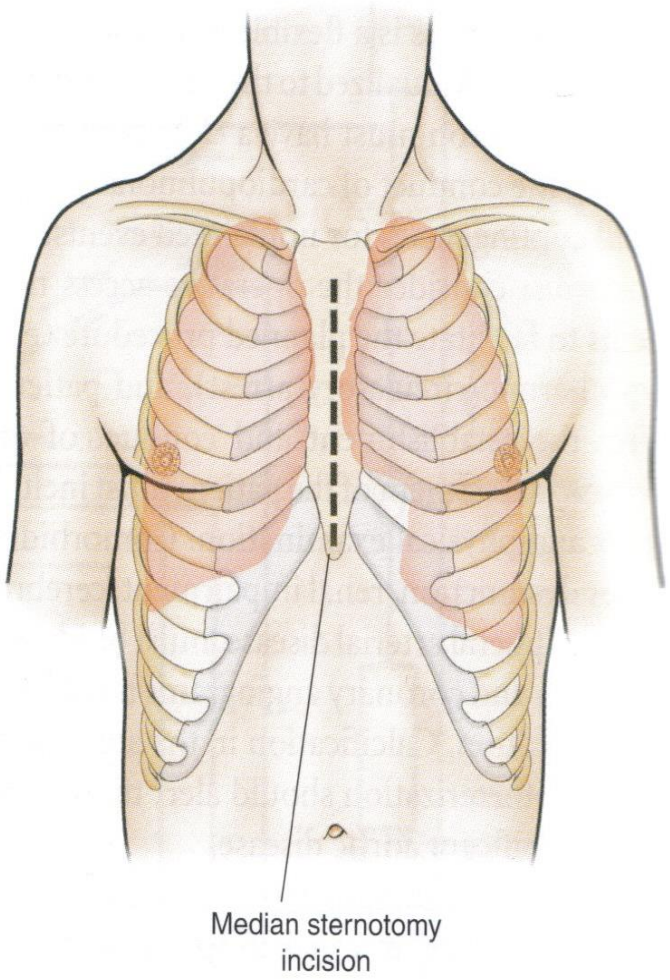
CNE THORAXCHIRURGIE

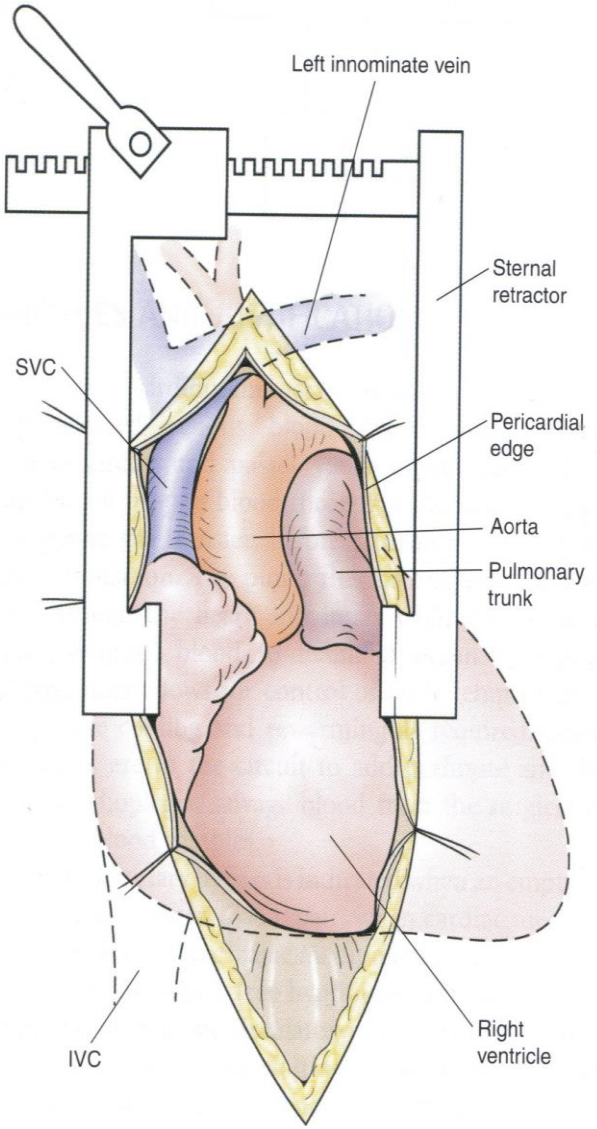
Anatomie en fysiologie van het hart

Dr. A.L.P. Markou
Cardio-thoracaal chirurg
24 maart 2015

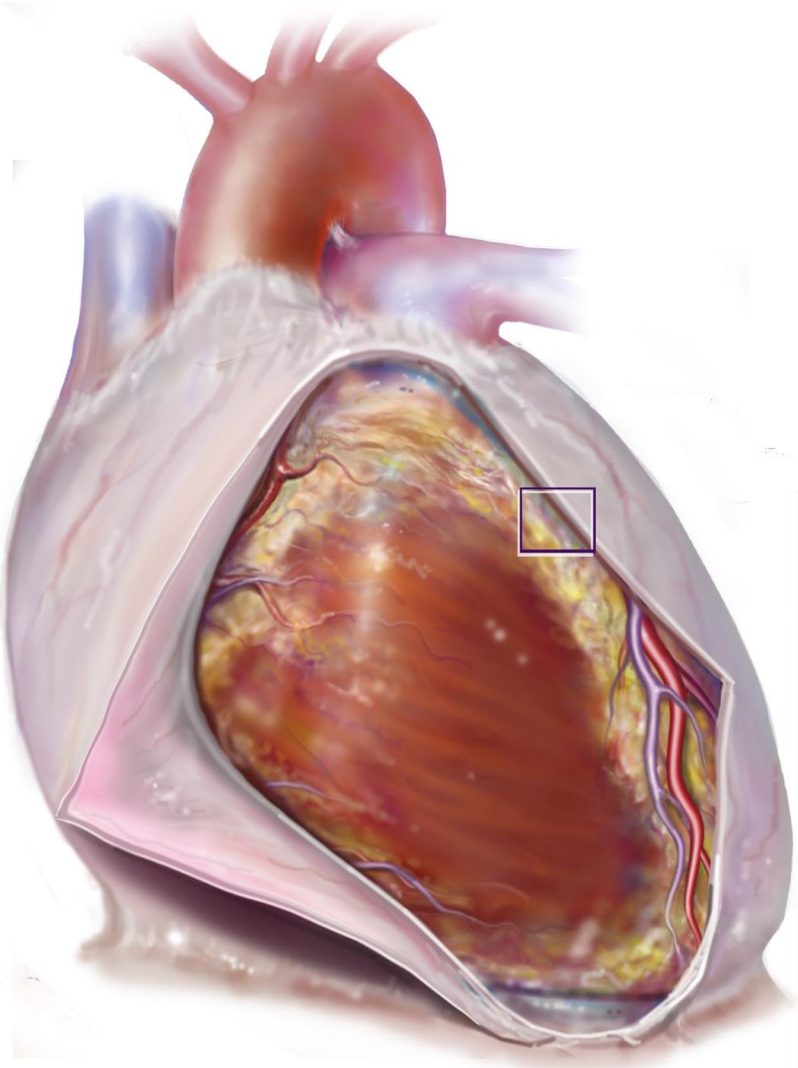
isala

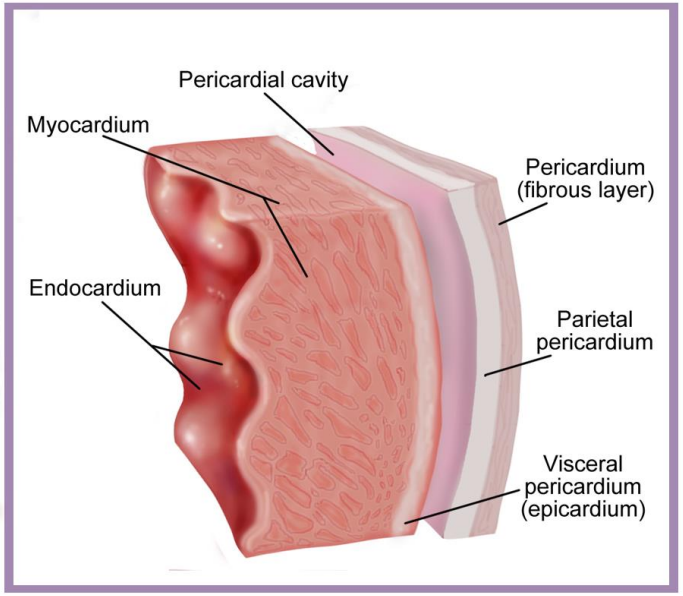
Mediane sternotomie



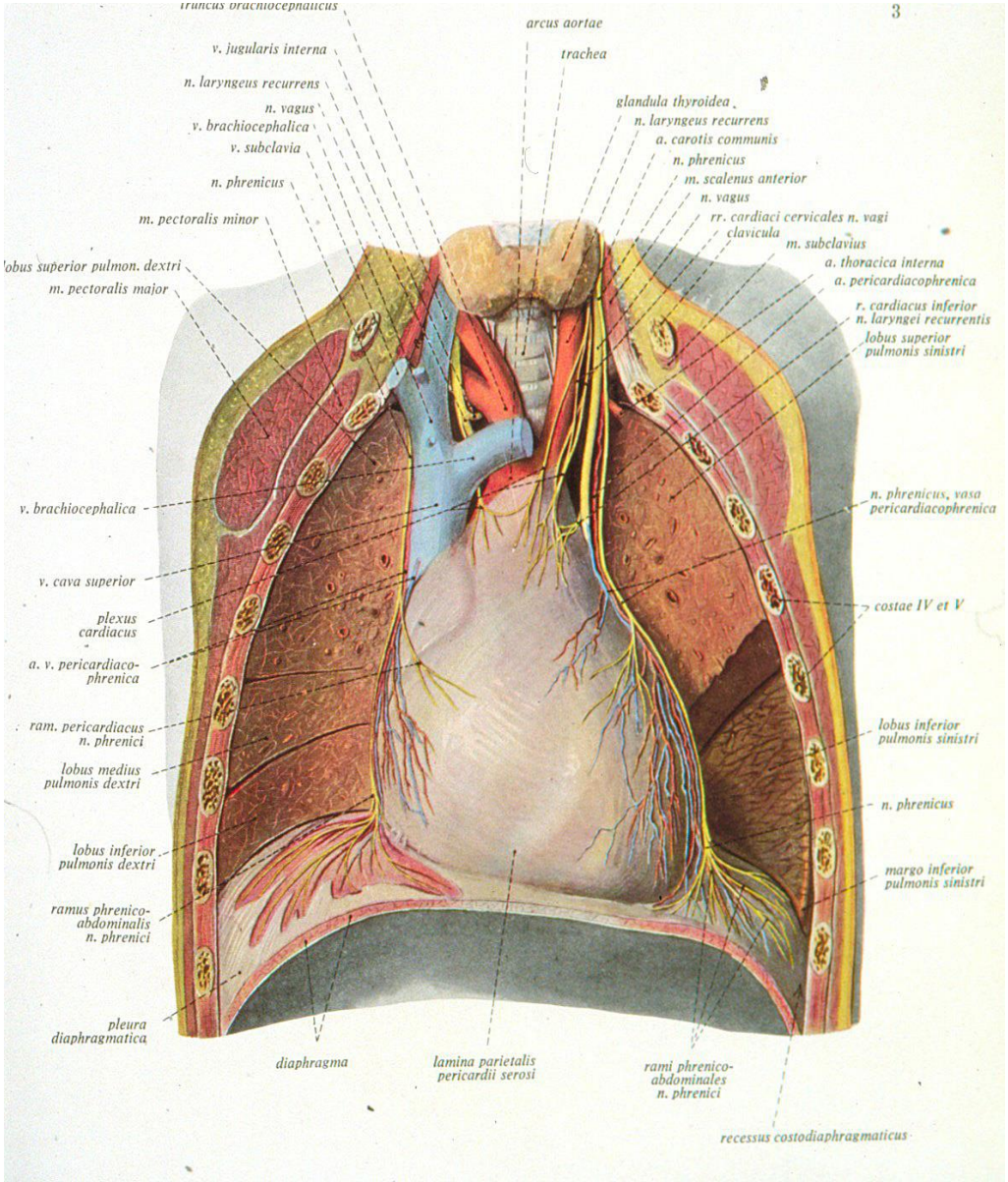


Pericard

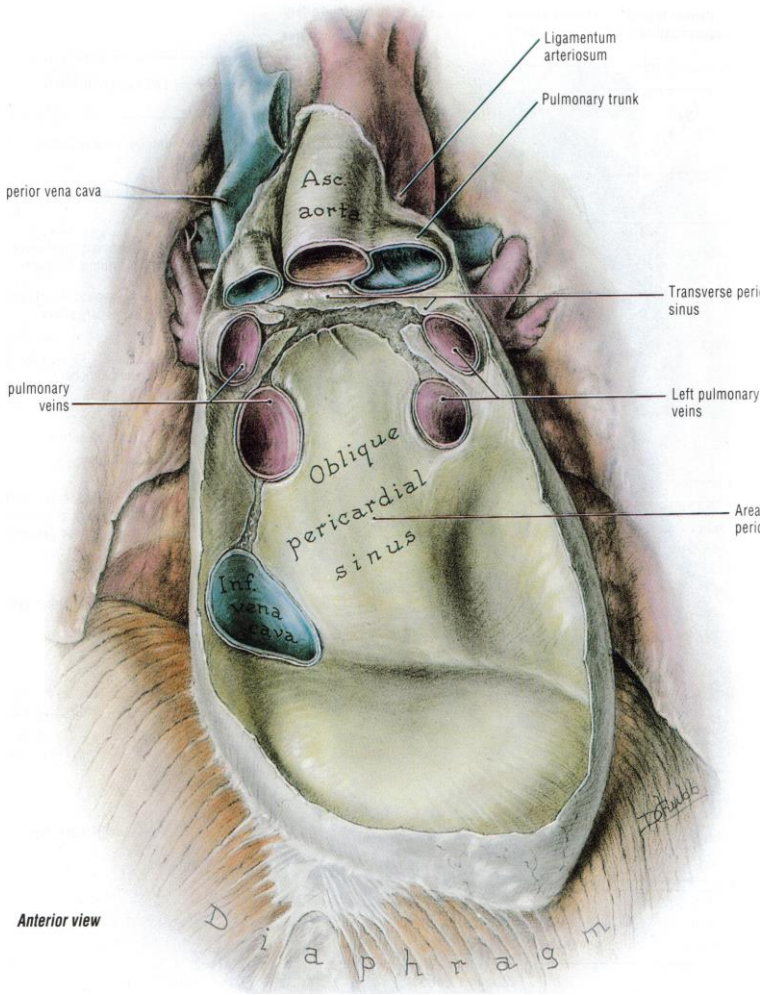


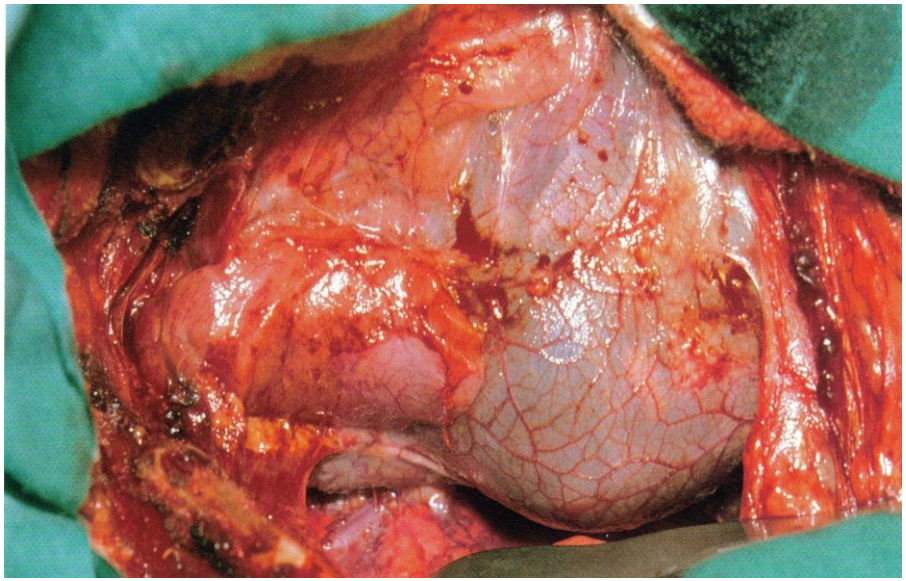

Pericardial cavity
Myocardium
Pericardium
(fibrous layer)
Endocardium
Parietal
pericardium
Visceral
pericardium
(epicardium)

Gesloten pericard

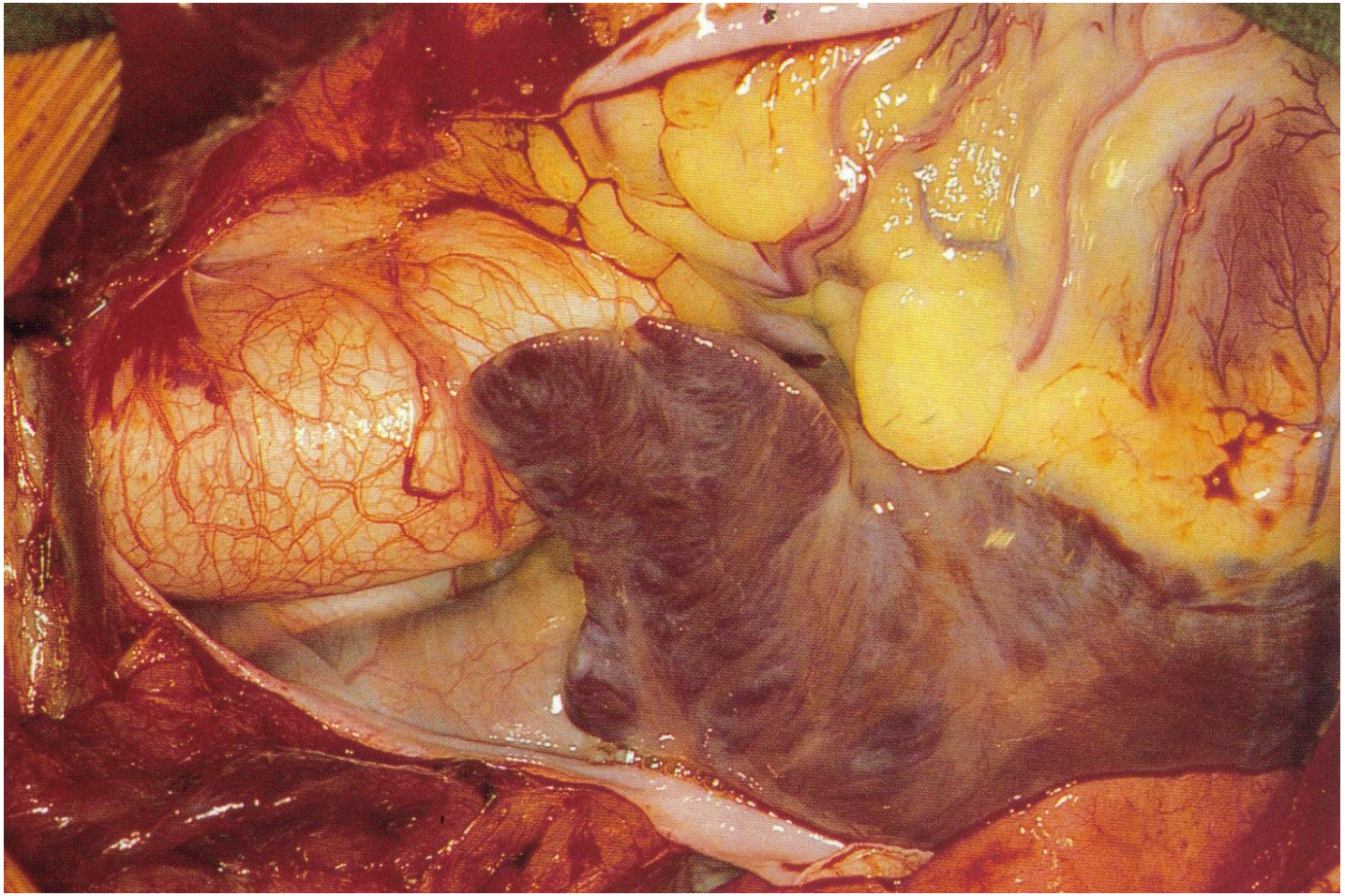


Pericard

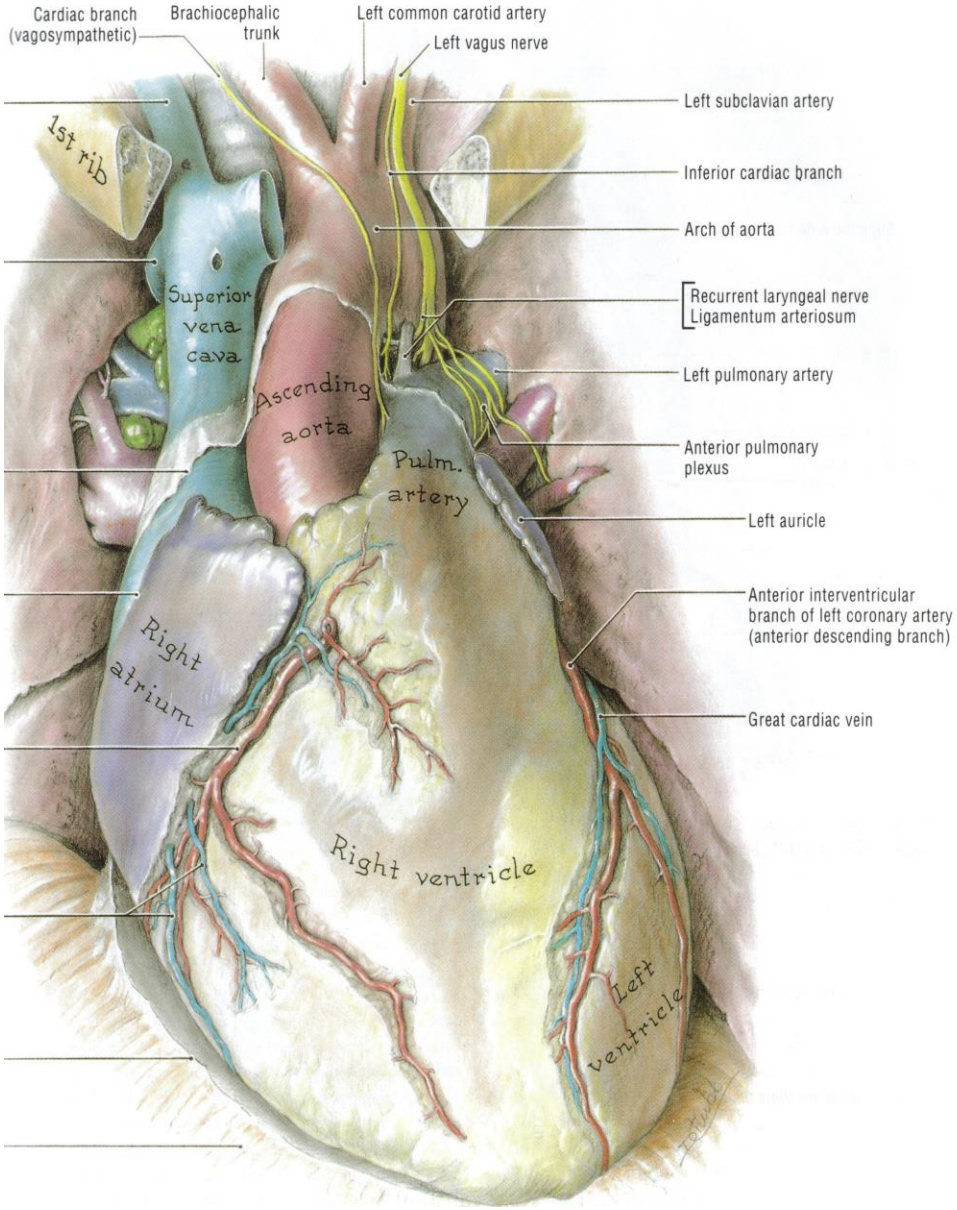

Ligamentum arteriosum
Pulmonary trunk
perior vena cava
Asc aorta
Transverse peri sinus
pulmonary veins
Left pulmonary veins
Oblique pericardial sinus
Area peri
Inf. vena cava
Anterior view
Diaphragm



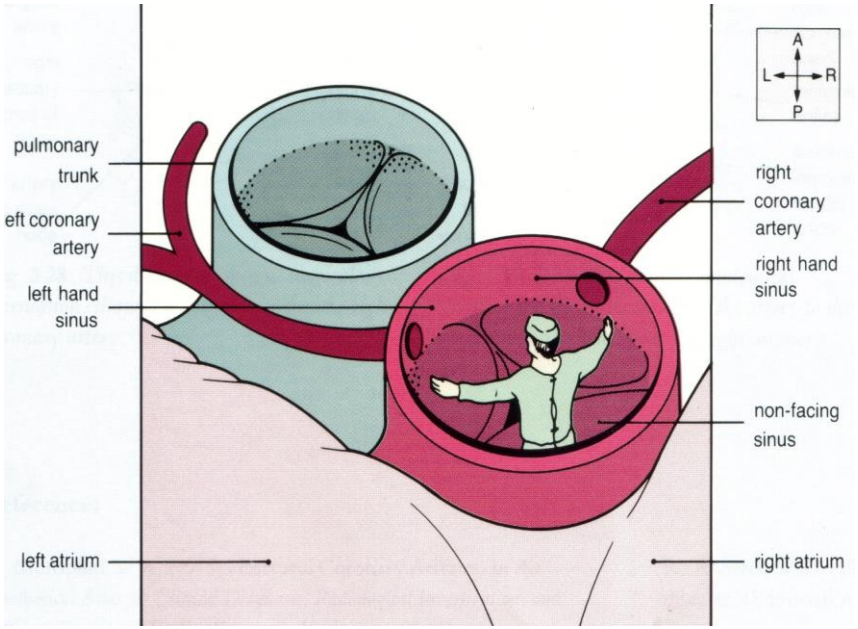
Geopend pericard

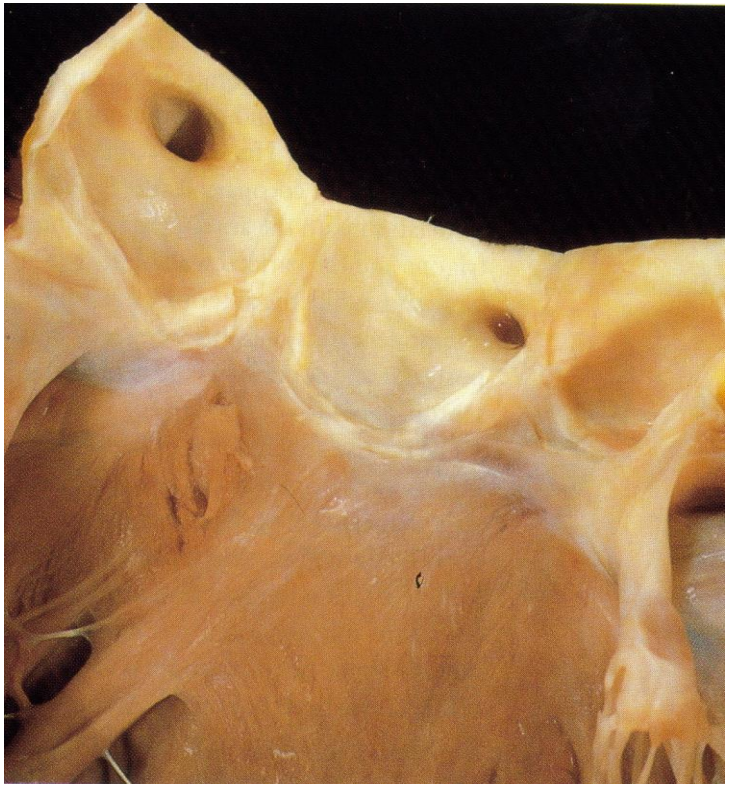


Extern aspect van het hart

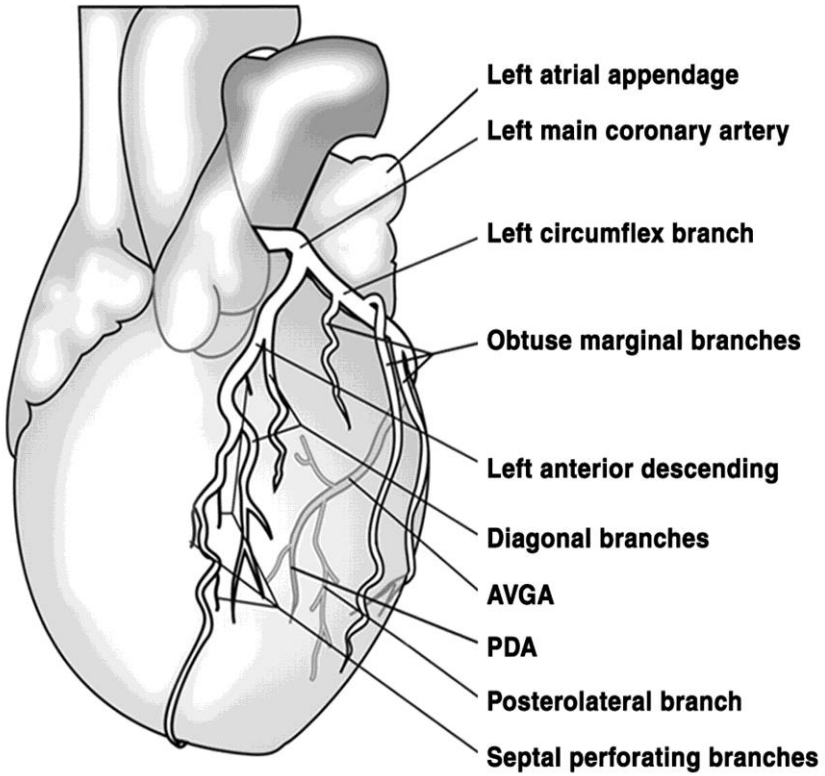


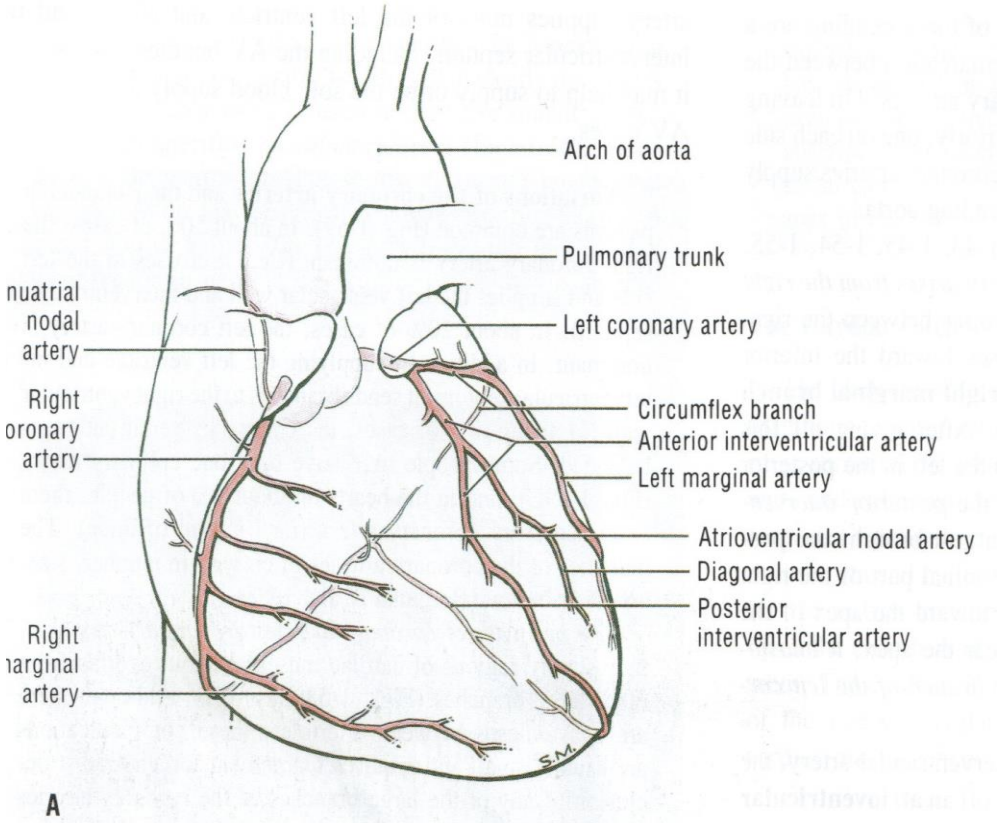
Oriëntatie coronairen



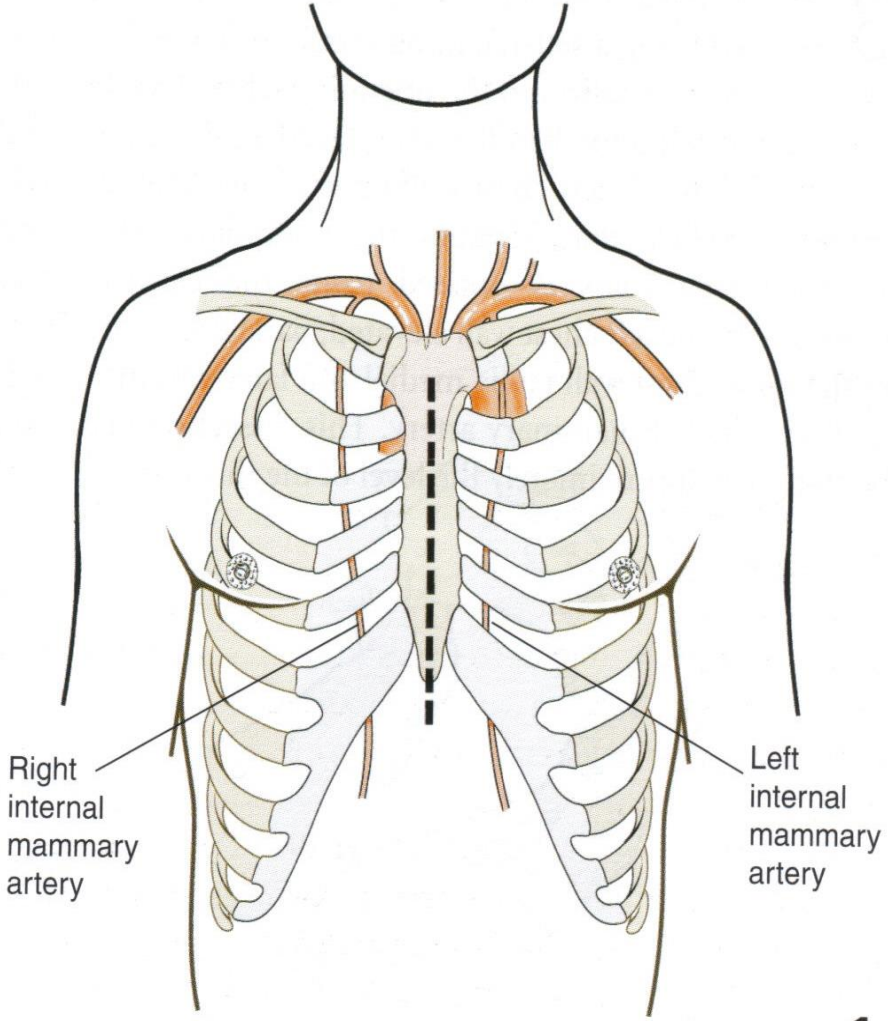


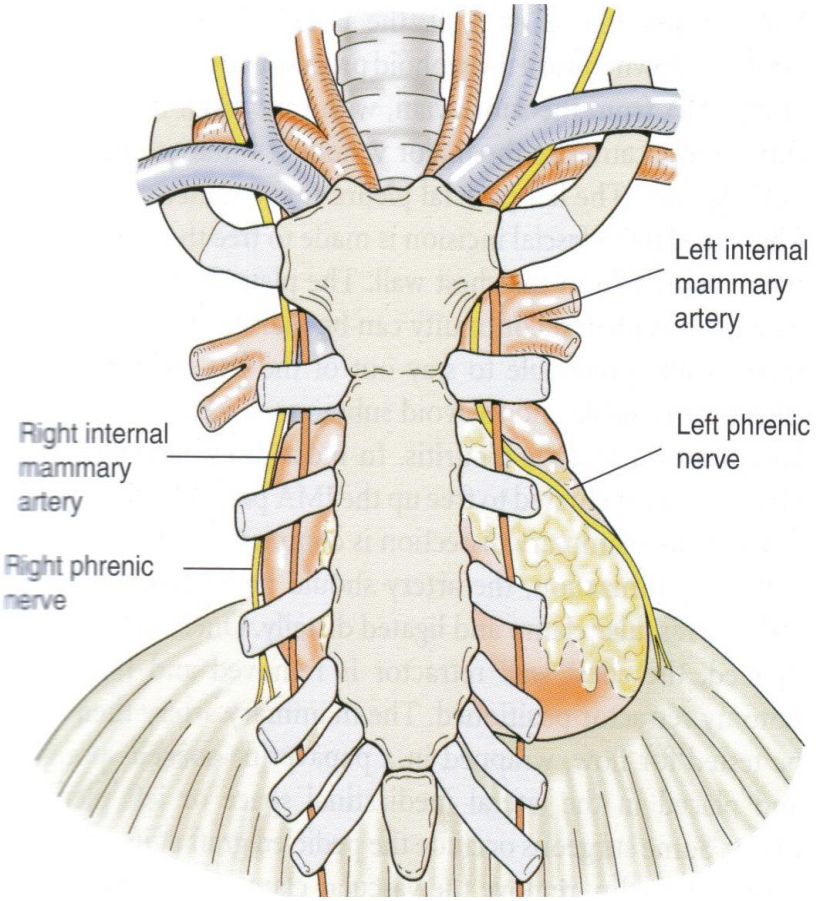
Coronair anatomie





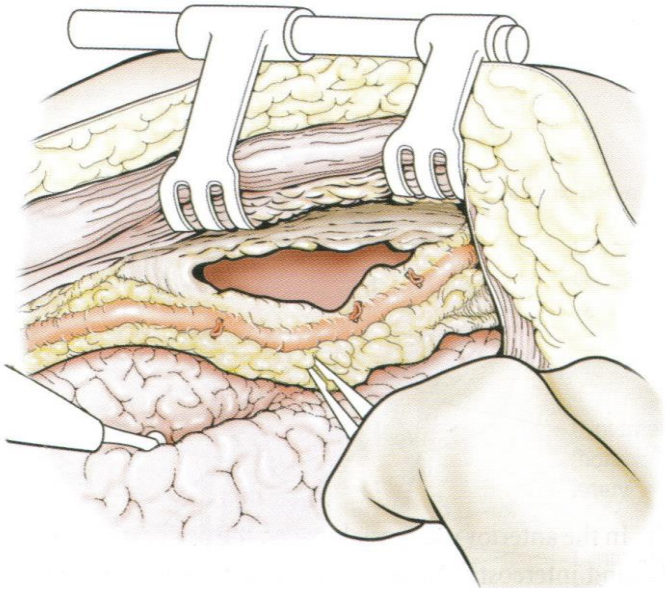
Aa. mammariae

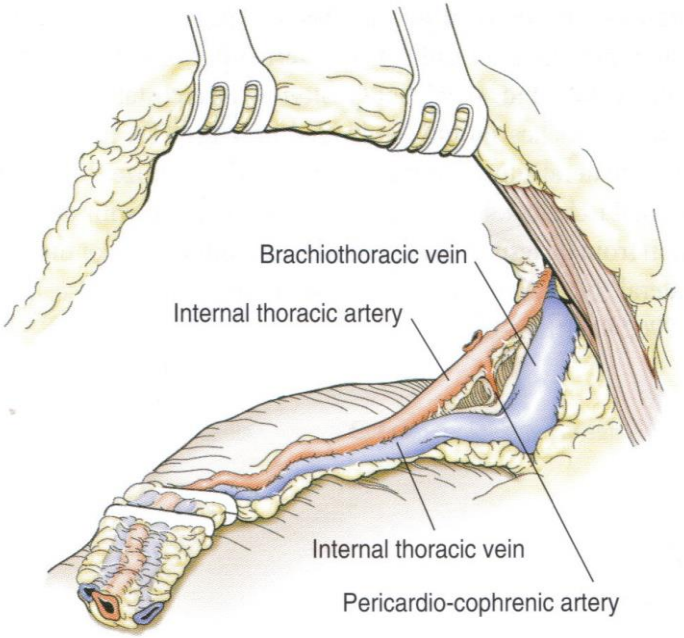


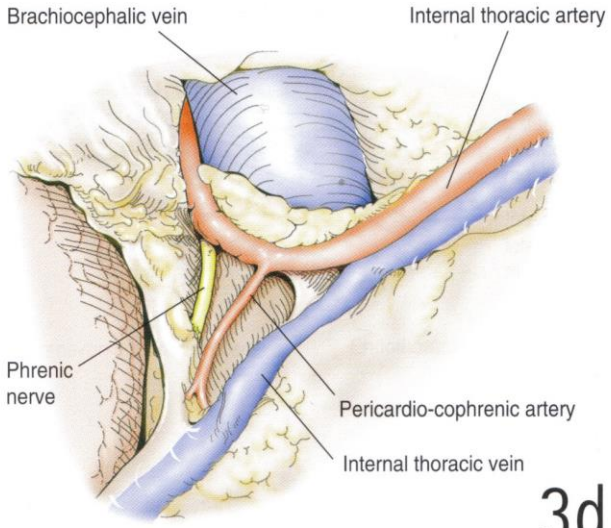


1

LIMA vrijprepareren







Vena Saphena magna en parva

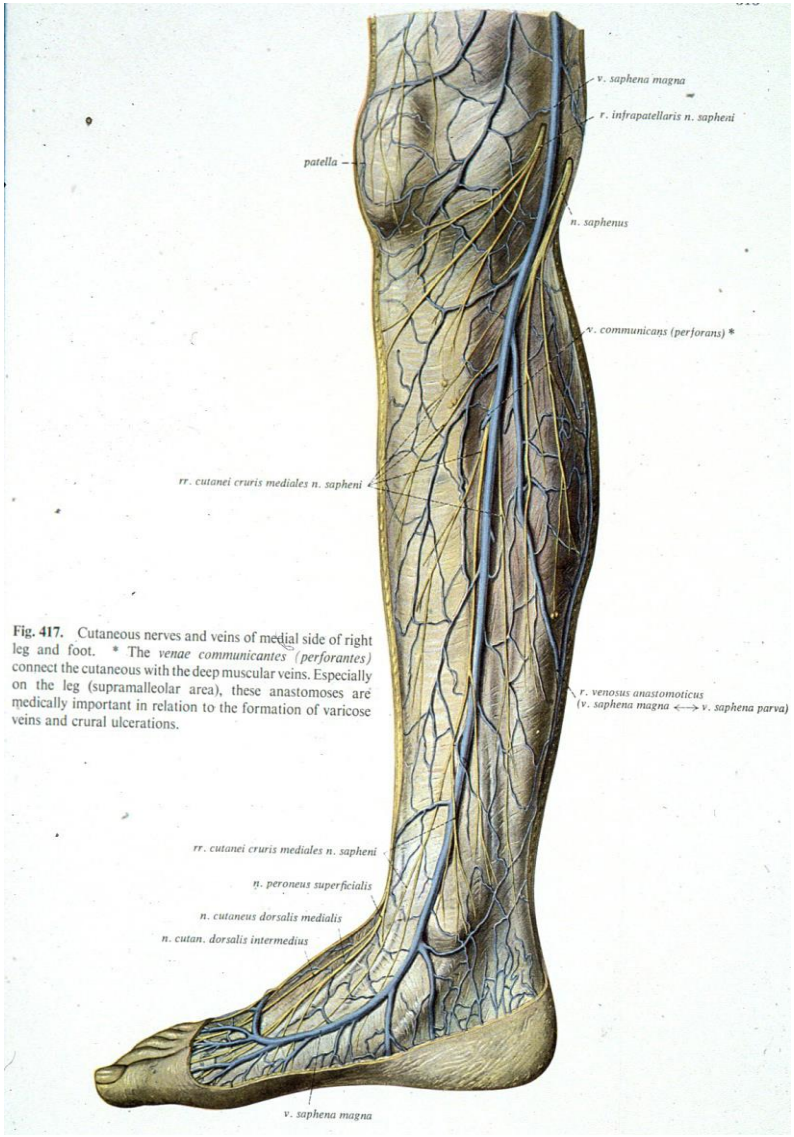


Fig. 417. Cutaneous nerves and veins of medial side of right leg and foot. * The *venae communicantes (perforantes)* connect the cutaneous with the deep muscular veins. Especially on the leg (supramalleolar area), these anastomoses are medically important in relation to the formation of varicose veins and crural ulcerations.

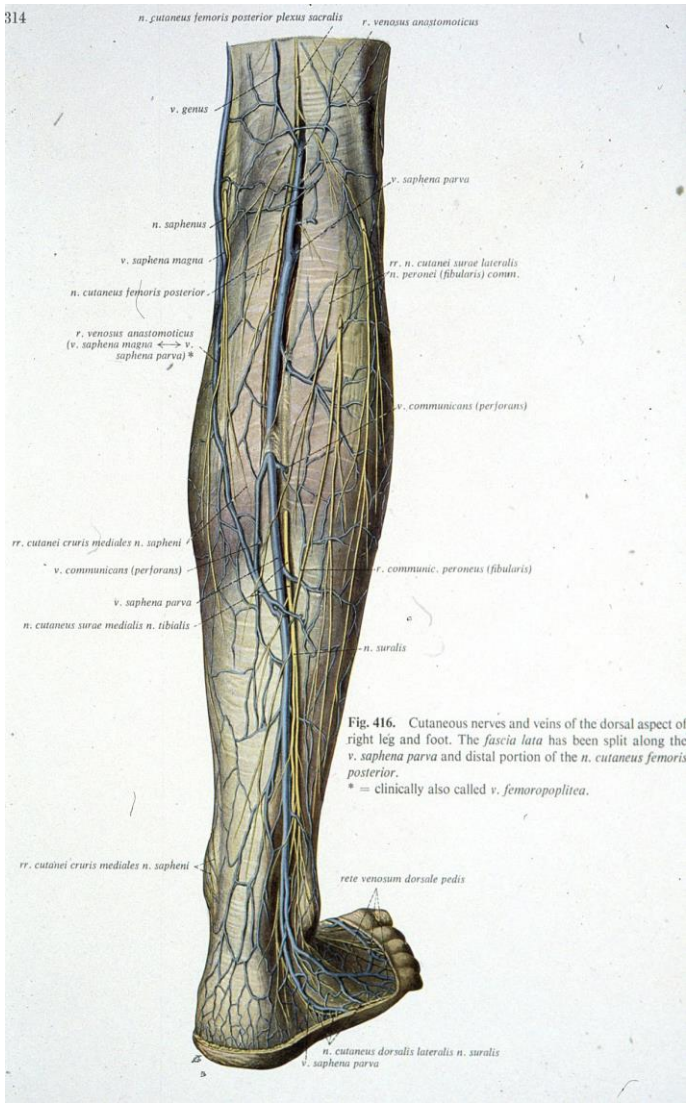
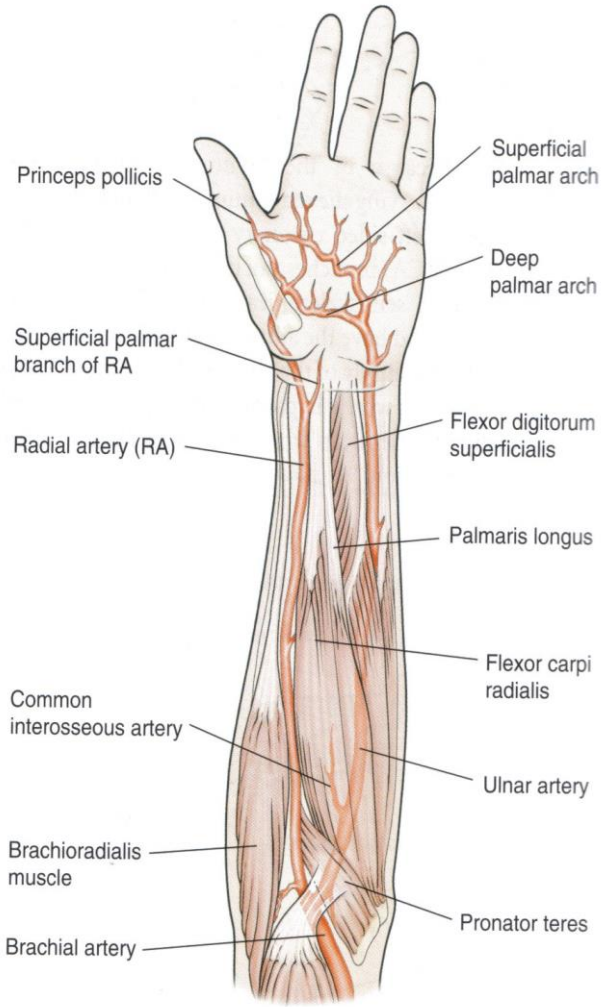
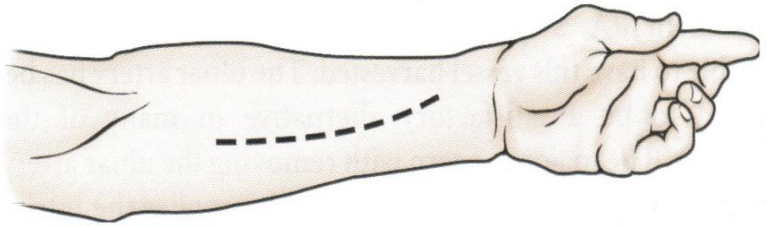
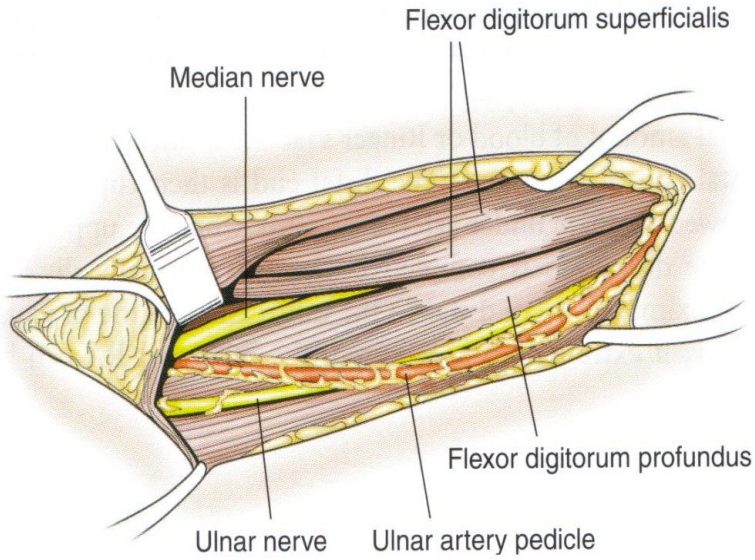


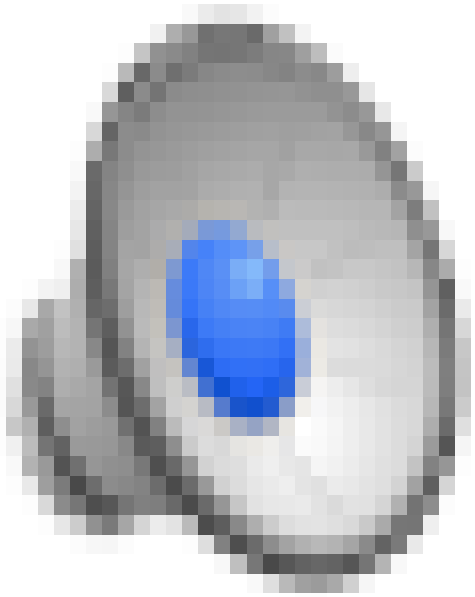
Fig. 416. Cutaneous nerves and veins of the dorsal aspect of right leg and foot. The *fascia lata* has been split along the *v. saphena parva* and distal portion of the *n. cutaneus femoris posterior*.
* = clinically also called *v. femoropoplitea*.

A. radialis


Princeps pollicis
Superficial palmar arch
Deep palmar arch
Superficial palmar branch of RA
Radial artery (RA)
Flexor digitorum superficialis
Palmaris longus
Flexor carpi radialis
Common interosseous artery
Ulnar artery
Brachioradialis muscle
Pronator teres
Brachial artery

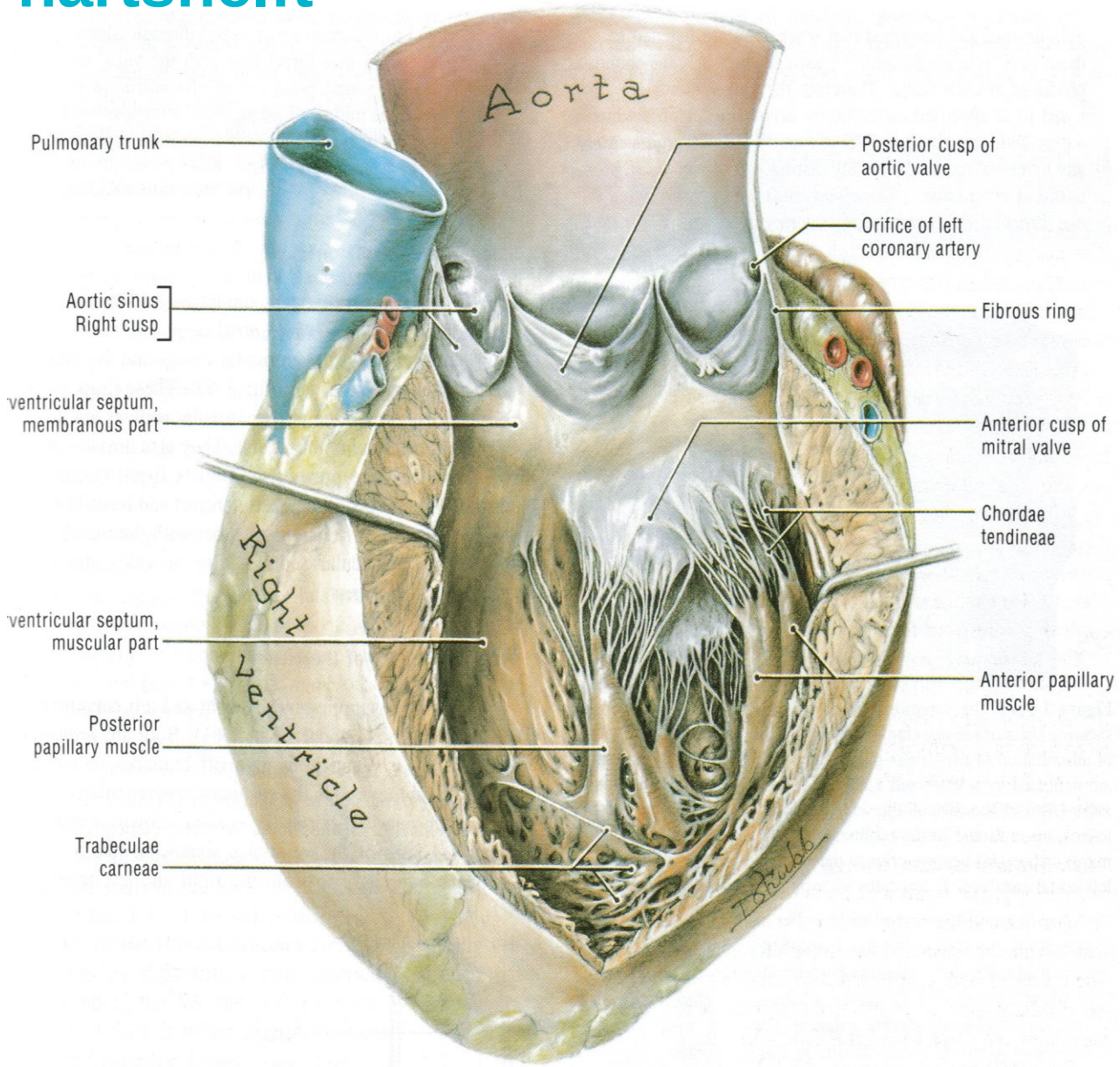



Flexor digitorum superficialis
Median nerve
Flexor digitorum profundus
Ulnar nerve
Ulnar artery pedicle

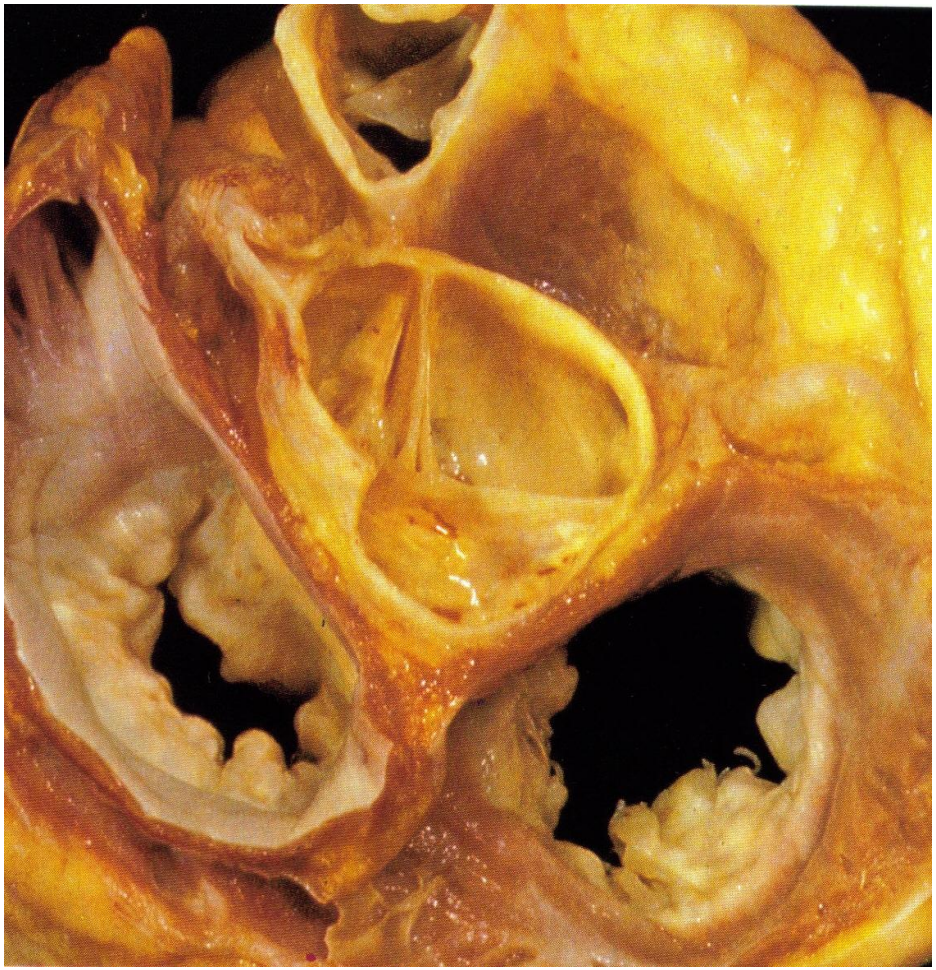


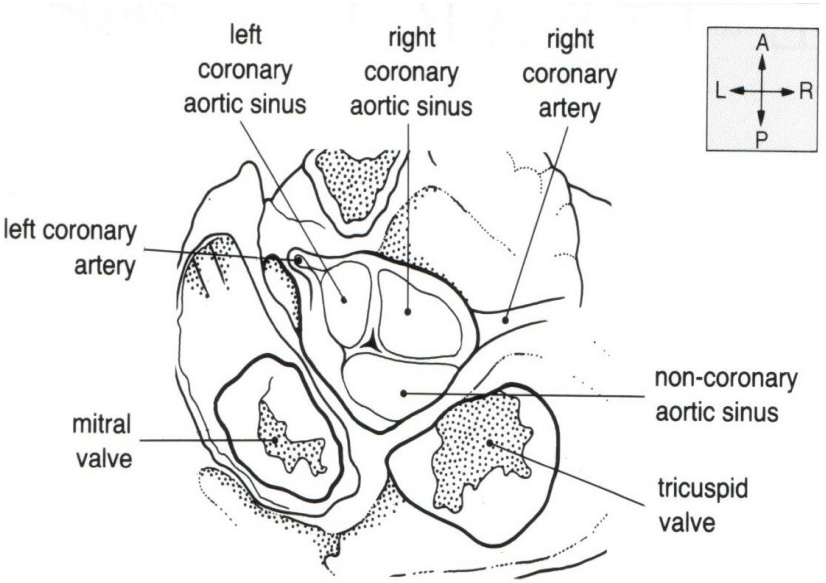
Isala

Linker hartshelft

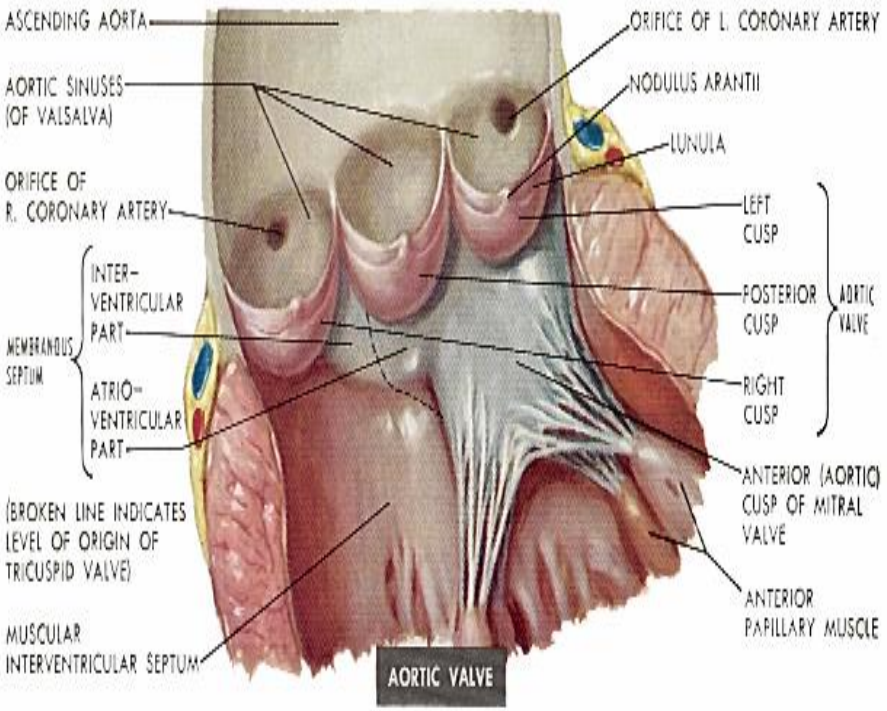


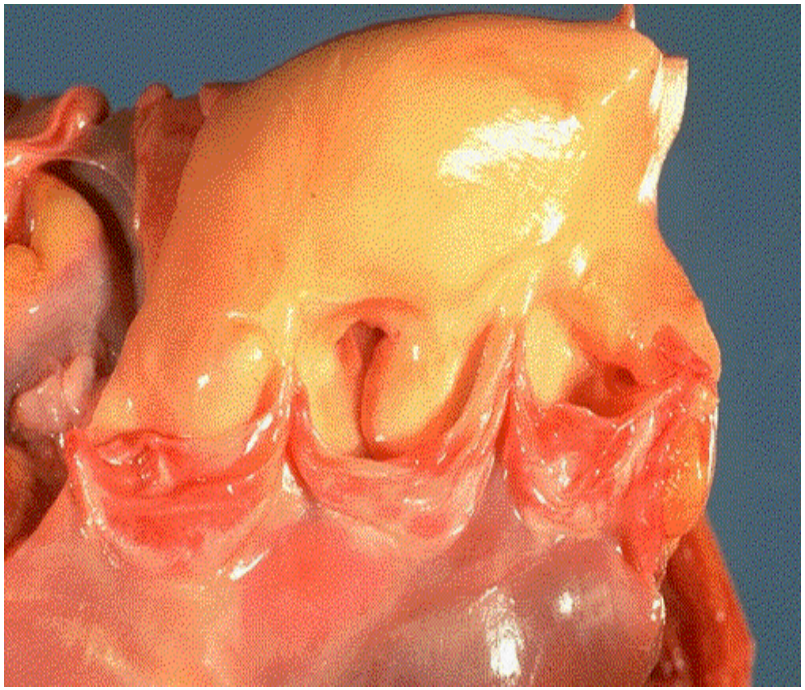
Hartbasis



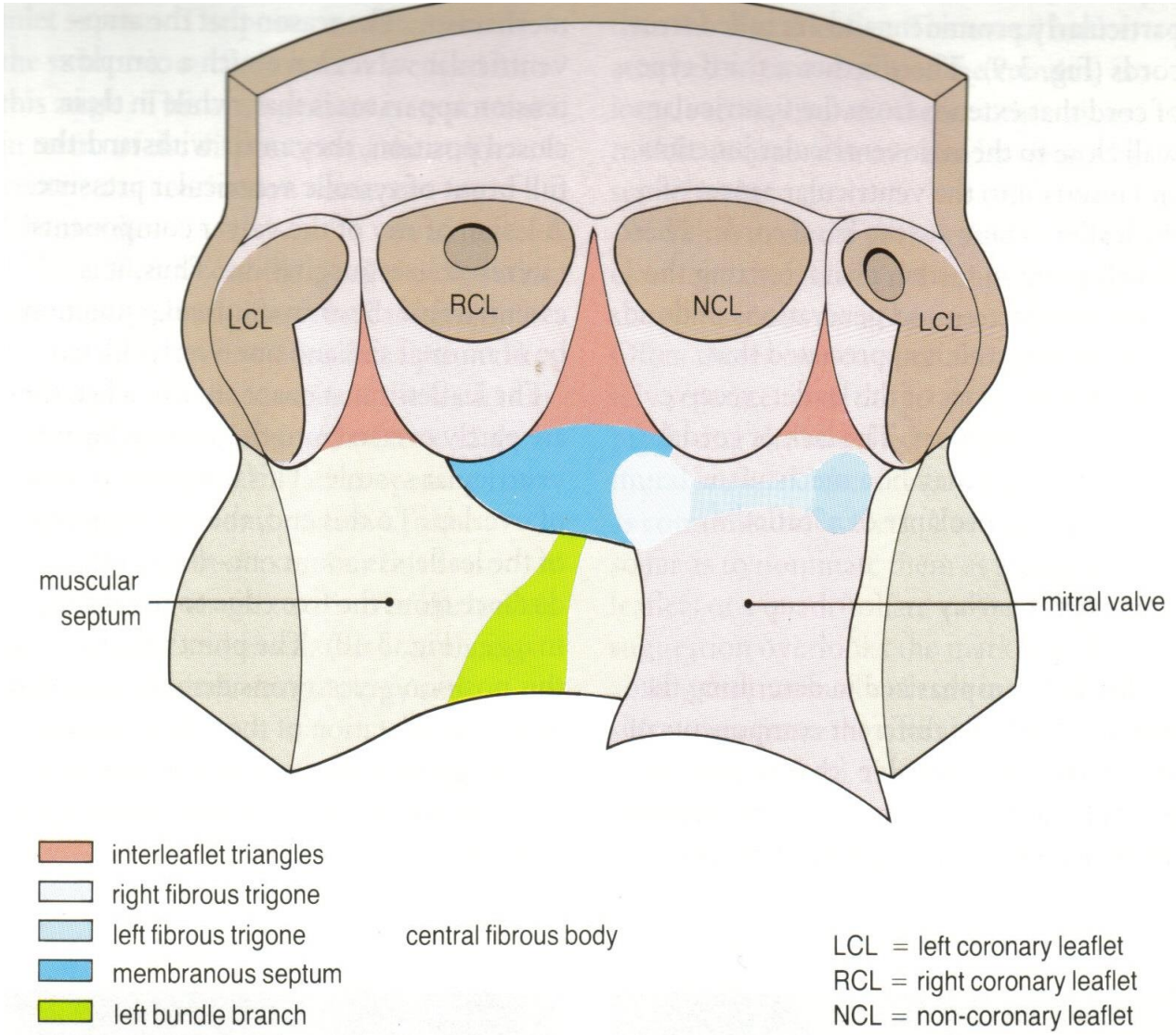

left
coronary
aortic sinus
right
coronary
aortic sinus
right
coronary
artery
A
L
R
P
left coronary
artery
non-coronary
aortic sinus
mitral
valve
tricuspid
valve

Aortaklep

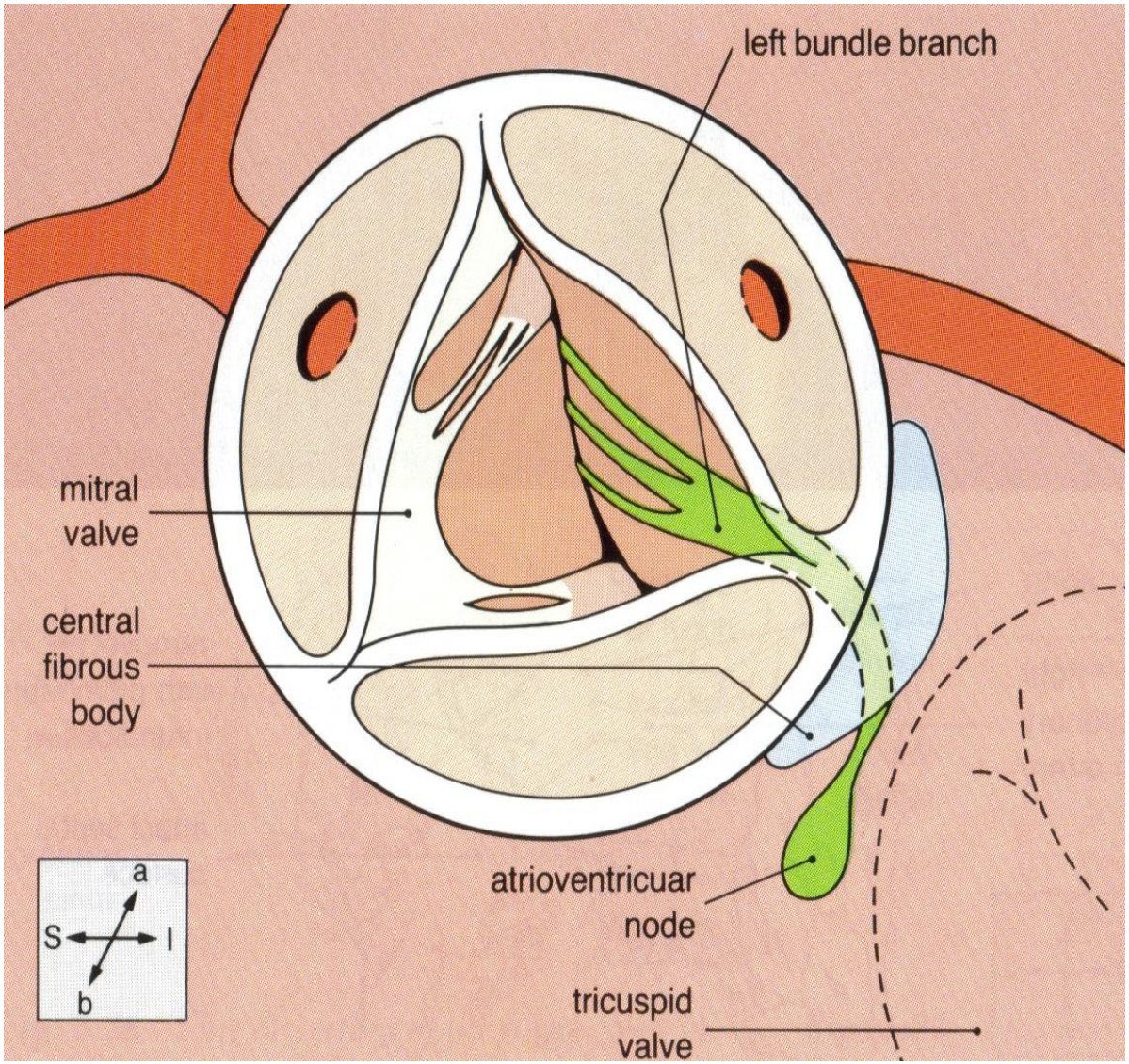

ASCENDING AORTA
AORTIC SINUSES (OF VALSALVA)
ORIFICE OF R. CORONARY ARTERY
MEMBRANOUS SEPTUM
INTER-VENTRICULAR PART
ATRIO-VENTRICULAR PART
(BROKEN LINE INDICATES LEVEL OF ORIGIN OF TRICUSPID VALVE)
MUSCULAR INTERVENTRICULAR SEPTUM
ORIFICE OF L. CORONARY ARTERY
NODULUS ARANTII
LUNULA
LEFT CUSP
POSTERIOR CUSP
RIGHT CUSP
AORTIC VALVE
ANTERIOR (AORTIC) CUSP OF MITRAL VALVE
ANTERIOR PAPILLARY MUSCLE
AORTIC VALVE



Aortaklep


LCL
RCL
NCL
LCL
muscular septum
mitral valve
interleaflet triangles
right fibrous trigone
left fibrous trigone
membranous septum
left bundle branch
central fibrous body
LCL = left coronary leaflet
RCL = right coronary leaflet
NCL = non-coronary leaflet

Aortaklep, coronaire ostia en geleidingssysteem



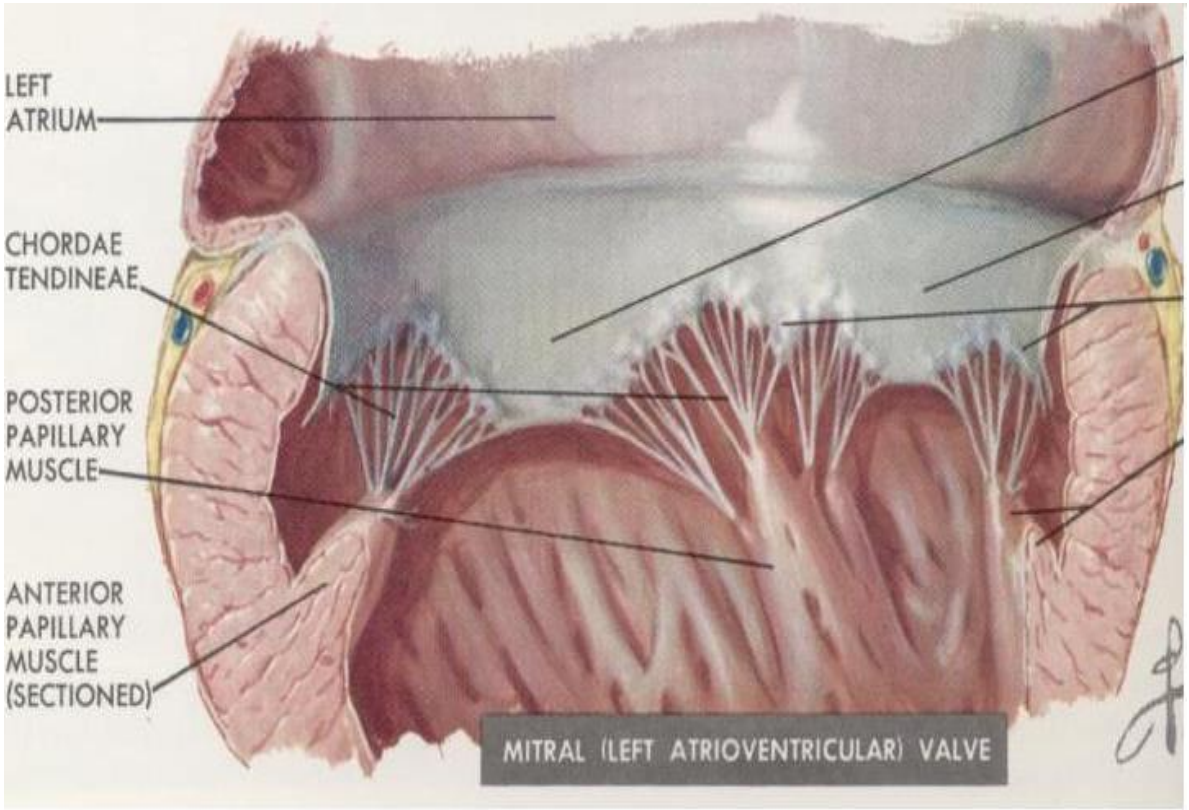
Mitralisklep

Valvulair

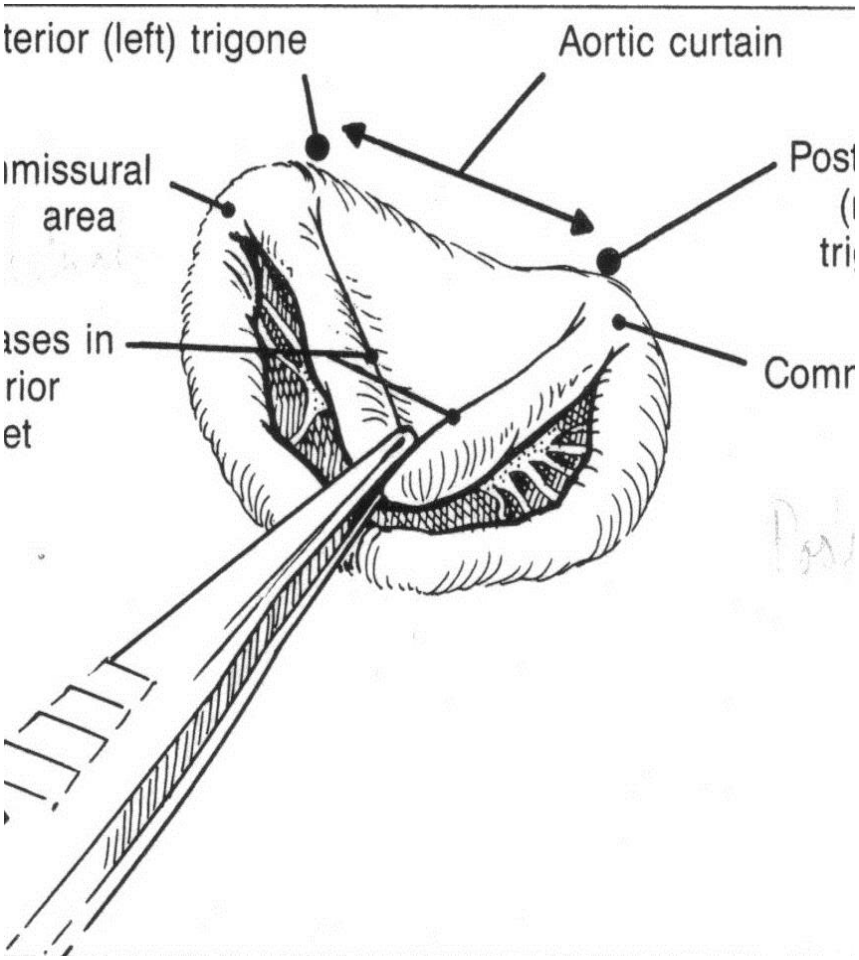
- Annulus
- Klepbladen
- Commissuren

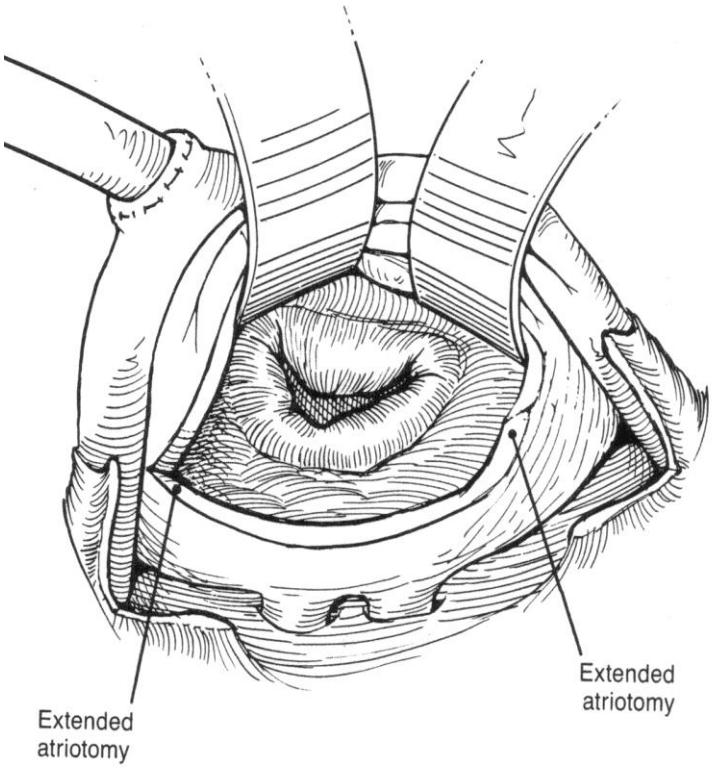
Subvalvulair

- Chordae tendineae
- Papillairspieren
- Myocard



Mitralisklep, chirurgische anatomie





Benadering mitralisklep

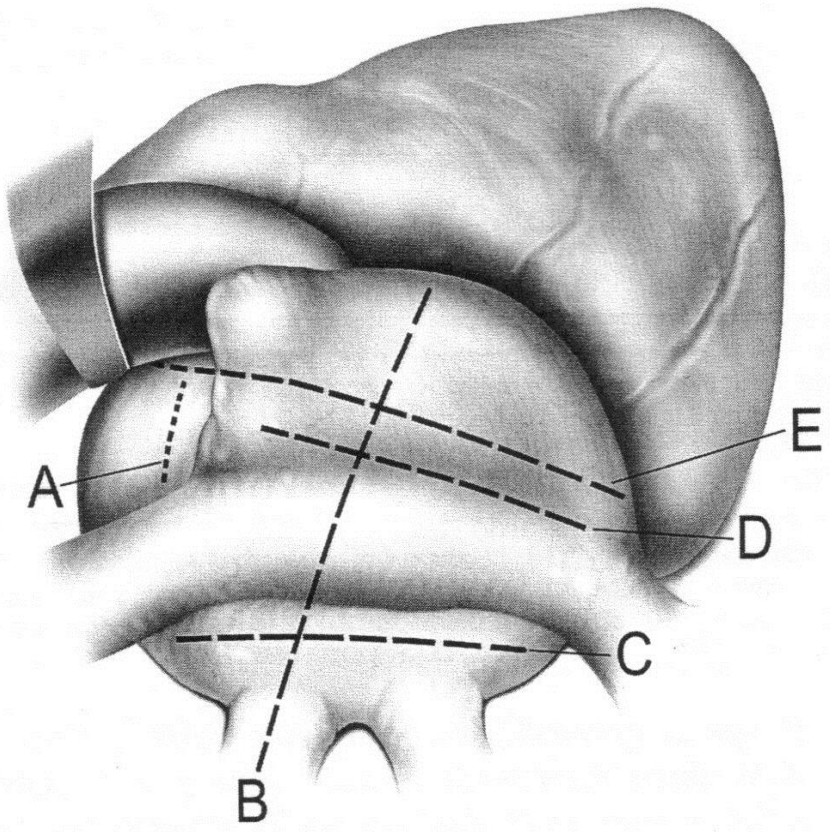


Fig 1. Approaches to the mitral valve: A = superior left atrial, B = Dubost transverse transseptal, C = conventional left atriotomy, D = minitransseptal, E = extended vertical/superior transseptal.

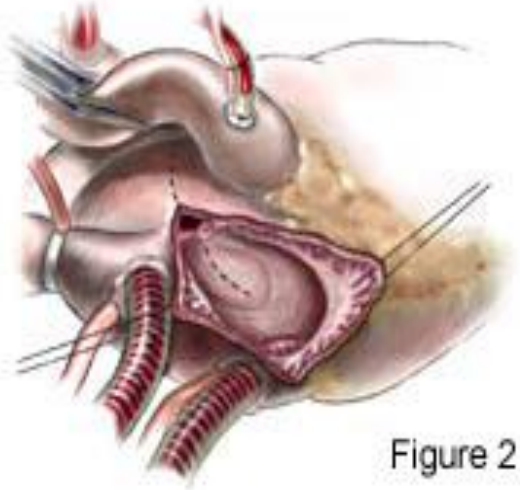


Figure 2

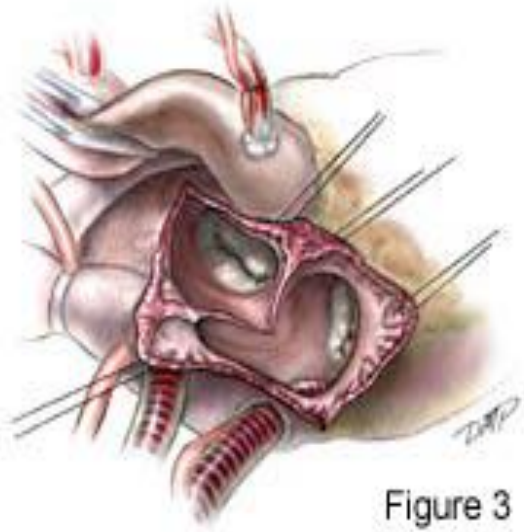
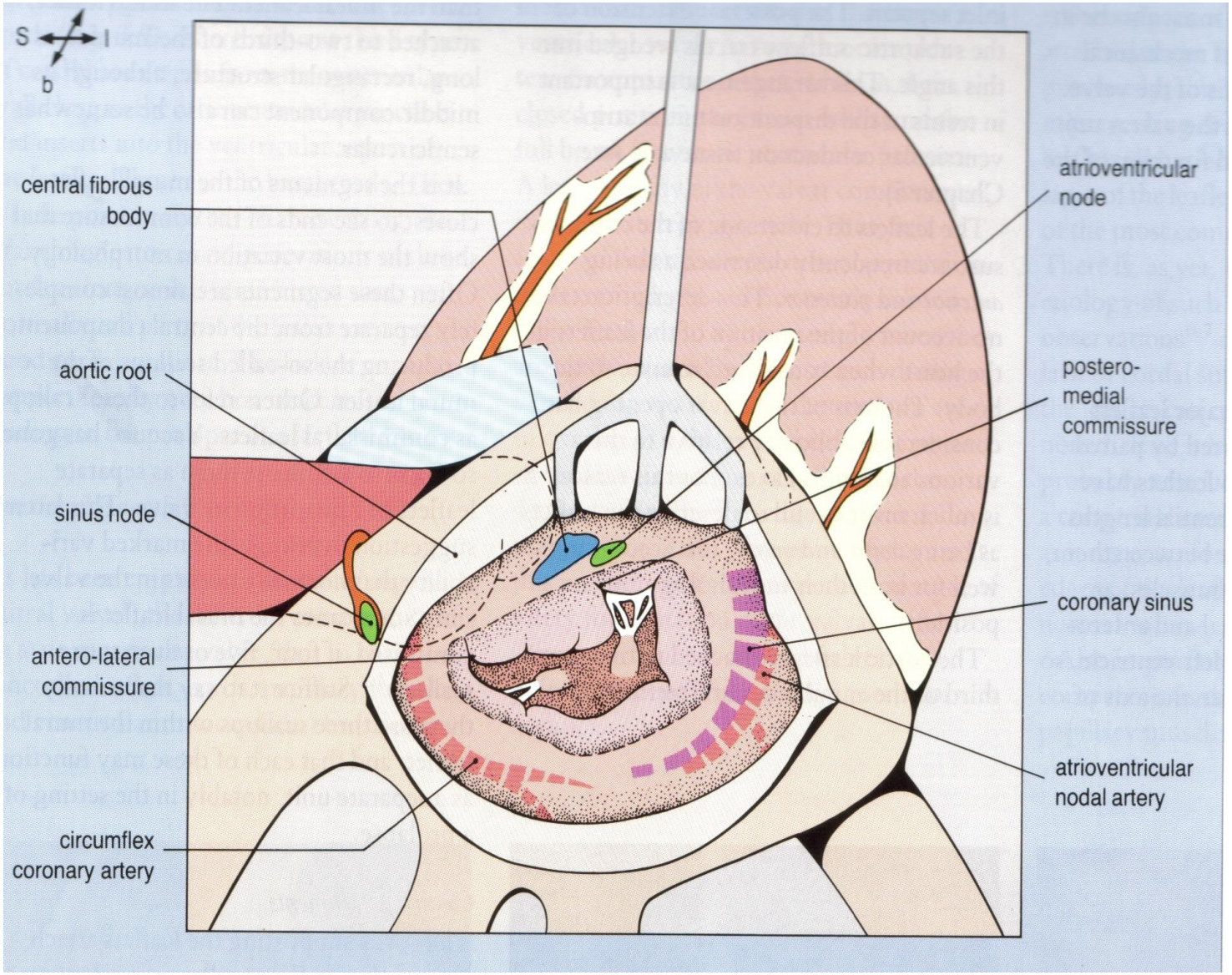


Figure 3

Mitralisklep vanuit de chirurg (LA)



Aortaklepstenose

Aetiologie

Valvulair

- Congenitaal (***bicuspide klep***) → Calcificaties
- Verworven (acuut gewrichtsreuma) → Fibrosering
- Degeneratief (arterosclerose)

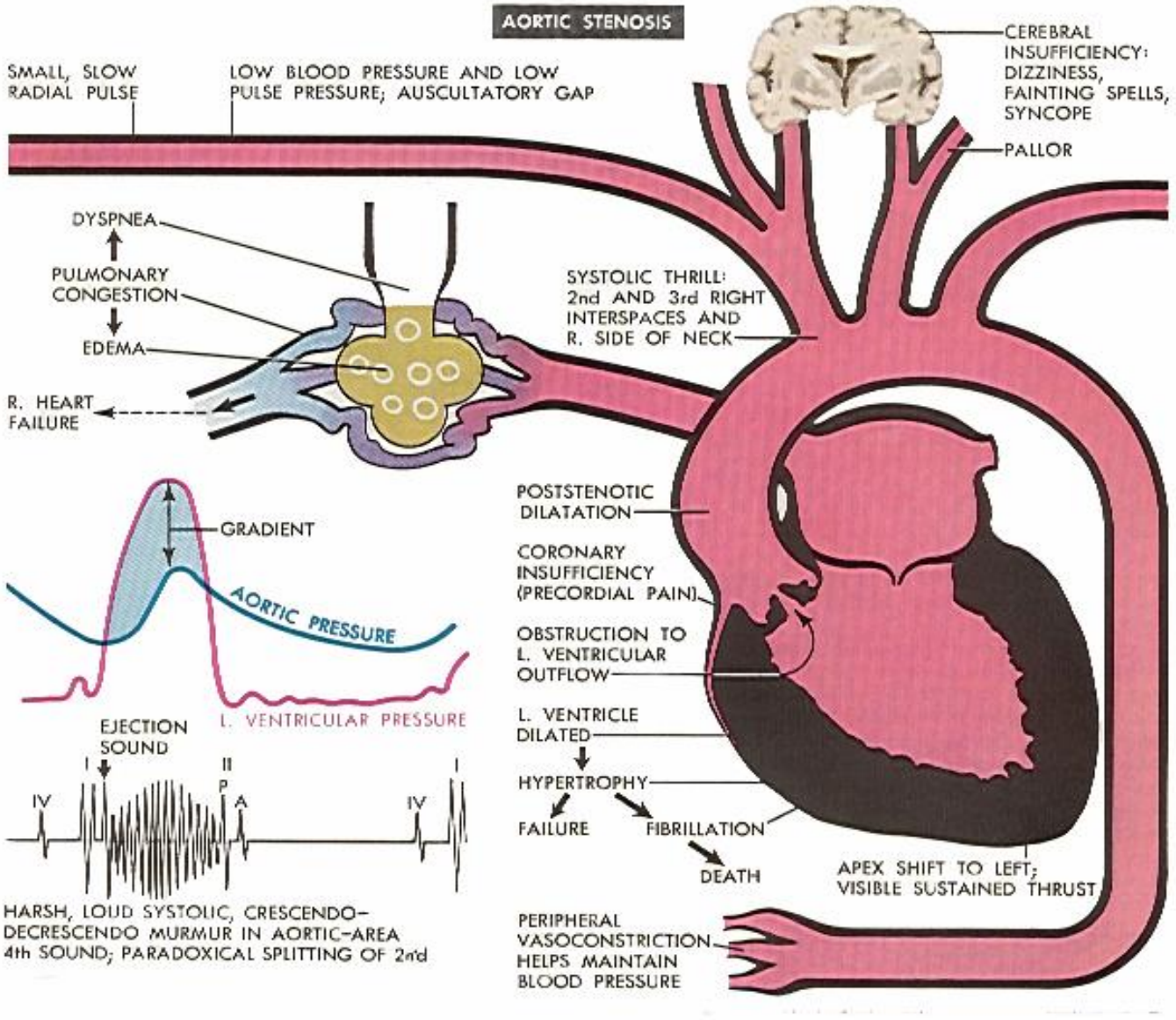
Supravalvulair

- Membraan, plooi
- Aorta-ascendensvernauwing, coarctatio aortae

Subvalvulair

- Membraan
- Cardiomyopathie (HOCM)

Aortaklepstenose



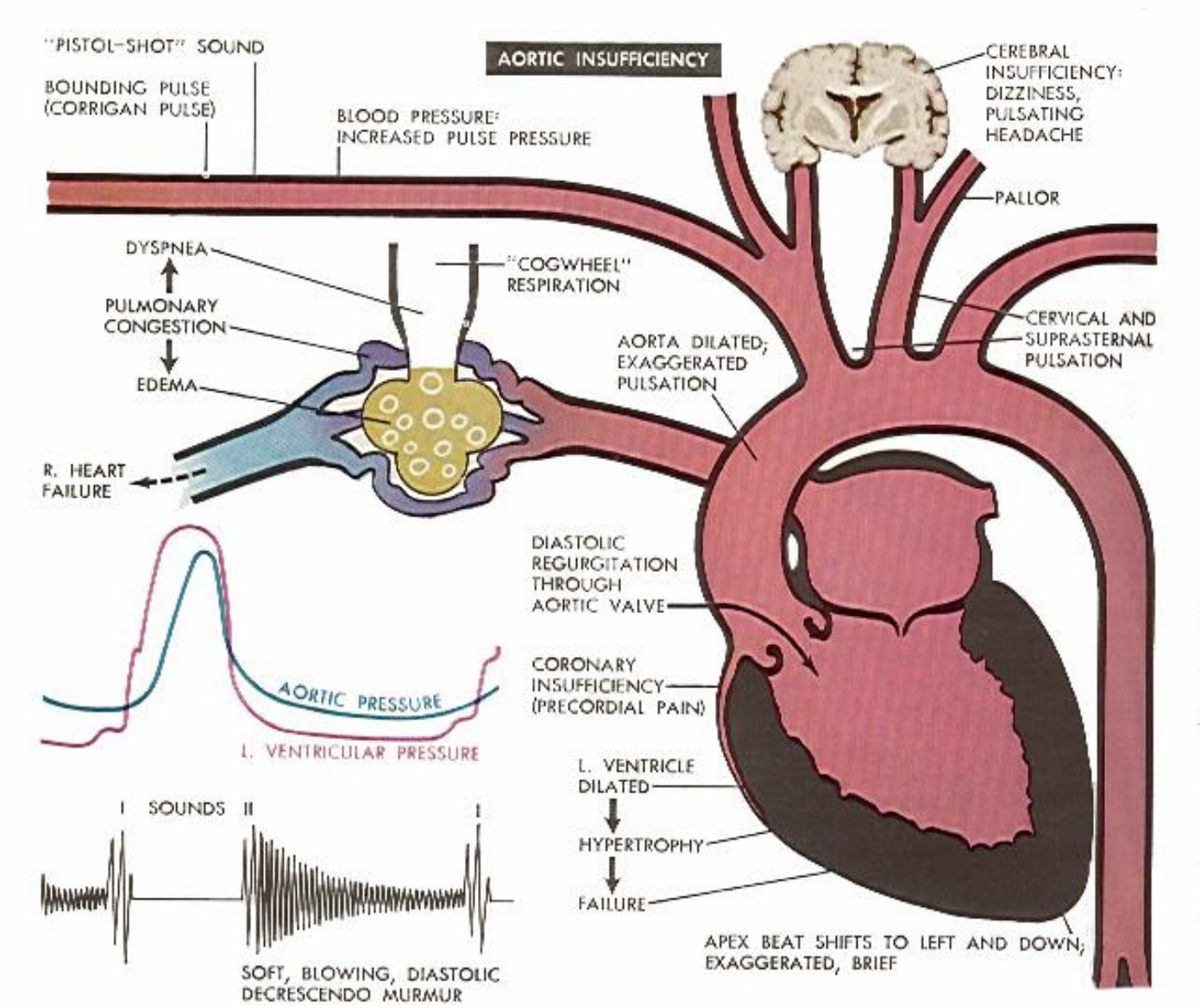
Aortaklepstenose

Operatie-indicatie

- Symptomatisch
- Klepgradiënt (PG) > 50 mmHg
- Klepopening (AVA) < 0,8 – 1,0 cm^2

Aortaklepvervanging (AVR)

Aortaklepinsufficiëntie



Aortaklepinsufficiëntie

Aetiologie

- Endocarditis
- Congenitaal (Lealfet prolaps)
- Acuut gewrichtsreuma (schrompeling klepbladen)
- Aortitis (RA, Ziekte van Reiter)
- Annulo-aortic ectasia

  > Cystische media degeneratie

  > Aneurysmavorming sinus Valsalva → Annulusdilatatie
- Atherosclerotische aneurysmata aortae (Syphilis)
- Bindweefselaandoeningen (Marfan)

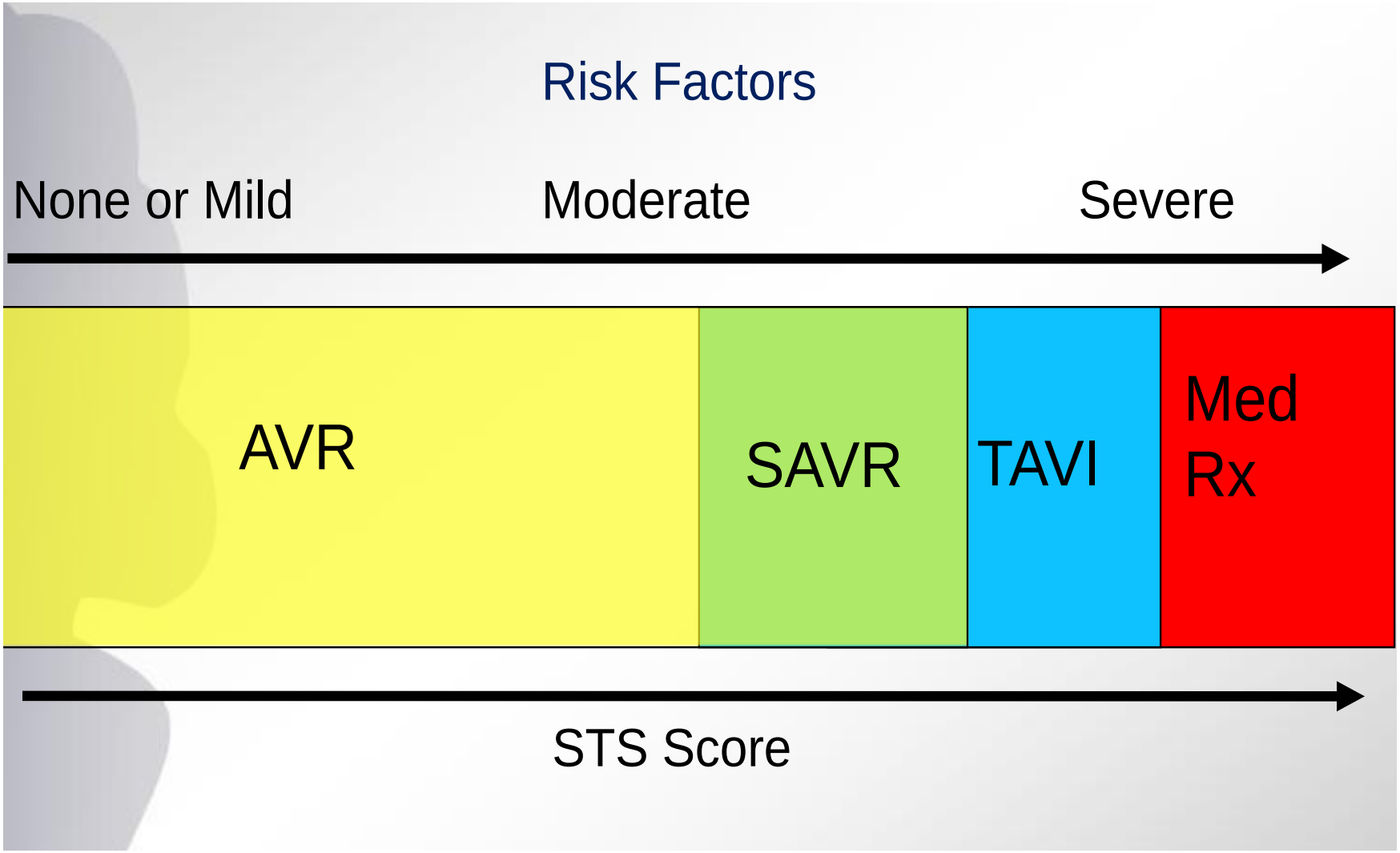
Aortaklepinsufficiëntie

Operatie-indicatie

- Symptomen
- LVEDD (= einddiastolische diameter LV) > 5,0 cm

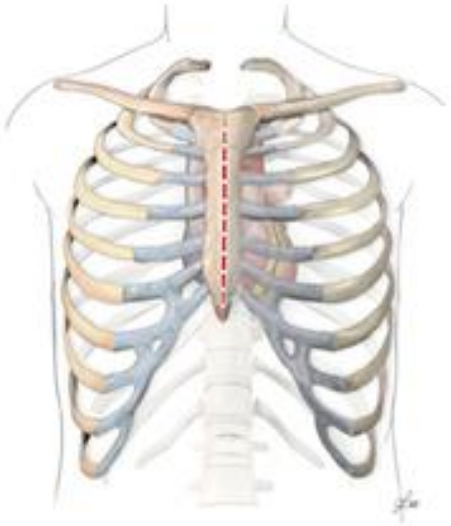
Aortaklepvervanging (AVR)

Procedure/ patiënt selectie

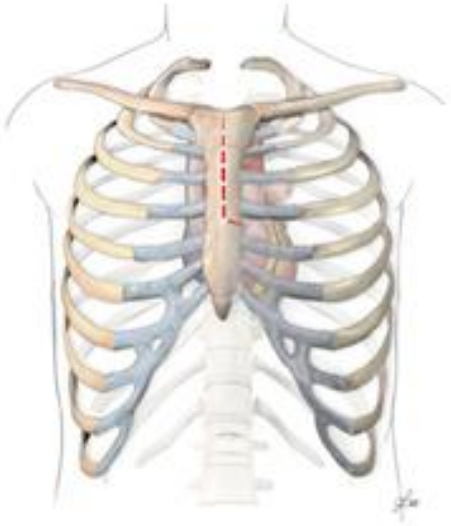


Toegangsweg

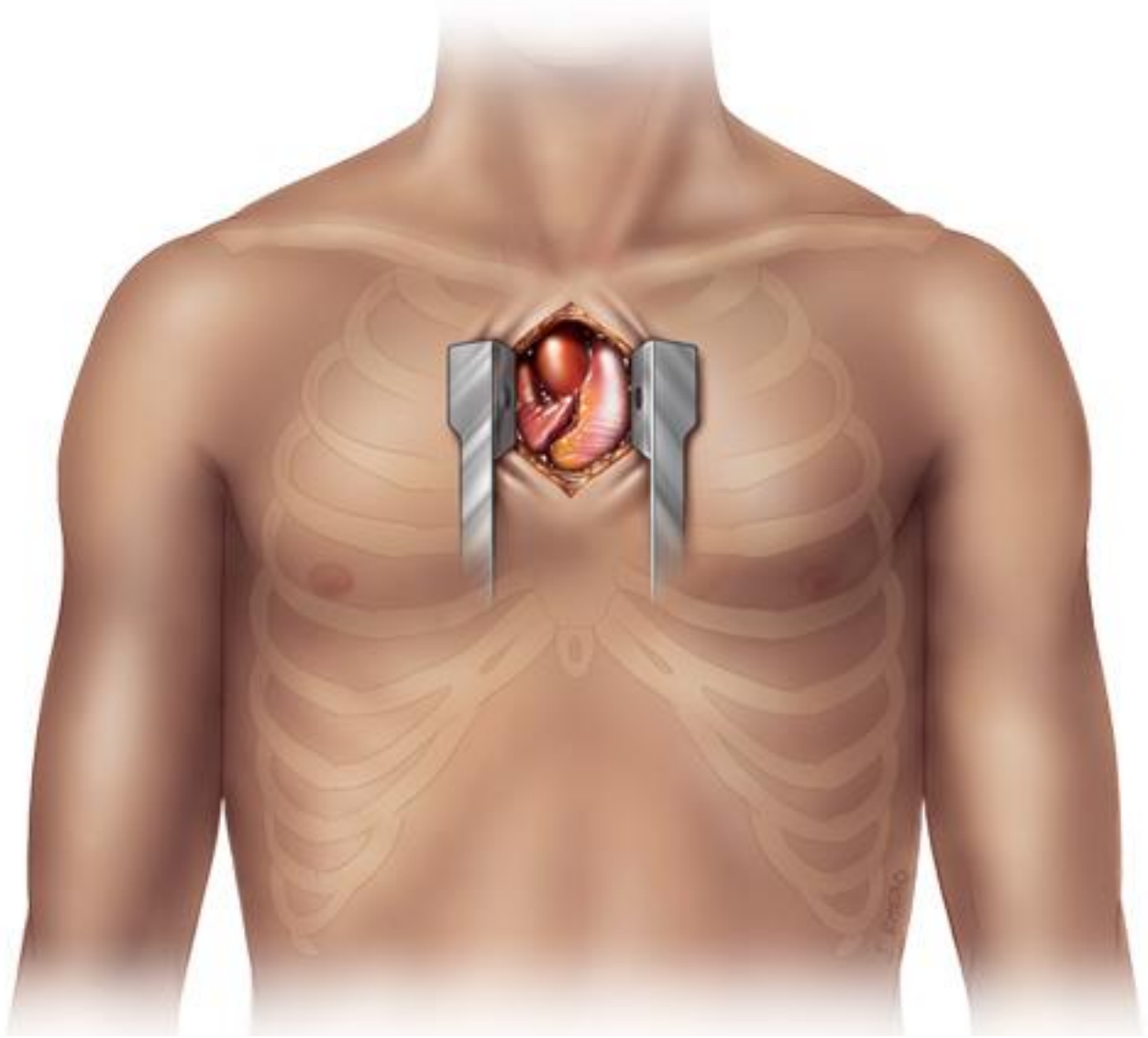
Mediane sternotomie



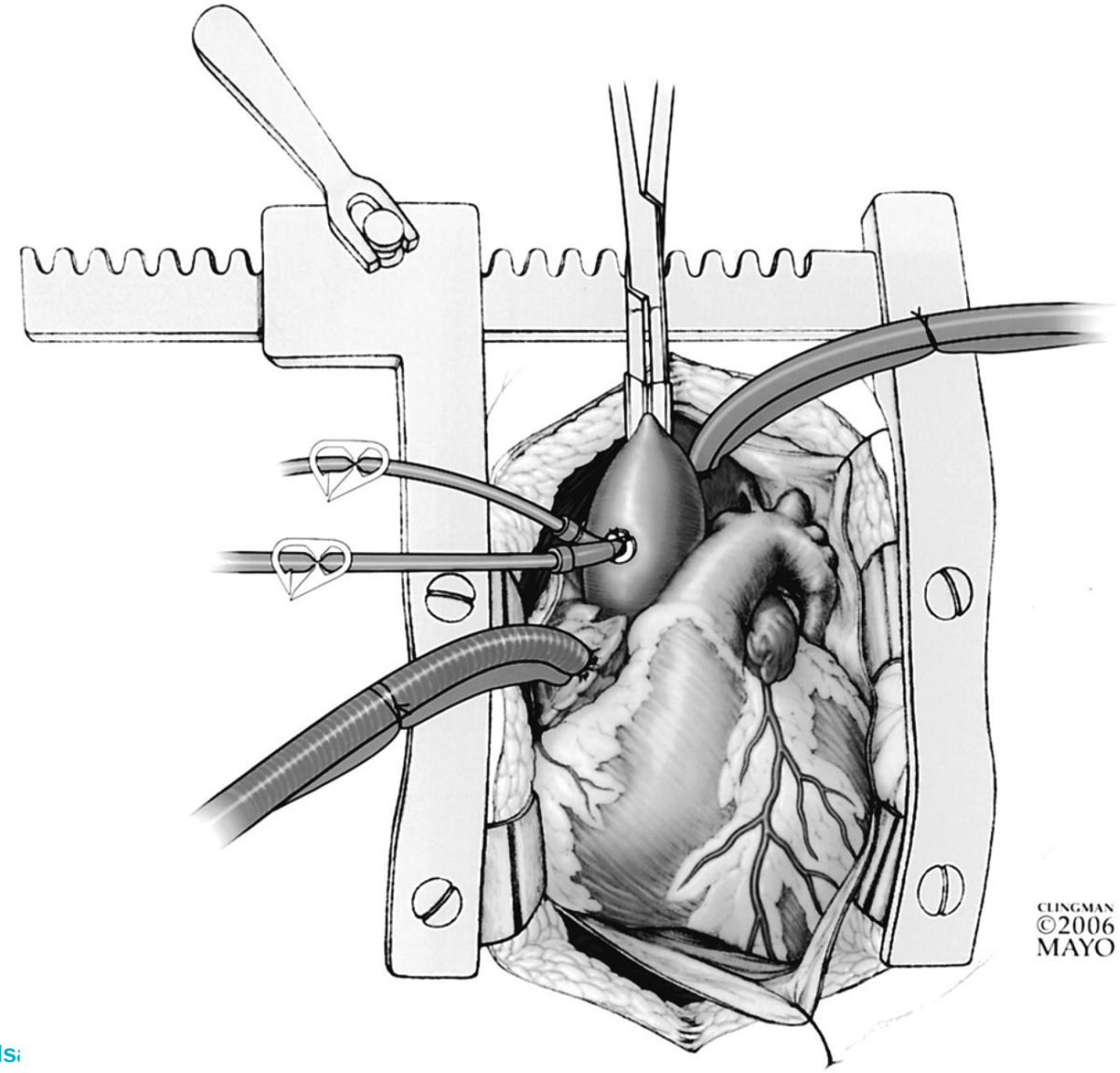
Partiële sternotomie **Mini-AVR**



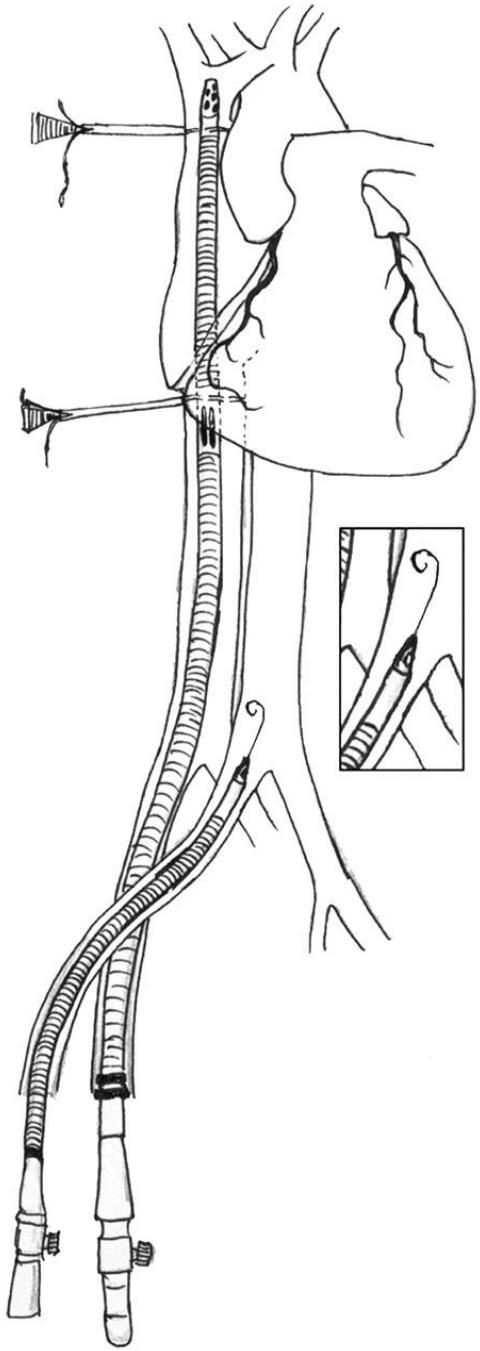
Mini AVR



Canulatie ECC (Conventionele AVR)



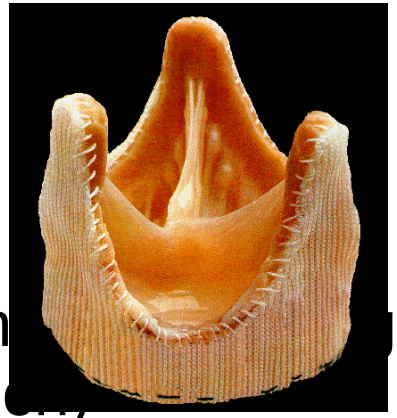
Liescanulatie (Mini AVR)



Type klepprothesen

Mechanischeprothese

Bioprothese
- >Stentless
- >Stented



Composite graft
- >Aortaklep + aorta ascen ging
  (mechanisch of biologisch)

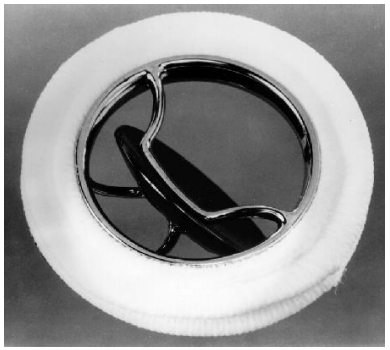
Mechanische prothesen

Typen

- Bi-leaflet (St. Jude®, CarboMedics®, ATS®)
- Tilted disc (Björk-Shiley®)
- Caged-ball (Starr-Edwards Silastic Ball®)

Jonge patienten (< 60 jaar)

Pyrolytisch carbon



Duurzaam (levenslang)

Levenslange orale antistolling (INR)

Bioprothesen

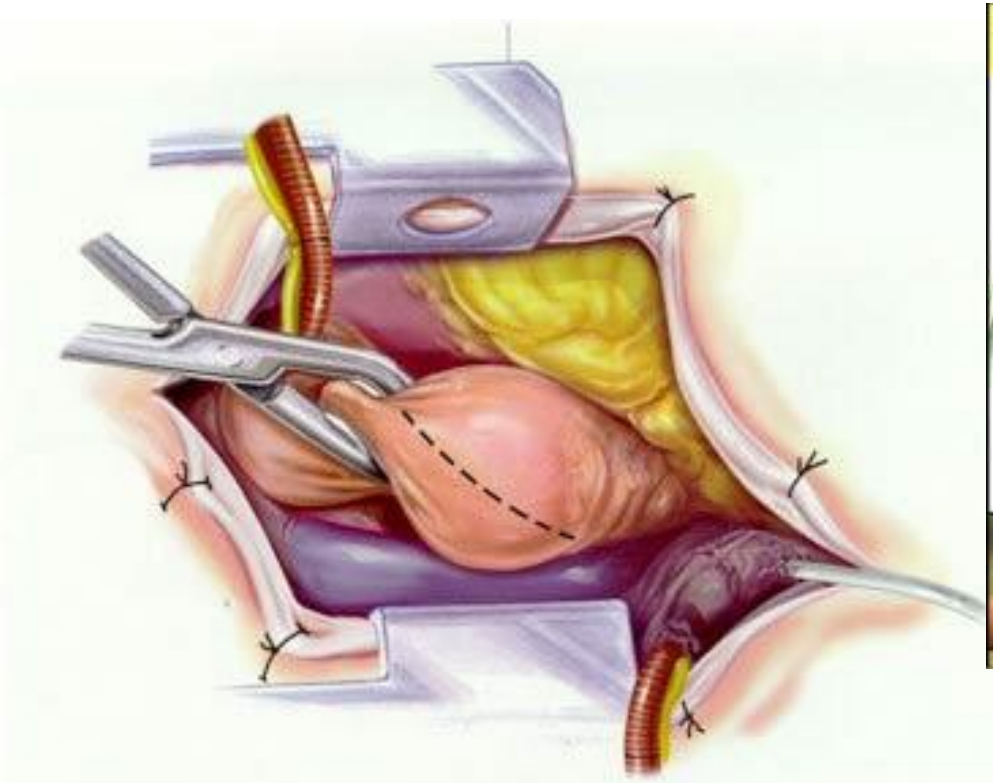
Bij patiënten > 60 jaar

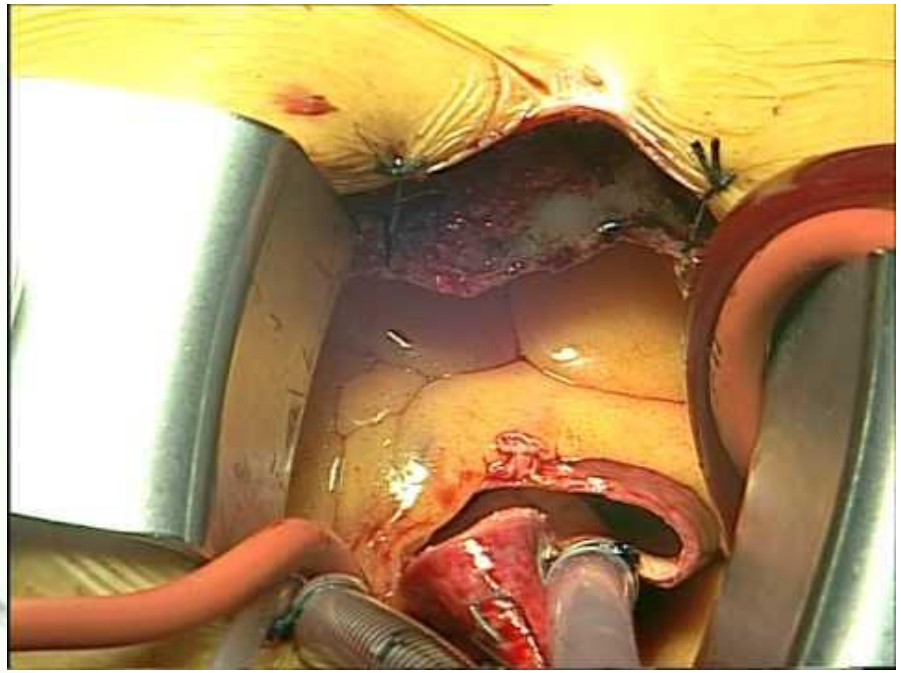
Runderpericardkleppen

Degeneratie na 15-20 jaar

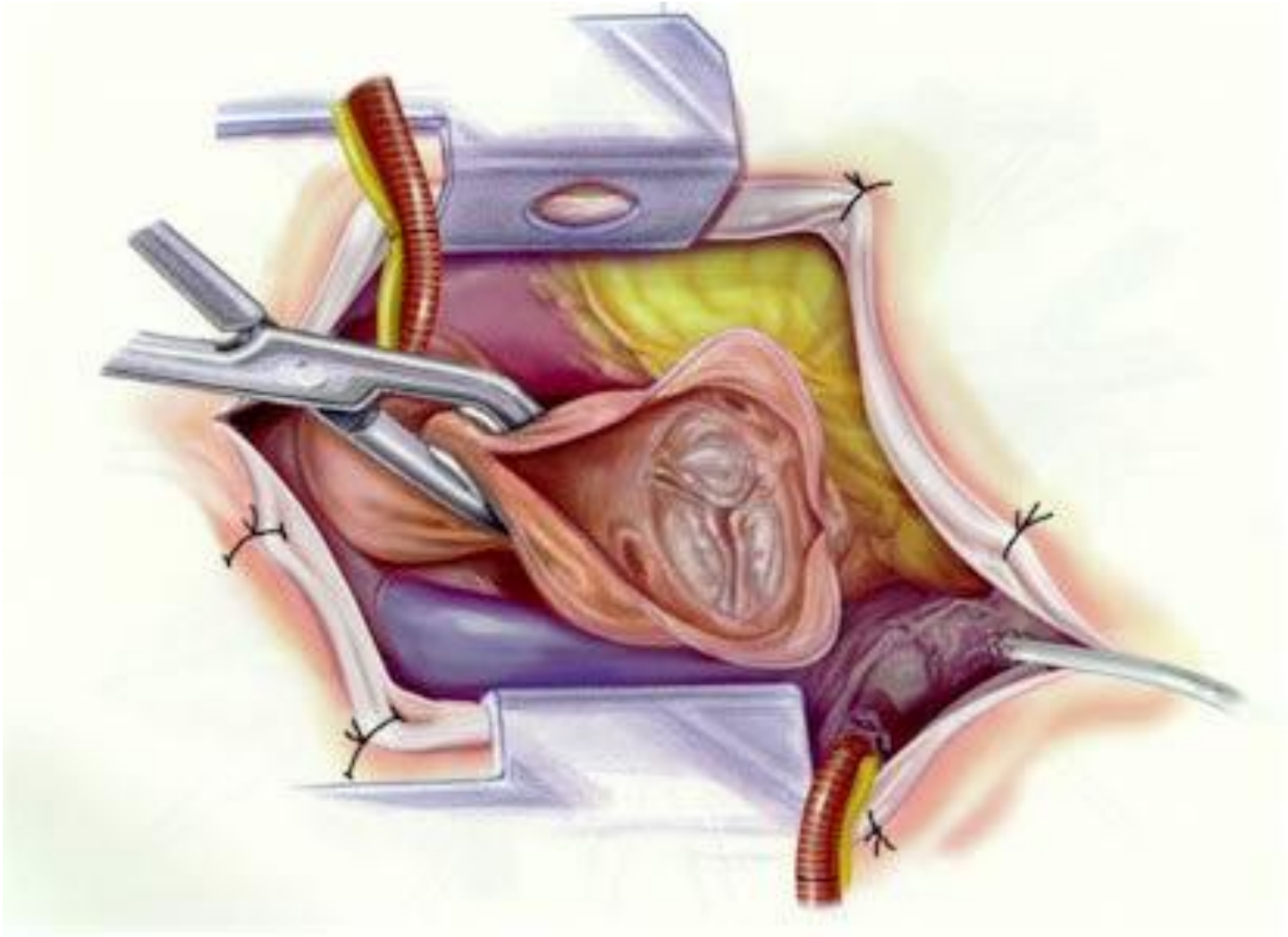
Geen antistolling

(Mini) AVR

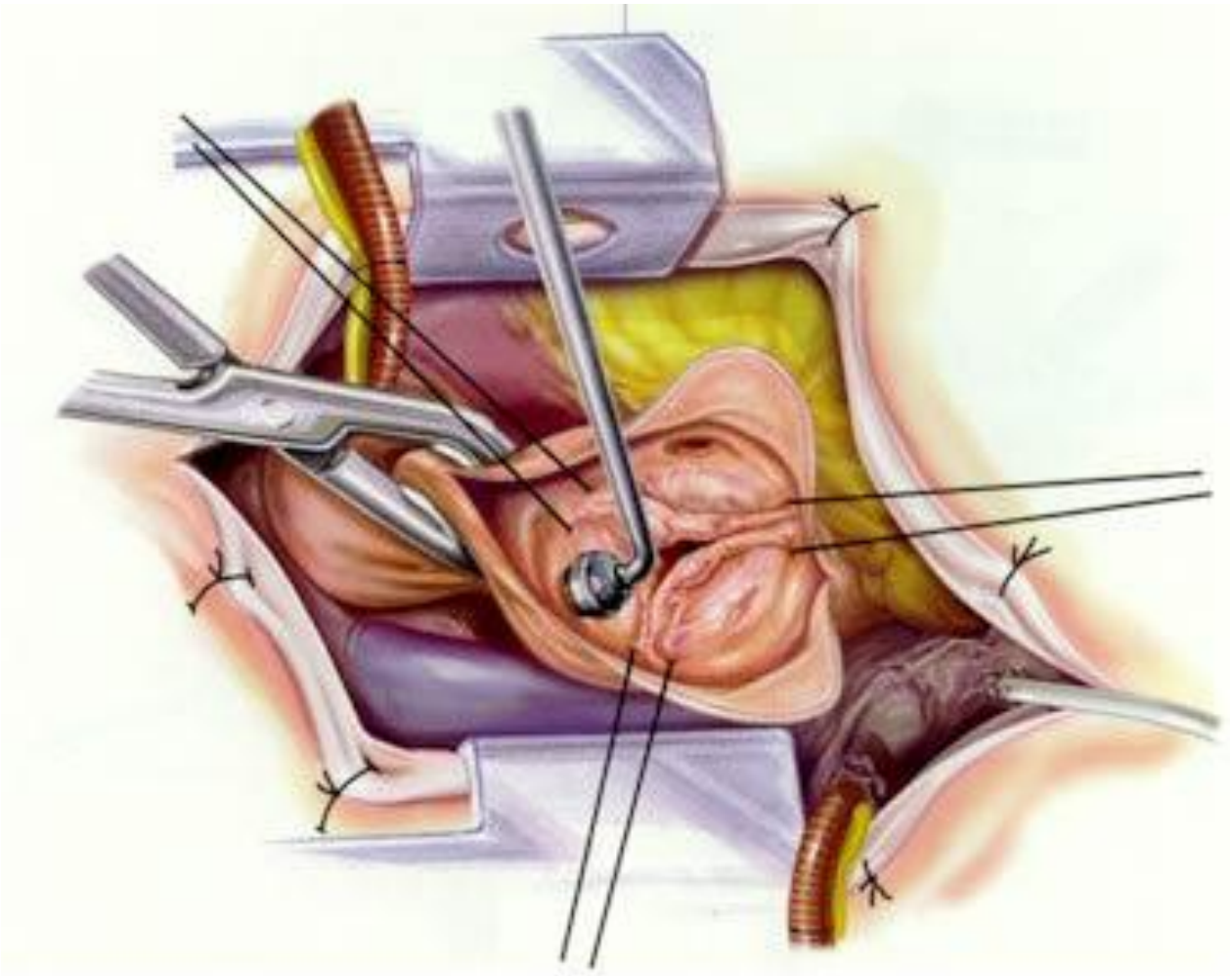




(Mini) AVR

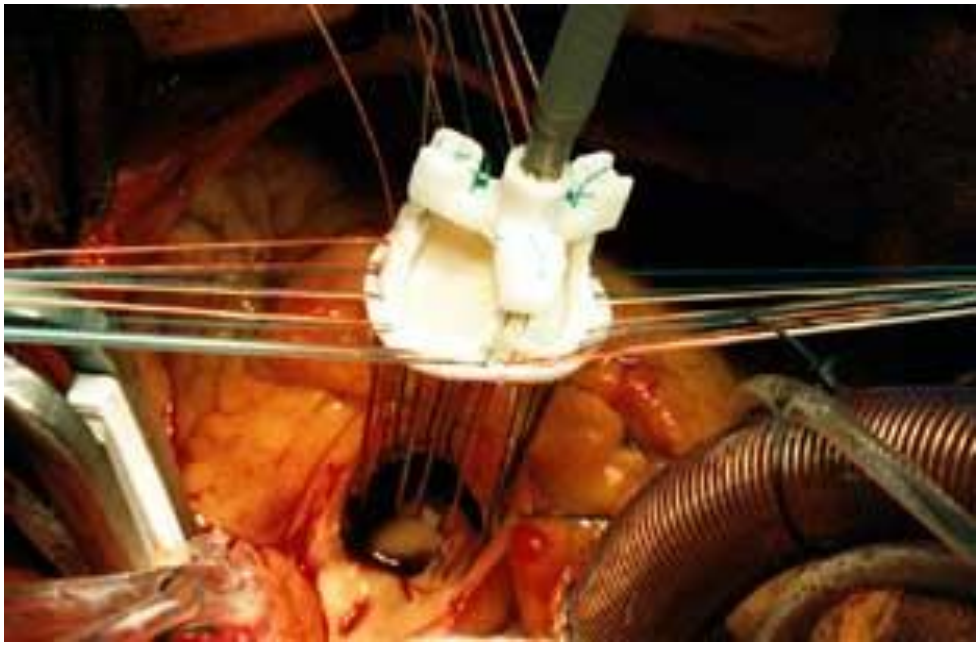


(Mini) AVR

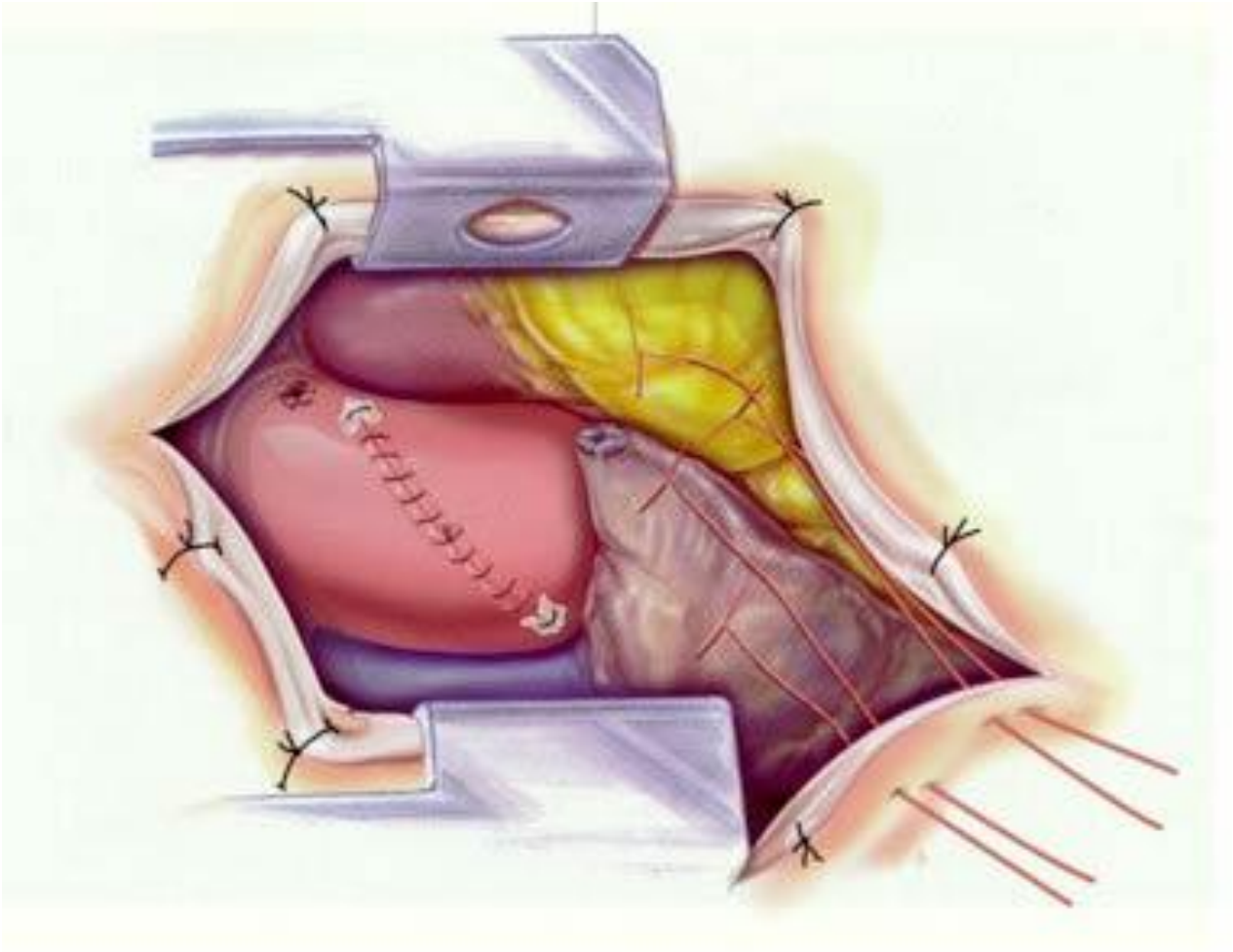


(Mini) AVR

5 If the valve cannot be repaired, it is resected sharply. The annulus is cleared of any remaining calcium. Once this maneuver is accomplished, pledgeted 2/0 horizontal mattress sutures are placed from the ventricular side at the commissures or commissural remnants. These sutures are tacked to the surrounding drapes with tonsil clamps under moderate tension to elevate the aortic root up into the surgical field. This maneuver serves to retract the aorta and maintain orientation of the aortic root, and it generally provides excellent exposure for placement of the remaining horizontal mattress sutures to secure an appropriately sized valve in the supra-annular position. The mattress sutures are of alternating



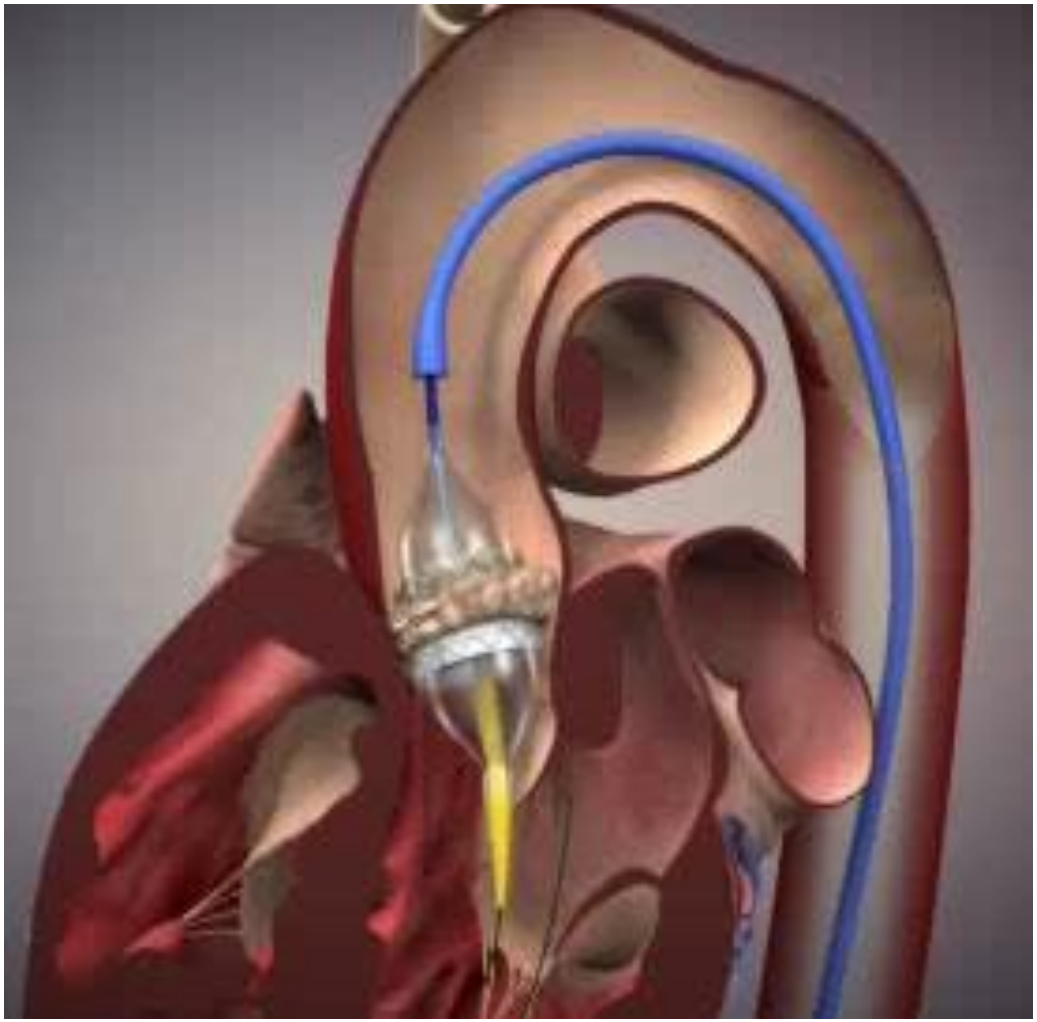
(Mini) AVR



TAVI of THI

Trans Aortic Valve Implantation

Transcutane Hartklep Implantatie



Indicaties TAVI

- Ernstige (tricuspide) aortaklepstenose
- Patiënten afgewezen voor conventionele AVR
- Porceleinen aorta
- “frailty”
- Hoog risico = EuroSCORE > 20%
- Toegankelijk voor TAVI (femoraal traject)
- (Status na thoracale radiotherapie)
- (Reoperatie)

Complicaties TAVI

- Vasculaire complicaties
- CVA
- Coronaire occlusie
- Atrio-ventriculir block
- Paravalvulaire lekkage/ endoleakage

Mitralisinsufficiëntie

Anatomie

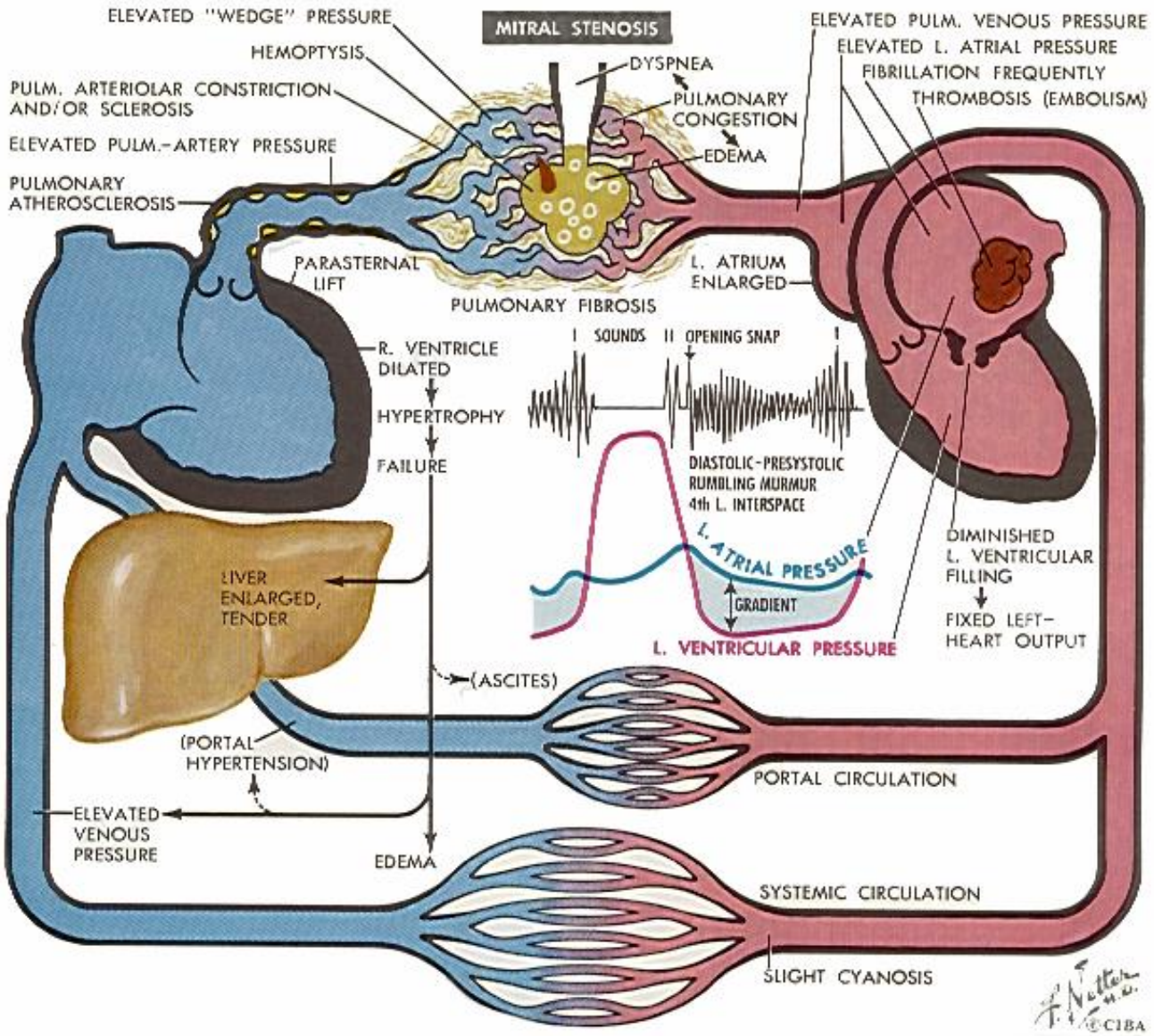
Valvulair

- Annulus
- Klepbladen
- Commissuren

Subvalvulair

- Chordae tendineae
- Papillairspieren
- Myocard

Mitralisklepstenose



Mitralisklepstenose

Operatie- indicatie

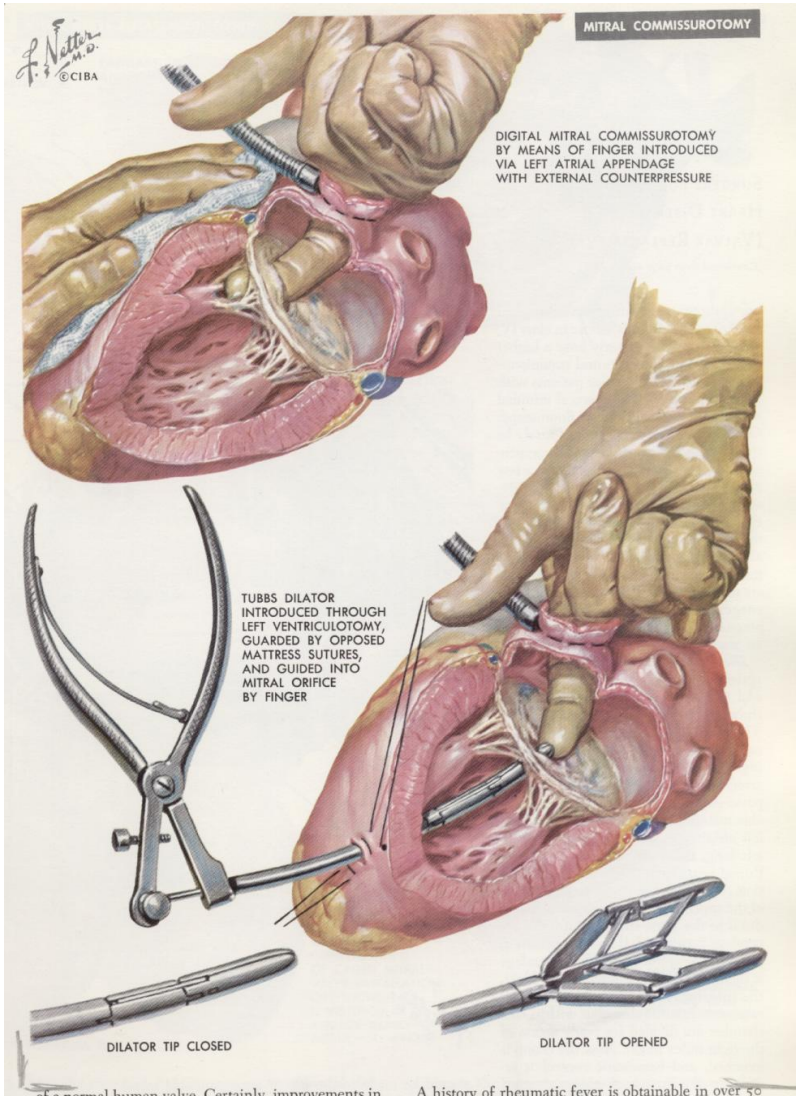
- Symptomen
- Klepopening MVA (normaal 4 cm^2) < 1,0 cm^2

Cave: ritme en pulmonaaldrukken

Mitralisklepvervanging (MVR)

Mitralisklepstenose

Tubbs valvulotomie / MVR



Mitralisinsufficiëntie

Aetiologie (1)

Valvulair

- Calcificatie annulus en klepbladen
- Dilatatie mitralisklepannulus *(coaptatiestoornis)*
- Verkorting, rigiditeit, deformatie, retractie klepbladen
- Mitralisklepprolapssyndroom *(*myxomateus*, Barlow)*

Subvalvulair apparaat

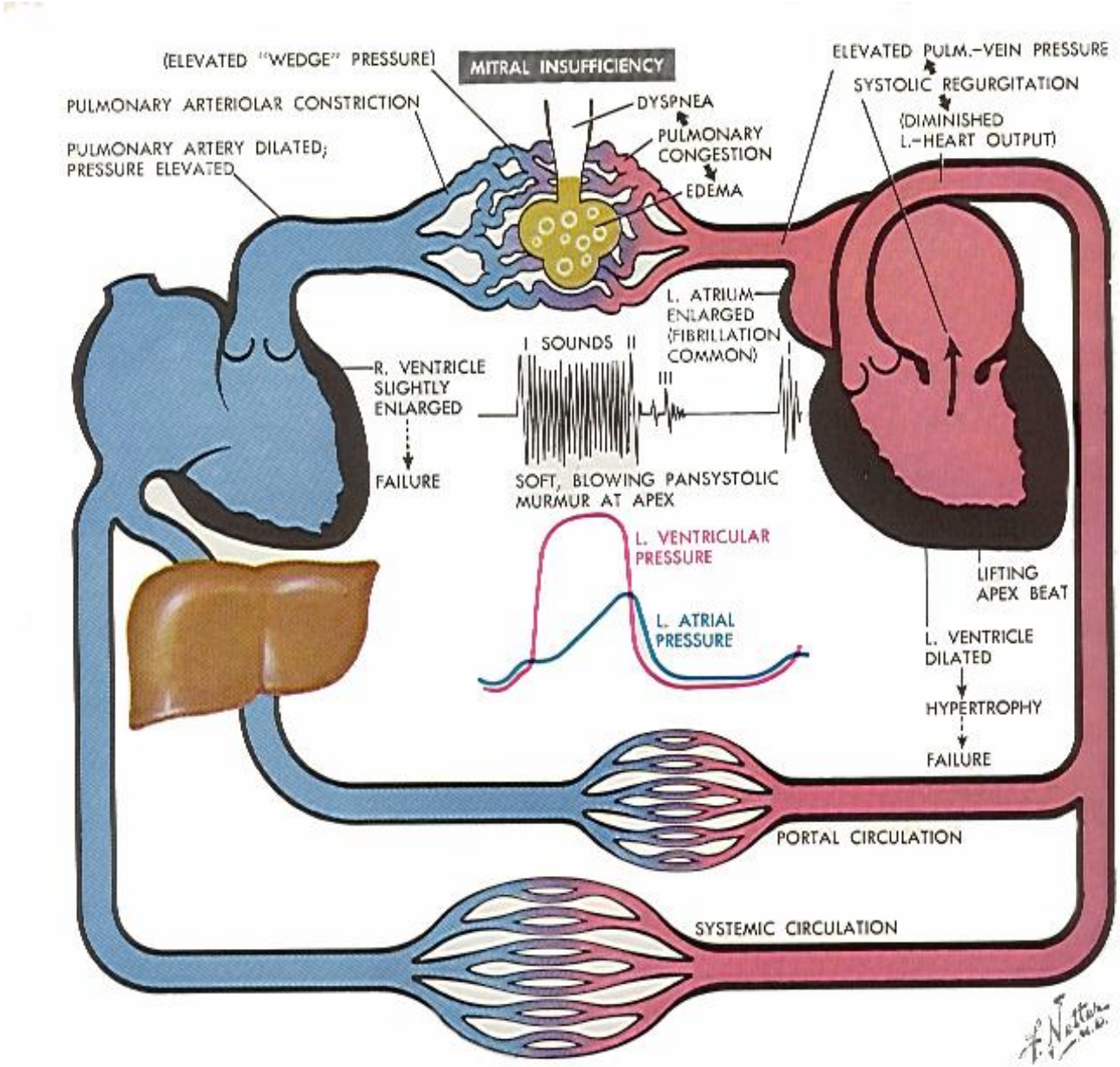
- Chorda ruptuur Acute MI vs. chronische MI
- Papillairspieren *(LV dilatatie, ischemie)*

Mitralisinsufficiëntie

Aetiologie (2)

- Acuut gewrichtreuma
- Endocarditis
- Ischemie
- Mitralisklepprolaps (myxomateuze klepdegeneratie)
- Collageen-vasculaire oorzaken
- Cardiomyopathie
- Trauma

Mitralisinsufficiëntie



Mitralisinsufficiëntie

Operatie indicatie

- (Symptomen)
- Mitralisklepinsufficientie graad III - IV
- OK ***voordat*** LV dilatatie is opgetreden

Mitralisklepplastiek (MVP)

Mitralisklepvervanging (MVR)

Mitraliskleplastiek

Annuloplastiek ring
(rigid, fexible,posterior

Mechanisme kleplijden

Antistolling 3 maanden (SR?)

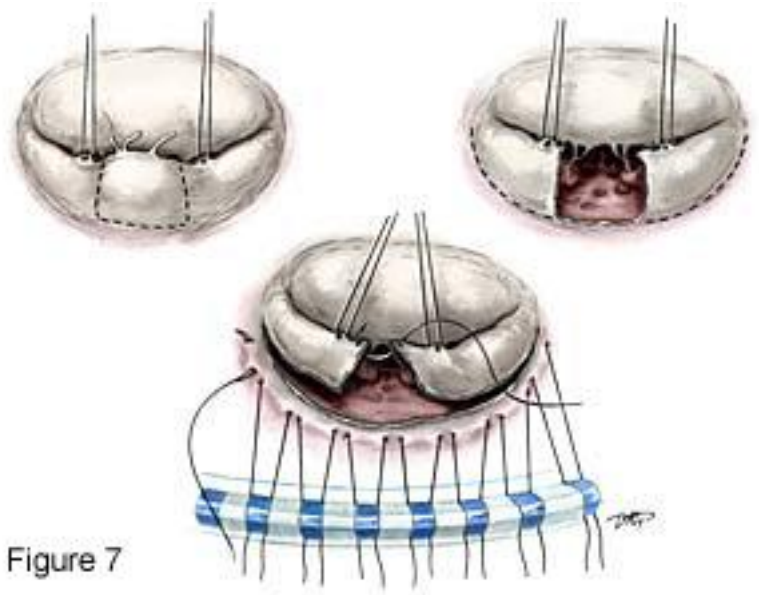
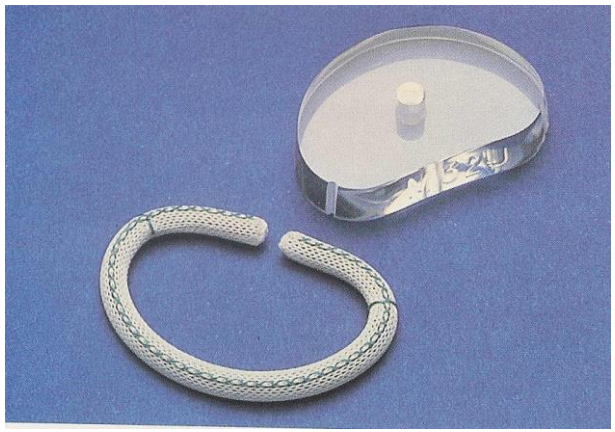
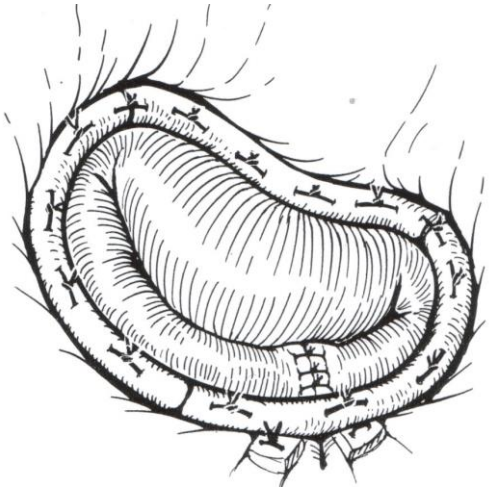
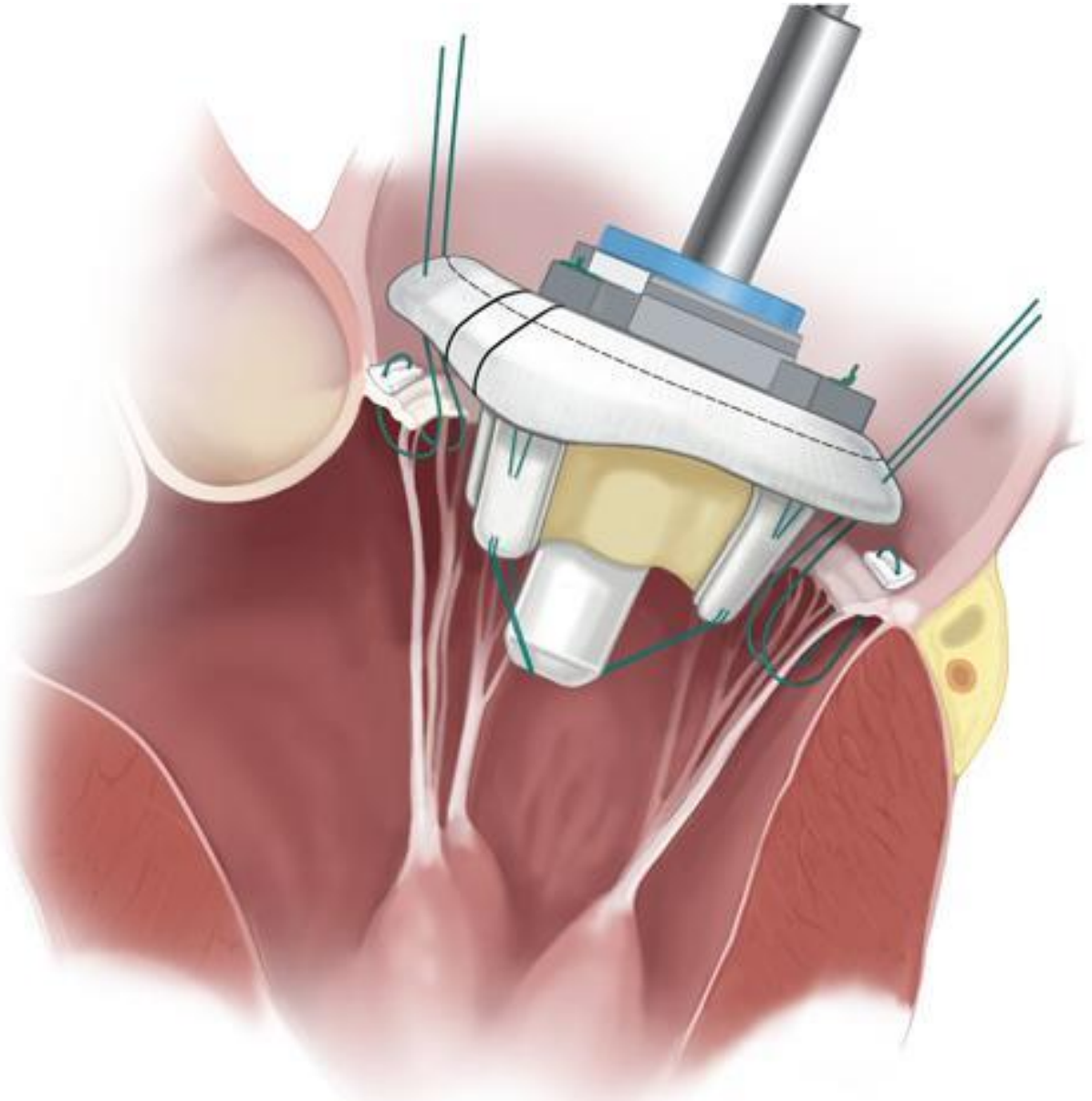


Figure 7



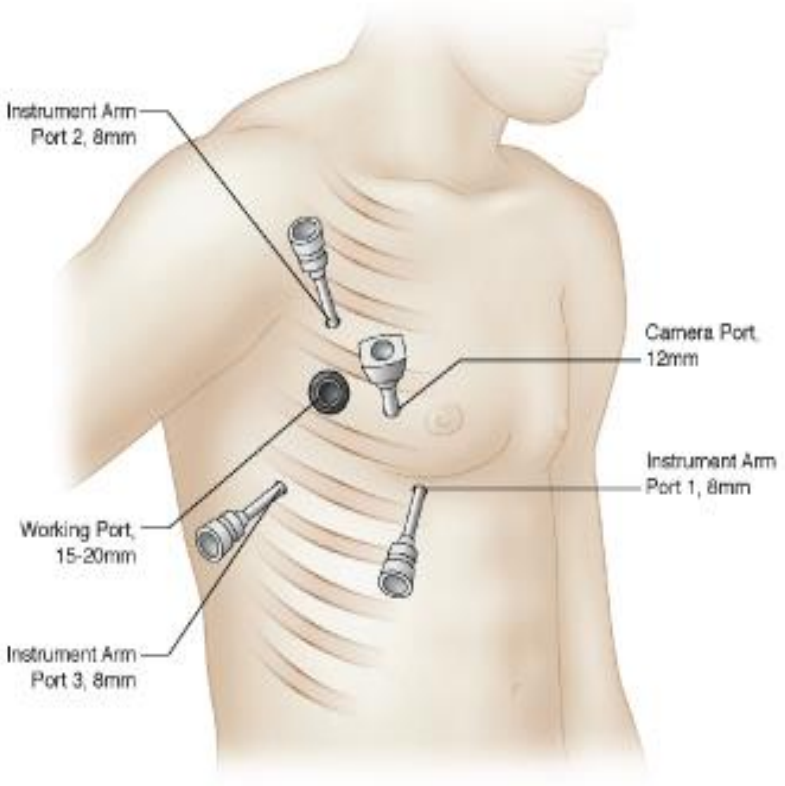


Mitralisklepvervanging



“Toekomst”

Robot geassisteerde Mitralisklepplastiek



De daVinci operatierobot

Wat kunnen we met de Da Vinci in CTC?

RATS (Robotic assisted thoracoscopic surgery)

- Longchirurgie
- Thymectomie/ voorste mediastinum tumoren

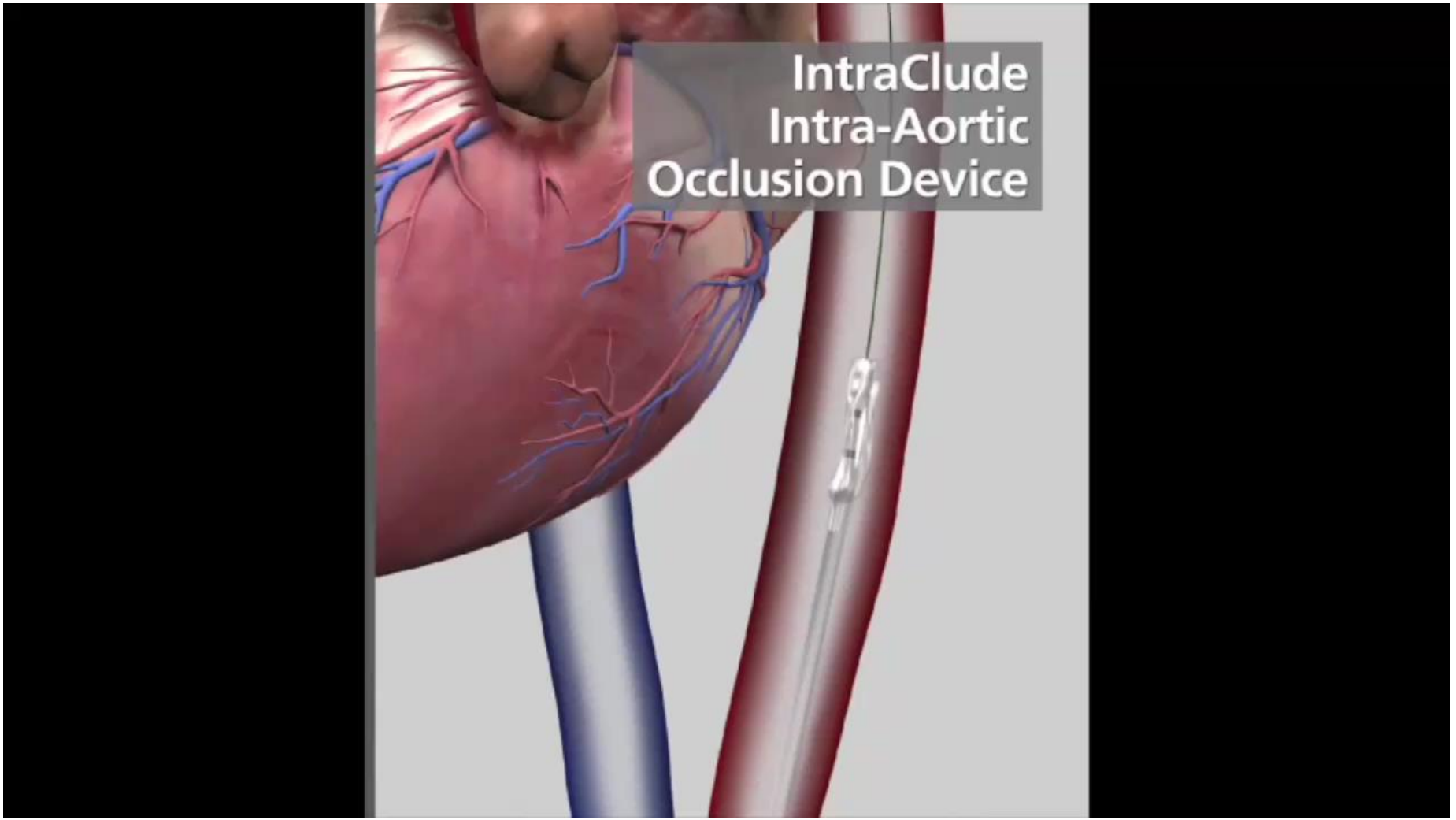
Robo-MVP (Robot gefaciliteerde mitralisklepplastiek)

- Mitralisklepplastiek
- Ritmechirurgie: Longvene ablatie/ MAZE

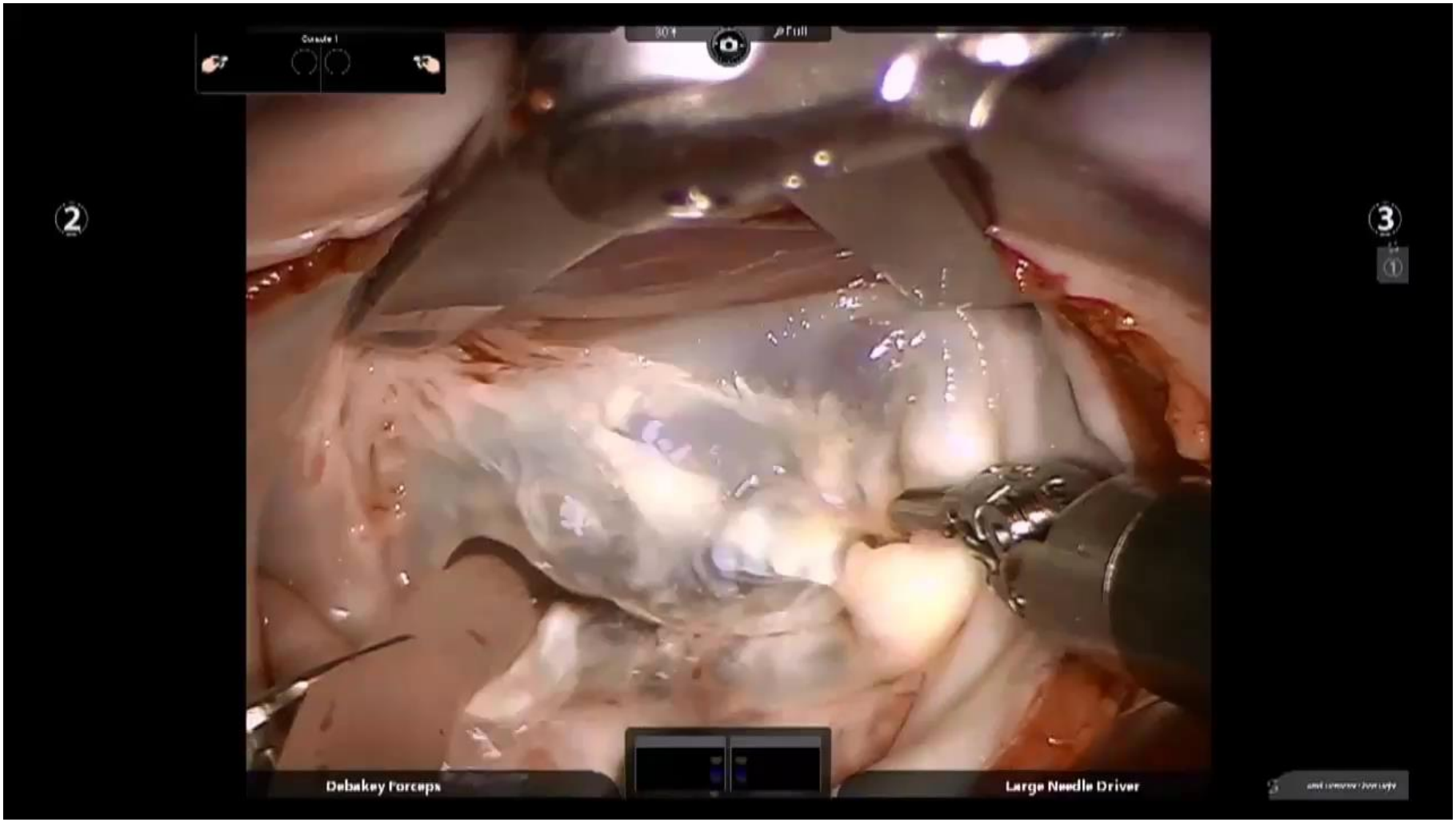
Robo- CABG (Robot gefaciliteerde CABG)

- CABG met LIMA-LAD anastomose
- Kleine anterieure thoracotomie/ volledig robotic gefacilliteerde anastomose (nabije toekomst)
- Hybride behandeling: Robo-CABG en PCI’s

Op afstand AoX en cardioplegisch arrest



Robot gefaciliteerde MVP



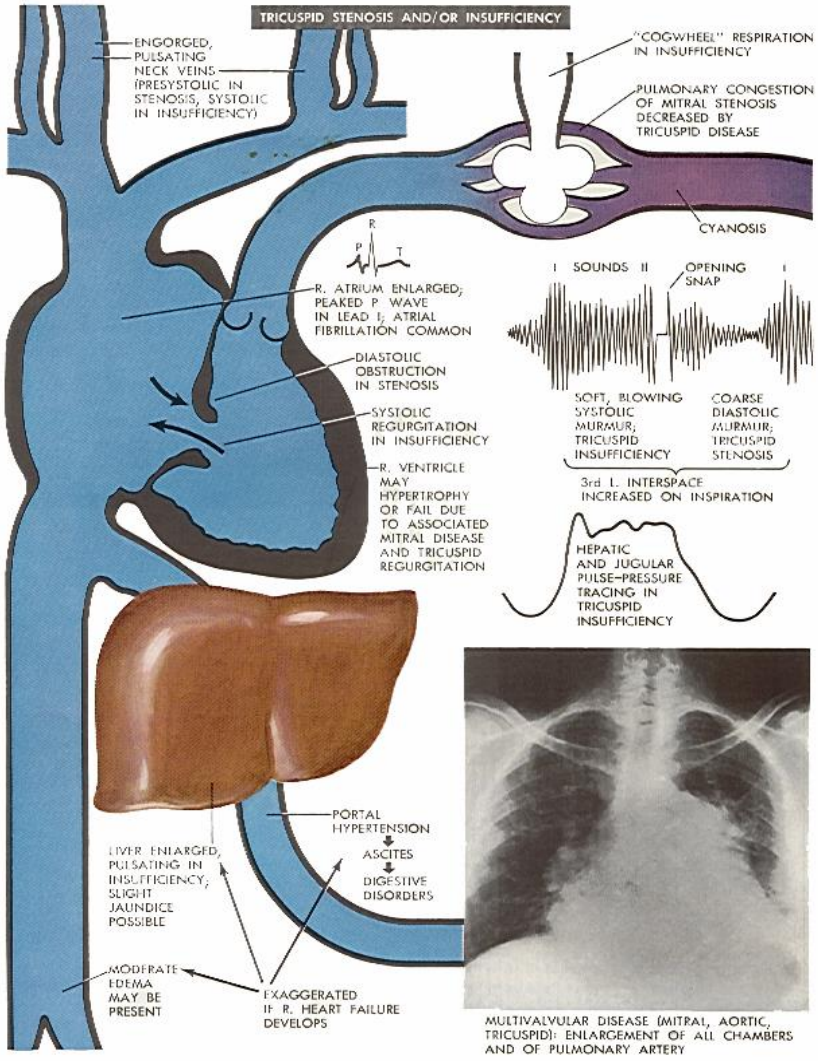
Tricuspidalisklep

Stenose

- Acuut gewrichtsreuma

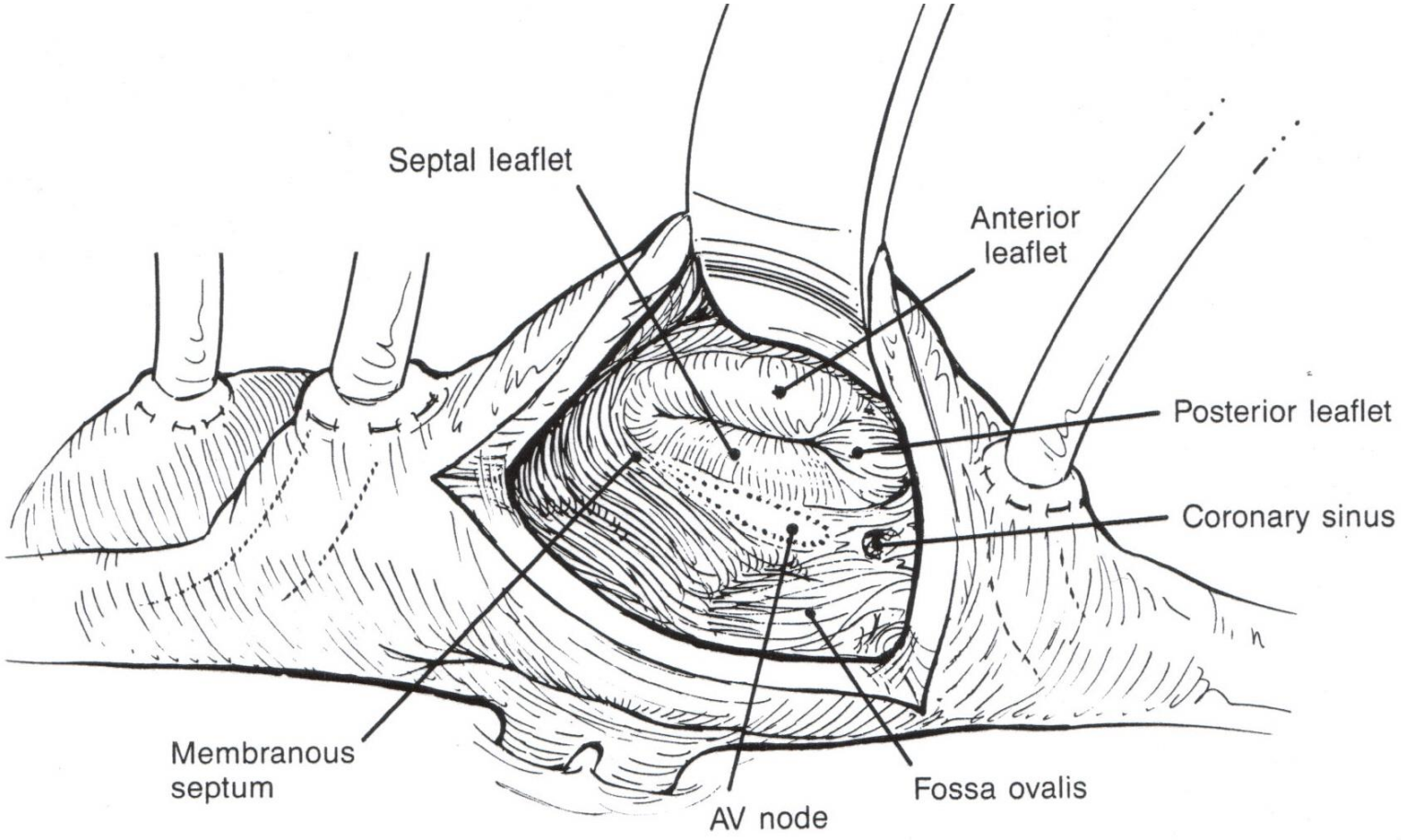
Insufficiëntie

- Pulmonale hypertensie (MI)
- Endocarditis
- Trauma
- Annulusdilatatie
- RV falen



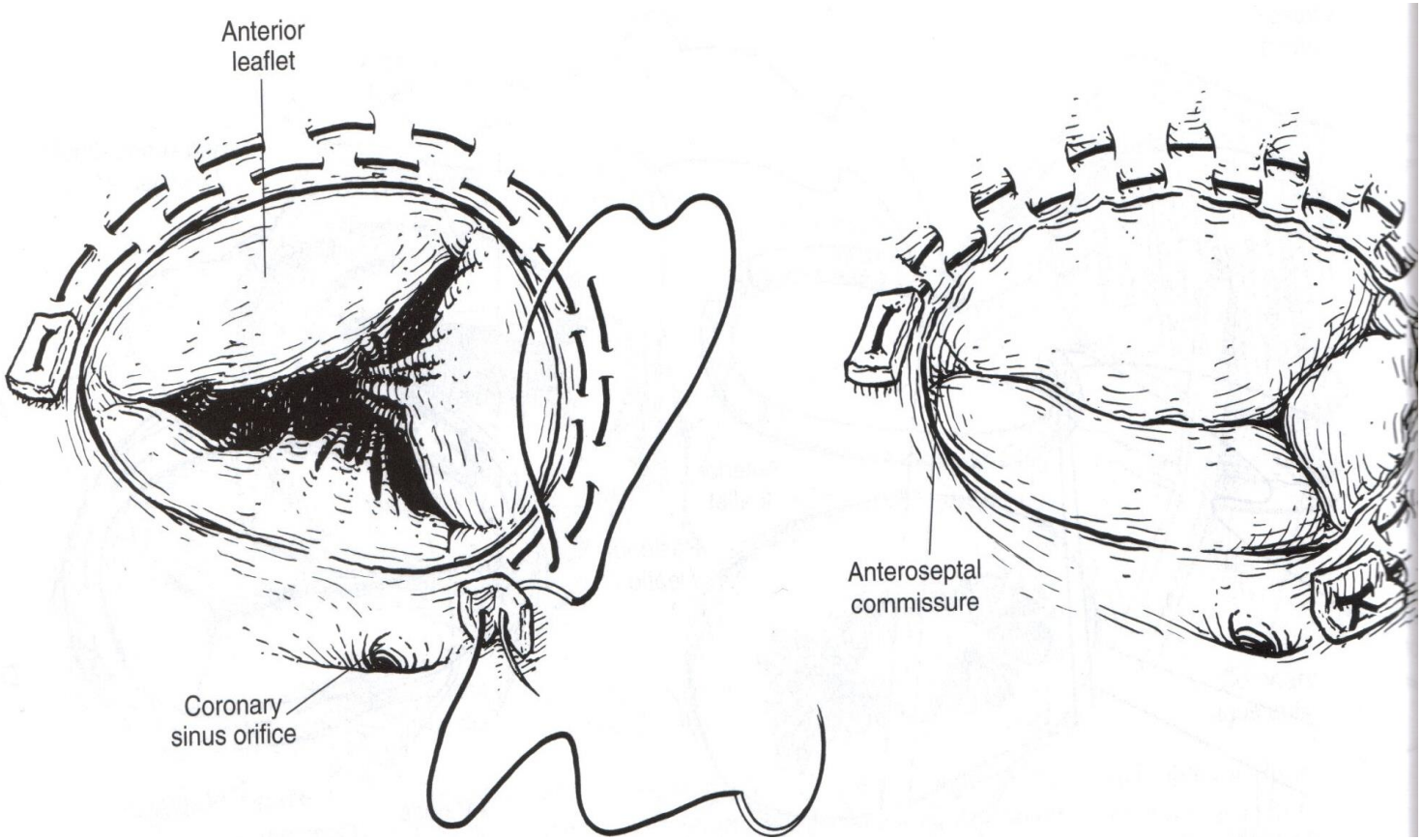
Tricuspidalisklepplastiek

Benadering



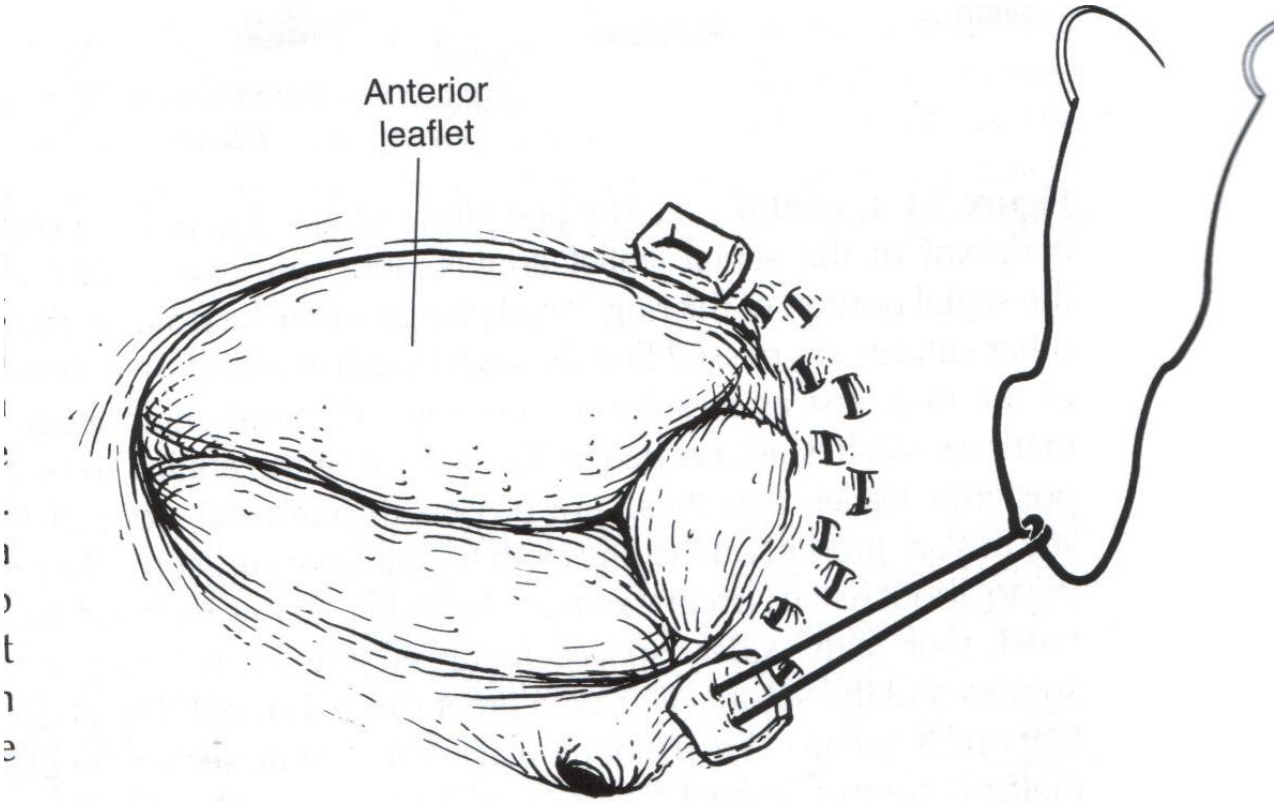
Tricuspidalisklepplastiek volgens De Vega

De Vega plastiek



Tricuspidalisklepplastiek volgens Kay

Kay plastiek



Tricuspidalis annuloplastiek

Chirurgische behandeling van AF

- PVI = pulmonaal vene isolatie
- Maze procedure = “doolhof” operatie (RA + LA)
- Mipi- Maze = minimaal invasieve PVI

AF: 3 stadia

Paroxysmaal

- Laatste episode < 7 dgn
- Eindigt spontaan
- Regelmatig terugkerend

Persisterend

- Eindigt NIET spontaan
- Cardioversie noodzakelijk

Permanent

- Kan niet worden beëindigd

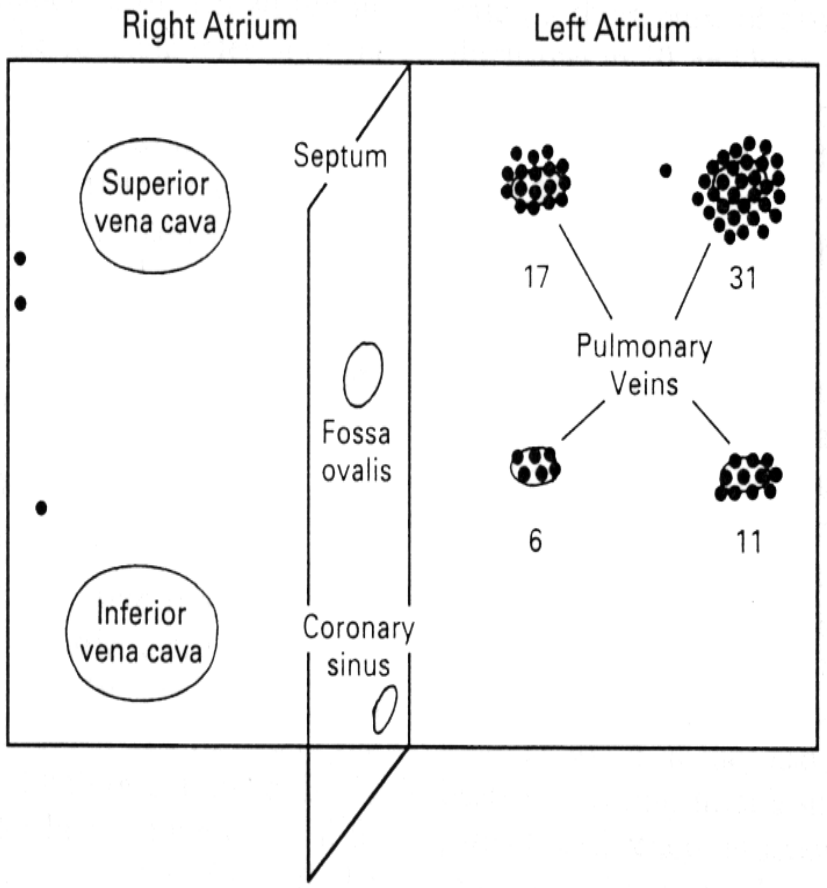
Normaal substraat

Nog geen remodeling

Remodeling

Substraat

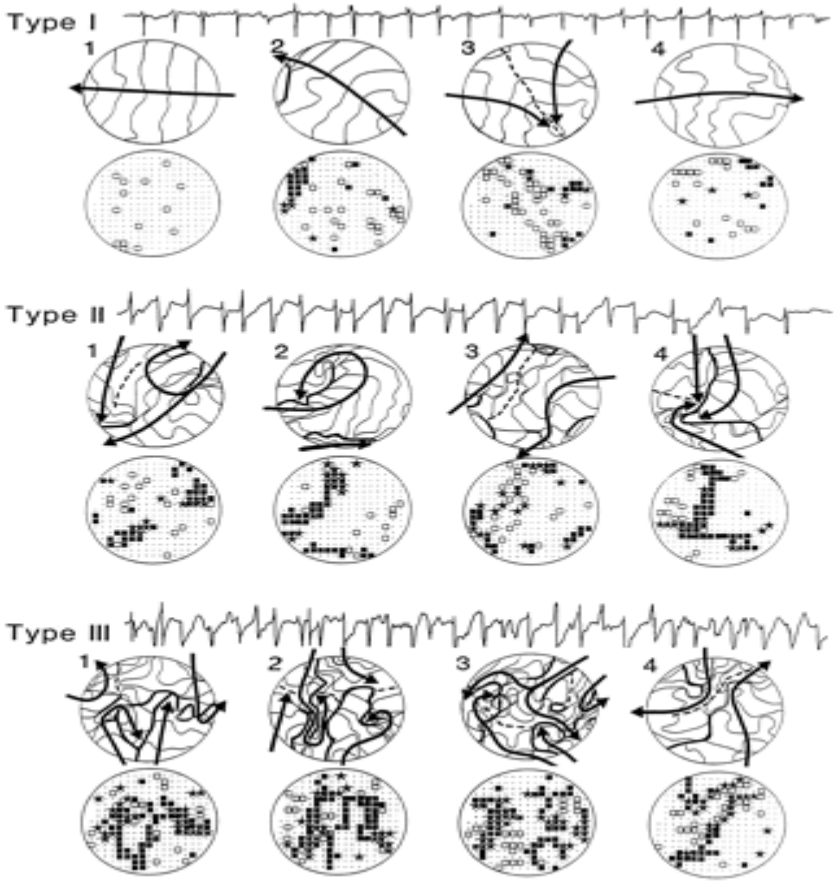
Paroxysmaal AF



- 40% v/d patienten
- Self-initiating
- Self-terminating
- Ectopische foci
- Atrium is normaal

Haissaguerre et al, N Engl J Med 1998; 339: 659-66

Permanent AF



60% v/d patienten

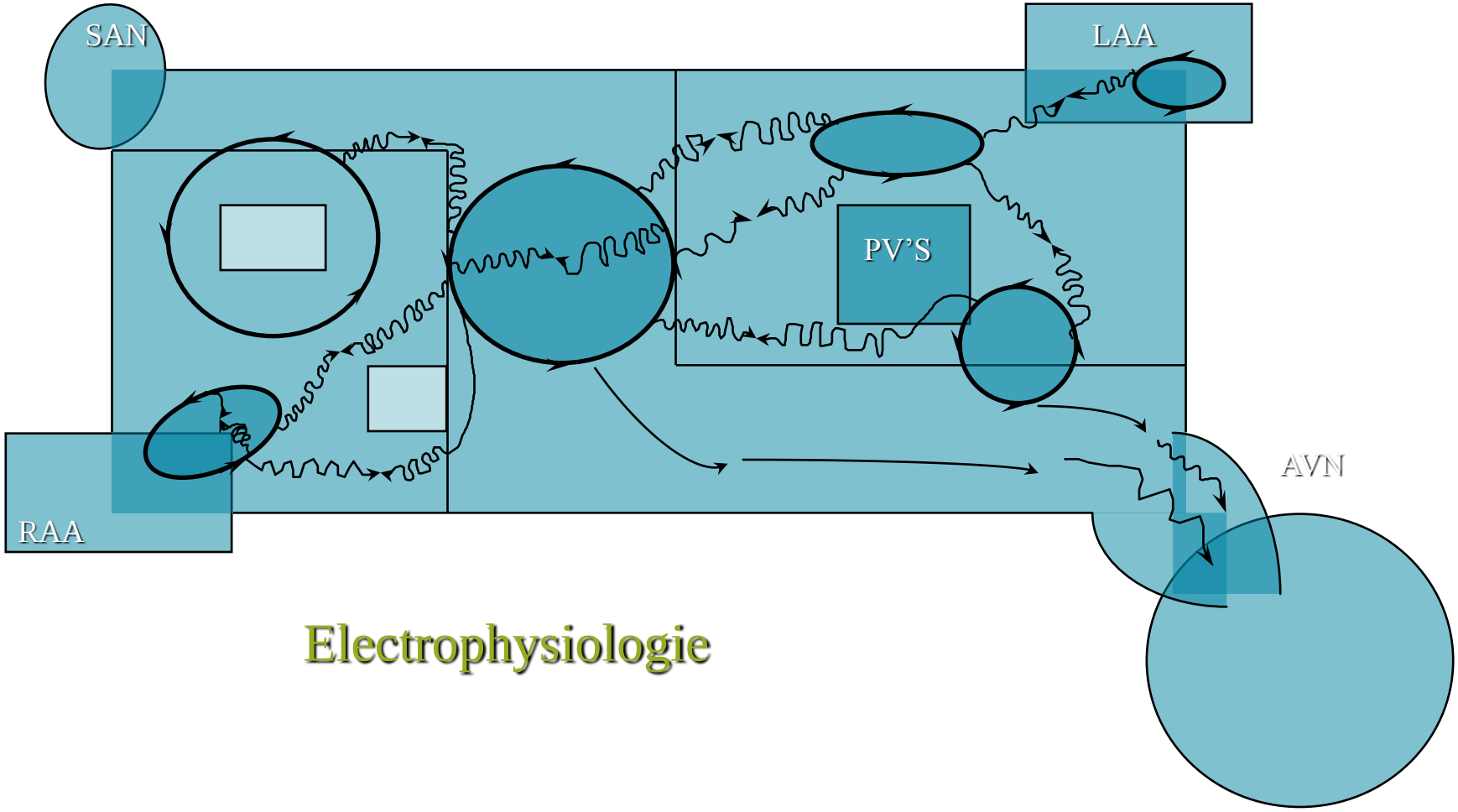
Geen ectopische foci

Random macro-reentry circuits

Erg korte cyclus lengte

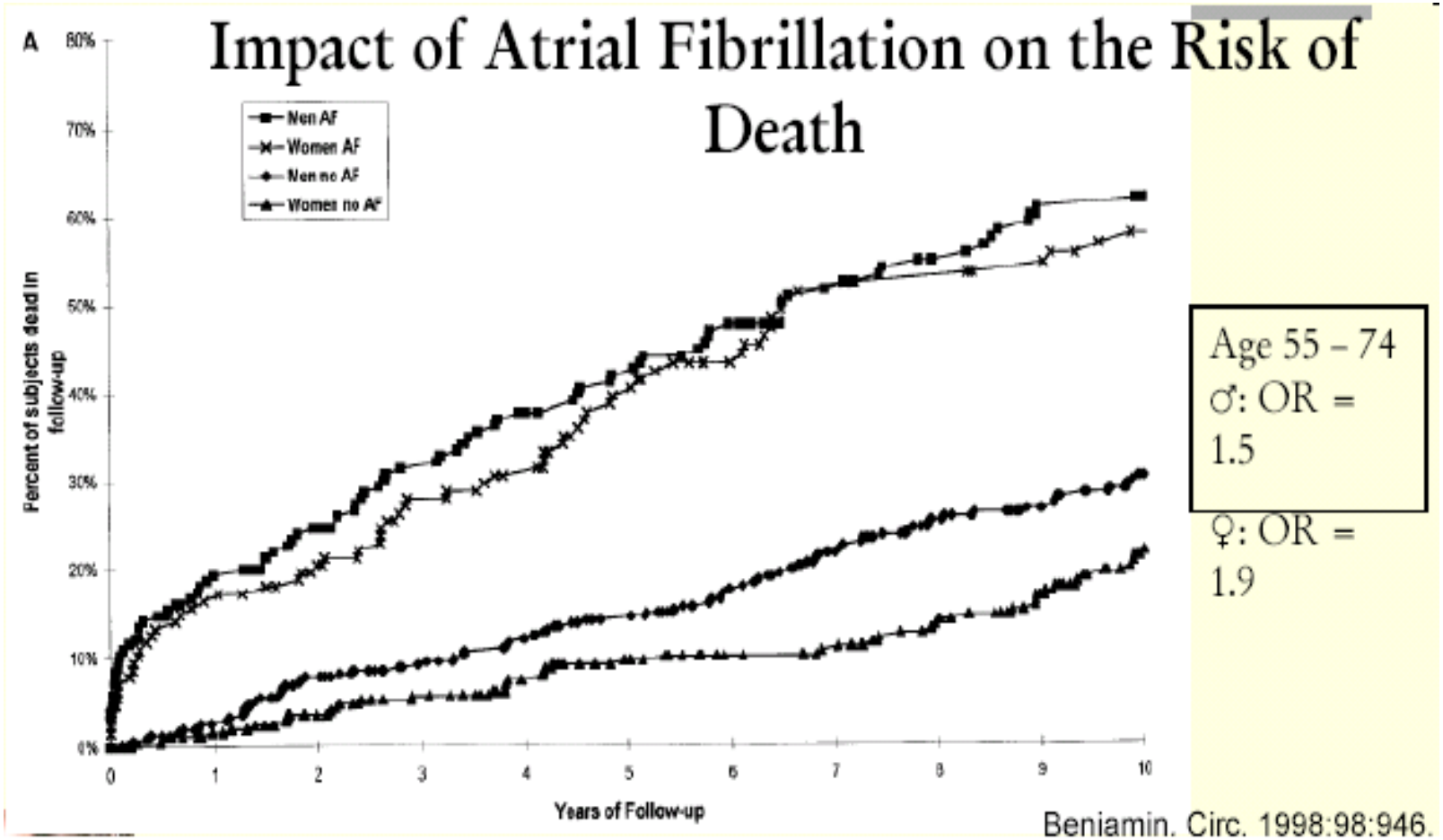
Konings, et al. Circulation. 95:1231, 1997.

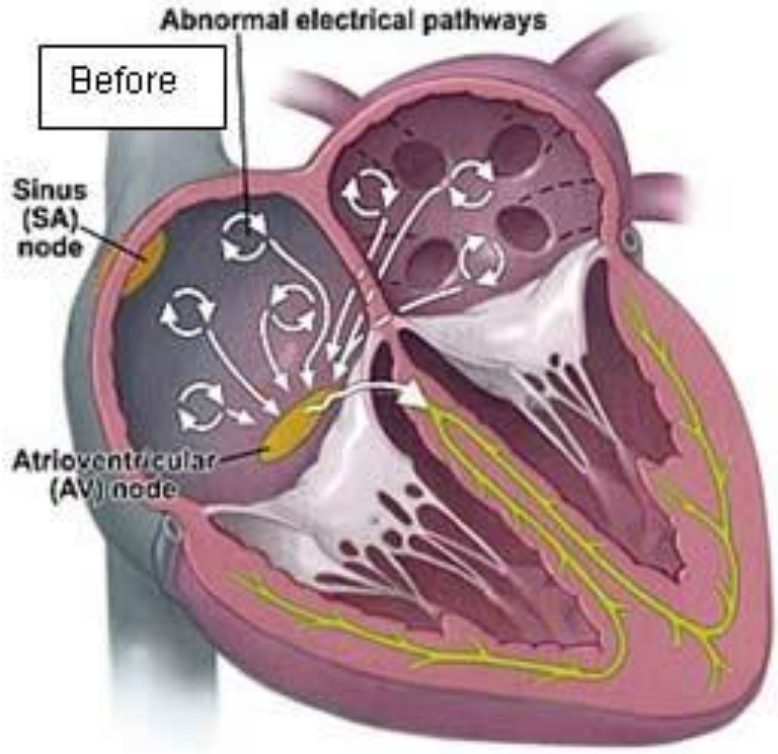
Atriumfibrilleren

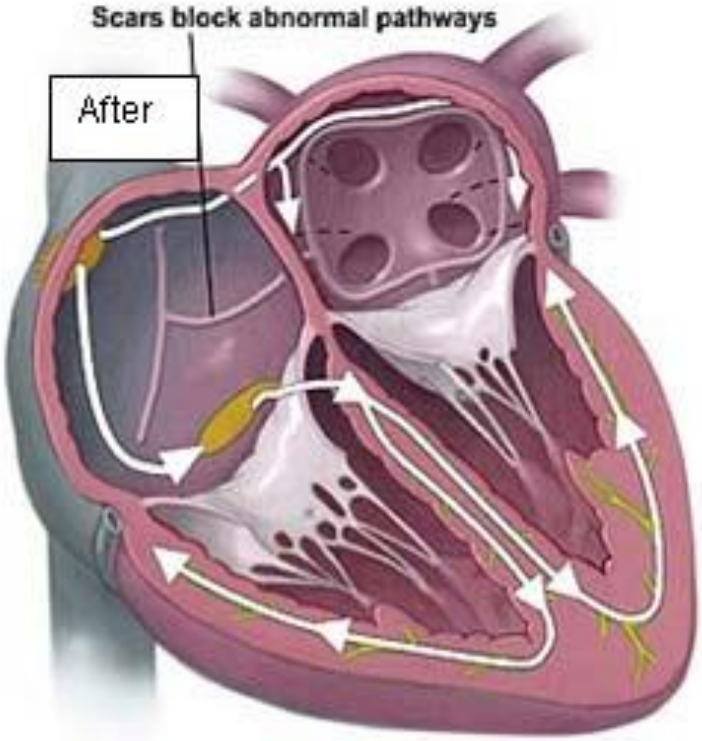


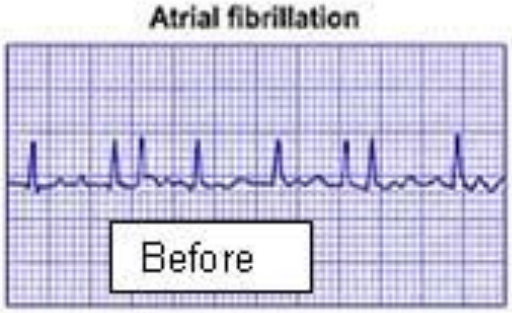
Electrophysiologie

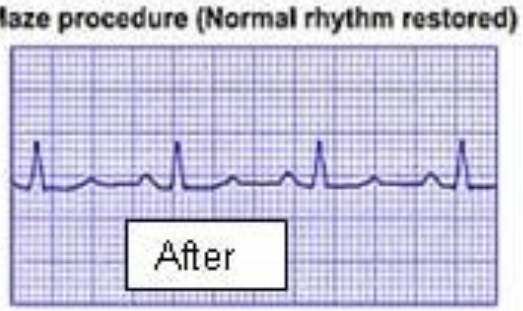
Risico's van AF




Abnormal electrical pathways
Before
Sinus (SA) node
Atrioventricular (AV) node

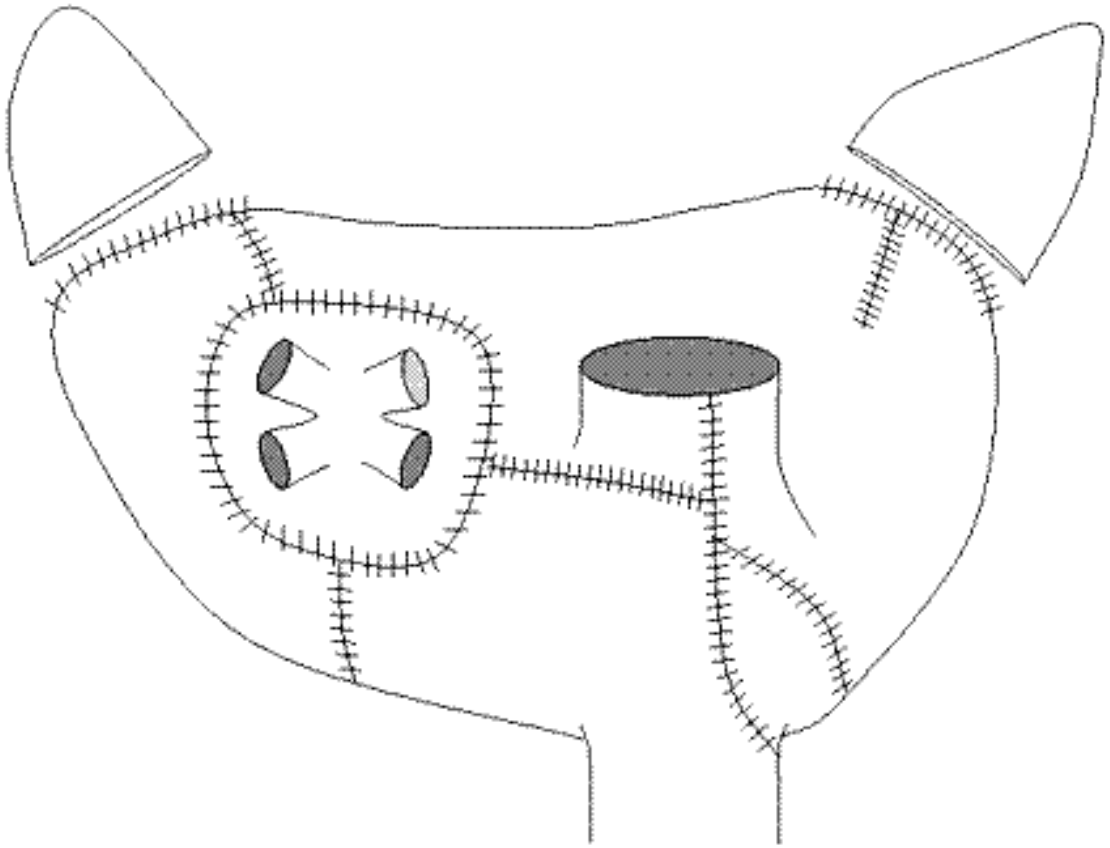

Scars block abnormal pathways
After


Atrial fibrillation
Before


Maze procedure (Normal rhythm restored)
After

Cox Maze procedure

Figure 1.



Standaard laesies linker atrium