Umbilical Artery (UA) and Umbilical Vein (UV) Catheterization

1. **Indications**: Vascular access (via UV), blood pressure monitoring (via UA), or blood gas monitoring (via UA) in critically ill neonates.

2. **Complications**: Infection, bleeding, hemorrhage, perforation of vessel,thrombosis with distal embolization, ischemia or infarction of lower extremities, bowel, or kidney, arrhythmia if catheter is in the heart, airembolus.

3. **Caution**: UA catheterization should never be performed if omphalitis or peritonitis is present. It is contraindicated in the presence of possible necrotizing enterocolitis or intestinal hypoperfusion.

4. **Catheter length**: Determine the length of catheter required using either a standardized graph based on shoulder-umbilical length or the birth weight (BW) regression formula below:
(1) UAC Length (cm) = (3 x BW (kg)) + 9
(3) UVC Length (cm) = (3 x BW (kg)) + 9 /2

Procedure for UA line

a. Determine the length of the catheter to be inserted for either high(T6–T9) or low (L3–L5) position.

b. Restrain infant. Maintain the infant's temperature during theprocedure. Prepare and drape the umbilical cord and adjacent skin using sterile technique.

c. Flush the catheter with sterile saline solution before insertion.

d. Place sterile umbilical tape around the base of the cord. Cut through the cord horizontally about 1.5–2 cm from the skin; tighten the umbilical tape to prevent bleeding.

e. Identify the one large, thin-walled umbilical vein and two smaller, thick-walled arteries. Use one tip of open, curved forceps to gently probe and dilate one artery. Use both points of closed forceps, and dilate artery by allowing forceps to open gently

f. Grasp the catheter 1 cm from its tip with toothless forceps and insert the

catheter into the lumen of the artery. Aim the tip toward the feet and gently advance the catheter to the desired distance. Do not force. If resistance is encountered, try loosening umbilical tape, applying steady and gentle pressure, or manipulating the angle of the umbilical cord to the skin. Often the catheter cannot be advanced because of the creation of a "false luminal tract." There should be good blood return when the catheter enters the iliac artery.

g. Confirm catheter tip position with x-ray or ultrasound. Secure catheter with a suture through the cord, a marker tape, and a tape bridge. The catheter may be pulled back but not advanced once the sterile field is broken.

h. Ultrasound confirmation (see Expert Consult).

i. Observe for complications: Blanching or cyanosis of lower extremities,perforation, thrombosis, embolism, or infection. If any complications occur, the catheter should be removed.

j. Use isotonic fluids containing heparin per institutional policy. Never use hypo osmolar fluids in the UA. Confirmation of umbilical venous or high arterial catheter placement can be performed with ultrasound. This procedure assumes the patient has normal situs.
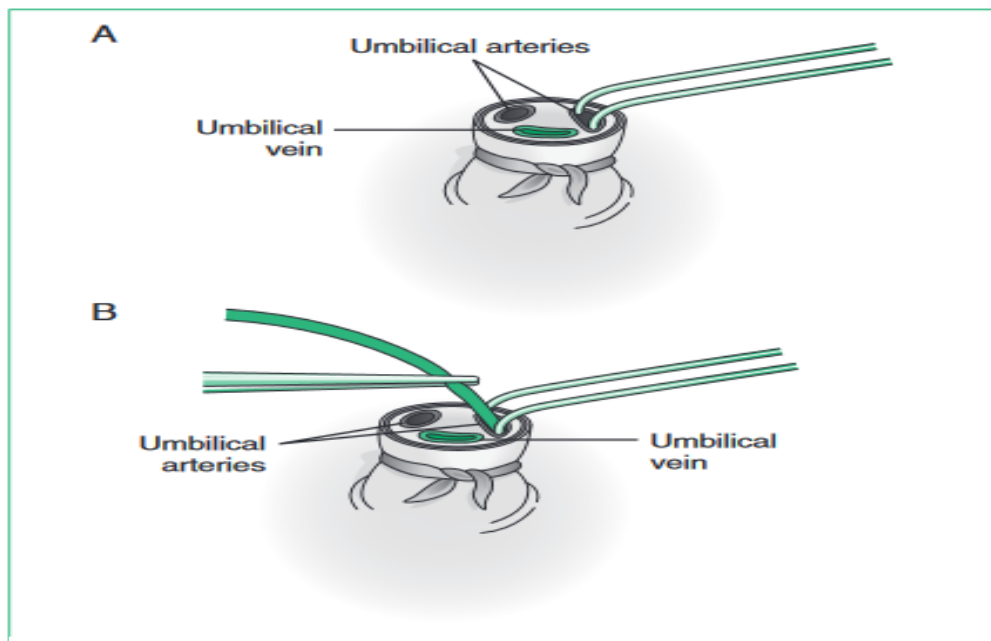
Placement of umbilical arterial catheter. **A,** Dilating lumen of umbilical artery. **B,** Insertion of umbilical artery catheter. (From Dieckmann R, Fiser D, Selbst S. Pediatric Emergency and Critical Care Procedures. St. Louis: Mosby; 1997.)

Procedure for UV line

a) Determine the desired length and follow steps "a" through "d" for UA catheter placement.

b) Isolate the thin-walled umbilical vein, clear thrombi with forceps, and insert catheter, aiming the tip toward the right shoulder. Gently advance the catheter to the desired distance. Do not force. If resistance is encountered, try loosening the umbilical tape, applying steady and gentle pressure, or manipulating the angle of the umbilical cord to the skin. Resistance is commonly met at the abdominal wall and again at the portal system. Do not infuse anything into the liver.

c) Confirm catheter tip position with x-ray or ultrasound, Secure catheter