

FAST - Flow Assisted Surgical Technique during AV Fistula Creation

Why Measure Flow

Intraoperative flow measurements are intended to provide quantitative flow information that may assist the surgical team in evaluating AV flow conditions during AVF creation. Flow measurements should be interpreted in the context of the patient's anatomy, vascular condition, hemodynamic status, surgical findings, and the clinician's overall assessment, and are not intended to be used as the sole basis for diagnosis or surgical decision-making.

Introduction

Intraoperative flow measurements during AV fistula creation provide quantitative flow rates to assist the surgical team in assessing fistula outflow and distal arterial perfusion during the procedure. Published studies have reported associations between intraoperative flow observations and subsequent AV fistula maturation outcomes. Intraoperative flow assessment may also provide additional information regarding distal arterial flow patterns that may be associated with ischemic steal syndrome.

Measurement Steps (after AV Fistula Construction)

1. Identify Vessel to Be Measured

Identify exposed venous outflow and distal arterial segments associated with the AV fistula anastomosis suitable for flow measurement.

2. Select Flowprobe Sizes

Measure the vessel's diameters and select a Flowprobe so that the vein will fill between 75% - 100% of the sensing window of the probe (Fig. 1).

PROBE SIZE	NONRESTRICTIVE VESSEL RANGE
3 mm	2.7 - 4.0 mm
4 mm	3.0 - 5.0 mm
6 mm	4.0 - 7.3 mm

3. Check Blood Pressure

Low systemic blood pressure may contribute to reduced flow measurements and should be considered during interpretation of flow observations.

4. Apply Flowprobe to Vessel

1. Select a site that will accommodate the Probe's acoustic reflector.
2. Apply sterile acoustic gel or saline to the Flowprobe or surgical field respectively to ensure ultrasound coupling.
3. Apply the Flowprobe to the vessel, bending the flex neck so the vessel lies within the sensing window and is perpendicular to the Flowprobe handle (Fig. 1).



Fig. 1: Outflow vein filling 75-100% of the Probe's sensing window.

4. Check the Signal Strength indicator on the Flowmeter to verify good acoustic coupling (<15%).
5. FlowSound may be turned on; the higher the pitch, the greater the flow.

A. FISTULA FLOW ASSESSMENT

A1. Measure Venous Outflow

End-to-End or Venous End-to-Arterial Side Anastomosis: When the AVF is constructed with an end-to-end or venous-end-to-arterial-side anastomosis, measure venous outflow distal to the venous anastomosis (Fig. 2). If the anastomosis is constructed with a venous-side-to-arterial-side anastomosis or end-artery-to-venous-side anastomosis, occlude the vein proximal to the venous anastomosis while measuring flow distal to the anastomosis (Fig. 3). In cases where vasospasm is suspected, consider the use of vasodilators where clinically appropriate to ensure accurate flow assessment.

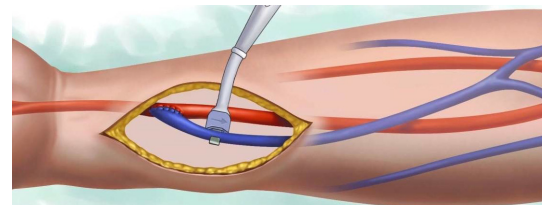


Fig. 2: Measuring venous outflow flow in a fistula anastomosed end to side.

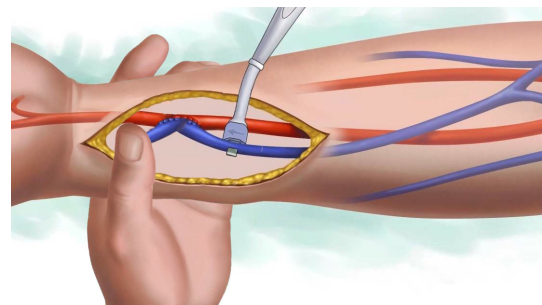


Fig. 3: Measuring venous outflow flow in a fistula anastomosed side to side.

AV Fistula Creation

B. DISTAL ARTERIAL FLOW ASSESSMENT

B1. Measure Fistula Arterial Flow

Measure brachial or radial arterial flow that supplies the fistula distal to the AV fistula anastomosis in order to assess distal arterial flow patterns that may be associated with ischemic steal syndrome (Fig. 4).

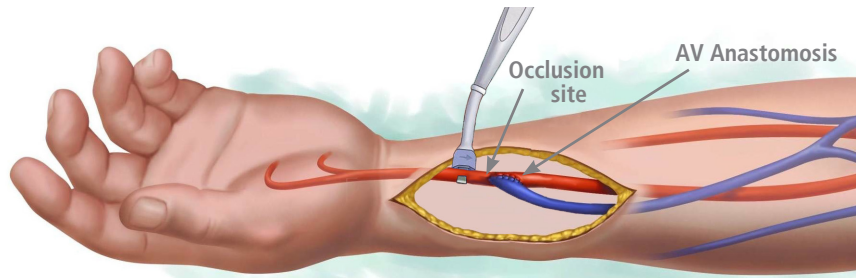


Fig. 4: Flow supplying the hand is measured with the Flowprobe placed on the artery distal to the AV anastomosis. Flow is zeroed by occluding the artery immediately adjacent to the Flowprobe.

B2. Evaluate Flow Values

Check that flow values are well above zero and that the direction of flow is running toward the hand (distally) and not reversed so that it is flowing (proximally) into the AV fistula. If in doubt, zero flow by occluding the artery immediately next to the Flowprobe (Fig. 5). Evaluate flow volume and direction to confirm that sufficient blood flow distal to the AV anastomosis is directed toward the hand. Temporary occlusion of the artery immediately adjacent to the Flowprobe (Fig. 4) may be used to isolate and assess distal arterial flow rates.

Blood flow that remains directed distally may be considered supportive of maintained distal perfusion. Flow measurements that are near zero and/or demonstrate flow reversal toward the AV fistula may be consistent with steal syndrome and may warrant additional surgical assessment or consideration of flow-modulating interventions, based on the overall clinical situation. Following reassessment or intervention, flow measurements may be repeated to evaluate changes in distal flow patterns.

DOCUMENT FLOWS

Once measurements have stabilized, flow measurements and waveforms may be recorded electronically, saved as snapshots, or printed on systems configured with recording or printing capability.

Published Intraoperative Flow Ranges reported in AV Fistula Maturation Studies			
AV Fistulas	Berman 2008 ²	Won 2000 ³	Lin 2008 ⁴
Radio-cephalic	> 140 (n = 21)	> 160 (n = 50)	> 200 (n = 109)
Brachio-cephalic	> 308 (n = 49)		

Table 1: Comparison of AV Fistulas threshold studies to predict maturation.

References:

- 1 Johnson CP et al, "Prognostic Value of Intraoperative Blood Flow Measurements in Vascular Access Surgery," *Surgery* 1998; 124: 729-38.
- 2 Berman SS et al, "Predicting Arteriovenous Fistula Maturation with Intraoperative Blood Flow Measurements," *J Vasc Access*. 2008; 9(4): 241-7.
- 3 Won T et al, "Effects of Intraoperative Blood Flow on the Early Patency of Radiocephalic Fistulas," *Ann Vasc Surg* 2000; 14(5): 468-72.
- 4 Lin CH et al, "Correlation of Intraoperative Blood Flow Measurement with Autogenous Arteriovenous Fistula Outcome." *J Vasc Surg*. 2008; 48(1): 167-72.

AV Fistula Creation

