



Chapter 14: Arterial Puncture Procedures



Objectives

1. Define the key terms and abbreviations listed at the beginning of this chapter.
2. State the primary reason for performing arterial punctures and identify the personnel who may be required to perform them.
3. Explain the purpose of collecting arterial blood gas (ABG) specimens and identify and describe commonly measured ABG parameters.
4. Identify the sites that can be used for arterial puncture, the criteria used for selection of the site, and the advantages and disadvantages of each site.



Objectives (cont' d)

5. List equipment and supplies needed for arterial puncture.
6. Identify typical required and supplemental requisition information and describe patient assessment and preparation procedures, including the administration of local anesthetic, prior to performing arterial blood gases.
7. Explain the purpose of the modified Allen test, describe how it is performed, define what constitutes a positive or negative result, and give the procedure to follow for either result.



Objectives (cont' d)

8. Describe the procedure for collecting radial arterial blood gases and the role of the phlebotomist in other site collections.
9. List hazards and complications of arterial puncture, identify sampling errors that may affect the integrity of an arterial sample, and describe the criteria for specimen rejection.

Overview: Video (Arterial blood gas sampling)

- Disadvantages of Arterial Puncture
 - Technically difficult
 - Potentially more painful & hazardous than venipuncture
 - Thus, not normally used for routine blood tests
- Reason for Arterial Puncture
 - To obtain blood for arterial blood gas (ABG) tests
 - **Arterial blood:**
 - **Best specimen for evaluating respiratory function**
 - Has high oxygen content & consistency of composition

ABGs

- Used in diagnosis & management of respiratory disorders
- Provide valuable info. about patient's:
 - Oxygenation
 - Ventilation
 - Acid-base balance
- Used in management of electrolyte & acid-base balance in patients w. diabetes & other metabolic disorders
- Specimens are sensitive to effects of preanalytical errors

Commonly Measured ABG Analytes

Analyte	Normal Range	Description
pH	7.35–7.45	A measure of acidity or alkalinity of blood (acidosis or alkalosis)
PaO ₂	80–100 mm Hg	Partial pressure of O ₂ dissolved in arterial blood
PaCO ₂	35–45 mm Hg	Partial pressure of CO ₂ dissolved in arterial blood
HCO ₂	22–26 mEq/L	A measure of bicarbonate in blood
O ₂ sat	97%–100%	Percent O ₂ bound to hemoglobin
Base excess	-2–+2 mEq/L	A calculation of nonrespiratory part of acid-base balance

Personnel Who Perform Arterial Puncture

- Nurses
- Medical technologists & technicians
- **Respiratory therapists-Most of the time**
- Emergency medical technicians
- Level II phlebotomists

Site-Selection Criteria

- Presence of collateral circulation
 - **Blood supply from more than one artery (Allen Test)**
- Artery accessibility & size
- Type of tissue surrounding puncture site
 - Low risk of injuring adjacent structures or tissue during puncture
 - Ability to fix or secure artery to prevent rolling
 - Adequate pressure can be applied to artery after collection
 - Absence of inflammation, irritation, edema, hematoma, lesion, wound, AV shunt in close proximity, or recent arterial puncture

Arterial Puncture Sites

- The Radial Artery
 - **Advantages**
 - **Good collateral circulation (radial & ulnar arteries)**
 - Easy to palpate (close to surface of skin)
 - Less chance of hematoma formation after collection
 - **Disadvantages**
 - Requires considerable skill to puncture it successfully due to small size
 - Difficult to locate on patients with hypovolemia or low cardiac output

Arterial Puncture Sites (cont' d)

- The Brachial Artery
 - **Advantages**
 - Large & relatively easy to palpate & puncture
 - Sometimes the preferred artery for a large volume of blood
 - Adequate collateral circulation (but not as good as radial)
 - **Disadvantages**
 - Deeper & can be harder to palpate than radial artery
 - Lies close to basilic vein; risk of mistakenly puncturing it
 - Lies close to median nerve; risk of pain & nerve damage
 - Increased risk of hematoma formation

Arterial Puncture Sites (cont' d)

- The Femoral Artery
 - Largest artery used for arterial puncture
 - Located superficially in groin, lateral to pubis bone
 - **Performed primarily by physicians & specially trained emergency room personnel**
 - Generally used only in emergency situations or when no other site is available

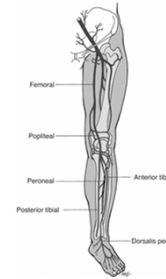
Arterial Puncture Sites (cont'd)

- The Femoral Artery
 - **Advantages**
 - Large & easily palpated & punctured
 - Sometimes, only site where arterial sampling is possible
 - **Disadvantages**
 - Poor collateral circulation
 - Lies close to femoral vein; risk of mistakenly puncturing it
 - Increased risk of infection due to location & pubic hair
 - Risk of dislodging plaque buildup from inner artery walls
 - Requires extended monitoring for hematoma formation

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Arterial Puncture Sites (cont'd)

- Arteries of the leg



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Arterial Puncture Sites (cont'd)

- Other Sites
 - **In infants:**
 - Scalp
 - Umbilical arteries
 - **In adults:**
 - Dorsalis pedis arteries

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ABG Specimen Collection

- Test Requisition
 - Info. concerning conditions at time of collection is needed:
 - Current body temperature
 - Respiratory rate
 - Ventilation status
 - *Fraction of inspired oxygen (FIO₂)
 - *Prescribed flow rate in liters per minute

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ABG Specimen Collection (cont'd)

- Equipment and Supplies
 - **Personal protective equipment**
 - Fluid-resistant lab coat, gown, or apron
 - Gloves
 - Face protection

ABG Specimen Collection (cont'd)

- Equipment & Supplies
 - Antiseptic
 - Local anesthetic (optional)
 - Sharp, short-bevel hypodermic needle
 - 1- to 5-mL self-filling syringe
 - Luer-tip normal or bubble removal cap
 - Coolant
 - 2- by 2-in. gauze squares
 - Self-adhering gauze bandage
 - ID & labeling materials
 - Puncture-resistant sharps container

ABG Specimen Collection (cont'd)

- ABG equipment



ABG Specimen Collection (cont'd)

- Patient Preparation
 - Identification & explanation of procedures
 - Patient preparation & assessment
 - Steady state
 - **Modified Allen test**
 - Administration of local anesthetic (optional)

ABG Specimen Collection (cont'd)

- Modified Allen test procedure
 1. Have patient make a tight fist
 2. Compress patient's radial & ulnar arteries at same time
 3. Maintaining pressure, have patient open hand slowly
 4. Lower patient's hand & release pressure on ulnar artery only
 5. Assess results: +hand flushes pink; -hand does not flush pink
 6. Record results on requisition

ABG Specimen Collection (cont'd)

- **Left:** using middle & index fingers to apply pressure to patient's wrist. **Middle:** patient opens hand. **Right:** positive result—hand flushes pink within 15 seconds.



ABG Specimen Collection (cont'd)

- Preparing and Administering Local Anesthetic
 1. Verify absence of allergy to anesthetic or its derivatives
 2. Sanitize hands & don gloves
 3. Attach needle to syringe
 4. Clean stopper of anesthetic bottle w. alcohol wipe
 5. Insert needle through bottle stopper & withdraw anesthetic
 6. Carefully replace needle cap & put syringe in horizontal position
 7. Clean & air-dry site

ABG Specimen Collection (cont'd)

- Preparing and Administering Local Anesthetic
 8. Insert needle into skin at site at angle of 10 degrees
 9. Pull back slightly on plunger
 10. Slowly expel contents into skin, forming a raised wheal
 11. Wait 1 to 2 min. before proceeding w. arterial puncture
 12. Note anesthetic application on requisition

ABG Specimen Collection (cont'd)

- Radial ABG Procedure
 1. Review & accession test request
 2. Approach, identify, & prepare patient
 3. Check for sensitivities to latex & other substances
 4. Access steady state, verify collection requirements, & record info
 5. Sanitize hands & don gloves
 6. Assess collateral circulation
 7. Position arm & ask patient to extend wrist
 8. Locate radial artery & clean site

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ABG Specimen Collection (cont'd)

- Assess collateral circulation



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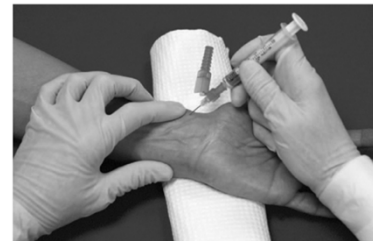
ABG Specimen Collection (cont'd)

- Radial ABG Procedure
 9. Administer local anesthetic (optional)
 10. Prepare equipment & clean gloved nondominant finger
 11. Pick up equipment & uncap & inspect needle
 12. Relocate radial artery & warn patient of imminent puncture
 13. Insert needle at a 30- to 45-degree angle, slowly direct it toward pulse, & stop when a flash of blood appears
 14. Allow syringe to fill to proper level
 15. Place gauze, remove needle, activate safety feature, & apply pressure

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ABG Specimen Collection (cont'd)

- Insert needle at a 30- to 45-degree angle, slowly direct it toward pulse, & stop when a flash of blood appears



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ABG Specimen Collection (cont'd)

- Radial ABG Procedure
 16. Remove & discard syringe
 17. Expel air bubbles, cap syringe, mix, & label specimen
 18. Check patient's arm & apply bandage
 19. Dispose of used & contaminated materials, remove gloves, & sanitize hands
 20. Thank patient & transport specimen to lab ASAP

ABG Specimen Collection (cont'd)

- Expel air bubbles, cap syringe, mix, & label specimen



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Hazards and Complications of Arterial Puncture and Sampling Errors

- Hazards & Complications
 - Arteriospasm
 - Artery damage
 - Discomfort
 - Infection
 - Numbness
 - Thrombus formation
 - Vasovagal response
- Sampling Errors
 - Air bubbles
 - Delay in analysis
 - Improper mixing
 - Improper syringe
 - Obtaining venous blood by mistake
 - Use of improper anticoagulant
 - Use of too much or too little heparin

Chapter 13 & 14 Test information: 68 total questions

- **Know:**
 - All key terms
 - How do you insure no compromise in pt care
 - Most analyzed non-blood fluid
 - What do non blood-body fluid consist of
 - What do you do if delay in transporting to lab
 - **From Chap 12:** pre-analytical, most common cause of hemolysis, routine specimens should arrive in lab within 45 min of collection. STAT, cholesterol & uric acid test least likely to require special handling), homocystine & renin (study question #10), QNS, centrifuge "balanced", Aliquot, know study questions.
- Fecal fat test
 - Pleural, pericardial, peritoneal
 - Electrolytes in PST
 - Commonly measured ABG parameters
 - Collateral circulation
 - Abducted
 - Arteriospasm
 - Allen test
 - Steady state
 - What causes erroneous ABG values
 - Know all study questions from both chapters