Medical Note

Intraoperative Blood Flow Measurement during Venous EC-IC Bypass Construction

Courtesy of FT Charbel, M.D., F.A.C.S.

When construction of an arterial extracranial to intracranial (EC-IC) bypass is impossible due to atherosclerosis, twisting or a poor section of the temporal artery, the cerebrovascular surgeon may elect to harvest a vein to use as an EC-IC bypass (Fig. 1) in order to preserve or augment intracranial flow. Transonic's quick intraoperative flow measurements provide valuable on-the-spot feedback during the surgery as the surgeon identifies and defines specific hemodynamic requirements for the bypass and formulates an ongoing operative strategy for the case.

Venous Bypass

Since the proximal end of the vein graft is anastomosed to a carotid artery, one concern with this type of bypass is that it will produce too much flow for the recipient vasculature. Free flow is, therefore, measured in the graft once it has been anastomosed to the carotid artery to determine the maximum flow capacity for the graft and to match the graft hemodynamically to the recipient arterial vasculature. Baseline flows are also measured in the intracranial recipient vessel before anastomosis.

After the graft has been anastomosed intracranially to the recipient cerebral artery, post-anastomotic flows are measured in the graft and recipient artery and compared with baseline flows.

Flow Measurement Steps

Extracranial Donor Venous Graft

1. Choose the appropriate size probe to measure baseline flow in the extracranial venous graft. Record flow on the EC-IC Bypass Record (Fig. 4).

Probe Size	Vessel Range, Outer Diameter
3 mm	2.4 - 4.0 mm
4 mm	3.2 - 5.3 mm
6 mm	4.5 - 7.5 mm

2. After anastomosing the venous graft proximally to the carotid artery, measure the free flow or "carrying capacity" of the graft. Record flow on the EC-IC Bypass Record (Fig. 3).

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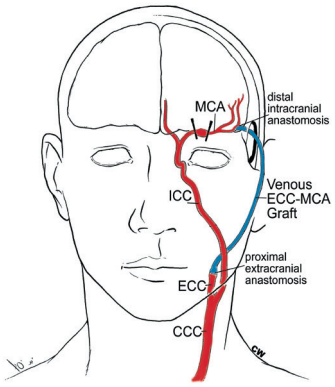

Fig. 1: Frontal view of a venous EC-IC Bypass. A venous graft is harvested and then anastomosed proximally to the External Carotid Artery (ECA) and distally to the Middle Cerebral Artery (MCA).

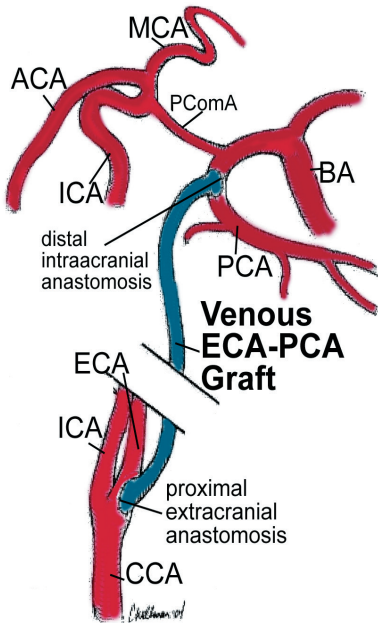

Fig. 2: Venous bypass from the External Carotid Artery (ECA) to the Posterior Cerebral Artery (PCA).

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Intraoperative Blood Flow Measurement during Venous EC-IC Bypass Construction Cont.

3. After the bypass has been anastomosed to the recipient vessel, measure post-bypass flow in the donor graft. Record flow on the EC-IC Bypass Record (Fig. 3). Compare the flow hemodynamically with flow in the recipient artery and with free flow.
4. If post-bypass flow in the donor artery is substantially less (<50%) than free flow, reexamine the anastomosis and redo, if necessary.

Intracranial Recipient Artery

1. Choose an appropriate size flowprobe and measure and record baseline flow in the intracranial recipient artery.

Probe Size	Vessel Range, Outer Diameter
1.5 mm	1.0 - 1.5 mm
2 mm	1.5 - 2.7 mm
3 mm	2.5 - 3.7 mm

2. After the bypass has been constructed, measure flows in the recipient vessel and compare with graft flows. Record flows on the EC-IC Bypass Record.
3. Evaluate the hemodynamic match between the donor flows and recipient vessel flows.

Measurement Tips

- Select a Flowprobe size so that the vessel will fill at least 75% of the lumen of the Flowprobe. Use sterile saline or cerebrospinal fluid to obtain good ultrasonic contact between the Flowprobe and vessel.
- Bend the Flowprobe's flexible segment to best position the Flowprobe around the vessel. Listen to FlowSound® to hear volume flow.
- When flow readings are stable, flow data can be captured by recording or taking a snapshot on the Aureflo®, or by pressing PRINT on a HT300-Series Flowmeter. If the HT300-Series flow reading is negative on the LED, press INVERT to reverse the polarity of the flow reading from negative to positive before printing out the waveform.

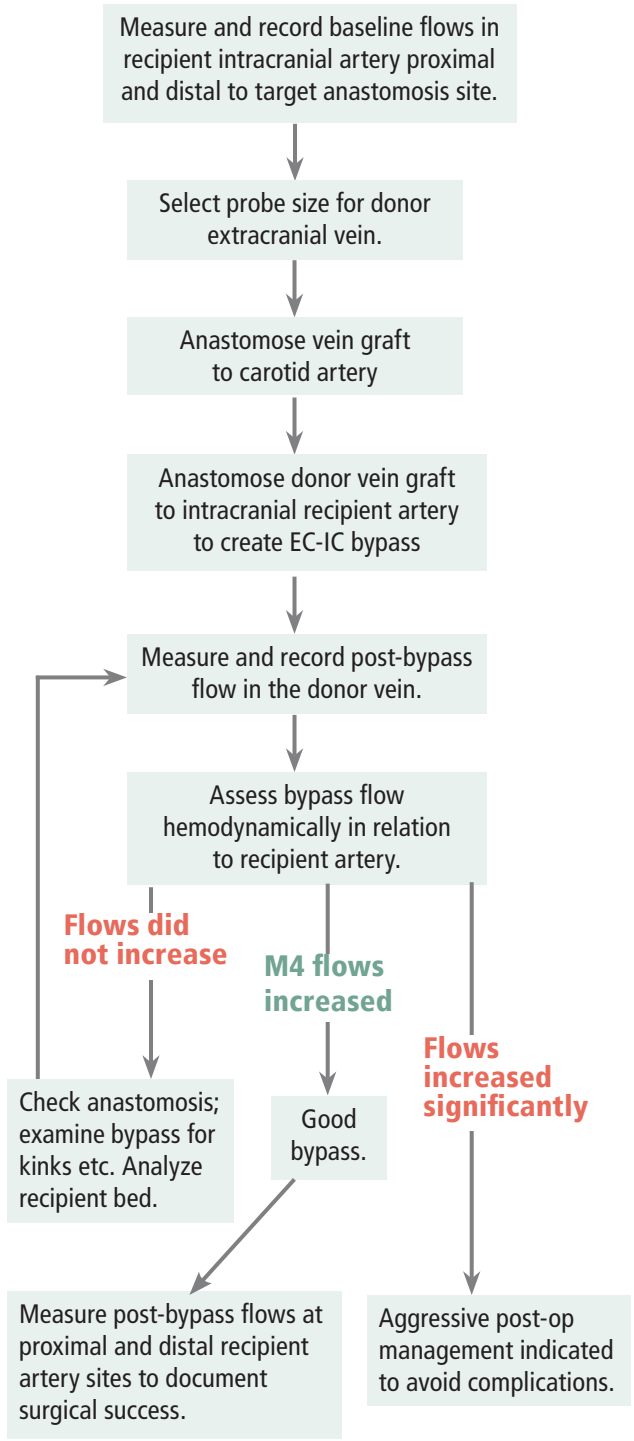
Flow Record
EC-IC Bypass

Patient Label (optional) or Name/Age/Sex

Date	Type of Bypass		Reason for Bypass		Surgeon
Extracranial Donor	**Probe Size**	**BP Mean**	**Pre-Bypass Flow** ml/min	**Post-Bypass Flow1** ml/min	**Post-Bypass Flow2** ml/min
Intracranial Recipient Artery	**Probe Size**	**BP Mean**	**Pre-Bypass Flow** ml/min	**Post-Bypass Flow1** ml/min	**Post-Bypass Flow2** ml/min
Comments/Observations/History					

Fig.3: Example of a Flow Record to record flow readings during EC-IC Bypass.

Protocol: Flow Measurements during Venous EC-IC Bypass



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