THE VARIETY OF BLOOD CULTURE COLLECTION SITES
(PERIPHERAL, FEMORAL, ARTERIAL, CATHETER)

Sepsis is a potentially life-threatening condition of an infection and the most common cause of death in hospitalized patients. Blood cultures serve as a reliable test for detecting bacteremia often associated with sepsis and as a vital tool in tailoring antibiotic therapy. Blood culture remains a cornerstone of the diagnosis and should be taken prior to starting treatment in all cases. Meticulous aseptic techniques are required when taking blood cultures so as to reduce the risk of contamination with skin commensal which can lead to misdiagnosis. In patients with chronic or sub acute presentation, three sets of optimally filled blood cultures should be taken with more than 6 hours interval in between prior to commencing antimicrobial therapy. Taking blood cultures at different times is critical to identifying a constant bacteremia. The two most common blood collection sites are the central line catheter and the peripheral venipuncture.

Central venous catheters are inserted by using the Seldinger catheter-over-wire technique with maximal barrier precautions and under strict sterile precautions. Peripheral arterial catheters represent the majority of arterial access. They are inserted by using 20-gauge catheter-over-needle intravenous equipment following skin preparation similar to that used for peripheral venipuncture. Femoral catheters are inserted using barrier precautions similar to central line insertion.

Peripheral blood cultures were obtained from venipuncture following skin preparation with 70% isopropyl alcohol or 0.5% chlorhexidine in 70% alcohol using 21-gauge and 23-gauge needle. Blood samples should be obtained in pairs (2 sets) from different peripheral sites rather than single (1 set) because cultures of single samples are difficult to interpret. Therefore, cultures of lone samples may cause false-positive results that lead to unnecessary or increased duration of antibiotic therapy and potentially prolonged hospital stays.

The approved sites for peripheral blood collection are listed below in the order of preference:
I. Antecubital area of the arm
II. Back of hand or side of wrist
III. Back of hand or side of wrist below a lock
IV. Antecubital area of arm above a lock
V. Back of hand or side of wrist below an I.V. line. I.V. must be turned off for a minimum of three minutes prior to collection
VI. Foot or ankle only with written permission of physician
VII. As a last resort, at the discretion of physician/nurse, a phlebotomist may collect from a site above an I.V. line. Physician must provide written permission for this procedure and must turn off I.V. for a minimum of three minutes prior to collection. A comment will be appended to the test results, indicating the possibility of dilution/contamination effect.
The process of obtaining blood cultures can be divided broadly into three parts: preparing the phlebotomy site, drawing the blood and inoculating the blood into the culture bottles. All three parts can be sources of blood culture contamination. Contamination of blood cultures causes diagnostic confusion and sometimes leads to unnecessary use of antimicrobial agents.

Studies demonstrated that blood cultures taken at the time of central line insertion using strict aseptic techniques yielded a higher rate of contamination than did blood culture obtained from peripheral venipuncture.\textsuperscript{5,6} However, study also demonstrated a higher yield of true pathogens in cultures drawn at the time of central line insertion than in those drawn from peripheral venipuncture.\textsuperscript{3} Approximately 20\% of skin bacteria live within the deeper layers of dermis and subcutaneous tissue, into which topical antiseptics cannot penetrate and these bacteria could be contaminating centrally drawn cultures. The longer time required for central line insertion also increases exposure to environmental contaminants including \textit{Staphylococcus epidermis}. The high contamination rate may be related to increase skin and soft tissue manipulations performed during central line insertion and this may lead to higher contamination rates due to difficulty of adequately sterilizing a collection site in the presence of catheter.\textsuperscript{1}

The convenience of obtaining blood specimens from intravascular catheters for routine laboratory testing is not recommended as the proportion of false-positive may increase. Another major concern regarding obtaining cultures through intravascular catheters is the possibility of introducing an infection via the catheter. This will result in unnecessary administration of costly and potentially toxic antibiotics to patients, increased length of hospitalization, healthcare cost and antimicrobial resistance of microorganisms.\textsuperscript{7}

Collecting cultures through catheters has several advantages associated with avoidance of additional venipuncture during the index encounter, including improved patient comfort, reduced needle stick risks, and less time spent obtaining cultures. For some patients who are obese, dehydrated or edematous, specimen collection through a catheter may be the only available method for rapidly obtaining cultures.\textsuperscript{5} Most importantly, clinicians must be aware of the drawbacks in interpretation of positive catheter-drawn samples. Proper clinical interpretation has to be done in context of the prior likelihood of infection, the organism involved, the clinical condition of the patient and other available microbiological data.\textsuperscript{8}

As a conclusion, blood should be obtained from peripheral venous sites. Obtaining blood cultures from central venous catheters, arterial lines and inguinal vessels increase the likelihood of obtaining a false positive blood culture. The practice of drawing blood for culture from catheters should never be performed when a peripheral (i.e. non-characterized) site is available.
References


