ABG SAMPLING TECHNIQUE

Before you can interpret an ABG you must, of course, obtain a sample of arterial blood. The following steps should be used as a guide but the best way to learn is at the bedside with experienced supervision.

BEFORE SAMPLING

- Confirm the need for the ABG and identify any contraindications (Box 1.6.1).
- Always record details of O₂ therapy and respiratory support (e.g. ventilator settings).
- Unless results are required urgently, allow at least 20 minutes after any change in O₂ therapy before sampling (to achieve a steady state).
- Explain to the patient why you are doing the test, what it involves and the possible complications (bleeding, bruising, arterial thrombosis, infection and pain); then obtain consent to proceed.
- Prepare the necessary equipment (heparinised syringe with cap, 20–22G needle, sharps disposal container, gauze) and don universal precautions.
- Identify a suitable site for sampling by palpating the radial, brachial or femoral artery (Figure 18). Routine sampling should, initially, be attempted from the radial artery of the non-dominant arm.
Figure 18 Arterial puncture sites.

Box 1.6.1 Contraindications to ABG analysis*

Inadequate collateral circulation at the puncture site
Should not be performed through a lesion or a surgical shunt
Evidence of peripheral vascular disease distant to the puncture site
A coagulopathy or medium- to high-dose anticoagulation therapy

*These are not absolute and depend upon the clinical importance of ABG analysis.
RADIAL ARTERY SAMPLING

- Perform a modified Allen test to ensure adequate collateral circulation from ulnar artery\(^1\) (Figure 20).
- Position the patient’s hand as shown in Figure 19 with the wrist extended 20–30°. Greater extension of the wrist may impede arterial flow.
- Identify the radial artery by palpating the pulse; choose a site where the pulse is prominent.
- Clean the sampling site with an alcohol wipe.
- Expel the heparin from syringe.
- Steady your hand on the patient’s hand, as shown, then insert the needle at 45°, bevel facing up.
- Be sure to insert the needle slowly to minimise the risk of arterial spasm.
- When the needle is in the artery a flash of pulsatile blood will appear in the barrel of the needle. Most ABG syringes will then fill under arterial pressure (see info box over page).
- Obtain at least 3 mL of blood before withdrawing.

\(^1\) However, the value of routinely performing a modified Allen’s test prior to arterial puncture has been questioned, in part due to its poor sensitivity and specificity for identifying inadequate collateral circulation. (Slogoff S, Keats AS, Arlund C. On the safety of radial artery cannulation. Anaesthesiology 1983;59:42–47).
Arterial sampling (particularly from the radial artery) can be extremely painful; discomfort can be reduced by injecting 1 mL of 1% lidocaine, at the needle insertion site prior to sampling.

**Tip: local anaesthetic**

Dark, non-pulsatile blood that requires manual suction to aspirate often indicates a venous sample (except in severe shock/cardiac arrest). Another clue is when $Sao_2$ on ABG analysis is significantly lower than $Sao_2$ on pulse oximetry.
AFTER SAMPLING

- Once adequate blood has been obtained, remove the needle and apply firm, direct pressure to the sample site for at least 5 minutes (and until bleeding has ceased).
- Dispose of all sharps and contaminated materials appropriately.
- Ensure that no air bubbles are present in the sample, as they may compromise results. Any sample with more than very fine bubbles should be discarded.
- The sample should be analysed promptly: if the transit time is likely to exceed 10 minutes, then the syringe should be stored on crushed ice.
- If sampling is unsuccessful it is often advisable to repeat the test on the opposite wrist as even slight irritation of the artery on the first attempt may have provoked arterial spasm, thwarting further attempts at puncture.
Instruct the patient to clench his/her fist then occlude both arteries. Release the ulnar artery. If the colour returns to the hand within 10s this indicates adequate circulation.

**Figure 20** Modified Allen test.