Complications of Central Venous Catheterization

TO THE EDITOR: The results of the randomized trial by Parienti et al. (Sept. 24 issue) comparing insertion sites for central venous catheterization will help guide clinicians in their choice of sites. We were surprised, however, that the authors did not report the number of patients in each insertion-site group who were receiving positive-pressure ventilation. The increased positive end-expiratory pressure and large tidal volumes associated with mechanical ventilation can predispose a patient to the development of pneumothorax. Some evidence suggests that the risk of pneumothorax from subclavian-vein catheterization may be higher among patients receiving positive-pressure ventilation than among those not receiving it. Without knowing how the outcomes are stratified according to ventilation status, it is hard to fairly assess the true risk profile of subclavian-vein access.

The authors correctly observe that “the cumulative risk of infectious and thrombotic complications increases with increasing catheter exposure.” We think the inference is worth stating more plainly: one means of preventing infectious complications from central venous catheterization is prompt removal of the catheter when it is no longer needed.

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TO THE EDITOR: We are concerned with the reporting by Parienti and colleagues of central-catheter–associated bloodstream infections with the use of Medical Dictionary for Regulatory Activities definitions. These rates are inconsistent with contemporaneous American and Australian data on central-catheter–associated bloodstream infections defined according to the Centers for Disease Control and Prevention (CDC).

Data from the Victorian Healthcare Associated Infection Surveillance System, based on 303,968 days of central venous catheter use at 29 intensive care units (ICUs) from 2009 through 2013, showed the statewide rate of catheter-associated bloodstream infections to be 1.26 per 1000 catheter-days. This is approximately 60% of the aggregate 2.0 bloodstream infections per 1000 catheter-days reported in the 3SITES trial by Parienti et al.

Our institution is a typical Australian tertiary referral center. Local protocols for the insertion of central venous catheters mandate the following: skin preparation with topical chlorhexidine, chlorhexidine-impregnated catheters, and ultrasonographic guidance. The rate of central-catheter–associated bloodstream infections in local ICUs is 1.1 per 1000 catheter-days overall. Moreover, the rate of attributable iatrogenic pneumothorax in our ICU was 0 per 2221 insertions of central venous catheters from 2013 through 2015. We suggest that the findings of

THIS WEEK’S LETTERS

1489 Complications of Central Venous Catheterization
1492 Pregnancy, Primary Aldosteronism, and Somatic CTNNB1 Mutations
1495 Evaluation of KIR4.1 as an Immune Target in Multiple Sclerosis
1496 Multiple Sclerosis and Antibodies against KIR4.1
the 3SITES trial are of limited external validity to jurisdictions and sites that apply the above catheter-insertion principles and different definitions of central-catheter–associated bloodstream infections.

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TO THE EDITOR: The 3SITES trial provides sitespecific complication rates after central venous catheterization and suggests the preferential use of the subclavian vein in critical illness. Not considered, however, are long-term complications, which might influence the choice of site, particularly in the subgroup of patients who are likely to require long-term dialysis.

Chronic central-vein stenosis is asymptomatic in many persons but leads to malfunction of surgically created arteriovenous fistulae in patients receiving dialysis, in whom it often recurs after venoplasty. Central-vein stenosis is particularly associated with catheters in the subclavian vein (as opposed to the internal jugular or femoral vein), regardless of catheter size, even after short-term use. This is of relevance to a growing proportion of patients: between 1996 and 2010, the percentage of critically ill patients who initiated dialysis during intensive care increased by a factor of almost 4, with up to a quarter of surviving patients remaining permanently dependent on dialysis. The subclavian venous site may provide short-term benefits, but in those who may face permanent renal failure, this site has longer-term disadvantages that need consideration.

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1. Haute Autorité de Santé. Check-list: pose d’un catheter...


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TO THE EDITOR: Parienti et al. report catheter-related infectious and thrombotic complications of central venous catheterization according to insertion site. They chose compression ultrasonography as the diagnostic standard for deep-vein thrombosis (DVT). Although compression ultrasonography alone has efficacy that is similar to that of combined-method ultrasonography (color Doppler ultrasonography combined with compression ultrasonography) in diagnosing DVT in the legs,1 this might not be the case for DVT in the arms. The vascular insertion site of subclavian-vein catheterization is usually located beneath the clavicle, which makes it difficult for the site to be visualized or compressed with compression ultrasonography. Color Doppler ultrasonography has been shown to be more sensitive and accurate than compression ultrasonography in diagnosing DVT in the arms.2 The American College of Chest Physicians guidelines also suggest initial evaluation with combined-method ultrasonography over other initial tests in patients with suspected DVT in the arms.3 Using compression ultrasonography alone to diagnose subclavian-vein thrombosis might lead to underestimation of the event rate.

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TO THE EDITOR: Parienti et al. report that use of the subclavian site for catheter insertion was associated with lower risks of infection and thrombosis but a higher risk of pneumothorax than use of the jugular or femoral sites. Although these results may be explained by the choice of anatomical site alone, there are other factors of equal or greater importance. Rates of ultrasonographic guidance for catheter insertion were low, which could explain the reported rates of insertion failure, hematoma, and pneumothorax. Systematic reviews show that the use of ultrasonographic guidance for central venous cannulation is associated with fewer complications than without such guidance.1,2 Chlorhexidine skin preparation was used less than 50% of the time, and chlorhexidine-impregnated dressings were not used.3 Less than 60% of the catheters were removed when no longer required. Appropriate indications for central-venous-catheter placement, the use of insertion bundles, proper catheter care (including the use of chlorhexidine-impregnated dressings),4 daily needs assessment, and prompt removal of catheters when no longer needed may be more important than the insertion site.

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THE AUTHORS REPLY: Vinson et al. raise the issue of ventilation status. The majority of catheterizations were performed with positive-pressure ventilation (2859 of 3471 [82.4%]) and positive end-expiratory pressure (PEEP) ventilation (2676 of 3471 [77.1%]). The higher risk of pneumothorax...
associated with the use of PEEP than with non-use is difficult to assess, because the PEEP was turned off at the inserter’s discretion during catheterization.

In response to Urbancic et al.: we used a rigorous definition of catheter-related bloodstream infection, not the less accurate surveillance definition of central-catheter-associated bloodstream infection to which they refer. The former definition requires specific laboratory testing in order to unambiguously identify the catheter as the source of the bloodstream infection, whereas the latter definition indicates a bloodstream infection that occurred in the presence of a central catheter or within 48 hours after its removal, without any obvious other cause except the catheter. The low incidence of central-catheter-associated bloodstream infection that they report may relate to a different case mix or the use of chlorhexidine-coated catheters, which were not used in our trial. Given their low rate of pneumothorax, they could decrease further their incidence of central-catheter-associated bloodstream infection by adding the CDC and Australian and New Zealand Intensive Care Society guidelines recommendation “prefer the subclavian site” to their local protocol.

The risk of subclavian-vein stenosis described by Corbett and Ashby has been associated with infection, not the less accurate surveillance definition of catheter-related bloodstream infection. Cochrane Database Syst Rev 2012; 3:

We agree with Bauer and colleagues that factors other than the insertion site can influence the risk of intravascular complications, but the site access was randomized. The CDC guidelines available when our trial was initiated stated, “No comparison has been made between using chlorhexidine preparations with alcohol and povidone–iodine in alcohol to prepare clean skin. Unresolved issue.” The results of the CLEAN trial were not available when we initiated or conducted our trial. Nevertheless, the incidence of catheter-related bloodstream infections in that trial was similar with chlorhexidine preparations and povidone–iodine preparations (P=0.51) for central venous catheters.

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Pregnancy, Primary Aldosteronism, and Somatic CTNNB1 Mutations

TO THE EDITOR: Teo et al. (Oct. 8 issue) describe three women with aldosterone-producing adenomas. Each adenoma had a somatic mutation in CTNNB1, the gene encoding β-catenin in the Wnt cell-differentiation pathway. The authors suggest that there is an association among a somat-