

흉부외과 1년차의 기본술기

-이론과 실제-

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- 1. Endotracheal Intubation**
- 2. Central line Insertion**
- 3. A-line Insertion**
- 4. Closed Thoracostomy**

1. Endotracheal Intubation

Non Intubation Management

Triple Airway Maneuver, 삼중기도처치법

- Unconsciousness but (+) self respiration
- Head tilting, jaw thrust, chin lift : supra-laryngeal airway patency

D Benson et al. Resuscitation.1996;32(1):51-62

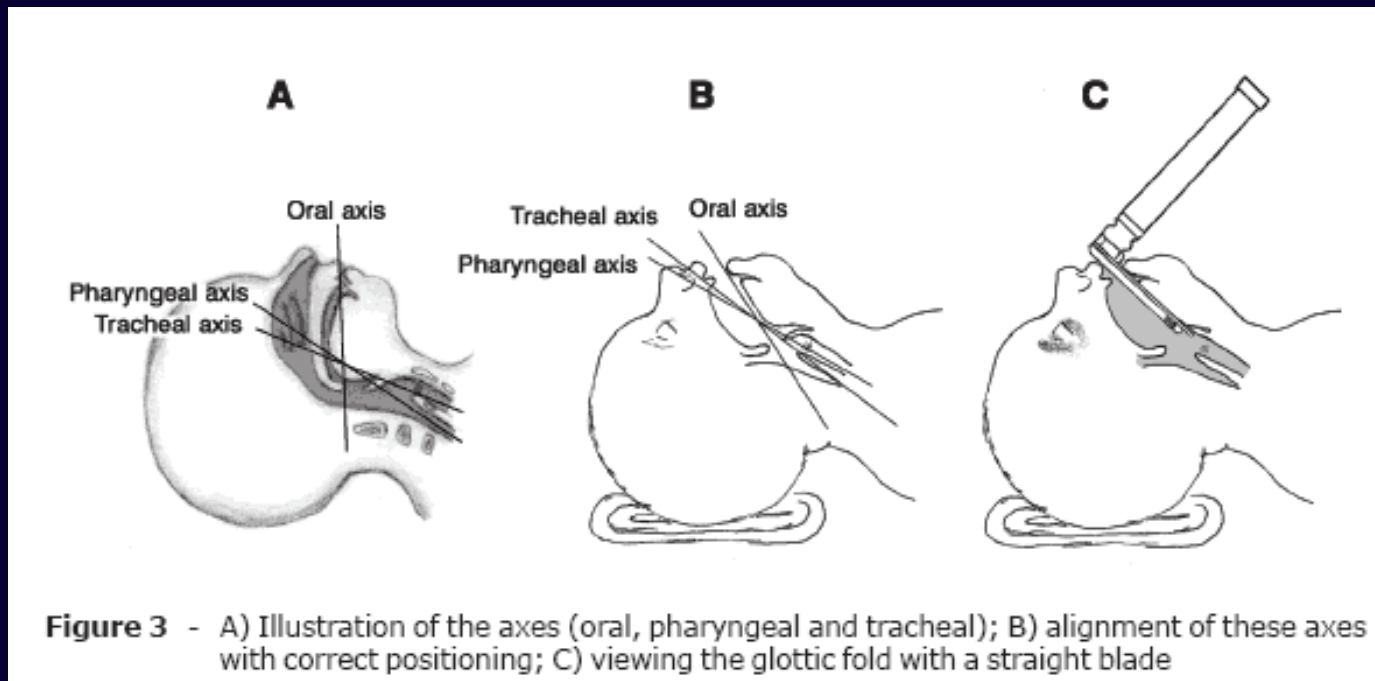


Anatomy

Upper Airway -3 Axis

-Oral Axis, Pharyngeal Axis, Tracheal Axis

-Need pillow under subscapular lesion (children) or occipital bone(Adult)



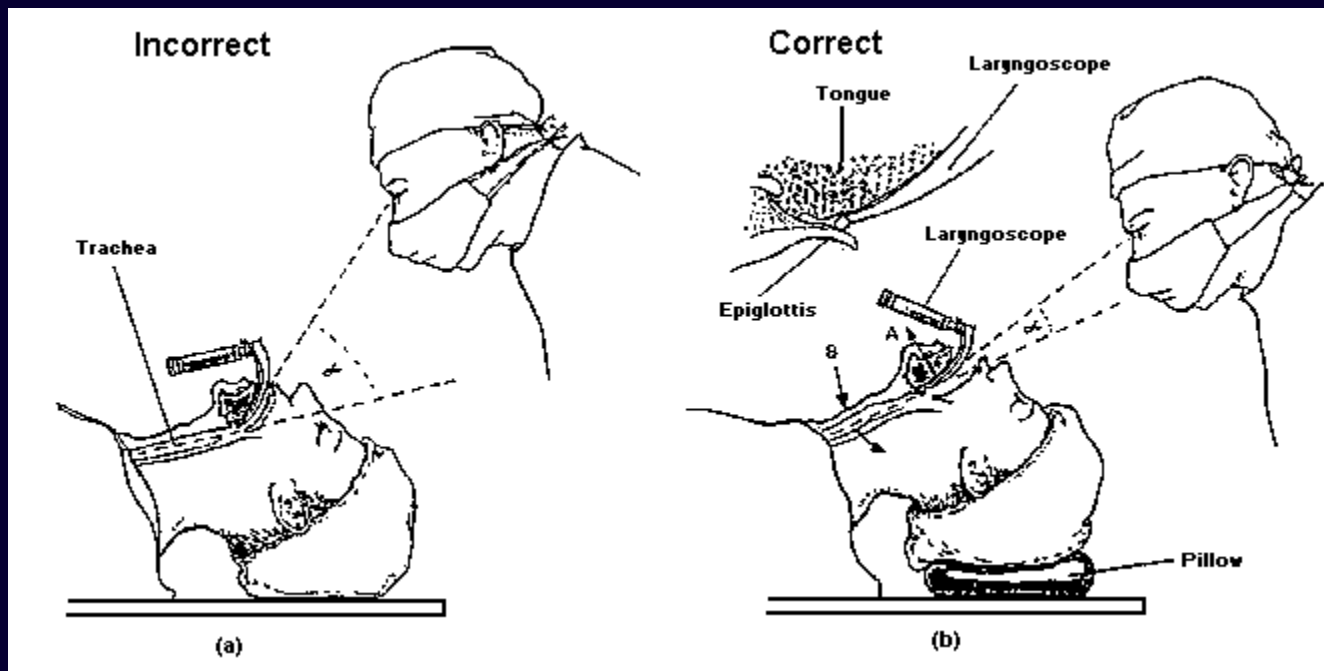
Anatomy

Upper Airway -3 Axis

-Oral Axis, Pharyngeal Axis, Tracheal Axis

-Need pillow under subscapular lesion (children) or occipital bone(Adult)

“ Sniffing Position ”



Endotracheal Intubation

Endotracheal tube, General

-Internal Diameter :

8.0(=8mm), 7.5(=7.5mm), 7.0(=7mm Bronchoscopic limit)

Adult male = 7.0-8.0

Adult female=6.5-7.5

In Children, Size=(Yrs+16)/4

-Depth :

21Cm for women, 23Cm for men

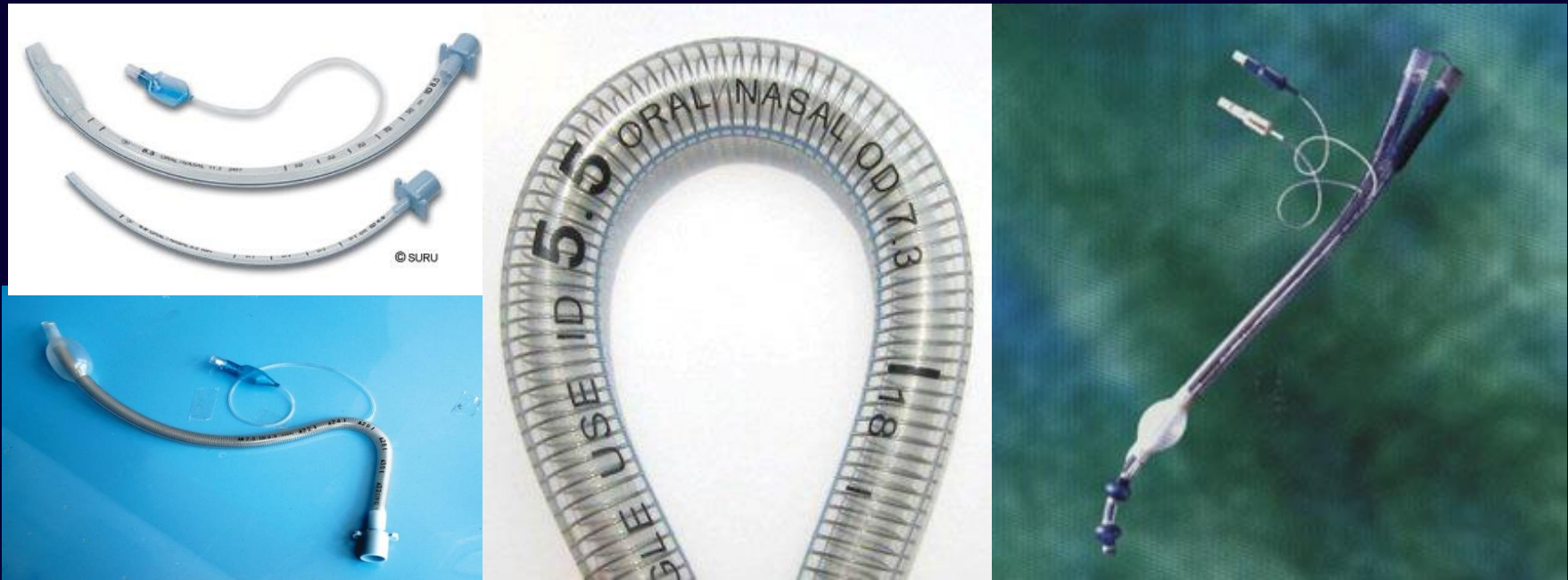
In Children, Depth Cm=10+Yrs/2



Endotracheal Intubation

Types of endotracheal tube

- Uncuffed tube : children under 12 yrs (narrowest in the subglottic area)
- Reinforced tube : internal metal ring
- Double lumen tube : protection of healthy lung
- Southfacing tube, Northfacing tube : no role in ICU



Endotracheal Intubation

Indications : any situation to maintain a patent and safe airway

PaO₂ ↓ , not corrected by conventional oxygen supplement by mask and nasal prongs

PaCO₂ ↑ or Failure to maintain airway patency

- Swelling of upper airway : anaphylaxis, infection
- Facial or neck trauma with Oropharynx bleeding
- Decreased consciousness and loss of airway reflex

Bronchial Toilet

- Failure to protect airway aspiration

Failure to ventilate

- General Anesthesia

Charles E et al. In Current Emergency Diagnosis and Treatment. 4th Edi. 1992. SAUNDERS.

Barash PG, Clinical Anesthesia. 1992. Lippincott.

Endotracheal Intubation

Contra-Indications :

Severe Airway Trauma or Obstruction, that does not permit safe passage of an endotracheal tube. → Emergency Cricothyrotomy

Cervical spine injury need for complete immobilization. → Fiberoptic intubation

Inability to open mouth (e.g. trismus, scleroderma) → nasotracheal intubation

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Endotracheal Intubation

Double lumen Endotracheal tube

Absolute Indication

- Soilage risk – hemoptysis pts.
- Bronchopulmonary lavage

Relative Indication

- Lung resection surgery
- Thoracoabdominal aneurysm repair
- Esophageal surgery
- VATS
- Thoracic spine surgery

Endotracheal Intubation

Preparing the Precedure : ICU에 붙여두세요

1. Ambu bag & Oxygen line
2. Suction tip
3. Laryngoscope : curved and straight
4. E-tube : size, type
5. Oral airway
6. Stylets
7. Syringe : 10mml
8. Sedative and relaxative drug
9. Lubricant
- 10.gloves

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SAUNDERS.

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Endotracheal Intubation

P/Ex : Difficulty Check !!

1. Head shape
micrognathia, mandibular hypoplasia, Down SD.
2. Protruding or prosthetic teeth
3. Large big tongue
trisomy 21, mucopolysaccharidoses
4. T-M joint mobility ↓
ankylosis, type 1 DM, trauma, RA
5. Oral cavity malformation
Laryngeal CA, edema, post OP edema

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Endotracheal Intubation

Complications :

During intubation

Laryngospasm

Laceration lips,tongue,pharynx

Dislodgement of teeth

Perforation trachea,esophagus

Cervical spine injury

Haemorrhage

Aspiration gastric content/ FB

Esophageal intubation

Arytenoid cartilages injury

Hypoxemia, hypercarbia.

Bradycardia, tachycardia

Hypertension

Increased ICP or IOP

Endotracheal Intubation

Complications :

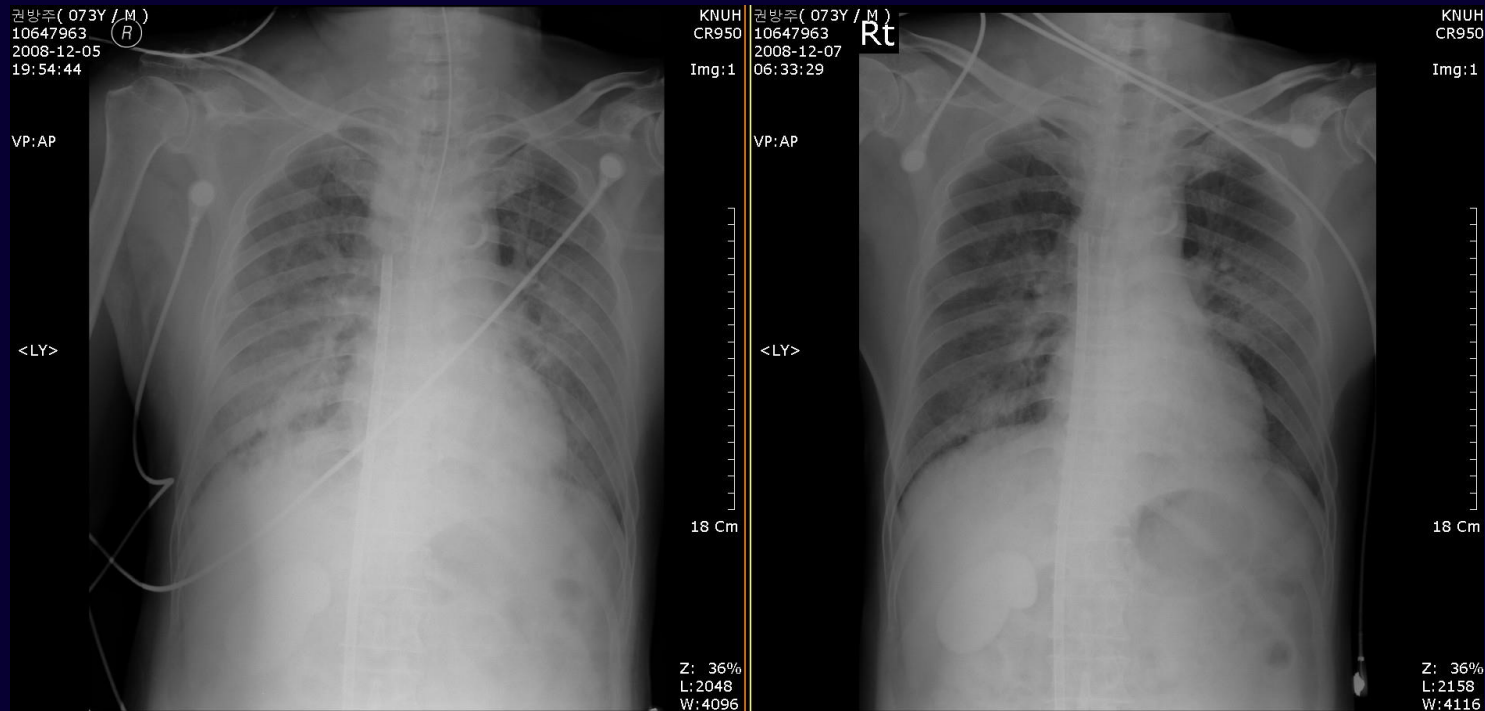
Complication after extubation

- Laryngospasm
- Aspiration
- Glottic,subglottic, uvular edema
- Dysphonia,aphonia
- Paralysis of vocal cord
- Sore throat
- Laryngeal incompetance.
- Tracheomalacia
- Glottic,subglottic or tracheal stenosis
- Vocal cord granulomata.

Endotracheal Intubation

Verification Of Correct Tube Placement

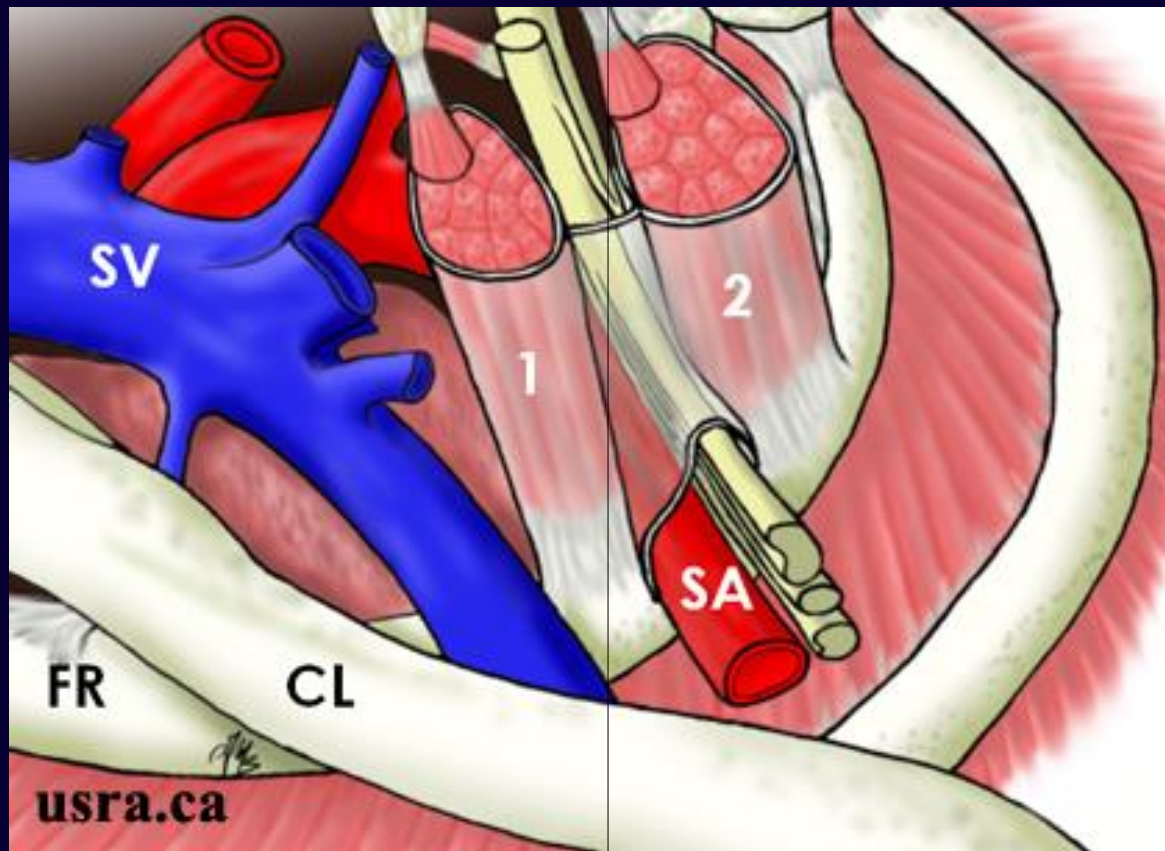
- Direct vision of the endotracheal tube passed through the vocal cords
- Symmetric Chest Movement , Symmetric Breath Sounds
- End tidal Carbon Dioxide : > 30 For 3-5 Breaths
- Fiberoptic Bronchoscopy



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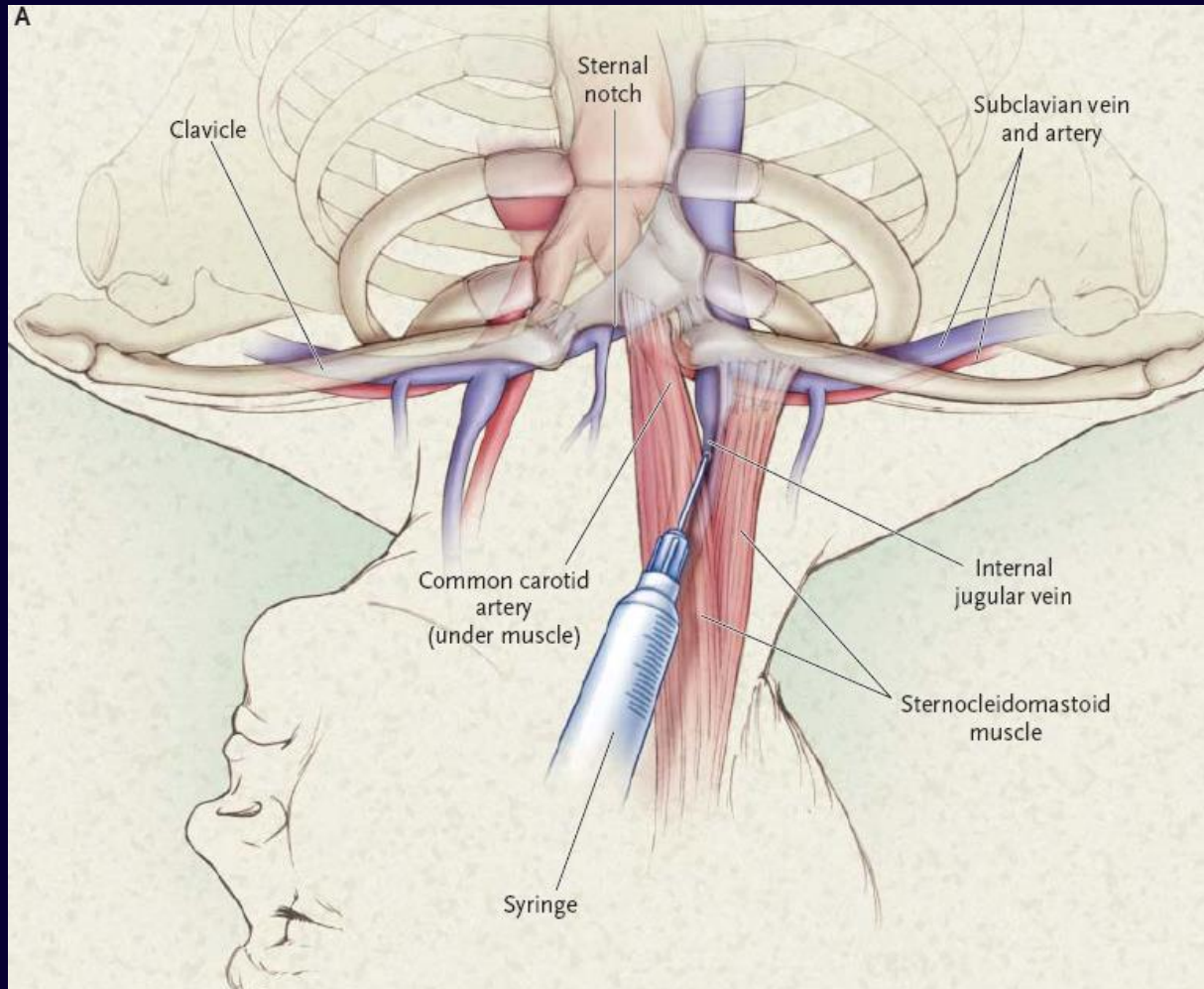
2. Central Line Insertion

Anatomy Subclavian vein, SCV



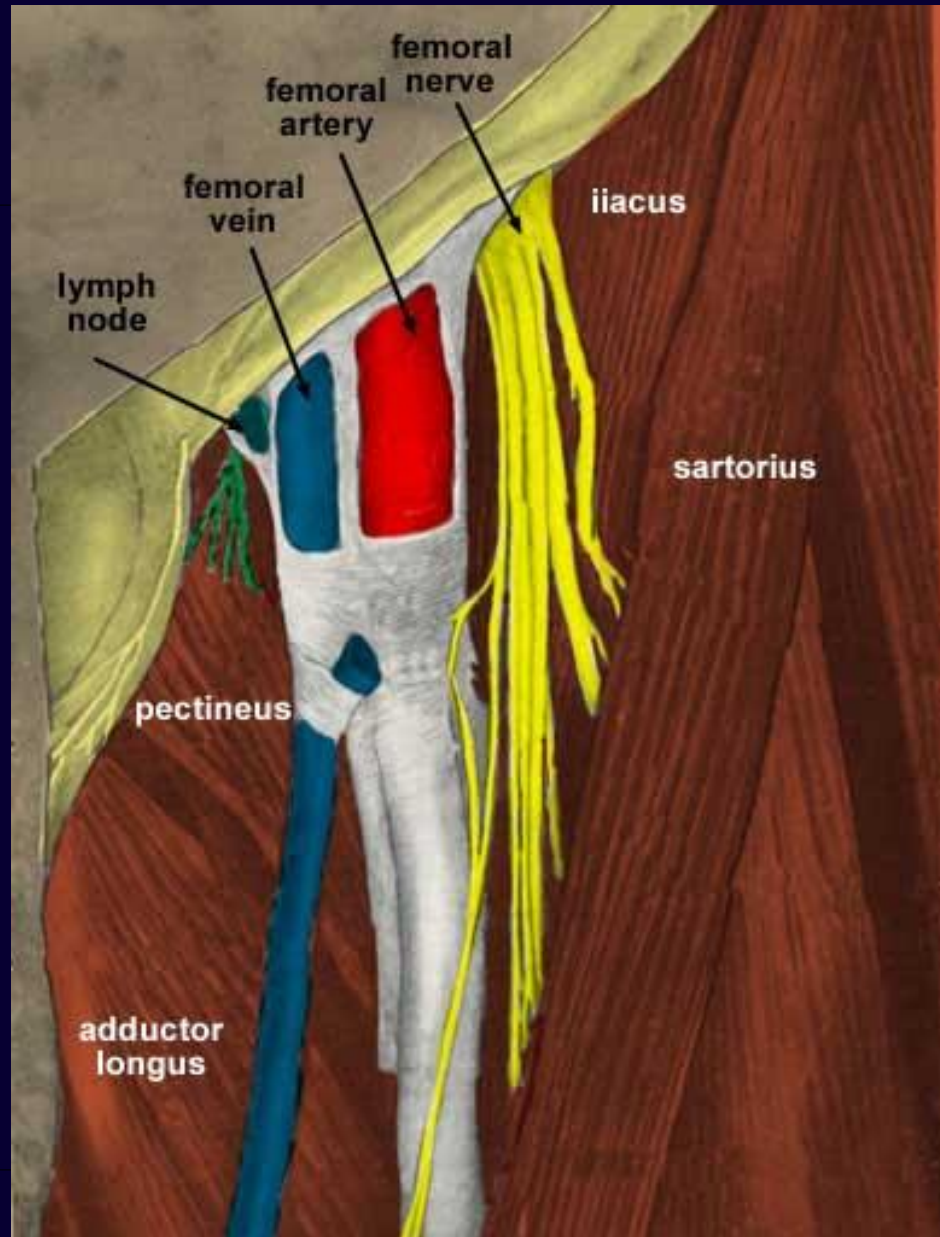
Internal Jugular Vein

Surface Anatomy



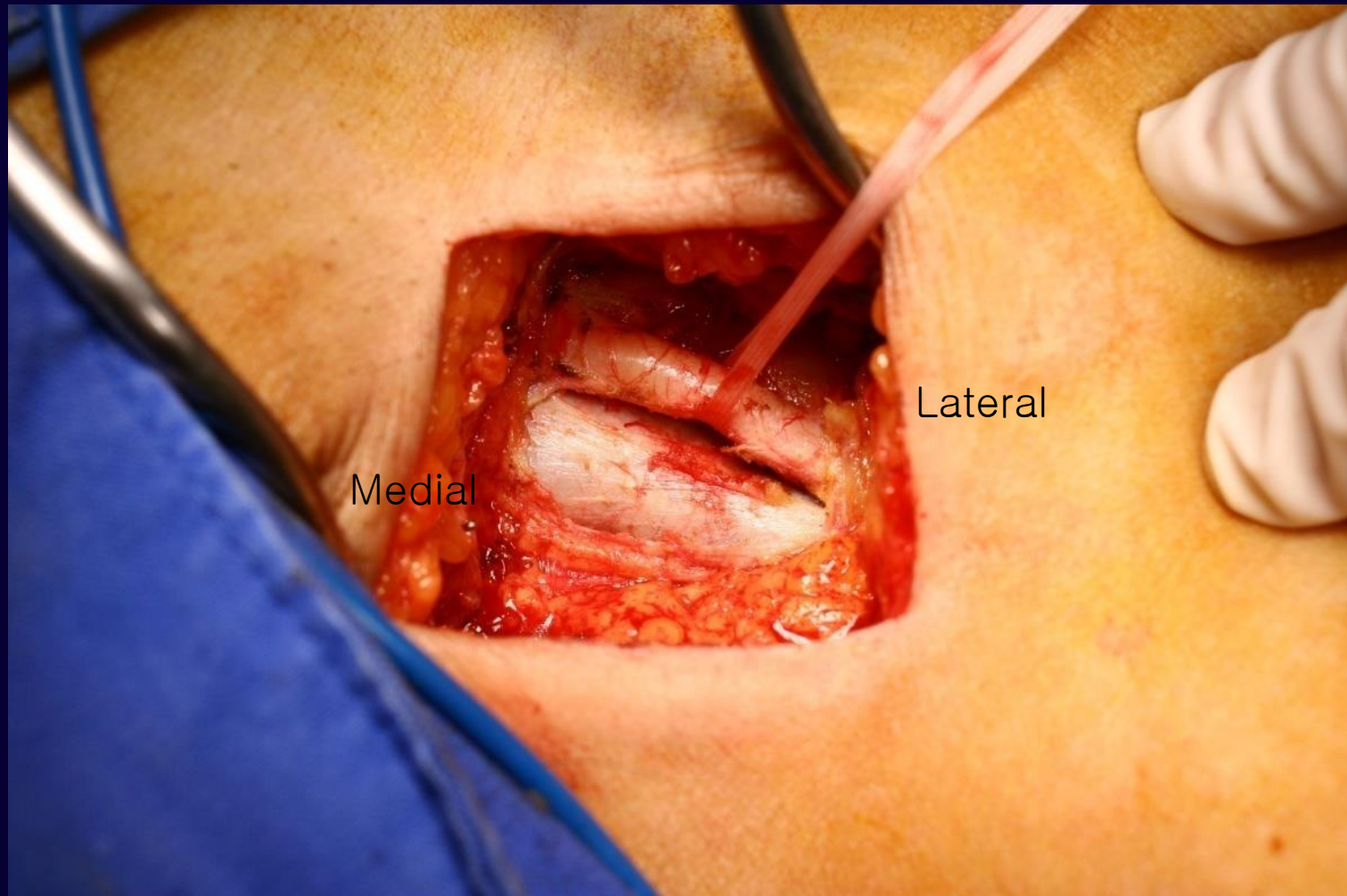
Anatomy

Femoral Vein, FV



Anatomy

Femoral Vein, FV



Indication of C-line insertion

Major Indication

Administration of Medication ; vasopressor, chemotherapy, TPN
Hemodynamic monitoring ; CVP
Plasmapheresis, hemodialysis, CVVH

Minor Indication

Poor peripheral access : PICC
Volume resuscitation : large bore cath.
Frequent blood draw : PICC

Contra-Indication of C-line insertion

Absolute

Peripheral IV access is adequate for the clinical needs of the patient

Infection over catheter site

Operator inexperience (unless supervised by an experienced practitioner)

Uncooperative or combative patients

Clot in the selected vein

Relative

Coagulopathy and thrombocytopenia (platelets are $< 50k$ and INR > 1.5)

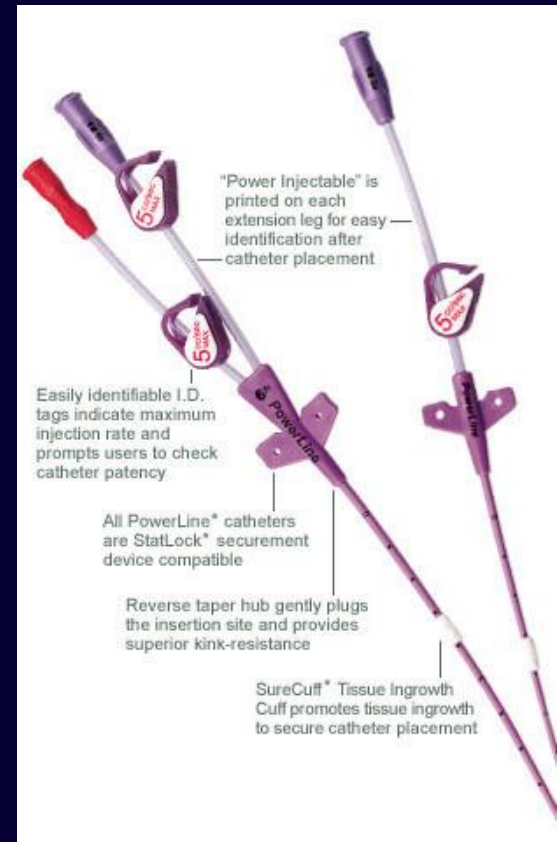
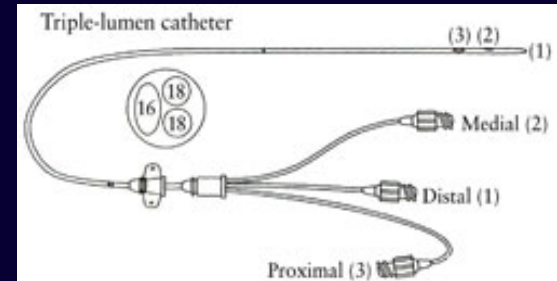
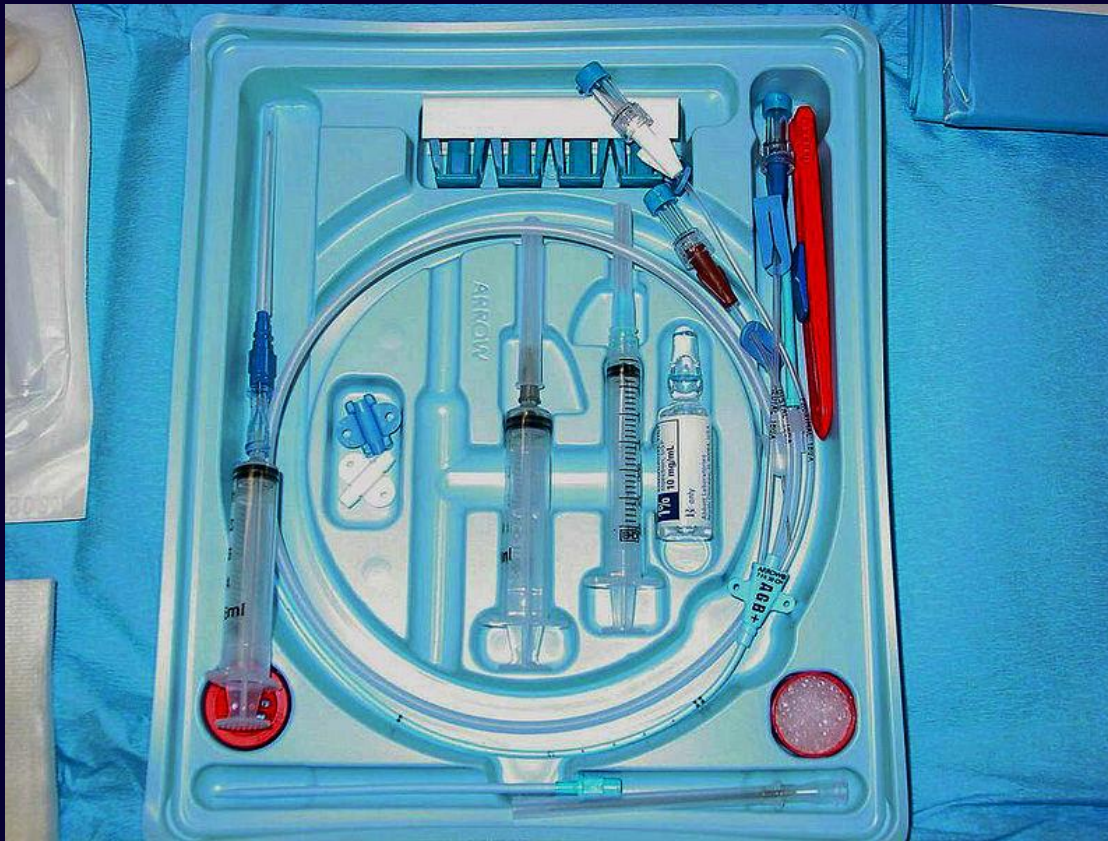
Injury or previous surgery to superior vena cava (e.g., superior vena cava syndrome)

Complications that can be life-threatening (i.e pneumothorax in COPD or bleed).

Site Selection

Location	Advantages	Disadvantages
Femoral Vein	Fast, easy, high success rate Does not interfere with Intubation 0% risk of pneumothorax	No CVP monitoring Prevents patient mobilization Higher rates of thrombosis, infection than SCV Femoral artery puncture more frequent than SCV
Internal Jugular Vein	Easy to control bleeding Pneumothorax is less common Straight shot into SVC	Difficult to access (intubation, tracheostomy) Poor landmarks in obese, short neck patients Carotid puncture more frequent than SCV Higher rates of thrombosis than SCV
Subclavian Vein	Most comfortable for patient Bony landmarks in obesity Lowest risk of thrombosis Lowest risk of line infection	Higher risk for pneumothorax Compression of bleeding site difficult Long pass from skin to vein (consider in obesity) Contraindications in lung disease, coagulopathy

Equipment



Procedure

Internal Jugular vein

1. Informed consent from patient
2. Skin preparation : both area using povidone-iodine or 2% chlorhexidine
3. Turn head in the opposite direction and head down
4. Local anesthesia and U/S guided marking, lateral to CCA
5. puncture the top of triangle at 30° and aspiration. (if not, 3 finger rule)
6. Guide wire insertion –caution
7. Note the arrhythmia
8. Remove the needle
9. Skin dilator insertion – twisting and No. 11 blade
10. Remove the dilator
11. Place catheter over guide wire – brown cap
12. Remove the guide wire
13. Flush the line through all port
14. Suture
15. Confirm chest film – SVC and RA junction.

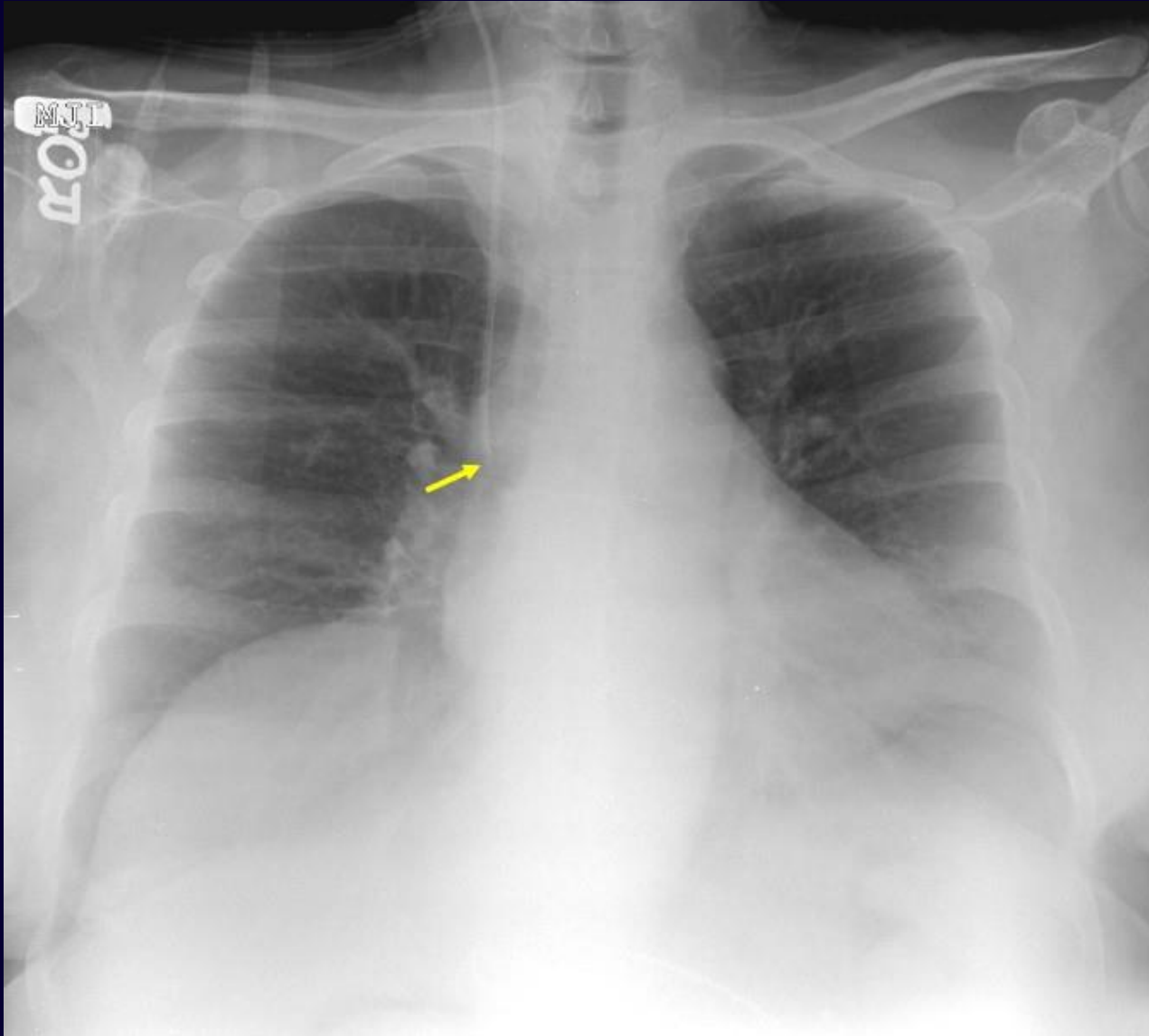
Procedure

Subclavian vein



75세 남자, 폐엽절제술 예정으로 술 전 검사에서 특별한 이상소견은 없었으나 마취직후 A fib RVR 발생. 추정되는 원인은?

Procedure



General Complications

Complications during insertion

- Arterial puncture
- Pneumothorax
- Arrhythmias
- Bleeding, haematoma, haemothorax
- Damage to thoracic duct, chylothorax
- Nerve injury
- Air emboli
- Catheter shearing/fragment
- Malplacement
- Airway obstruction
- (rare : may be due to large bilateral hematoma)

Late complications

- Infection
 - local
 - systemic
 - endocarditis
- Thrombosis, thromboembolism
- Cardiac dysrhythmias
- Cardiac perforation and tamponade
- Mediastinitis

Table 1. Risk of Complications Associated with Internal Jugular, Subclavian, and Femoral Central Venous Catheterization.

Complication	Risk of Complication at Catheterization Site*		
	Internal Jugular Vein	Subclavian Vein	Femoral Vein
Pneumothorax (%)	<0.1 to 0.2	1.5 to 3.1	NA
Hemothorax (%)	NA	0.4 to 0.6	NA
Infection (rate per 1000 catheter-days)	8.6	4	15.3
Thrombosis (rate per 1000 catheter-days)	1.2 to 3	0 to 13	8 to 34
Arterial puncture (%)	3	0.5	6.25
Malposition	Low risk (into inferior vena cava, passing through right atrium)	High risk (crossing to contralateral subclavian vein, ascending internal jugular vein)	Low risk (lumbar venous plexus)

Complications

Infectious Complication (SC<IJ or FV)

3 Mechanism

- 1) local insertion site infection → Ascending infection
- 2) Intra luminal hub colonization
- 3) Hematogenous seeding

5 step consideration : all (+) evidence

- 1) hand hygiene
- 2) Gowning
- 3) 2% chlorhexidine skin antisepsis
- 4) optimal catheter site selection
- 5) daily review of the necessity

Complications

Mechanical Complications : IJ or SC < FV

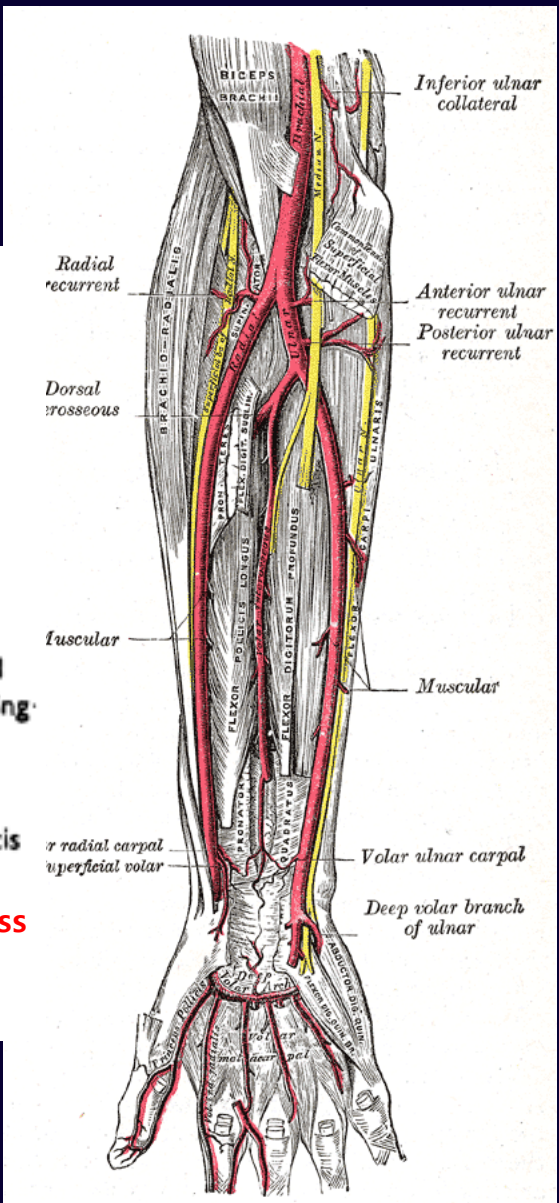
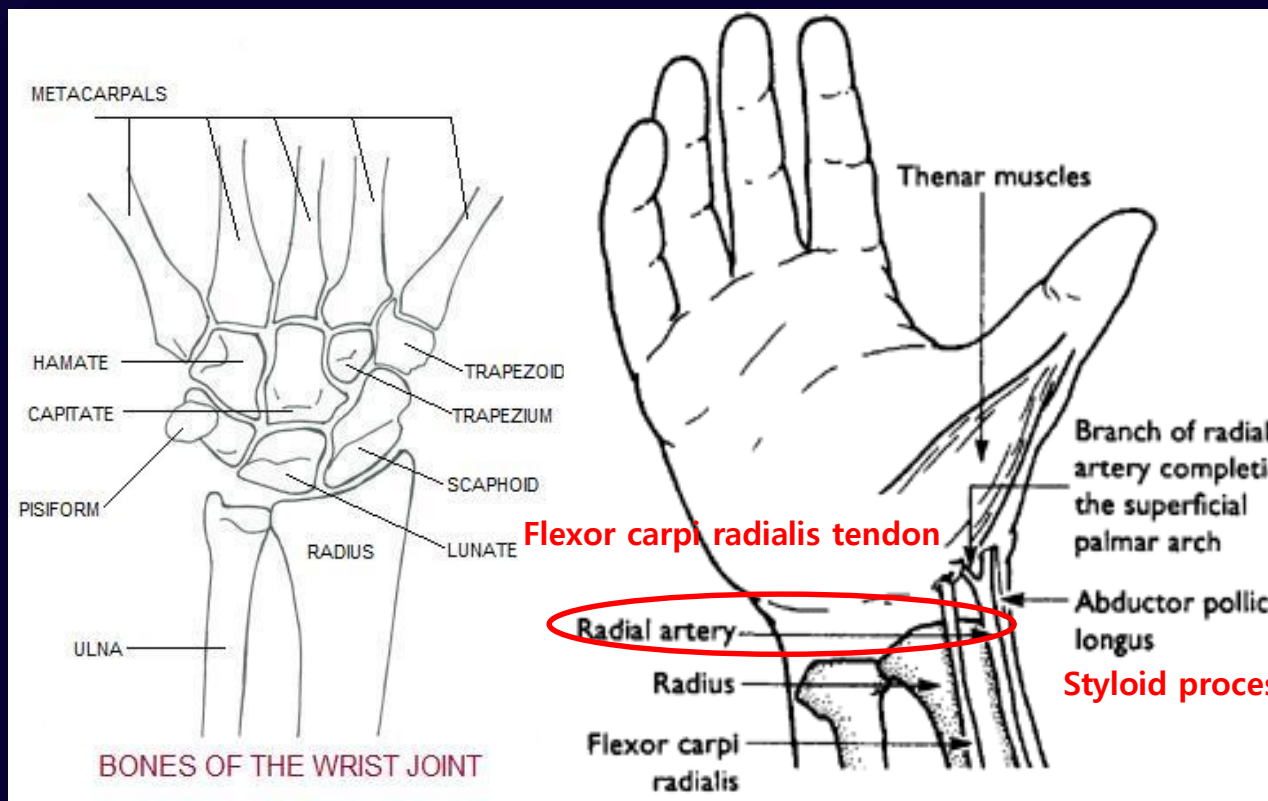
Arterial puncture, hematoma, Px, Hx, arrhythmia, improper location.

Thrombotic complication : SCV(1.9%) < FV(21.5%) or IJV (8%)

3. A-line insertion

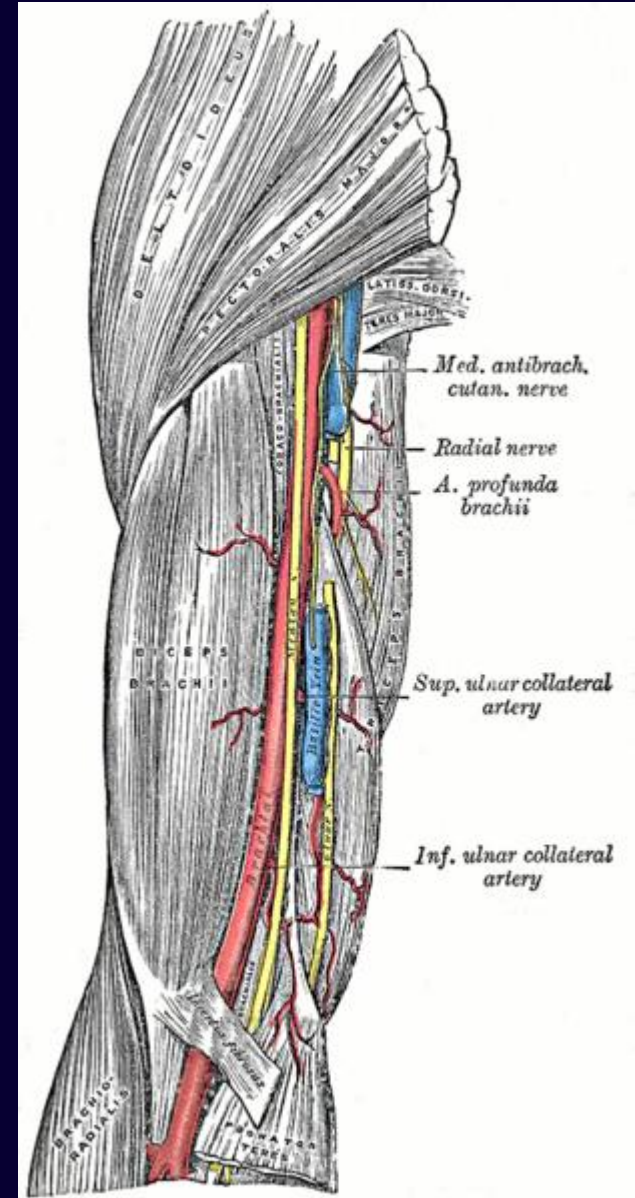
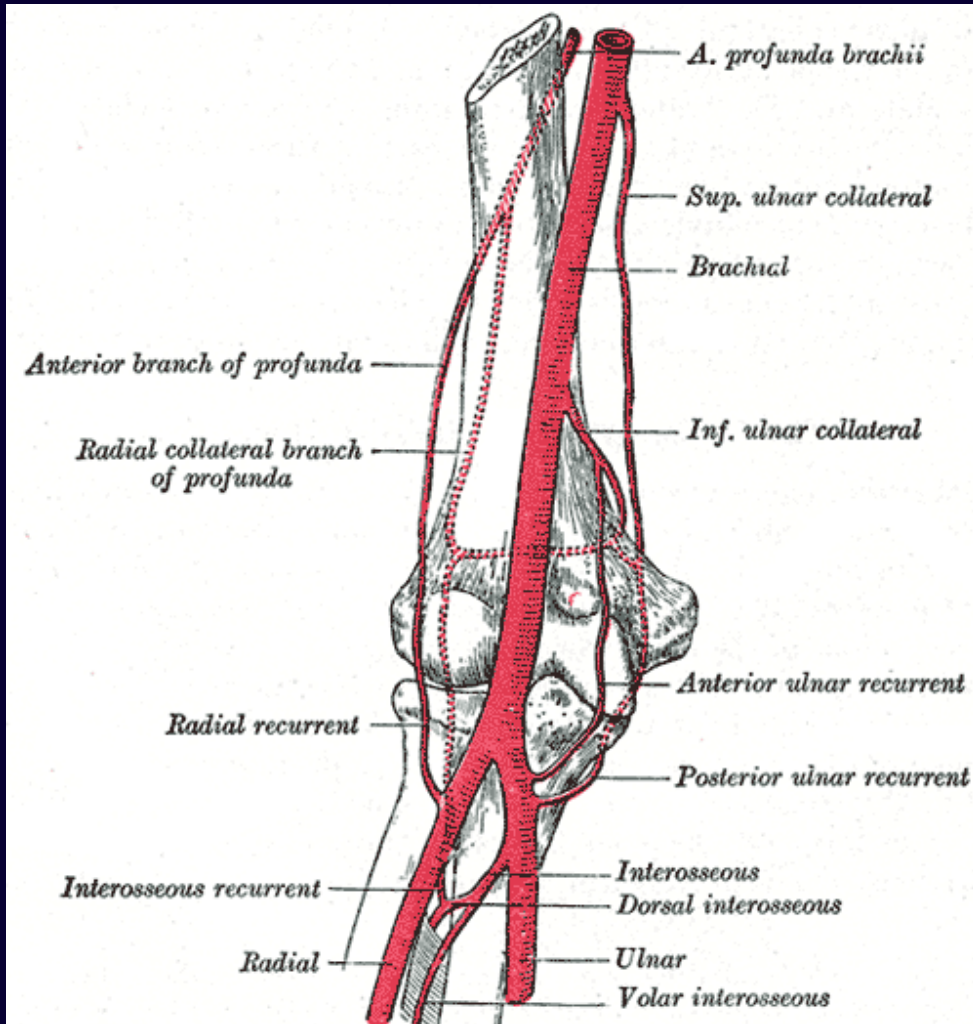
Anatomy

Radial artery



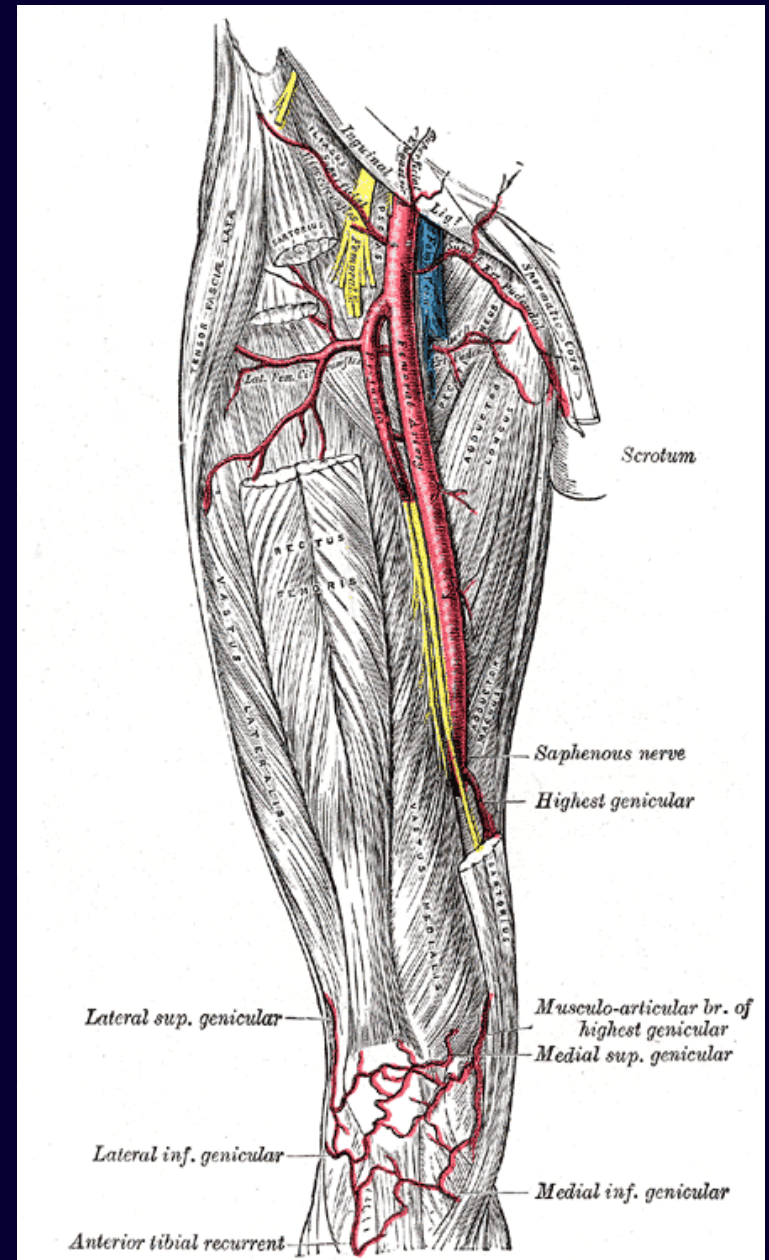
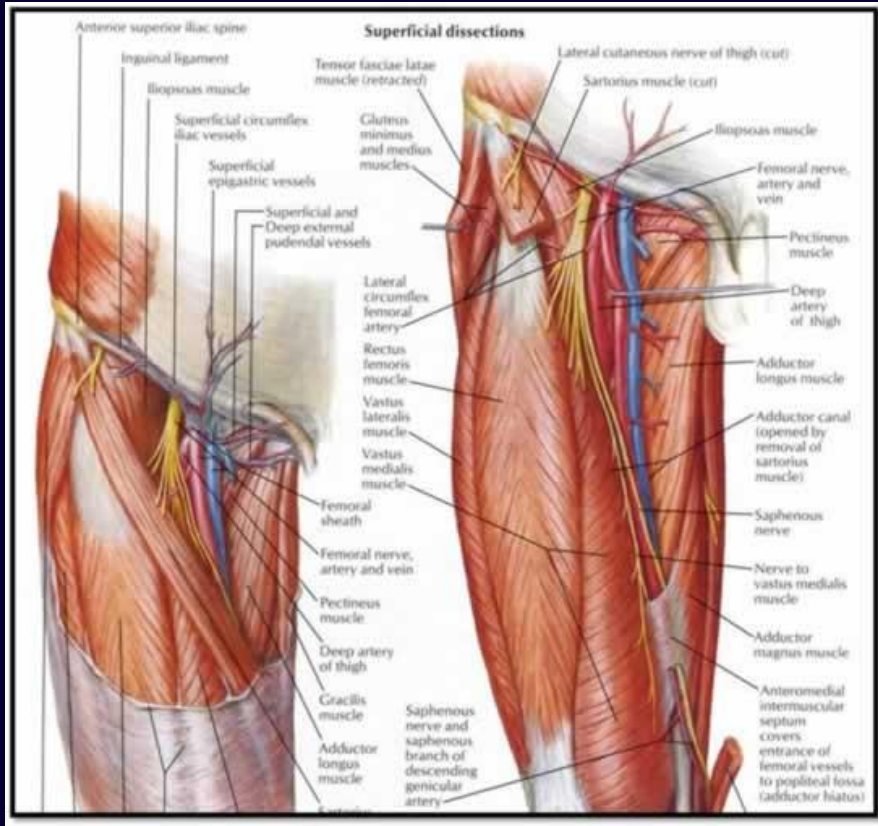
Anatomy

Brachial artery



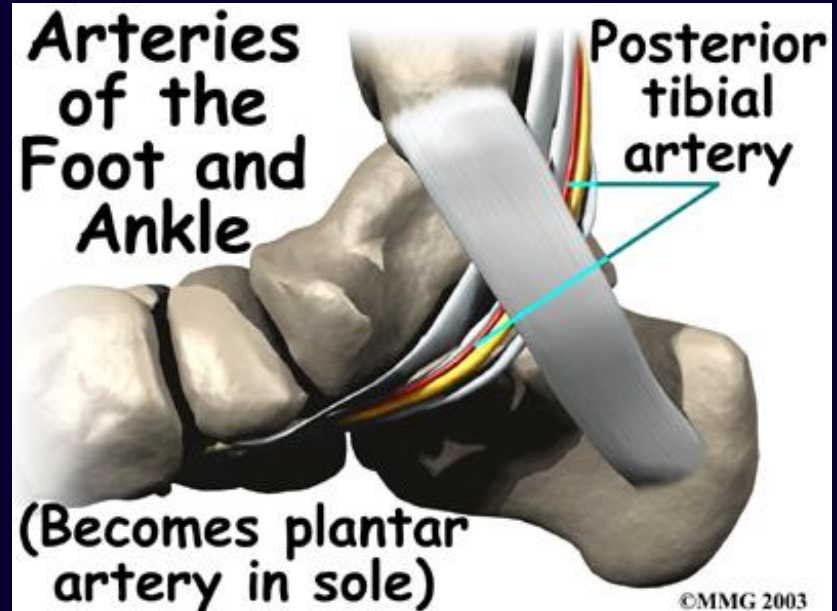
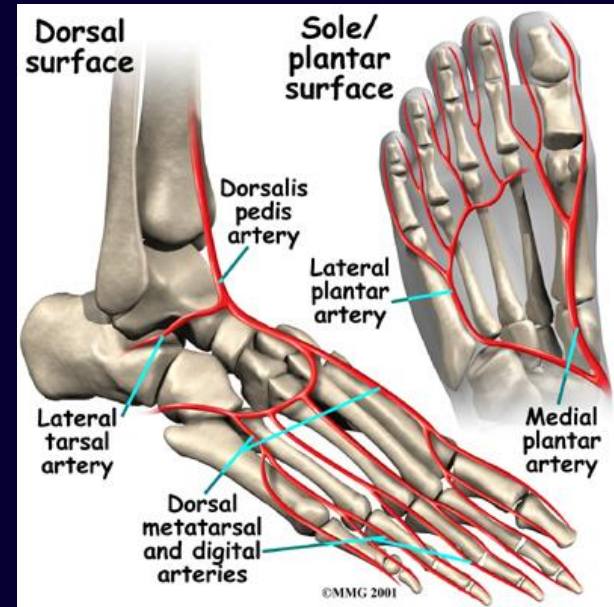
Anatomy

Femoral artery



Anatomy

DPA and PTA



Indication & Cix of A-line insertion

Indication

Frequent ABGA, blood sample

Consistant monitoring of blood pressure, wave form (IABP)

Impossible to checking NBP : burn, obesity, multiple trauma

Contra-Indication

Cellulitis or other infections over the radial artery

Absence of palpable radial arterial pulse

Positive Allen test

Coagulation defects and bleeding tendency

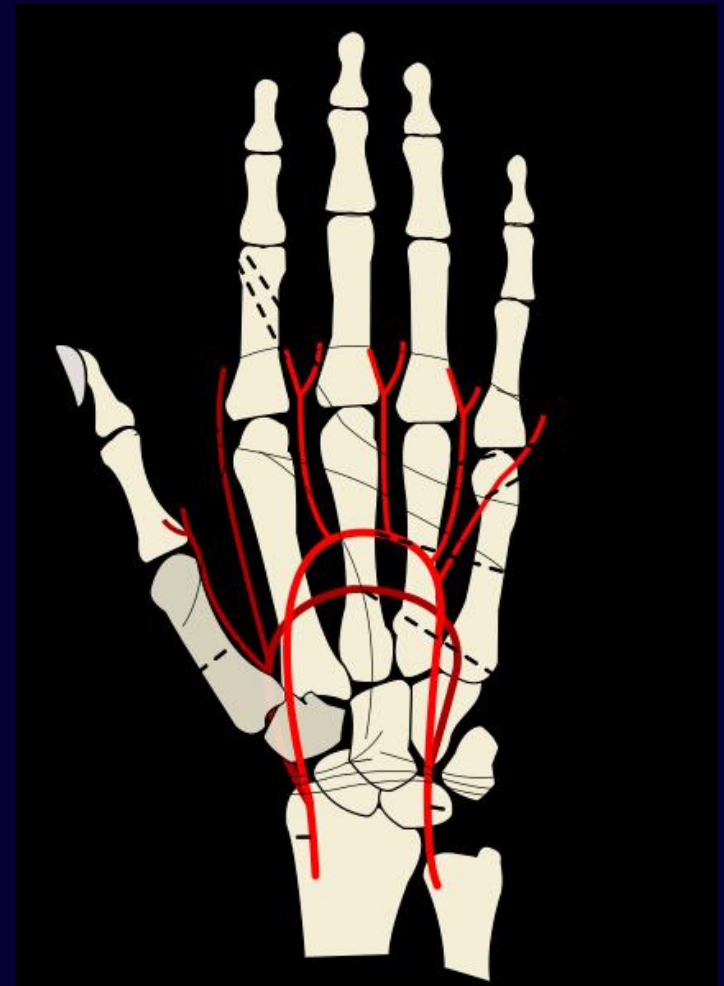
Charles E et al. In Current Emergency Diagnosis and Treatment. 4th Edi. 1992.
SAUNDERS.

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(+) Allen Test

- 1) The hand is elevated and the patient is asked to make a fist for about 30 seconds.
- 2) Pressure is applied over the ulnar and the radial arteries so as to occlude both of them.
- 3) Still elevated, the hand is then opened. It should appear blanched.
- 4) Ulnar pressure is released and the color should return in 7 seconds.

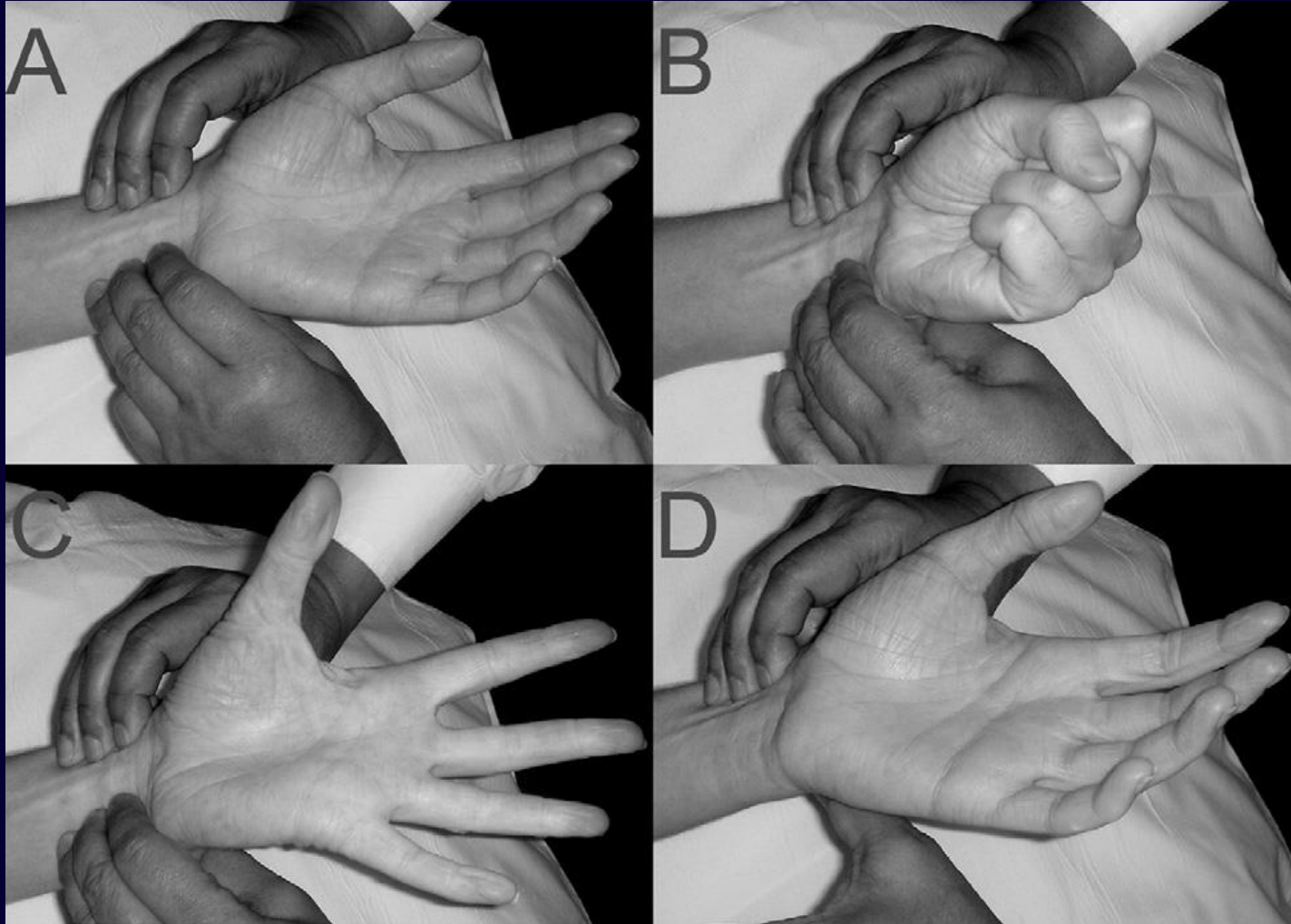
If color does not return or returns after 7–10 seconds, then the ulnar artery supply to the hand is not sufficient and the radial artery therefore cannot be safely pricked/cannulated.



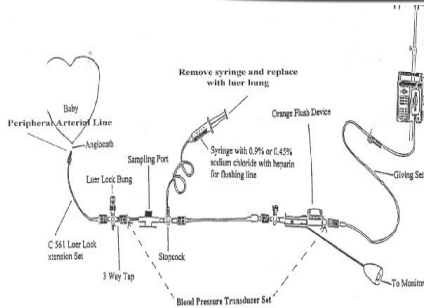
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3 digit Mod. Allen Test



Equipment



Procedure

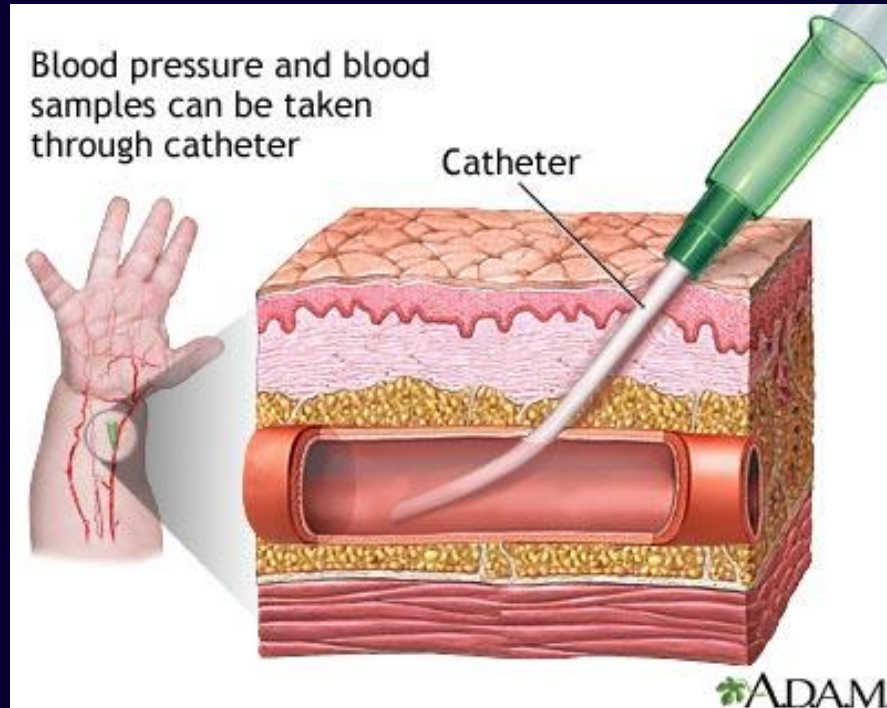


Complications

Rare fatal complication (less than 1%)

Ischemia :

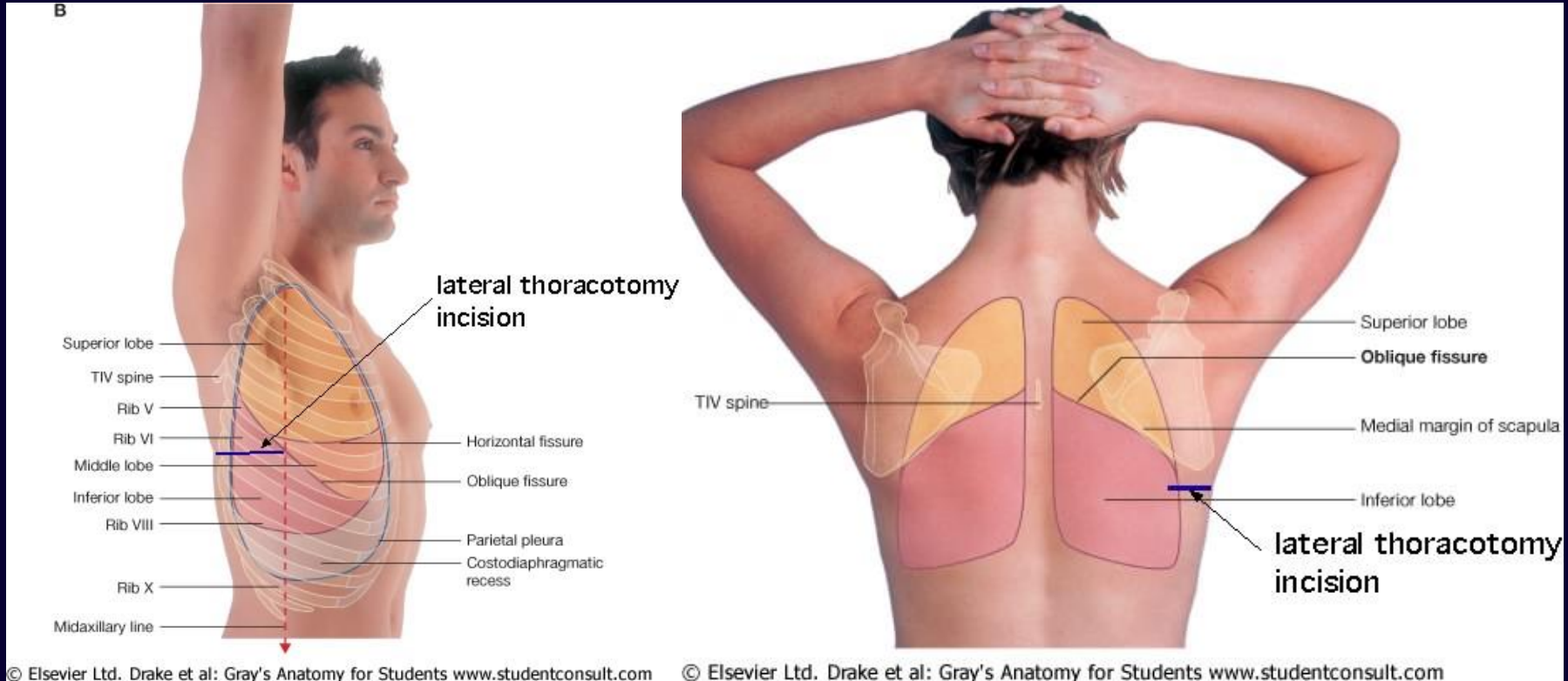
PAD,
indwelling time,
puncture time
Pseudoaneurysm
Hematoma
Nerve injury
Infection



4. Closed Thoracotomy

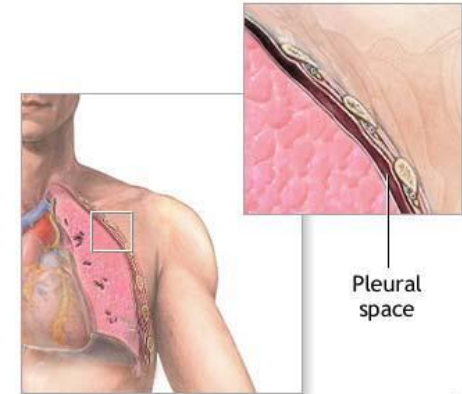
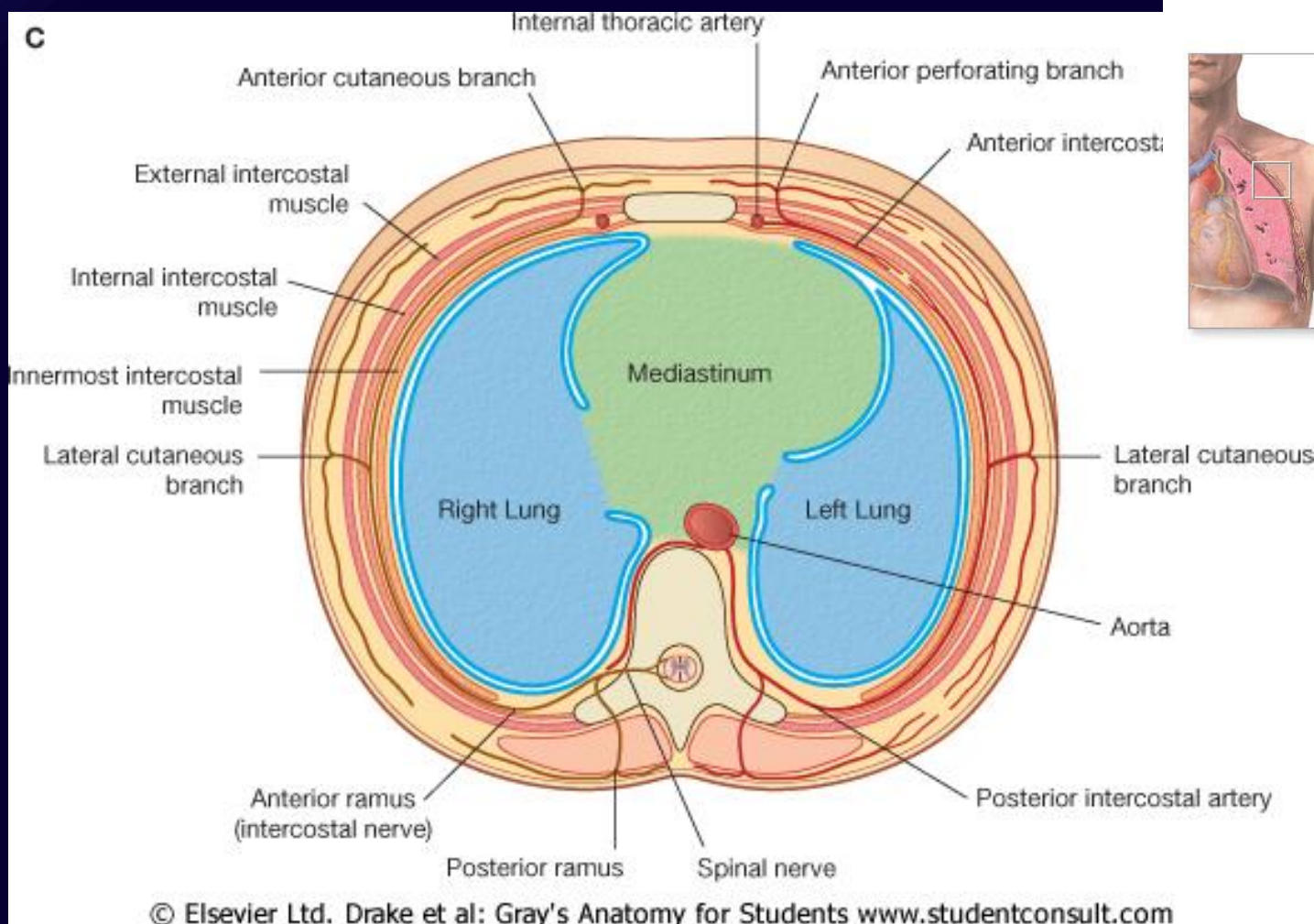
Anatomy

Surface Anatomy ; 4th, 6th, 8th ICS



Anatomy

Intercostal muscle, Endothoracic fascia, Parietal pleura



Indication & Contra-Ix

Indication – Drainage and Lung expansion

1. Pneumothorax
 - ventilated pts.
 - tension Px
 - large secundary pneumothorax over 50 years.
2. Malignant pleural effusion
3. Empyema, Complicated parapneumonic effusion.
4. Traumatic hemopneumothorax
5. Post thoracotomy

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Barash PG, Clinical Anesthesia. 1992. Lippincott.

Indication & Contra-Ix

Contra-Indication : no absolute Cix, if pt in respiratory distress

1. Infection over insertion site
2. Uncontrolled bleeding diathesis

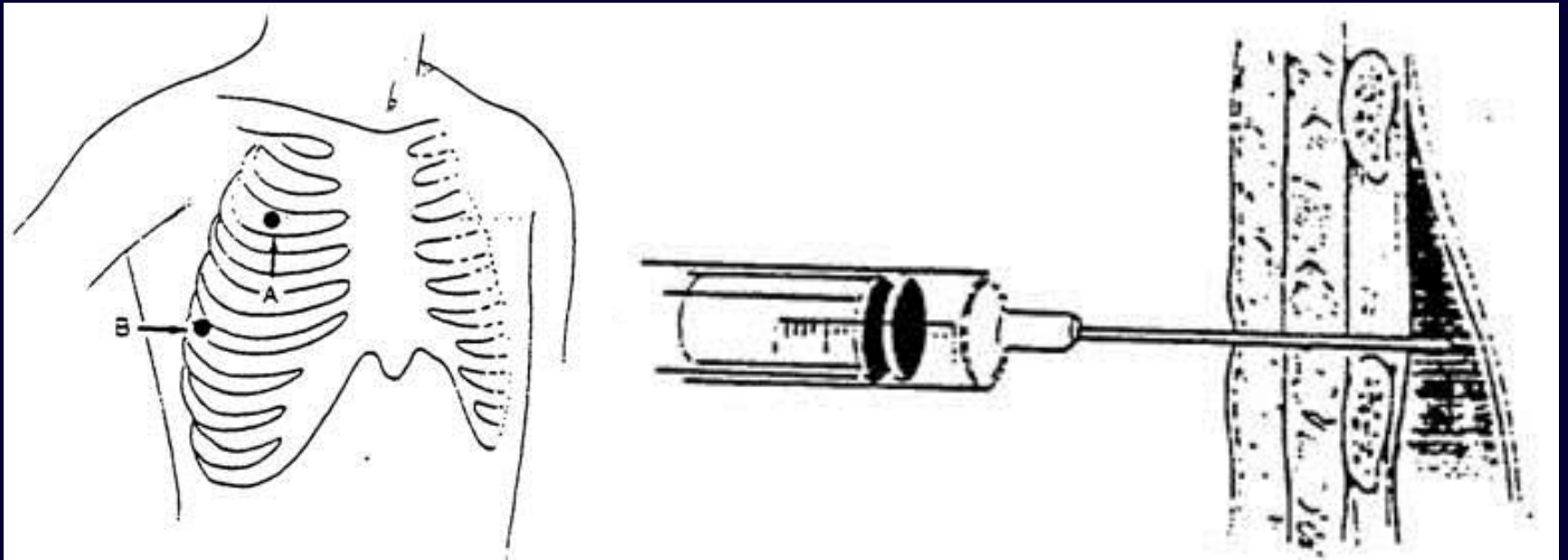
Never forget caution when the pt has

- * **Obesity**
- * **Adhesion possibility**
- * **Giant bullae**
- * **LVH**

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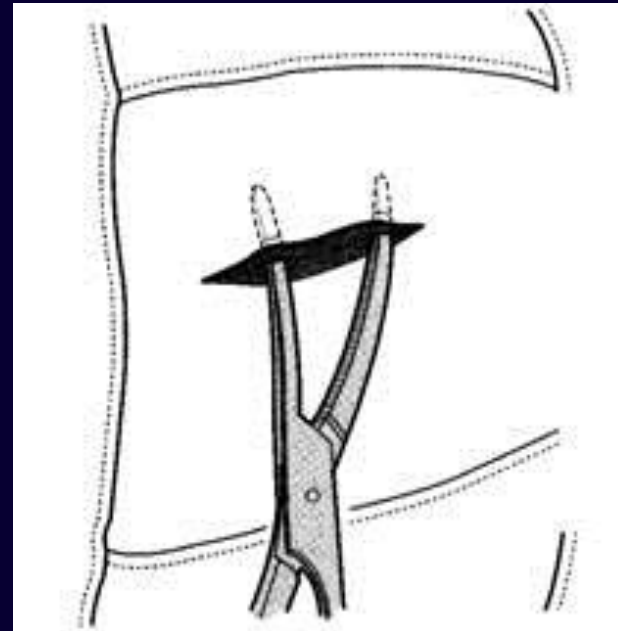
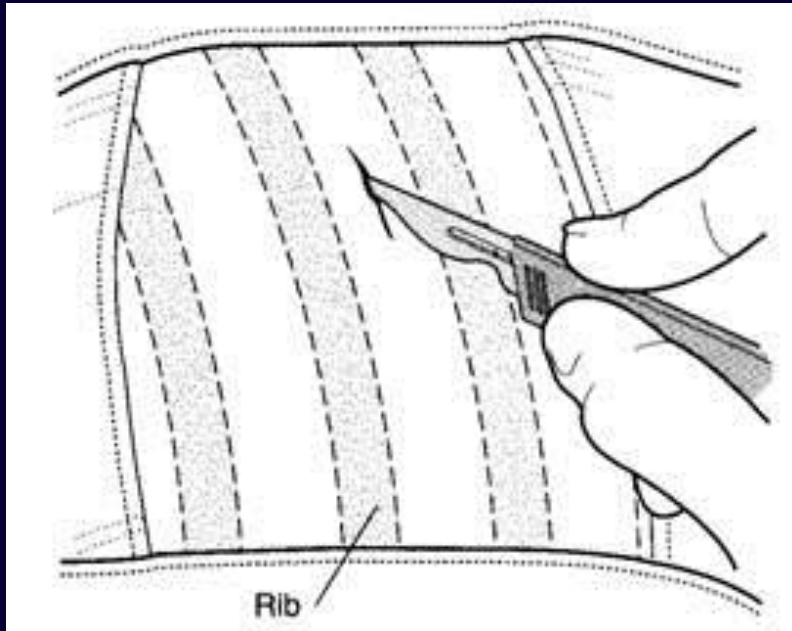
Procedure



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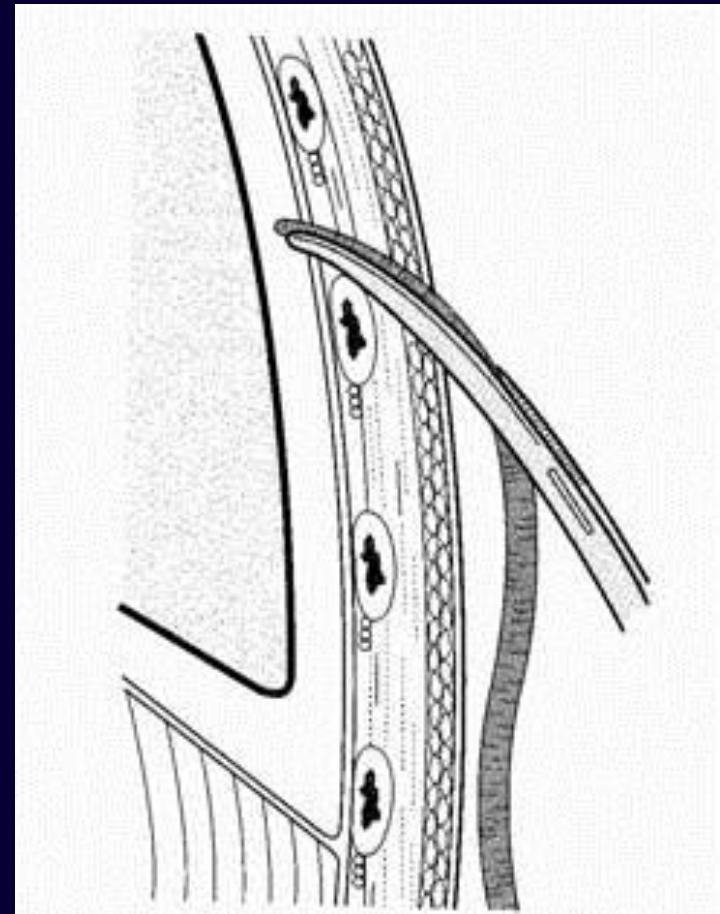
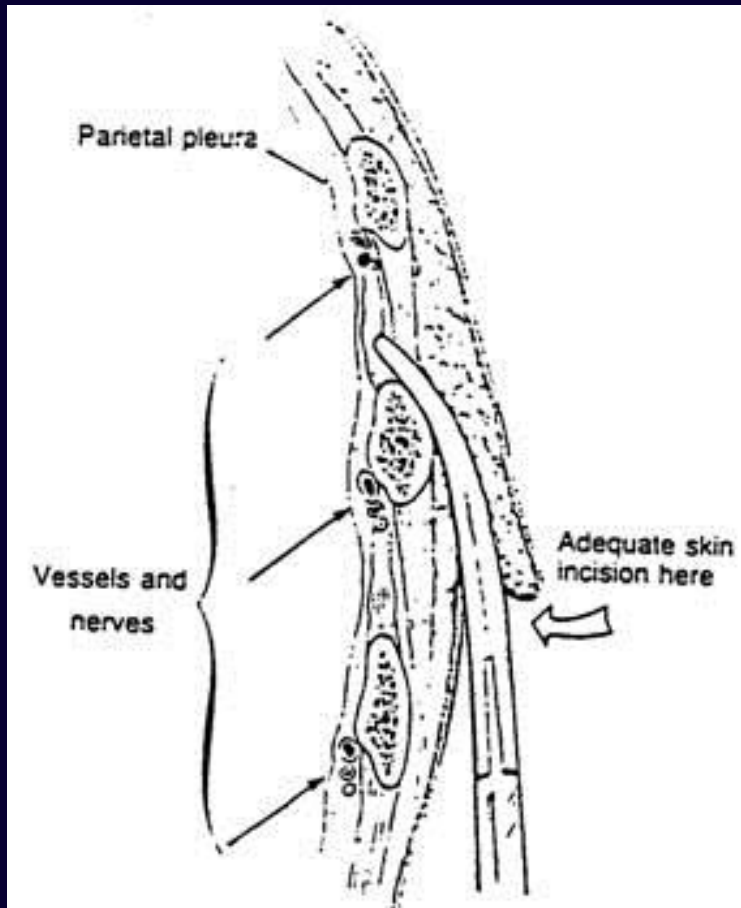
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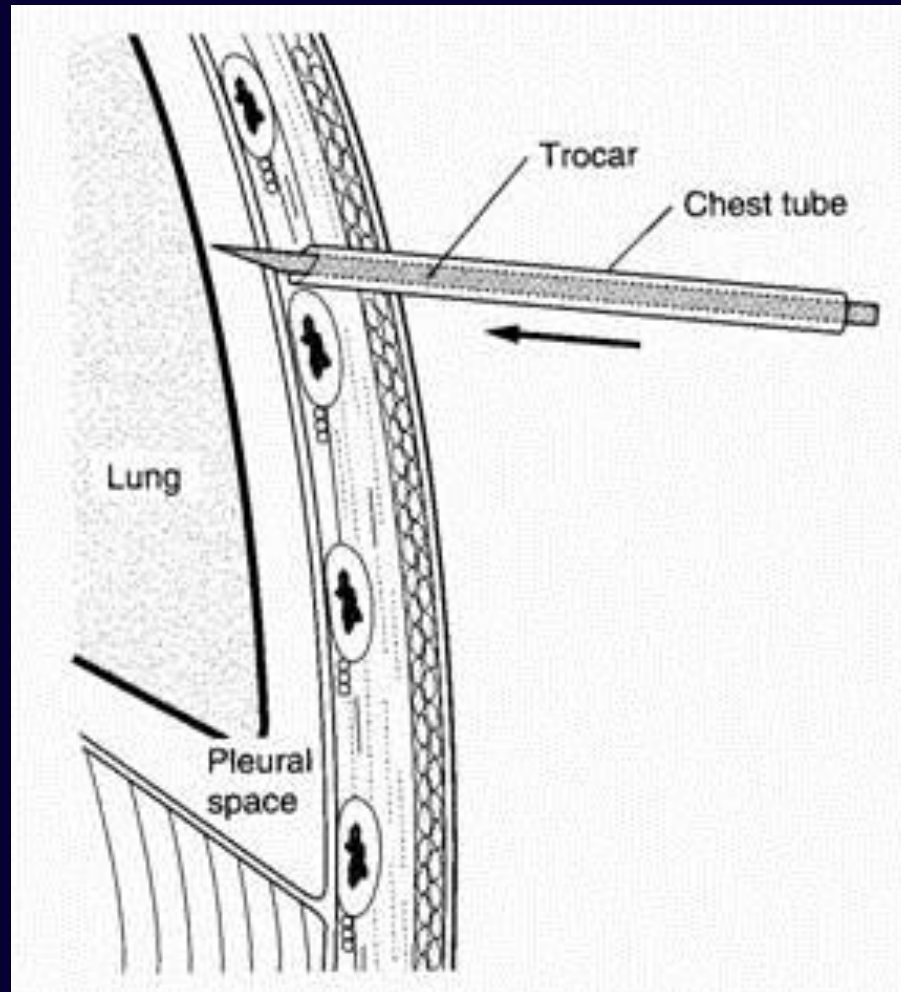
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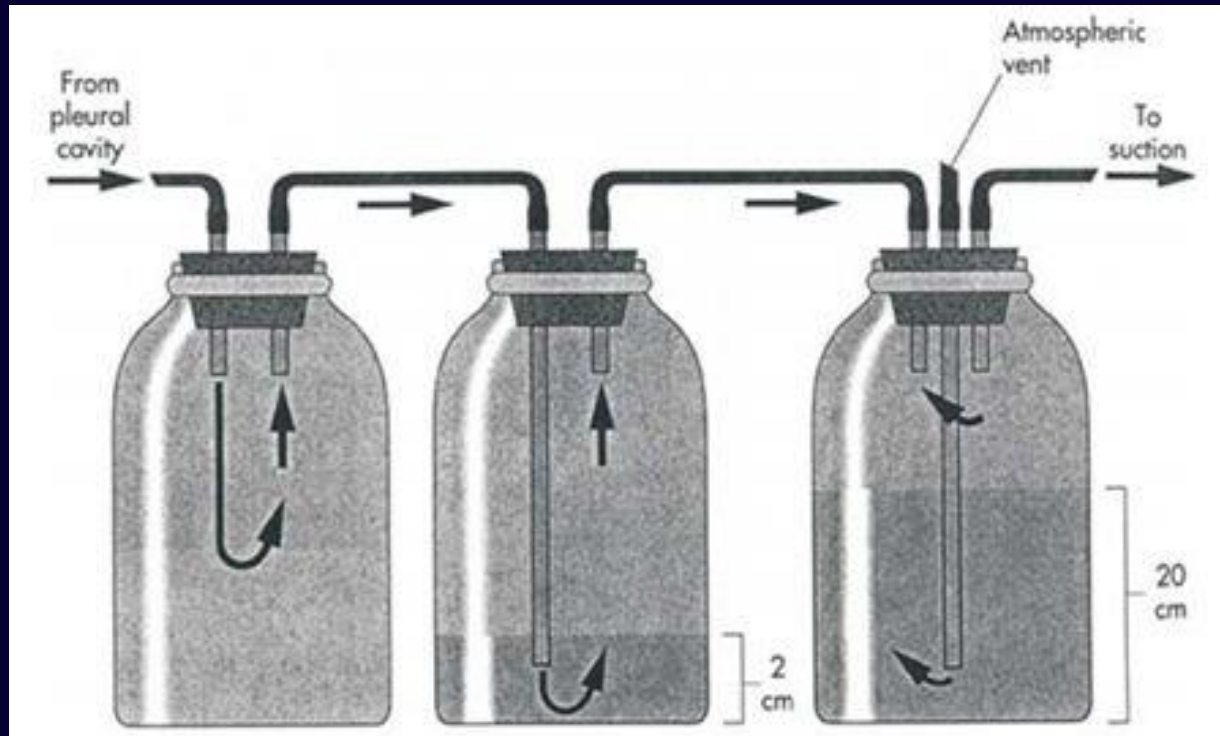
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Procedure



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Complications

1. Malposition – Abdominal cavity (liver, spleen, diaphragm injury)
2. Insertion into pulmonary parenchyme
3. Mediastinal organ injury (Left Ventricle)
4. Intercostal neurovascular Injury (pain, bleeding)

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*Failure to Prepare is
Preparing to Failure !*