Central Venous Catheters in Small Infants

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HOW to best insert and maintain central venous catheters in small infants is a question of interest to all health professionals working in the field. The hospitalized small infant population is growing as extremely premature baby survival rates increase.[1] In parallel, ultrasound technology is developing rapidly. Smaller vessel and catheter diameters imply increased technical difficulties during both insertion and maintenance when compared with larger children and adults. In this issue of Anesthesiology, Breschan *et al.*[2] describe an experience in Austria with respect to central vein cannulation technique in preterm infants. In 2010, they decided to change their default central venous catheter cannulation technique to in-plane ultrasound-guided cannulation of the brachiocephalic vein in small infants. Their aim was to increase success rates and efficiency, and to reduce complications. One particular advantage of the target brachiocephalic vein is that it relatively maintains its diameter in hypovolemic and shocked patients. The detailed description of the technique, along with the pitfalls to be avoided, is of great potential interest to all anesthesiologists and, indeed, all practitioners inserting central venous catheters in small infants.

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Preterm infants have substantial intravenous therapeutic needs over prolonged periods of time. Antibiotics, hydration, inotropes, and parenteral nutrition are very commonly prescribed in the neonatal intensive care unit. Peripherally inserted central venous catheters are regularly inserted to provide such therapies. However, they take longer to insert than other central venous catheters; have higher failure, occlusion, and venous thrombosis rates; and have relatively low maximum flow rates when compared with central venous catheters inserted directly into central veins.[3] They are also of no use for blood sampling. As a result, following peripherally inserted central venous catheter failure or unsuitability, other practitioners are regularly called upon to insert central venous catheters in small infants in specialized centers.

In parallel, ultrasound technology is improving rapidly, with higher-frequency, higher-resolution probes appearing on the market at regular intervals. Anesthesiologists are well placed to stay up to date with ultrasound technology and to be leaders in this field, as ultrasound progressively becomes ubiquitous in the anesthetic environment. Before the advent of ultrasound, open surgical cut down was commonly performed in very small children by pediatric surgeons. Today, percutaneous venous access under ultrasound guidance has become "standard of care" in the aim to preserve venous capital, and anesthesiologists are more frequently called upon to provide this service.

Selection of the type of catheter to be inserted depends on local expertise notably in the areas of catheter tunneling and securement. The choice is among percutaneous nontunneled or "standard" central venous catheters, tunneled central venous catheters (cuffed or uncuffed), and totally implantable venous access devices (also known as "ports"). Decision-making trees in any given center depend upon local traditions and expertise, taking into account adult data demonstrating that infection rates are highest in nontunneled central venous catheters and lowest in totally implanted devices.[4] Totally implantable devices are rarely inserted into small infants because even the smallest ports are impractical in children under 3 kg. Generally, central venous catheter insertions into central veins require positioning and access that is best provided in a surgical operating room under general anesthesia, and some centers will choose to insert longer-term tunneled central venous catheters early when infants present for surgery or as a stand-alone procedure.

Although the preterm infant population is growing, the numbers of patients requiring central venous access remain relatively low when compared with older children or adults. This, combined with evolving technology and catheters, means that centers are currently innovating according to local expertise and enthusiasm, with a paucity of quality outcome data. A significant number of publications explore specific, easily

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quantifiable complications such as catheter-related or catheter-associated bloodstream infection rates, thrombosis rates, and interventions such as dressing types and therapeutic bundles in children. A smaller number of sizeable cohorts describing central venous catheter insertions by anesthesiologists in infants and children[5] are gradually appearing in the literature. Fewer still provide data on global outcomes such as central venous catheter removal or the need for secondary device insertion.

Good central venous access is often crucial to quality care in small infants, and we need good-quality evidence to guide practice. This will not be easy to achieve given the patient population and the heterogeneity of approaches developing worldwide. International collaboration, high-quality data registries, and multicenter trials are required to explore optimal approaches in securing and maintaining central access in small infants. Articles that share innovative experiences, such as that by Breschan *et al.*, are a step in the right direction.

Competing Interests

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