

PR48: Arterial Blood Gas Sampling

Arterial Blood Gas Sampling

Applicable To

- CCP only

Introduction

Arterial blood gas analysis provides insight into many aspects of critical care. Samples can be obtained from either an arterial puncture or from an existing arterial line.

Indications

- The need for acquisition of an arterial blood sample to assess:
 - Arterial oxygenation
 - Arterial acid-base status
 - Electrolyte levels

Contraindications

- Infection, thrombus, or distorted anatomy at the site of puncture.
- Abnormal modified-Allen's test suggesting inadequate distal collateral flow.
- Severe peripheral vascular disease or Raynaud's syndrome affecting the puncture site.

Cautions

- Arterial punctures for blood gas analysis should preferentially be taken from the radial artery.
- Monitoring for bleeding or adverse effects (i.e., impaired distal blood flow) should be undertaken following any arterial sampling.
- Arterial sampling should be minimized where possible to reduce the risks of infectious exposure and bleeding.
- Vasospasm, nerve damage, and vasovagal syncope can all result from arterial puncture and should be anticipated.

Procedure

Arterial Puncture Sampling

1. Gather necessary equipment:
 1. Heparinized, vented 23g sampling syringe/needle
 2. Bandage or gauze
 3. Alcohol wipes and/or appropriate site cleanser
 4. Local anesthetic (lidocaine 1% or 2% without epinephrine) plus single-use syringe if required.
2. Select the site for puncture considering:
 1. Ease of access
 2. Strength of pulse
 3. Ability to compress the site
 4. Collateral blood flow (modified-Allen's test may be used)
3. Utilize aseptic technique including hand hygiene, gloves, and cleaning of the selected site.
4. Palpate artery and insert needle at approximately a 45-degree angle to obtain flash.
5. Ultrasound may be used to aid in the acquisition.
6. Obtain flash and allow syringe to fill without manipulating the plunger.
7. Withdraw needle when a sufficient sample is obtained and secure the needle.

8. Expel excess air using the plunger and the cap in place.
9. Apply gauze and pressure to the site for a length of time sufficient to stop any bleeding.
10. Dress the site with a bandage if not already done.
11. Perform hand hygiene.
12. Utilize the blood sample for analysis. (Point of Care Testing)
13. Monitor the site of puncture for ongoing bleeding or complications.

Arterial Line Sampling (VAMP™ line)

1. Gather necessary equipment:
 1. Heparinized, vented 23g sampling syringe/needle
 2. VAMP™ blunt access tip
 3. Alcohol wipes and/or appropriate site cleanser
2. Remove arterial sampling needle and attach VAMP™ blunt access tip to the sampling syringe
3. Turn stopcock at sample access port to allow for line flow and sampling
4. Squeeze the VAMP reservoir module tabs and pull back over 3-5 seconds to fill the reservoir with blood.
5. Close valve next to reservoir to prevent clearance blood from being sampled.
6. Clean the access port.
7. Insert the syringe with blunt access tip into sampling port and obtain sample.
8. Open the valve next to the reservoir.
9. Push the reservoir down slowly to replace the withdrawn blood.
10. Open the proximal valve and flush the arterial line.
11. Ensure adequate waveform on arterial tracing.

Arterial Line Sampling (non-VAMP™ line)

1. Gather necessary equipment:
 1. Heparinized, vented 23g sampling syringe/needle
 2. VAMP™ blunt access tip
 3. 10cc syringe with blunt tip
 4. Alcohol wipes and/or appropriate site cleanser
2. Remove arterial sampling needle and attach VAMP™ blunt access tip to the sampling syringe.
3. Attach 10cc syringe to open port of the stopcock distal to the transducer.
4. Turn the stopcock such that it is closed proximally and open to the patient and 10cc syringe.
5. Withdraw a minimum of 5cc's of blood into the 10cc syringe.
6. Close the stopcock to the syringe.
7. Remove and discard the 10cc syringe and blood.
8. Turn the stopcock such that it is closed distally (to patient) and open to the distal/fluid side and the open port.
9. Briefly flush the port into a disposable container to clear any blood from the port by pulling on the flush valve tab, mindful of the potential for splash, and then cap the open port with a sterile non-vented cap.
10. Insert the syringe with blunt access tip into sampling port distal to the stopcock and obtain sample.
11. Turn the stopcock such that it is closed to the free port and open to the patient and fluid side and flush the arterial line until it is free from blood.
12. Ensure adequate waveform on arterial tracing.

Notes

- Consider the use of venous samples when appropriate.

- Arterial samples are often not required if oxygenation is known to be appropriate and SpO₂ levels are adequate and reliable.
- Venous blood gas samples can be adapted to determine acid-base status with the appropriate conversions. (Excluding a reliable PaO₂)

References

- Theodore, AC. (2021). Venous blood gases and other alternative to arterial blood gases. In S. Manaker & G. Finlay (Eds.), *UpToDate*. Retrieved February 2, 2021, from <https://www.uptodate.com/contents/venous-blood-gases-and-other-alternatives-to-arterial-blood-gases>
- Theodore, AC. (2021). Arterial blood gases. In S. Manaker & G. Finlay (Eds.), *UpToDate*. Retrieved February 2, 2021, from <https://www.uptodate.com/contents/arterial-blood-gases>
- WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization; 2010. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK138661/>

