**Insertion of Umbilical Lines**

**Indications:**  
Umbilical Venous Catheter (UVC)  
- For intravenous access in emergency situations  
- To obtain secure venous access for administration of intravenous fluids including TPN and drugs  
- For exchange transfusion

Umbilical Arterial Catheter (UAC)  
- To continuously monitor arterial blood pressure  
- To obtain arterial blood gases/ blood sampling  
- For exchange transfusion

**Contraindications:**  
- Anterior abdominal wall defects (gastroschisis, exomphalos)  
- Omphalitis  
- Significant abdominal distension e.g. NEC  
- Evidence of local vascular compromise in lower limbs (in case of UAC insertion)

**Insertion Distance (in cm) from skin (add umbilical stump length to this value)**

**Method 1:** by infant's birth weight in kg (Shukla and Ferrara 1986)  
- UAC: \[(3 \times \text{birth weight}) + 9\]  
- UVC: \[(0.5 \times \text{UAC line calculation}) + 1\]

**Method 2:** by measuring infant's shoulder umbilicus length in cm and then using nomograms to determine insertion length (Dunn 1966)

Using method 1 for determining UAC insertion length and method 2 for UVC insertion length leads to increased accuracy in catheter-tip placement (Verheij, Te Pas et al.)

**Tip Position:**

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<th>UAC</th>
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| Below the inferior vena cava and right atrial junction (usually just below the diaphragm on X ray) | High position: T6-T9 (to avoid PDA and mesenteric arteries)  
Low position: L3-L5 (to avoid mesenteric arteries) |
Types of catheters:
- Single lumen catheters (40 cm in length; use as UAC)
  - 5 Fr (size 5): ≥ 2 kg infant
  - 4 Fr (size 4): 1 - 2 kg infant
  - 3.5 Fr (size 3): ≤ 1 kg infant
- Double lumen catheters (20 cm in length; use as UVC) 4 Fr

Duration of use (UVC ONLY):
- UVC should be removed as soon as infant is stable or has peripheral long line inserted.
  - Preterm: consider inserting a long line in 2-3 days
  - Term: consider removal in 5-7 days

Types of Infusion (UAC ONLY):
- If preterm or sick term babies, sodium bicarbonate infusion (refer to drug file for dosages). At 0.3ml/hr.
- For others, Sodium Chloride infusion.

Equipment:
- UAC/UVC insertion pack
- Sterile gloves x 2
- Sterile gown
- Cord tie
- Umbilical catheters
- 5ml syringes x 2
- Green needle
- 0.9% sodium chloride
- 3 way taps
- Blade
- Suture
- Chloraprep
- Procedure form

Procedure:
The procedure should be performed using full aseptic technique wearing sterile gown and gloves following surgical scrubbing.

1. Open cut down set. Draw up 5ml of saline
2. Attach 3-way tap with blue dot for UVC and red dot for UAC onto umbilical catheters and then attach syringe. Flush all ports on 3 way tap and catheter with saline.
3. Clean skin around umbilicus inward to outwards and then clean umbilical stump upwards with chloroprep. Place a sterile drape around the cord. Remove one pair of gloves or change gloves.
4. Place cord tie at the base of cord stump, around Wharton jelly rather than skin and tie loosely around the cord. Slice cord horizontally below cord-clamp (in single motion) leaving around 2cm of stump.
5. If bleeding occurs tighten the cord tie slightly. Dab, rather than wipe, blood.
6. Identify two arteries and a vein. Arteries are smaller, thick walled and white, and may also protrude. Vein is thin walled and lies closely to periphery of umbilical stump (see image above).
7. Carefully grasp cord stump with two forceps on opposite sides of cord, away from vessel to be cannulated, and apply traction. Dilate opening of vessels with appropriate dilators (in pack).
8. Gently insert tip of catheter to estimated distance. For UVC, if catheter does not advance, withdraw 2-3cm, gently rotate and reinsert. For UAC, use umbilical dilator to dilate lumen of artery, if necessary. Apply gentle suction to syringe making sure of blood flow. Note colour of lower extremities/buttocks while inserting UAC.
9. If inserting a UAC, take necessary bloods especially for coagulation screen before connecting heparinised solution. Secure catheter with suture and steristrips.
10. X ray and identify the tip position. Never advance catheter as this could introduce infection. If not in an ideal position, withdraw as required. Fill in the procedure form.

Complications:

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<td>Infection, thromboembolism, peritoneal perforation, portal hypertension, arrhythmias, pericardial effusions, hepatic necrosis</td>
<td>Thromboembolism and its sequelae, vascular spasm and compromise, NEC, infection, hypertension, vessel perforation. Significant chance of misplacement (see anatomy above)</td>
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Removal of umbilical catheter:
- Sterile procedure pack
- Sterile scissors
- Chloraprep solution

1. Make sure there is an adequate access for intravenous infusion. Stop infusion through umbilical catheters. Check the length of catheter inserted on the procedure form.
2. Put sterile gloves and open the sterile pack. Clean the cord.
3. Carefully remove suture using scissors making sure the blade is facing away from baby and umbilical catheters. If cord is dried up and difficult to remove suture, soak the cord with wet gauze and leave it for 5-10mins, but make sure baby does not get cold.
4. Slowly withdraw the catheter making sure the entire catheter is removed. For UAC, place a cord tie in case of bleeding and slowly withdraw the catheter until about 5 cm of catheter remaining, tighten the cord tie. Withdraw the remainder very slowly allowing vessels to contract. If bleeding occurs, apply lateral pressure to the cord.

References

M Chakraborty and S Barr May 2012; to be re-evaluated in May 2015