Arterial catheter-related sepsis

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Vascular catheter-related infections are the leading cause of nosocomial bloodstream infections (BSI). In critically ill patients they are associated with increased morbidity, mortality, length of stay in the ICU and extra costs[1]. Most studies focus on infectious complications of central venous catheters (CVCs), because it is assumed that the incidence of arterial catheter-related bloodstream infections (CRBSIs) is lower than the incidence of central venous CRBSIs. Many clinicians consider arterial catheters to pose little risk of catheter-related BSI and do not regularly culture arterial catheters in patients with suspected catheter-related sepsis.

In a systematic review of 200 published prospective studies, the rate of intravascular-related bloodstream infections for non-cuffed CVCs is 4.4/1000 catheter-days, and for arterial catheters used for haemodynamic monitoring 0.8%. In contrast, when risk is expressed as BSI per 1000 catheter-days, the level of risk differs substantially for non-cuffed CVCs and arterial catheters. The CRBSI incidence in femoral access (1.92/1000 catheter-days) is significantly higher than in radial access (0.25/1000 catheter-days)[2]. This last method is more reliable in estimating the risk of catheter-related BSI than the method whereby the rate is calculated per 100 catheters. Thus, the above-mentioned figures of BSI per 1000 catheter-days show a substantial rate of BSI caused by arterial catheters. The CRBSI incidence in femoral access (1.92/1000 catheter-days) is significantly higher than in radial access (0.25/1000 catheter-days)[3]. The types of microorganism isolated from arterial catheters do not differ; gram-positive cocci are more common than gram-negative bacilli, and among the gram-positive cocci, coagulase-negative staphylococci are predominant[4].

An arterial CRBSI can be a life-threatening event. This is well demonstrated in a case report published in this issue. Bruins et al describe a patient with S. aureus bacteraemia and septic embolii of the hand caused by a radial artery catheter[5]. Prevention of this kind of complication is desirable.

What measures can be taken to prevent CRBSI from arterial catheters? Nearly all the studies concerning the prevention of CRBSI focus on prevention of central venous CRBSI. Although not evidence-based, one can assume that the guidelines for preventing central venous CRBSI apply to arterial catheters too. The recommended procedures are hand washing with a disinfectant, cleaning the skin with chlorhexidine before inserting a catheter, sterile barrier precautions during insertion of the catheter, using catheter dressings, avoiding the femoral site if possible and removing unnecessary catheters [6]. Strict compliance with these guidelines (by implementing among other things an educational intervention and asking providers daily whether catheters can be removed) could even eliminate CRBSI [7,8].

During CVC insertion, maximum sterile barrier precautions are essential to prevent catheter colonization and catheter-related infections. These precautions include wearing of sterile gloves and gown, a mask, and a cap as well as using sterile drapes. However, these full sterile barrier precautions are not necessary for insertion of radial or dorsalis pedis arterial catheters. Standard precautions during insertion (hand washing, wearing of sterile gloves and skin disinfection) have not been shown to result in reduced risk of catheter colonization and arterial catheter-related infection than insertion using maximum sterile barrier precautions [9]. Femoral and brachial artery catheterization is usually performed using the Seldinger technique and for this reason full sterile barrier precautions are used in this situation.

In conclusion, if a CRBSI is suspected, one always should keep in mind that the arterial catheter is possibly the focus of infection, especially if the catheter is located in the femoral artery and/or if the catheter has been in place for several days. Daily inspection of the exit sites of the catheters for signs of infection, can give a clue as to which catheter is infected. If there is no exit site infection, removal of both CVC and arterial catheter is indicated. The tips of the catheters should be cultured and concomitant blood cultures taken to diagnose CRBSI. Depending on the clinical picture, antimicrobial therapy is administered. However, most importantly, a strict protocol on prevention of catheter-related infections should be followed. Every ICU should have such a protocol in place. For reasons of quality control registering CRBSI per 1000 catheter-days is advisable in order to determine the incidence of CRBSI in each individual ICU.

References