

## **GUIDELINE**

## **Peripheral Arterial Catheter Insertion, Sampling and** Removal

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU 3B, NETS WA

### **Child Safe Organisation Statement of Commitment**

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

#### This document should be read in conjunction with this disclaimer

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## Aim

Describes the procedure for peripheral arterial line (PAL) insertion, maintenance, sampling, and removal.

## **Risk**

Improper insertion, sampling and removal of a PAL may cause vascular compromise to the limb. Improper insertion, securement and sampling may reduce the life of the PAL.

## **Key Points**

- Preferable to only use radial or posterior tibial arteries for PAL.
- **Only** infuse heparinised saline through a PAL. Never use glucose solutions.
- Always withdraw and flush lines **<u>slowly</u>**. Use no more than 2mL flush.
- Consider removal of PAL when signs of blanching, poor trace, not bleeding back or flushing easily.
- Remove PAL's associated with signs of vascular compromise to the limb

## Indications

- Frequent blood sampling and/or removal of blood during exchange transfusion
- Invasive blood pressure monitoring
- If umbilical artery cannulation not possible

## **Contraindications**

- Failed modified Allen's test (radial and ulnar PAL)
- An artery that has recently been used for an arterial line (the artery will remain occluded for at least a month). If another arterial line is required, discuss placement with the neonatology consultant.
- Local skin infection or breakdown
- Limb abnormality
- Limb fracture
- Abnormal coagulation studies/ platelets

## **Artery selection for PAL Insertion**

Only an artery with collateral circulation should be cannulated. The following sites are recommended:

Radial artery

- Posterior tibial artery
- Ulnar artery but **ONLY** if radial artery on the same limb has not been previously accessed.

For radial arterial lines assess collateral circulation using the <u>Allen test</u>. The risk of ischaemia secondary to radial or ulnar arterial cannulation is approximately 5%. Occasionally, an infant's condition may require arterial access via one of the following:

- Femoral artery
- Brachial artery

It should be noted that complication rates of arterial access in these vessels are greater, specifically peripheral ischaemia and gangrene (10% published rate). The brachial artery has very limited collateral circulation. Therefore, if one of these arteries is to be used, the femoral is preferable.

- Cannulation or sampling of femoral or brachial arteries is only to take place after discussion with NICU consultant.
- If femoral or brachial artery is used, the limb should be watched extracautiously and if there is any compromise seen, the catheter should be removed immediately.
- Cannulation or sampling of axillary or superficial temporal arteries should not be performed.

## **Modified Allen's Test**

The Modified Allen's Test is used to assess the adequacy of collateral circulation if planning to cannulate the radial or ulnar artery.

- Elevate the arm and simultaneously occlude the radial and ulnar arteries at the wrist, then rub the palm to cause blanching.
- Release pressure on the ulnar artery. If normal colour returns to the palm in <10 seconds, adequate ulnar circulation is present.
- Document Allen test undertaken in progress notes.





## Equipment

- Dressing pack
- 1% Chlorhexidine and 70% Alcohol swab >27 weeks gestation <u>or</u> Povidone-iodine 10% solution <27 weeks gestation</li>
- 24G Intravenous cannula (see appendix 1)
- Luer lock monitoring extension set
- 1 mL syringe filled with normal saline
- Fenestrated occlusive dressing (see appendix 2)
- Splint and cut tapes <u>or</u> large leukostrips (preterm infants)
- Baby wire available (not opened)
- Transducer set and cable
- 50mL syringe and extension set with:
  - 0.45% saline + 0.5 units/mL heparin for preterm infants ≤27 weeks
  - $\circ$  0.9% saline + 0.5 units/mL heparin for infants >27 weeks
- Syringe Pump
- Transilluminator (particularly useful for preterm infants).
- Ultrasound machine

## **Procedure (Standard Aseptic Technique)**

### Refer to Aseptic Technique (within the NICU) and CAHS Aseptic Technique

Insertion Procedure	Additional Information
1. Check correct patient for procedure.	
2. Check adequate analgesia/ sedation as this is a painful procedure.	
3. Prime monitoring extension set.	Attach 50ml syringe of 0.45% or 0.9% Heparinised saline depending on gestation to non-drug line and extension set.
<ol> <li>Clean skin and allow skin prep to dry for 30 seconds before proceeding with the procedure</li> </ol>	<ul> <li>1% Chlorhexidine and 70% Alcohol swab &gt;27 weeks gestation (wait 30 seconds)</li> </ul>
	<ul> <li>Povidone-iodine 10% solution &lt;27 weeks gestation (wait 60 seconds)</li> </ul>
5. Puncture the anterior wall of the artery until blood return is seen.	At this point the cannula should be in the lumen of the artery

### Peripheral Arterial Catheter Insertion and Removal

Insertion Procedure		Additional Information
6.	Advance the cannula into the artery while simultaneously withdrawing and then removing the stylet.	Blood should be flowing freely from the cannula if the cannula is properly positioned.
7.	Advance the cannula to the hub, attach the 1mL syringe, check the line bleeds back and then flush the cannula slowly, to avoid blanching/ spasm.	
8.	Secure cannula with fenestrated occlusive dressing for infants >27 weeks <u>(see appendix 2)</u> or with Leukostrips ( <b>NO occlusive dressing</b> ) for infants <27 weeks and attach primed monitoring extension set. Recheck that the line bleeds back and flushes easily.	Immediately commence heparinised saline infusion. Run at 1mL/hr. Watch for blood backing up into tubing, may need to increase infusion rate temporarily to 1.5- 2mL/hr. Reduce back to 1mL/hr once able.
9.	Secure arm board using Brown Tape and Purple cap (see appendix 2) for optimal positioning.	Document the number of attempts, sites accessed and final placement in MR420. Document on the observation chart when and where the arterial line was inserted.

#### NOTE: The Arterial line should bleed back, flush easily and give a good trace.

## **Calibrating the Transducer**

- Turn the 3-way tap off to patient,
- Remove the white/red cap
- Click Zero ART on monitor Wait till you hear two beeps on the monitor
- Reconnect white/red cap
- Turn 3-way tap on to patient and infusion
- Arterial trace should appear on the screen
- Press "Optimise scale" on monitor to level arterial trace

## **Positioning of the Transducer**

Transducer should be level with the right atrium (heart) for accurate BP reading.

## Monitoring of the Limb with a PAL in situ

• Care must be taken during sampling and flushing to avoid trauma and spasm.

- Aside from transient blanching, when the arterial line is flushed, if persistent, it should be reviewed for consideration of removal by medical staff.
- Over-vigorous flushing of the arterial line has a risk of blanching, arterial spasm and the dispersal of emboli to the peripheral limb
- If the limb is not pink and well perfused or there is no arterial waveform on the monitor or if the line does not bleed back and flush easily the line should be reviewed by medical staff.
- Lines which cause ongoing limb colour change despite being flushed or having dressing altered usually need to be removed on instruction from medical staff.

## Sampling and Flushing a PAL

- Use a 2% Chlorhexidine Swab, 2x 3mL leur lock syringe, arterial blood gas syringe (if needed) and Posi-flush syringe.
- Swab PAL hub
- Attach 3mL leur lock syringe
- Aspirate maximum 3mL of blood SLOWLY.
- <u>DO NOT</u> draw back vigorously as it will cause arterial spasm
- Attach second 3mL leur lock syringe or arterial blood gas syringe for sample
- Return initial blood aspirated SLOWLY.
- Flush PAL with Posi-flush <u>SLOWLY until line is clear, to a maximum 2mL</u>. Watch for blanching.

## **Trouble shooting**

- Flat line trace on the monitor
  - Is the 3-way tap turned off to patient?
  - Is the transducer positioned correctly?
  - Manually flush PAL SLOWLY
- Unable to aspirate blood for sampling
  - o Is the 3-way tap turned on to the sample port?
  - Apply slight traction on the cannula (Might be sitting up against arterial wall)

## **Complications of Arterial Lines**

• Compromise of arterial circulation, skin blanching, limb ischaemia, necrosis +/gangrene due to thromboembolism/ vasospasm/ thrombosis

- Spasm of the artery may occur PROXIMAL to cannulation site with more extensive gangrene (e.g. whole forearm).
- Haematoma
- Infection
- Aneurysm of punctured artery
- Tendon or nerve damage.

NB If ischaemia occurs, PAL should be removed immediately and consider use of topical Glyceryl Trinitrate 0.2% ointment to minimise tissue loss.

## **Removal of a Peripheral Arterial Catheter**

Can be removed by a RN deemed competent in this procedure.

- 1. Cease infusion.
- 2. Remove all tapes with adhesive remover.
- 3. Apply pressure over the insertion site with gauze and withdraw catheter whilst maintaining pressure over the insertion site.
- 4. Continue to apply firm pressure without occluding blood supply to limb for a minimum of 5 minutes or longer until bleeding has ceased.
- 5. Document removal of catheter on observation chart and MR420, noting perfusion of peripheries after removal.

#### Related CAHS internal policies, procedures and guideline

Aseptic Technique in the Neonatal Unit

Infection Control Aseptic Technique

### References and related external legislation, policies, and guideline

WNHS Infection Prevention Manual - Aseptic Technique

Glyceryl Trinitrate 0.2%

- 1. Baserga M C, Puri A, Sola A. The use of topical nitroglycerine ointment to treat peripheral tissue ischemia secondary to arterial line complications in neonates. J Perinatol 2002; 22(5): 416-9.
- 2. Chalmers E A. Neonatal thrombosis. J of Clin Path. 2000;. 53:419-23.
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- 4. Vasquez P, Burd A, Mehta R, et al. Resolution of peripheral artery catheter induced ischemic injury following prolonged treatment with topical nitroglycerine ointment in a newborn: a case report. J Perinatol. 2003; 23(4):348-50.
- 5. Wong A F, McCulloch L M, Sola A. Treatment of peripheral tissue ischaemia with topical nitroglycerine ointment in neonates. J Pediatr. 1992; 121(6):980-3

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Neonatology   Community Health   Mental Health   Perth Children's Hospital				

## Appendix 1 - Types of cannulae available for PALs



### A - 24G cannulae, 19mm long

Note that the Neoflon has a smaller internal diameter, slower flow rate and an Arrow Wire does not pass through the hub.



### B - 24G cannulae, Jelco 32mm long and Arrow 5cm long

Note longer cannulae should only be used where the tip of the cannula will be before the joint and not have passed into a larger artery (ie. tip not crossing a joint, and not sitting in the brachial or femoral artery).

### Peripheral Arterial Catheter Insertion and Removal



**C-Arrow wire** 

## **Appendix 2 - Securement/ Taping**

There are 2 different products for use. Use clinical judgement and the below weights as a guide.

#### For babies GREATER THAN 2.0 - 2.5KG - 3M 1610



A Soft cloth tape reinforcement - for added strength and security of dressing

B Pre-cut sterile soft cloth tape strips - help secure the cannula and infusion lines

• Original frame delivery system - provides ease of application and accurate positioning

D Tegaderm transparent film over insertion site - allows easy monitoring without unnecessary dressing removal

- E Specially designed deep notch for securing catheter wings and hubs
  - Waterproof Tegaderm film extends over entire dressing surface effectively protects the I.V. site from external contaminants
- G Pictures of teddy bears encourage patient concordance

### For babies LESS THAN 2.0 - 2.5KG - 3M 1680

#### Securement

- Optimizes all characteristics to provide advanced catheter securement
- Reinforced border, deep notch, and tape strips work
  together to enlist the entire dressing in securement
- Provides superior catheter securement over standard transparent dressings\*
- Designed to maintain securement by preventing edge lift, flexing with patient movement, and managing moisture

#### Value

- Can potentially reduce the number of dressing changes and restarts
- May be worn for the life of a PIV catheter
- · Provides up to 7 days of wear time for CVC's\*\*

#### Wear time

- Provides superior wear time over standard transparent dressings\*
- Designed to support the goal of extended PIV dwell times

#### Gentle removal

 Gentle yet secure adhesive to protect and care for pediatric skin



#### Securement tape strips

- Enhances securement while promoting consistent application
- Waterproof film coating
- Pre-printed for documenting dressing changes

#### Stabilization border

- · Maximizes securement,
- breathability and wear time
- · Flexible and conformable
- Designed to reduce edge lift to maintain securement
- · Waterproof film coating

#### Deep notch

- Fits easily and conforms around hubs and lumens
- Designed to discourage edge lift
- Designed to reduce the risk of catheter manipulation and dislodgement

#### Highly breathable transparent film

- Designed to release moisture quickly to provide better wear time and securement
- A waterproof, sterile barrier to external contaminants\*\*\*

#### Picture-frame delivery

- · Minimizes potential to stick to gloves or to itself
- · One-handed application

Securement/Taping procedure	Images
<ol> <li>Allow all preps and protectants to dry thoroughly before dressing application. Peel the liner off the dressing</li> </ol>	
<ol> <li>Centre the transparent portion over the insertion site with the top of the keyhole notch lined up at the connection between the catheter hub and tubing</li> </ol>	
<ol> <li>Use 1x securement strip under tubing connection. Use the second securement strip over the hub of the catheter</li> </ol>	
4. Secure arm board using Brown Tape and Purple for optimal positioning.	