Percutaneous arteriovenous fistula creation with the Ellipsys Vascular Access System—the state of the art

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Keywords: AVF; Dialysis; EndoAVF; Fistula; pAVF

A traditional radiocephalic arteriovenous fistula (AVF) remains our first choice when adequate vessels are present. However, an AVF created in the proximal forearm between the proximal radial artery (PRA) and the perforating vein of the elbow (PVE) is, in our experience, the next best alternative for patients with inadequate vessels for distal AVF creation.[1] In recent years, a minimally invasive technique allowing for the percutaneous creation of such a fistula has been developed.[2] The vessel size requirements are similar to those for surgical PRA-AVFs, with the only addition a required distance of ≤1.5 mm between the PRA and PVE. Using the PRA for surgical or percutaneous access inflow requires confirmation of adequate distal blood flow in the ulnar artery and palmar arch to be intact.

The Ellipsys Vascular Access System (Avenu Medical, San Juan Capistrano, Calif) uses thermal energy and pressure with tissue fusion to create a permanent anastomosis between the PRA and PVE. Avoidance of side branch ligation allows for multiple, mainly superficial, outflow veins to mature, resulting in lower pressure within these conduits.[3] The technical success and patency rates have been excellent and compare well with results from expert surgical centers.[4] Unlike the mastery required for excellent results in vascular surgery, the Ellipsys technique is relatively simple and has a learning curve of 5 to 10 cases. It is, therefore, easy to teach, which allows for reproducible good results.[5] The average Ellipsys procedure time for 232 patients in our recent report was 15 minutes (range, 7-35 minutes), with technical success in 99% of the patients.[4]

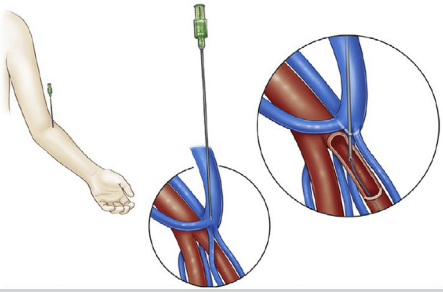

Fig 1. Puncture of proximal radial artery (PRA) through the deep communicating vein at the level of the antecubital fossa. A guidewire should be placed to secure the connection between the artery and vein for the subsequent steps of the procedure.

Our Video illustrates the main steps of the technique, which requires a single vessel puncture, and is performed exclusively under ultrasound guidance without the need for contrast administration. A key element in creating an Ellipsys percutaneous AVF (pAVF), demonstrated in the Video, is the needle cannulation through the PVE and successful needle crossing with guidewire passage into the PRA. The steps in the pAVF procedure are presented in Figs 1 to 4.

Both surgical and percutaneous PRA-AVFs have a lower incidence of morbidity, such as hemodialysis access-induced hand ischemia, high flow cardiac issues, arm edema, and other complications associated with higher flow brachial artery–based upper arm access.[1,4] However, creation of the Ellipsys pAVF avoids some issues associated with a surgical incision and inflammation in the cubital fossa resulting from vessel dissection and manipulation. In addition, the Ellipsys AVF distributes flow through both the median cubital and the median cephalic veins, resulting in lower pressure and turbulence in these vessels and offering important additional undisturbed cannulation length. The procedure does not leave a surgical scar, results in less postoperative pain, and can be performed in an office-based setting, resulting in high patient satisfaction.[6]

Maintenance of any vascular access in hemodialysis patients could eventually require some form of intervention, including these pAVFs. Such procedures for the Ellipsys AVFs can almost always be accomplished with balloon

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Author conflict of interest: A.M. and W.C.J. are consultants for, and shareholders of, Avenu Medical.

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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

J Vasc Surg Cases and Innovative Techniques 2021;7:506-7
2468-4287

https://doi.org/10.1016/j.jvscit.2020.12.009

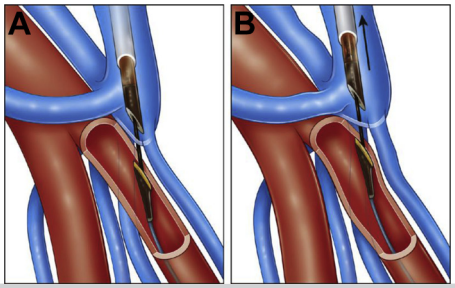

Fig 2. A, Ellipsys catheter advanced into the artery in an open position with the tip of the device in the artery and the base of the device remaining in the vein. **B,** Gentle traction is applied to the device to ensure the device has captured the arterial wall—the operator should feel the resistance when the artery is seen secured adjacent to the vein.

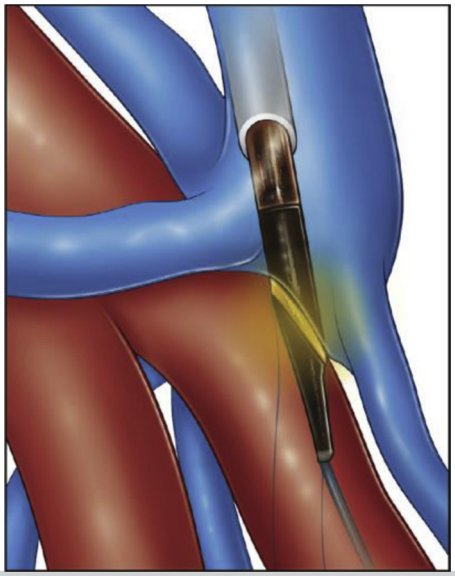

Fig 3. The device is closed and activated. Thermal energy and pressure will cut and fuse the anastomosis between the proximal radial artery and deep communicating vein.

angioplasty guided by a fistulogram or duplex ultrasound imaging and have been proved to offer safe and reliable outcomes. Our recent review of mid-term outcomes offers technical recommendations, images, and an algorithm for maintenance.[4]

Figures 1-4. Images show the stepwise progression of creating an Ellipsys percutaneous arteriovenous fistula.

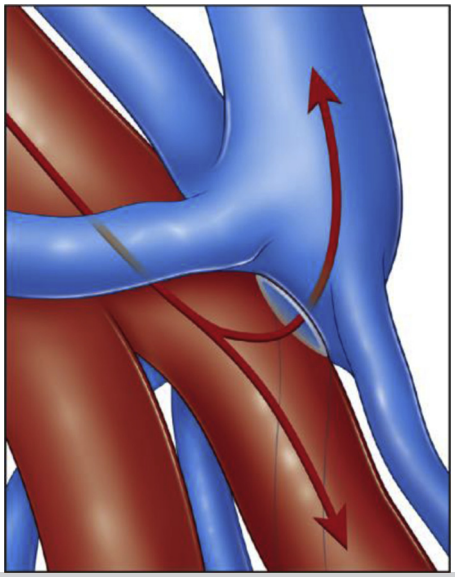

Fig 4. The anastomosis between the proximal radial artery and deep communicating vein is completed.

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Submitted Oct 23, 2020; accepted Dec 16, 2020.