



A New Tool for the Vascular Access Toolbox

By Steve Bierman, MD

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All around the world, vascular access specialists are pleading for a new tool in their toolboxes. More and more often, their skill with ultrasound is being put to use on difficult IV access patients, so-called DIVAs. But no sooner do vascular access specialists leave the bedside, where they have skillfully inserted an ultrasound-guided peripheral IVs (UGPIV), then they are called back to repeat the process. The line they just started has kinked, fallen out, extravasated in CT or complicated in some other way.

In fact, one extensive review of UGPIVs notes that the median survival of these lines in some facilities is an abysmal 26 hours, while their average failure rate is 56 percent.¹ What other device in the hospital is tolerated with a 56 percent failure rate?

Of course, there is some significant history here. The first peripheral, over-needle IV was introduced in 1950: it was 2 inches long and made of PVC.² Since that time, brilliant innovations—in materials, safety features, tipping and needle technology—have vastly improved PIVs. Today, PIVs are predominantly made of polyurethane—a material capable of holding a sharp thermoformed tip so as to penetrate skin, and yet softening in seconds at body temperature. Intended for placement in superficial vessels, today's PIVs perform reasonably well for short-term (i.e., less than 48 hours) intravenous therapy.

For longer-term therapy, as well as for patients with difficult venous access and/or frequent phlebotomies, the new power-injectable midlines have proven a serviceable addition to the vascular access armamentarium.⁵⁻⁷

But these midlines are not so useful for forearm placement of IV catheters—now recommended by the 2016 Infusion Standards of Practice.⁸ Nor are they appropriate for most renal patients or other patients for whom upper arm vein preservation is essential.

So, what does one do with a DIVA who does not or cannot receive a power-injectable midline? Unfortunately, the answer today must either be: (1) Place a central line and risk a CLABSI, or (2) place an UGPIV, knowing you will probably have to replace it in 26 hours.

Now let me add an interesting wrinkle. One of the finest infection preventionists in the business, Chellie DeVries, recently told me in a personal communication that she did a “deep dive” on all the MRSA bloodstream infections recorded in her institution last year. Here is what she found, much to her amazement and mine, too. All of the patients with MRSA bloodstream infections, without exception, had undergone a minimum of five repetitive PIV sticks prior to their infection. Makes sense, right? The MRSA that infects our patients resides on THEIR skin—the skin that is being traversed by PIV insertion attempts to repeatedly access the bloodstream.

We need a new device—shorter than a midline, longer than a PIV—that can efficiently and effectively gain and maintain access for DIVAs, renal patients, and all forearm IV access patients. We need a true extended dwell catheter (EDC).

What is an EDC? In my view, the term “EDC” is a mere marketing label unless the catheter in question satisfies the following prerequisites:

- Proper length: 2.25-3.00 inches
- High first-attempt success (not merely “success” despite the number of attempts)
- Power-injectable (at least 6 ml/sec)
- Blood drawable (at least 60 percent for full length of stay)
- Low complications (under 10 percent)
- High completion of therapy (80 percent or better)

Any intravascular catheter meeting these requirements would represent a whole new category of VAD, and one

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very much needed in today's hospitals and alternate site facilities.

So, the first question is: Does such an EDC exist? Unfortunately, while there are a few 6 cm catheters (trimmable and non-trimmable) on the market, none meet the aforementioned criteria beyond the mere length requirement. Most are old-style silicone catheters, inserted either through a break-apart needle or a peelable sheath, and certainly none are power-injectable or blood drawable.

Some traditional PIVs have been extended beyond 2.25 inches. For example, a 2.5-inch, 18-gauge FEP (Teflon-type) catheter is offered by one of the major catheter manufacturers. Unfortunately, this catheter material was demonstrated, as far back as 1989, to cause a higher rate of phlebitis than a polyurethane material.⁹ Further, this catheter is not power-injectable. So, again, it meets only the length prerequisites of our proposed EDC.

You might think the solution is easy: Simply make a longer polyurethane peripheral IV catheter. Here is the problem: Polyurethane's strength is also its weakness: it gets soft, at body temperature, very quickly. This works well when access is fast—when the vessel is shallow and easily cannulated. However, when the vessel is deep, rolling or sclerotic and time is required to ultimately access it, then the polyurethane catheter softens before it is advanced off the needle; when this happens, and it happens often with UGPIVs, the tip of the catheter crumples as it encounters the vessel wall and will not advance. This is why UGPIV has a good "success" rate, but generally not a good "first-attempt success" rate.



What is clearly needed is a longer catheter, made of a new material that will soften in time, but not as quickly as polyurethane. Clinicians need an extra minute or two to cannulate the deeper more elusive vessels of DIVAs.

Presently, there is but one entry into the emerging EDC marketplace, as defined above. It is a 6cm, 3Fr (19.5g), power-injectable, non-trimmable IV catheter made of a unique polymer and FDA cleared for insertion "in the vascular system" for up to 29 days. This first EDC, despite encouraging early reports, has

yet to demonstrate evidence of performance in a peer-reviewed journal. One hopes such evidence will surface quickly.

In the meantime, there is no doubt other manufacturers will scurry to meet the expanding need for high-performing EDCs. Clinicians can contribute at the outset by insisting on all of the aforementioned performance criteria. Thereafter, they can insist on an unbiased and replicable evidence base.

There is much to be gained through the development of true EDCs, both by clinicians and industry—and even more to be gained by patients with difficult IV access.

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