PANEL DISCUSSION

Current Pulse in Dialysis Access Care

Experts weigh in on significant research and clinical needs in dialysis access interventions, evaluating treatment options for dysfunctional accesses, incorporating pAVFs into clinical practice, and engaging the next generation of thought leaders.

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What do you see as the most significant research needs in the field of dialysis access creation and intervention right now?

Dr. Hohmann: Of course, the holy grail of dialysis access (and vascular surgery) is the prevention of intimal hyperplasia. The use of drug-coated balloons (DCBs) has been a bit of a roller coaster, but other drugs may provide further advantages over standard strategies. I am ready for wearables and/or implantable devices to allow for the rapid and precise detection of flow anomalies on a more frequent basis than the standard once-monthly (or longer) monitoring.

Dr. Rajan: The most significant research need is the creation of a low-lifetime-cost, minimal-to-no repeat intervention, long-term, durable dialysis access or a solution to make this a possibility with current access choices. Also, no evidence-based algorithm exists in terms of choosing the right access for the right patient at the right time. Interpretation of mega data sets with artificial intelligence is another research avenue forward toward optimal patient access solutions.

Dr. Niyyar: Core outcomes in the field of dialysis access creation and intervention have remained relatively stagnant until the last few years; however, recent innovations in devices have revolutionized the field and have enormous potential, but we need to ask the right questions. Research that focuses on determining the optimal timing and type of access creation will help guide clinicians on how to incorporate them within each patient's access life plan. Access dysfunction is inevitable in the current scenario, and investigating techniques to prevent access dysfunction; comparing efficacy and safety of interventions like percutaneous transluminal angioplasty (PTA), cutting balloons, DCBs, covered stents, or other emerging technologies; and identifying effective strategies for preventing and managing complications associated with dialysis access are critical. As we move toward individualized, person-centric care and focus on patient-centered outcomes, we need to evaluate the impact of dialysis access interventions on patients' quality of life, as well

as assess resource utilization and the cost-effectiveness of these interventions.

What are the current headwinds and tailwinds for DCBs and specialty balloons in dialysis access interventions?

Dr. Rajan: The most significant headwind for DCBs and specialty balloons remains reimbursement and/or adoption of the technologies globally. In addition, despite publication of two industry-sponsored randomized clinical trials for both the In.Pact (Medtronic) and Lutonix (BD Interventional) DCBs, which demonstrated clear efficacy over plain old balloon angioplasty (POBA), the PAVE study showed no benefit. There are also several small-population, single-center, randomized, prospective and nonrandomized prospective or retrospective studies showing benefit or no benefit. Given differences in study populations and conflicting results, there is ongoing confusion as to the benefits of DCBs and when to use them. As for specialty balloons, limited published outcomes with added costs of use over POBA negatively impact adoption.

On the flip side, positive tailwinds are reflected in the two randomized studies that demonstrated superiority over POBA.[1,2] This has driven adoption to a certain extent and continued interest in the clinical use and study of DCBs.

Dr. Niyyar: DCBs have a lot of potential in dialysis access interventions, although we have conflicting data on their efficacy. Recent rigorous, well-executed randomized industry- and investigator-sponsored trials using the In.Pact (paclitaxel 3.5 µg/mm^2) and Lutonix (paclitaxel 2 µg/mm^2) balloons have evaluated DCBs in peripheral dialysis access interventions (from the anastomosis to the subclavian vein) after preparing the PTA site with a high-pressure balloon angioplasty that had a residual stenosis > 30%.[1,2] The difference in target lesion primary patency was not statistically significant in most of the studies except the In.Pact study, which showed a patency advantage. Additionally, none of the trials indicated specific lesion locations that would respond better to angioplasty with a DCB as compared to POBA or high-pressure balloons. Initial concerns regarding safety and potential risk of mortality have been by and large negated.

As we evaluate "headwinds and tailwinds" for the use of DCBs in dialysis access interventions, further clarity on indications for use in specific sites like central veins or in-stent stenosis would help guide therapy and use. A rigorous trial protocol was followed in the studies that included prolonged inflation times, and a pragmatic trial would help elucidate applicability to real-world situations. Long-term safety data and the potential for any systemic effects also require further investigation. Patient perspectives and preferences, including the trade-offs of less frequent procedures, should be incorporated within the treatment algorithm. Adequate reimbursement, especially in ambulatory settings, is another limiting factor. Randomized controlled trials comparing sirolimus-coated balloons to paclitaxel-coated balloons (ie, SAFE AVF, MATILDA) are underway in Singapore, and it will be interesting to see the evolution in this area.

Dr. Hohmann: At-risk models between the government and large dialysis groups will drive the quest for decreased interventions, and this will be the main tailwind for DCBs, as their cost is the main headwind. With so many interventions being performed in outpatient settings, I believe cost is the main barrier to adoption.

What do you consider the optimal scenario for using covered stents versus DCBs versus PTA alone?

Dr. Niyyar: The optimal scenario for using covered stents, DCBs, or PTA alone in dialysis access stenosis is dependent on many factors, including the specific characteristics of the stenosis, patient factors, site of procedure performed (ambulatory vs hospital) and the operator's clinical judgment. I would always start with a PTA alone, especially where there is short, focal stenosis and the risk of restenosis is low, or if there is symptomatic central venous stenosis or in-stent stenosis. Peripheral lesions in the dialysis access circuit that repeatedly restenose or have recurrent stenosis in areas that are not optimal for a covered stent placement would be considerations for DCBs. I reserve covered stents for the more challenging or recurrent cases with longer segments of significant stenosis, complex lesions where POBA or DCBs may not be sufficient to maintain patency, or, of course, vessel rupture.

Dr. Hohmann: Covered stents work well in the cephalic arch, basilic swing segment, and arteriovenous graft venous outflow stenosis, particularly at the elbow joint. DCBs work well in areas of early restenosis, particularly in cannulation zones. PTA is the workhorse of dialysis maintenance and maturation; I am a fan of longer inflation times. Nevertheless, I feel angioplasty is often overused to avoid increased costs associated with covered stents and DCBs rather than being the optimal treatment.

Dr. Rajan: Standard POBA is what I consider first for a majority of stenoses. Oddly, with recent randomized studies comparing standardized POBA technique/outcomes to DCBs, POBA had improved outcomes compared to prior

historical outcomes. However, I consider the use of DCBs for de novo stenoses and rapidly recurrent stenosis < 3 months. I reserve stent grafts for lesions that have failed angioplasty with DCBs and rapidly recurring (< 3 months) cephalic arch stenosis. I also use stent grafts for clinically symptomatic central venous stenosis and occlusions, as POBA has historically poor patency for these lesions.

In which cases is percutaneous AVF (pAVF) creation most ideal or appropriate?

Dr. Rajan: Provided instructions for use requirements are met, I think pAVFs are most appropriate as a first access type if the patient is not a good candidate for successful surgical creation and there is high probability of maturation of a radiocephalic fistula. I would also consider pAVF creation before forearm loop graft creation and more central surgically created accesses in the upper extremities.

Dr. Hohmann: I feel it is important when discussing pAVF creation to understand it is fistula creation with a unique approach and anastomotic type. Nevertheless, it is a fistula with the problems inherent to fistulas: intimal hyperplasia, need for maturation procedures, superficialization (also known as a "lift," a useful term I learned from Dr. Matthew Mitchell from Fort Worth, Texas, as patients respond to it much better). There is a significant opportunity in predialysis (chronic kidney disease stages 4 and 5) patients, and it is much easier to accept a procedure than a surgery. I also feel it should be in the progression of access. If a radiocephalic arteriovenous fistula (AVF) is not possible or has been previously attempted, one should consider pAVF prior to brachiocephalic AVF creation, as it is in a location unique to the others (ie, perforator, ulnar, or radial vein). As we learn more about pAVFs, I am attracted to the moderate flow concept and its potential advantage to cephalic arch stenosis and aneurysmal degeneration. Not that they cannot happen, but my gestalt is they are much less common.

Dr. Niyyar: pAVF creation is not a panacea, but the addition of this technology to our armamentarium has definitely added to the hemodialysis access options for our patients. During my evaluation for potential access options, I divide eligibility for pAVF into two basic categories—anatomic and patient-related factors. Once a patient has had a detailed vascular mapping, including both arterial and venous evaluation, if the patient is not a candidate for a surgical distal wrist-based AVF, their next option would be evaluation for a pAVF. Earlier reports suggest that a majority of patients are anatomically eligible for a pAVF, but within our practice, the rates are much lower.

Patient preference is another key factor, as some patients may prefer the minimally invasive pAVF creation over open surgery, as well as the cosmetic appearance of the AVF with minimal scarring. Additionally, in those patients in whom open surgery or anesthesia is contraindicated, including those with symptomatic or severe congestive heart failure, pAVF might be better tolerated. Theoretically, for those patients with an urgent need for dialysis, pAVF would provide timely initiation due to their faster maturation rate; however, within our practice, most pAVFs so far have required multiple interventions that have extended the time to first cannulation.

A multidisciplinary approach with collaboration and discussion between nephrologists, vascular surgeons, and interventionalists is ideal to determine the most suitable approach and access for each patient.

What are the forces affecting adoption of pAVF creation, both supporting adoption and impeding it? How do you see this trending over the next year or two?

Dr. Hohmann: The main problem is accessing the fistula at the dialysis center. Moderate flow fistulas are exotic to the American dialysis center and are the single biggest hurdle. There has definitely been an expansion of awareness and ability to access the fistulas, but any change can be hard. Both the Ellipsys (Medtronic) and WavelinQ (BD Interventional) systems received FDA clearance at the end of 2018, and when you subtract 2 years at least for COVID, it is still a relatively "new" technology. When large dialysis companies embrace them, they will continue to become mainstay. Use of these devices in office-based labs and ambulatory surgery centers will continue to increase, and they will show their value and ease of use. Yet, open surgery will always have a role in maintenance of dialysis access. I am so glad the number of practitioners creating fistulas continues to expand, taking quality care of patients and giving them a lifeline.

Dr. Niyyar: I see the trends for pAVF being driven by the patient perspective. Most patients prefer the nonsurgical approach, and if we are able to provide a functional access with minimal interventions that can be cannulated repeatedly and consistently, I have no doubt that will lead to widespread adoption. All the factors mentioned previously—including the minimally invasive nature of the procedure, with shorter procedure times, minimal scarring, a faster recovery period compared to traditional surgical AVF creation, patients who are high-risk surgical candidates for traditional AVF creation seeking an alternative option, and the growing interest in home dialysis therapies—support adoption of pAVF creation.

The limitations are:

- **Availability of the technology and skilled interventionalists,** especially in underserved and remote areas.
- **Lack of a holistic approach to access creation.** There is still a dichotomy in approach, with most surgeons doing open surgical access creation and percutaneous accesses being placed by interventional nephrologists and radiologists, often in different practice settings. In our practice, one of the challenges has been to have a common vascular mapping that is accepted by all. Collaboration is key, and the primary nephrologists are critical in leading these multidisciplinary groups to best advocate for their patients.
- **Anatomic variability.** In our practice, we have seen that only a limited number of patients referred for percutaneous access creation are eligible candidates.
- **Number of procedures required for maturations,** which in turn prolongs time to first cannulation and delays central venous catheter removal.
- **End-user experience for cannulation.** We use ultrasound guidance to evaluate all new accesses for maturity and to guide cannulation as these dual- or split-flow accesses are sometimes harder to visualize. Optimizing cannulation processes, with and without ultrasound guidance, is a key factor to successful use and widespread adoption of these technologies.

As we overcome these challenges and the benefits become clearer through further research and experience, I anticipate that the adoption of pAVF creation will continue to grow, although uptake may still vary across regions and health care settings.

Dr. Rajan: Supporting forces are continued publication of outcomes beyond the pivotal trials for both devices, which remain consistent with improved outcomes over surgical fistulas. As adoption grows, more outcomes will become available, further strengthening usage. Also, current favorable reimbursement within the United States supports adoption.

Impeding forces are barriers with nephrologists and vascular surgeons who remain skeptical about pAVFs in terms of value and benefit for patients. Furthermore, lack of reimbursement mechanisms outside the United States has certainly been an additional barrier to global adoption.

Within the near future, I expect a positive trend in further adoption of the technology. Many patients desire a nonsurgical option and may be a driving force for increased use. Also, as all stakeholders become more comfortable with the technology and gain cannulation expertise, acceptance and usage will increase. This will be partially driven by more experienced operators both in creating pAVFs and cannulating them.

What enhancements or capabilities would you like to see in future pAVF platform iterations?

Dr. Niyyar: pAVF is a welcome addition to our armamentarium and has revolutionized the world of hemodialysis vascular access; however, there is always room for improvement. I would love to see it as "one and done"—the patient gets access creation in an ambulatory setting, with minimal systemic medications or anesthesia, and has a functional access with no or minimal interventions within 2 to 4 weeks. Ideally, it would be patent for a long period of time, with a minimal complication rate. This is an area of constant innovation, and with at least two new second-generation devices in clinical trials, it is my hope that technological advancements and refinements in pAVF creation techniques will further enhance procedural success rates and patient outcomes. Continued collaboration between nephrologists, vascular surgeons, and interventional radiologists will be essential to ensure appropriate patient selection, standardized protocols, and the dissemination of best practices.

Dr. Hohmann: My tongue-in-cheek answer is easier, cheaper, faster, and more effective! The technologies are both incredible and the companies that developed them, as well as those that continue to innovate, should be commended.

Dr. Rajan: With the Ellipsys system, a smaller-diameter device may increase access creation site options. With the WavelinQ device, an enhancement that allows the device to be visualized by ultrasound for creation of the fistula would reduce or eliminate the need for fluoroscopy. For both or for a new device, it would be beneficial to everyone if there are advances that make the devices easier to use procedurally. Although a procedural enhancement may be placement of a stent or stent graft at the anastomosis and/or perforator, I am not personally in favor of this. This may result in better technical outcomes and faster maturation, but long-term implications on the access and future accesses are unknown and require meaningful investigation.

What are the most significant needs in terms of patient advocacy and awareness in the dialysis access population today?

Dr. Rajan: We as a group of stakeholders (surgeons, endovascular specialists, nephrologists, and cannulators) need to focus on what works for the patient. This requires easy-to-use, universal tools that allow patient education

and engagement with translation of accumulated information to the medical profession. The AVACS (AV access cosmesis scale) consensus publication is a step and example of that direction for patient advocacy and awareness.

Dr. Hohmann: Respect of the dialysis population seems to be lacking in some circles. There seems to be a bias of patients "not taking care of themselves" or "always having problems." Dialysis access can be quite challenging and, at the same time, beautiful and creative. I feel the general population needs to understand the challenges of the dialysis population, particularly the prevalence of chronic kidney disease. Professional societies need to recognize the skill, importance, and, frankly, volume of access procedures performed.

Dr. Niyyar: "Nothing for me without me." The patient's voice and perspective should be incorporated into every aspect of their care, not just dialysis access. I strongly believe that education is empowerment, and as we strive to integrate patient perspectives, we need to ensure that every patient has access to accurate and easily understandable information so they can actively participate in their own care, make informed decisions, and effectively manage their access.

It is also critical that we address access disparities in dialysis care; investigate the impact of socioeconomic factors, race, ethnicity, and geographic location on access outcomes; and identify strategies to mitigate these disparities.

What can and should be done to engage and develop the next generation of dialysis access thought leaders and researchers?

Dr. Hohmann: This is one of the more difficult questions. The interest in dialysis access starts with engaged practitioners and leaders sharing their enthusiasm with trainees. Industry can play a key role in engaging trainees and supporting forums to understand dialysis access, creation, and maintenance, as well as troubleshooting. With increased awareness of our professional societies, I hope we will have the opportunity to showcase the importance of dialysis access care, including the challenges, successes, and quality care, for those often most underserved patients.

Dr. Niyyar: Research and innovation are crucial to moving the field of dialysis access forward and are the key areas in which we should focus our efforts to engage the next generation of thought leaders. We need to encourage young researchers to explore novel technologies, investigate promising interventions, and be actively involved in every aspect of product development as well as clinical trials and outcomes research. This could be done through professional societies like The American Society of Diagnostic and Interventional Nephrology, which has instituted research funding and grant opportunities specifically dedicated to dialysis access research, as well as research mentorship programs through which we have paired experienced dialysis access researchers with early career professionals and trainees to help shape the next generation of thought leaders.

Future collaborations between academia and industry could provide even more opportunities that would drive innovation and provide real-world insights. Additionally, incorporating dialysis access–related topics into training programs can help foster interest and expertise among future health care professionals. The recently formed TDAT (Transforming Dialysis Access Together) initiative is developing educational programs that provide in-depth knowledge on the various multidisciplinary aspects of dialysis access, as well as a comprehensive dialysis access curriculum for fellowship programs.

The future is here, and the future is now! There is a lot of excitement, enthusiasm, and innovation in the field of dialysis access, and it is up to us to harness the momentum.

Dr. Rajan: I think this is already happening. With the introduction of pAVFs and DCBs, there is renewed excitement and engagement within the field of vascular access. To build on this, a consensus on needs and future areas of research would provide some direction. The revised Kidney Disease Outcomes Quality Initiative document took a step in this direction by pointing out future research for each guideline. Also, many companies now offer educational grants through internal vetting processes that assess the merit and feasibility of projects. This is another avenue for funding beyond traditional granting organizations. Finally, the dialysis access field has been largely ignored by the medical profession. Increased awareness across medicine regarding patient outcomes, needs, funding, and areas of deficiencies will help vet future clinical and academic leaders. ■

1. Lookstein RA, Haruguchi H, Ouriel K, et al. Drug-coated balloons for dysfunctional dialysis Arteriovenous fistulas. N Engl J Med. 2020;383:733–742. doi: 10.1056/NEJMoa1914617
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Disclosures
Dr. Hohmann: Consultant to and speaker for BD, Gore & Associates, Merit Medical, and Medtronic; Principal Investigator, Sonavex.
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