

Central Venous Catheterization

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Central venous access remains a cornerstone of resuscitation and critical care in both the emergency department (ED) and intensive care unit. Advanced hemodynamic monitoring, rapid infusion of fluid, placement of transvenous pacemakers, and administration of selected medications all require reliable central venous access. Central venous catheterization has also gained acceptance in the resuscitation and treatment of critically ill patient. Over the past decade, the increased availability of, training in, and provider competence in bedside ultrasonography have had a significant impact on the standard approach to both peripheral and central venous catheterization. Ultrasound-guided central venous catheterization has improved success rates, reduced complication rates, decreased the time required to perform the procedure, and resulted in overall cost savings.

Access Site

Traditionally, the subclavian vein (SV), internal jugular (IJ) vein, and femoral vein have provided reliable and easily obtainable vascular access through the use of identifiable anatomic landmarks.

Technique	Advantages	Disadvantages
IJ	<ul style="list-style-type: none">– Good external landmarks– Improved success with ultrasound– Less risk for pneumothorax than with SV access– Can recognize and control bleeding– Malposition of the catheter is rare– Almost a straight course to the superior vena cava on the right side– Carotid artery easily identified	<ul style="list-style-type: none">– More difficult and inconvenient to secure– Possibly higher infectious risk than with SV access– Possibly higher risk of thrombosis than with SV access
Femoral	<ul style="list-style-type: none">– Good external landmarks– Usefull alternative with coagulopathy	<ul style="list-style-type: none">– Difficult to secure in ambulatory patients– Not reliable for CVP measurement– Highest risk for infection– Higher risk for thrombus
SV1 Infraclavicular	<ul style="list-style-type: none">– Good external landmarks	<ul style="list-style-type: none">– “Blind” procedure– Should not be attempt in children younger than 2 year
SV2 Supraclavicular	<ul style="list-style-type: none">– Good external landmarks– Practical method in inserting a central line in cardiorespiratory arrest	<ul style="list-style-type: none">– “Blind” procedure– Unable to compress bleeding vessels

INDICATIONS, CONTRAINDICATION, AND COMPLICATION

Central venous access has several clinical indications. If necessary, any central venous approach could be used for each of these situations. The clinical indications are listed below:

Indications

- Central venous pressure monitoring
- High-volume/flow resuscitation
- Emergency venous access

- Inability to obtain peripheral venous access
- Repetitive blood sampling
- Administering hyperalimentation, caustic agents, or other concentrated fluids
- Insertion of transvenous cardiac pacemakers
- Haemodialysis or plasmapheresis
- Insertion of pulmonary artery catheters

Contraindication

- Infection over the placement site
- Distortion of landmarks by trauma or congenital anomalies
- Coagulopathies, including anticoagulation and thrombolytic therapy
- Pathologic conditions, including superior vena cava syndrome
- Current venous thrombosis in the target vessel
- Prior vessel injury or procedures
- Morbid obesity
- Uncooperative patients

Complication

- Arterial puncture and hematoma
- Pneumothorax (subclavian and internal jugular approach)
- Hemothorax (subclavian and internal jugular approach)
- Vessel injury
- Air embolism
- Cardiac dysrhythmia
- Nerve injury
- Infection
- Thrombosis
- Catheter misplacement

EQUIPMENT

We strongly recommend stocking all additional equipment such as sterile gowns, gloves, and drapes in a dedicated “central line cart.” This is a fundamental part of the “bundling” practice that has been shown to reduce the search for supplies, improve compliance with full-barrier technique, and subsequently decrease catheter-related infections. Sterile barrier precautions with cap, face mask, sterile gown, and gloves should be used at all times during insertion of CVCs.

1. Ultrasound

Ultrasound- guided CVC placement allows the provider to survey the anatomy before the procedure, guide insertion of the needle into the correct vessel, and confirm placement of the catheter in the vessel.

2. Needle

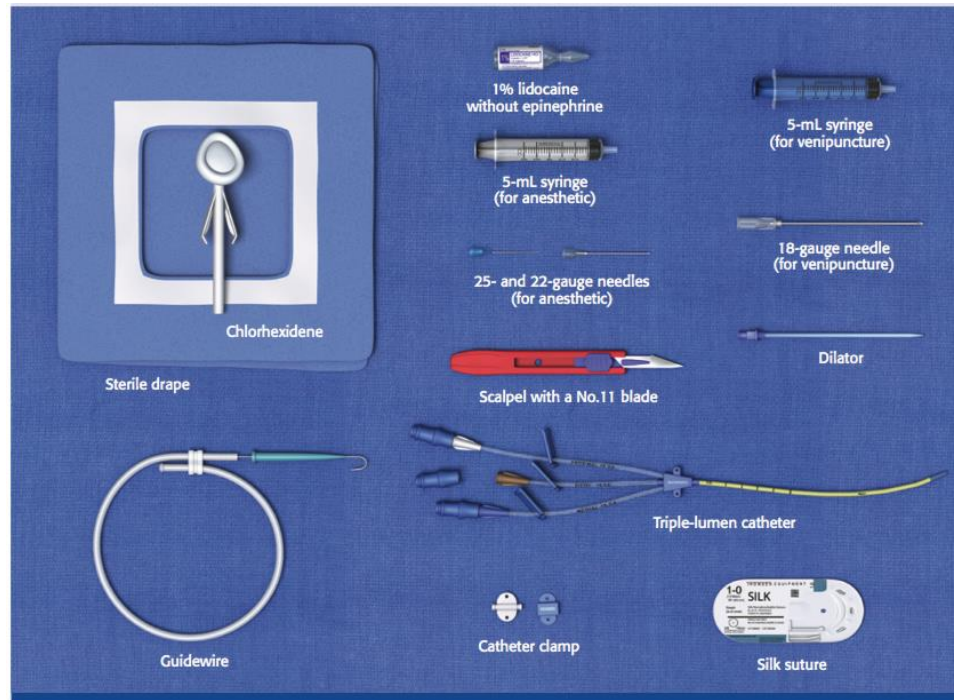
Standard needles may have a uniformly straight-bore lumen throughout their length. A wire passing into a straight needle may encounter an obstacle at the proximal end. The proximal end of a Seldinger needle incorporates a funnel- shaped taper that guides the wire directly into the needle. It is advisable to use a non-Luer-Lok or slip-tip type of syringe because the added twisting that is required to remove a Luer-Lok syringe from the introducer needle may dislodge a tenuously placed needle. Safety syringe systems exist that permit passage of the wire without removal of the aspirating syringe by using a central tunnel in the barrel. This device incorporates a hollow syringe through which the guidewire can pass directly into the introducing needle without detachment. It also reduces the risk for air embolism, which can occur when the needle is open to air. It is not uncommon for the wire to become snagged at the junction of the safety syringe and the needle hub. In this case, simply remove the syringe and insert the wire directly.

3. Guidewire

Two basic types of guidewires are used: straight and J shaped. Straight wires are for use in vessels with a linear configuration, whereas J-wires are for use in tortuous vessels. Both wires have essentially the same internal design.

4. Catheters

The functions of catheters have become more sophisticated as well, most notably for continuous monitoring of central venous oxygen saturation and cardiac output. Generally, one can place single-, double-, and triple-lumen catheters by sliding the catheter directly over a guidewire into the intended vessel.



PREPARATION

1. Explain the procedure of the action to be performed to the patient and family, any indications and complications that may arise, and the possibility that will occur if the procedure is not performed.
2. After understanding and agreeing, the patient and family sign the action permit/ informed consent
3. Conduct hemodynamic examination and blood test
4. Determine the location of the central venous catheter: in the internal jugular vein or subclavian
5. Provide necessary tools and materials:
 - a. Needle 21G
 - b. (2 pcs) 5 ml syringe
 - c. Catheter set Jugular-Subclavian 14 G
 - d. Silk 3.0
 - e. Needle Holder
 - f. Scissor
 - g. CVC set (certofix trio)
 - h. (3 amp) Lidocaine 2 %
 - i. Plaster
 - j. Sterile gloves
 - k. Sterile Gown
 - l. Sterile Duk
 - m. NaCl 0.9% 100cc

TECHNIQUE

1. The patient is in a Trendelenburg position. The position of the head below will make the internal jugular vein more visible.
2. Make sure all equipment is available
3. First, study and determine the anatomy where the procedure will be performed, conduct aseptic and antisepsis before performing.
4. Ask the patient to slightly tilt the head to the left, this will expand the field on the right neck. Find 2-Caput of Muskulu-sternokleidomasteideus, (the Caput of the clavicle and the Caput of the sterna. The superior corner that is formed by both Caputs, is cannulated to the Internal Jugular veins
5. Conduct aseptic and antiseptic, once we determined the site of the workplace.
6. Remember the cannulated site to the Internal Jugular veins that is described above. Conduct a palpation to the Carotid artery, where is located on the medial side of the canal site. Perform anesthesia procedures with lidocaine, starting from superficial to the deeper areas.
7. Start the procedures with a 22G needle that is connected to 5 ml syringe. Insert the needle, with a 45-degree angle position, to the determined site. Pull up the syringe, whenever we insert the needle deeper. And if it fails, pull back the needle and try to perform it to the more lateral site.
8. When the needle has entered the vein, insert the 18G catheter needle, on the same line and location as the previous needle. When the needle has entered into the vein, pull back the needle carefully, while inserting the catheter in. Close the back of the catheter (catheter hub) to prevent air embolism.
9. Take the guidewire with the other hand to close the catheter hub, use the thumb to insert the wire carefully into the vein. Wire should be able to enter unhindered into the vein.
10. Take the scalpel # 11, make the incision wider on the skin, so that the venous catheter can be inserted with guidewire guidance.
11. After the central venous catheter successfully inserted, make a strong fixation on the skin.

References

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