Skill 2
Umbilical Vein Catheterization

Umbilical vein catheterization should be considered as a potential intravenous access site in infants up to 2 weeks old. The procedure is indicated for neonates with shock or cardiopulmonary failure.

**Equipment**
- 5 or 8 French catheter, or a 5 French feeding tube
- 10-mL syringe
- Umbilical cord tape or suture to tie the base of the cord
- Flush solution

**Technique**
1. Place the infant beneath a radiant warmer and restrain the extremities.
2. Prepare the abdomen and umbilicus with antiseptic solution (surgical prep).
3. Drape the umbilical area in a sterile manner. Expose the infant's head for observation.
4. To anchor the line after placement, place a constricting loop of umbilical tape at the base of the cord. Using a scalpel blade, trim the umbilical cord to 1 to 2 cm above the skin surface.
5. Identify the umbilical vessels. The umbilical vein is a single, thin-walled, large-diameter lumen, usually located at 12 o’clock. The arteries are paired and have thicker walls with a small-diameter lumen (Figure 2.1).
6. Obtain an umbilical vascular catheter (5 Fr). Flush the catheter with heparinized saline (1 unit per mL) and attach it to a 3-way stopcock.
7. Measure and mark 5 cm from the tip of the catheter.
8. Close the ends of a pair of smooth forceps, then insert the end into the lumen of the umbilical vein. Dilate the opening by allowing the ends of the forceps to separate, then insert the catheter into the lumen of the umbilical vein and advance it gently toward the liver for 4 to 5 cm or until blood return is noted.
9. If resistance to advancement of the catheter is encountered, the tip might be in the portal vein or the ductus venosus. The catheter should be pulled back until blood can be withdrawn smoothly.
10. Remove the catheter when resuscitation is complete and peripheral vascular access has been obtained.

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**Figure 2.1** Umbilical vein catheterization.
Complications and Pitfalls

Central venous catheterization is an invasive form of vascular access, and many potential complications are associated with this technique. Some of these potential complications are common to all sites of insertion, while others are site specific. The complications common to all insertion sites are as follows:

- **Arterial injury**: The most common complication of this technique is accidental puncture and/or cannulation of the adjacent artery. In most cases, this results in a minor injury to the artery that can be easily managed with direct pressure at the insertion site or by application of a pressure dressing. Obviously, it is much harder to control significant bleeding of one of the carotid arteries, but fingertip pressure applied directly to the site might be sufficient. Use of the vein dilator or a mishap with the scalpel can result in more serious injury to the artery, necessitating the involvement of a vascular surgeon. If possible, it is best to avoid injuring the artery.

- **Infection**: Central venous catheters are foreign bodies and can, like any such object, become colonized by bacteria. Central venous catheter infections can have devastating consequences, particularly in critically ill children. Furthermore, the emergence of multiple-resistant bacteria in many hospitals increases the risks substantially. Attention to sterile technique is critical. When time permits, those involved in the placement should don sterile gowns and wear masks and hats. Large sterile drapes can prevent inadvertent contamination of the guidewire and catheter prior to insertion.

- **Thrombosis**: Just as any foreign object can become infected, almost any foreign object can become a nidus for thrombus formation. The risk is highest with polyvinylchloride catheters and when the rate of infusion through the catheter is less than 3 mL/hr. Flushing the catheter with heparin when it is not in use and using heparinized fluid when the rate of infusion is less than 3 mL/hr might prevent thrombus formation. Catheters made of Teflon have surface characteristics that are not conducive to thrombus formation. Unfortunately, these catheters are also quite stiff and can injure vascular structures. Likewise, catheters that are impregnated with heparin are less often associated with thrombus formation.

- **Guidewire misplacement**: In rare instances, the guidewire enters the central venous circulation and must be retrieved by an angiographer or a surgeon. This complication can be avoided by ensuring that one hand remains in firm contact with the wire at all times.

- **Air embolus**: Allowing a bolus of air to enter the catheter can result in an air embolus when the end of the needle or catheter is open to the air and the venous pressure is low. This complication is most likely to occur when the catheter is placed into the internal jugular vein or the subclavian vein. An air embolus can be avoided by covering the open end of the catheter with the thumb after the guidewire has been removed, before connecting the intravenous fluids, and by positioning the patient with the insertion site slightly dependent. Such positioning has the added benefit of aiding catheter placement because it dilates the veins. Aspirating the catheter before flushing will remove air within the catheter. Older patients can be asked to perform a Valsalva maneuver during internal jugular and subclavian cannulation to avoid negative pressure within the vein.

**Site-Specific Complications**

- **Umbilical vein catheterization**: Should be used for temporary vascular access only, and the catheter should be removed once the patient is stable and vascular access is no longer required.
has been secured via other sites. Umbilical vein catheterization can cause hepatic thrombosis, infection, and hemorrhage due to vessel perforation.

References