Editorial

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Choosing the Right Anaesthesia: Enhancing Venous Dilatation for Vascular Access Placement

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Editorial

There are currently three main modalities for vascular access in patients requiring haemodialysis. These include arteriovenous fistulas (AFVs), arteriovenous grafts (AVGs), and central venous catheters (CVCs). Each modality carries with them inherent risks, benefits, and certain placement guidelines.

However, it is relatively well established that primary arteriovenous fistula (AVF) remains the best vascular access modality for haemodialysis with the best long-term primary patency rate, fewer interventions to maintain patency and therefore lower costs and the lowest incidence of morbidity and mortality [1,2]. AVGs and CVCs pose a higher risk of infections and thrombotic complications compared to AVFs: CVCs have infection rates reported up to 10X as high as that of AVFs and even AVGs [3]. Despite this, an estimated 20% of patients are maintained with CVCs [4]. Therefore, the National Kidney Foundation began the "Fistula First Breakthrough Initiative", which seeks to increase the number of successfully placed AVFs. Multiple factors play a role in primary AVFs creation. These included target vessels size and quality, central venous disease, hypercoagulable states and location of access placement. The preference is starting as distal as possible in the extremity with an adequate vein.

This is a crucial component: vein size. While many factors influence the outcome of a created vascular access, preoperative vein diameter has been described as the major predictor of fistula maturation and the main limiting factor for primary AVF creation [5]. A study by Bashar et al. found that 76%, 16%, 65%, and 45% of AVFs successfully matured when using veins with diameters of over 2 mm, under 2 mm, over 4 mm, and under 3 mm, respectively [6]. Therefore, we prefer to consider a vein adequate for upper extremity AVF creation if the diameter is 3 mm or above. This leads the question: is there a way to increase the patient's target vein diameter pre- or intra-operatively? An increase in vein diameter at the time of surgery may allow for the surgeon to alter their plan from an AVG placement to a primary AVF placement, thereby contributing to the "Fistula First Breakthrough Initiative" and providing the patient with a historically more reliable and cheaper vascular access.

An interesting potential mechanism for venous dilatation is administration of regional anaesthesia *via* local brachial plexus block. A study by Hingorani et al. showed that regional anaesthesia is the preferred technique for vasodilatation in the creation of upper extremity AVF [7]. Additionally, Aitken et al conducted a prospective randomized trial that revealed improved 3 month primary and functional patency and 12 months functional patency rates in radio-cephalic AVF [8]. Although interesting, the mechanism remains unclear. The Shemesh et al group theorized the vasodilatation effect of brachial plexus block was sympathectomy-like, where sympathetic denervation results in vasodilation [9]. The venous vasodilatation may possibly prevent early access failure and improve patency. Also, the impact of regional anaesthesia should be considered concomitantly with the inherent avoidance of the risks associated with general anaesthesia. The use of ultrasound guided regional block has decreased the risk of complications and increased the rate of success for patients undergoing arteriovenous fistula creation. A patient may present for vascular access placement with veins smaller than 3 mm, yet regional anaesthesia may allow for the patient to receive a primary AVF due to the associated venous dilatation all while avoiding the risks of general anaesthesia. Ultimately, this could increase the ratio of AVFs *vs.* AVGs placed and therefore lessen patient risks and costs related to their long term vascular access for haemodialysis.

To further address this concept a prospective investigation highlighting and defining the effects that regional brachial plexus block has on vascular access outcomes, as well as a sub-analysis of evaluating vascular access outcomes following an alteration of the original surgical plan due to intraoperative venous dilation (from ≤ 3 mm to >3 mm) associated with regional anaesthesia. Currently, we are investigating the impact of brachial plexus block on AVF/AVG outcomes by

retrospective analysis of all patients who received AVG or AVF through the Division of Vascular Surgery, Mayo Clinic Florida. We've found that 41% of patients that were not candidates for AVF placement and planned for AVG placement were successfully switched to AVF placement following an increase in vein diameter associated with regional block. All of these patients' AVFs were free from failure and were not abandoned due to loss of patency.

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