Evoluties in de Hartchirurgie :

Of hoe technologie revalidatie ten goede komt

Hartchirurgie anno 2019 in het OLV te Aalst

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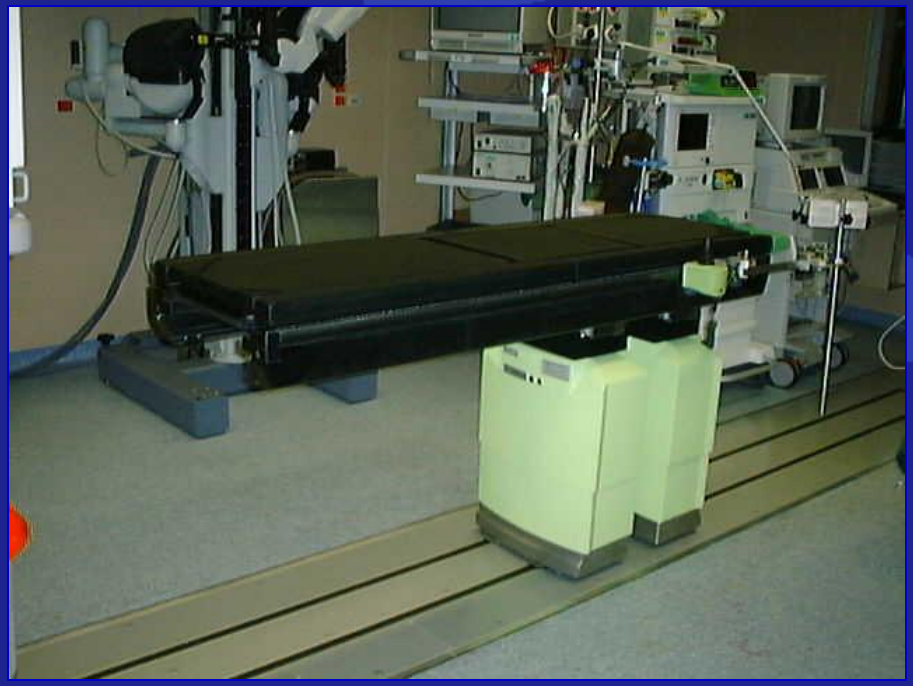
Department of Cardiovascular and Thoracic Surgery

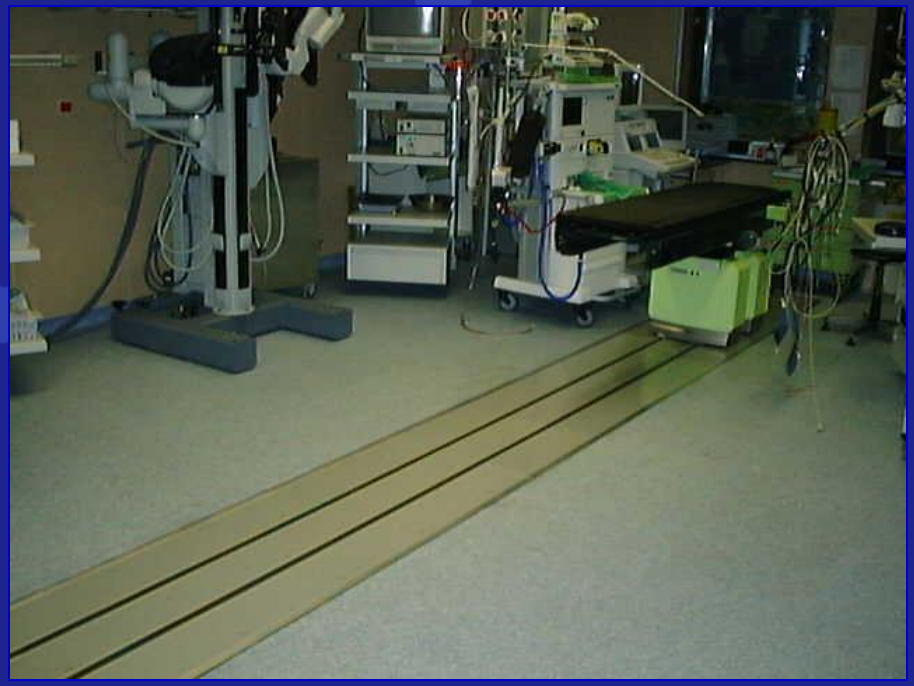
OLV Clinic

AALST

PEOPLE INVOLVED

- 7 Staff Surgeons
- 1 Fellow, 3 Residents
- 6 CV Anesthesiologists, 3 Intensivists
- 5 Perfusionists
- 2 Coordinators, 4 Secretaries, 1 data base manager
- 24 ICU beds, Ward (40 beds)
- Specialized nursing staff






MON 1
DE CRAECKER, JOSEPH CYRIEL
Artis Live
Artis Reference
Artis Assist
MAENE

Revalidatie in het Hartcentrum Aalst

Cardiovascular Center OLV Aalst

Revalidatie in praktijk

Fase I

- In hospitaal

Fase II

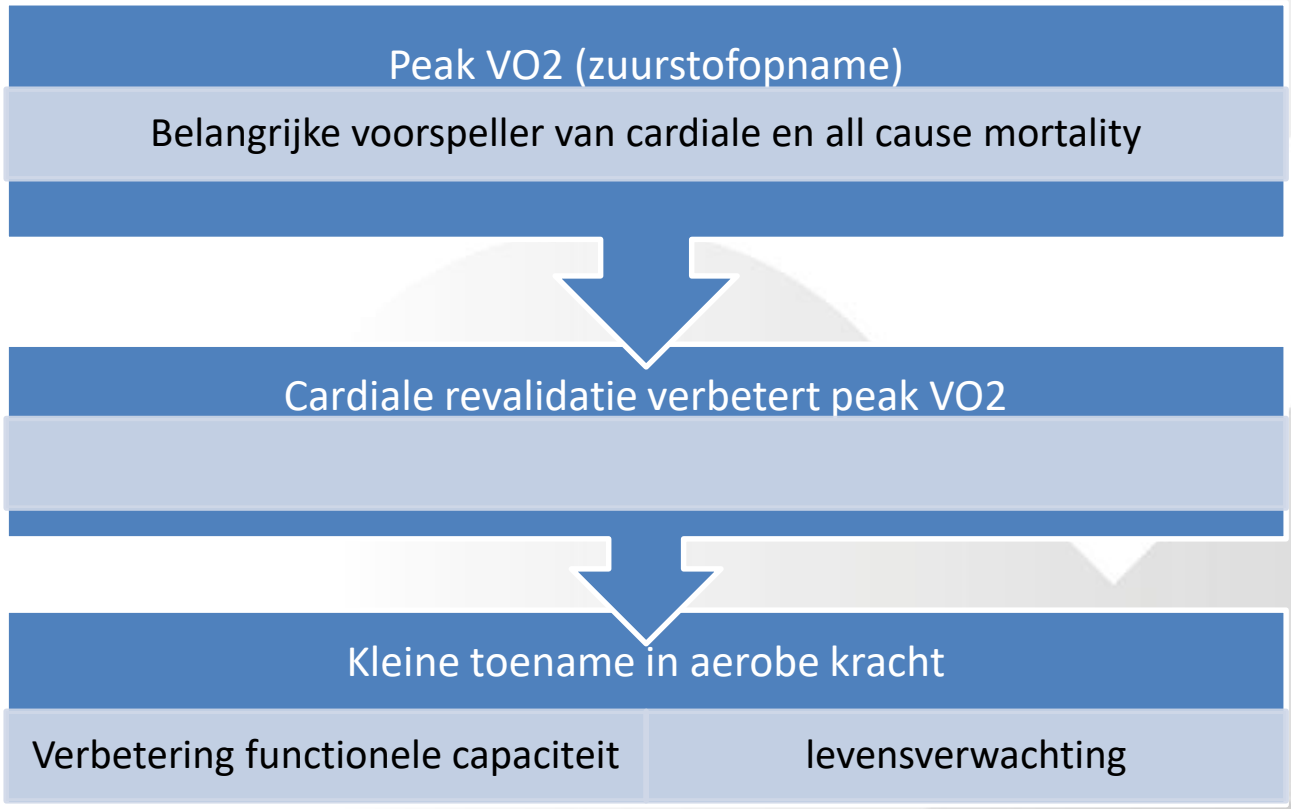
- Ambulant

Fase III

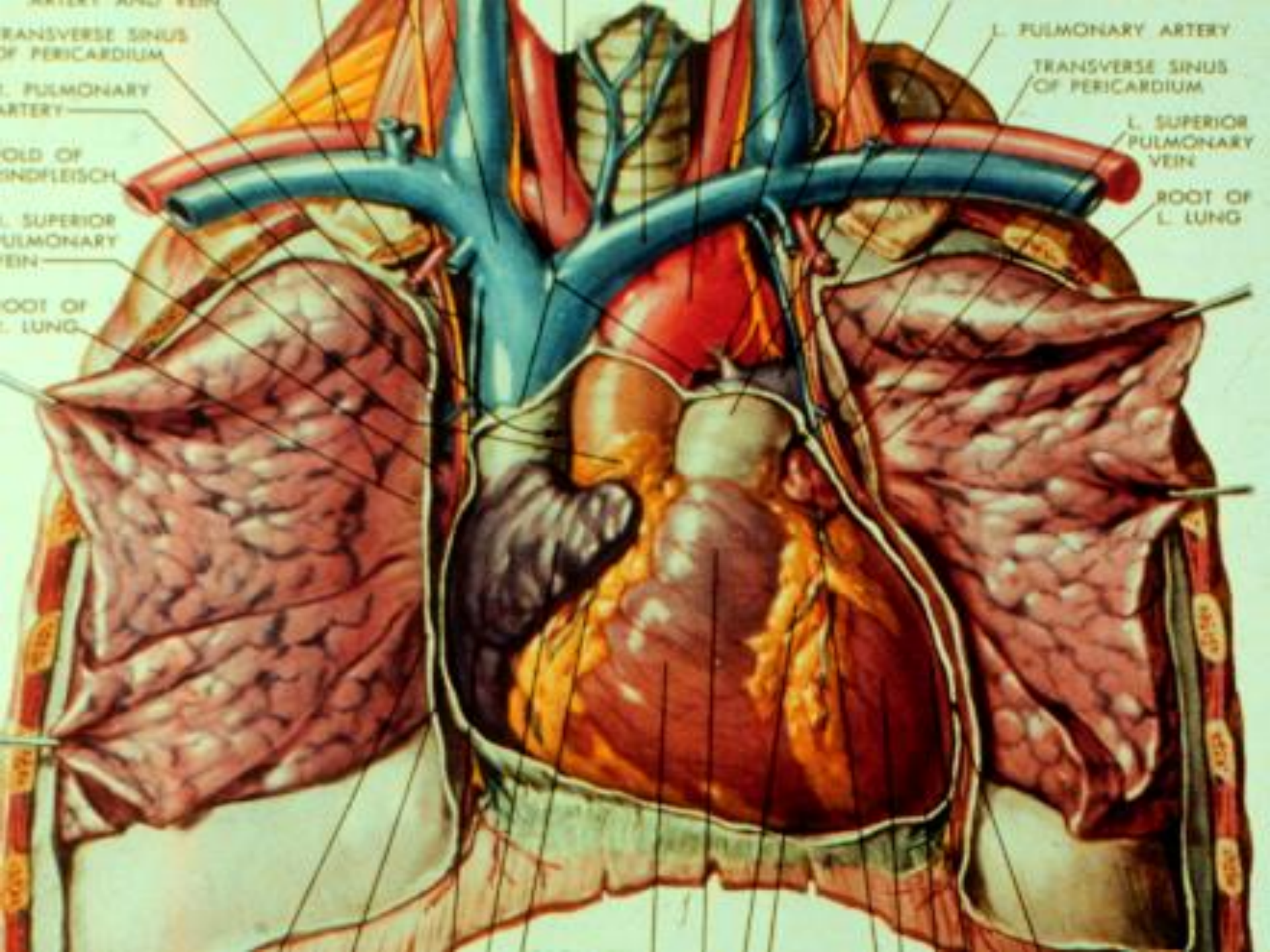
- Verderzetting

Cardiovascular Center OLV Aalst

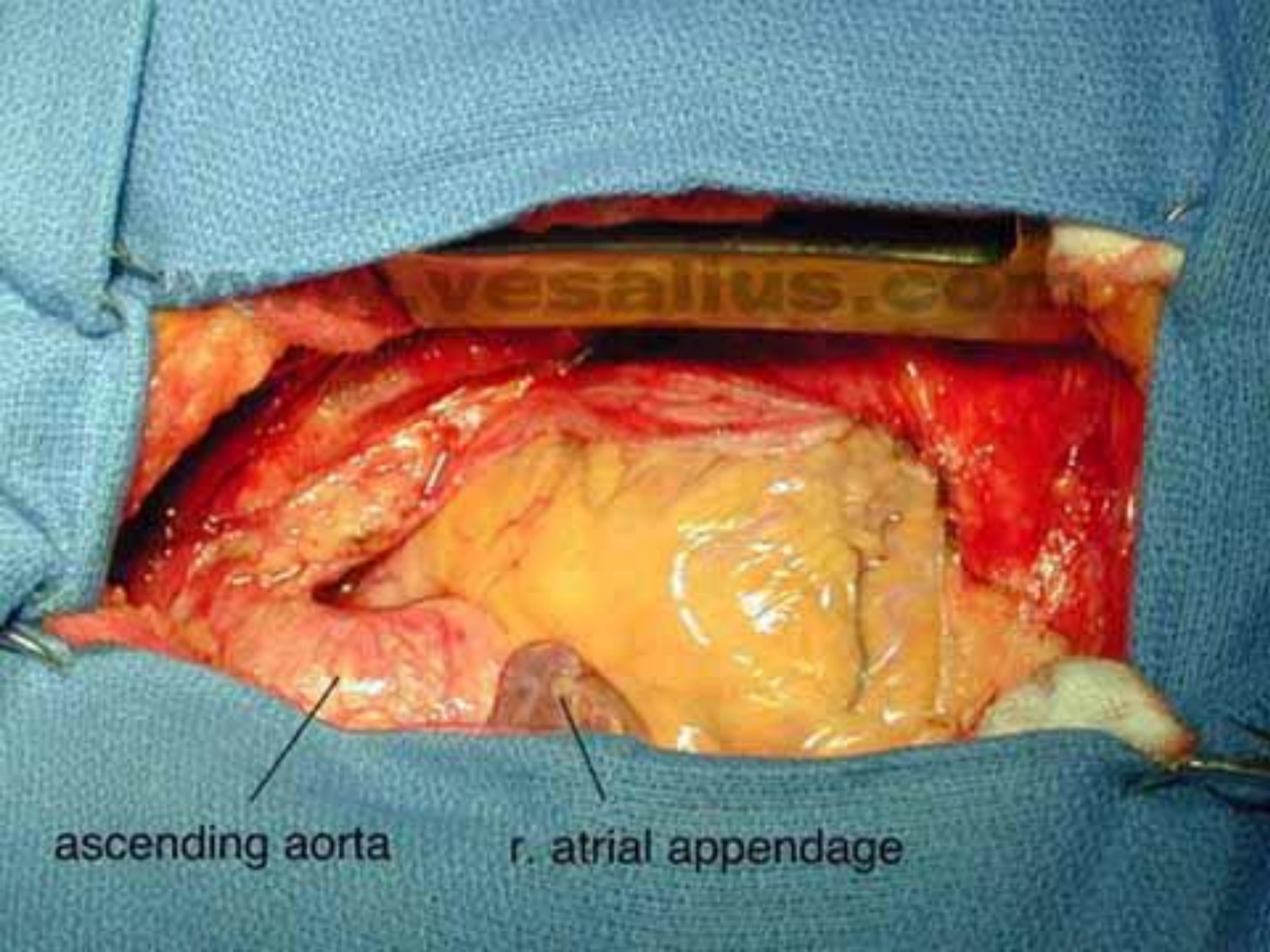
Fysieke trainingen

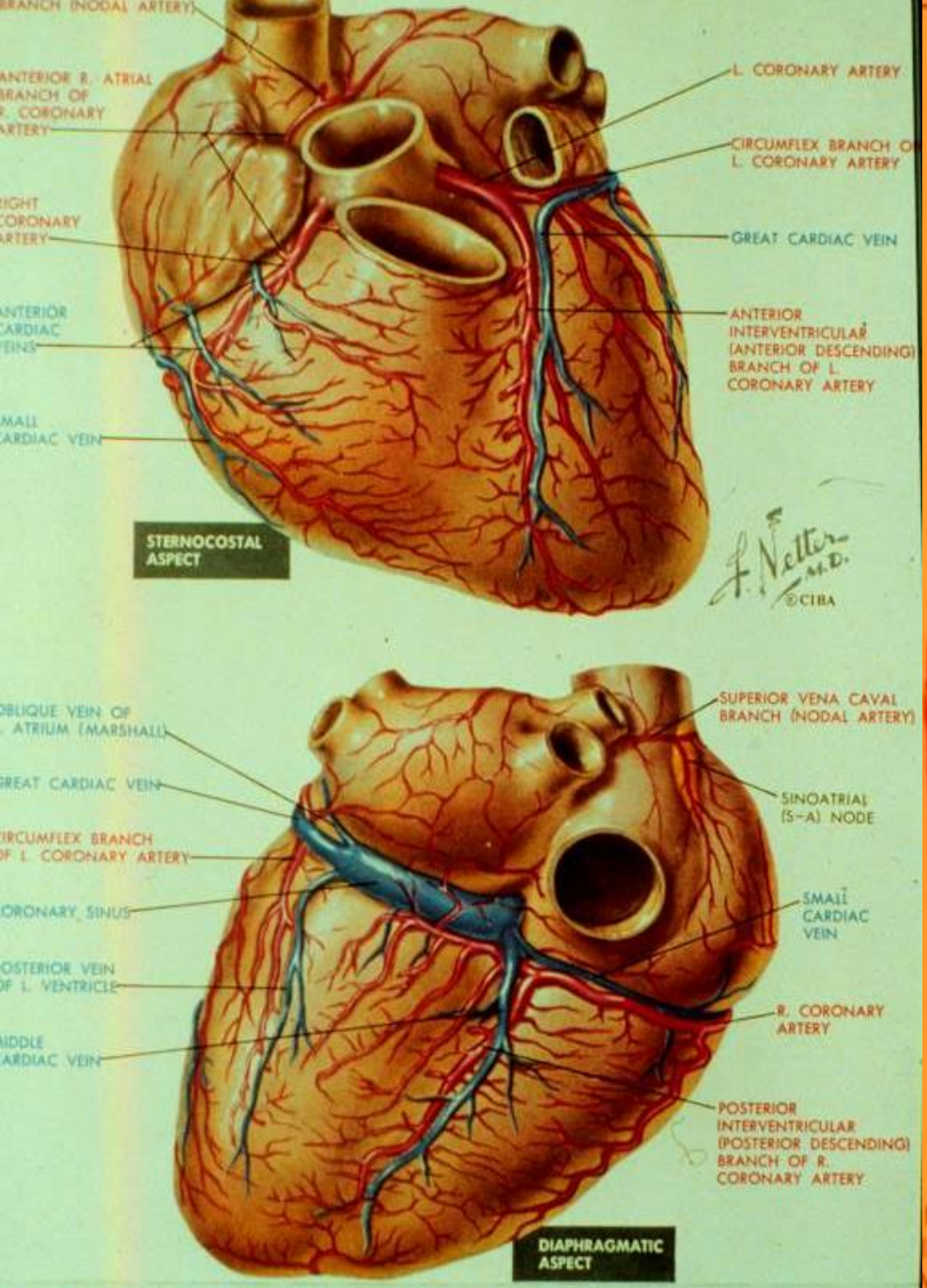


Cardiovascular Center OLV Aalst

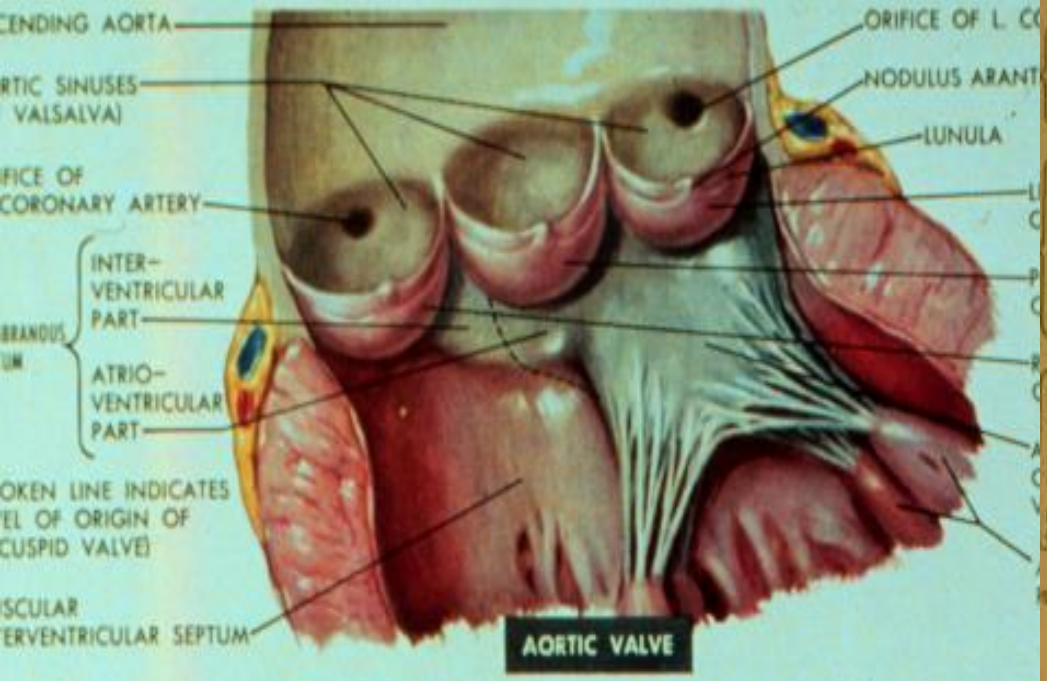

L. PULMONARY ARTERY
TRANSVERSE SINUS OF PERICARDIUM
L. SUPERIOR PULMONARY VEIN
ROOT OF L. LUNG

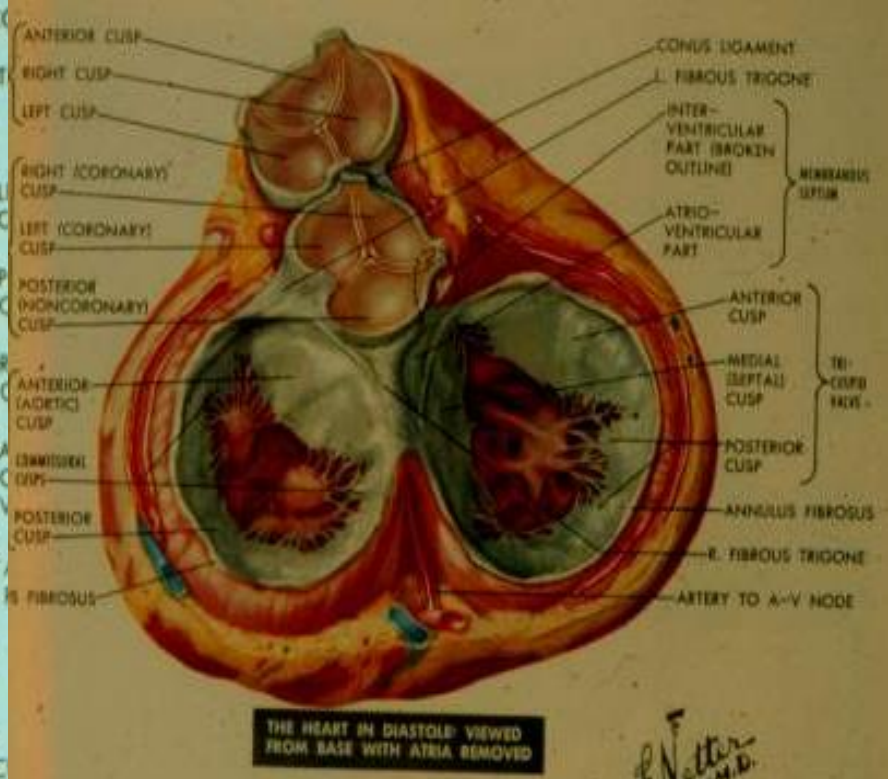

Median sternotomy


ascending aorta
r. atrial appendage

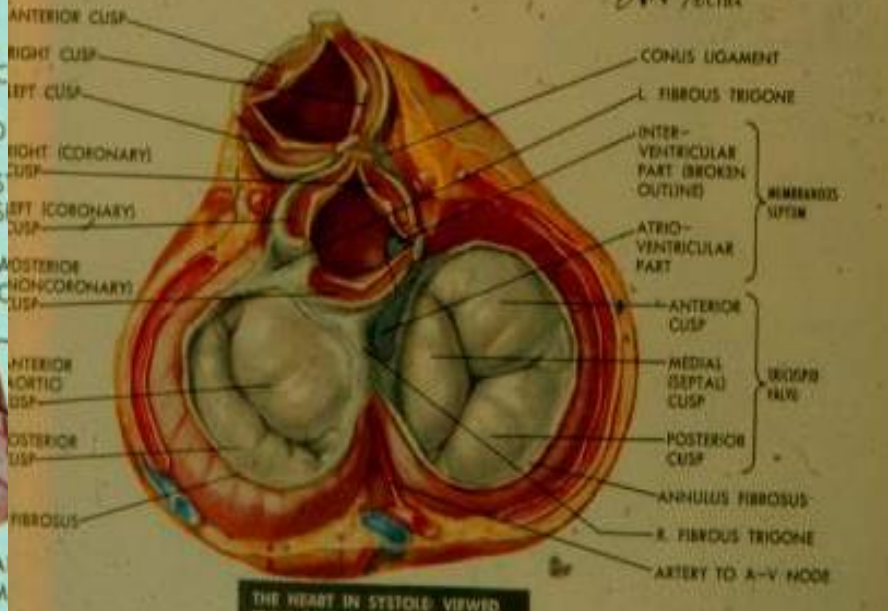


1520 CORONARY ARTERIES AND VEINS:
STERNOCOSTAL AND DIAPHRAGMATIC ASPECTS

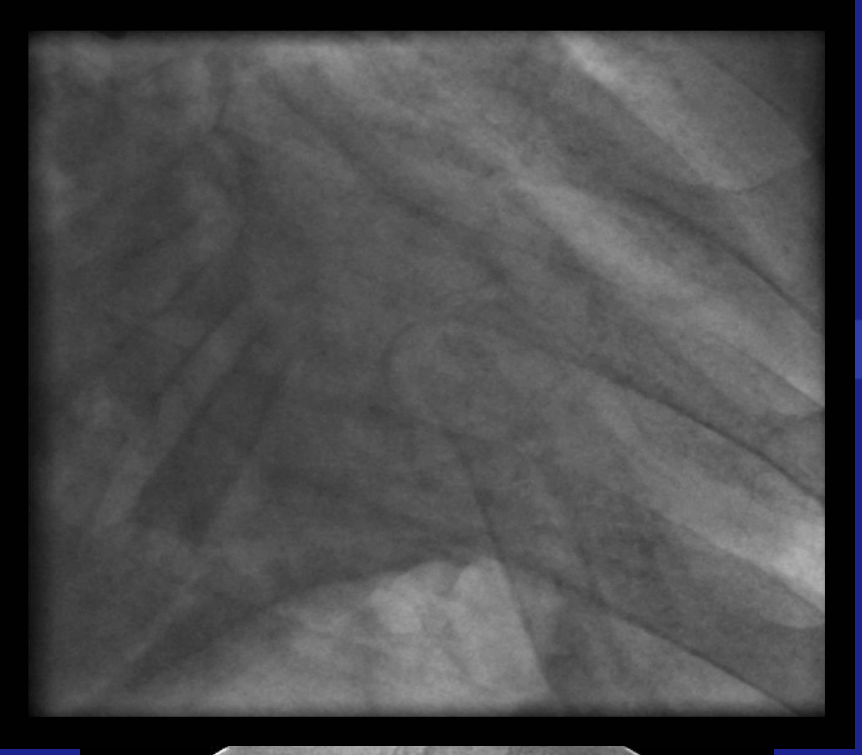

CENDING AORTA
ORIFICE OF L. C
RTIC SINUSES
VALSALVA)
NODULUS ARANT
LUNULA
FICE OF
CORONARY ARTERY
INTER-
VENTRICULAR
PART
ATRIO-
VENTRICULAR
PART
OKEN LINE INDICATES
EL OF ORIGIN OF
CUSPID VALVE)
SCULAR
ERVENTRICULAR SEPTUM
AORTIC VALVE

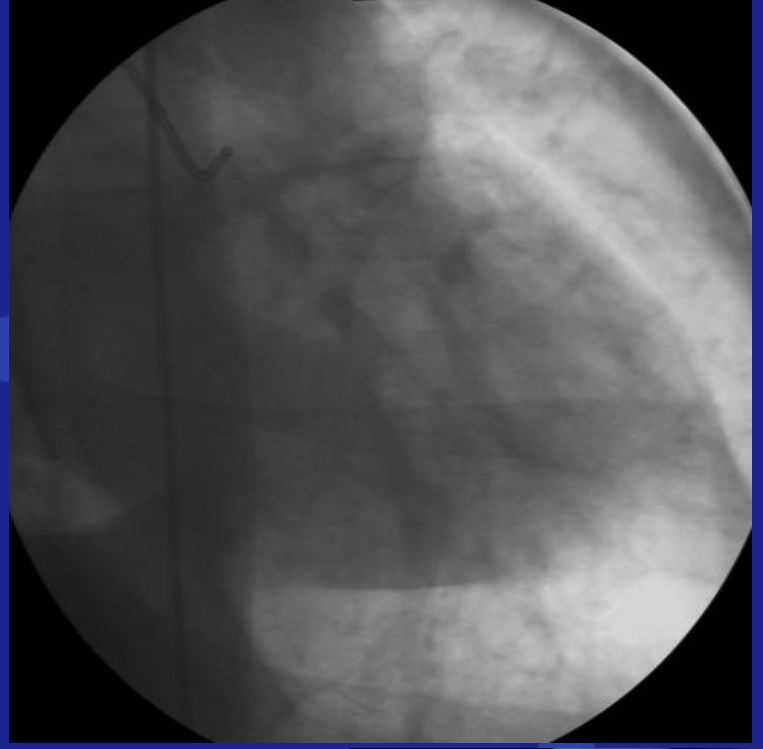

ANTERIOR CUSP
RIGHT CUSP
LEFT CUSP
CONUS LIGAMENT
L. FIBROUS TRIGONE
INTER-
VENTRICULAR
PART (BROKEN
OUTLINE)
MEMBRANOUS
SEPTUM
RIGHT (CORONARY)
CUSP
LEFT (CORONARY)
CUSP
ATRIO-
VENTRICULAR
PART
POSTERIOR
(NONCORONARY)
CUSP
ANTERIOR
CUSP
MEDIAL
(SEPTAL)
CUSP
TRI-
CUSPID
VALVE
ANTERIOR
(AORTIC)
CUSP
POSTERIOR
CUSP
ANNULUS FIBROSUS
R. FIBROUS TRIGONE
ARTERY TO A-V NODE
THE HEART IN DIASTOLE VIEWED
FROM BASE WITH ATRIA REMOVED

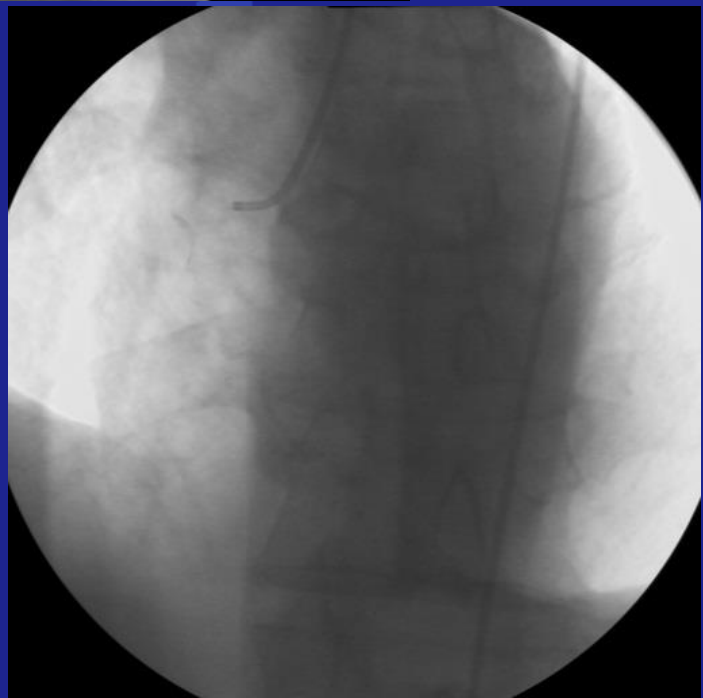

ERIOR
NA CAVA
ATRIO-
VENTRIC
PART
INTER-
VENTRIC
PART
(BEHIND
ORDAE
NDINEAE
DIAL
ONAL)
PILLARY
SCLE
STERIOR
PILLARY
USCLES
CTIONED)
PTAL
ND
RIETAL
ND
TRICUSPID (RIGHT ATRIOVENTRICULAR) VALVE

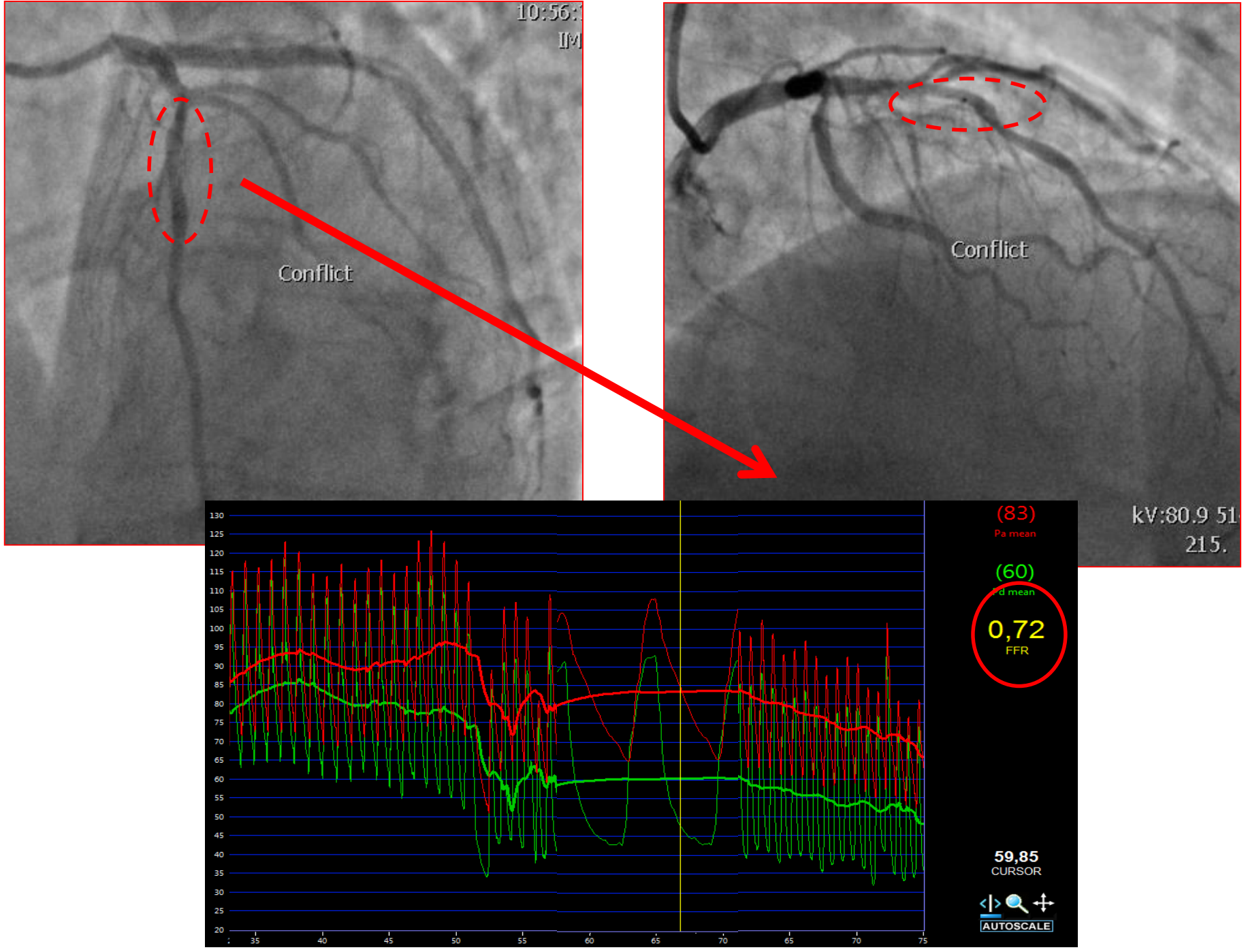

ANTERIOR CUSP
RIGHT CUSP
LEFT CUSP
CONUS LIGAMENT
L. FIBROUS TRIGONE
INTER-
VENTRICULAR
PART (BROKEN
OUTLINE)
MEMBRANOUS
SEPTUM
RIGHT (CORONARY)
CUSP
LEFT (CORONARY)
CUSP
ATRIO-
VENTRICULAR
PART
POSTERIOR
(NONCORONARY)
CUSP
ANTERIOR
CUSP
MEDIAL
(SEPTAL)
CUSP
BICUSPID
VALVE
POSTERIOR
CUSP
ANNULUS FIBROSUS
R. FIBROUS TRIGONE
ARTERY TO A-V NODE
THE HEART IN SYSTOLE VIEWED
FROM BASE WITH ATRIA REMOVED

CORONARY ANGIOGRAPHY



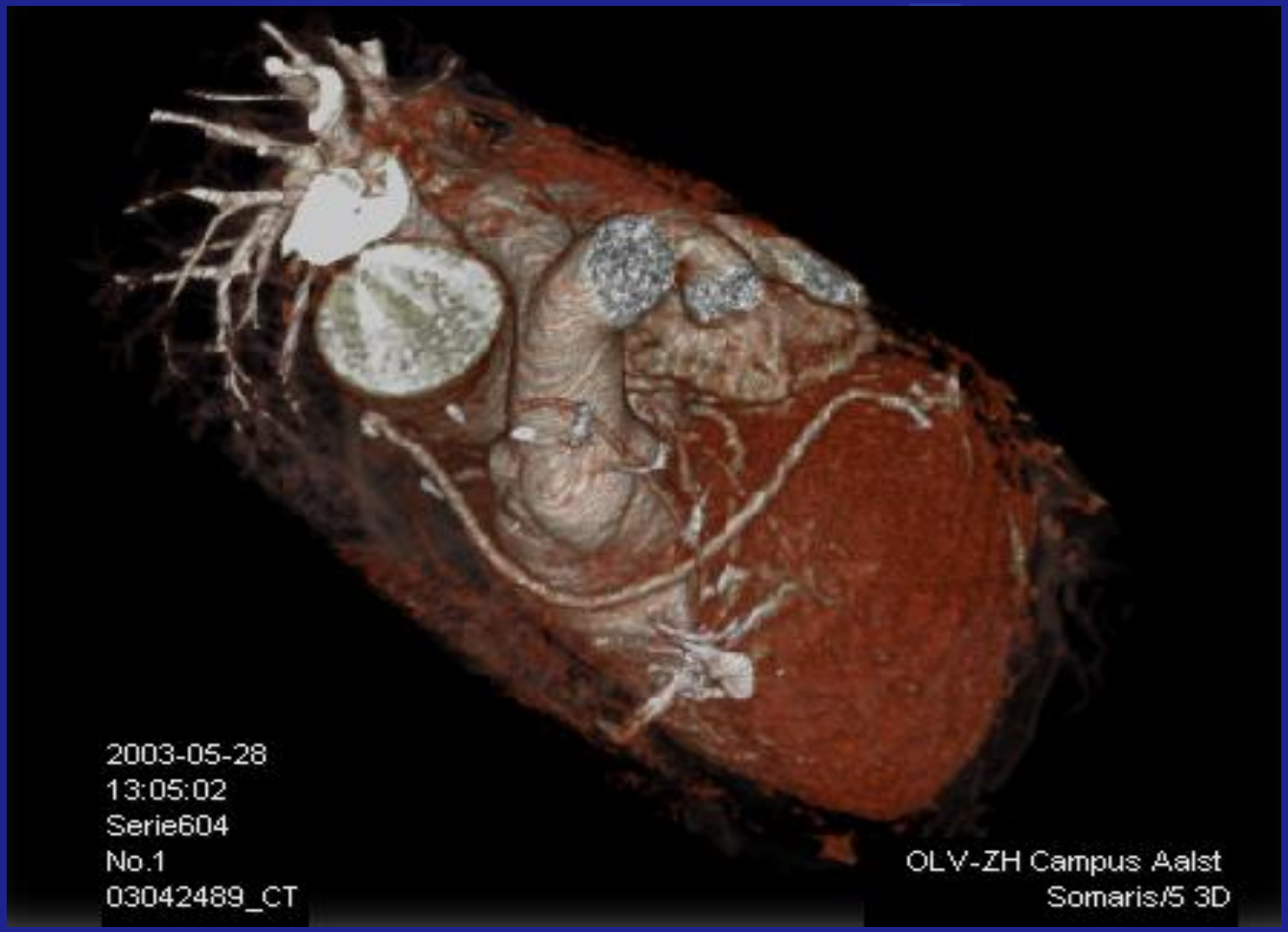





Conflict
Conflict
kV:80.9 51
215.
(83)
Pa mean
(60)
d mean
0,72
FFR
59,85
CURSOR
AUTOSCALE

OTHER IMAGING MODALITIES

ANGIO-CT SCAN

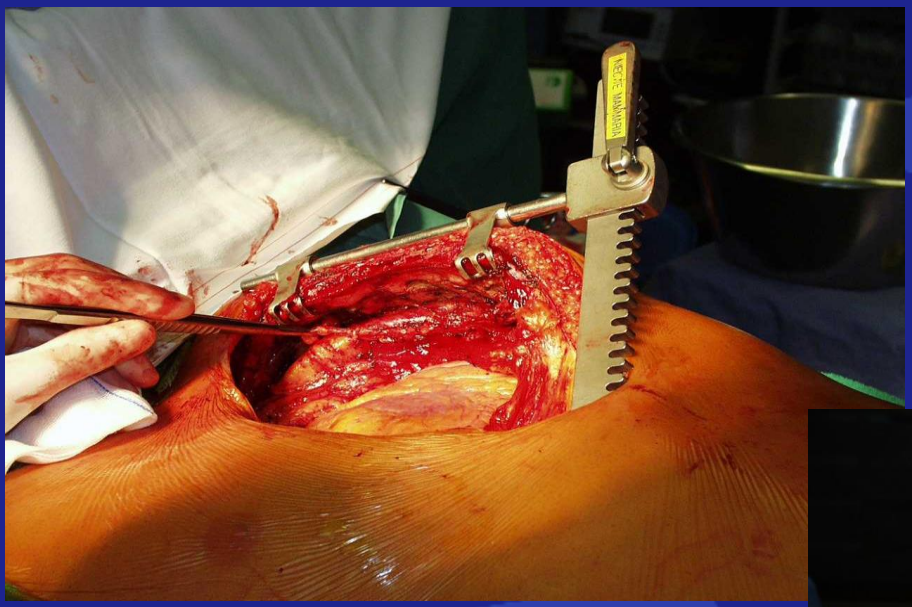


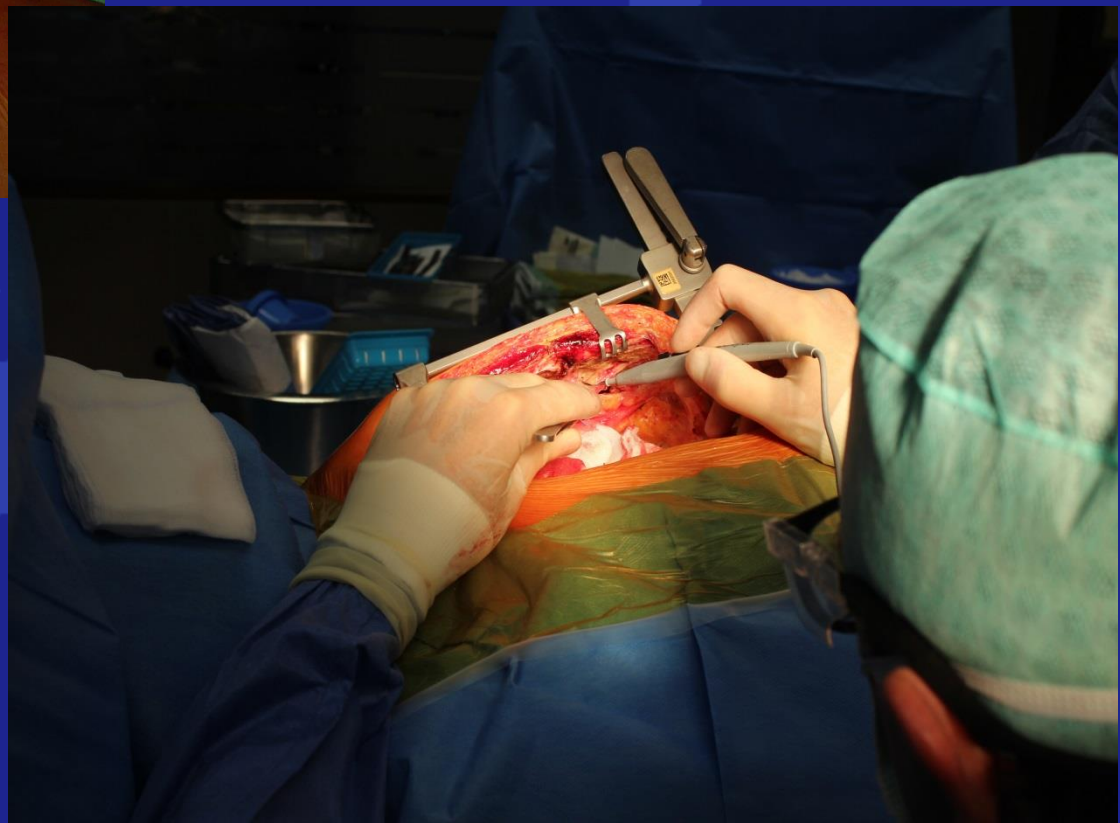
PATHOLOGY:

- Coronary arteries
- Valves
- Rhythm
- Aorta
- Heart failure

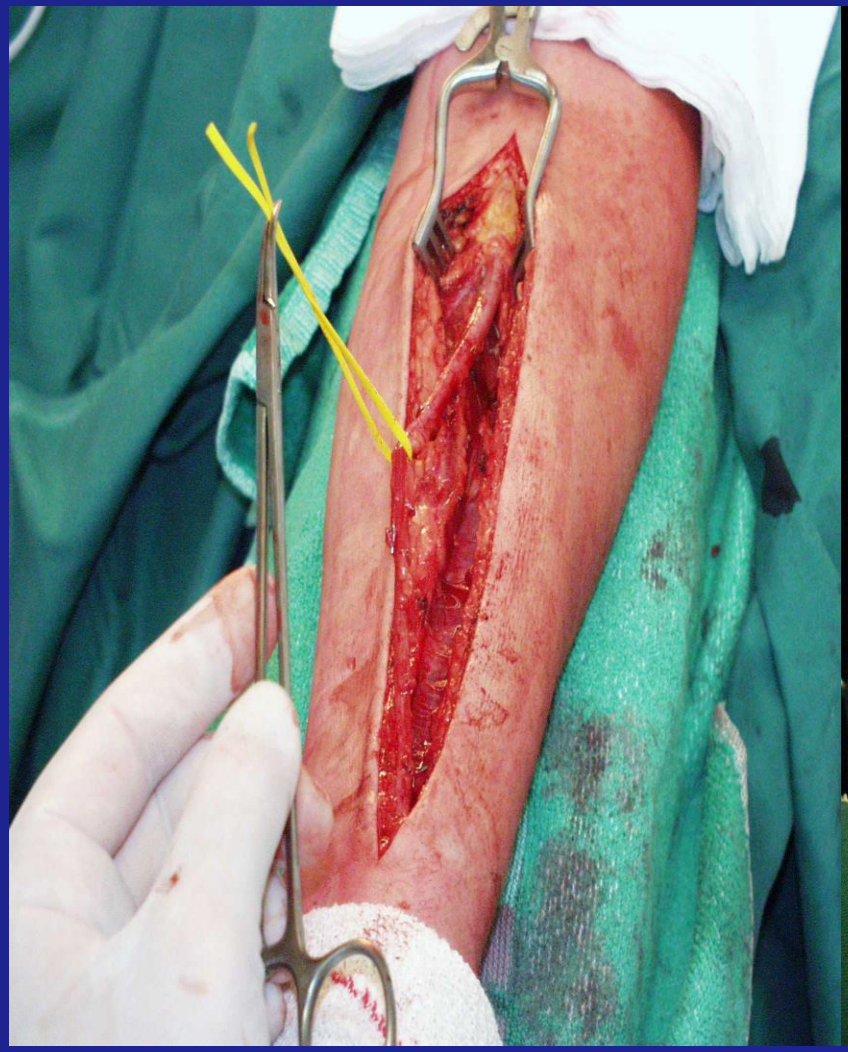
CORONARY ARTERY BYPASS GRAFTING : CABG

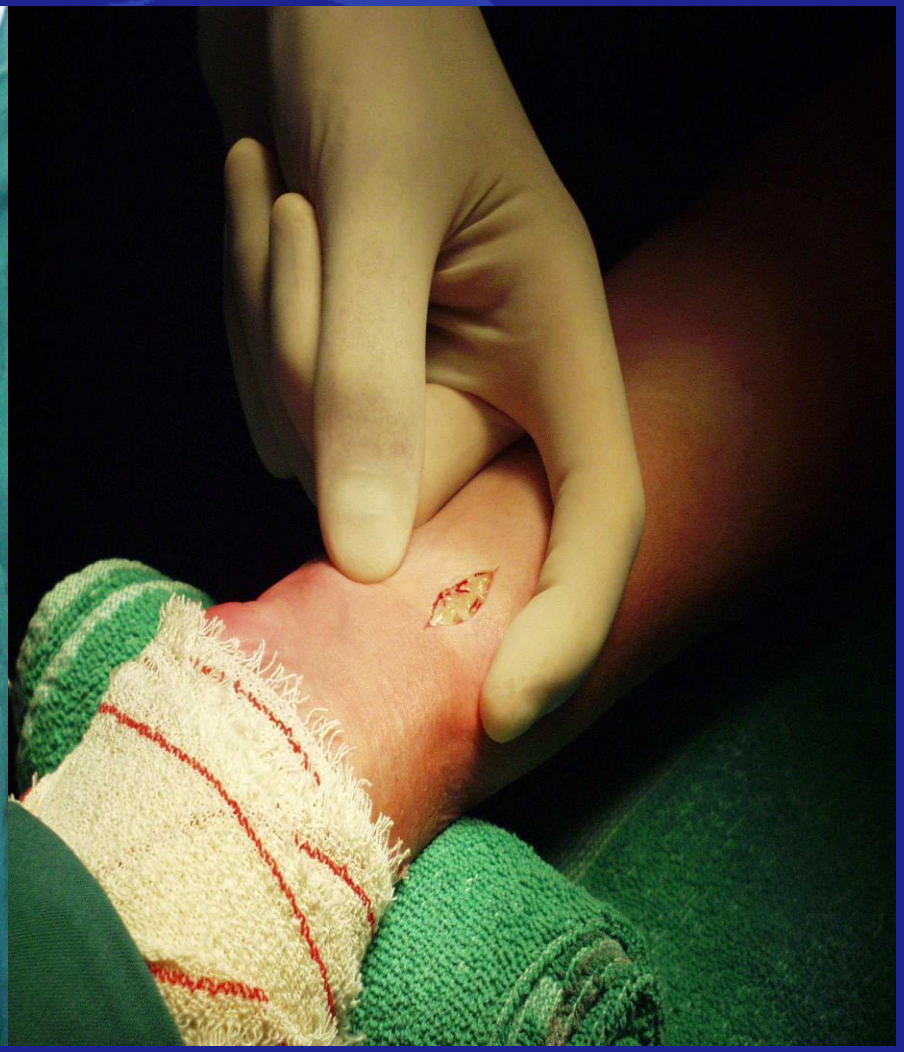
INTERNAL MAMMARY ARTERY



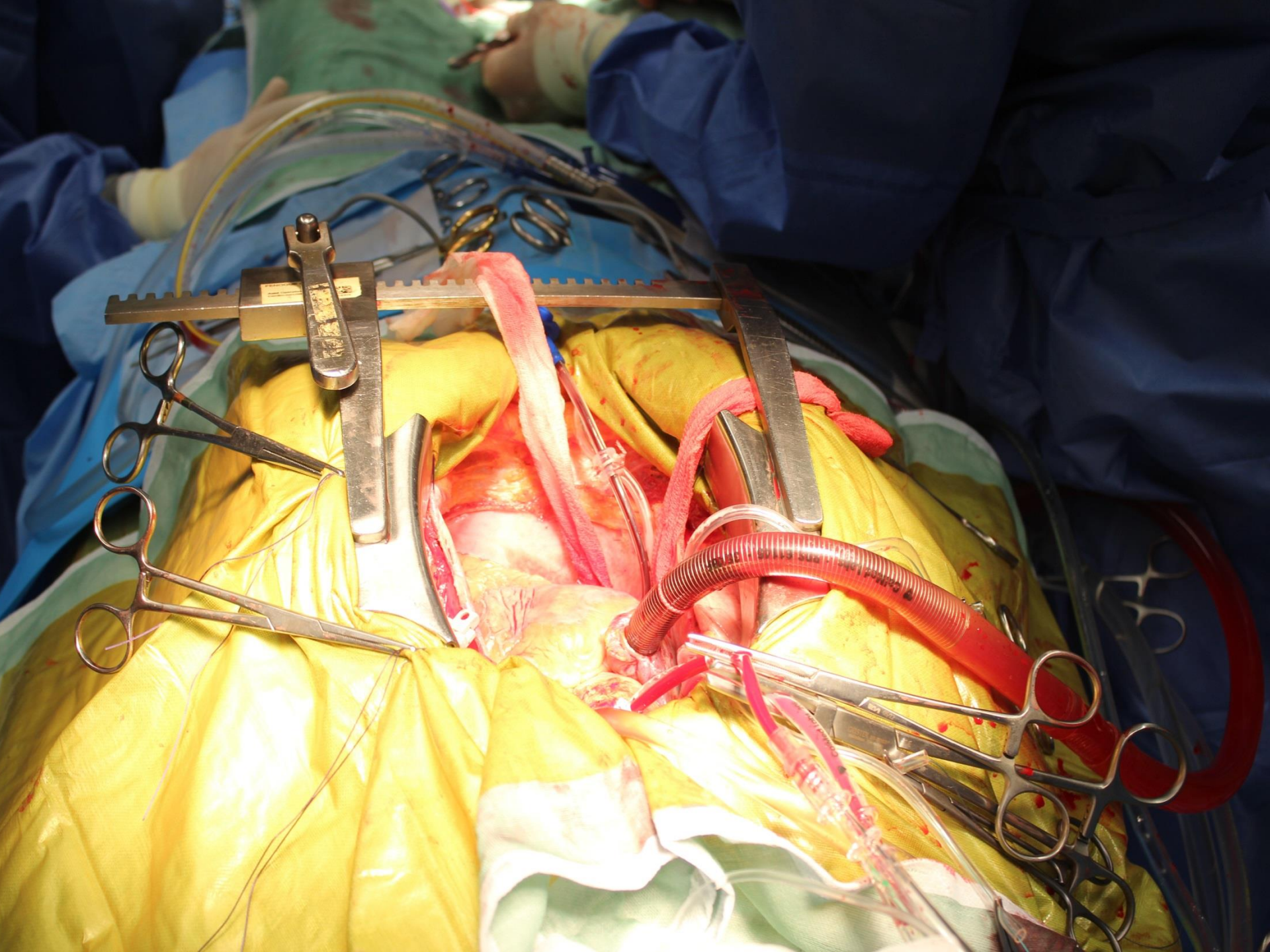


OPEN VERSUS ENDO



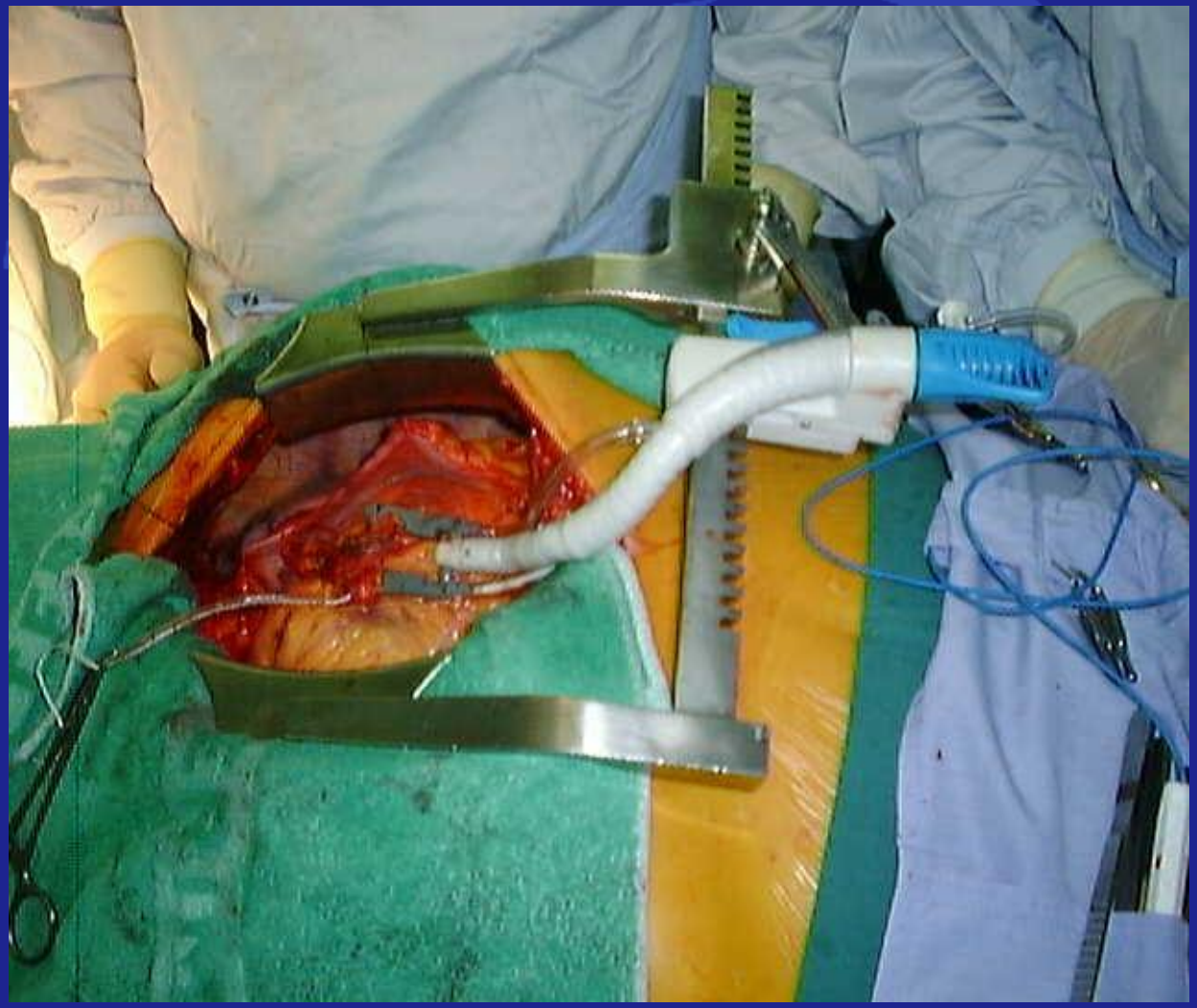


ARRESTED HEART

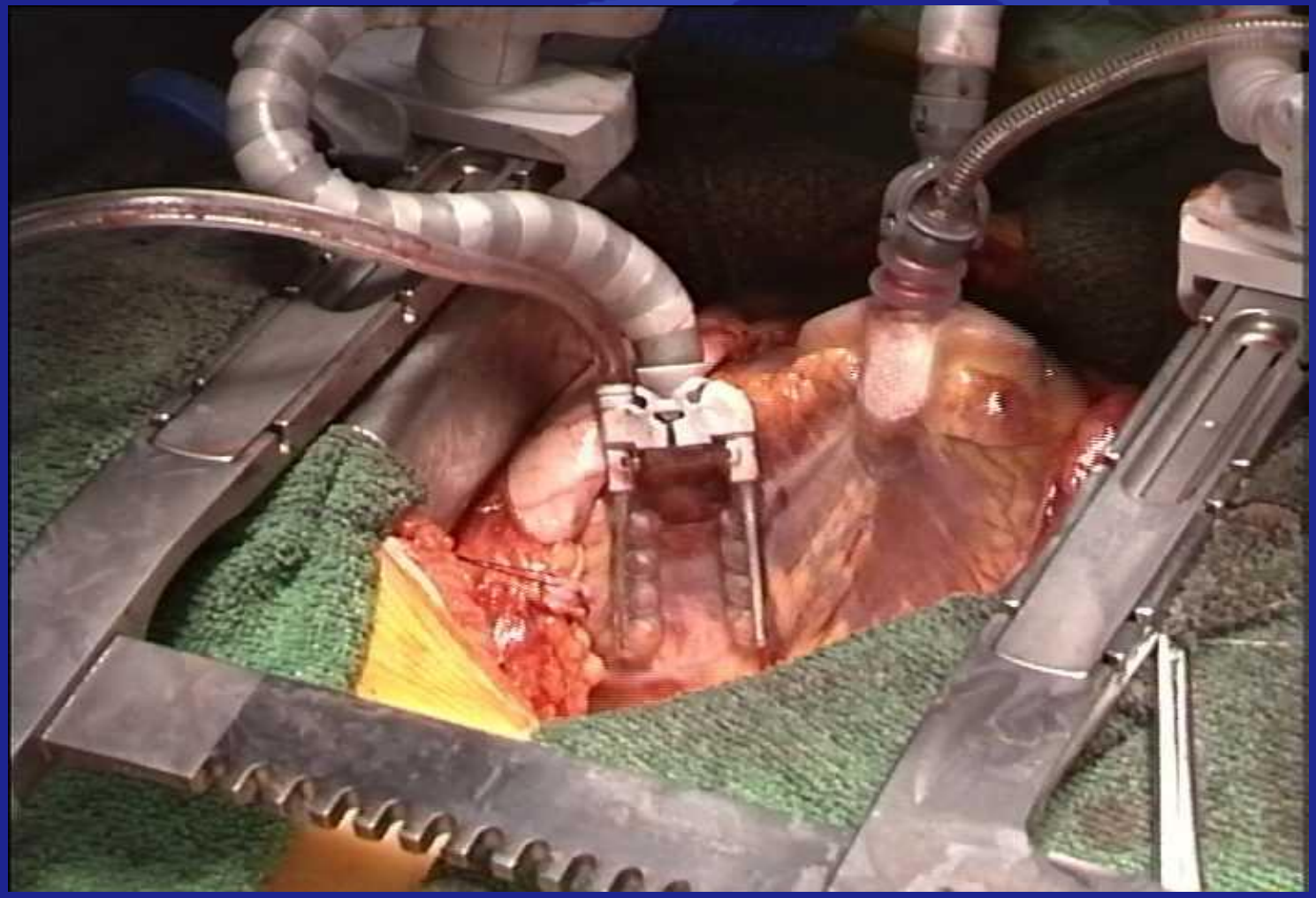


BEATING HEART

Octopus®



OFF PUMP CORONARY ARTERY BYPASS GRAFTING : OPCAB

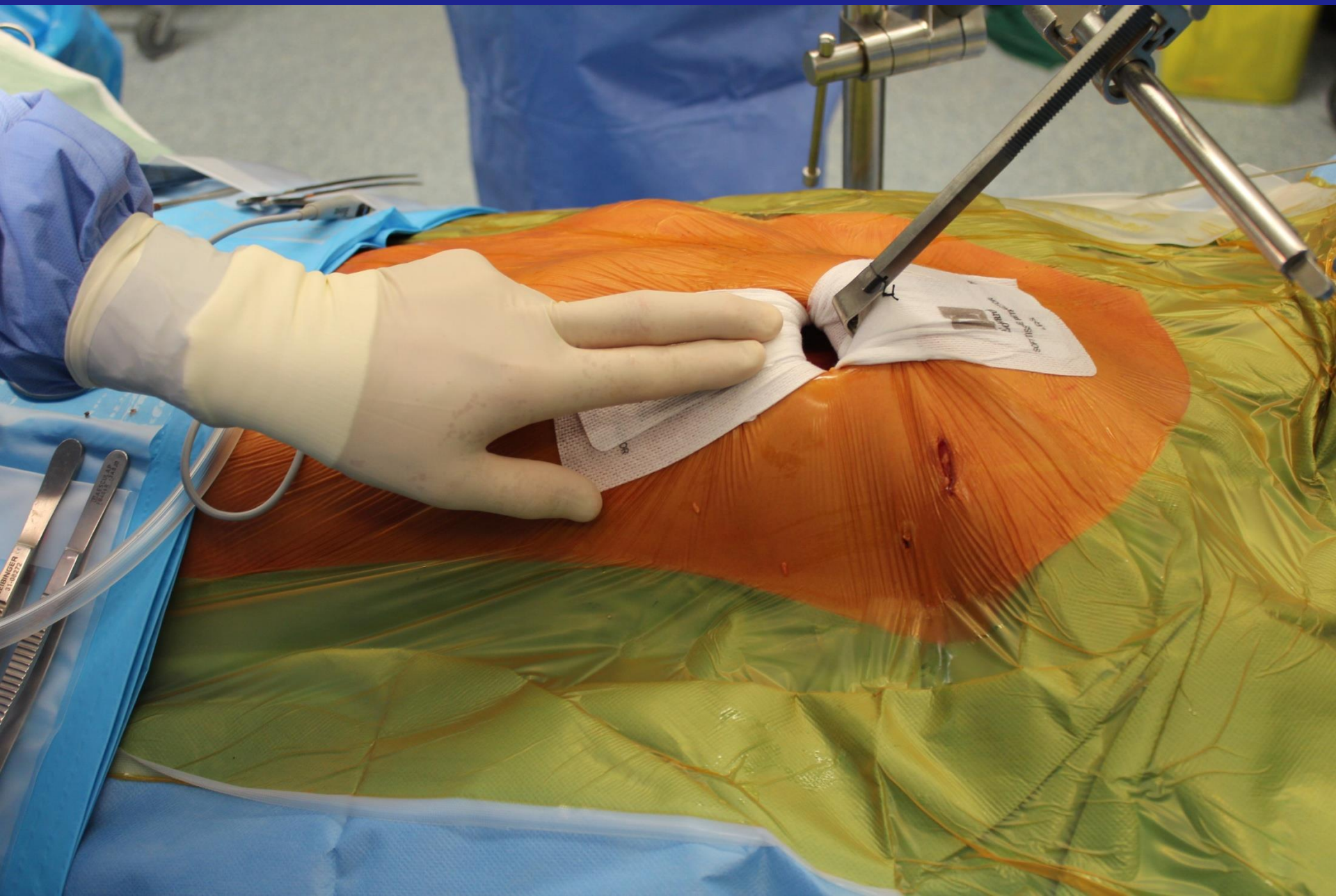


ROBOTIC ENHANCED CABG

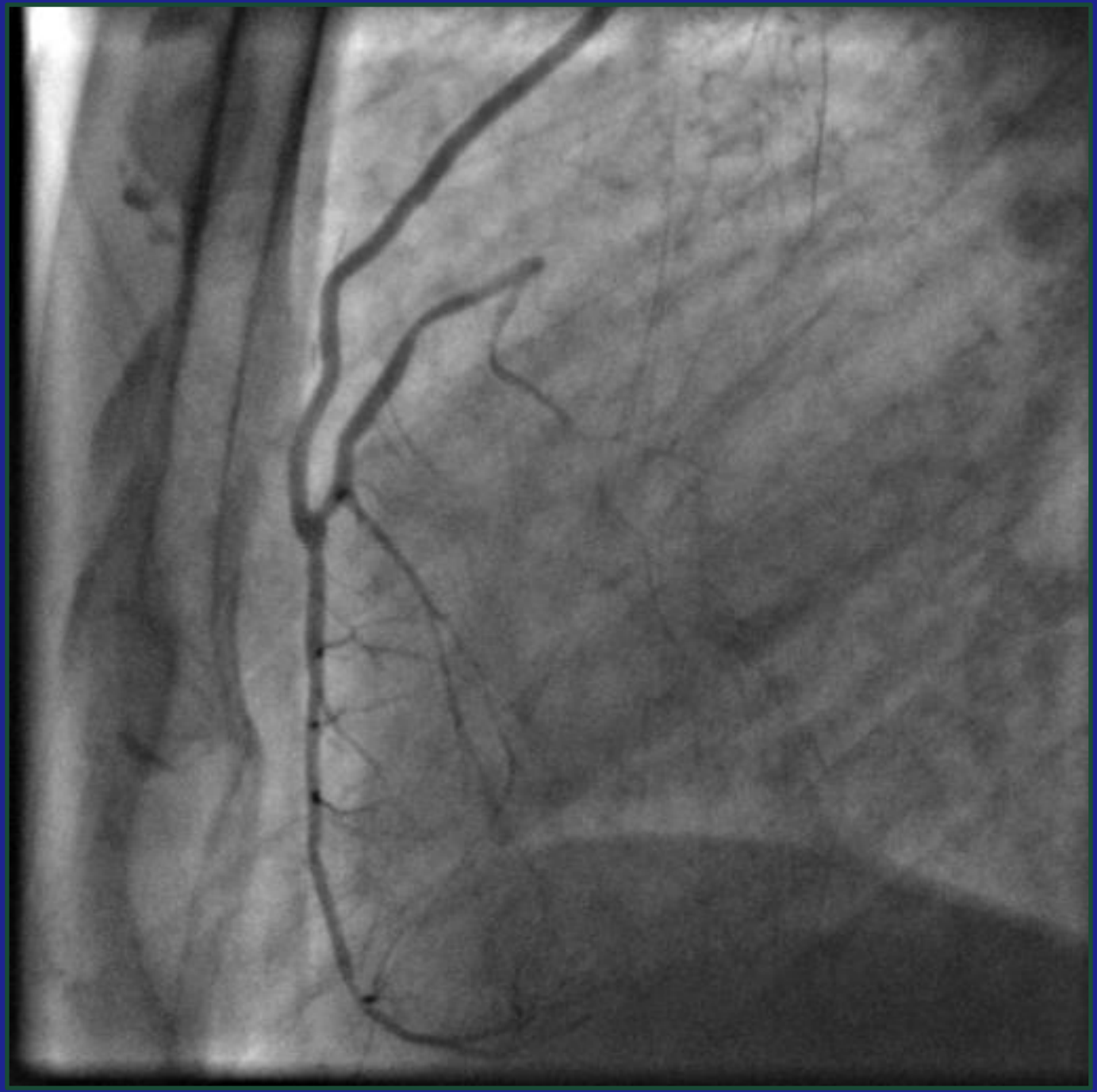
Surgeon at console

ROBOTIC ENHANCED SURGERY

Lift thoraxwand



Stabilisatie en anastomose



Robotically enhanced midcab
(n=511)

MORTALITY (in hospital and 30 day): n = 3 (0.6 %)
(100% FU complete)

MORBIDITY

- Early redo OPCAB : n = 3
- Early redo MVP+TVP+maze (sternot) : n = 1
- Thoracotomy CPB for C arrest: n = 1
- PCI Mid LAD + early redo : n = 1
- Redo PCI: n = 3
- Revision for bleeding : n = 8
- **CVA : n = 2**
- Pacemaker : n = 2
- ICD: n = 1
- Atrial fibrillation : n = 50
- Tracheotomy pulmonary insuff.: n = 3
- Pneumonia : n = 18
- Repair lunghernia : n = 1
- Thoracoscopy pneumothorax: n = 1
- ECLS : n = 1

Robotically enhanced midcab (n=511)

Planned as hybrid therapy : n = 151 *(29,5 %)*

Hybrid therapy	N	Delay (days)	Delay (range)
PCI before	58	60 ± 46,2	1-233
PCI same day	1		
PCI planned after *	92	9 ± 12,5	2-73

***PCI after : 12 pts not done**

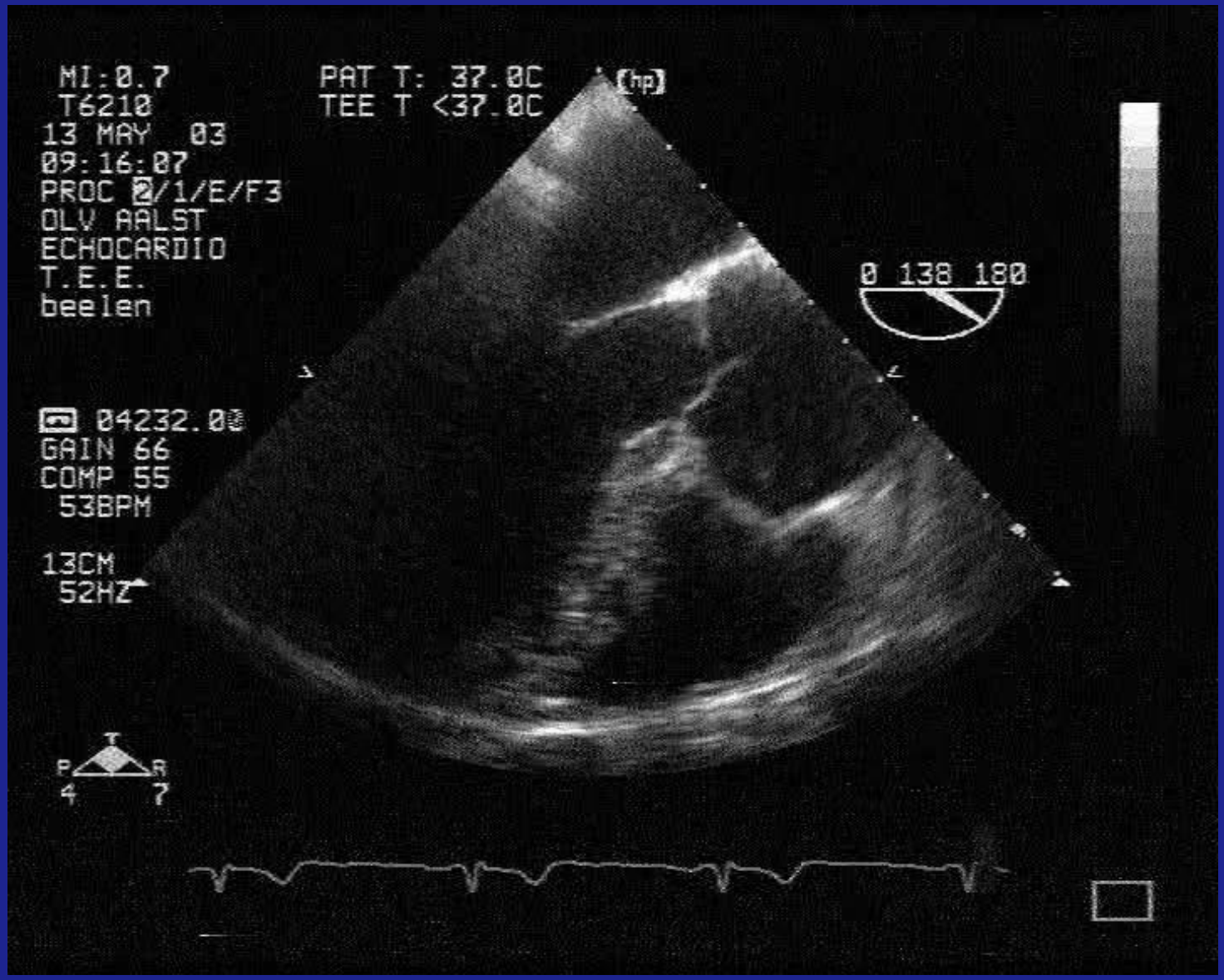
Procedure (n = 139, 12 pts not done)

- **PCI + Stent (n = 121)**
  - RCA : n = 75
  - CX : n = 27
  - RCA, CX : n = 13
  - LAD/D1: n = 3
  - RA : n = 1
  - LAD, RCA, CX : n = 1
  - LM n = 1

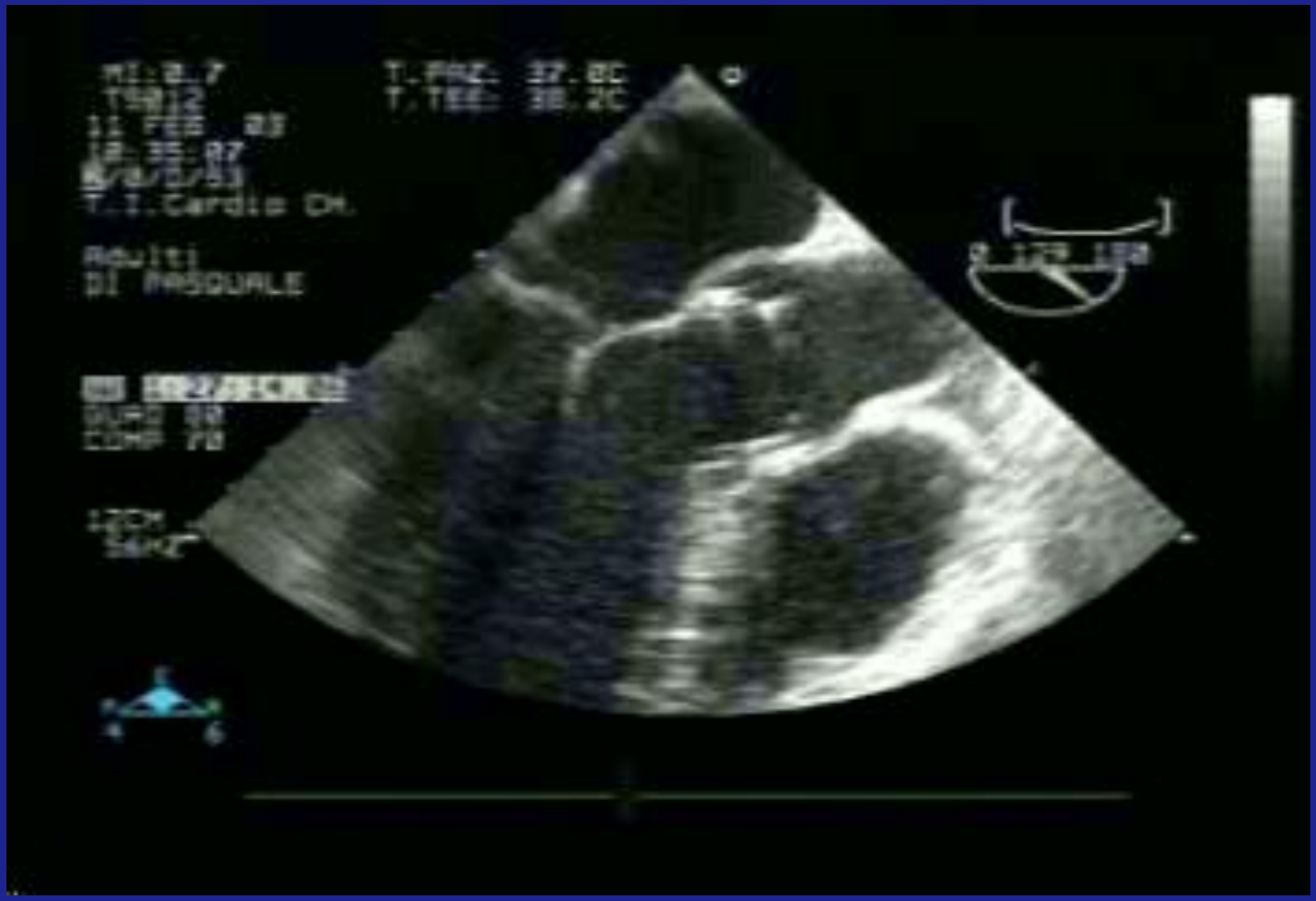
- **FFR (n = 18)**
  - RCA : n = 8
  - RA : n = 1
  - CX : n = 5
  - LM : n = 2
  - LM prox CX: n = 1
  - D1: n = 1

VALVE DISEASE

TEE – Aortic root dilat.: Nrl MV



TEE – P2 Prolaps



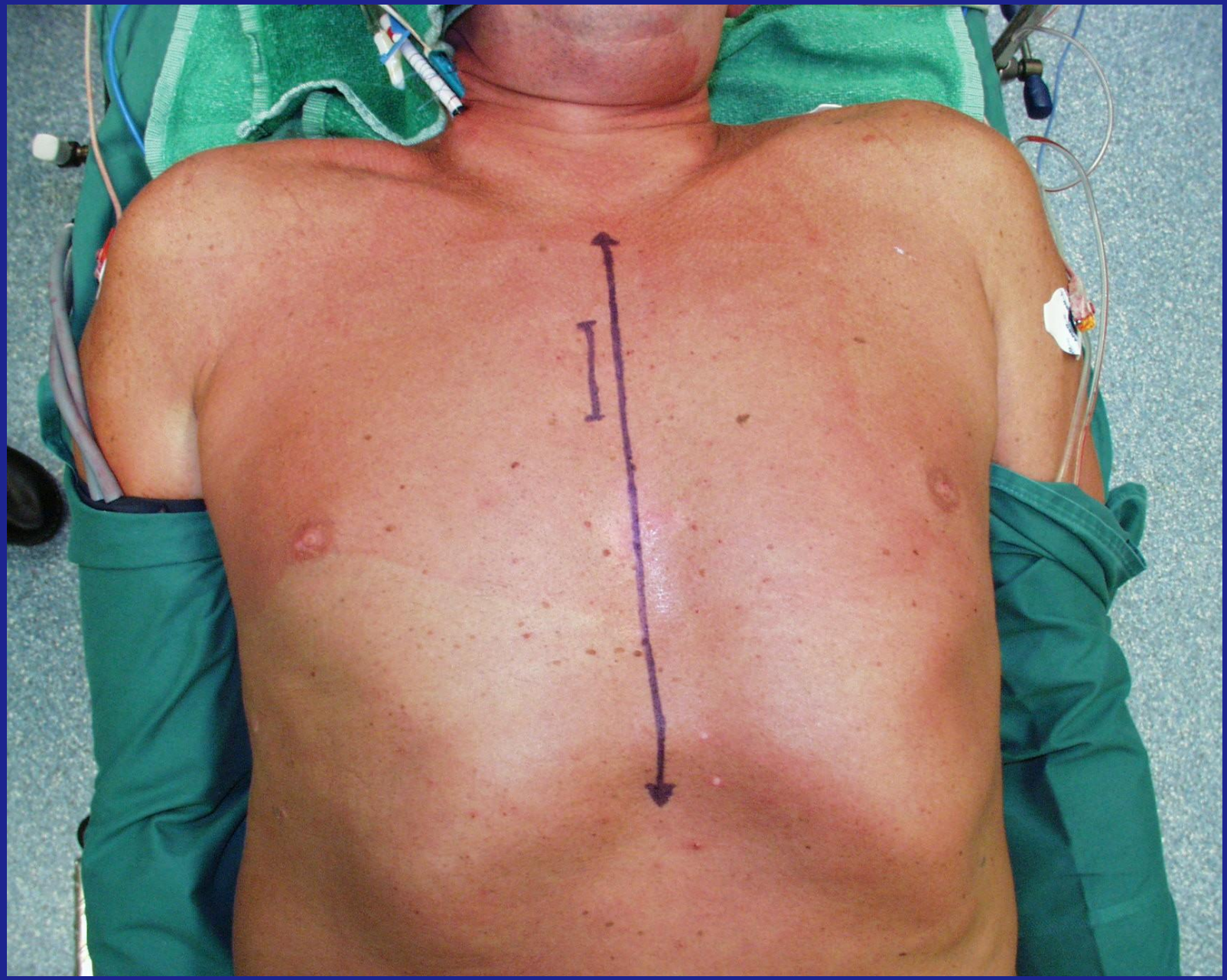
Aortic valve

→ J-Sternotomy

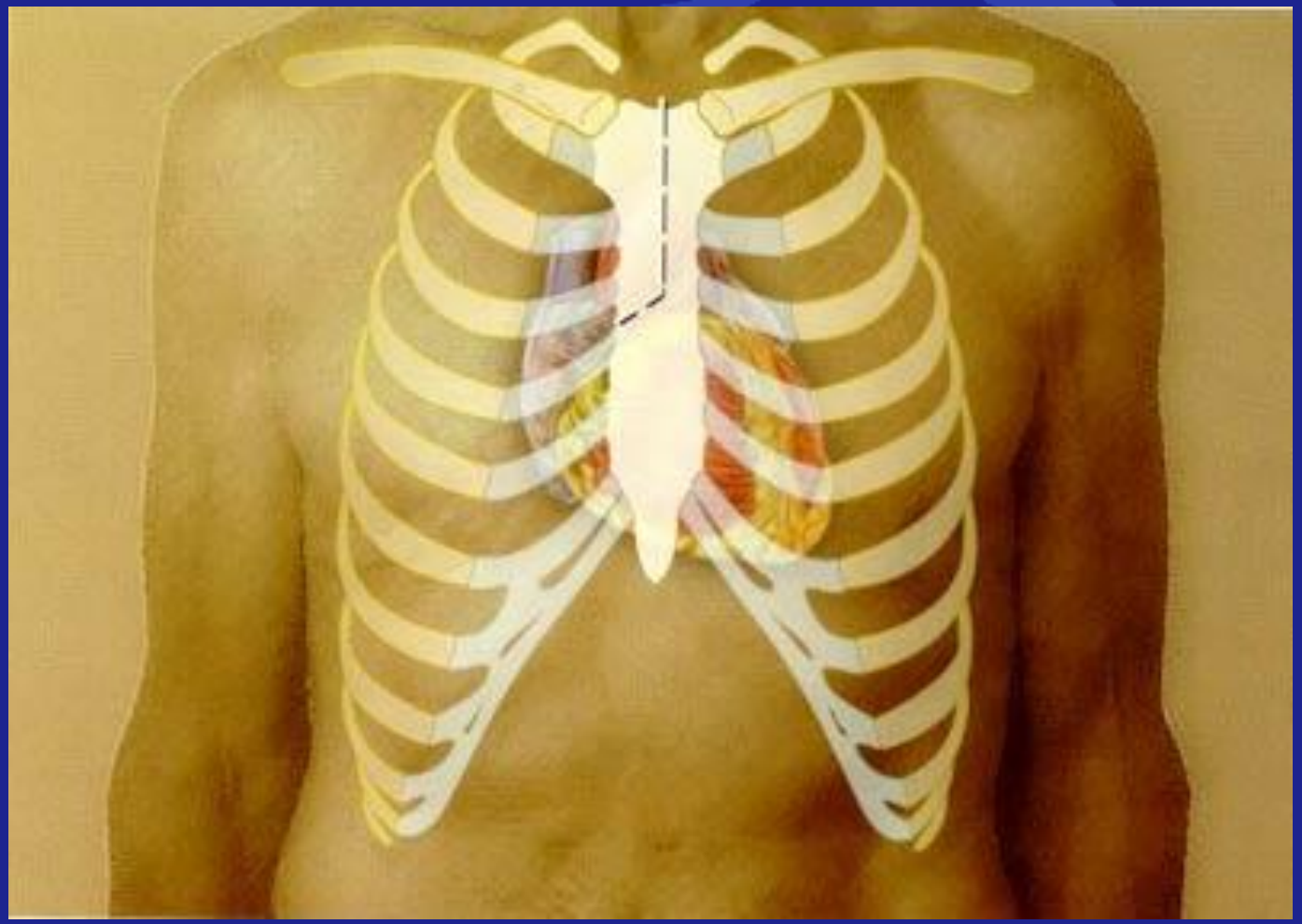
→ Sternotomy

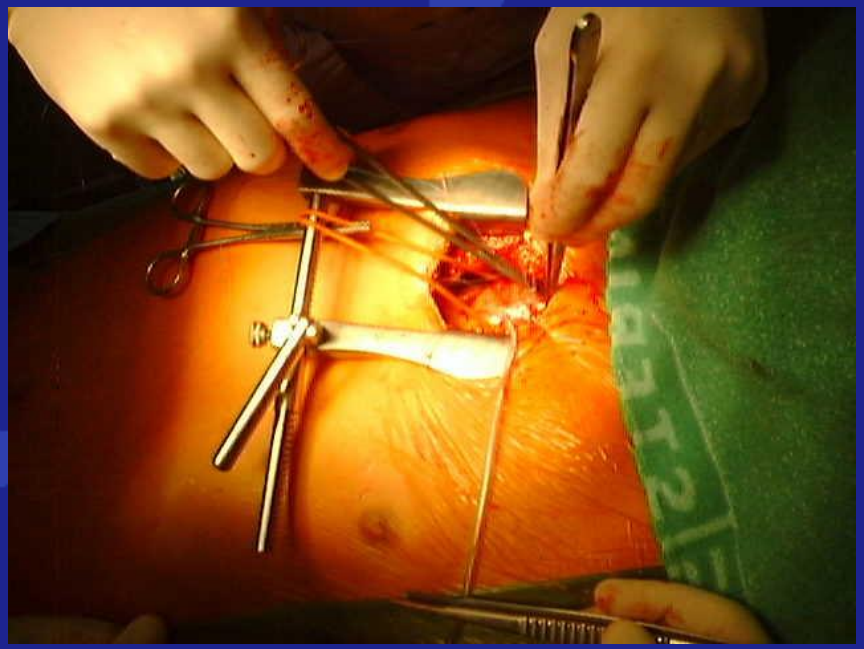
→ Percutaneous AVR

→ Valve sparing



Aortaklep
“J-Sternotomie”





AVR J vs FULL STERNOTOMY

Minimally Invasive Versus Standard Approach Aortic Valve Replacement: A Study in 506 Patients

Ihsan Bakir, MD, Filip P. Casselman, MD, PhD, Francis Wellens, MD, Hugues Jeanmart, MD, Raphael De Geest, MD, Ivan Degrieck, MD, Frank Van Praet, MD, Yvette Vermeulen, MS, and Hugo Vanermen, MD

Department of Cardiovascular Surgery, Siyami Ersek Thoracic and Cardiovascular Surgery Center, Istanbul, Turkey; Cardiovascular and Thoracic Surgery Department, OLV Clinic, Aalst, Belgium

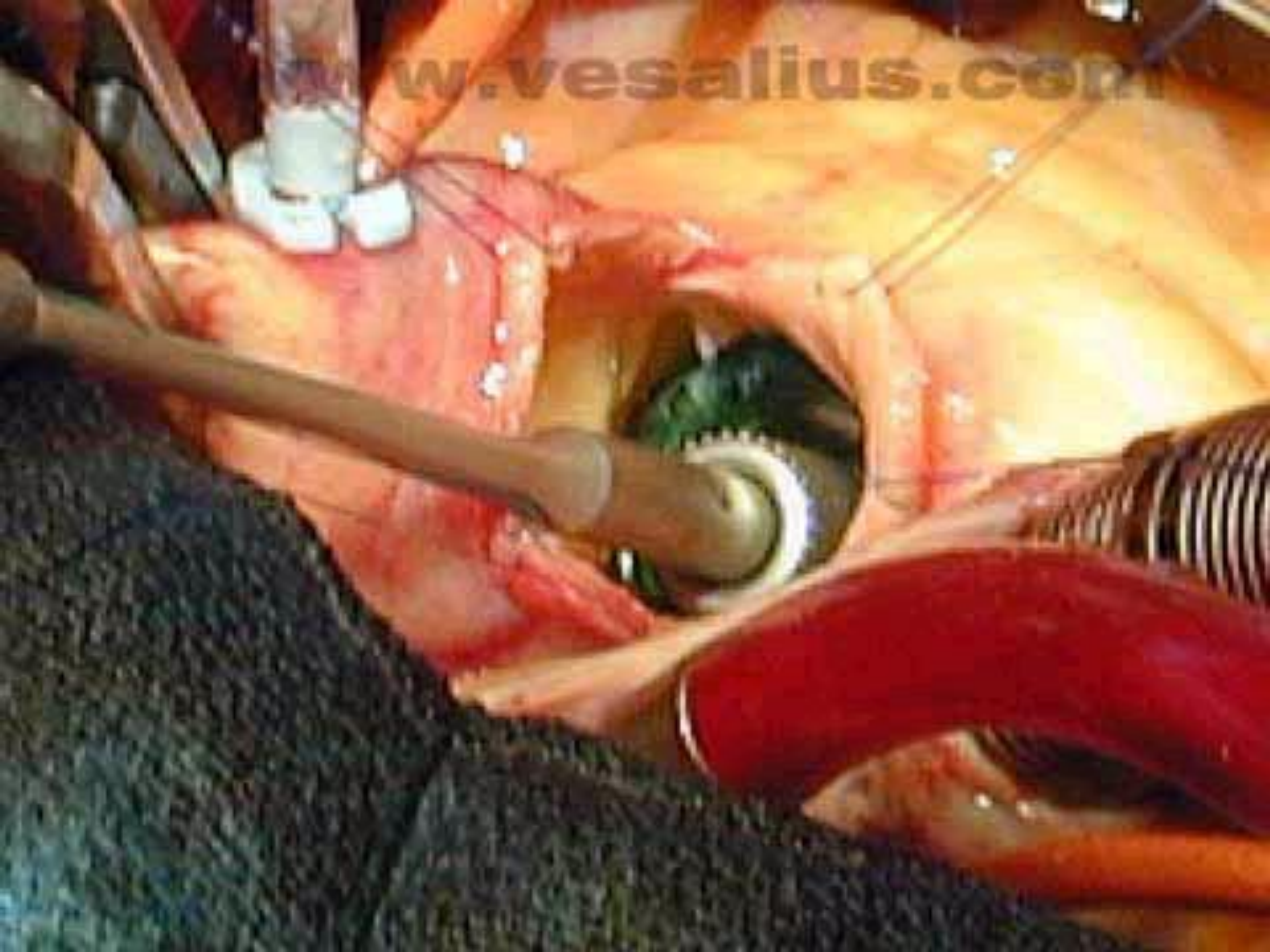
Background. Minimally invasive aortic valve replacement through partial upper sternotomy has been shown to reduce surgical trauma, and, supposedly, decrease postoperative pain, blood loss, and hospital stay.

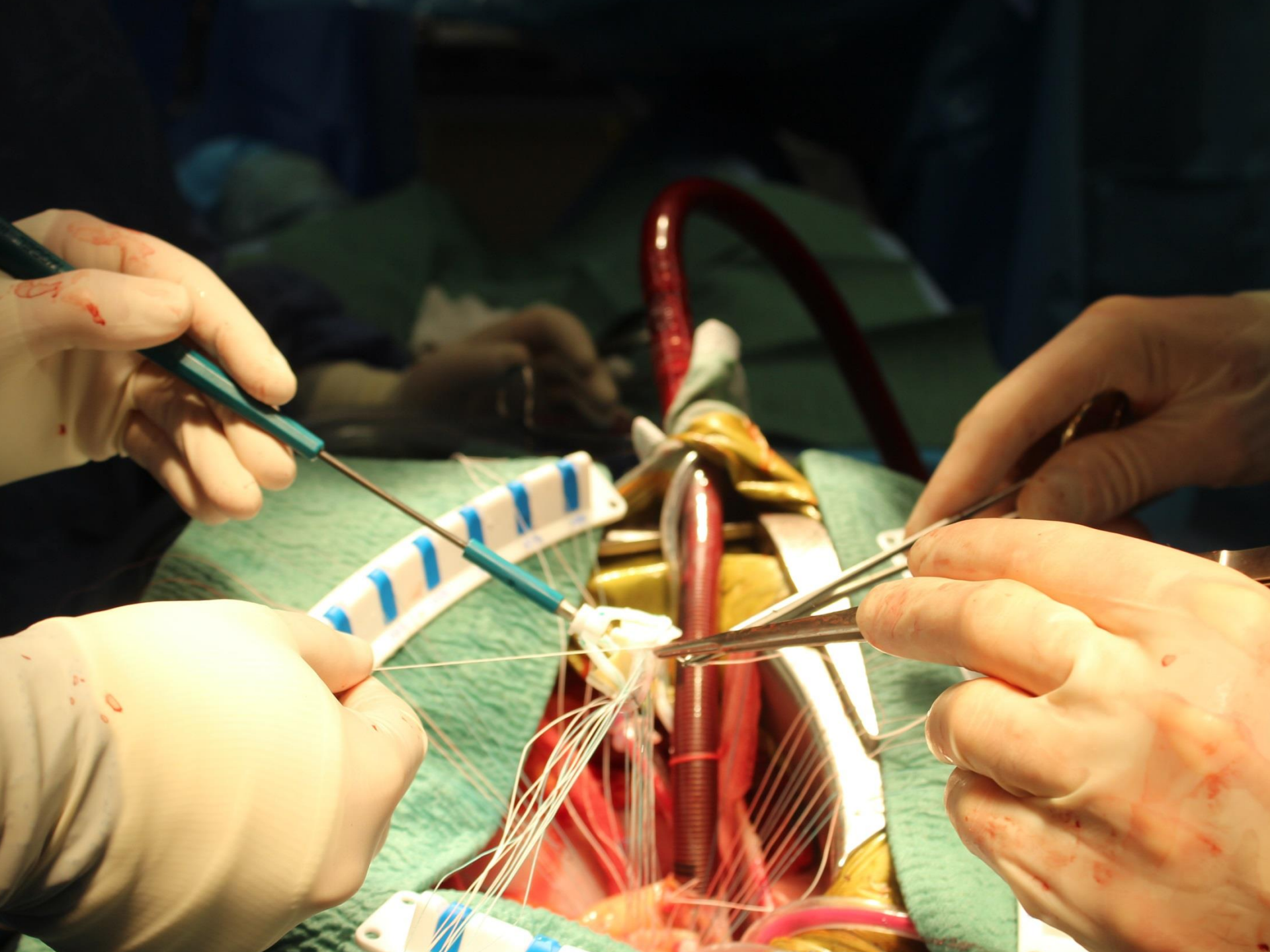
Methods. From October 1997 until November 2004, 506 patients received isolated aortic valve replacement, of which 232 underwent the minimal access J-sternotomy approach (group 1). The control group (group 2) consisted of 274 patients who underwent aortic valve replacements by median sternotomy. We retrospectively reviewed outcomes of the patients in the early follow-up period.

Results. In group 1 and group 2, respectively, early mortality was 2.6% (6 patients) and 4.4% (12 patients). The minimal access group had reduced aortic cross-clamp and cardiopulmonary bypass times compared with conventional group: 61.8 ± 16.6 versus 69.5 ± 16.6 minutes ($p < 0.05$) and 88.8 ± 23.2 versus 100.2 ± 22.6 minutes ($p < 0.05$), respectively. Mean blood loss was lower in group 1 compared with group 2 ($p < 0.05$). Intensive care unit and hospital stays were shorter in the minimal access group: 2.1 ± 2.5 versus 2.5 ± 5.3 days (p = nonsignificant) and 10.8 ± 7.1 versus 12.8 ± 10.6 days ($p < 0.05$), respectively.

Conclusions. Aortic valve replacement can be performed safely through a partial upper sternotomy on a routine basis for isolated aortic valve disease.

(Ann Thorac Surg 2006;81:1599–604)


w.vesalius.co



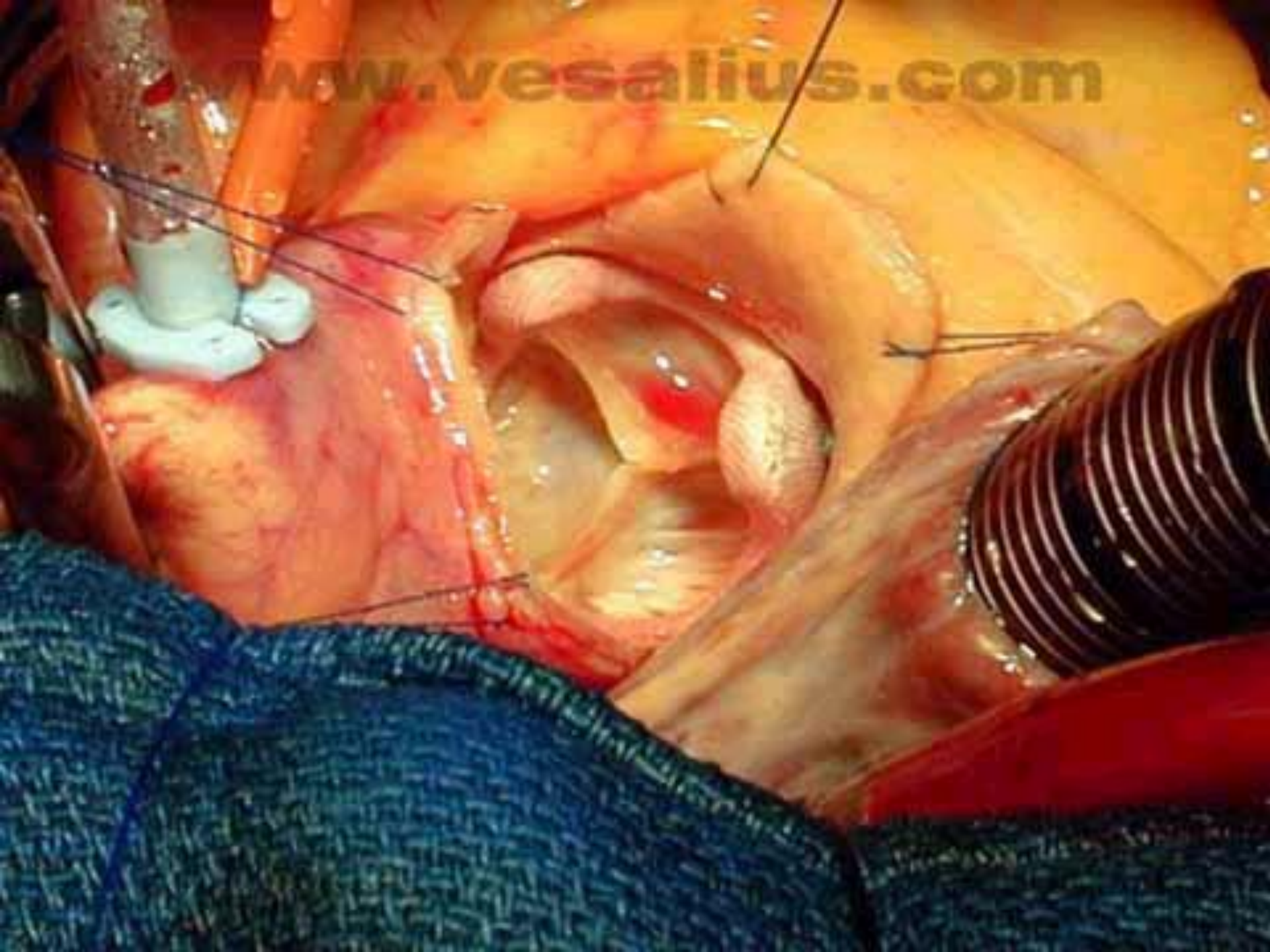
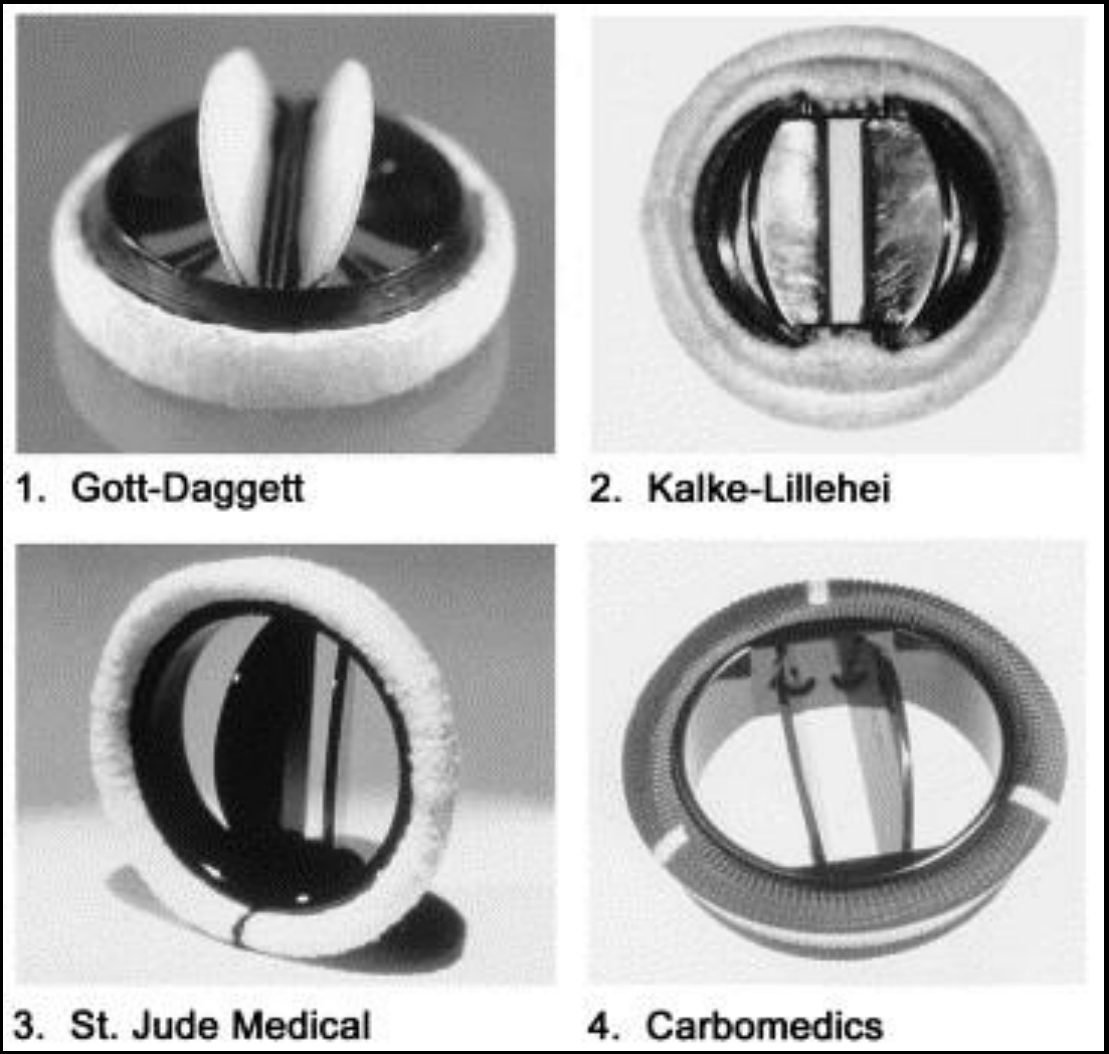
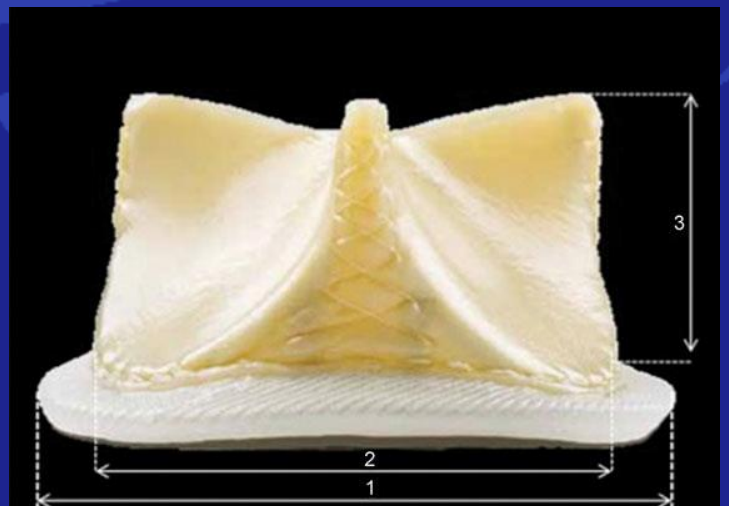


Fig 5



The Annals of Thoracic Surgery 2003 76, S2230-S2239DOI: (10.1016/j.athoracsur.2003.09.002)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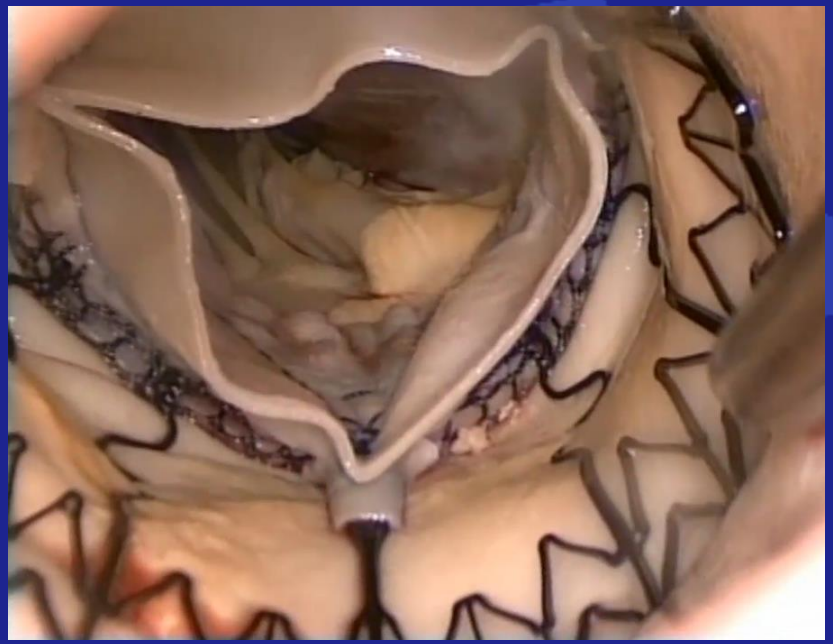
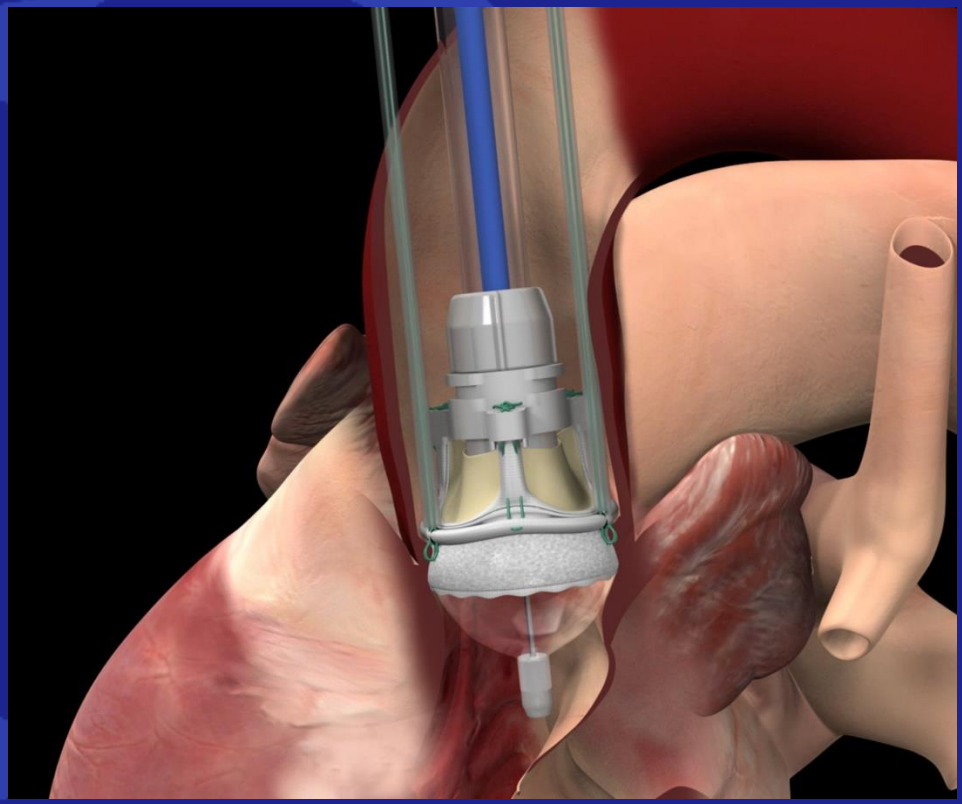
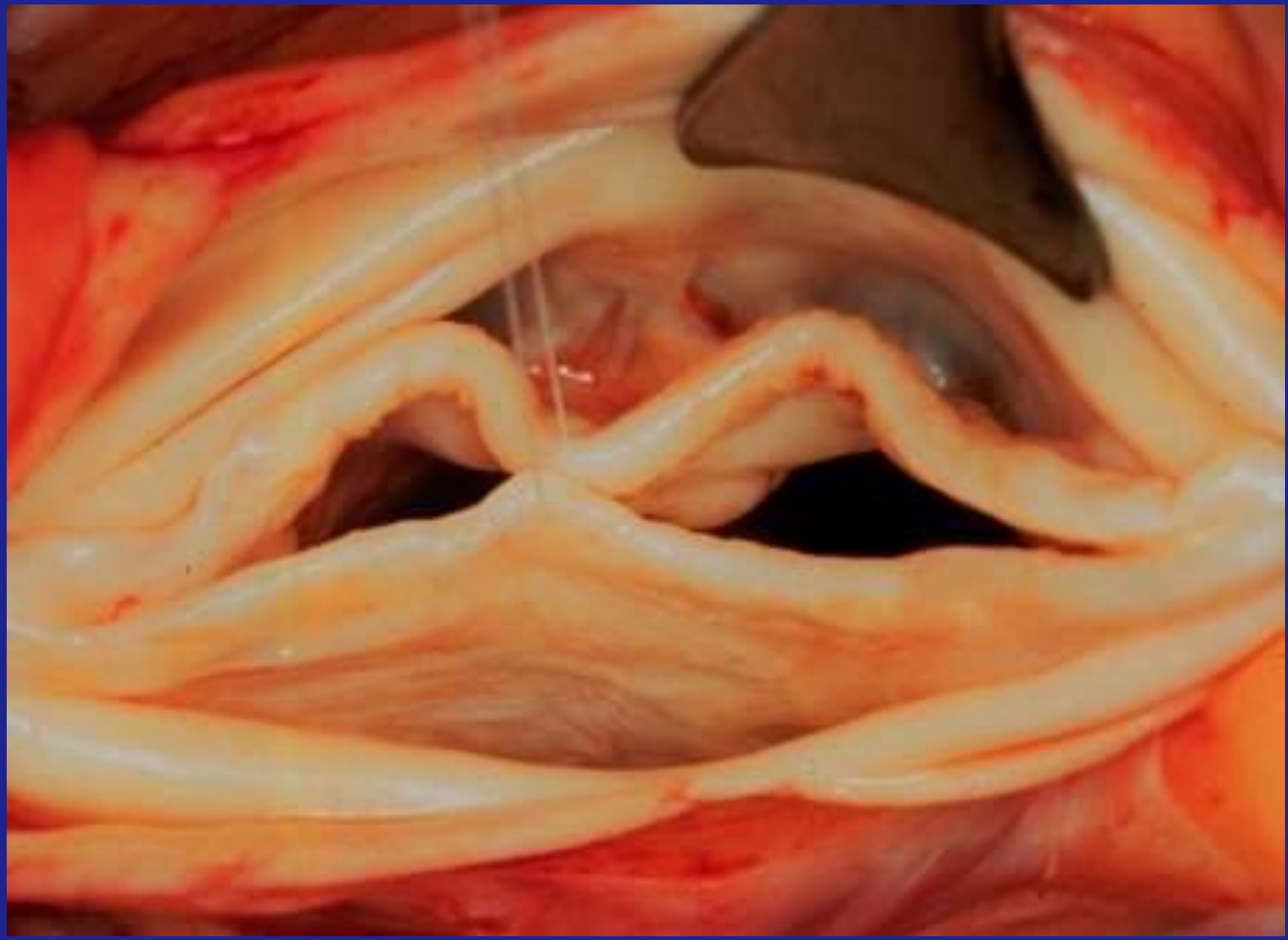
perceval s

investigational device

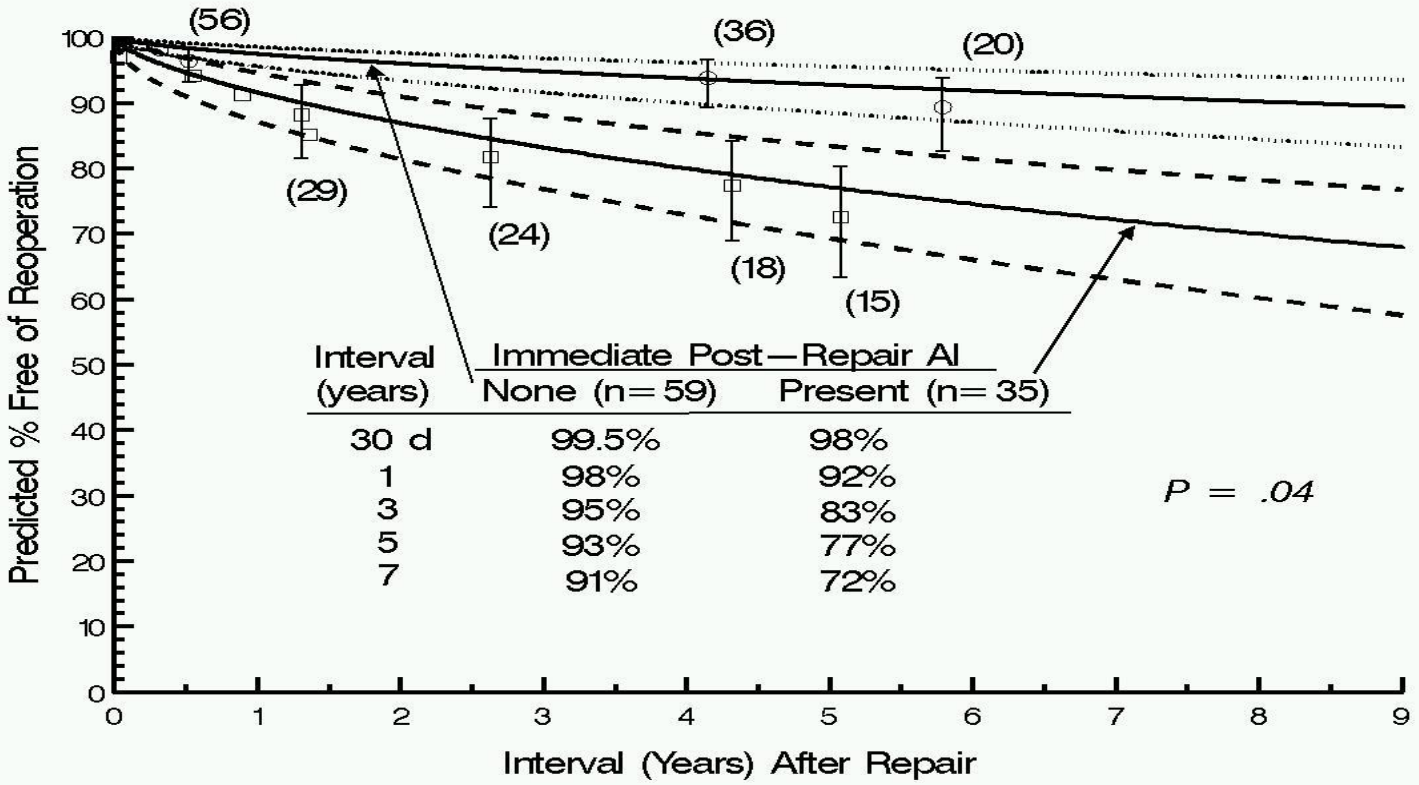




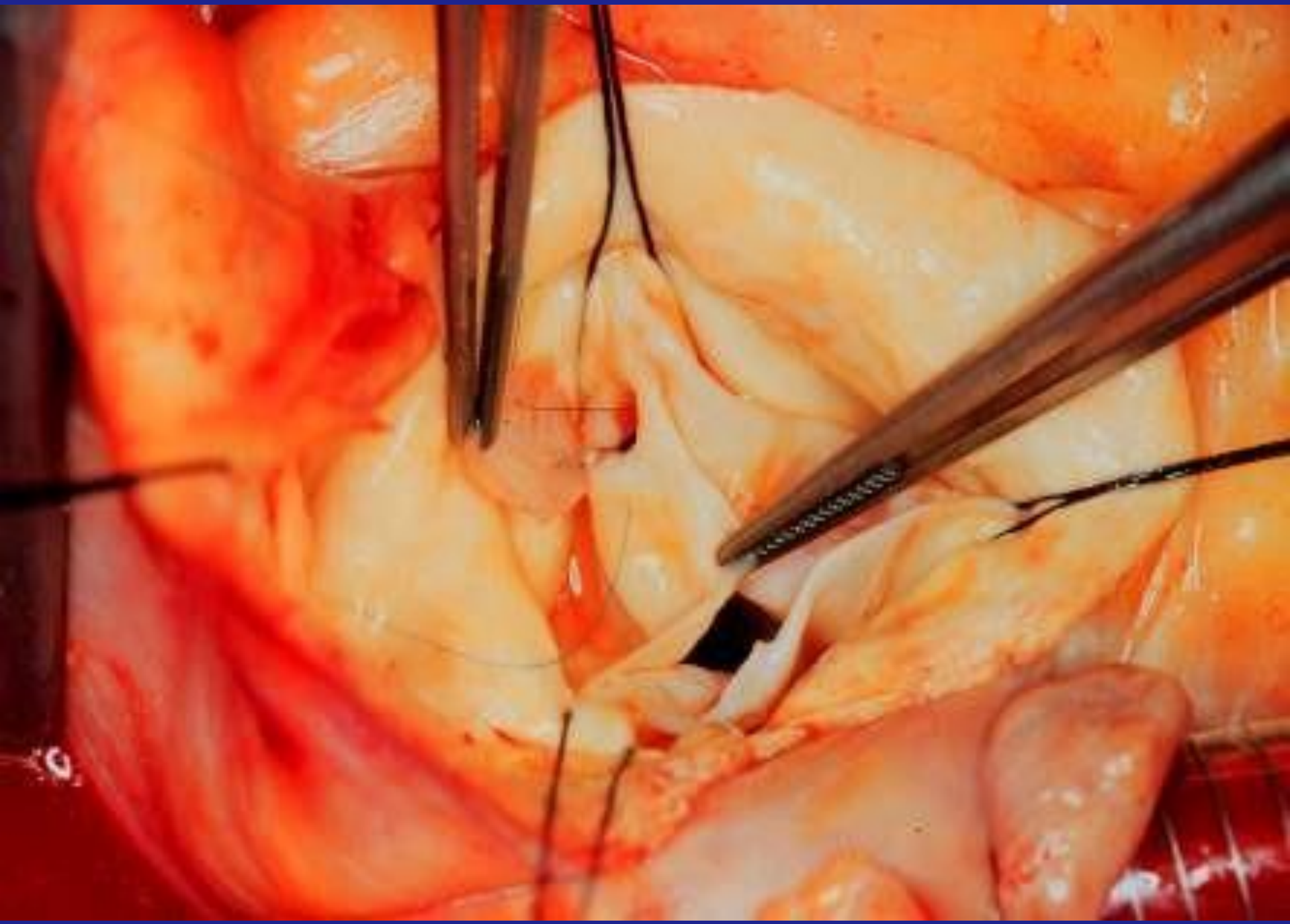
BICUSPID AORTIC VALVE



BICUSPID AORTIC VALVE
N=94



Casselman Eur J Cardiothorac Surg 1999;15:302-8



Homograft

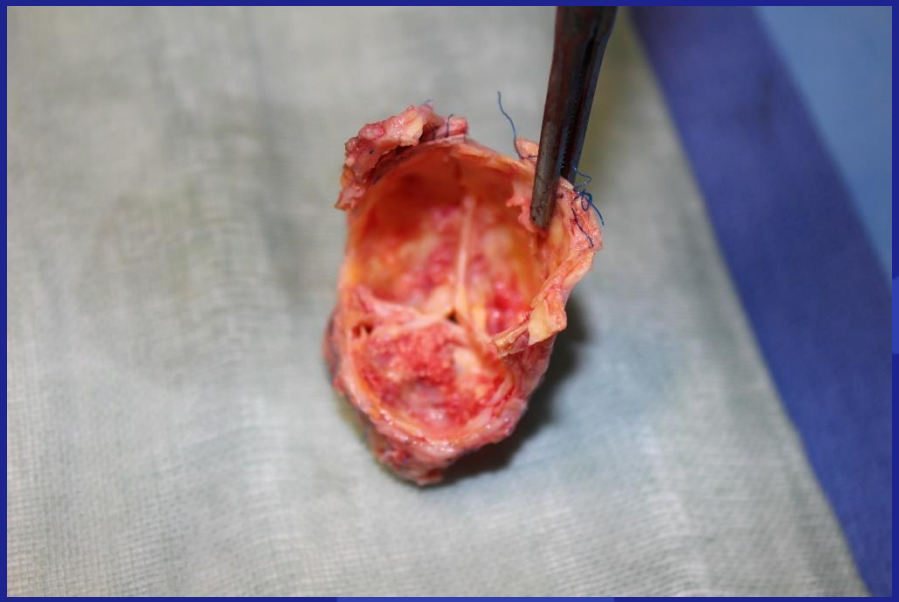
- Human aortic valve - root – ascending Ao

- Used as a biological conduit in younger patients

  → : difficult reoperations

- Very resistent to **endocarditis**

  → : main indication today

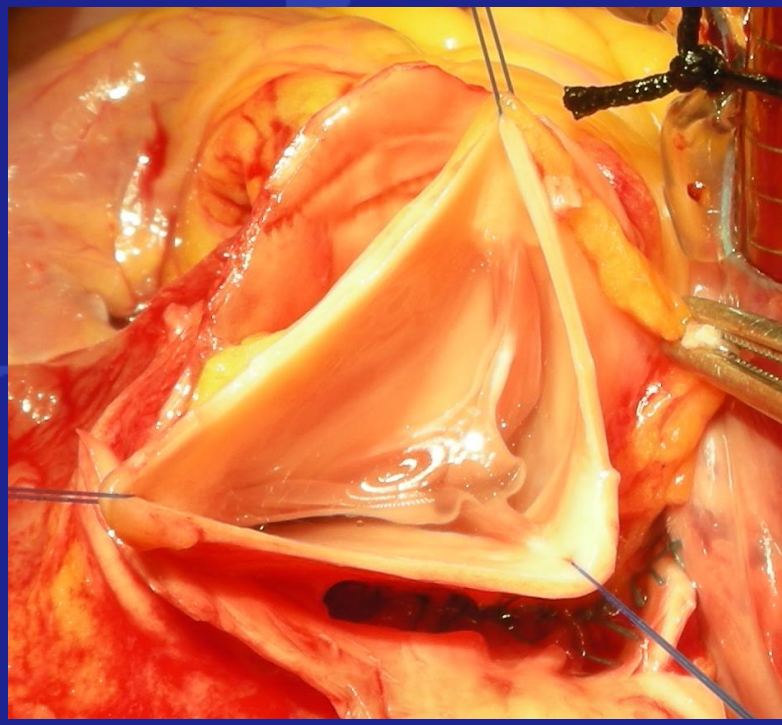



1
1

Ross procedure

- Autologous pulmonary valve in aortic position – homograft in pulmonary position
- Growth potential !

  Congenital heart domain
- Selectively used in adults



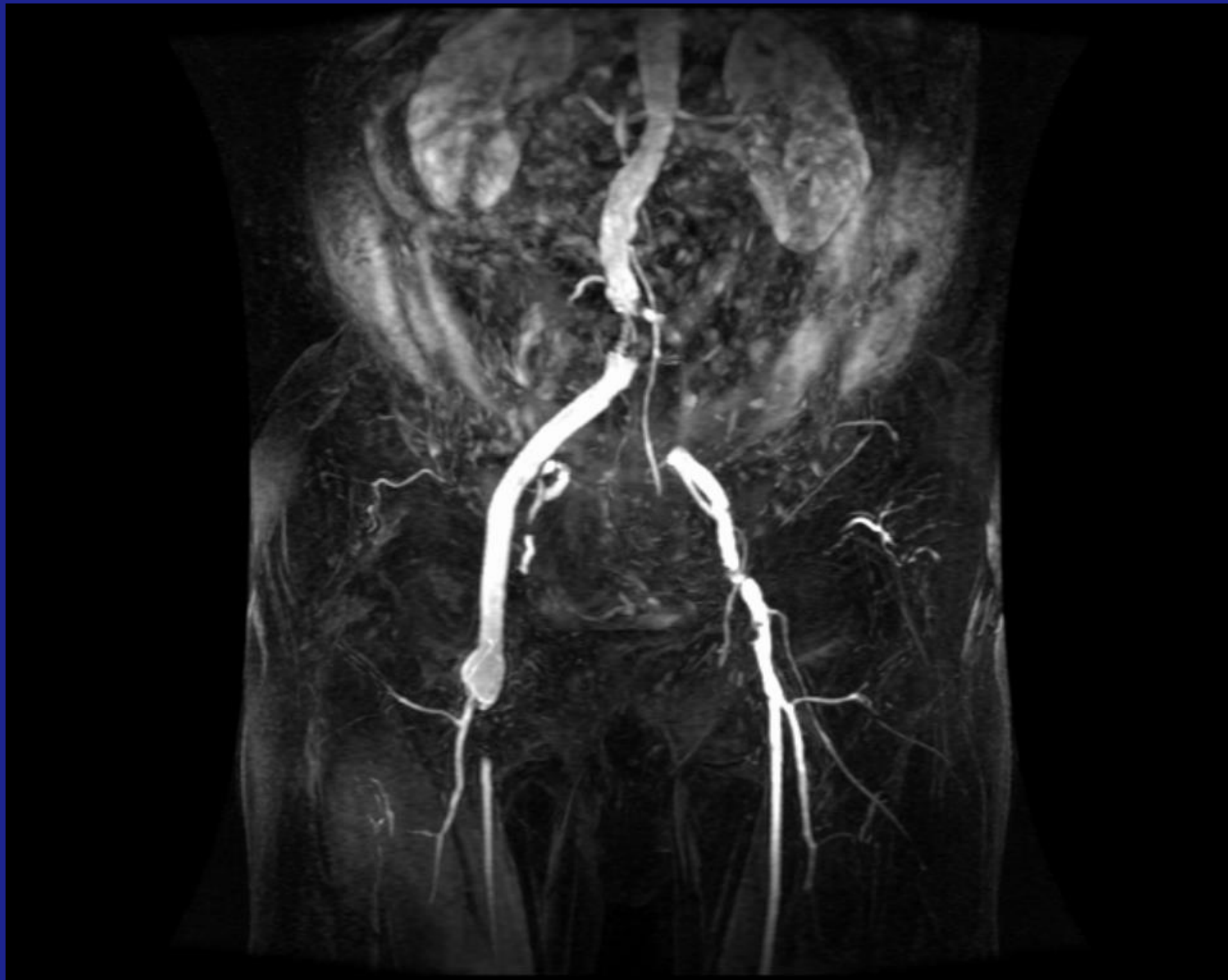
Percutaneous valves
Original ‘birth’

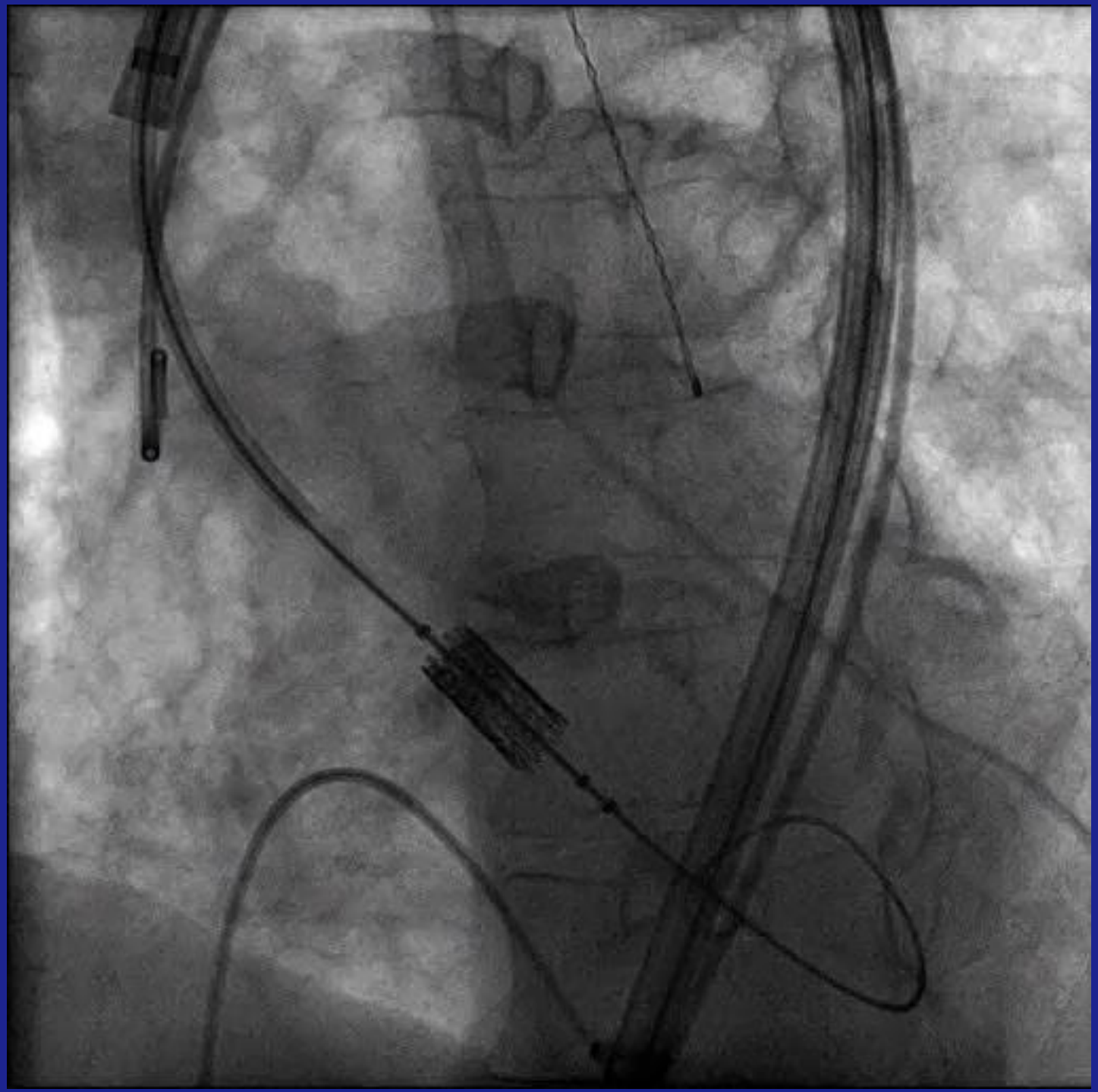
- Patients with excessive operative risk
  - multiple comorbidities (severe COPD, renal failure, …)
  - ‘age’
  - frailty
  - multiple redo procedure

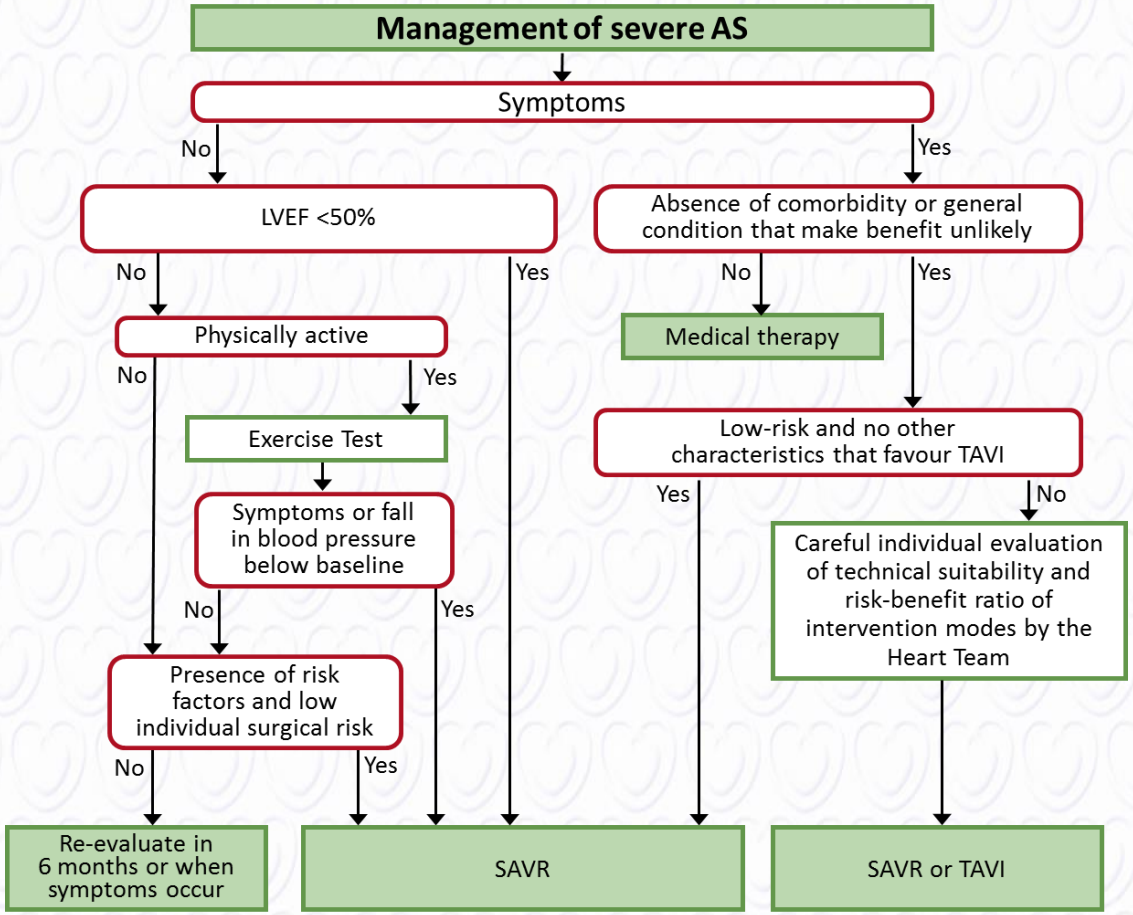
Percutaneous valves

Percutaneous valves
Access routes

- **Transfemoral**
- Transapical
- Transaortic
- Transsubclavian, transcarotid, transcaval, …





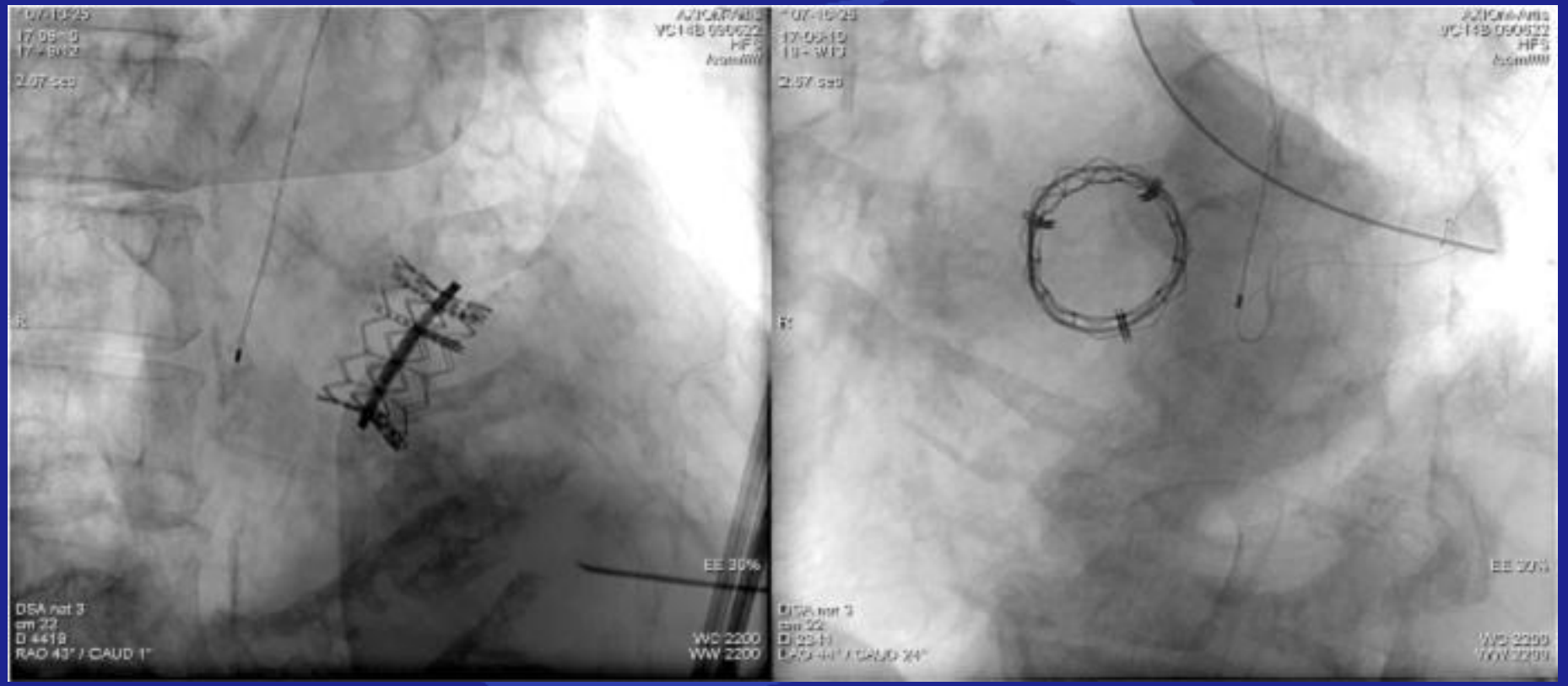

Management of severe AS
Symptoms
No
Yes
LVEF <50%
Absence of comorbidity or general condition that make benefit unlikely
No
Yes
No
Yes
Physically active
Medical therapy
No
Yes
Exercise Test
Low-risk and no other characteristics that favour TAVI
Yes
No
Symptoms or fall in blood pressure below baseline
Careful individual evaluation of technical suitability and risk-benefit ratio of intervention modes by the Heart Team
No
Yes
Presence of risk factors and low individual surgical risk
No
Yes
Re-evaluate in 6 months or when symptoms occur
SAVR
SAVR or TAVI

Low Risk Trials
Word of caution

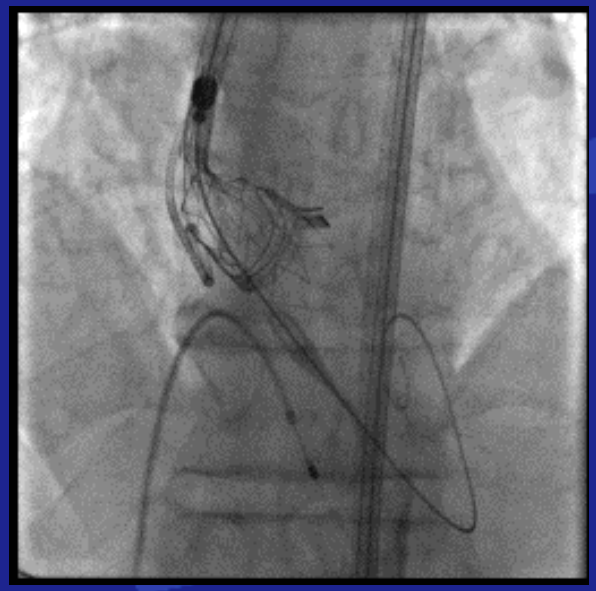
- 36 % of screened patients were refused
- 25 % of patients underwent concomitant R/
- Durability unknown beyond 6-7 years
- Some valves up to 30 % of PM need !!
- Cost remains an issue
- Bicuspid valve
- Vascular access
- PPM - PVL
- Life-expectancy (? > 10 y ?)

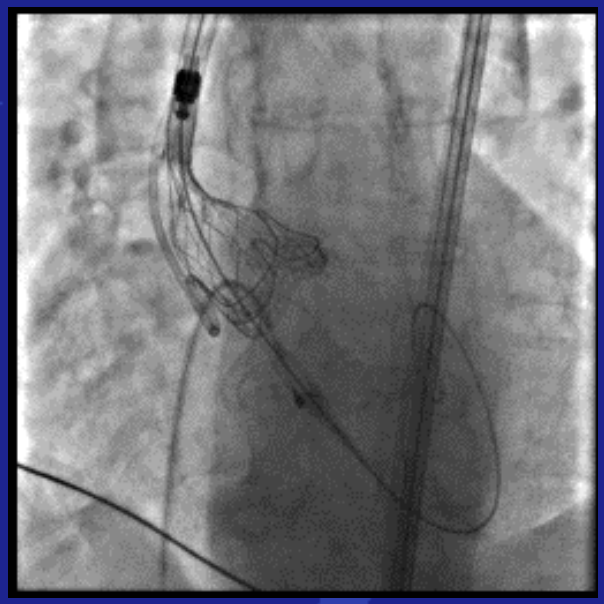
Percutaneous valve therapy
2019 Belgium

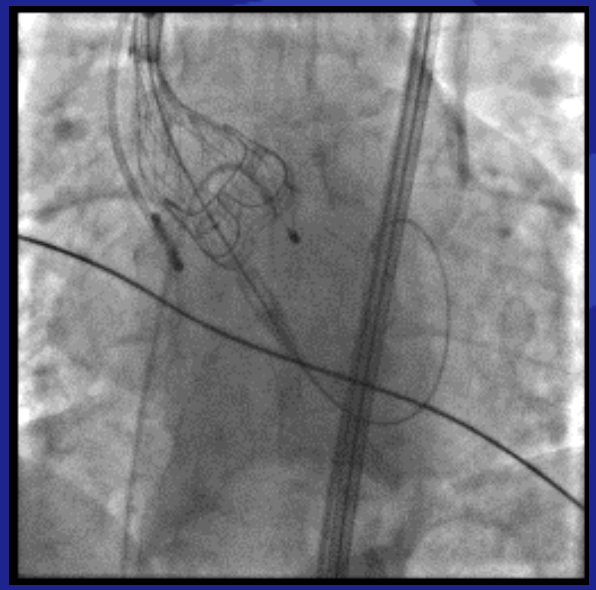
- Reimbursement as Quotum (10 %) per center per year related to average valve volume over the last 3 years

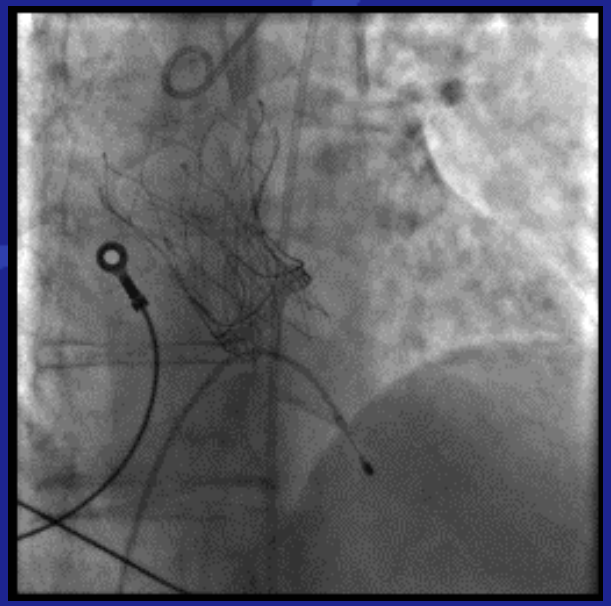

DSA rat 3
cm 22
D 4418
RAO 43° / CAUD 1°
WC 2200
WW 2200

ViV (Valve in Valve)





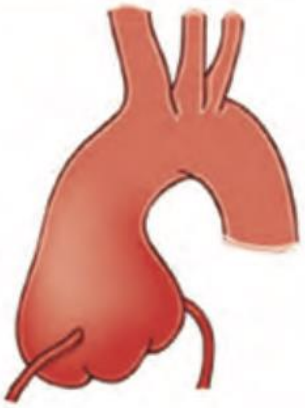




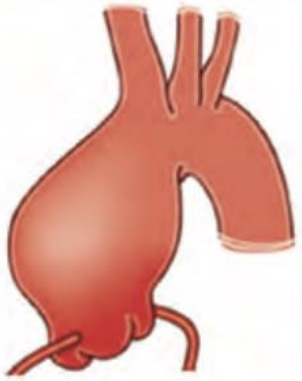
2017 ESC/EACTS Valvular Heart Disease GL
AORTIC REGURGITATION

- **EVALUATION**

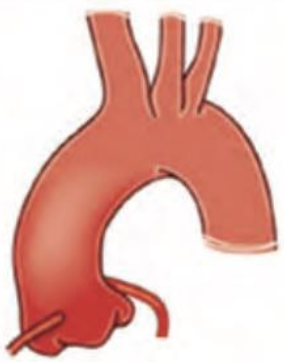
Phenotypes of the aortic root and ascending aorta



Aortic root aneurysm
Sinuses of valsalva ≥45 mm

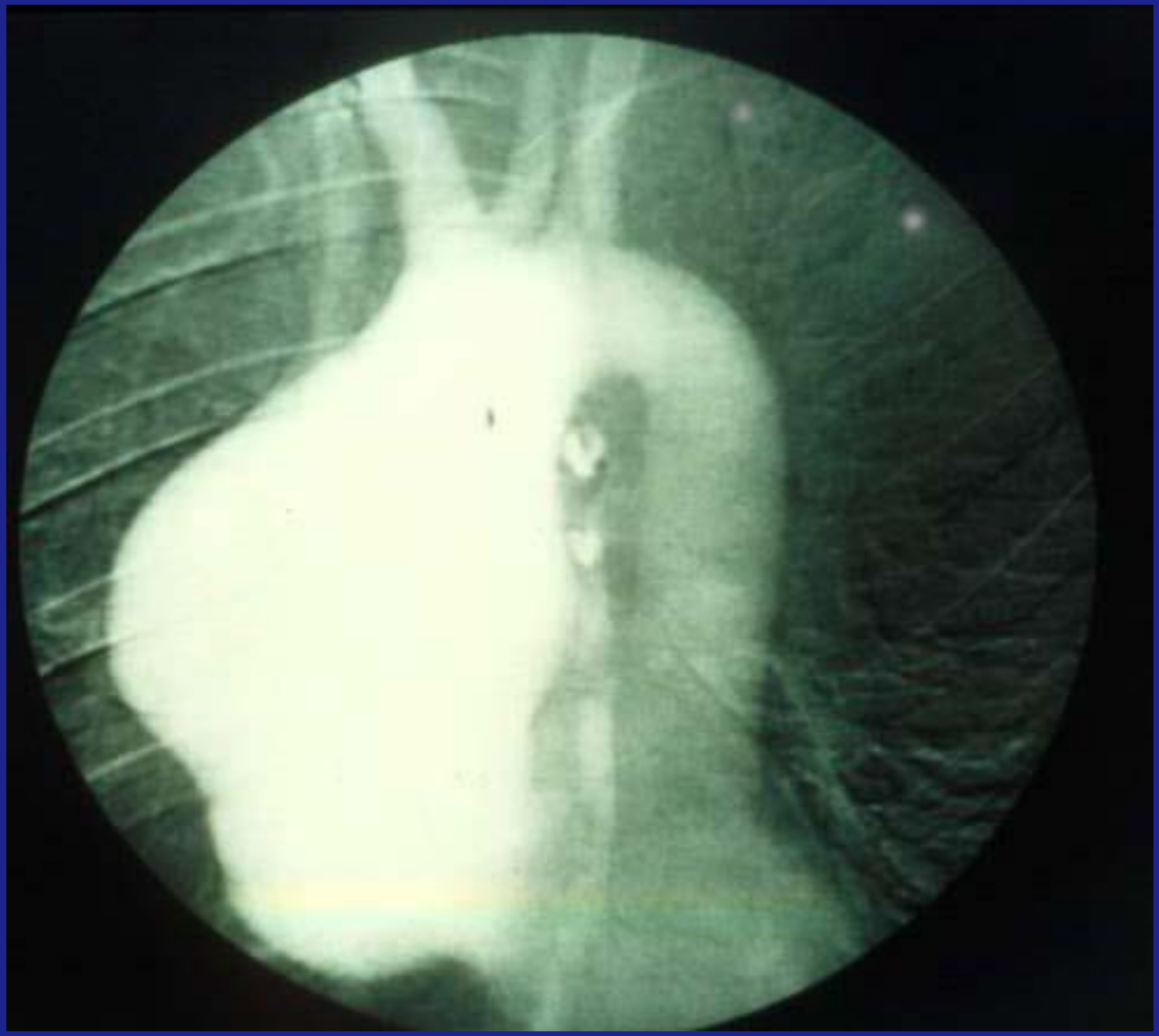


Tubular ascending aorta aneurysm
Sinuses of valsalva ≤40 mm

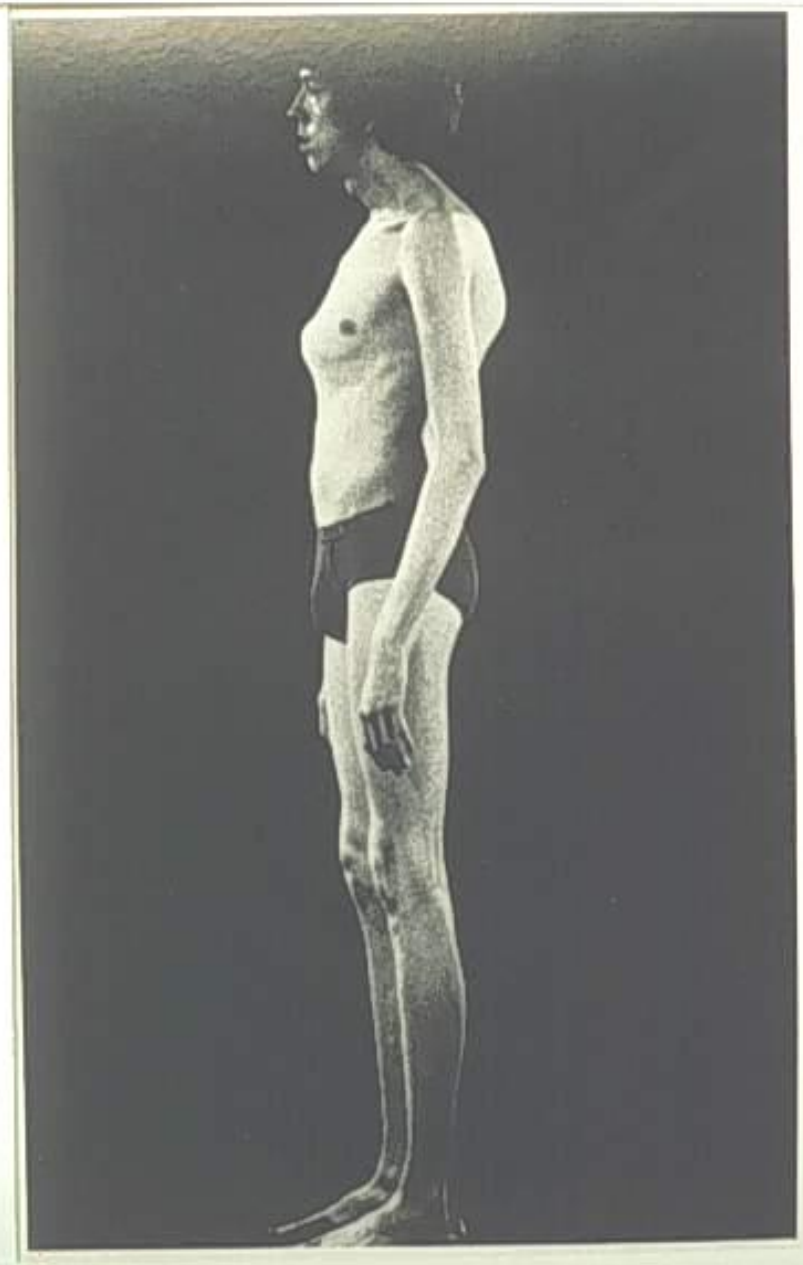


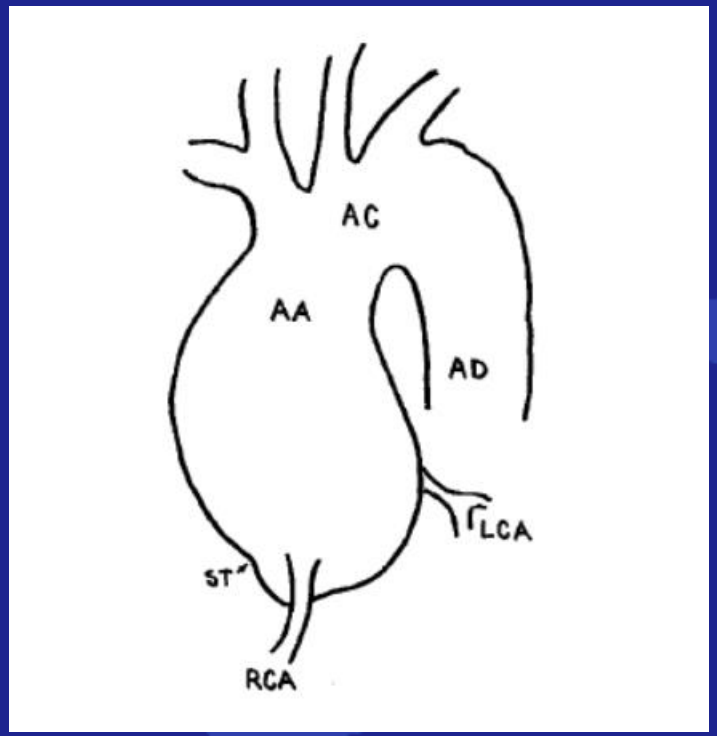
Isolated AR
All diameters <40 mm

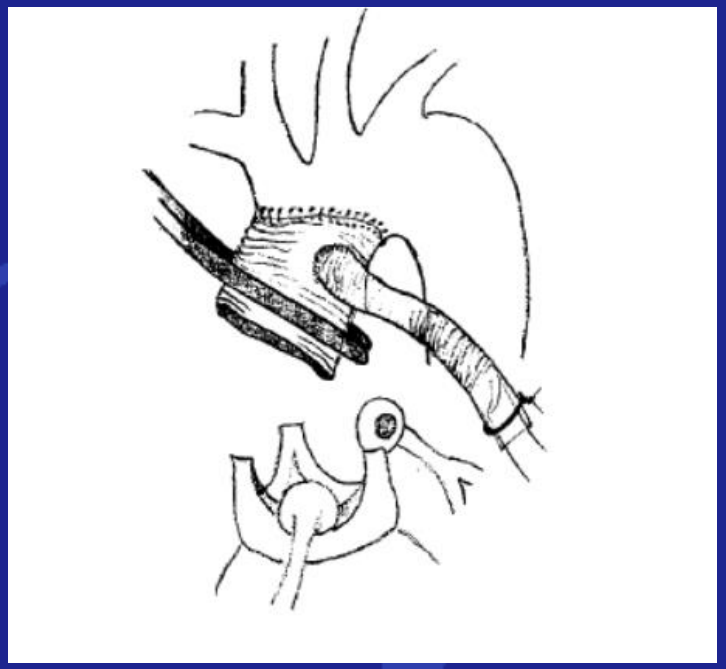
2017 ESC/EACTS Guidelines for the Management of Valvular Heart Disease
(European Heart Journal 2017 - doi:10.1093/eurheartj/ehx391)

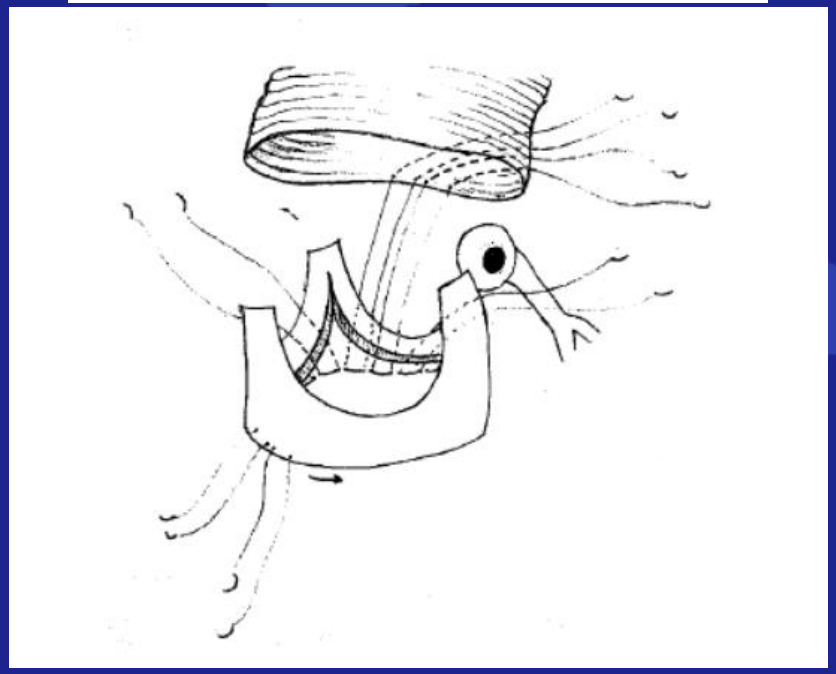


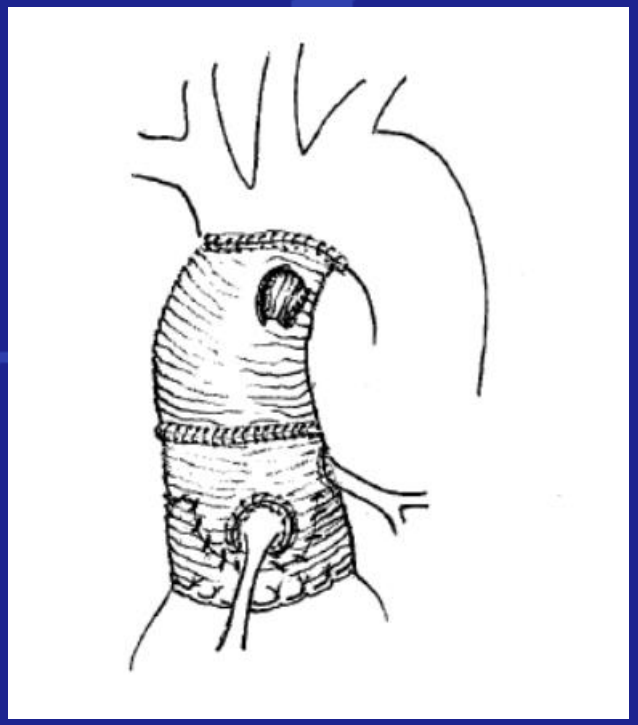
MARFAN'S SYNDROME

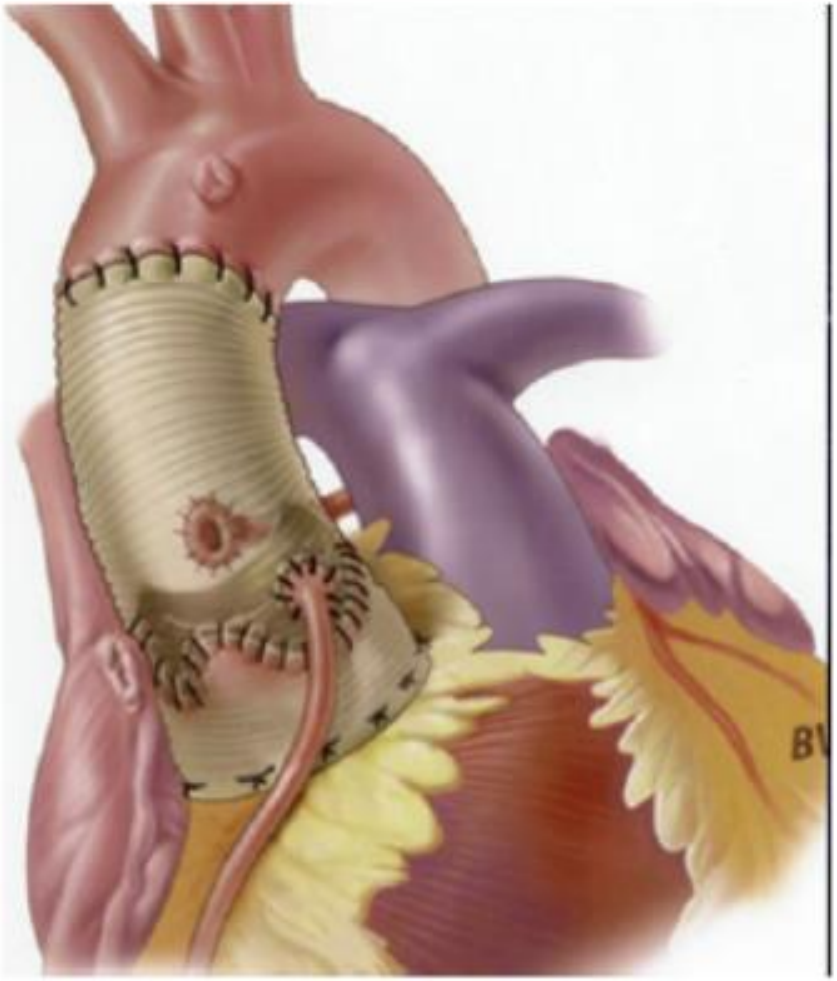



AC
AA
AD
LCA
ST
RCA

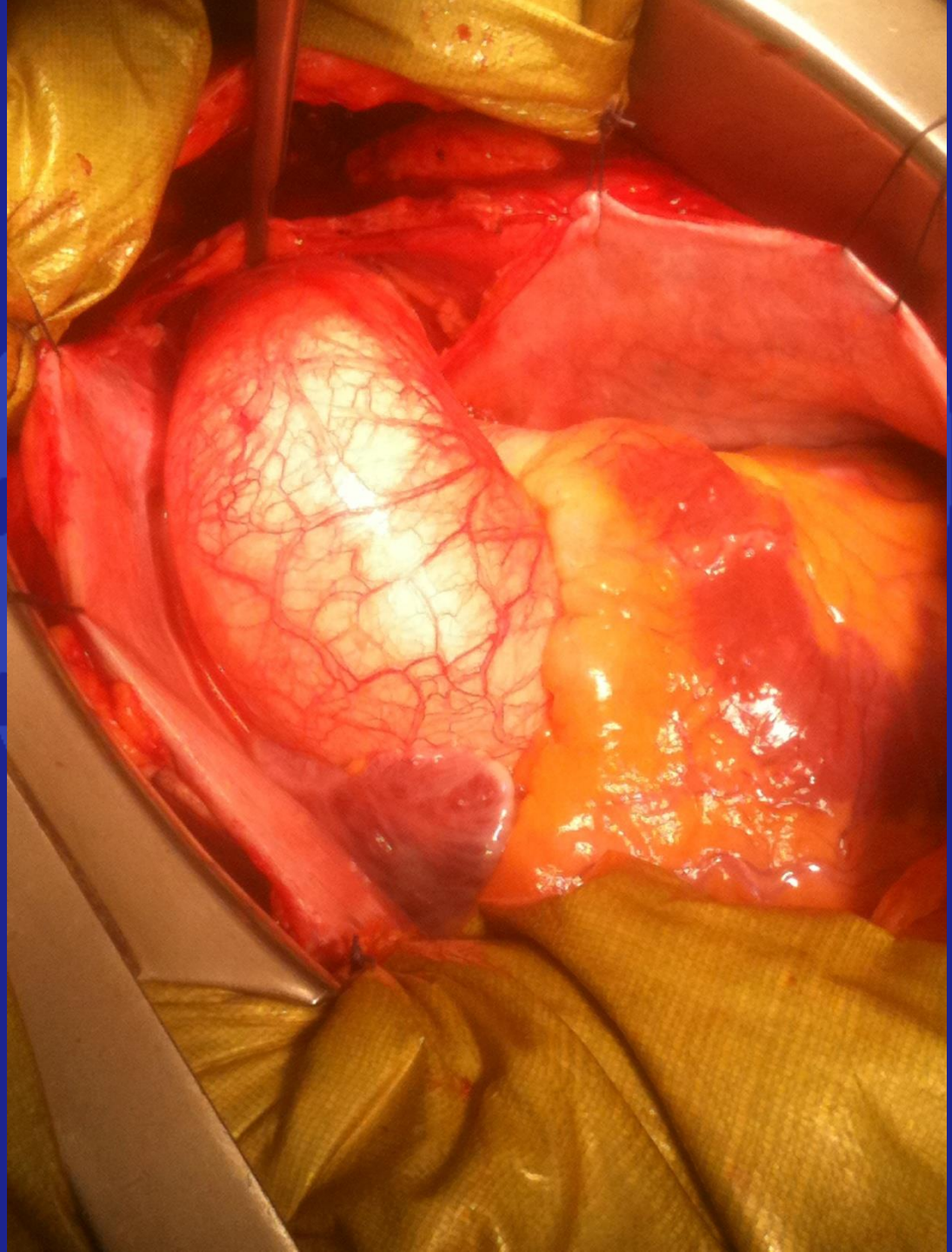


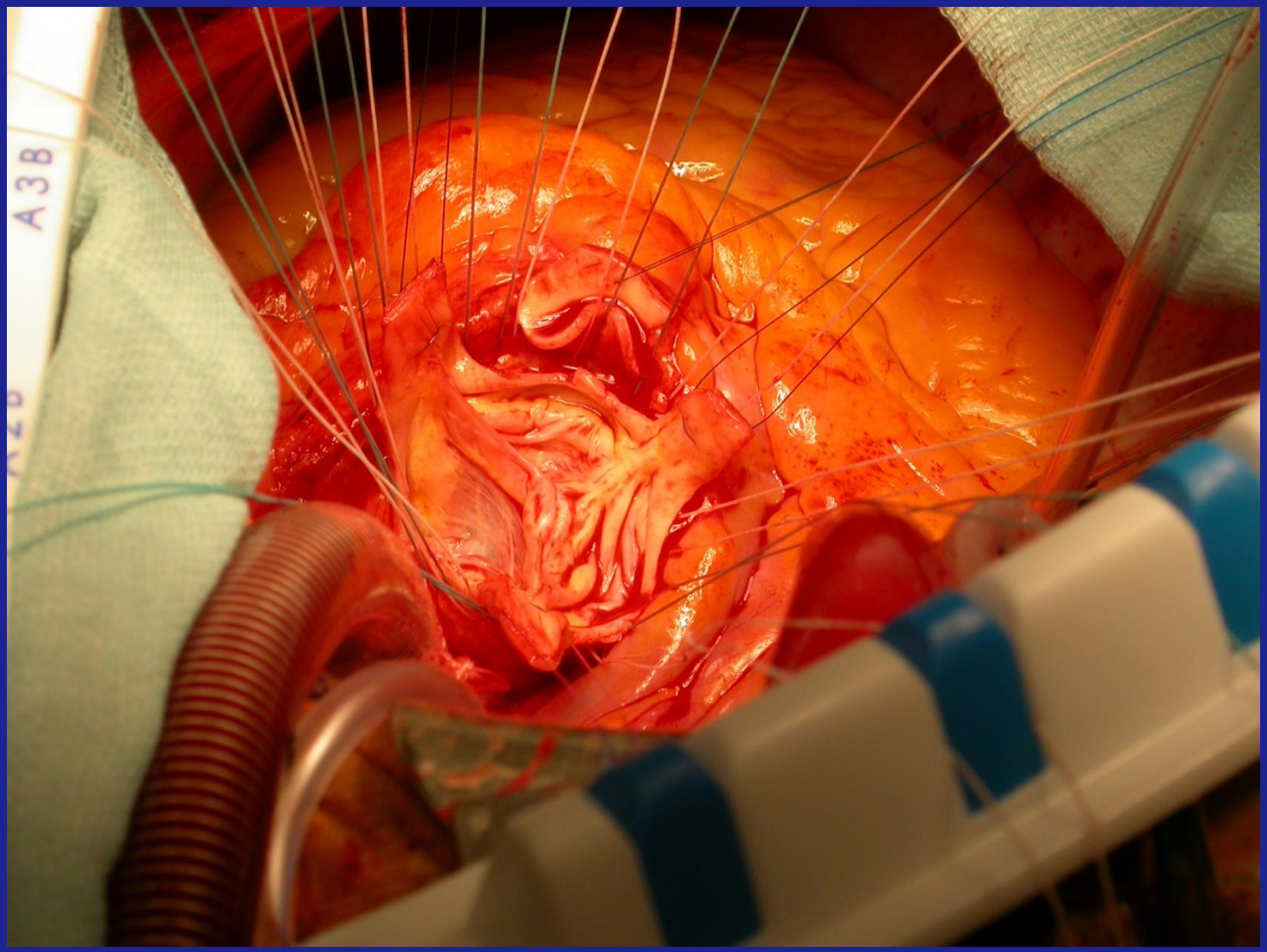


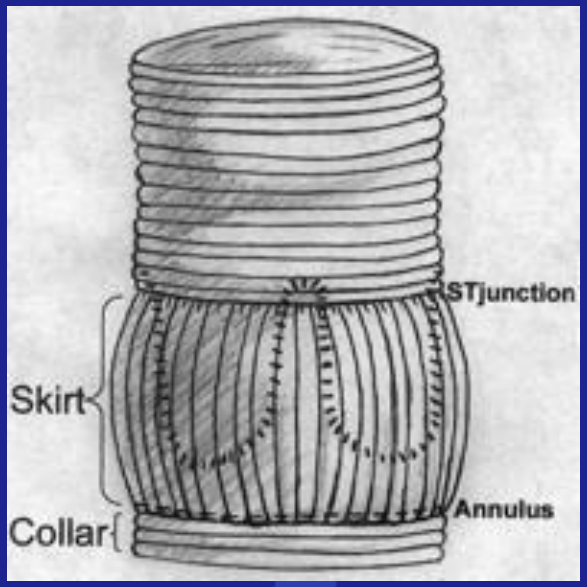


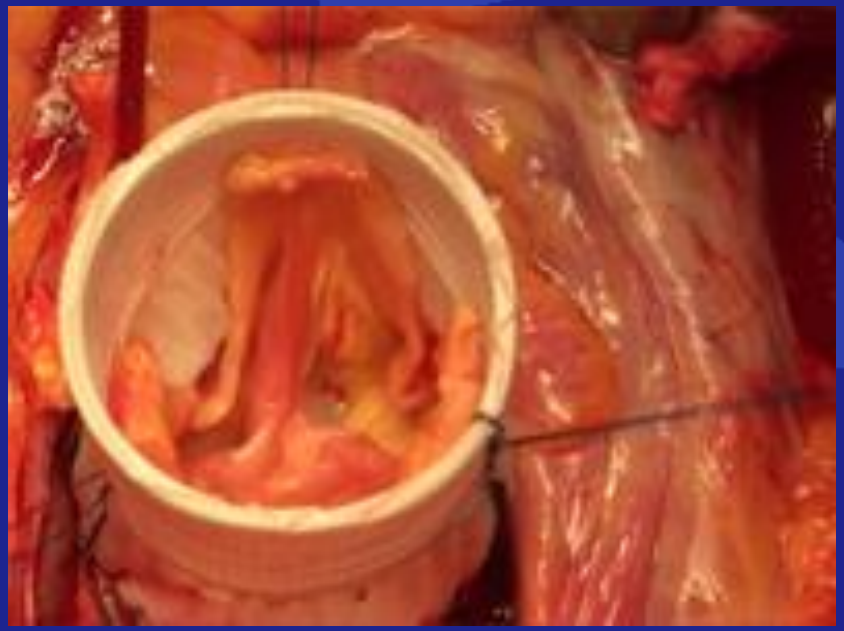


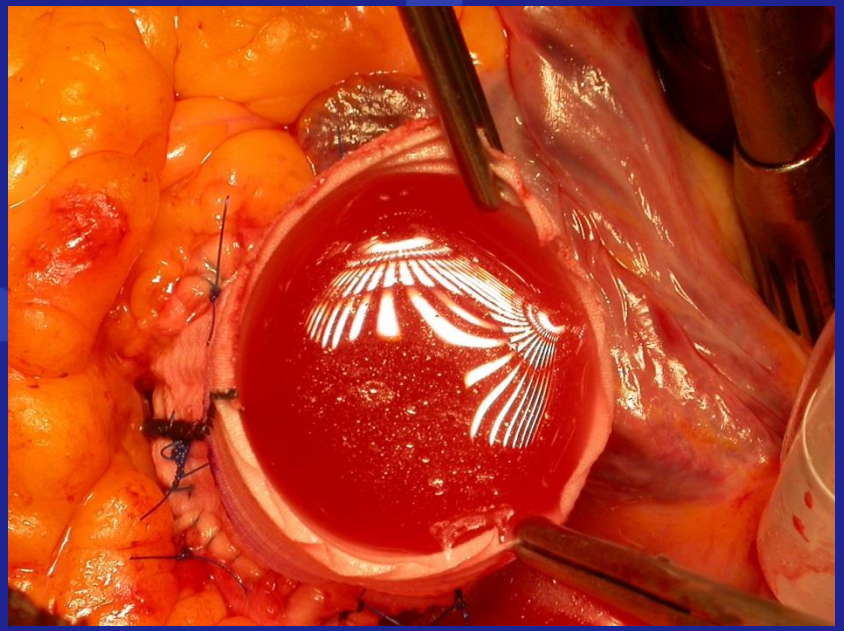
Reimplantation of the aortic valve.

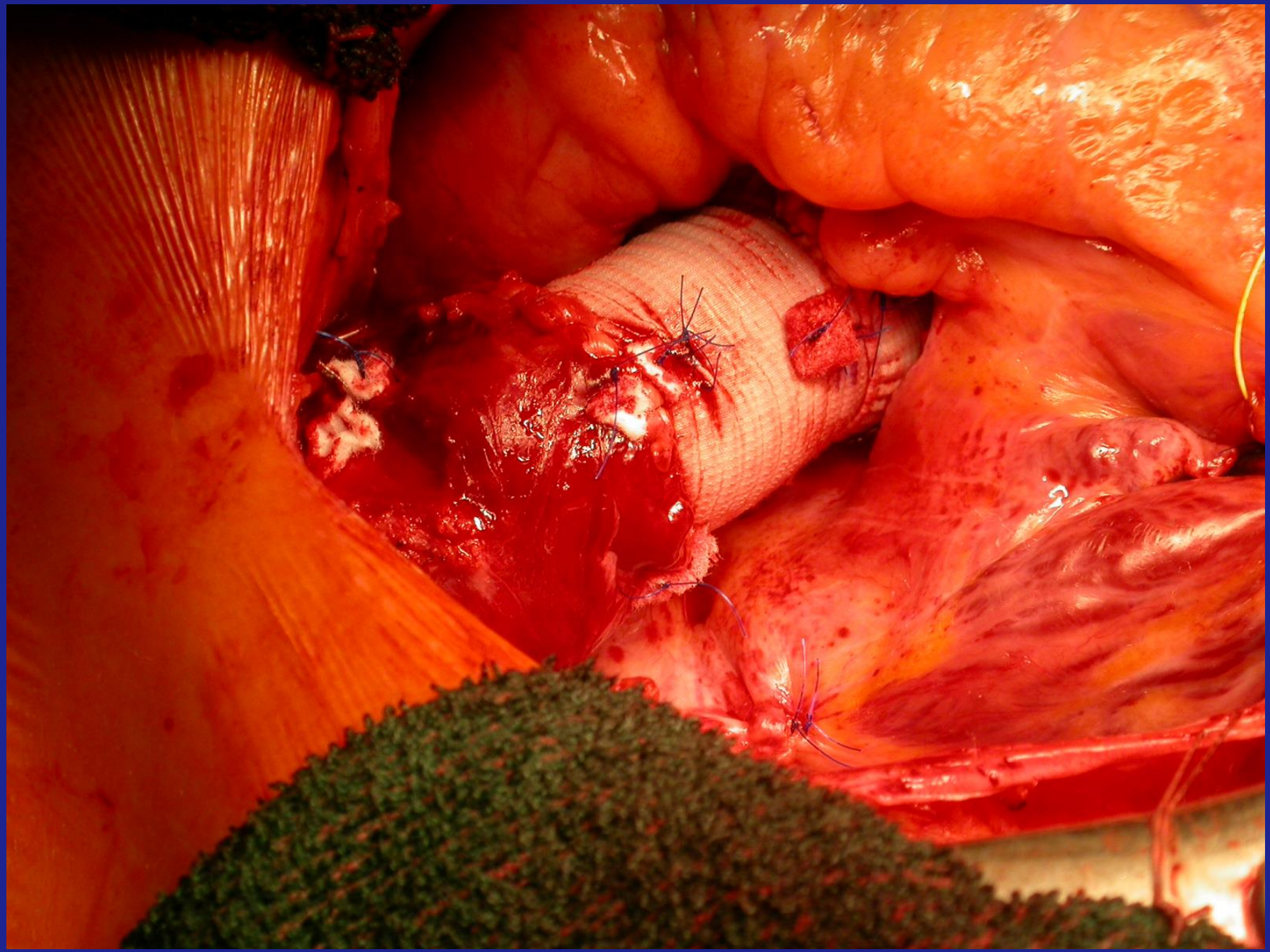



A3B


STjunction
Skirt
Annulus
Collar







AV SPARING 20y Follow-up

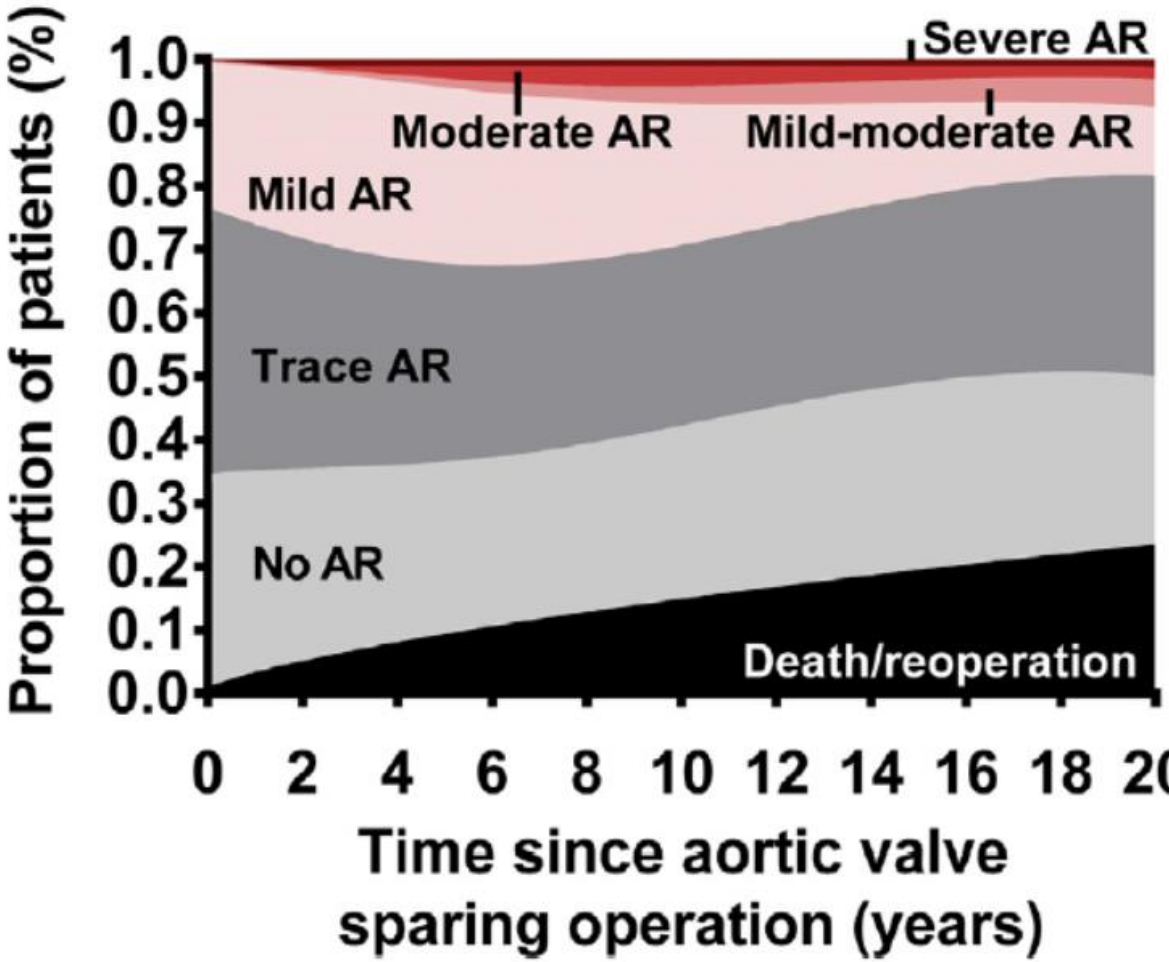
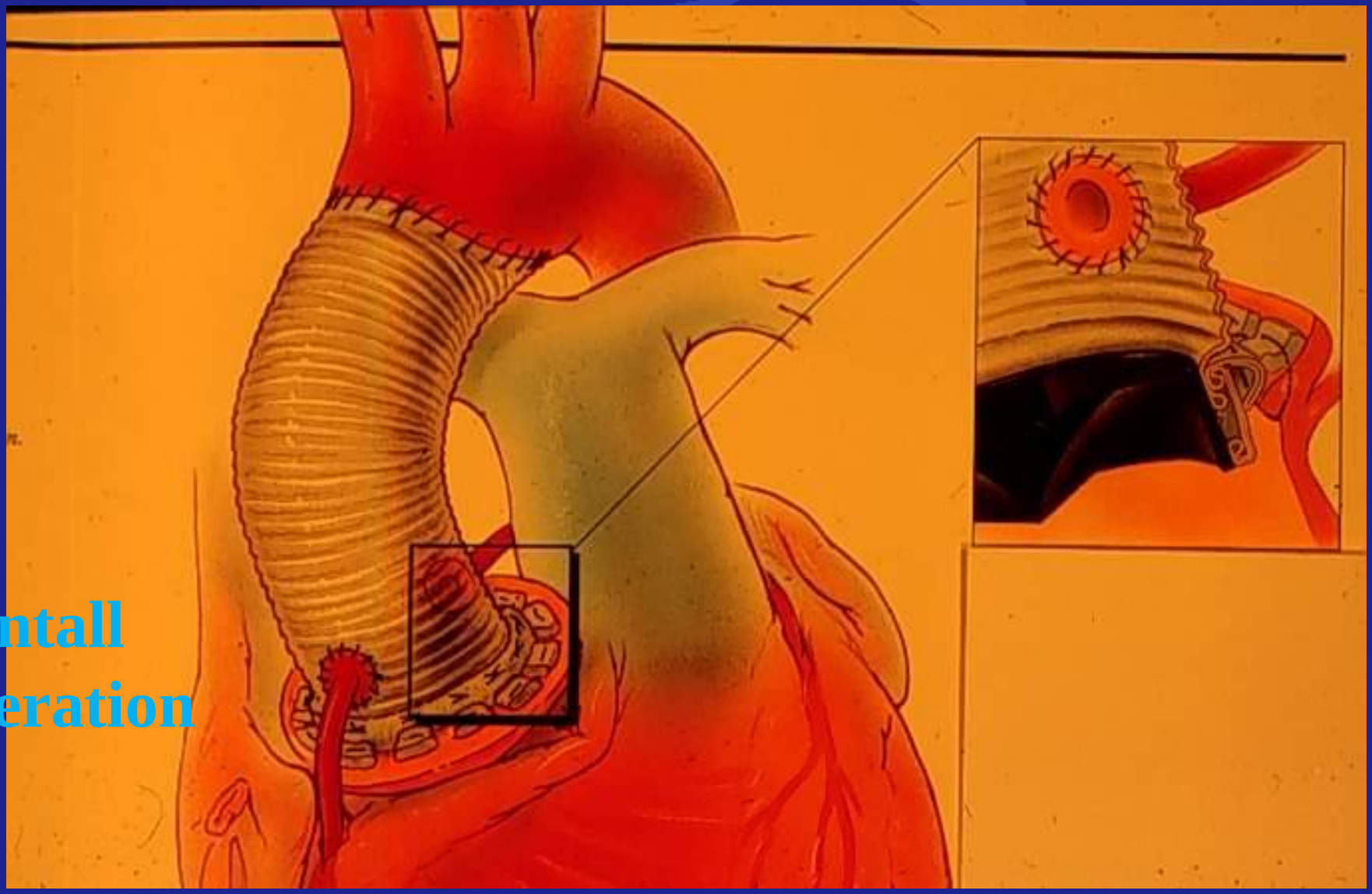


FIGURE 2. Aortic regurgitation after aortic valve reimplantation over time. *AR*, Aortic regurgitation.

David J Thorac Cardiovasc Surg 2017;153:232-38

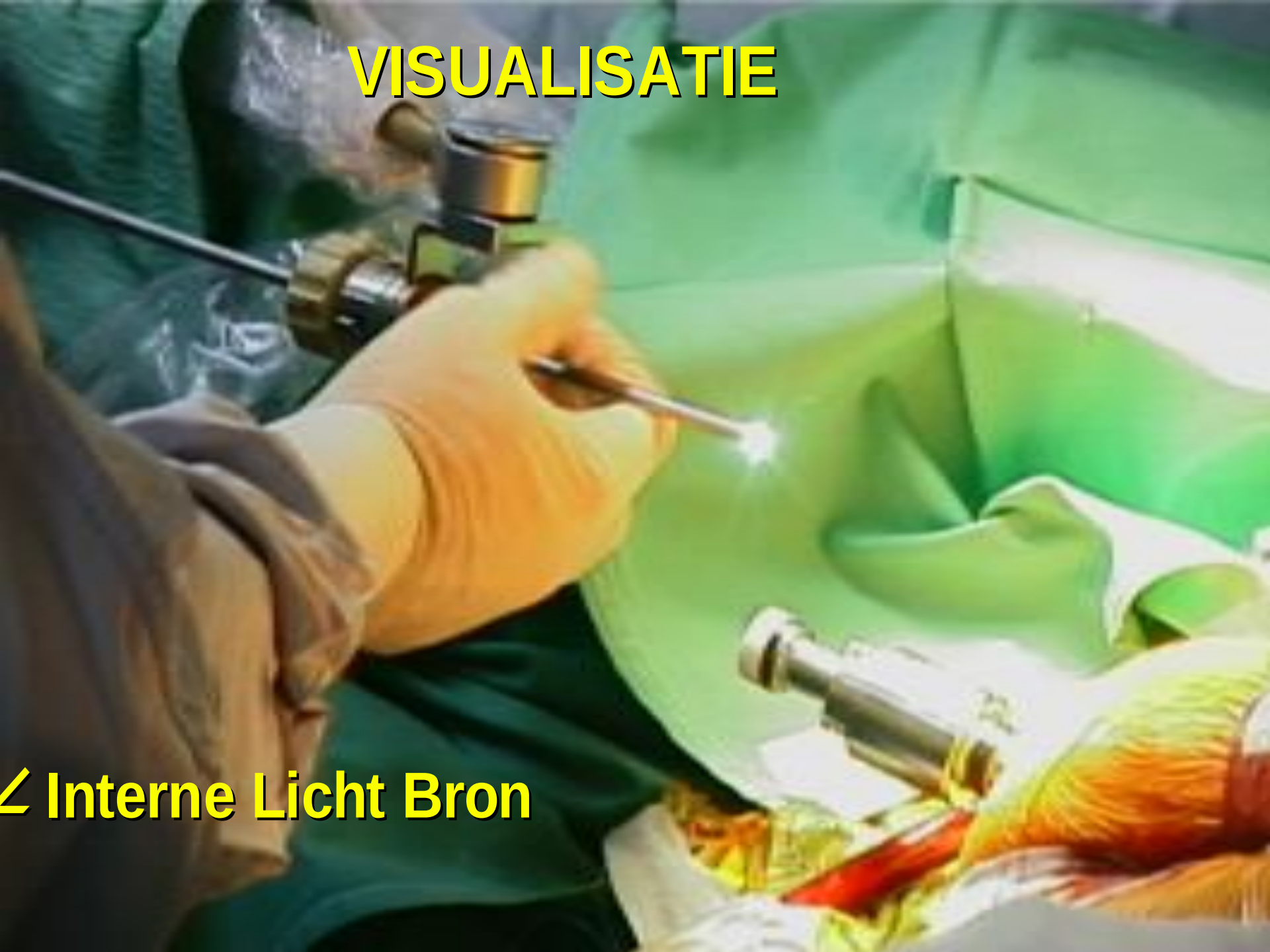
ASCENDING AORTIC ANEURYSM : BENTALL procedure



Bentall operation

Mitral and Tricuspid valve

VISUALISATIE

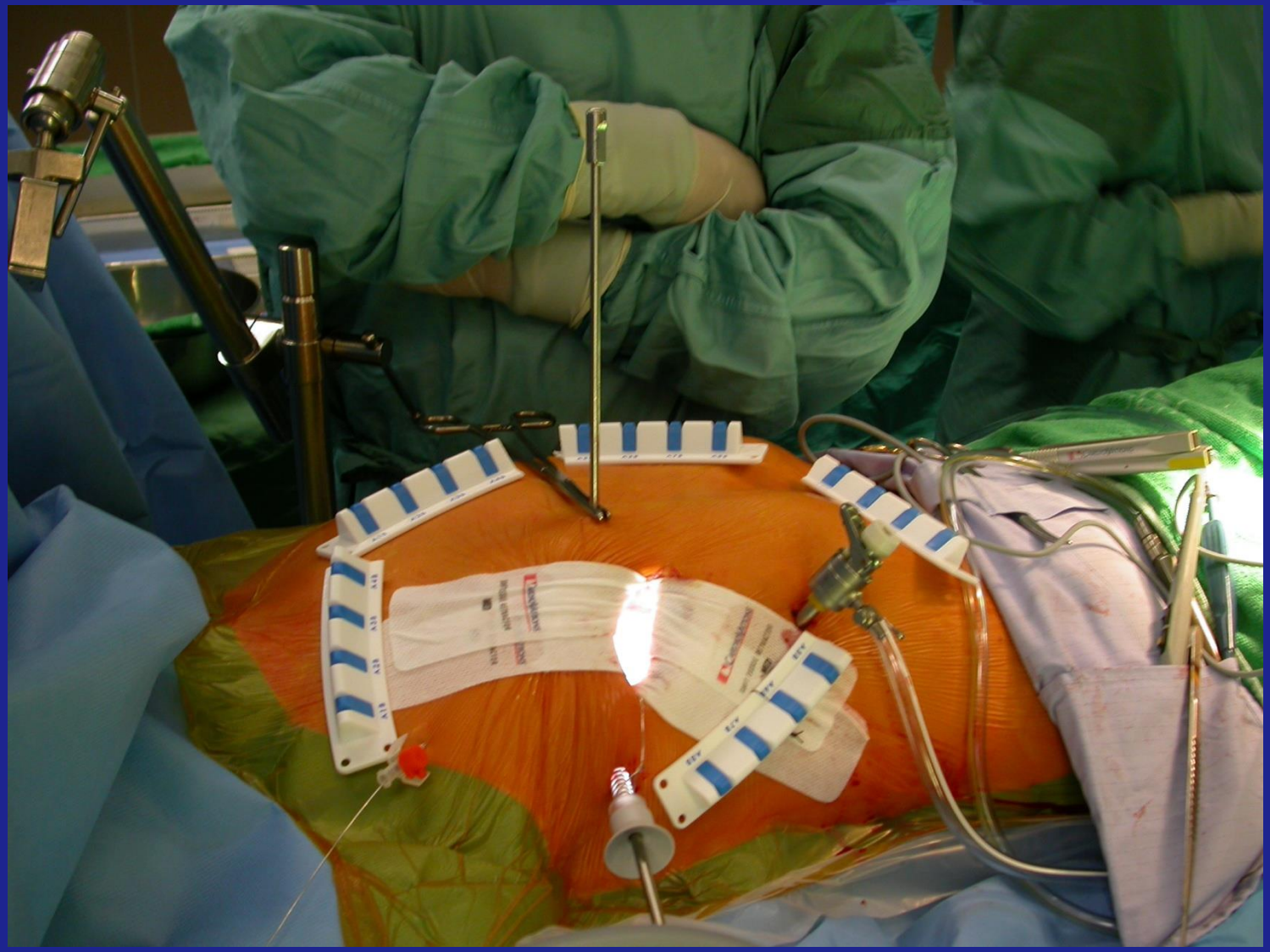


- Interne Licht Bron

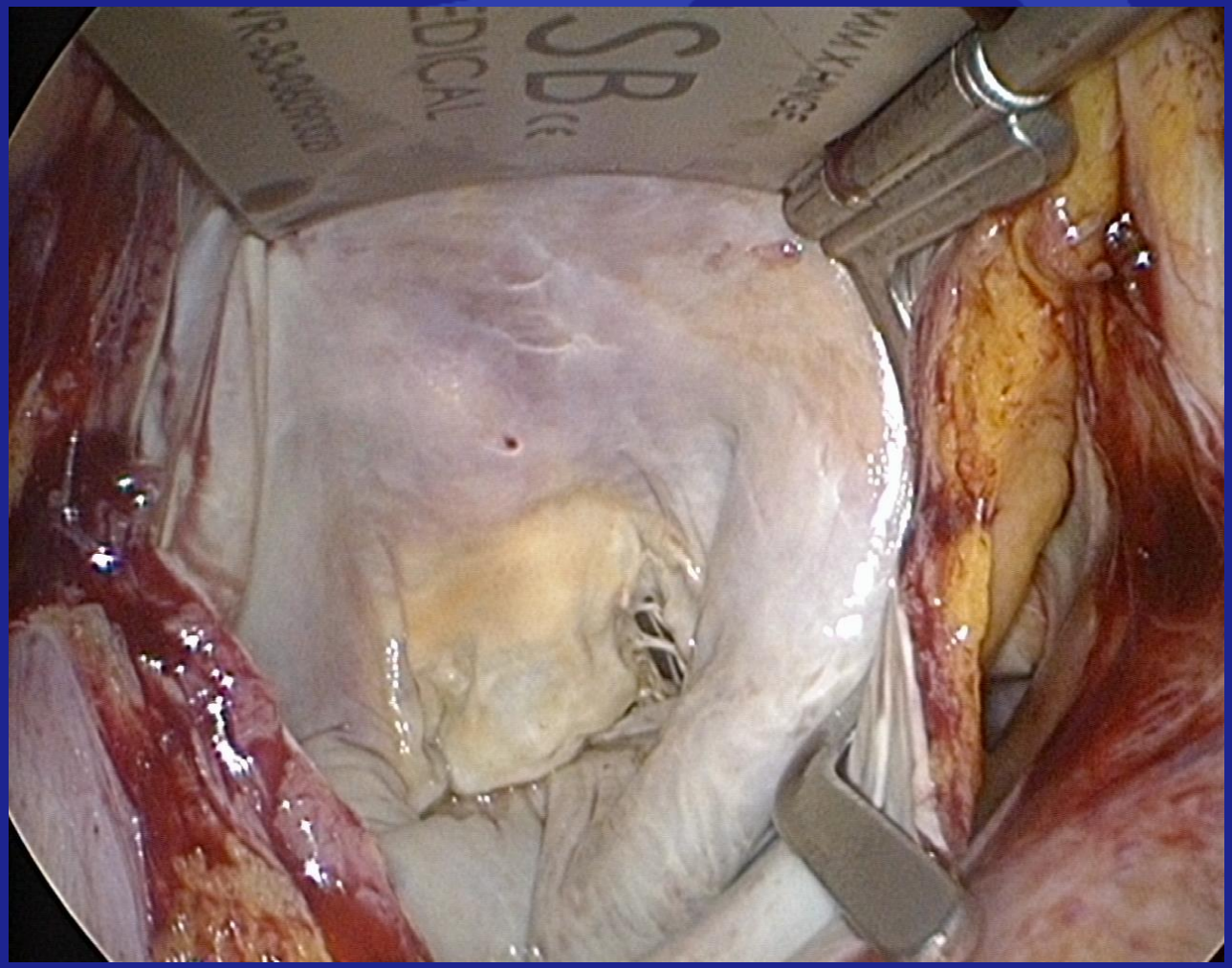
Visualisatie

- Video-Assisted
- 3D Video-Directed

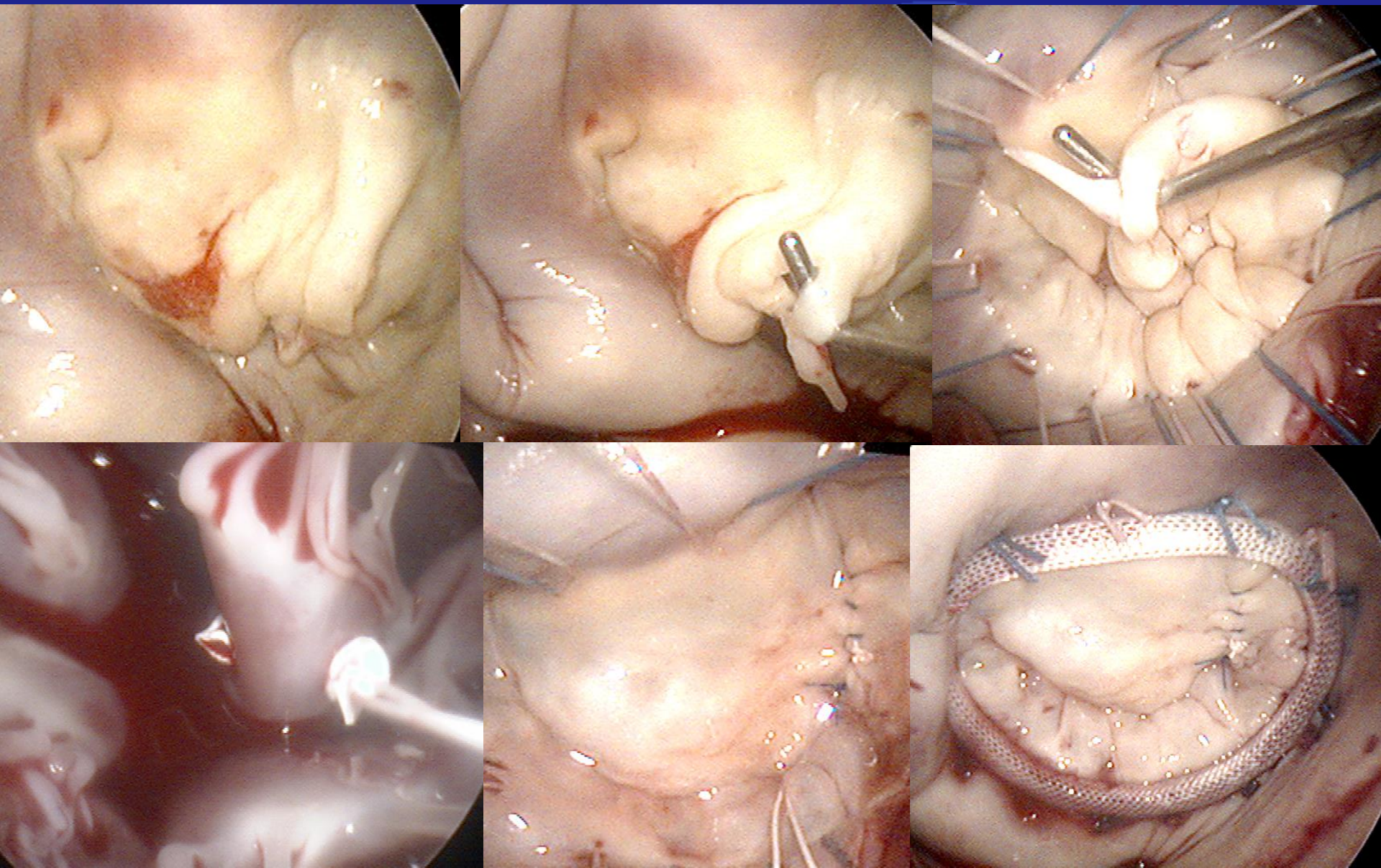
Setup pre ECC
Mini-thoracotomie

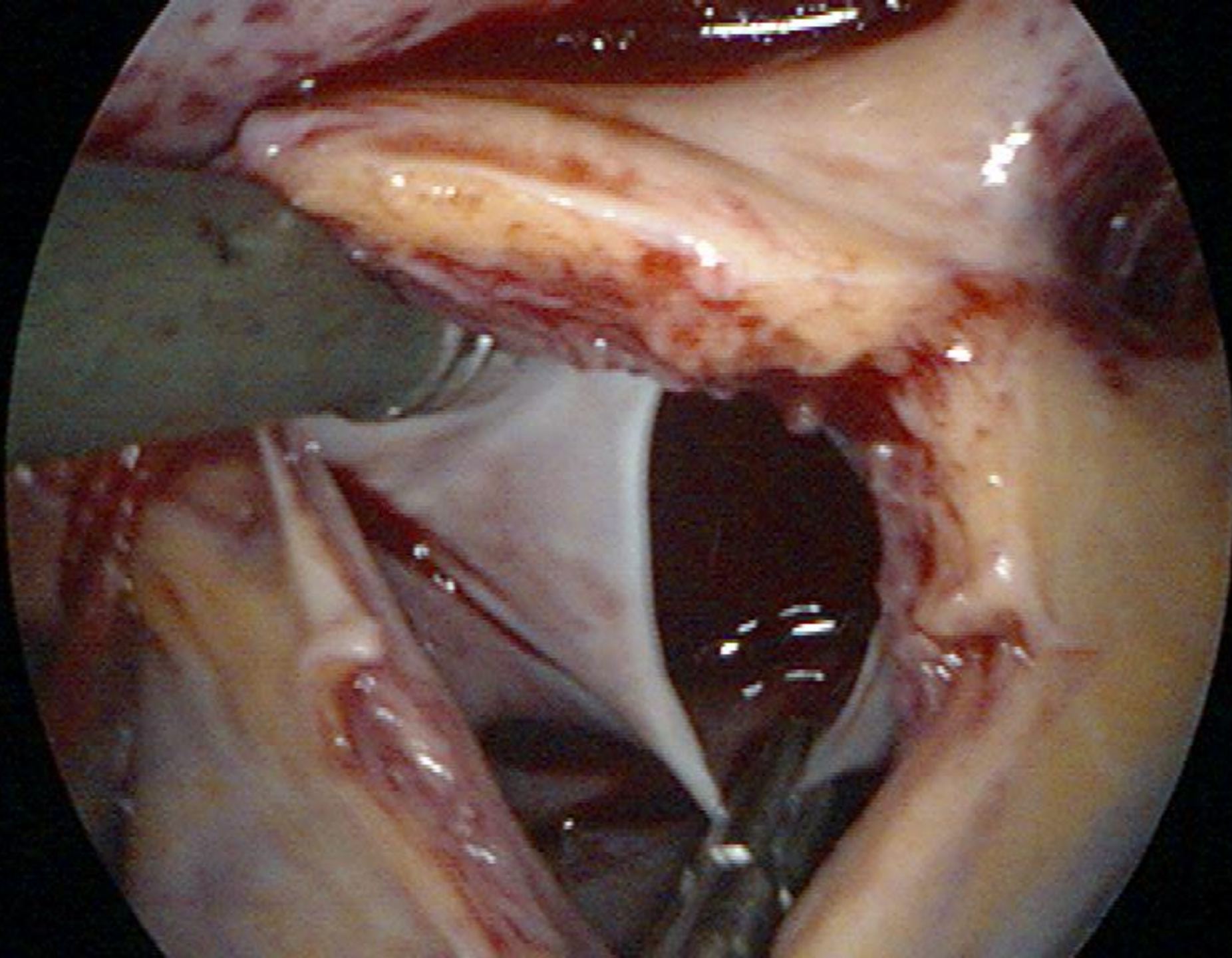


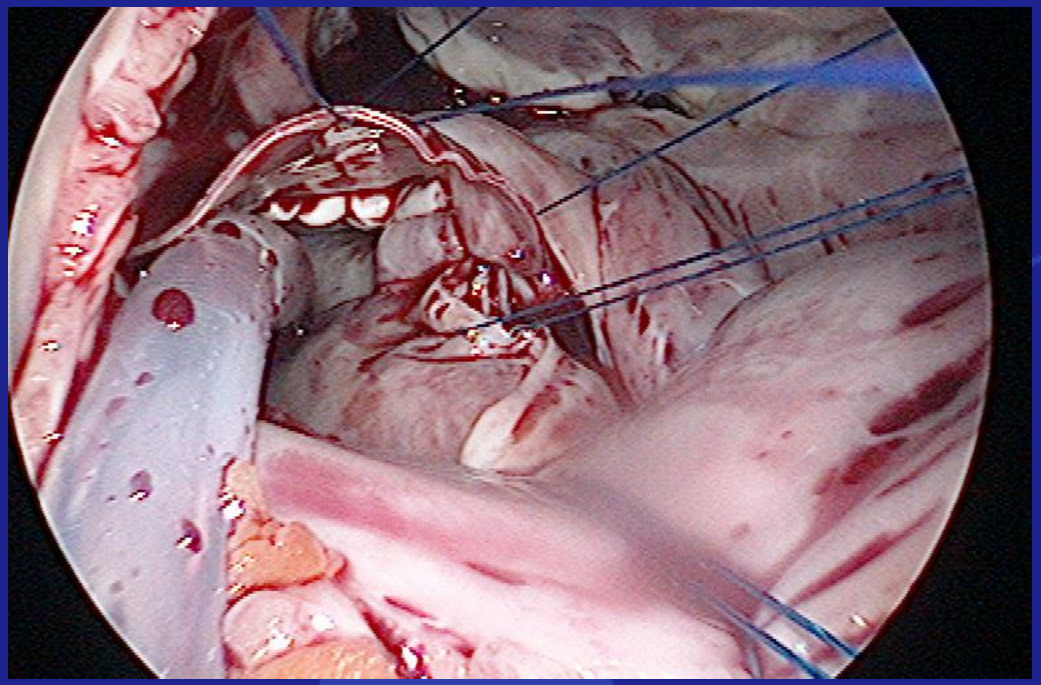
LA retractor
Side arm



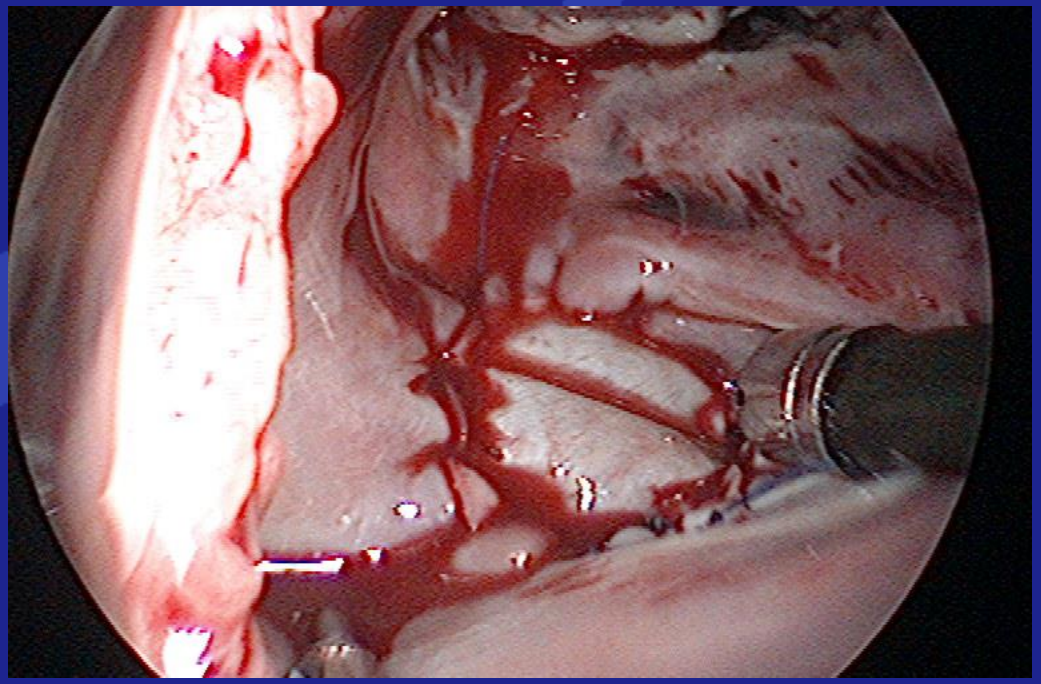
Endocarditis-sequellae: Anterior leaflet repair: triangular resection and PTFE chorda

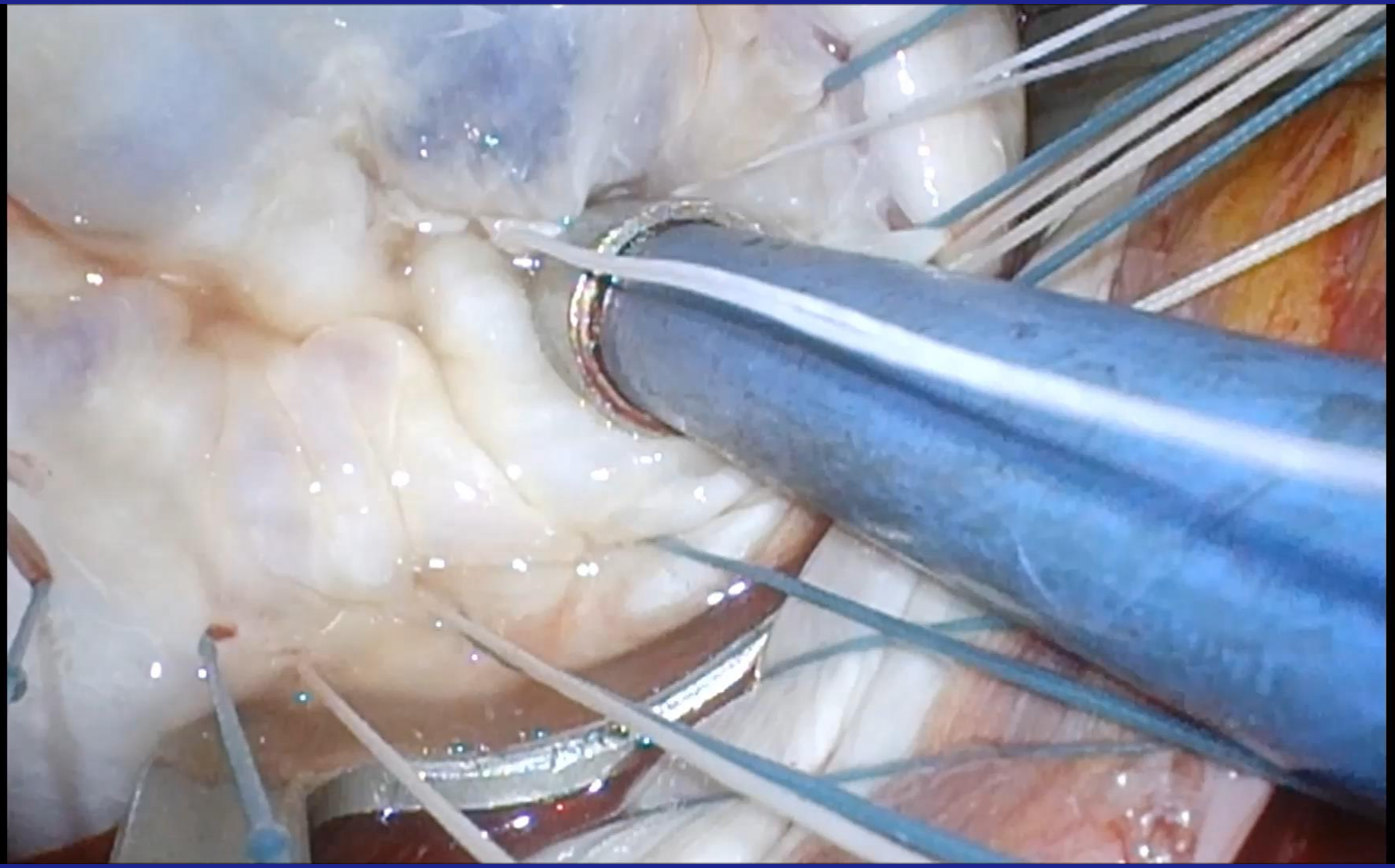




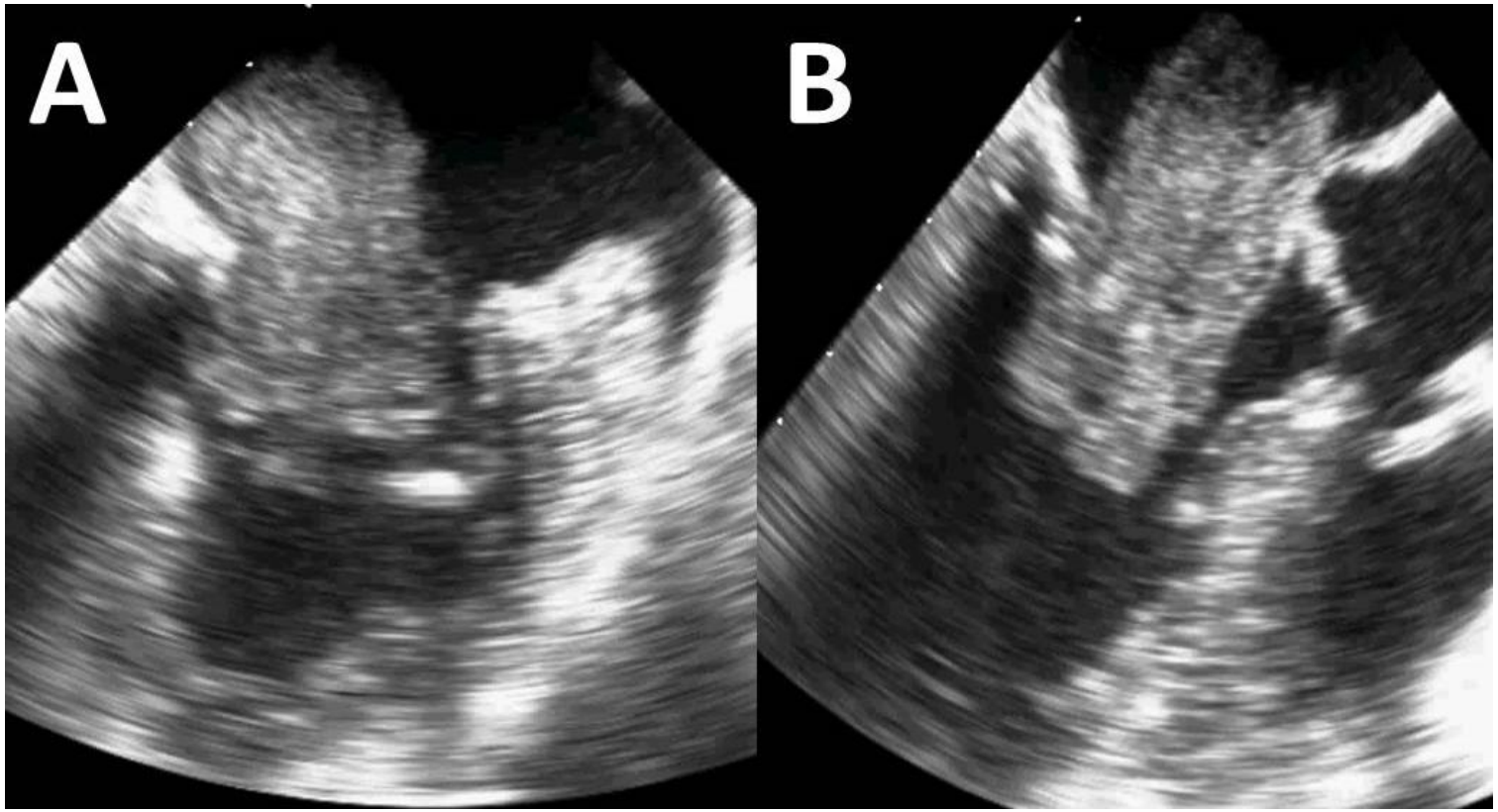


Patch sluiting ASD II



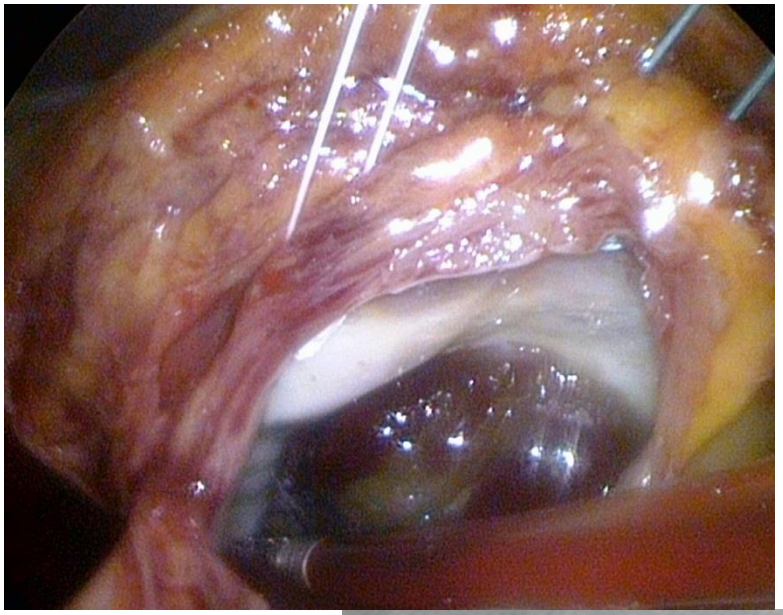


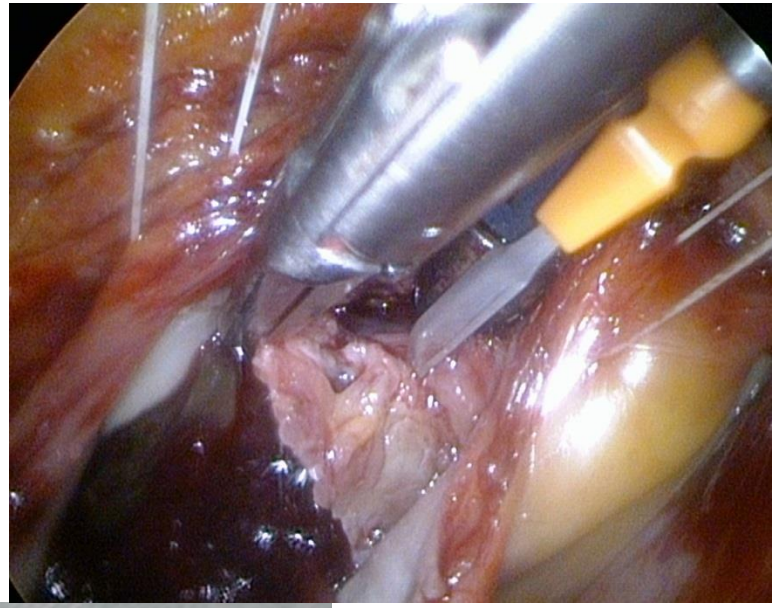
Giant Myxoma



Johan van der Merwe, Cardiothoracic Surgeon, Bloubergstrand, South Africa

Giant Myxoma





10 month follow-up

- **No recurrence**
- **NYHA I**

PORT-ACCESS™ VALVE SURGERY
Feb '97 – 31 May '13
In hospital mortality : n = 56 (2.2 %)

Surgery	N	Mort	% mort
First	2227	59	1,7
Redo	281	19	6,8 (predicted Log EuroScore 19!!)
Total	**2411**	**56**	**2,2**

Cause of mortality	N
Aortic dissection	4
Ventricular rupture (AV dehiscention)	4
Early redo MVR (1 sternot, 1 port-access)	2
Heartfaillure	19
Hemorragic complications	4
Respiratory failure	6
Neurological failure	3
MOF	9
Endocarditits	2
Adenocarcinoma	1
Sudden death	1

Effect of mitral valve repair on exercise tolerance in asymptomatic patients with organic mitral regurgitation

Juraj Madaric, MD,[a] Patrick Watripont, MD,[b] Jozef Bartunek, MD, PhD,[a] Filip Casselman, MD, PhD,[c] Marc Vanderheyden, MD,[a] Frank Van Praet, MD,[c] William Wijns, MD, PhD,[a] Ann Feys, MD,[a] Hugo Vanermen, MD,[c] and Bernard De Bruyne, MD, PhD[a] *Aalst, Belgium*

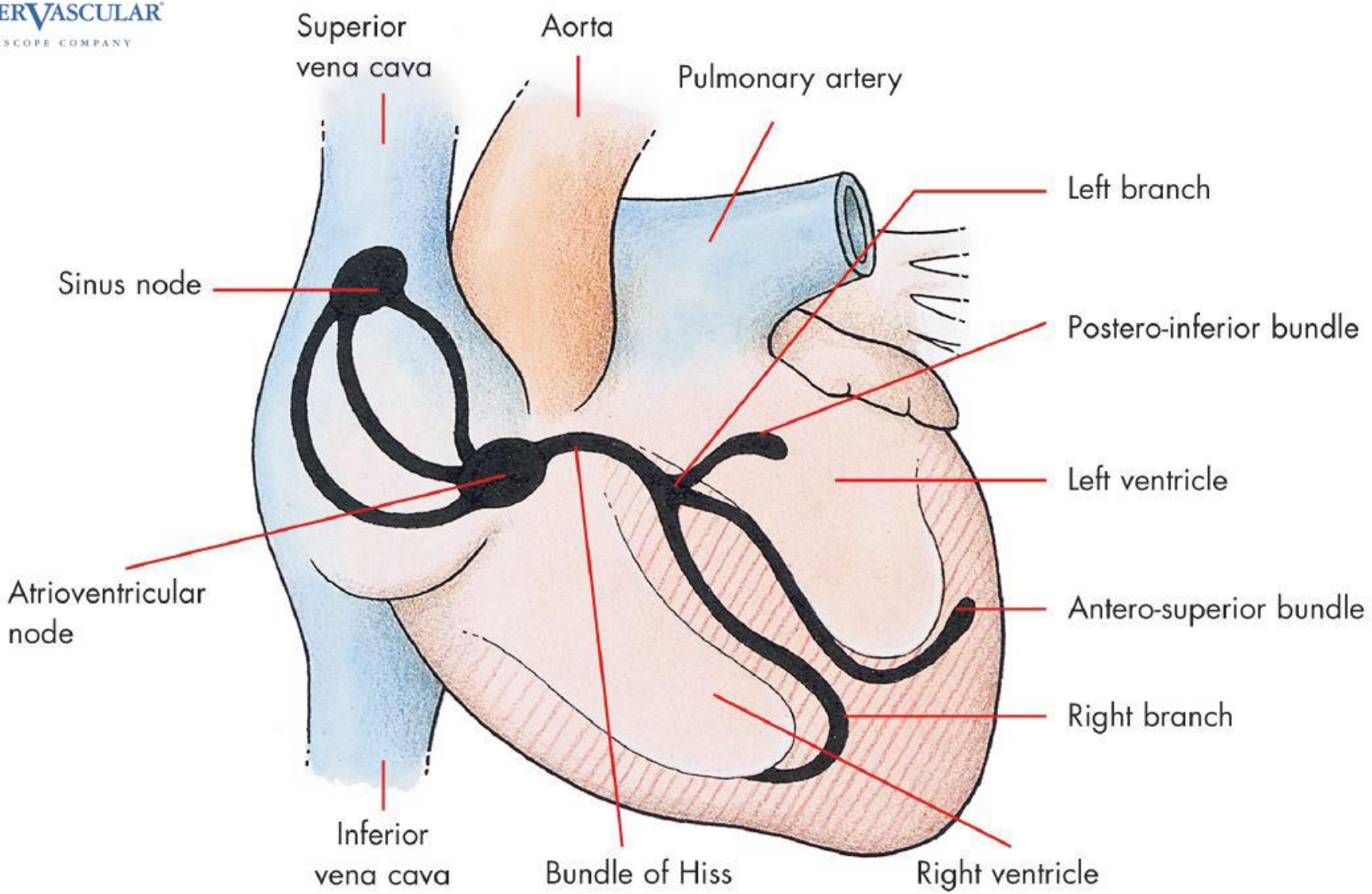
Background The aim of the study was to quantify the changes in cardiopulmonary function after minimally invasive video-assisted mitral valve repair for organic mitral regurgitation (MR) in asymptomatic or minimally symptomatic patients.

Methods Twenty-six patients (age 54 ± 11 years) with severe organic MR (regurgitant volume of 94 ± 37 mL, effective regurgitant orifice [ERO] of 0.73 ± 0.35 cm^2) and mild or no symptoms (New York Heart Association class 1.2 ± 0.4) underwent exercise echocardiography and cardiopulmonary exercise testing 1 week before and 4 months after uncomplicated video-assisted mitral valve repair.

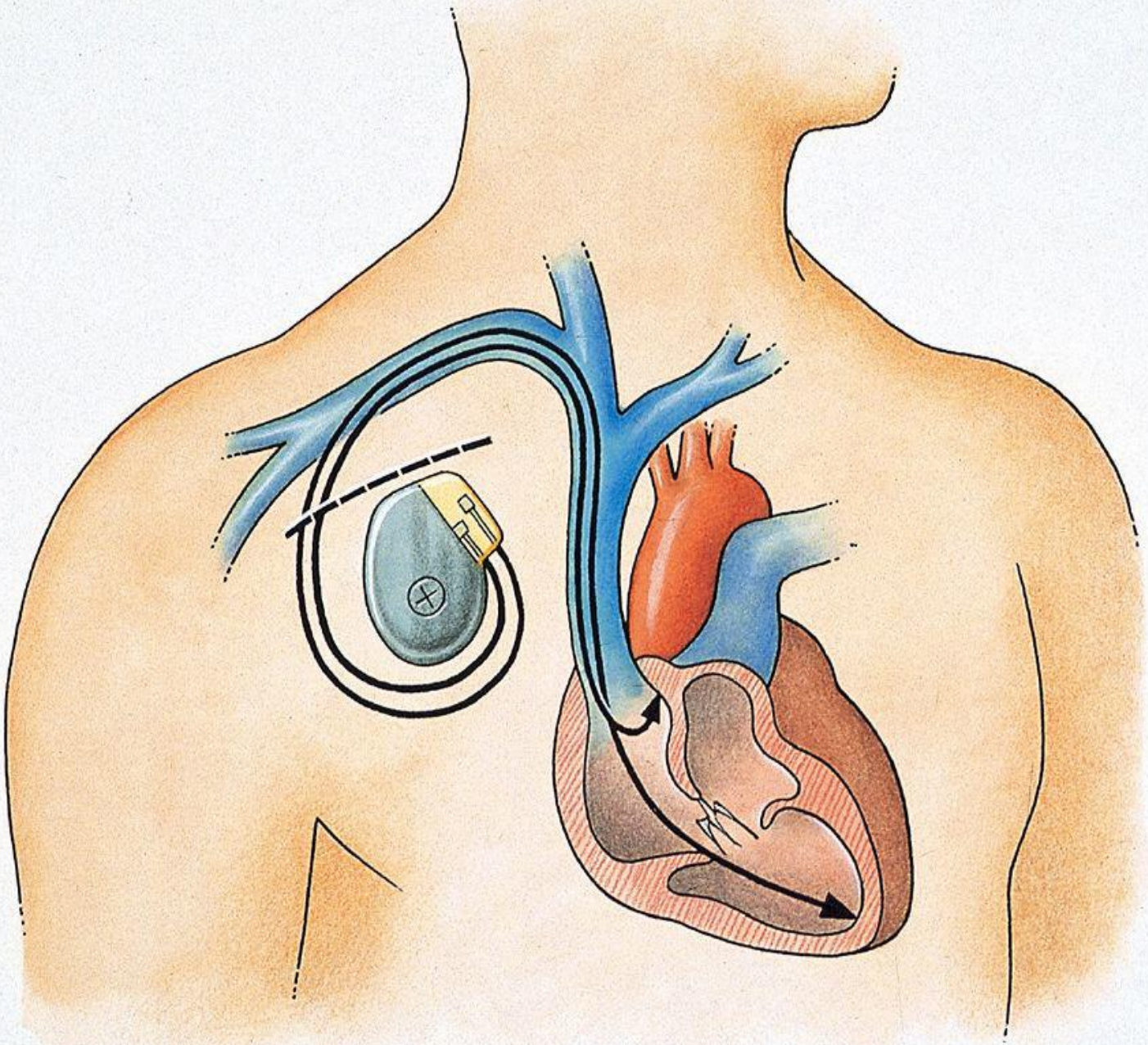
Results During exercise, left ventricular ejection fraction increased from 68% ± 7% to 74% ± 6% ($P < .0001$), but ERO did not change significantly. Four months after video-assisted mitral valve repair, a significant improvement was observed in peak oxygen uptake (Vo_{2max} from 23 ± 6 to 25 ± 7 mL · kg^{-1} · min^{-1}, $P < .001$), peak oxygen pulse (from 11 ± 3 to 12 ± 4 mL per beat, $P < .005$) as well as in maximal workload (from 143 ± 49 to 159 ± 55 W, $P < .0001$). When only patients without any symptoms (New York Heart Association class I, n = 20) were considered, these changes were even more pronounced (Vo_{2max} from 24 ± 7 to 27 ± 7 mL · kg^{-1} · min^{-1}, $P < .001$). Post-operative changes in Vo_{2max} correlated with preoperative exercise-induced contractile reserve ($r = 0.72$, $P < .0001$), preoperative ERO ($r = 0.49$, $P < .05$), and preoperative ejection fraction at rest ($r = 0.42$, $P < .05$).

Conclusion In patients with severe organic MR but mild or no symptoms, cardiopulmonary performance improves after successful minimally invasive video-assisted mitral valve repair. Improvement is directly related to preoperative left ventricular function and contractile reserve. (Am Heart J 2007;154:180-5.)

ATRIAL ARRHYTHMIA SURGERY



INTERVASCULAR
A DATASCOPE COMPANY



AF and SURGICAL OUTCOMES

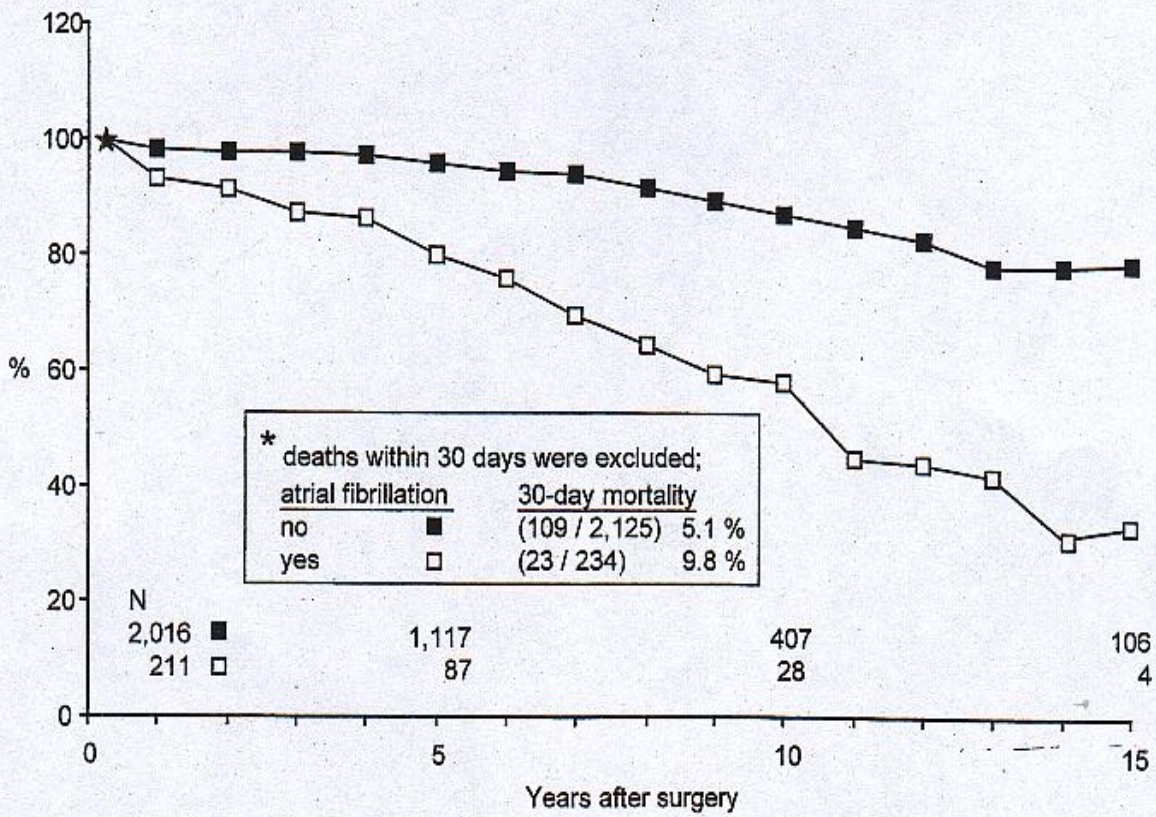


Figure 7. Relative survival after primary AVR by preoperative heart rhythm in patients who survived the first postoperative month. The numbers (N) of patients at risk and the number of deaths within 30 days in each group are given.

Surgery,[a] Cardiology,[b] and Biostatistics,[c] National Cardiovascular Center, Osaka, Japan; Department of Cardiothoracic Surgery,[d] Kobe City General Hospital, Kobe, Japan; Department of Cardiovascular Surgery,[e] Sakakibara Heart Institute, Tokyo,

Conclusion: Preoperative permanent/persistent atrial fibrillation was associated with a dilated left atrium and reduced left ventricular function in patients with mitral regurgitation. Including the maze procedure with mitral repair improved survival, late cardiac function, and freedom from late stroke.

Operative approach

Operative approach
Cryo-ablation

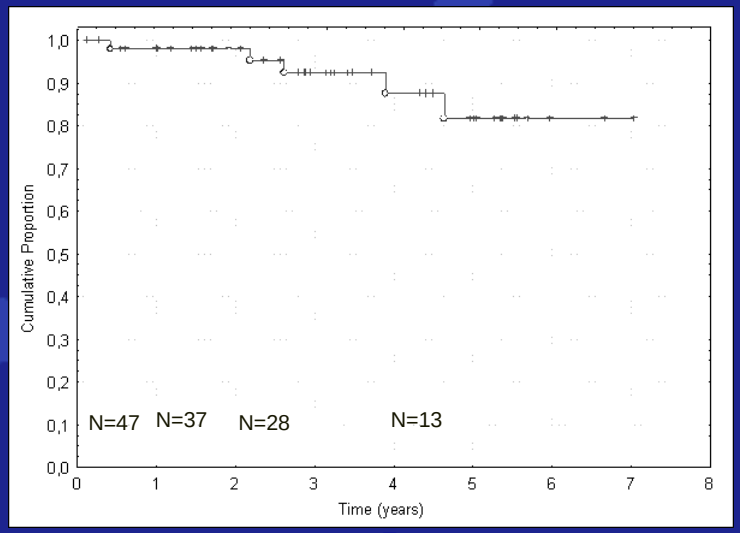
Latest follow-up

Mean clinical follow-up time (n=53) : 45 ± 22 months (1,5-84) (49 pts over 1 year)

Mean ECG/Holter follow-up time (n=48): 39 ± 21 months (1,5 - 80) (49 pts over 1 year)

Sinus rhythm is :

- 98% ± 2.0 at 1 year
- 92% ± 4.3 at 3 years
- 82% ± 8,1 at 5 years



Medication pts > 6 months : n = 51

Antico : n = 19 (37,3%)

Antiarrhythmia : n = 20 (39,2%)

AORTIC SURGERY

ACUTE DISSECTION

Stanford classification

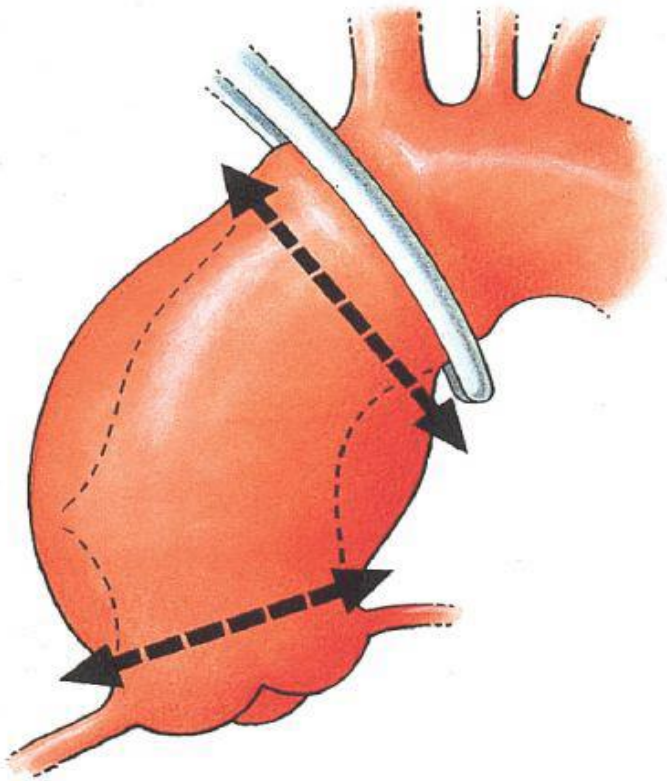
Type A

Type B

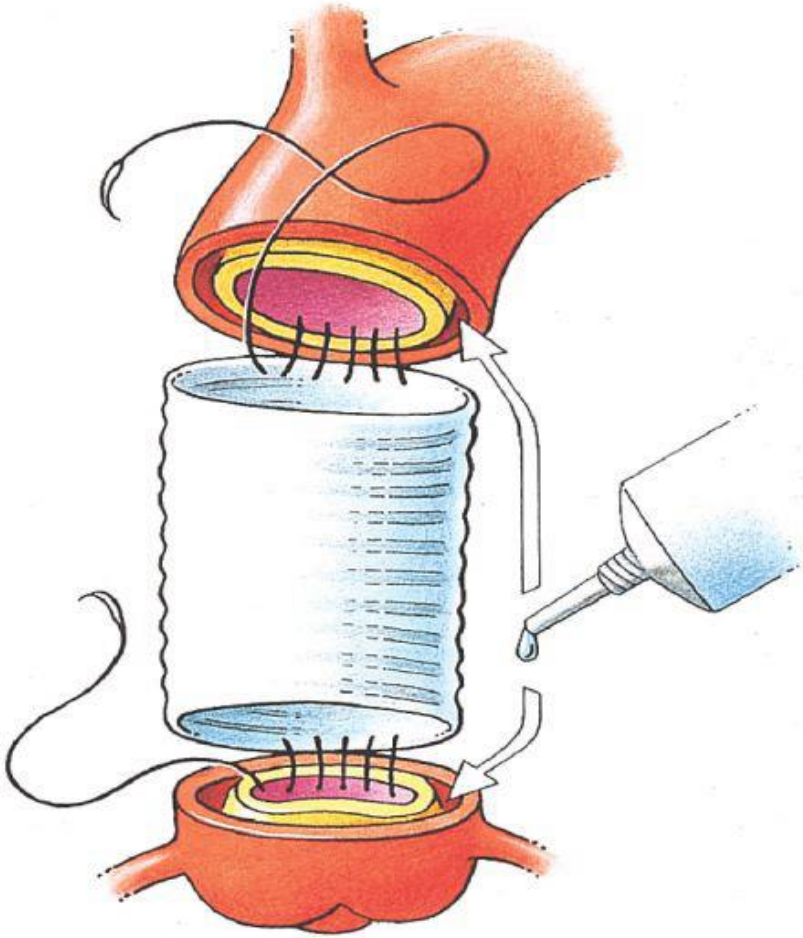
THORACIC ANEURYSM
etiology

- Degenerative disease of media
- Atherosclerosis
- Chronic dissection
- Infection
- Trauma

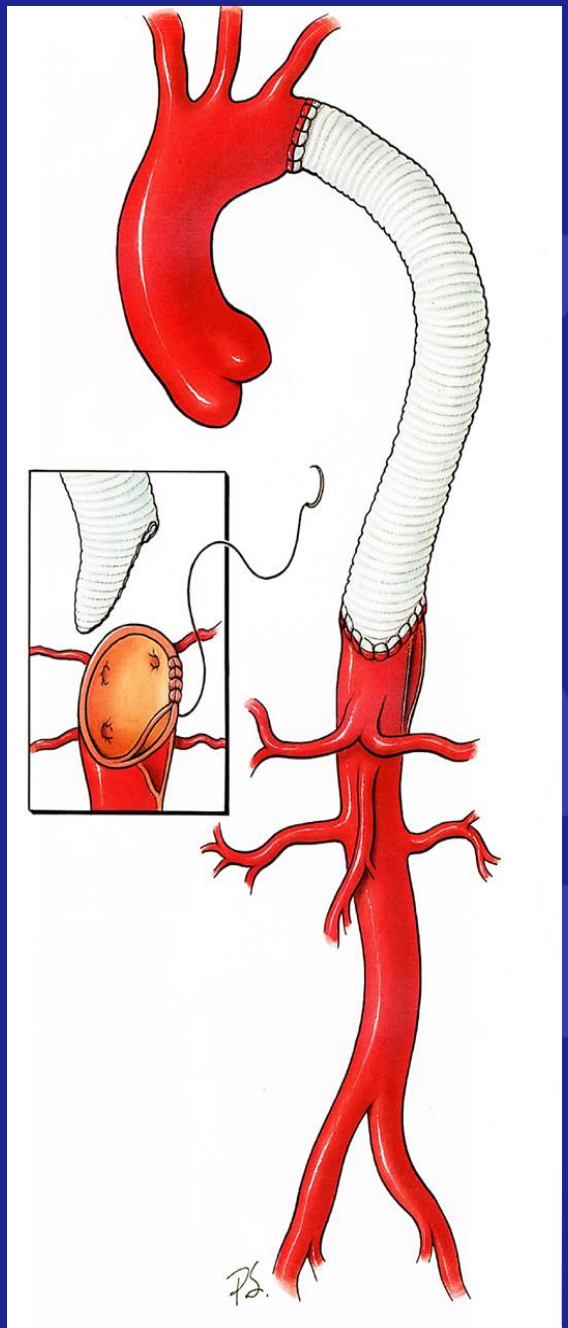
INTERVASCULAR
A DATASCOPE COMPANY

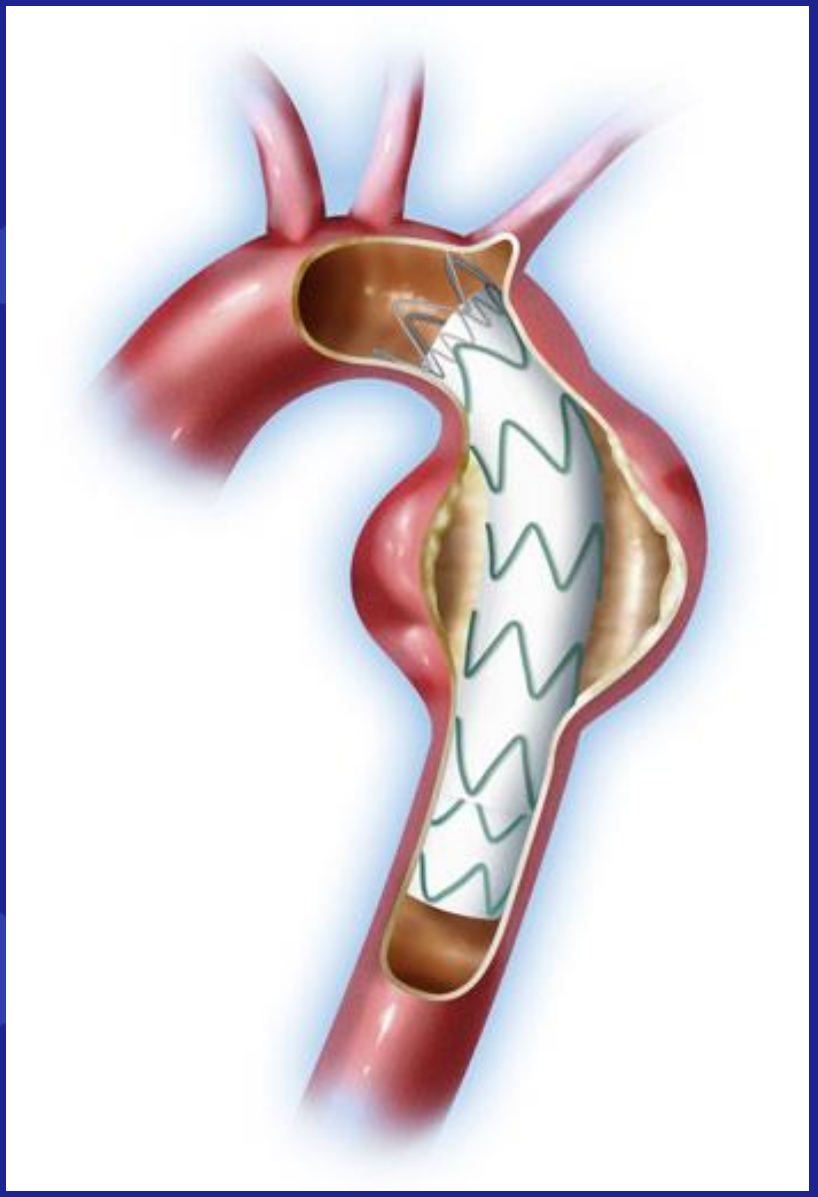


A



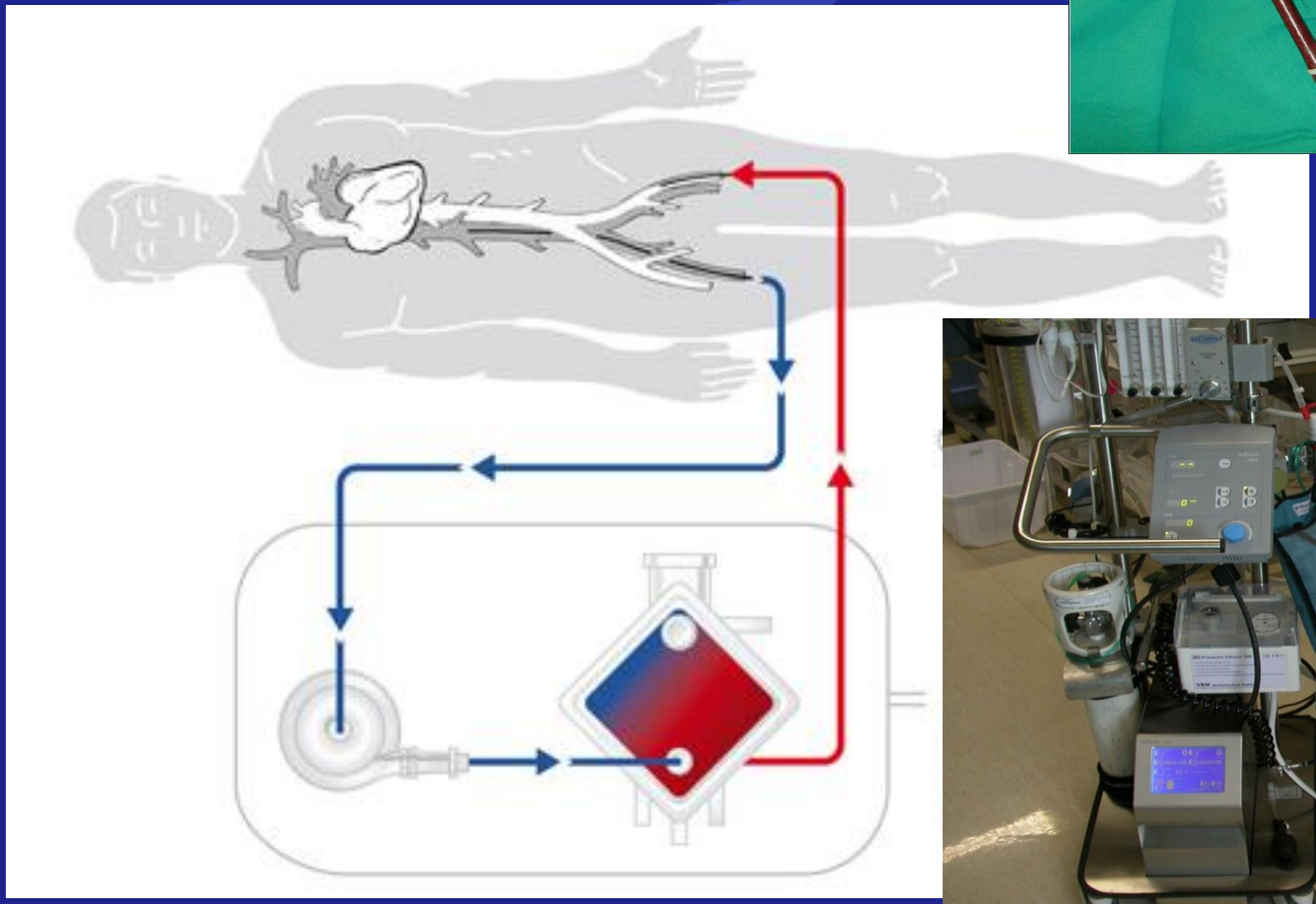
B





HEART FAILURE

ECLS

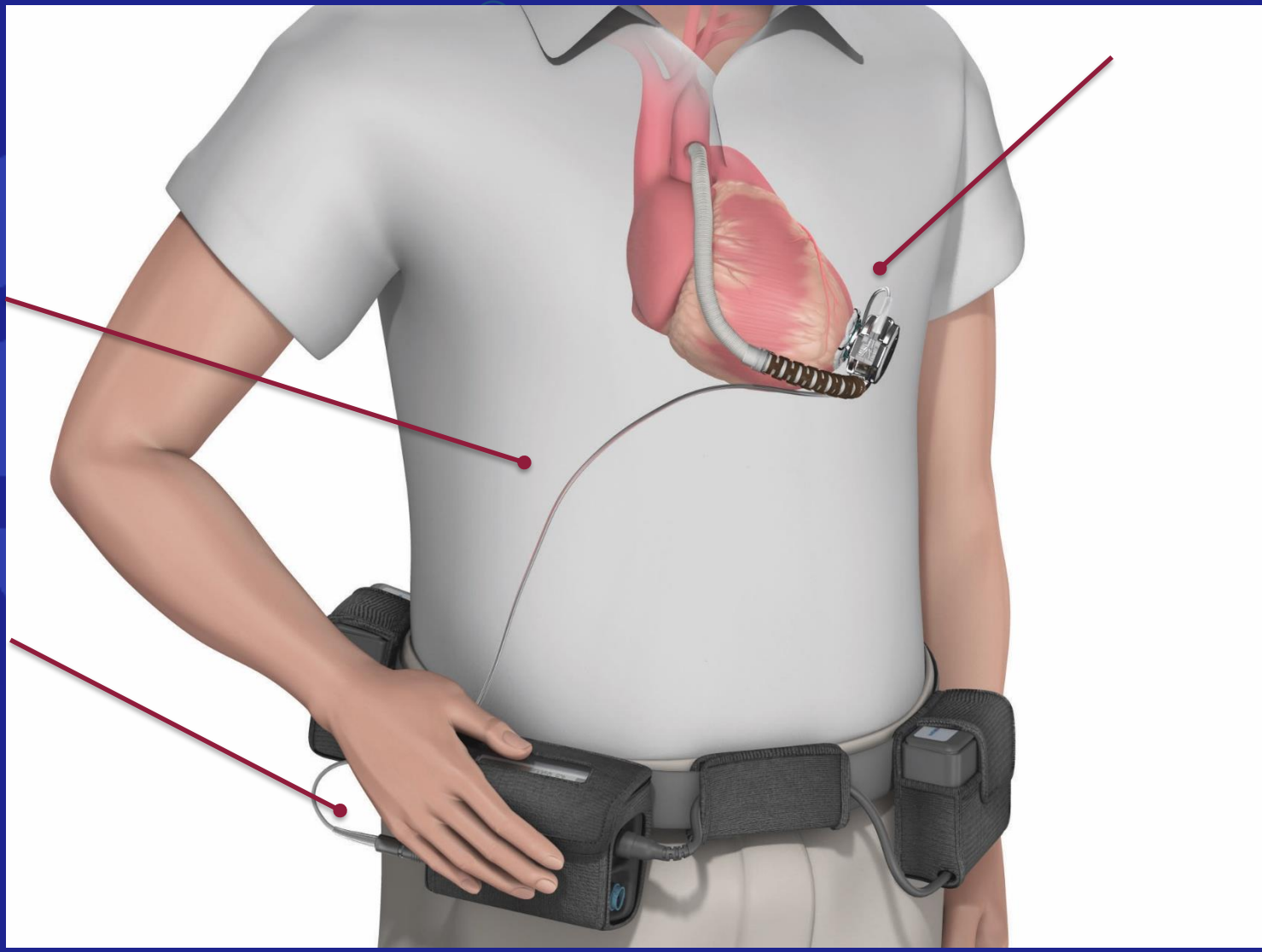


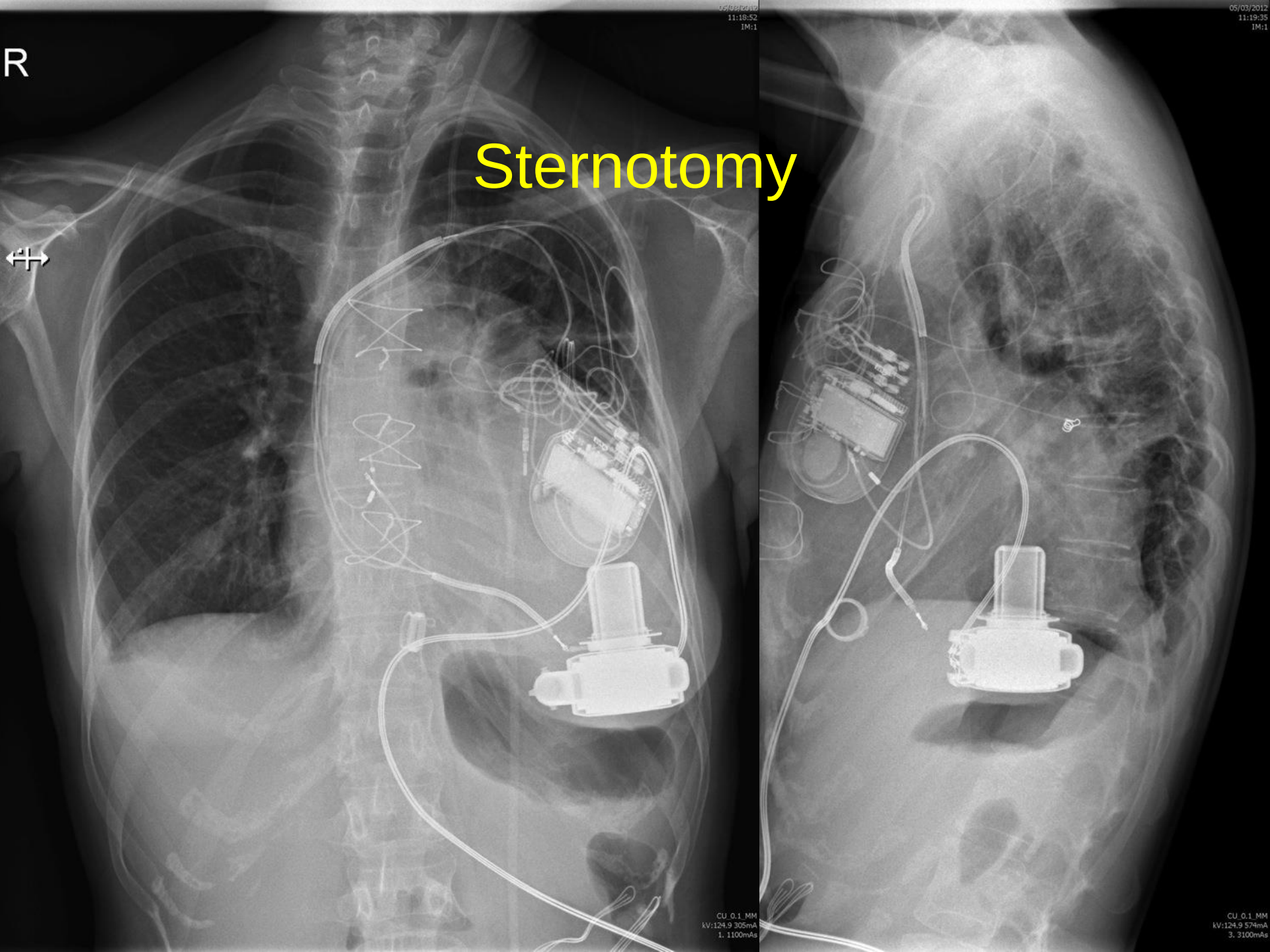

RFLORA
NATIONALE
BRIMEUX
FFFT
de Tab
1

Small pump attaches directly to heart

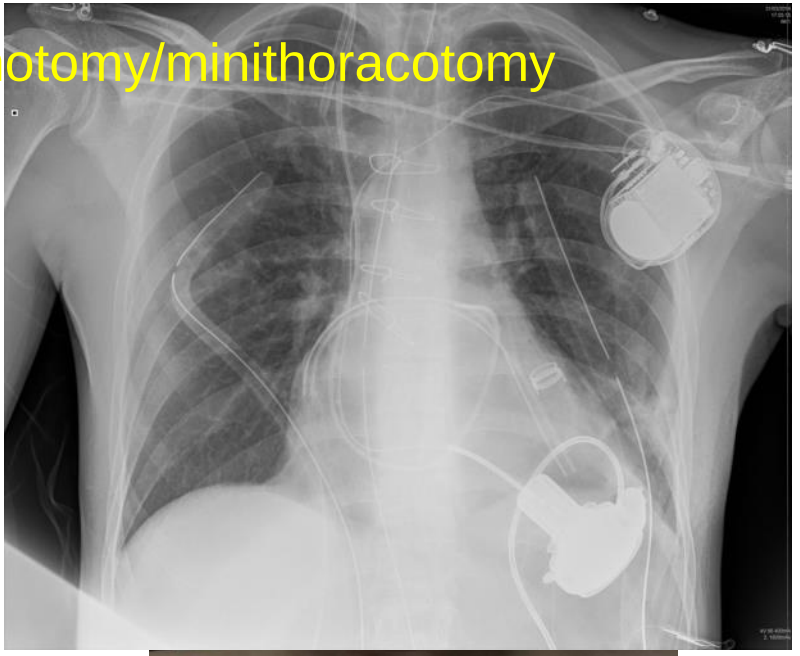
Thin, flexible driveline cable exits skin

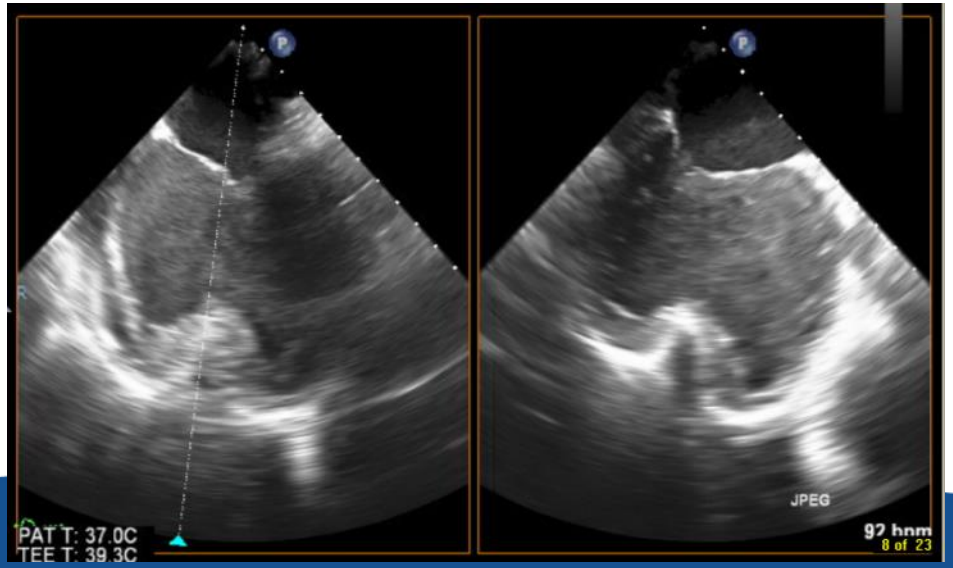
A small controller & batteries run the pump




R
Sternotomy

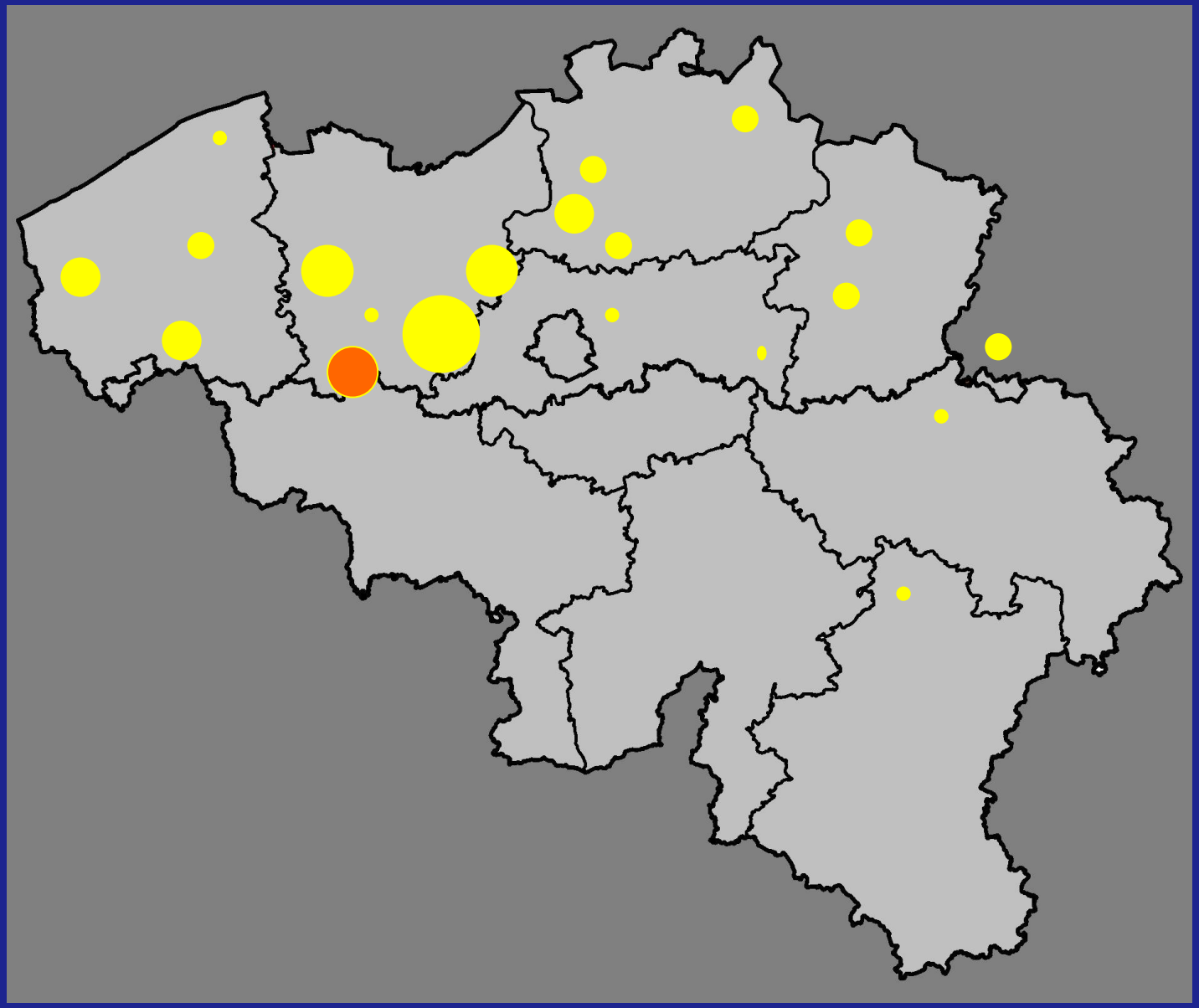
Minimal invasive LVAD: ministernotomy/minithoracotomy





Device-surgery

Verwijspatroon:



FUTURE PERSPECTIVES

- Rapidly evolving field
- Highly related to technological evolutions
- Minimally invasive ! → enhanced recovery
- Hybrid therapy

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