Recalibrating Vascular Access for Elderly Patients

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Hemodialysis patients should be well informed about their vascular access options. Fistulas are strongly encouraged by guidelines and quality improvement initiatives. Governments in numerous jurisdictions have set targets for fistula utilization and some have tied reimbursement to attaining these targets. This creates an environment in which it is tempting to overemphasize the benefits of fistulas and the risks of catheters when discussing vascular access options with our patients. However, informed consent requires us to not only present the options, but to also provide an accurate, unbiased description of the risks and benefits.

The choice of vascular access should be relatively straightforward for a younger patient, with good vessels, who is expected to receive hemodialysis for a prolonged period of time. These patients will have a high likelihood of maturing their fistula and will hopefully experience few access-related complications as a result. The situation is different for elderly individuals. Elderly patients often have poor vessels and a high burden of comorbidity, which increases their risk of fistula failure and lowers their expected survival on hemodialysis. Elderly patients may also be more concerned about their quality of life, rather than extending survival at all costs. The best vascular access option for the growing population of elderly patients is less clear, particularly in light of the study by Murea *et al.* in this issue of the *CJASN* (1).

Hemodialysis catheters can cause exit-site infections, tunnel infections, and bloodstream infections (BSIs). BSIs are particularly concerning because patients can become critically ill from sepsis and bacteria can seed joints, the spine, heart valves, and other vital areas, leading to permanent disabilities or death. Most clinicians can vividly recall patients who have experienced devastating complications from catheter-related infections. For these reasons, infection looms large in our minds and understandably we want to do everything we can to avoid them. Murea *et al.* report that BSIs in their study population were complicated by severe sepsis or hematogenous seeding in 20 of 208 cases (for an overall risk per BSI of 10%), which is consistent with the literature (2–4). In their series, 8 of 11 cases of septic shock resulted in death.

Informing patients about the possibility of serious infections is insufficient. We must also quantify the risk and present it in a way that is easily understood. The rate of BSIs is generally expressed per 1000 catheter days (CDs). The rate is highly variable, and studies of tunneled hemodialysis catheters report rates as low as 0.6 per 1000 CDs and as high as 5.5 per 1000 CDs (5,6). A recent study of 17 dialysis facilities in the Northeast United States conducted by the US Centers for Disease Control and Prevention reported even lower rates, ranging from 0.31 to 0.43 per 1000 CDs, after an intervention was implemented to reduce infections (7). Although the study by Murea *et al.* was a relatively small, single-center study, the authors reported 0.55 BSIs per 1000 CDs in patients aged≥75 years, which was significantly lower than the rate in younger patients. To provide some perspective, this rate is equivalent to one infection every 5.4 years. Notably, Murea *et al.* studied prevalent patients who may have lower infection rates because the risk appears to be highest in the first 6 months after an access placement or procedure (8). These temporal effects are important to consider when measuring local infection rates and quoting infection risks to patients. Bearing this in mind, if this low rate of infection is applied to the average hemodialysis patient using a central venous catheter, the patient's lifetime risk of a BSI would be approximately 50%, given a median survival of 3 years in the incident hemodialysis population (9). If the risk of a serious complication (severe sepsis, hematogenous seeding) after BSI is 10%, then the absolute risk over 3 years is approximately 5%.

One could argue that a simple way to avoid the risk of infection is to strongly recommend that patients have fistulas created. If predialysis patients have fistulas created, they can avoid catheters altogether. Hemodialysis patients can have their catheters removed as soon as their new fistula matures. These ideas underpin programs that aggressively promote fistula creation. Unfortunately, attempting a fistula only reduces the risk of catheter-related infection, and the reduction may be less than expected. There is a substantial risk of primary failure, nonuse (fistula is patent but not cannulated reliably for a variety of reasons), delayed catheter removal, and failure after use requiring subsequent catheter insertion. Primary failure is variably defined in the literature, but a recent meta-analysis defined it as the inability to use the fistula 6 months after creation despite intervention to facilitate maturation (10). Al-Jaishi *et al.* found an overall primary failure rate of 23%, which increased to 37% in patients aged≥65 years. The secondary patency rate was 64% at 2 years. DeSilva *et al.* recently reported that only 50% of elderly patients in the United States with predialysis fistula creation used it to start hemodialysis (11). We

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previously found that the time from fistula creation to catheter removal averages 3 to 4 months for upper arm fistulas (12). Therefore, attempting a fistula reduces exposure to catheters, but the benefit is proportional to the amount of time that a fistula is used independently (catheter-free use). Recent literature reports that the risk of fistula failure is high in elderly patients and Murea *et al*. now report that the risk of catheter-related infection is low. This combination attenuates the potential benefits of fistulas. As the authors rightly point out, it may be time for us to "recalibrate" our recommendations to elderly patients.

It is equally important to note that we do not have well powered randomized controlled studies comparing catheters with fistulas to support our recommendations. Previous studies consistently show associations between fistula use and lower risks of mortality and hospitalization and reduced costs. However, they are only that—associations. Furthermore, a comprehensive meta-analysis recently found that this literature has a significant risk of bias (13,14). Bias occurs because almost all patients who start dialysis acutely with high comorbidity and very high risk of death must use catheters for access. It is unlikely this degree of confounding can be adjusted out with statistical techniques. Furthermore, patients who are not candidates for fistula creation are included in the catheter group in most comparisons. They also have a higher risk of death and likely bias comparisons (15). Finally, individuals whose fistula attempts fail may have unmeasured comorbidity that is not adjusted for in prior analyses (13). These patients are also included in the catheter group in most studies.

Many fistula advocates would still argue that the mountains of data demonstrating the benefits of fistulas outweigh any concerns about bias in prior studies, but our collective experience should remind us to be cautious. There are several well known examples in nephrology in which conclusions based on consistent associations in observational studies were later refuted in randomized trials. Normalizing hemoglobin, early start dialysis, and the importance of clearance are examples. Are we really so sure that a randomized controlled study of catheters versus fistulas in elderly patients would show differences in mortality or other important outcomes? Murea *et al.* argue that such a randomized controlled trial is warranted and we would be inclined to agree. A properly designed and powered randomized controlled trial is required to truly understand how access decisions affect patient outcomes.

A final consideration is quality of life for patients on hemodialysis. We, as a medical community, tend to focus on hard outcomes, such as death, infectious complications, hospitalizations, and costs. These outcomes are important and we should make every effort to reduce them in our patients. However, as patients age, their perspectives may change and perhaps so should ours. Issues such as pain and convenience of treatment may figure more prominently in their decision making than long-term survival. For example, we administered a vascular access questionnaire to hemodialysis patients and found that elderly patients were more likely to report pain with cannulation, bleeding, and bruising when using fistulas (16). Elderly patients have fragile skin, less subcutaneous tissue, and less robust vessels, and are more likely to receive antiplatelets or warfarin, which can increase their risk of cannulation-related complications (17). Elderly patients may therefore be more likely to view catheters as a pain-free, convenient method to receive hemodialysis.

We must always be vigilant to ensure that patients are well informed of the serious complications of catheter use, including infection; however, we should also accept that in the end, it is the patients' choice as to what vascular access they use—not ours. We should also acknowledge that the evidence on which we base our recommendations may be more biased than we think. We should advocate for high-quality trials to inform clinical decision making and better characterize the risks and benefits of choosing one form of vascular access over another, particularly in the elderly hemodialysis population.

Disclosures

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See related article, "Risk of Catheter-Related Bloodstream Infection in Elderly Patients on Hemodialysis," on pages 764–770.