

**Guidelines for Umbilical Venous Catheterization,
Management and Removal of Catheter**

Umbilical Venous Catheterization

Indications

- Emergency procedure
- Exchange Transfusion
- Difficult peripheral IV access
 - BW<800g
 - Gestation<24weeks
- Infusion of hypertonic solutions (>10%)
- Administration of vaso-active drugs
- Initial delivery of parenteral nutrition until percutaneous central venous access is established
- Delivery of blood and blood products except PLATELETS
- Measurement of central venous pressure

Contraindication

- Omphalitis
- Omphalocele
- Nectrotizing enterocolitis
- Peritonitis

Equipment

1 scalpel blade No. 11 and handle
1 pair vein scissors
1 pair suture scissors
1 needle holder
2 bowls
Cotton wool swabs
Gauze swabs
Tape measure
Sterile gown and gloves

1 sterile plastic drape 1 disposable luer lock
3-way tap
1 x 5ml syringe and 18G needle
1 x 10ml ampoule 0.9% saline
1 packet 3/0 black silk suture
Skin preparation solution
Infusion pump
Drug additive label
Elastoplasts for taping of catheter

UVC catheter
Single lumen(Argyle)

Double lumen(Bard)
Size 3.5Fg or 5Fg

Method (elective procedure)

- Estimate the position of catheter length
 - Shoulder to umbilicus distance and use graph to calculate how far to insert the catheter so it is placed safely in the inferior vena cava 1cm above the level of the diaphragm
 - Formula: [(weight(Kg) X 1.5) + 5]
Remember to add on the length of the umbilical stump.
- Chose appropriate UVC
 - Double lumen for
 - Infants<1000g
 - Infants<28weeks
 - Infants likely to require inotropes/insulin
 - Meconium aspiration syndrome
 - Persistent pulmonary hypertension

Double lumen umbilical venous catheters are well tolerated for short-term use, decrease the need for additional venous catheters in critically ill neonates and may not significantly increase the risk of complications when compared with single lumen venous catheters.

- 3Fg for infants<1000g
- 5Fg for infants
 - >1000g
 - Exchange transfusion
 - Large volume replacement
- Under sterile condition wearing sterile gown and gloves:
- Fill a 5ml syringe with 0.9% saline and flush through a 3 way tap attached to the umbilical catheter. **OR**
Attach a three-way tap and an empty syringe to the catheter, occluding the catheter and allows easy aspiration of blood for cord gases and other investigations. Either way occludes the catheter and prevents air being sucked into the circulation causing air emboli if the baby should take a deep inspiration and generate a negative pressure. The first method means that to take a blood sample all the flush solution has to be sucked back prior to doing so.
- Cut a hole in the centre of the sterile towel
- With a pair of straight forceps grasp the end of the cord clamp and clean the umbilical cord, cord clamp and surrounding 3-4cm of abdomen with aqueous chlorhexidine - DO NOT USE ALCOHOL. **For babies<1000g do not use iodine**

- Preparation of the skin at the insertion site is regarded as one of the most important measures for preventing catheter related infection.
- **Do not allow the solution to pool under the infant as it may burn the skin particularly in the very low birthweight infant.** Change any damp or wet linen under the infant immediately following the procedure.
- Pass the umbilicus through the hole in the sterile towel and drape the towel around the umbilicus over the baby.
- Hand the forceps to the assistant or place on towel.
- Tie a short piece of rolled gauze around the base of the cord. It should be secure enough to maintain haemostasis but not too tight to prevent passage of the catheter. Within 6-12 hours of delivery there is a risk of haemorrhage from the arteries when the cord is cut.
- Maintain gentle upward traction on the cord with the forceps, and slice the cord with the scalpel, 2 – 2.5cm from the skin margin.
- Dispose of the forceps and cord clamp. **Do not** use these forceps again during the procedure.
- Blot the cut surface dry and identify the umbilical vessels:
 - The single thin walled umbilical vein
 - Two smaller thick walled round arteries, generally constricted so that the lumen appear pinpointed.
- Immobilise cord using an artery forcep and with the second forcep grasp the wall of the vein.
- Insert catheter into vein to required length. Some resistance will be felt at the umbilical ring just below the level of the skin; apply gentle pressure until the catheter passes through. If in, catheter will fill with blood. If blood is not drawn back easily insert the catheter a little further or withdraw it back slightly and try again. Flush the catheter with saline to avoid clotting.
- Check position of catheter with X-ray, it should be sited between T6-T10, (above the diaphragm or just inside the right atrium). **Placement of the catheter tip in the portal circulation or liver is not acceptable and catheter should be removed. Under no circumstances should the catheter be advanced, it should be removed and a new catheter inserted under sterile conditions.** Only Infusions of 10% dextrose and/or morphine can be commenced until conformation of catheter tip.
- Secure catheter with 3/0 black silk suture by placing a suture around the base of the cord, avoiding the skin, either side of catheter, knotting securely and keeping the ends long. The stump is nerve free and therefore there will be no discomfort for the infant, do not suture catheter to the surrounding skin area as this is painful and increases the risk of infection. Cut a long strip of elastoplast and place at 90degrees to the catheter, sticky side up. Take the ends of the 2 tied sutures; bring them up keeping them parallel to the catheter and place along with the catheter on the sticky side of the elastoplasts. Fold the Elastoplasts over so that sticky surface meets sticky surface and it enclose the catheter and suture ends.

Method (emergency procedure)

- In a real emergency then there is no time for full aseptic technique, however you should work as cleanly as possible and observe universal precautions
- Fill a 5ml syringe with 0.9% saline and flush through a 3 way tap attached to the umbilical catheter. **OR**

Attach a three-way tap and an empty syringe to the catheter, occluding the catheter and allows easy aspiration of blood for cord gases and other investigations.

Either way occludes the catheter and prevents air being sucked into the circulation causing air emboli if the baby should take a deep inspiration and generate a negative pressure. The first method means that to take a blood sample all the flush solution has to be sucked back prior to doing so.

- Tie the core ligature or tape loosely around the base of the cord. The arteries are unlikely to bleed at this point though bleeding from the vein is still likely and arterial bleeding may occur following recovery.
- Clean the umbilicus with an alcohol swab.
- Cut the cord about a centimetre from the skin with a clean stroke of the scalpel. A sawing action causes 'teeth' at the vessel edge making cannulation difficult.
- Identify the vein and grasp the cord with the artery forceps near the vein. With a second grip one wall of the vein before gently inserting the catheter into the vein using fingers or forceps. Do not probe the vein without supporting it by its edges with forceps. The umbilical vein may need to be gently dilated using a probe or a closed artery clip but is often easily entered without this.
- Insert catheter into vein until resistance is felt at the umbilical ring just below the level of the skin; apply gentle pressure until the catheter passes through. If in, catheter will fill with blood. In an emergency it is sufficient to get the end of the cannula in a large vessel, i.e. into a vessel from which it is easy to aspirate blood. If blood is not drawn back easily insert the catheter a little further or withdraw it back slightly and try again. Advancing only by about 3-5cm beyond the muco-cutaneous junction will prevent the catheter reaching as far as the portal circulation. Flush the catheter with saline to avoid clotting.
- Tape the catheter in place with one piece of tape across the abdomen. In the preterm infant this should be avoided, as removal of the tape will damage the skin.

Management of Umbilical Venous Catheter

Ongoing Management

- Post catheter insertion visualize stump and observe closely for bleeding and/or displacement.
- Remove umbilical tie once bleeding controlled to avoid possible skin necrosis.
- Observe the umbilical area for local signs of infection

Umbilical Venous Catheterisation

Complications

- **Haemorrhage**
 - Due to disconnection of tubing. Always use a Luer locked connection when attaching the catheter to infusion lines.
- **Infection**
 - Rates vary from 3%-16% and associated with a variety of factors:
 - Maturity of infant
 - Insertion technique
 - Number of catheter connections
 - Days of catheter insertion
 - Number of associated invasive procedures
 - Exposure to multiple care givers
 - Exposure to multiple pieces of equipment
 - Routine use of heparin
 - Strict adherence to hand washing and a strict aseptic technique will help to prevent catheter related sepsis.
- **Thromboemboli**
 - Emboli from a venous catheter may be widely distributed.
 - Liver: If catheter tip lies in the portal venous system and the ductus venosus has closed.
 - Lungs: If catheter has passed through the ductus venosus.
 - Systemic: If catheter has passed through the ductus venosus and there is right-to-left shunting of blood either through the foramen ovale or ductus arteriosus, especially in a sick infant.
 - The emboli may be infected and therefore cause widespread abscesses.
- **Malpositioned catheter**
 - In heart and great vessels:
 - Pericardial effusion / cardiac tamponade (cardiac perforation)
 - Cardiac arrhythmias – Withdraw line
 - Thrombotic endocarditis
 - Hemorrhagic infarction of the lungs
 - Hydrothorax (catheter lodged in or perforated pulmonary vein)
 - In portal system:
 - Necrotizing enterocolitis
 - Perforation of colon
 - Hepatic necrosis:
 - Thrombosis of hepatic veins
 - Infusion of hypertonic or vasospastic solution into liver tissues
- **Other**
 - Perforation of peritoneum
 - Obstruction of pulmonary venous return (in patient with anomalous pulmonary venous solution into liver tissues)
 - Plasticizer in tissues
 - Portal hypertension
 - Electrical hazard
 - Fungal mass in right atrium
 - Pseudomonas in left atrium
 - Digital ischemia

Removal of Umbilical Venous Catheter

Indications

- No longer clinically required
- >More than 7-14days in situ
- Development of complications/sepsis

Equipment Required

- Alcohol swab
- Sterile stitch cutter/Sterile blade
- Sterile scissors
- Specimen container

Method

- Turn infusion off
- Clean procedure
- Cut sutures/remove tape.
- Withdraw catheter gradually as a single procedure
- Send tip for culture if infection suspected
- If bleeding occurs press firmly using sterile gauze just above umbilicus for 5minutes
- Do not nurse infant prone during removal of the catheter and for the following 4 hours.
- Observe stump regularly for excessive ooze or haemorrhage