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**SOP**
**Arterial Line Management**
**for Adult Patients**

Ownership - Lead Nurse - Clinical Quality Adult Critical Care
Publication date
Original 2006
Last update October 2018

Next Review date - June 2020
Status
Target groups (clinical competence):
Applies to all patients who have an arterial cannula and transduced monitoring in situ within LTHT
Applies to registered practitioners who have achieved competency.

## Aims

To provide patients with robust evidence based care
To provide practitioner with graded evidenced based procedures of care
To enable care to be audited in a meaningful manner

## Background and indications for standard operating procedure/protocol

Arterial Cannula are used for

- Blood pressure measurement
- Arterial blood sampling

Arterial cannulation allows for continuous blood pressure monitoring (the displayed waveform can be useful for diagnostic purposes) and repeated sampling, particularly for arterial blood gas analysis of $PaO_2$, $PaCO_2$ and acid base status.

Arterial pressure measurement does vary according to cannulation site used.

Radial and dorsalis pedis measurement is higher than femoral cannulation due to the greater distance travelled from the heart to the distal vessels and the smaller vessel lumen (Adams and Osbourne 1997).

The choice of site is made by the Practitioners inserting the cannula based on various factors.
Accepting the need for appropriate placement of cannula to meet the needs of disabled people or people with a specific medical condition, religious requirements e.g. symbols and taking into account rights under human rights legislation promoting dignity, respect and autonomy, especially where the patient does not have capacity to make a decision.

## Procedure method (step by step)

Consent
Wherever possible, informed consent should be obtained from the patient. When consent cannot be obtained it is assumed, as the procedure is regarded as necessary for the patients wellbeing. (In accordance with LTHT policy).

**Cannula insertion**

Insertion is carried out by competent clinical practitioners and medical staff under sterile conditions
http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=537

Equipment required:

- Pressure bag
- 500/1000 ml bag of 0.9% sterile saline
- Cannula
- Dressing pack, sterile gloves
- 2% Chlorhexidine with 70% alcohol wipes
- Semi permeable transparent dressing
- Transducer kit (red arterial transducer set or dual CVP/Arterial transducer)
- Red needle free connector
- Syringes
- Local anaesthetic (Preferable)

| Action | Rationale |
|---|---|
| Obtain consent / inform patient | Ensure compliance and agreement with procedures. |
| Prepare transducer set.<br>Ensure set is fully flushed especially the transducer section. Check all ports are secure and pressurise to 300mmHg. The blood aspiration port on the 3 way tap should have a red smart site to aid with identification of it as an arterial line.<br>The transducer set should be a dedicated red arterial transducer set and/or clearly labelled arterial | Ensure safety of connectors and reduces risk of air embolisation. An inflation pressure of 300mmHg is higher than arterial pressure so an automatic flush system if activated which delivers 3ml/hr so maintaining patency of set, cannula and artery (Morton and Fountaine, 2009).<br>Inadvertent disconnection can result in blood losses of around 500ml/minute (Oh 1997).<br>Clear identification of arterial line helps reduce risk of inadvertent injection (Sen et al 2005) |
| Assist in positioning of hand – ensure you are wearing gloves. Taping the hand can suffice. | Prevents adverse movement |
| Assist in the connection of the transducer set post cannula insertion. Check for arterial waveform on the monitor. | Ensures transducer is flushed and that a waveform appears on the monitor. |
| Ensure roller clamps are open | Opens automatic flush system |
| Ensure insertion site is clean, apply dressing and secure tubing. | Leaves site clean and visible for further inspection. |
| Place transducer in appropriate holding place (transducer ramp or attached to patients are both acceptable). If using a ramp then adjust transducer height to mid axilla. | Ensure appropriate levels for monitoring. If the transducers are above or below the mid-axilla position, monitoring will be inaccurate. |
| Zero transducer to air to obtain accurate waveform and measurement**.** Attach needle free connector to access port. | |
| Document cannula insertion and condition of site. | Complies with LTH documentation requirements. |

**On-going care of indwelling cannula and monitoring**

Assess insertion site twice daily using the VIP score. Assessment includes site appearance, condition of distal limb (colour, temperature, pain).

Ask daily if the cannula is still required.

Arterial cannulas are only changed when clinically indicated (unexplained pyrexia, obvious site infection) (CDC 1996).

Dressing need only be changed if blood is present, if there is excessive moisture or if the dressing is loose, use a semi permeable transparent dressing. (Loveday et al, EPIC 3 2014). The area should be cleaned with chlorhexidine 2% in 70% isopropyl alcohol moving from the catheter site outwards (use alternative eg povidine iodine in 70% alcohol if patient has a history of chlorhexidine sensitivity (EPIC 3 2014).

Check transducer system each shift for fluid level and secure connections, re zero transducer once per 24hrs, keep inflated to 300mmHg. If in doubt over accuracy of BP reading correlate with NIBP.
The transducer must be positioned and zero'd to the phlebostatic axis which is at the intersection of the fourth intercostal space and the mid axillary line.

Every 96hrs, replace whole transducer set down to the arterial cannula hub or up to and including 3 way tap and red needle free connector. (A double transducer set is the one of choice if CVP monitoring is also required).
This is a two person aseptic procedure: one to occlude the artery and one to change the set.

**No drugs are to be given via an arterial cannula**. Inadvertent intra-arterial administration can lead to parasthesia, severe pain, motor dysfunction, compartment syndrome, gangrene and limb loss, (Sen et al, 2005).
Check transducer fluid as part of shift checks - 0.9% Saline should be used - a glucose based product can have the potentially fatal risk of unrecognised hypoglycaemia as effects listed above.

Anti-embolic stocking must **not** be used when the dorsalis pedis site is in use, they can cause pressure on the cannula self.

When accessing transducer set to obtain blood, adhere to Aseptic Non Touch Technique (ANTT) and Personal Protective Equipment must always be used.

**Taking blood from a transduced arterial cannula**

**This can only be done or supervised by a registered and competent practitioner using an Aseptic Non-Touch Technique (ANTT).**

Check that arterial blood is required, if not then consider accessing blood via another line e.g. central line (this is often not possible in critical care due to administration of other drugs).

Equipment :
Gloves, plastic apron, pre-heparinised syringe, 2ml syringe x 2 ( a 5ml syringe may be needed in cardiac ICU due to the positioning of the 3 way tap on the transducer system), 2% Chlorhexidine in 70% alcohol wipes.

| Action | Rationale |
|---|---|
| Inform patient of event | Involves patient in care |
| Put apron on, wash hands or use alcohol rub as per LTHT Hand Hygiene Policy and put on gloves. http://nww.lhp.leedsth.nhs.uk/common/guidelines/detail.aspx?ID=673 | Demonstrate good infection control techniques. |
| Clean the arterial access Red Smart site port with 2 %Chlorhexidine swab for 15 seconds, allow to dry for 15 seconds. (EPIC 3 2014)<br><br>Using 2ml syringe, open 3-way tap to patient, withdraw waste saline/ blood. ( a 5 ml syringe may be required if the 3 way tap is located further from the patient in the transducer set - as used in cardiac intensive care) | Minimises infection risks<br><br>Prevents dilution of blood sample with saline. |
| Occlude 3-way tap, attach pre- heparinised 2ml syringe, open 3-way tap and slowly withdraw 2ml of blood. | Slow withdrawal helps prevent vessel spasm and minimises risk of haemolysis of sample . Only taking 2mls avoids excessive blood loss. |
| Occlude 3-way port, place cap on sample syringe. Place sample to one side. | |
| Turn 3-way tap to transducer, using a clean syringe attach to needle free connector, open port and the manual release on the transducer, flush the blood from the port into the syringe. Turn the 3-way tap back to patient and flush blood from the transducer line into the artery. Reclean the arterial access red Smart site port with 2 % Chlorhexidine swab to remove any residual blood. | Clears residual blood from the set and allows pressure waveform to re-establish on monitor.<br>Large flush volumes can cause back flow of arterial blood leading to cerebral artery emboli.(Santolla and Wechel 1983) |
| Dispose of contaminated equipment appropriately. | |
| If sample is for ABG analysis, perform analysis within 10min of taking sample keeping sample gently mixed to avoid blood separation. | Sample deteriorates after 10 minutes. |
| Document results obtained and samples sent. | Complies with LTH documentation requirements and allows next practitioners to evaluate and reassess care requirements. |

**Removal of arterial cannula**

Can only be performed or supervised by a registered and competent practitioner using ANTT.

When?

- Sampling access or waveform monitoring is no longer required
- Signs of infection/inflammation.

It is recommended that the clotting status of the patient is known and documented prior to removal.
Adverse clotting times affect the length of time the practitioner will need to occlude the artery post cannula removal. **Minimum occlusion time is 3 minutes.**

Procedure

- Decontaminate hands as per LTHT Hand Hygiene policy.
- Switch alarms off on monitor.
- Decontaminate hands as per LTHT Hand Hygiene policy.
- Apply clean examination gloves and a disposable apron.
- Remove dressing.
- Remove cannula with a steady movement, keeping parallel to the skin. Apply pressure for at least 3 minutes. Check integrity of cannula before disposing - Only send cannula tips for M C & S if clinically indicated.
- When bleeding stopped apply semi-permeable occlusive dressing or plaster.
- Document VIP score, time and date of removal in patient documentation.

Post removal observations include:

- Colour, warmth and presence of pulse of limb.
- Checking for bleeding for the first hour after removal.
- Ask patient not to use the hand excessively for the first hour after removal.
- Avoid taking non-invasive BP on that arm for 12-24 hours to minimise bleeding.
- Inform shift coordinator or medical staff if bleeding occurs, haematoma develops, limb loses colour, or the patient complains of undue pain.
- If VIP score >1 continue to monitor and record daily until 0.

## Conflicts of Interests

Nil

## Evidence Base: References

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