



L'essentiel sur les stratégies de surveillance des AV: les mesures de débit répétées

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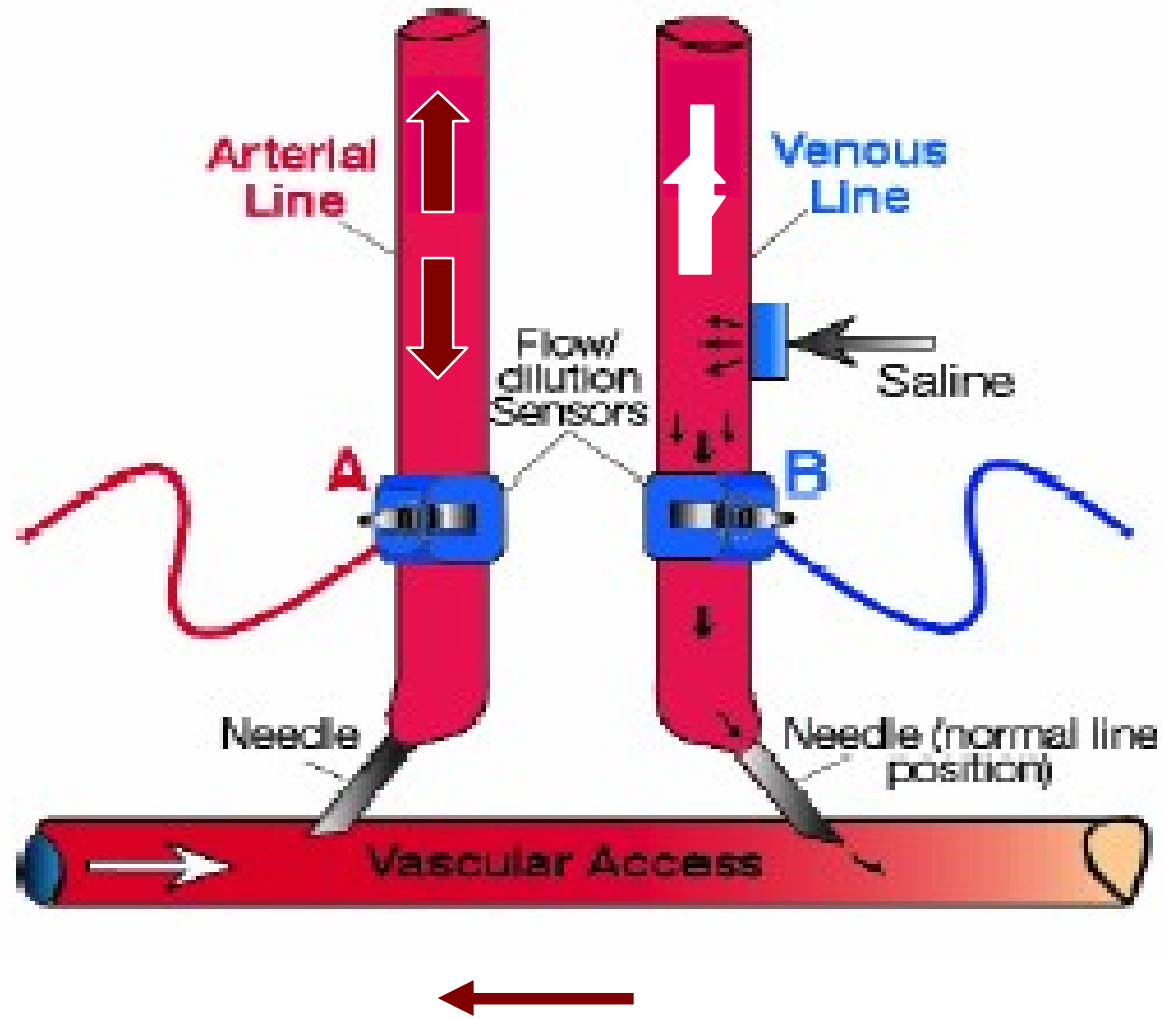
L'hypothèse de la "dysfonction"

- i 1- Mesures de débit Q_a reproductibles d'une séance à l'autre
- i 2- Progression suffisamment lente pour permettre d'intervenir avant la survenue de la thrombose
- i 3- Le facteur sténose est seul responsable
- i 4- L'AV qui thrombose a une diminution du débit précédent la thrombose (sensibilité élevée) et l'AV qui ne thrombose pas n'ont pas de diminution (faible taux de faux positifs)

Flow Methods in Dialysis Access

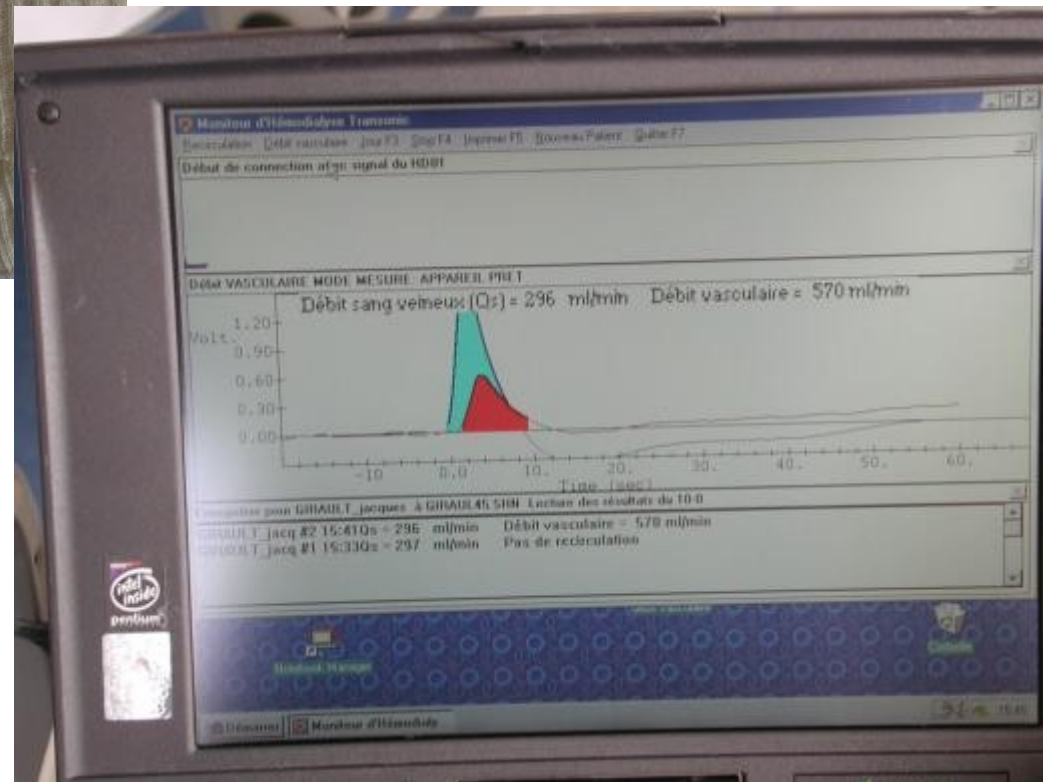
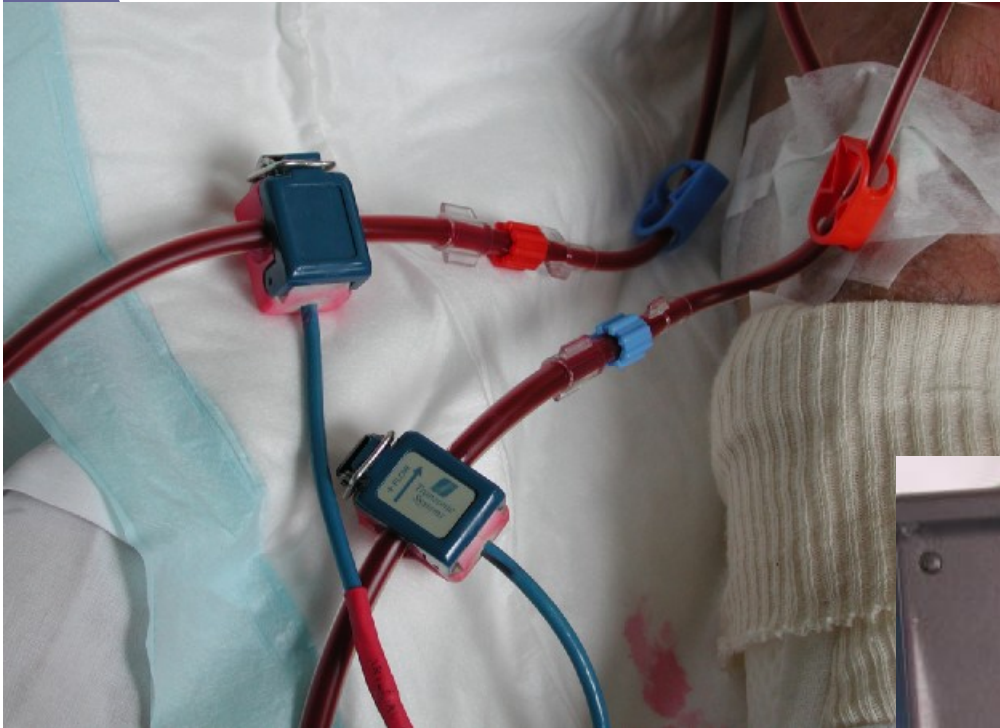
Duplex Doppler Ultrasound (Quantitative color velocity imaging): **[DDU]**
Magnetic Resonance Angiography: **[MRA]**
Variable Flow Doppler Ultrasound (Specs USA): **[VFDU]**
Ultrasound dilution (Transonics): **[UDT]**
Crit-Line III (optodilution by ultrafiltration; HemaMetrics): **[OABF]**
CritLine III direct transcutaneous (HemaMetrics): **[TQA]**
Glucose pump infusion technique **[GPT]**
Urea dilution **[UreaD]**
Differential Conductivity (GAMBRO): **[HDM]**
In Line Dialysance (Fresenius): **[DD]**

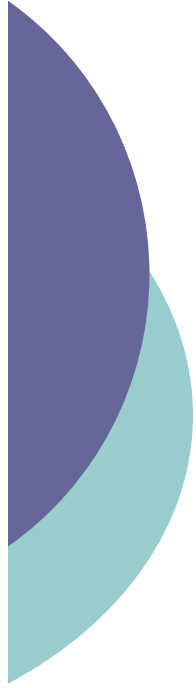
Mesures de débit « en ligne »



Systeme Transonic

Krivitski N.





Prothèses

DOQI : 4.2 Surveillance in graft

American Journal of Kidney Diseases, Vol 48, No 1, Suppl 1 (July), 2006: pp S210-S233

i | **4.1 Physical examination (monitoring):** Physical examination should be used to detect dysfunction in fistulae and grafts at least monthly by a qualified individual. (B)

i | **4.2 Surveillance of grafts:**

i | **4.2.1 Preferred:**

| 4.2.1.1 Intra-access flow using sequential measurements with trend analysis. (A)

| 4.2.1.2 Directly measured or derived static venous dialysis pressure by 1 of several methods. (A)

| 4.2.1.3 Duplex ultrasound. (A)

i | **4.2.2 Acceptable:**

| 4.2.2.1 Physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or altered characteristics of pulse or thrill in a graft. (B)

i | **4.2.3 Unacceptable:**

| 4.2.3.1 Unstandardized dynamic venous pressures (DVPs) should not be used. (A)



EBPG on Vascular Access

In summary, access flow measurement is an accurate predictor of fistula/graft dysfunction, which may result in access thrombosis. **An access flow <600 ml/min in AV grafts [8-10] respectively, a reduction of flow >20% per month [9] or <300 ml/min in forearm AV fistulae is an indication for pre-emptive intervention .**

- i For upper arm fistulas these flow data are lacking.
- i **Monthly** flow measurements for grafts and **three monthly** for fistulae are recommended.

Hemodialysis vascular access monitoring: Current concepts

Michael ALLON, Michelle L. ROBBIN

Effect of surveillance on graft thrombosis: Observational studies

Reference	Surveillance method	Thrombosis rate (per graft-years)		
		Historical control	Surveillance period	% reduction
Schwab et al. ³³	Dynamic dialysis venous pressure	0.61	0.20	67
Besarab et al. ³¹	Static dialysis venous pressure	0.50	0.28	64
Safa et al. ¹⁴	Clinical monitoring	0.48	0.17	64
Allon et al. ³⁰	Clinical monitoring	0.70	0.28	60
Cayco et al. ¹⁰	Clinical monitoring	0.49	0.29	41
McCarley et al. ³²	Flow monitoring	0.71	0.16	77

Hemodialysis vascular access monitoring:

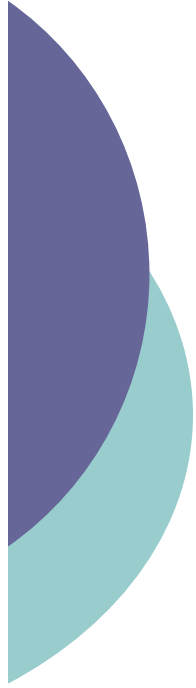
Current concepts

Michael ALLON, Michelle L. ROBBIN

Randomized clinical trials of graft surveillance

Reference	Surv method	# subjects		PTA/y		Thrombosis/y	
		Con	Surv	Con	Surv	Con	Surv
Lumsden et al. ⁸	Doppler US	32	32	0	1.5	0.47	0.51
Ram et al. ¹⁷	Access flow	34	32	0.22	0.34	0.68	0.91
	Doppler US		35		0.65		0.51
Moist et al. ¹⁶	Access flow	53	59	0.61	0.93	0.41	0.51
Dember et al. ¹⁵	Static DVP	32	32	0.04	2.1	1.03	0.89
Malik et al. ³⁵	Doppler US	92	97	NA	NA	NA	NA
Robbin et al. ¹³	Doppler US	61	65	0.64	1.06	0.78	0.67

con=control; DVP=dialysis venous pressure; NA=not available; PTA=percutaneous transluminal angioplasty; surv=surveillance; US=ultrasound.



FAV Natives



DOQI : 4.3 Surveillance in fistulae:

American Journal of Kidney Diseases, Vol 48, No 1, Suppl 1 (July), 2006: pp S210-S233

4.3.1 Preferred:

- | 4.3.1.1 Direct flow measurements. (A)

- | 4.3.1.2 Physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or altered characteristics of pulse or thrill in the outflow vein. (B)

- | 4.3.1.3 Duplex ultrasound. (A)

4.3.2 Acceptable:

- | 4.3.2.1 Recirculation using a non- urea-based dilutional method.(B)

- | 4.3.2.2 Static pressures (B), direct or derived. (B)

4.4 When to refer for evaluation (diagnosis) and treatment:

- | ...

- | 4.4.3 An access flow rate less than 600 mL/min in grafts and less than 400 to 500 mL/min in fistulae. (A)

- | 4.4.4 A venous segment static pressure (mean pressures) ratio greater than 0.5 in grafts or fistulae. (A)

Adding access blood flow surveillance to clinical monitoring reduces thrombosis rates and costs, and improves fistula patency in the short term: a controlled cohort study

Nicola Tessitore

i Patients in *Control* were referred for access imaging (digital subtraction angiography or DU) only if there was

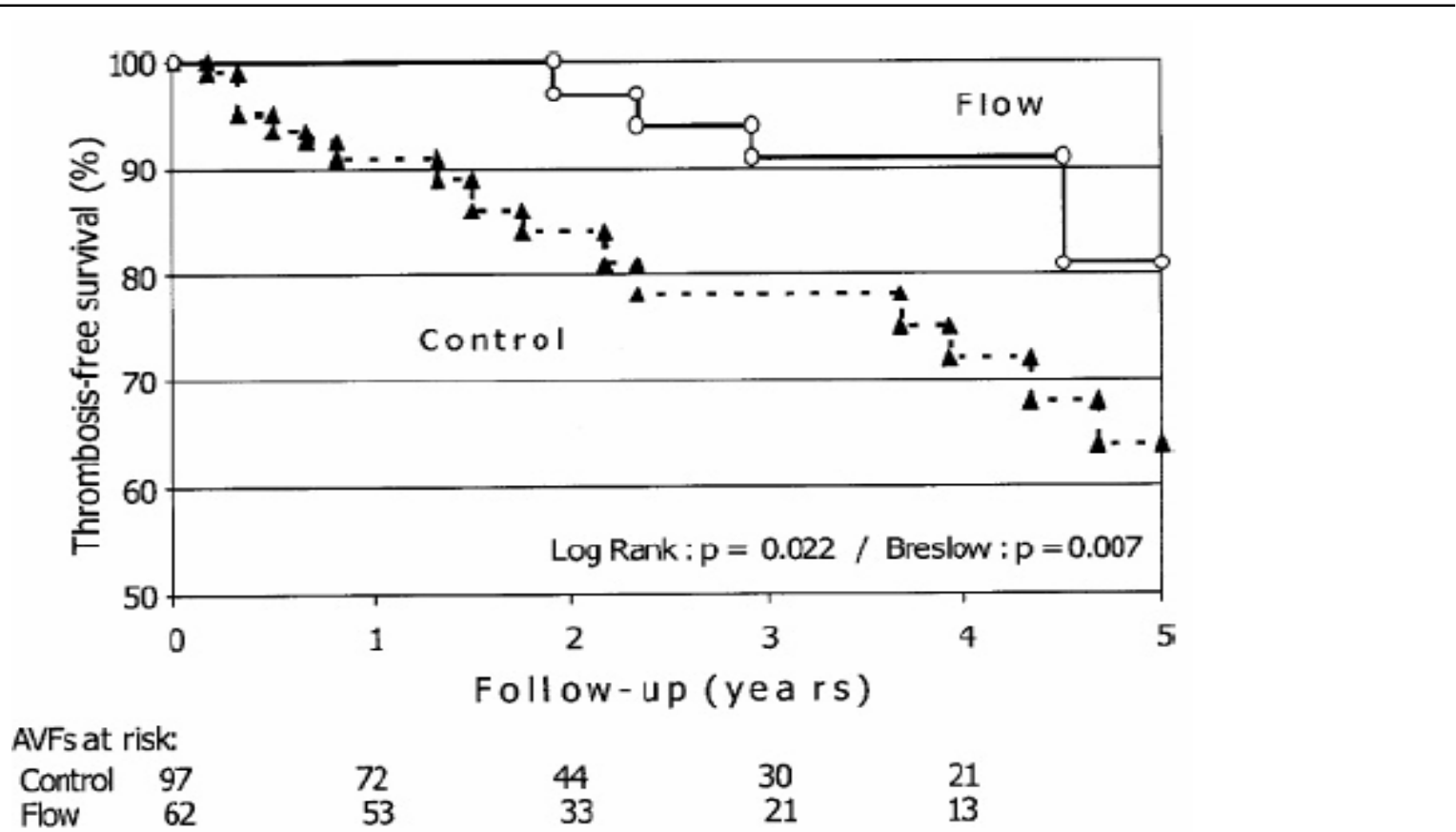
- | Clinical suspicion of stenosis, e.g. arm oedema, aneurysm onset or enlargement,
- | palpation of stenotic segments,
- | persistent (for at least three consecutive haemodialysis sessions) cannulation difficulties
- | inability to achieve the prescribed Q_b ,
- | excessive post-dialysis bleeding.

i Patients in *Flow* were referred for access imaging using the same criteria as in *Control*

- | or a $Q_a < 750 \text{ ml/min}$ or dropping by $>20\%$, whatever the absolute flow value. Whenever possible, the drop in Q_a was compared with the mean Q_a obtained from previous measurements.

Adding access blood flow surveillance to clinical monitoring reduces thrombosis rates and costs, and improves fistula patency in the short term: a controlled cohort study

Nicola Tessitore




Unadjusted thrombosis-free survival. The graph shows the unadjusted thrombosis-free survival as of enrollment, according to the Kaplan-Meier analysis. Thrombosis-free survival was significantly better in *Flow* (open circles, continuous line) than in *Control* (closed triangles, dashed line).

Adding access blood flow surveillance to clinical monitoring
reduces thrombosis rates and costs, and improves fistula patency
in the short term: a controlled cohort study Nicola Tessitore

	Control (event/AVF-year)	Flow (event/AVF-year)
Access imaging	0.172	0.660
Stenosis detection	0.141	0.409
Elective stenosis repair	0.119	0.304
Temporary CVC	0.097	0.026
Thrombosis	0.088	0.033
Access loss	0.062	0.026

Population rates of study outcomes



Adding access blood flow surveillance to clinical monitoring reduces thrombosis rates and costs, and improves fistula patency in the short term: a controlled cohort study Nicola Tessitore

- i Total cost in Euro/AVF-year:
 - | Control: 1213 € (0-16139)
 - | Flow mean 743 € (0-5685) $p < 0.0001$



En pratique ...

- i Quels seuils d'intervention?
- i Quelle fréquence de mesure?



Diagnostic Accuracy of Ultrasound Dilution Access Blood Flow Measurement in Detecting Stenosis and Predicting Thrombosis in Native Forearm Arteriovenous Fistulae for Hemodialysis

Nicola Tessitore,

n=120 pts

i Stenosis:

- | Distal AVF: $Q_a < 750$ ml/min: Se 93%, Sp: 87,5%
- | Midforearm: $Q_a < 1000$ ml/min: Se: 90,9%, Sp: 94,1%

i Thrombosis:

- | $Q_a < 300$ ml/min Se: 91,6 %, Sp: 94,3%
- | $Q_a < 350$ ml/min Se: 100 %, Sp: 90,5%

Surveillance d'Abord Vasculaire

FAV /Prothèse

Droit/Gauche

CVC

Distal/Proximal

2000														
1800														
1600														
1500														
1400														
1300														
1200														
1100		1180												
1000	1010													1080
900			950											
800					860			810						
700				760		710			730					
600							670					610		
500										510	540			
400														490
300														
Recirculation														
Débit veineux														
PAM														
PA/PV														
MBL*														
Fistulographie														
Débit référent														

*Manœuvre du Bras Levé: levé le bras à la verticale; la FAV doit s'affaisser tout le long du trajet: noter RAS;



AV : Indications de fistulographie

Mesures de débit et examen clinique
mensuels ou plus

FAV: Diminution du débit $> 50\%$ /débit référent
ou
Débit seuil < 400 ml/mn

*Prothèses: Diminution du débit $> 25\%$ /débit référent
ou
Débit seuil < 600 ml/mn*

Hyperpression
Main ischémique
.....

Délai d'intervention (1 à 2 semaines)



Résultats: nombre de thromboses Tours

- i Juin 2001
- i Octobre 2003*
- i Mai 2004
- i Avril 2005
- i Avril 2009 (2)



Conclusion

- i Les stratégies de surveillance par les mesures de débit ont montré leur intérêt et leur limites dans la prise en charge des prothèses et des FAV
- i Dans tous les cas , ces mesures doivent être associées aux autres mesures de surveillance, en particulier cliniques