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# OBJECTIVES

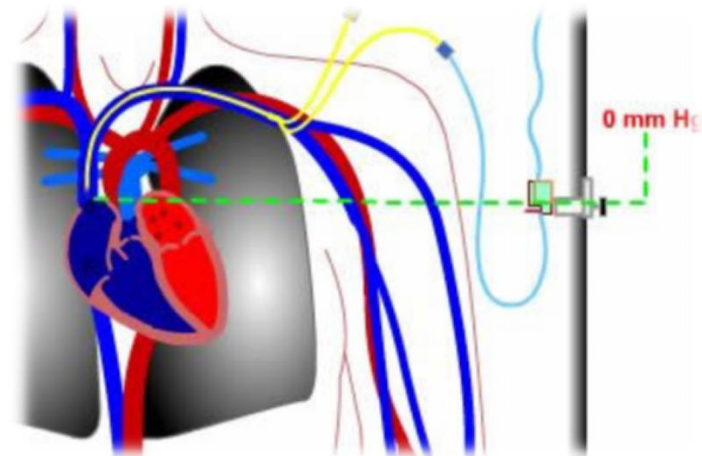
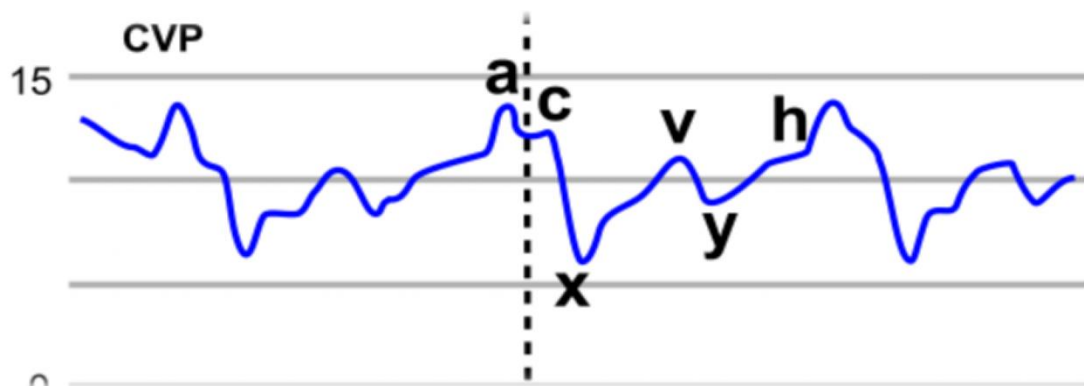
- *Introduction*
- *Indications and Contraindications*
- *Complications*
- *Technique*
- *Basic principles*
- *Specifics by Site*
- *Basic materials*

# WHAT IS CENTRAL VENOUS PRESSURE....???

- Clinical measure of right ventricular filling
- The zero reference point for venous pressures in the thorax is a point on the external thorax where the fourth intercostal space intersects the mid-axillary line (i.e., the line midway between the anterior and posterior axillary folds).
- This point (called the phlebostatic axis) corresponds to the position of the right and left atrium when the patient is in the supine position.

## ○ MEASUREMENT

- Calibrated transducer or water manometer



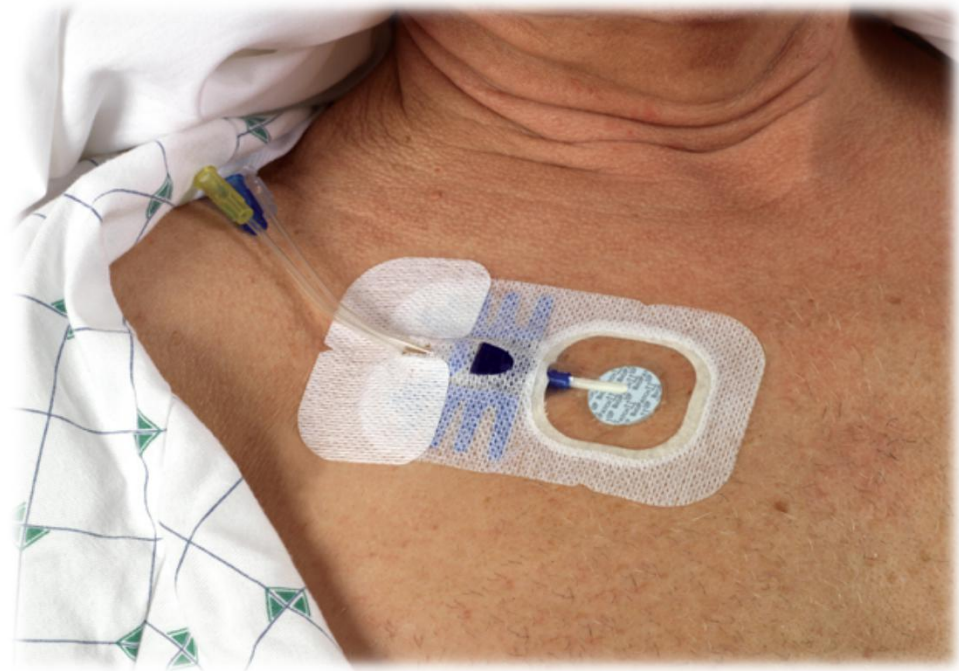
# INDICATIONS

- *Central venous pressure monitoring*
- *Volume resuscitation*
- *Cardiac arrest*
- *Lack of peripheral access*
- *Infusion of hyperalimentation*
- *Infusion of concentrated solutions*
- *Placement of transvenous pacemaker*
- *Cardiac catheterization, pulmonary angiography*
- *Hemodialysis*



# RELATIVE CONTRAINDICATIONS

- *Bleeding disorders*
- *Anticoagulation or thrombolytic therapy*
- *Combative patients*
- *Distorted local anatomy*
- *Cellulitis, burns, severe dermatitis at site*
- *Vasculitis*



# COMPLICATIONS

## ○ *Vascular*

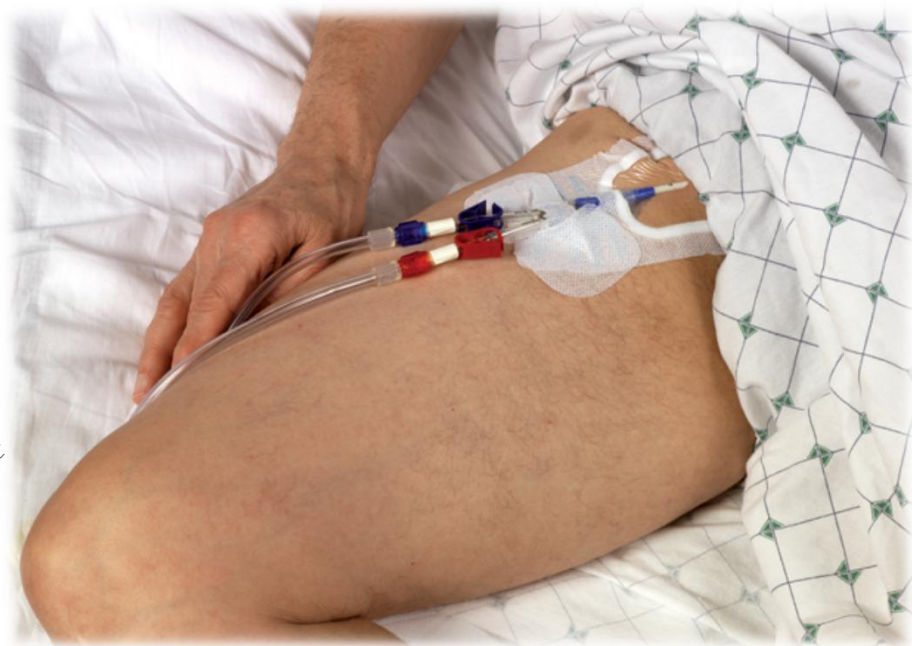
- *Air embolus*
- *Arterial puncture*
- *Arteriovenous fistula*
- *Hematoma*
- *Blood clot*

## ○ *Infectious*

- *Sepsis, cellulitis, osteomyelitis, septic arthritis*

## ○ *Miscellaneous*

- *Dysrhythmias*
- *Catheter knotting or malposition*
- *Nerve injury*
- *Pneumothorax, hemothorax, hydrothorax, hemomediastinum*
- *Bowel or bladder perforation*

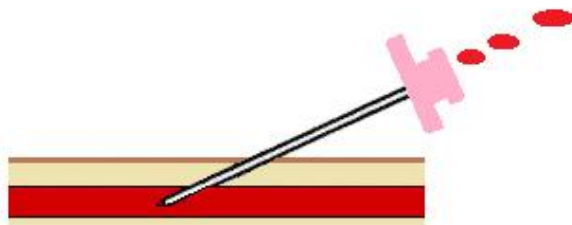




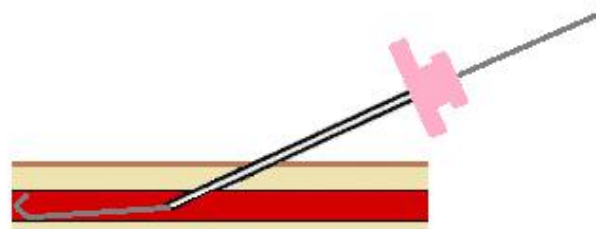
# TECHNIQUE

## ○ *Modified Seldinger technique*

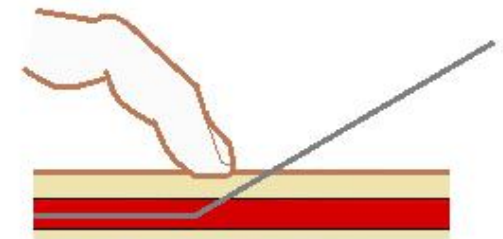
- *Use introducing needle to locate vein*
- *Wire is threaded through the needle*
- *Needle is removed*
- *Skin and vessel are dilated*
- *Catheter is placed over the wire*
- *Wire is removed*
- *Catheter is secured in place*



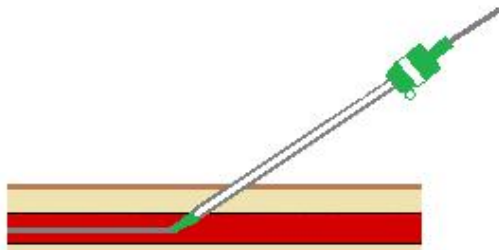
**A.** Pulsatile blood flow upon entry.



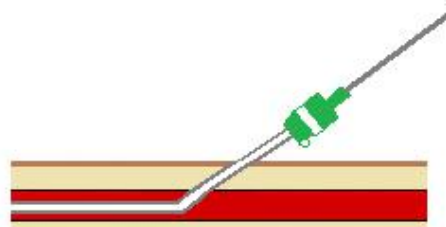
**B.** J-tip guidewire is advanced



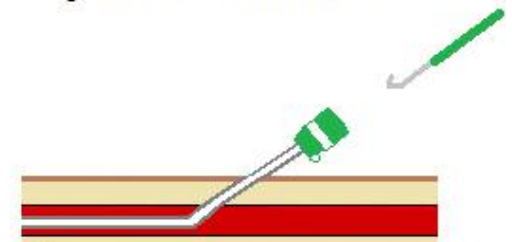
**C.** Needle is removed leaving guidewire inside of the vessel



**D.** Sheath is advanced over guidewire



**E.** Sheath advanced to skin entry



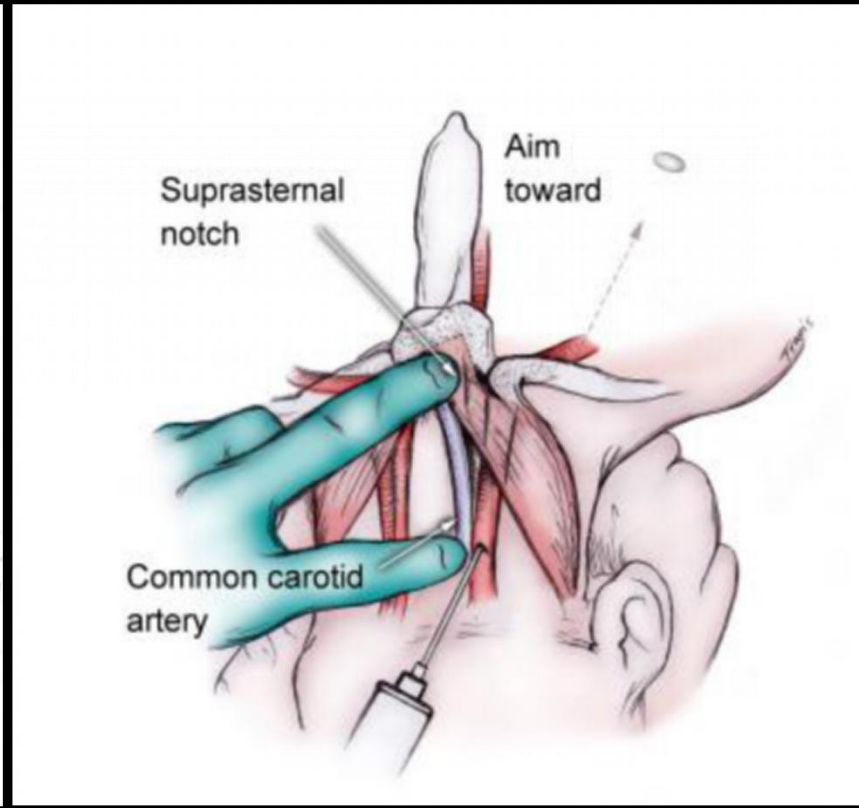
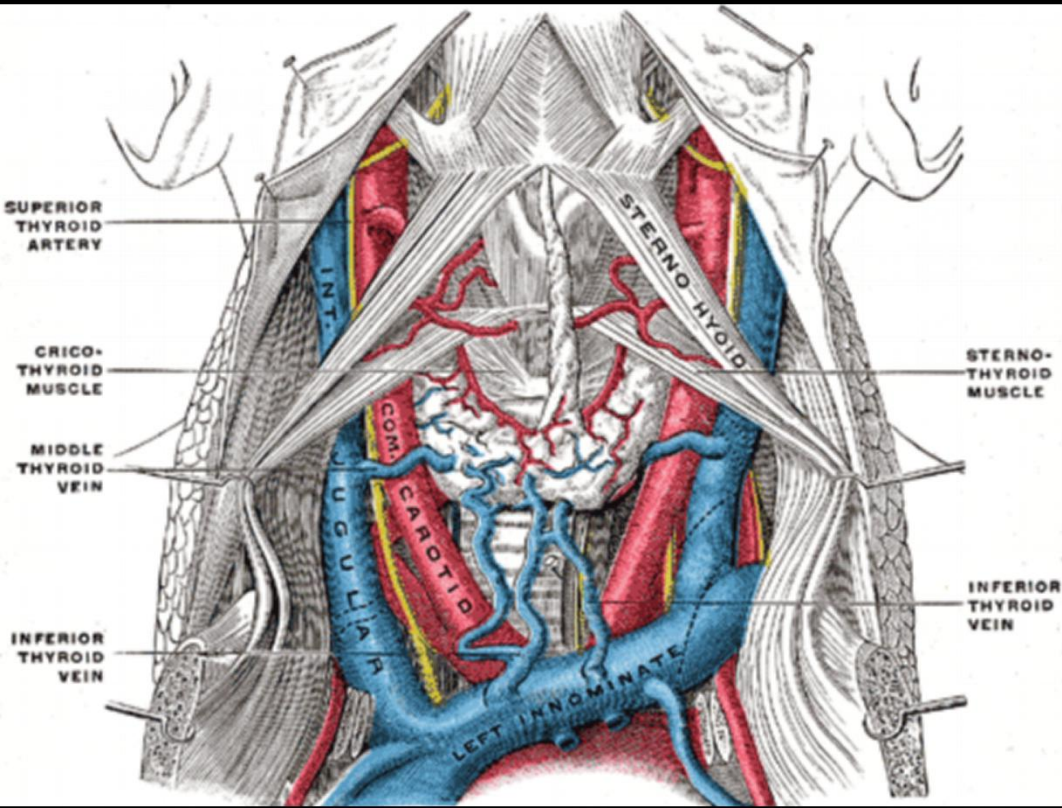
**F.** Guidewire and dilator removed.

# BASIC PRINCIPLES

- *Decide if the line is really necessary*
- *Know your anatomy*
- *Be familiar with your equipment*
- *Obtain optimal patient positioning and cooperation*
- *Take your time*
- *Use sterile technique*
- *Always have a hand on your wire*
- *Ask for help*
- *Always aspirate as you advance as you withdraw the needle slowly*
- *Always withdraw the needle to the level of the skin before redirecting the angle*
- *Obtain chest x-ray post line placement and review it*



<i>Location</i>	<i>Advantage</i>	<i>Disadvantage</i>
<i>Internal Jugular</i>	<ul style="list-style-type: none"> <li>● <i>Bleeding can be recognized and controlled</i></li> <li>● <i>Malposition is rare</i></li> <li>● <i>Less risk of pneumothorax</i></li> </ul>	<ul style="list-style-type: none"> <li>● <i>Risk of carotid artery puncture</i></li> <li>● <i>PtX possible</i></li> </ul>
<i>Femoral</i>	<ul style="list-style-type: none"> <li>● <i>Easy to find vein</i></li> <li>● <i>No risk of pneumothorax</i></li> <li>● <i>Preferred site for emergencies and CPR</i></li> <li>● <i>Fewer bad complications</i></li> </ul>	<ul style="list-style-type: none"> <li>● <i>Highest risk of infection</i></li> <li>● <i>Risk of DVT</i></li> <li>● <i>Not good for ambulatory patients</i></li> </ul>
<i>Subclavian</i>	<ul style="list-style-type: none"> <li>● <i>Most comfortable for conscious patients</i></li> </ul>	<ul style="list-style-type: none"> <li>● <i>Highest risk of PtX, should not do on intubated pts</i></li> <li>● <i>Should not be done if &lt; 2 years</i></li> <li>● <i>Vein is non-compressible</i></li> </ul>



### ○ *Needle placement: Central approach*

- *Locate the triangle formed by the clavicle and the sternal and clavicular heads of the SCM muscle*
- *Gently place three fingers of left hand on carotid artery*
- *Place needle at 30 to 40 degrees to the skin, lateral to the carotid artery*
- *Aim toward the ipsilateral nipple under the medial border of the lateral head of the SCM muscle*
- *Vein should be 1-1.5 cm deep, avoid deep probing in the neck*

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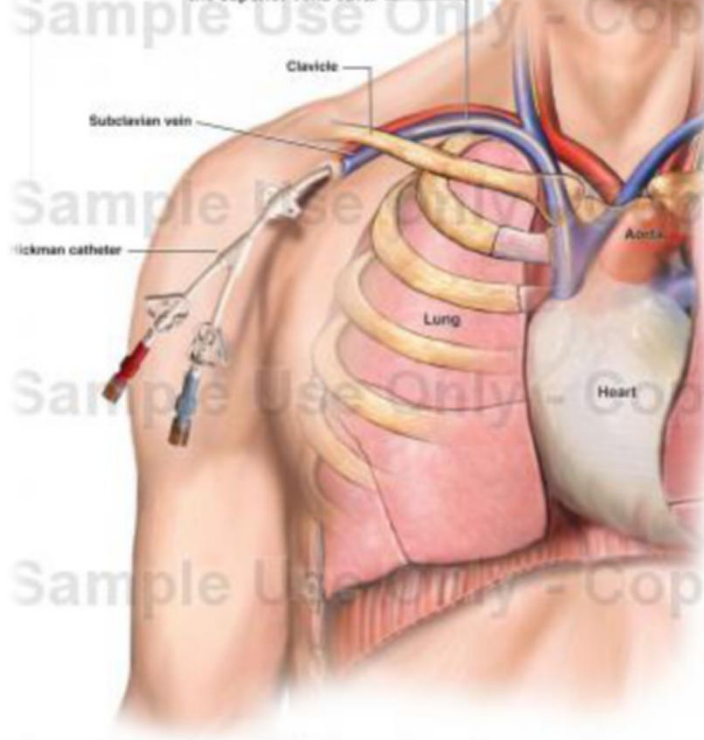
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The Hickman catheter is inserted into the subclavian vein and advanced to the superior vena cava.



Finger in suprasternal notch

Subclavian vein

Clavicle



First rib

Superior vena cava

## ○ Needle placement

○ Junction of middle and medial thirds of clavicle

○ At the small tubercle in the medial deltopectoral groove

○ Needle should be parallel to skin

○ Aim towards the supraclavicular notch and just under the clavicle

# FEMORAL CATH

## ○ Positioning

○ Supine

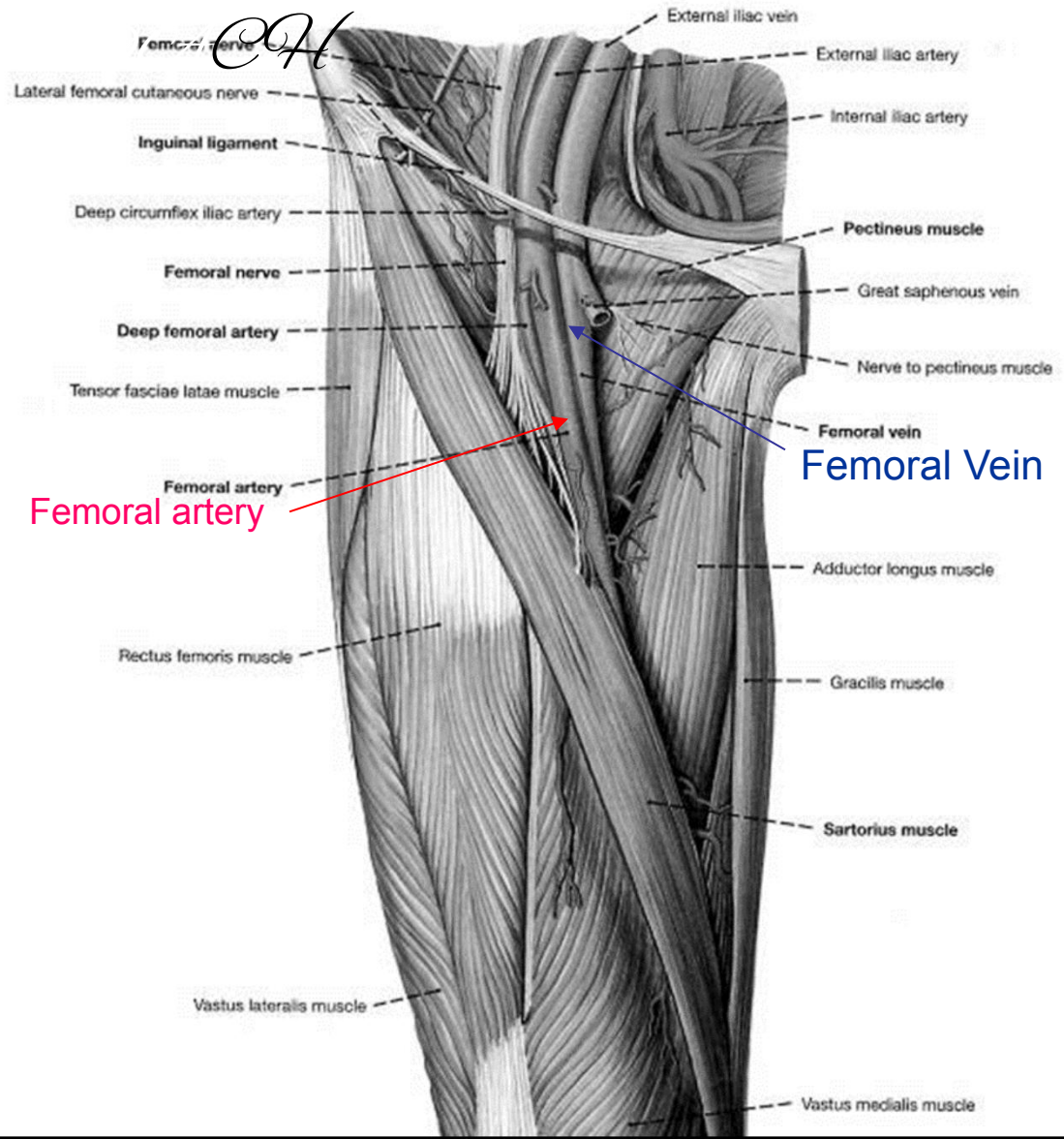
## ○ Needle placement

○ Medial to femoral artery

○ Needle held at 45 degree angle

○ Skin insertion 2 cm below inguinal ligament

○ Aim toward umbilicus





# POST-CATHETER PLACEMENT

- *Aspirate blood from each port*
- *Flush with saline or sterile water*
- *Secure catheter with sutures*
- *Cover with sterile dressing (tega-derm)*
- *Obtain chest x-ray for IJ and SC lines*
- *Write a procedure note*

# PROCEDURE NOTE

- *Name of procedure*
- *Indication for procedure*
- *Comment on consent, if applicable*
- *Describe what you did, including prep*
- *Comment on aspiration/flushing of ports*
- *How did patient tolerate procedure*
- *Any complications*

# ULTRASOUND-GUIDED CENTRAL VENOUS ACCESS

- *Becoming standard of care*
- *Vein is compressible*
- *Vein is not always larger*
- *Vein is accessed under direct visualization*
- *Helpful in patients with difficult anatomy*



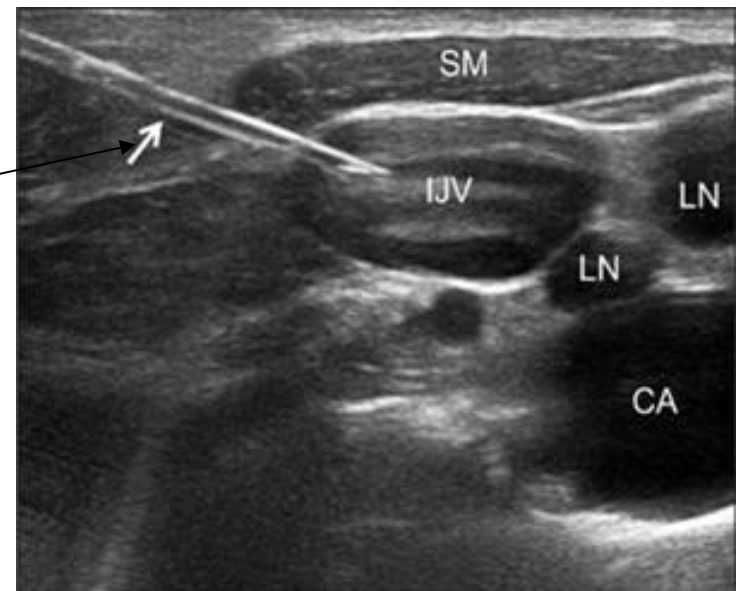
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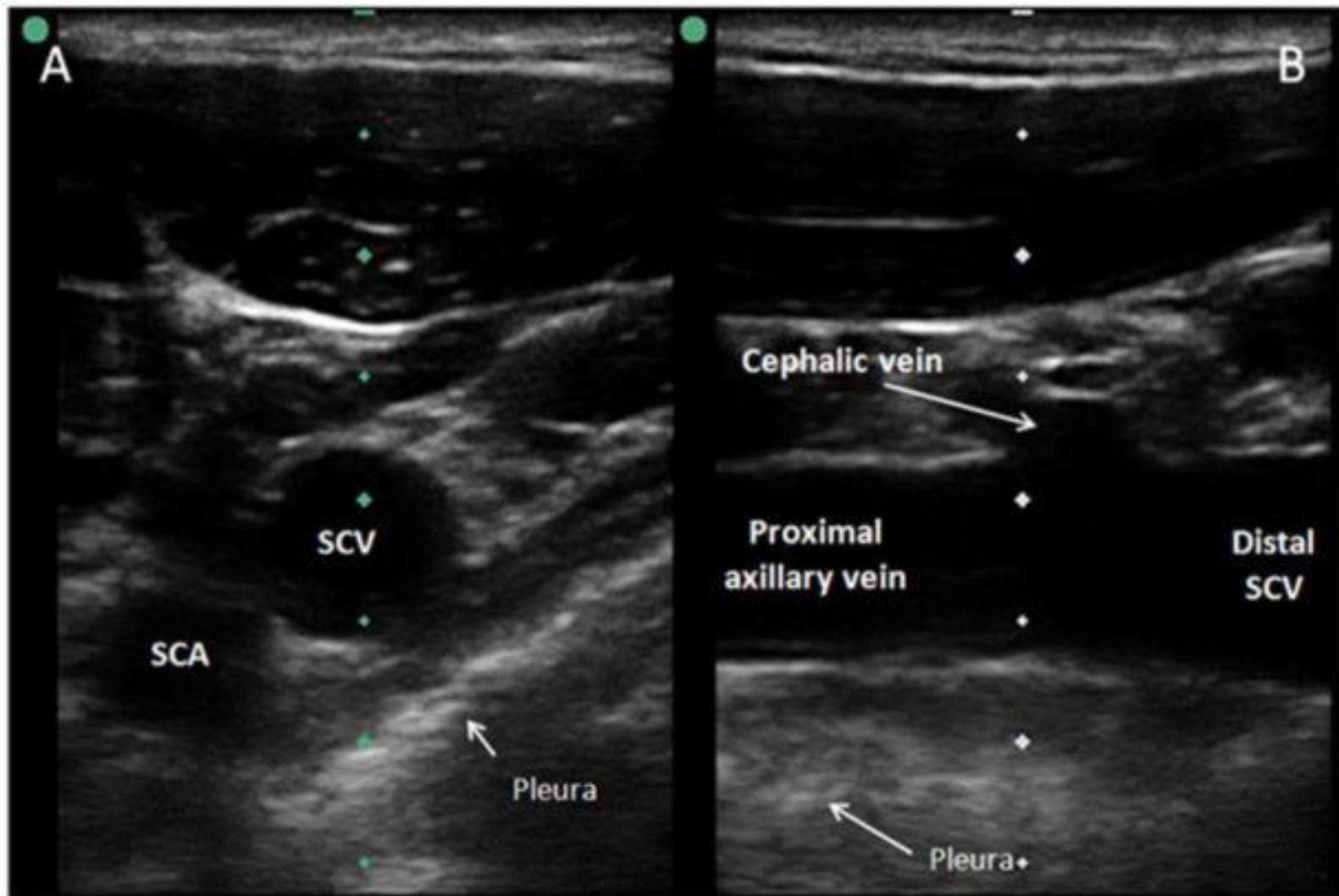


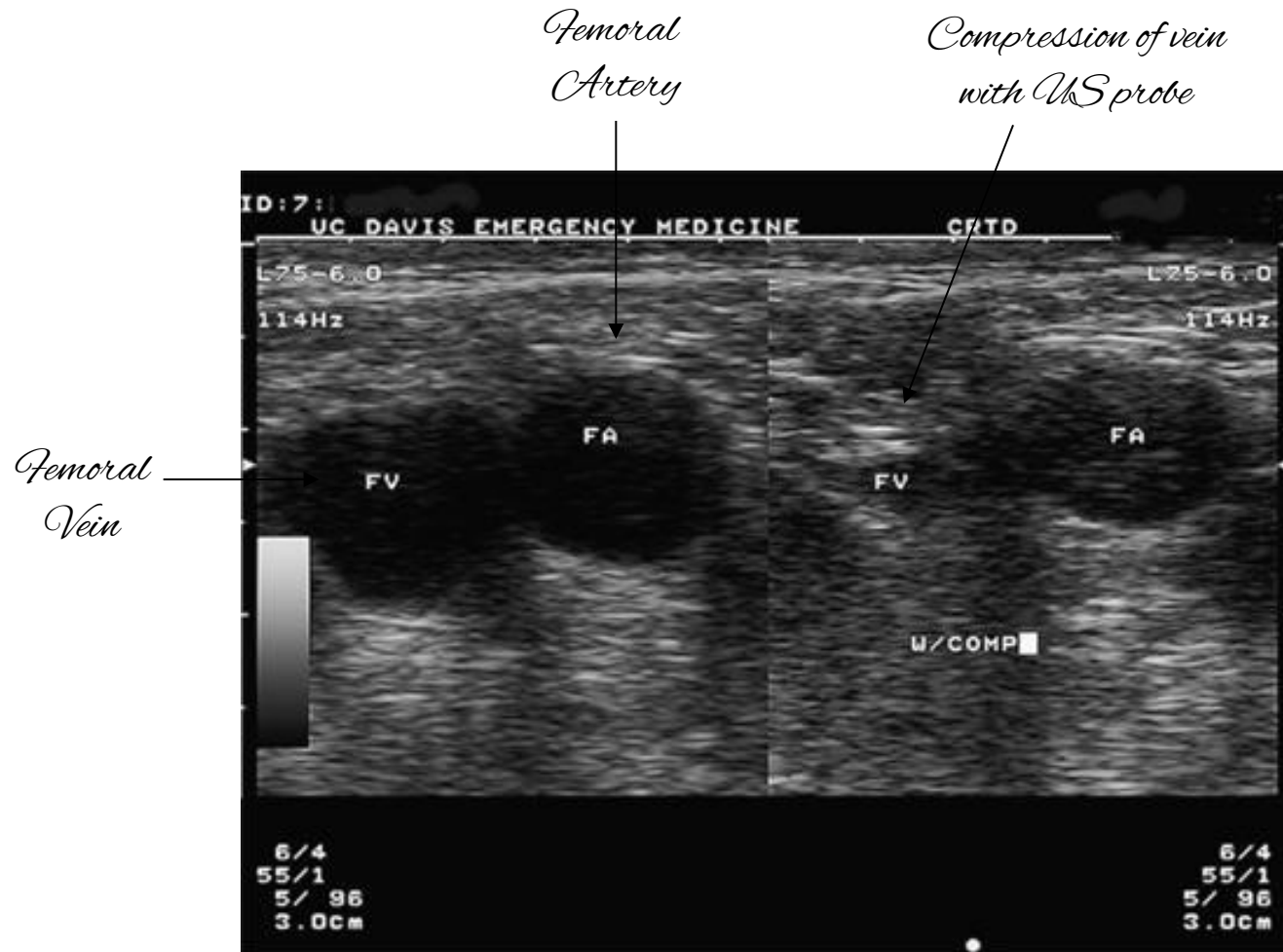


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*Needle entering IJ*

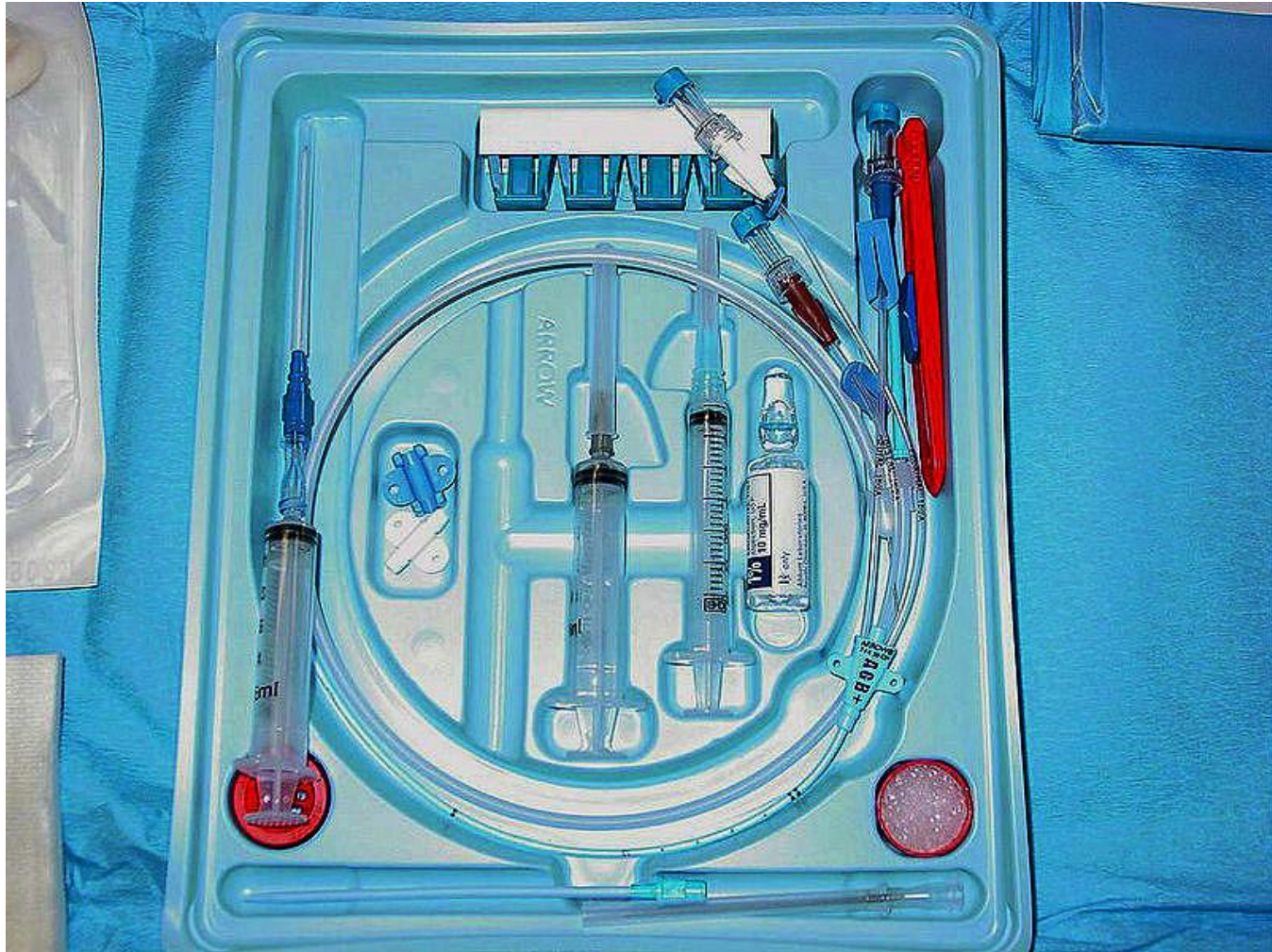






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# CATHETERIZATION KITS



# REFERENCES

- Clinical Procedures in Emergency Medicine, Roberts and Hedges, 4<sup>th</sup> edition
- Clinician's Pocket Reference, Leonard Gomella, 8<sup>th</sup> edition
- Atlas of Human Anatomy, Frank Netter, 2<sup>nd</sup> edition