

# Abords Vasculaires et médecine vasculaire: Quoi de neuf ?

Yara FARES (Rouen)

09/12/2023



# Standardized Methodology for Duplex Ultrasound Examination of Arteriovenous Access for Hemodialysis: A Proposal of the French Society of Vascular Medicine and the French-Speaking Society of Vascular Access

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on behalf of the Société Française de Médecine Vasculaire and the Société Francophone de l'Abord Vasculaire

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Société Francophone  
de l'Abord Vasculaire

Le site multidisciplinaire des médecins concernés par  
l'Abord Vasculaire pour Hémodialyse Chronique



**SFMV**

Société Française  
de Médecine Vasculaire



# Echodoppler de référence



An initial evaluation of the AV access should be used as a reference throughout the follow-up period: **prior to use of the AV access, after any surgical or endovascular repair and prior to return to dialysis in transplant patients.** DUS is also indicated in cases of delayed AVF maturation, difficulty in use, abnormal dialysis parameters (*i.e.*, low blood flow, high venous pressure, recirculation) and abnormal clinical examination (Table 1). Intradialytic monitoring using dilution techniques can detect decreased blood flow and lead to DUS. Finally, DUS is particularly useful in self-care dialysis patients who do not have intradialytic monitoring of access flow [6,14,15].

- Avant une 1<sup>ère</sup> utilisation
- Avant retour en hémodialyse des transplantés
- Après PEC chirurgicale ou endovasculaire

# Echodoppler dans le suivi



An initial evaluation of the AV access should be used as a reference throughout the follow-up period: prior to use of the AV access, after any surgical or endovascular repair and prior to return to dialysis in transplant patients. DUS is also indicated in cases of delayed AVF maturation, difficulty in use, abnormal dialysis parameters (*i.e.*, low blood flow, high venous pressure, recirculation) and abnormal clinical examination (Table 1). Intradialytic monitoring using dilution techniques can detect decreased blood flow and lead to DUS. Finally, DUS is particularly useful in self-care dialysis patients who do not have intradialytic monitoring of access flow [6,14,15].

- Retard de maturation
- Dysfonction en hémodialyse (recirculation, clairance, ↗ PV, difficultés de ponction)
- Modification du débit mesuré en intra dialyse
- Examen clinique anormal

# Examen clinique primordial!







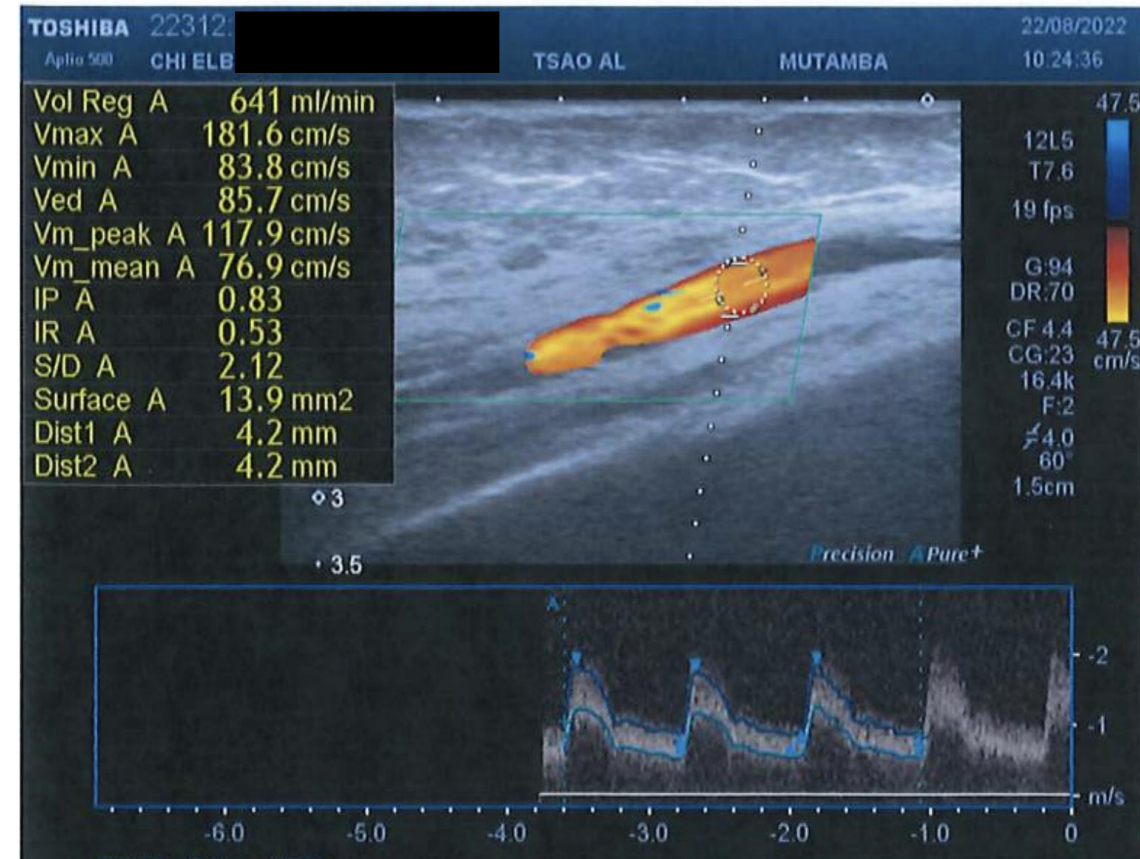
# Anastomose artérioveineuse

- Mesurer le plus large diamètre
- Peu d'intérêt de mesurer les vitesses
- Possibilité de sténose secondairement avec le remodelage



# Débit

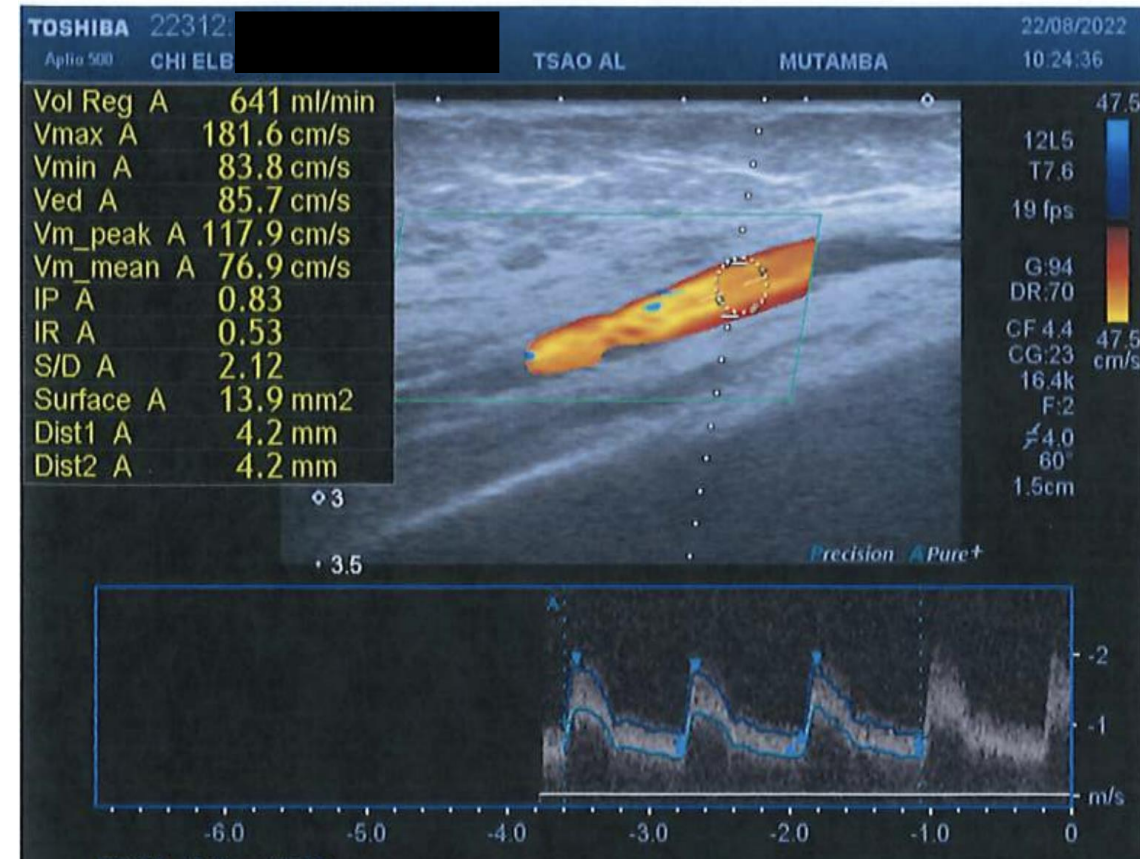
- FAV distale: 600-800ml/min
- FAV proximale: 900-1200ml/min
- HYPODÉBIT:  
500ml/min ou  $\searrow$  de 25%  
→ < 500ml/min pour les distales  
→ < 600 ml/min pour les proximales





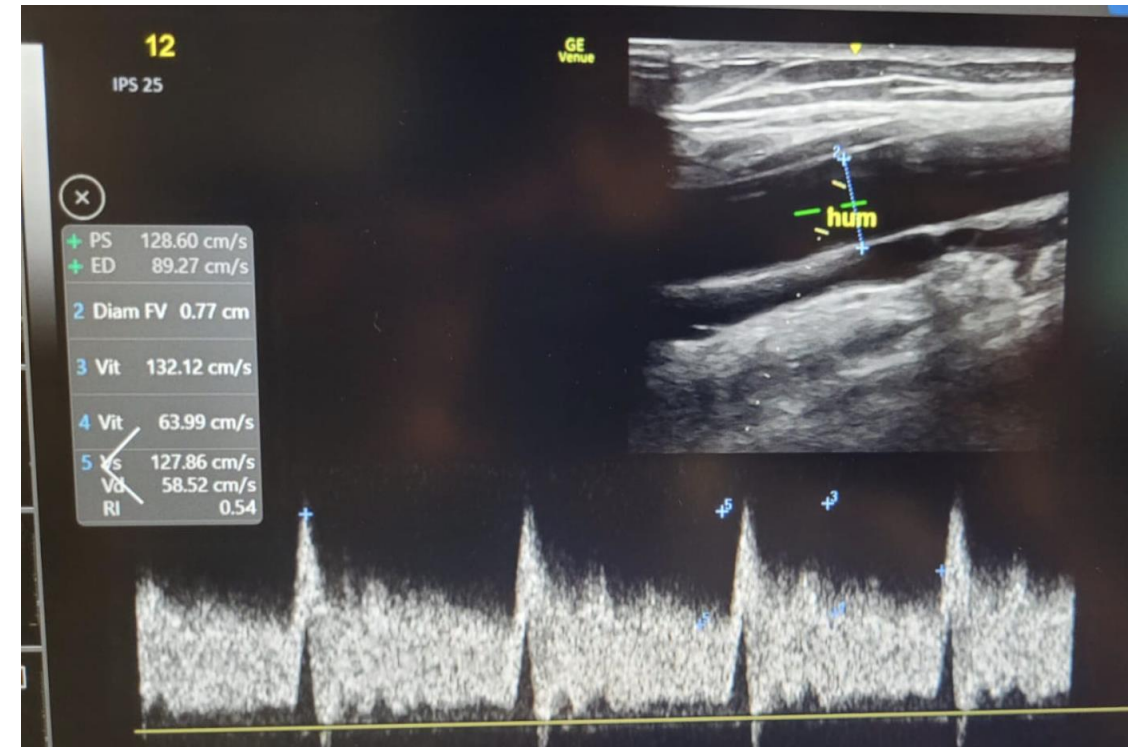
# Débit

- FAV distale: 600-800ml/min
  - FAV proximale: 900-1200ml/min
  - HYPERDÉBIT
    - 1500-2000ml/min ou  $Q_{aav}/Q_c > 20\%$
- ➔ suggère 1500 ml/min comme seuil indicatif d'un hyperdébit



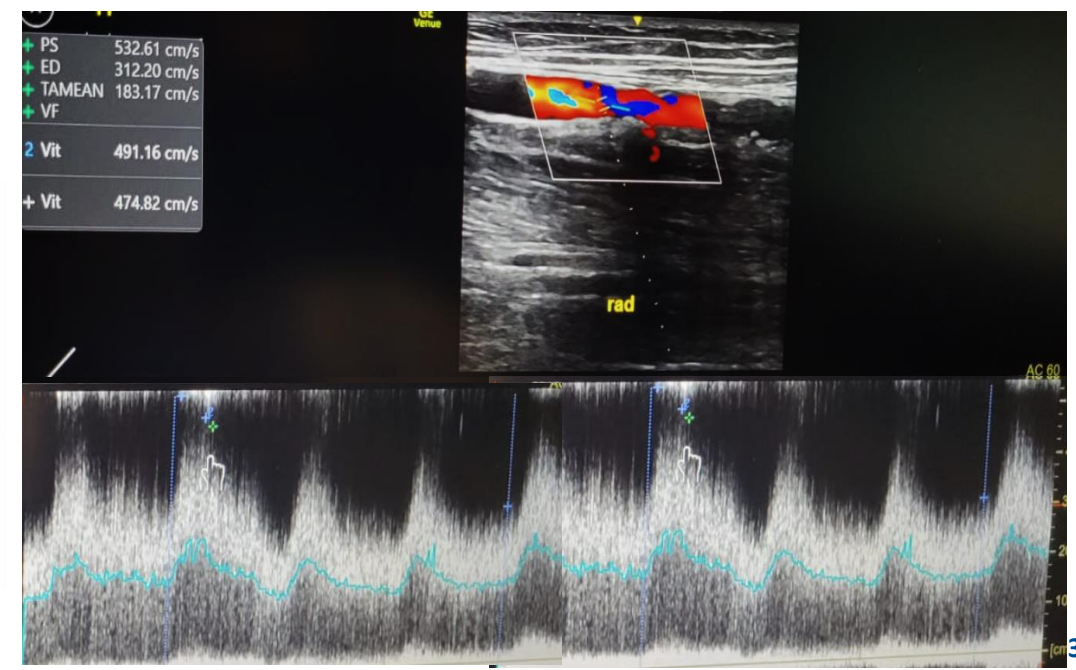
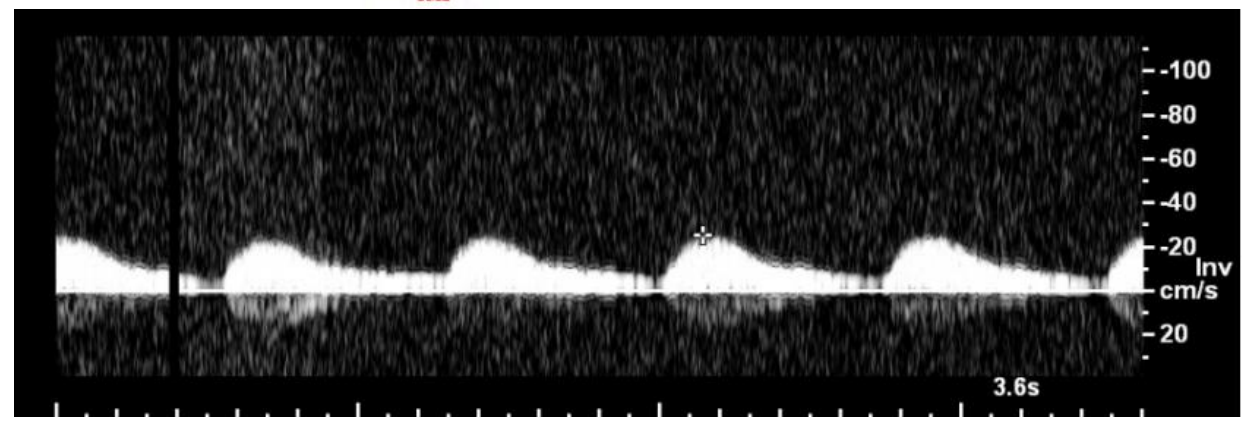
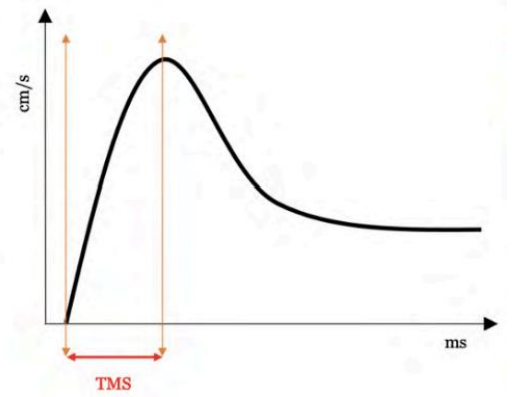
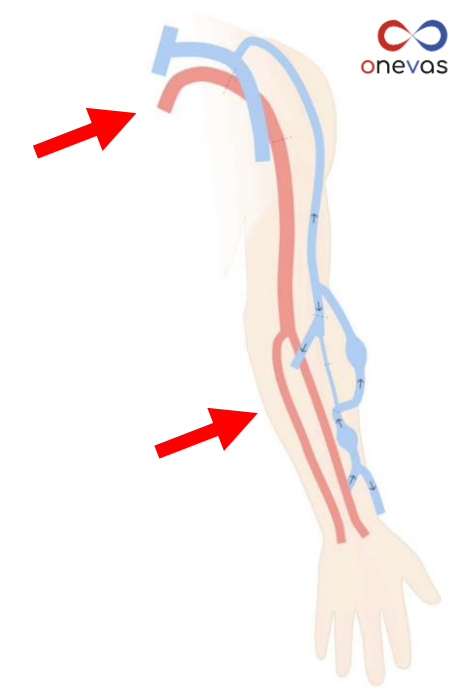
# Index de résistance

- Sur l'artère humérale
- $IR = S - D / S$
- Normes: 0,4 à 0,6
- Elevé:
  - ➔ **> 0,63**: risque de dysfonction de l'AAV
  - ➔ **> 0,7**: risque de thrombose



# Sténose artérielle afférente

- Se base sur les signes indirects
- Rapport de vitesse et retentissement d'aval



# Sténose artérielle afférente

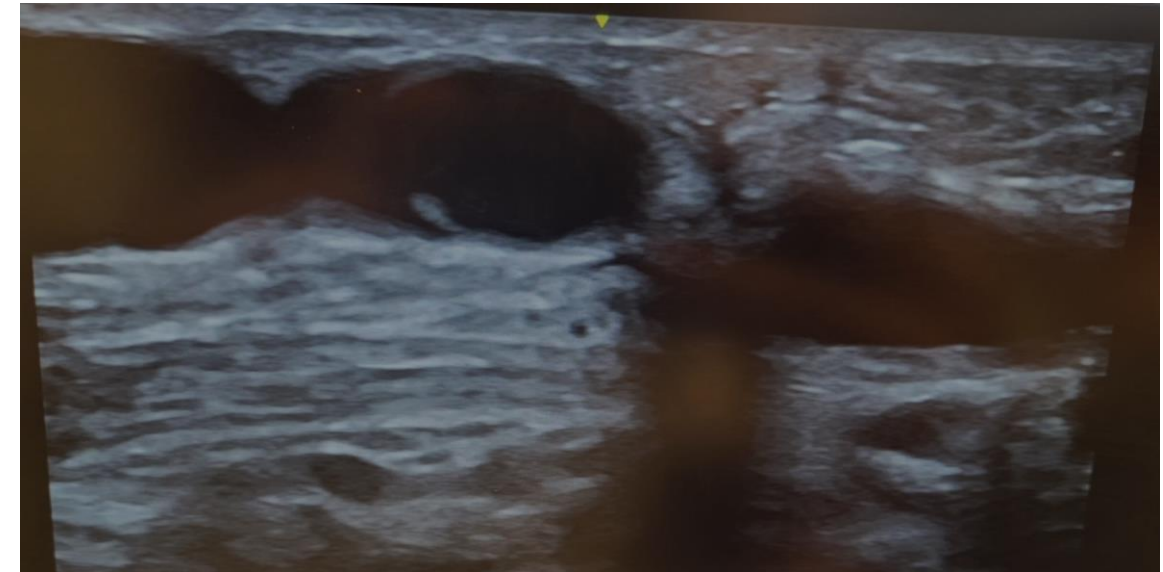
	Diameter (mm)	PSV (cm/s)	PSV ratio	Brachial artery flow (mL/min)
Significant venous stenosis	<2.7	>500	>4	
Venous stenosis of high risk of thrombosis	<2			<400 (distal AVF) <500 (proximal AVF)
Central venous stenosis			>2.5	
Arterial stenosis		>400	>3	
Venous aneurysm	≥20			

AVF, arteriovenous fistula; PSV, peak systolic viscosity.

Significativité: que si hypodébit ou ischémie!



# Sténose Veineuse: Type de sténose



# Sténose veineuse

- Bonne corrélation ED et fistulographie

**Table 1 Agreement between Duplex US and Angiogram regarding stenosis**

Type of access	No. of paired tests	Congruence between US and Angiogram	Congruence (%)	Kappa value	Sensitivity (%)	Specificity (%)	Positive Predictive Value	Negative Predictive Value
Overall AVF/AVG	51	46	90.2	0.560	95.5	57.1	93.3	66.7
AVFs only	35	31	88.6	0.533	93.3	60.0	93.3	60.0
AVGs only	16	15	93.8	0.636	100	50.0	93.3	100

Vardza and al. Ann Vasc Dis 2013;6:57–61

- Ne pas utiliser le ratio de diamètre -> irrégularité de calibre et conséquences hémodynamiques différentes!

# Sténose veineuse

## Main thresholds

	Diameter (mm)	PSV (cm/s)	PSV ratio	Brachial artery flow (mL/min)
Significant venous stenosis	<2.7	>500	>4	
Significant venous stenosis AVG	∩>50%		>2	
Venous stenosis of high risk of thrombosis	<2			<400 (distal AVF) <500 (proximal AVF)
Central venous stenosis			>2.5	
Arterial stenosis		>400	>3	
Venous aneurysm	≥20			

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# Sténose veineuse

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# Sténose veineuse

## Main thresholds

	Diameter (mm)	PSV (cm/s)	PSV ratio	Brachial artery flow (mL/min)
Significant venous stenosis	<2.7	>500	>4	
Venous stenosis of high risk of thrombosis	<2			<400 (distal AVF) ou $\searrow$ Q>25% <500 (proximal AVF) IR>0,7 <600 (AVG)
Central venous stenosis			>2.5	
Arterial stenosis		>400	>3	
Venous aneurysm	$\geq 20$			

AVF, arteriovenous fistula; PSV, peak systolic viscosity.

# Création AVAV – Réfection AVAV – Passage en autodialyse

## Surveillance clinique et ED le l'AVAV

AVAV  
pathologique

Réfection ou  
Nouvel AVAV

Sténose « limite »

Surveillance clinique  
Surveillance ED M3 M6 ?  
Réfection ?

AVAV normal

Surveillance clinique  
Surveillance ED M12 ?



D'après O pichot

Réunion d'Automne 2023

# Surveillance? Traitement préemptif?

Recommendation 49	Class	Level	Refs.
Surveillance of arteriovenous fistulas with duplex ultrasound at regular intervals and pre-emptive balloon angioplasty should be considered to reduce the risk of arteriovenous fistula thrombosis.	Ila	A	385

Eur J Vasc Endovasc Surg (2018) 55, 757e818






## Pre-emptive correction for haemodialysis arteriovenous access stenosis (Review)

Ravani P, Quinn RR, Oliver MJ, Karsanji DJ, James MT, MacRae JM, Palmer SC, Strippoli GFM



Suggère un intérêt de prise en charge préemptive pour Q<500ml/min ou  $\downarrow$ >25% ET un PSV> 400cm/s ou un RV>3

# The role of Doppler ultrasonography in vascular access surveillance—controversies continue

Jan Malik<sup>1,2</sup> , Carlo Lomonte<sup>3</sup>, Mario Meola<sup>4</sup> , Cora de Bont<sup>5</sup> , Robert Shahverdyan<sup>6</sup>, Joris I Rotmans<sup>7</sup> , Francois Saucy<sup>8</sup>, Tamara Jemcov<sup>9,10</sup> and Jose Ibeas<sup>11</sup> 

**Table 1.** Complex criteria of a significant vs borderline stenosis—according to Malik et al.<sup>13</sup> and Ishii et al.<sup>14</sup>

Significant	Borderline
Main criteria	
Diameter reduction by >50%	
Peak systolic velocity increase >2–3×	
Additional criteria (≥1):	
Residual diameter <1.9–2.0 mm	No additional criterion
Flow volume decrease by >25% <sup>a</sup> )	
Flow volume <600 mL/min for AVGs, <500 mL/min for AVFs	

➔ **Réévaluation à S6-S8**

➔ **Traitement**

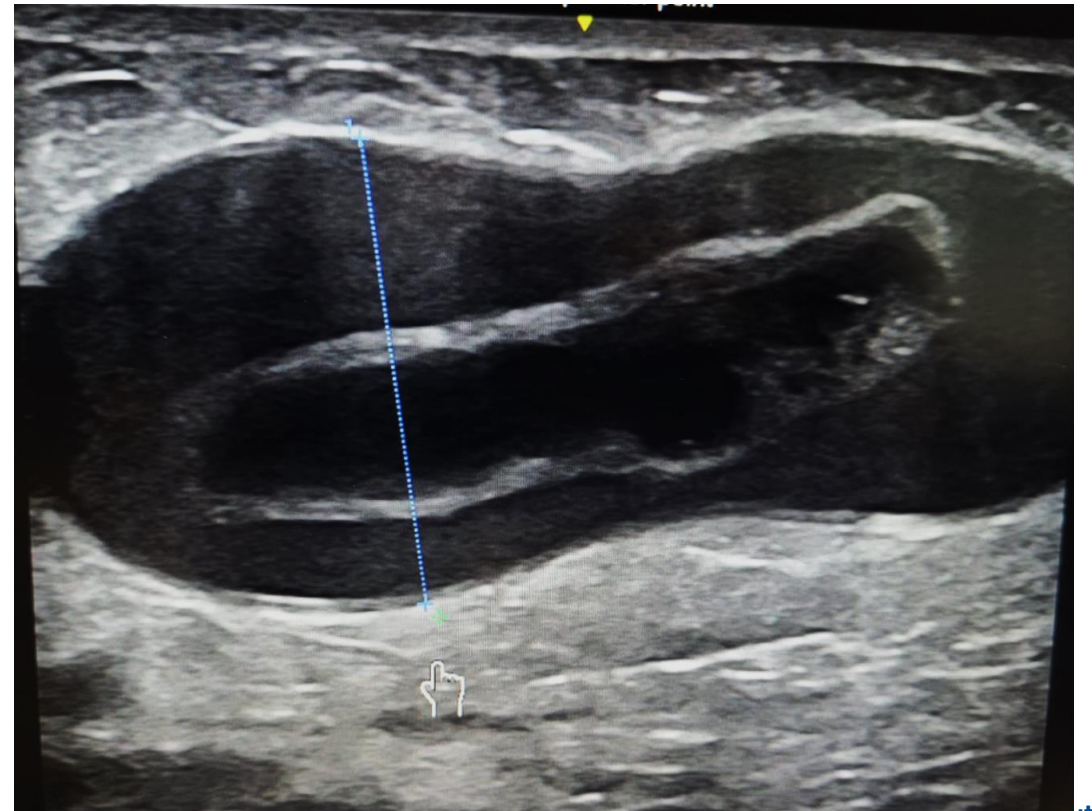
If only the main criteria are present, the stenosis is borderline and re-evaluation is indicated within 6–8 weeks. Significant stenoses are indicated to correction.

<sup>a</sup>Flow volume decrease by >25% if the previous value was <1000 mL/min.



# Thrombose veineuse

Il est suggéré d'avoir recours à un échodoppler s'il ne retarde pas la thrombectomie



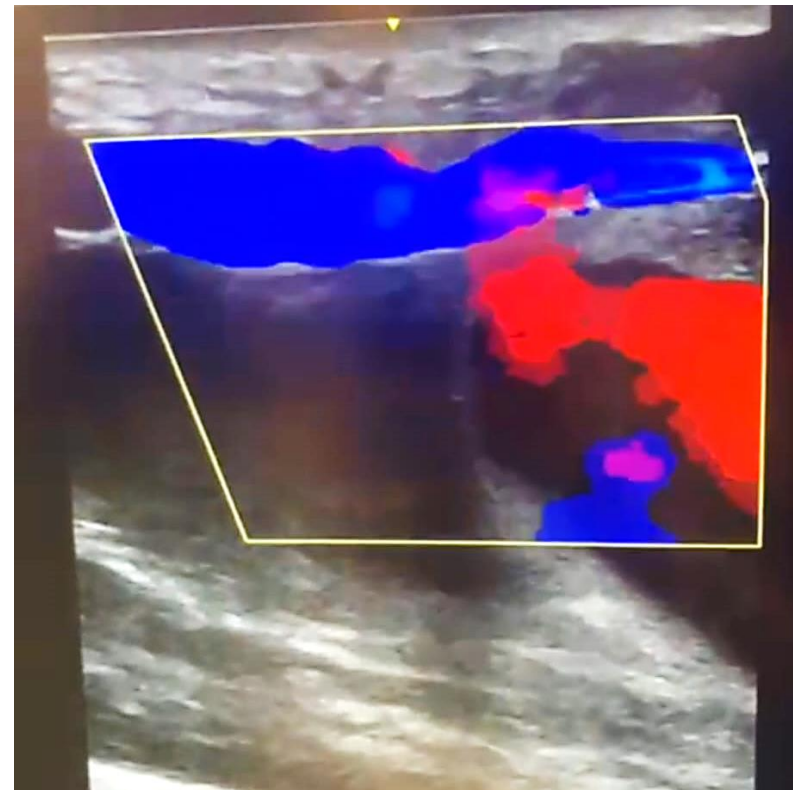
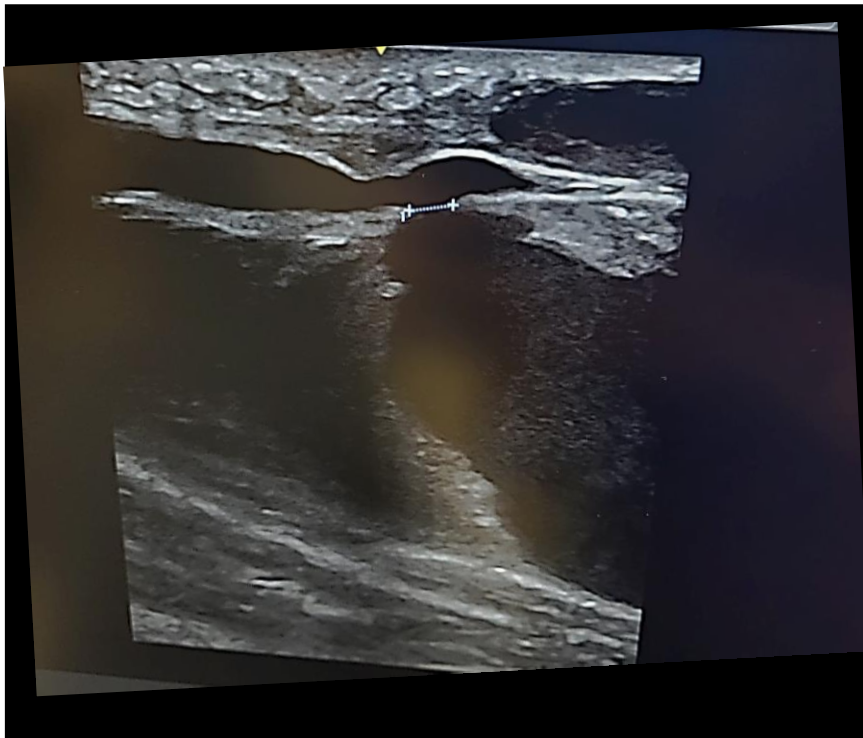
# Anévrisme veineux

- Thrombus mural -> sténose d'aval
  - Diamètre 18 mm -> **20mm**
  - Mesurer la distance à la peau
    - Surveiller la progression



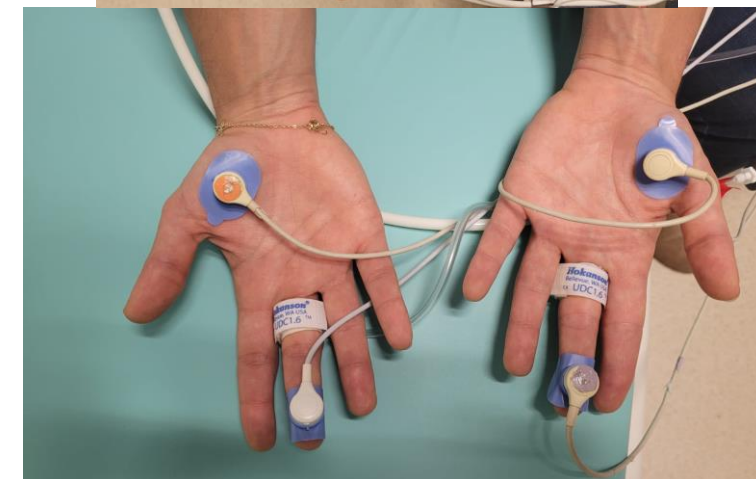
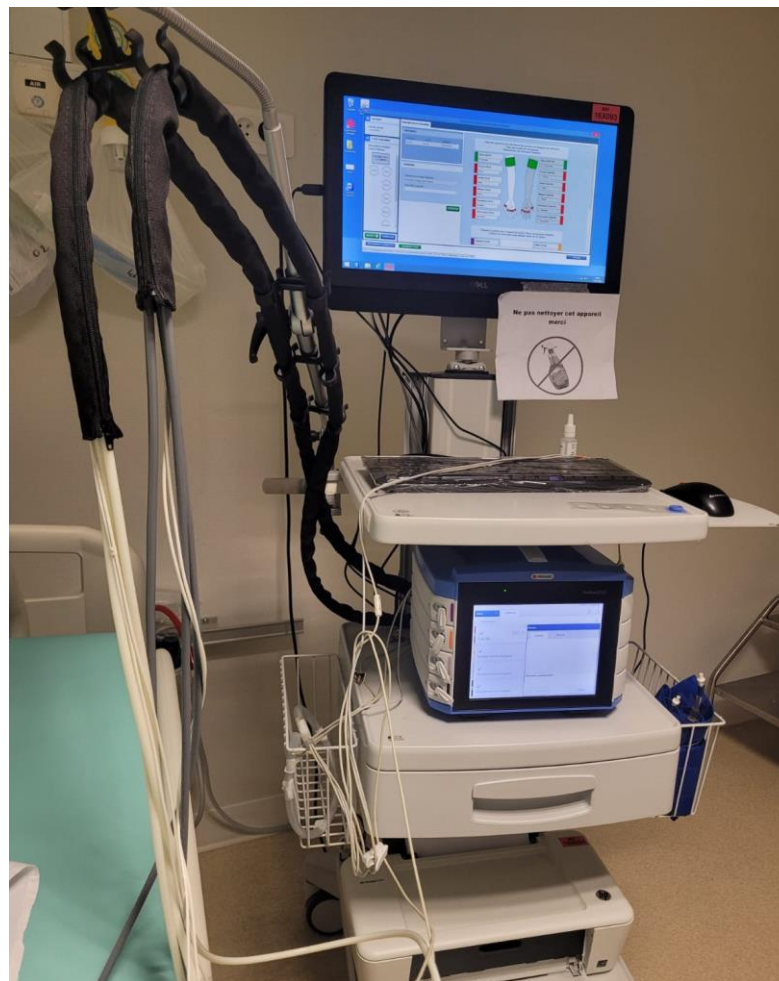
# Hématome périveineux

- L'échodoppler permet de mettre en évidence un saignement actif (faux anévrisme) ou une compression veineuse ou la présence d'un lymphocèle





# Ischémie digitale





# Ischémie digitale

$\Delta c$ Ischémie	Se	Sp
PD < 60 mmHg	100 %	87%
IDB < 0,4	92%	96%

➤ TcPO<sub>2</sub>: pas de seuils définis

D'après M.HANOY

Odland and al. Surger 1991, Schanzer and al. A Vasc Med 2006, Goff and al. Ann Vasc Surg 2000

# Score WIFI

**Table 7** Assessment of the risk of amputation: the **WIFI** classification (for further details see Mills et al<sup>317</sup>)

Component	Score	Description		
<b>W</b> (Wound)	0	No ulcer (ischaemic rest pain)		
	1	Small, shallow ulcer on distal leg or foot without gangrene		
	2	Deeper ulcer with exposed bone, joint or tendon ± gangrenous changes limited to toes		
	3	Extensive deep ulcer, full thickness heel ulcer ± calcaneal involvement ± extensive gangrene		
<b>I</b> (Ischaemia)		ABI	Ankle pressure (mmHg)	Toe pressure or TcPO <sub>2</sub>
	0	≥0.80	> 100	≥60
	1	0.60–0.79	70–100	40–59
	2	0.40–0.59	50–70	30–39
	3	<0.40	<50	<30
<b>fi</b> (foot Infection)	0	No symptoms/signs of infection		
	1	Local infection involving only skin and subcutaneous tissue		
	2	Local infection involving deeper than skin/subcutaneous tissue		
	3	Systemic inflammatory response syndrome		

Example: A 65-year-old male diabetic patient with gangrene of the big toe and a <2 cm rim of cellulitis at the base of the toe, without any clinical/biological sign of general infection/inflammation, whose toe pressure is at 30 mmHg would be classified as Wound 2, Ischaemia 2, foot Infection 1 (WIFI 2-2-1). The clinical stage would be 4 (high risk of amputation). The benefit of revascularization (if feasible) is high, also depending on infection control.

ABI = ankle-brachial index; TcPO<sub>2</sub> = transcutaneous oxygen pressure.

a, Estimate risk of amputation at 1 year for each combination

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	L	M	VL	L	M	H	L	L	M	H	L	M	M	H
W-1	VL	VL	L	M	VL	L	M	H	L	M	H	H	M	M	H	H
W-2	L	L	M	H	M	M	H	H	M	H	H	H	H	H	H	H
W-3	M	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3

b, Estimate likelihood of benefit of/requirement for revascularization (assuming infection can be controlled first)

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	VL	VL	VL	L	L	M	L	L	M	M	M	H	H	H
W-1	VL	VL	VL	VL	L	M	M	M	M	H	H	H	H	H	H	H
W-2	VL	VL	VL	VL	M	M	H	H	H	H	H	H	H	H	H	H
W-3	VL	VL	VL	VL	M	M	M	H	H	H	H	H	H	H	H	H
	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3	fi-0	fi-1	fi-2	fi-3

# Prognostic value of Wound, Ischemia and foot Infection (WIFI) score after lower extremities bypass surgery for peripheral artery disease in chronic hemodialysis patients FREE

Y Kumada, N Kawai, N Ishida, A Mori, H Takahashi, H Ishii [Author Notes](#)

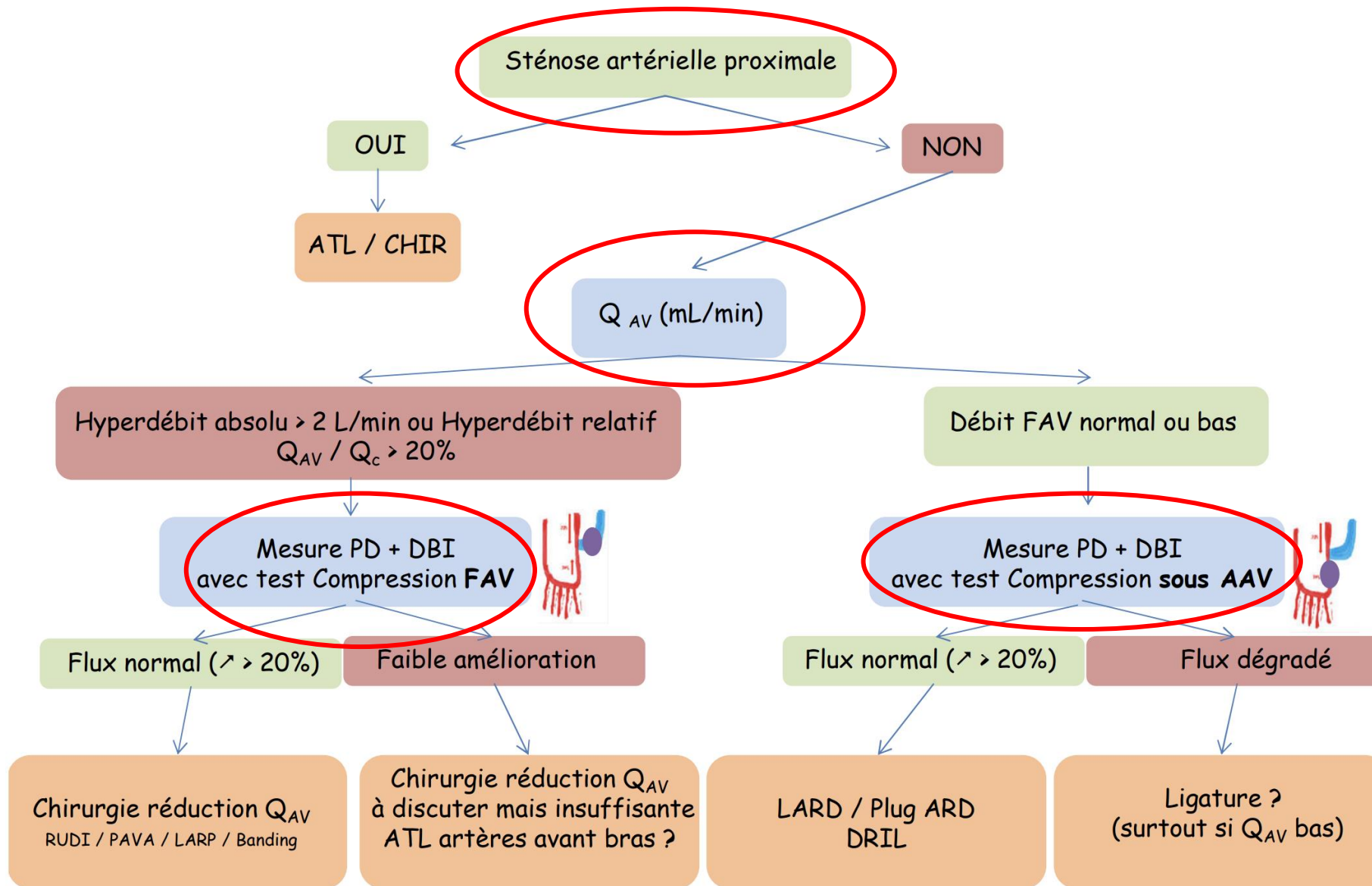
*European Heart Journal*, Volume 44, Issue Supplement\_2, November 2023, ehad655.2074, <https://doi.org/10.1093/eurheartj/ehad655.2074>

**Published:** 09 November 2023



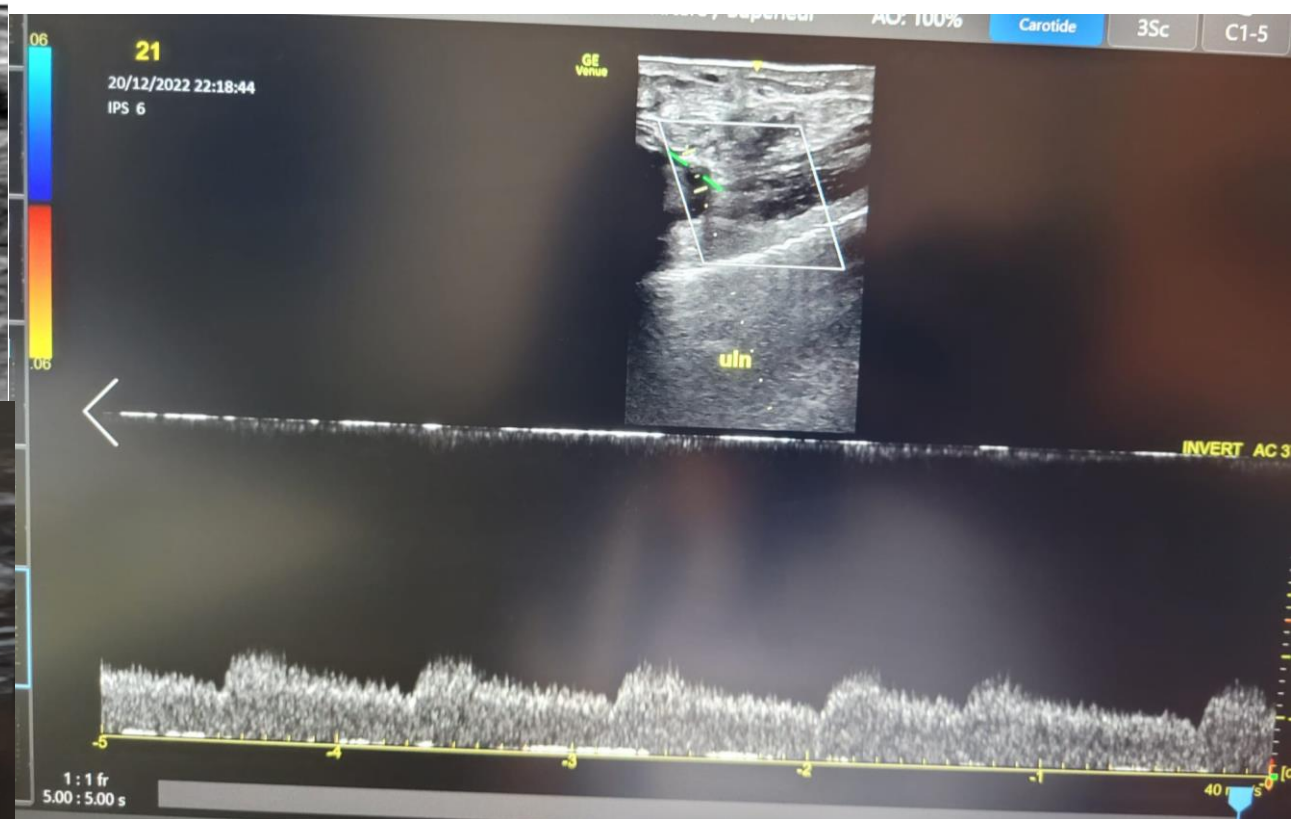
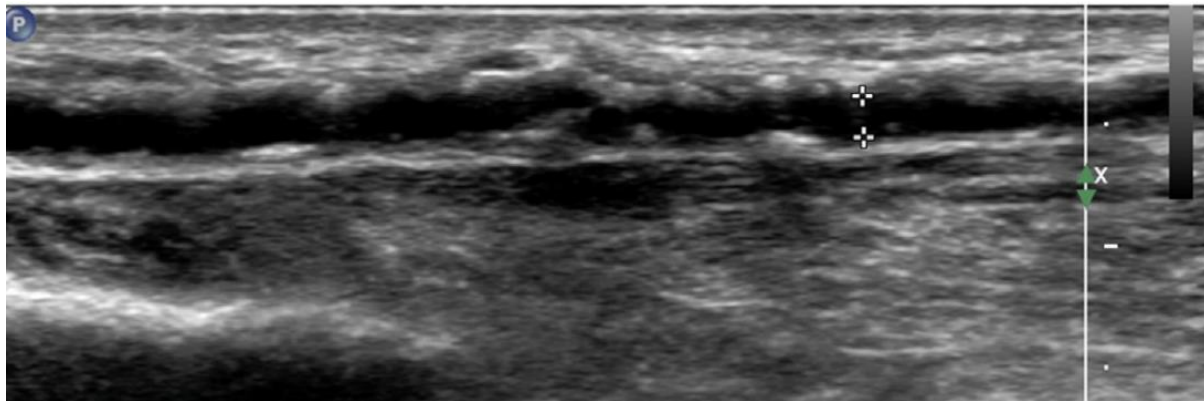
## Conclusion

Wound and foot infection grade as components of the WIFI score could stratify the risk of amputation and/or mortality after bypass surgery even in HD patients. Severity of wound or infection status was higher in HD patients compared to non-HD patients, however, high risk of poor AFS even without any wound or infection should be paid attention in this high-risk population.



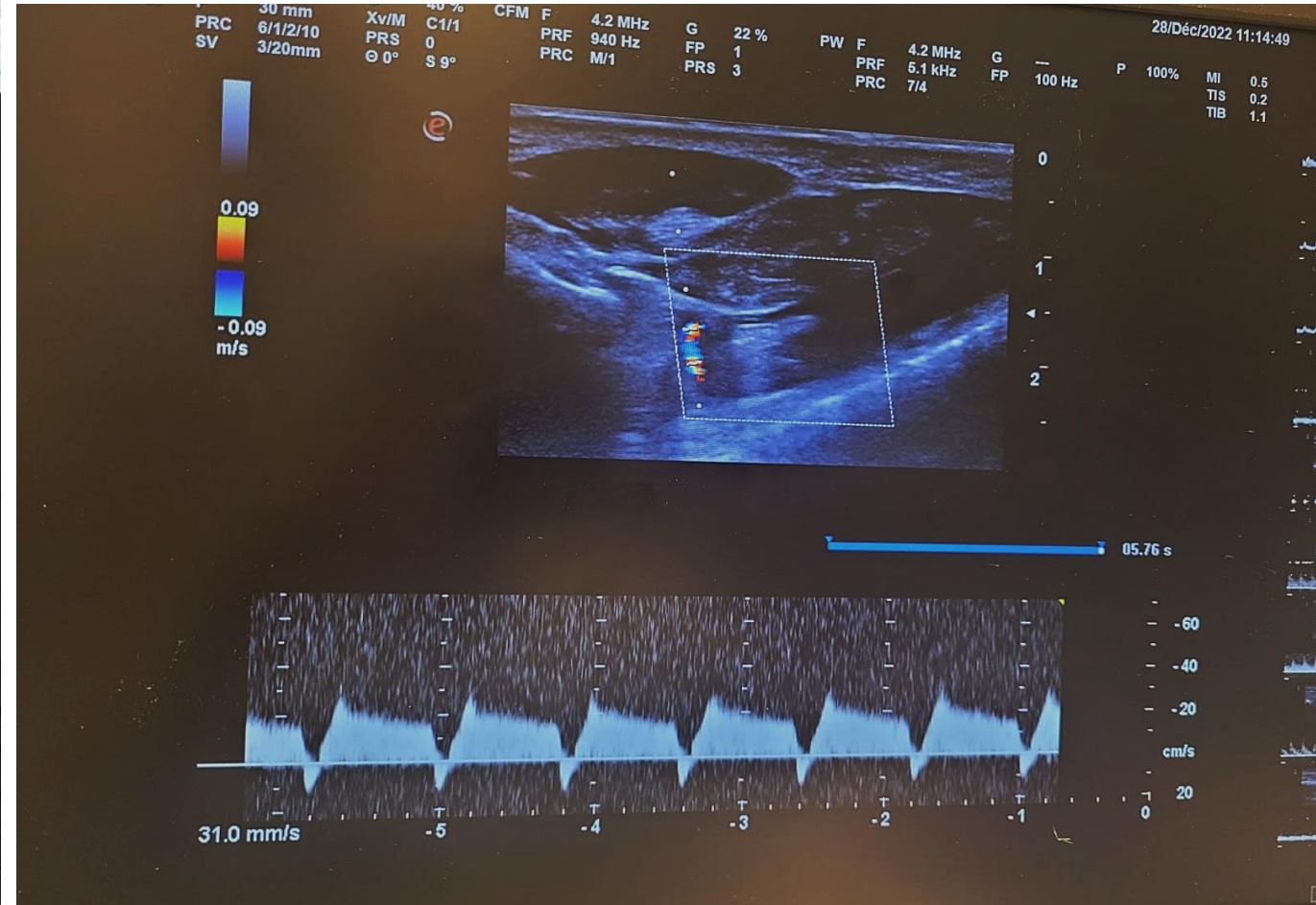
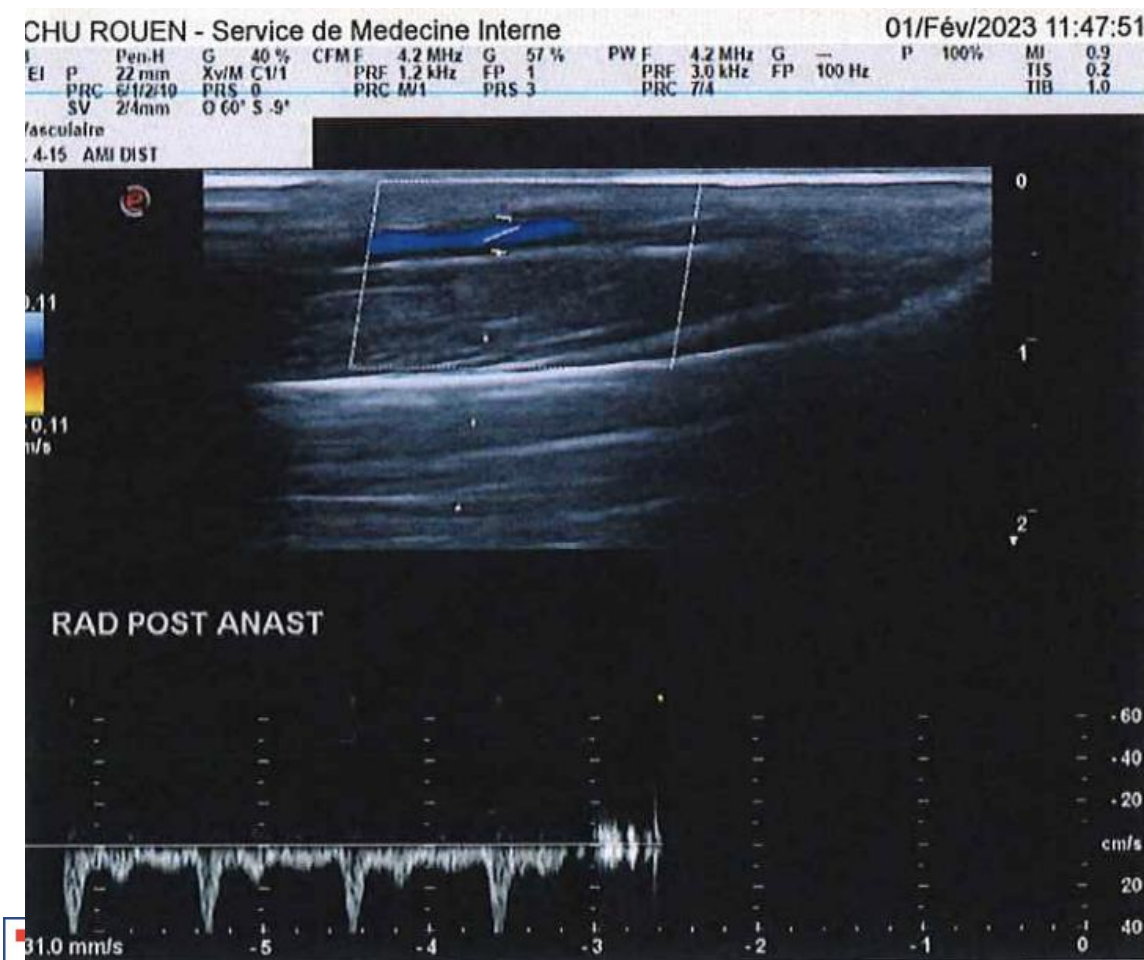
D'après M.HANOY

# Artères antébrachiales

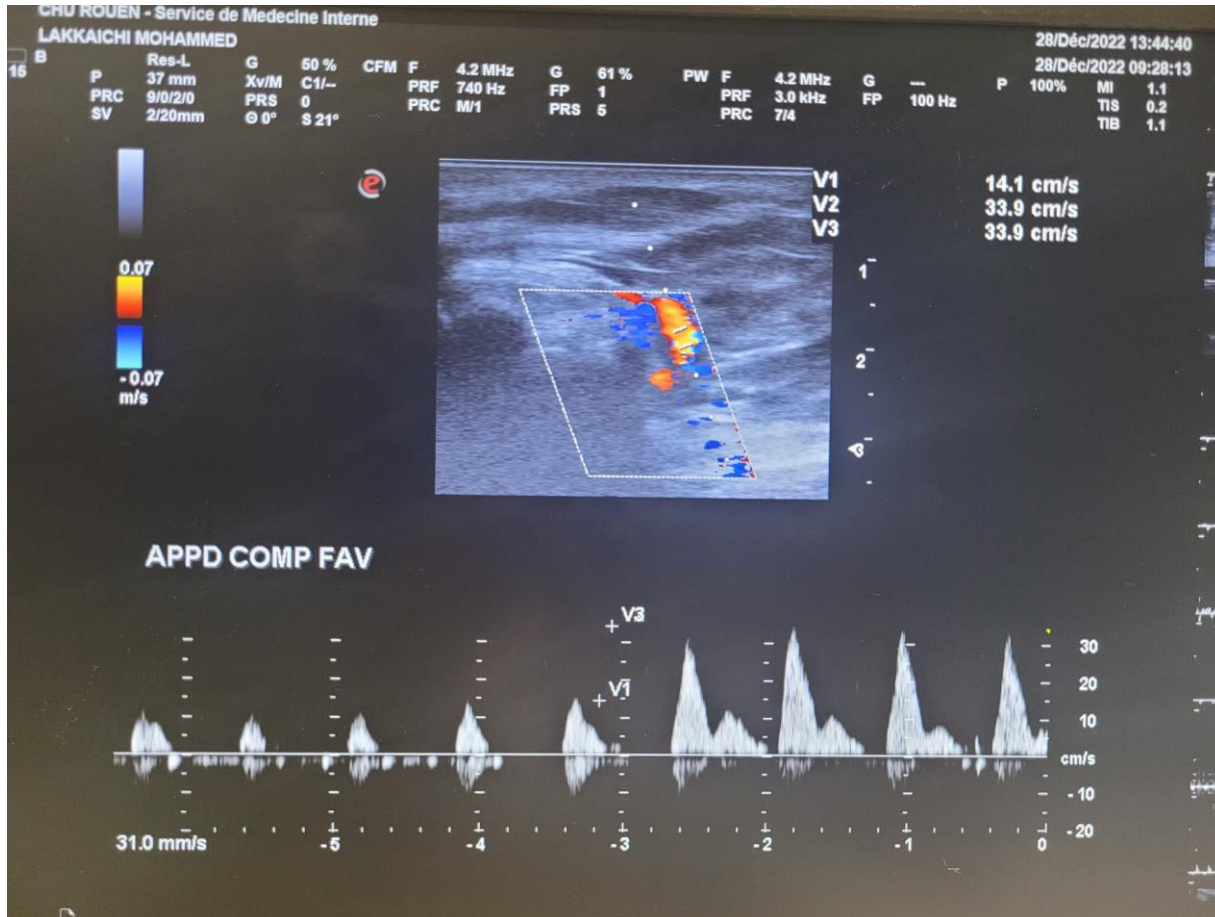




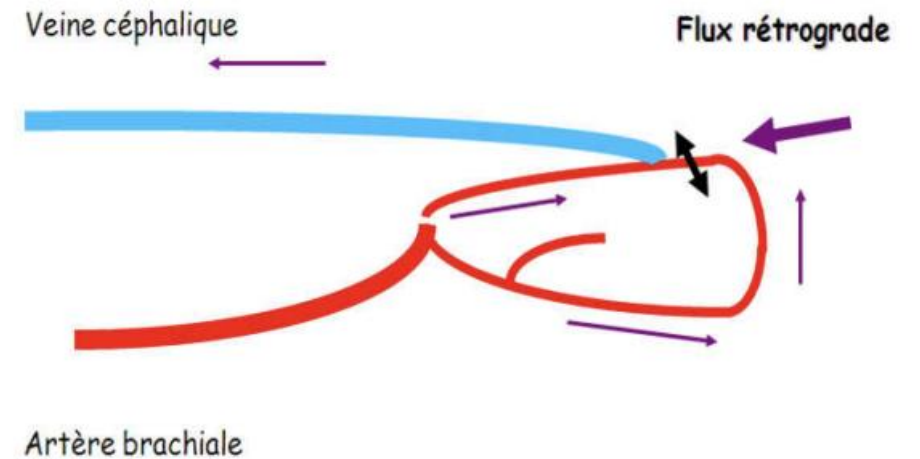
# Artères antébrachiales



# Test de compression

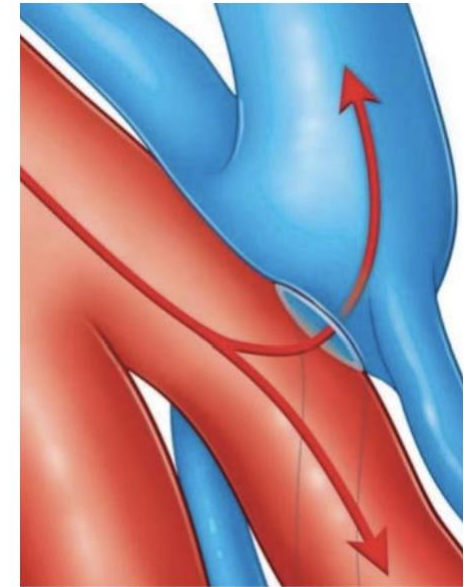
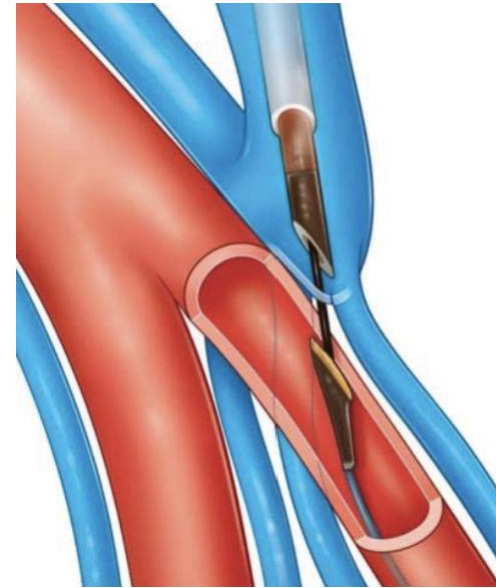


## LARD



# Fistule Percutanée

- Entre l'artère et la veine ulnaires (WavelinQ)
- Entre l'artère radiale proximale et une veine perforante (Ellipsys)
- Echodoppler à M1: **Q  $\geq$  500-600ml/min**
- Bien analyser le drainage





# Evaluation of hemodialysis vascular access involving multidisciplinary integration: Perspective from Latin America and Peru

Edwin Castillo Velarde <sup>1,2,3\*</sup>, José A. Ruiz-Peñañiel<sup>1,2,4</sup>,  
Sheyla Alfaro Ita<sup>2,5</sup> and Tushar J. Vachharajani <sup>6,7</sup>

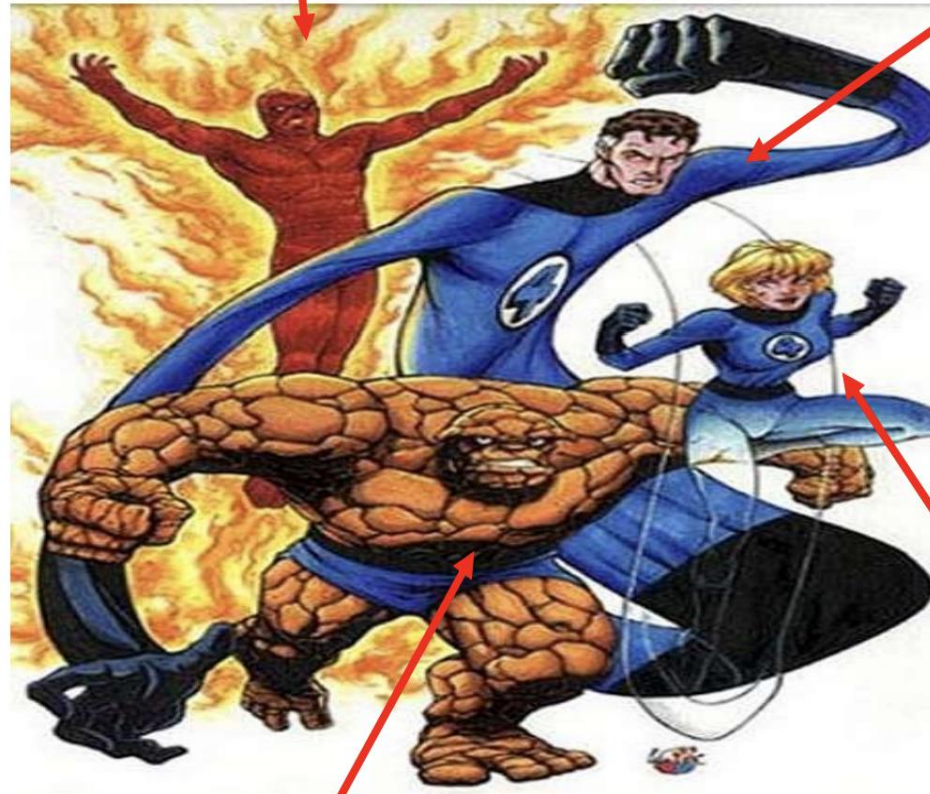
It has been reported that a multidisciplinary approach on vascular access increased nAVF creation **from 33% to 69%**, reduced surgical complications, and promoted the patency, making the framework more cost-effective (18). Multidisciplinary

Castillo and al (2023) Nephrol. 2:1051541.

# FANTASTIC 4

Néphrologue motivé

Radiologiste interventionnel adroit



Infirmier(e)  
expérimentée

Chirurgien fidélisé

D'après Frank LE ROY





Néphrologue motivé

Radiologiste interventionnel adroit



Médecin Vasculaire  
dynamique

Infirmier(e)  
expérimentée

Chirurgien fidélisé