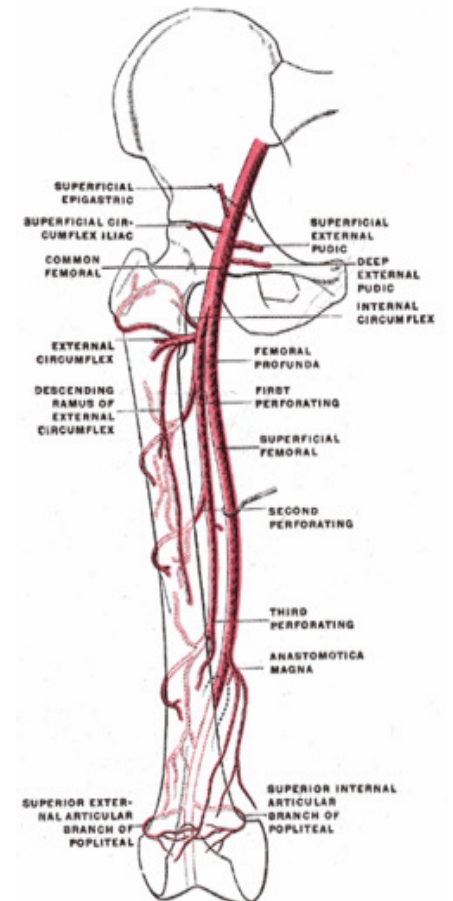
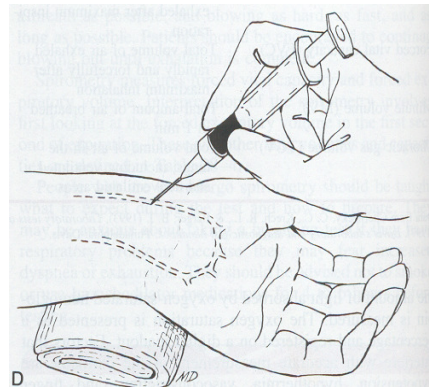
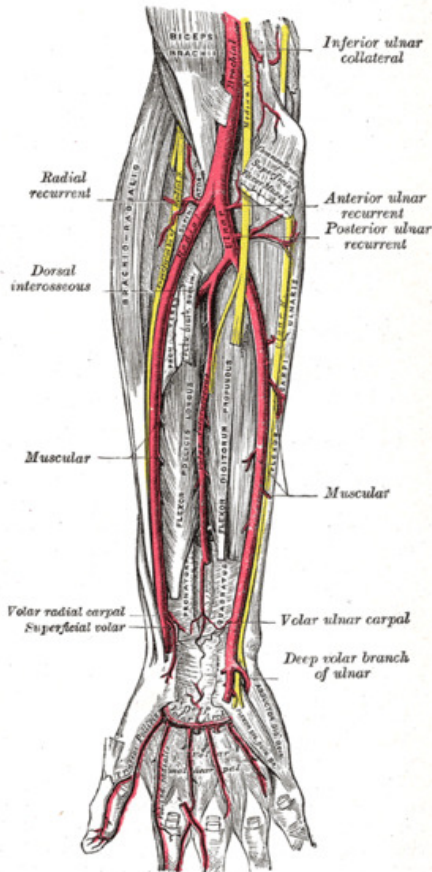


ABG Puncture and Procedure



Lesson Objectives:

- I. The student will be able to assist and to perform proper sampling of arterial blood for gas and pH analysis.**

- II. The student will be knowledgeable in determining the indications and contraindications in performing arterial blood gas puncture.**

Why do ABGs

- 1. Precise measurement of acid – base balance of the blood**
- 2. Check lungs' ability to oxygenate blood and to remove CO₂**
- 3. Assess respiratory function**
 - O₂ and CO₂ levels determined primarily by the lungs**

Equipments

Arterial blood gas kit

1. One 1 cc to 5 cc vented, pre-heparinized, usually with dry lithium heparin plastic syringe
2. One 20 - 25 gauge 1 –1 1/2” needle
(NOTE: Longer needles are required for brachial and femoral artery puncture.)
3. Vent cap (for evacuation of air bubble)
4. Needle guard to prevent accidental needle sticks
5. One Biohazard labeled plastic bag
6. Two 1 x 1 sterile gauze
7. Alcohol prep pad
8. Specimen/Patient label
9. Iodine pad
10. One adhesive bandage
11. Lab Form
12. Ice



Puncture Procedure

1. Check for Orders

- a. Check for indications and contraindications
 - Indications can be wide and varied
 - No absolute contraindications, mostly just extra precautions and hazards
 - i. Dialysis shunt – choose another site
 - ii. Mastectomy – use opposite side
 - iii. Pt on anticoagulant therapy – MAY have to hold pressure on puncture site longer than normal – includes aspirin therapy

2. Introduce yourself and explain what is ordered

- a. Patient cooperation needed to help simplify and minimize pain
- b. if patient refuses, notify physician

3. Make positive patient I.D.

- a. Ask patient their name
- b. Check patient I.D. wristband

4. Put on gloves

Puncture Procedure

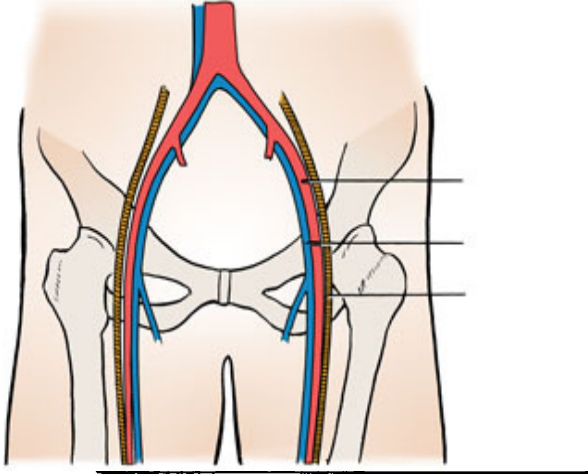
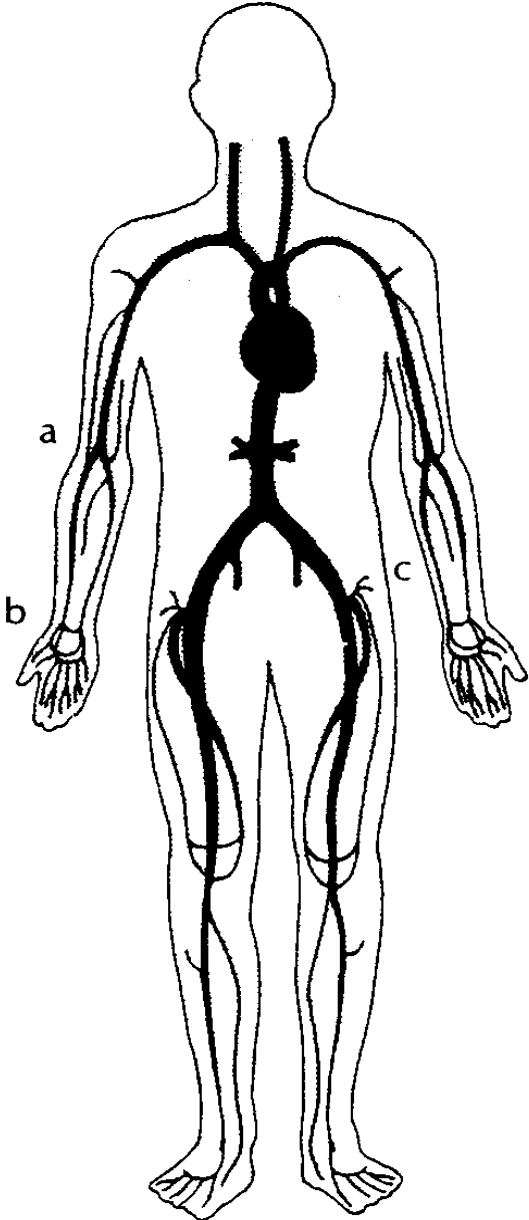
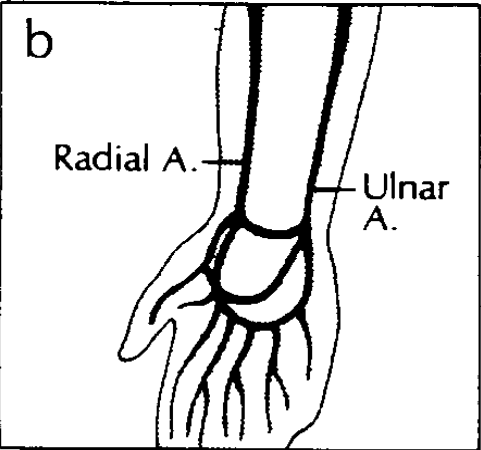
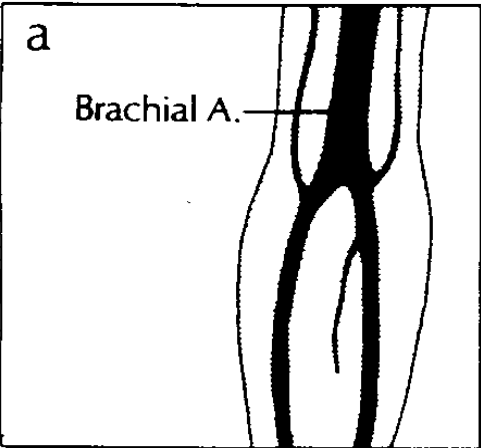
5. Assemble needle to syringe

- a. keep needle sterile
- b. eject excess heparin and air bubbles, if using syringe with liquid heparin
- c. pull back syringe plunger to at least 1 cc to give room for blood to fill syringe when puncture is made
- d. **NEVER** recap needle

6. Select Site

- A. **Palpate the right and left radials arterial pulse and visualize the course of the artery.**
- B. **Pick strongest pulse**
 1. **Radial artery is always the first choice and should be used because of it provides collateral circulation**
 - i. if radial pulse weak on right, move to left
 - ii. if pulse on left weak, then try brachial
 2. **Brachial used as alternative site**
 3. **Femoral is the last choice in normal situations**
 - almost every related complication has been with femoral site
 - usually first choice puncture site in code

Arterial Puncture Sites



Other Puncture Sites:



Puncture Procedure: Allen's Test

When using radials, perform Allen's Test for collateral circulation

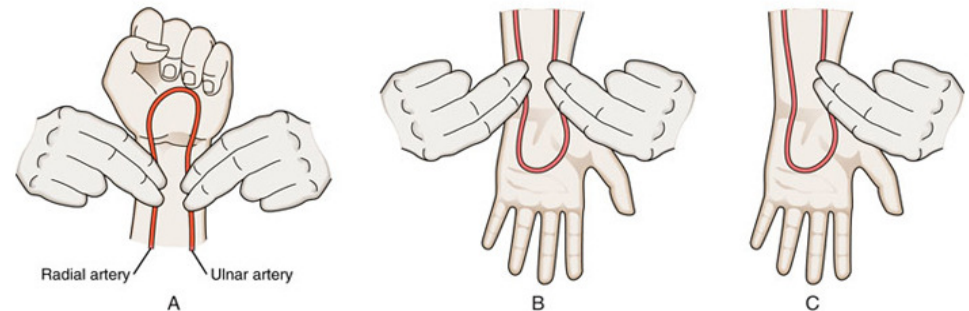
A. In a conscious and cooperative patient:

1. compress ulnar and radial arteries at wrist to obliterate pulse
2. have patient clench and release pulse until hand blanches
3. with radial still compressed, release pressure on ulnar artery
4. watch for pinkness to return should "pink up" within 10 – 15 second

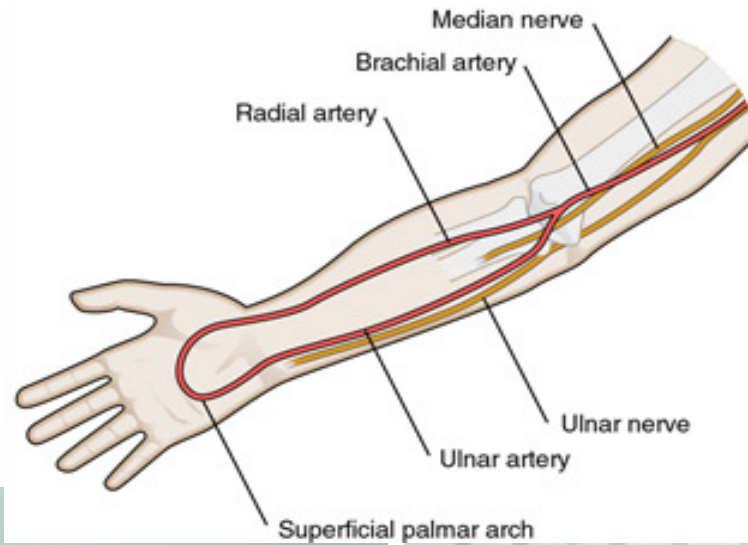
B. In an unconscious:

1. compress ulnar and radials
2. elevate hand above head, squeeze hard
3. release ulnar and lower hand below heart

Palpate left and right radial arteries noting maximal pulse. The one with the stronger pulse will be your site of entry.



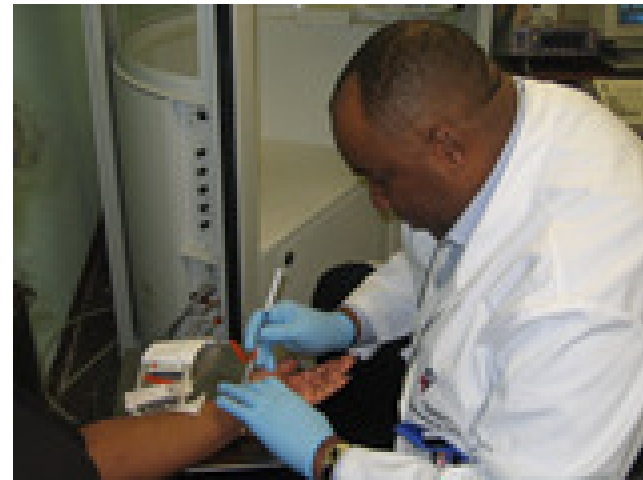
Performing Allen's Test



The idea here is to figure out if there is adequate collateral circulation from the ulnar artery to perfuse the hand.

Puncture Procedure

- 7. Drape the bed and stabilize the wrist in the position that gives maximal pulse**
 - (hyper-extended, using a rolled up towel if necessary)
- 8. Prepare the site**
- 9. Cleanse the chosen area with a alcohol and/or iodine**
- 10. Secure needle to syringe and remove cap from needle**



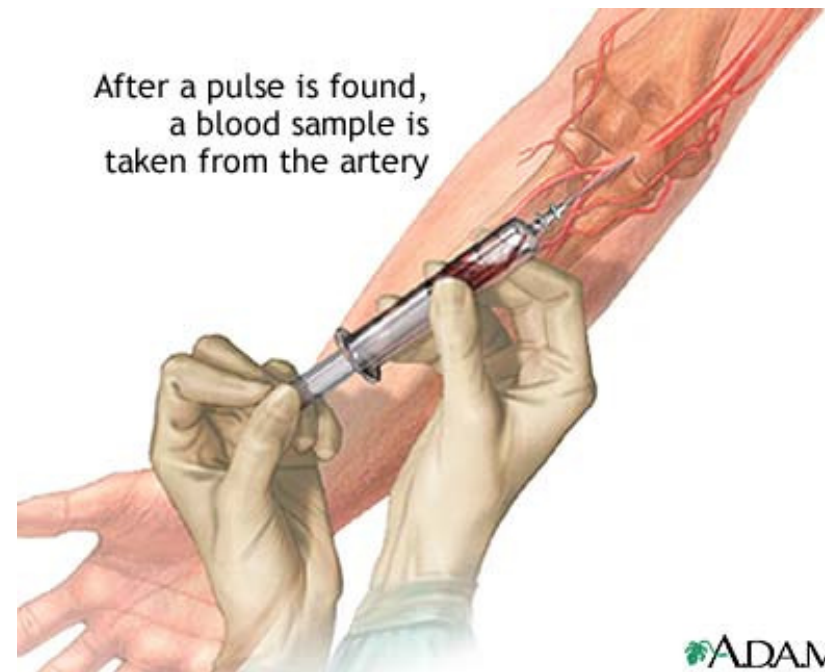
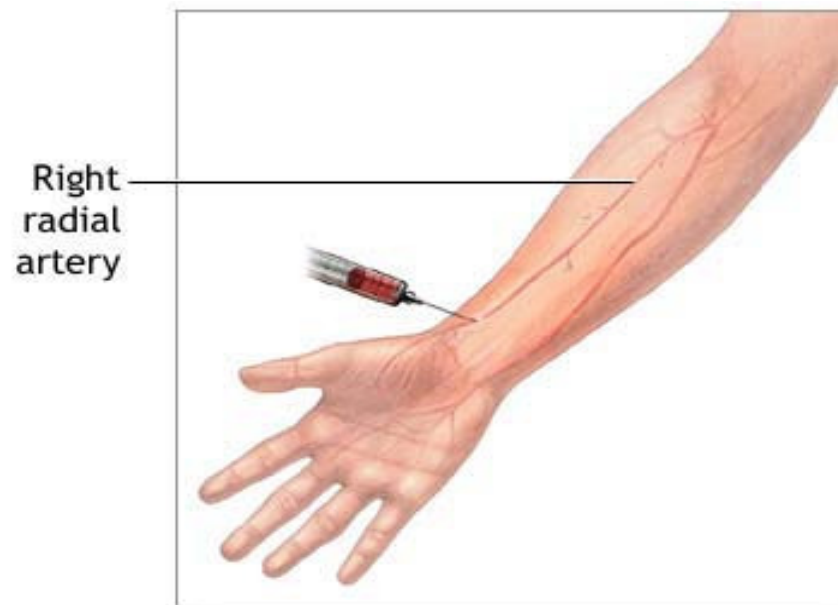
Puncture Procedure



Puncture Procedure

11. Pierce the skin at puncture site

- keep needle angle constant
- Bevel of needle **up**, or **into** the arterial flow (Bevel faces the heart)



Angle of Entry

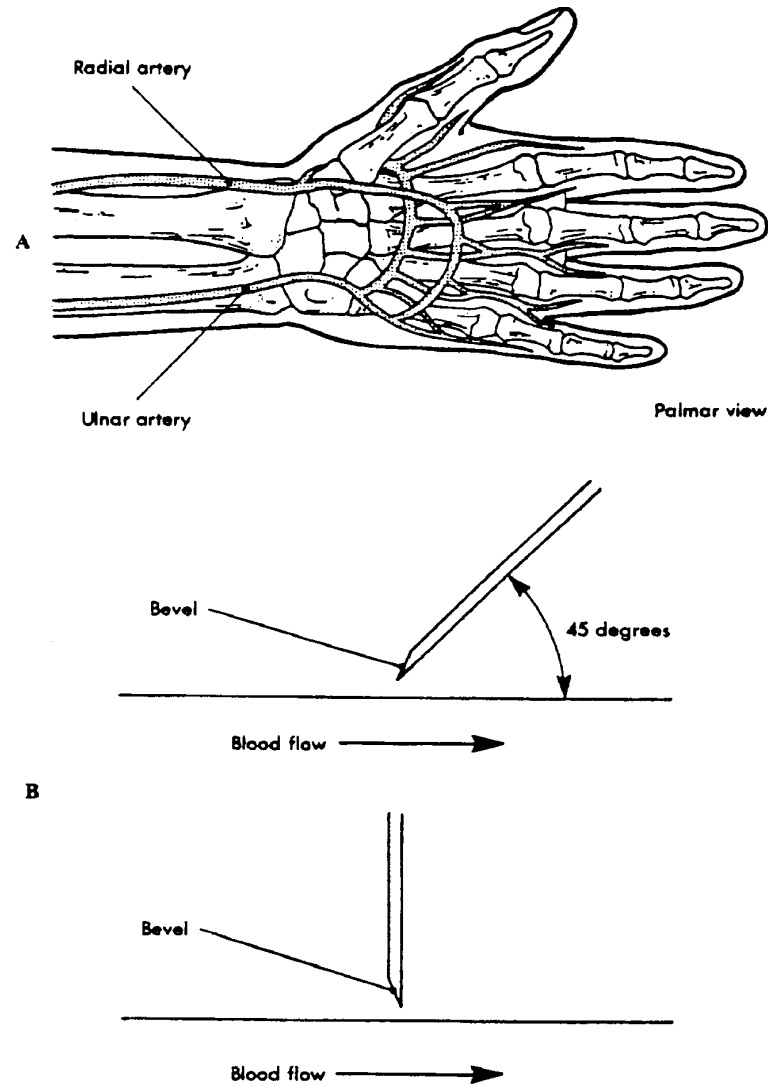


FIG 2-2.

A, radial arterial position in the lower portion of the arm and wrist. **B**, bevel and needle positioning for radial arterial puncture and other arterial punctures, respectively. (From Lane EE, Walker JF: *Clinical Arterial Blood Gas Analysis*. St Louis, CV Mosby Co, 1987. Used by permission.)

Angle of Entry



Puncture Procedure

12. **Slowly advance in one plane**
13. **When the artery is punctured, blood will enter the syringe – “flash”**



Puncture Procedure

14. Slowly allow blood to fill syringe

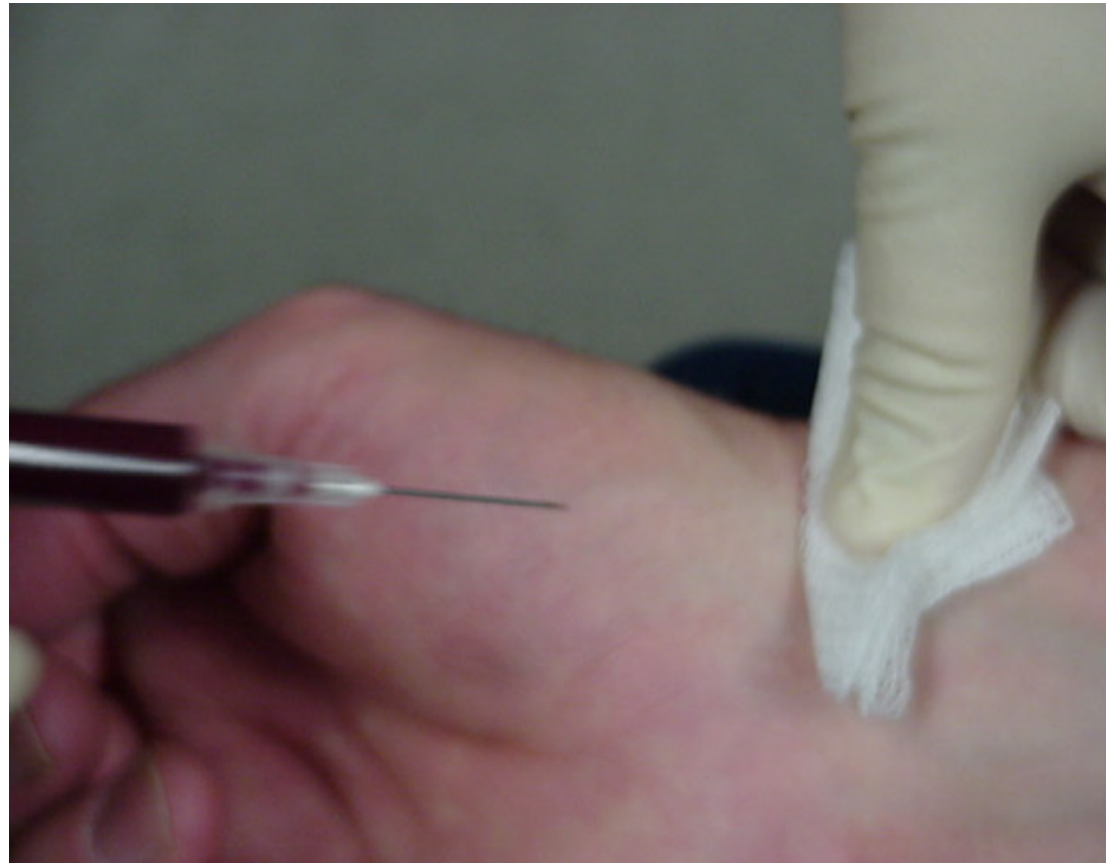
- if no blood appears, remove, change needles, and start again



Puncture Procedure

15. Upon removal of the needle, hold pressure on the puncture site for at least 5 minutes.

- Pressure may need to be held longer (> 5 mins) if the patient is on anticoagulant therapy



Puncture Procedure

16. Check for:

- a. Bleeding
- b. movement of fingers and tingling sensation
- c. pulse distal to puncture
 - if pulse not palpable, notify physician **STAT**

Post Puncture Procedure

- 1. Remove any air bubbles from sample and cap syringe**
 - Dispose of needle in sharps container
- 2. Roll syringe to mix heparin with sample**
- 3. Immerse in ice**
- 4. On lab slip indicate:**
 - a. FIO₂
 - b. patient temperature
 - c. ventilator parameters
- 5. Deliver to lab**

Post Puncture Procedure



Complications of Arterial Punctures:

COMPLICATION	CAUSE	ACTION
Arteriospasm	May occur secondary to pain or anxiety.	Reassure patient; explain procedure and purpose.
Hematoma	Leakage of blood into tissue due to lack of sufficient elastic tissue to seal puncture site, especially in elderly.	Ensure using small diameter needle. Ensure proper technique in holding site X5 minutes post-puncture.
Hemorrhage	Patient receiving anticoagulant therapy or patients with known blood coagulation disorders. Laceration of Artery.	Two minutes after pressure is released inspect site for bleeding oozing or seepage of blood; continue pressure until bleeding ceases. A longer compression time is necessary.
Sepsis	Infection/inflammation adjacent to puncture site.	Avoid sites indicating presence of infection or inflammation.

Complications of Arterial Punctures:

COMPLICATION	CAUSE	ACTION
Nosocomial Bacteremia	Inadequate cleansing prior to puncture.	Ensure appropriate cleansing technique.
Distal ischemia	No collateral circulation. Clotting of Artery. Lack of perfusion. Necrosis of tissue.	Only proceed with puncture after patient has a (+) Allen's Test.
Numbness of hand	Nerve damage.	Ensure proper technique. Palpate artery well, do not redirect when needle lies deep within tissue.
Infection of Health Care Provider	Contact with virus, infections contained in blood of infected patients.	Universal blood & body fluid precautions should be implemented. All blood samples from all patients must be treated with full precautions.

Technical Causes of Abnormal Results:

- 1. Room air mixed with sample**
 - a. PaO₂ will equilibrate to above 160
 - i. Dalton's Law – Barometric pressure x FiO₂

- 2. CO₂ will be lower due to equilibration**
 - a. By Dalton's Law, the partial pressure of CO₂ in room air is approx. 2 mmHg
 - **Diffusion is responsible – diffuse from area of high concentration to low concentration**

Technical Causes of Abnormal Results:

3. Delay in running sample

- a. O₂ consumption will continue as will CO₂ production – pH does what CO₂ tells it to do
- b. Iced, sample will last an hour without a change in the results
 - un-iced, ABG's can be significantly changed after 10 minutes

4. Venous sample drawn

- a. Usually this in shocky patient that you expect low pressures and dark blood
- b. Should doubt when PO₂ is significantly lower than expected
 - i. draw venous blood to check comparison or
 - ii. redraw sample

Technical Causes of Abnormal Results:

4. Capillary samples

- a. From infants warmed heel
- b. CAUTION – pay attention to puncture site and sample type
- c. ONLY diagnostic values are pH and PaCO₂
- d. PaO₂ value is NOT diagnostic

5. Heparin

- a. Sodium Heparin 1% solution should be used
- b. ammonium heparin will alter pH
- c. dry lithium heparin is OK
 - All unnecessary heparin should be ejected from syringe, excess can effect results

Technical Causes of Abnormal Results:

6. Patient pain

- a. Can cause hyperventilation or breath holding
- b. An anesthetic may be injected prior to stick for pain, although this hurts probably as much
 - Usually 2% lidocaine
 - **CAUTION** – some people allergic to “caines”

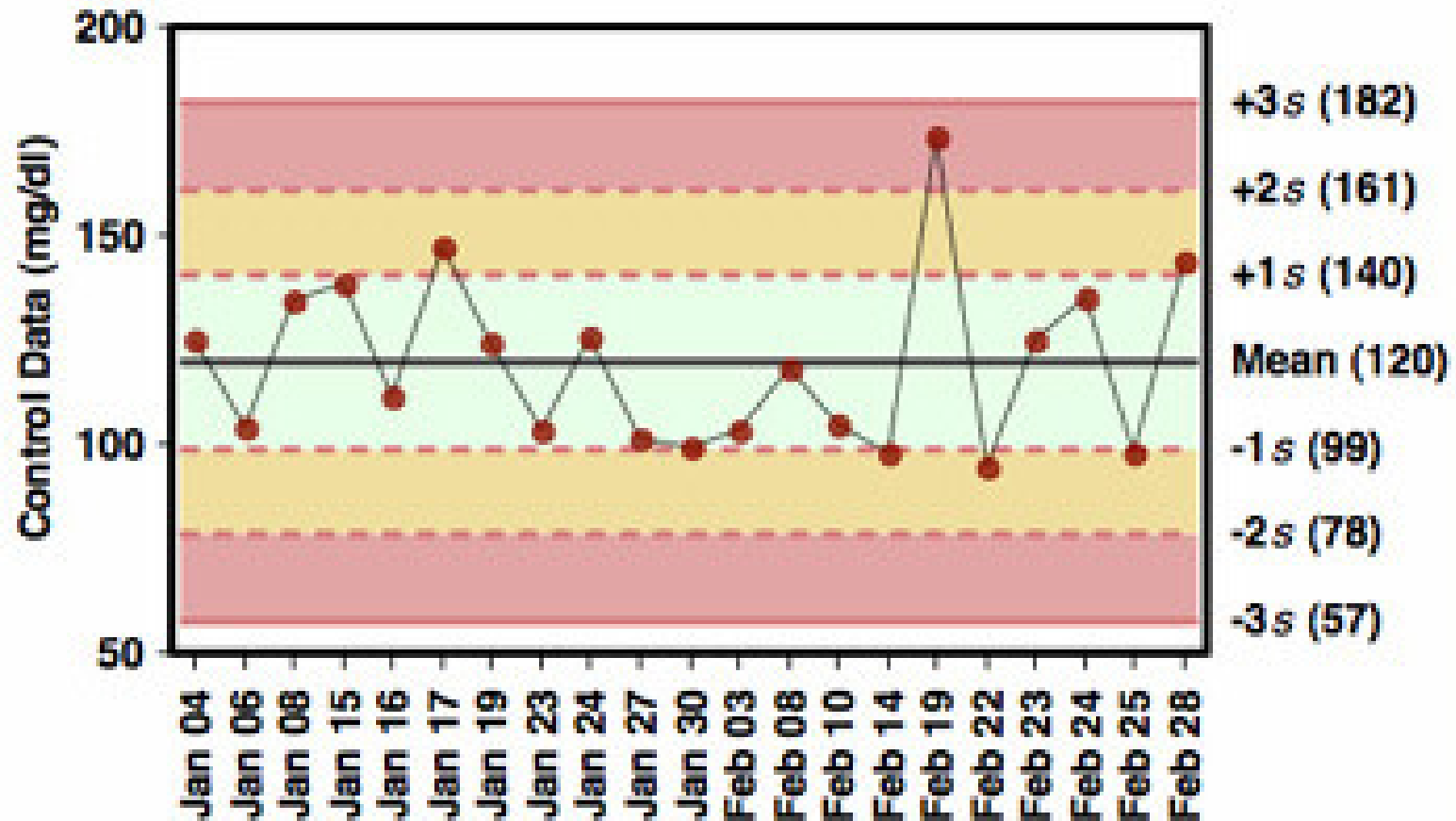
7. Machine errors

- a. Improper calibration
- b. Air bubbles in electrodes
- c. Torn membranes

Quality Control/Performance Improvement

- I. **Quality control levels (high, normal, low) are run every 8 hours to check performance of machine**
 - Levey-Jennings chart – assesses whether control value falls within acceptable limits.
 - i. trend – 6 or more results in an increasing or decreasing pattern
 - ii. shift – 6 or more results falling on the same side of the mean

Quality Control/Performance Improvement



Westgard Procedure Warning Rules

Run Accepted

Quality Control/Performance Improvement

II. The Clinical Laboratory Improvement Act of 1988 (CLIA) requires proficiency testing be done through the year

Arterial Line Insertion



Position, Prep and feel for a good pulse.

Arterial Line Insertion



A Closer View.

Arterial Line Insertion



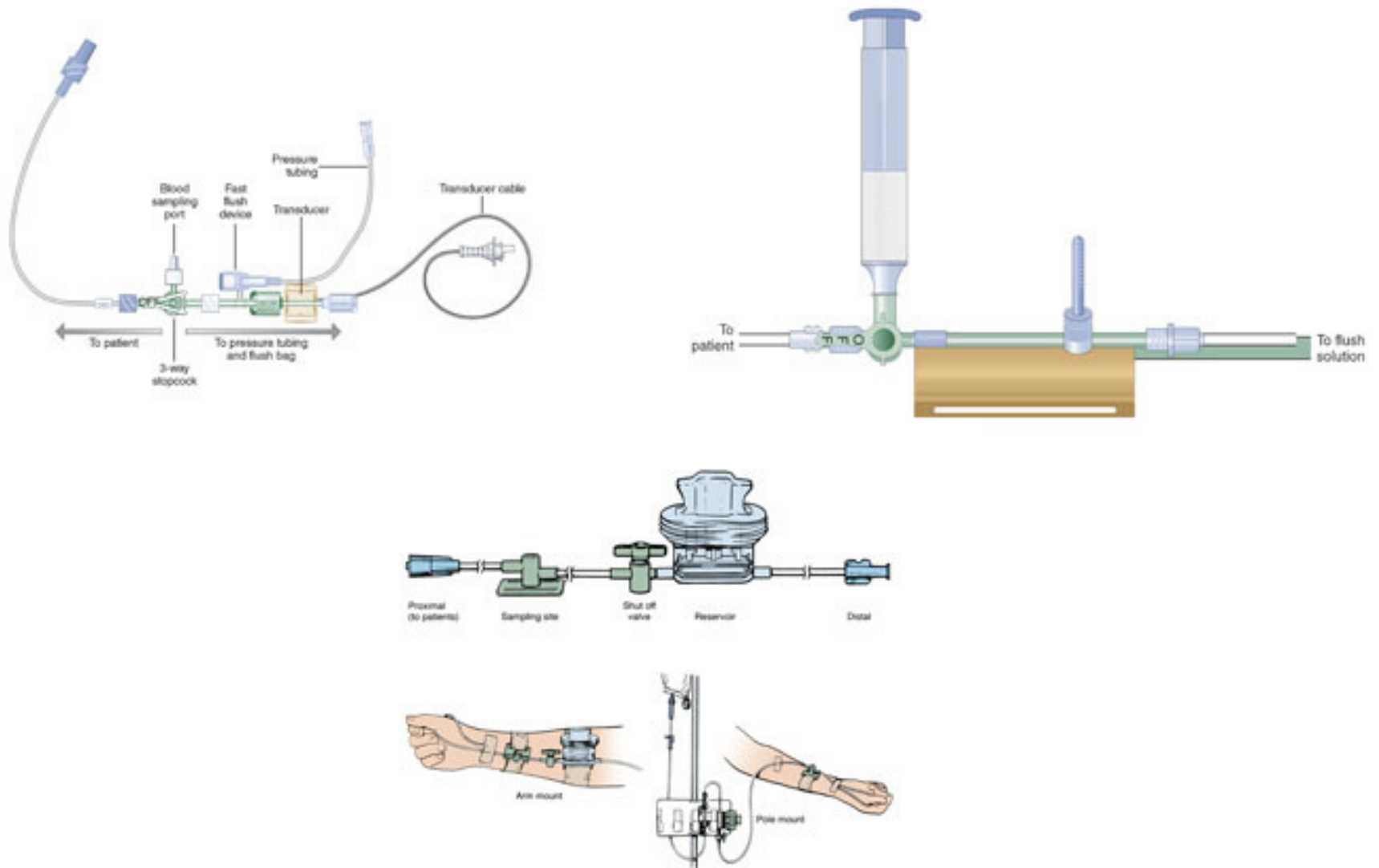
Insert needle and cannulate artery.

Arterial Line Insertion



Secure and attach to pressure monitor.

A-Line Sampling



THE END