Intro to Procedures: The Arterial Blood Gas

Information Obtained from an ABG:

- Acid base status
- Oxygenation
  - Dissolved O2 (pO2)
  - Saturation of hemoglobin
- CO2 elimination
- Levels of carboxyhemoglobin and methemoglobin

Indications:

- Assess the ventilatory status, oxygenation and acid base status
- Assess the response to an intervention

Contraindications:

- Bleeding diathesis
- AV fistula
- Severe peripheral vascular disease, absence of an arterial pulse
- Infection over site

Why an ABG instead of Pulse oximetry?

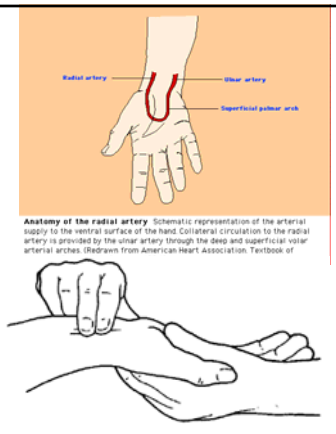
- Pulse oximetry uses light absorption at two wavelengths to determine hemoglobin saturation.
- Pulse oximetry is non-invasive and provides immediate and continuous data.

Why an ABG instead of Pulse oximetry?

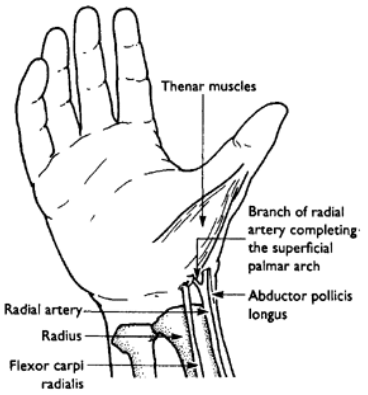
- Pulse oximetry does not assess ventilation (pCO2) or acid base status.
- Pulse oximetry becomes unreliable when saturations fall below 70-80%.
- Technical sources of error (ambient or fluorescent light, hypoperfusion, nail polish, skin pigmentation)
- Pulse oximetry cannot interpret methemoglobin or carboxyhemoglobin.

Which Artery to Choose?

- The radial artery is superficial, has collaterals and is easily compressed. It should almost always be the first choice.
- Other arteries (femoral, dorsalis pedis, brachial) can be used in emergencies.

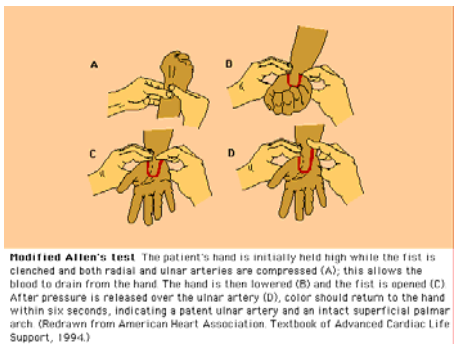


Anatomy of the radial artery. Schematic representation of the arterial supply to the ventral surface of the hand. Collateral circulation to the radial artery is provided by the ulnar artery through the deep and superficial volar arterial arches. (Redrawn from American Heart Association Textbook of



Preparing to perform the Procedure:

- Make sure you and the patient are comfortable.
- Assess the patency of the radial and ulnar arteries.



Modified Allen's test The patient's hand is initially held high while the fist is clenched and both radial and ulnar arteries are compressed (A); this allows the blood to drain from the hand. The hand is then lowered (B) and the fist is opened (C). After pressure is released over the ulnar artery (D), color should return to the hand within six seconds, indicating a patent ulnar artery and an intact superficial palmar arch. (Redrawn from American Heart Association. Textbook of Advanced Cardiac Life Support, 1994.)

Collection Problems:

- Type of syringe
  - Plastic vs. glass
- Use of heparin
- Air bubbles
- Specimen handling and transport

Type of Syringe

- Glass-
  - Impermeable to gases
  - Expensive and impractical
- Plastic-
  - Somewhat permeable to gases
  - Disposable and inexpensive

Heparin

- Liquid
  - Dilutional effect if <2-3 ml of blood collected
- Preloaded dry heparin powder
  - Eliminates dilution problem
  - Mixing becomes more important
  - May alter sodium or potassium levels

The Kit

Air bubbles

- Gas equilibration between ambient air (pO2 ~ 150, pCO2~0) and arterial blood.
- pO2 will begin to rise, pCO2 will fall
- Effect is a function of duration of exposure and surface area of air bubble.
- Effect is amplified by pneumatic tube transport.

Transport

- After specimen collected and air bubble removed, gently mix and invert syringe.
- Because the wbcs are metabolically active, they will consume oxygen.
- Plastic syringes are gas permeable.
- Key: Minimize time from sample acquisition to analysis.

Transport

- Placing the AGB on ice may help minimize changes, depending on the type of syringe, pO2 and white blood cell count.
- Its probably not as important if the specimen is delivered immediately.

Performing the Procedure:

- Put on gloves
- Prepare the site
  - Drape the bed
  - Cleanse the radial area with a alcohol
- Position the wrist (hyper-extended, using a rolled up towel if necessary)
- Palpate the arterial pulse and visualize the course of the artery.

Performing the Procedure:

- If you are going to use local anesthetic, infiltrate the skin with 2% xylocaine.
- Open the ABG kit
- Line the needle up with the artery, bevel side up.
- Enter the artery and allow the syringe to fill spontaneously.

Performing the Procedure:

- Withdraw the needle and hold pressure on the site.
- Protect needle
- Remove any air bubbles
- Gently mix the specimen by rolling it between your palms
- Place the specimen on ice and transport to lab immediately.