

# Medical Note

## Flow-guided AV Fistula Banding

Courtesy of M. R. Scheltinga, M.D., Máxima Medical Center, Veldhoven, The Netherlands.

### Why Band a High Flow Fistula?

The need to increase venous outflow resistance in an arteriovenous fistula (AVF) used to deliver hemodialysis results from:

#### Hemodialysis Access-Induced Distal Ischemia (HAIDI)

Clinically significant HAIDI, that occurs primarily in diabetic patients, is a potentially devastating complication of an AVF. The surgeon's challenge is to relieve the distal ischemia, but maintain a functional AVF for hemodialysis. One strategy is to band the AVF to increase AVF flow resistance, thereby reducing AVF flow and increasing distal flow.

#### Cardiac Overload

When AVF flow is too high (~>2L/min), cardiac function can become compromised resulting in cardiomegaly. Banding increases AVF resistance and lowers fistula flow, thereby reducing excessive stress on the heart.

### Flow-Guided Fistula Banding

The surgeon begins with a pre-operative AVF flow level (determined by a Transonic® hemodialysis monitor in the dialysis clinic) and pre-sets the percent decrease in AVF flow to be achieved by banding. As the band is tightened, AVF venous outflow is measured intraoperatively. These continuous measurements guide the surgeon in achieving a target AVF flow value.

### Flow Measurement Steps

0. **Preoperative:** From preoperative surveillance in the hemodialysis clinic, determine % drop in flow to be achieved by banding.
1. **Identify & Expose Venous Outflow of Fistula:** Make a second 1.5-cm incision at least 10 cm downstream (of the upper arm cephalic or basilic vein) towards the axilla away from the dialysis cannulation sites. Identify and expose the AVF venous outflow. Check if this part of the vein is suitable for measurements (no scar tissue/aneurysms/adhesions).
2. **Select Flowprobe Size (FMV-Series):** Measure the vein's diameter. Select a Probe so that the vein will fill between 75% - 100% of the flowsensing window of the Probe (Fig. 1).
3. **Measure Venous Outflow**
  - a) Confirm that the outflow site is wide enough to accommodate the Flowprobe's acoustic reflector.
  - b) Apply sterile gel inside the Flowprobe's sensing window to ensure good ultrasound coupling.
  - c) Apply the Flowprobe to the vein, bending the Probe's flexible neck so that the entire vein lies within the Probe's

sensing window (Fig. 1).

d) Check the Signal Quality Indicator on the Transonic flowmeter display to verify good acoustic contact.

e) If using a perivascular flowmeter, listen to the pitch of FlowSound®. The higher the pitch, the greater the flow.

4. **Document Flows:** When flow readings are stable, flow data can be captured by recording or taking a snapshot on the flowmeter, or by printing on a flowmeter equipped with this option. If the flow reading is negative, press "INVERT" to reverse the polarity of the flow reading from negative to positive before printing out the waveform.



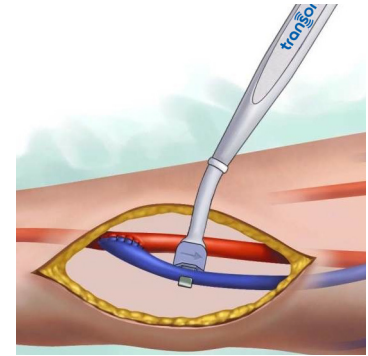
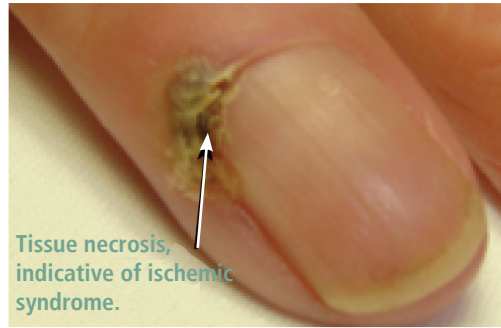
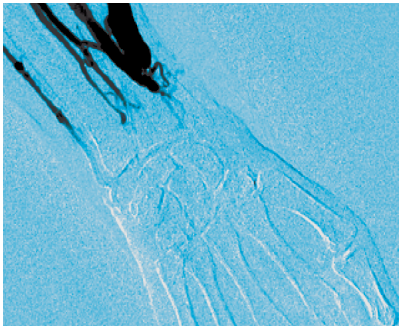
Fig. 1: Align the Probe on the vessel as shown.

### Flow Measurement Protocol

0. Pre-operative: Determine % fistula flow decrease to be achieved by banding.
1. Expose AV fistula and its venous outflow (2 incisions).
2. Expose venous outflow diameter and select Flowprobe size.
3. Apply Flowprobe to venous outflow site.
4. Measure baseline flow. Calculate target flow (baseline flow times % decrease).
5. Tighten band. Remeasure flow.
6. Repeat step 5 until flow reaches intraoperative target flow.

# Flow-guided AV Fistula Banding Cont.

Photo essay below shows continuous measurement of blood flow with a vascular flowprobe directing a fistula banding procedure, courtesy of M. R. Scheltinga, M.D., Dept. of Surgery, Máxima Medical Center, Veldhoven, The Netherlands.



Figs. 1,2: HAIDI: Banding of an AV fistula (AVF) may be indicated for hemodialysis access induced distal ischemia (HAIDI). Preoperative angiography of HAIDI patient with radiocephalic AVF shows the absence of hand arteries visualization (Fig. 1). Tissue necrosis in the hand (Fig. 2) also indicates presence of HAIDI.

Fig. 3: Banding: Minimally invasive positioning of a Transonic® Flowprobe guides the degree of tightening of a 5 mm Dacron band during this procedure.

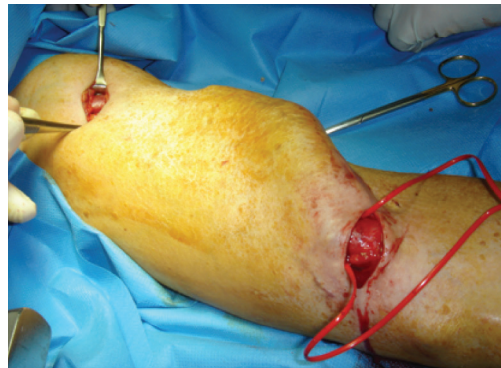
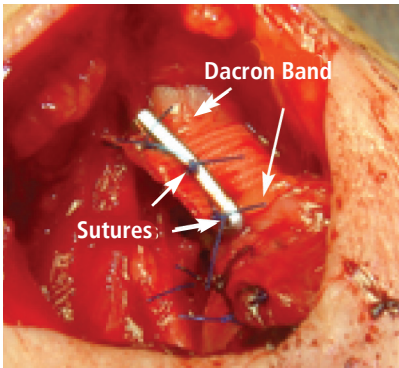


Fig. 4: A 5 mm Dacron band is fixed using a clip and stitches. In this patient, AVF thrill was maintained and radial arterial pulses returned.

Fig. 5: Banding may also be performed for a high flow AV fistula (HFA) > 2L/min. This patient suffered from fatigue in the presence of a 3.7 L/min upper arm AVF.

Fig. 6: If HFA is also associated with HAIDI, measurement of finger pressures is also required. Once an optimal combination of access flow (> access thrombotic threshold level, generally > 500 mL/min) and finger pressure (>50 mmHg) is attained, the band is fixed.

## REFERENCES

[www.vascularprocedures.com/html/algemeen/home.php](http://www.vascularprocedures.com/html/algemeen/home.php)

1. van Hoek F et al, "Steal in hemodialysis patients depends on type of vascular access," *Eur J Vasc Endovasc Surg* 2006; 32: 710-717.
2. van Hoek F, Scheltinga MR et al, "Access flow, venous saturation and digital pressures in hemodialysis," *J Vasc Surg* 2007;45: 968-73.
3. van Hoek F, Scheltinga MR et al, "Banding of hemodialysis access causing hand ischemia or cardiac overload," *Seminars in Dialysis* 2009; 22: 204-208.
4. Scheltinga MR, van Hoek F, Bruyninckx CMA, "Surgical banding for refractory Hemodialysis Access-Induced Distal Ischemia (HAIDI)," *J Vasc Acc* 2009;10: 43-49.
5. Scheltinga MR, van Hoek F, *Vascular Access*. J. Tordoir (ed). "Banding for high flow hemodialysis access (HFA)," Minerva, Turin, 2009, pp 141-150.141-150.

**transonic**  
THE MEASURE OF BETTER RESULTS.

[www.transonic.com](http://www.transonic.com)