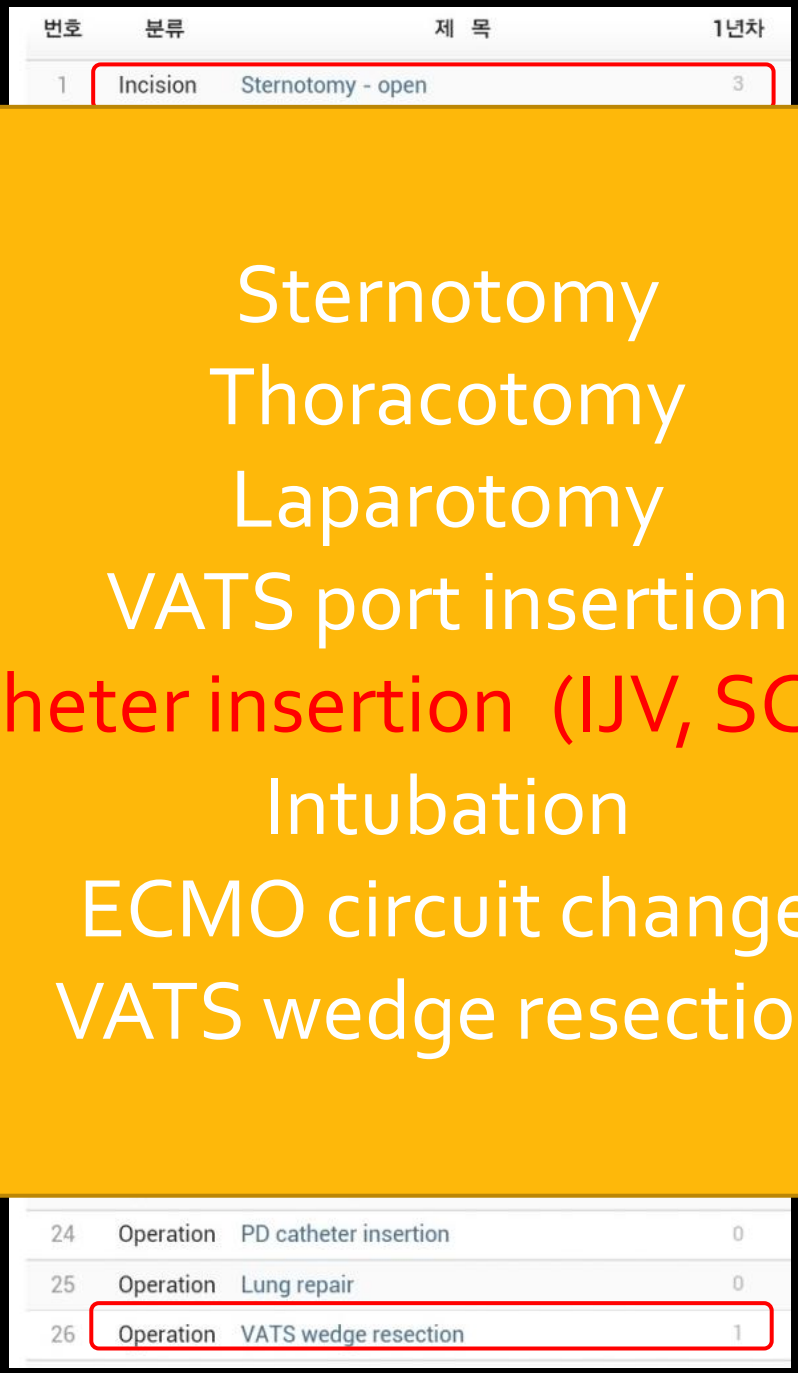
신입 전공의 워크샵

1년 차가 알아야 할 술기

서울대병원 흉부외과
전임의 박샘이나



번호	분류	제 목	1년차
1	Incision	Sternotomy - open	3
24	Operation	PD catheter insertion	0
25	Operation	Lung repair	0
26	Operation	VATS wedge resection	1

Sternotomy
Thoracotomy
Laparotomy
VATS port insertion
Catheter insertion (IJV, SCV, FV)
Intubation
ECMO circuit change
VATS wedge resection

Elements of this video have been reproduced from the NEJM Video in Clinical Medicine, *Central Venous Catheterization*, because the procedures are similar. This has been done with consent of the authors, and the *Journal*.

Indications

- Intravenous hemodynamic monitoring
- Central venous sampling
- Parenteral nutrition
- Hemodialysis
- Transvenous pacing
- Placement of pulmonary artery catheters

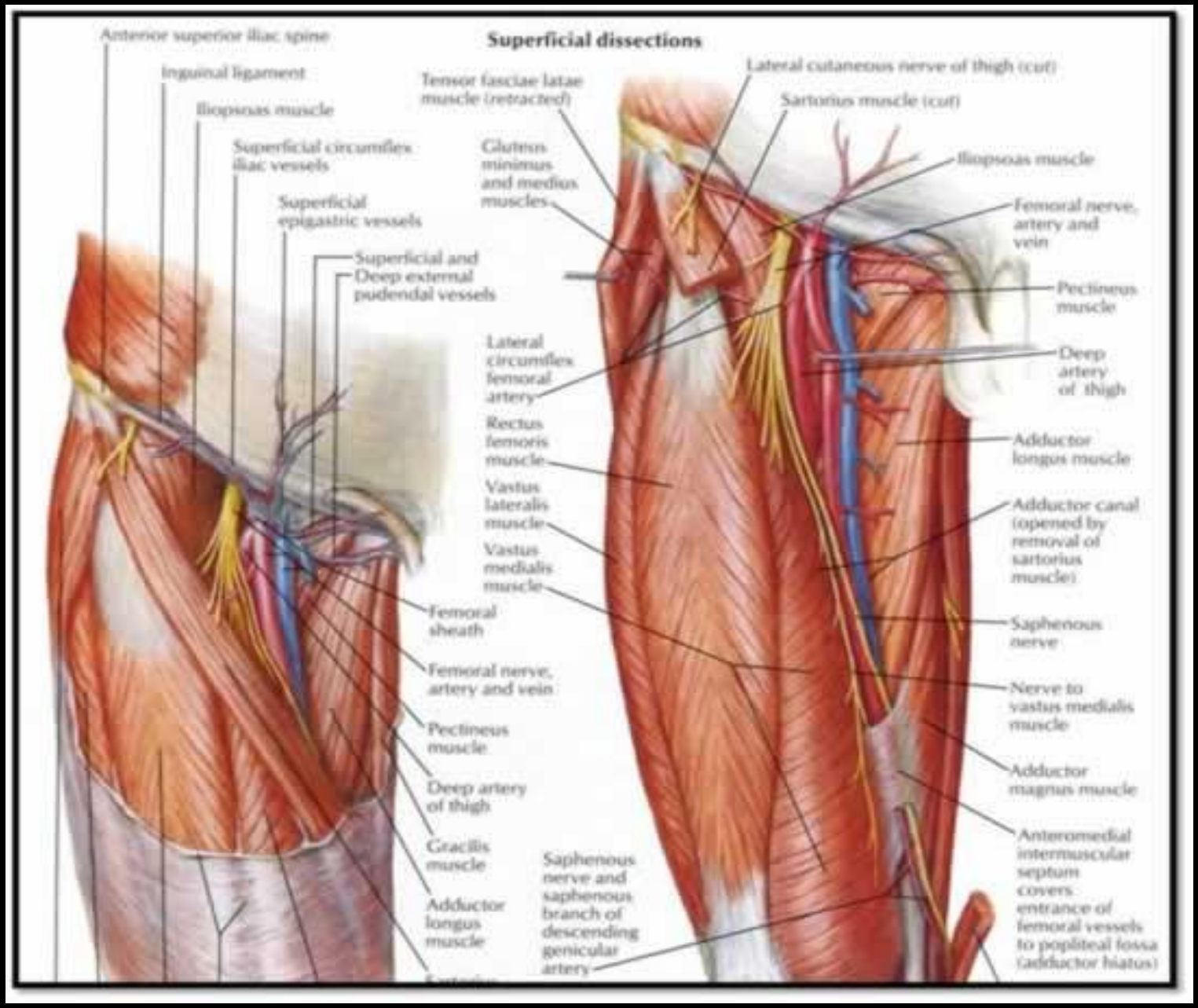
Equipment

- Chlorhexidine skin preparation solution.
- Sterile gown, gloves, and drapes.
- Hat and mask.
- 1% lidocaine.
- Sterile gauze pads.
- 22-gauge finder needle.
- 18-gauge introducer needle.
- J-tip guidewire.
- Transduction tubing.
- Tissue dilator.
- Sterile saline for flushing the line.
- Catheter.
- 2-0 silk sutures.
- Sterile dressing.

Patient Positioning

- Subclavian and internal jugular
  - Trendelenburg (head-down) position
  - rolled towel can be placed between the shoulder
- Femoral lines
  - Reverse Trendelenburg (head-up) position
  - leg slightly abducted and externally rotated

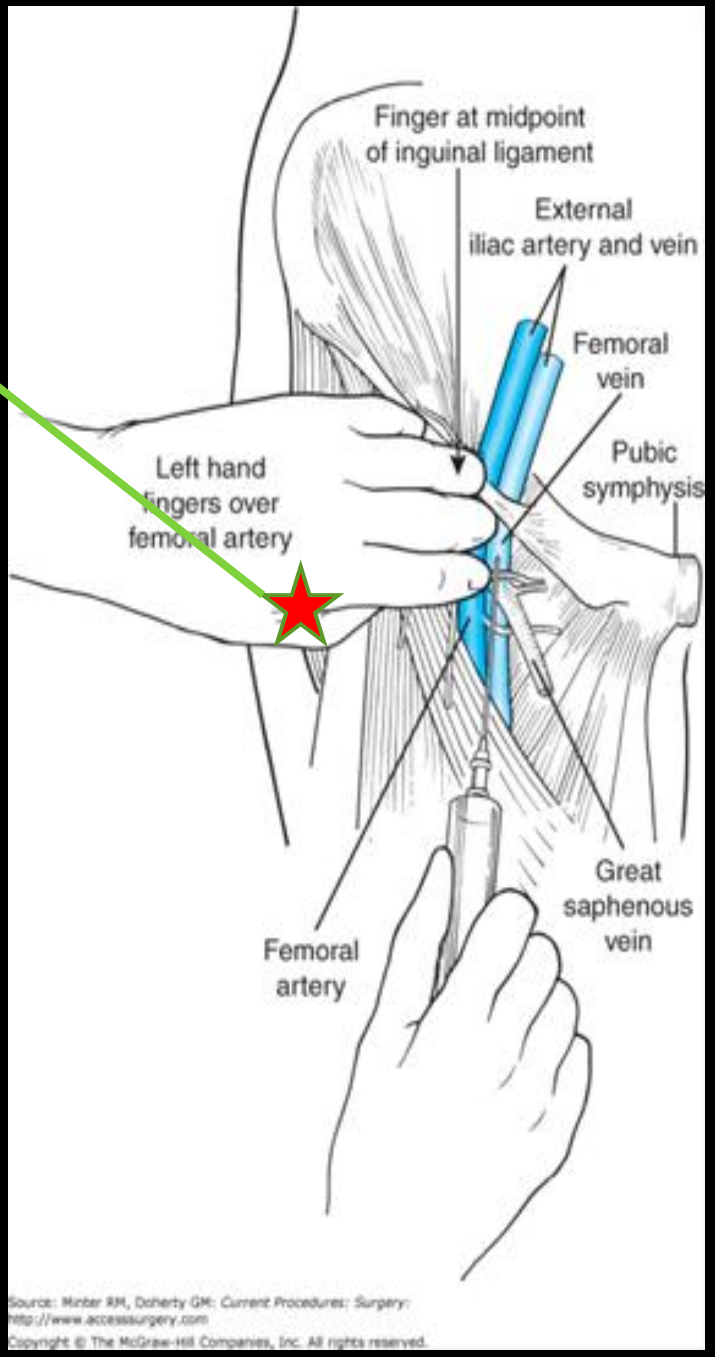
Femoral Vein


Superficial dissections
Anterior superior iliac spine
Inguinal ligament
Iliopsoas muscle
Superficial circumflex iliac vessels
Superficial epigastric vessels
Superficial and Deep external pudendal vessels
Tensor fasciae latae muscle (retracted)
Gluteus minimus and medius muscles
Lateral circumflex femoral artery
Rectus femoris muscle
Vastus lateralis muscle
Vastus medialis muscle
Femoral sheath
Femoral nerve, artery and vein
Pectineus muscle
Deep artery of thigh
Gracilis muscle
Adductor longus muscle
Saphenous nerve and saphenous branch of descending genicular artery
Lateral cutaneous nerve of thigh (cut)
Sartorius muscle (cut)
Iliopsoas muscle
Femoral nerve, artery and vein
Pectineus muscle
Deep artery of thigh
Adductor longus muscle
Adductor canal (opened by removal of sartorius muscle)
Saphenous nerve
Nerve to vastus medialis muscle
Adductor magnus muscle
Anteromedial intermuscular septum covers entrance of femoral vessels to popliteal fossa (adductor hiatus)

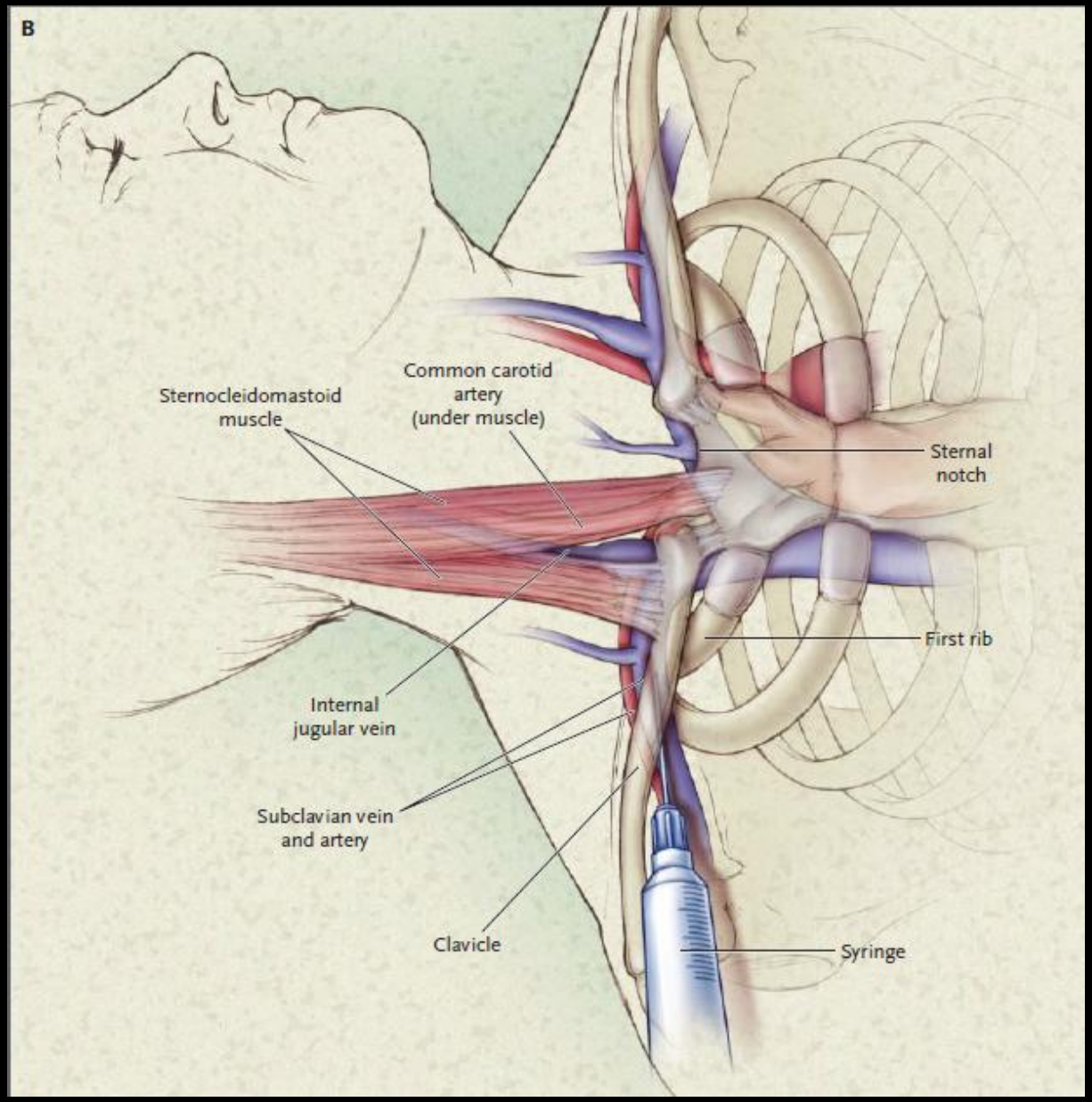
Landmarks

- anterior iliac spine & symphysis pubis.

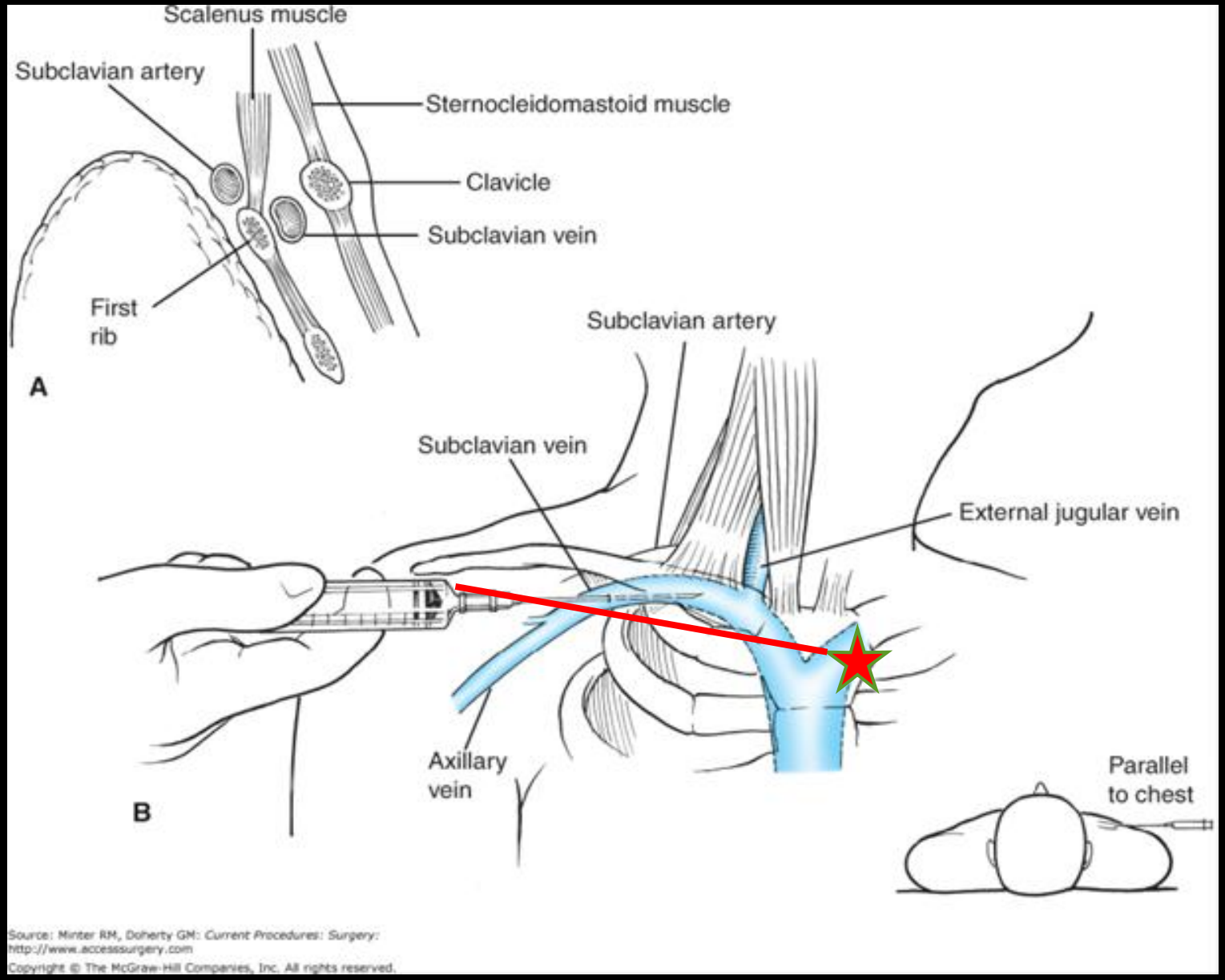
- halfway between these landmarks just below the inguinal ligament, lateral to the artery and medial to the nerve.



Subclavian Vein



제7차 신입전공의 워크샵


Scalenus muscle
Subclavian artery
Sternocleidomastoid muscle
Clavicle
Subclavian vein
First rib
A
Subclavian artery
Subclavian vein
External jugular vein
Axillary vein
B
Parallel to chest
Source: Minter RM, Doherty GM: Current Procedures: Surgery: http://www.accesssurgery.com
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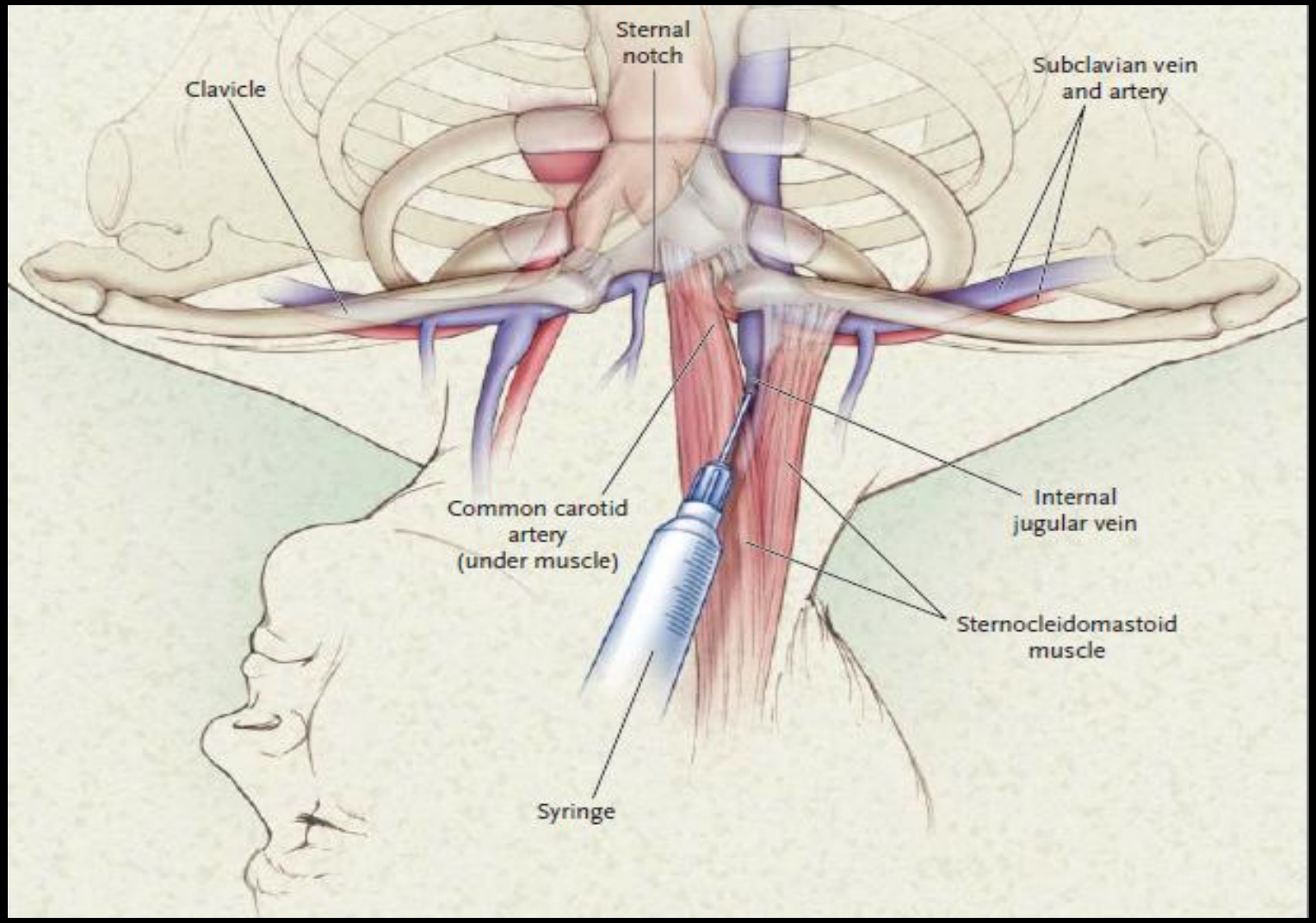
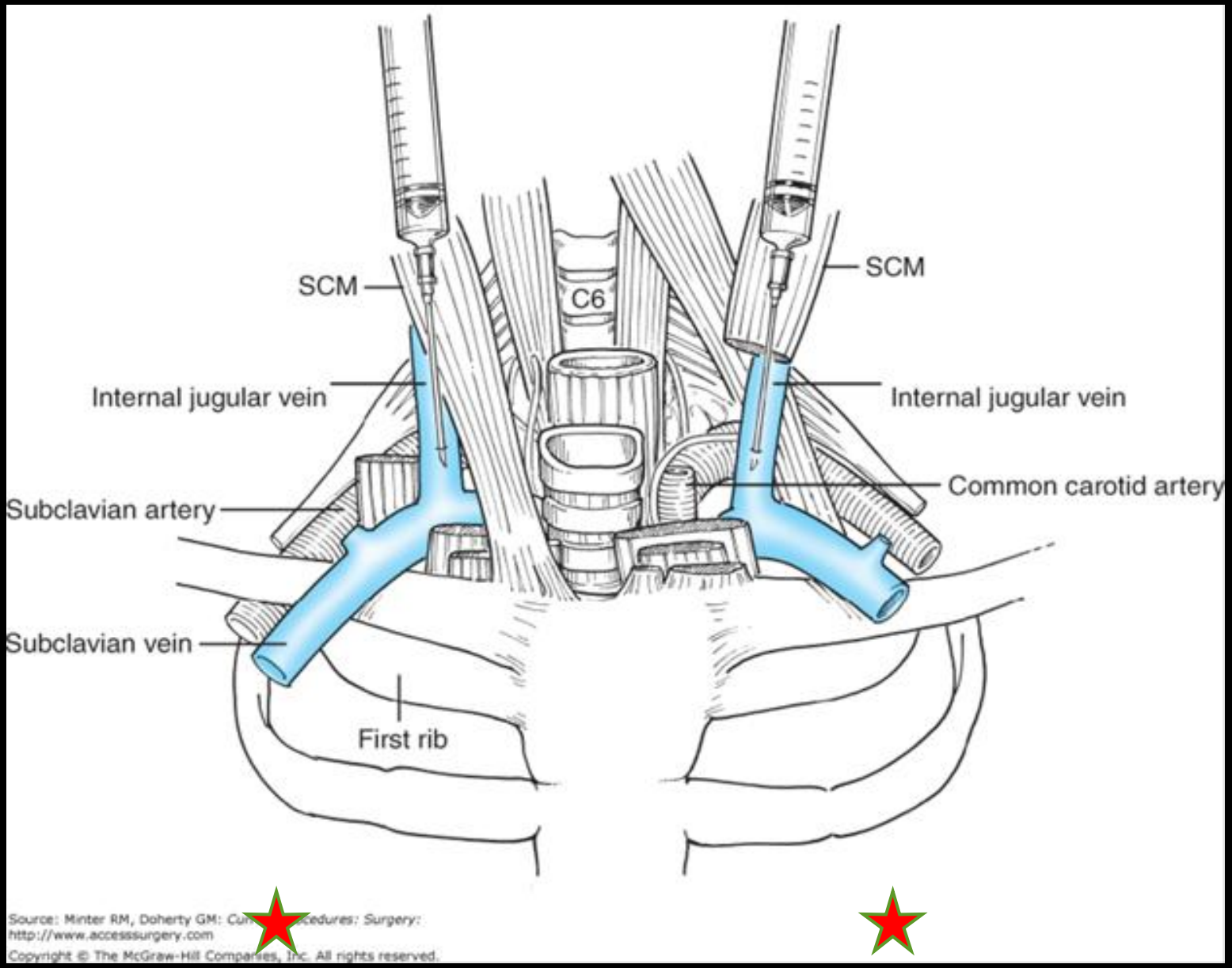
Internal Jugular Vein

Anatomy


Sternal notch
Clavicle
Subclavian vein and artery
Common carotid artery (under muscle)
Internal jugular vein
Sternocleidomastoid muscle
Syringe


SCM
C6
SCM
Internal jugular vein
Internal jugular vein
Common carotid artery
Subclavian artery
Subclavian vein
First rib
Source: Minter RM, Doherty GM: Cu edures: Surgery:
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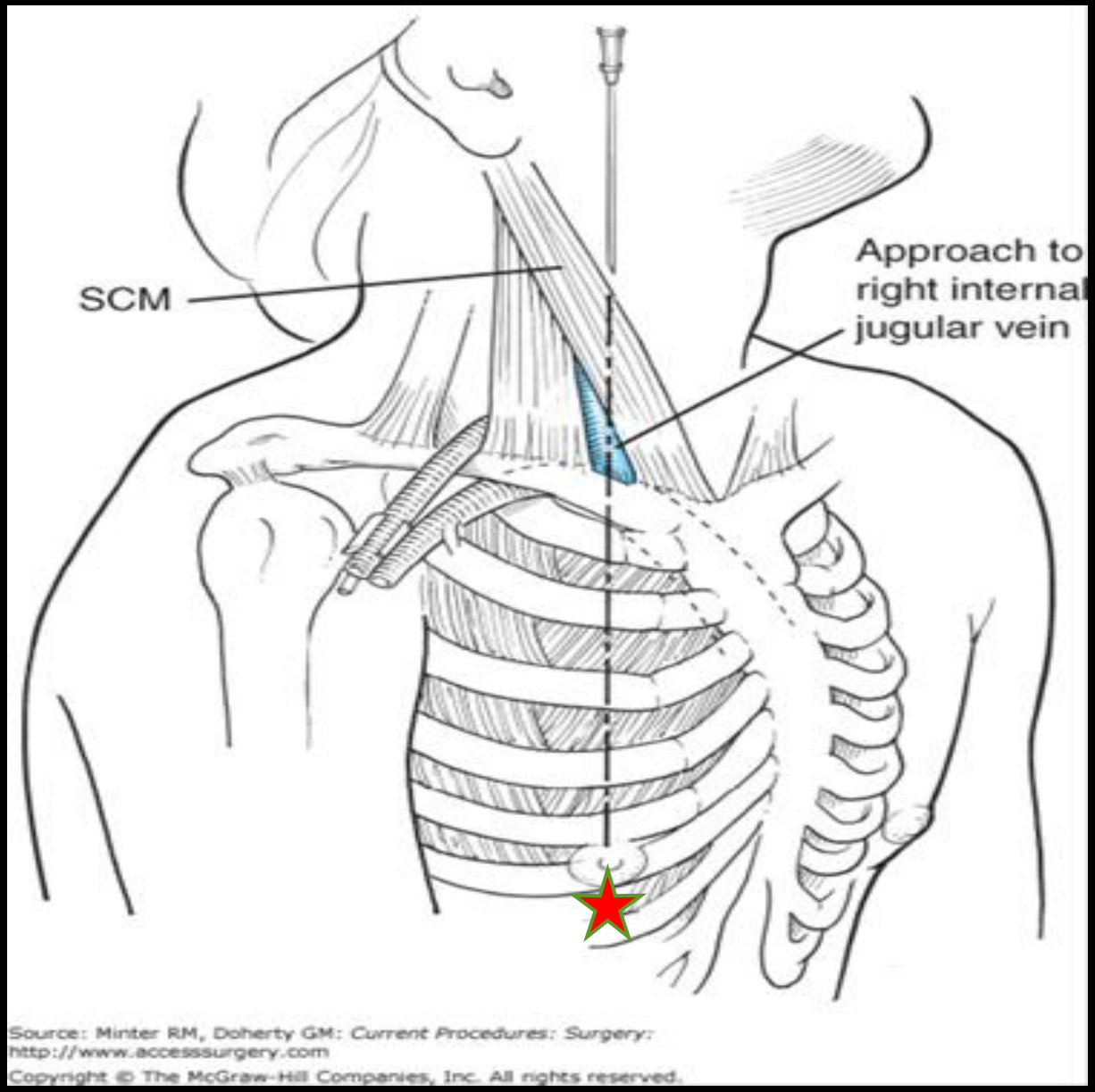
SCM
Approach to
right internal
jugular vein
Source: Minter RM, Doherty GM: Current Procedures: Surgery:
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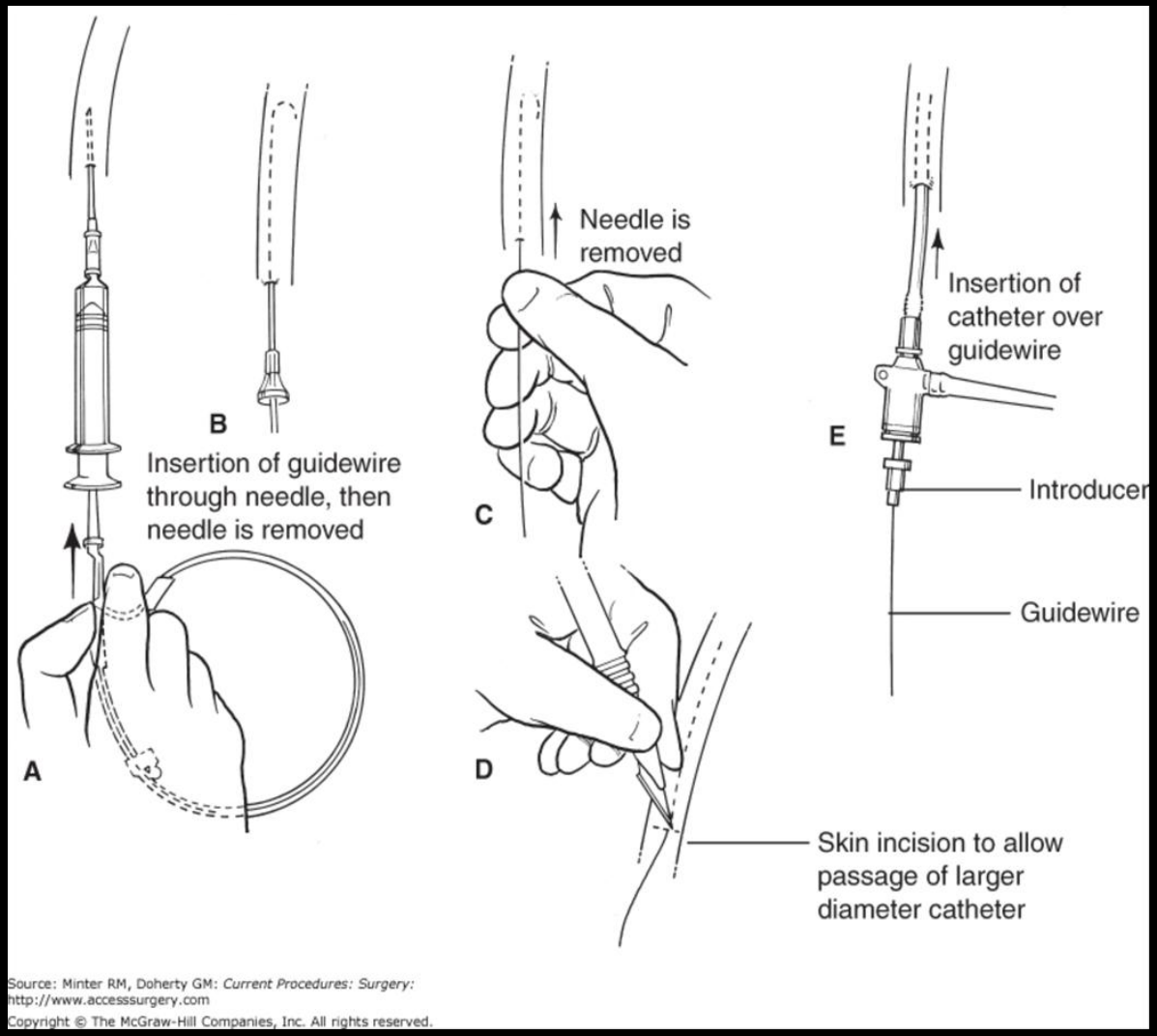
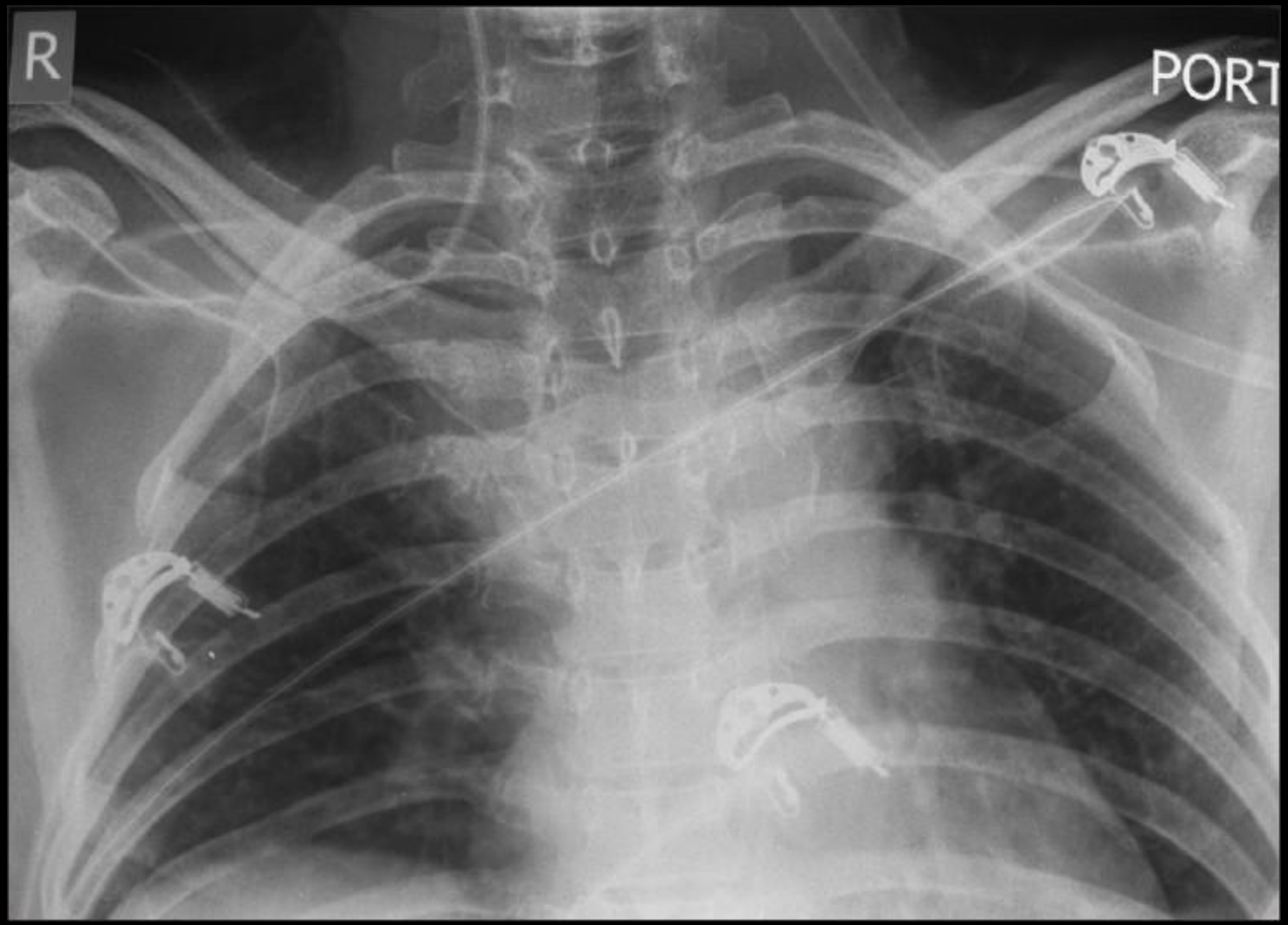
Seldinger Technique



Postoperative Care

- Chest radiograph
  - within the superior vena cava
  - outside of the right atrium
  - above the pericardial reflection
  - the tip should lie above the level of the carina



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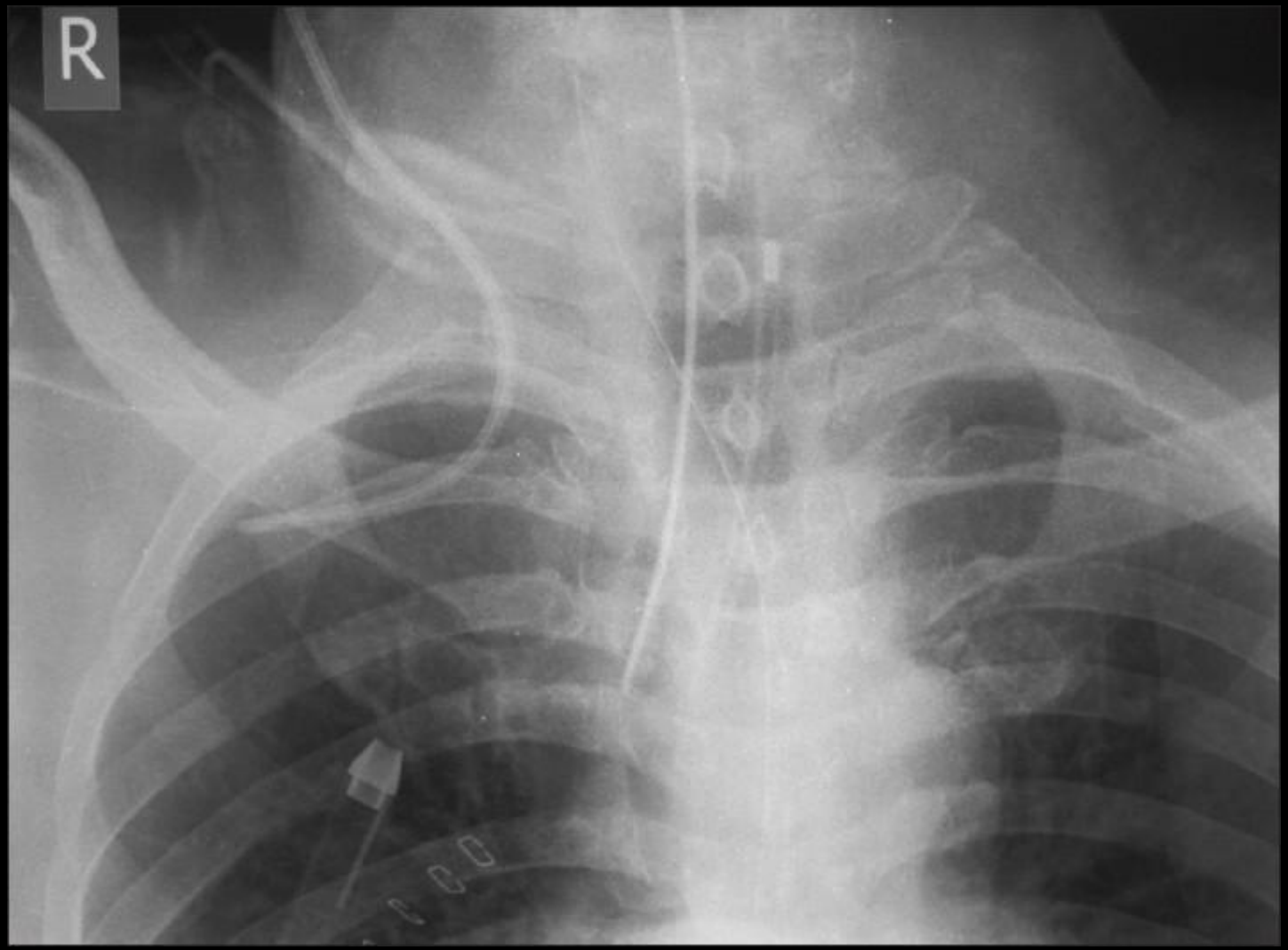

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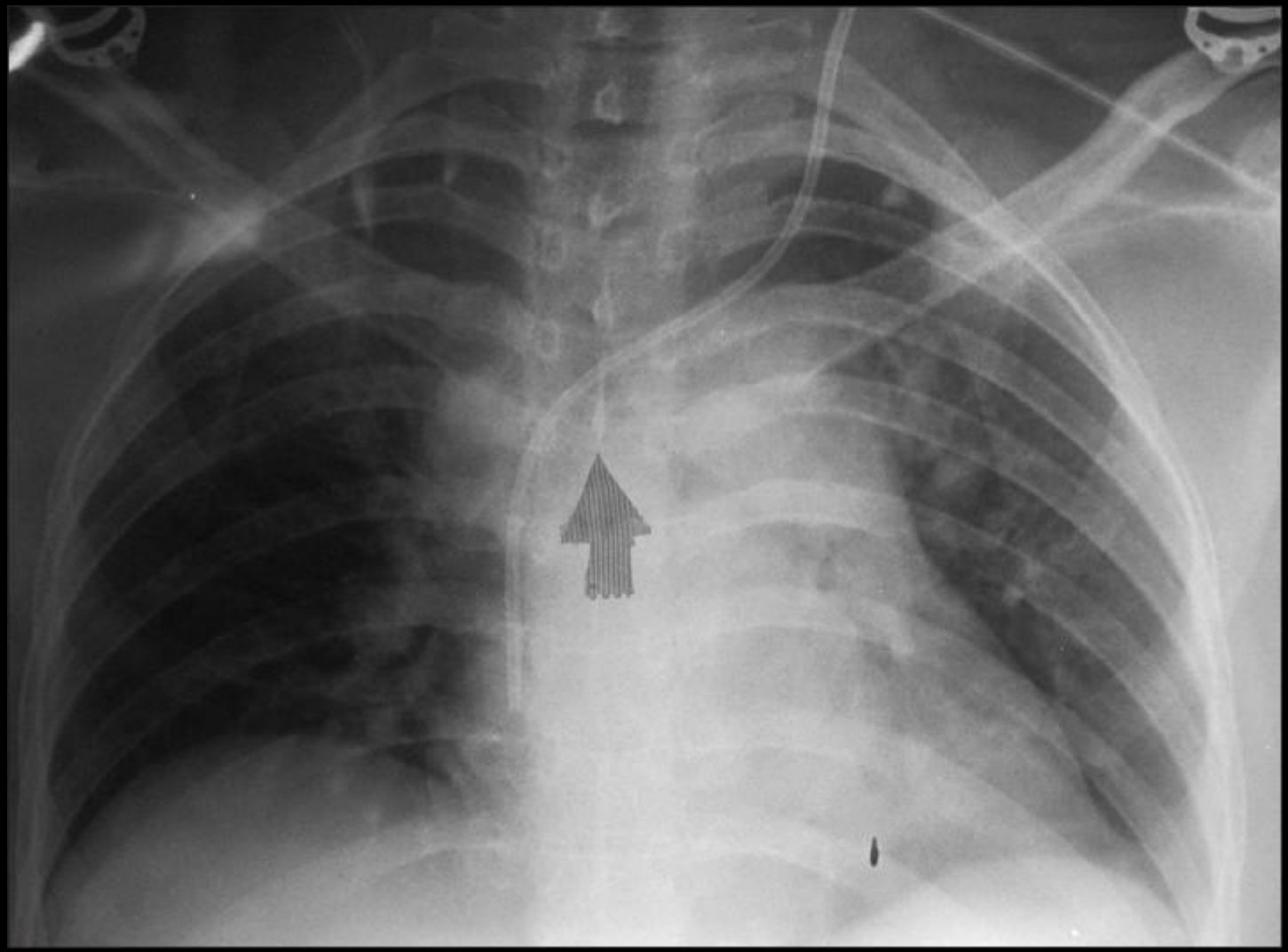

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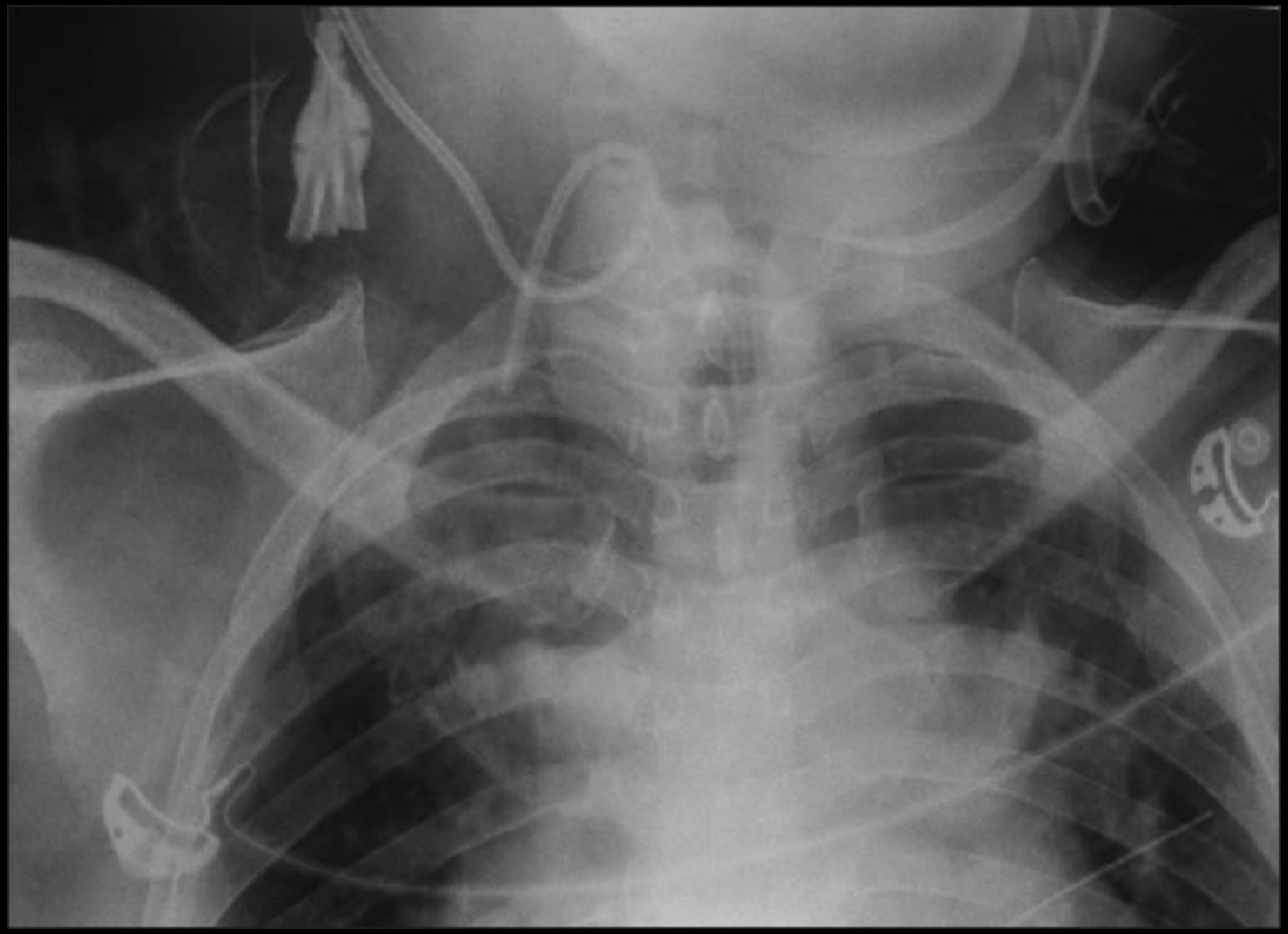

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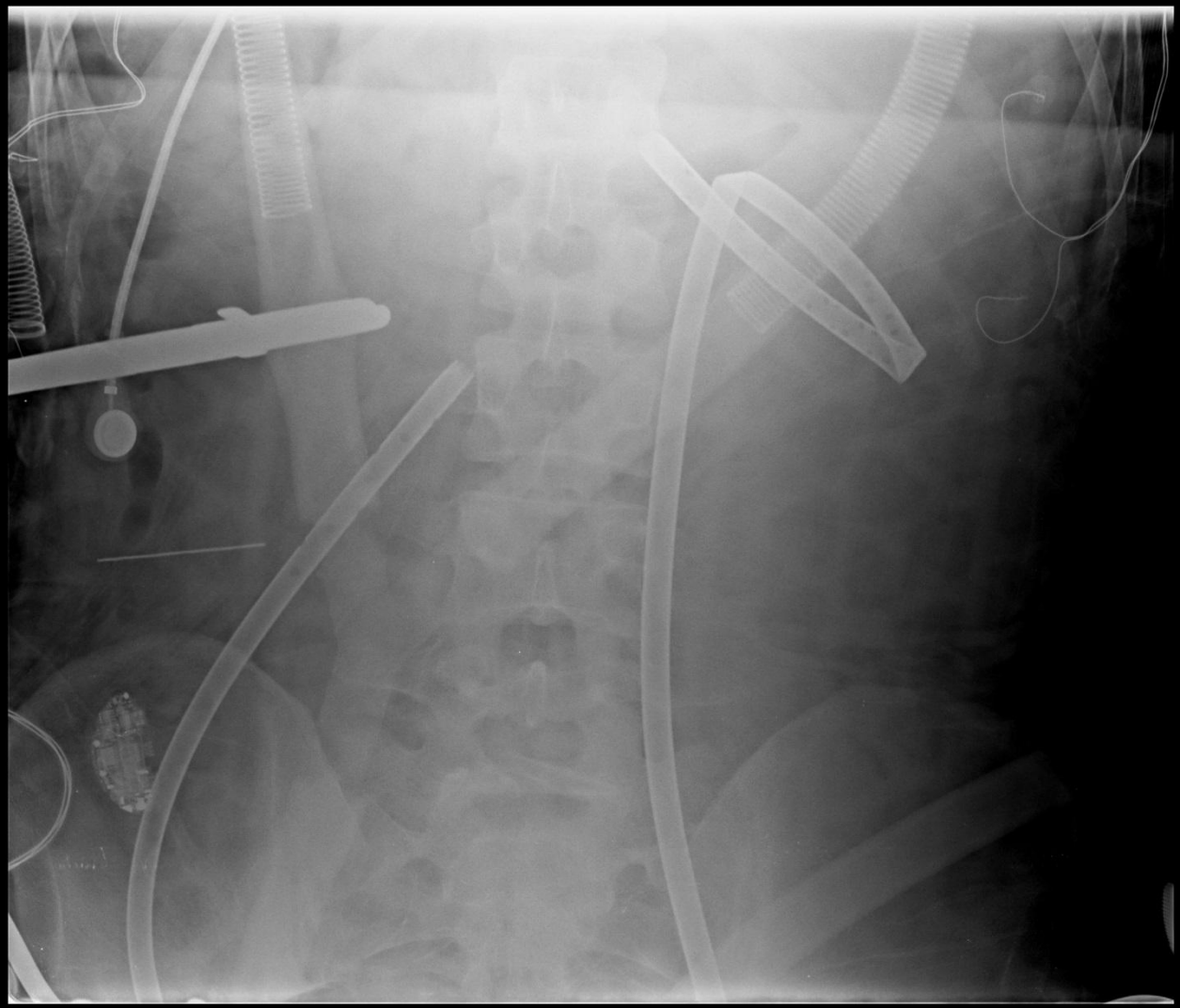


제7차 신입전공의 워크샵

Infectious problem

Table 1. Interventions to Prevent Complications.

Type of Complication and Intervention	Rationale
Infectious	
Use antimicrobial-impregnated catheters	The use of antimicrobial-impregnated catheters reduces the risk of catheter-related bloodstream infections and reduces costs when the rate of catheter-related bloodstream infection >2%[9-11]
Insert catheters at the subclavian venous site	The risk of catheter-related infection is lower with subclavian catheterization than with internal jugular or femoral catheterization[5,9,12,13]
Use maximal sterile-barrier precautions during catheter insertion	Use of a mask, cap, sterile gown, sterile gloves, and large sterile drape reduces the rate of infections and reduces costs[14]
Avoid the use of antibiotic ointments	The application of antibiotic ointments increases the rate of colonization by fungi,[15] promotes the development of antibiotic-resistant bacteria,[16] and has not been shown to affect the risk of catheter-related bloodstream infections[17]
Disinfect catheter hubs	Catheter hubs are common sites of catheter contamination[18]
Do not schedule routine catheter changes	Scheduled, routine replacement of central venous catheters at a new site does not reduce the risk of catheter-related bloodstream infection[19,20]; scheduled, routine exchange of catheters over a guide wire is associated with a trend toward increased catheter-related infections[19]
Remove catheters when they are no longer needed	The probability of colonization and catheter-related bloodstream infection increases over time[9,10,21]

N Engl J Med 2003;348:1123-33.

Mechanical problem

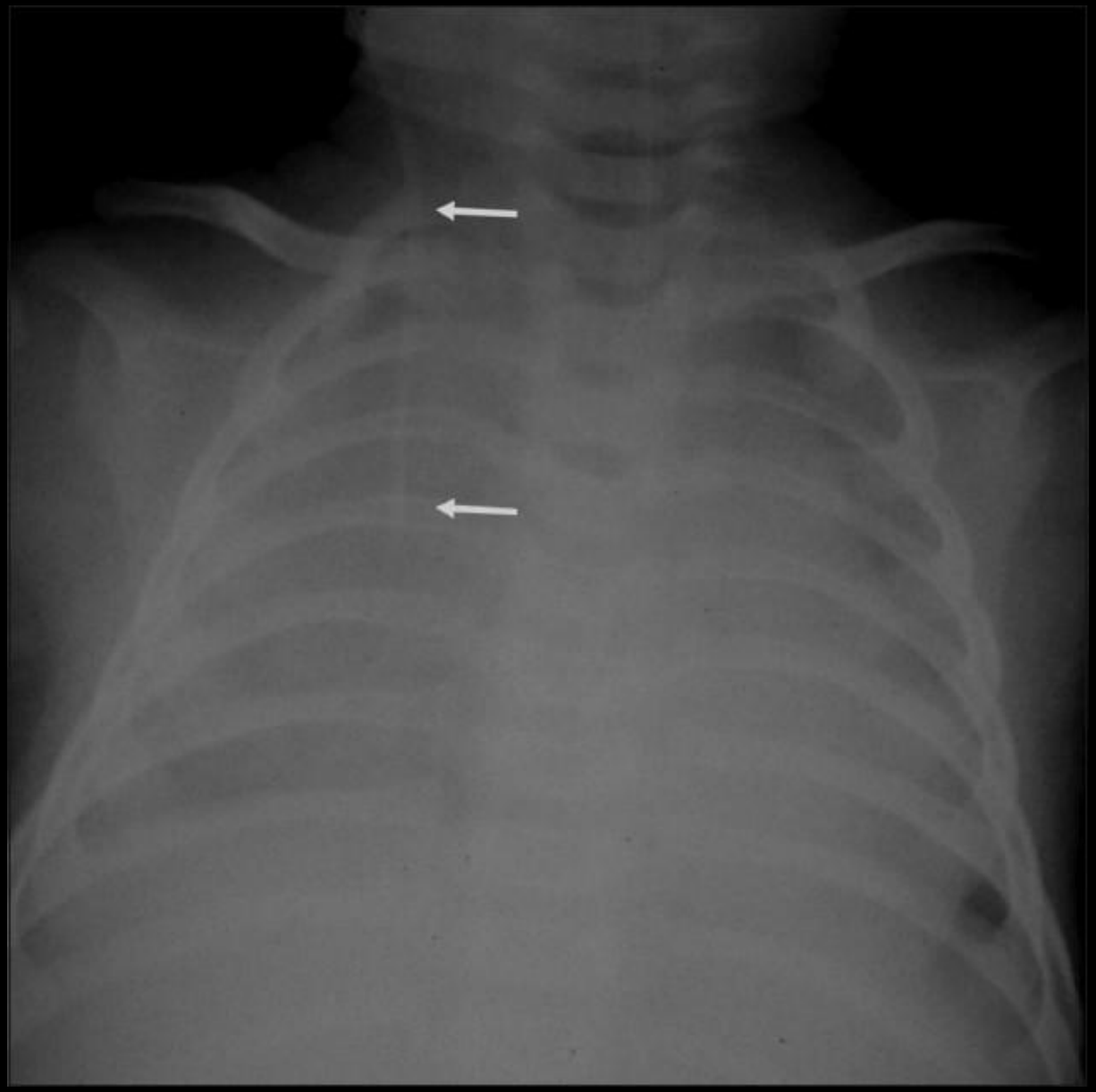
Mechanical	
Recognize risk factors for difficult catheterization	A history of failed catheterization attempts or the need for catheterization at sites of prior surgery, skeletal deformity, or scarring suggests that catheterization may be difficult[8]
Seek assistance from an experienced clinician	Insertion by a physician who has performed ≥50 catheterizations is half as likely to result in a mechanical complication as insertion of a catheter by a physician who has performed <50 catheterizations[6]
Avoid femoral venous catheterization	The frequency of mechanical complications with femoral catheterization is higher than with subclavian or internal jugular catheterization[5,6,8,22-24]; the rates of serious complications are similar with the femoral and subclavian approaches[5]
Use ultrasound guidance during internal jugular catheterization	The use of ultrasound guidance during internal jugular catheterization reduces the time required for insertion and reduces the rates of unsuccessful catheterization, carotid-artery puncture, and hematoma formation[25,26]
Do not schedule routine catheter changes	Scheduled, routine replacement of catheters at new sites increases the risk of mechanical complications[19,27]
Thrombotic	
Insert the catheter at the subclavian site	Subclavian catheterization carries a lower risk of catheter-related thrombosis than femoral or internal jugular catheterization[5,28]

 N Engl J Med 2003;348:1123-33.

Common complications

- **Pneumothorax**
  - Occurrence rates
    - 1 to 6%
  - If the patient is stable, and the pneumothorax is small (<15%),
    - close expectant observation
  - If the patient is symptomatic
    - thoracostomy tube

제7차 신입전공의 워크샵



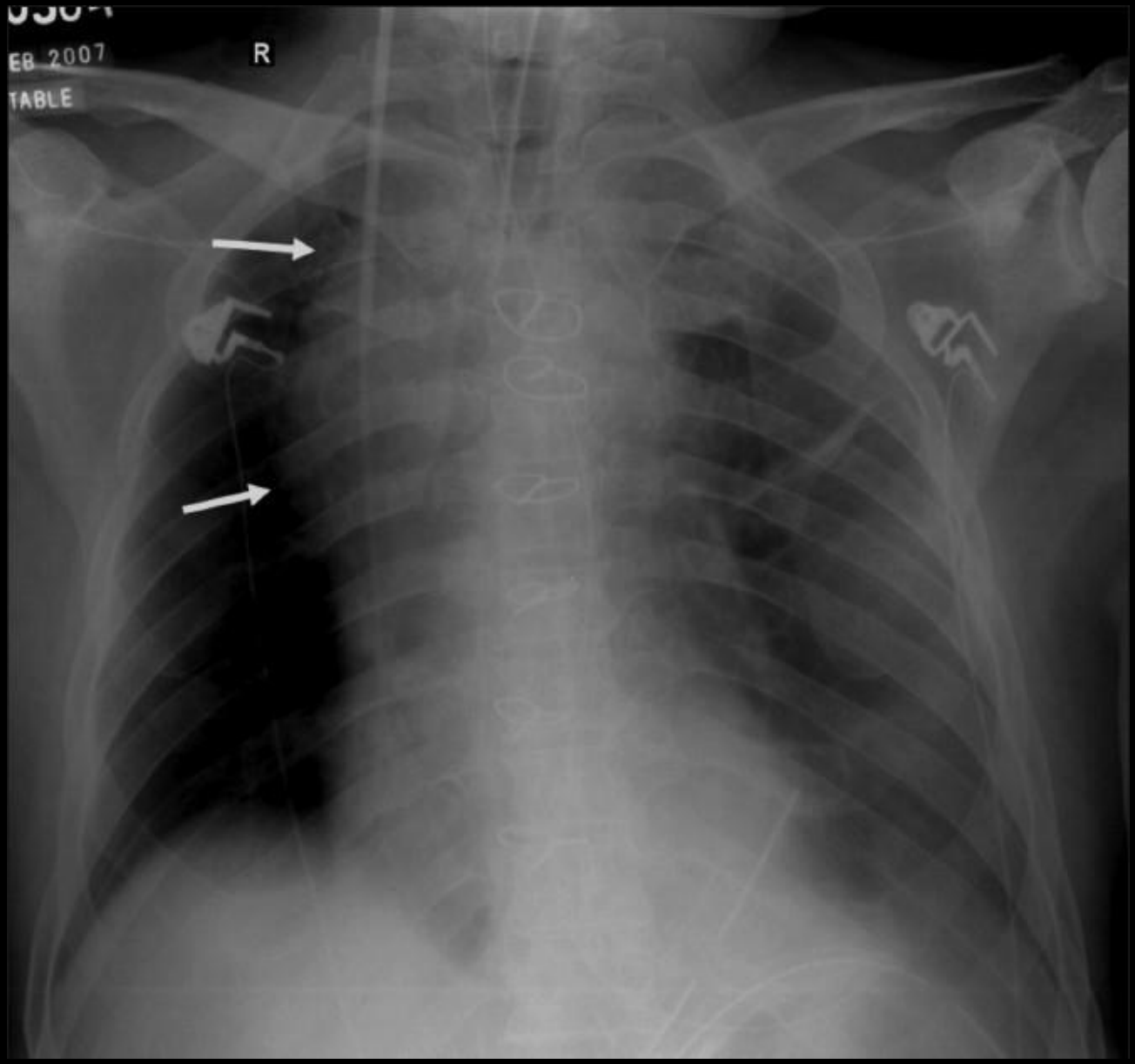
제7차 신입전공의 워크샵

Table 2. Frequency of Mechanical Complications, According to the Route of Catheterization.*

Complication	Frequency		
	Internal Jugular	Subclavian	Femoral
		percent	
Arterial puncture	6.3–9.4	3.1–4.9	9.0–15.0
Hematoma	<0.1–2.2	1.2–2.1	3.8–4.4
Hemothorax	NA	0.4–0.6	NA
Pneumothorax	<0.1–0.2	1.5–3.1	NA
Total	6.3–11.8	6.2–10.7	12.8–19.4

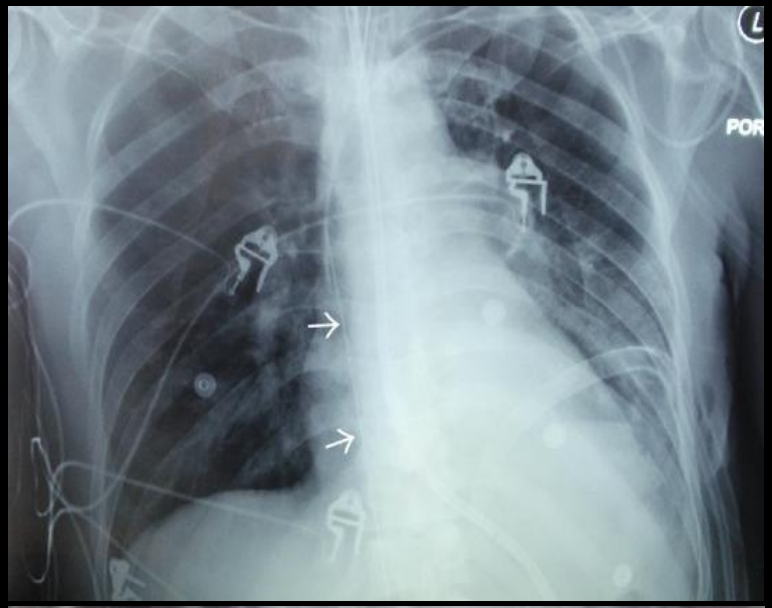
- **Arrhythmias**
  - withdrawn from the right heart
  - electrocardiogram (EKG) monitoring

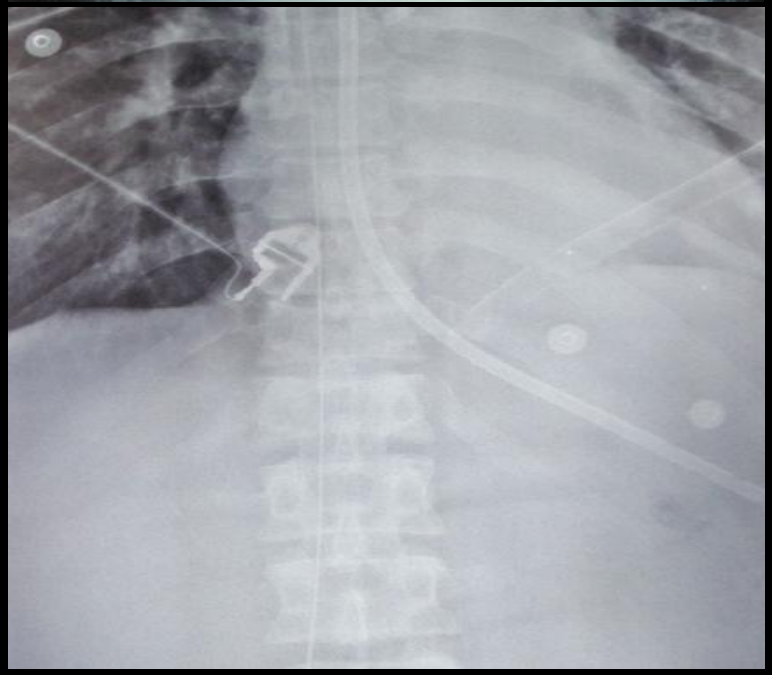
- **Arterial Puncture**
  - direct pressure on or near the arterial injury site
  - stent placement, or surgery be required to repair



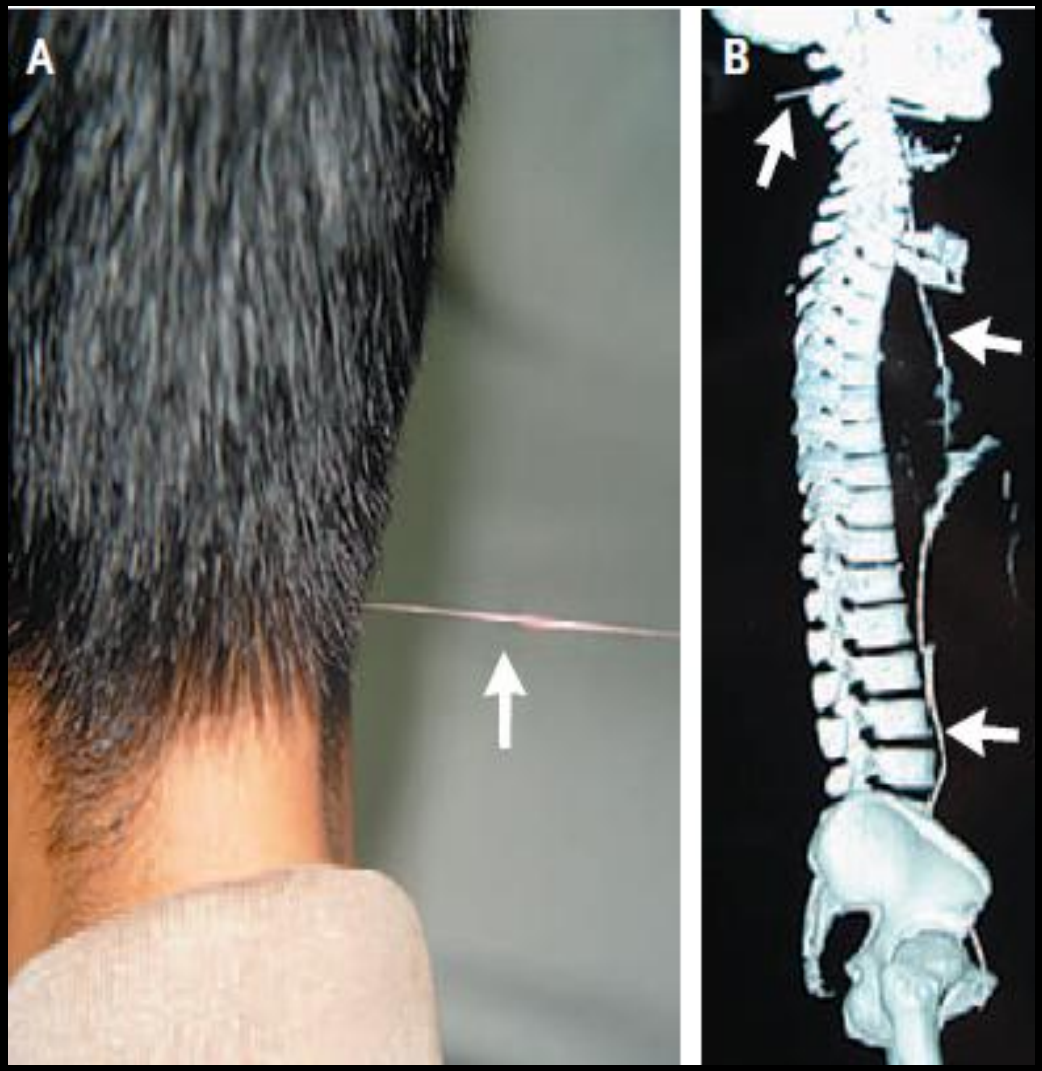
제7차 신입전공의 워크샵

- **Lost Guidewire**
  - readily retrieved with interventional angiography techniques
- **Air Embolus**
  - dramatic and fatal
  - Treatment may prove futile if the air bolus is larger than 50 mL.
  - left lateral decubitus Trendelenburg position
    - entrapping air within the right ventricle.

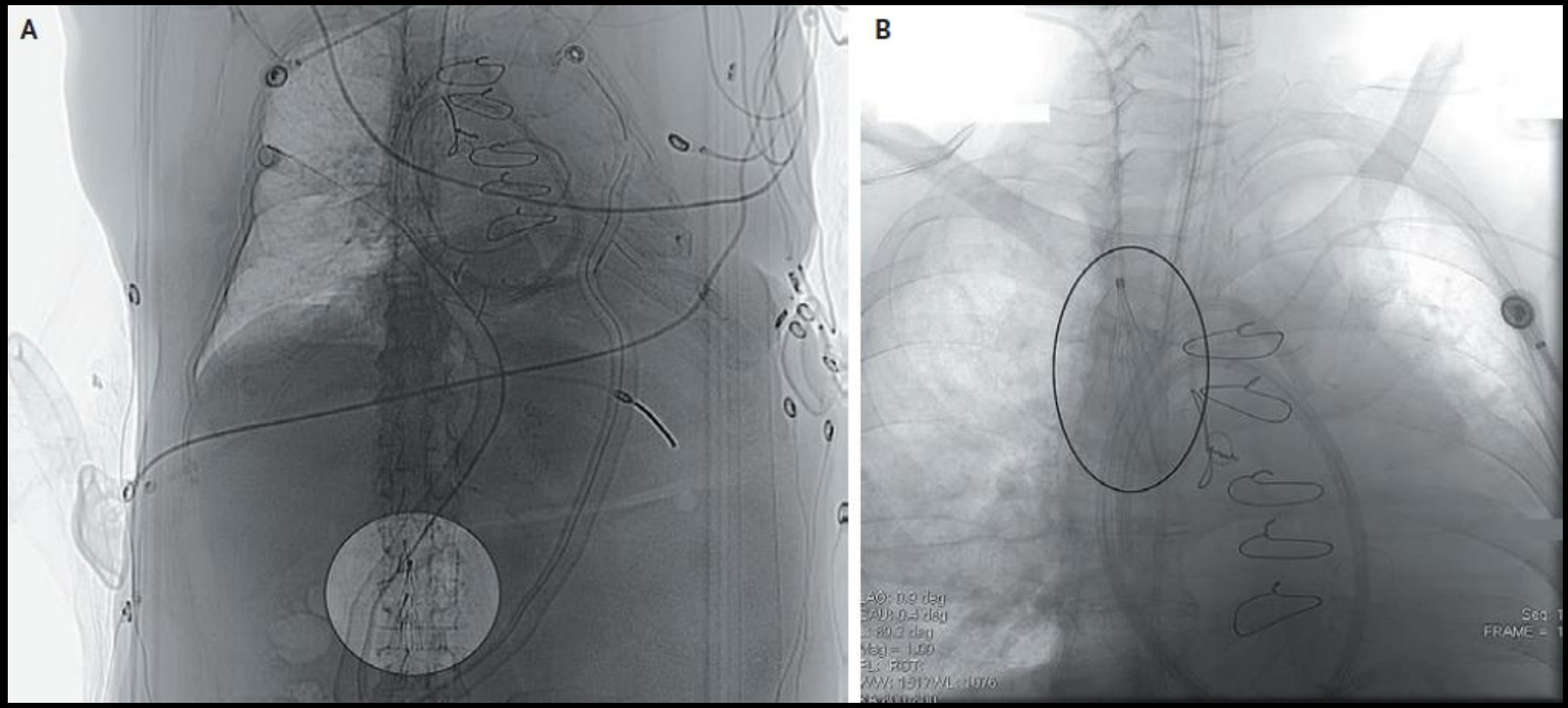





제7차 신입전공의 워크샵



제7차 신입전공의 워크샵



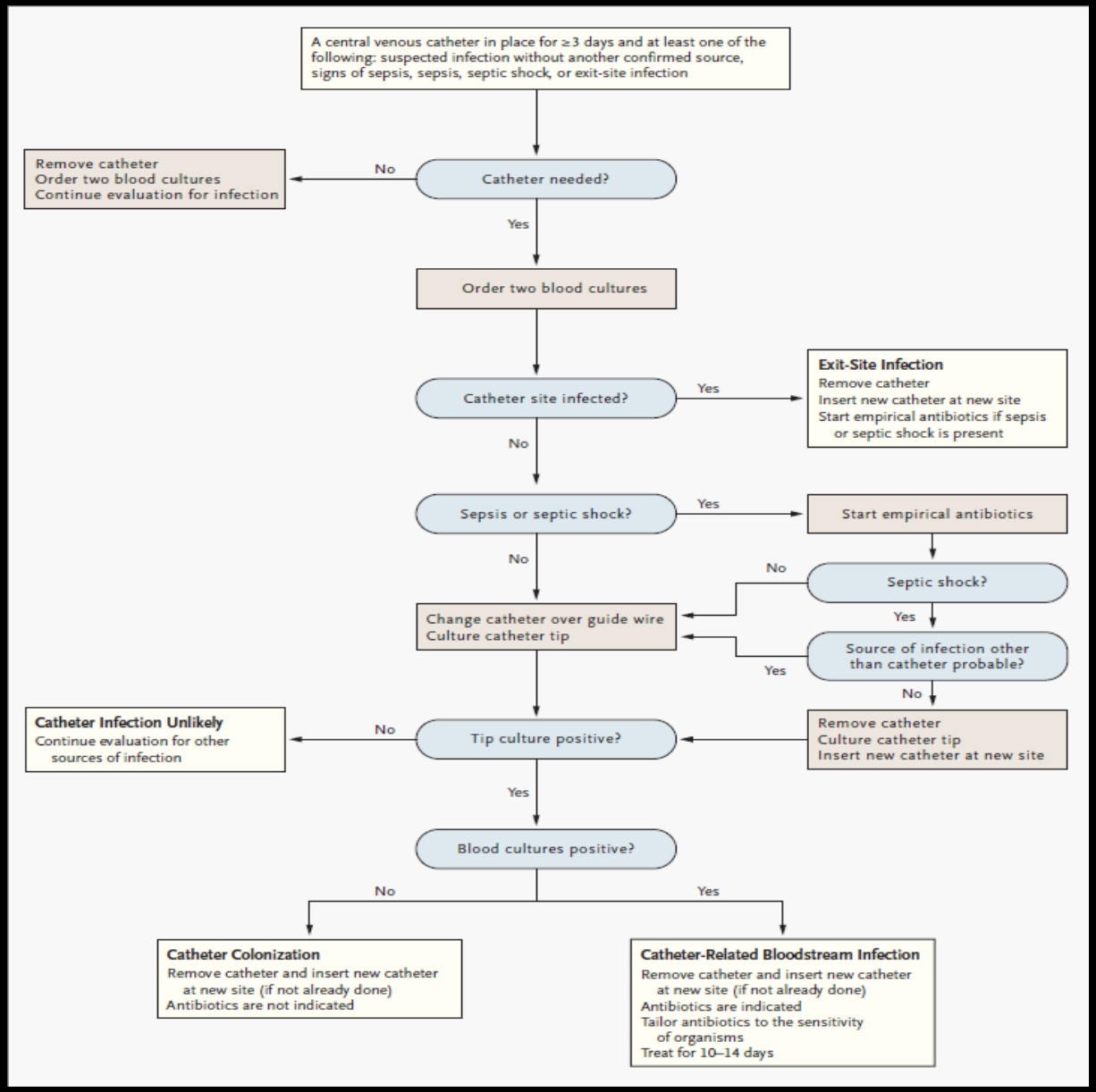
제7차 신입전공의 워크샵

- **Pulmonary Artery Rupture**
  - “Swan-Ganz”
  - uncontrolled hemoptysis.
  - Reinflation , immediate airway intubation with mechanical ventilation, an urgent portable chest x-ray, ,mergent thoracotomy may be required
  - pulmonary angiogram with angio embolization or vascular stenting

- **Central Venous Line Infection**
  - Mortality rates
    - 12 to 25%
  - Removing the line is adequate
  - *Staphylococcus aureus* infections,
    - metastatic seeding of bacterial emboli
    - 4 to 6 weeks of antibiotic therapy

Table 3. Types of Catheter-Associated Infections.*

Type	Description
Catheter colonization	Growth of organisms from a catheter segment by either semiquantitative or quantitative culture†
Catheter-related bloodstream infection	Isolation of the same organism from a blood culture and from a semiquantitative or quantitative culture of a catheter segment, accompanied by clinical symptoms of bloodstream infection without any other apparent source of infection‡
Exit-site infection	Erythema, tenderness, induration, or purulence within 2 cm of the exit site of the catheter


A central venous catheter in place for ≥3 days and at least one of the following: suspected infection without another confirmed source, signs of sepsis, sepsis, septic shock, or exit-site infection
Catheter needed?
No
Remove catheter
Order two blood cultures
Continue evaluation for infection
Yes
Order two blood cultures
Catheter site infected?
Yes
Exit-Site Infection
Remove catheter
Insert new catheter at new site
Start empirical antibiotics if sepsis or septic shock is present
No
Sepsis or septic shock?
Yes
Start empirical antibiotics
No
Septic shock?
Yes
Change catheter over guide wire
Culture catheter tip
Source of infection other than catheter probable?
Yes
No
Catheter Infection Unlikely
Continue evaluation for other sources of infection
No
Tip culture positive?
Remove catheter
Culture catheter tip
Insert new catheter at new site
Yes
Blood cultures positive?
No
Yes
Catheter Colonization
Remove catheter and insert new catheter at new site (if not already done)
Antibiotics are not indicated
Catheter-Related Bloodstream Infection
Remove catheter and insert new catheter at new site (if not already done)
Antibiotics are indicated
Tailor antibiotics to the sensitivity of organisms
Treat for 10–14 days

Pearls and Tips

- Prepare the area widely enough
- failed in JV or SVC
  - obtain a chest radiograph before attempting on the contralateral side
  - rule out the presence of a pneumothorax

- Pressure transducer
  - Pressure and wave form

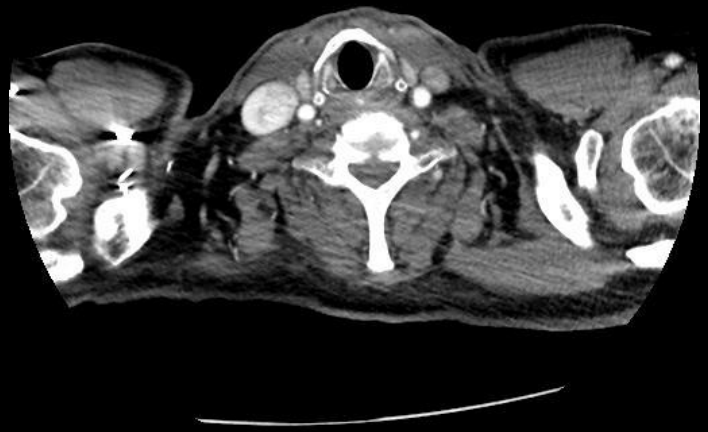
- saline-filled length of single-lumen tubing
  - venous blood : variation with respirations
  - arterial blood : pulsations

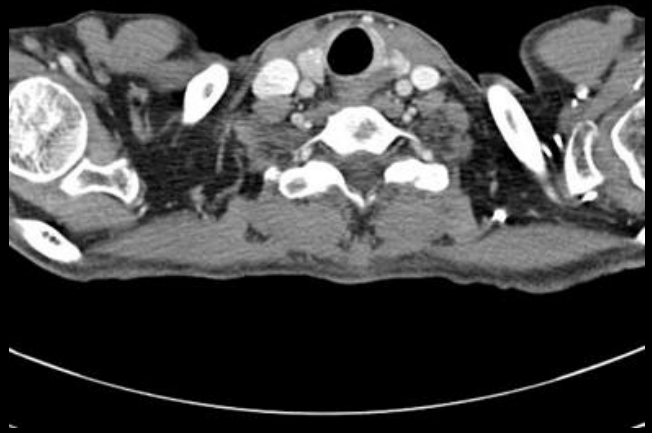
- To avoid malposition
  - Manually occluding the ipsilateral jugular vein
  - Head to the contralateral side against resistance

- Rt internal jugular vein
  - larger caliber
  - lower apex of the right lung

- Lt internal jugular vein
  - smaller than the right in about one third of patients.

제7차 신입전공의 워크샵





TO BE A GOOD SURGEON

- PASSION
- PERSEVERANCE
- KNOWLEDGE
- INTEGRITY
- DECISION MAKING
- INNOVATION
- SURGICAL SKILL
- EARLY APPLICATION OF NEW TECH
- TIME MANAGEMENT
- TAKE CARE OF YOURSELF