

Chapter 8

Vascular Access

Introduction

Vascular access is a critical early step in the management of trauma. Peripheral access should be attempted first; if unsuccessful, additional percutaneous central access locations include the subclavian vein, the internal and external jugular veins, and the common femoral veins. Cutdowns for the saphenous vein at ankle or femoral sites are alternative options.

- Basic Equipment.
 - Tourniquet.
 - 1%–2% Lidocaine.
 - Sterile prep solution, drape, gloves, and 4 x 4 gauze pads.
 - 3mL syringe with 25-gauge needle.
 - Scalpel, hemostat, 11 blade scalpel and fine scissors.
 - Vein introducer or “vein pick”.
 - IV catheter; IV tubing (modified with distal connector cut off), and 8 F NG tube are field expedients.
 - 3-0 or 4-0 silk ties to secure catheter in vein.
 - 2-0 or 3-0 suture to secure catheter to skin.
 - Central catheter kit (for central lines) or intraosseous device for intraosseous insertion.

Subclavian Vein Access or Internal Jugular Venipuncture

- Place the patient supine in Trendelenburg (15° head down).
- Prep and drape subclavian/jugular area. Sterile gloves should be worn.
 - Subclavian line.
 - ◆ With an index finger placed at the sternal notch, the thumb is placed at the junction of the medial and middle third of the clavicle.
 - ◆ 1% lidocaine is infiltrated into the skin, subcutaneous tissue and periosteum of the clavicle.

- ◆ Introduce a large caliber needle with attached 5 mL syringe. Insert with the bevel of the needle up, directing the needle towards the contralateral clavicular head. Keep the needle horizontal to avoid a pneumothorax.
- ◆ While aspirating, slowly advance the needle underneath the clavicle.
- o Jugular vein line.
 - ◆ Turn the patient's head 45° toward the contralateral side to expose the neck.
 - ◆ Identify the apex of the anterior cervical triangle formed by the heads of the sternocleidomastoid muscle to locate the carotid artery.
 - ◆ Palpate the carotid artery and stay lateral with your venipuncture.
 - ◆ Introduce a large-bore needle on 10mL syringe at a 45° angle into the apex of the triangle, lateral to the carotid pulse.
 - ◆ Carotid Puncture: Immediately withdraw the needle and place pressure on site for a minimum of 5 minutes.
 - ◆ Advance the needle caudally, parallel to the sagittal plane and at a 30° posterior angle (eg, toward the ipsilateral nipple).
 - ◆ When free flow of venous blood appears, advance the needle an additional 4 mm (the length of the needle bevel), then remove the syringe and quickly cover the hub of the needle to prevent air embolism.
 - ◇ If air or arterial blood appears, stop immediately. Withdraw needle immediately and place pressure at the site for at least 5 minutes.
 - ◆ If no venous blood return after advancing 5 cm, slowly withdraw the needle while aspirating. If this fails, redirect the needle.
- o Subclavian vein or internal jugular vein catheter insertion.
 - ◆ Once the needle is in the vein, introduce the "J" wire through the needle (Seldinger technique). The wire should pass with minimal resistance. If wire does not pass easily, withdraw the entire apparatus and reattempt line placement.
 - ◆ Remove the needle.

- ◆ Enlarge the puncture site with a scalpel and dilator.
- ◆ Pass the catheter over the wire while holding the wire in place, to a depth of 18 cm on the left and 15 cm on the right for subclavian, and to a depth of 9 cm on the right and 12 cm on the left for jugular vein, then remove the wire.
- ◆ Aspirate from all ports, flush all ports, suture in place, apply antibiotic ointment, dress area, secure tubing, and label date of insertion.
- ◆ Chest radiograph to ensure line position and rule out pneumothorax.

Greater Saphenous Vein Cutdowns

- **Contraindications.**

- Deep vein thrombosis (DVT) or severe ipsilateral lower extremity trauma.

- **Procedure.**

- Expose, prep, and drape ankle or femoral site.
- For ankle, administer local anesthetic proximal to the medial malleolus.
- Make a superficial transverse incision through the skin over the entire width of the flat tibial edge (~3cm) in the area of the saphenous vein.
- Using a curved hemostat, isolate the greater saphenous vein from the nerve and underlying bone.
- Using the open hemostat as a platform, cut a 1–2 mm venotomy in the anterior surface of the vein with a number 11 blade (Fig. 8-1a).
- Place the intravenous tubing (previously beveled) or angiocatheter at least 4 cm into the vein (may require use of a vein introducer) (Fig. 8-1b).
- Secure the catheter with a proximal silk ligature, and tie off the distal vein.
- Secure the catheter with a suture.
- Apply a clean dressing.
- Femoral procedure is essentially the same, with site being a handbreadth below the inguinal ligament, medial to the midline of the thigh. After skin incision, finger bluntly dissects through the fat to the fascia. Hook the finger and lift, and the vein comes up with it.

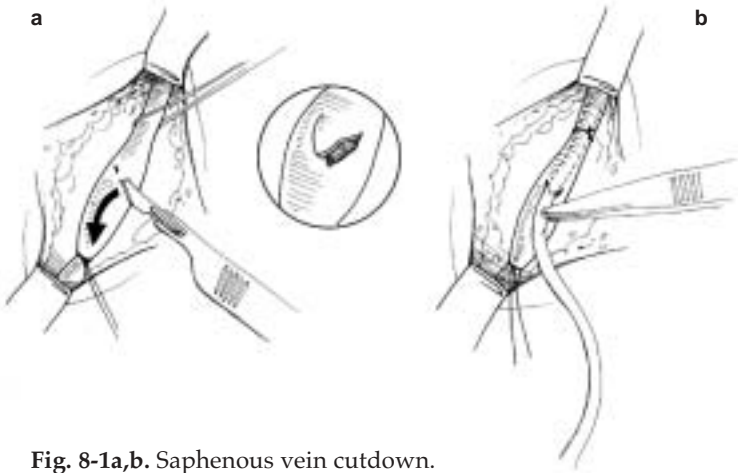


Fig. 8-1a,b. Saphenous vein cutdown.

- Cutdown can also be performed on the common femoral veins, the jugular veins, and on veins of the forearm.

IO Infusion

- **Contraindications.**
 - Trauma or infection at insertion site.
 - Recent IO device at the same site.
 - Fracture of insertion bone.
 - Recent sternotomy.
- **Devices/ Procedure.**
 - F.A.S.T. 1, BIG, SurFast, Jamshidi Needle, VidaPort.
 - Procedures vary based on model; all IV fluids acceptable except possibly hypertonic solutions.
 - BIG, SurFast, and Jamshidi may be placed in proximal medial tibia, distal medial tibia, or the radius.
 - F.A.S.T. 1 is designed for sternal placement, 1.5 cm below the sternal notch.
 - Pediatric: Insert a bone-marrow aspiration needle or 14–19-gauge spinal needle, directing it caudally through the outer cortex. Common sites: tibia, distal femur.
 - Aspirate to confirm placement.