Should central venous catheters be routinely replaced in adults?

Central venous catheters are sited for a variety of reasons in the adult critically ill patient. There is clear guidance for indications and maintenance of central venous catheters, but there is no clear guidance on how long a central venous catheter should remain in situ. This article looks at evidence to answer this question.

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Central venous catheters are sited in the critically ill patient for a variety of reasons, including invasive monitoring, administration of drugs requiring a central vein, total parental nutrition, and difficult peripheral venous access. Central venous access can be achieved either by inserting a catheter directly into a central vein or via a peripherally inserted central catheter. Current National Institute for Health and Care Excellence (2002) recommendations state that the central venous catheter should be reviewed daily for both signs of infection and for the ongoing need of central venous access. However, there is no clear guidance on how long a central venous catheter should remain in situ. It is unclear whether these should be routinely replaced or replaced only when clinically indicated.

Indications for removal of central venous catheters

Clear indications that a central venous catheter needs to be removed or replaced include blocked lumen, suspected or confirmed sepsis related to the catheter, evidence of infection or inflammation at the insertion site, thrombosis, or that central access is no longer required (Smith and Nolan, 2013).

Central venous catheter-related infections arise from different mechanisms: infection at the insertion site and migration of the microbe on the external surface of the catheter, infection of the catheter port causing intraluminal catheter colonisation, and seeding of the catheter from systemic infections. Catheter-related bloodstream infections are associated with increased morbidity and mortality, as well as a prolonged length of critical care and hospital stay (Smith and Nolan, 2013).

Meticulous insertion and care of the central venous catheter is essential to reduce the risk of infection. Techniques used include strict asepsis during insertion, avoiding the femoral route of insertion, daily inspection of the catheter and insertion site, daily dressing changes, and daily re-determining of the clinical indication for the central venous catheter (Bion et al, 2013).

A central venous catheter can be replaced via guidewire exchange or use of a different site. If a site is infected, a new site must be selected. If a patient has a systemic infection and the risk of mechanical complication is high, then changing the central venous catheter over a guidewire may be considered.

Central venous catheters should be routinely replaced

Central venous catheters may be routinely replaced in an attempt to prevent associated infectious complications. The longer a central venous catheter is in place, the higher the risk of colonisation and the associated risk of catheter-related bloodstream infections. A study by Ullman et al (1990) recommended routine replacement of central venous catheter at 7 days. They revealed a sequential relationship between colonisation of the central venous catheter and the onset of sepsis. Sepsis had been caused by the same organism(s) that were cultured from the central venous catheter lumen and tips in the preceding days. Catheter-related bloodstream infections remain low in the first 3–4 days after insertion,

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but after this time it is probable that the risk remains the same, although cumulatively the incidence rises over time (Fletcher, 2005). This suggests that early replacement would likely avoid catheter-related bloodstream infections.

Central venous catheters should not be routinely replaced

The risks associated with central venous catheter insertion must be considered when replacing them purely based upon the duration since insertion. The risks of central venous catheter insertion include arterial puncture and/or inadvertent intra-arterial placement of catheter, pneumothorax, arrhythmias from malposition of the catheter tip, thoracic duct injury, cardiac tamponade, air embolism and wire embolism (Smith and Nolan, 2013). Some of these risks, particularly inadvertent arterial puncture or intra-arterial placement of the catheter, can be mitigated by using ultrasound for insertion. Failure rates for central venous catheter insertion are as high as 35% using the landmark technique (National Institute for Health and Care Excellence, 2002). Using safety checklists for insertion can also reduce complications like wire embolisation by ensuring the wire has been removed. One indication for removing a central venous catheter is a suspected catheter-related bloodstream infection in the sick patient. However, 80% of catheters removed on the basis of fever with or without a leucocytosis alone will be sterile. Therefore, routinely changing central venous catheters for this reason increases the risk of mechanical and thromboembolic complications (Fletcher, 2005) and reduces the number of available sites for future central venous catheters, as well as being unpleasant for the unsedated patient, who is fully awake for this procedure. Routinely replacing central venous catheters also has resource implications (both staffing and equipment) for the critical care unit.

Conclusions

The decision to routinely replace central venous catheters comes down to a balance between the risk of the mechanical and thromboembolic complications of insertion vs the increasing risk of infection with the longer duration of insertion. Having reviewed the evidence, the authors recommend that central venous catheters should be changed based on clinical need, rather than after a predetermined number of days. This requires a meticulous approach to both the insertion and the ongoing care of the catheter, highlighting the importance of central venous catheter care bundles. It may also be worth considering use of a peripherally inserted central catheter line in certain patients, which gives access to a central vein but with fewer mechanical complications.

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