Placement of Central Venous Catheter

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Indications and Benefits

- Central intravenous access, short or long term
- Emergency resuscitation
- Central Venous Pressure monitoring
- Infusions of critical or caustic substances (vasoactive medications, chemotherapy, and parenteral nutrition)
- Hemodialysis, plasmapheresis, apheresis
- Pulmonary artery catheterization
- Benefits: Accesses with single or multiple lumen catheter for infusion, dialysis, or hemodynamic monitoring

Risks and Alternatives

- Standard risks include bleeding, infection, need for additional procedures, and risks of anesthesia.
- Early complications: Hematoma, pneumothorax, hemothorax, inadvertent arterial puncture, cardiac arrhythmia, thoracic duct injury, retained guide wire or guide wire embolus, air embolus, hemopericardium, cardiac tamponade, chylothorax, and catheter knots.
- Late: Line infection, catheter fracture, vascular erosion, and vessel stenosis.

Essential Steps

1. Select appropriate catheter type and size based on patient characteristics and indication for insertion.
2. Identify insertion site and appropriate anatomic landmarks. The use of ultrasound for identification of the target vessel is recommended.
3. Position patient in Trendelenburg position (internal jugular or subclavian lines), or reverse Trendelenburg (femoral line).
4. Don hair cover, face mask, sterile gown, and sterile gloves.
5. Prep and drape insertion site, place sterile ultrasound cover if it is used.
6. Prep central line by flushing with sterile saline and ensure that wire threads easily through the catheter.
7. Using anatomic landmarks and/or ultrasound, once again identify target site for insertion.
8. Puncture skin with introducer needle while applying backward pressure on syringe plunger. If using ultrasound, watch for the shadow of the needle appear within the
lumen and watch for a flash of venous blood in syringe to confirm access.

9. Once access is obtained, place introducer and thread guidewire through the needle. If patient has continuous cardiac monitoring, watch for arrhythmia induced by guidewire.

10. Remove needle, leaving guidewire in place. Make small incision adjacent to guidewire to facilitate passage of dilator.

11. Insert dilator over wire, then remove while applying pressure at the insertion site to minimize blood loss.

12. Thread catheter over guide wire taking care to always maintain a grasp on the end of the wire while inserting the catheter to prevent wire embolus.

13. Advance tip of catheter to appropriate position and remove guidewire. Confirm backflow of nonpulsatile bleeding from catheter through all ports, then flush and place hubs or caps.

14. Secure catheter in place, clean site, and apply sterile dressing.

**Note These Variations**

- If percutaneous access is not available, a venous cut down may be performed to facilitate catheter insertion.
- Tunneled lines are inserted in a similar fashion but the distal end is tunneled away from the venipuncture site under the skin creating an access site at a more functional or sustainable position.
- Vascular access ports are placed in a similar manner to a tunneled central line, but the distal end of the catheter is attached to an access port which is placed in a subcutaneous pocket.

**Template Operative Dictation**

**Preoperative Diagnosis** ___ necessitating need for central venous access.

**Postoperative Diagnosis** Same as preoperative diagnosis

**Findings** Same as postoperative diagnosis

**Procedure(s) Performed** Placement of central venous catheter

**Anesthesia** General/regional/procedural sedation

**Specimen** None

**Drains** None

**Implants** ___ Fr, single/dual/triple/___ lumen tunneled central venous catheter (Hickman / Broviac / ___).

**Estimated Blood Loss** ___

**Indications** This is a/an ___ -day/week/month/year-old male/female with a history of ___ and need for durable central venous access. Treatment of this condition necessitated central venous access for resuscitation/monitoring/infusion/hemodialysis.

**Procedure in Detail:**

[Choose One]

**Bedside procedure:** Informed consent from the patient including a thorough explanation of the risks and benefits of the procedure was obtained. The patient was positioned in Trendelenburg. A procedural time out was performed per institutional policy. This confirmed the correct patient, procedure, operative site, and additional critical information prior to the start of the procedure. The right/left neck/chest/groin was then prepped in the usual sterile fashion.

**Procedure in the Operating Room:** After obtaining informed consent from the patient including a thorough explanation of the risks and benefits of central venous catheter insertion, the patient was taken to the operating room. Following satisfactory induction of anesthesia, the patient was placed in Trendelenburg and appropriately padded. Timeouts were performed using both preinduction and preincision safety checklists with participation of all present in the operative suite. These confirmed the correct
patient, procedure, operative site, and additional critical information prior to the start of the procedure. The right/left neck/chest/groin was then prepped and draped in the usual sterile fashion.

[Choose One:]

**Internal jugular placement:** Using ultrasound, the right/left internal jugular vein was visualized and an 18 g needle was inserted into the vein and was confirmed with aspiration of blood within the syringe. A guidewire was inserted through the needle using Seldinger technique. The needle was withdrawn. The wire tip was deemed to be in the appropriate position using surgeon-interpreted fluoroscopy/the wire tip was deemed to be in the appropriate position with visualization of ectopy on cardiac monitoring. A small stab incision was made in the skin adjacent to the wire. A dilator was passed over the guidewire, then removed. The distal tip of the catheter was threaded over the wire while maintaining control of the distal tip of the wire. The guide wire was removed. The catheter was flushed and aspirated without difficulty. The distal tip was confirmed to be in appropriate position using surgeon-interpreted fluoroscopy. A 2-0 nylon suture was used to secure the line to the skin. The site was cleaned and a sterile dressing was placed over the insertion site. The instrument and sponge count was correct at the end of the case. The patient tolerated the procedure and was transferred to the postoperative recovery area in good condition.

**Femoral placement:** Using ultrasound, the right/left femoral vein was visualized and a Cook catheter needle was inserted into the vein and was confirmed with aspiration of blood within the syringe. A guidewire was inserted through the needle using Seldinger technique. The needle was withdrawn. A small stab incision was made in the skin adjacent to the wire. A dilator was passed over the guidewire, then removed. The distal tip of the catheter was threaded over the wire while maintaining control of the distal tip of the wire. The guide wire was removed. The catheter was flushed and aspirated without difficulty. A 2-0 nylon suture was used to secure the line to the skin. The site was cleaned and a sterile dressing was placed over the insertion site. The instrument and sponge count was correct at the end of the case. The patient tolerated the procedure and was transferred to the postoperative recovery area in good condition.

**Subclavian placement:** The angle of the clavicle was located and local anesthetic was injected in the skin and subcutaneous tissue along with the periosteum of the clavicle. A Cook catheter needle was inserted through the skin and subcutaneous tissue along with the periosteum of the clavicle. After feeling the clavicle with the needle, the needle was passed under the bone to access the left/right subclavian vein. A guidewire was inserted through the needle using Seldinger technique. The needle was withdrawn. The wire tip was deemed to be in the appropriate position using surgeon-interpreted fluoroscopy/the wire tip was deemed to be in the appropriate position with visualization of ectopy on cardiac monitoring. A small stab incision was made in the skin adjacent to the wire. A dilator was passed over the guidewire, then removed. The distal tip of the catheter was threaded over the wire while maintaining control of the distal tip of the wire. The guide wire was removed. The catheter was flushed and aspirated without difficulty. The distal tip was confirmed to be in appropriate position using surgeon-interpreted fluoroscopy. A 2-0 nylon suture was used to secure the line to the skin. The site was cleaned and a sterile dressing was placed over the insertion site. The instrument and sponge count was correct at the end of the case. The patient tolerated the procedure and was transferred to the postoperative recovery area in good condition.

**Tunneled internal jugular/subclavian catheter placement:** Using ultrasound guidance, an introducer needle was used to locate the right/left internal jugular/subclavian vein. After aspiration of venous blood, a guidewire was inserted through the needle using Seldinger technique. The needle was withdrawn. The distal tip of the wire was confirmed to be in the appropriate position using surgeon-interpreted fluoroscopy. A small stab incision was made adjacent to the wire. A subcutaneous tunnel was created and the distal tip of the catheter was
pulled through the tunnel to the level of the cuff. The catheter was cut to appropriate length. A dilator was threaded over the wire followed by introduction of the introducer sheath. The wire was removed and the distal tip of the catheter was threaded through the introducer sheath which was simultaneously withdrawn. The catheter was flushed and aspirated without difficulty. The distal tip was confirmed to be in appropriate position using surgeon-interpreted fluoroscopy. A 2-0 nylon suture was used to secure the line to the skin. The stab incision at the neck was closed with a 4-0 monocryl suture. The catheter site was cleaned and a sterile dressing was placed over the insertion site. The catheter was flushed with an appropriate volume of heparinized saline. The instrument and sponge count were correct at the end of the case. The patient tolerated the procedure and was transferred to the postoperative recovery area in good condition.

A postprocedure chest X-ray was reviewed to verify position of the catheter and to assess for procedure-related complications.