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Toward a Better Understanding of What Is Necessary for Access Maintenance



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The Kidney Disease Outcomes Quality Initiative currently recommends monitoring dialysis access by regular physical examination by an experienced clinician as the primary means of detecting dysfunction.¹ Cautious assessment of access is warranted as intervening may not always be beneficial. Nevertheless, quantitative appraisal to supplement qualitative findings on physical examination may provide compelling evidence that intervention is necessary to prolong the life of the dialysis access. Access flow (Qa) surveillance has been proposed as a useful aid in the maintenance of arteriovenous fistula patency. A meta-analysis of randomized controlled trials comparing screening by clinical monitoring or by measuring the Qa revealed that correcting stenoses identified by Qa surveillance halved the rate of thrombosis, a significant finding. These authors suggested that a strategy of adding Qa surveillance

using thresholds > 500 ml/min for intervention may be especially beneficial in centers with high rates of access loss despite clinical monitoring.² Generally, however, an optimal level of blood flow has not been identified and thresholds of Qa projecting failure vary. This is likely because the hemodynamics of arteriovenous access is complex, and a single measurement of flow may afford inadequate information regarding the adequacy of the system to provide sufficient clearance. This does not negate utility of quantitative data but implies that a single value or even range of values may not have the same import for each access. Rather, modifying factors will likely need to be considered in addition to quantitative data before a decision should be made to intervene.

Yang *et al.*³ investigated the functional patency of radiocephalic arteriovenous fistulas in which initial Qa by ultrasound dilution was <500 ml/min but with no clinical evidence of dysfunction. The intent was to find an optimal Qa threshold that predicted future functional patency, thus avoiding unnecessary intervention. In addition, body

weight was analyzed to determine whether it is a useful factor in predicting patency. These arteriovenous fistulas were monitored by periodic Qa measurements unless clinical findings indicated the need for intervention. Of the 52 patients in the study, 25 required percutaneous transluminal angioplasty (PTA) within 3 months of the initial Qa measurement. Another 10 patients underwent PTA a few months after.

Interestingly, 17 patients remained asymptomatic despite Qa < 500 ml/min throughout the surveillance period. Further analysis revealed that a low Qa per ideal body weight or Qa/ideal body weight < 7.1 predicts failure. Also interestingly, more men than women in the group required PTA, although this difference was not statistically significant. The first Qa mean value did not differ significantly between those who required PTA and those who did not (378.5 ± 123.9 vs. 341.2 ± 105.3). The second Qa mean measurement dropped to <300 ml/min in the 10 patients who ultimately required PTA but rose to >400 ml/min for those who did not and presumably remained clinically asymptomatic.

As noted in the Kidney Disease Outcomes Quality Initiative guidelines, there are insufficient data to make recommendations on quantitative surveillance of access. Nevertheless, this study, although based on a small number of patients, leads to a few conclusions, which are as follows:

1. The ultrasound dilution technique has much support in the literature as a reliable means of measuring flow,^{4,5} but what are the critical flow rates that indicate a pre-emptive intervention should be undertaken

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to prevent access thrombosis? This remains still a matter of debate. Initial Qa measurements may be especially helpful in determining which patients need more intense surveillance by regular use of both clinical monitoring and Qa measurements.

2. The development of clinical symptoms or signs of access dysfunction is rightly a strong indication for intervention. In this study, some patients underwent PTA without requiring further Qa measurements based on their physical findings. An experienced clinician performing regular physical examination may be the best defense against access thrombosis. These days, however, in this pandemic era with critical staffing shortages, well-trained clinicians may not be readily available and an alternative means of monitoring access should be available.
3. A combination of qualitative and quantitative measures may prove to be the best monitoring tools. Use of Qa measurements and monitoring has been found by the Hemodialysis Access Surveillance Evaluation study to reduce thrombotic event rates when compared with monitoring alone,⁶ but what this combination is may vary from unit to unit, dependent on the experience and numbers of

staff, facility with performing surveillance, characteristics of the patients, and their types and ages of accesses. In our own practice, for example, we prefer duplex ultrasound to measure volume flow and examine the anatomy of questionable access, but this technique is highly dependent on the experience of the ultrasonographer to provide reliable results.

Maintaining arteriovenous fistula patency is a difficult undertaking. Certainly, it is appealing to have a more detailed understanding of when to intervene when faced with a patient whose access is borderline, but these decisions go beyond clinical findings or Qa measurements as surgical/interventional skill and availability including a myriad of other factors have an impact on whether an access can be successfully maintained. The exact means for this critical aspect of care have not yet been fully identified but will likely comprise general guidelines that require modification according to particular patient and access characteristics in a particular dialysis unit. More investigations of this nature are sorely needed to help us understand the nuances of access creation and maintenance as the lives of our patients are dependent on our ability to provide reliable working lifelines.

DISCLOSURE

The author declared no competing interests.

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