



Vascular Access

Document Control Information

Author	Ramnarayan	Author Position	Consultant, CATS
Document Owner	Polke	Document Owner Position	CATS Co-ordinator
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Vascular access guidance

1. Scope of guidance

This document only covers guidance for Insertion during retrieval of:

- a) Central venous catheters (percutaneous, short-term)
- b) Arterial catheters
- c) Intra-osseous needles

Although some of the principles can be applied to all vascular access procedures, this document does not specifically cover:

- a) Peripheral intravenous catheters
- b) Umbilical catheters (arterial and venous)
- c) Tunnelled central venous catheters
- d) Silastic lines (long lines, PICC lines)

2. Central venous catheter insertion during retrieval

2.1. Patient selection

The main indications for insertion of central venous catheters (CVC) on retrieval are:

- Need for secure venous access to administer vasoactive agents such as dopamine, adrenaline and noradrenaline, or to deliver concentrated solutions of potassium, salbutamol or similar irritant drugs.
- Need for secure venous access for transfer when peripheral IV sites are unavailable or have been exhausted (“poor venous access” situation).

2.2. Insertion site(s)

The usual site of CVC insertion is the femoral vein. Occasionally, the internal jugular and subclavian veins can also be used. Internal jugular and subclavian CVCs should be inserted only after discussion with the CATS consultant.

Tip: Try and preserve the right internal jugular vein for ECMO cannulation in ECMO retrievals.

2.3. Catheter selection

The CATS equipment contains 3 different types and sizes of CVC:

- Cook Medical 4 Fr double lumen, 5 cm length (suitable for neonatal patients <5 kg)
- Cook Medical 5 Fr triple lumen, 8 cm length (suitable for infants and young children <15 kg)
- Cook Medical 5 Fr triple lumen, 15 cm length (suitable for older children >15 kg)

2.4. Procedure

2.4.1. Information to parents/carers

If time permits, it is important that parents/carers are informed about the nature of the CVC insertion procedure, indications and risks associated with the procedure (bleeding and haematoma, inadvertent arterial puncture, and rarely haemo- or pneumothorax [for internal jugular and subclavian lines]). Written informed consent is not usually required for CVC insertion (consent is presumed as part of the intensive care treatment offered by CATS).

2.4.2. Preparation and equipment

- Check safety of planned procedure – coagulopathy and/or thrombocytopenia are relative contraindications to internal jugular and subclavian line insertions.
- There are CVC insertion packs in the CATS equipment. These packs contain most, but not all, of the equipment needed to perform a CVC insertion (sterile gown, drapes, gauze, syringes, needle holder, scissors, mersilk suture and surgical blade).
- Sterile gloves and skin cleaning solution is kept within the kit.

Tip: To provide sufficient operating space and to maximise the chances of success, it is advisable to use a clean trolley from the referring hospital to lay out all the equipment.

2.4.3. Hand hygiene and personal protective equipment

- CVC insertion should be performed in strict aseptic conditions.
- Thoroughly wash hands up to elbows with surgical scrub (should be available at referring hospital). Sterile gown and gloves to be donned. Theatre hat and surgical mask are advisable.
- Theatre hats and surgical masks are not available within the kit. Sourcing this equipment locally is advisable.
- Eye/face protection is recommended if there is a risk of splashing with blood or body fluids.

Skin disinfection

- The CATS equipment contains Chloraprep®, which is a 3ml applicator with 2% chlorhexidine gluconate in 70% isopropyl alcohol. This is the skin disinfectant of choice for patients > 2 months old (including >2/12 corrected gestational age). For patients under 2 months of age (or premature infants), use aqueous solution of chlorhexidine.
- **DO NOT USE CHLORAPREP IF KNOWN ALLERGY TO CHLORHEXIDINE**

Tip: Allow 60 sec for the chlorhexidine to dry before starting the procedure.

2.4.4. Technique

- The modified Seldinger technique is used for CVC insertion.
- Ultrasound guidance should be considered in most situations to aid successful CVC placement, except under exceptional clinical circumstances (NICE guidance Updated 2014). One Sonosite™ is available in each ambulance and should be taken as part of the standard CATS equipment to the patient bedside at the referring hospital.
- Confirmation of successful CVC placement requires all lumens to bleed back and flush easily without any resistance.
- Once inserted, the CVC should be secured adequately with the use of a suture.
- A transparent dressing is recommended for fixation so that the insertion site can be examined regularly for bleeding or signs of infection.
- Internal jugular and subclavian line placements need to be confirmed by means of a chest x-ray. The ideal position of the CVC tip is the superior vena cava-right atrium junction.

2.4.5. Complications

The main complications of CVC insertion are: bleeding/haematoma formation, inadvertent arterial puncture (rarely insertion of CVC into the artery), injury to surrounding structures (nerve, bladder, peritoneal cavity with femoral CVC), haemo- and pneumothorax (subclavian and internal jugular CVC) and limb discolouration/ischaemia.

2.4.6. Documentation

Once CVC insertion is completed, record procedure in the CATS medical notes. Use the peel-away sticker in the CVC pack to record details and affix to notes. The minimum information recorded should be: date and time of insertion, type and size of CVC, site, any unsuccessful attempts, confirmation of successful placement and any complications.

3. Arterial catheter insertion during retrieval

3.1. Patient selection

The main indications for insertion of arterial catheters (AC) on retrieval are:

- Need for haemodynamic monitoring (invasive blood pressure).
- Need for frequent arterial blood gas analysis in ventilated patients.

3.2. Insertion site(s)

The usual site(s) of arterial line insertion are the peripheral arteries (radial and posterior tibial or dorsalis pedis). The femoral and axillary sites may be used either when peripheral arterial access is unobtainable or as first choice in very small infants. Brachial artery site is not recommended except under exceptional circumstances (risk of upper limb ischaemia).

3.3. Catheter selection

In most cases, an appropriately sized standard peripheral venous catheter is inserted into the artery (e.g. Abbocath). For central arteries (femoral, axillary), a LeaderCath can be used (part of CATS equipment).

Tip: Since Venflons have a port to administer drugs, they are not recommended for arterial access due to risk of inadvertent injection of drugs into the artery.

3.4. Procedure

3.4.1. Information to parents/carers

If time permits, it is important that parents/carers are informed about the nature of the arterial catheter insertion procedure, indications and risks associated with the procedure (bleeding and haematoma, arterial occlusion and limb ischemia). Written informed consent is not usually required for arterial insertion (consent is presumed as part of the intensive care treatment offered by CATS).

3.4.2. Preparation and equipment

- Check safety of planned procedure – anticipate significant bleeding and rapid haematoma formation in cases of coagulopathy and/or thrombocytopenia.
- CATS equipment contains various sizes of Abbocath, short line extension, and transparent adhesive dressings.

3.4.3. Hand hygiene and personal protective equipment

Arterial line insertion should be performed in aseptic conditions – for most routine peripheral arterial line insertions, sterile gloves are sufficient. For central arterial line insertions, full sterile precautions (sterile gown, drape, gloves and if indicated, eye/face protection) should be strongly considered, as noted above.

3.4.4. Skin disinfection

The CATS equipment contains Chloraprep®, which is a 3ml applicator with 2% chlorhexidine gluconate in 70% isopropyl alcohol. This is the skin disinfectant of choice for patients >2 months

old (including >2/12 corrected gestational age). For patients under 2 months of age (or premature infants), use aqueous solution of chlorhexidine.

- **DO NOT USE CHLORAPREP IF KNOWN ALLERGY TO CHLORHEXIDINE**

Tip: Allow 60 sec for the chlorhexidine to dry before starting the procedure.

3.4.5. Technique

- The technique for peripheral arterial lines is no different to insertion of a peripheral intravenous catheter.
- Insertion of a Leadercath is performed using the modified Seldinger technique (catheter over guidewire).

3.4.6. Complications

The main complications are bleeding/haematoma formation, arterial injury and occlusion resulting in limb ischaemia, and injury to surrounding structures.

Tip: Limb ischaemia (cold, pale, pulseless limb) is an emergency, and urgent vascular surgical input should be sought to restore circulation to the limb.

3.4.7. Documentation

Once arterial line insertion is completed, record procedure in the CATS medical notes. The minimum information recorded should be: date and time of insertion, type and size of catheter, site, any unsuccessful attempts, confirmation of successful placement and any complications.

4. Intra-osseous needle insertion during retrieval

4.1. Patient selection

The main indication for intra-osseous (IO) access on retrieval is the need for emergency vascular access in states of vascular collapse and shock. Intra-osseous access can be obtained either as:

- Sole site of vascular access when peripheral venous access is absent
- Additional site of (central) vascular access when a central venous line is unobtainable.

4.2. Insertion site

The recommended insertion site(s) are anterior upper tibia, lower femur, iliac crest, humeral head and sternum. In practice, tibia and femur are the most commonly used sites.

4.3. Needle selection

CATS equipment contains the EZ-IO drill and attached needles for IO access. Use the smaller needle for infants and neonates, and the paediatric needle for young children. The suggested weight range 3-39kg (15mm 15g IO) and 40kg> (25mm 15g IO).

4.4. Procedure

- Ensure that you are competent to use the EZ-IO drill before using it.
- Since IO access is usually performed as an emergency, it may not be possible to fully explain to parents/carers the indications, risks and complications associated with IO access. This should be done at the earliest possible opportunity after the emergency.
- IO insertion should be performed in as aseptic condition as possible – sterile gloves are recommended. Chloraprep can be used for skin disinfection; otherwise, aqueous chlorhexidine is advisable.
- Main complications are extravasation of fluids/drugs and limb swelling (risk of compartment syndrome) and injury to growth plate due to incorrect insertion site.
- Record IO attempts and insertion in medical notes. Document any complications.