Difficult intravenous access: the Vygon Leadercath as an introducer for wider-bore cannula

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DESCRIPTION
Both ultrasound and the Seldinger technique have been shown to improve outcomes during vascular access. International guidelines recommend ultrasound-guidance when difficulties are encountered or expected. However, difficulties still occur, and a broader array of adjuncts is likely to be useful. I would like to recommend a novel technique using the Vygon Arterial Leadercath polyethylene (PE) kit (Vygon, Ecouen, France) as a coaxial introducer for wider-bore cannula, in cases of difficult intravenous access (DIVA).

A 48-year-old man presented for right laparoscopic adrenalectomy and required wide-bore peripheral venous access. Veins were not favourable for direct-puncture. Using ultrasound-guidance, the Vygon Arterial Leadercath 18G (4F) kit (Vygon, Ecouen, France) and aseptic technique, the target vessel was accessed with the 19G introducer needle. The 0.71 mm diameter guidewire was inserted and needle removed. The 18G, 10 cm Leadercath was preloaded with a 16G 48 mm BD Insyte cannula (Becton Dickinson, Utah, USA) and inserted as a unit, with the Leadercath acting as a coaxial introducer. The wire and Leadercath were removed, leaving only the conventional wide-bore intravenous cannula in-situ (figures 1 and 2). A 20G (3F) 8 cm Leadercath can similarly be used to insert an 18G Insyte cannula (figure 1).

These cannula-over-Leadercath combinations couple seamlessly allowing smooth insertion. Skin incision is not required; however, 48 mm long cannula are recommended, due to the higher rate of early dislocation when short cannulas are used with ultrasound. As an adaption, an in-situ 22G Insyte cannula could be easily upsized to an 18G cannula using the 20G Leadercath and its 0.53 mm wire, or an in-situ 20G Insyte upsized to a 16G cannula over the 18G Leadercath and its 0.71 mm wire for a rapid, two-size cannula upgrade in emergency situations where access is difficult.

The advantage of this cannulation ‘lifeline’ is primarily combining the benefits of the Seldinger technique with ultrasound-guidance, whilst appropriating a relatively ubiquitous device—the Vygon Leadercath, to achieve wide-bore access, in the context of limited availability of equivalent proprietary Seldinger-based intravenous cannulation equipment. Furthermore, some practitioners may be uncomfortable using the Leadercath for standalone access, as the red hub is intended to signify Arterial access, and may lead to staff confusion. This technique circumvents this problem.

Midline catheters 6–15 cm, or ‘long’ peripheral intravenous cannulas (PIVCs), have increased in popularity for DIVA of late, and include a limited range of proprietary devices and repurposed Arterial access devices using both the classic and modified-Seldinger technique (integral wire). Devices using the modified Seldinger technique include the AccuCath (Becton Dickinson) and Arrow QuickCath Arterial Catheter (Teleflex, Figure 1 An 18G BD Insyte cannula (Becton Dickinson, Utah, USA) over a 20G Vygon Arterial Leadercath (Vygon, Ecouen, France), and a 16G Insyte cannula over an 18G Vygon Arterial Leadercath.

Figure 2 Ultrasound-guided insertion of a 16G Insyte cannula using an 18G Vygon Arterial Leadercath as a coaxial introducer.
Wayne, Pennsylvania, USA). Devices using the classic Seldinger technique include the Vygon Arterial Leadercath and Leaderflex (Vygon).

Studies of these devices have generally demonstrated high insertion success for DIVA, long dwell time and low complication rate, however, each has its limitations. Cost, availability, length, lack of pressure rating, off-label use and small gauge are common limiting factors, particularly in resuscitation scenarios where high flow rates are required. As such, these devices are arguably more suited for DIVA in subacute patients requiring maintenance therapy, and a gap in wide-bore solutions still exists.

The above discussion begs the question: Is it time low-cost, wide-bore and purpose-made classic Seldinger/ultrasound cannulation kits were developed? Ideal features would be:

1. Convenient minimalist kits with different gauge options (e.g., 12G-18G).
2. Small-gauge access needle with echogenic tip.
3. A fine wire with floppy tip.
4. A smooth transitioning cannula-over-dilator setup ( coaxial introducer), essentially a smaller version of an ARROW Rapid Infusion Catheter (RIC) (Teleflex).
5. Slightly longer than conventional cannula (eg, 50 mm) to minimise dislocation, but short enough to maximise flow rate as per the Hagen-Poiseuille Law.

I believe such an option would be a valuable addition to the repertoire for practitioners encountering DIVA. Purpose-designed devices with integral wires such as the AORROW Rap- id introducer (coaxial introducer), essentially a smaller version of an ARROW Rapid Infusion Catheter (RIC) (Teleflex).

Finally, the interventional radiology Micropuncture access set (Cook Medical, Bloomington, Indiana, USA) exhibits many of the ideal properties; however, its use in this context is similarly limited due to its longer sheath (10 cm) that is not designed for fluid administration under pressure. It would, however, serve as a valuable prototype for Seldinger/ultrasound cannulation kits and allows for serial upsizing.

Learning points

► Both ultrasound and the Seldinger technique have been shown to increase success for difficult vascular access.
► The 20G and 18G Vygon Arterial Leadercath can be used as a conduit to ‘piggyback’ in 18G and 16G conventional cannula, respectively, due to a seamless fit, representing a novel alternative for situations where wider-bore peripheral access is required.
► Wide-bore (12G–18G), ultrasound-focused Seldinger-based difficult intravenous access kits incorporating a coaxial dilator should be developed for volume resuscitation scenarios.

Future studies could objectively compare efficacy of ultrasound-guided Seldinger cannulation using the above methods versus direct puncture for difficult intravenous access.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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REFERENCES

8 Fabiani A, Dreas L, Sanson G. Ultrasound-guided deep-arm veins insertion of long peripheral catheters in patients with difficult venous access after cardiac surgery. Heart Lung 2017;46:46–53.

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Images in...

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