Placement of Central Venous Catheters or Introducer Sheaths

Anesthesia Protocol
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Overview

1) Prep with chlorhexidine
2) Maximum barrier precautions
3) Ultrasound for all internal jugular lines
4) Pressure waveform monitoring or manometry for all lines
5) Chest xray in PACU or ICU. Confirm safe location of catheter tip.

The Procedure

1) **Chlorhexidine** is the best choice for skin prep.

2) Utilize **barrier precautions** including mask, hat, sterile gloves and gown. Cover patient with a large drape. The translucent plastic 3M “eye” drapes are preferable to the paper drapes that are included in some central line kits.

3) **Ultrasound is highly recommended for ALL internal jugular lines.** Ultrasound may also be useful for subclavian lines, but the utility may be substantially less than for internal jugular lines.

4) **Venous (versus arterial) placement of the Seldinger needle should be confirmed with pressure waveform monitoring** or “manometry” prior to placing the wire through the needle. Pressure waveform monitoring is preferred, but manometry is acceptable in situations where a pressure transducer is not available. Be sure that there is a continuous fluid pathway between the vein and the transducer prior to assessing the pressure waveform (i.e. aspirate blood freely from the needle). The setup illustrated in Fig. 1 is recommended for pressure waveform monitoring.

5) Fluoroscopy should be strongly considered in situations where the anatomy is unusual or if there is any difficulty advancing the wire.

6) **If there is no contraindication to right internal jugular catheterization, the LEFT internal jugular vein is NOT the first choice** for access because of the risks associated with “turning the corner” where the internal jugular vein joins the innominate vein. Injury to the
innominate vein is a risk of this approach. Thoracic duct injury or cannulation of the thoracic duct is also possible from the left side. Consideration should be given to the use of a shorter than normal introducer sheath (to avoid having to cross the internal jugular-innominate junction with the sheath) (Fig 2) and to the use of fluoroscopy if the left-sided approach is utilized.

7) **CVP catheters placed in the right internal jugular vein should be advanced no further than 10-12 centimeters in typical adults.** Deeper insertions will result in the catheter tip residing in the right atrium in many patients, which increases the risk of cardiac perforation.

8) If blood cannot be aspirated from an introducer sheath or CVP catheter after insertion, consideration should be given to the following. Inability to aspirate blood could be due to a kink in the sheath or catheter or could be due to the tip of the device being outside of the vein in several possible locations:

   - The catheter tip could be in the subcutaneous tissue. Generally this will not result in serious complications if the vein has not been perforated.
   - The catheter tip could be in the pleural space. Generally this will not result in life threatening complications if the vein has not been perforated, as long as any pneumothorax which might be present is recognized and appropriately treated.
   - The catheter tip could have passed through both walls of the vein and is residing outside of the vein. This is a life threatening situation. Abrupt removal of the sheath or catheter in this setting could result in massive intrathoracic hemorrhage.

Distinguishing between these possibilities is essential prior to removing the sheath or catheter. Transthoracic ultrasound examination of the chest or fluoroscopy with intravenous contrast administration is probably the best first step in making a diagnosis, but other imaging modalities may be useful in specific circumstances. Involvement of a cardiothoracic or vascular surgeon is highly advisable if a vascular injury is suspected. Surgery may be required if there is injury to an intrathoracic blood vessel.

9) Inadvertent cannulation of an artery (carotid, subclavian, innominate, aortic arch) should be extremely rare if pressure waveform monitoring is used. However, if an artery is cannulated with an introducer sheath or CVP catheter, consider the following. Allowing the device to
remain in the artery may result in thrombosis and the possibility of stroke. Removal of the device from the carotid artery and application of pressure will result in good outcomes in many patients. However, uncontrolled bleeding into the neck or damage to the carotid artery is a possibility. Surgery may be necessary to control bleeding or to repair the artery. If the arterial entry site is inside of the chest (subclavian artery, innominate artery, aortic arch) removal of the sheath can result in massive thoracic hemorrhage. Therefore a vascular or cardiothoracic surgeon should be consulted prior to removing the sheath, and the surgeon may wish to remove the sheath surgically.

10) Obtain a chest x-ray for every central line in the recovery room or ICU and ascertain that the line is properly positioned. The tip of a central venous catheter should be located in the superior vena cava, parallel to the walls of the cava and outside of the heart. If the catheter tip is at or above the level of the carina it should be outside of the heart.

**Billing**

Billing for ultrasound guidance (CPT code 76937). The use of ultrasound guidance for central line placement is a billable service. All diagnostic ultrasound examinations, including those when ultrasound is used to guide a procedure, require permanently recorded images. The images can be maintained in the patient record or some other archive—they do not need to be submitted with the claim. Images can be stored as printed images, on a tape or electronic medium. Documentation of the study must be available to the insurer upon request. A written report of all ultrasound studies should be maintained in the patient’s record. In the case of ultrasound guidance studies, the written report may be filed as a separate item in the patient’s record or it may be included within the report of the procedure for which the guidance is utilized.

The best way to meet these requirements at UWMC is to document the central line placement with a formatted central line placement procedure note in ORCA. Save an ultrasound image from the procedure on the Sonosite machine (cannot be done with the SiteRite; be sure to enter the patient’s identifying information in the Sonosite). The Sonosite images will be periodically downloaded and archived.