

Arterial Puncture for Arterial Blood Sampling

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Critical Points

1. Critical care and Emergency Department nurses who have been completed competency may perform as per the following:
 - a. **ADULT:** Adult critical care and Parnassus Emergency Department nurses may ~~only~~ perform radial arterial punctures.
 - b. **NEONATAL:** Neonatal critical care nurses in the ICN unit only may perform radial or posterior tibial arterial punctures.
 - c. Providers may access other arterial sites (brachial, femoral, etc.).
2. Arterial puncture is indicated when an arterial blood sample is required and other means to obtain blood are unavailable .
 - a. An indwelling arterial line should be considered if frequent specimens are required.
 - b. If there is a known or presumed coagulopathy, discuss patient management with the provider. See [Post-Procedure](#) for management of bleeding.
 - c. **ICN:** This procedure may be performed for blood sampling when venous access has not been successful. In this case, a discussion with providers should occur prior to arterial puncture.
 - d. **PEDIATRIC:** In pediatric critical care units, providers are notified if a RN is unable to obtain a venous blood sample. Providers will screen a patient for need of arterial puncture and perform it if necessary. Prior to puncture, the provider and RN will devise plan for post-care management specific to risk, procedural support, on-going assessments, post-procedure site pressure, and dressing type.
3. Potential risks and complications of arterial puncture may include pain, swelling, bleeding, vessel damage, thrombus formation, nerve damage, distal limb ischemia, compartment syndrome, and complications of hematoma formation.
4. Avoid radial punctures on dominant hand/arm in age-appropriate patients when possible.

Procedure

PRE-PROCEDURE ASSESSMENT

1. Assess patient for history of hemophilia, wrist/hand surgery, presence of an A-V fistula/graft for dialysis, current coagulation status (PT, PTT, platelets), and any current anticoagulant medications.

Arterial Puncture (continued)

2. Prior to puncturing the artery, the RN assesses the collateral circulation. If the radial artery is to be punctured, then the pulse of the ulnar artery is assessed. If the dorsalis pedis artery is to be accessed, then the posterior tibial pulse is also assessed; likewise, if the posterior tibial approach is used the dorsalis pedis pulse is assessed.
3. The modified Allen test may be used to assess collateral circulation of the ulnar artery before a radial artery puncture, but its presence does not always ensure adequate flow. A Doppler ultrasound flow indicator may be used to verify collateral circulation and is an option for the provider to consider when indicated. **Notify provider prior to proceeding with arterial puncture:**
 - If the collateral circulation is poor and RN cannot palpate a pulse
 - If for any reason the circulation is compromised to the extremity being assessed for arterial puncture
 - Document collateral circulation findings in RN note (see [Documentation](#) below)

PREPARATION & SUPPLIES

1. Assemble all necessary supplies:
 - a. Gloves
 - b. Arterial Blood Gas kit with needle
 - c. Additional syringes and specimen tubes
 - d. Chlorhexidine-based wipes/swabs or alcohol when chlorhexidine is contraindicated
 - e. Gauze (2x2 or 4x4)
 - f. 1 inch tape
 - g. **ICN:** 23- or 25-gauge safety “butterfly” IV catheter to puncture artery
 - h. Patient label, lab requisition, red specimen bag
2. Use 2 patient identifiers. Prepare patient and/or the patient’s family by explaining the rationale for procedure and expected sensation.
3. For pediatrics, consult with a Child Life Specialist for procedural support of the child and family when indicated. Review the Pediatric Procedural Support Procedure. A plan for procedural support should be formulated together with the family, the nurse, and the Child Life Specialist. This plan should include age appropriate preparation and discussion of coping techniques, positioning, comfort measures and parent participation.
4. **ICN:** Obtain a second clinician to assist during the procedure (highly recommended).
5. Perform hand hygiene and use standard precautions.
6. Assess/palpate radial pulse on non-dominant hand/arm. Avoid use of dominant hand/arm if possible.
7. Dorsiflex wrist and support on small towel, if needed. Provide positioning and support of the foot when using the dorsalis pedis or posterior tibial arteries.

PUNCTURE

1. Use aseptic technique and standard precautions.
2. Palpate the radial artery and identify the site where the pulse is the strongest. Avoid areas with overlying veins to prevent venous admixture sampling.
3. Prepare the patient's skin with a 2% chlorhexidine wipe/swab or alcohol swab when chlorhexidine is contraindicated.
4. Place two or three fingers along the course of the artery both to locate its position and direction, and to stabilize it.

Arterial Puncture (*continued*)

5. Penetrate the skin smoothly holding the needle at 30-60 degree angle with the needle bevel up and pointed proximally. The angle of the “butterfly” IV catheter should not exceed 45° for pediatric patients.
6. Re-establish the position and direction of the artery by palpation.
7. Gently and slowly advance the needle or “butterfly”, aiming directly for the area of maximum pulsation.
8. When the arterial lumen has been entered, less resistance is felt and blood appears in the syringe above the needle hub.
9. Obtain required amount of arterial blood for test(s):
 - a. Auto stick syringes will automatically fill up to the pre-set volume or 1-3 mLs.
 - b. **NEONATAL** patients: Hold the butterfly still and move your other hand to the plunger to aspirate or have a second person draw back the specimen.
10. If blood is not obtained on first attempt, withdraw the needle to just below the skin surface and advance needle at same angle but at 1 mm to either side of previous attempt.
11. Place the 2x2 gauze over the site of the puncture then withdraw the needle from the artery. Press firmly at the site for at least five minutes, or longer until the bleeding stops. Apply bandage or pressure dressing.
12. Prepare blood sample for lab(s) tests.

POST-PROCEDURE

1. Apply firm and constant pressure on the puncture site for **at least five minutes**, or longer until the bleeding stops. If the patient has a coagulopathy and/or hemophilia longer compression up to 15 minutes, either by hand or use of a pressure dressing may be needed.
2. Observe the site for discoloration, bleeding or swelling. Assess patient for pain or discomfort at site or distal limb. Note perfusion by examining the extremity for color, warmth, capillary filling, and pulse, and compare to the opposing extremity. Assess for pain, paresthesia, pallor, pulselessness, paralysis, tense skin as compared to opposing extremity, clenching and finger movement which can indicate compartment syndrome. Notify the provider of any noted abnormalities.
3. Observe the patient's extremity for sensory and motor changes. Signs and symptoms of radial nerve damage include subjective complaints of tingling and numbness in the thumb and first finger; objective signs include decrease in or loss of motor movement. Notify the provider of any signs or symptoms of pain, numbness, or tingling immediately.

DOCUMENTATION

1. Document the site of the arterial puncture, the patient's tolerance of the procedure and any noted complications (e.g. “Right radial art stick/puncture for ABG, tolerated well, no complications noted”). This should be documented in APeX as a RN note.

Arterial Puncture (*continued*)

Troubleshooting

Problem	Suspected issue	Action
Excessive bleeding or hematoma at site	<ul style="list-style-type: none"> Post puncture bleeding secondary to coagulopathy Patient is receiving anticoagulation therapy 	<ul style="list-style-type: none"> Continue to hold pressure on puncture site Notify provider Document findings
Change in color, size, temperature, sensation, movement, or pulse in the extremity used for arterial puncture	<ul style="list-style-type: none"> Peripheral vascular or neurovascular compromise 	<ul style="list-style-type: none"> Notify provider Document findings
Pain, paresthesia, pallor, pulselessness, paralysis, tense skin as compared to opposing extremity, clinching and decreased finger movement pulse in the extremity used for arterial puncture	<ul style="list-style-type: none"> Possible compartment syndrome 	<ul style="list-style-type: none"> Notify provider Assess distal perfusion with doppler

References

Level of Evidence (FAME [®])	Level*	Reference
Level of Evidence (FAME [®])	E4	Curley, A.Q., & Moloney-Harmon, P.A. (2001). <i>Critical care nursing of infants and children</i> . (2 nd ed.). W.B. Saunders
	E4	Kline, A.M.(2008). Arterial puncture: perform. In J.T. Verger & R.M. Lebet (Eds.), <i>AACN procedure manual for pediatric acute and critical Care</i> (1 st ed., pp 1128 – 1133). Elsevier Saunders.
	E4	Bucher, L. & Brown, J.M. (2011). Arterial puncture. In D. J. Lyn-McHale Wiegand (Ed.), <i>AACN procedure manual for critical care</i> (6 th ed., pp 713-720). Elsevier Saunders
FAME Scale details: See nursing policy Policy, Procedure, & Competency Development, Review, & Approval		

Procedure History

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