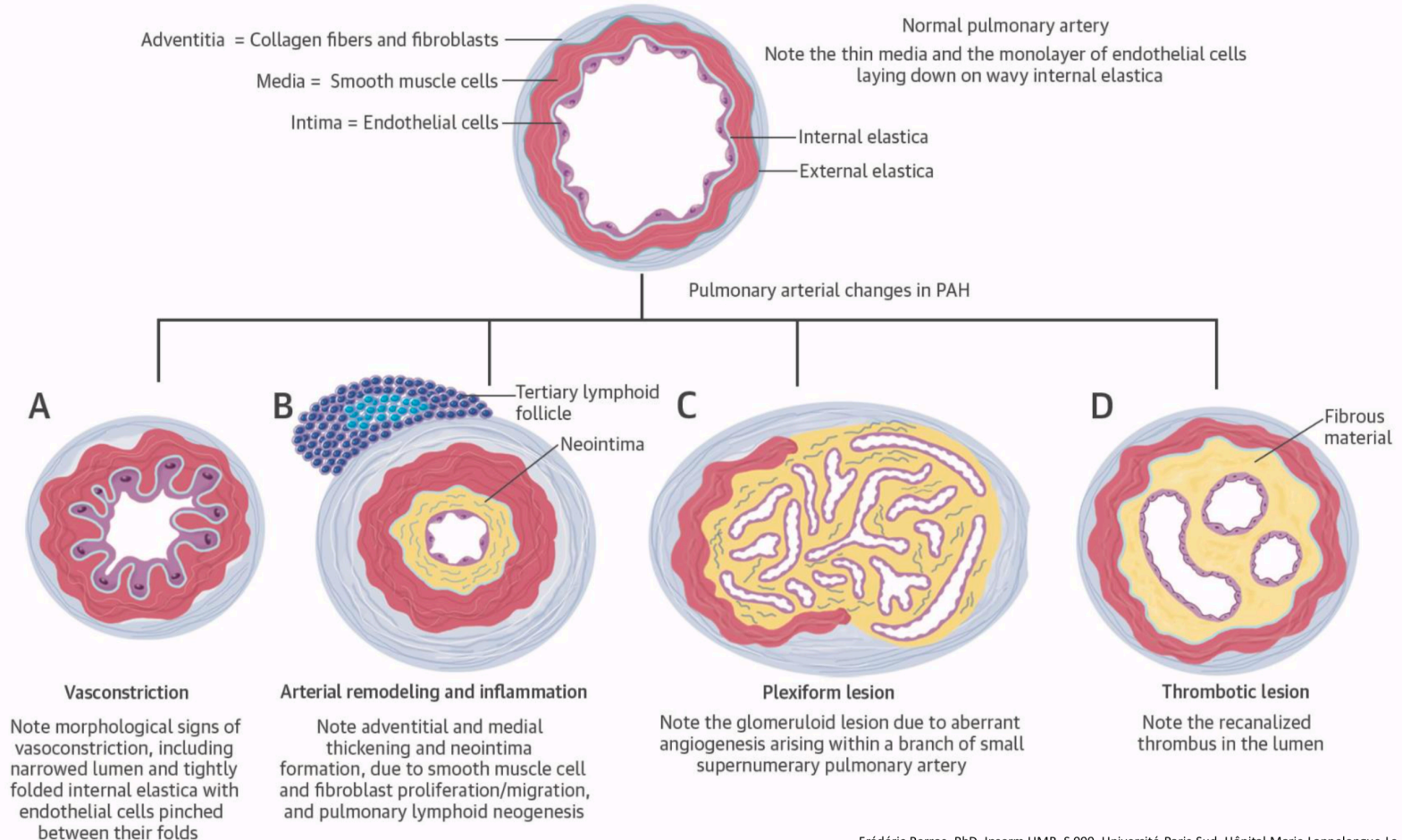
- PH is defined as an increase in mean pulmonary arterial pressure (PAPm) ≥ 25 mmHg at rest as assessed by right heart catheterization (RHC)
- Available data have shown that the normal PAPm at rest is 14 ± 3 mmHg with an upper limit of normal of approximately 20 mmHg
- Pulmonary Arterial Hypertension (PAH) =
 - pre-capillary PH
 - defined by a pulmonary artery wedge pressure (PAWP) ≤ 15 mmHg and
 - PVR > 3 Wood units (WU) in the absence of other causes of pre-capillary PH such as PH due to lung diseases, CTEPH or other rare diseases

Classification

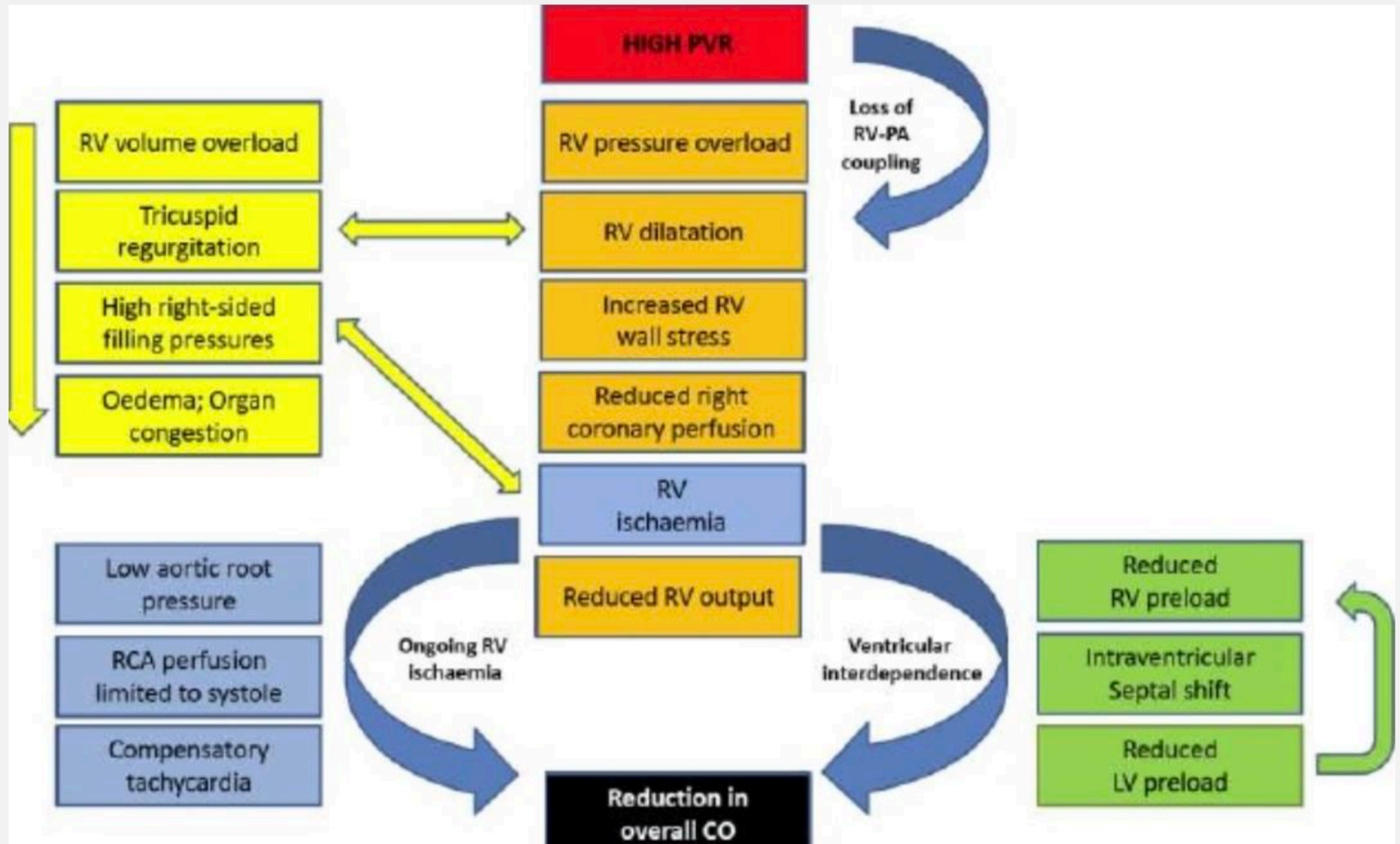
5th World Symposium on Pulmonary Hypertension, Nice, France, February 27 to March 1, 2013

- **Group 1:** Pulmonary arterial hypertension (PAH) and other subtypes of PAH (eg idiopathic, heritable, drugs and toxins induced, connective tissue disease, HIV, schistosomiasis)
- **Group 2:** PH due to left-sided heart disease (eg. LV syst/diastol dysfunction, valvular disease, congenital cause)
- **Group 3:** PH due to respiratory disease and hypoxemia (eg. COPD, interstitial lung disease, sleep-disordered breathing, obstructive/restrictive lung disease, chronic exposure to high altitude)
- **Group 4:** Chronic thromboembolic pulmonary hypertension (CTEPH) and other pulmonary artery obstructions (eg. angiosarcoma, congenital pulmonary artery stenosis)
- **Group 5:** Miscellaneous causes (eg. hematological, systemic, metabolic disorders)

Pathophysiology in PAH

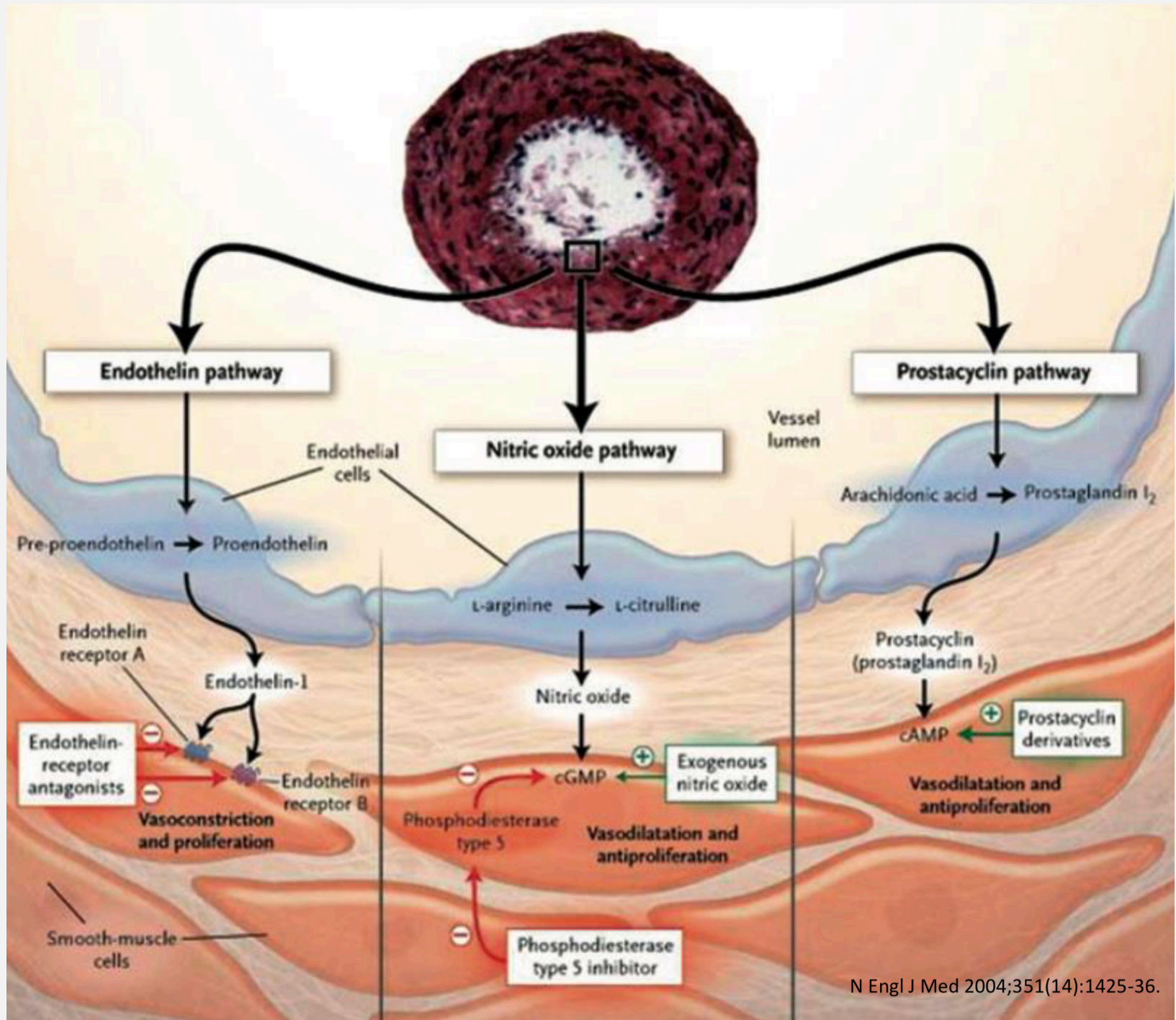


Hemodynamic impact of PH



Risk-patienter: mPAP > 50 mmHg

- Sänk MPAP/PVR
 - Beh smärta
 - Låga intrathorakal tryck, Peep, spontan andning
 - Undvik acidosis, hyperkapné, hypoxi
 - Undvik atelektaser
 - Vasodilaterare
- Upprätthåll MAP/SVR*
 - Undvik systemisk vasodilatation
 - Upprätthåll koronartryck
 - Undvik bradykardi
 - Normovolemi
 - Syrgas = potent vasodilator
 - TEE bra, PA-kateter om möjligt
 - Cave hö-kammarsvikt
 - Vasopressor till hands



Temporär pacemaker

- AAI, VVI eller DDD vanligast
- 1. Pace 2. Sense 3. Svar på sense
- Hö kammare +/- hö förmak
- Sensing (mV): har hjärtat egenrytm?
 - ju lägre sense desto känsligare
 - för låg sense risk misstolka elektriska impulser
- Pacing (mA): Depolarisering av myokardiet, capture
- Kontrollera sense och pace-funktion.
- Tas ofta bort 3:e eller 4:e postopdagen.

