

Parkland Health & Hospital System
Women & Infant Specialty Health

Nursery Services Procedure Manual

Arterial Puncture

Practice

Statement Upon the written order of the provider, the credentialed registered nurse may obtain arterial blood from the radial, dorsalis pedis, and posterior tibial artery.

Refer to procedure # 1700.22 Completing a Laboratory Requisition Slip for Blood Gas Analysis.

Purpose To obtain an adequate sample of arterial blood for blood gas analysis.

To obtain routine laboratory test when venous and capillary sampling are not suitable.

Contraindications

Coagulation defects
Circulatory compromise in the extremity
Inadequate collateral circulation
Infection in sampling area
When cannulation of that vessel is anticipated

Equipment Provider Order
Laboratory Test Order Chart Form
Laboratory Requisition
Patient label(s)
Transilluminator (optional)
3ml syringe
Pre-heparinized blood gas syringe for arterial blood gas analysis
Appropriate sterile needles 23 or 25 gauge
Povidone-iodine swab
Alcohol prep pad
Ice slush in container
4x4 gauze

Note: *When obtaining arterial blood for numerous laboratory tests, obtain arterial blood sample in a non-heparinized syringe. Transfer blood to appropriate containers after blood collection.*

General Principles for Arterial Puncture

1. Transillumination may assist location of vessel.
2. Position needle for arterial puncture against direction of blood flow.
3. Keep angle of entry shallow for superficial vessels:
 - a. 15 to 25 degrees for superficial artery
 - b. 45 degrees for deep artery
4. Penetrate skin first, and then puncture artery to minimize trauma to vessel.
5. Use a fresh needle and repeat skin preparation if withdrawal from skin is necessary.
6. Apply firm, local pressure for 5 minutes to achieve complete hemostasis.

Procedure

A. Radial Artery Puncture:

1. Identify patient per Nursery procedure <http://intranet.pmh.org/home/PP-Index/NICU/100/100.02.doc>
2. Take provider's order and laboratory test order chart form to the HUC station. The HUC will enter the laboratory order and provide the nurse with a laboratory requisition(s).
3. The nurse shall verify **at the patient's bedside** that the name and medical record number of the infant (id band and crib card) matches the name and medical record number on the provider order, laboratory requisition and patient label. **This step must be completed prior to blood draw.**
4. Refer to Nursery procedure Labeling a Blood Gas Analysis Slip to properly complete the blood gas analysis requisition slip if obtaining blood for blood gas analysis <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.22.doc>
5. Assemble necessary equipment and don gloves.
6. Perform modified Allen's test for collateral supply:
 - a. Elevate infant's hand.
 - b. Occlude both radial and ulnar arteries at wrist.
 - c. Massage palm toward wrist.
 - d. Release occlusion of the ulnar artery only.
 - e. Look for color to return to the hand in 6 seconds or less indicating adequate collateral supply. Do not puncture radial artery if color returns take more than 6 seconds.
 - f. Document inadequate collateral circulation in nurse's notes and Kardex. Label bed to alert health care personnel not to obtain blood from affected extremity.

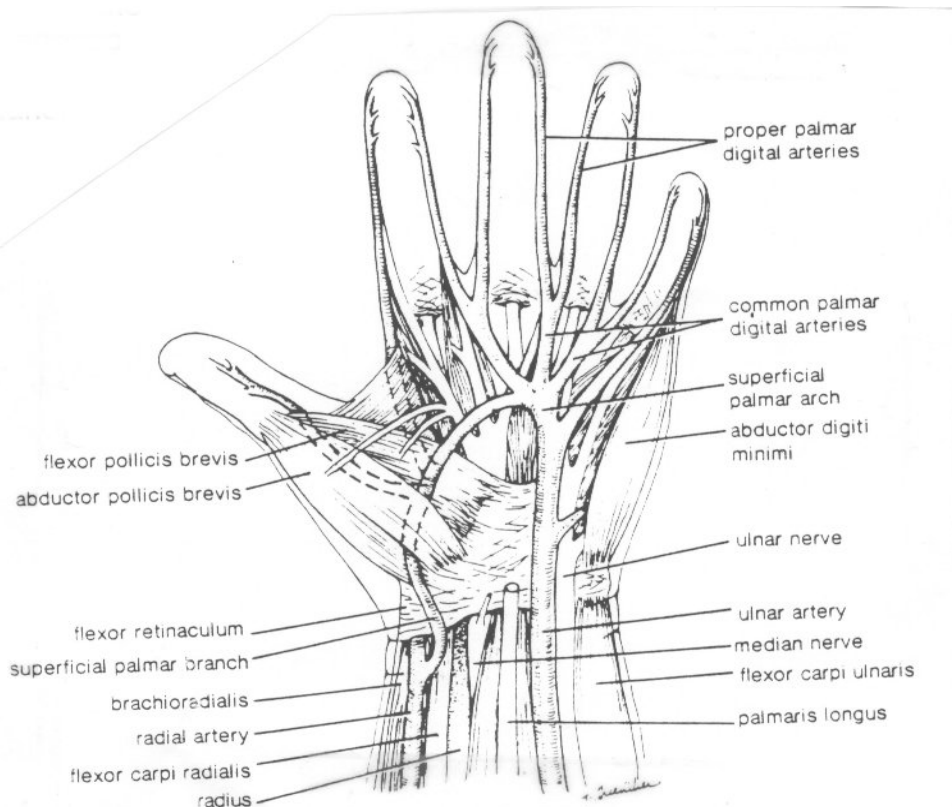
5. Extend wrist, supine, and not hyperextended, which may occlude the vessel.
6. Locate artery by palpation (the point of maximum impulse) or by transillumination. Clean area with povidone-iodine. Allow the area to dry.
7. Insert the needle at a 45° angle with the bevel up, facing the flow of blood. Penetrate the skin first and then puncture artery to minimize trauma to vessel. In most cases, the blood will flow into the syringe with minimal aspiration. If it does not flow, insert needle further. Slowly withdraw the needle, at the same time gently aspirating the syringe to the point at which blood appears. Hold the syringe and needle steady. To prevent tearing of the artery, do not allow unnecessary movements of the arm or the equipment. Use fresh needle and repeat skin preparation if withdrawal from skin is necessary.
8. After collecting the sample, withdraw the needle completely. At the same time, apply pressure to the puncture site. The pressure is maintained at least five minutes. Pressure should be held for no less than ten minutes in the following situations:
 - a. The patient is on any anticoagulants.
 - b. The patient with a coagulation deficit (e.g., low platelet count, DIC).
9. Remove needle and dispose appropriately. Refer to Nursing procedure Disposal of Used Needles and Sharp <http://intranet.pmh.org/home/PP-Index/Nursing/25-05.pdf>
10. Distribute blood to appropriate lab tube(s).
11. Document on patient label date, time, test ordered (i.e., CBC) and nurse's initials. Attach patient label(s) to specimen **before leaving patient bedside**.
12. Take specimen(s) and requisition(s) to HUC station.
13. Document on the flowsheet:
 - a. Time specimen collected.
 - b. Amount of blood withdrawn from infant over cumulative blood out from the patient.
 - c. Site from which the blood was drawn.
 - d. Test(s) performed.
14. If obtaining a blood gas specimen :
 - * Check the blood gas sample for the presence of air in the syringe and expel any present
 - * Cap the arterial blood gas syringe and gently rotate blood-gas syringe to ensure heparin and blood are mixed.

- * Document on patient label date, time, and nurse's initials. Attach patient label to specimen **before leaving patient bedside.**
- * Document the following on flowsheet:
 - a. Exact time specimen collected.
 - b. Oxygen concentration and/or ventilator settings including MAP
 - c. S_aO_2 measurement
 - d. Amount of blood withdrawn from infant over cumulative blood out from the patient
 - e. Site from which the blood was drawn.
- * If the gas is to be analyzed by Parkland Laboratory place the specimen in clear bag with ice and take to HUC station with blood gas requisition slip.
- * Transport specimen and blood gas requisition slip to the respiratory therapy room immediately to ensure accurate results.

15. Observe puncture site for adequate capillary refill, color, and temperature of the extremity and potential hematoma formation.

16. Remove povidone-iodine with alcohol prep pad.

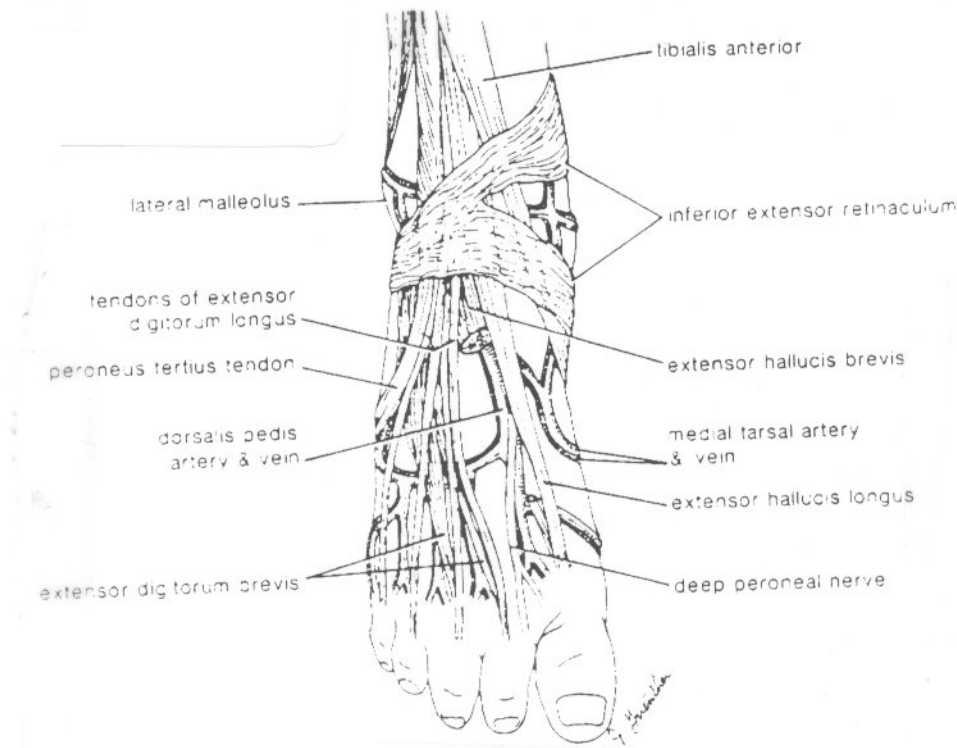
Anatomy of the
major arteries
of the wrist
and hand.



B. Dorsalis Pedis Puncture

1. Complete above steps 1-4.
2. Position the patient's foot on the mattress, making sure there is adequate support.
3. Locate artery by palpation or transillumination on dorsum of foot between extensor hallucis longus and extensor digitorum longus tendons.
4. Clean area with povidone-iodine. Allow the area to dry.
5. Insert the needle at a 15 to 25° angle with the bevel up, facing the flow of blood. Penetrate the skin first and then puncture artery to minimize trauma to vessel. In most cases, the blood will flow into the syringe with minimal aspiration. If it does not flow, insert needle further. Slowly withdraw the needle, at the same time gently aspirating the syringe to the point at which blood appears. Hold the syringe and needle steady. To prevent tearing of the artery, do not allow unnecessary movements of the foot or the equipment. Use fresh needle and repeat skin preparation if withdrawal from skin is necessary.
6. Complete steps A8-17.

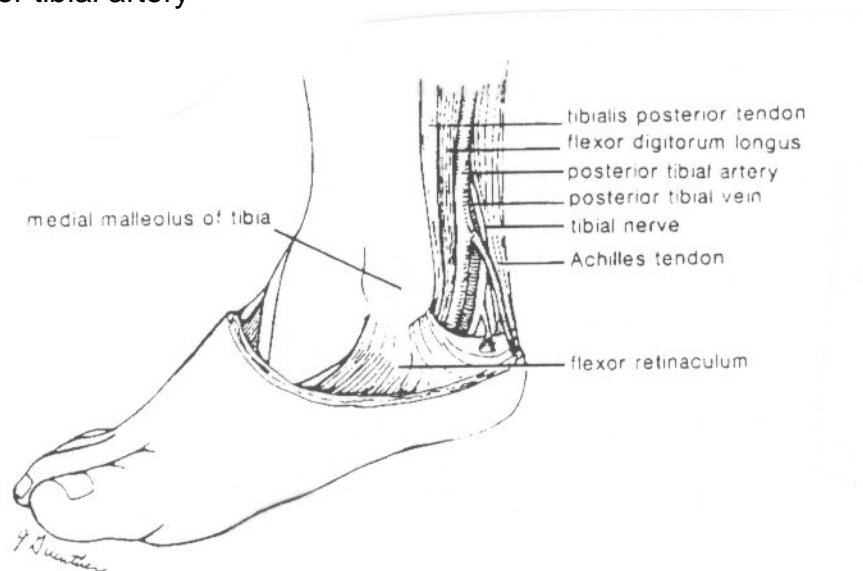
Anatomical relations of the dorsalis artery



C. Posterior Tibial Puncture

1. Complete above steps 1-4.
2. Position the patient's foot on the mattress, making sure there is adequate support.
3. Locate artery by palpation or transillumination between the Achilles tendon and medial malleolus.
4. Clean area with povidone-iodine. Allow the area to dry.
5. Insert the needle at a 45° angle with the bevel up, facing the flow of blood. Penetrate the skin first and then puncture artery to minimize trauma to vessel. In most cases, the blood will flow into the syringe with minimal aspiration. If it does not flow, insert needle further. Slowly withdraw the needle, at the same time gently aspirating the syringe to the point at which blood appears. Hold the syringe and needle steady. To prevent tearing of the artery, do not allow unnecessary movements of the foot or the equipment. Use fresh needle and repeat skin preparation if withdrawal from skin is necessary.
6. Complete steps A8-17.

Anatomical relations
of the posterior tibial artery



D. Factors affecting arterial blood gas values

1. Clotting – heparin is utilized to prevent clotting of the blood sample. The sample must be rotated/agitated to ensure adequate mixing of heparin and blood to prevent clotting.
2. Excessive heparin – changes the pH of the specimen.

3. Air contact – no air must come into contact with the blood sample. Air contact can increase the PO₂ and decrease the PCO₂ since there is usually more oxygen and less carbon dioxide in the air than in the blood as measured by partial pressures.
4. Temperature – red cell metabolism must be minimal. The sample must be placed immediately in ice slush to slow metabolism. Red cells that are warm will continue to metabolize, giving off CO₂ and consuming O₂, thus affecting the blood gas values.
5. Steady rate – the blood should be drawn when the patient is in an equilibrated state, that is, when at least 20 minutes have elapsed since any change has occurred or been made that might affect the blood gases. Significant changes are respiratory rate, tidal volume, minute volume, F_iO₂, and suctioning before sampling time.

E. Complications

1. Hematoma – blood may extravasate from a punctured artery and into the tissues or layers beneath the skin. This can cause discoloration if:
 - a. More than one puncture is made into the artery.
 - b. Too much time is spent in drawing.
 - c. Inadequate pressure is applied after the puncture.
2. Peripheral nerve damage – depends upon the site. One of the advantages of choosing the radial artery is that the radial nerve does not lie immediately adjacent to the radial artery in the area of the wrist where the puncture will be made. There is a nerve adjacent to the puncture site at the brachial and femoral arteries.
3. Thrombus – the possibility of an intra-arterial thrombus occurring must always be kept in mind. If a good pulse cannot be palpated down from the puncture site after puncture is performed, notify the physician immediately. If collateral circulation between the ulnar artery and the radial artery is present, there could be minimal loss of circulation caused by thrombus formation in the radial artery. Caution must always be taken to prevent injection of any air into the artery when performing the arterial puncture.

Reference

MacDonald M, Ramasethu J. (2002). *Procedures in Neonatology*. Philadelphia: Lippincott Williams & Wilkins.