Cardiothoracic surgery

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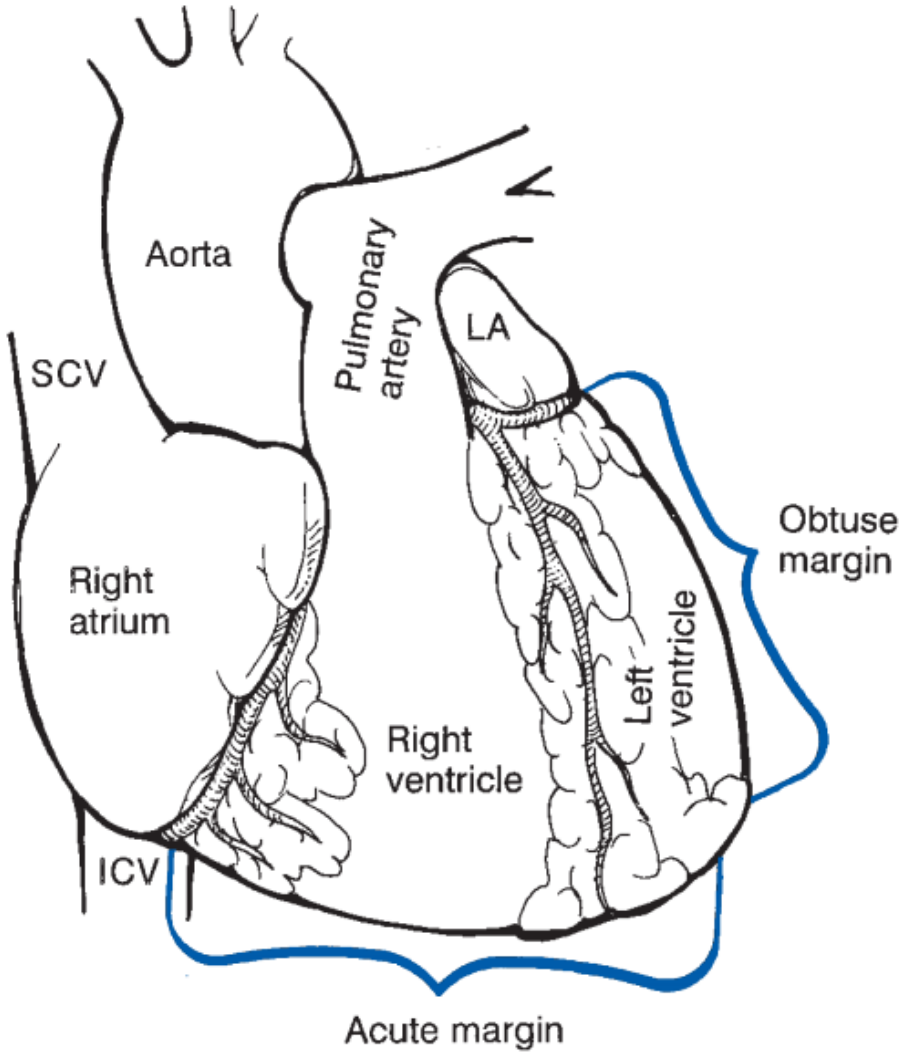
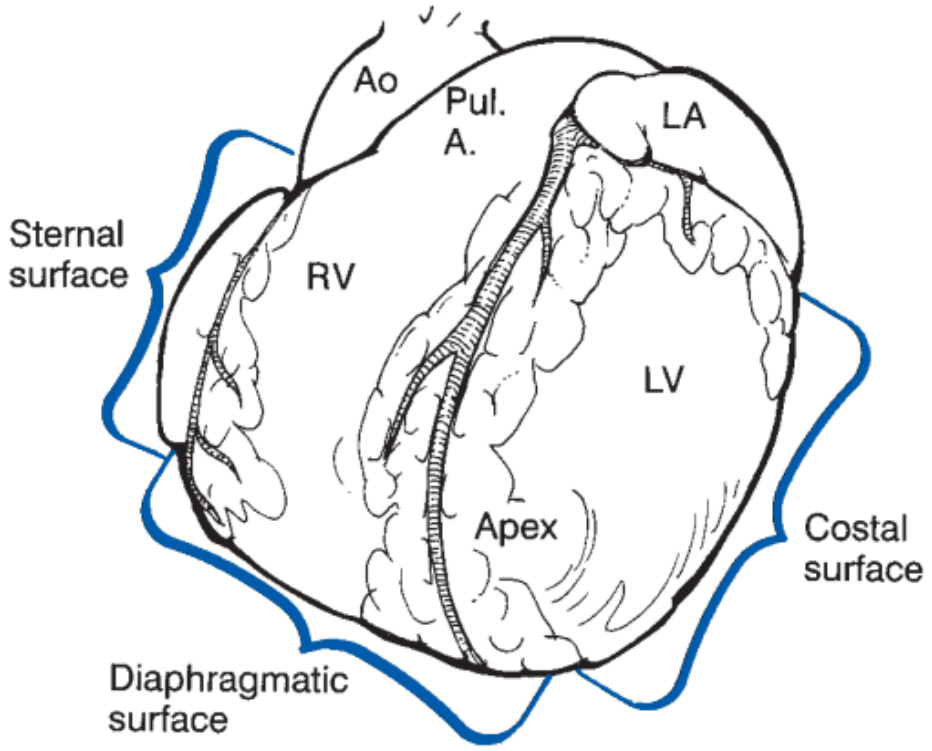

Aorta
Pulmonary artery
LA
SCV
Obtuse margin
Right atrium
Left ventricle
Right ventricle
ICV
Acute margin


Ao
Pul. A.
LA
Sternal surface
RV
LV
Apex
Costal surface
Diaphragmatic surface

OUTLINE

- Cardiac surgery
  - Type of disease
  - Cardiopulmonary bypass
  - complication
- Thoracic surgery
  - Type of disease
  - Thoracic incision
  - Complication

CARDIOPULMONARY BYPASS CIRCUIT

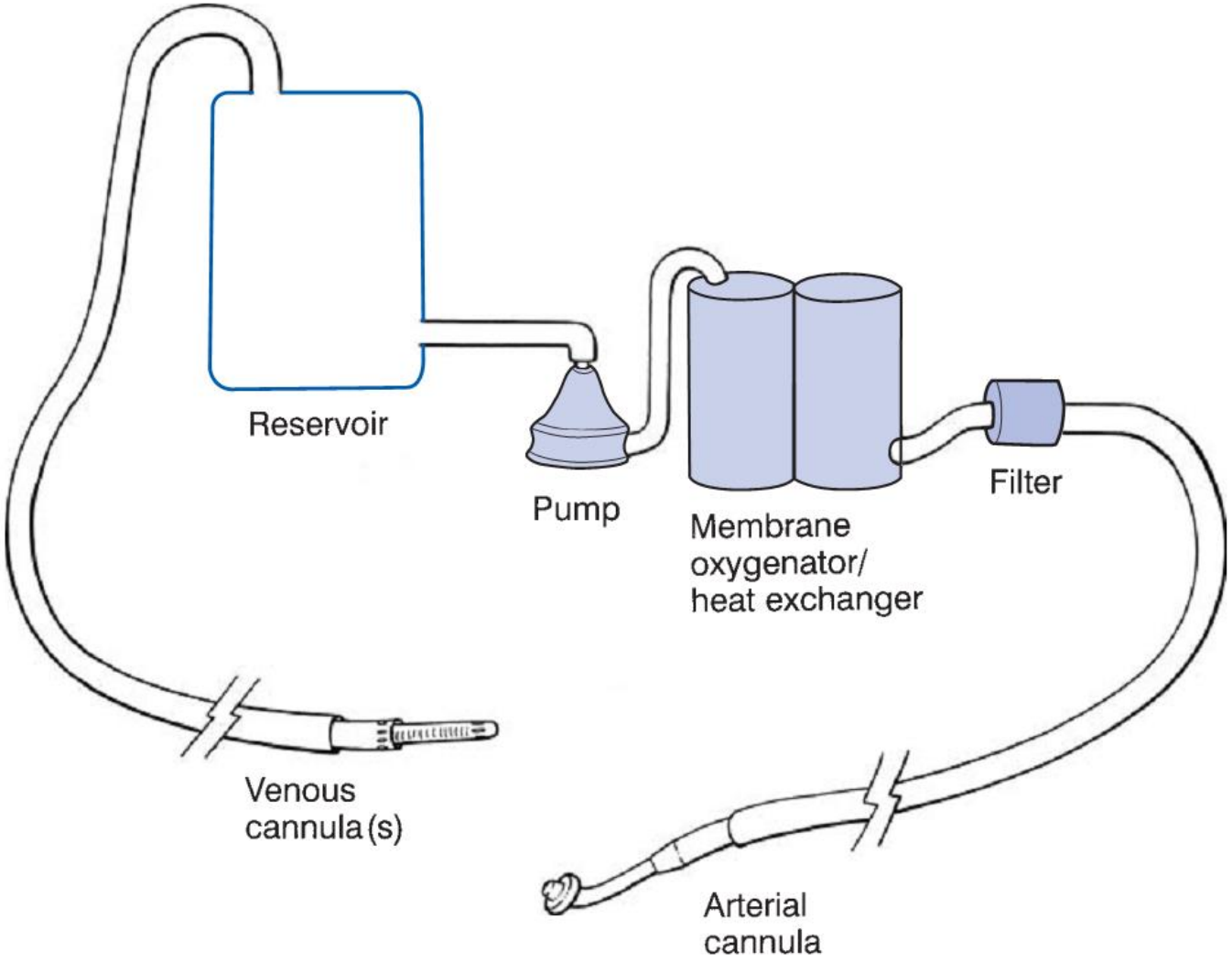


Figure 12-1. Basic cardiopulmonary bypass circuit with membrane oxygenator and centrifugal pump.

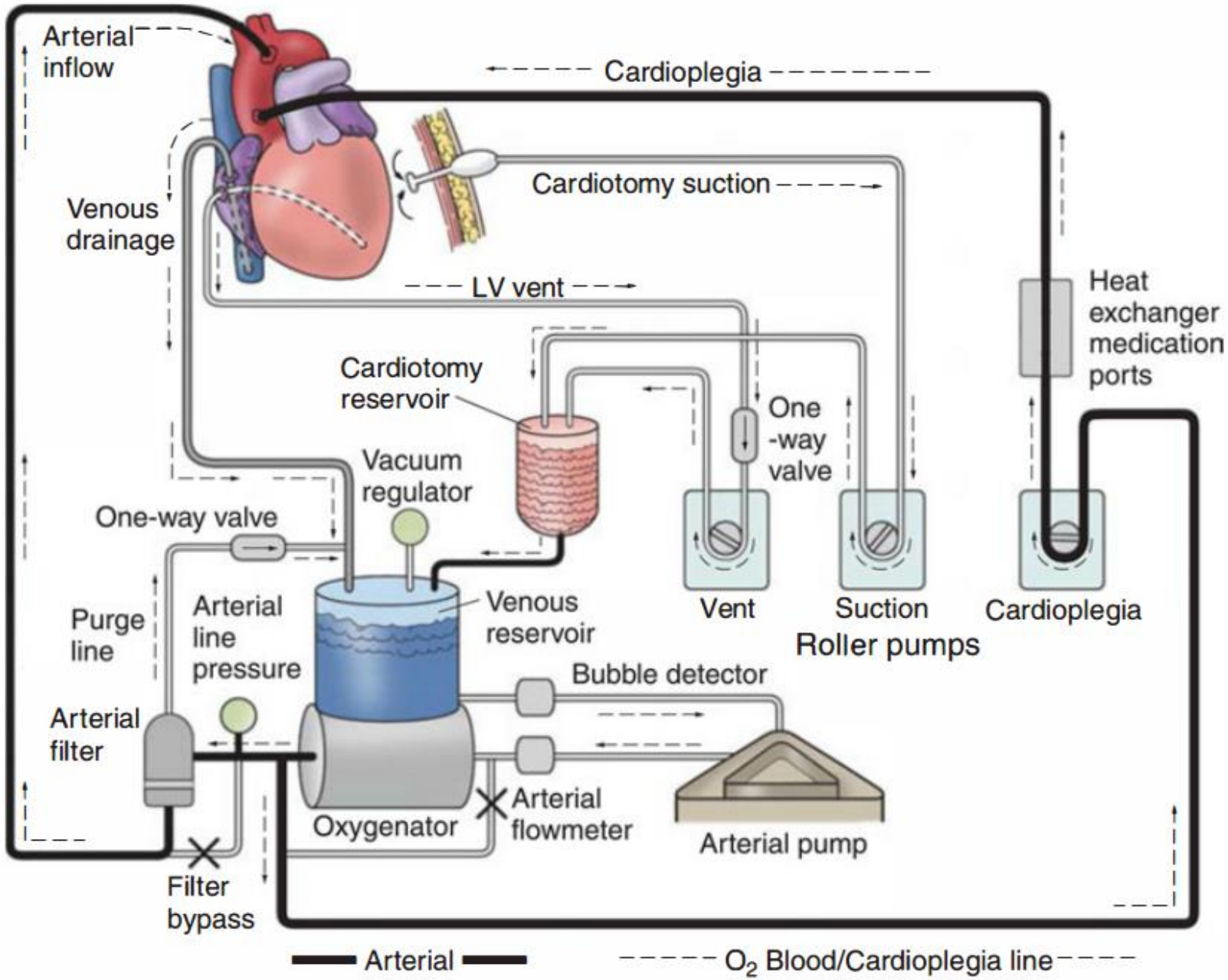
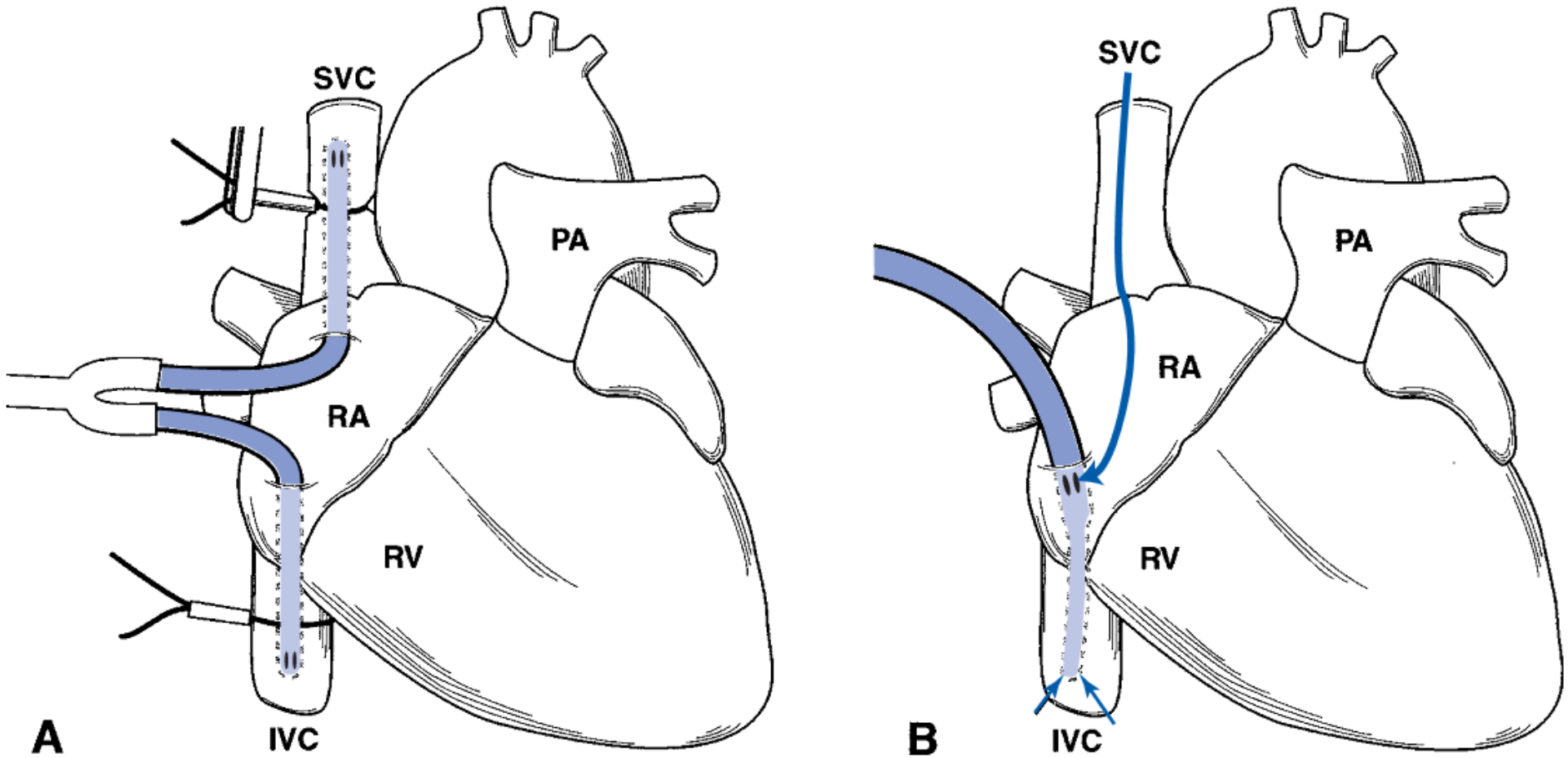
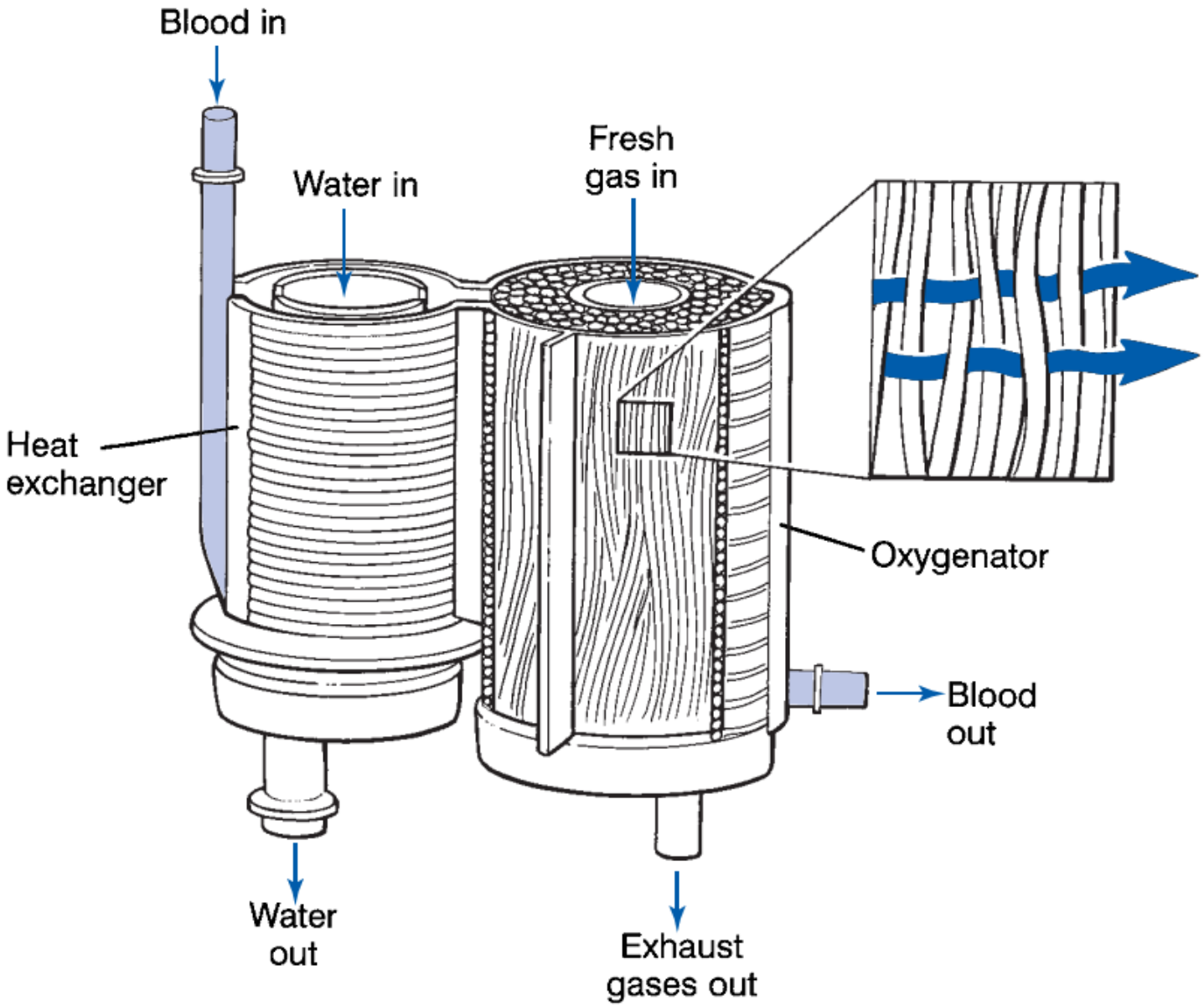
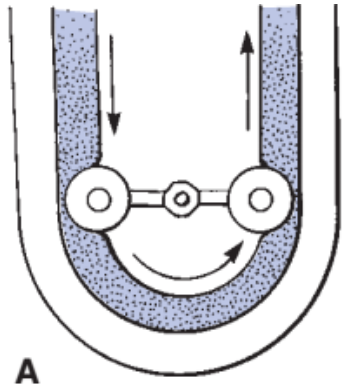


Fig. 36.10. Example of a complete cardiopulmonary bypass circuit. LV, left ventricle; P, pressure transducer.

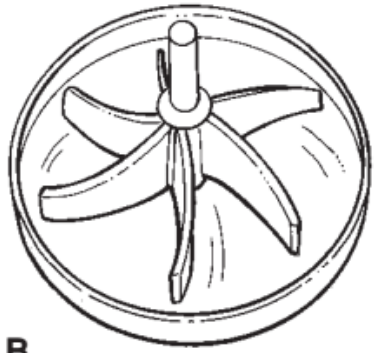

SVC
PA
RA
RV
IVC
A
SVC
PA
RA
RV
IVC
B

OXYGENETOR

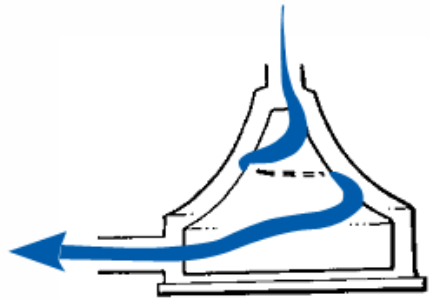

Blood in
Water in
Fresh
gas in
Heat
exchanger
Oxygenator
Blood
out
Water
out
Exhaust
gases out



A



B



C

Roller Versus Centrifugal Pump

	Roller pump	**Centrifugal pump**
Description	Nearly occlusive Afterload independent	Nonocclusive Afterload sensitive
Advantages	Low prime volume Low cost No potential for backflow Shallow sine-wave pulse	Portable, position insensitive Safe positive and negative pressure Adapts to venous return Superior for right or left heart bypass Preferred for long-term bypass Protects against massive air embolism
Disadvantages	Excessive positive and negative pressure Spallation Tubing rupture Potential for massive air embolism Necessary occlusion adjustments Requires close supervision	Large priming volume Requires flowmeter Potential passive backward flow Higher cost

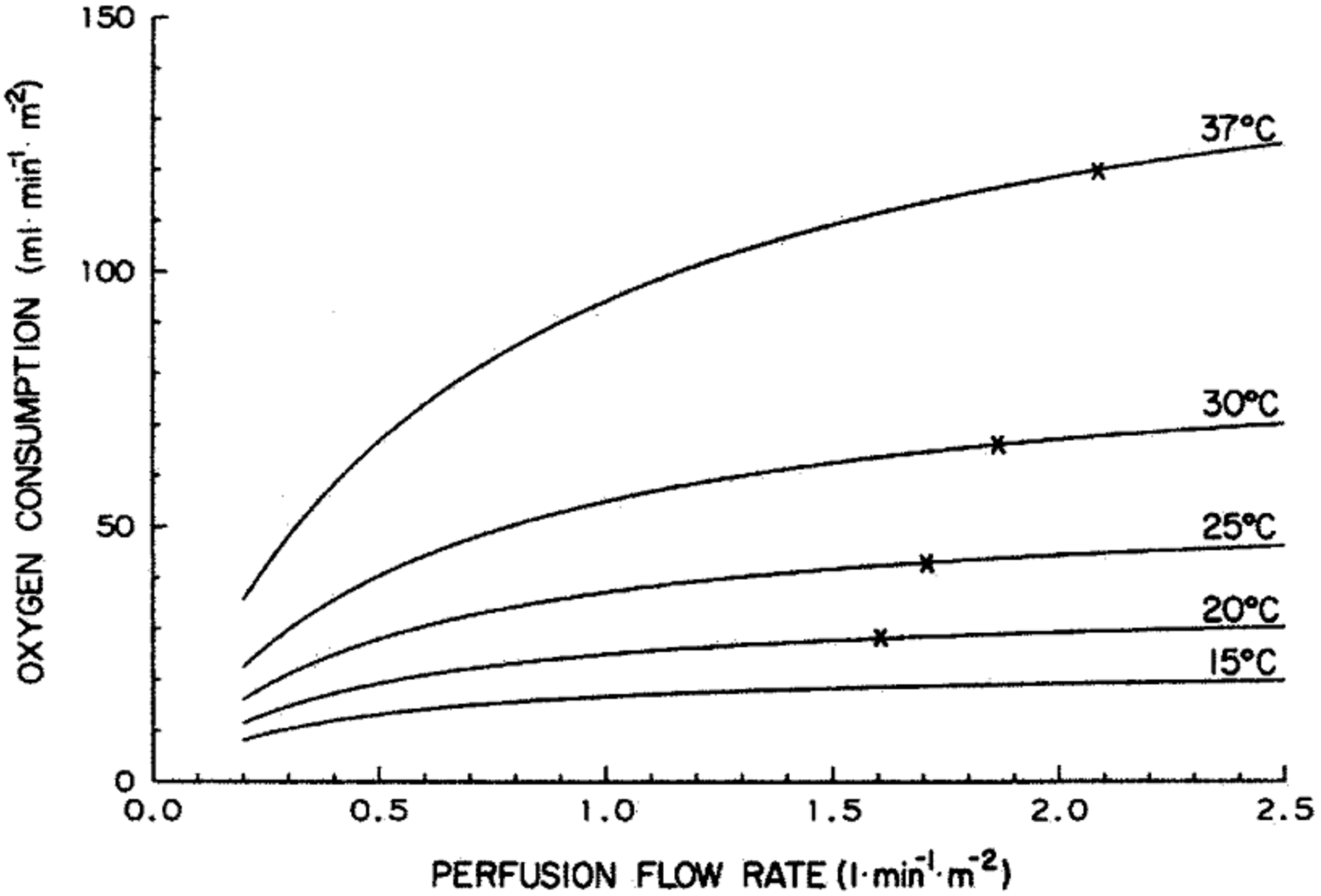
Minimizing Microemboli

Membrane oxygenator, centrifugal arterial pump
Cardiotomy reservoir filter (≤40 μm)
Arterial line filter/bubble trap (≤40 μm)
Keep temperature differentials <8–10°C
Prime with carbon dioxide flush; recirculate with saline and filter (5 μm)
Prevent air entry into the circuit Snug purse-string sutures Three-way stopcocks on all sampling ports Meticulous syringe management Adequate cardiotomy reservoir volume (for debubbling) Avoid excessive suction on vents One-way valved purge lines for bubble traps Use transesophageal echocardiography to locate trapped intracardiac air; de-air thoroughly
Wash blood aspirated from the surgical field
Prevent thrombus formation with adequate anticoagulation
Assess inflow cannulation site by epiaortic ultrasound imaging
Cannulate distal aorta or axillary artery
Consider use of special aortic cannulas

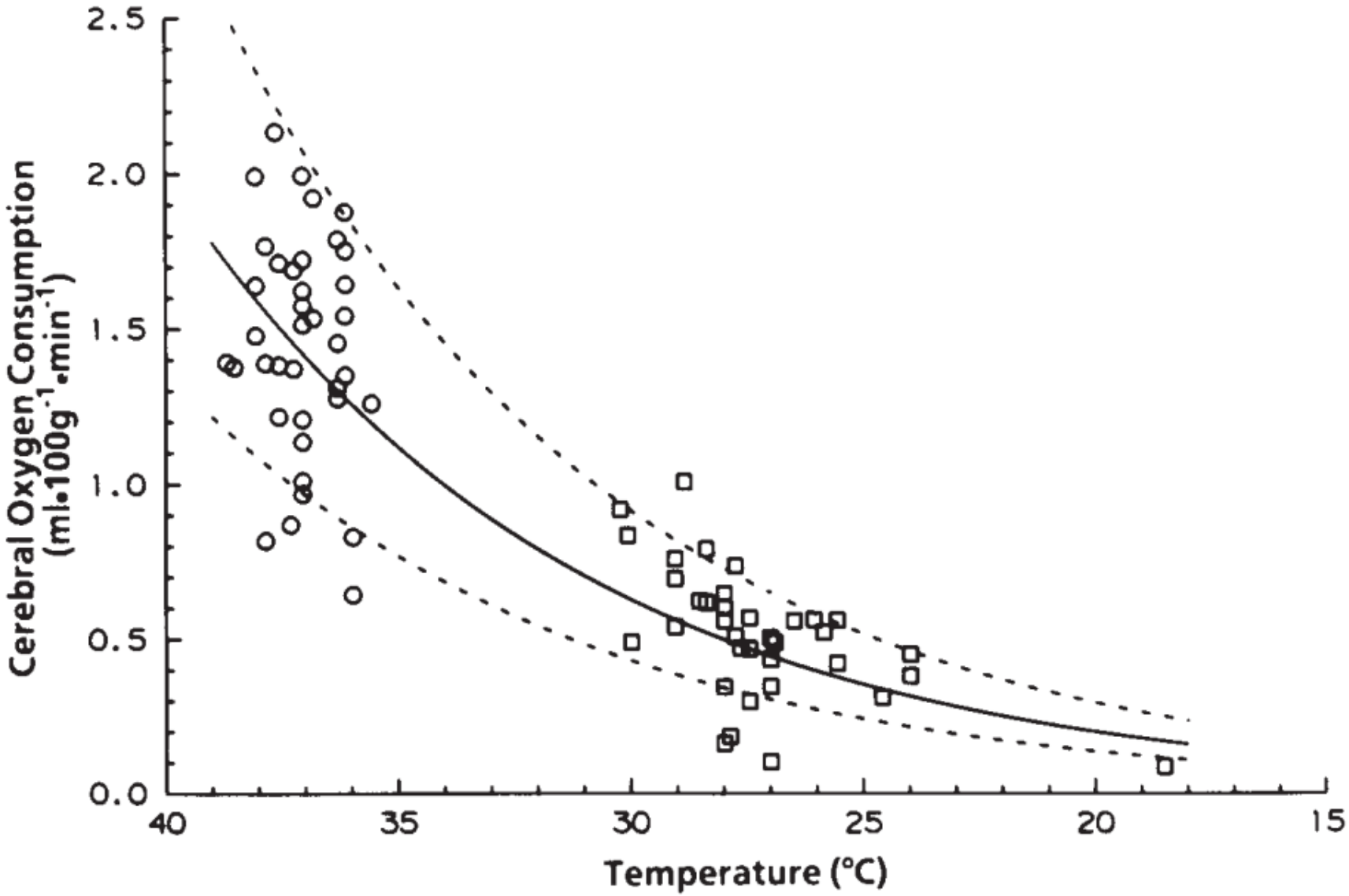
Major Sources of Microemboli

Gas	Foreign	Blood
Bubble oxygenators	Atherosclerotic debris	Fibrin
Air entry into the circuit	Fat, fat droplets	Free fat
Residual air in the heart	Fibrin clot	Aggregated chylomicrons
Loose purse-string sutures	Cholesterol crystals	Denatured proteins
Cardiotomy reservoir	Calcium particles	Platelet aggregates
Rapid rewarming	Muscle fragments	Platelet-leukocyte aggregates
Cavitation	Tubing debris, dust	Hemolyzed red cells
	Bone wax, talc	Transfused blood
	Silicone antifoam	
	Glue, Surgicel	
	Cotton sponge fiber	

OXYGEN CONSUMPTION AND PERFUSION FLOW



CEREBRAL OXYGEN CONSUMPTION AND TEMPERATURE



MYOCARDIAL PROTECTION

Therapeutic Innovations for Myocardial Protection

Reference	Year	Innovation
Bigelow WG[2]	1950	Studied the application of hypothermia to cardiac surgery in canines
Swan H	1953	Showed that hypothermic arrest (26°C) in humans provided a bloodless field for operating
Melrose DG, Bentall HH[3]	1955	Introduced the concept of reversible chemical cardiac arrest in canines
Lillehei CW	1956	Detailed a method for delivering hypothermic crystalloid cardioplegia by cannulating coronary arteries
Lam CR	1957	One of the earliest known uses of the term "cardioplegia"
Gerbode F, Melrose DG	1958	Used potassium citrate to induce cardiac arrest in humans
McFarland JA	1960	Challenged the safety of the Melrose technique; changed from potassium arrest to intermittent aortic occlusion or coronary artery perfusion for myocardial protection

CARDIOPLEGIA

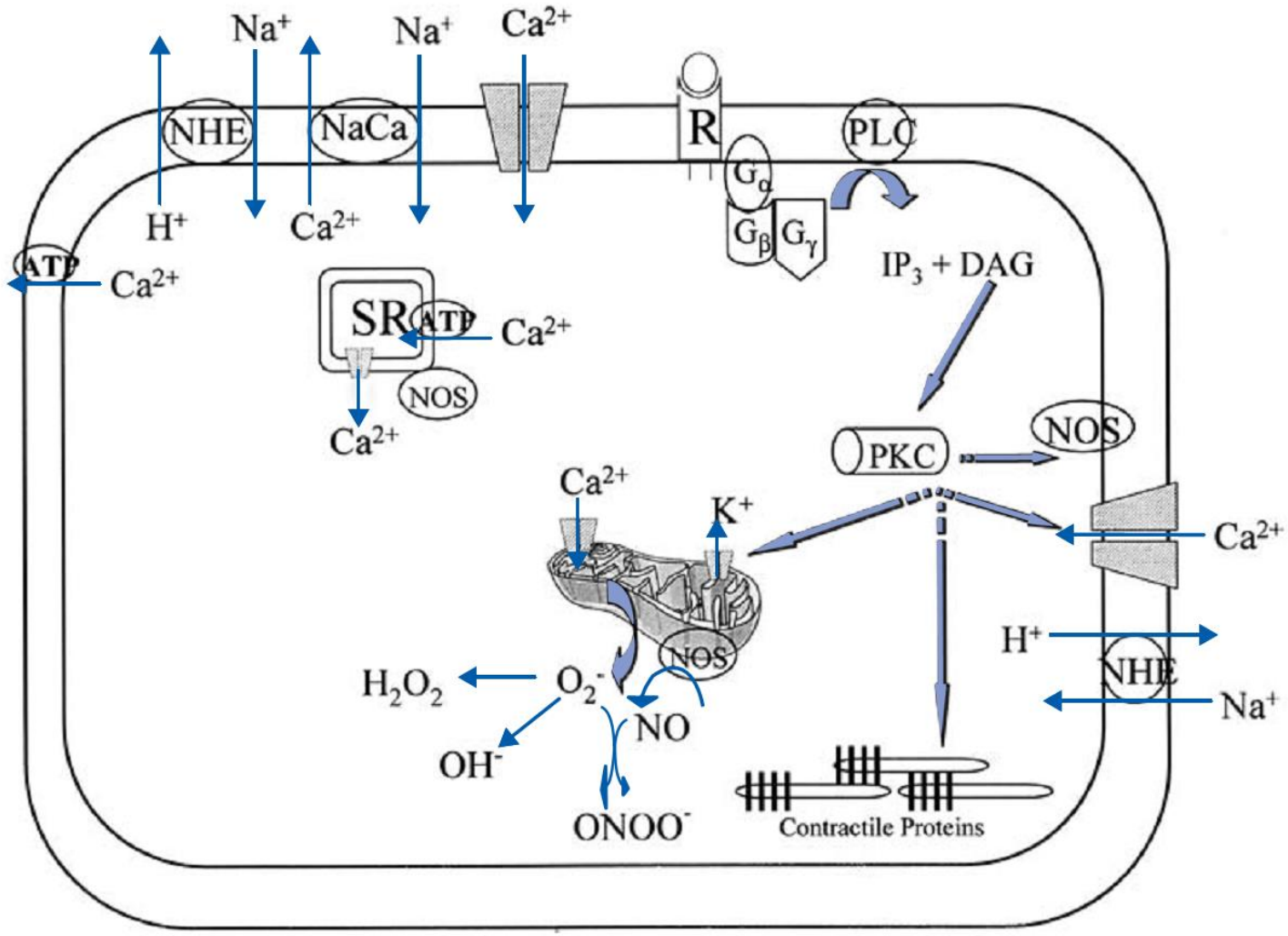
Components of Various Cardioplegic Solutions

Solution	Usual components*							Other components
	Sodium	Potassium	Magnesium	Calcium	Bicarbonate	pH	Osmolarity (mOsm/L)	
Bretschneider's no. 3	12.0	10.0	2.0	–	–	5.5–7.0	320	Procaine; mannitol
Lactated Ringer's	130.0	24.0	–	1.5	–	7.14	–	Lactate; chlorine
Tyer's	138.0	25.0	1.5	0.5	20.0	7.8	275	Acetate; gluconate; chloride
St. Thomas no. 2	110.0	16.0	16.0	1.2	10.0	7.8	324	Lidocaine
Roe's	27.0	20.0	1.5	–	–	7.6	347	Glucose; tris buffer
Gay/Ebert	38.5	40.0	–	–	10.0	7.8	365	Glucose
Birmingham	100.0	30.0	–	0.7	28.0	7.5	300–385	Glucose; chloride; albumin; mannitol
Craver's	154.0	25.0	–	–	11.0	–	391	Dextrose
Lolley's	–	20.0	–	–	4.4	7.78	350	Dextrose; mannitol; insulin

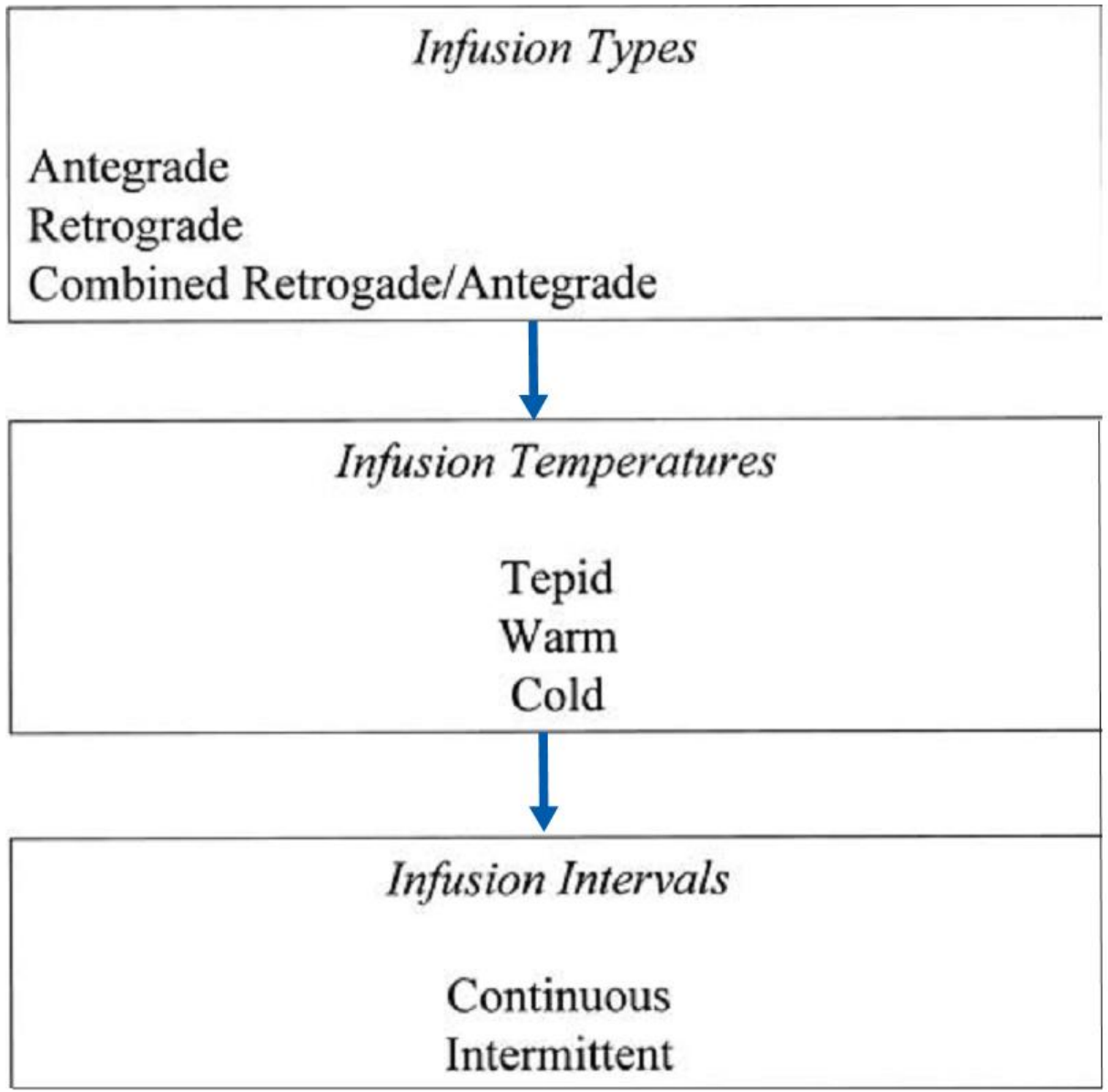
MEDIATORS OF ISCHEMIA-REPERFUSION INJURY

-INTRACELLULAR CA2+

-REACTIVE OXYGEN SPECIES FORMATION



Methods and delivery of cardioplegic solutions



TYPE OF CARDIAC DISEASE

- Ischemic heart disease
  - Revascularization
  - Surgical treatment of complications of ischemic heart
    - Postinfarction ventricular septal defect
    - Left ventricular aneurysm
- Valvular heart disease
  - Mechanical valve, bioprosthesis, repair
  - Aortic valve disease
  - Mitral valve disease

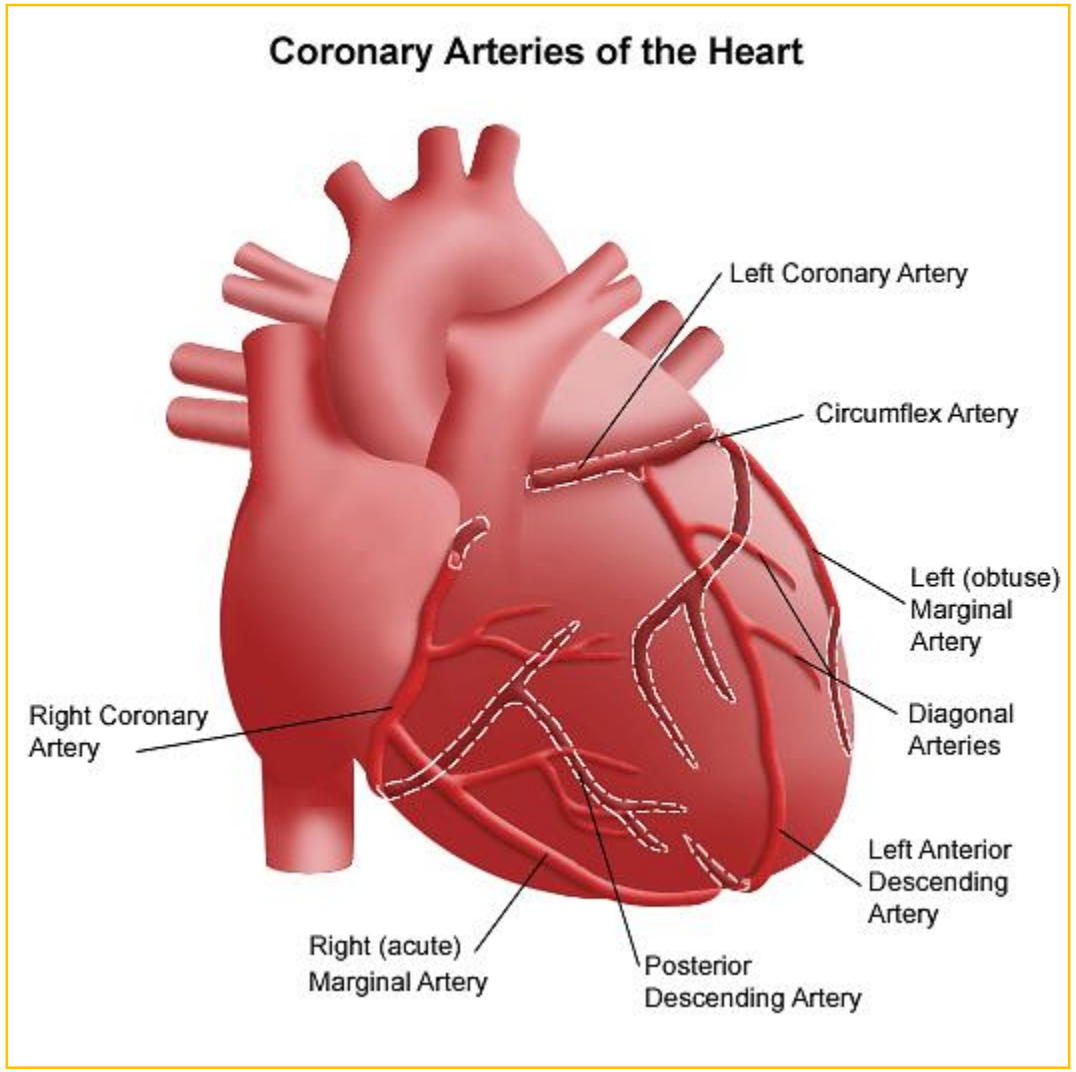
TYPE OF CARDIAC DISEASE

- Valvular heart disease
  - Tricuspid valve disease
- Diseases of great vessel
  - Aortic dissection
  - Aortic aneurysm
- Adult congenital heart disease
- Cardiac tumor

Cardiac Surgery

- Heart disease
  - Valvular heart disease
    - Mitral valve
    - Aortice valve
    - Tricuspid valve
    - Pulmonic valve
  - Coronary heart disease
  - Congenital heart disease
  - Aortic aneurysm
- Etiology
  - Rheumatic disease
  - Degeneration
  - Congenital
  - Infection
  - Tumor
  - Trauma
- Physiology
  - Stenosis
  - Regurgitation
  - Defect

ISCHEMIC HEART DISEASE



PURPOSES

- Restore blood flow to the heart
- Relieves chest pain and ischemia
- Improves the patient's quality of life
- Enable the patient to resume a normal lifestyle
- Lower the risk of a heart attack

INDICATIONS

- Patients with blockages in coronary arteries
- Patients with angina
- Patients who cannot tolerate PTCA (Percutaneous transluminal coronary angioplasty) and do not respond well to drug therapy
- Acute myocardial infarction
- Sever coronary artery disease

COMPLICATIONS

- Bleeding
- Heart attack
- Heart failure
- Arrhythmia
- Stroke
- Pleural effusions
- Wound infection
- Renal failure
- Death

CORONARY ANATOMY

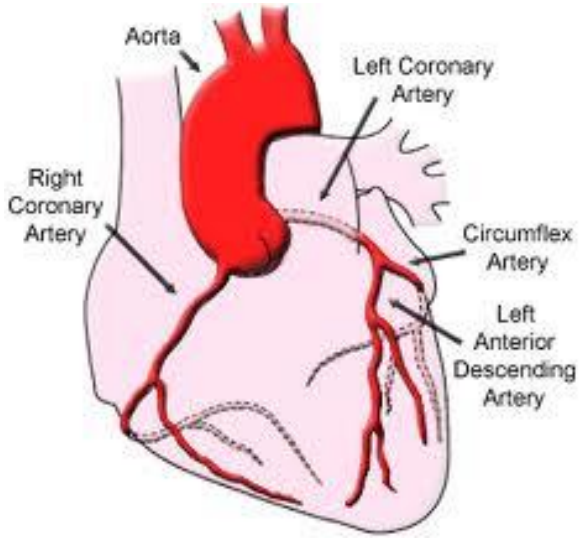
From surgical point of view, coronary system is divided into 4 parts:

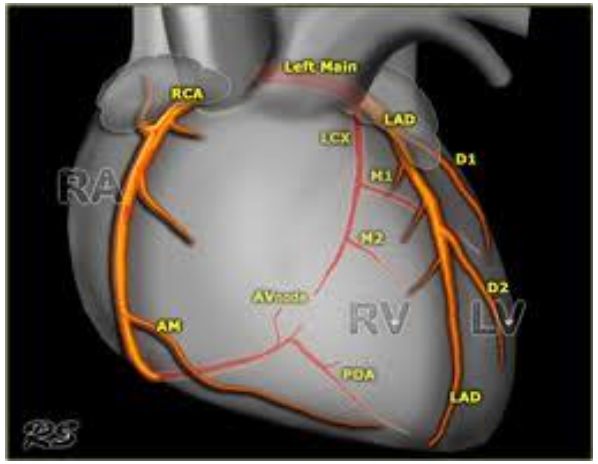
1-Left main coronary artery

2-Left anterior descending artery (LAD)(and its diagonal branches)

3-Left circumflex artery (and its marginal branches)

4-Right coronary artery (and its posterior descending branch [PDA])

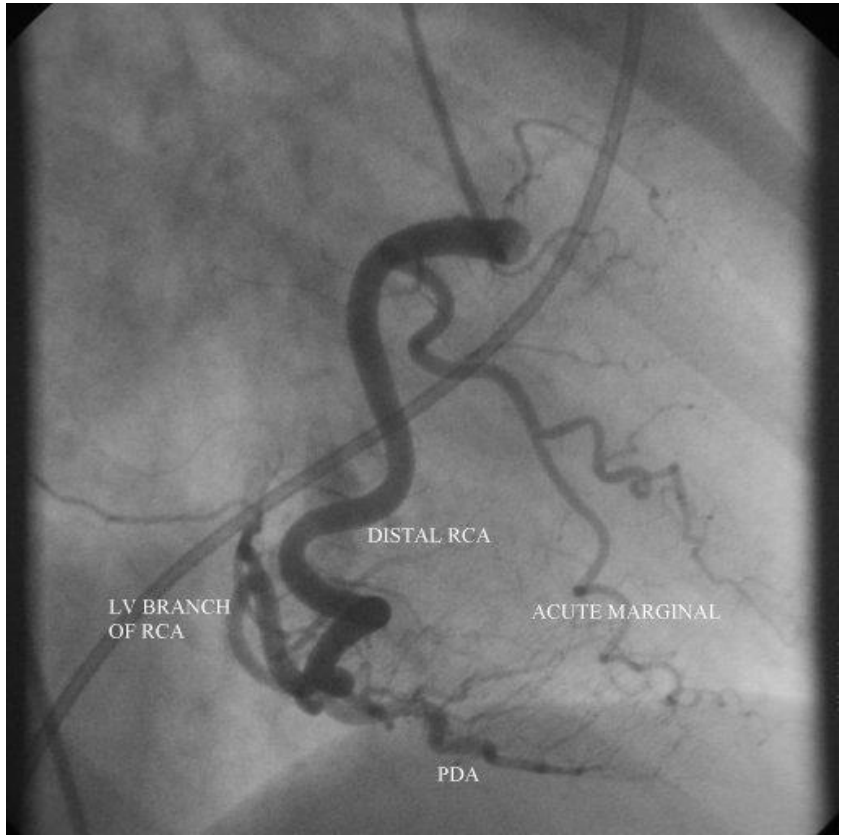


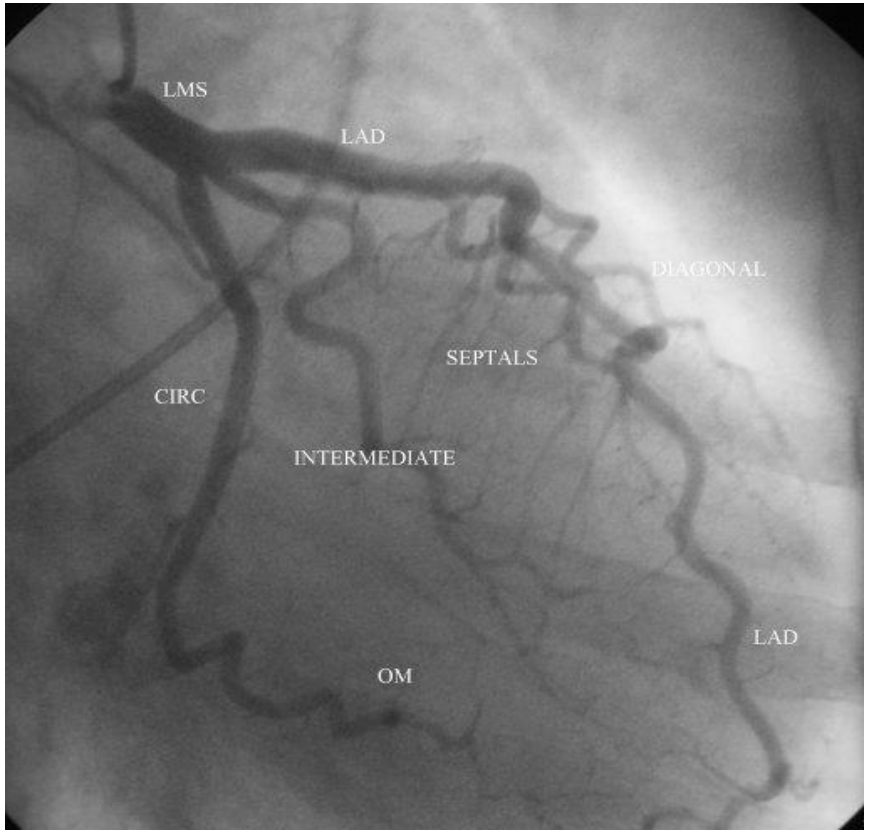


ANATOMIC CONSIDERATIONS

- **Left main disease:** A significant lesion at the left main coronary artery, and this lesion affects blood flow to both left anterior descending artery and left circumflex artery.
- **One-vessel disease:** A significant lesion (or lesions) affecting one of the other three arteries or one of its large branches is considered
- **Two-vessel disease** and **three-vessel disease**: Significant lesions affecting two arteries or three arteries, respectively.

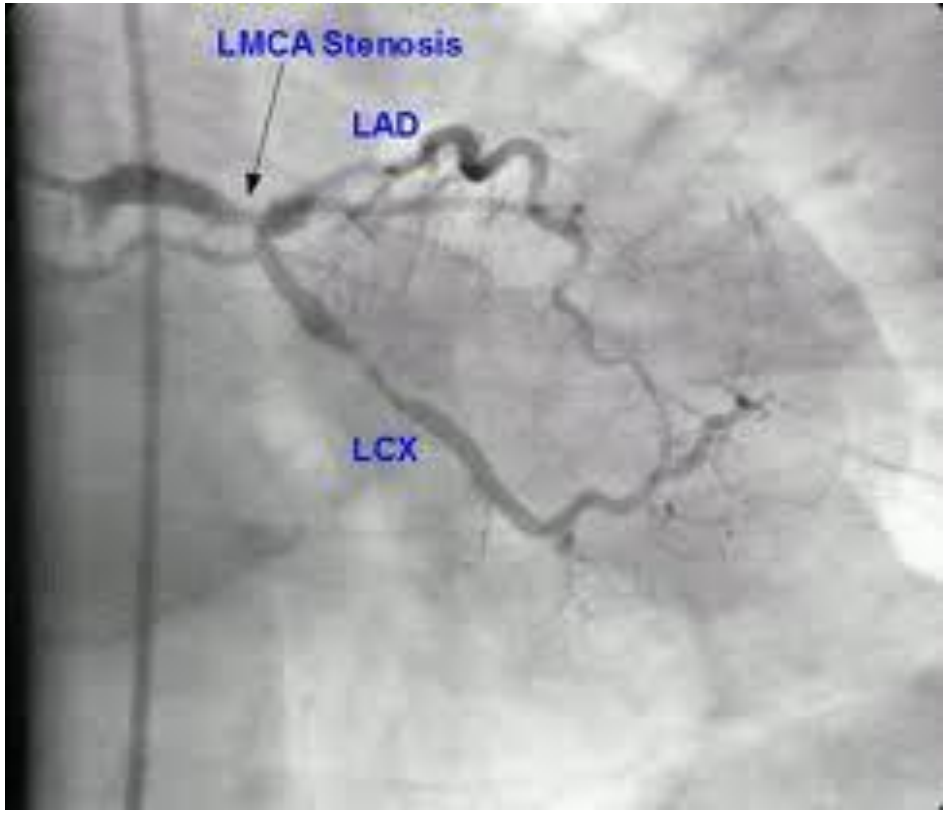
Coronary Angiography





Indications for CABG

1- Left main coronary artery stenosis :
Stenosis >50%, as annual mortality 10-15%



Indications for CABG, cont.

2- Left main equivalent:

> 70% stenosis of proximal left anterior descending (LAD) and proximal circumflex artery (PCA)

TECHNIQUES FOR CABG

- The standard approach ⇨ midline sternotomy

1- **On-pump CABG (**traditional, conventional tech.)

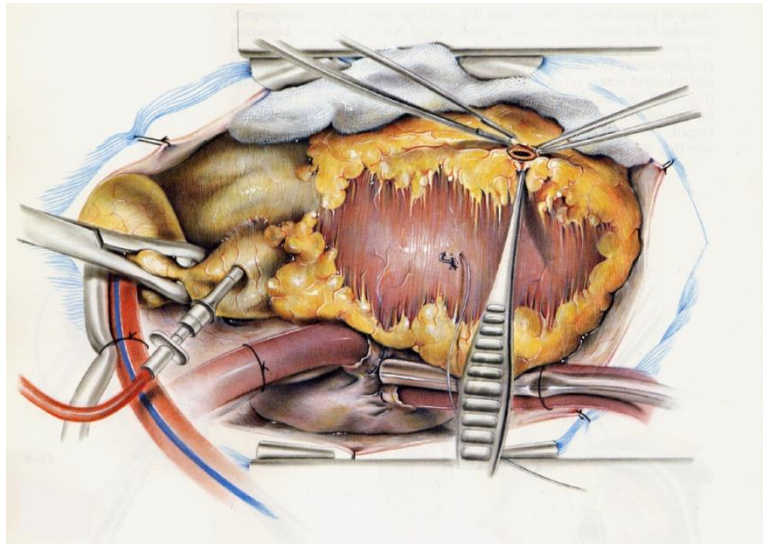
Arrested heart with cardioplegia , using Cardiopulmonary Bypass .

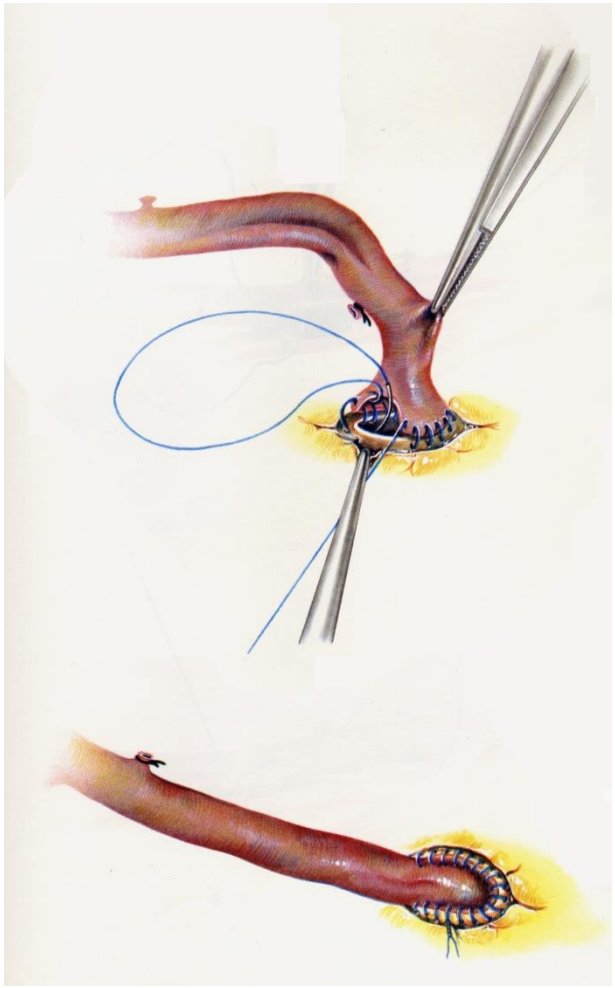
2- **Off-pump coronary artery bypass (OPCAB)**

With a beating heart and without the use of cardiopulmonary bypass.

On-pump CABG

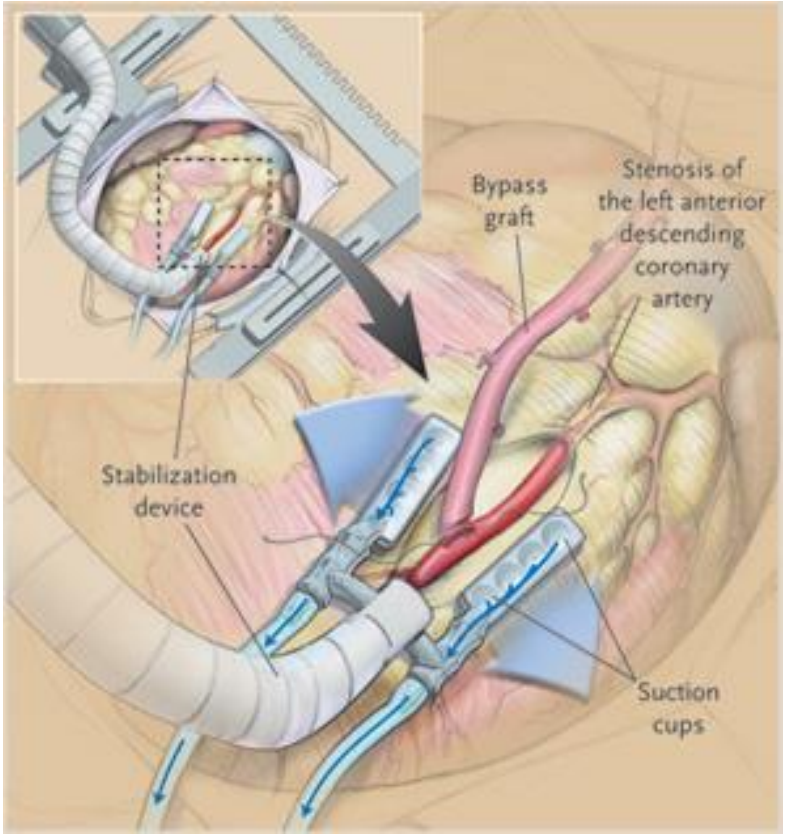
- Very low mortality and morbidity
- Excellent results.
- The most widely used technique worldwide.





Off-pump coronary artery bypass (OPCAB)

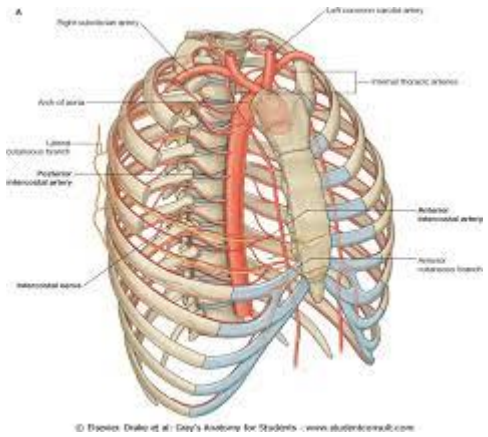
- Newer technique with the proposed benefit of lower complication rates.
- Highly specialized technique with good results in the hands of surgeons who perform this surgery regularly.

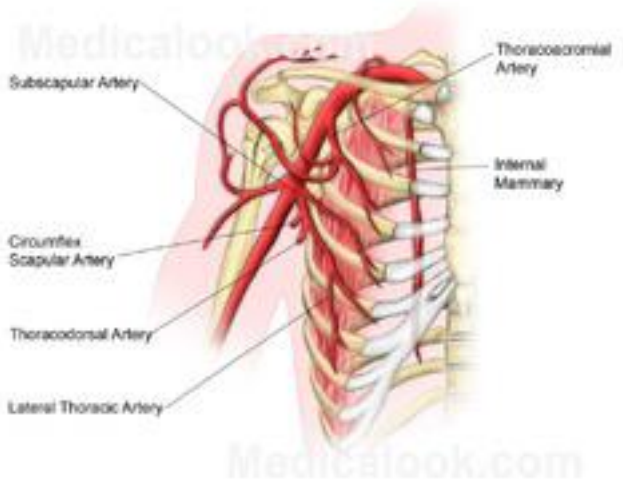


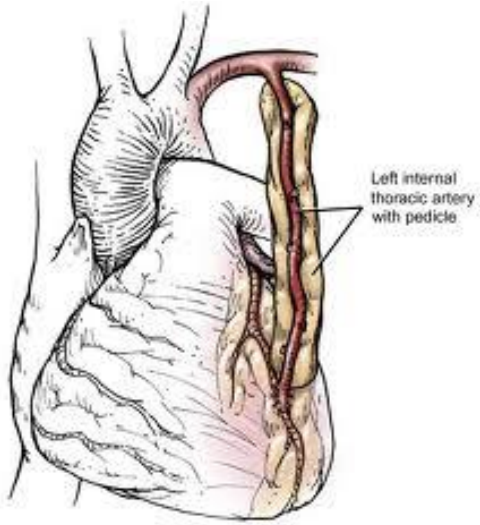
Conduits for CABG

1- Left internal thoracic (mammary) artery (LITA, LIMA):

- Gold standard for LAD
- excellent long term patency (90-95% at 15 years).







CONDUITS FOR CABG

- LIMA should always be used unless:

  1) Emergency operation with hemodynamic decompensation,

  2) History of chest wall radiation or radical mastectomy,

  3)Proximal left subclavian artery stenosis,

  4) Iatrogenic injury or hematoma during harvesting,

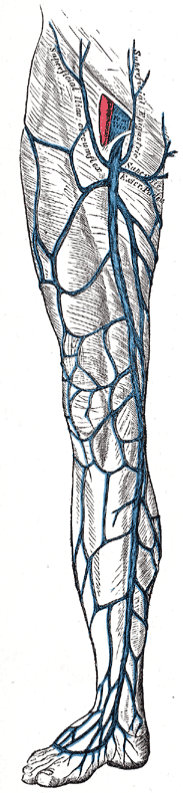
  5) Insufficient flow due to small size or persistent spasm

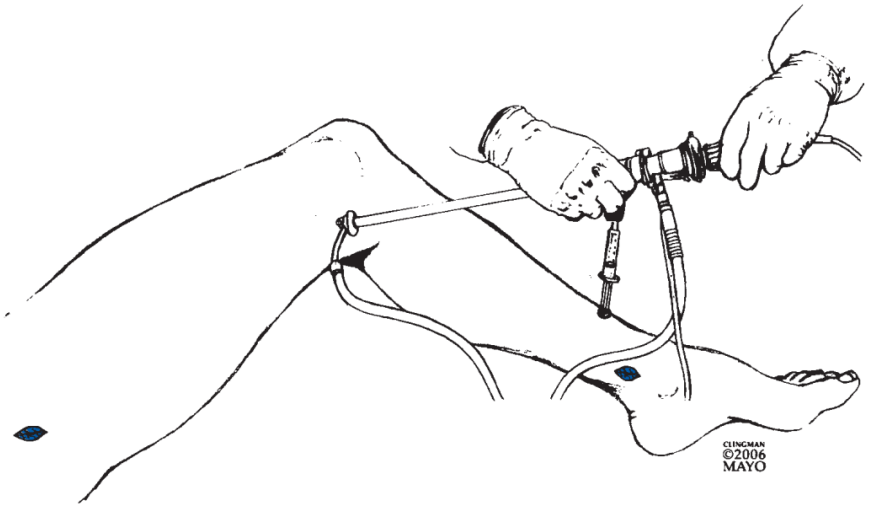
CONDUITS FOR CABG

2- Reversed saphenous vein grafts (SVG)

- Commonly used especially when many grafts. such as triple or quadruple bypass are required
- Ten-year patency is 60-70%.
- The causes of graft failure are :
  - Thrombosis,
  - Intimal hyperplasia
  - Graft atherosclerosis.

Reversed SVG



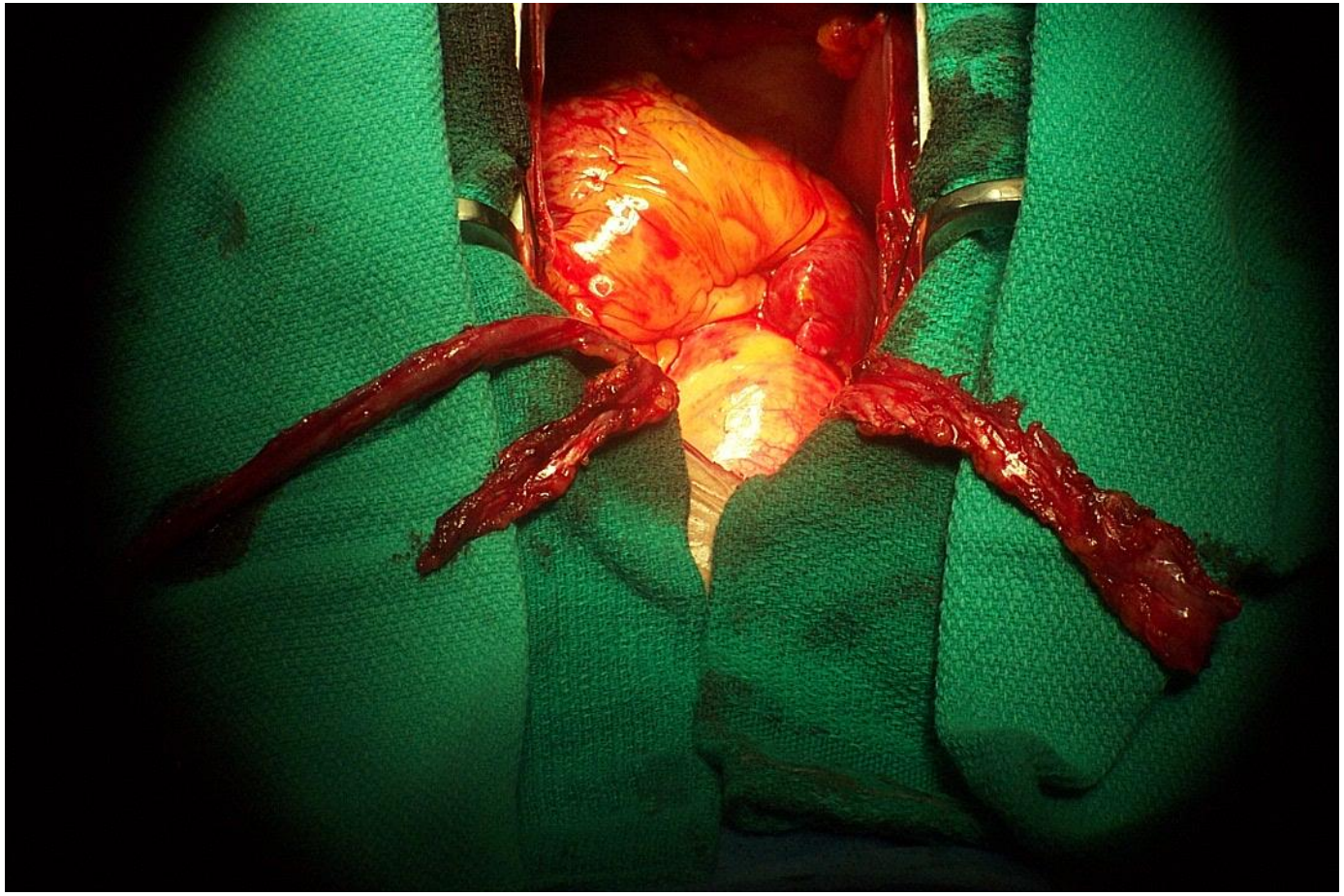


CONDUITS FOR CABG

3- Right internal thoracic (mammary) artery (RITA, RIMA)

- Used in bilateral internal thoracic (mammary) artery grafting
- Patients receiving bilateral IMAs:
  - Less risk of recurrent angina, BUT with ⇨
  - Higher rates of sternal infection, dehiscence and mediastinitis especially in elderly, obese or diabetic patients

bilateral IMAs

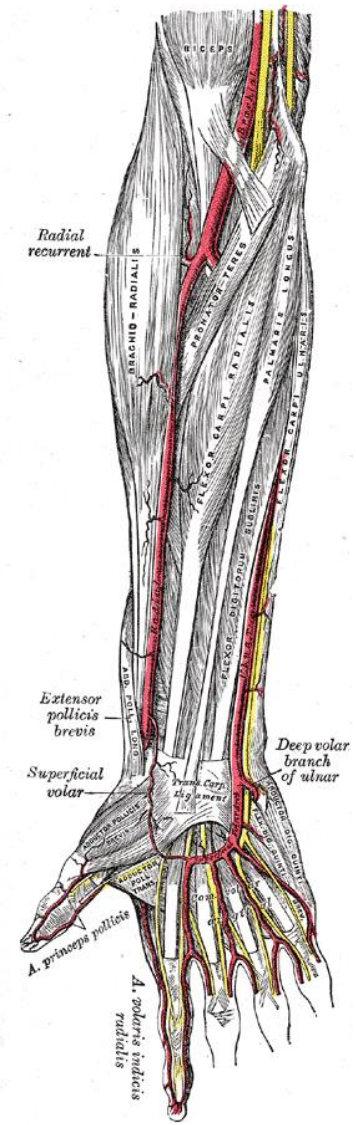


Conduits for CABG

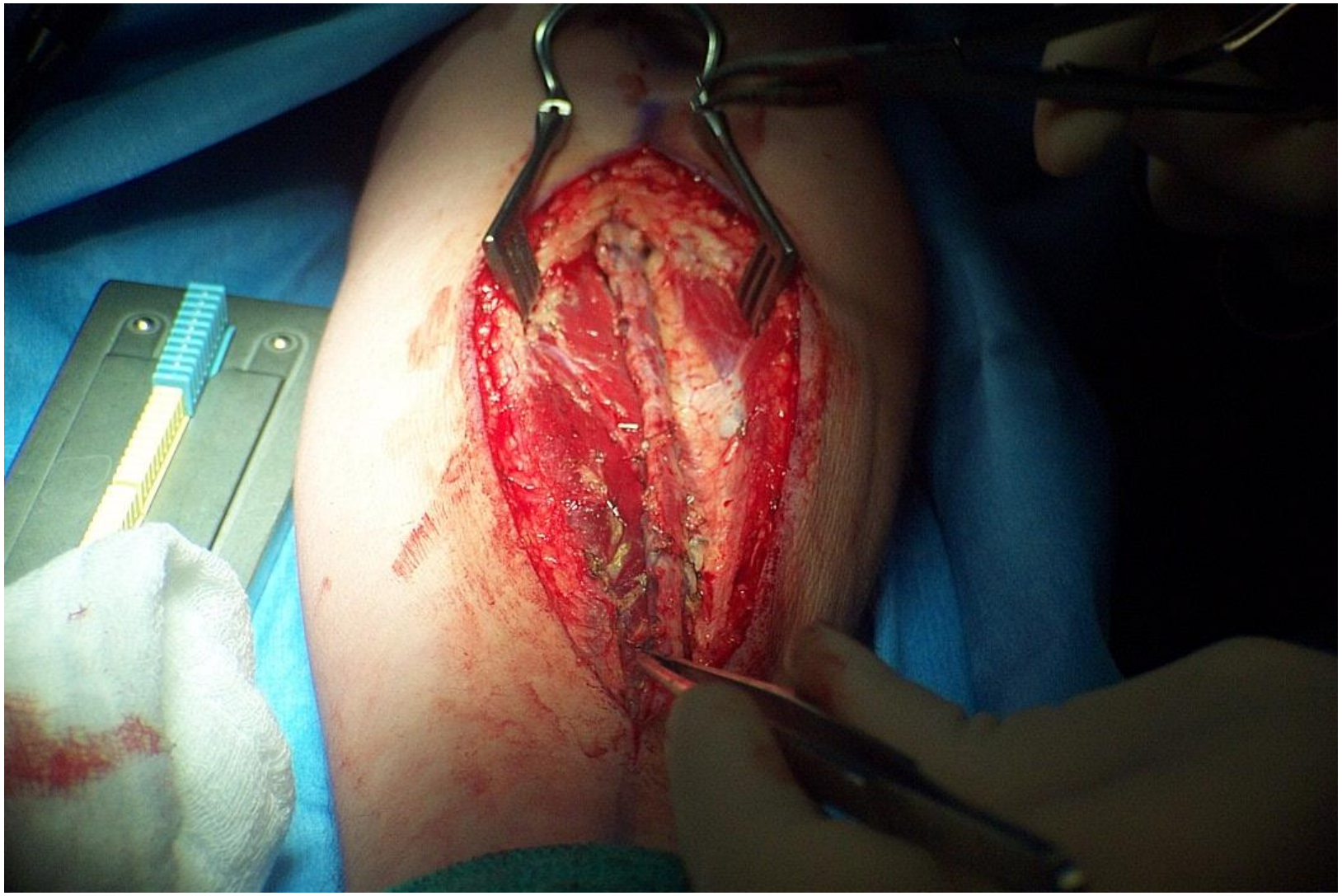
4-Radial artery

- Approximately 85-90% patency at 5 years

- Prone to severe vasospasm P.O. due to muscular wall; patients often placed on Calcium Channel Blockers.



RADIAL HARVEST

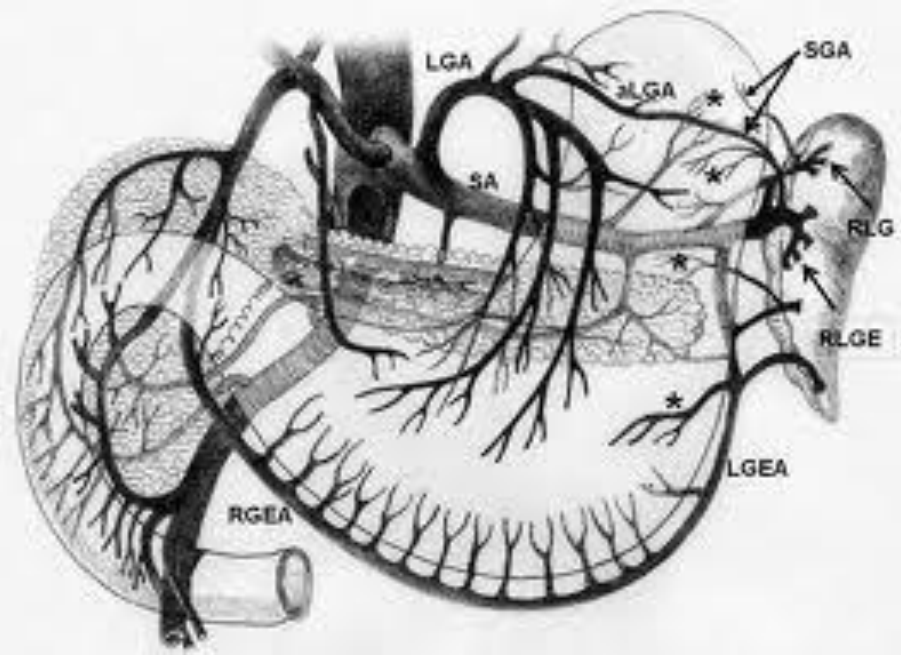


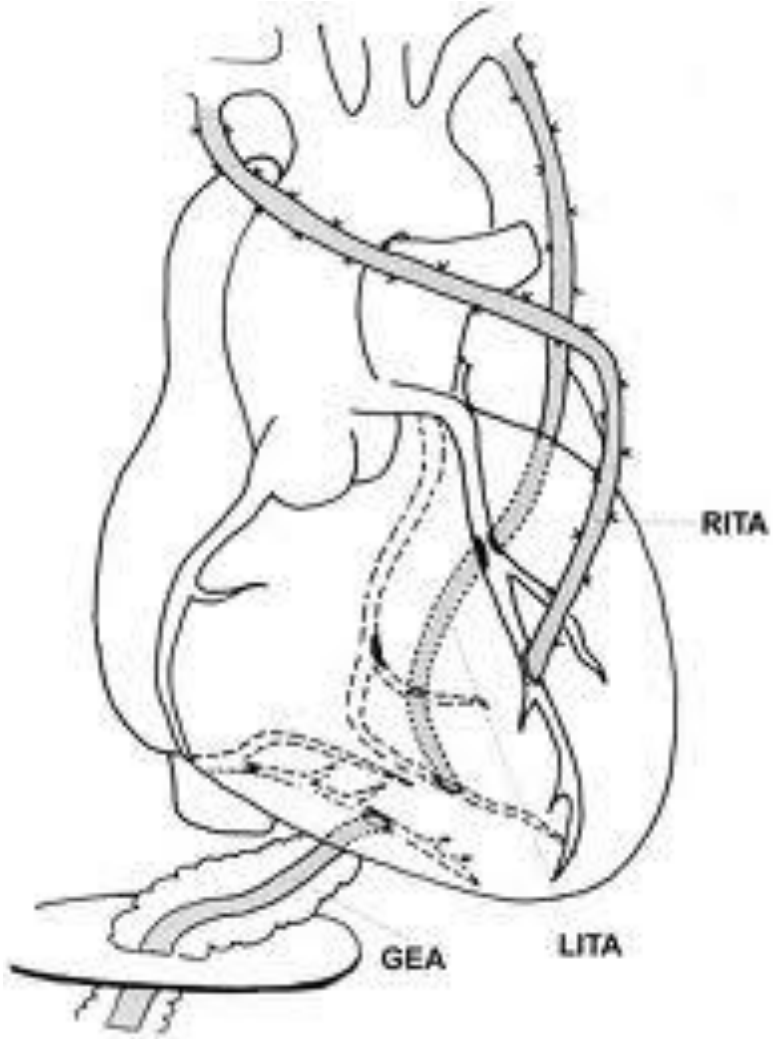
CONDUITS FOR CABG

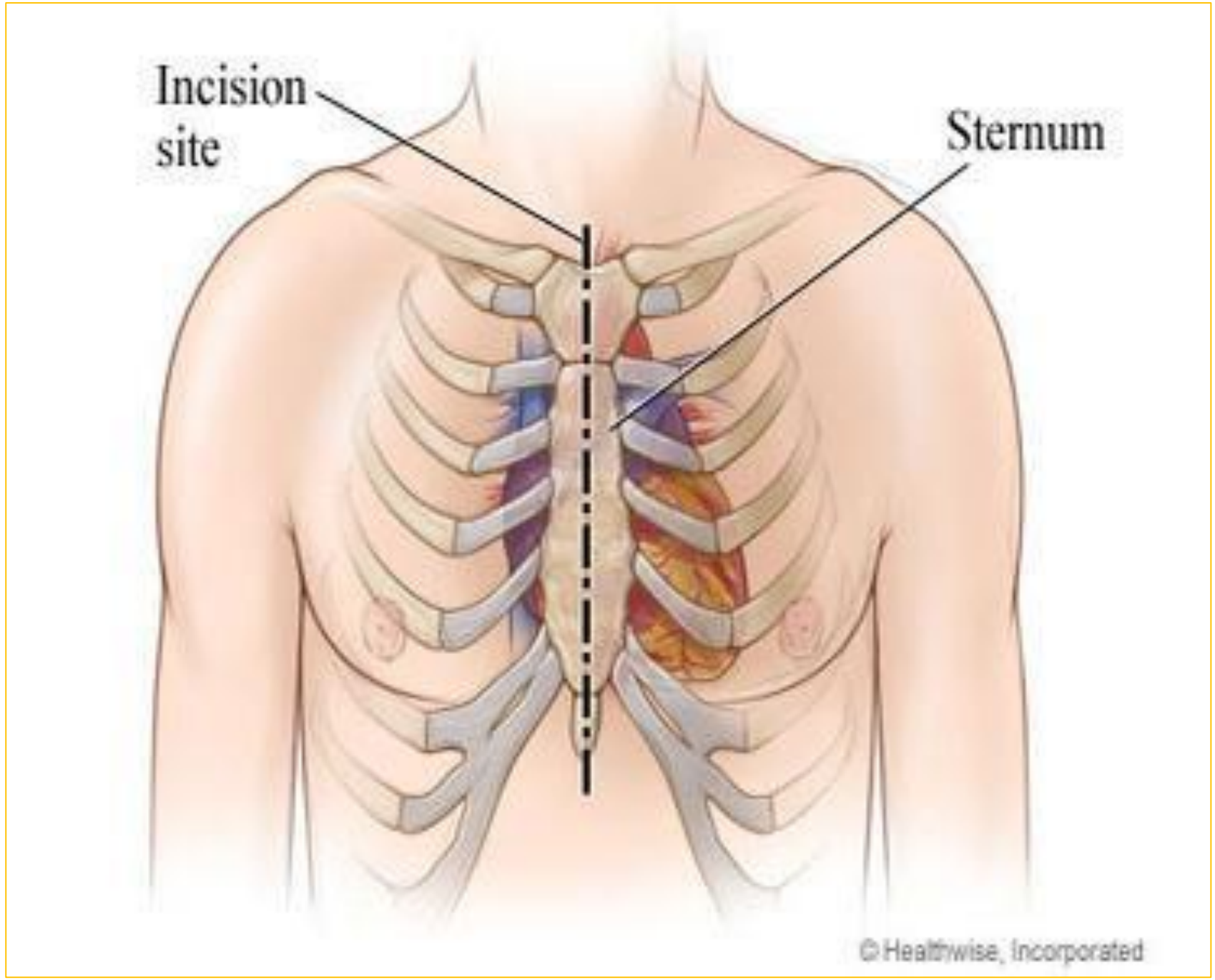
5- Right gastroepiploic artery

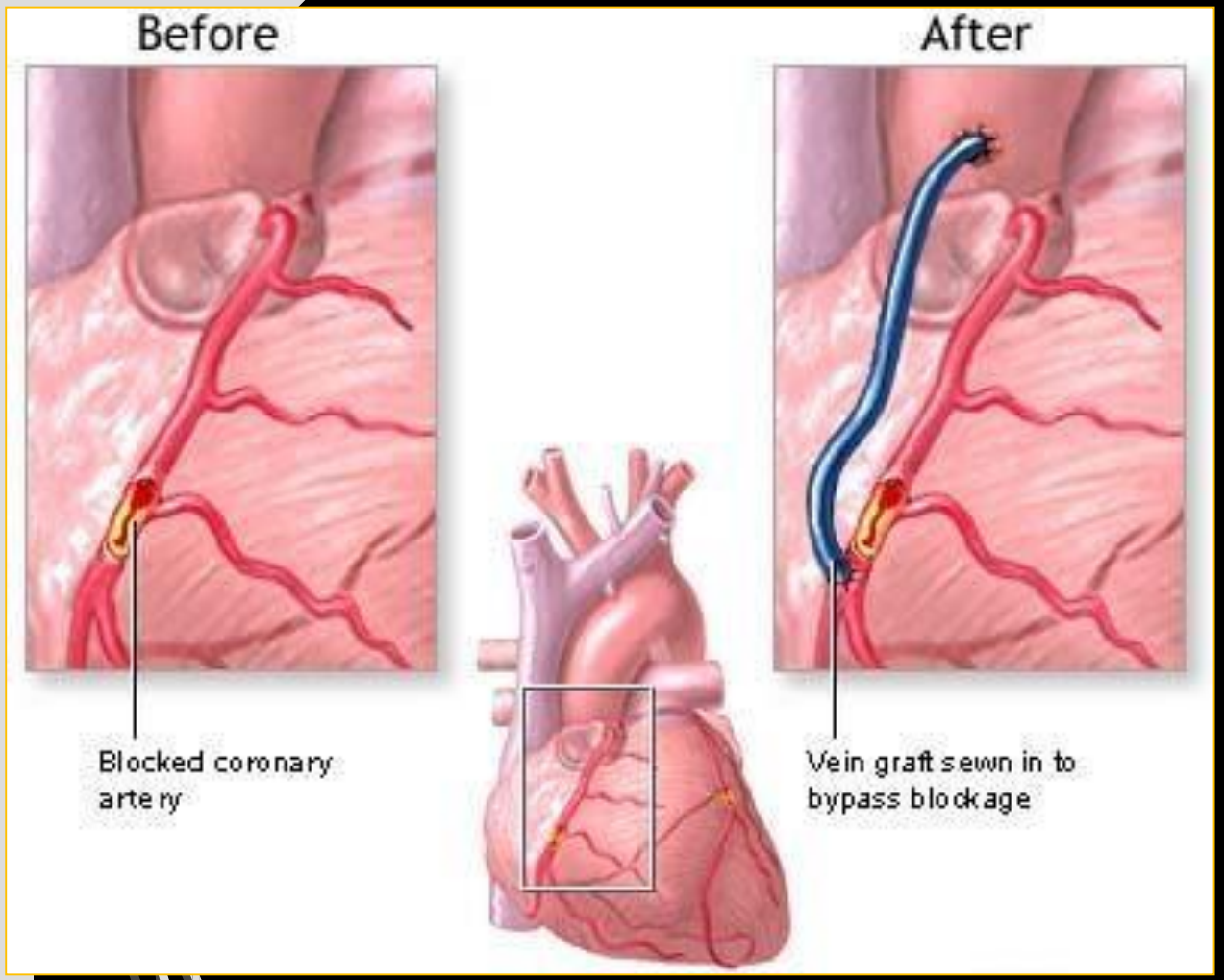
- Used as an in situ graft or as a free graft if no alternative suitable conduit are available
- Infrequently used: due to
  - The artery is fragile,
  - Small diameter at the site of distal anastomosis,
  - Possibility of vessel twisting,
  - Increased operative time (need laparotomy incision).

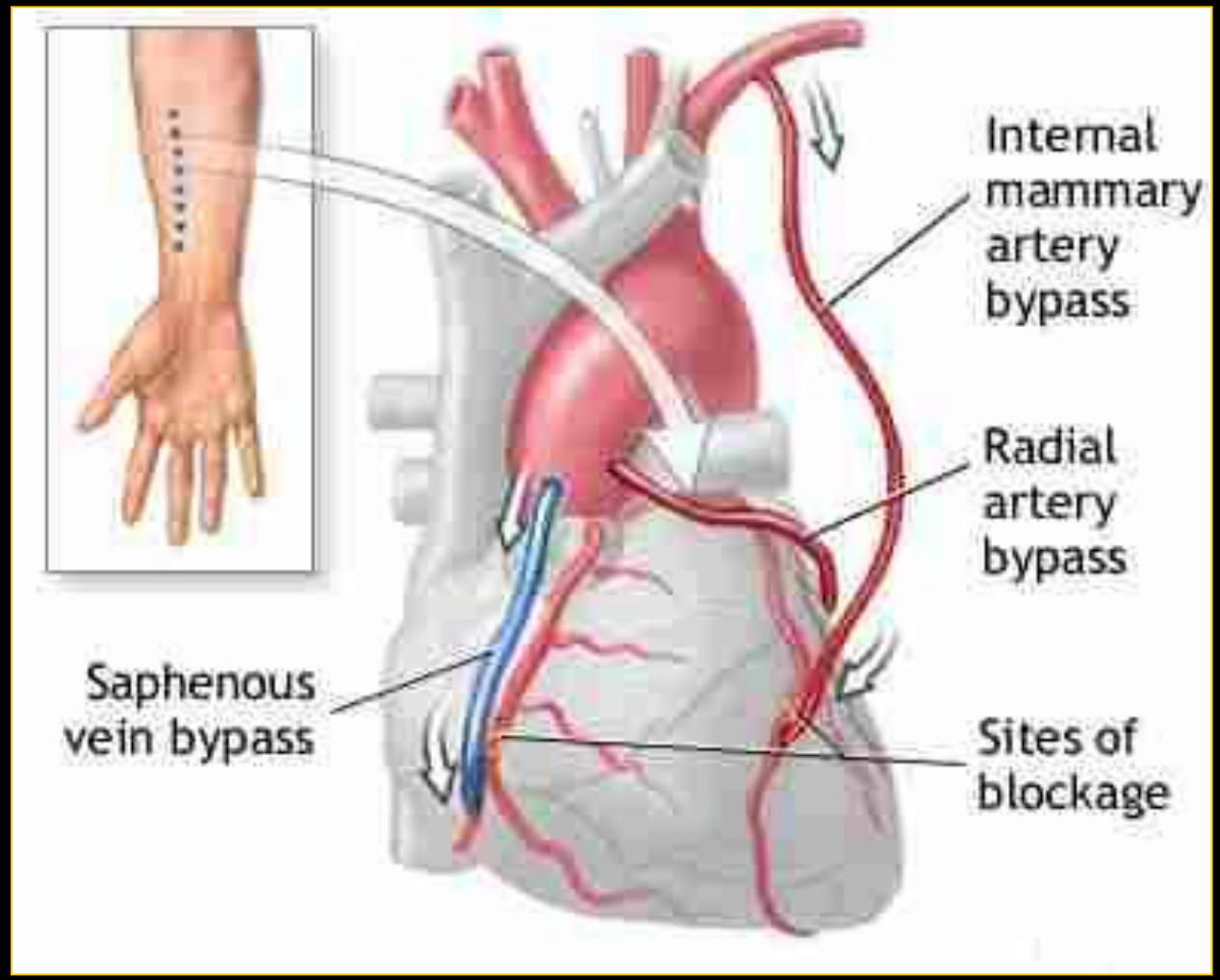
Right gastroepiploic artery



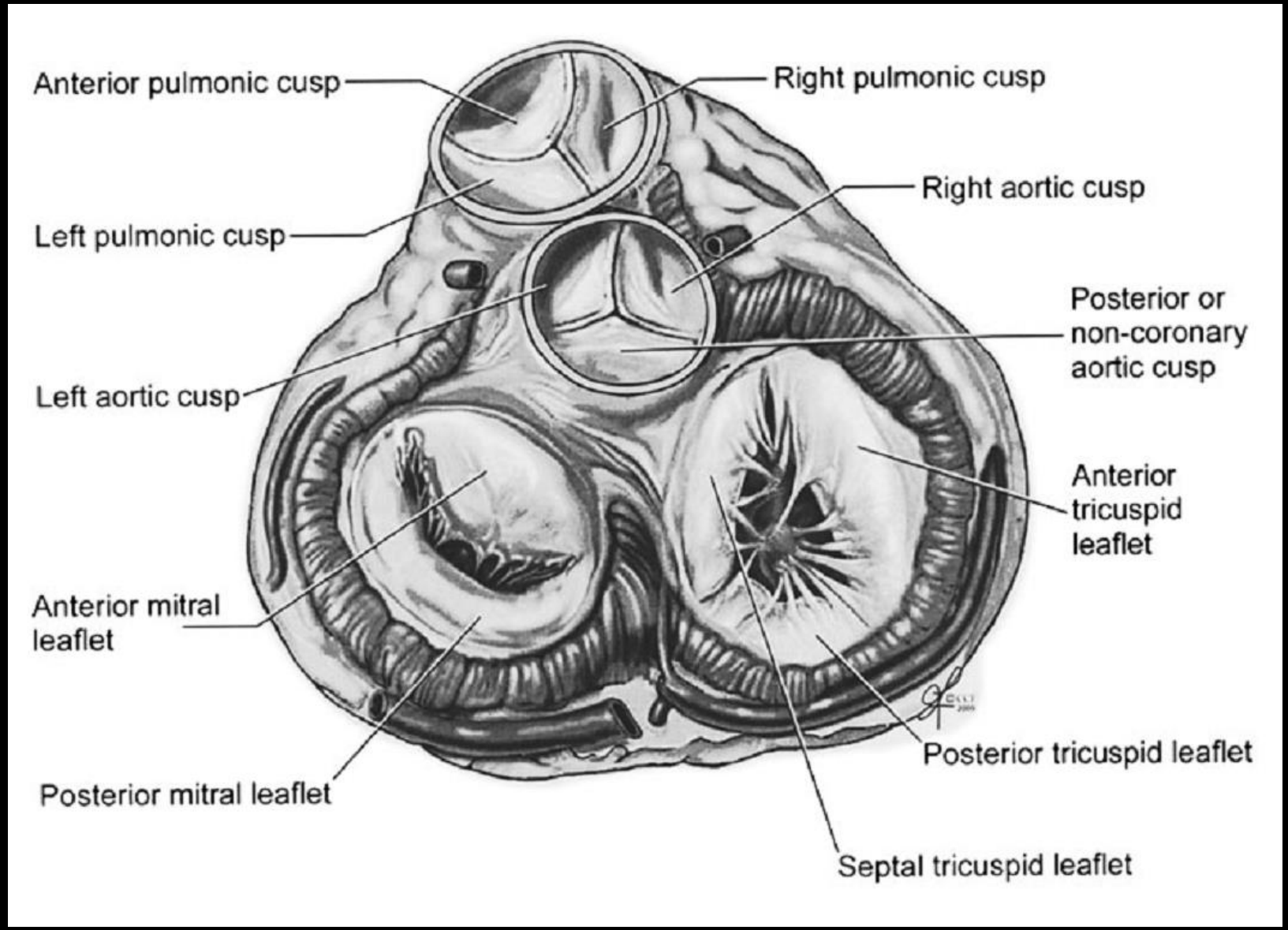



Incision site
Sternum
© Healthwise, Incorporated


Before
After
Blocked coronary artery
Vein graft sewn in to bypass blockage


Internal mammary artery bypass
Radial artery bypass
Saphenous vein bypass
Sites of blockage

AORTIC VALVE SURGERY



Valvular Abnormalities

Nodular Rheumatic Disease

Aortic Root Dilation

Endocarditis

Grading of Aortic Stenosis

Grade	Aortic Valve Area (cm^2)
Mild	>1.5
Moderate	1-1.5
Severe	<1

AORTIC REGURGITATION

Echocardiographic stages of chronic aortic regurgitation

	Compensated	Transitional	Decompensated*
Dimensions			
End-diastolic dimension (mm)	<60	60 to 70	>75
End-systolic dimension (mm)	<45	45 to 50	>55
Volumes			
End-diastolic volume (mL/m2)	<120	130 to 160	>170
End-systolic volume (ml/m2)	<50	50 to 60	>60
Left ventricular function			
Ejection fraction (percent)	>55	51 to 55	≤50
Fractional shortening (percent)	>32	30 to 31	<29

SURGERY – PRIMARY ROOT DISEASE

- Annuloplasty or other valve sparing surgery

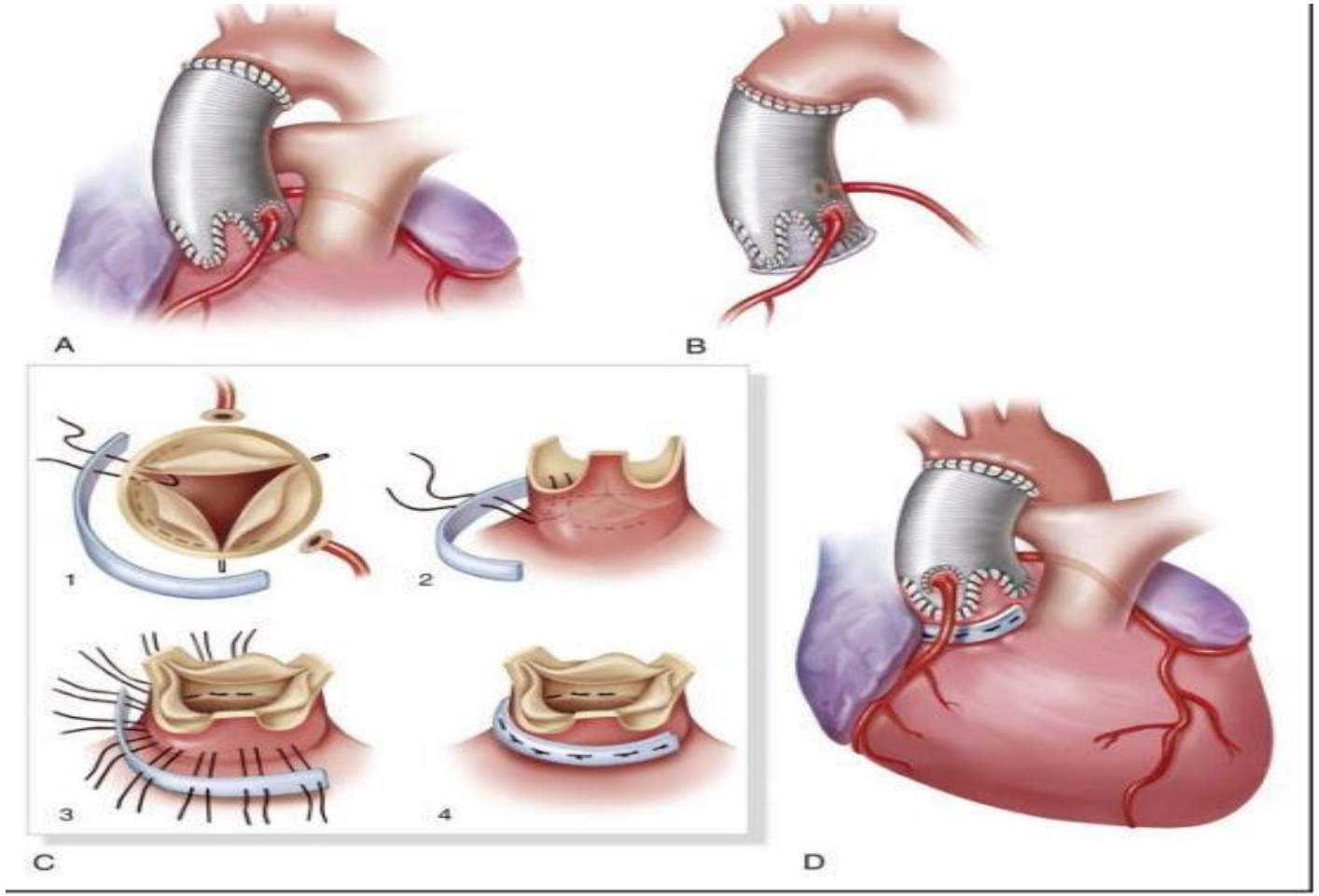


FIGURE 66-17 Repair of aortic regurgitation caused by aortic root dilation. **A,** Remodeling of the aortic root with replacement of all three aortic sinuses. **B,** Reimplantation of the aortic valve in patients with annuloaortic ectasia and aortic root aneurysm. **C, D,** Aortic annuloplasty in patients with annuloaortic ectasia. *(From David TE: Aortic root aneurysms: Remodeling or composite replacement? Ann Thorac Surg 64:1564, 1997.)*

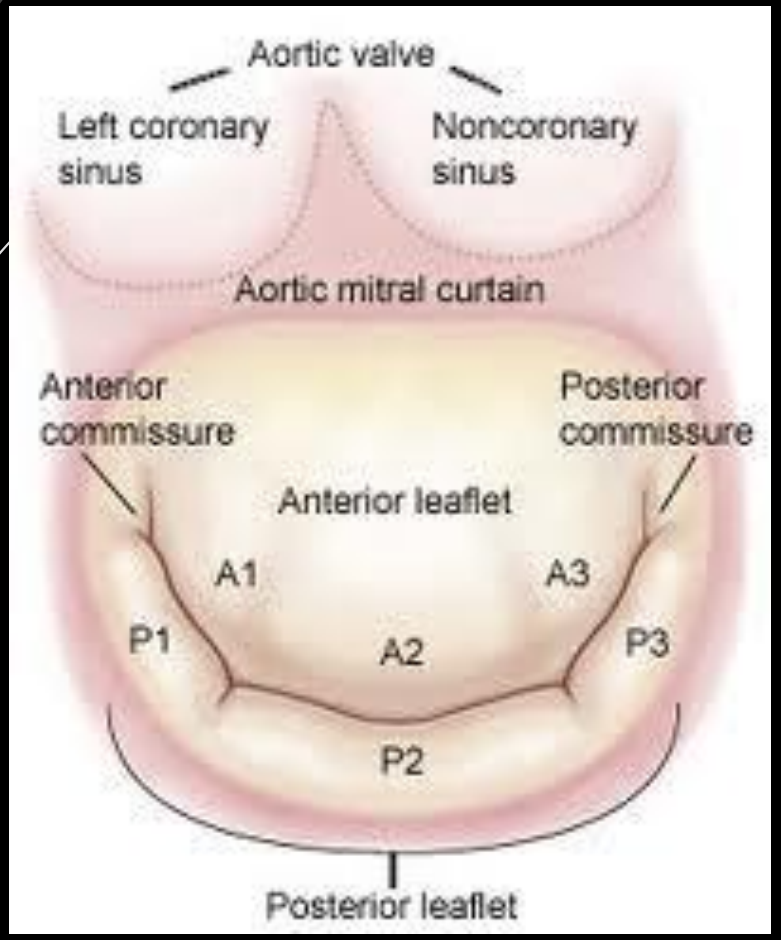
Mitral valve disease

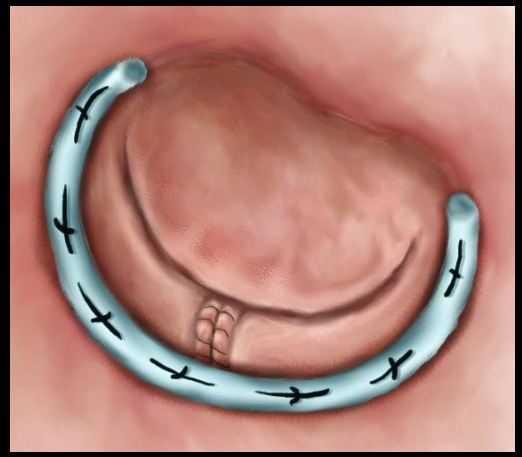
Mitral valve stenosis

Mitral valve regurgitation

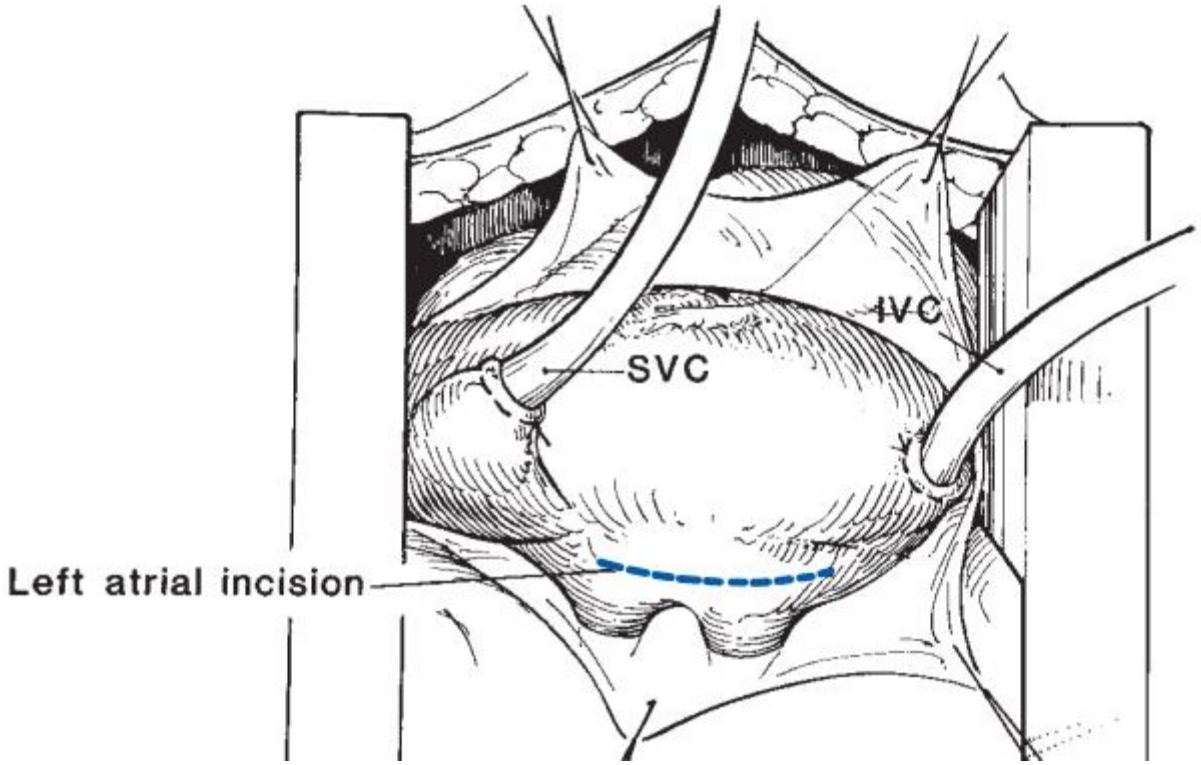
MITRAL VALVE SURGERY

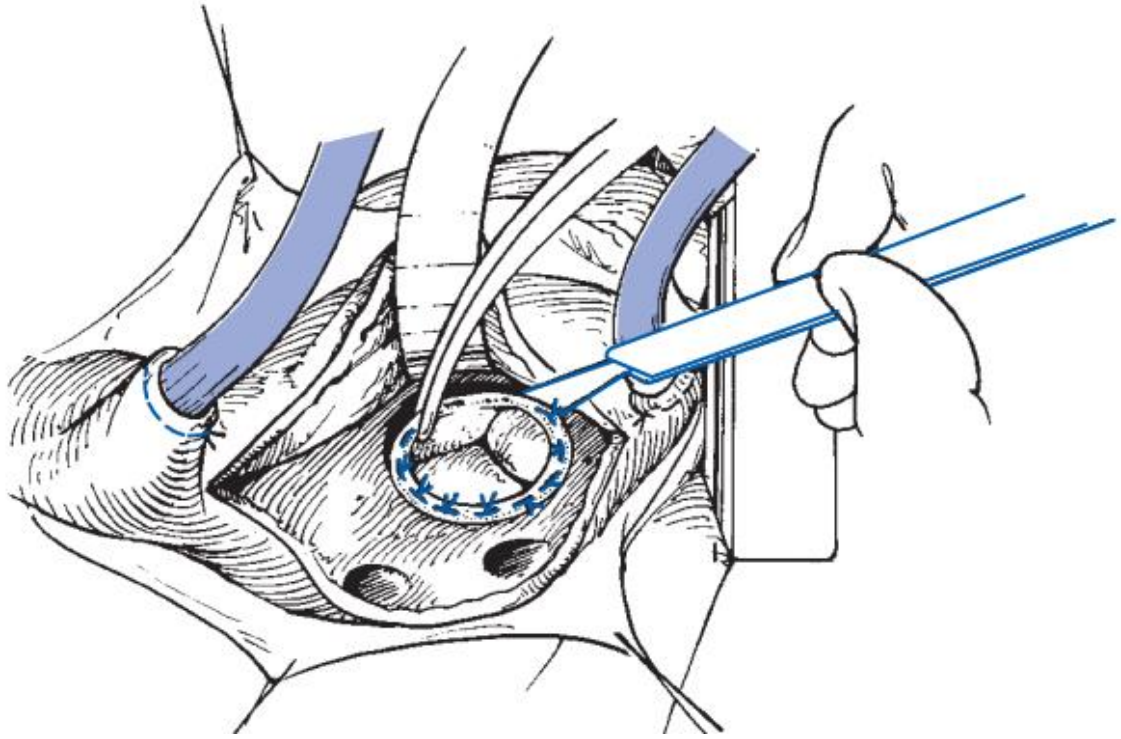
- Mitral valve replacement
- Mitral valve repair



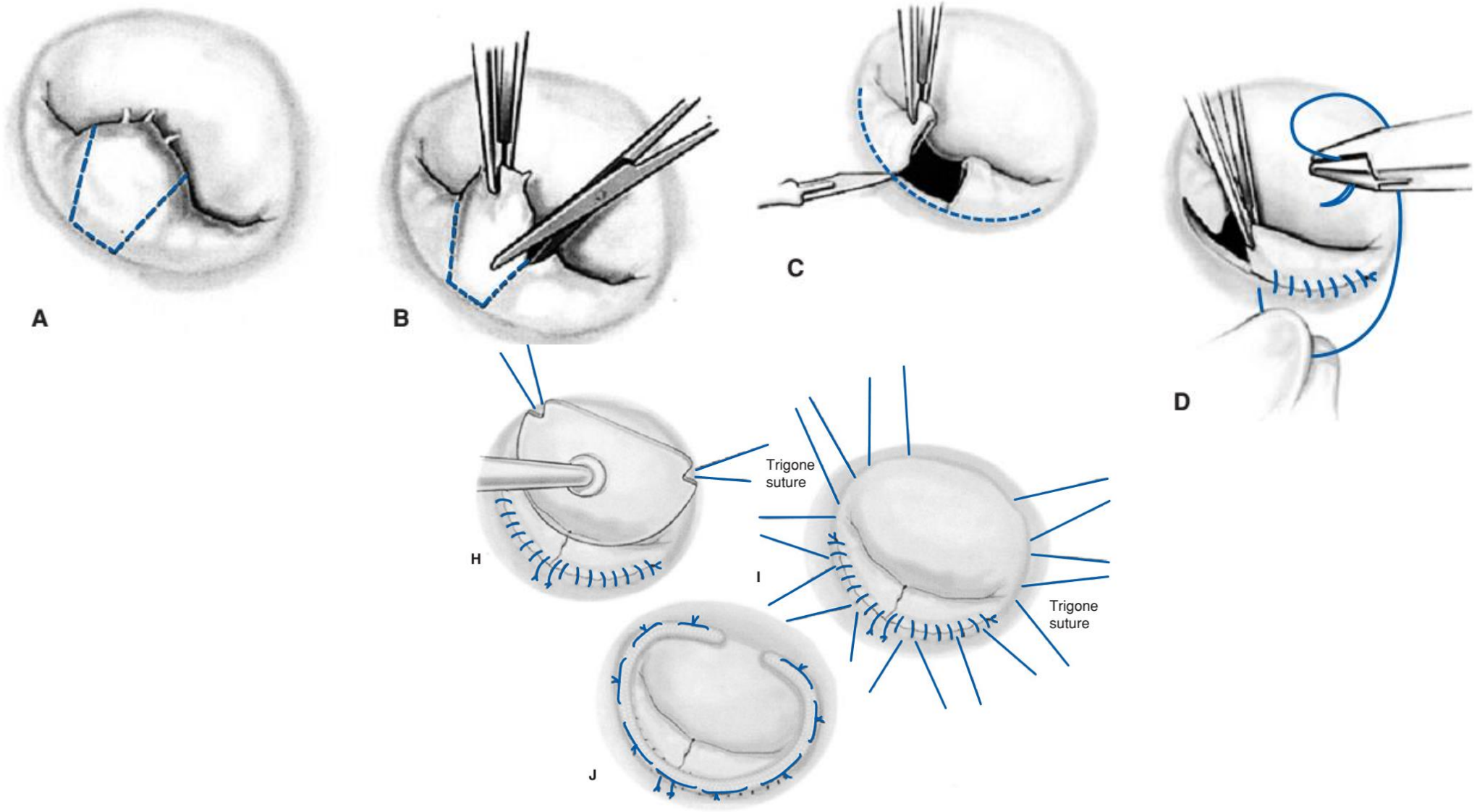


MITRAL VALVE REPLACEMENT



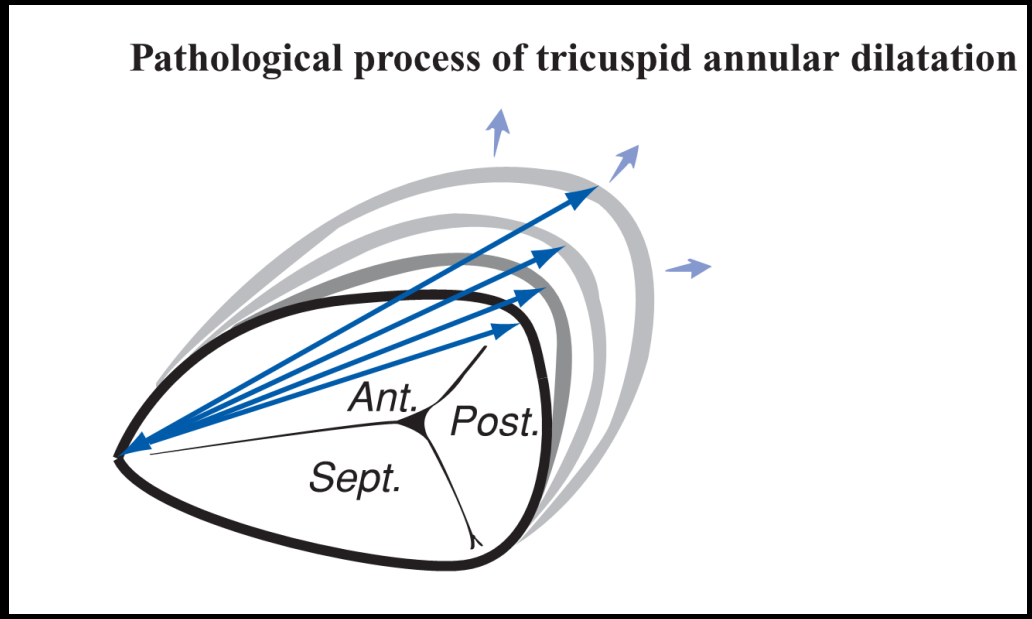


MITRAL VALVE REPAIR



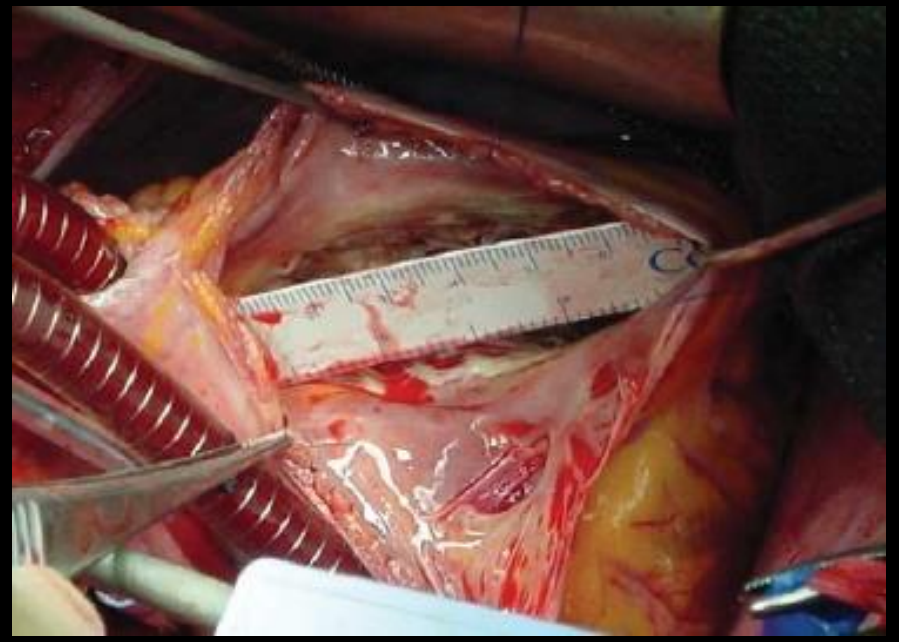
TRICUSPID VALVE DISEASE

- Tricuspid valve regurgitation
  - Functional regurgitation
  - Organic regurgitaton
- Tricuspid valve stenosis



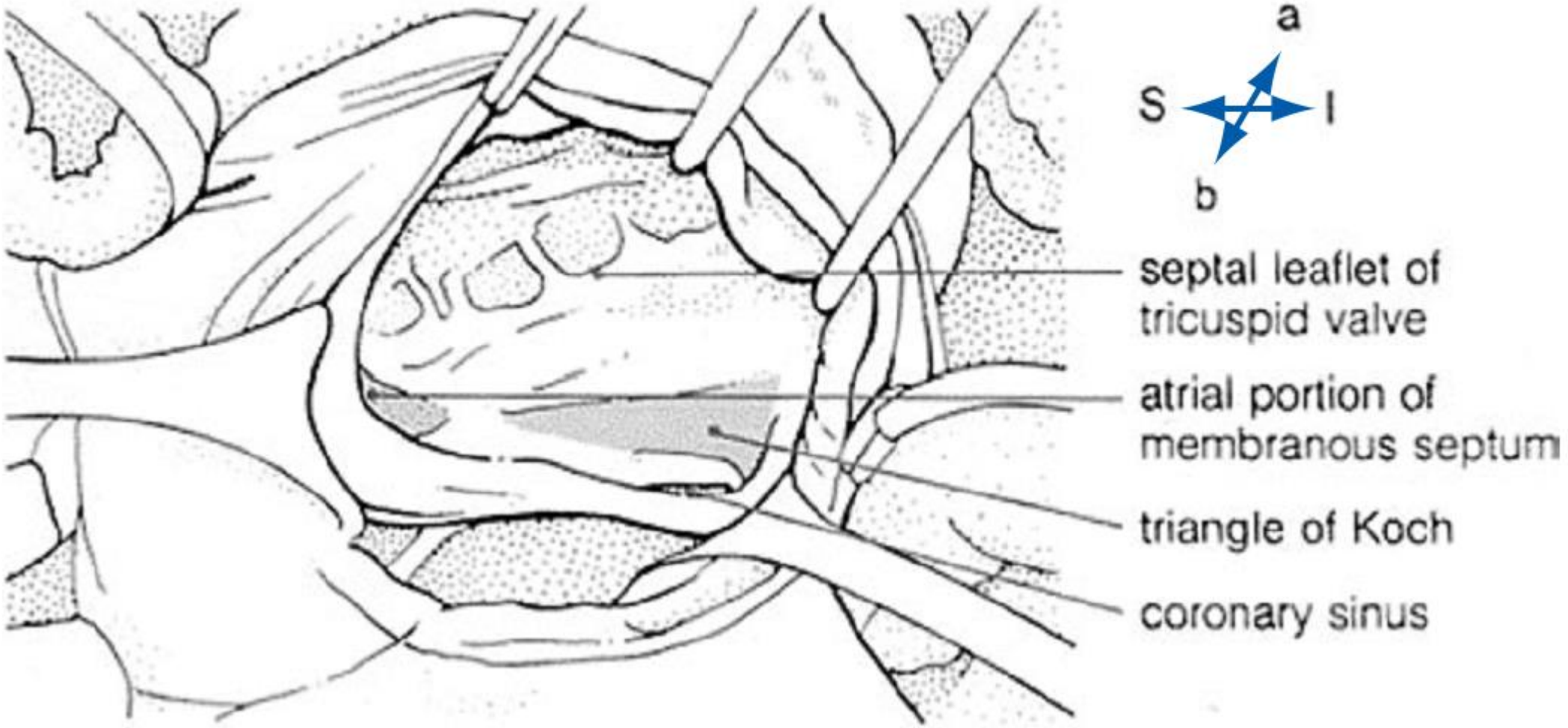
TRICUSPID INDICATION

- Tricuspid annular diameter
- Tricuspid pressure gradient
  - Mean ≥ 5 mmHg

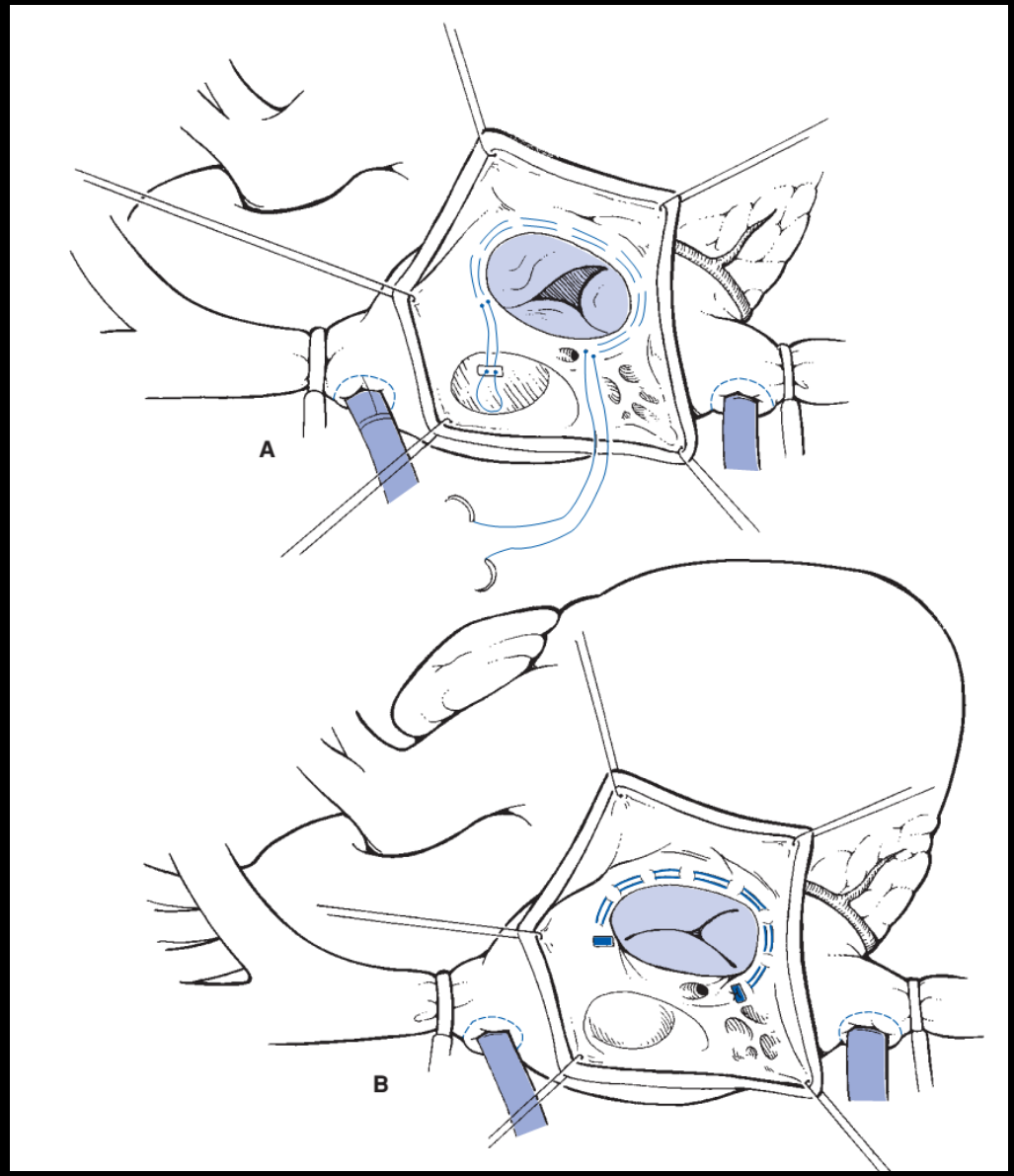


Surgery is indicated in patients with severe primary, or secondary, TR undergoing left-sided valve surgery.	I	C
Surgery should be considered in patients with mild or moderate secondary TR with dilated annulus (≥ 40 mm or > 21 mm/m²) undergoing left-sided valve surgery.	IIa	C

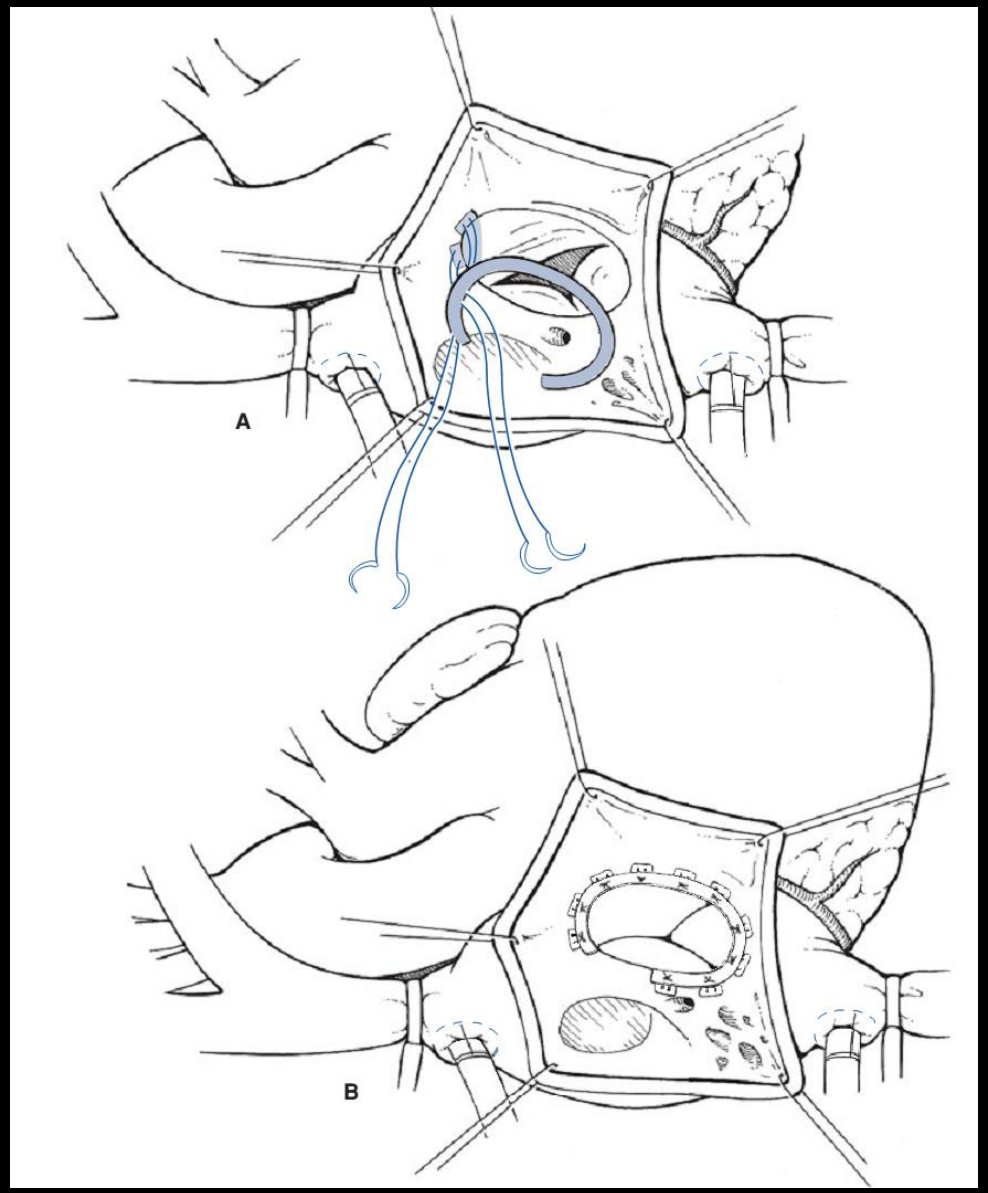
TRICUSPID CAUTION



TRICUSPID ANNULOPLASTY



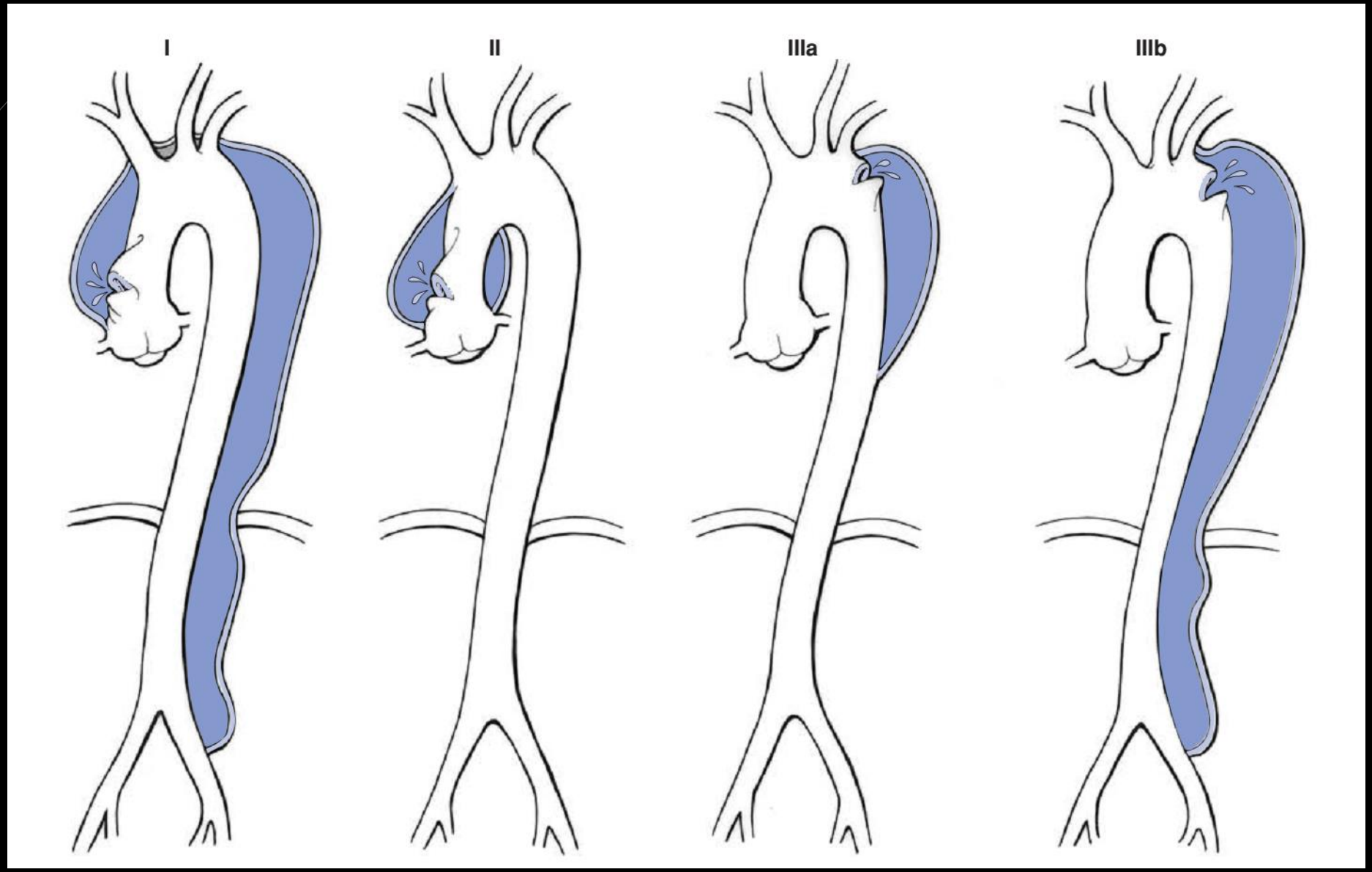
TRICUSPID VALVE REPAIR



DISEASE OF AORTA

- Aortic dissection
- Aortic aneurysm

AORTIC DISSECTION

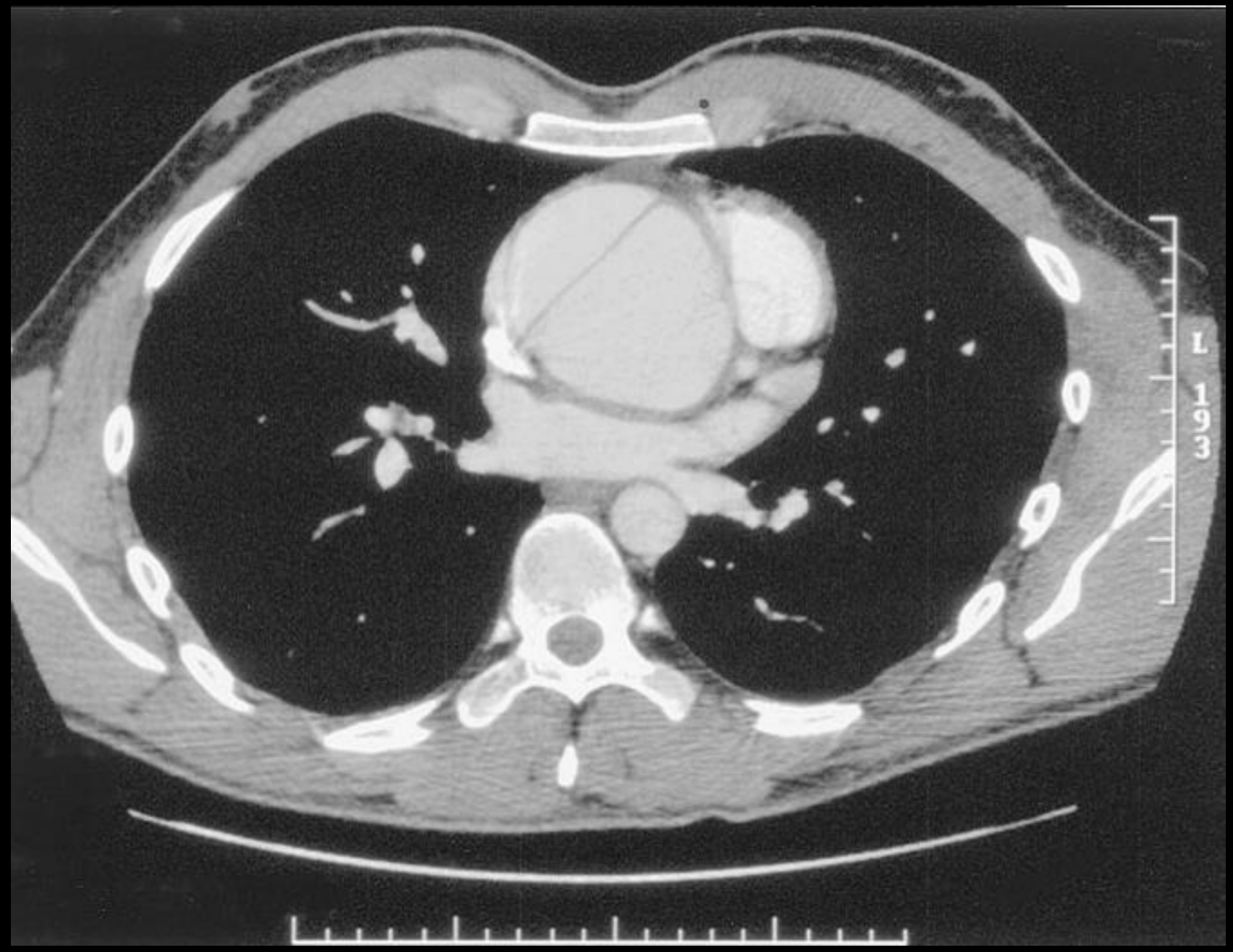


Clinical Characteristics of Patients Presenting with Acute Type A and B Thoracic Aortic Dissections

	Type A	Type B
Frequency	60–75%	25–40%
Sex (M:F)	1.7–2.6:1	2.3–3:1
Age (y)	50–56	60–70
Hypertension	++	+++
Connective tissue disorder	++	+
Pain		
Retrosternal	+++	+,−
Interscapular	+,−	+++
Syncope	++	+−
Cerebrovascular accident	+	−
Congestive heart failure	+	−
Aortic valve regurgitation	++	+,−
Myocardial infarction	+	−
Pericardial effusion	+,−	+++
Pleural effusion	+,−	+,−
Abdominal pain	+,−	+,−
Peripheral pulse deficit	Upper and lower extremities	Lower extremities

Risk Factors for Type A and B Thoracic Aortic Dissection

Hypertension
Connective tissue disorders Ehlers-Danlos syndrome Marfan disease Turner syndrome
Cystic medial disease of aorta
Aortitis
Iatrogenic
Atherosclerosis
Thoracic aortic aneurysm
Bicuspid aortic valve
Trauma
Pharmacologic
Coarctation of the aorta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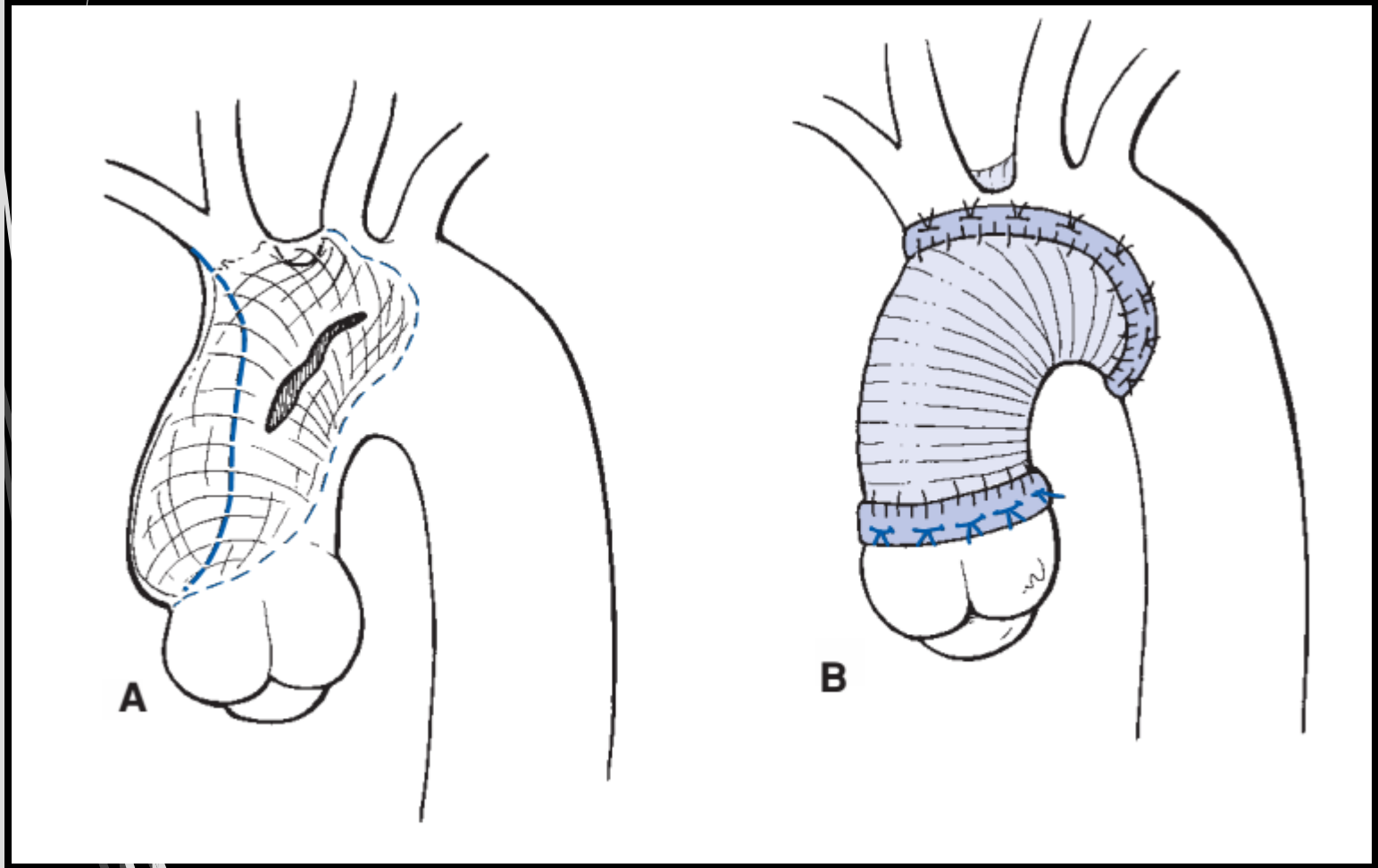
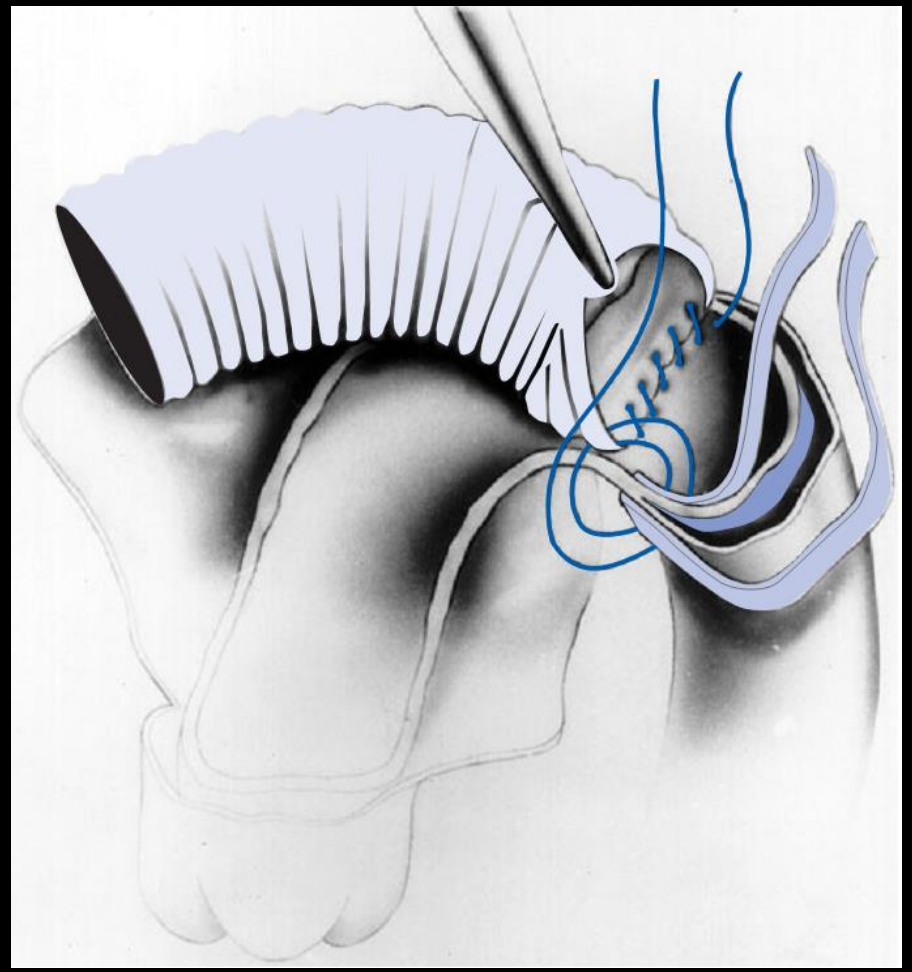
Operative Indications for Acute and Chronic Type A and B Thoracic Aortic Dissection

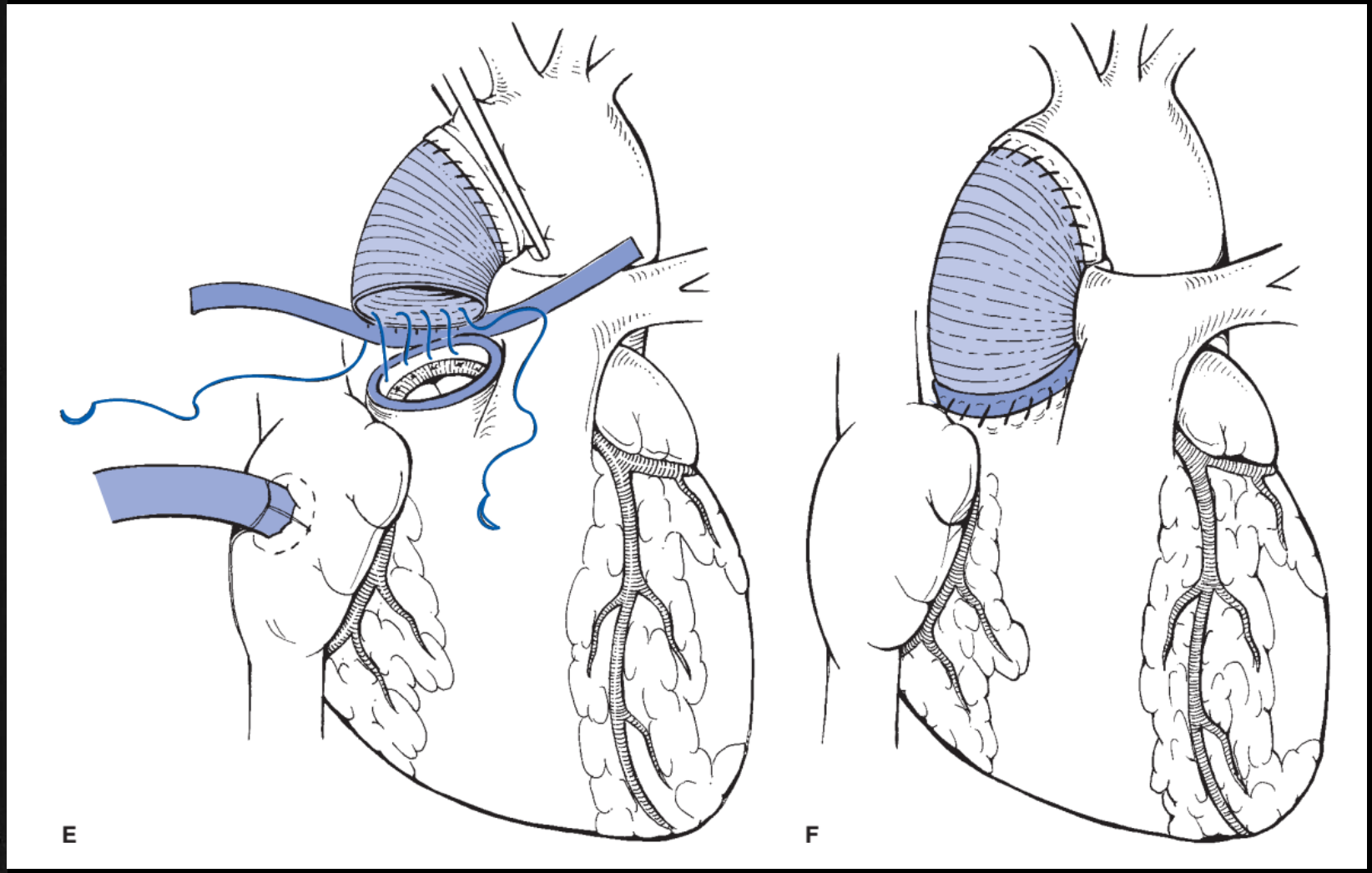
Dissection type	Operative indication
Acute	
Type A	Presence
Type B	Rupture
	Malperfusion
	Progressive dissection
	Failure of medical management
Chronic	
Type A	Symptoms related to dissection (congestive heart failure, angina, aortic regurgitation, stroke, pain)
	Malperfusion
	Aneurysm
Type B	Symptoms related to dissection
	Malperfusion
	Aneurysm

AORTIC DISSECTION SURGERY

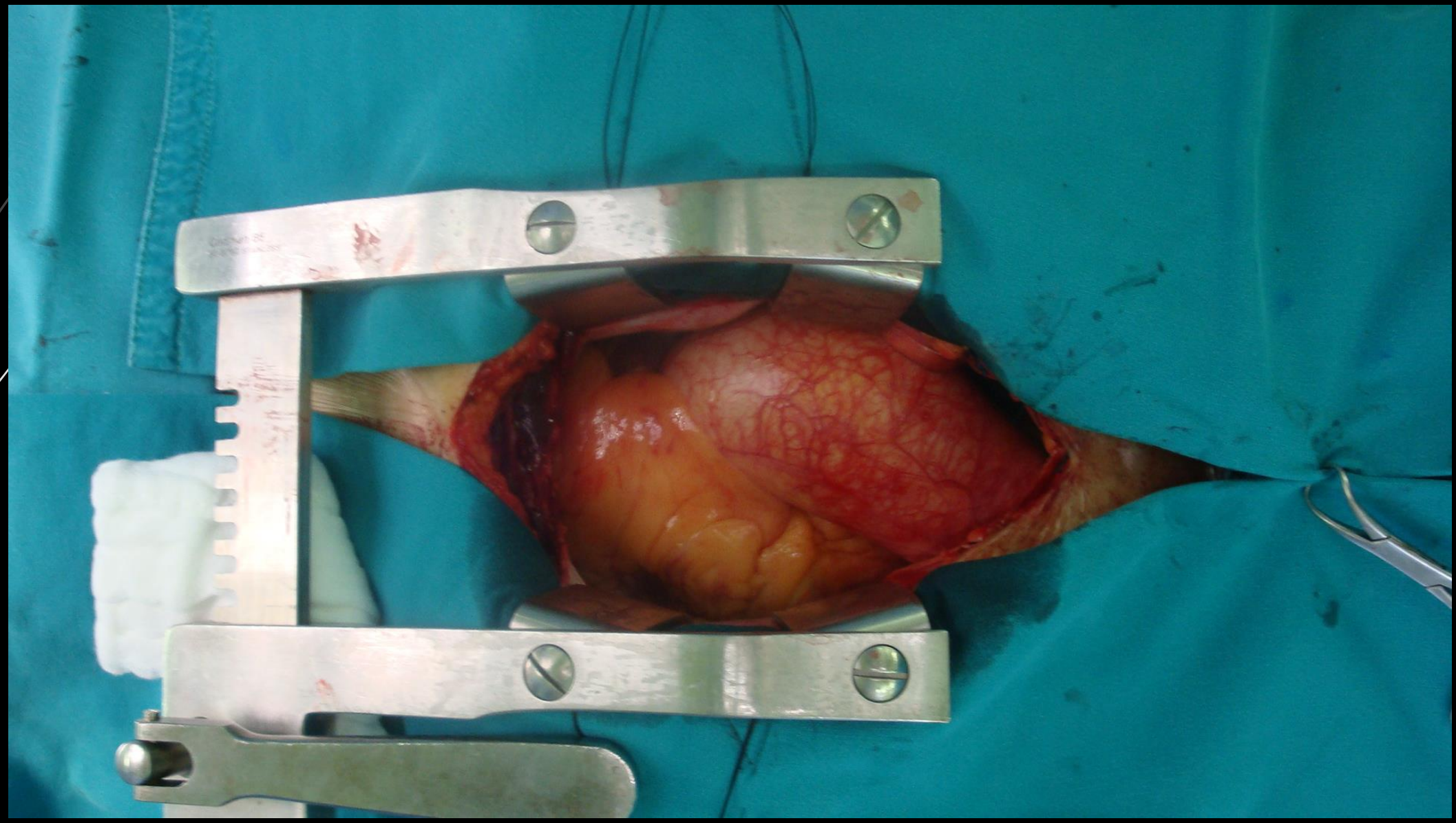


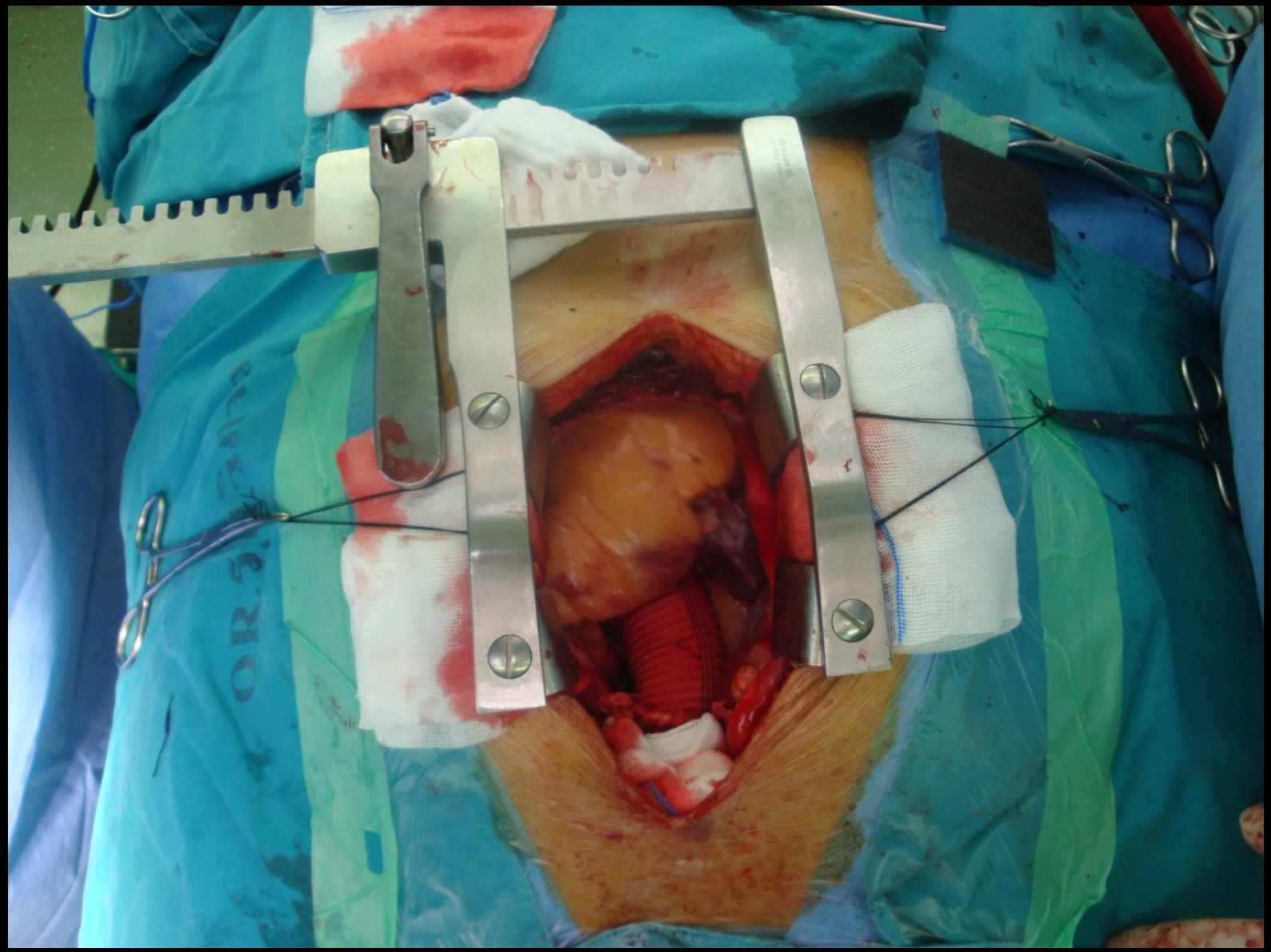


AORTIC ANEURYSM

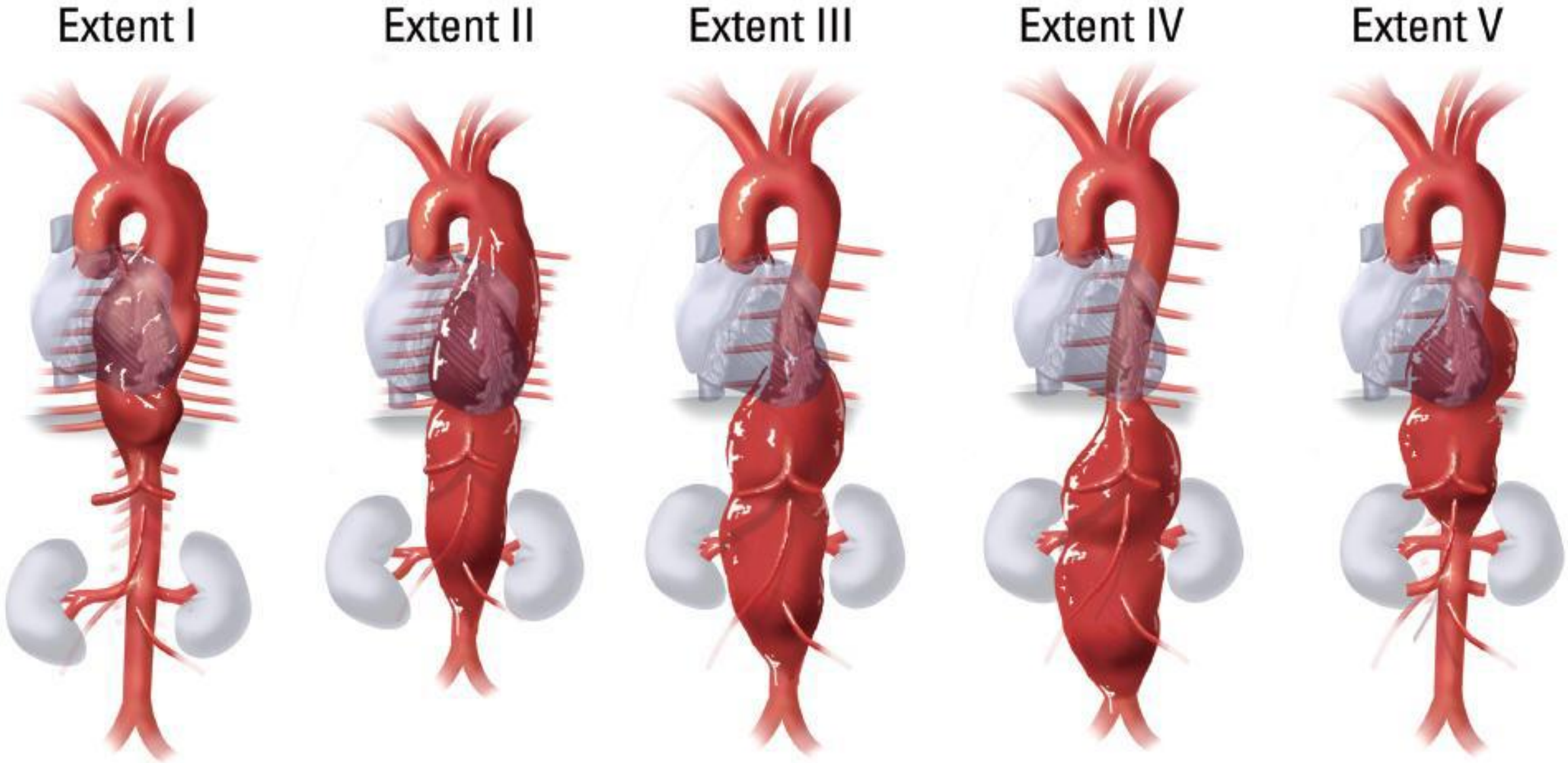


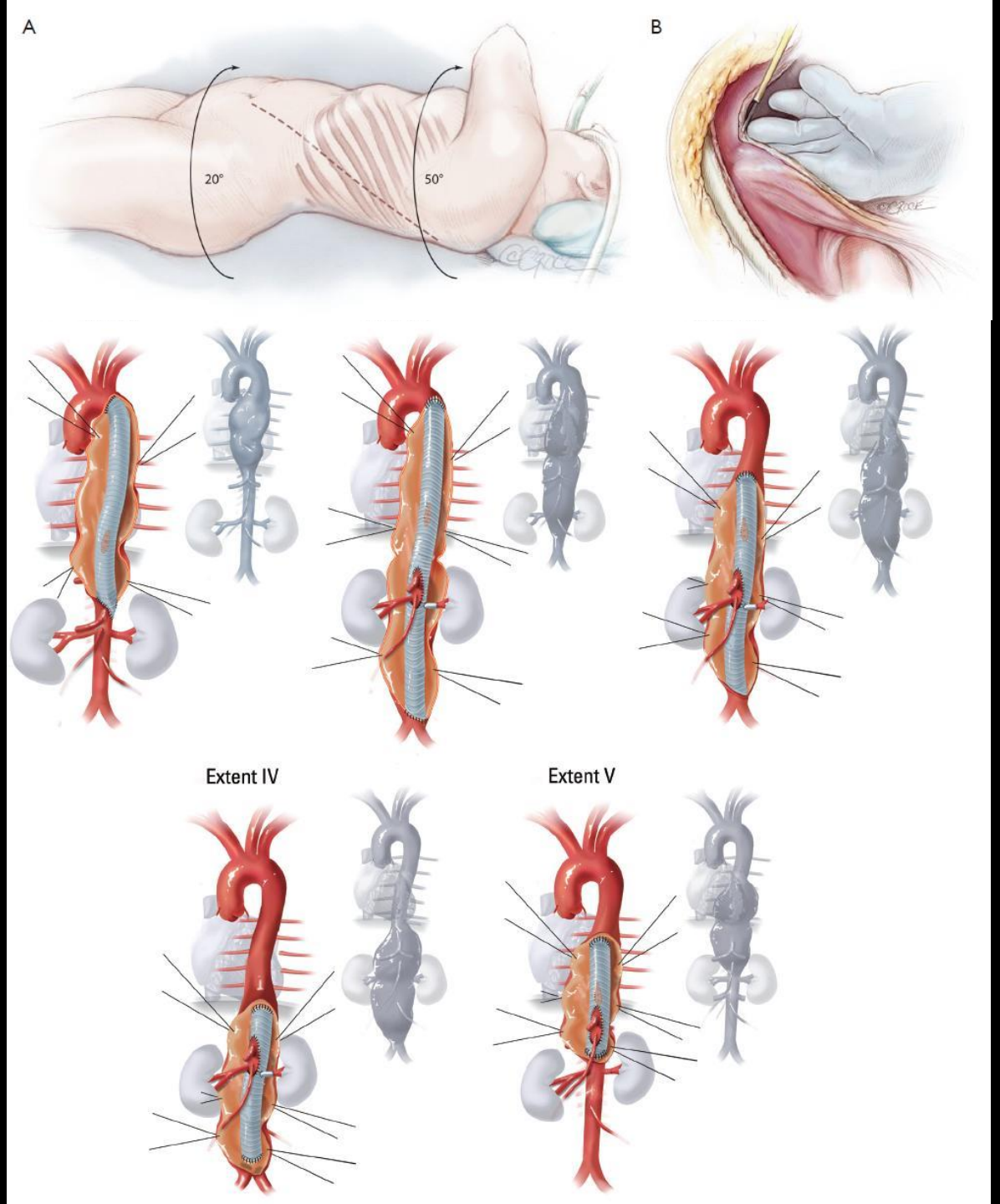
ASCENDING AORTIC SURGERY



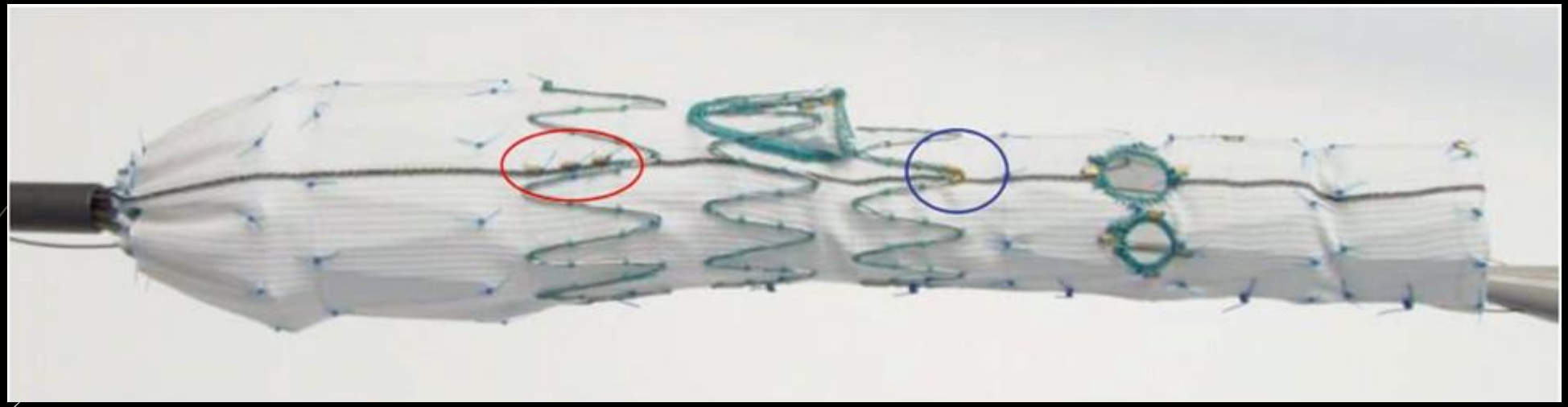


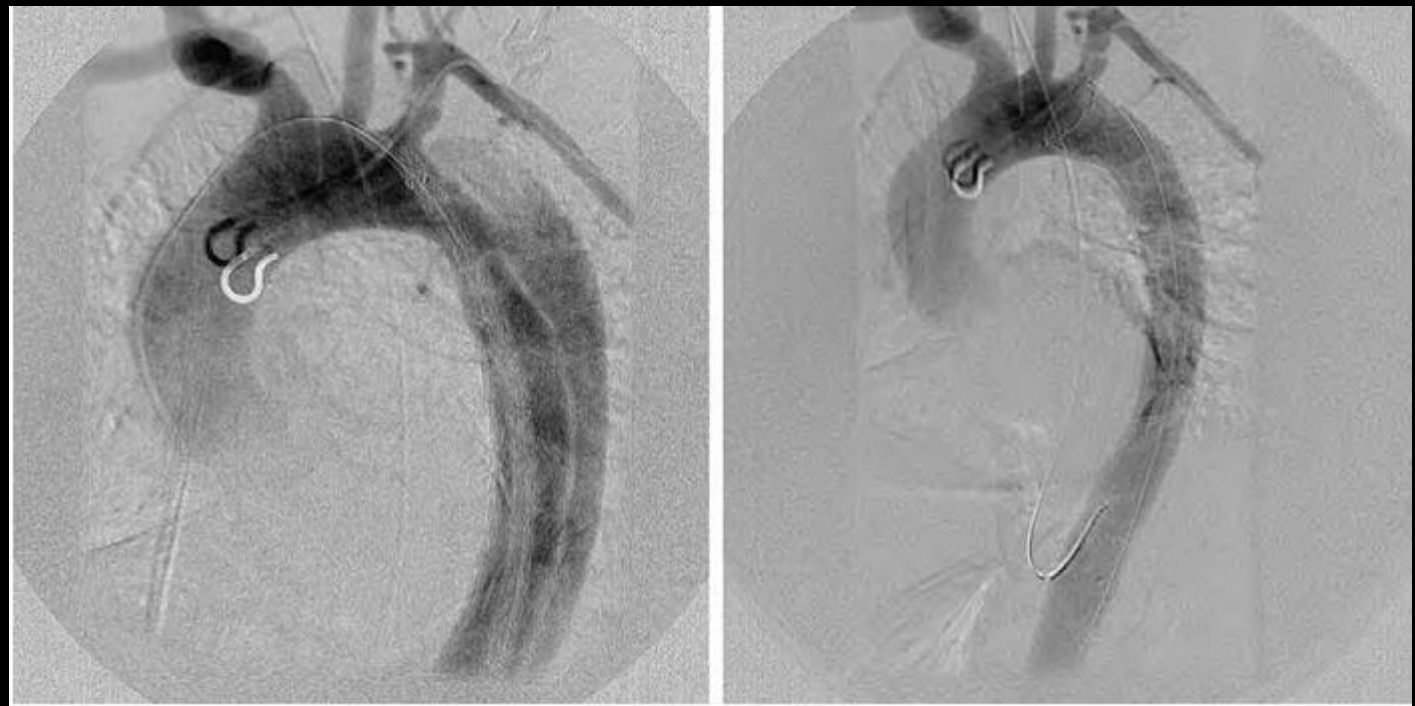
THORACOABDOMINAL ANEURYSM




A
20°
50°
B
Extent IV
Extent V

ENDOVASCULAR REPAIR





Cardiac tumor

- Primary tumors of the heart RARE (.0017 - .28%)
- Often BENIGN (75%)
- Potential for life-threatening complication
- Curable by surgery

Incidence of benign heart tumors

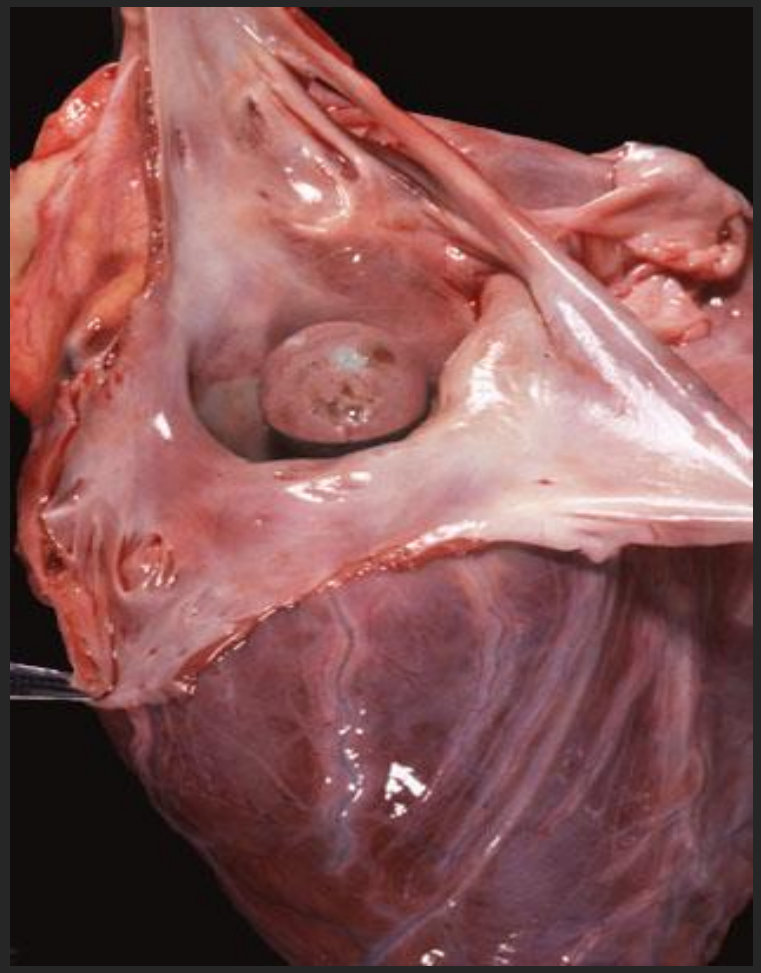
	incidence		
TUMOR	Adults	Children	Infants
Myxoma	46	15	0
Lipoma	21	0	0
Papillary fibroelastoma	16	0	0
Rhabdomyoma	2	46	65
Fibroma	3	15	12
Hemangioma	5	5	4

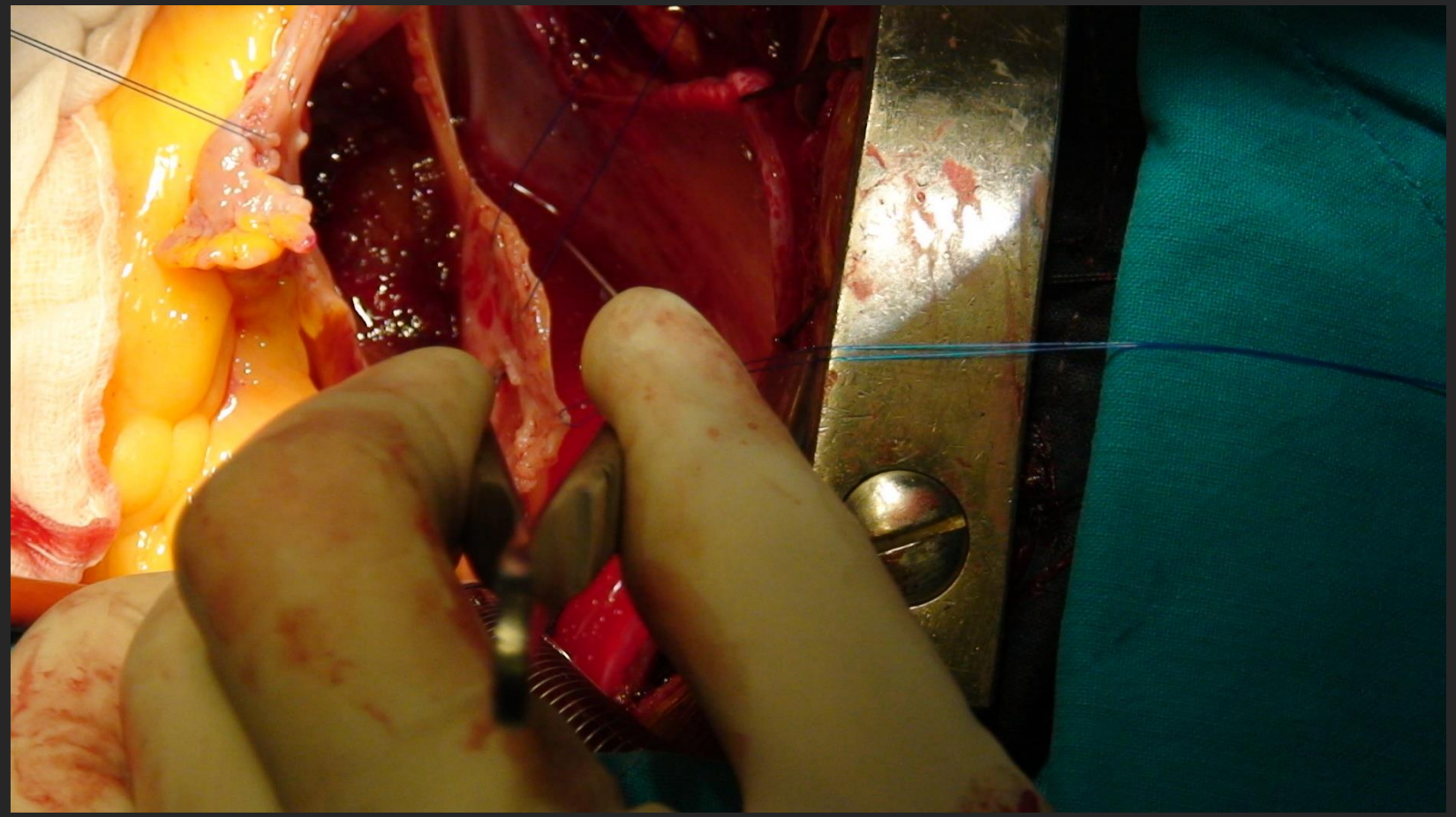
Incidence of primary malignant heart tumors

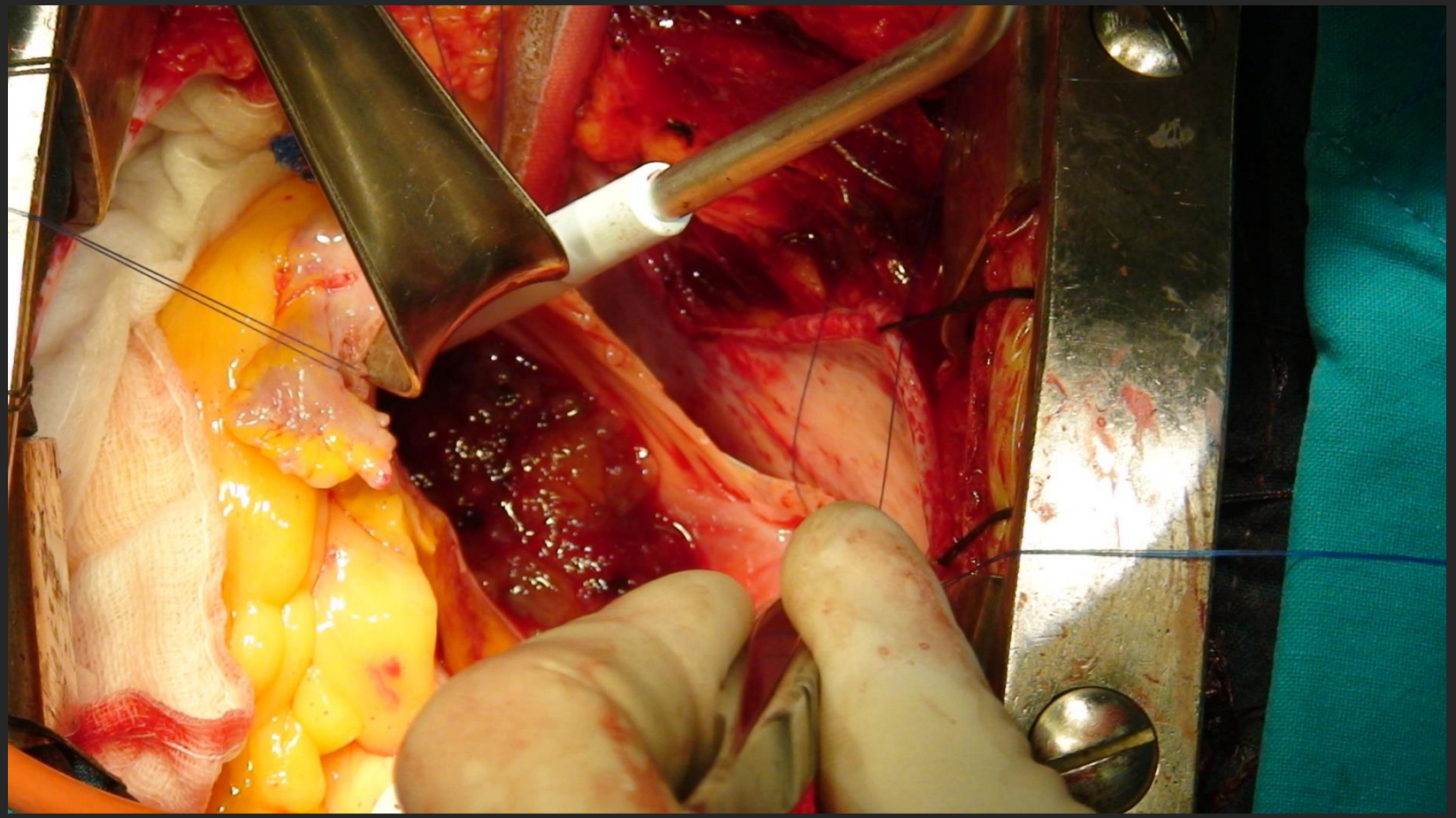
	Incidence(%)		
TUMOR TYPE	Adults	Children	Infants
Angiosarcoma	**33**	0	0
Rhabdomyosarcoma	21	33	**66**
Mesothelioma	16	0	0
Fibrosarcoma	11	11	33
Malignant lymphoma	6	0	0

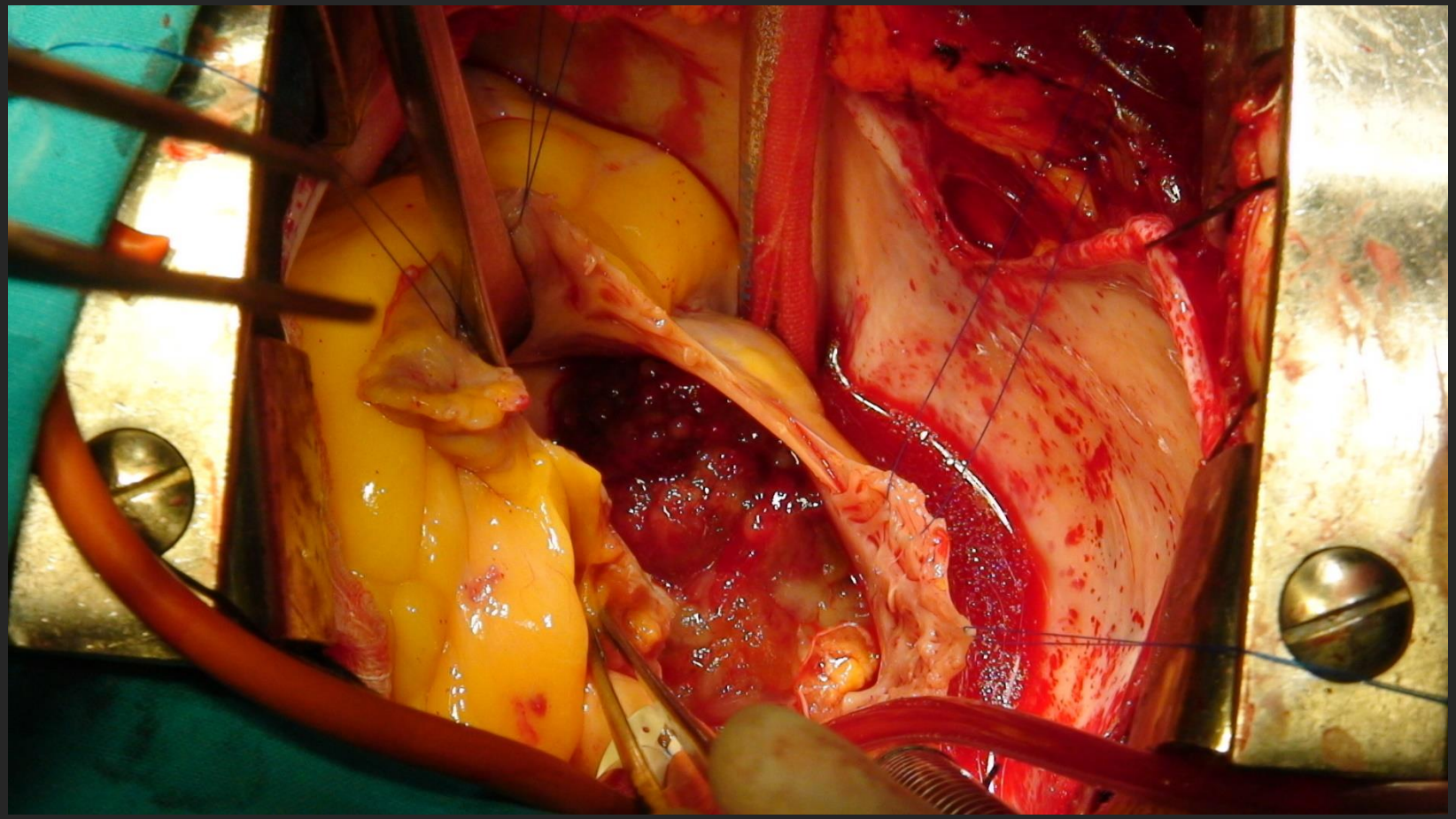
Myxoma

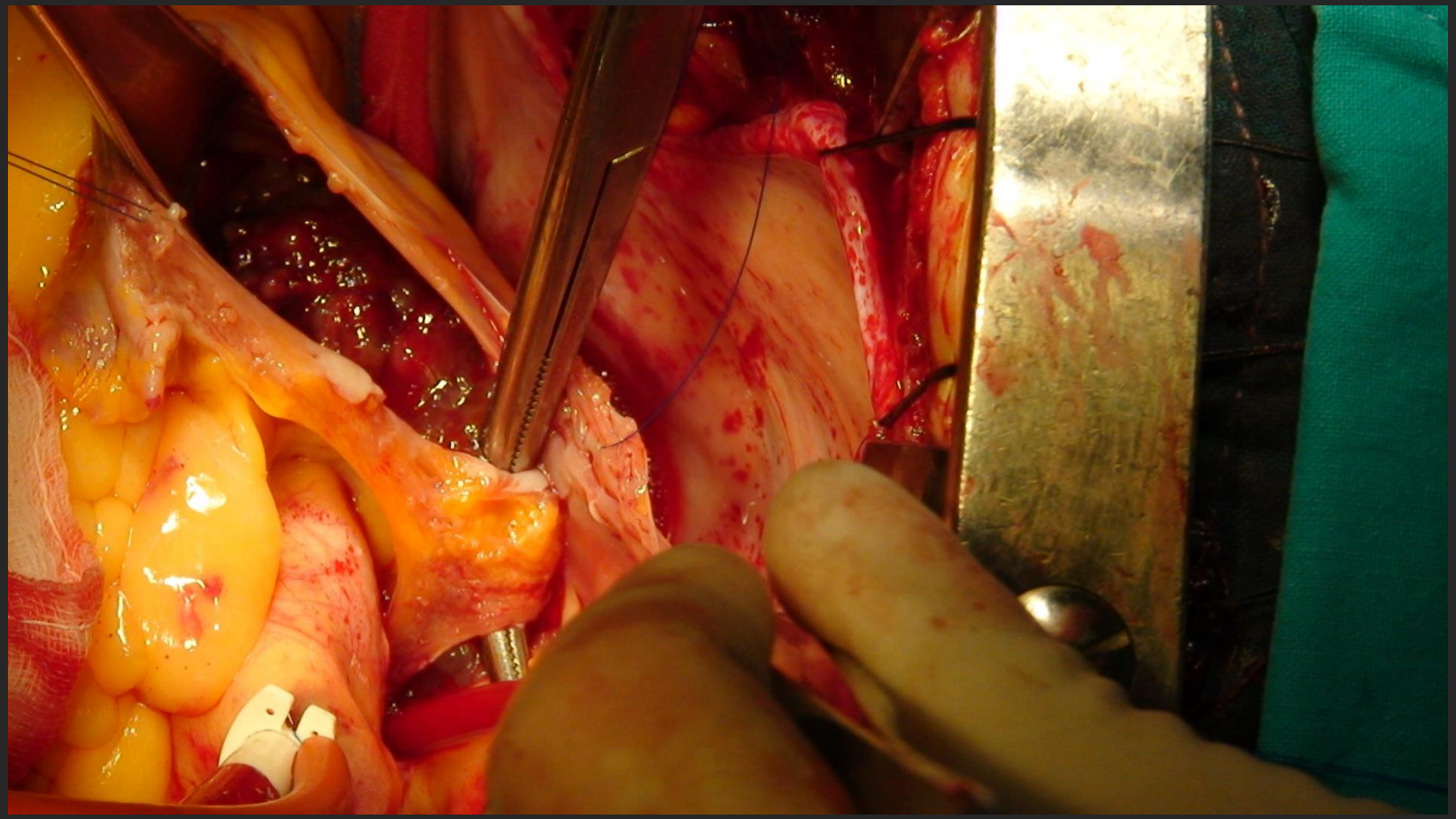
- most common primary cardiac neoplasm. most often attached to the atrial wall, but can arise on a valve or in a ventricle.
- produce a "ball valve" effect by intermittently occluding the atrioventricular valve orifice.
- Embolization of fragments of tumor may also occur.
- Easily diagnosed by echocardiography.

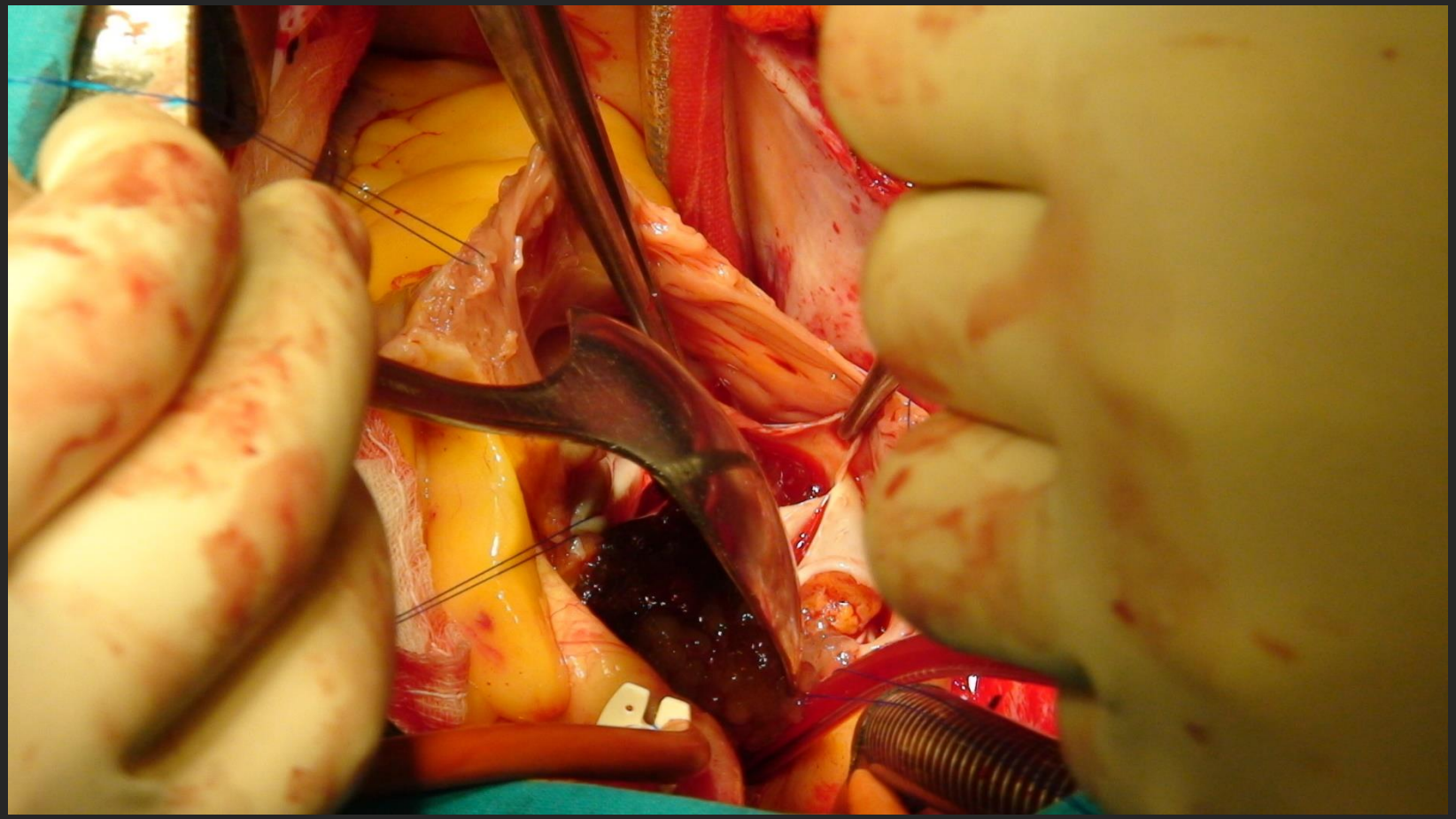


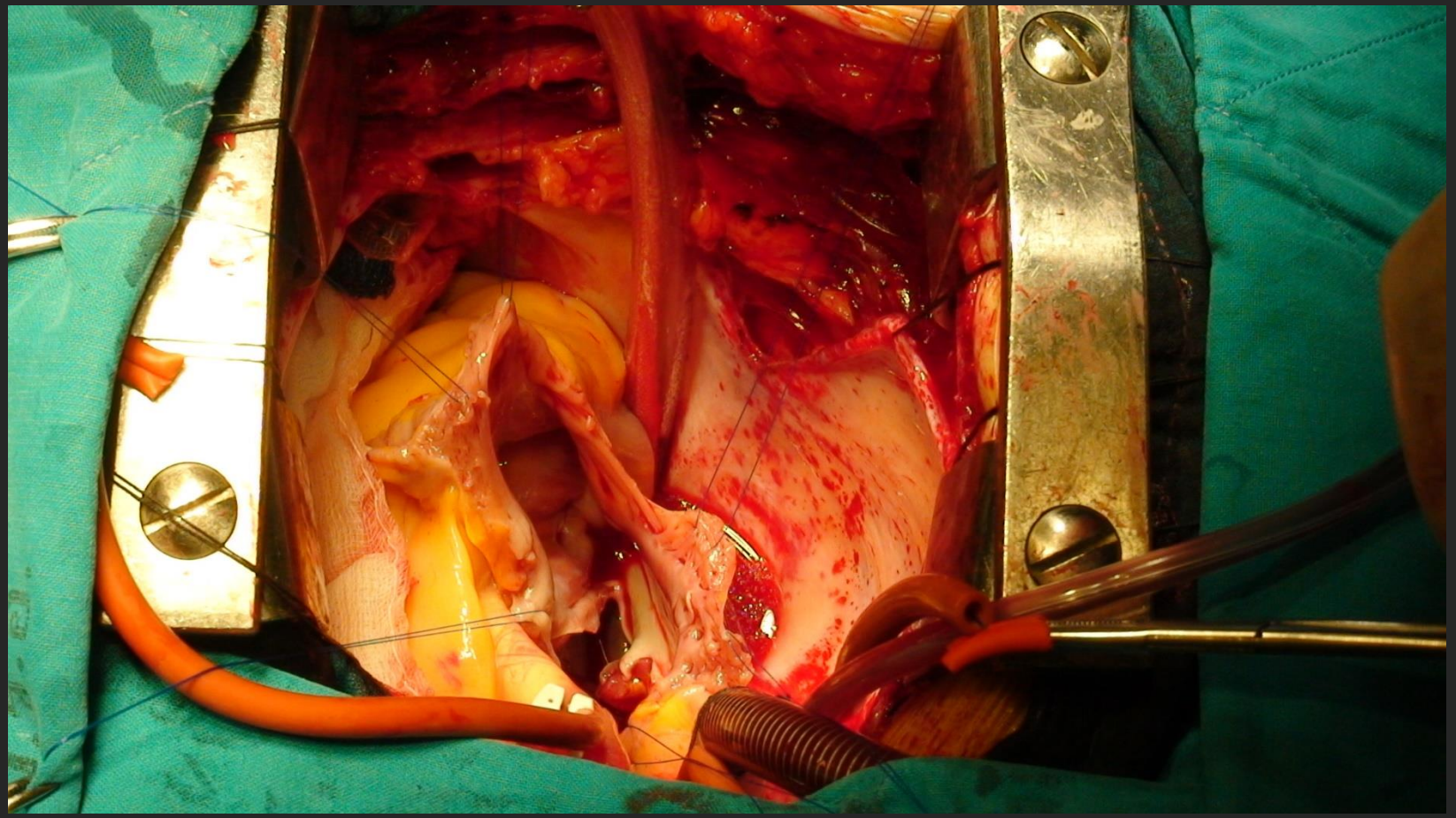


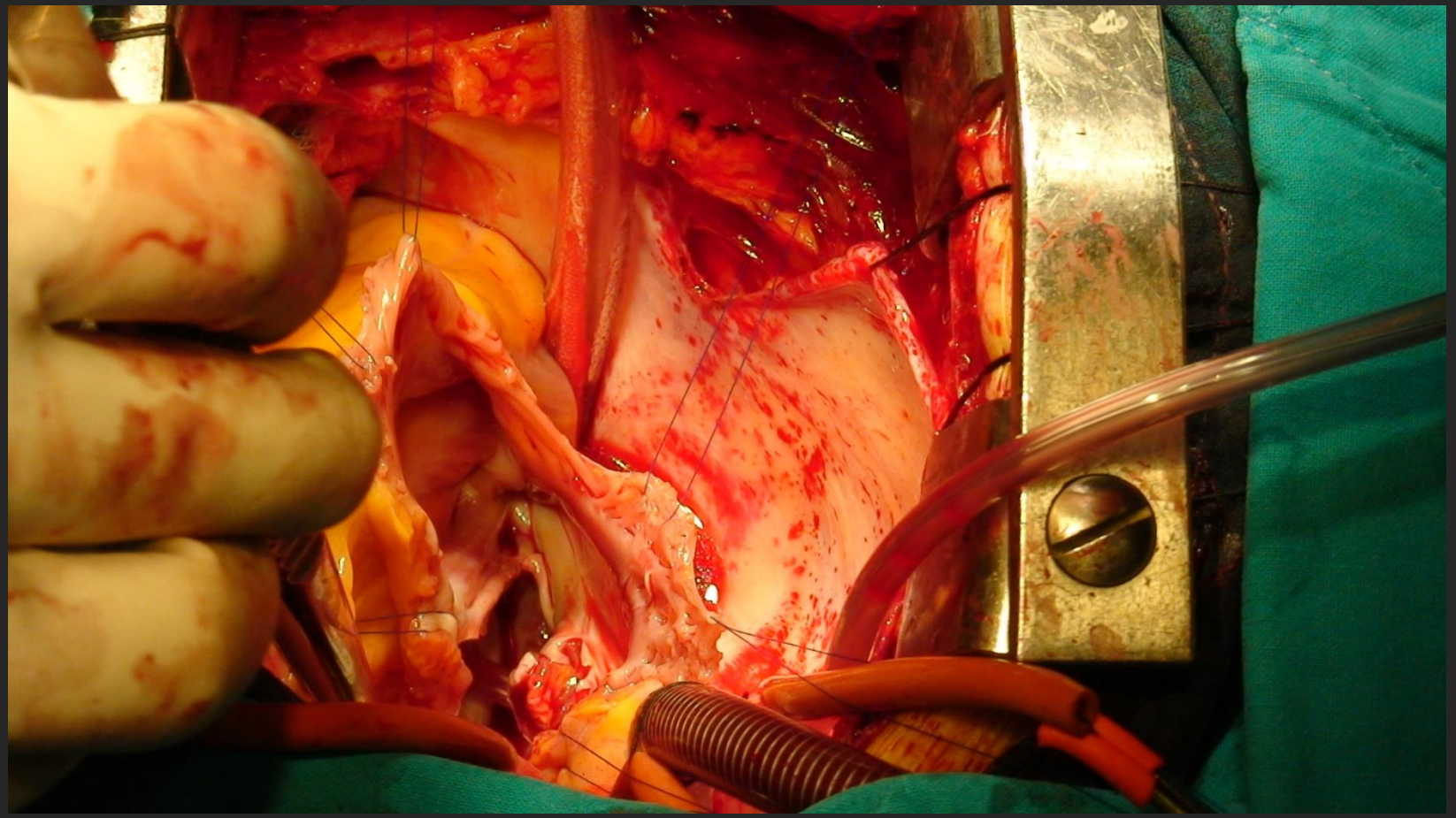


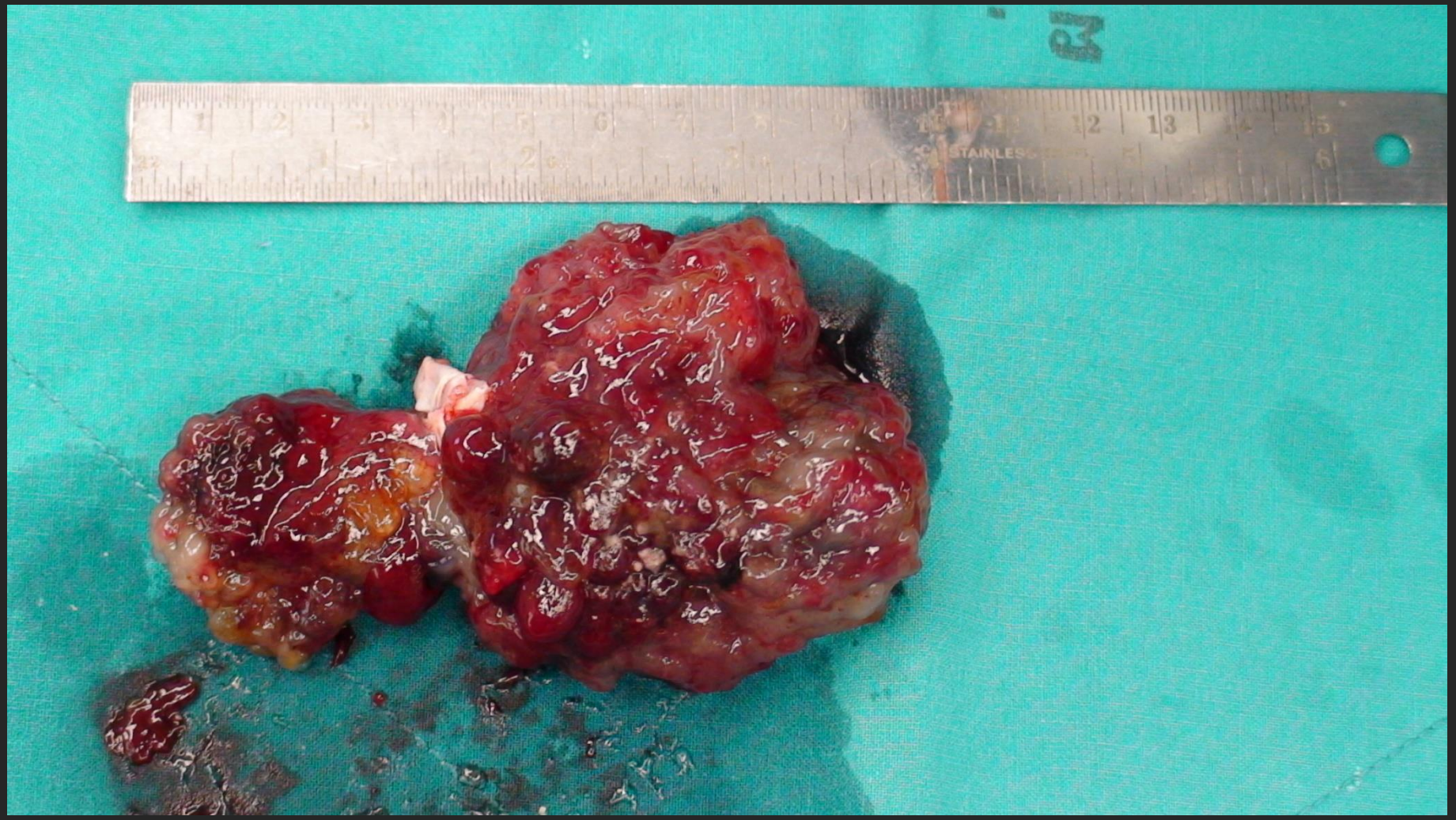






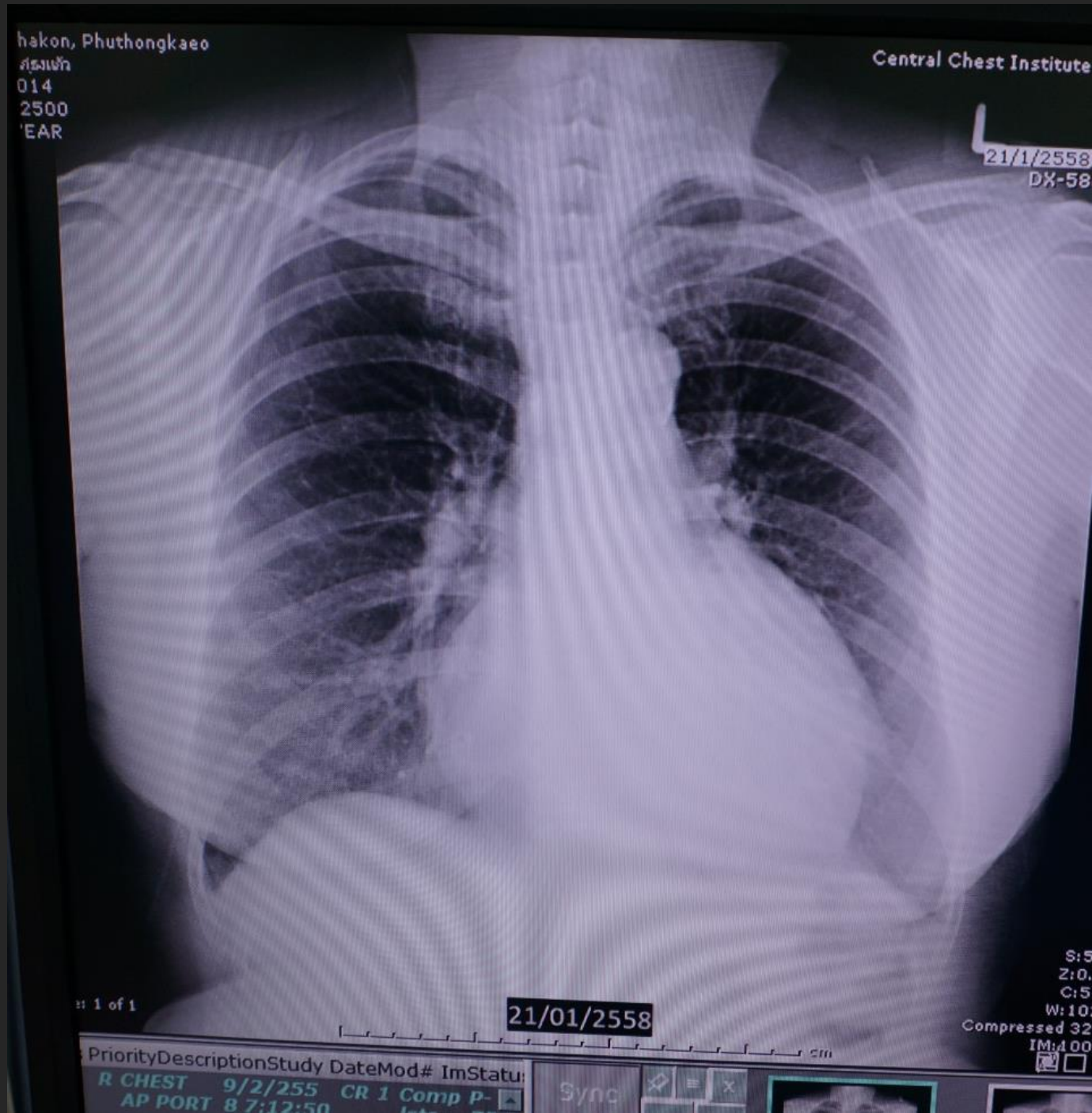


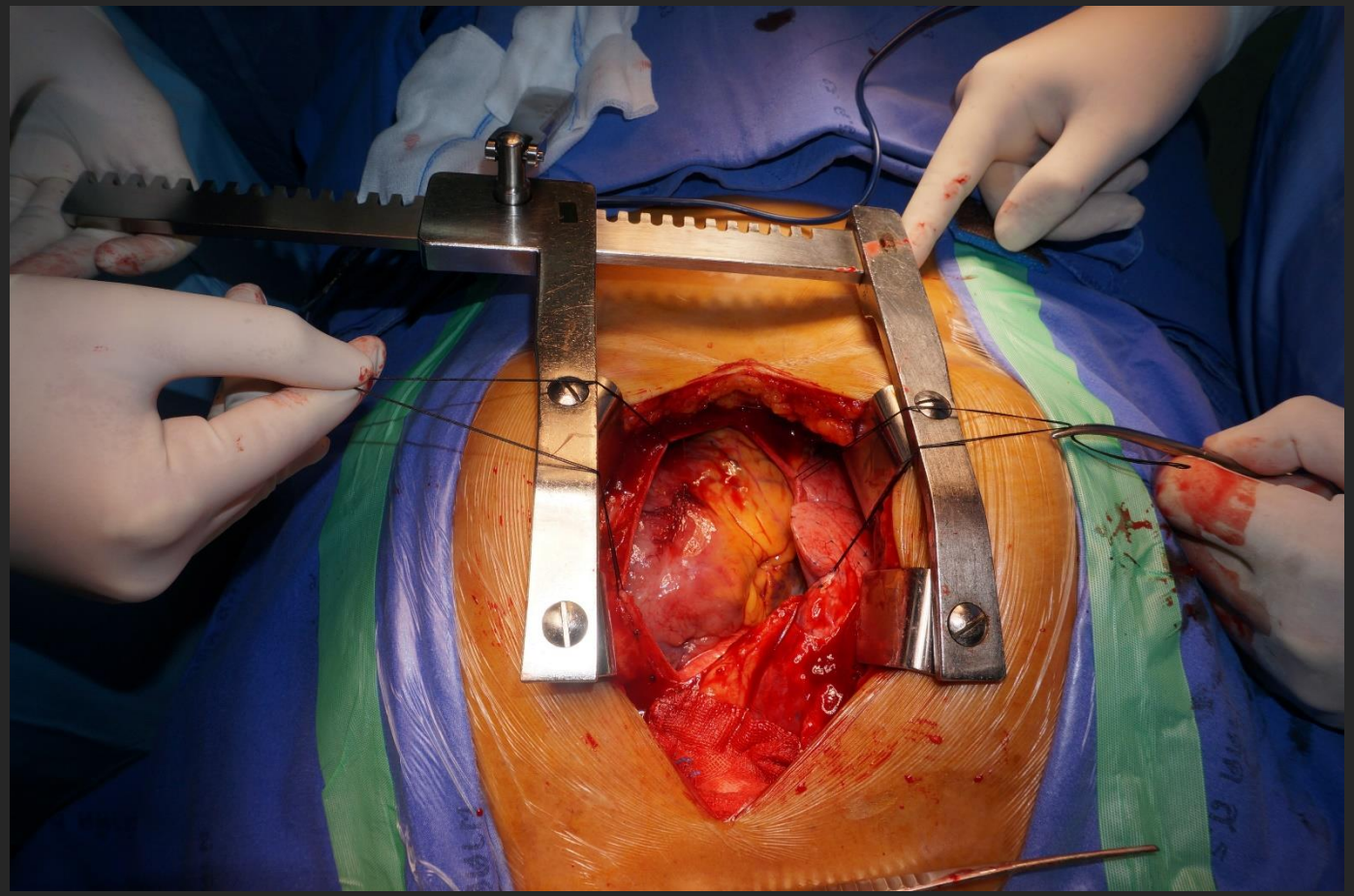


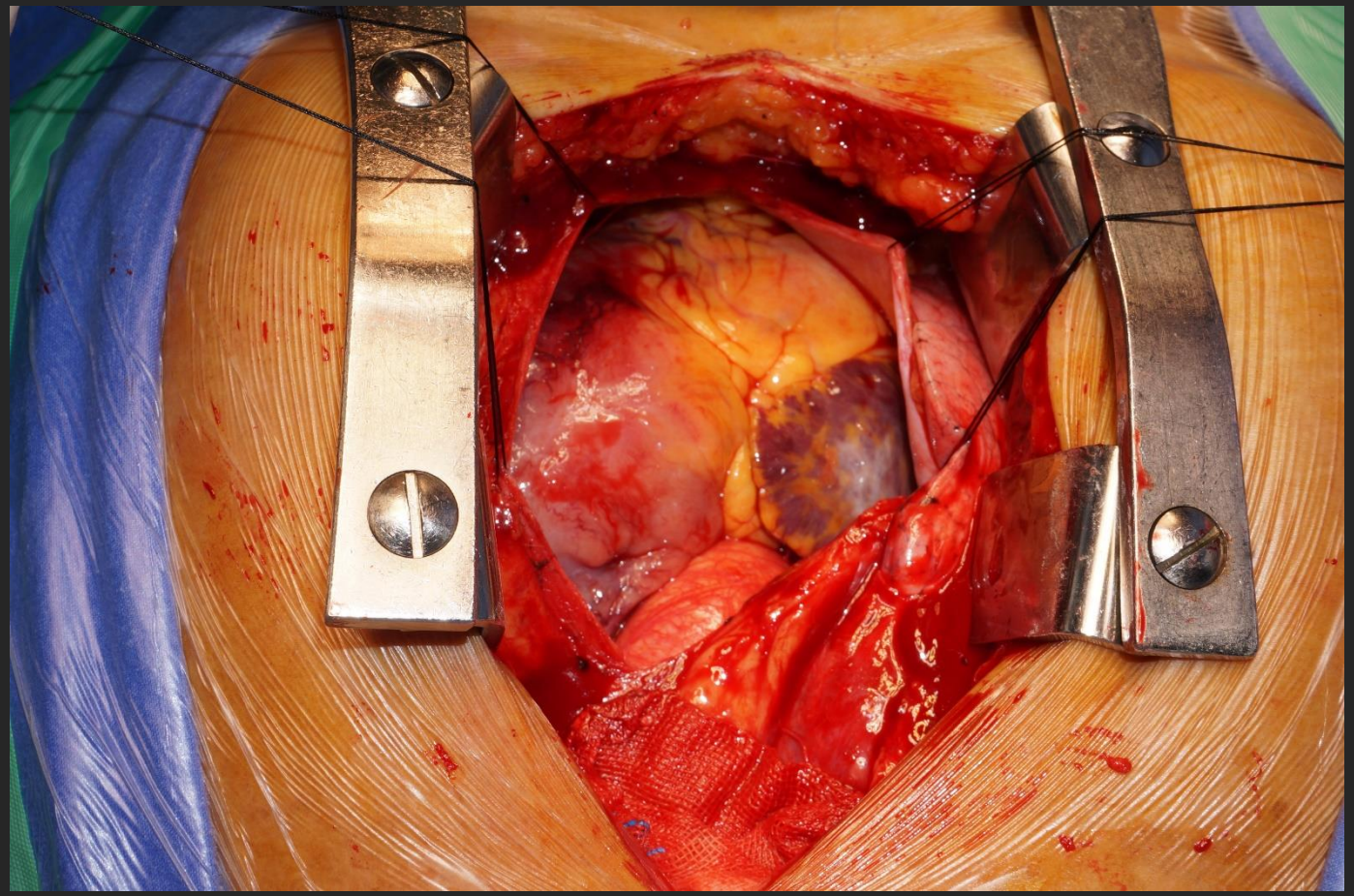


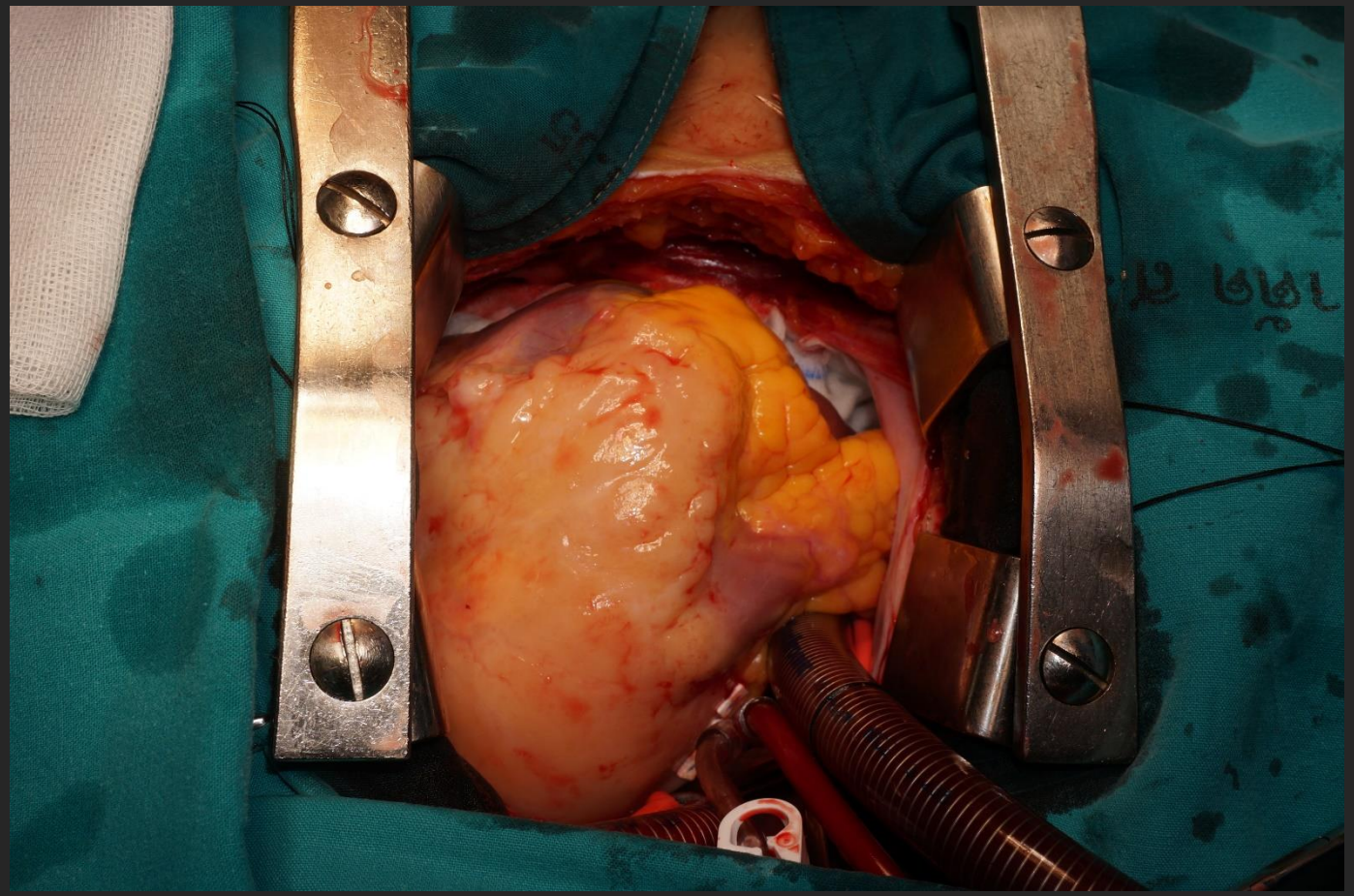
RV lymphoma

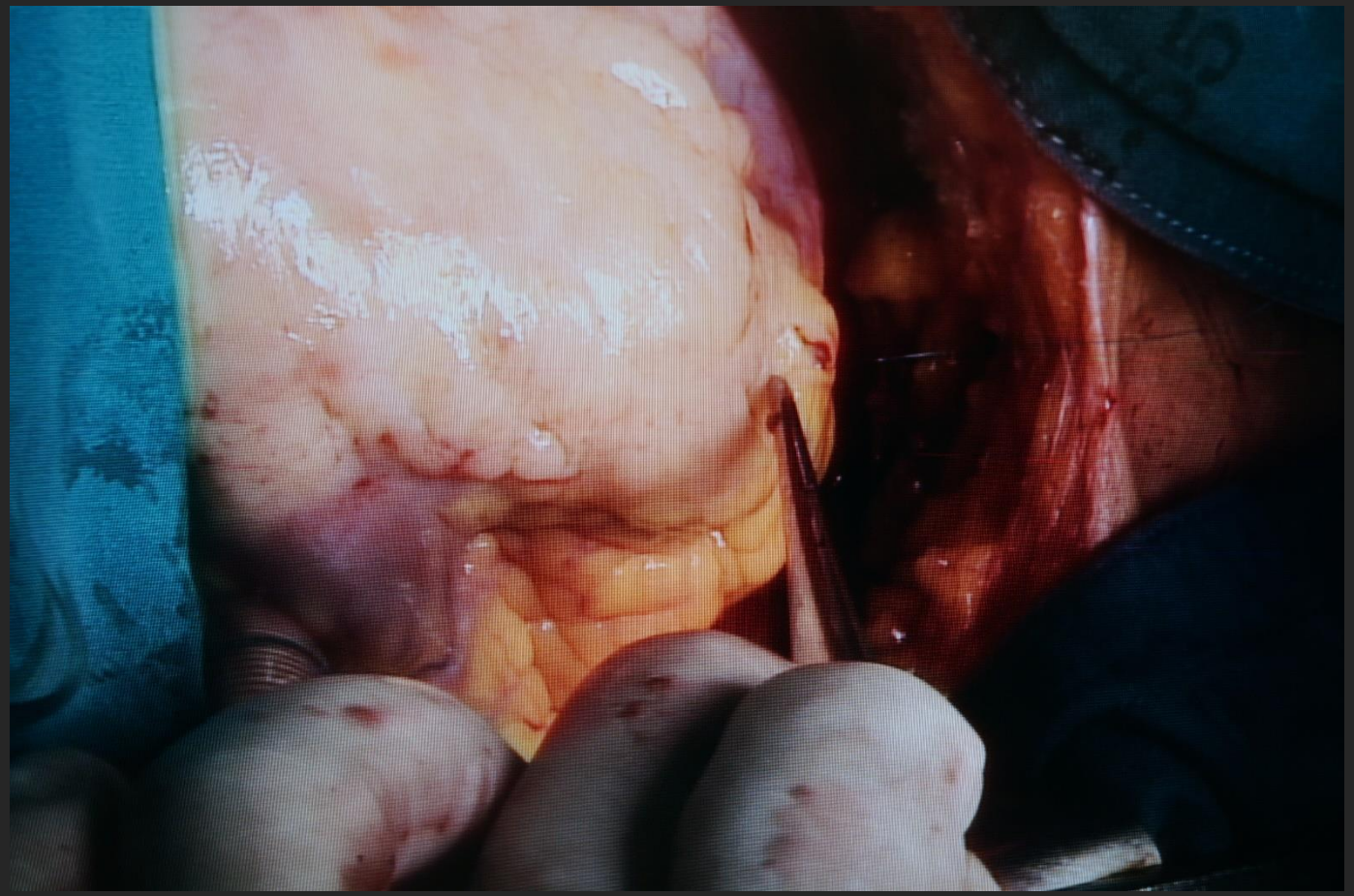
- Female, aged 48 years,
- Presented with Dyspnea and palpitation, edema
- Echo: Mass at RVOT



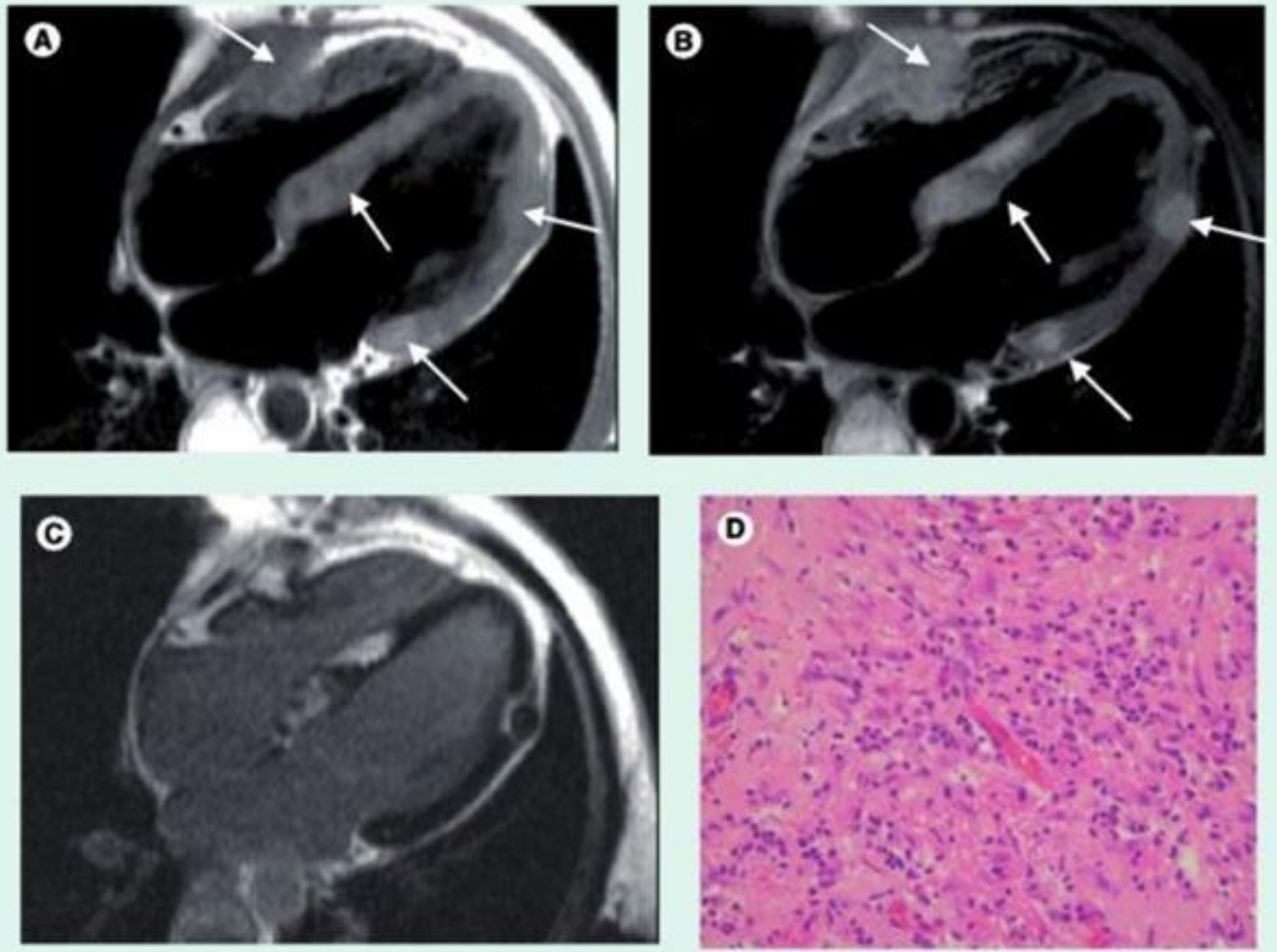








Cardiac lymphoma. (A) T1-weighted, **(B)** T2-weighted and **(C)** gadolinium-enhanced images. Multiple regional myocardial hypertrophy can be seen with abnormal signal intensity on the T2-weighted and the gadolinium-enhanced images. The hypertrophy is very localized (arrows) around the inferior interventricular groove, involving the right ventricle, septum and inferior wall of the left ventricle. Late gadolinium imaging demonstrates hyperenhancement due to interstitial expansion that is likely to be fibrosis or odema. **(D)** Hematoxylin- and eosin-stained section showing admixed histiocytes, blood vessels, lymphocytes and plasma cells. This tissue was infiltrating and destroying the myocardium and overlying pericardium. Magnification is ×400.



Cardiac lipoma

Female, aged 32 years

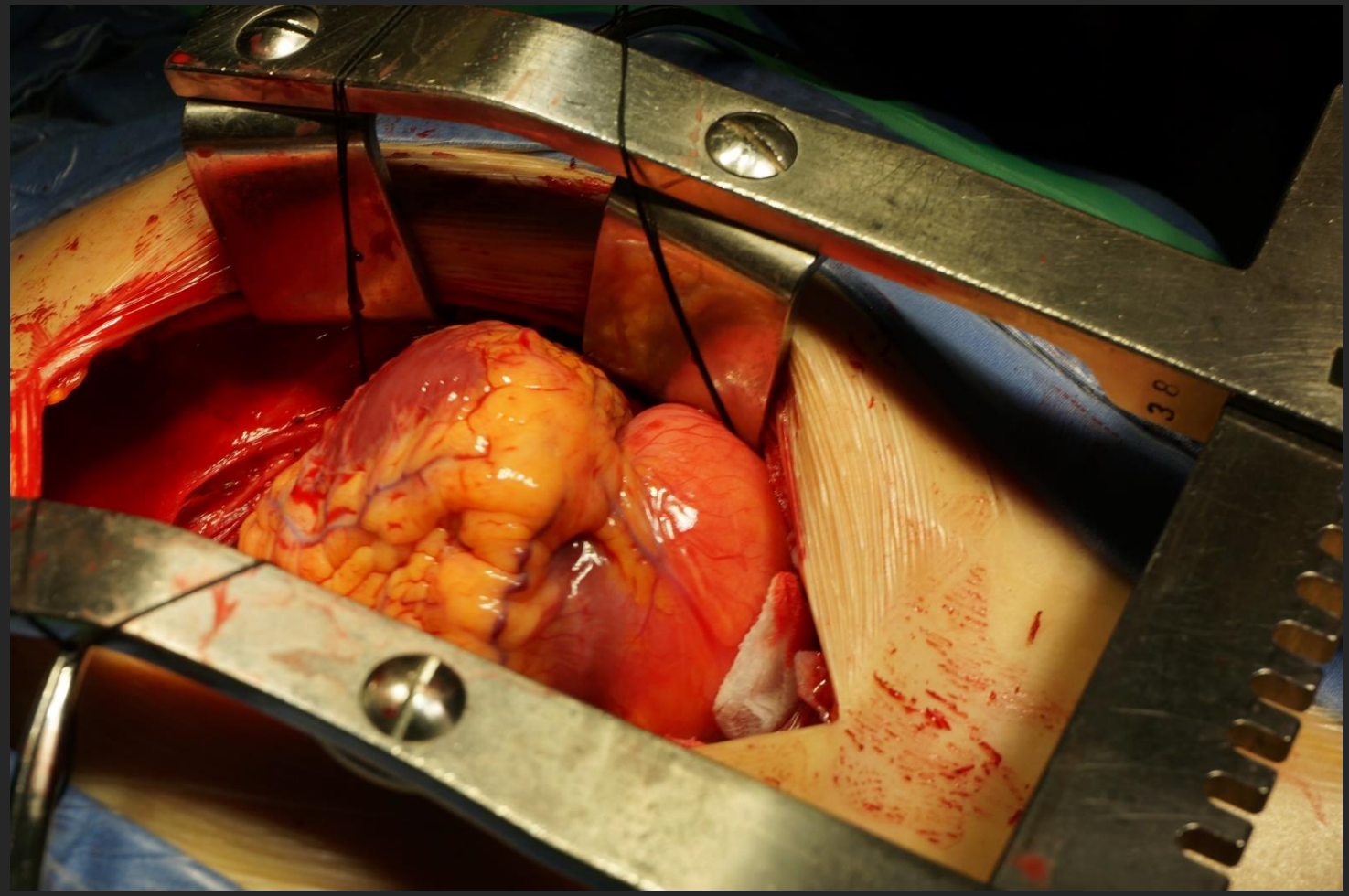
Presented with palpitation

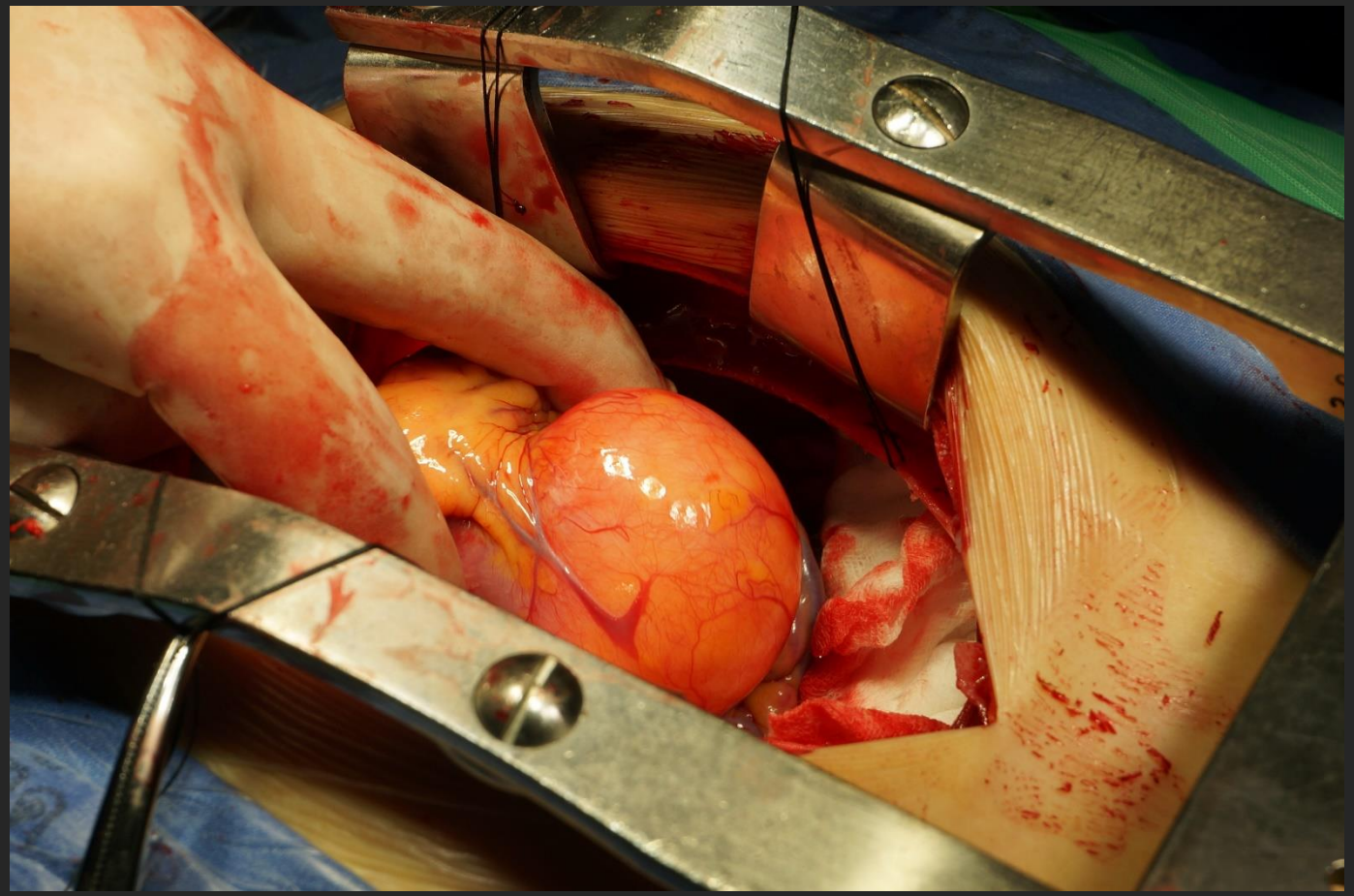
Echocardiographic Diagnosis: pericardial cyst

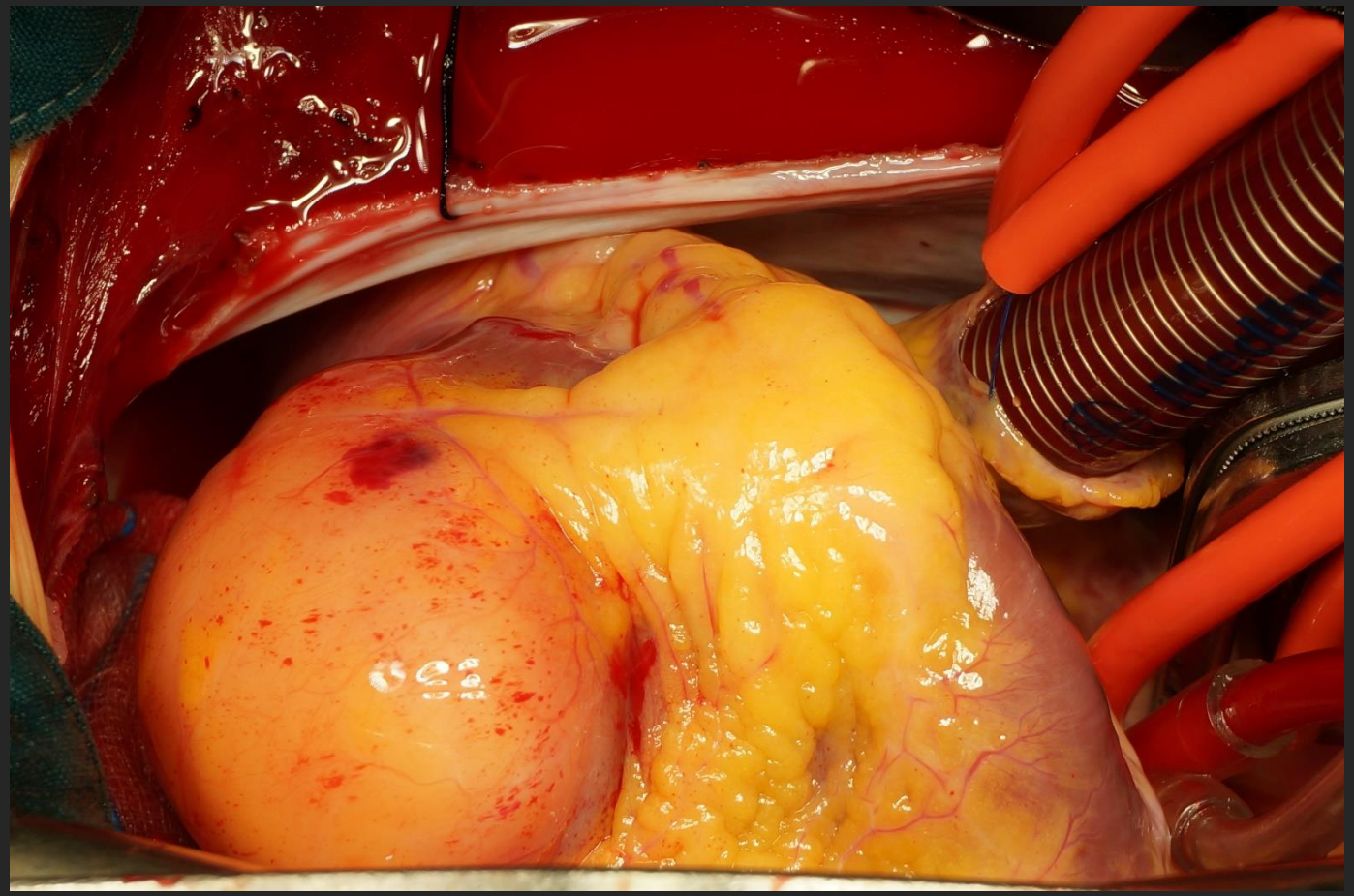
Opearative Finding Shown:

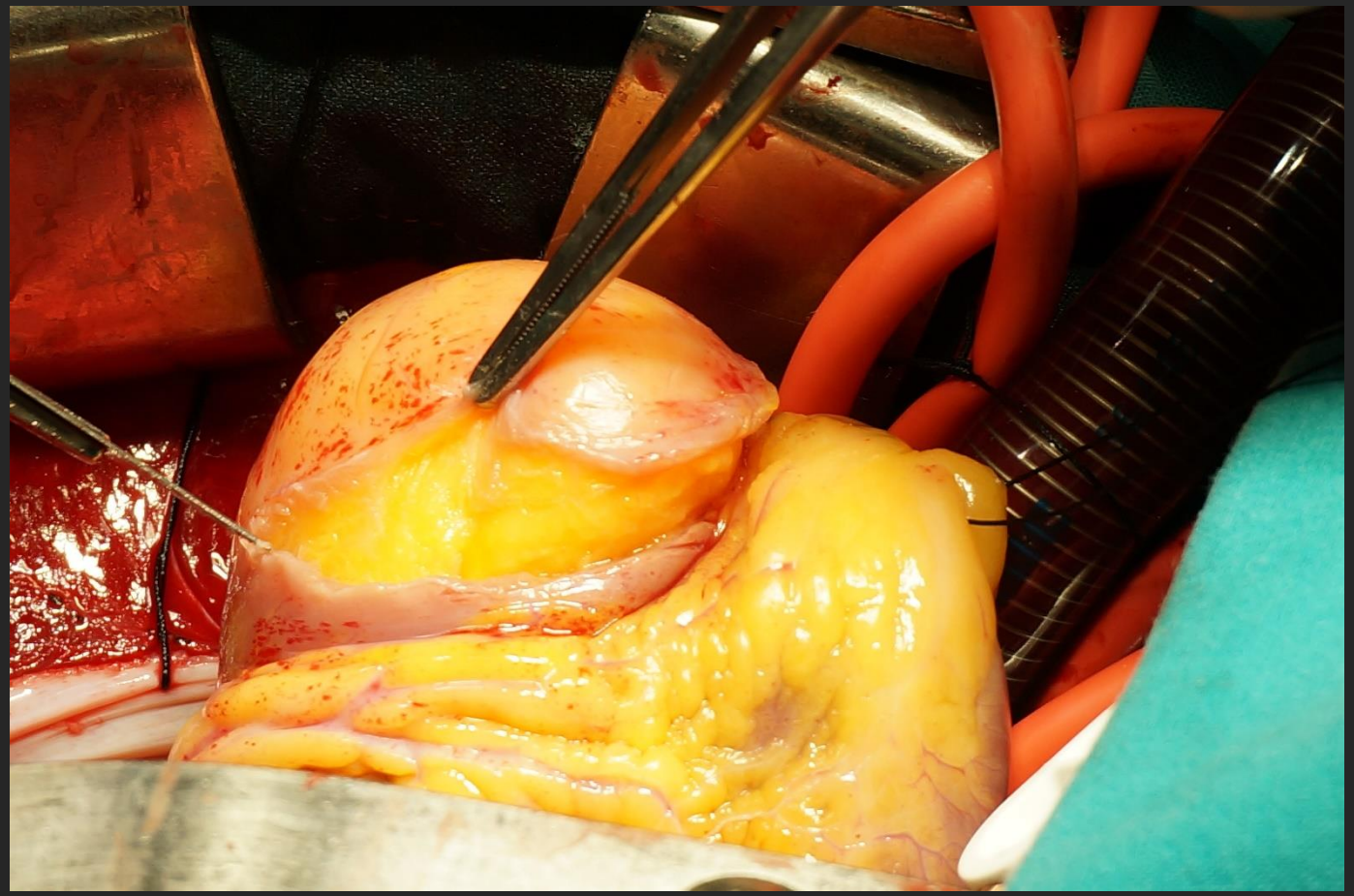
X clamp time: 41 mins

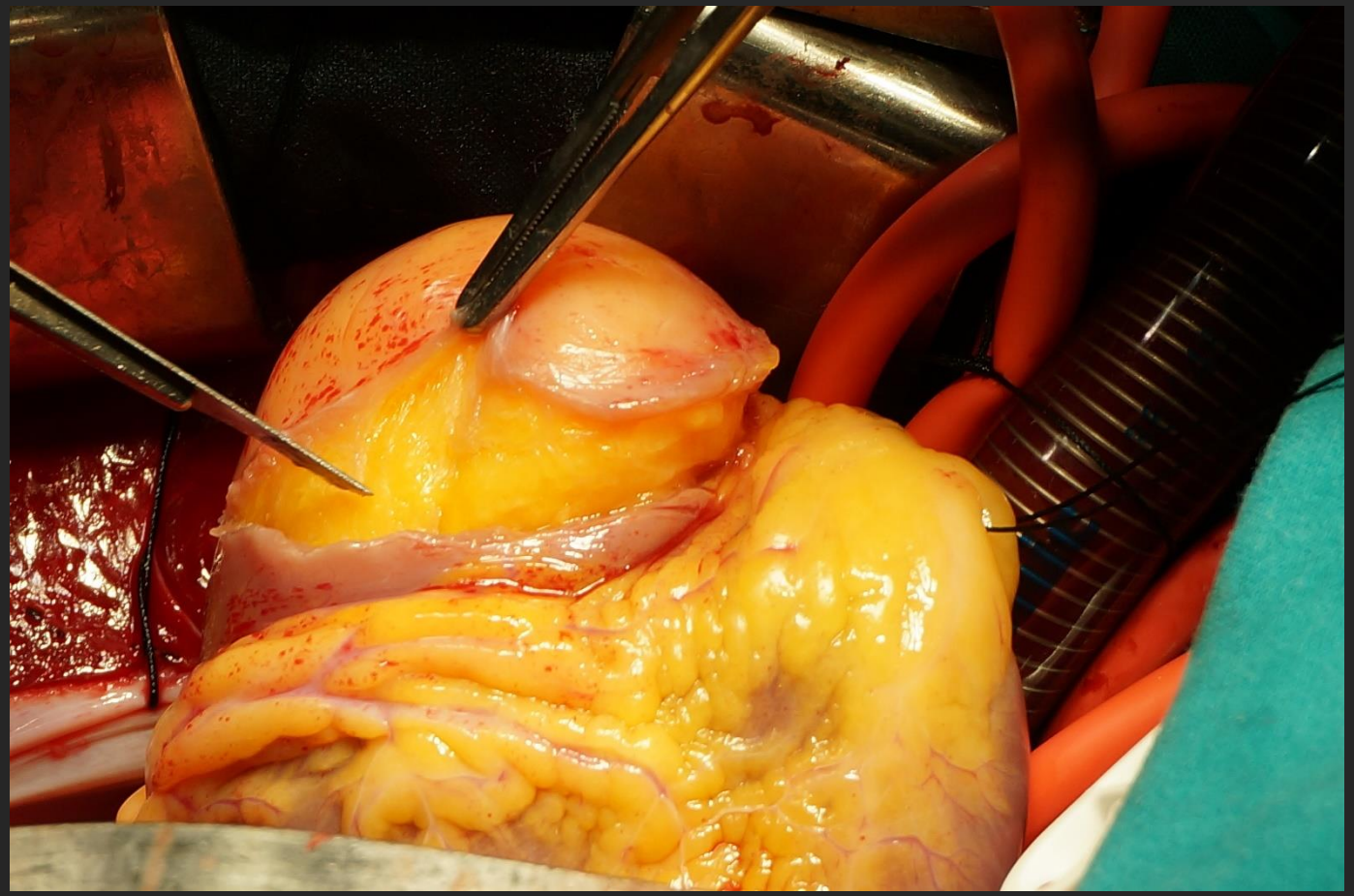
CPB time: 58 mins

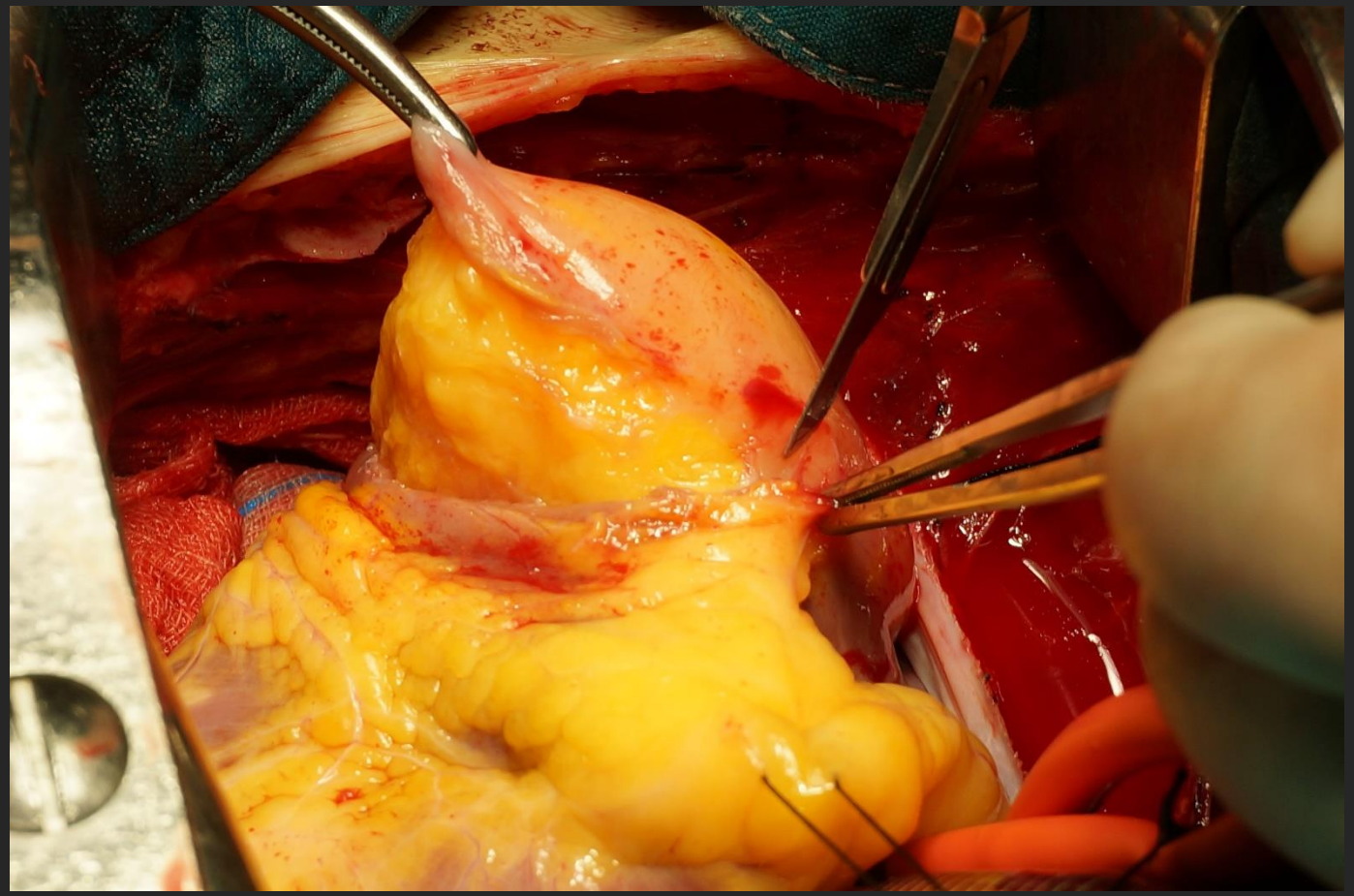


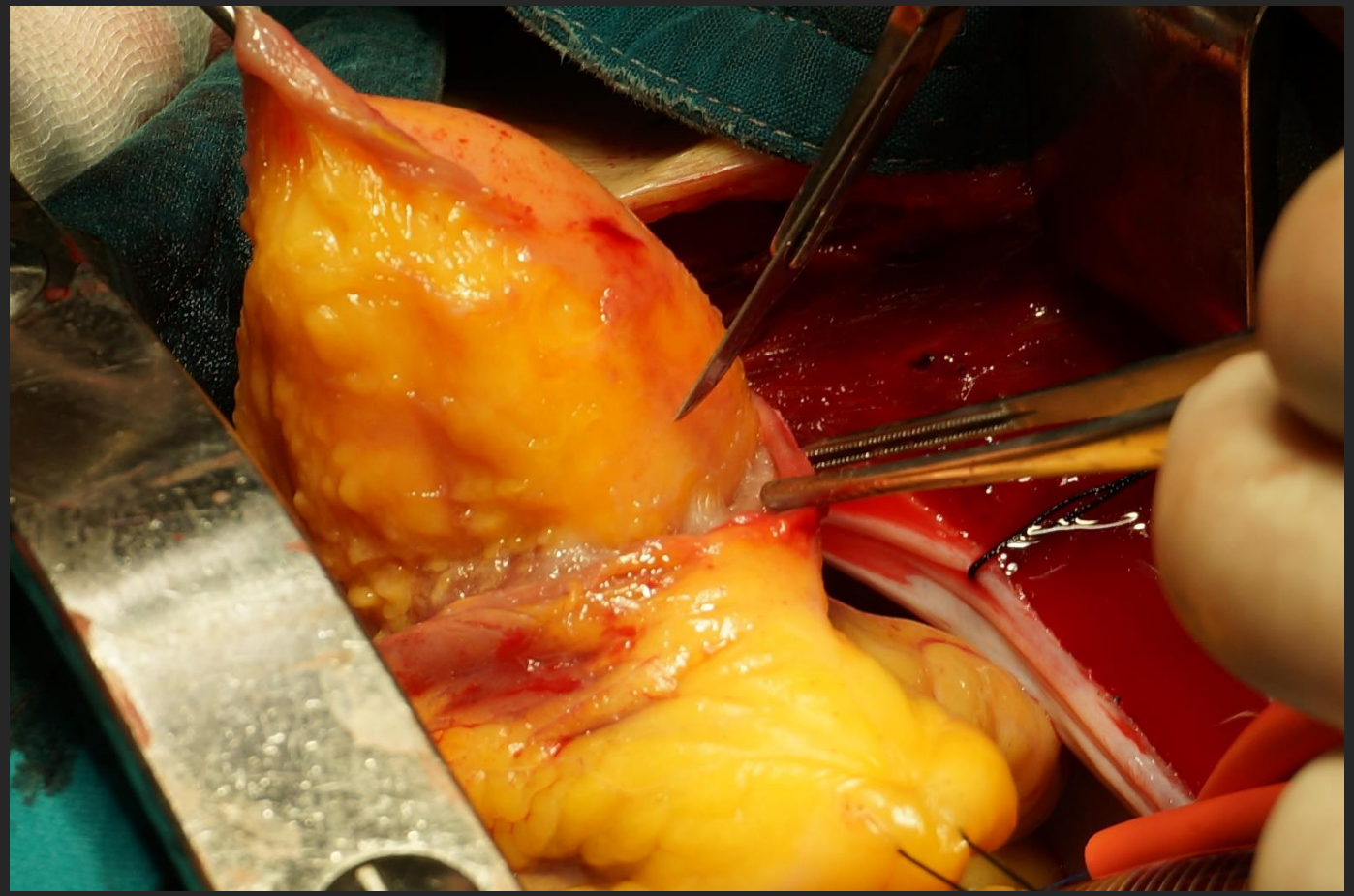


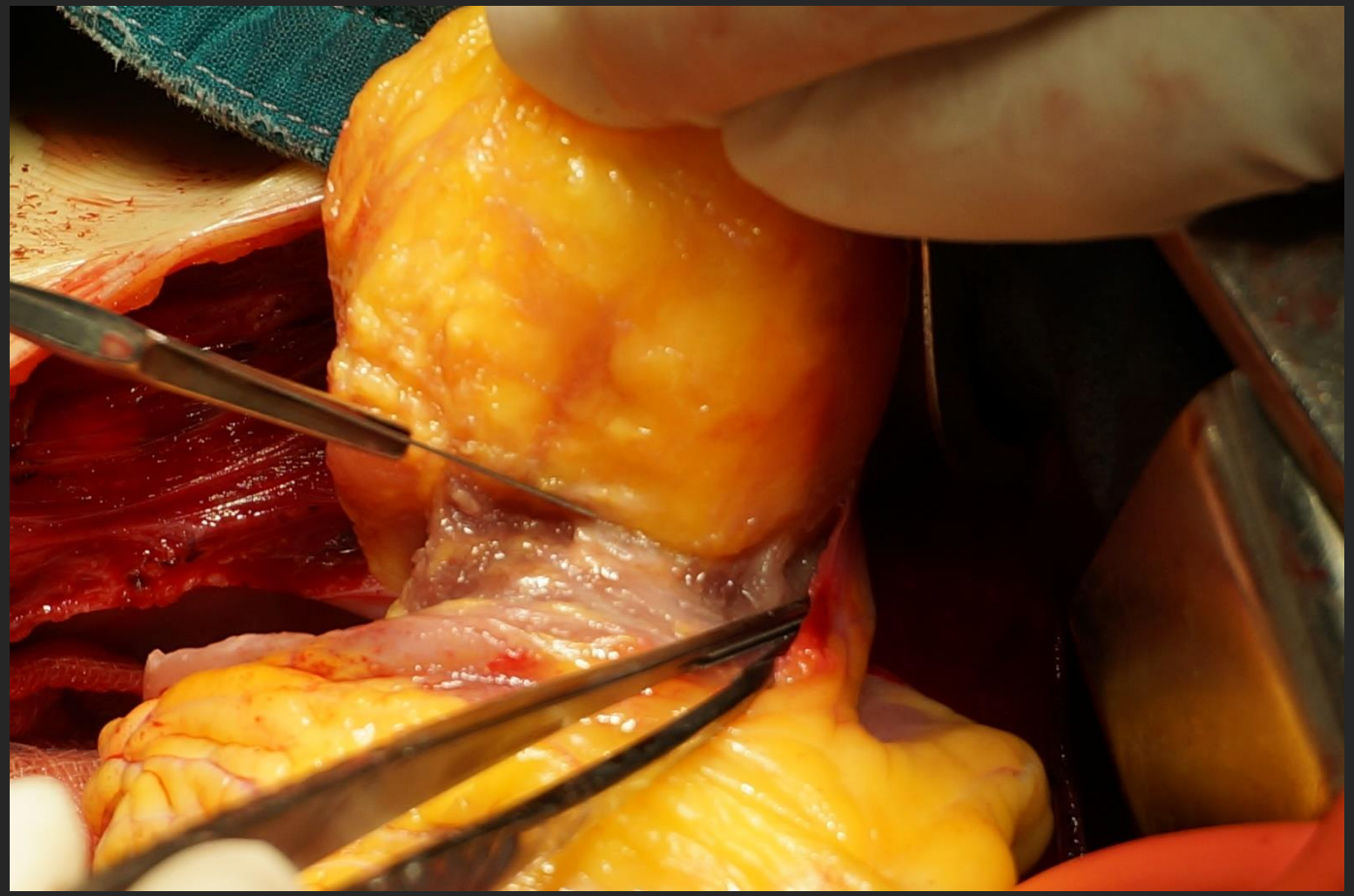


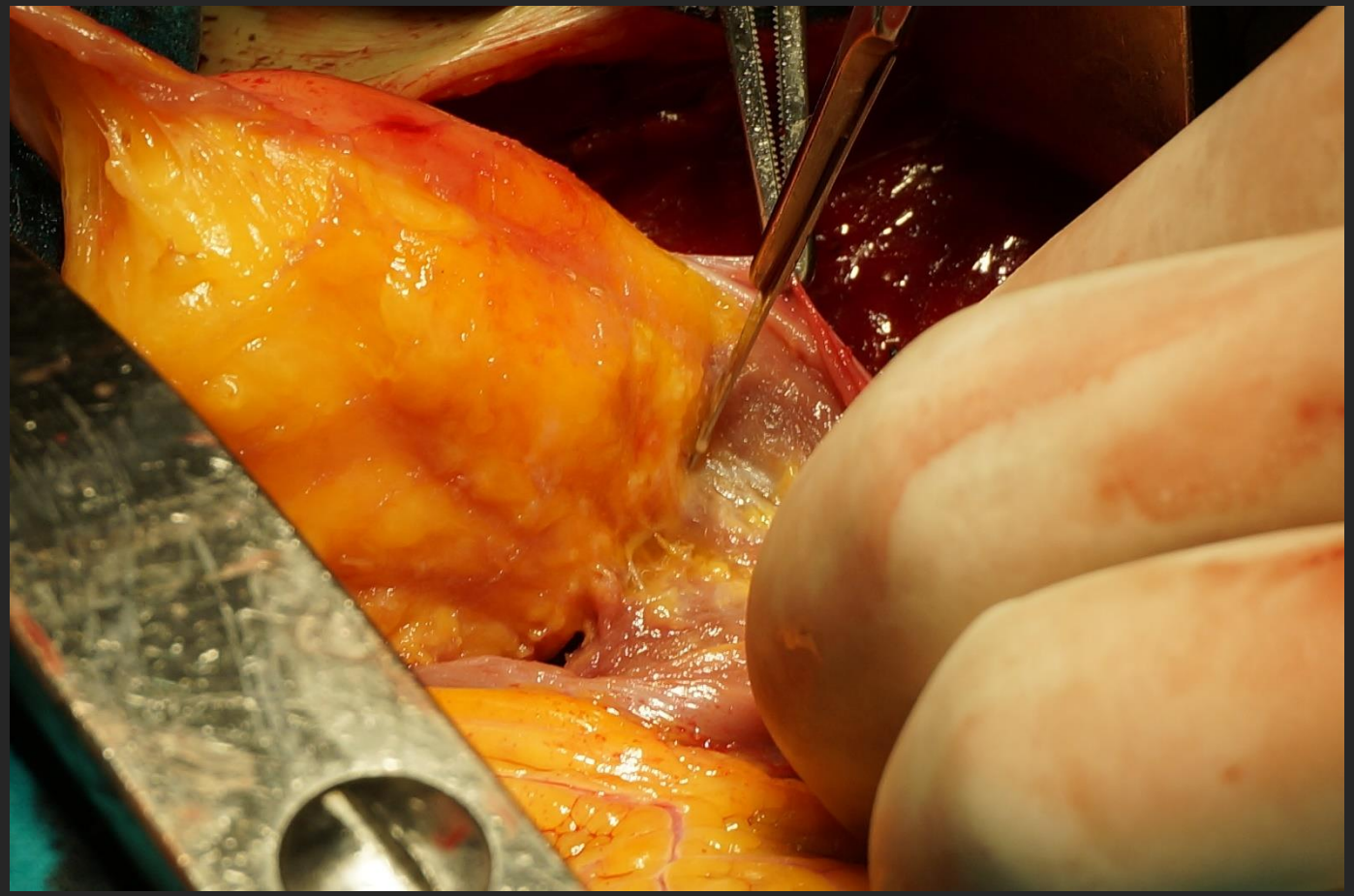


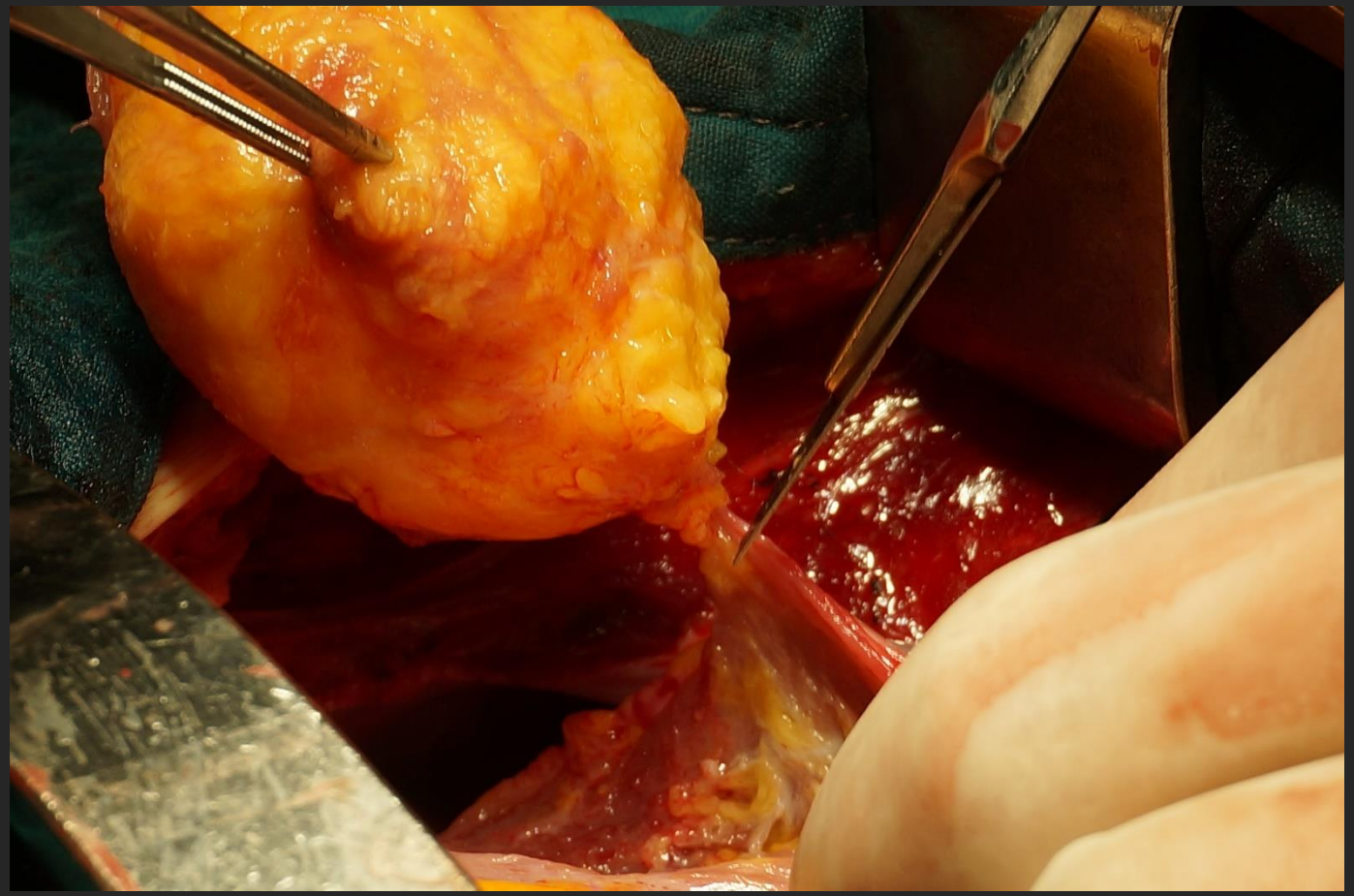


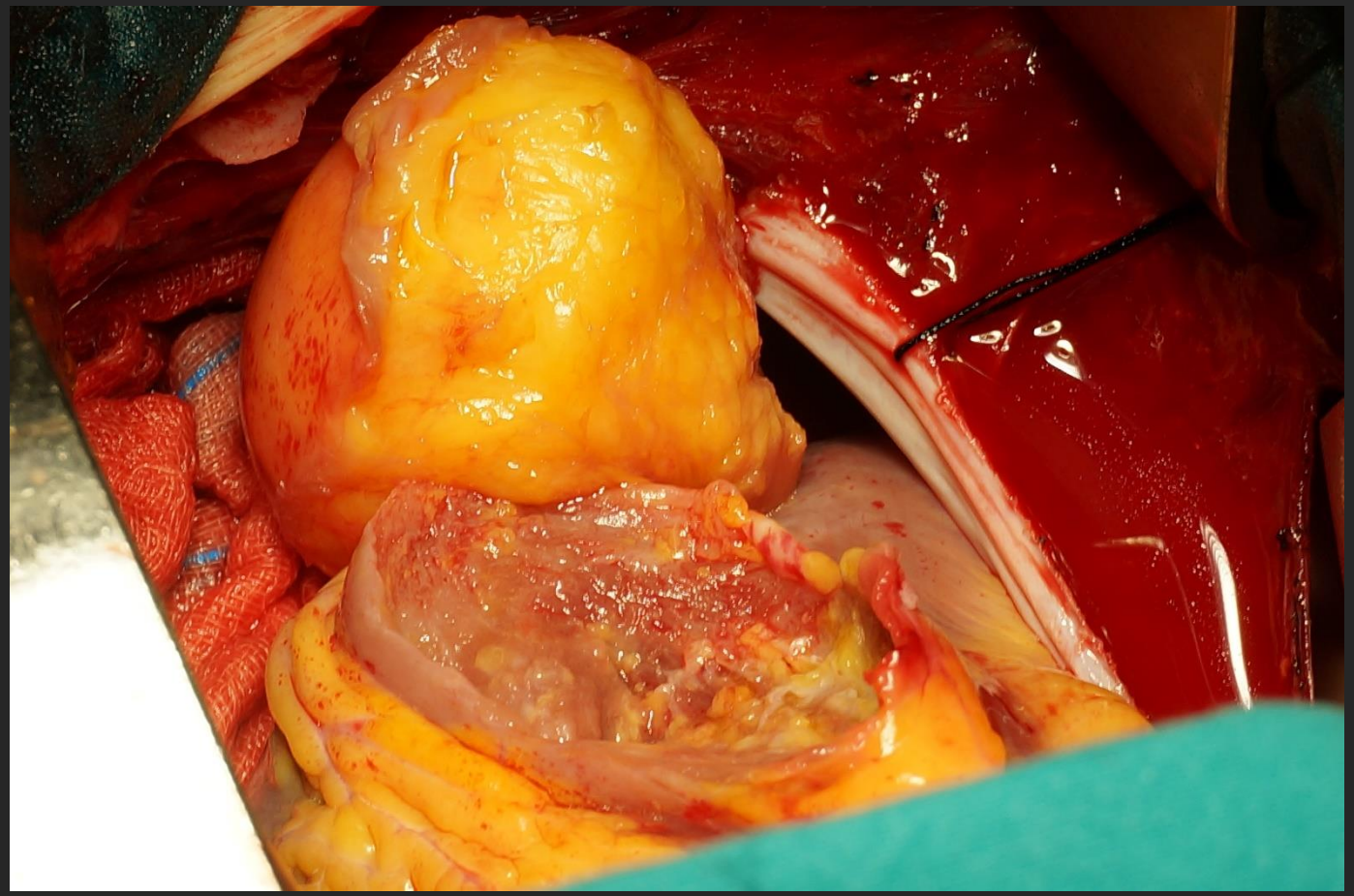


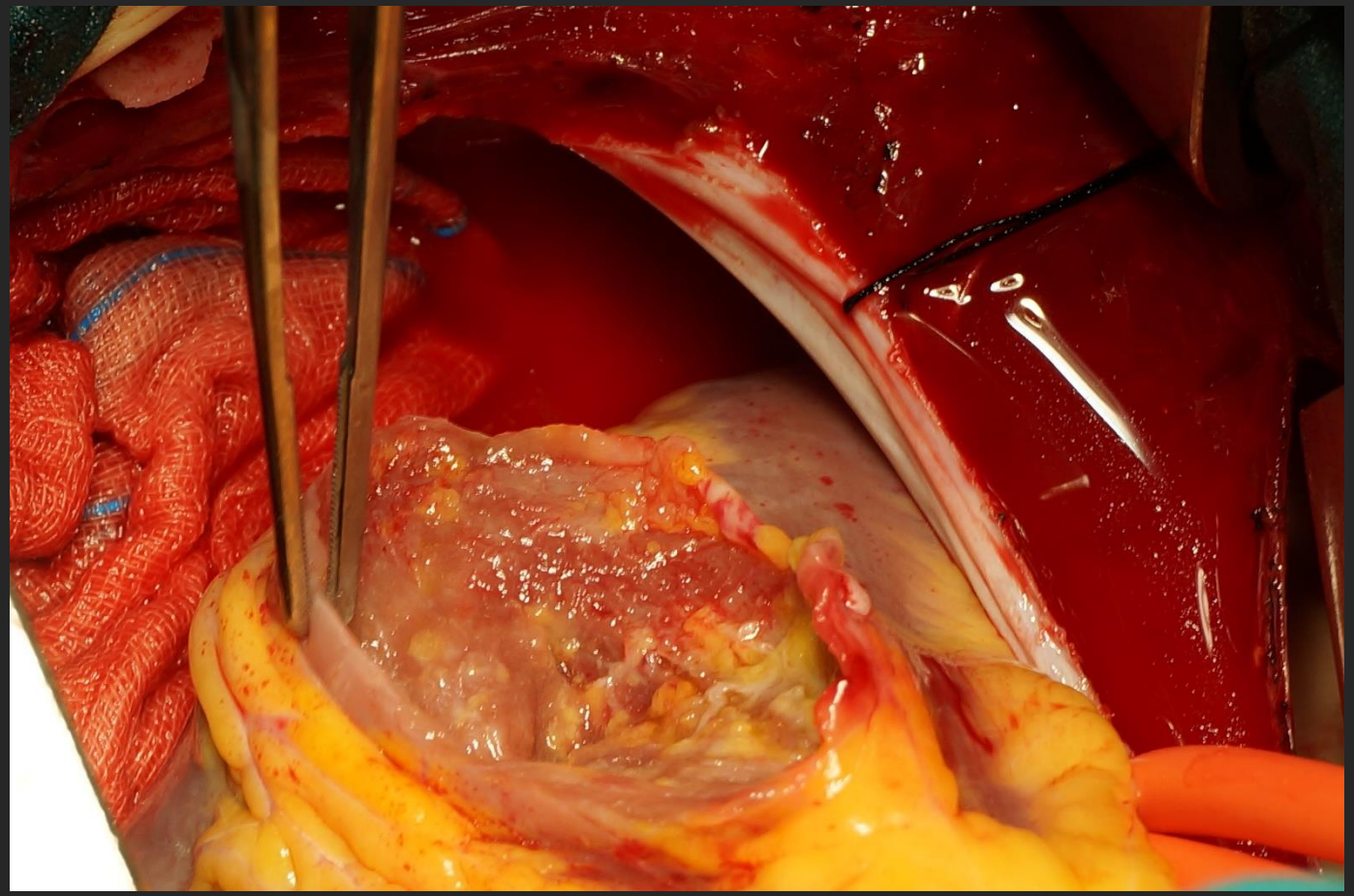


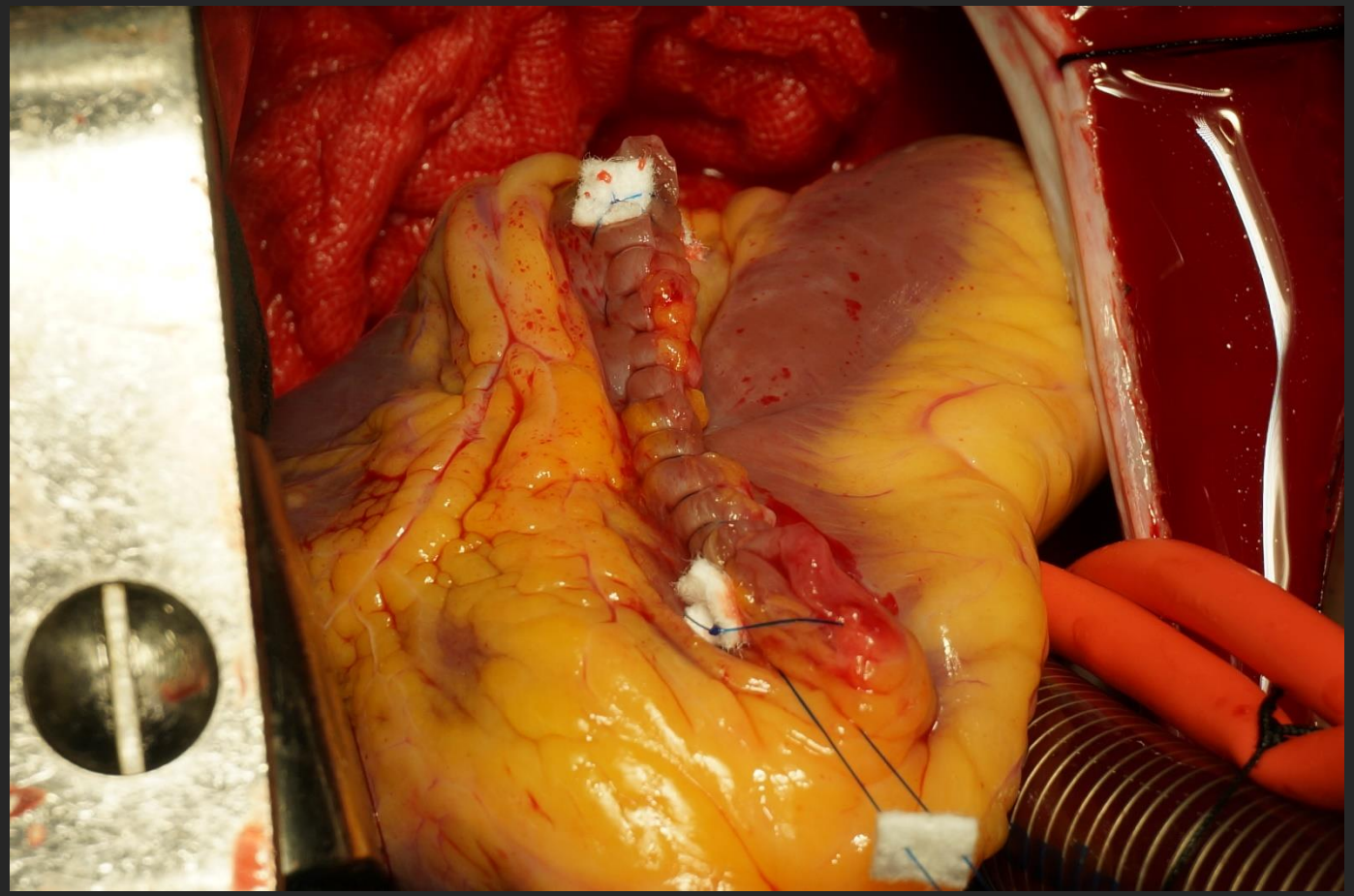


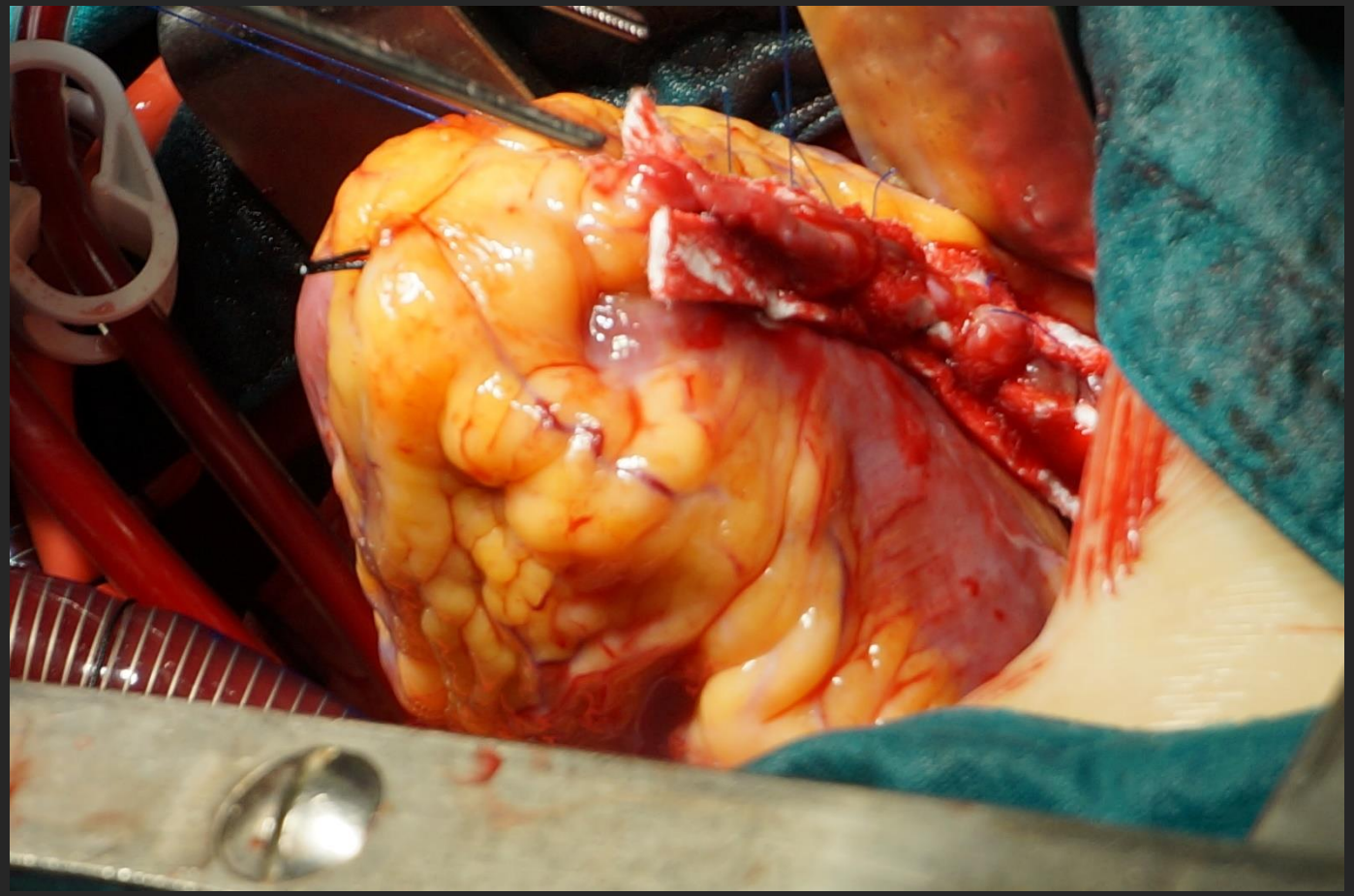








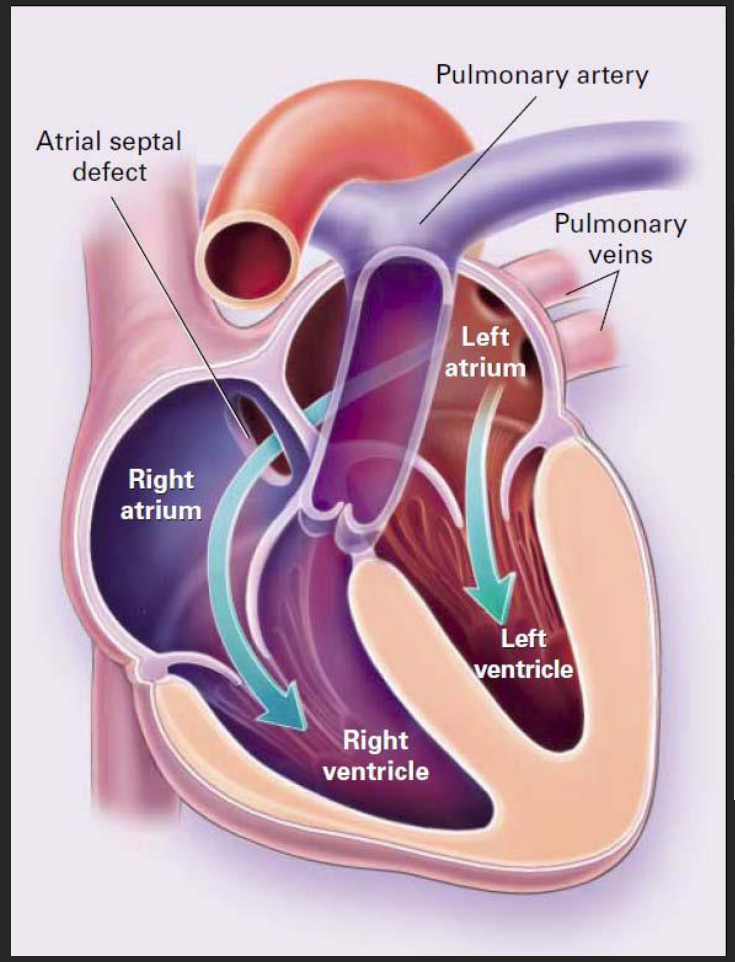


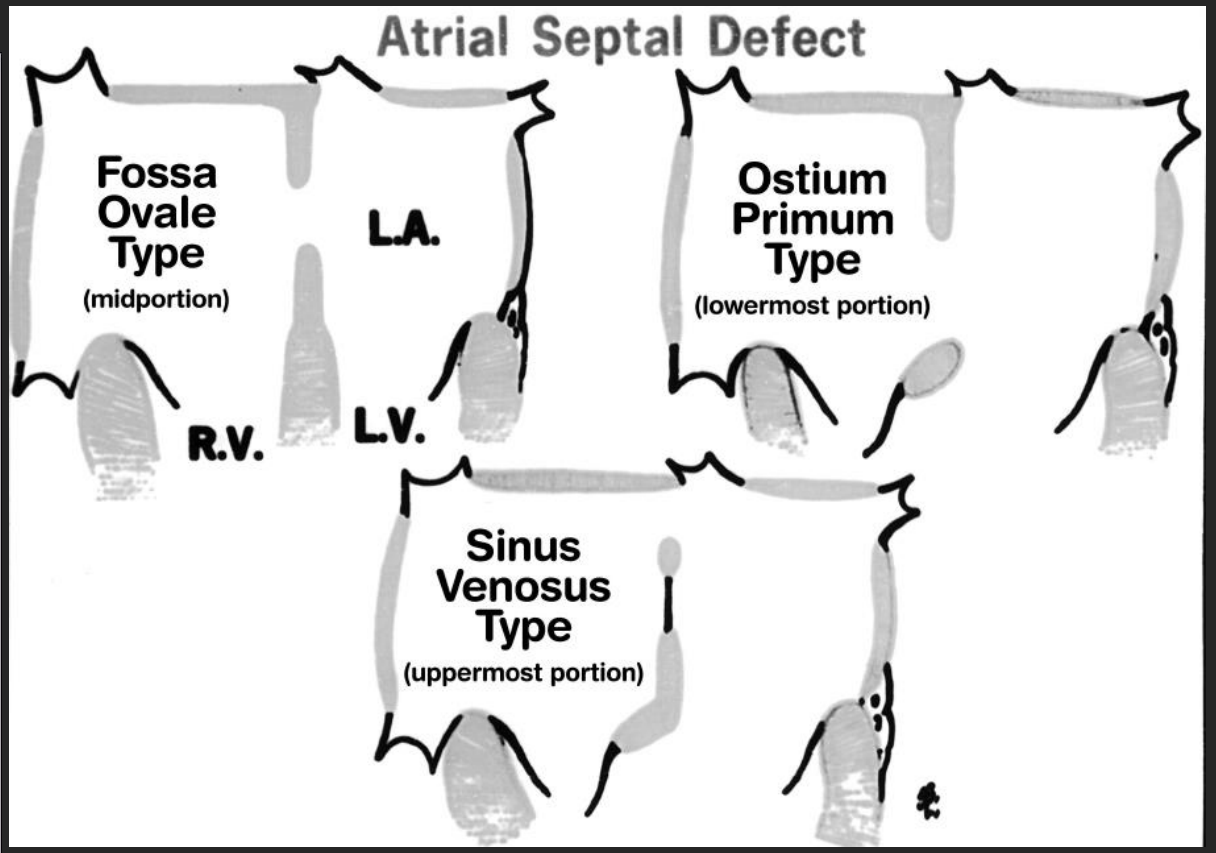


TYPE OF CONGENITAL HEART DISEASE

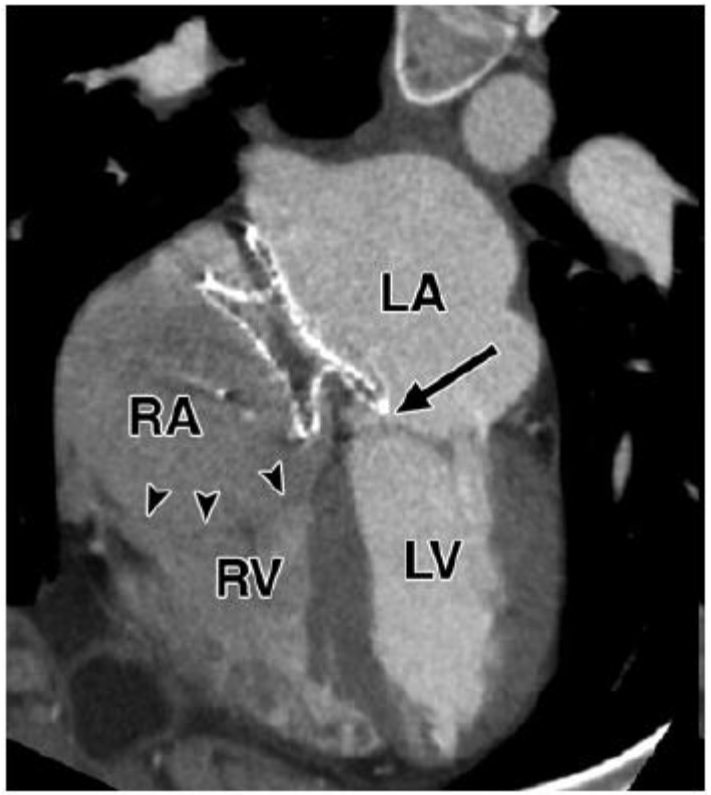
- ACYANOTIC CONGENITAL HEART DISEASE : Lt TO Rt SHUNT
  - ASD SECUNDUM
  - ASD PRIMUM
  - VSD
  - PDA
- CYANOTIC CONGENITAL HEART DISEASE : Rt TO Lt SHUNT
  - TOF
  - EBSTEIN'S ANOMALY

- Coarctation of Aorta

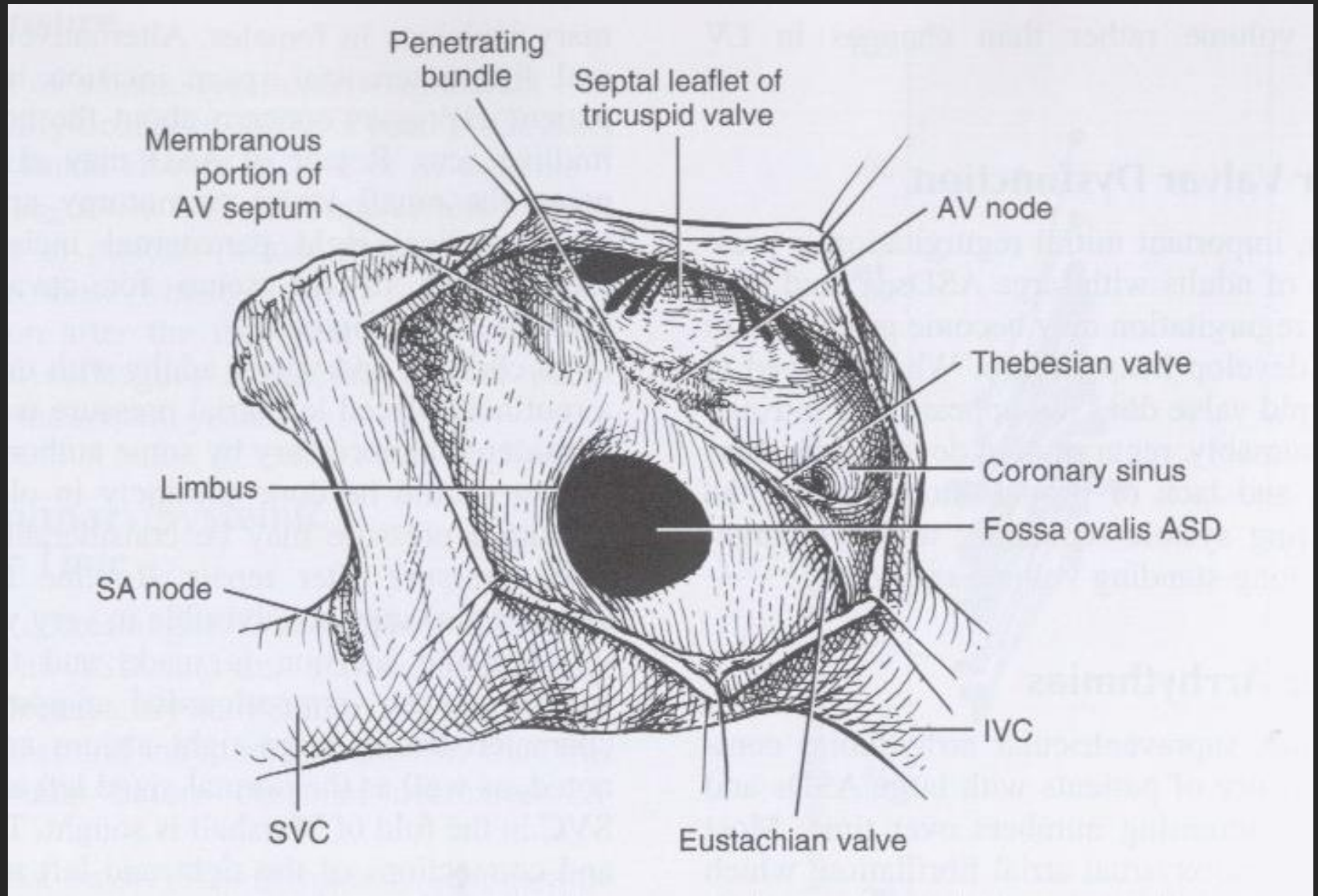

Pulmonary artery
Atrial septal defect
Pulmonary veins
Left atrium
Right atrium
Left ventricle
Right ventricle


Atrial Septal Defect
Fossa Ovale Type
(midportion)
L.A.
Ostium Primum Type
(lowermost portion)
R.V.
L.V.
Sinus Venosus Type
(uppermost portion)

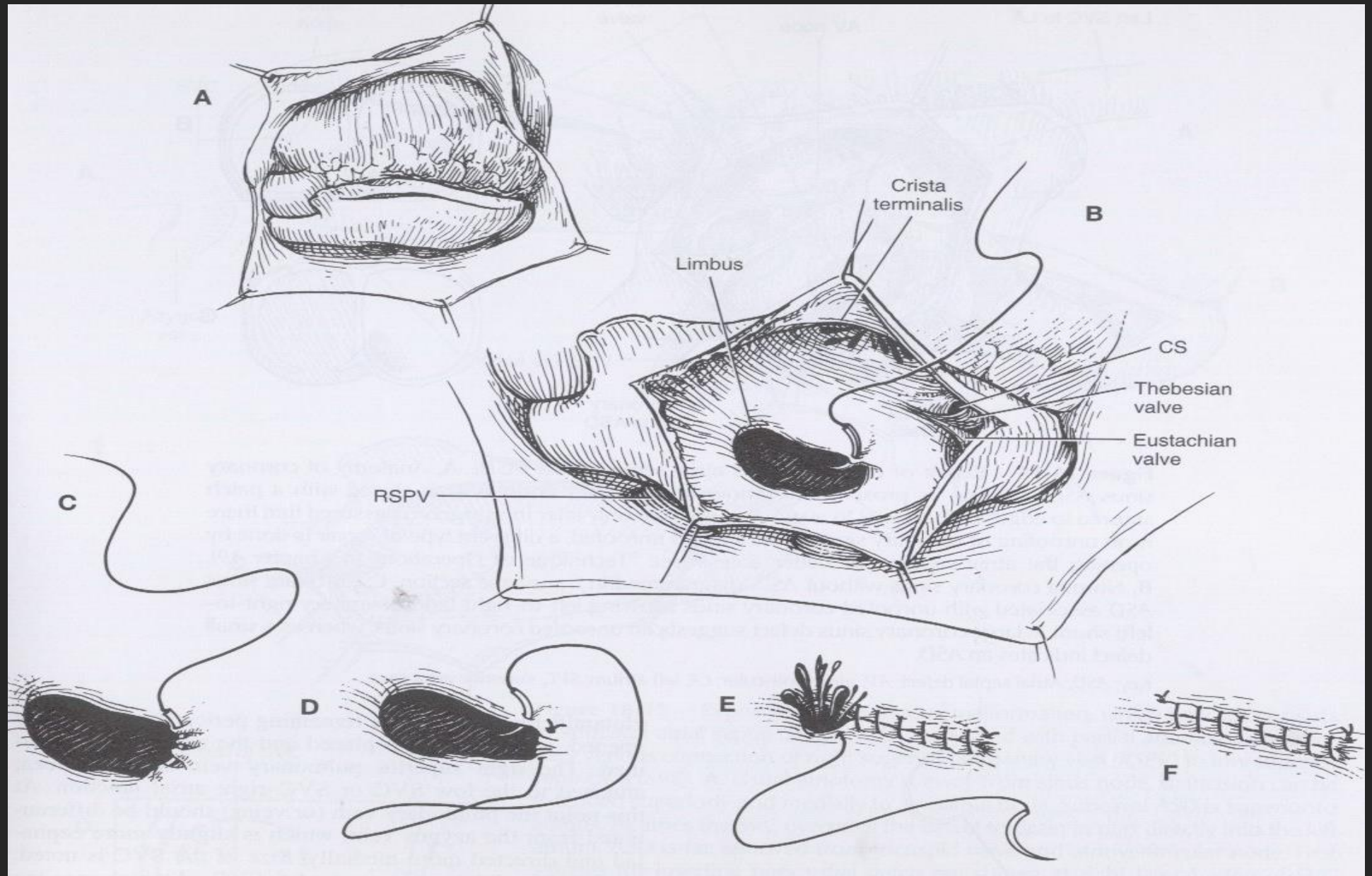
Amplatzer Septal Occluder for ASD



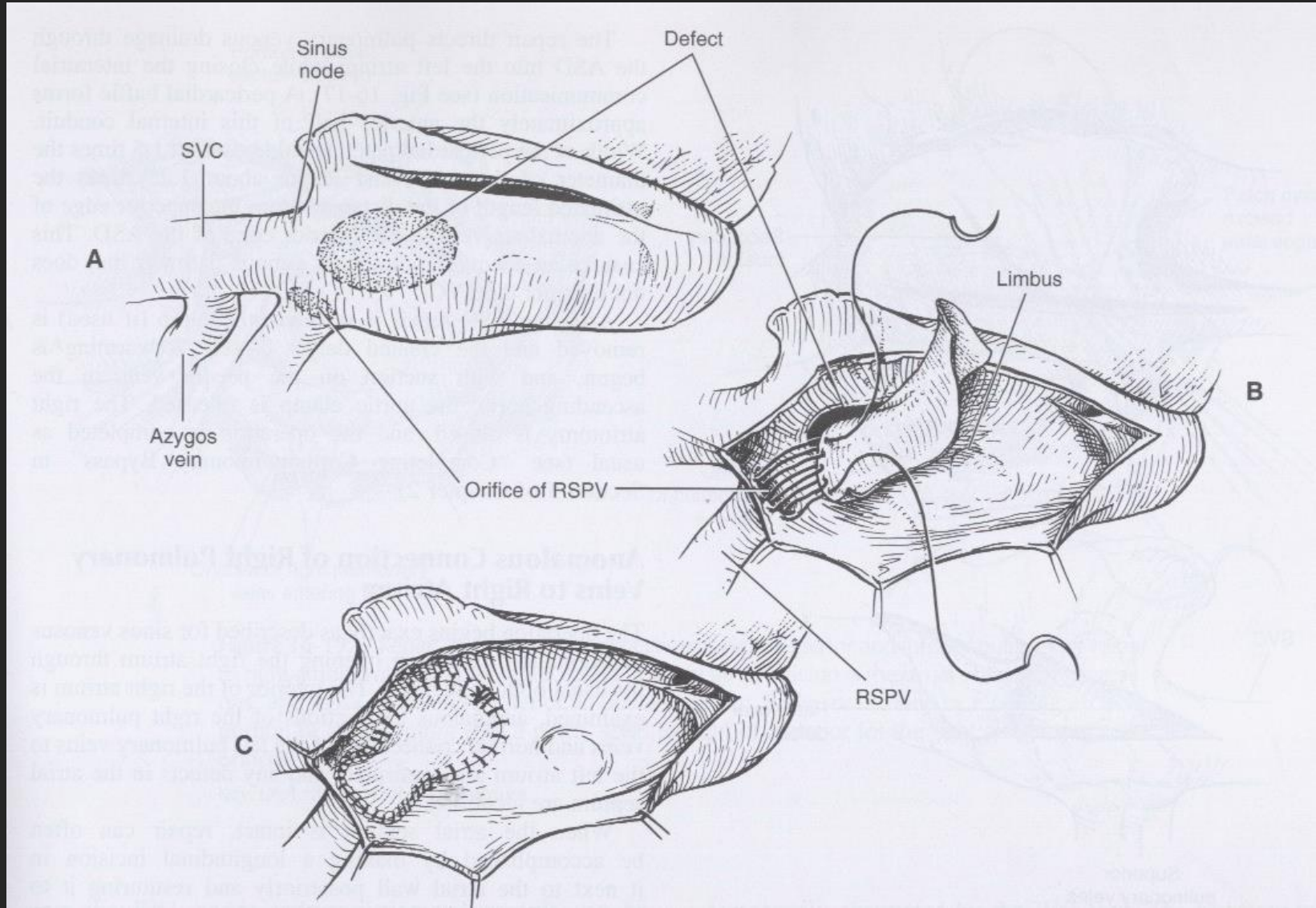
SURGERY


Penetrating bundle
Septal leaflet of tricuspid valve
Membranous portion of AV septum
AV node
Thebesian valve
Coronary sinus
Limbus
Fossa ovalis ASD
SA node
IVC
SVC
Eustachian valve

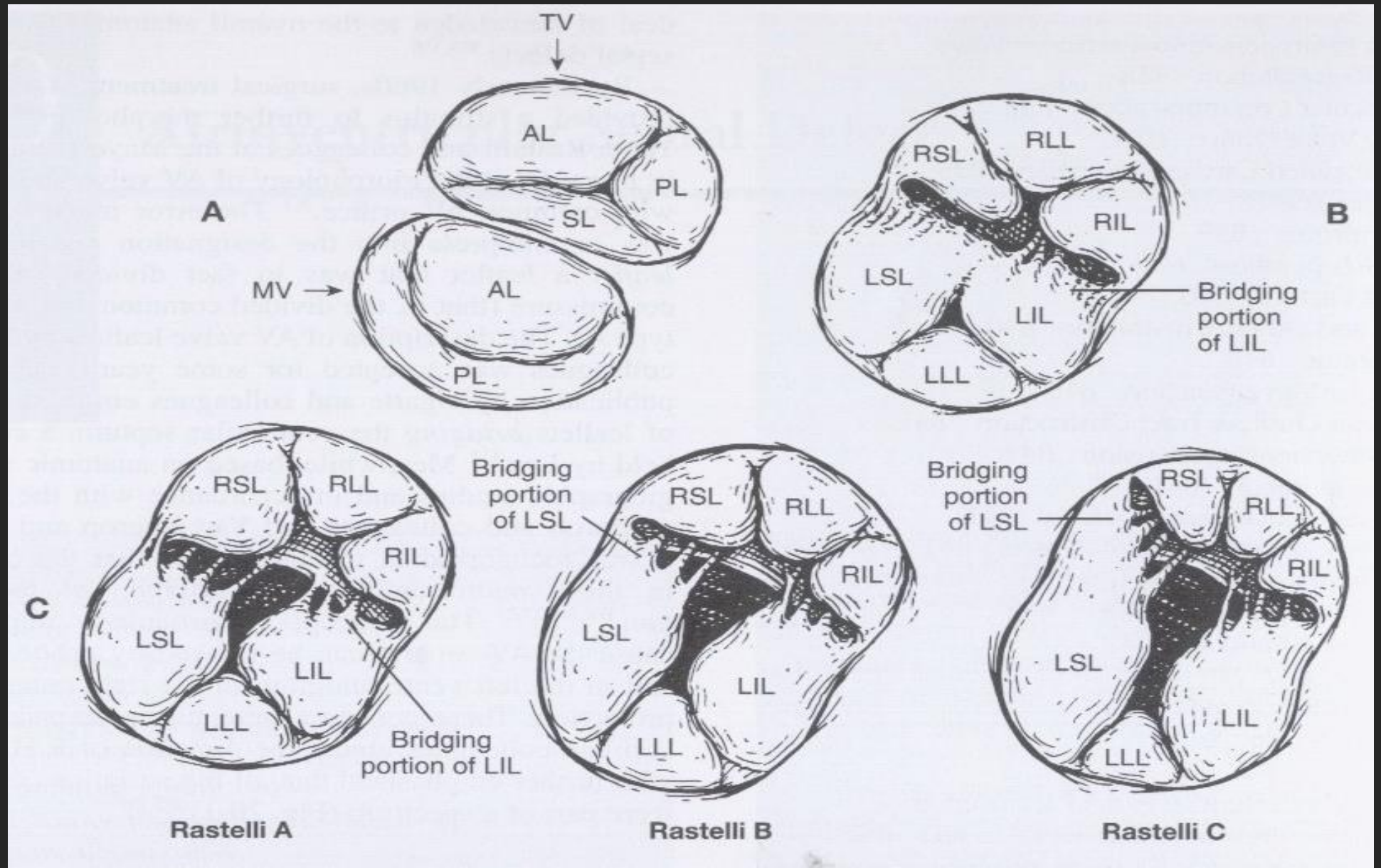
SURGERY


A
B
Crista terminalis
Limbus
CS
Thebesian valve
Eustachian valve
RSPV
C
D
E
F

SURGERY


Sinus node
Defect
SVC
A
Limbus
B
Azygos vein
Orifice of RSPV
RSPV
C

ASD PRIMUM


TV
AL
PL
SL
A
MV
AL
PL
RSL
RLL
RIL
B
LSL
LIL
LLL
Bridging
portion
of LIL
RSL
RLL
RIL
C
LSL
LIL
LLL
Bridging
portion of LIL
Bridging
portion
of LSL
RSL
RLL
RIL
LSL
LIL
LLL
Bridging
portion
of LSL
RSL
RLL
RIL
LSL
LIL
LLL
Rastelli A
Rastelli B
Rastelli C

CONDUCTION

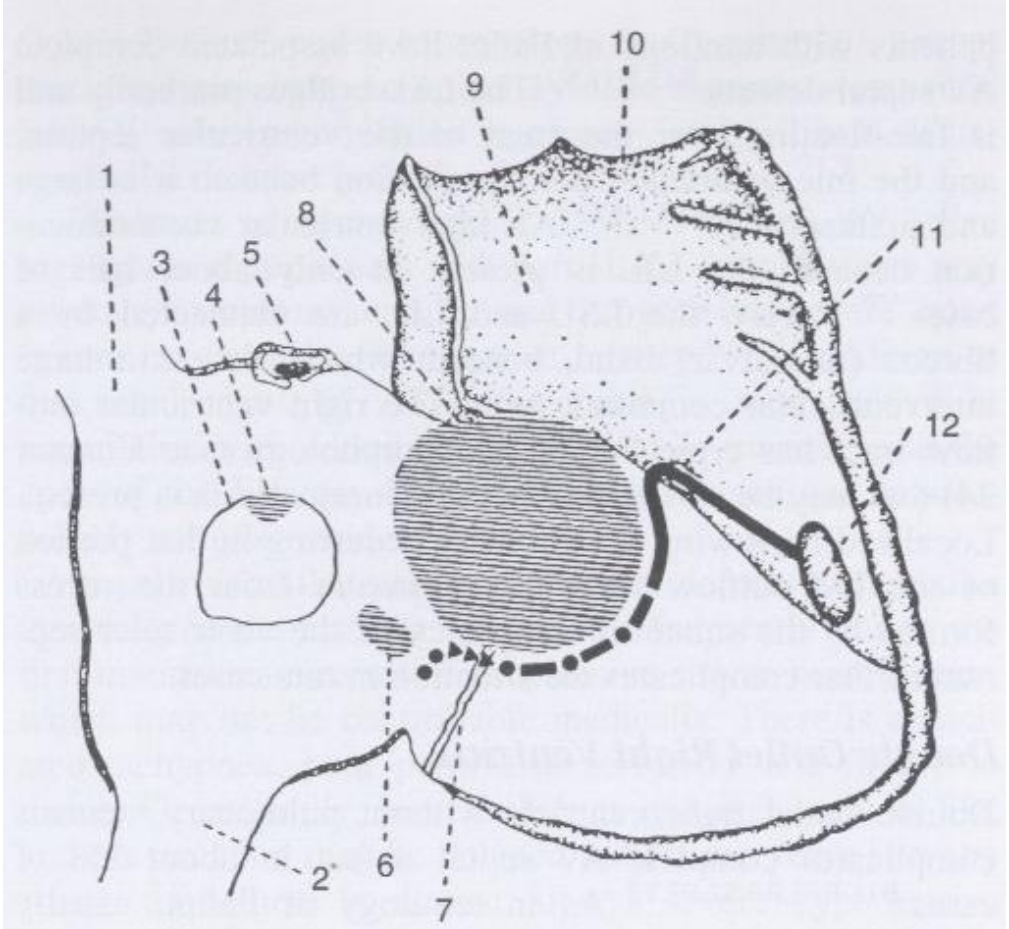
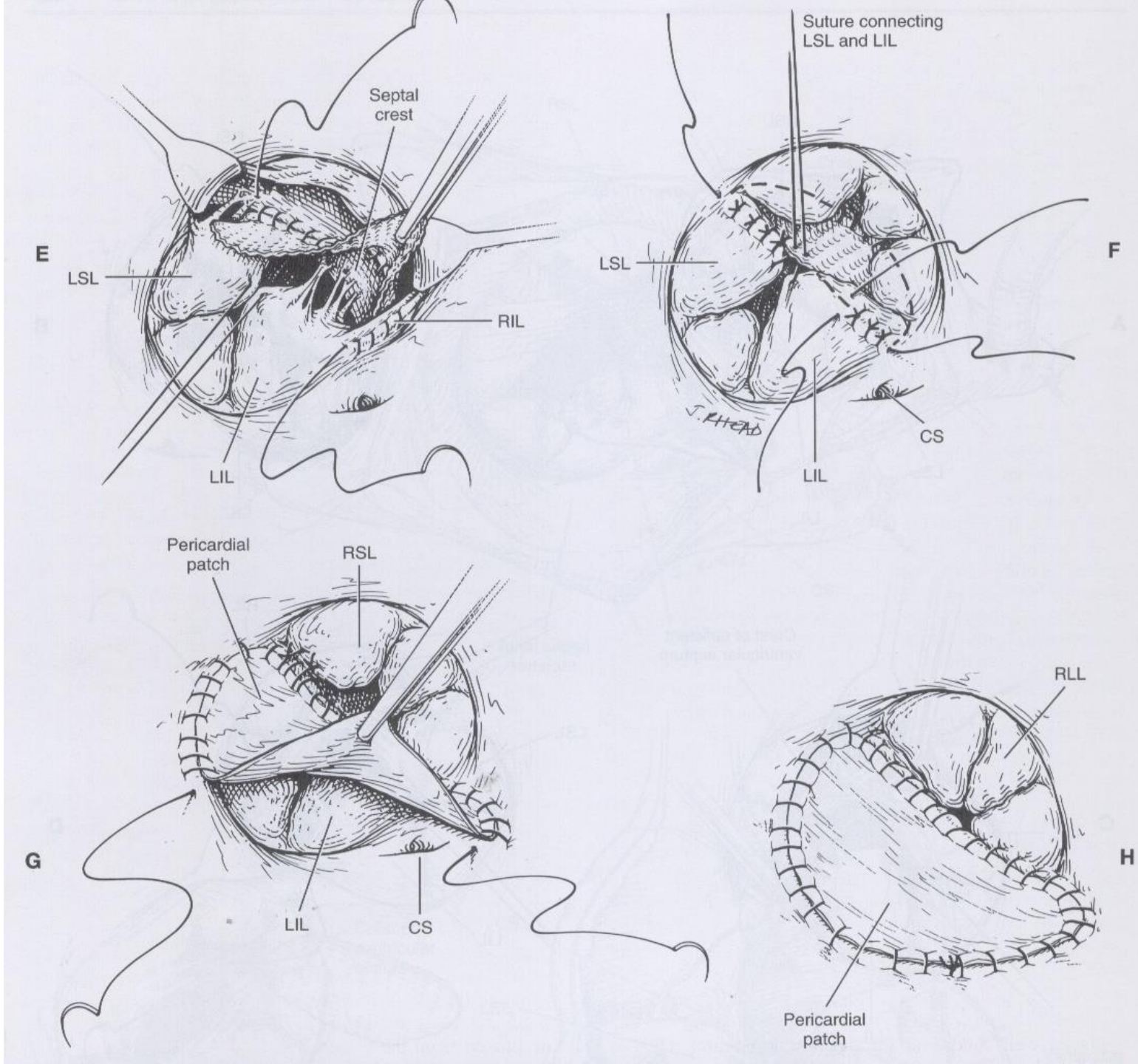
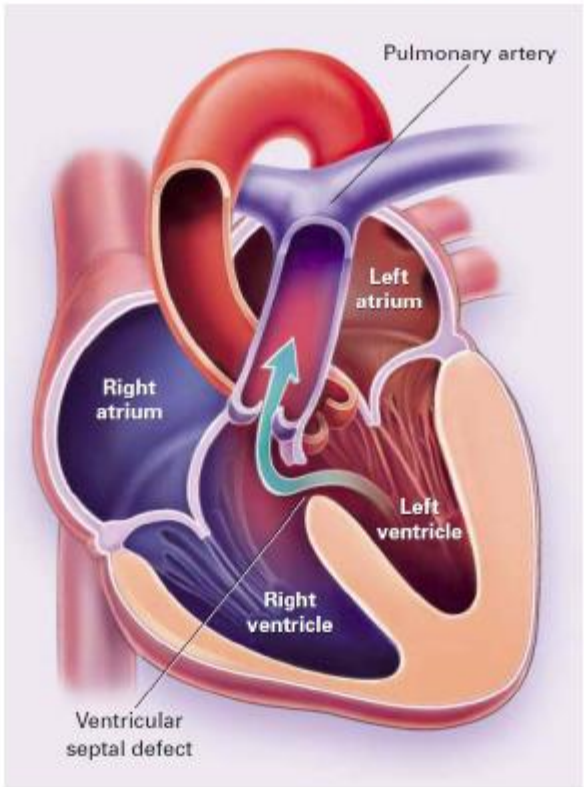


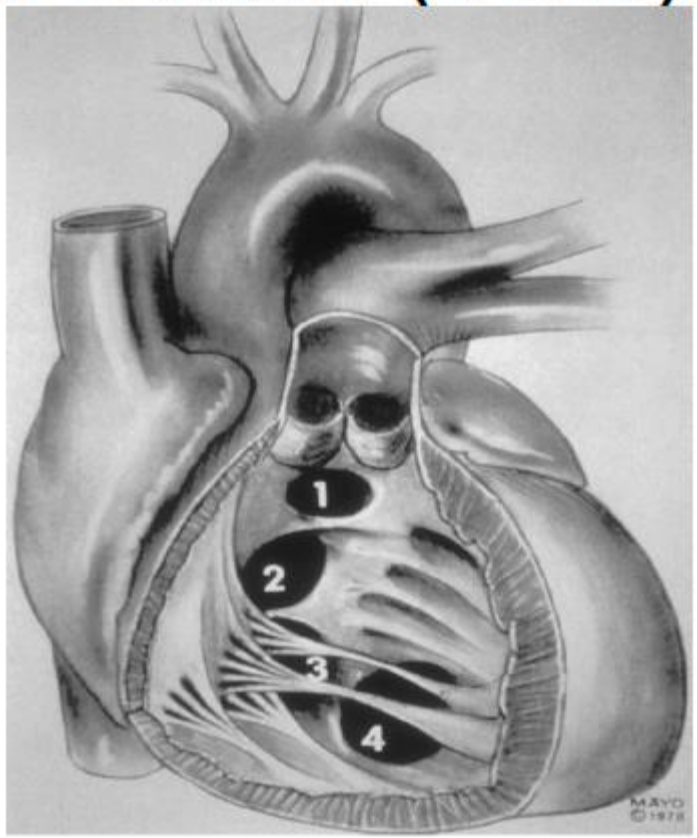
Figure 20-12 Diagrammatic sketch of the course of atrioventricular *(AV)* node, His bundle, and right bundle branch in common AV septal defect, right atrial and ventricular view. (Sinoatrial node is normal.) (From Lev.[L4])

Key: ●, Atrioventricular node; ▲, penetrating portion of the atrioventricular bundle; ● ▬, branching portion of the atrioventricular bundle; ▬, right bundle branch; *1,* superior vena cava; *2,* inferior vena cava; *3,* limbus; *4,* patent foramen ovale; *5,* cut edge of atrial appendage; *6,* entry of coronary sinus; *7,* base of atrioventricular valve; *8,* atrioventricular septal communication; *9,* infundibulum; *10,* base of pulmonary valve; *11,* muscle of Lancisi; *12,* cut edge of moderator band.


E
Septal crest
LSL
RIL
LIL
F
Suture connecting LSL and LIL
LSL
CS
LIL
G
Pericardial patch
RSL
LIL
CS
H
RLL
Pericardial patch

Ventricular Septal Defect (VSD)



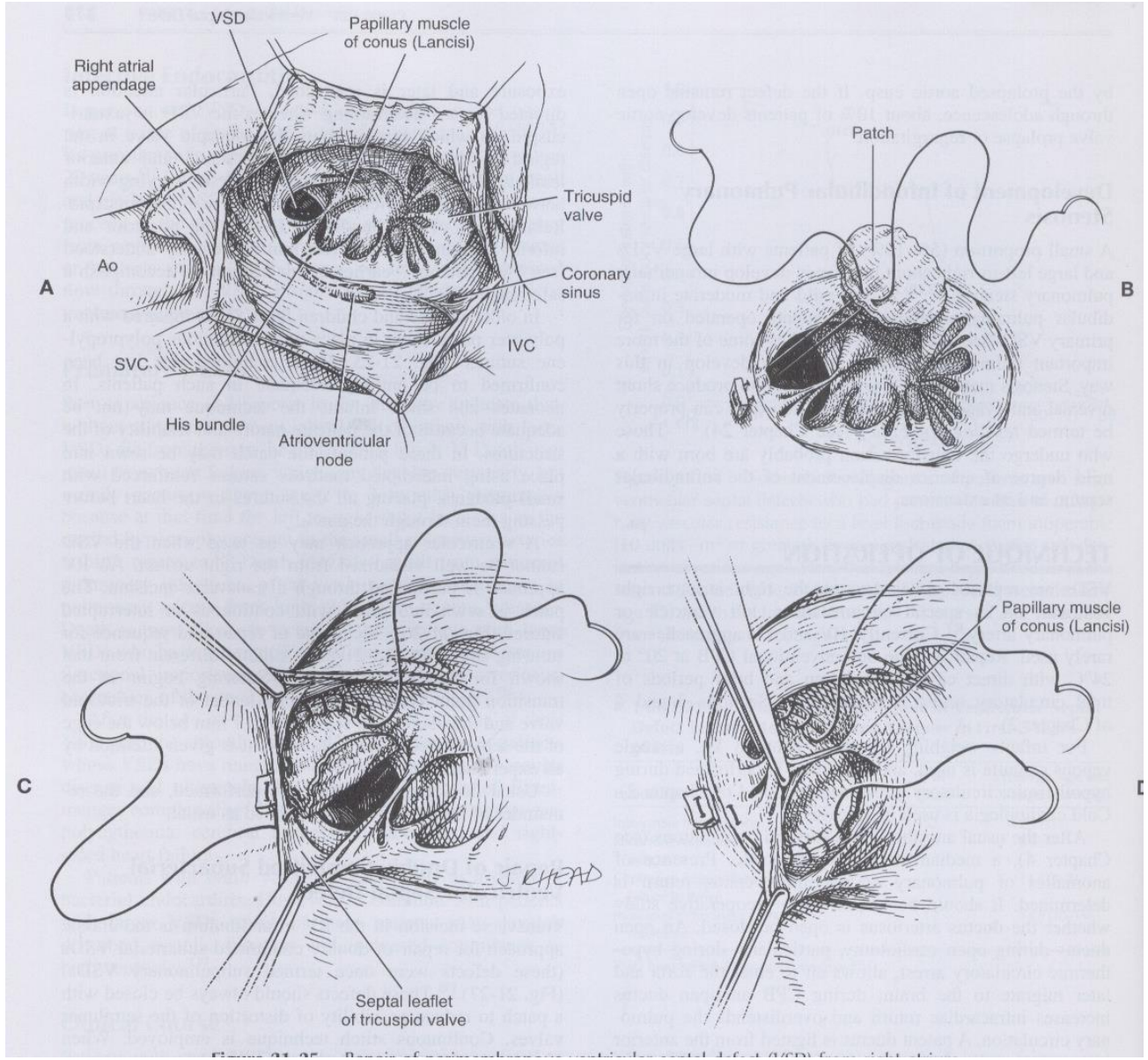


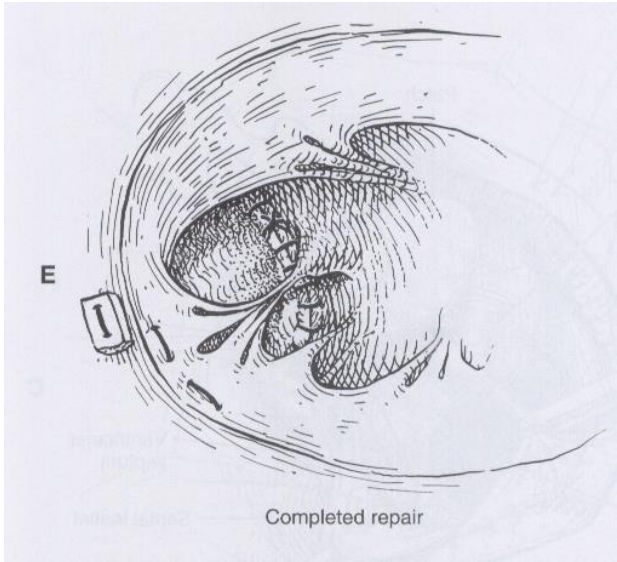
-Most common defect in children, 90% spontaneously close by 10 yrs old

-10% of all defects in adults

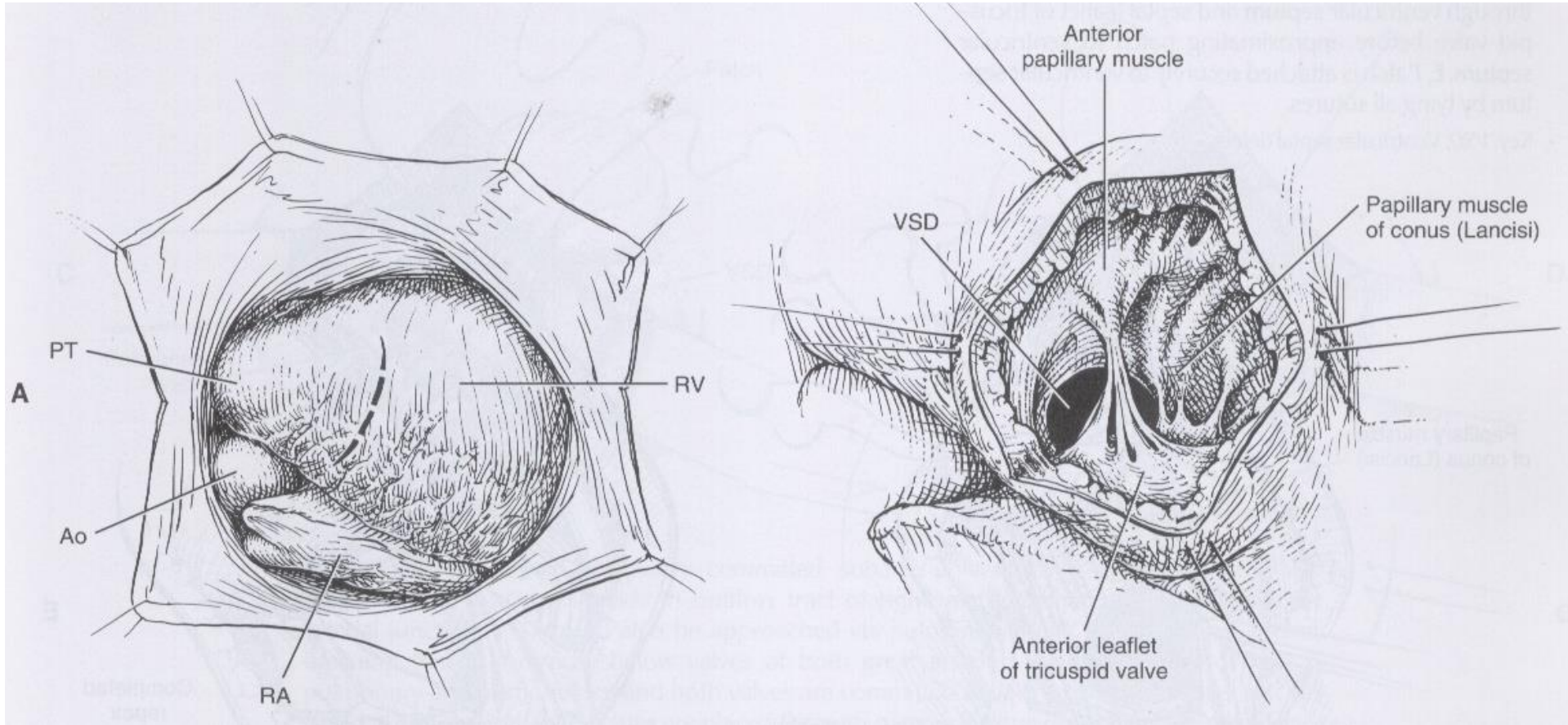
1. Supracristal (5%)
2. Perimembranous (70%)
3. Posterior
4. Muscular (20%)

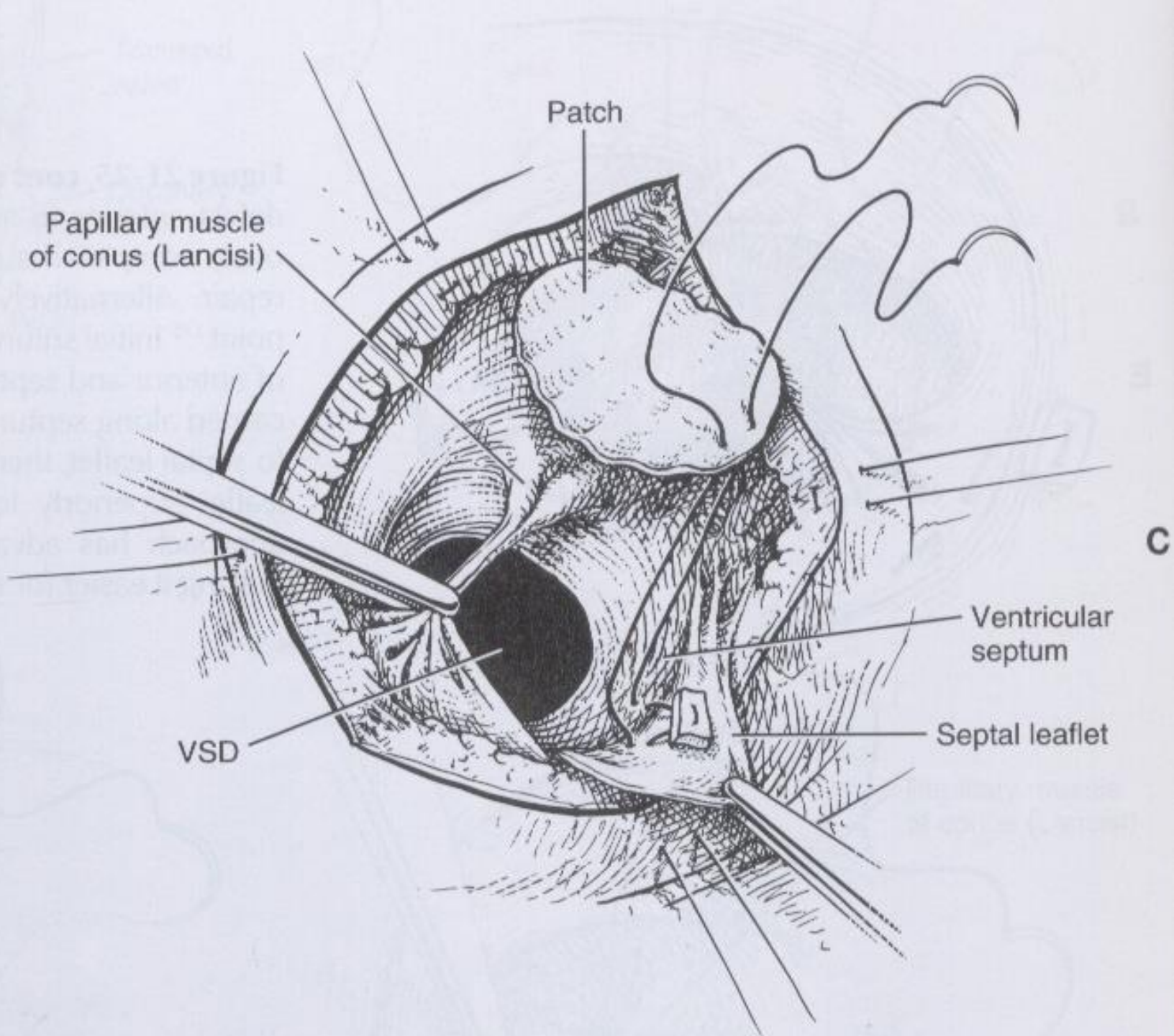
TRANS ATRIAL CLOSURE

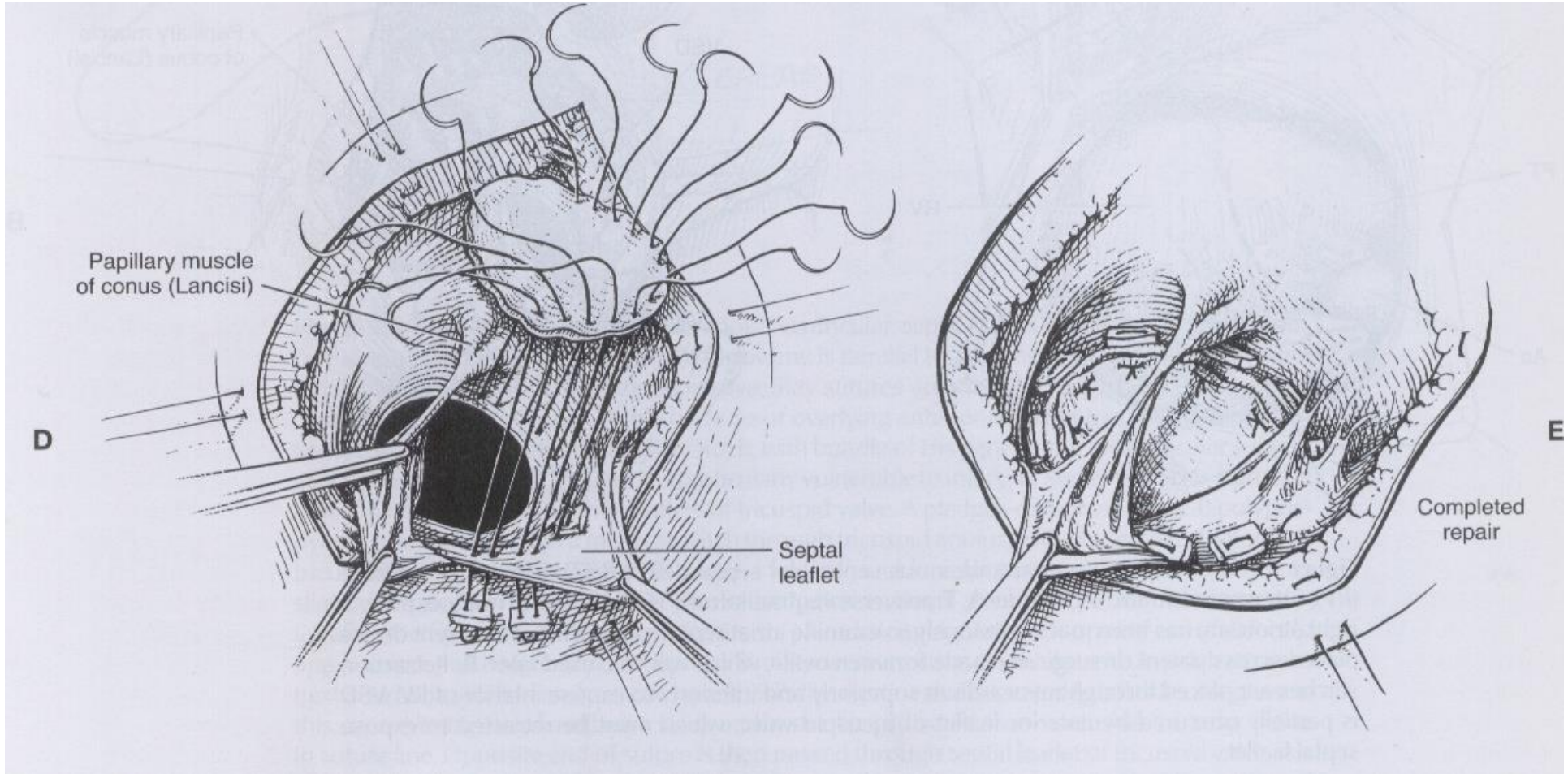

A
VSD
Papillary muscle of conus (Lancisi)
Right atrial appendage
Tricuspid valve
Ao
Coronary sinus
IVC
SVC
His bundle
Atrioventricular node
B
Patch
C
Septal leaflet of tricuspid valve
J. RHEAD
D
Papillary muscle of conus (Lancisi)


E
Completed repair

TRANS VENTRICULAR REPAIR


A
PT
RV
Ao
RA
Anterior
papillary muscle
VSD
Papillary muscle
of conus (Lancisi)
Anterior leaflet
of tricuspid valve

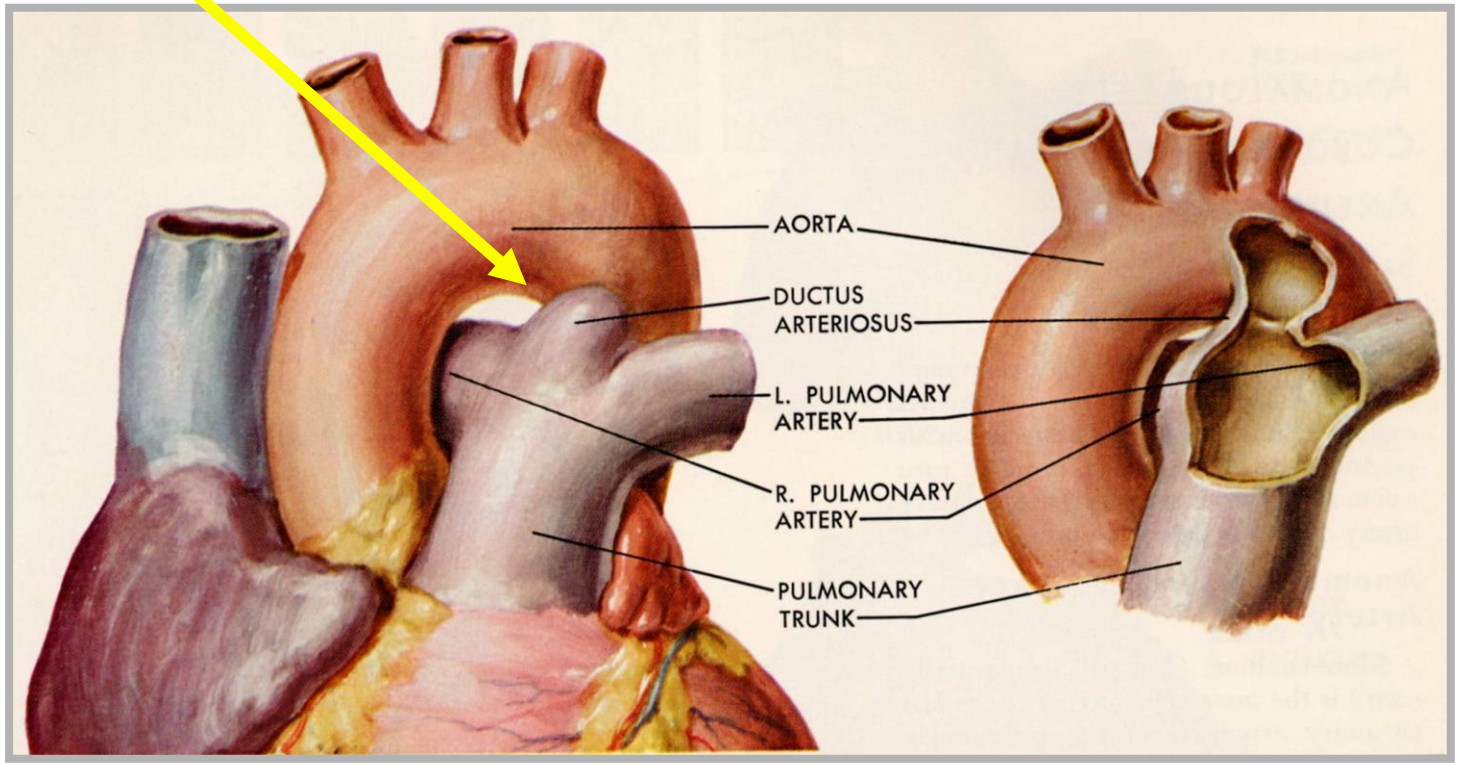

Patch
Papillary muscle
of conus (Lancisi)
Ventricular
septum
Septal leaflet
VSD
C


Papillary muscle
of conus (Lancisi)
Septal
leaflet
Completed
repair

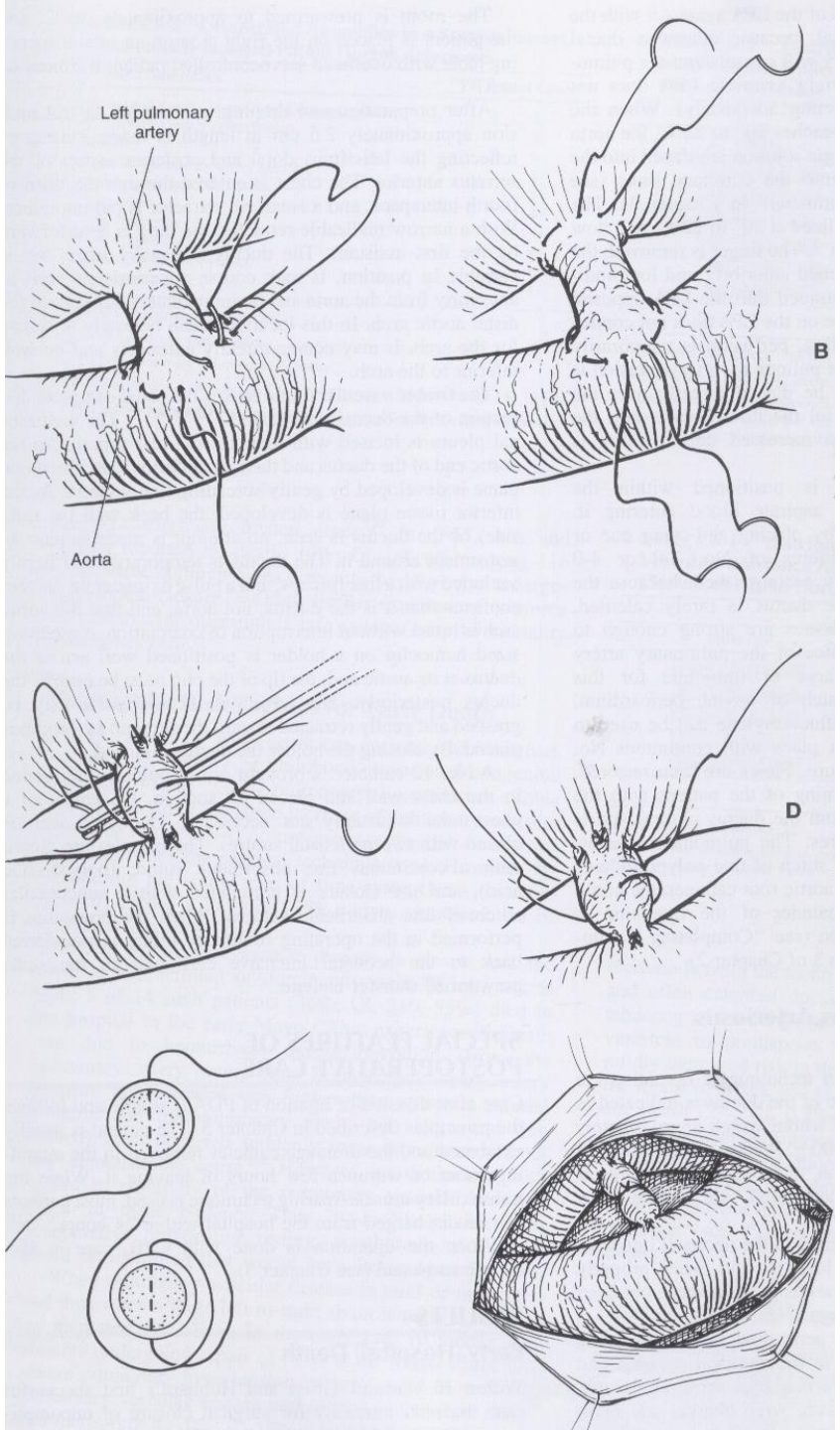
D

E

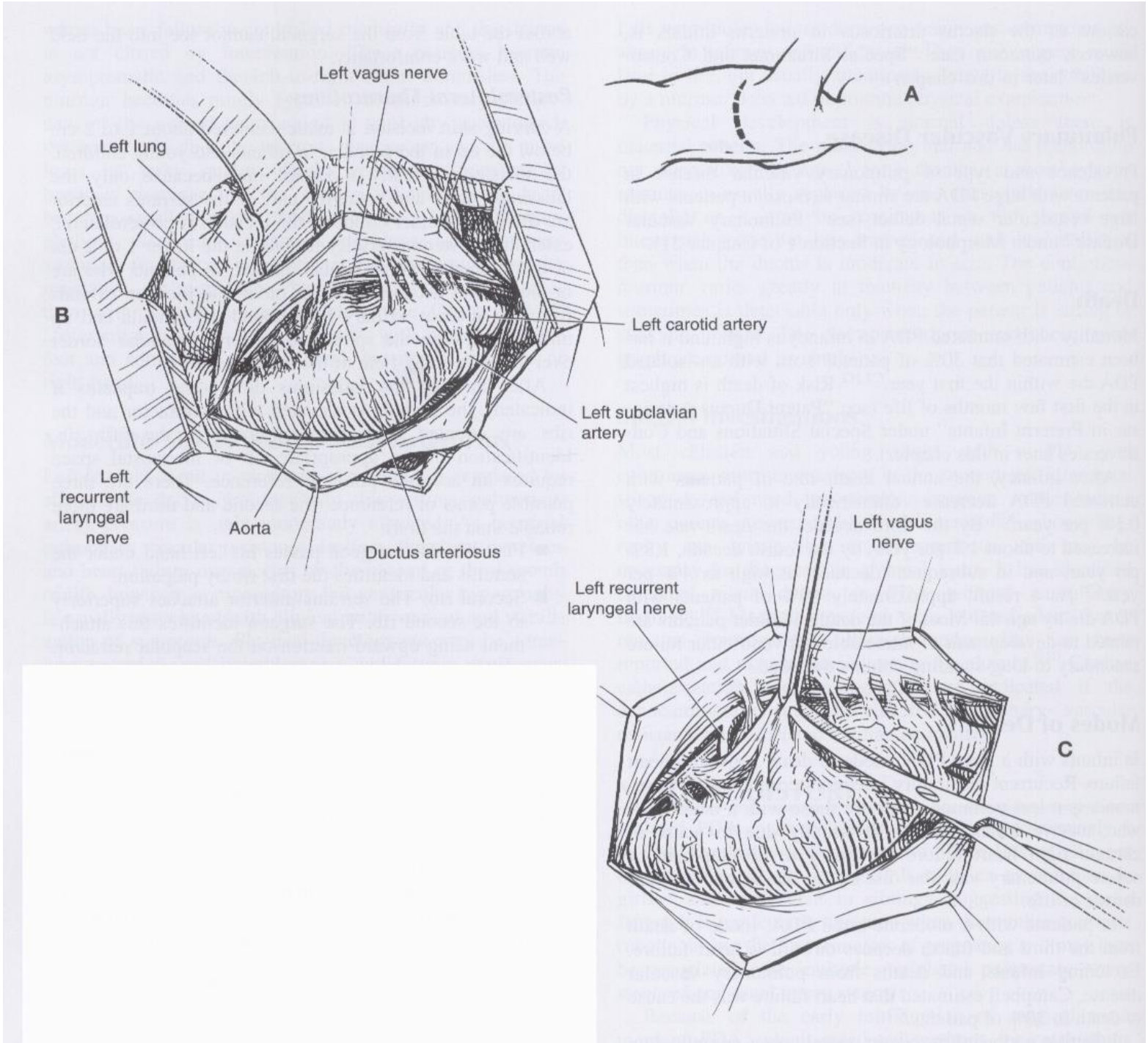
Ductus Arteriosus



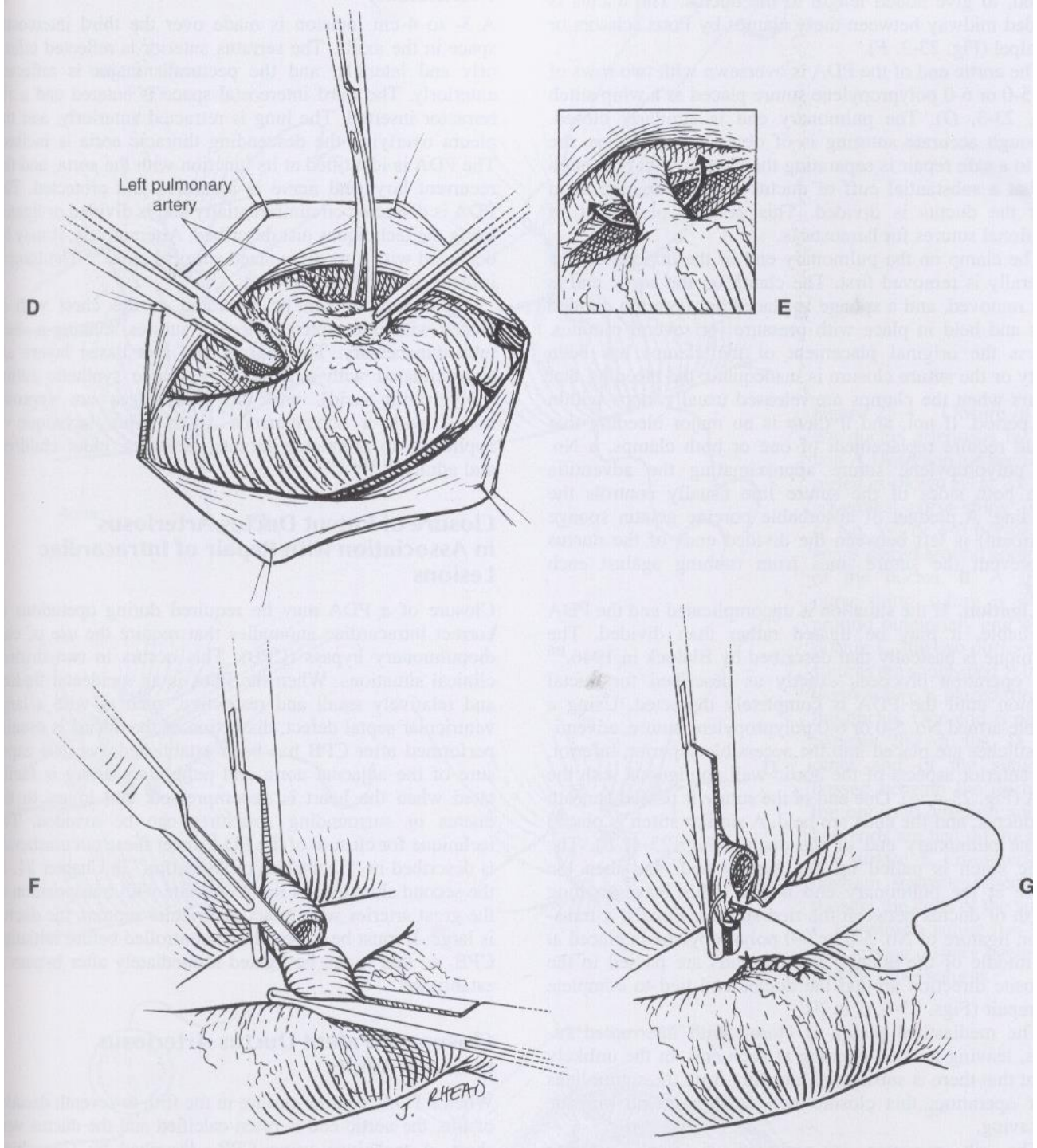
TRIPLE LIGTIONS



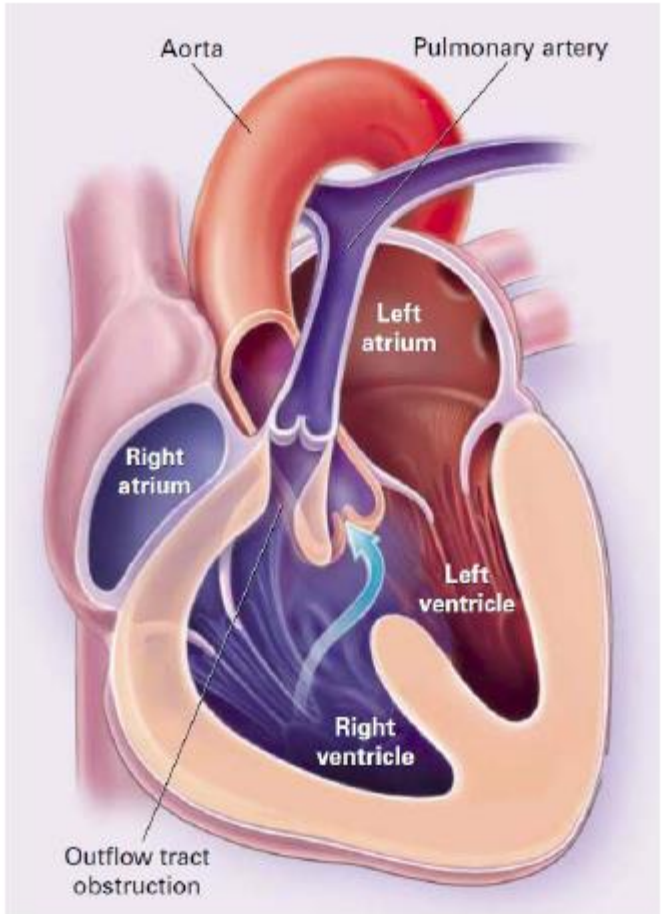
DIVISION


A
Left vagus nerve
Left lung
B
Left carotid artery
Left subclavian artery
Left recurrent laryngeal nerve
Aorta
Ductus arteriosus
Left vagus nerve
Left recurrent laryngeal nerve
C

DIVISION



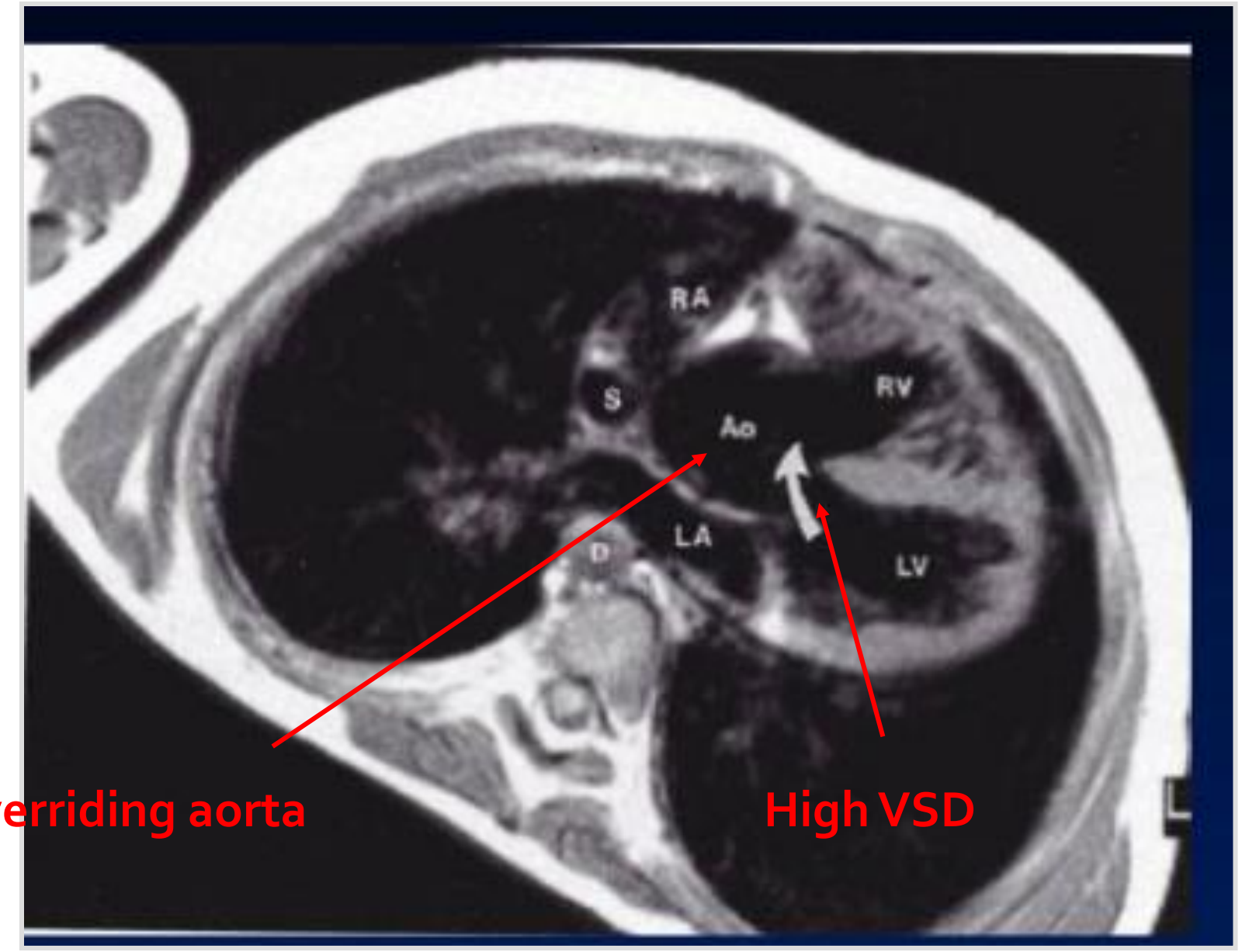
Tetralogy of Fallot (TOF)



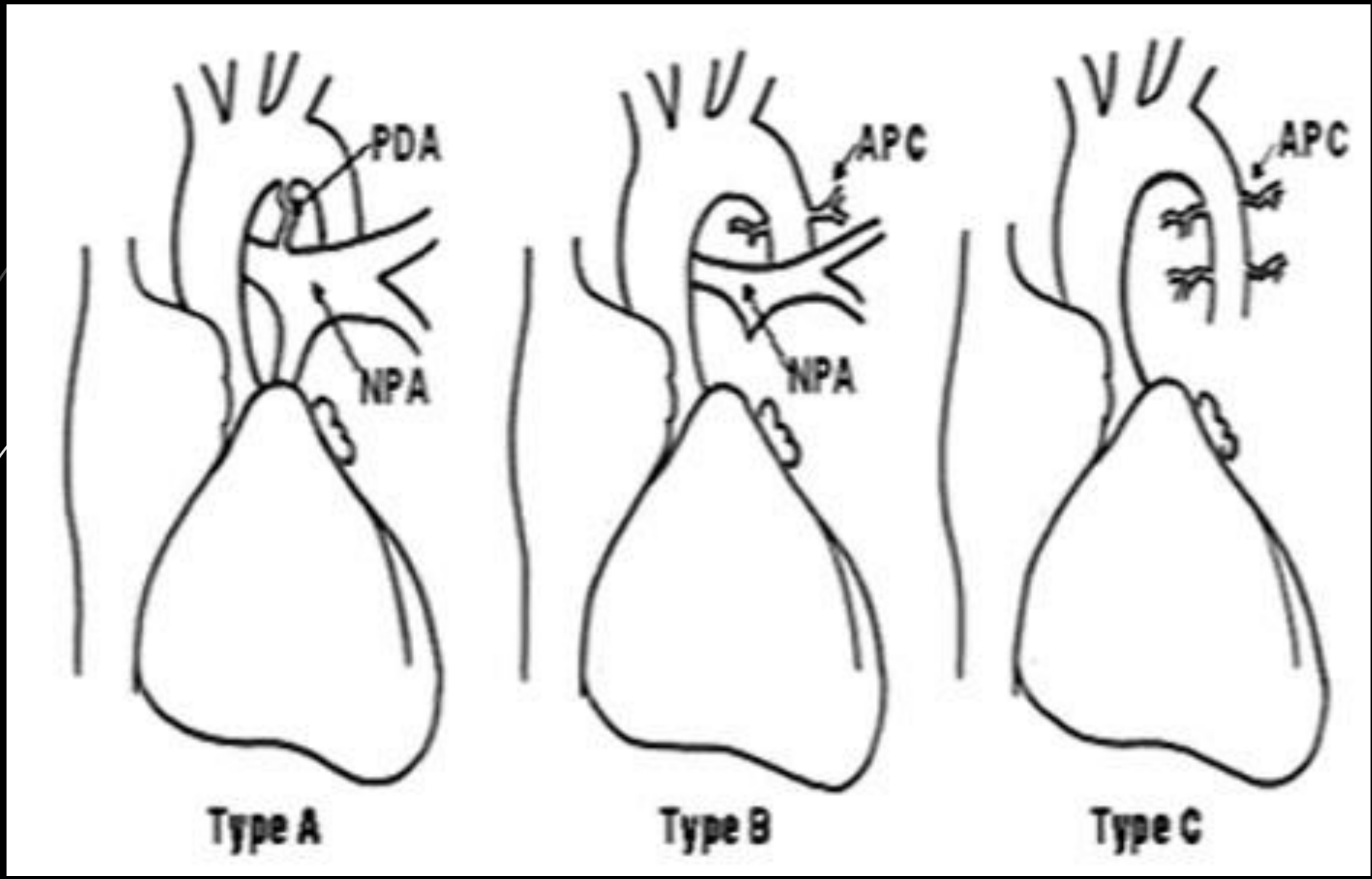
- Most common cyanotic condition in older kids and adults
- Key features:
  - Large VSD
  - Aorta that overrides left and right ventricles
  - Obstruction of RV outflow tract
  - RV hypertrophy

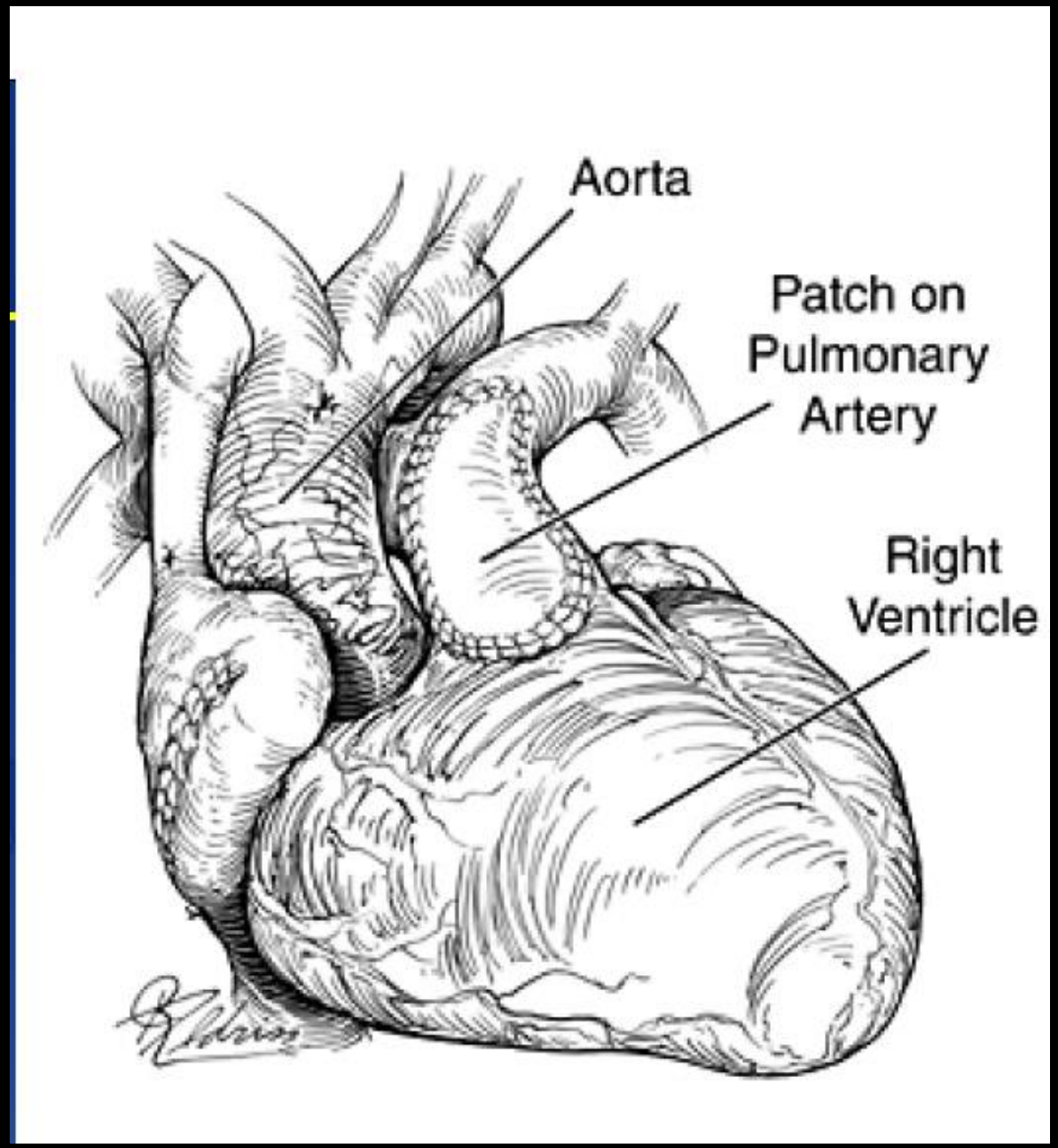
Cyanosis

Clubbing of fingers

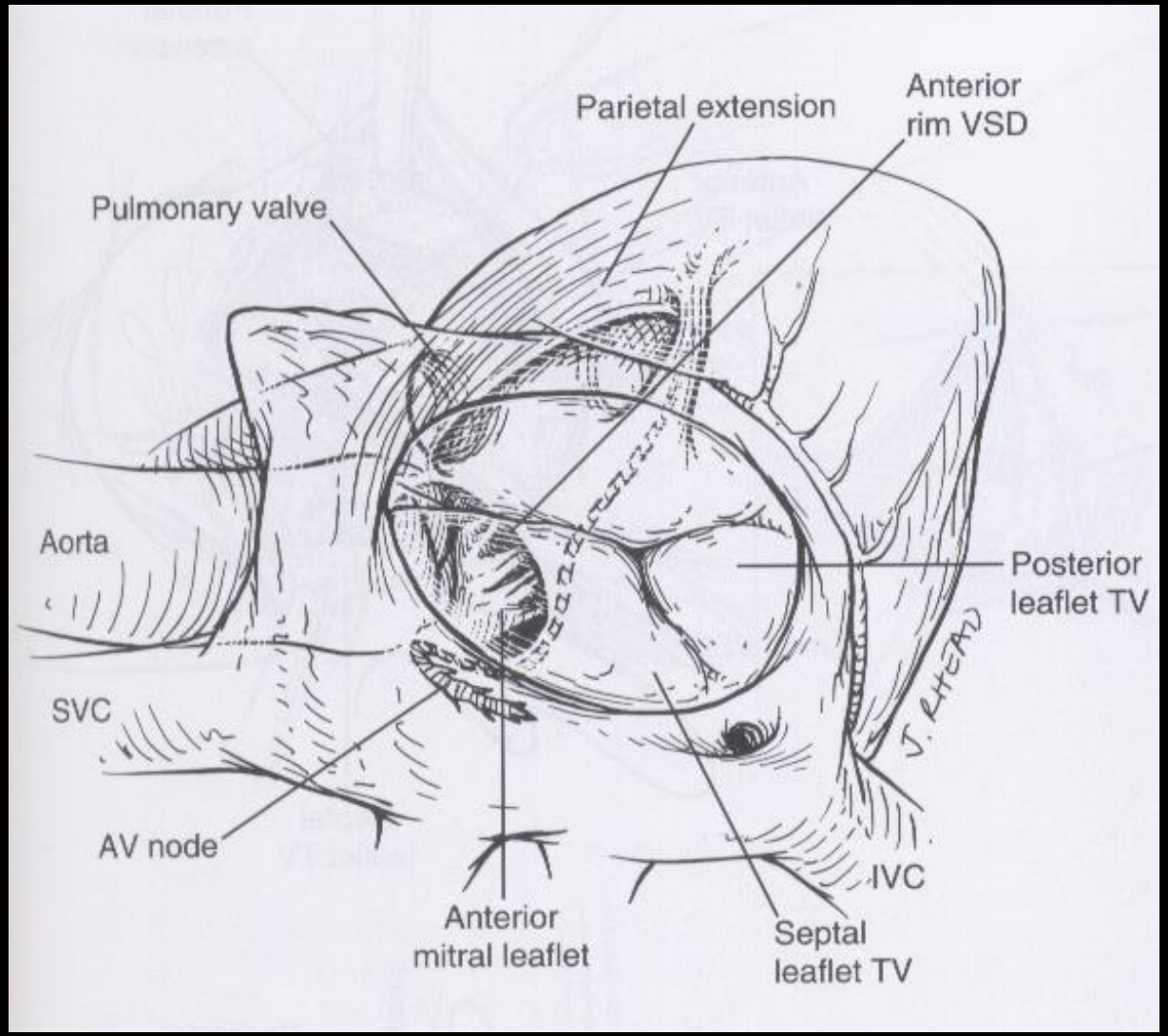

RA
S
RV
Ao
LA
D
LV
Overriding aorta
High VSD

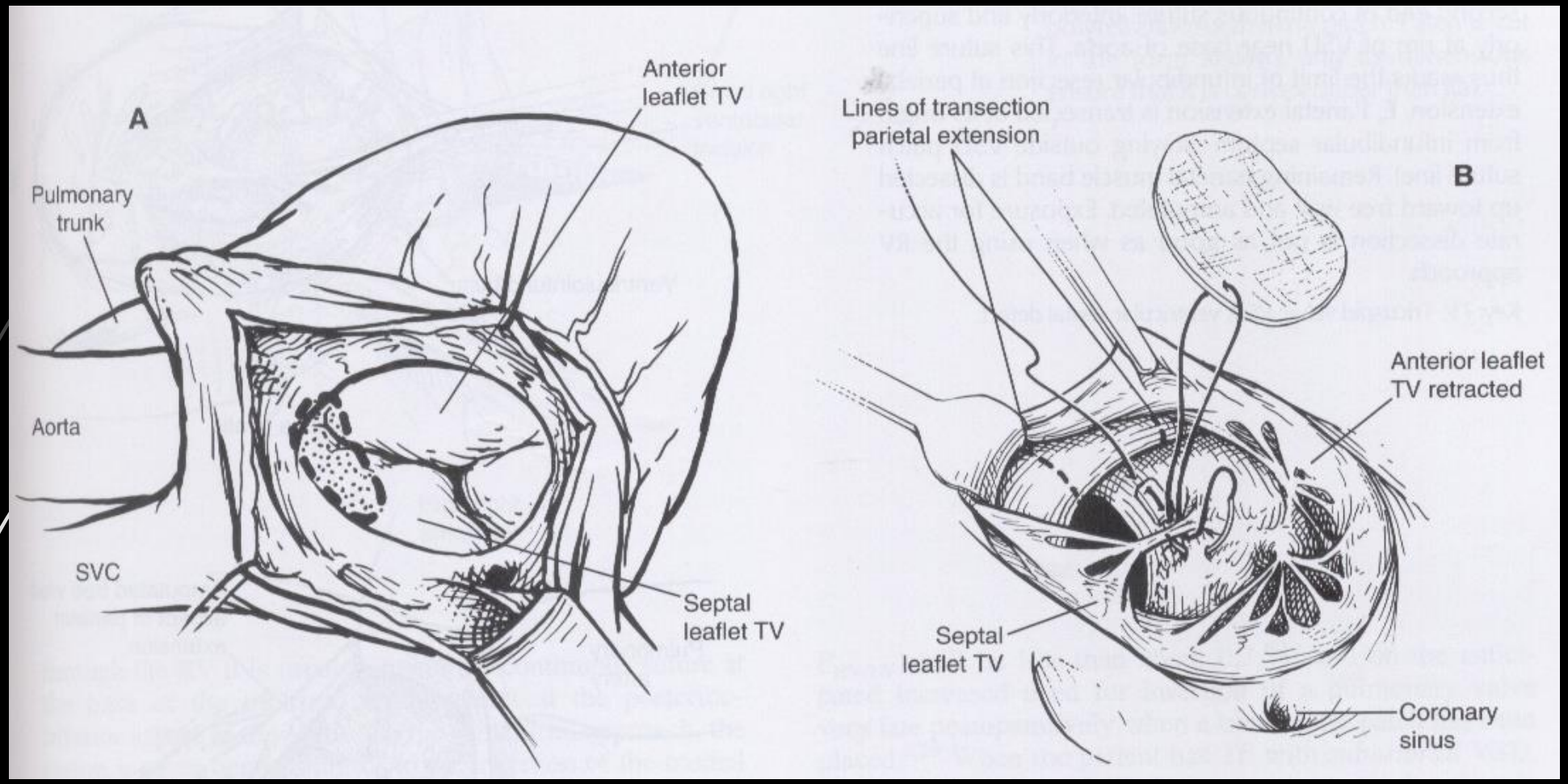
SEVERITY OF PULMONARY ARTERY

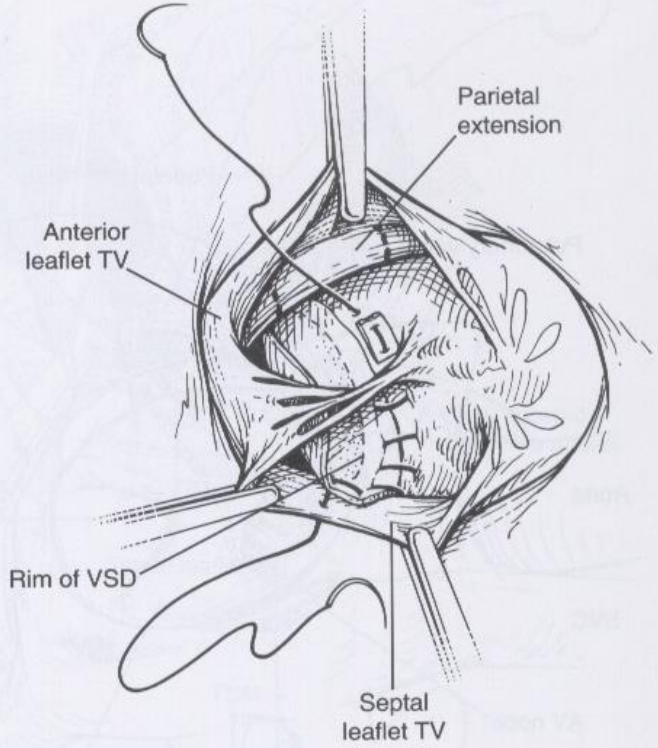


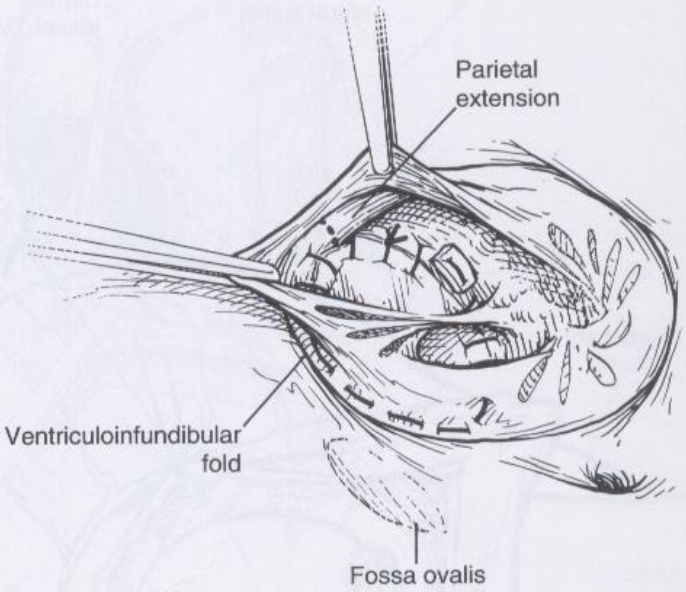

Aorta
Patch on
Pulmonary
Artery
Right
Ventricle

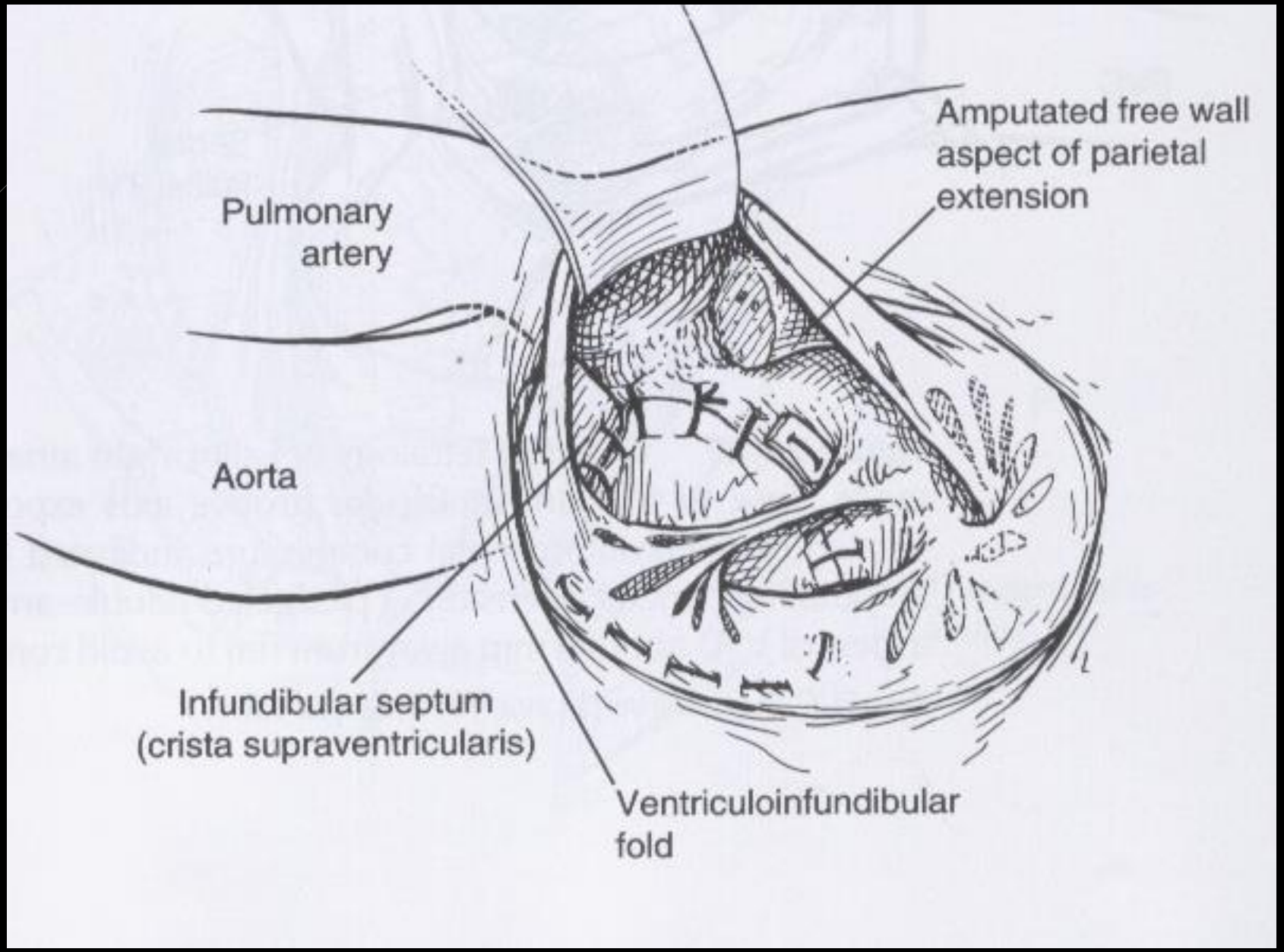
TRANS ATRIAL APPROACH

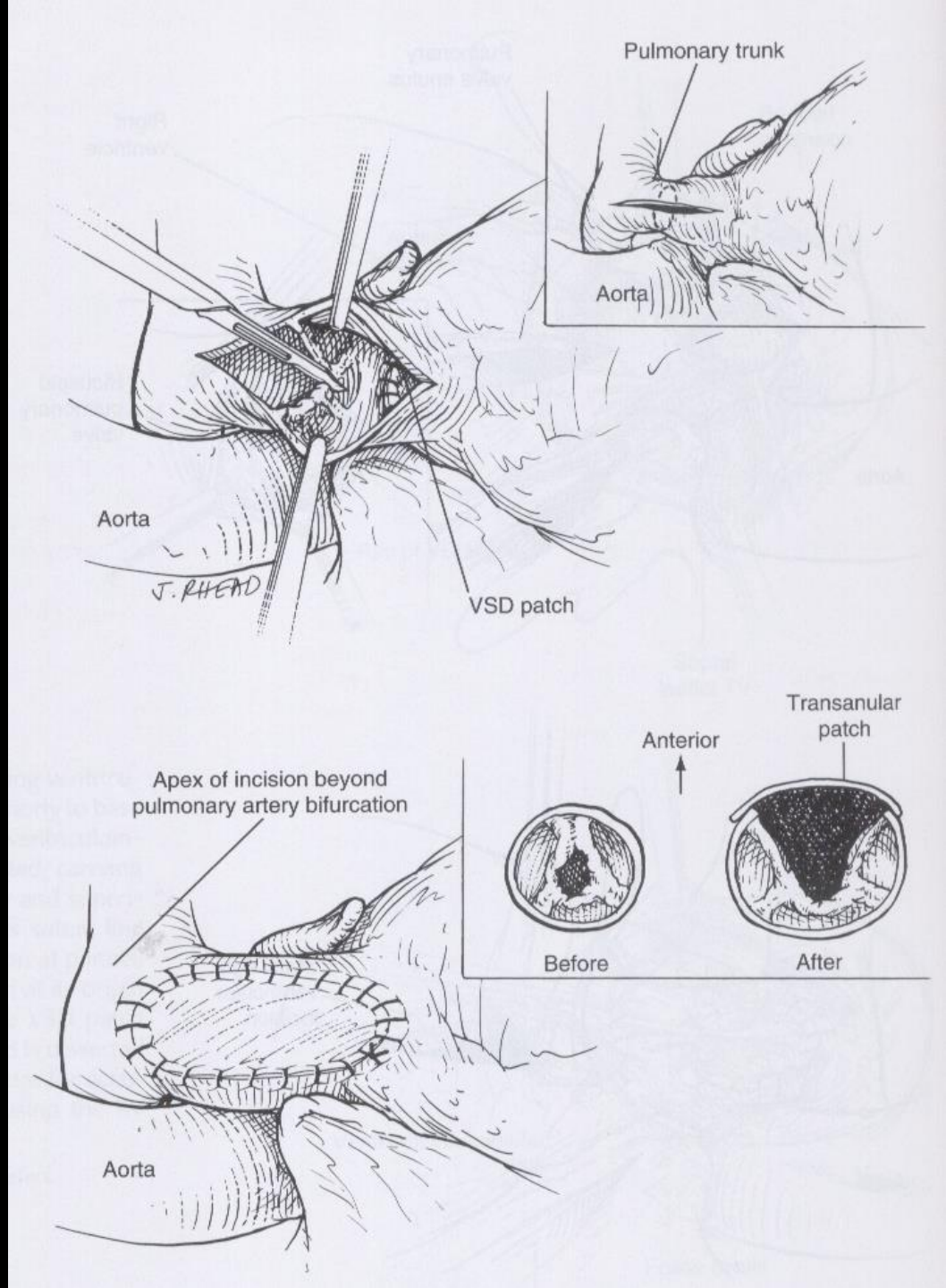



A
Anterior leaflet TV
Pulmonary trunk
Aorta
SVC
Septal leaflet TV
B
Lines of transection parietal extension
Anterior leaflet TV retracted
Septal leaflet TV
Coronary sinus


Parietal extension
Anterior leaflet TV
Rim of VSD
Septal leaflet TV

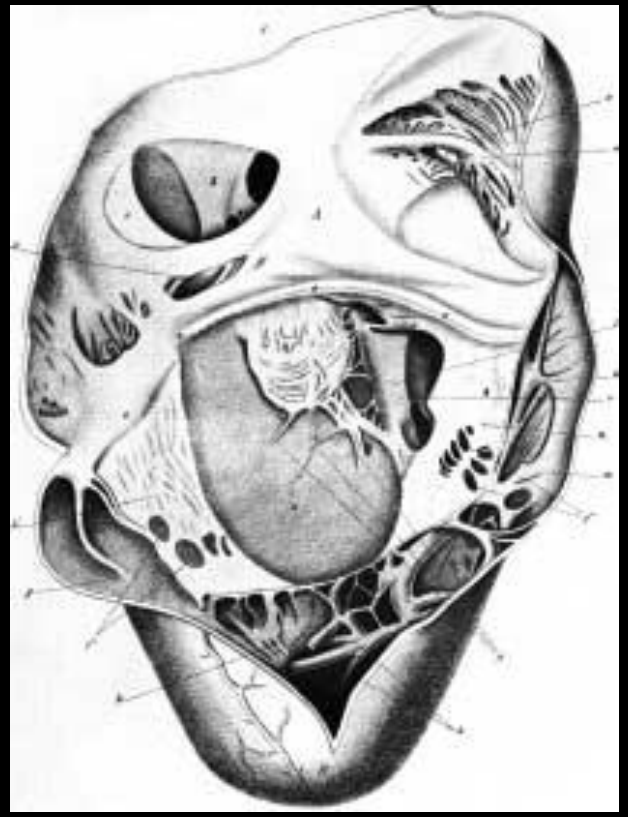

Parietal extension
Ventriculoinfundibular fold
Fossa ovalis

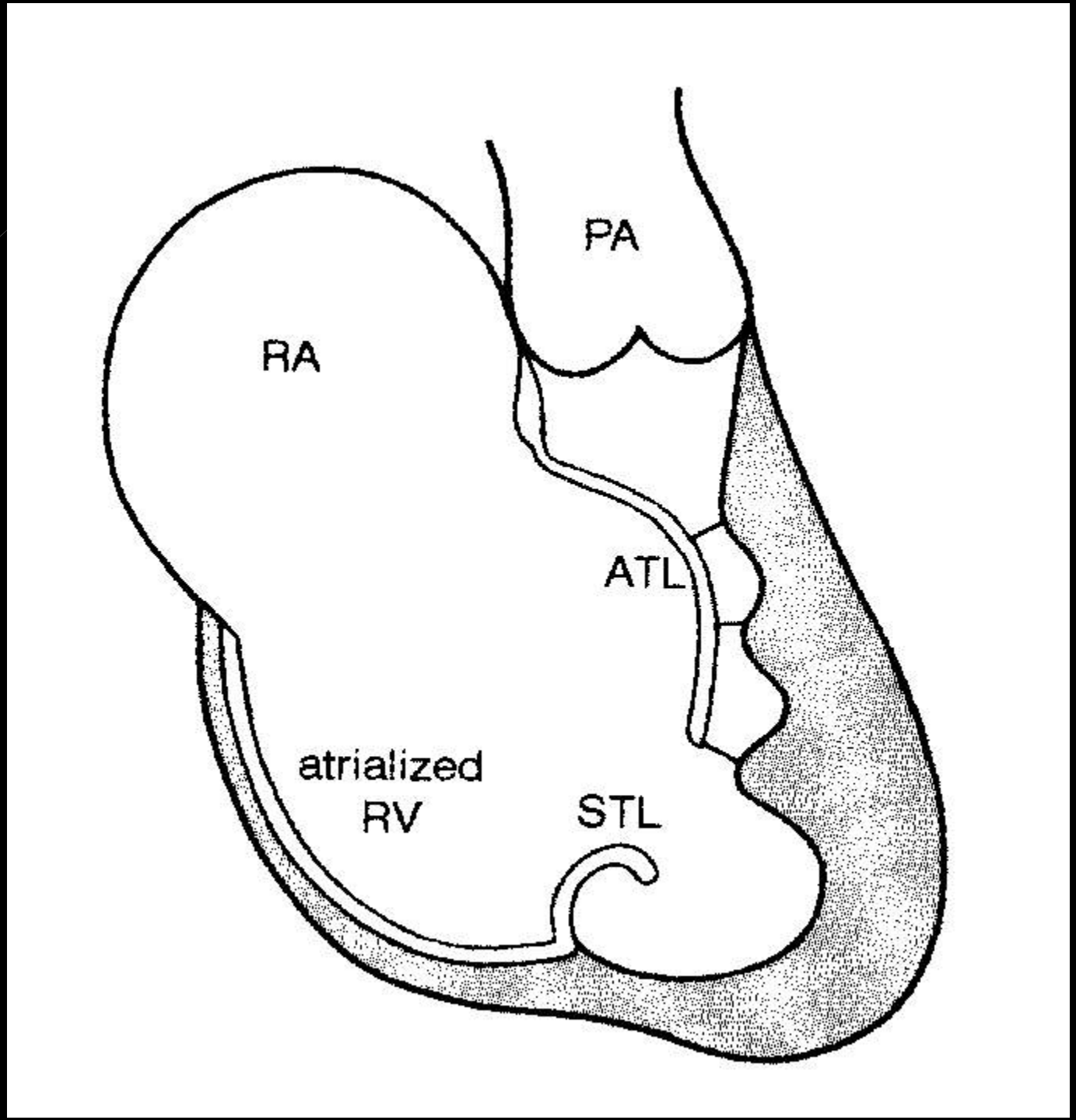

Amputated free wall aspect of parietal extension
Pulmonary artery
Aorta
Infundibular septum (crista supraventricularis)
Ventriculoinfundibular fold


Pulmonary trunk
Aorta
Aorta
J. RHEAD
VSD patch
Transanular patch
Anterior
Apex of incision beyond pulmonary artery bifurcation
Before
After
Aorta

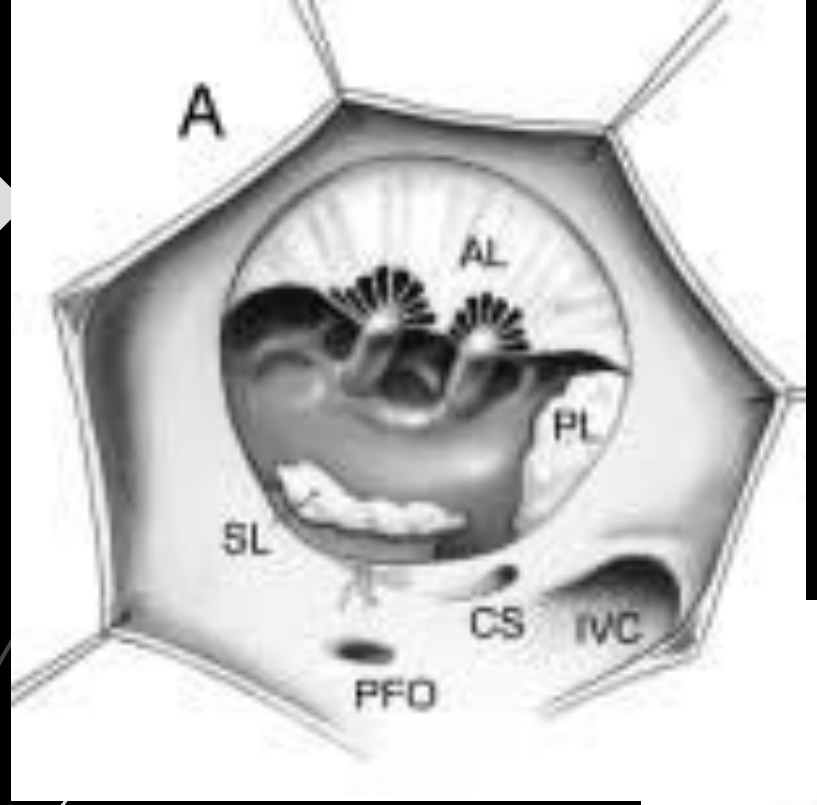
EBSTEIN'S ANOMALY

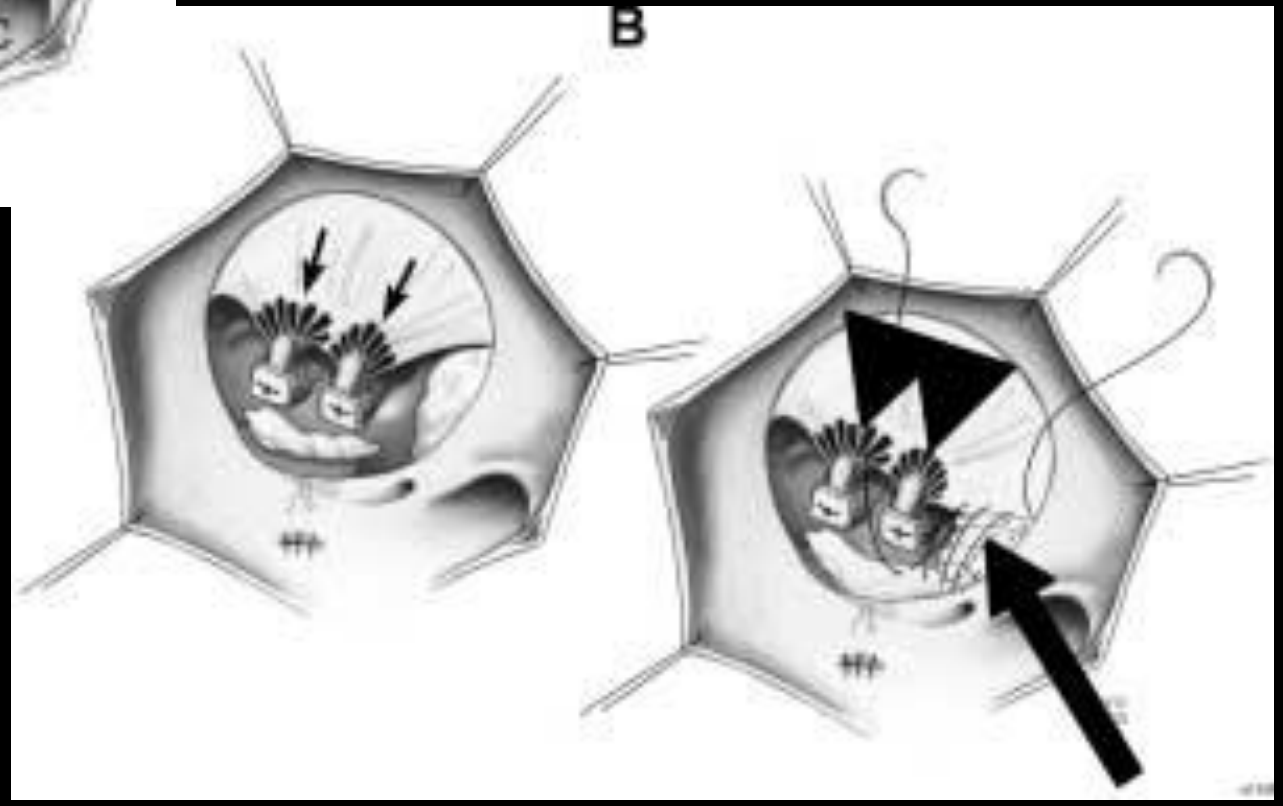
- Described by " Wilhelm Ebstein"
  - German Pathologist year 1866

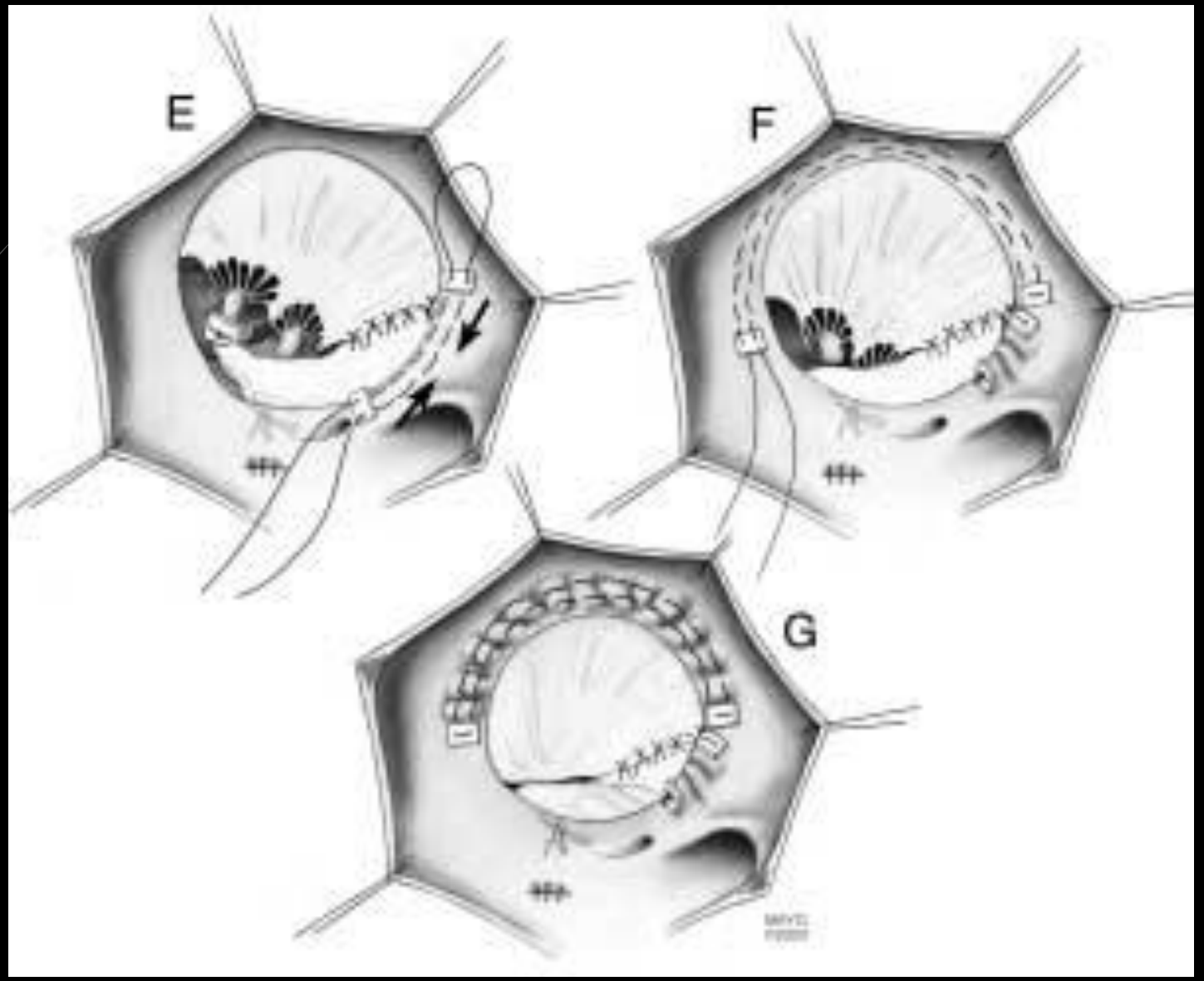



PA
RA
ATL
atrialized
RV
STL

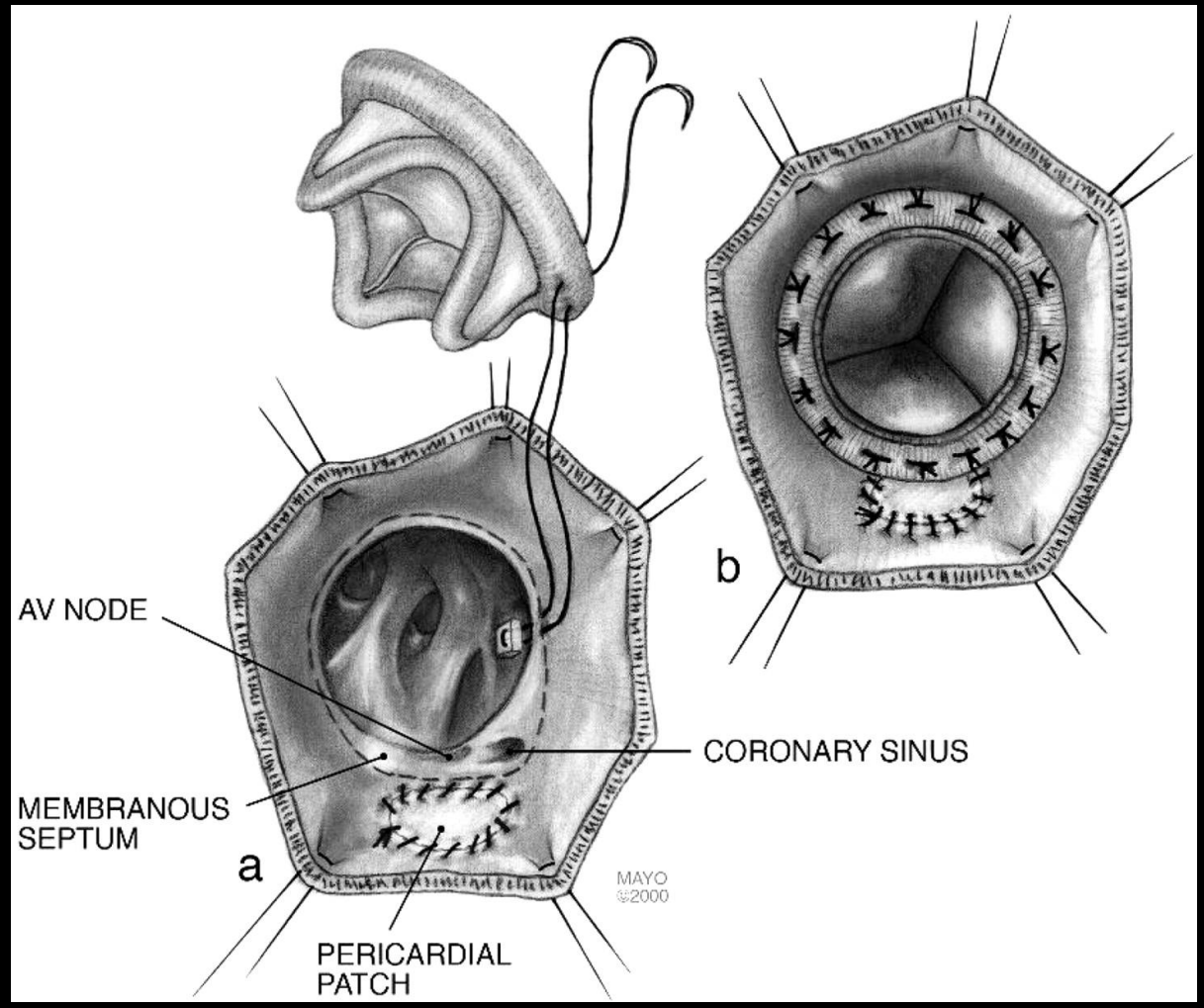
Modified Gordon K,Danielson technique



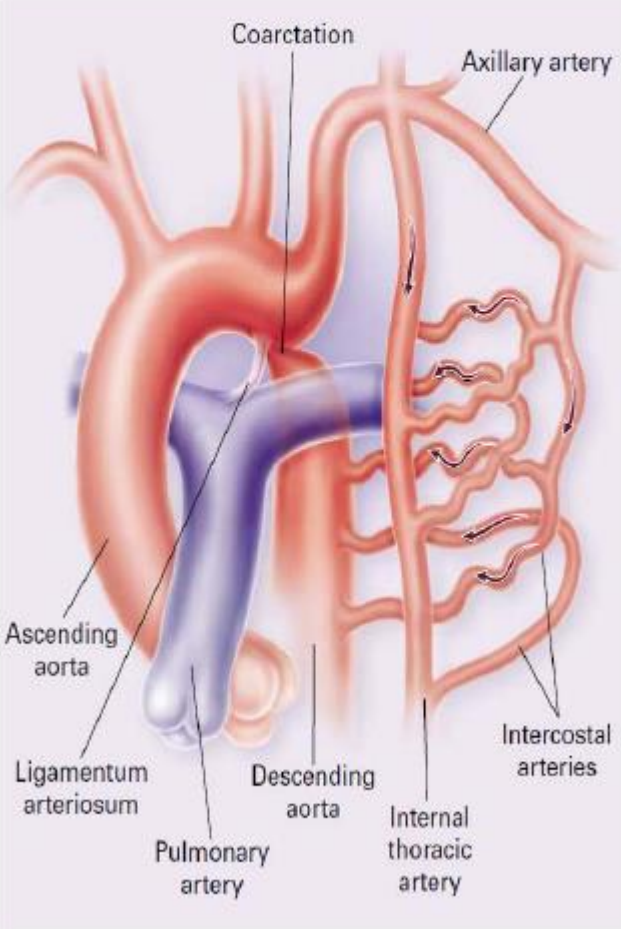



E
F
G

TV REPLACEMENT TECHNIQUE



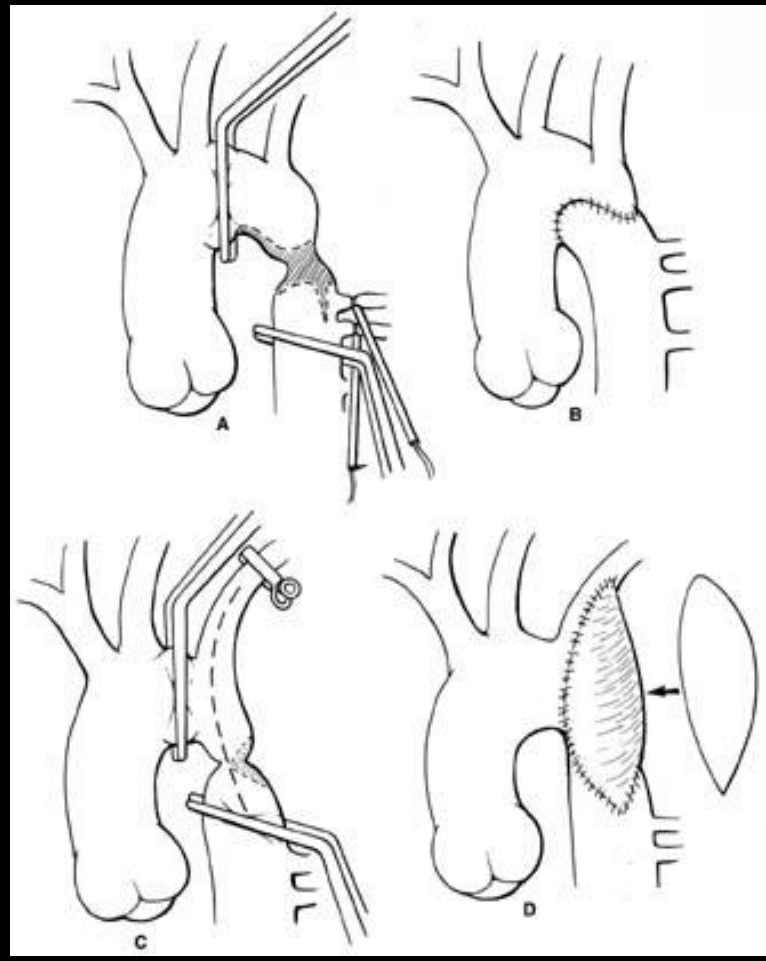
Coarctation of Aorta



- 6-8% of all CHD
- 2-5x more frequent in males
- Associations:
  - Bicuspid aortic valve
  - VSD
  - PDA
  - MS/MR
  - Multiple LV obstructive lesions (Shone syndrome)
  - Intracerebral aneurysms
  - Turner's Syndrome

COARCTATION REPAIR

- Surgical correction
  1) Patch aortoplasty with removal of segment and end to end anastomosis or subclavian flap repair
  2) bypass tube grafting around segment



Edmunds' Cardiac Surgery in the Adult, Ch 47

THORACIC SURGERY

- Pulmonary disease
  - Lung cancer
  - Pneumothorax
  - Empyema thoracis
- Thoracic incision
- Pleural drainage

LUNG CANCER PATHOLOGY

- Small cell
- Non small cell
  - Squamous cell carcinoma
  - Adenocarcinoma
  - Large cell carcinoma
  - Undifferentiated cell carcinoma

ASSESSMENT OF PATIENT

- Fitness for surgery
- Operability of the tumour - Staging

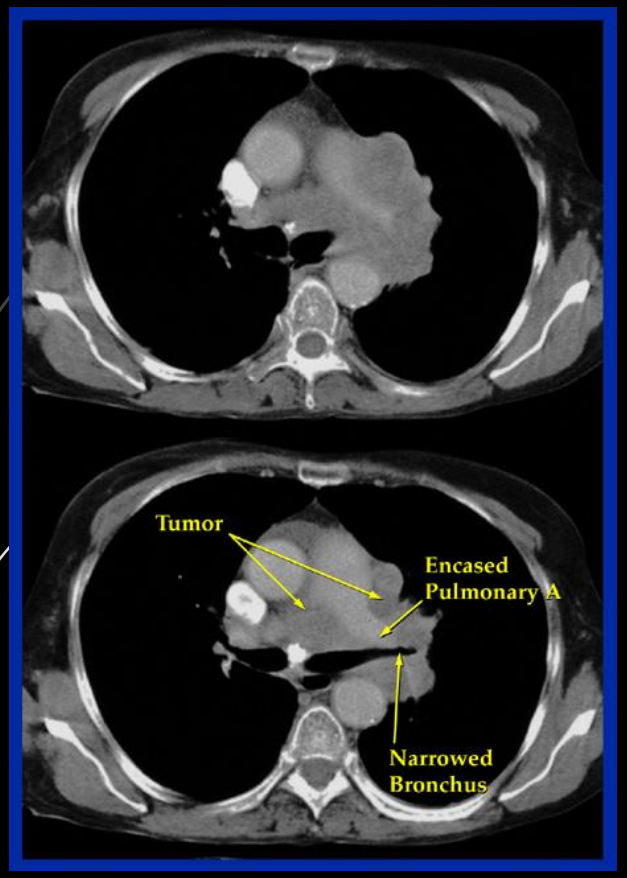
- TNM

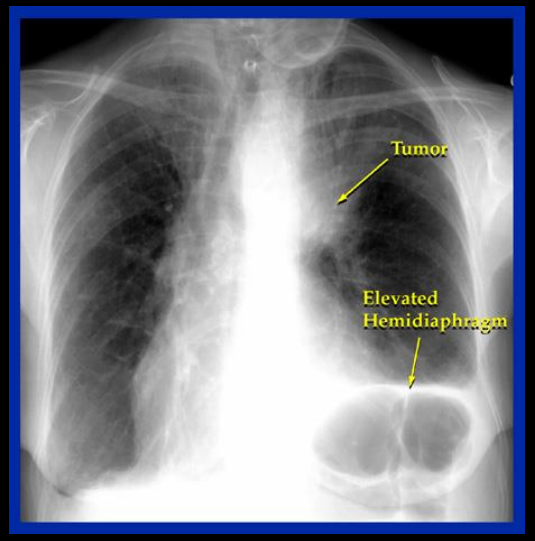
- T size and position of tumour
- N lymph node status
- M metastasis

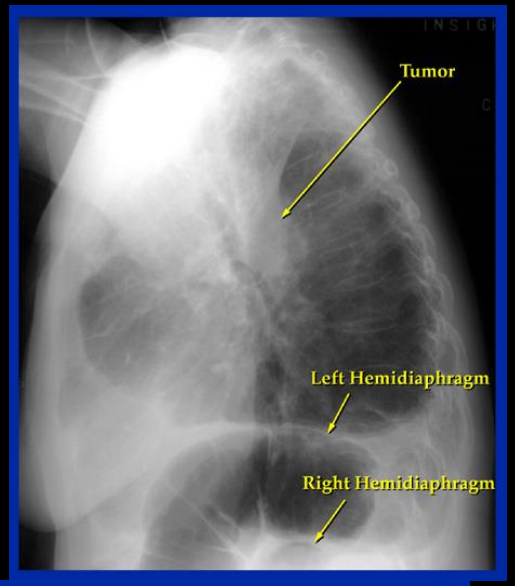
Stage Grouping—TNM Subsets

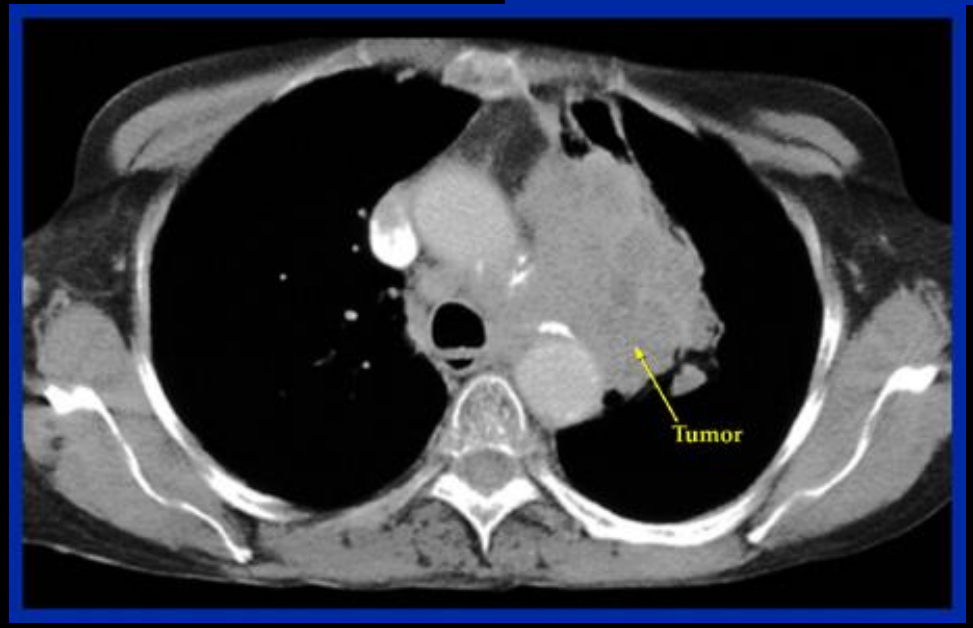
- Stage 0 (TisN0M0)
- Stage IA (T1N0M0)
- Stage IB (T2N0M0)
- Stage IIA (T1N1M0)
- Stage IIB (T2N1M0, T3N0M0) Surgery+Neoadjuvant
- Stage IIIA (T3N1M0), (T(1–3)N2M0)
- Stage IIIB (T4, Any N, M0) (Any T, N3M0)
- Stage IV (Any T, Any N, M1)

Small Cell Lung Cancer

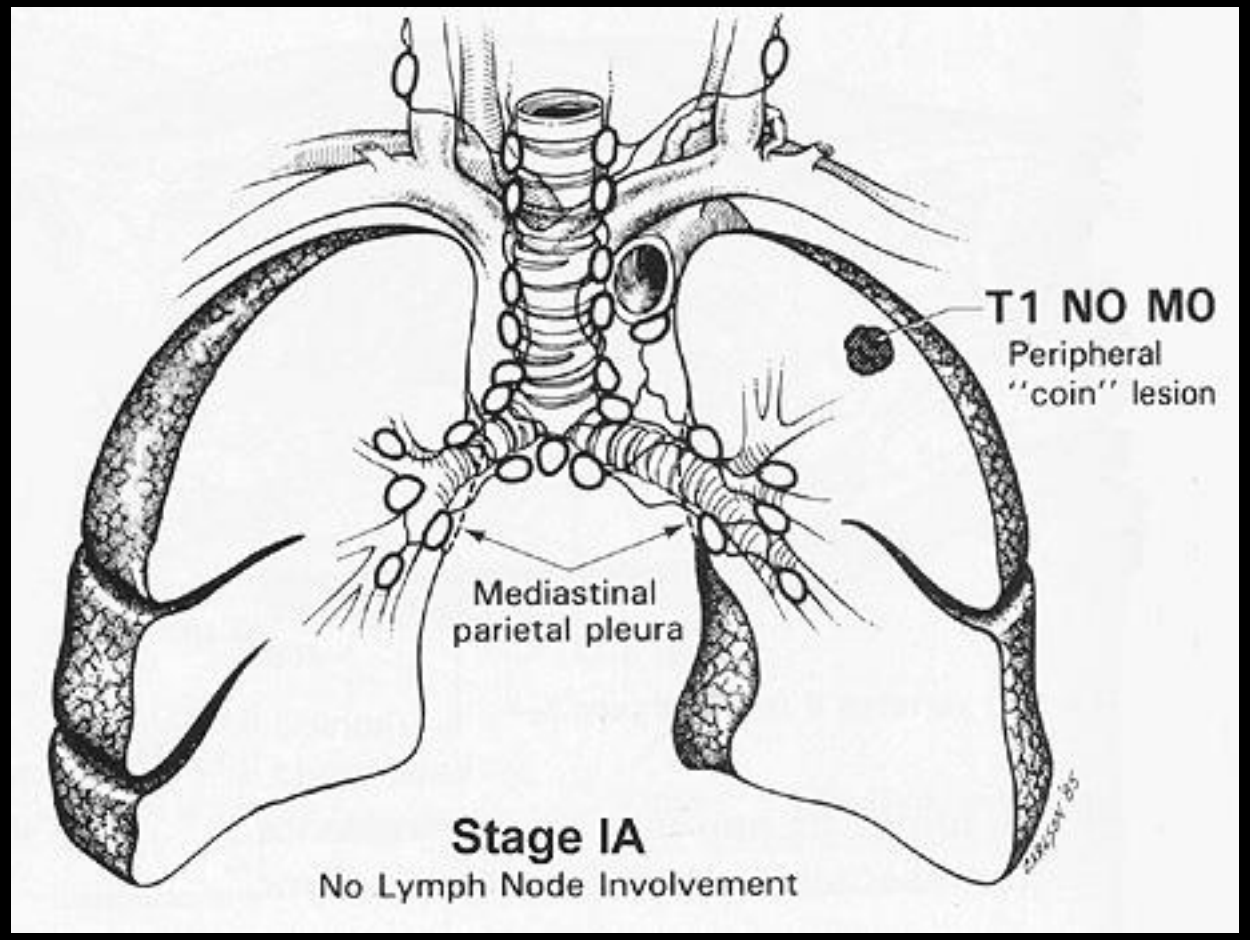




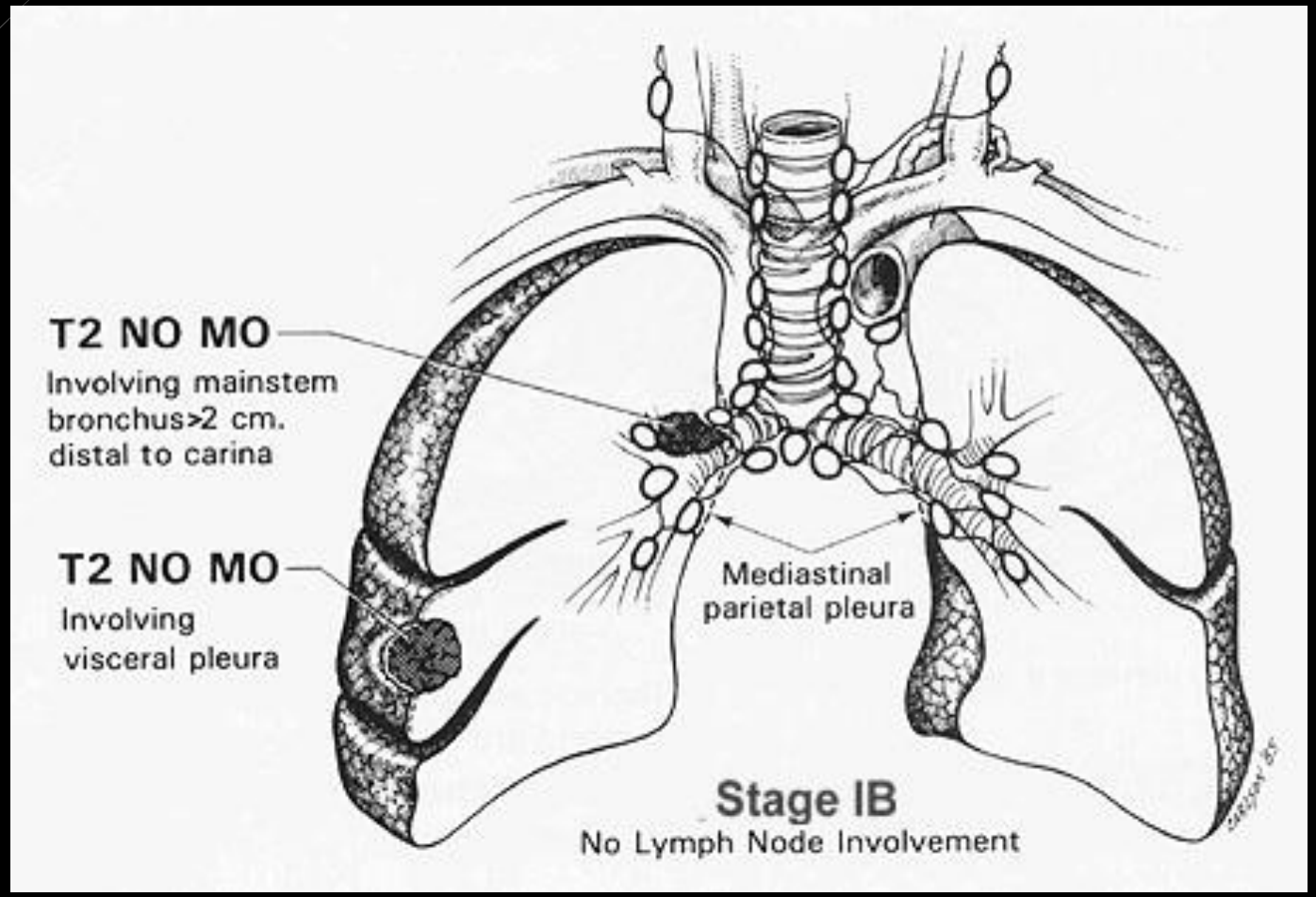




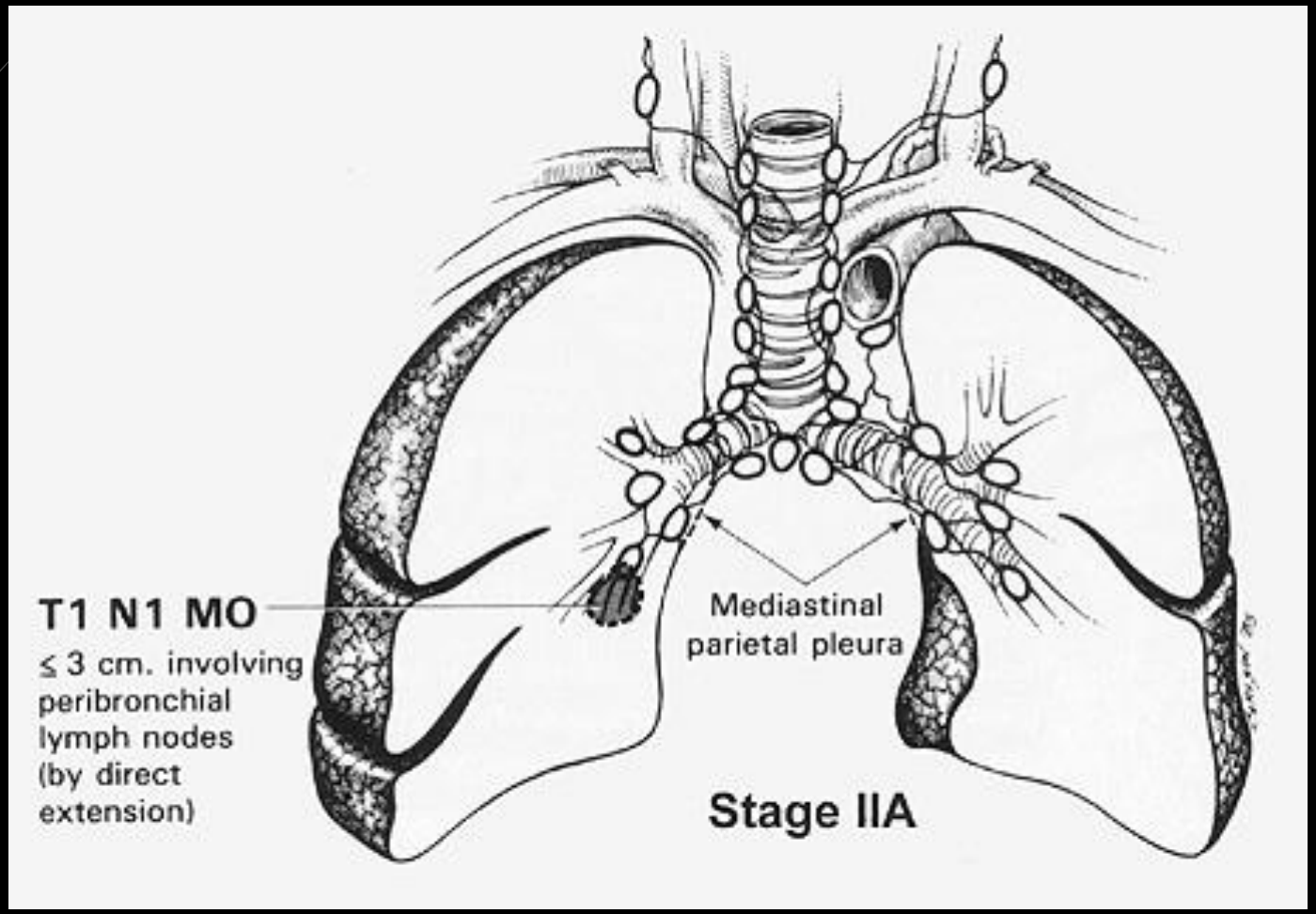
Stage IA of Lung Cancer



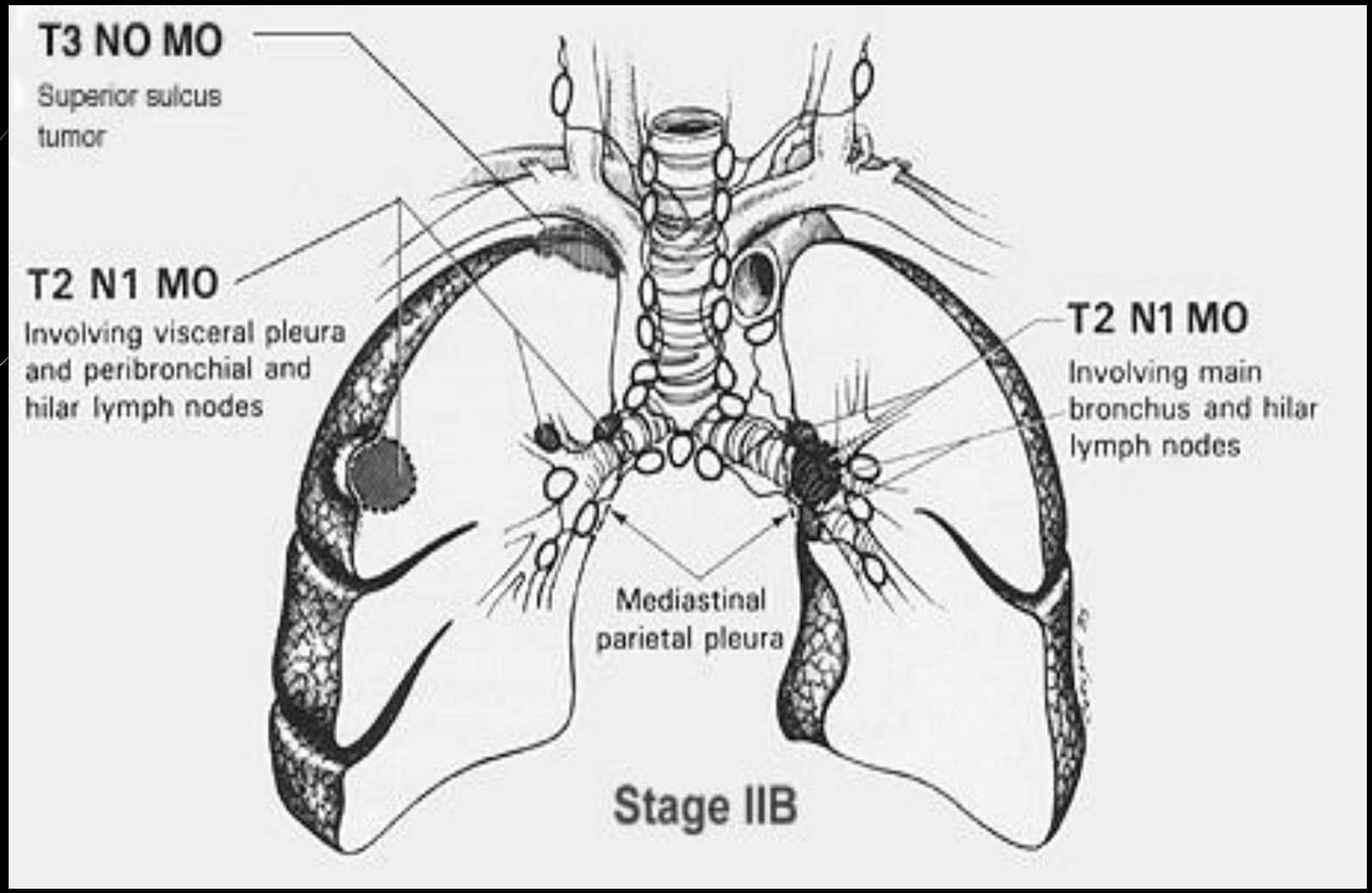
Stage IB of Lung Cancer



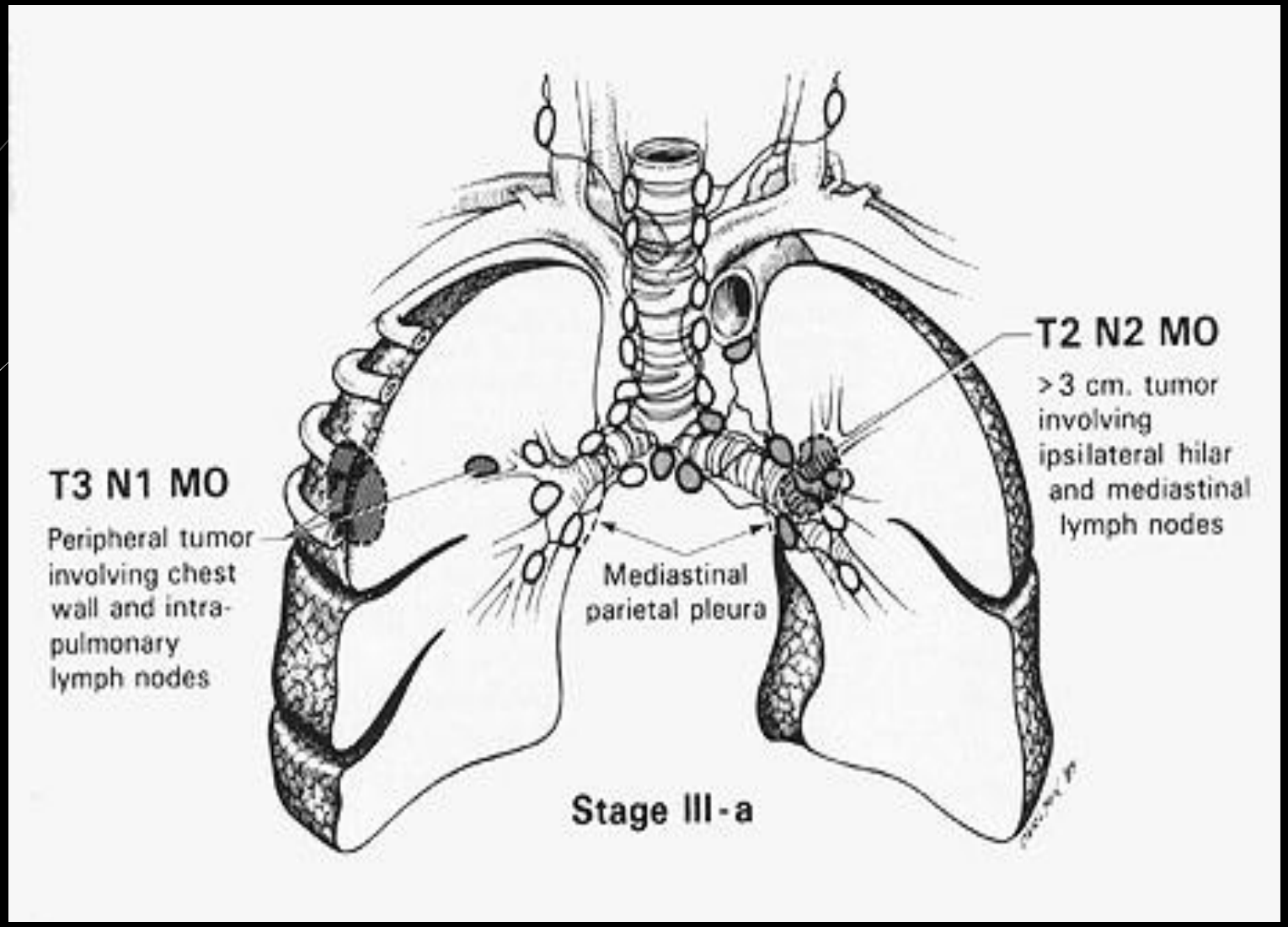
Stage IIA of Lung Cancer



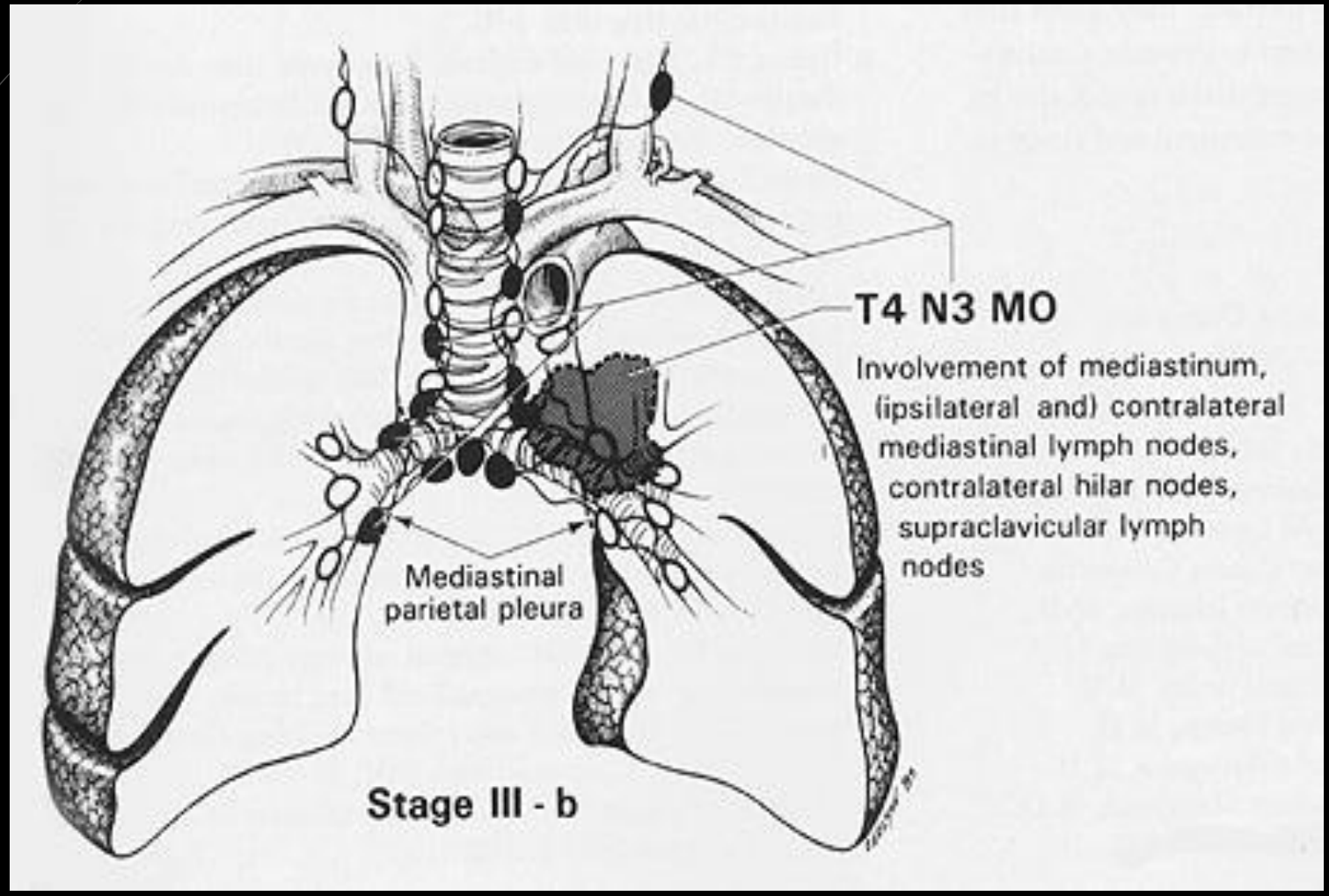
Stage IIB of Lung Cancer



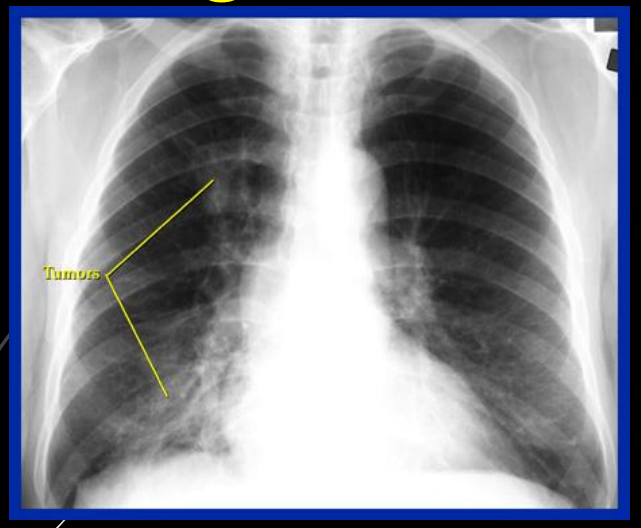
Stage IIIA of Lung Cancer

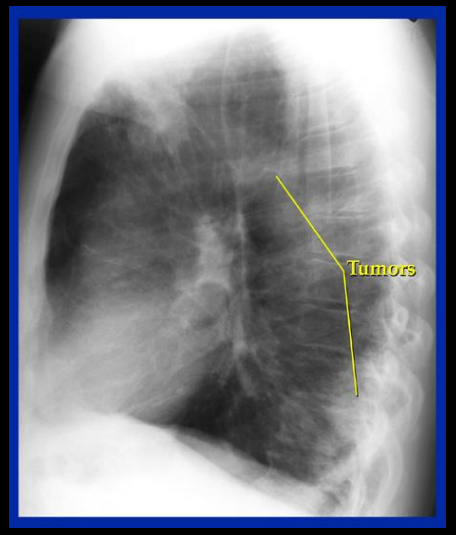


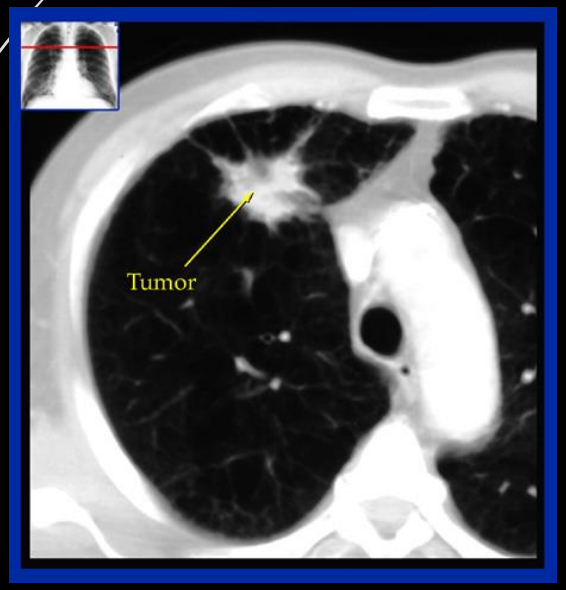
Stage IIIB of Lung Cancer

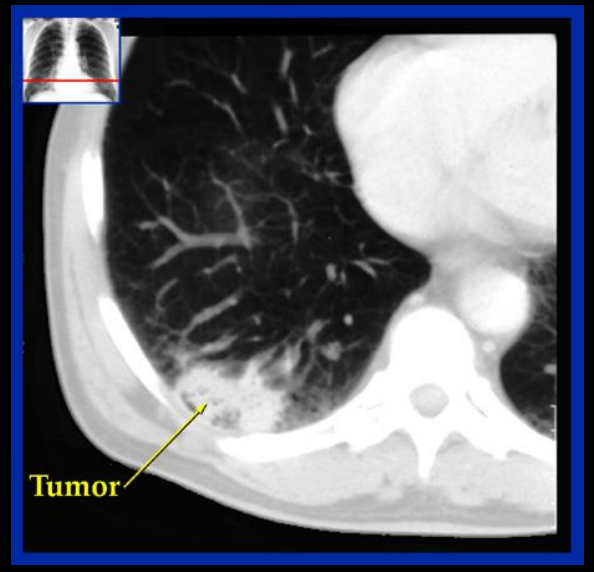


Stage IV of Lung Cancer









IV:

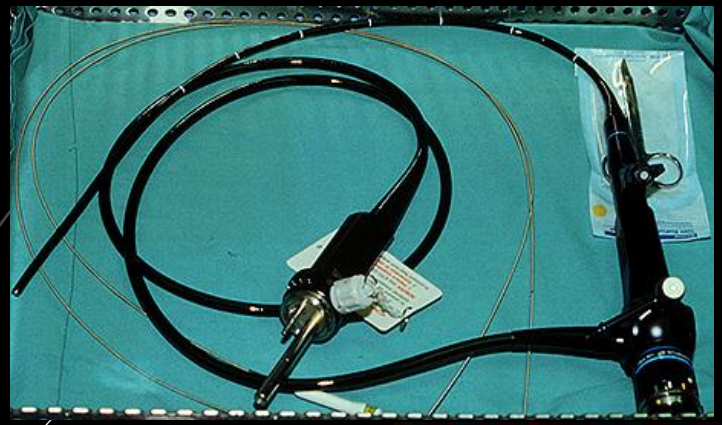
FITNESS FOR SURGERY

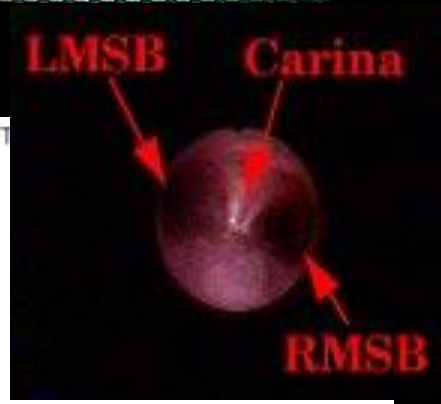
- Age
- Pulmonary function
- Cardiovascular function
- Medical conditions
- Nutritional Status
- Performance status

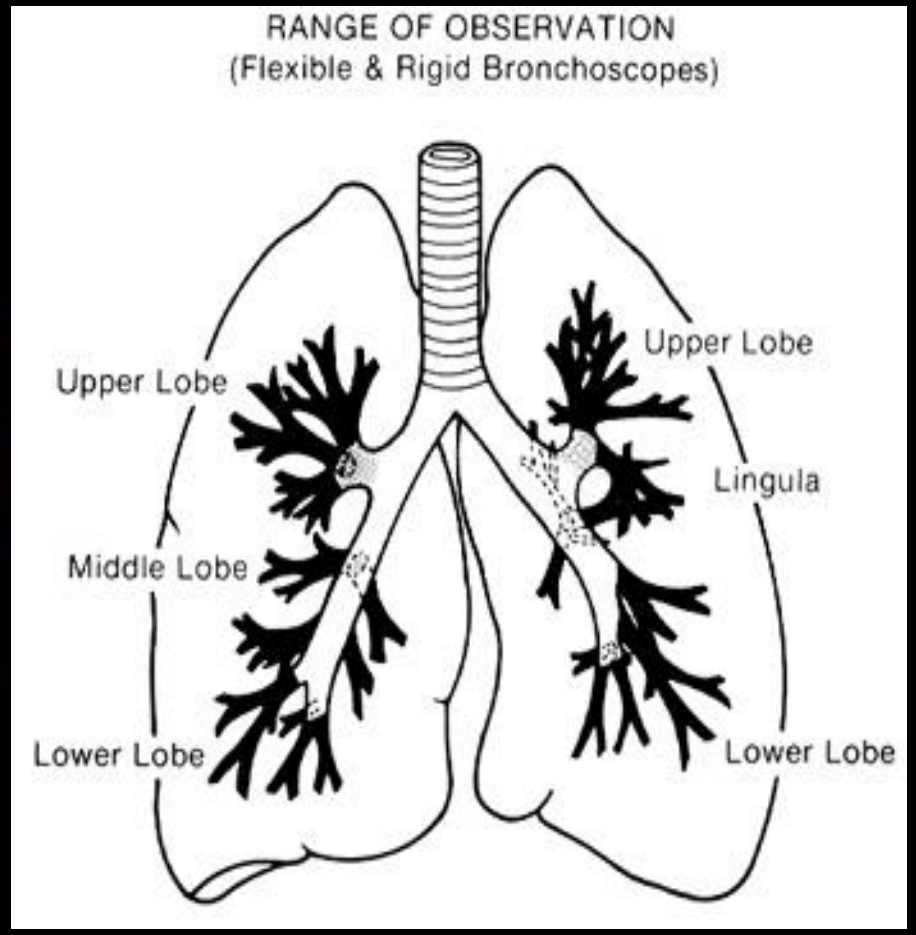
ASSESSMENT OF OPERABILITY

- CT scan
- Bone scan
- PET scan
- Mediastinoscopy
- Anterior Mediastinotomy
- VATS

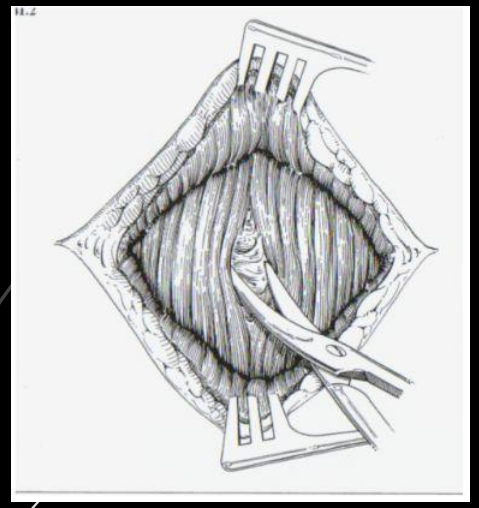
Bronchoscopy

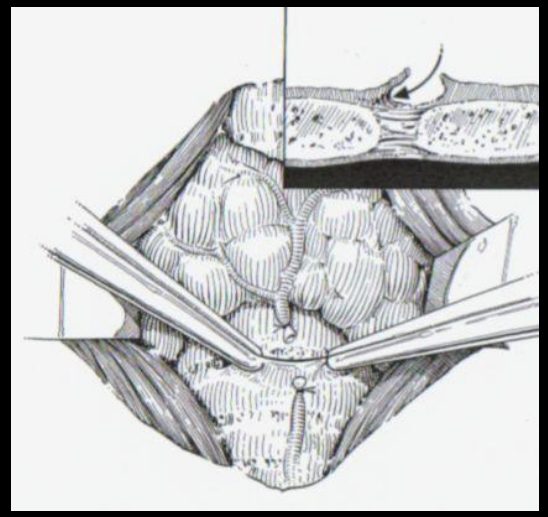


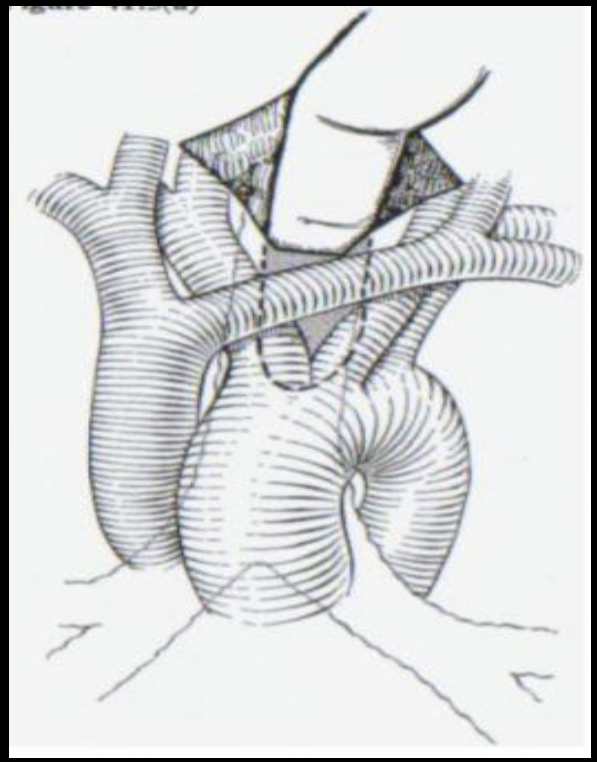




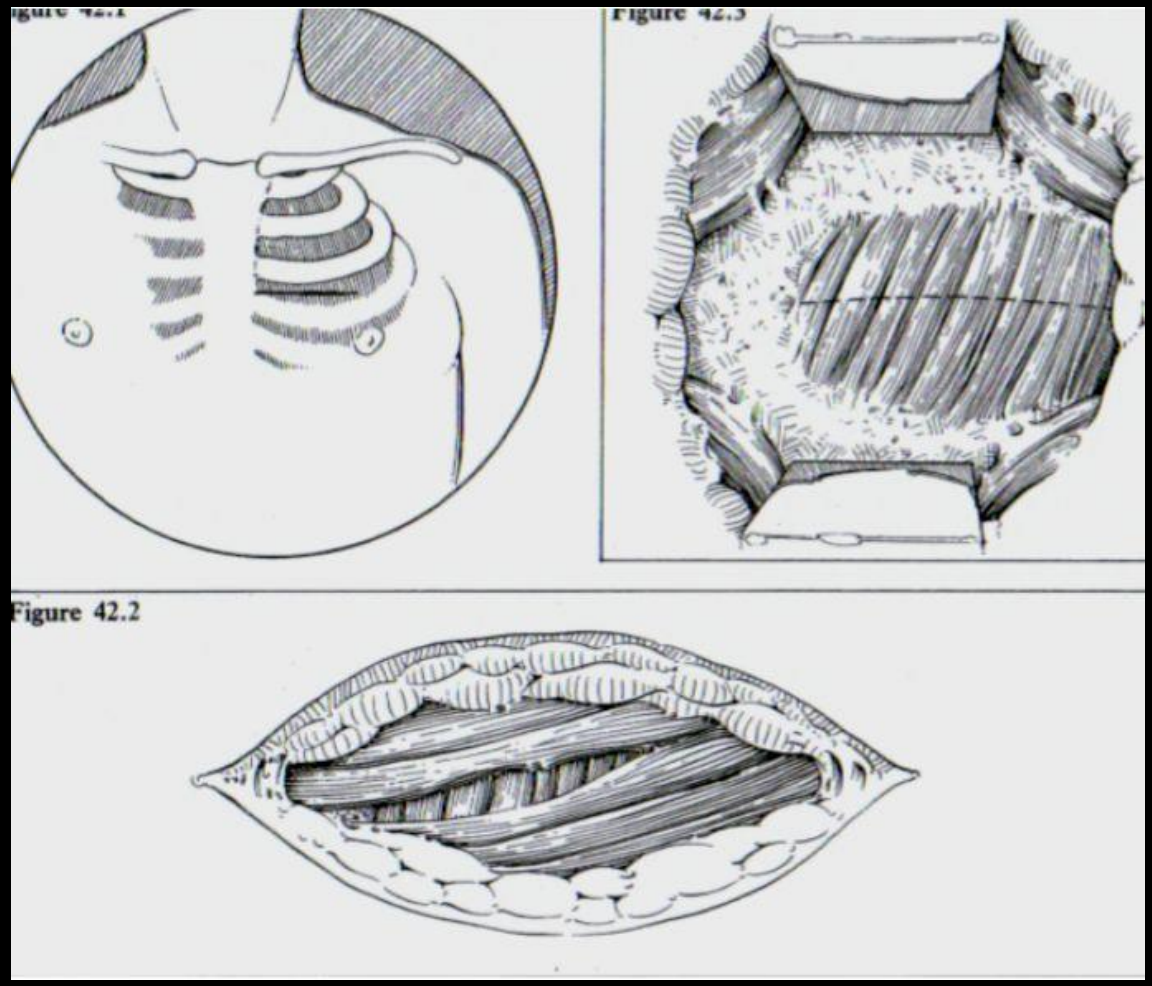
Mediastinoscopy



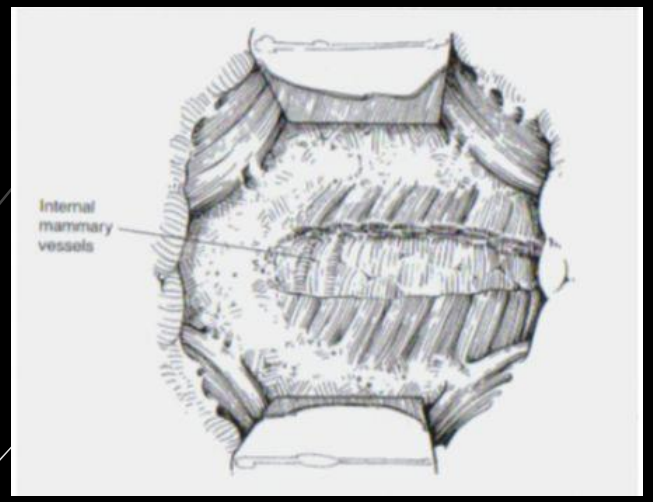


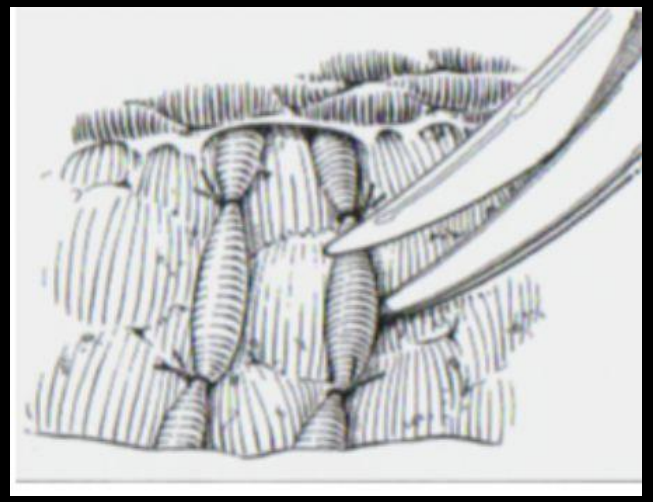


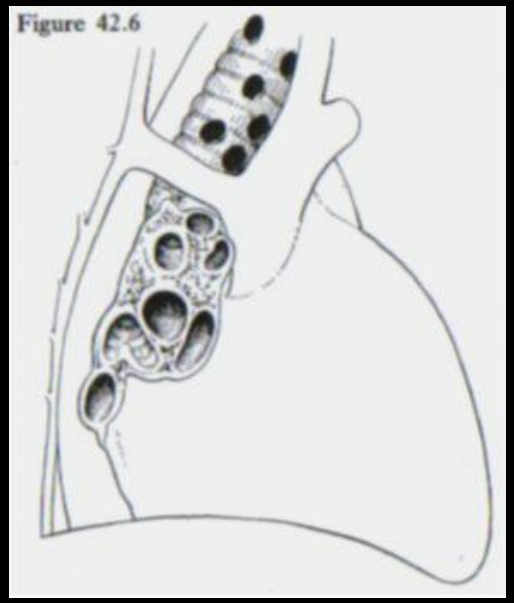
Mediastinotomy / Chamberlains

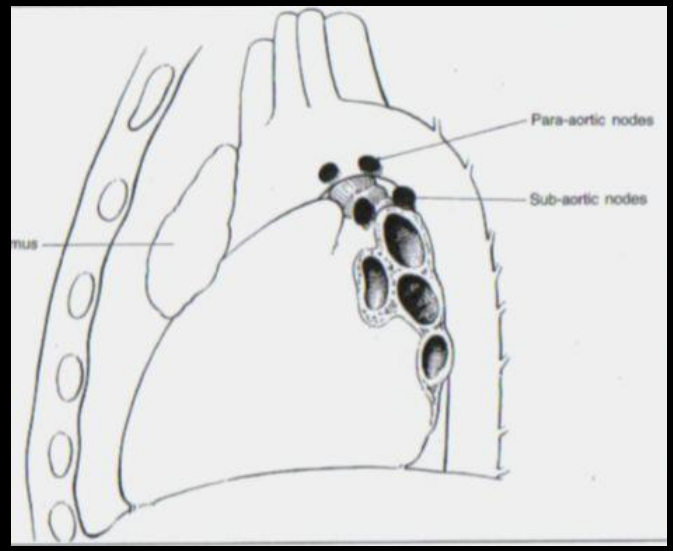


Mediastinotomy

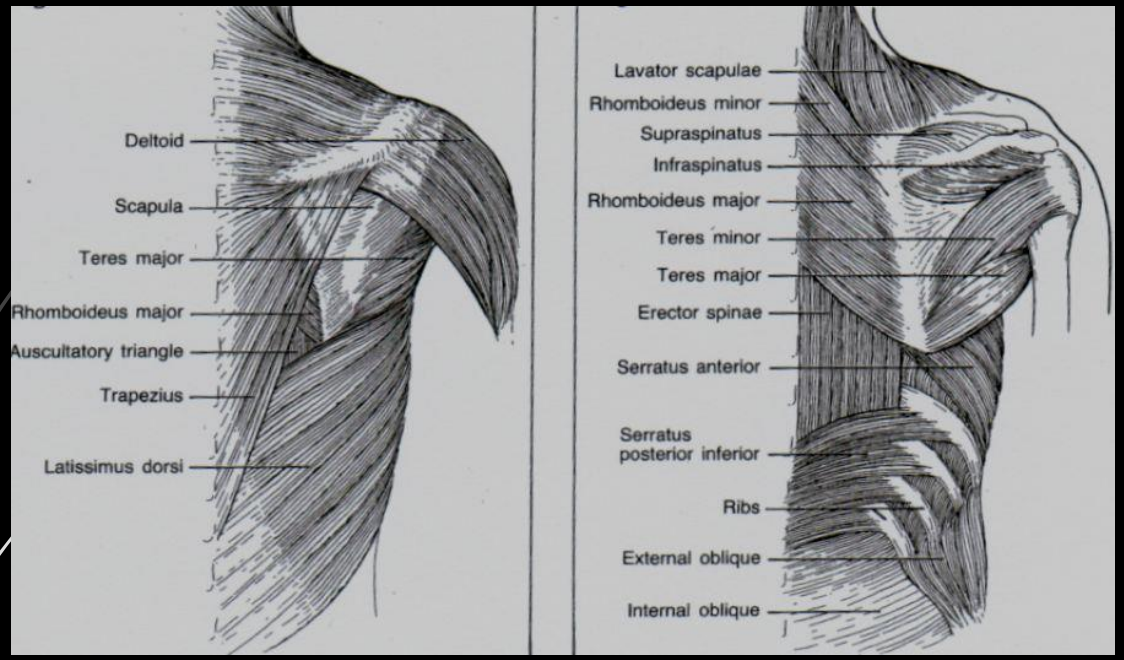


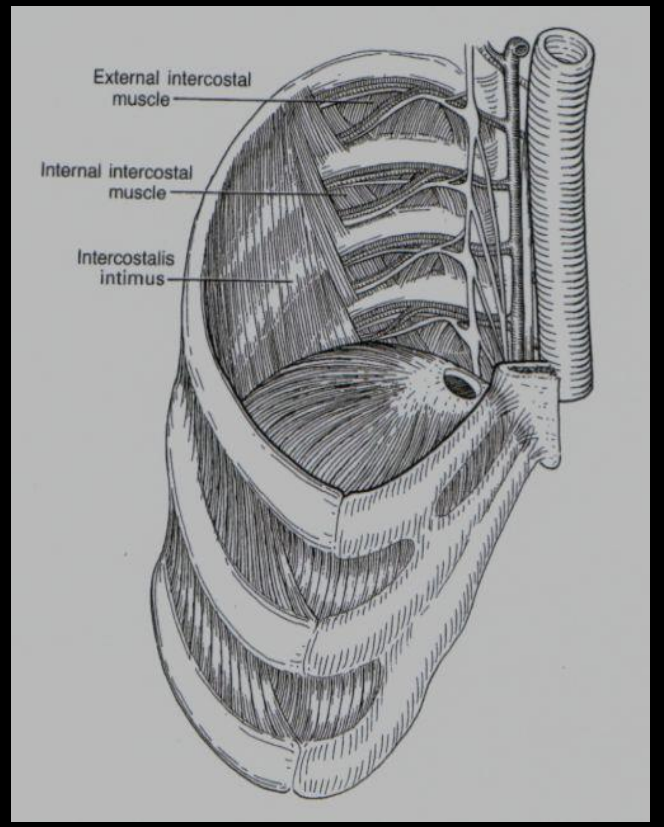




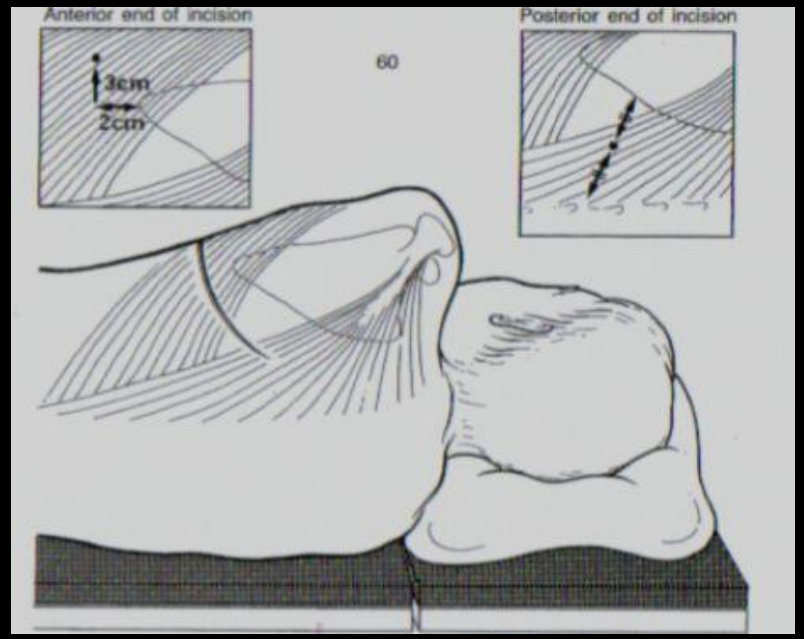


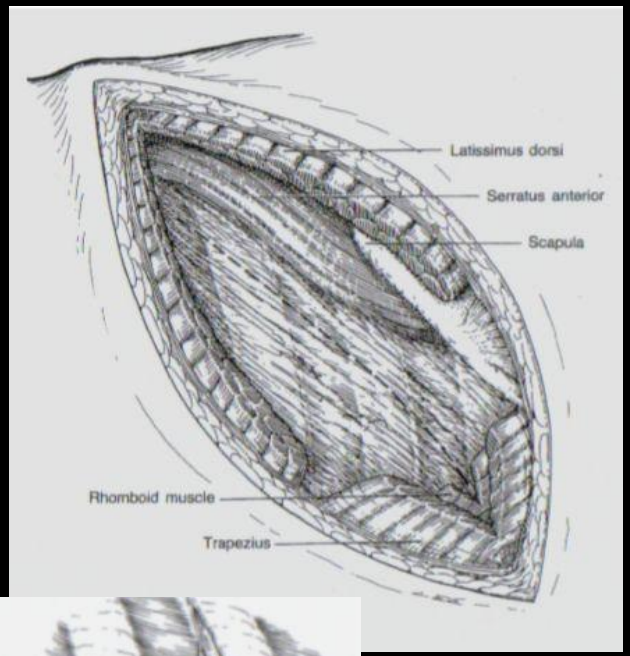
Thoracotomy

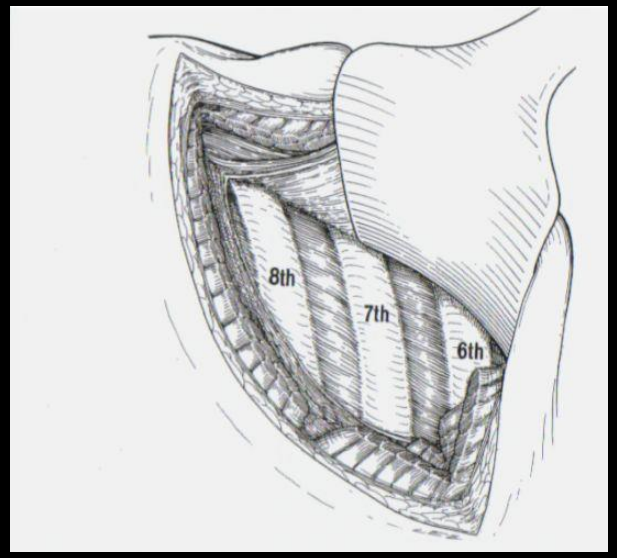


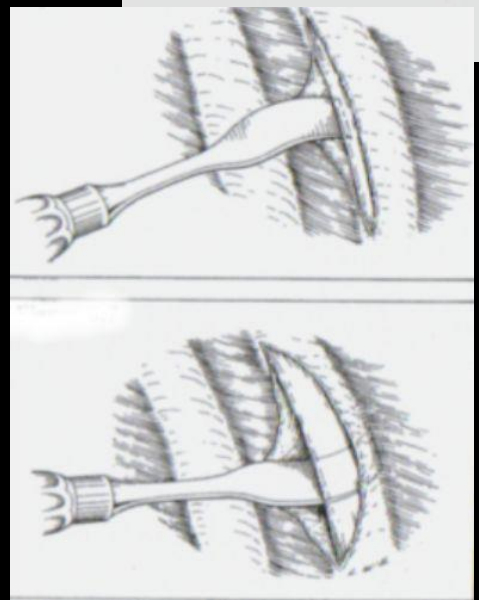


Thoracotomy - Posterolateral

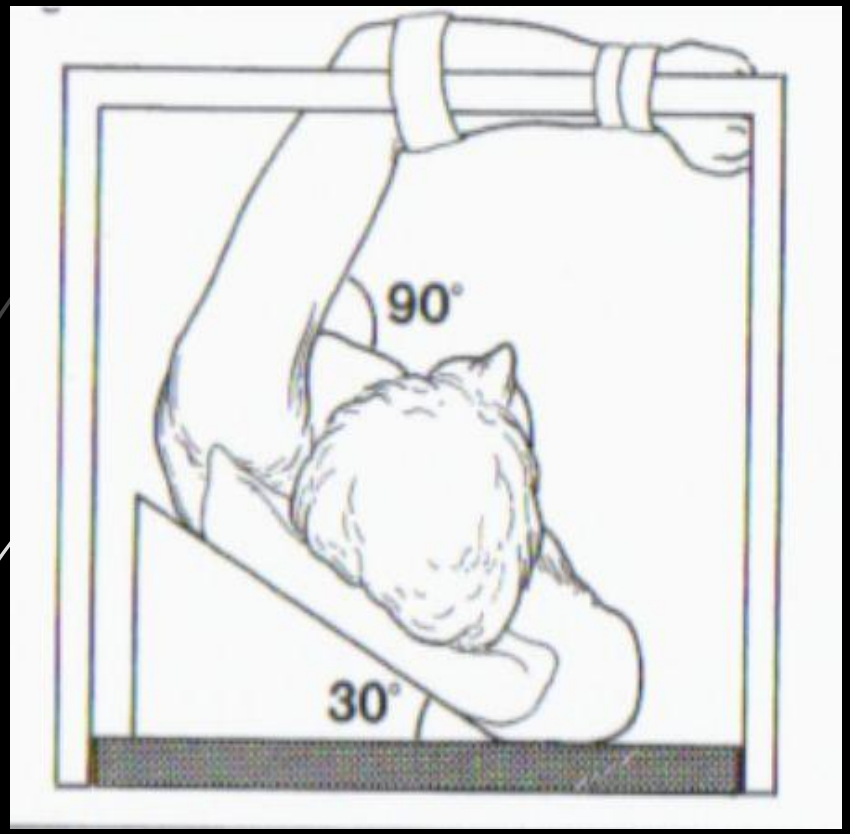


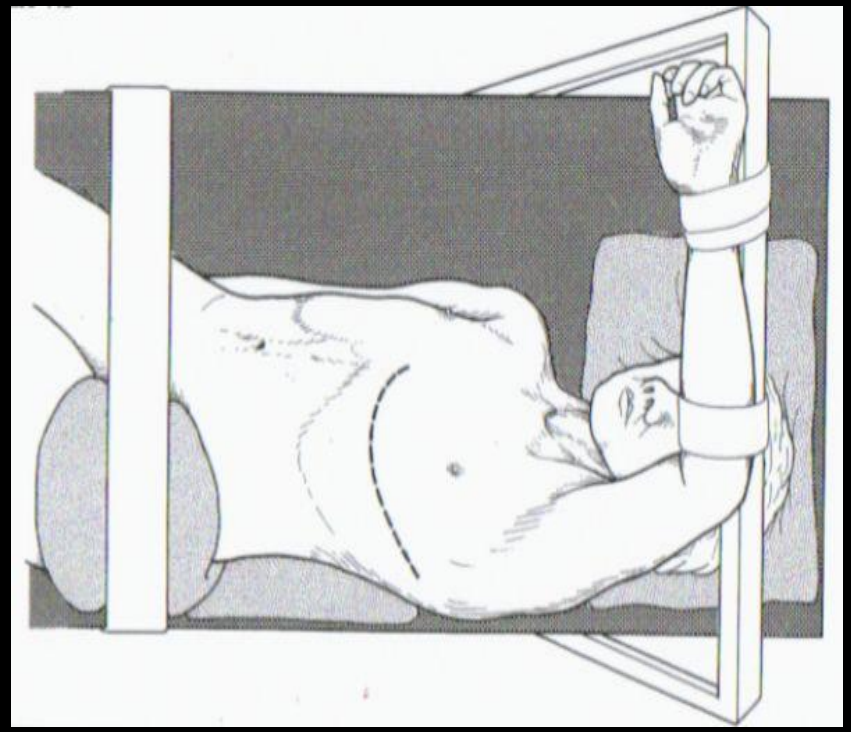






Thoracotomy - Anterolateral





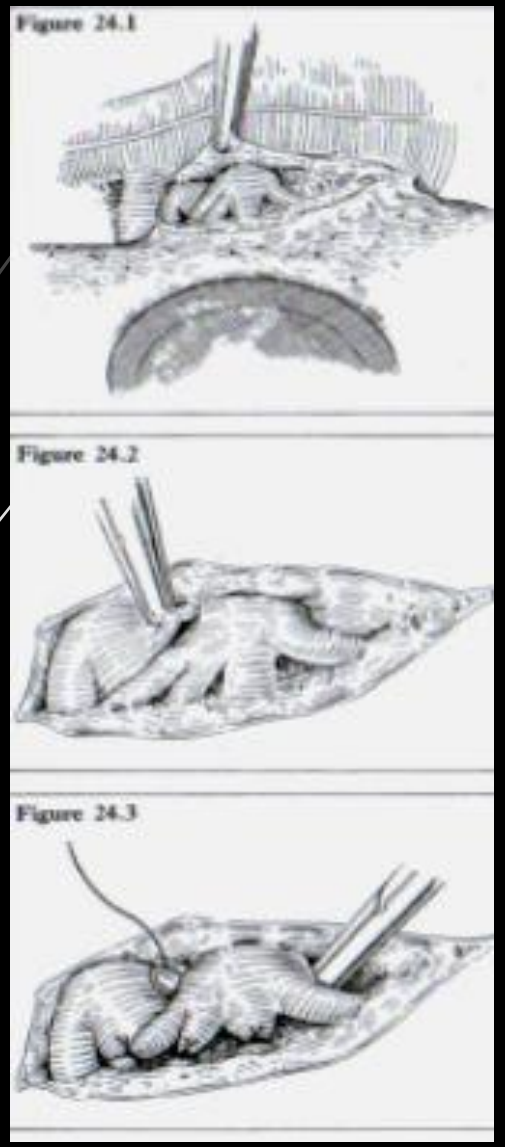
MINI THORACOTOMY

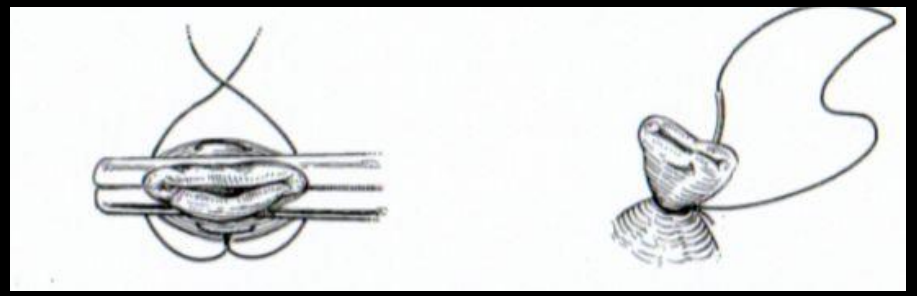
- Small incision thoracotomy

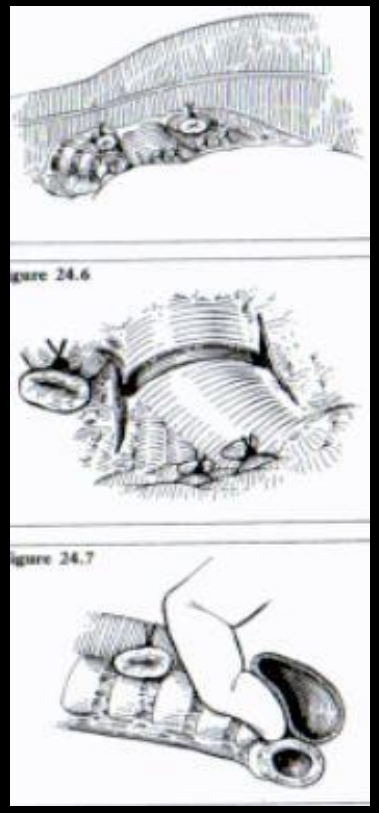
LUNG RESECTION

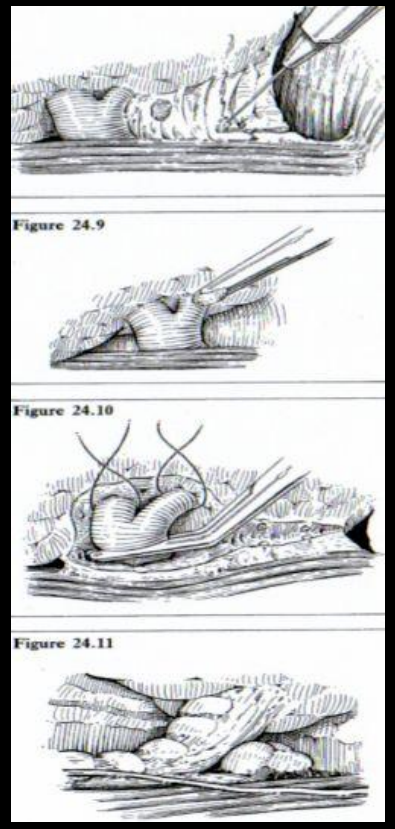
- Pneumonectomy
- Lobectomy
- Wedge

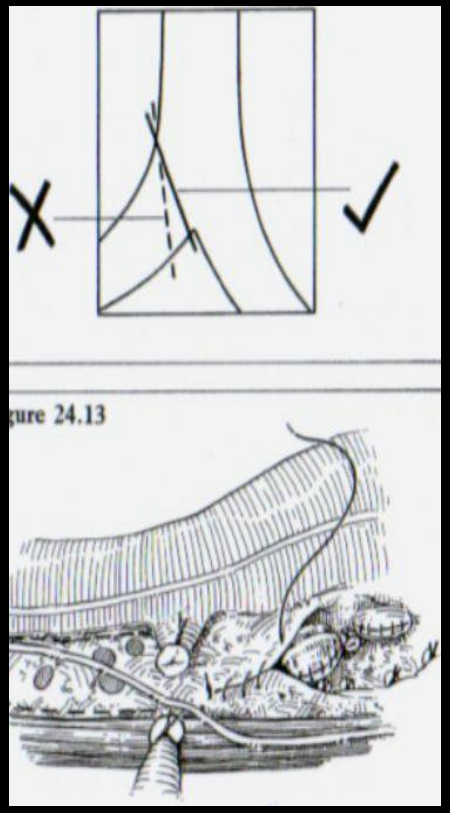
Lung Resection – Pneumonectomy







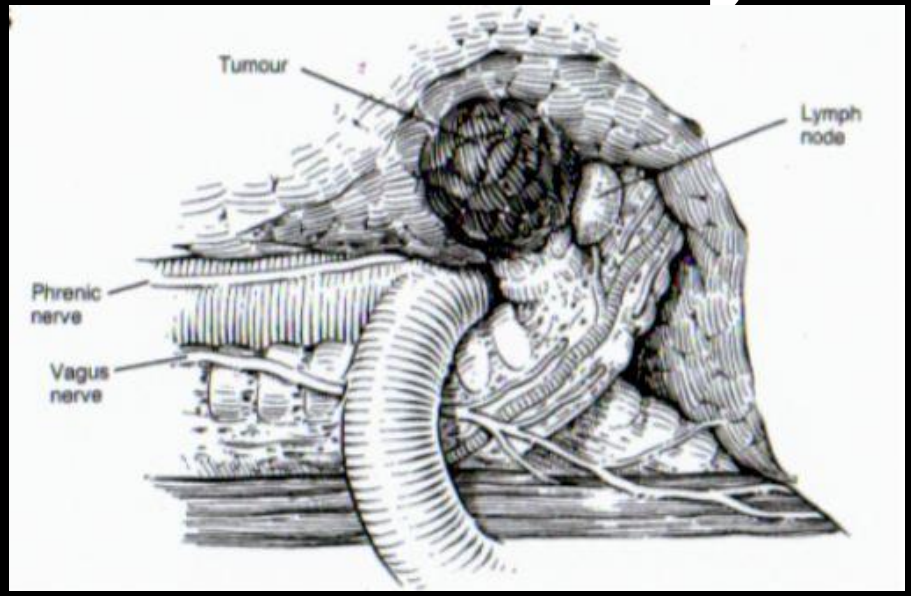


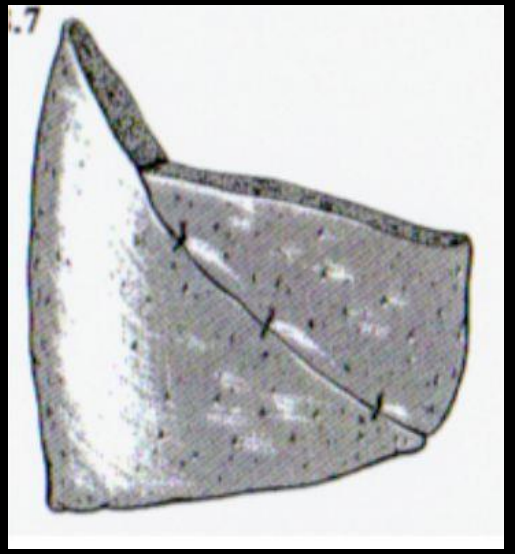


Lung Resection – Lobectomy

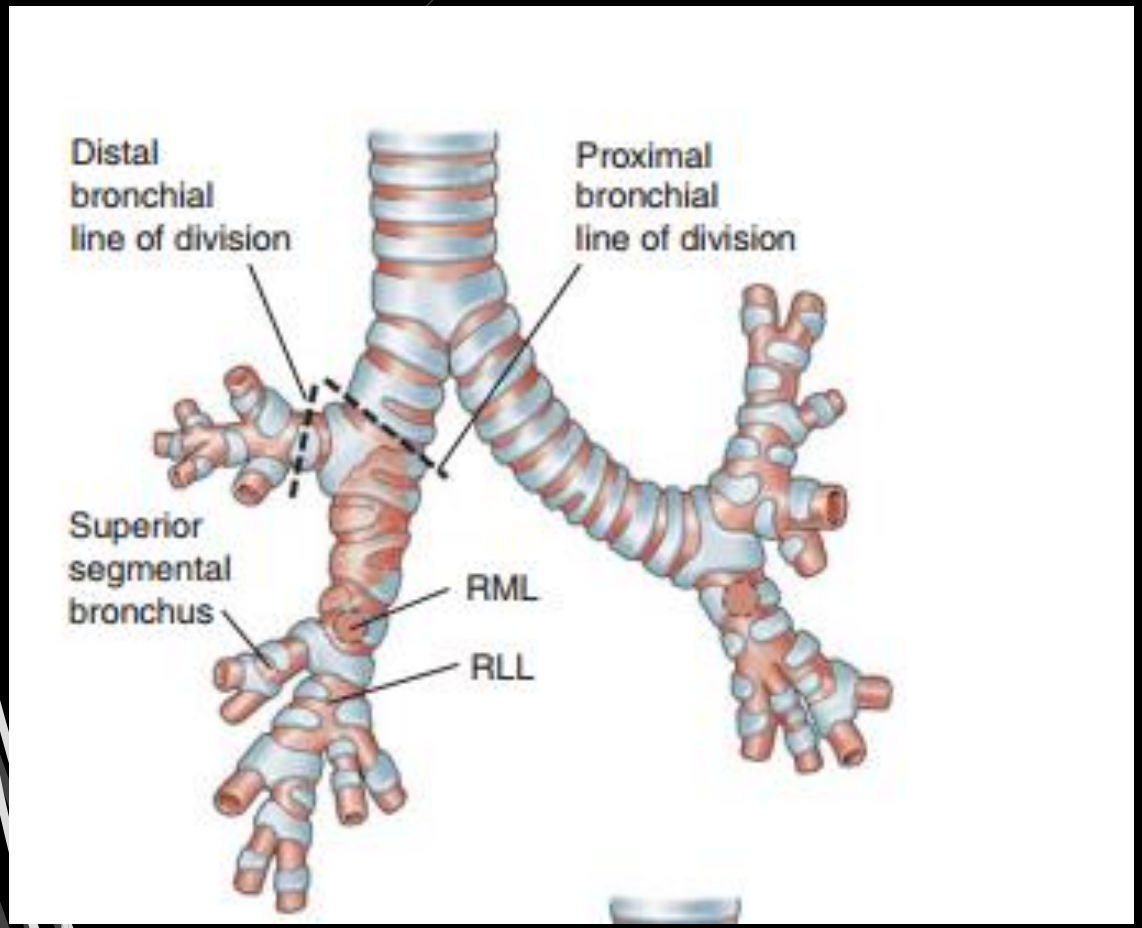
3 Lobes on RT
RUL
RML
RLL
(not RUL & RLL)

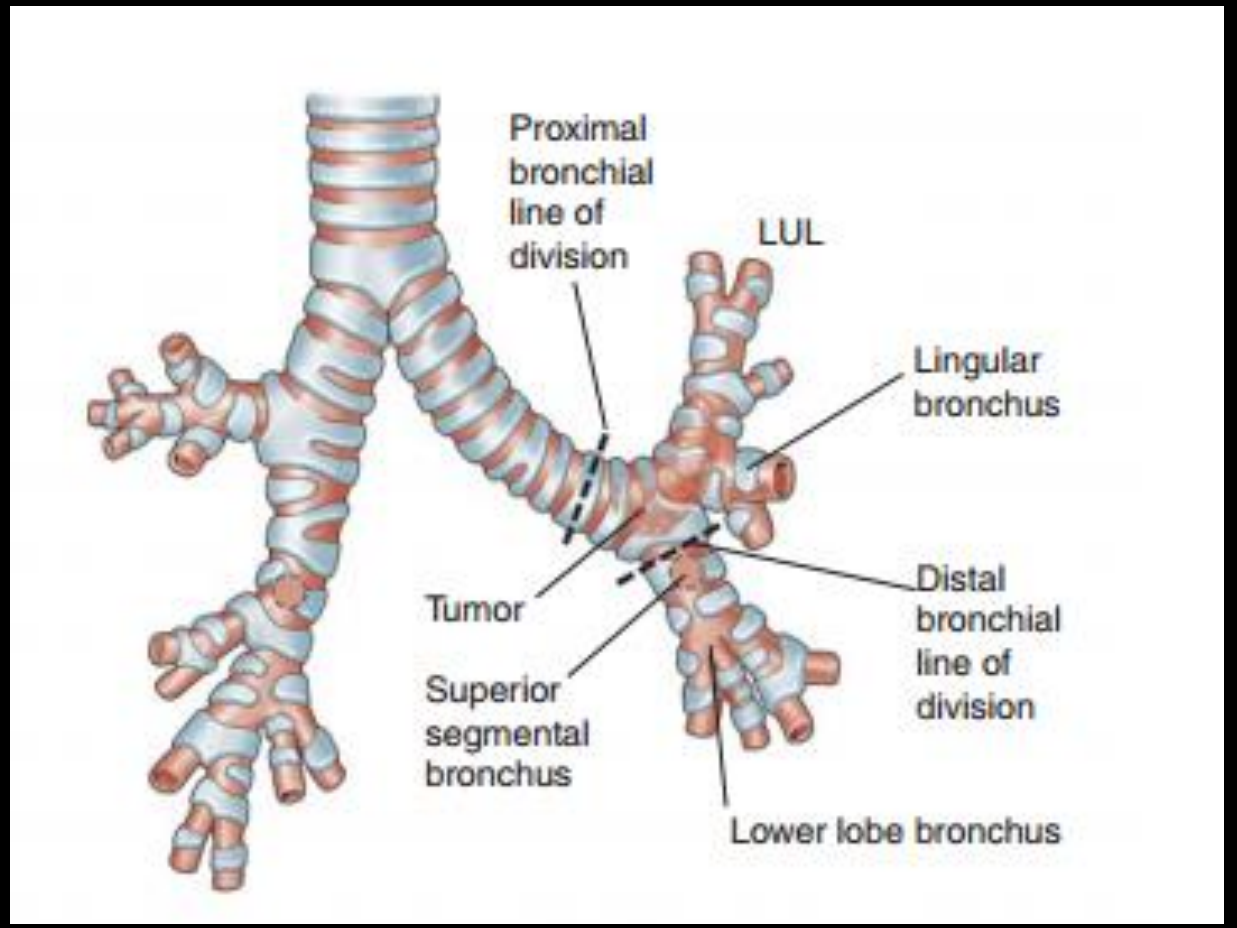
2 lobes on LT
LUL
LLL



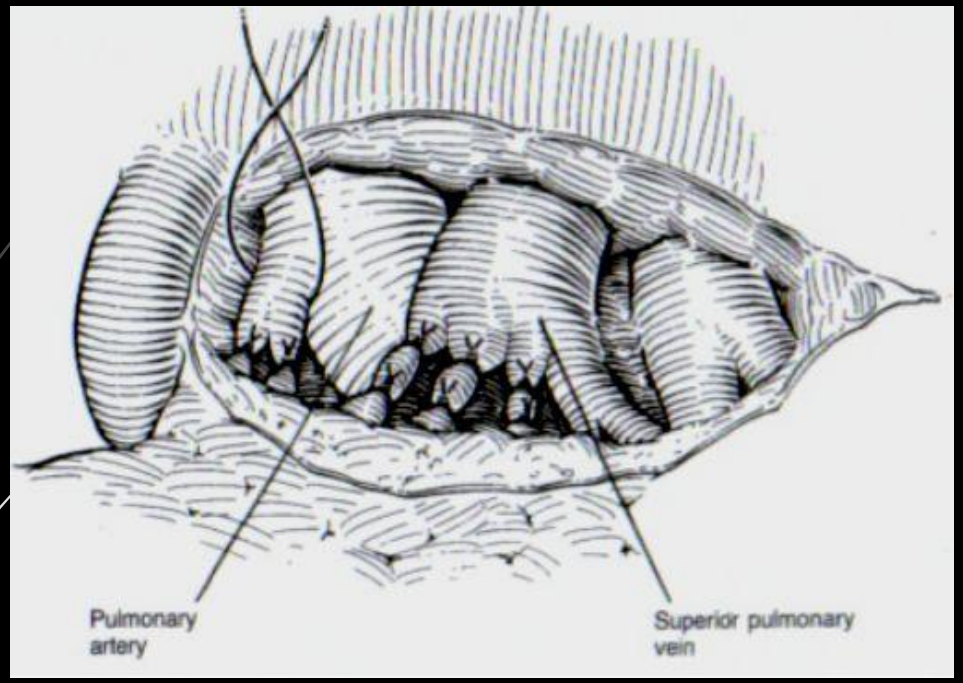


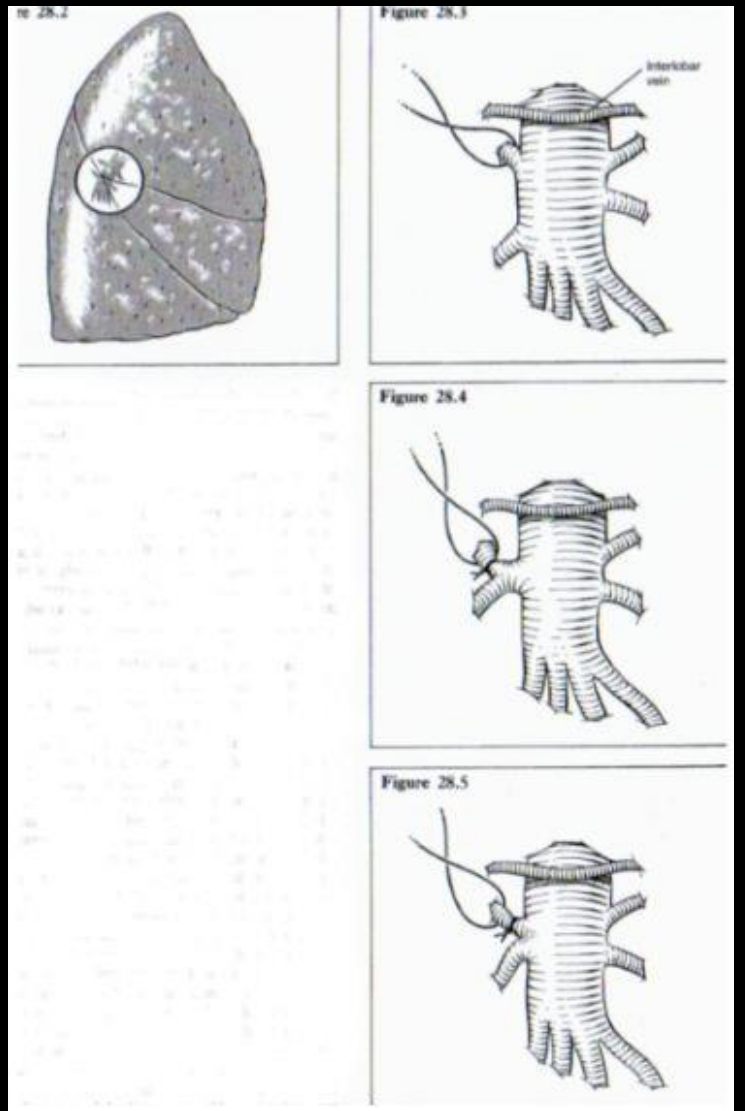
BRONCHUS


Distal
bronchial
line of division
Proximal
bronchial
line of division
Superior
segmental
bronchus
RML
RLL

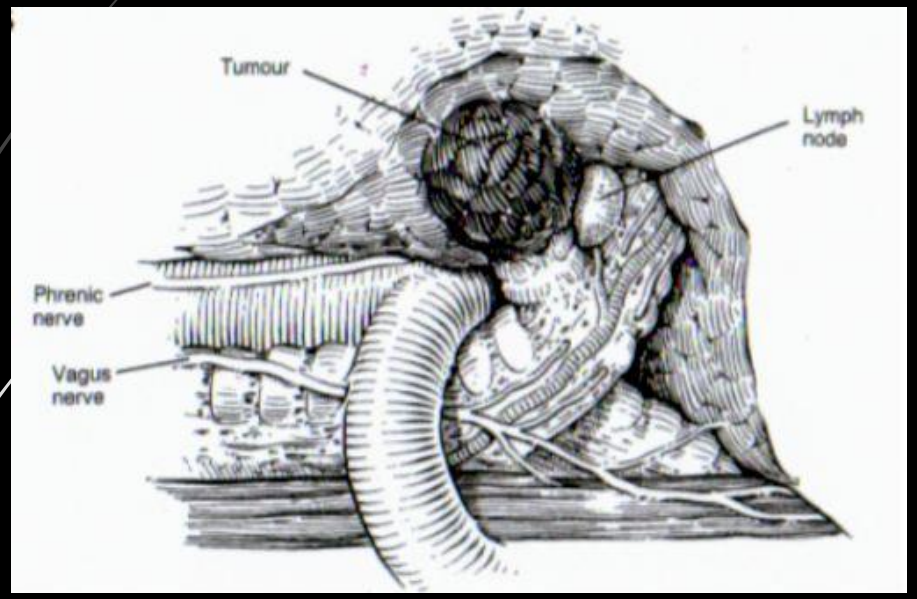

Proximal
bronchial
line of
division
LUL
Lingular
bronchus
Tumor
Distal
bronchial
line of
division
Superior
segmental
bronchus
Lower lobe bronchus

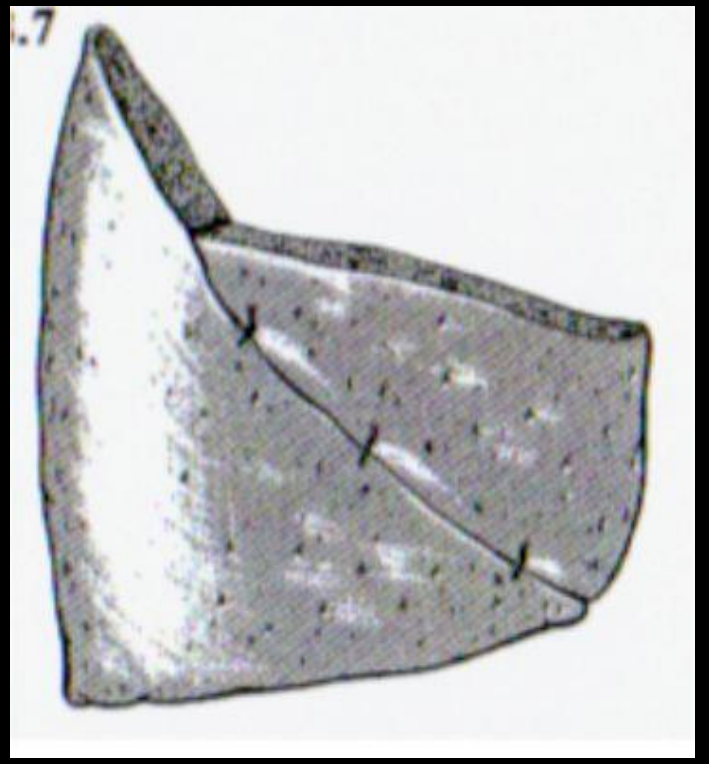
Lung Resection – Lobectomy (RUL)



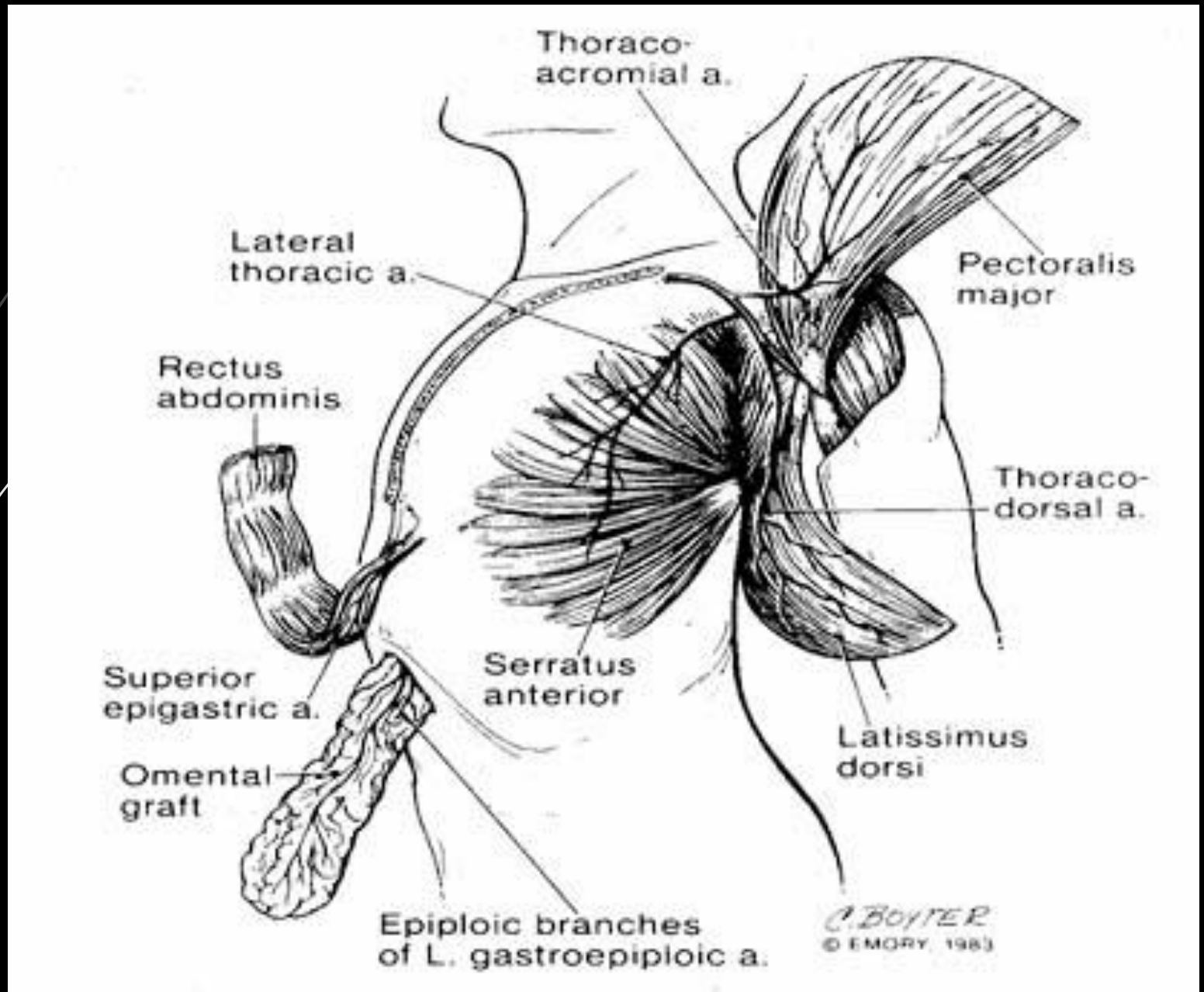


Lung Resection – Lobectomy (RUL)

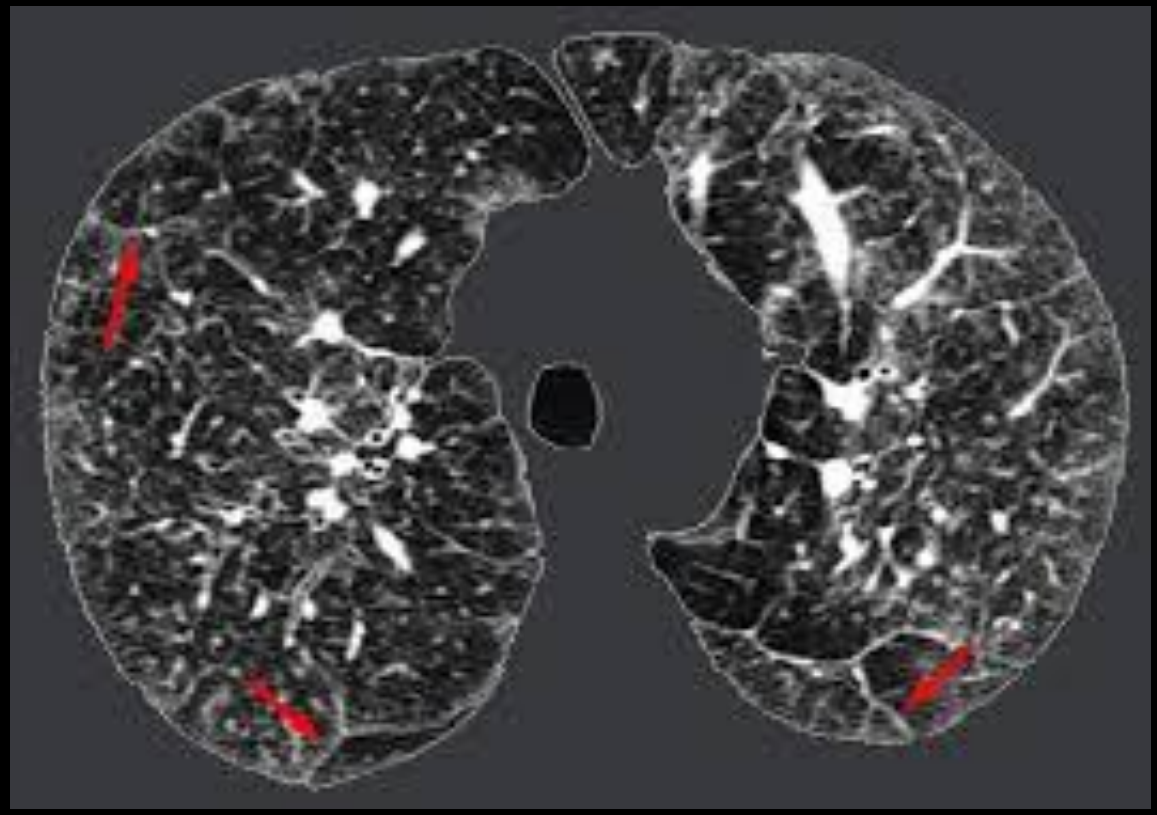




AVAILABLE TISSUE

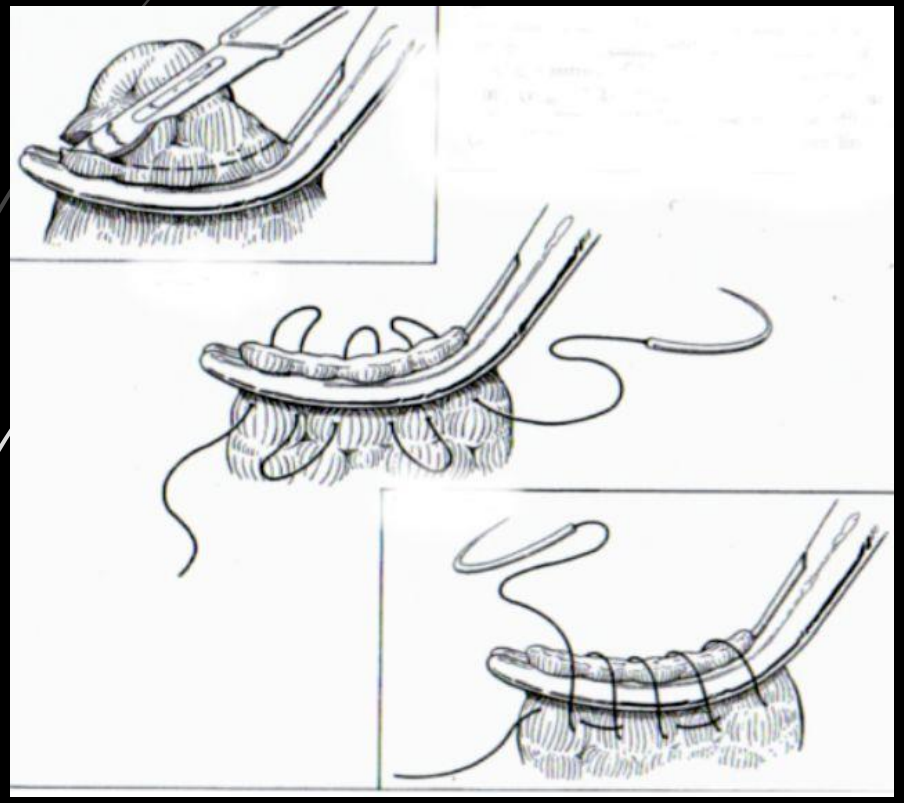


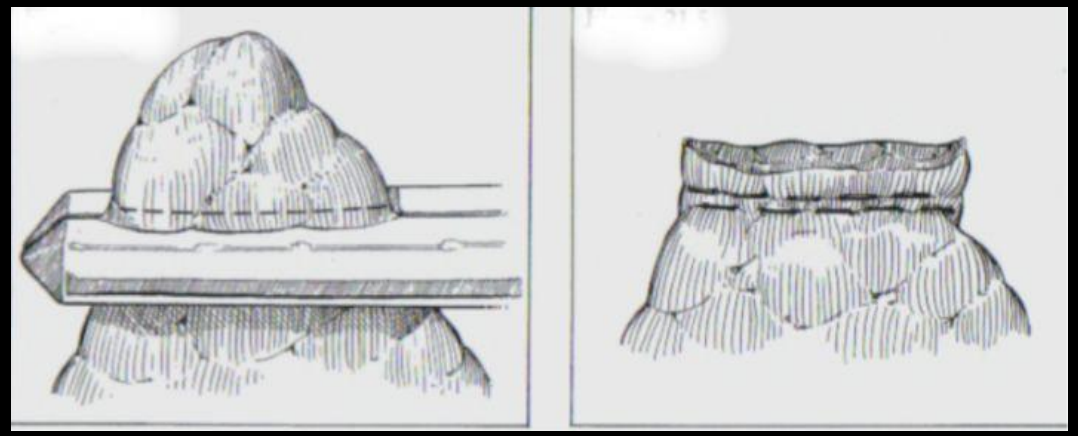
INTERSTITIAL LUNG DISEASE



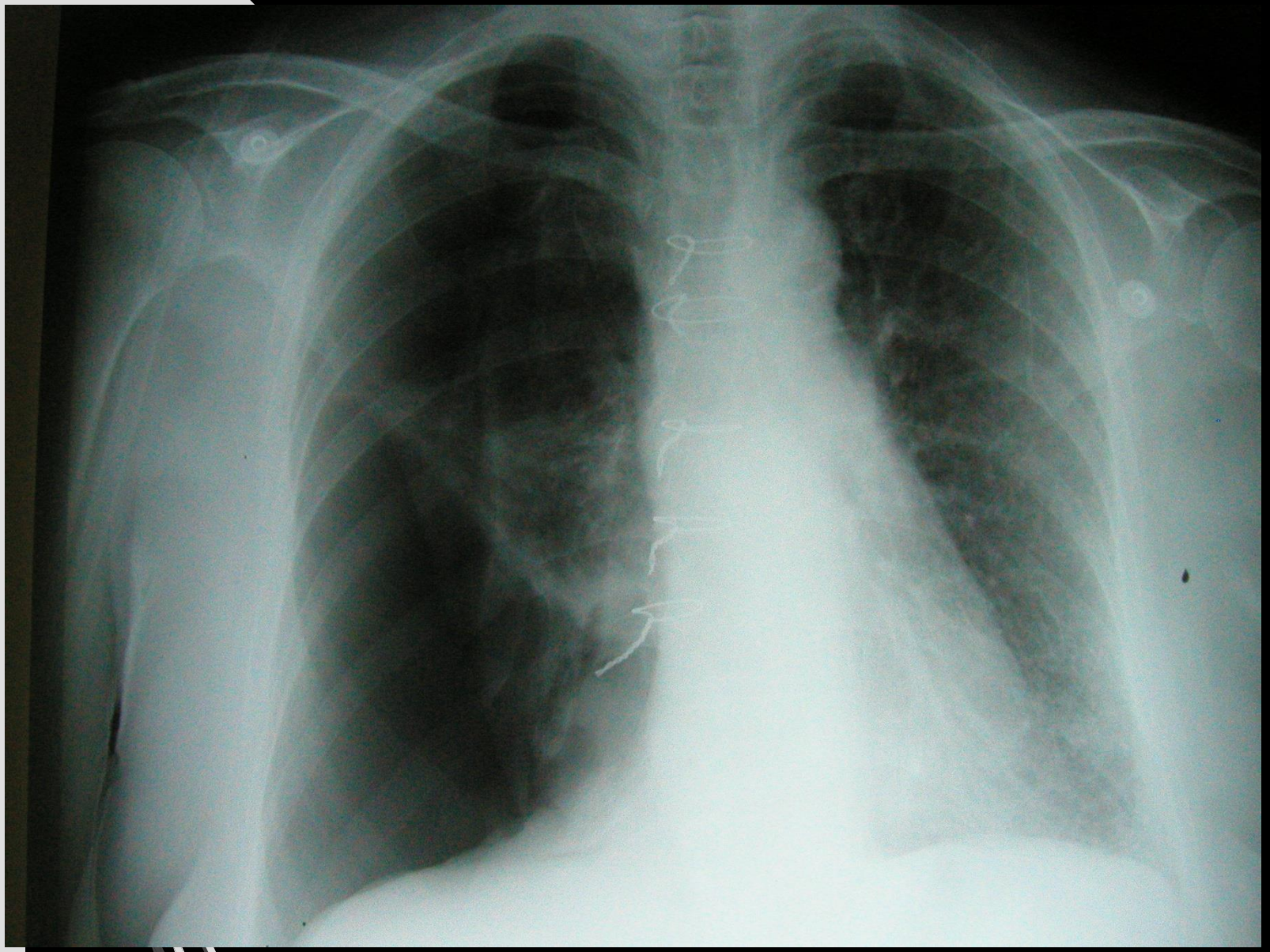
LUNG BIOPSIES

- Need tissue to diagnose "Interstitial lung disease"

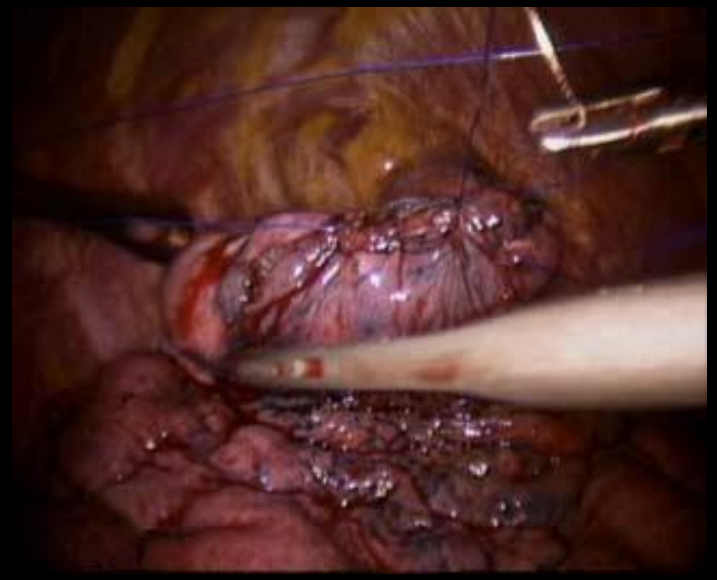


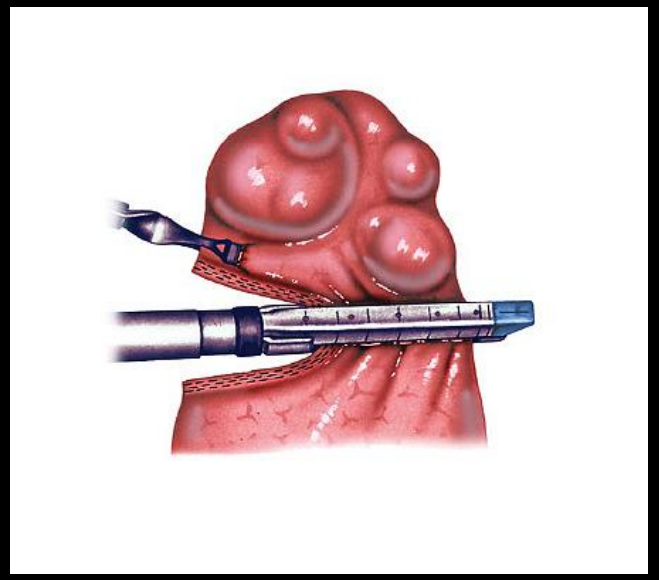


Pneumothorax



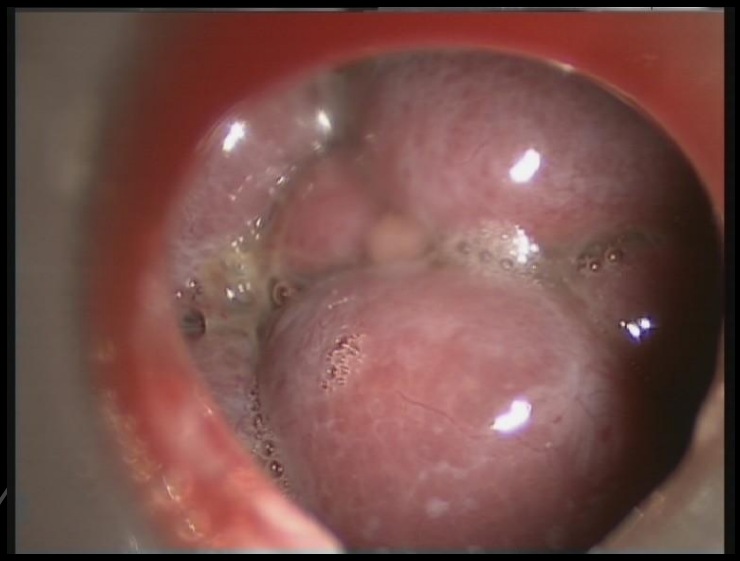
VATS for Pneumothorax

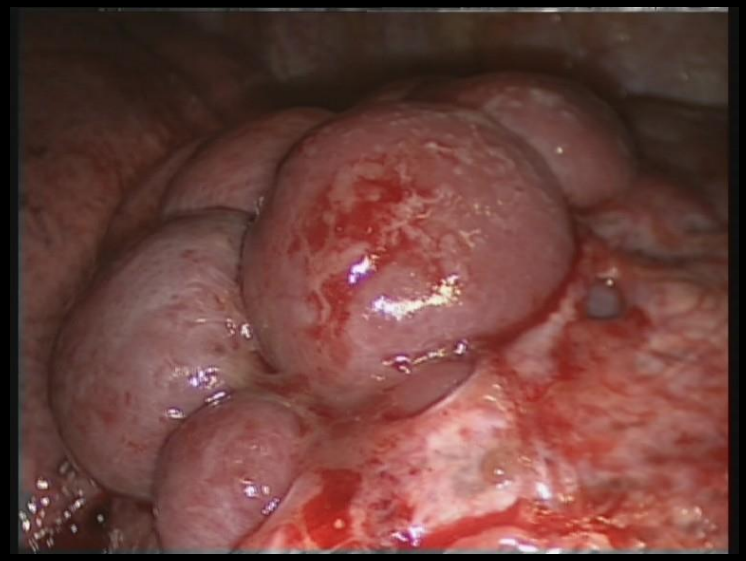


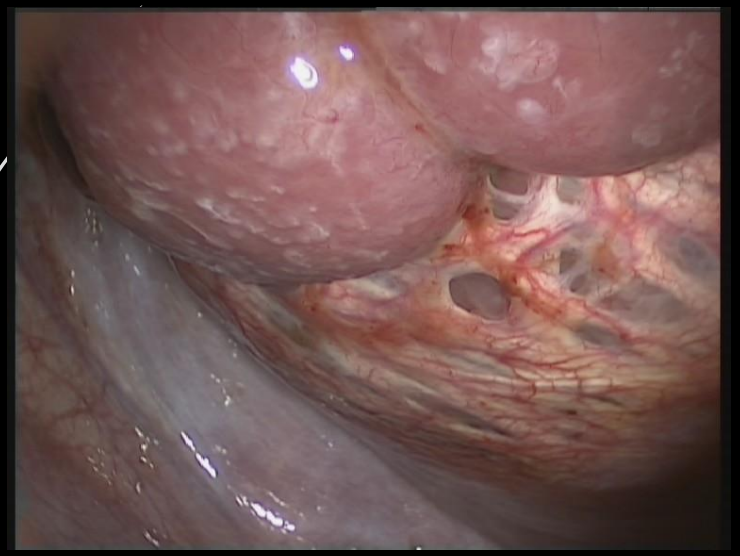


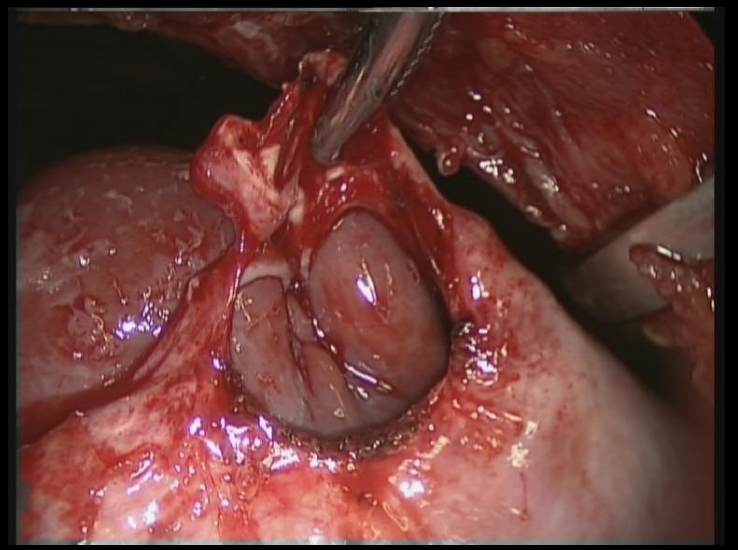
Catamenial Pneumothorax and Liver Protrusion : An Unusual Presentation

Chaiwut Yottasurodom, M.D.
Central Chest Institue of Thailand
August 4, 2012

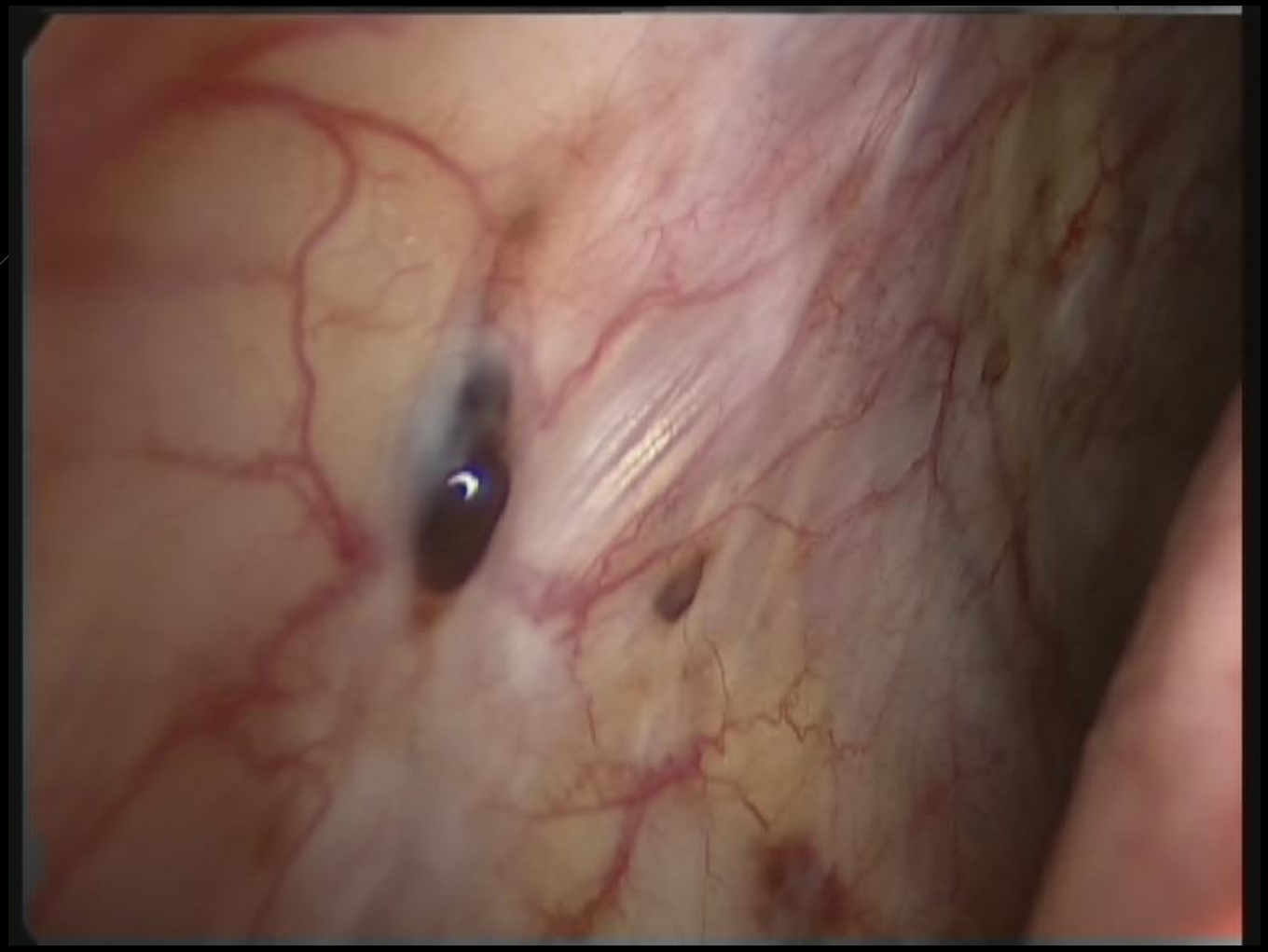








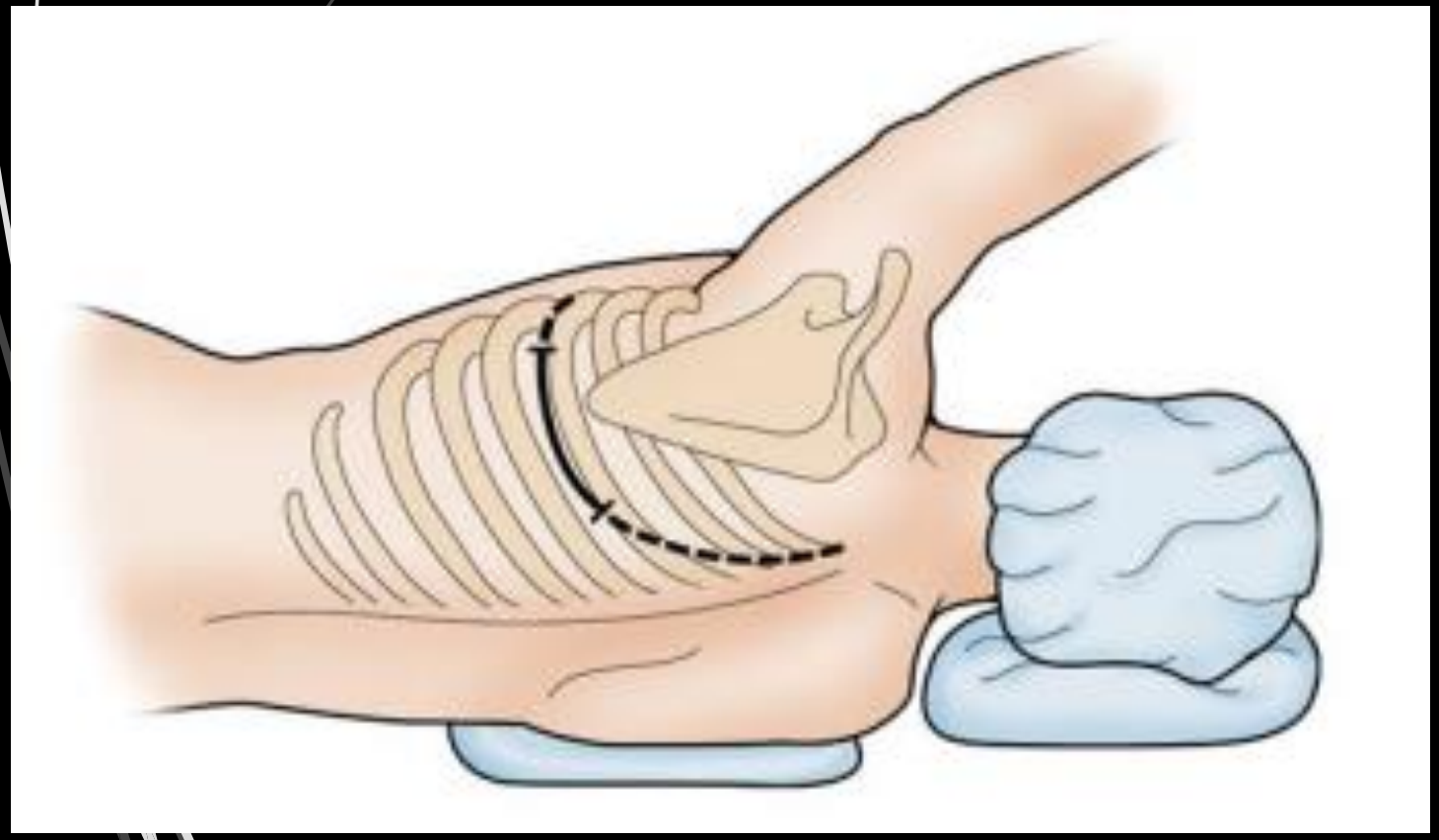
INTRAOPERATIVE FINDING

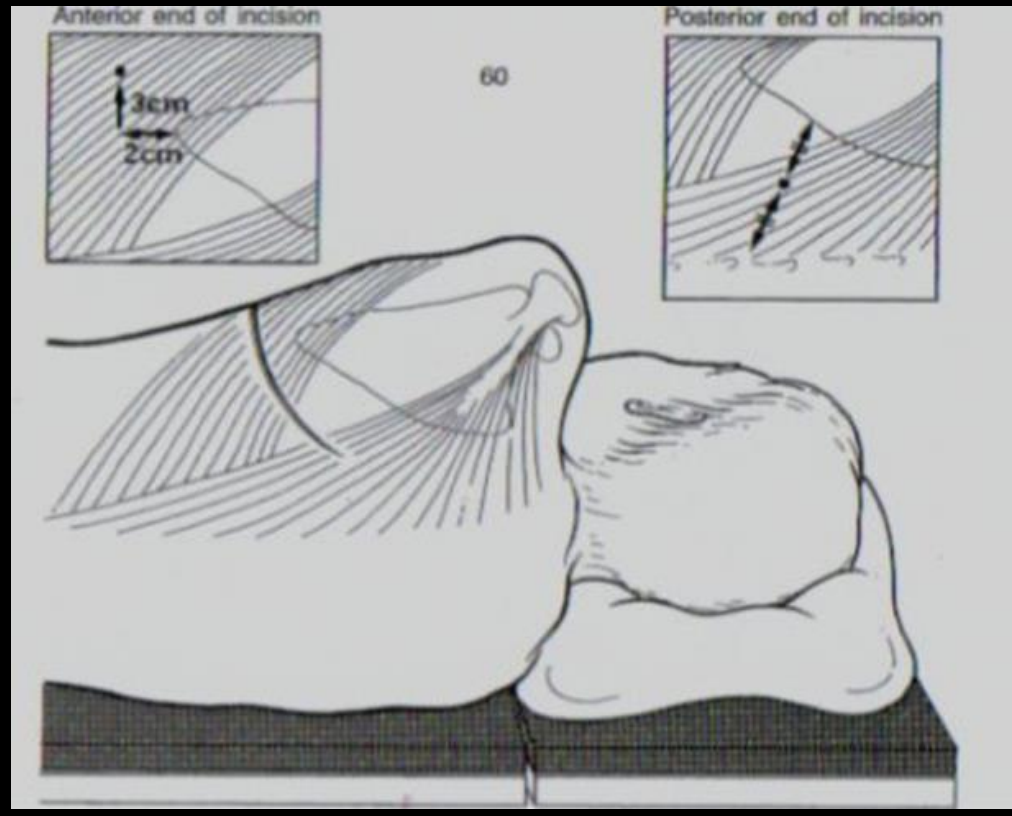


INTRAOPERATIVE FINDING

INCISION

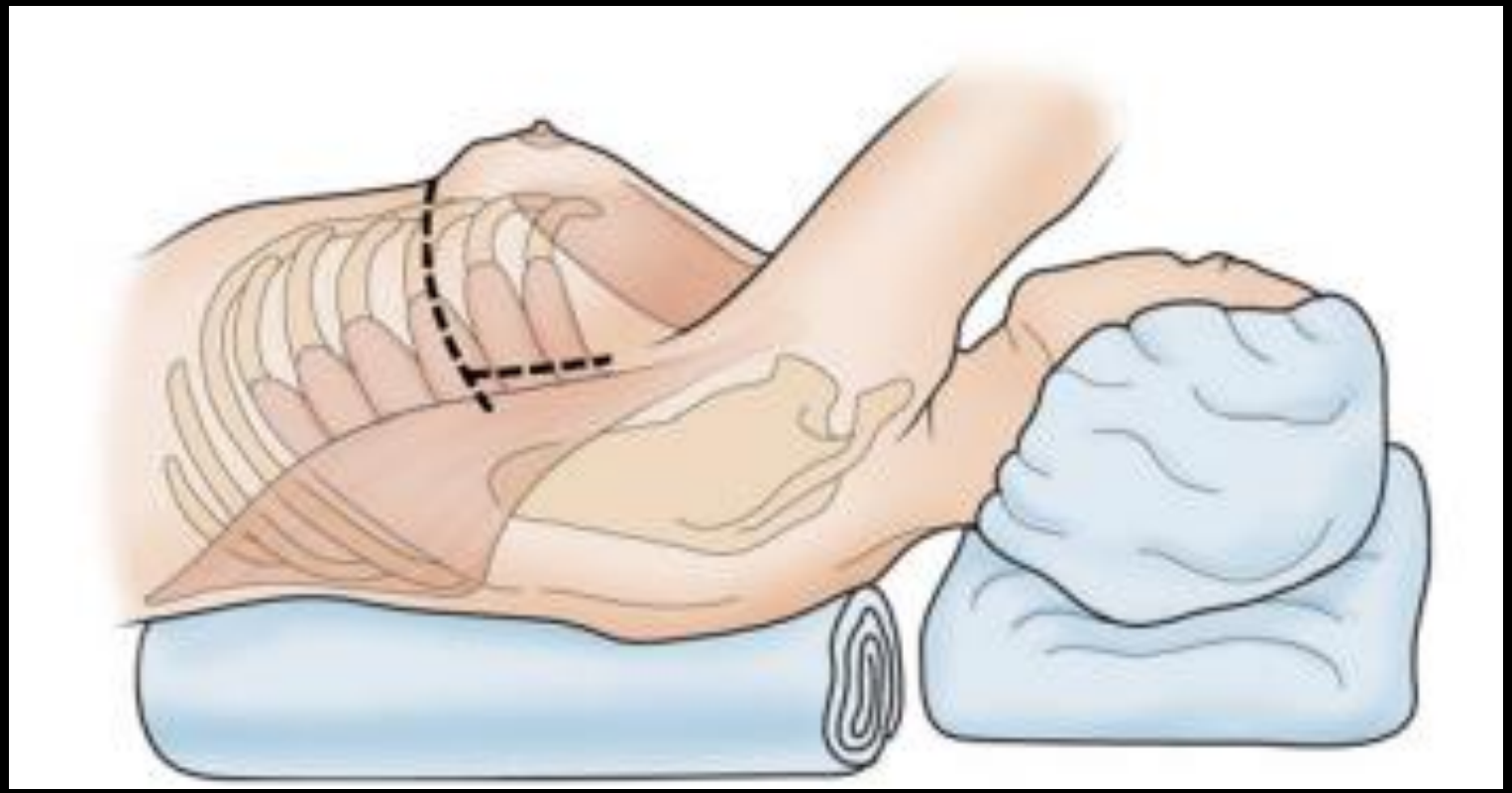
- Posterolateral incision



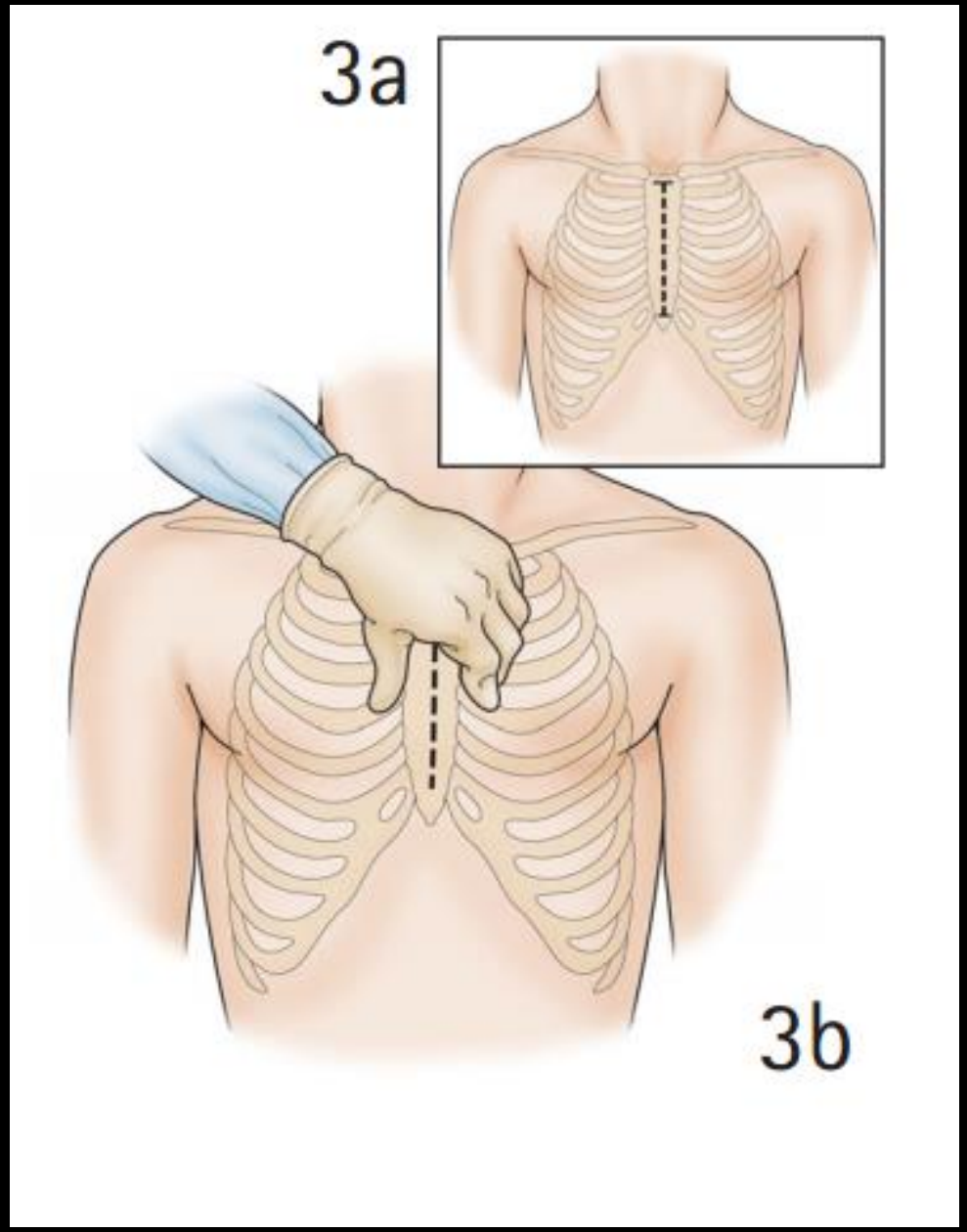


INCISION

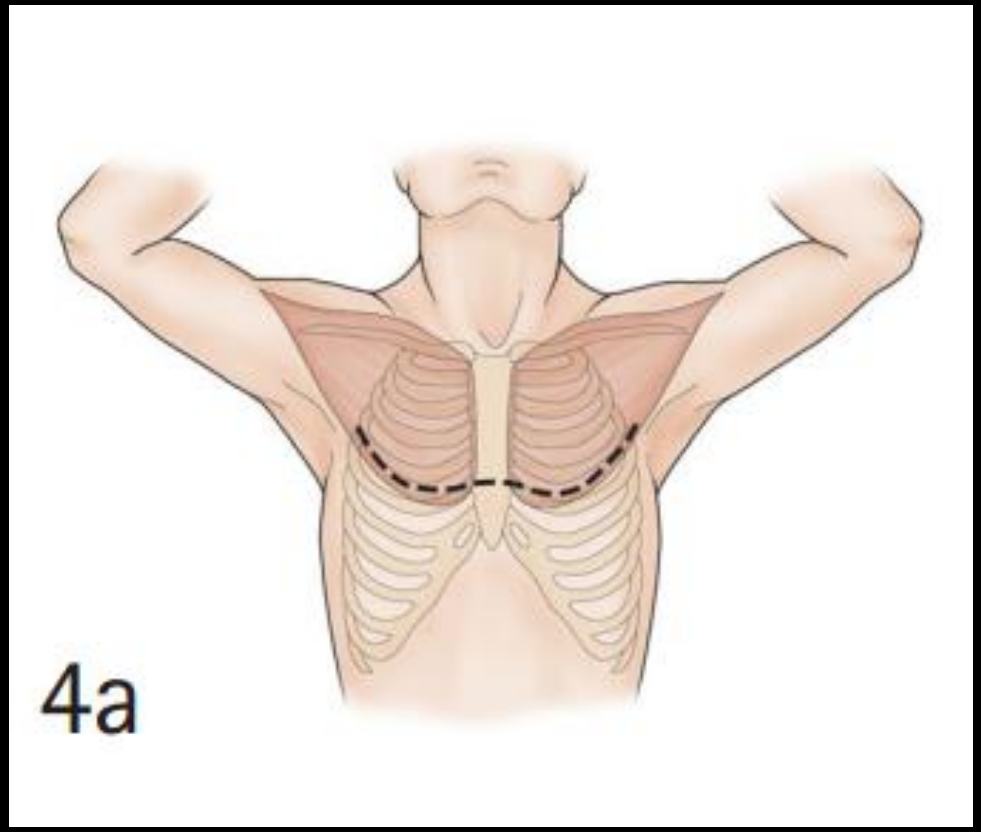
- Anterolateral incision

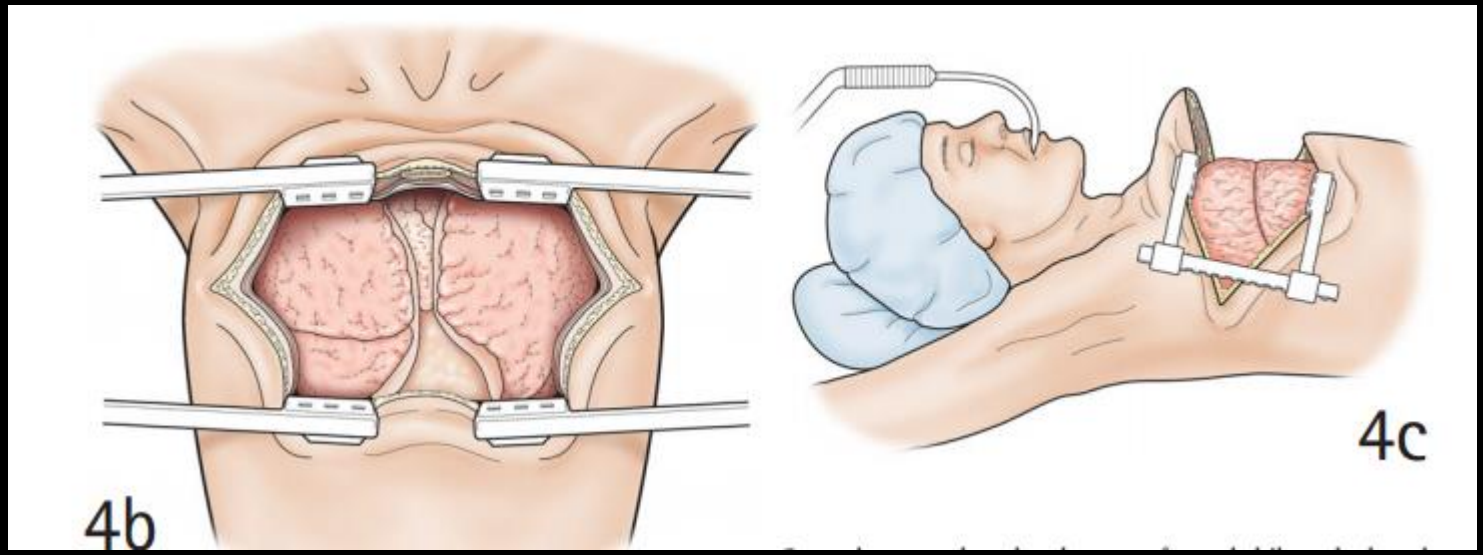


- Median sternotomy

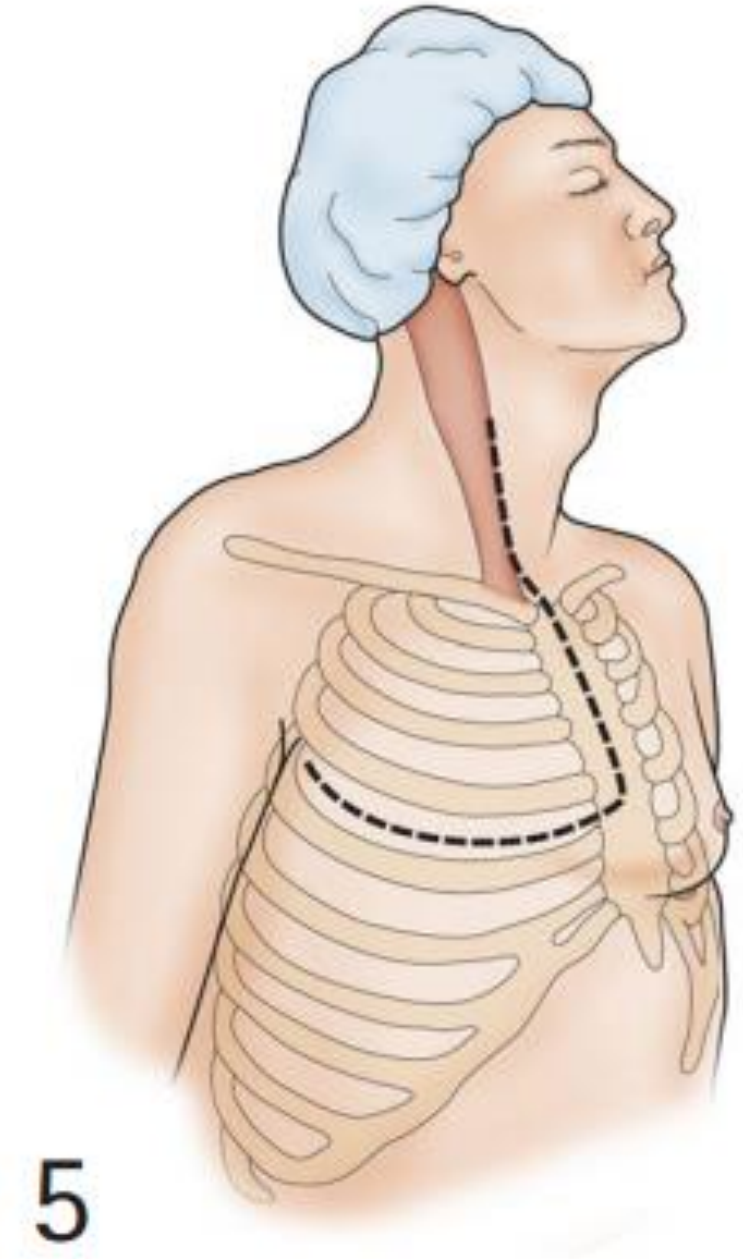


- Clampshell incision

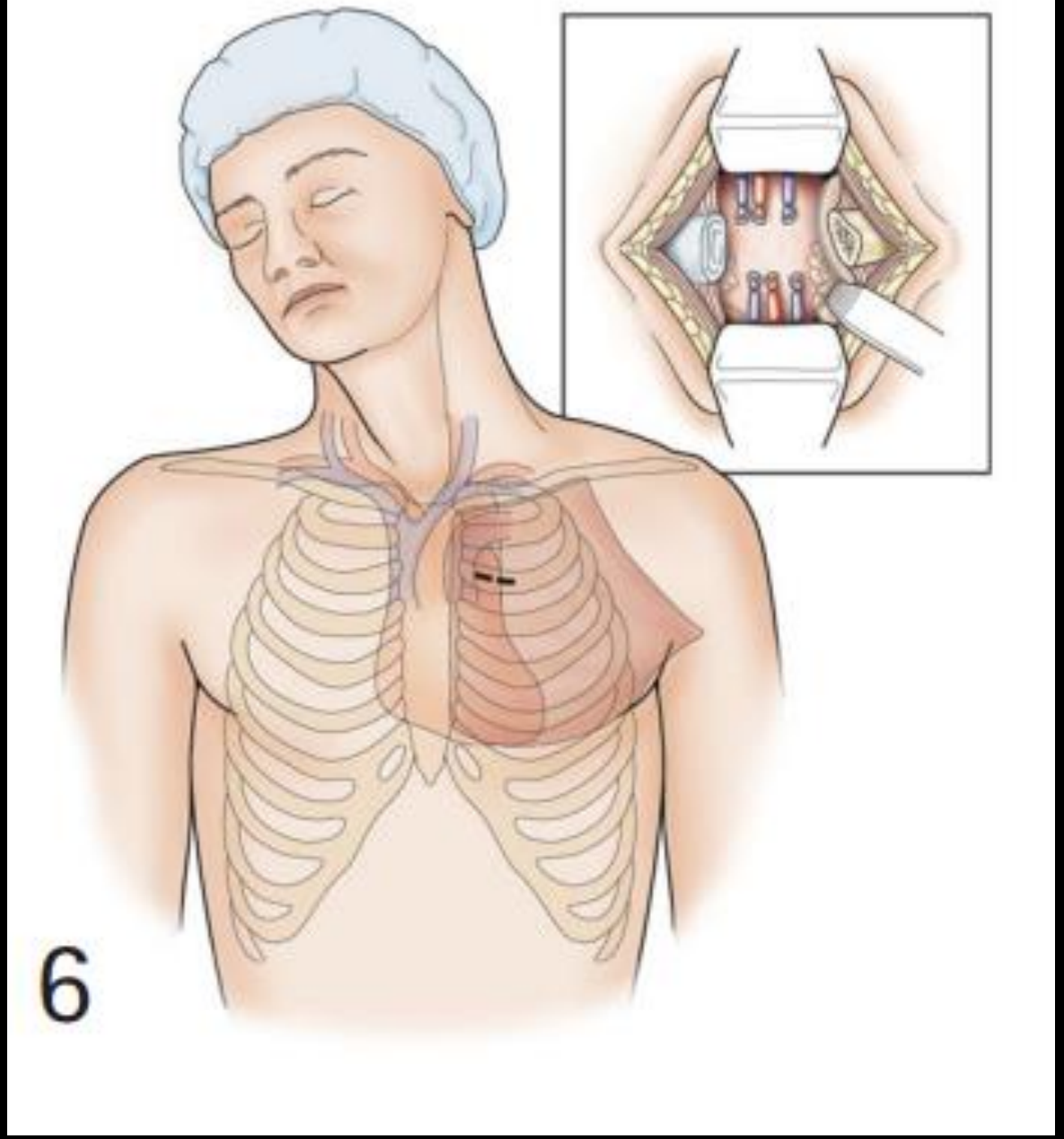




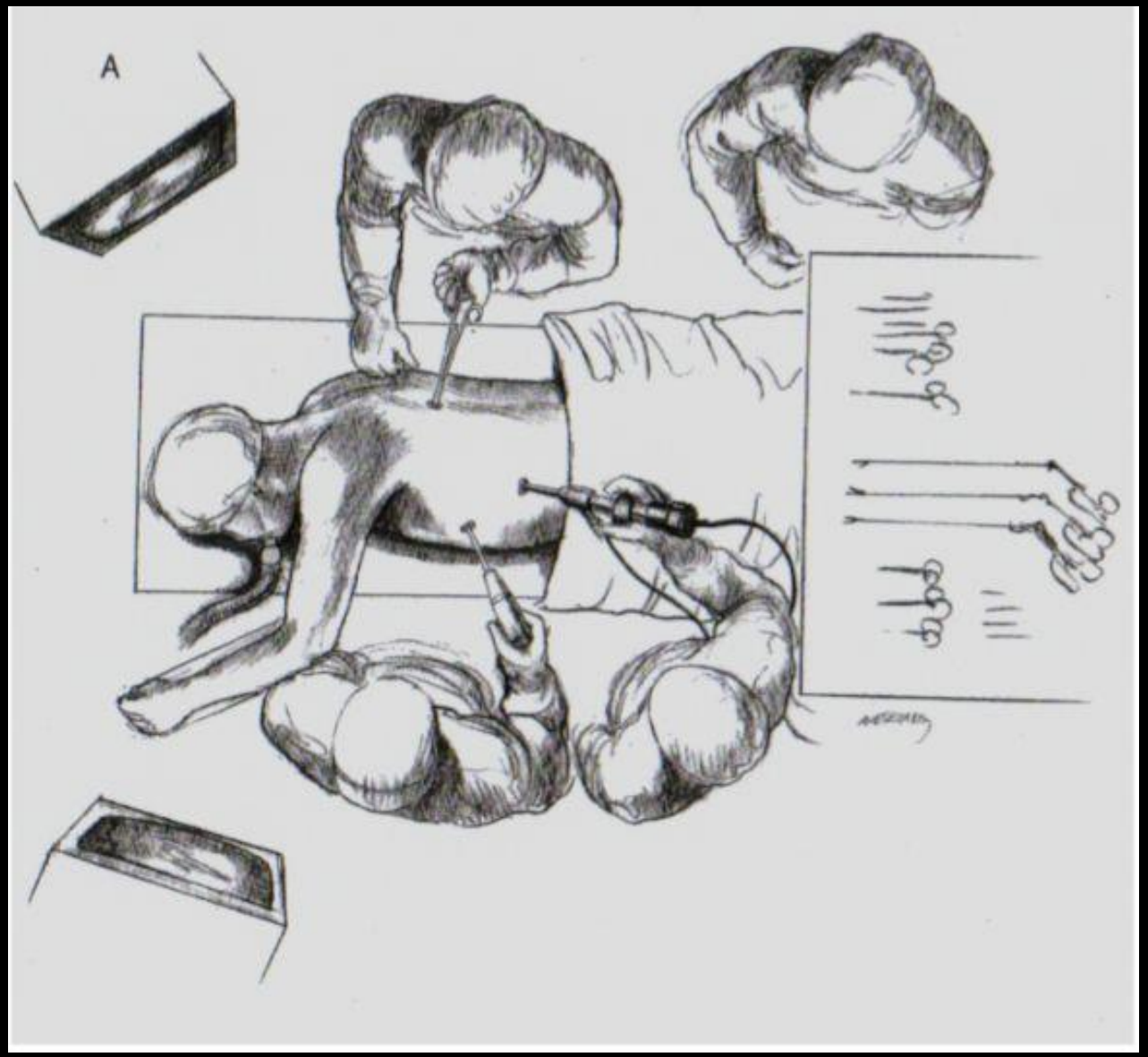
- Thoracosternotomy

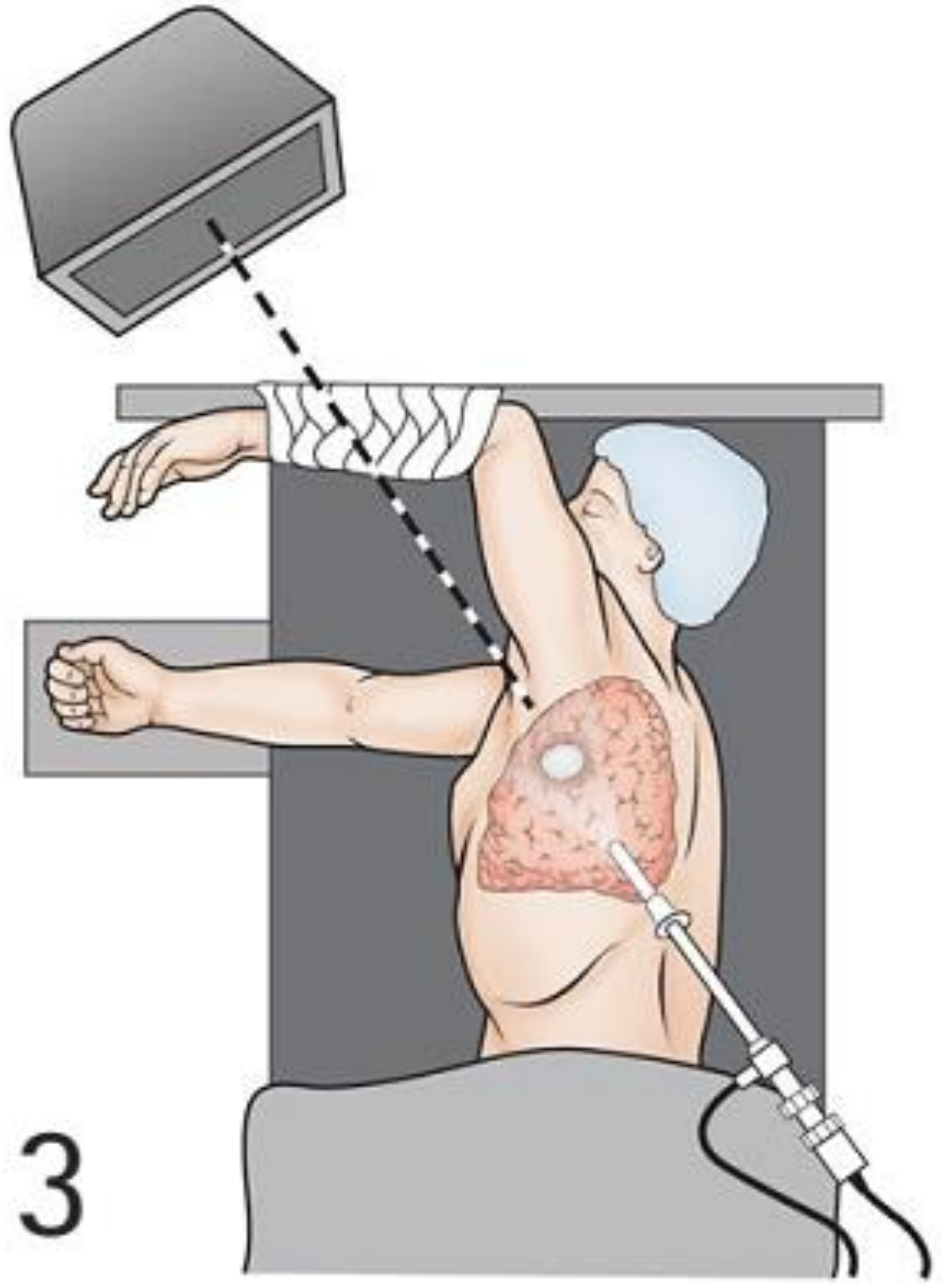


Anterior mediastinotomy

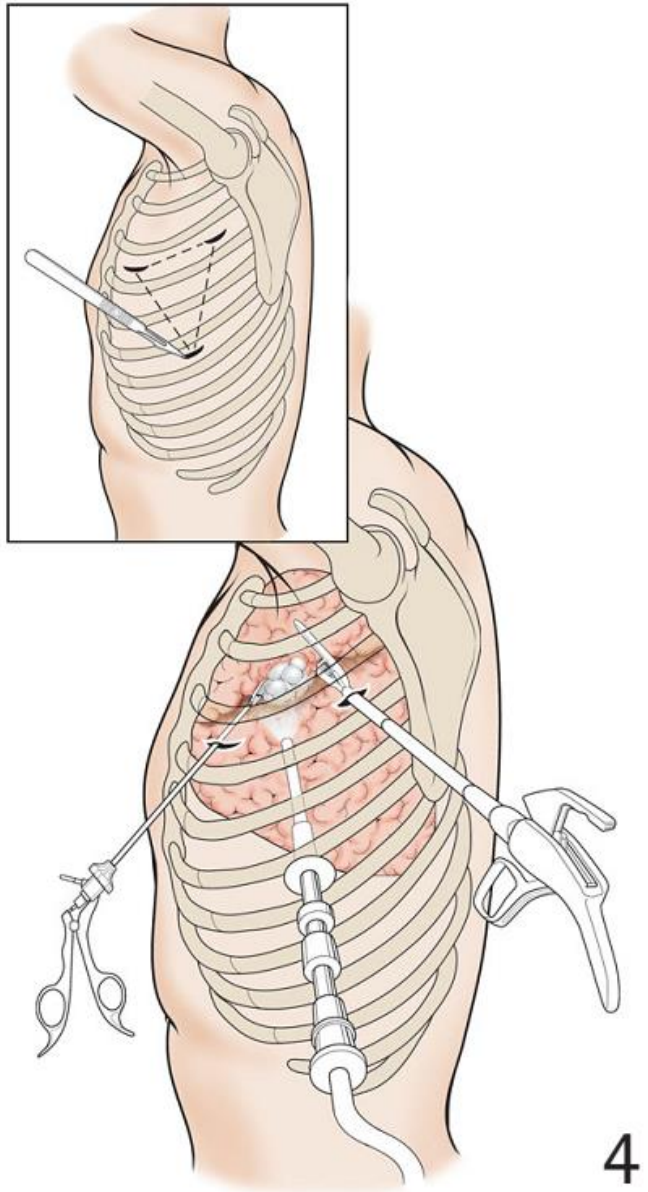


Video Assisted Thoracic Surgery





3



4

CHEST DRAINS

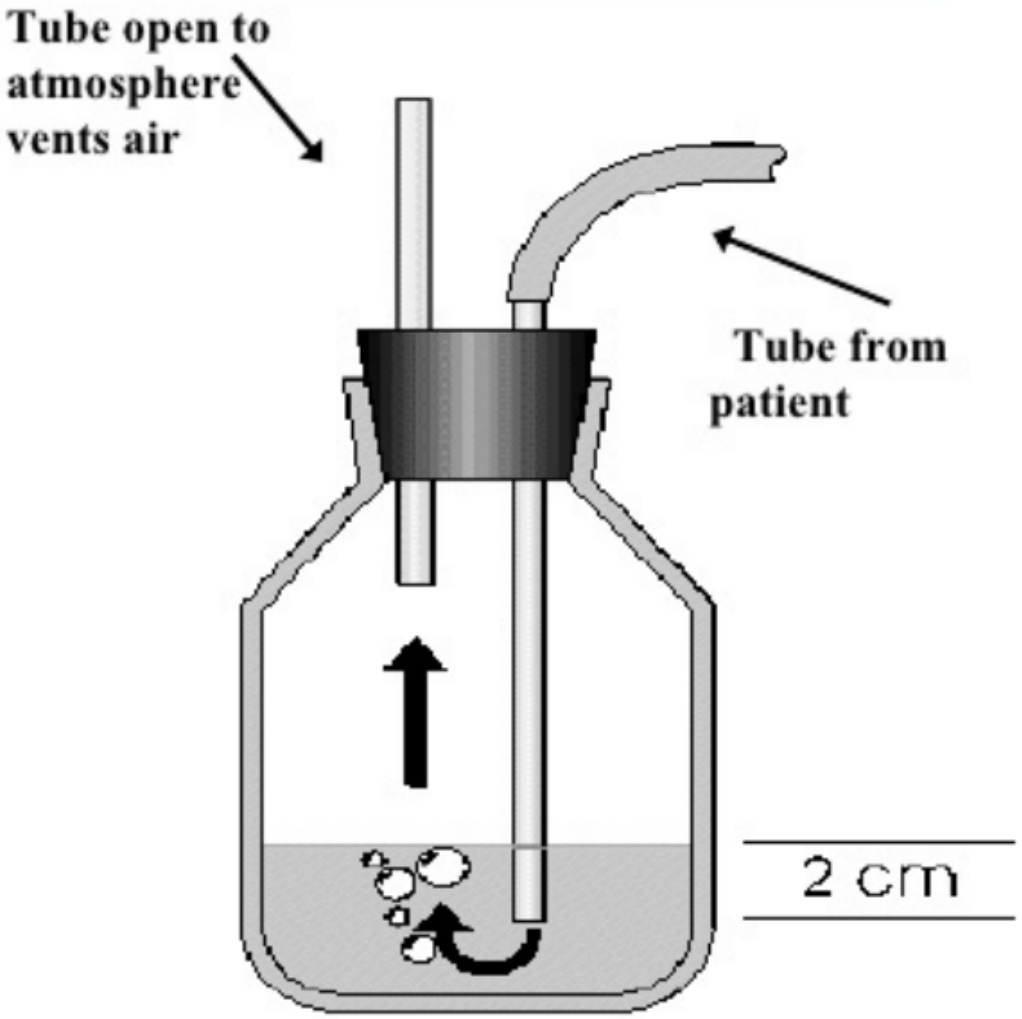
- Insertion site
- Type of chest drainage system: one, two, three bottle

Insertion site

- Triangle of safety(in mid axillary line) - 4th or 5th ICS
  - Ant.border of latissimus dorsi
  - Lateral border of pectoralis major
  - Line superior to horzontal level of nipple
  - Apex below axilla
- Midclavicular -2nd ICS
  - Thick pectoralis major –difficult to penetrate
  - Scar-cosmetic

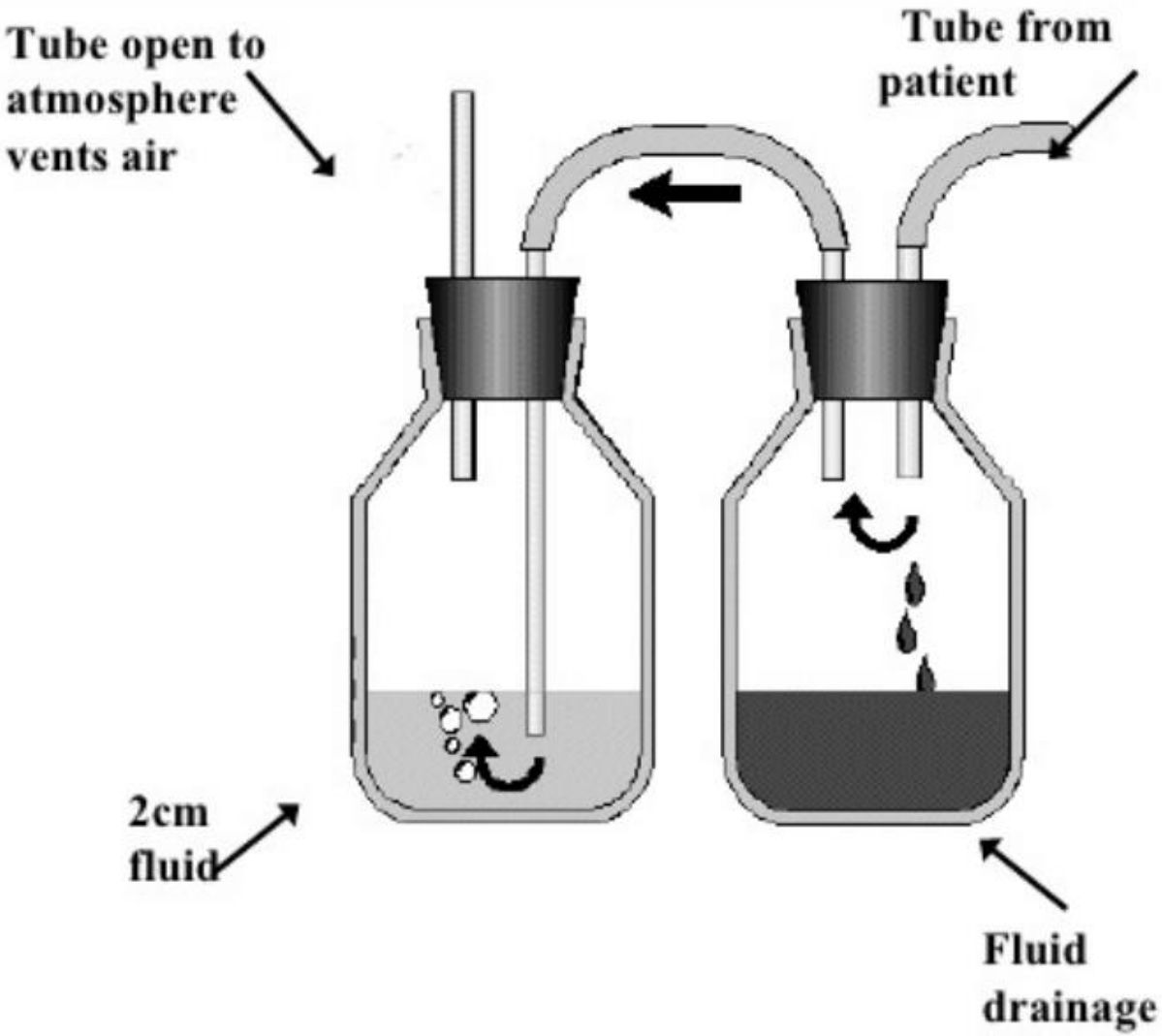
One bottle chest drainage system

- Water seal –low resistance one way valve
- Positive pressure > +2cm H2O
- **Tidalling** –pressure changes in the pleural space with breathing seen as fluctuations
- Combination of water seal and fluid collecton bottle

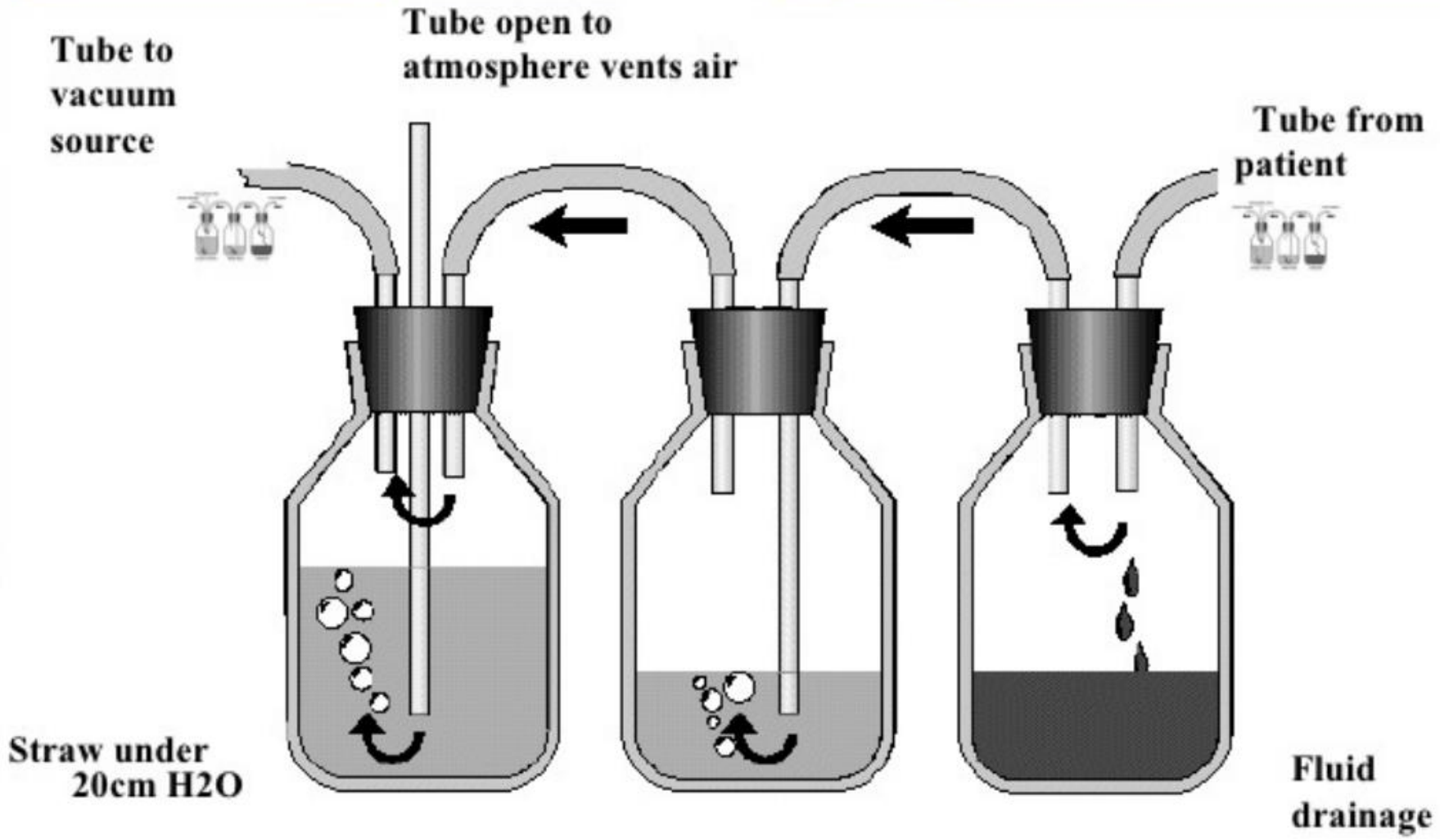


Two bottle chest drainage system

- Collection bottle and water seal
- Amount and rate of fluid drainage can be measured
- Water seal remain fixed
- Rely on gravity to create pressure gradient



Three bottle chest drainage system



POST OPERATIVE CARE

- Blood pressure
- Blood gases / saturation
- Urine output
- Bleeding
- Sputum
- Analgesia

CONCLUSION

- Cardiac sugery
  - Cardiopulmonary bypass
  - Cardiac surgical disease
- Thoracic surgery
  - Thoracic diseases
  - Thoracic incision
  - Thoracic procedure

Thank you for your attention

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