Nephrologists Versus Peripherally Inserted Central Catheters: Are the PICCs Winning?

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Because of their low rate of procedure-related complications, ease of placement, and favorable cost profile, peripherally inserted central venous catheters (PICCs) have increased in prevalence (1–3). In patients with difficult to obtain intravenous access, PICCs are a reasonable form of central venous access when repeated administration of intravenous therapy and/or phlebotomy is required. Although the use of PICCs may prove beneficial in many patient populations, there are complications related to PICC placement, including phlebitis, stenosis, and thrombosis of the involved veins (2).

Because of multiple comorbidities and the recurrent need for intravenous therapies, patients with AKI and patients with CKD are at risk to undergo PICC placement (4). Although this may provide benefit in the short term, the long-term outcomes related to these devices often prove to be deleterious. The dangers of PICCs in patients with CKD are well known, and multiple societies have created guidelines to limit the use of these devices in this vulnerable population. In 2012, the American Board of Internal Medicine Foundation in partnership with Consumer Reports initiated the Choosing Wisely campaign to identify areas in patient care and resource use with the greatest opportunities for improvement. An advisory group from the American Society of Nephrology submitted recommendations for inclusion in this campaign. One of the five recommendations of the group was not to place PICCs in patients with CKD stages 3–5 without consulting a nephrologist (5). The National Kidney Foundation Kidney Disease Outcomes Quality Initiative guidelines for vascular access state that, in patients with CKD stage 4 or 5, forearm and upper arm veins suitable for placement of vascular access should not be used for venipuncture or the placement of intravenous catheters, subclavian catheters, or peripherally inserted central catheter lines (6).

The Fistula First Breakthrough Initiative (FFBI) also recommends against PICC use in patients at risk for or with known midstage 3 CKD, stage 4 or 5 CKD, or ESRD or if the patient is a renal transplant patient (7). The FFBI offers an alternative management strategy: a small bore central catheter (SBCC) in the internal jugular (IJ) vein is recommended. SBCCs can last longer than PICCs, can be easily replaced, and have fewer complications for the period of time needed. Sasadeusz et al. (8) examined 34 patients with CKD in whom SBCCs were placed via the IJ or external jugular vein as a vein-preserving alternative to PICCs. No evidence of symptomatic central venous thrombosis or stenosis was observed. Unlike a PICC, an IJ line does not traverse the subclavian vein, thus eliminating trauma to this vessel and future stenosis. This method makes it less likely to limit the usefulness of a permanent hemodialysis vascular access placed in the ipsilateral arm.

The future availability of suitable vasculature for hemodialysis arteriovenous access creation must invariably be addressed by the nephrologist in patients with later stages of CKD. Recognizing that PICCs can damage vessels and render them unusable for dialysis is an important aspect of care. Shingarev and Allon (9) showed that PICCs are associated with high rates of upper extremity venous thrombosis and residual central venous stenosis. Chopra et al. (1), in a meta-analysis, reported that PICCs were strongly associated with deep venous thrombosis but not pulmonary embolism. Allen et al. (10) found a relatively high rate of venous thrombosis associated with PICCs, particularly cephalic thrombus. Allen et al. (10) recommended that all patients with a history of PICC placement requiring dialysis access undergo upper extremity venography before the placement of permanent access.

In the article by McGill et al. (11) in this issue of the Clinical Journal of the American Society of Nephrology, the authors present a well designed study to systematically explore the hypothesis that PICCs adversely affect outcomes in patients on dialysis with respect to vascular access and patient survival. Because it is impossible to perform a randomized trial comparing patients who have received PICCs with those who have not, McGill et al. (11) have chosen to perform a retrospective study of all Medicare beneficiaries who began dialysis with a hemodialysis catheter between April of 2010 and December of 2011. McGill et al. (11) attempt to correct for confounding by using adjusted hazard ratios to show differences in outcomes between patients who had PICC(s) placed and those who had not. As McGill et al. (11) point out in their limitations, this method is always subject to confounding by indication, namely that there were variables not examined that may have precipitated PICCs placement and also led to adverse outcomes. McGill et al. (11) attempt to include all comorbidities from predialysis Medicare
The result that PICCs placed predialysis resulted in poorer vascular access outcomes is expected and validates the hypothesis that PICCs scar the vessels that are required for effective arteriovenous fistula and arteriovenous graft functionality. PICCs are placed predialysis for a variety of indications, and many are placed without the knowledge of the nephrologist. Hence, there is a need for the interventionists who place the lines to adhere to previously mentioned guidelines. There may be significant confounding by indication, because PICCs are placed in patients with the poorest vessels who also have the poorest outcomes for successful permanent hemodialysis vascular access. McGill et al. (11) did not show an increased adjusted hazard ratio for death among all patients who had PICC(s) placed predialysis, but the reported mortality rates among patients who achieved a working arteriovenous fistula or arteriovenous graft were alarmingly high (56.4% with PICC exposure and 44.8% without PICC exposure). This may be caused by the mean age of the population studied (71.2 years old with PICC exposure and 72.8 years old without), because all were Medicare eligible. This very high mortality rate limits the generalizability of the study to the entire hemodialysis population; however, it does allow for the identification of a subgroup of patients who may benefit even more from the avoidance of these devices.

In the clinical setting, PICCs are placed in patients on dialysis primarily for antibiotics and nutritional support. The need for antibiotics is not accounted for in the baseline patient characteristics that were adjusted for, and the higher mortality among the patients requiring a PICC after dialysis initiation for antibiotic administration almost certainly represents confounding by indication. McGill et al. (11) rightfully point out that PICC placement in a catheter-dependent patient on hemodialysis may indicate clinical situations in which the short-term risk of death is particularly high.

A significant and concerning finding was that numerous patient on hemodialysis (about 2000) received a postdialysis initiation PICC for any reason. These patients were under the care of a nephrologist who presumably was consulting in the hospital and collecting a monthly capitation payment on the patients when they were not in the hospital. The primary nephrology team’s involvement and guidance in the clinical management of patients on hemodialysis receiving PICCs is highly suspect on the basis of these outcomes. The nephrologist certainly recognizes the consequences associated with PICC placement and dialysis access survival. Nonetheless, the large number of patients on hemodialysis undergoing PICC placement in the study by McGill et al. (11) suggests a gross deficiency among many nephrologists in providing a safety net to prevent this procedure. In many patients on hemodialysis, central venous access can be avoided altogether if the nephrologist is involved in choosing an antibiotic regimen that can be administered while the patient is receiving dialysis.

Nephrologists must accept the responsibility for protecting patients’ venous real estate both before and after hemodialysis initiation. The disastrous effects of PICCs are clear, alternate strategies are available, and guidelines are established to support nephrology input and guidance. It is almost inconceivable that thousands of patients on hemodialysis in the United States continue to receive PICCs under their nephrologists’ watch. This is a battle that should have been won already but will clearly require a reinvigorated effort to overcome the path of least resistance that PICCs seem to offer. This includes renewed educational initiatives directed at interventionists, nephrologists, patients, and their caregivers. The lifeline of hemodialysis vascular access is under assault from PICCs. Only a coordinated educational effort directed at all stakeholders and a change in practice mentality will ultimately allow the lifeline to prevail.

Disclosures
None.

References

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See related article, “Peripherally Inserted Central Catheters and Hemodialysis Outcomes,” on pages XXX–XXX.