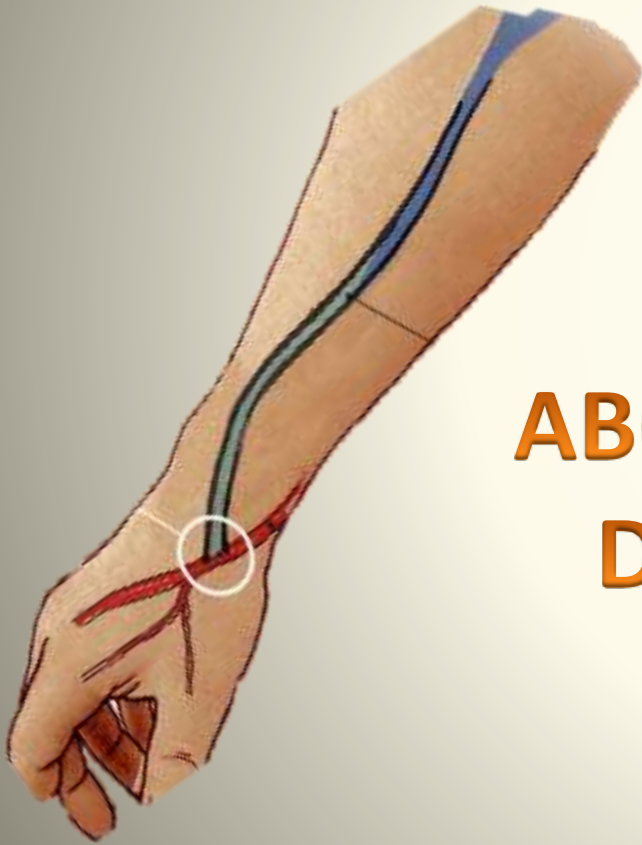


**BILAN NON INVASIF
AVANT
CREATION
D'UN
ABORD VASCULAIRE
D'HEMODIALYSE**



**G.FRANCO
CLINIQUE ARAGO
PARIS**

BUT

- **SENSIBILISATION À LA PRATIQUE DES EXAMENS PRÉOPÉRATOIRES NON INVASIFS**
 - POUR**
 - **PRIVILEGIER LA CREATION DE FAV**
 - **LIMITER LES RISQUES D'ÉCHECS DE CRÉATION DE FAV ET PAV**
 - **ANTICIPER CERTAINES COMPLICATIONS**
 - **LIMITER LES BILANS INVASIFS JUSQUE LA QUASI SYSTÉMATIQUES**
 - **LIMITER LES EX IODES CHEZ LES PATIENTS NON ENCORE DIALYSES**
- **LIMITER LE COUT DE CRÉATION**

Silva Jr MB.J Vasc Surg. 1998

Parmar ejvs.2006

Allon M. .Kidney Int. 2001

ACCES VASCULAIRE D'HEMODIALYSE

- **FAV:FISTULE ARTERIO-VEINEUSE**
- **PAV:PONTAGES ARTERIO-VEINEUX**
SYNTHETIQUE et BIO-PROTHESES
- **KT:** TEMPORAIRE OU DEFINITIF TUNELISE
- **HYBRIDE**

FFBI 2003/KDOQI 2006

CLINICAL PRACTICE GUIDELINES FOR VASCULAR ACCESS

CLINICAL PRACTICE RECOMMENDATIONS FOR GUIDELINE 1: PATIENT PREPARATION FOR PERMANENT HEMODIALYSIS ACCESS

Duplex ultrasound is the preferred method for preoperative vascular mapping. Vascular mapping in preparation for the creation of a vascular access refers to the evaluation of vessels, both arterial and venous, of patients with CKD who selected HD in preparation for the creation of a vascular access. Vascular mapping should be performed in all patients before placement of an access. Preoperative vascular mapping was shown to substantially increase the total proportion of patients dialyzing with fistulae.



GUIDES LINES EUROPEEN

EBPG 2007 :

Evaluation clinique et un échodoppler artériel et veineux

doivent être réalisés avant la

Création d'un accès vasculaire (niveau II)



Strategy for maximizing the use of arteriovenous fistulae
Beathard GA.Semin Dial. 2000

Vascular mapping techniques: advantages and disadvantages.
Asif A.J Nephrol. 2007

INSUFFISANCE RENALE CHRONIQUE

ETAT DES LIEUX

IRC

POPULATION :3 000 000

2/1000 A LA REUNION

0,5/1000 EN METROPOLE

10000 Nouveaux cas /an

150 DIALYSES EN +/Million/An

St 3 b clairance<44ml/min :665 000

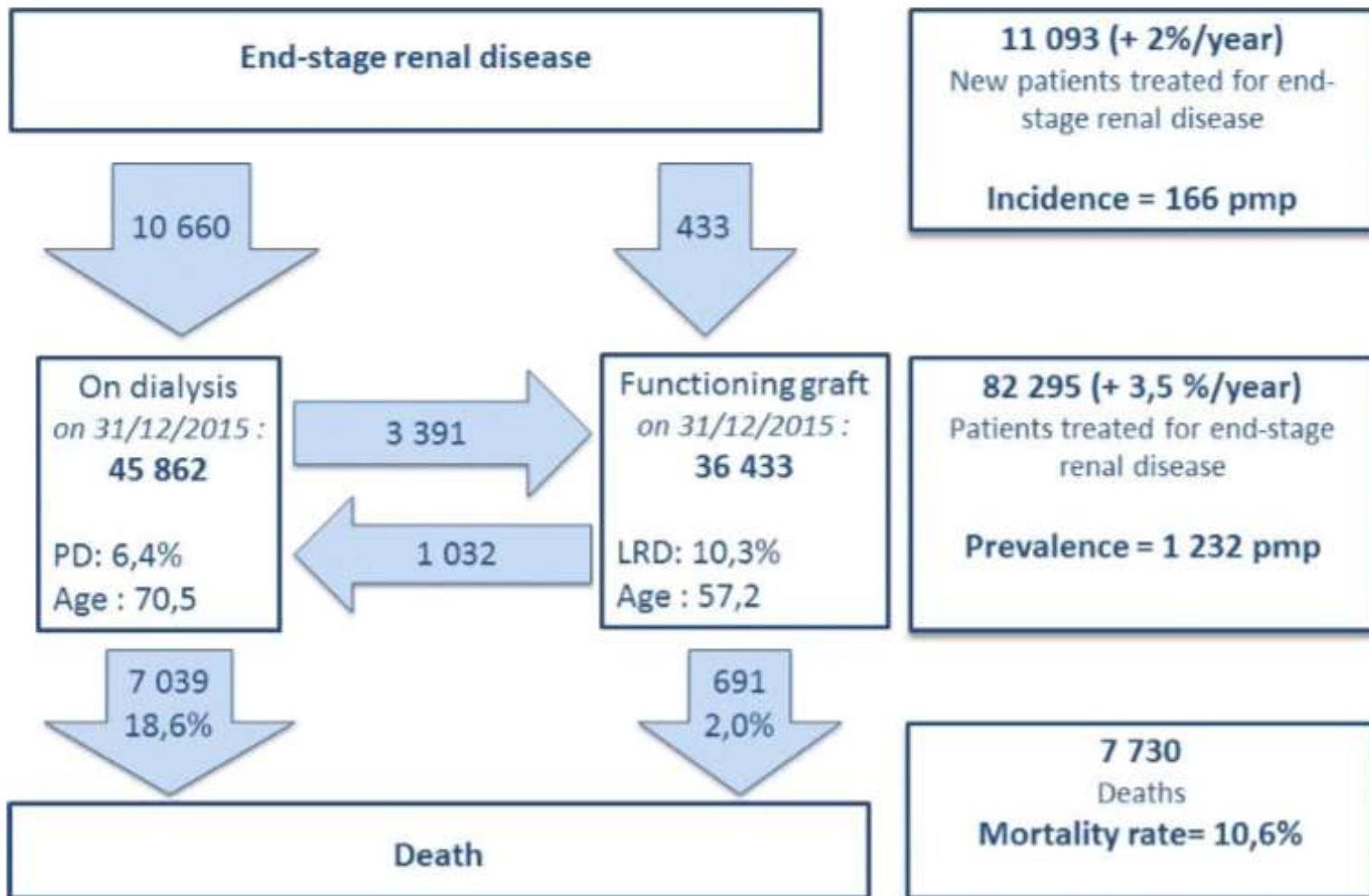
St 4 clairance< 15 ml/min: pré-suppléance

St 5 clairance<10ml/min : suppléance



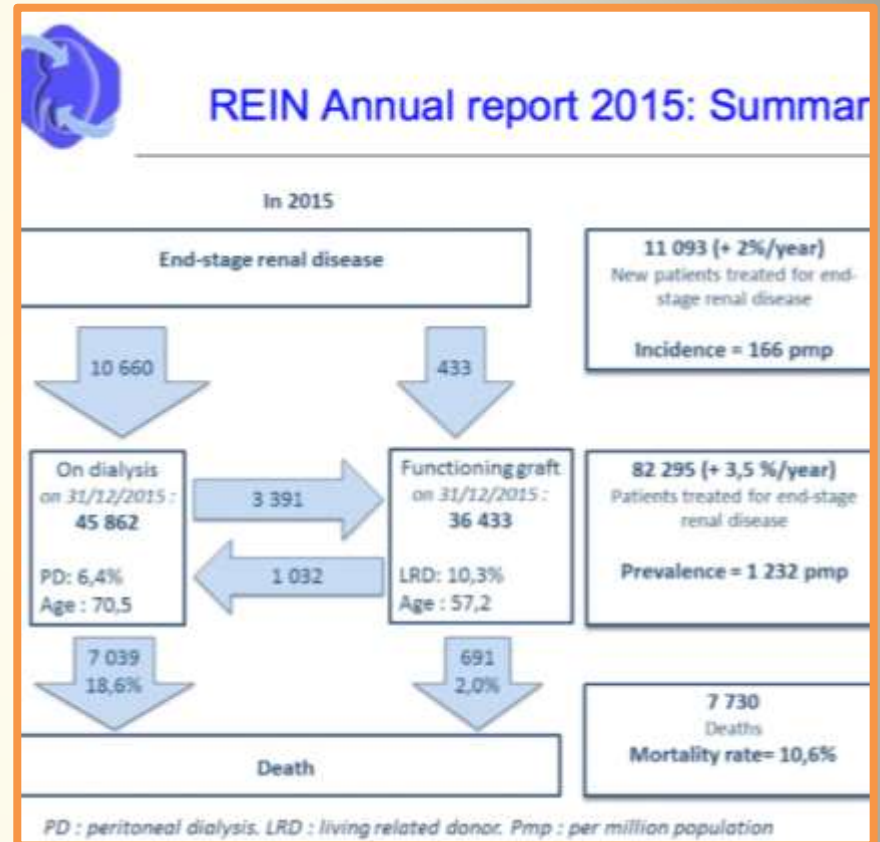
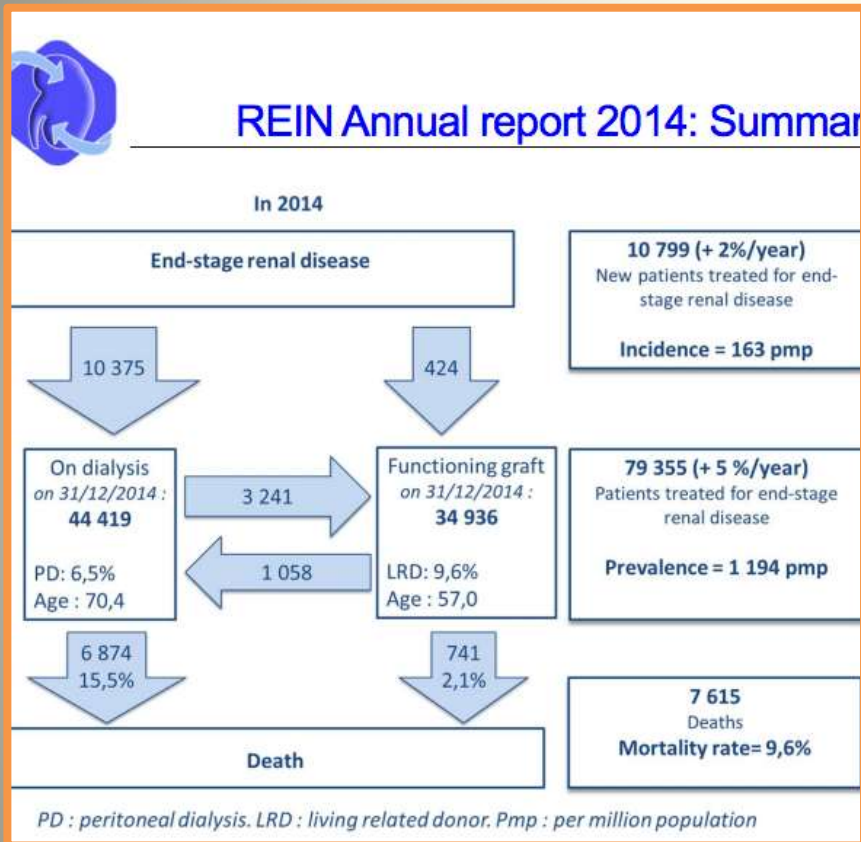
REIN Annual report 2015: Summary

In 2015



R.E.I.N

RESEAU EPIDEMIOLOGIE INFORMATION NEPHROLOGIE





DIALYSIS OUTCOMES AND
PRACTICE PATTERNS STUDY

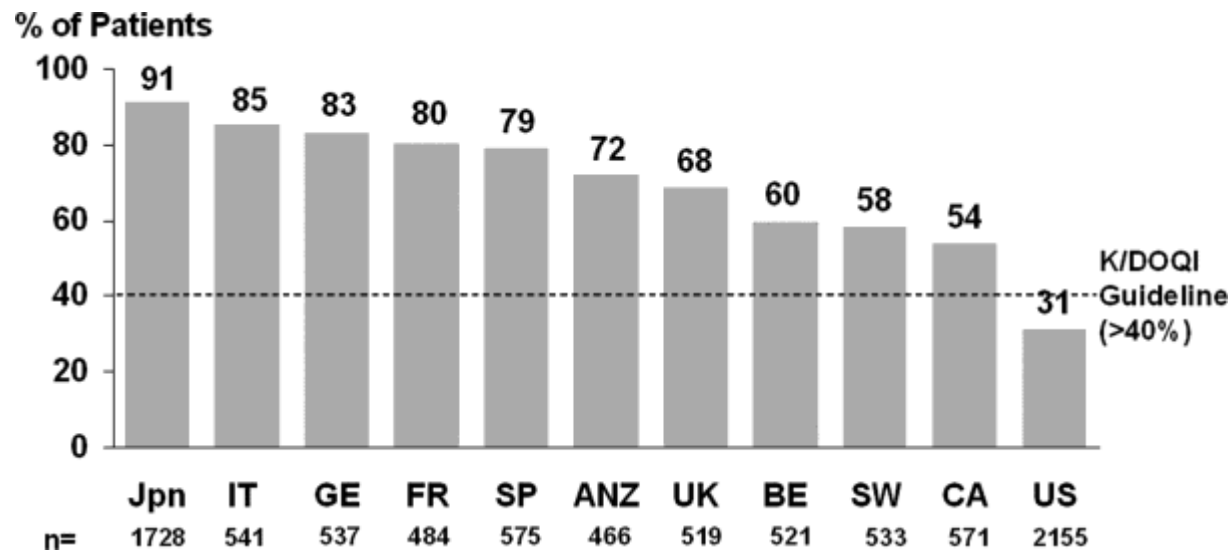
**Trends in US Vascular Access Use, Patient
Preferences, and Related Practices:
An Update From the US DOPPS Practice Monitor
with International Comparisons**

**Ronald L. Pisoni, Lindsay Zepel, Friedrich K. Port,
and Bruce M. Robinson**

American Journal of Kidney Diseases 2015;65(6):905-915

FAV NATIVE

Fistula use, by country, in a cross-section of prevalent hemodialysis (HD) patients in Dialysis Outcomes and Practice Patterns Study II (DOPPS II), 2002 to 2003.

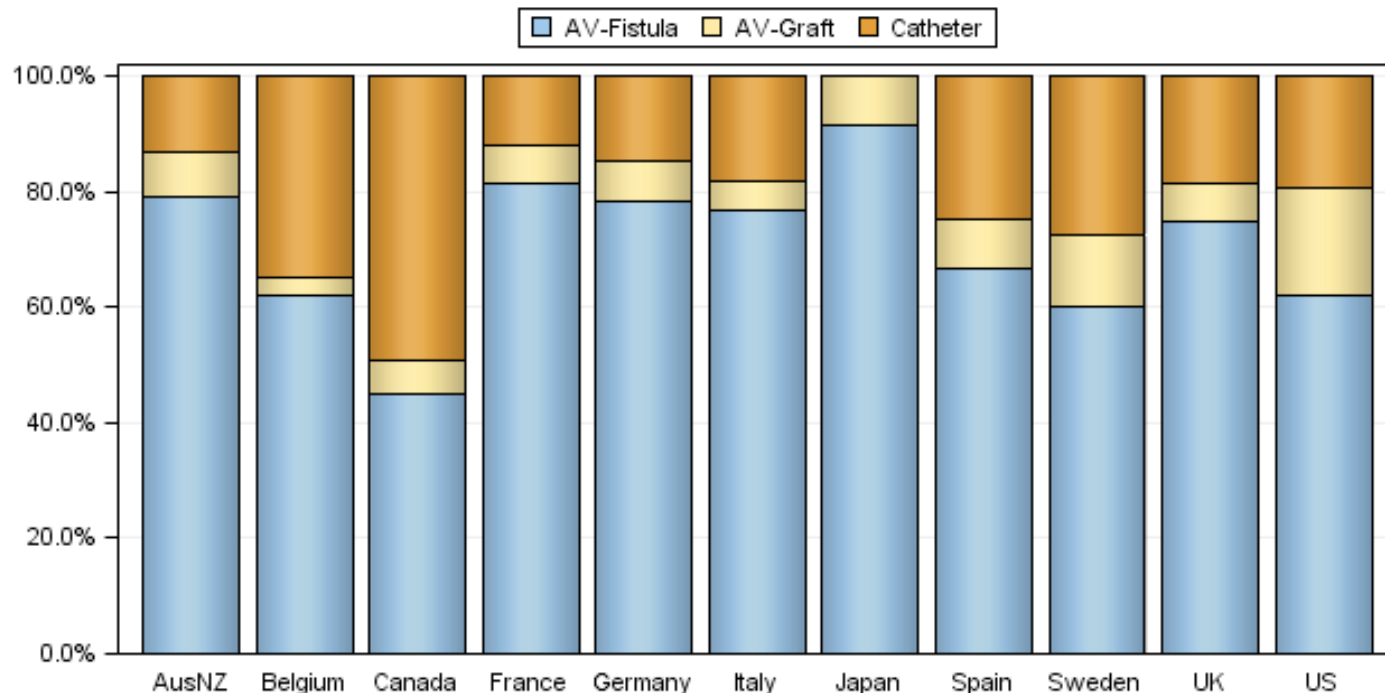


Friedrich K. Port et al. CJASN 2006;1:246-255

CJASN

DOPPS 2012

Dialysis Outcomes and Practice Patterns Study



AV-Fistula (N Ptns)	336	283	213	396	512	451	1,377	361	312	336	2,551
AV-Fistula (Wgtd %)	79.1%	61.8%	45.0%	81.3%	78.3%	76.7%	91.4%	66.6%	60.1%	75.0%	62.0%
AV-Graft (N Ptns)	41	16	28	35	45	24	130	41	61	32	724
AV-Graft (Wgtd %)	7.9%	3.2%	5.9%	6.7%	6.9%	4.9%	8.5%	8.5%	12.3%	6.6%	18.5%
Catheter (N Ptns)	57	159	219	64	92	114	2	149	142	76	717
Catheter (Wgtd %)	13.0%	35.0%	49.1%	11.9%	14.8%	18.4%	0.1%	24.9%	27.7%	18.5%	19.5%

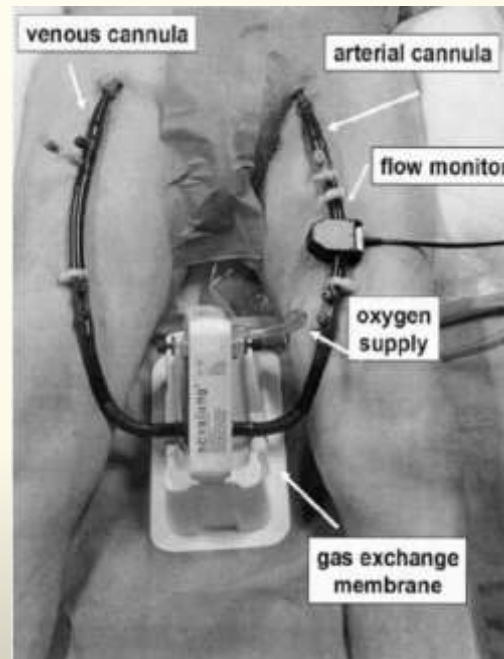
**BRÊVE
HISTOIRE
DE LA
DIALYSE**

SHUNTS

1960 SHUNT de SCRIBNER

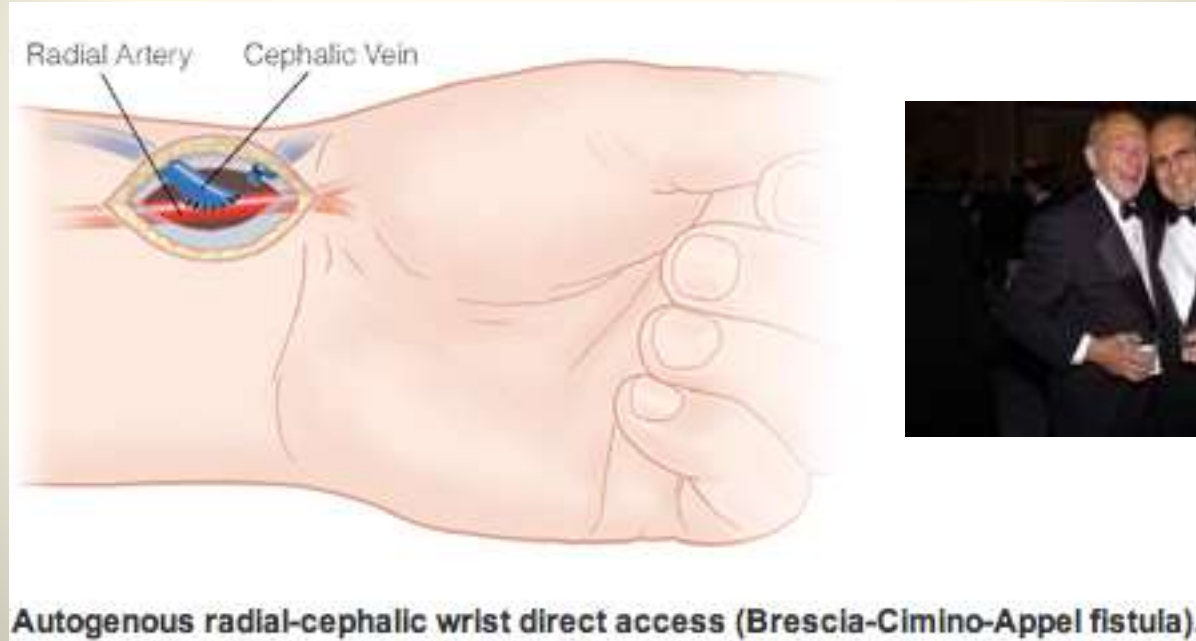


1969 : SHUNT FEMORAL DE THOMAS



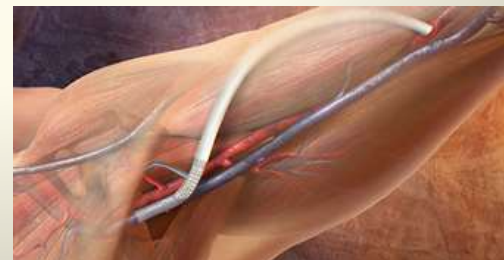
1966 : FISTULE ARTÉRIO-VEINEUSE NATIVE

Brescia MJ, Cimino JE, Appel K



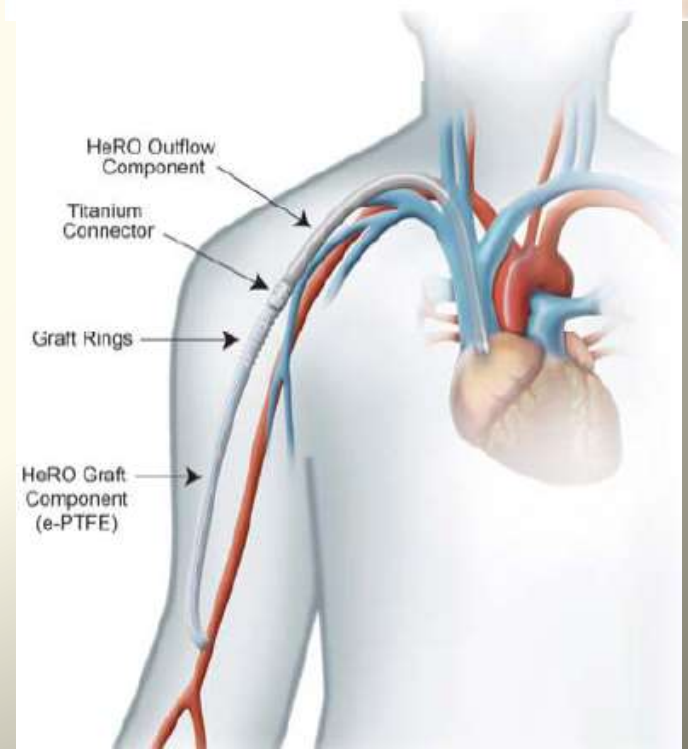
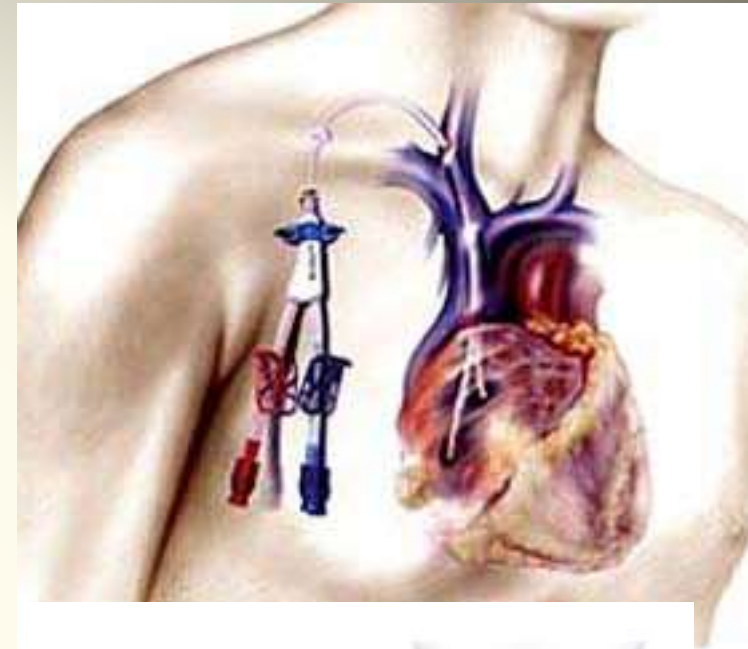
SUBSTITUTS

- 1973 : Carotide Bovine ProCol
- 1976 : PTFE
- 1979 : Hémasite
- 1994 Bioprotec
- 2004 Humacyte
- 2012 Gore hybrid
sutureless outflow anastomosis



KT

- 1979 : Cathéter Veineux Central
- 2010 HERO Hemodialysis Reliable Outflow



1981/1990 MICROCHIRURGIE

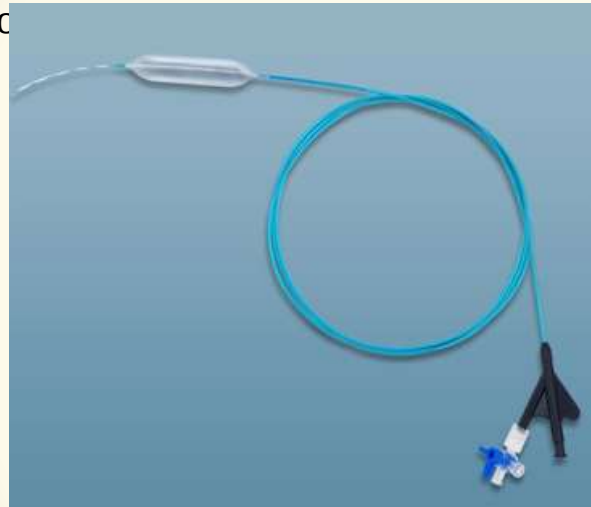


P. Bourquelot et al., Pediatric Nephrology 1990

ANGIOPLASTIE PERCUTANÉE

- Treatment of stenotic lesions in dialysis access fistulas and shunts by transluminal angioplasty.

Gordon DH Radiol



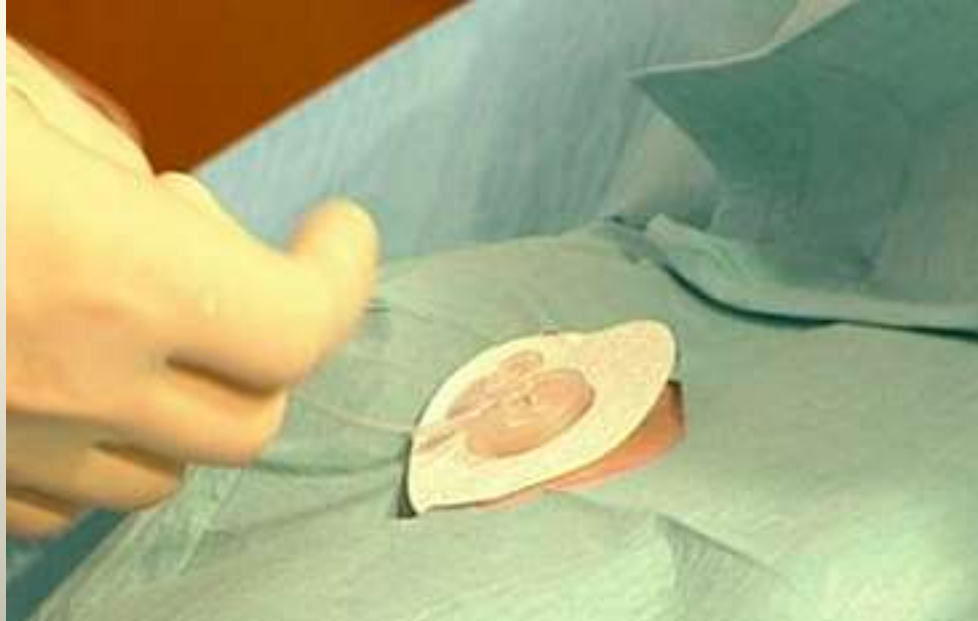
- Percutaneous transluminal angioplasty of stenotic lesions in dialysis vascular accesses.
Gaux JC, Bourquelot P, Raynaud A. Eur J Radiol 1983

1991

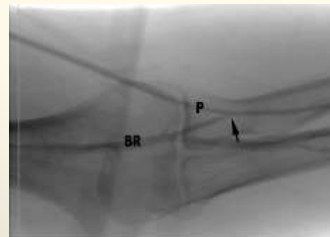
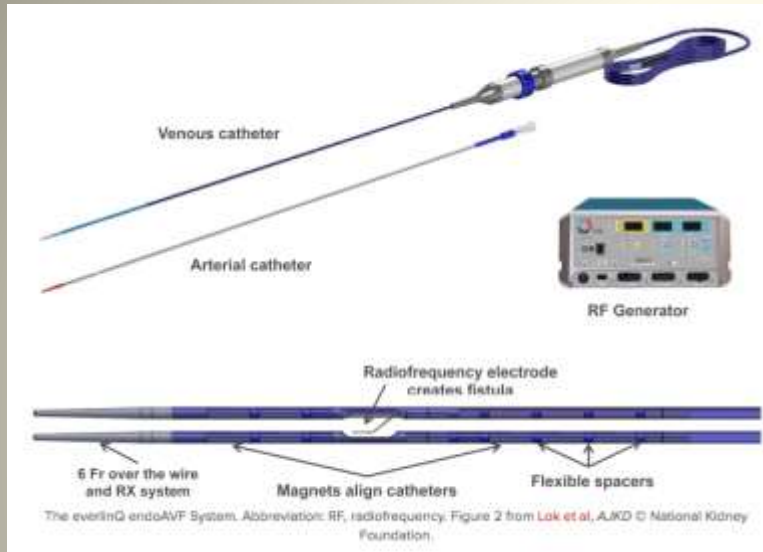
THROMBOLYSE/THROMBO-ASPIRATION PERCUTANÉE

Local thrombolysis and thromboaspiration in the treatment of acutely thrombosed arteriovenous hemodialysis fistulas.

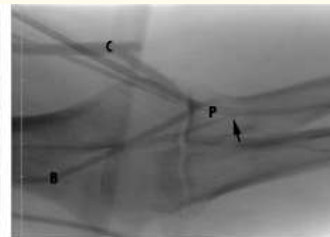
Poulain F, Raynaud A, Bourquelot P .Cardiovasc Intervent Radiol 1991



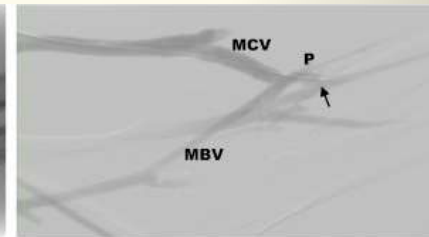
2013 CREATION de AAV THERMIQUE ENDOVASCULAIRE



a.



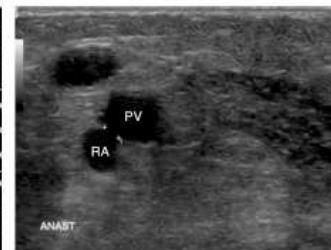
b.



c.

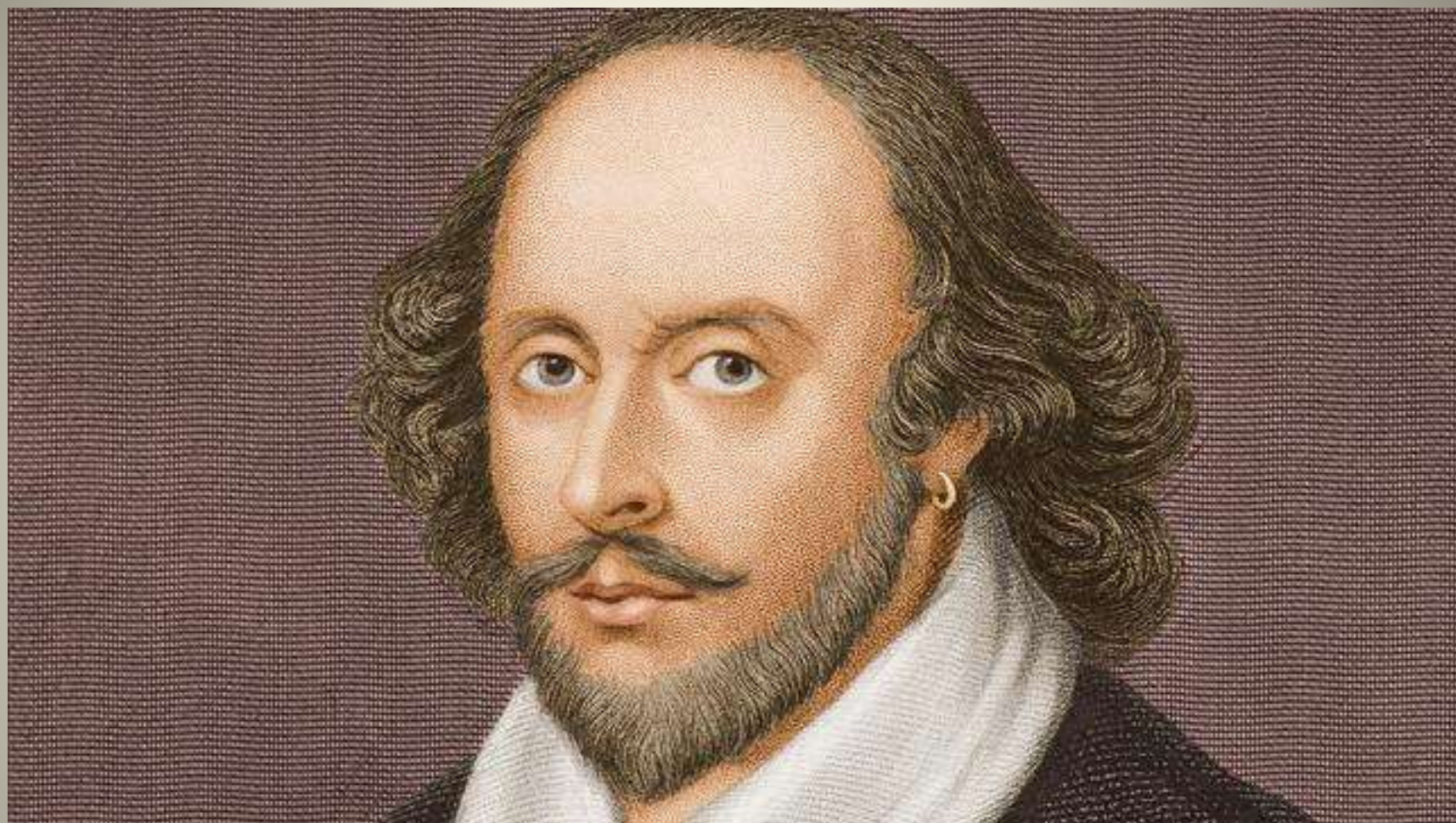


d.



e.

**CREATION
DE LA
FAV
TIMING**



CREATION de FAV et IRC

TIMING



- > 3 mois et < 1 an avant la date estimée de la mise en HD
- St 4 :préparation
- St 5 :création ?

DFG



Déclin physiologique > 40 ans :2 ml/mm/1,73 m²

Déclin modéré du DFG :2 à 4 ml/mm/1,73 m²

Déclin rapide du DFG > 5 ml/mm/1,73 m²

R.E.I.N



DFG MOYEN à L'INITIATION 9,2ml/mm/1,73 m²

-< 50% entre 5 et 9 ml/mm

- 17% < 6ml/mm

- 5% > 20ml/mm

KDOQI 1997-2007/FFBI

REVISION 2015

BUT:65% DE PREVALENCE DE FAV

GUIDELINE 1. PATIENT PREPARATION FOR PERMANENT HEMODIALYSIS ACCESS

- 1.3 Patients should have a functional permanent access at the initiation of dialysis therapy.
- 1.3.1 A fistula should be placed **at least 6 months before the anticipated start of HD** treatments. This timing allows for access evaluation and additional time for revision to ensure a working fistula is available at initiation of dialysis therapy. (B)
- 1.3.2 A graft should, in most cases, be **placed at least 3 to 6 weeks before the anticipated start of HD** therapy. Some newer graft materials may be cannulated immediately after placement. (B)

CLINICAL PRACTICE GUIDELINES FOR HEMODIALYSIS ADEQUACY

- **1.3 Timing of therapy:**
When patients reach stage 5 **CKD (estimated GFR < 15 mL/min/1.73 m²)**, nephrologists should evaluate the benefits, risks, and disadvantages of beginning kidney replacement therapy.

EBPG on VASCULAR ACCESS

EUROPEAN BEST PRACTICE GUIDELINES(2007)

Guideline 1.1.

An early plan for venous preservation should be a substantial part of pre-dialysis care and education in any chronic kidney disease (CKD) patient regardless the choice of treatment modality (Evidence level IV).

Guideline 1.2.

Every chronic renal failure patient, who have opted for haemodialysis, should start dialysis with a functioning vascular access (Evidence level III).

Guideline 1.3.

Potential chronic haemodialysis (HD) patients should be ideally referred to the nephrologist and/or surgeon for preparing vascular access when they reach the stage 4 of their CKD (glomerular filtration rate $<30 \text{ ml/min/1.73 m}^2$) or earlier in case of rapidly progressive nephropathy or specific clinical conditions such as diabetes or severe peripheral vascular disease (Evidence level III).

RECOMMENDATIONS

European Renal Association–European Dialysis and Transplant Association/ERBP Advisory Board (2011)⁴⁰

In patients with a GFR < 15 mL/min/1.73 m², dialysis should be considered when there is one or more of the following: symptoms or signs of uremia, inability to control hydration status or blood pressure, or a progressive deterioration in nutritional status. It should be taken into account that the majority of patients will be symptomatic and need to start dialysis with a GFR in the range of 9-6 mL/min/1.73 m². High-risk patients (eg, diabetics) and those whose renal function is deteriorating more rapidly than an eGFR 4 mL/min/y require particularly close supervision. If close supervision is not feasible and in patients whose uremic symptoms may be difficult to detect, a planned start to dialysis while still asymptomatic may be preferred. Asymptomatic patients presenting with advanced CKD may benefit from a delay in starting dialysis to allow preparation, planning, and permanent access creation rather than using temporary access.

NKF-KDOQI (2015)²⁵

The decision to initiate maintenance dialysis in patients who choose to do so should be based primarily on an assessment of signs and/or symptoms associated with uremia, evidence of protein-energy wasting, and the ability to safely manage metabolic abnormalities and/or volume overload with medical therapy rather than on a specific level of kidney function in the absence of such signs and symptoms.

R.E.I.N 2015

Tableau 4-15. Voie d'abord vasculaire des patients en hémodialyse au 31/12/2015
Vascular access in hemodialysis patients on December 31, 2015

Voie d'abord vasculaire	Ensemble des malades en dialyse		Malades avec diabète		<65 ans		65-74 ans		75-84 ans		≥85 ans	
	n	%	n	%	n	%	n	%	n	%	n	%
FAV native	31 653	78,1	12 460	76,0	12 075	81,3	7 675	78,1	8 575	76,8	3 328	71,2
Cathéter tunnélsé	7 112	17,6	3 188	19,4	2 230	15,0	1 710	17,4	2 033	18,2	1 139	24,4
Pontage	1 308	3,2	542	3,3	395	2,7	342	3,5	413	3,7	158	3,4
Autre	447	1,1	204	1,2	155	1,0	97	1,0	143	1,3	52	1,1

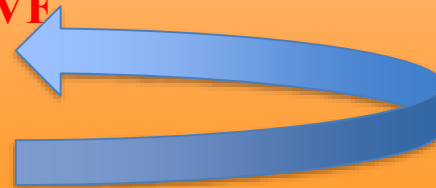
NB : 0 % de données manquantes sur la voie d'abord vasculaire

MAIS
31% DE FAV INUTILES (DECES –GREFFE-AMELIORATION)

KDOQI GUIDELINES

ORDER OF PREFERENCES FOR HD ACCESS

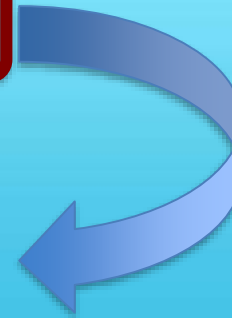
- RADIO –CEPHALIC ULNO-BASILIC ?
- BRACHIO-CEPHALIC AVF
- BRACHIO –BASILIC AVF
- FOREARM AVG
- UPPER ARM AVG
- LOWER LIMB AVF



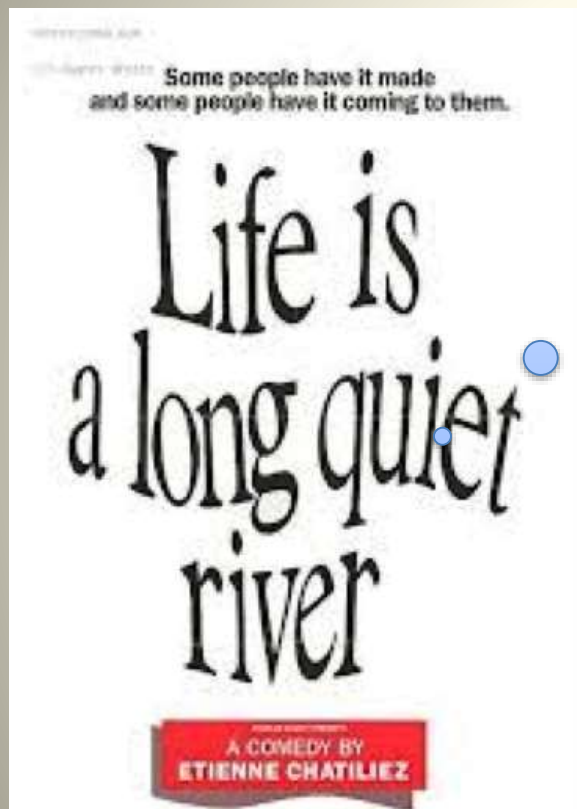
FISTULA FIRST FOR KID

AVF IN CASE OF TEENAGER WAITING TRANSPLANTATION:

- PERITONEAL DIALYSIS
- DISTAL AVF :first choice
- FOREARM GRAFT: could be second choice
- ELBOW AVF:HIGH FLOW
- FEMORAL AVF: last choice



LES MONTAGES



NOT FISTULA

**THEY WOULD
NEVER
HAVE MET**



IL Y 50 ANS et PAS une RIDE !!!



Chronic Hemodialysis Using Venipuncture and a Surgically Created Arteriovenous Fistula

Michael J. Brescia, M.D.[†], James E. Cimino, M.D.[‡], Kenneth Appel, M.D.[§], and Baruch J. Hurwich, M.D.
N Engl J Med 1966; 275:1089-1092 |

- **Anastomose latéro-latérale**
- **3 à 5 mm**
- **86% de perméabilité**



FAV à L'AVANT BRAS

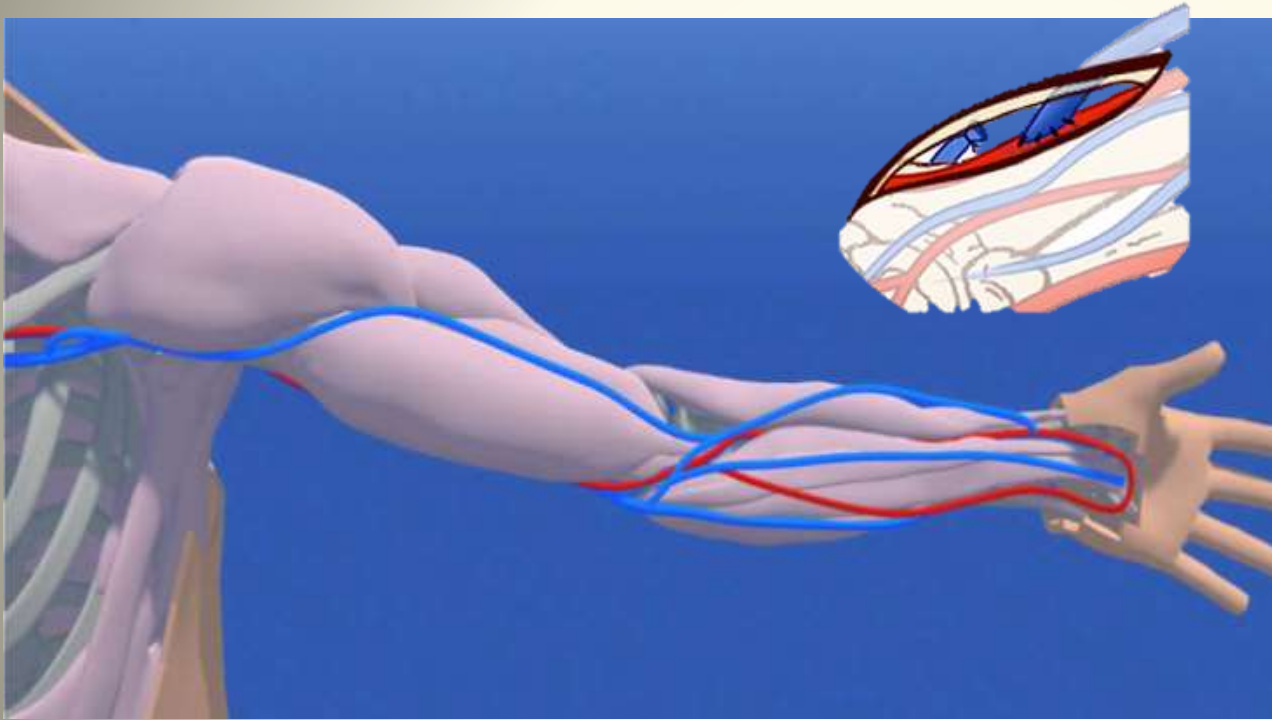
FAV RADIO-CEPHALIQUE

- AU POIGNET
- TABATIERE
- AVANT BRAS TIERS MOYEN
- AVANT BRAS TIERS SUPERIEUR
- TRANSPOSITION EN LOOP

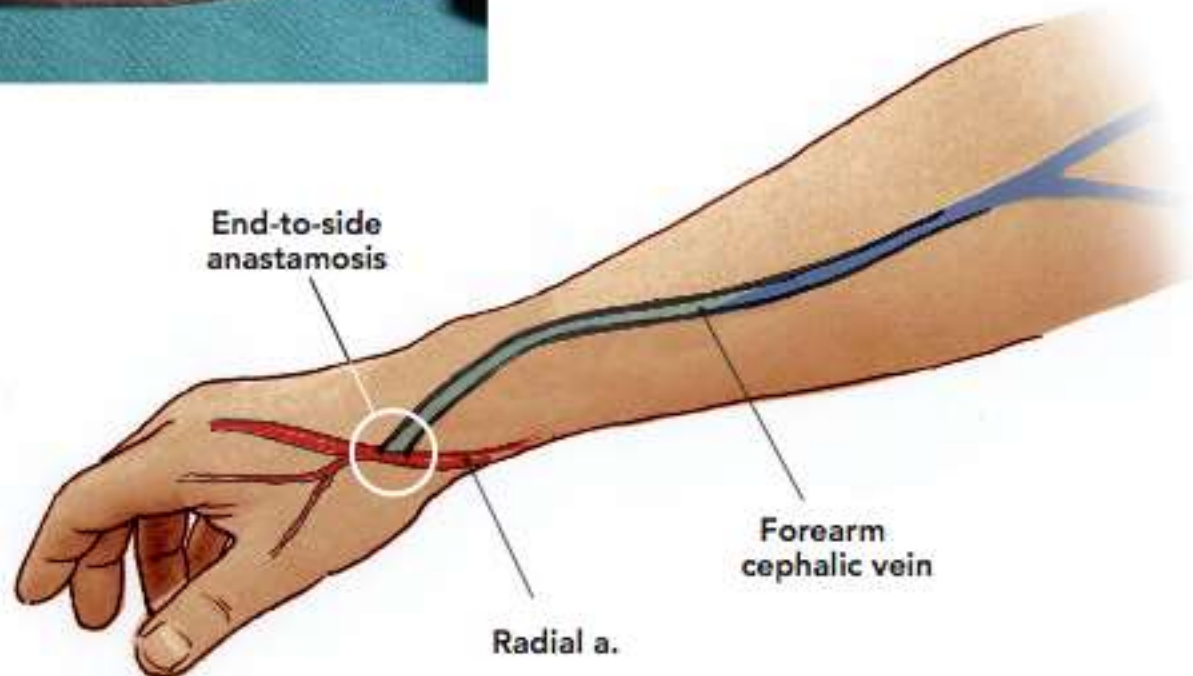
FAV ULNO-BASILIQUE

FAV RADIO-BASILIQUE (TRANSPOSITION)

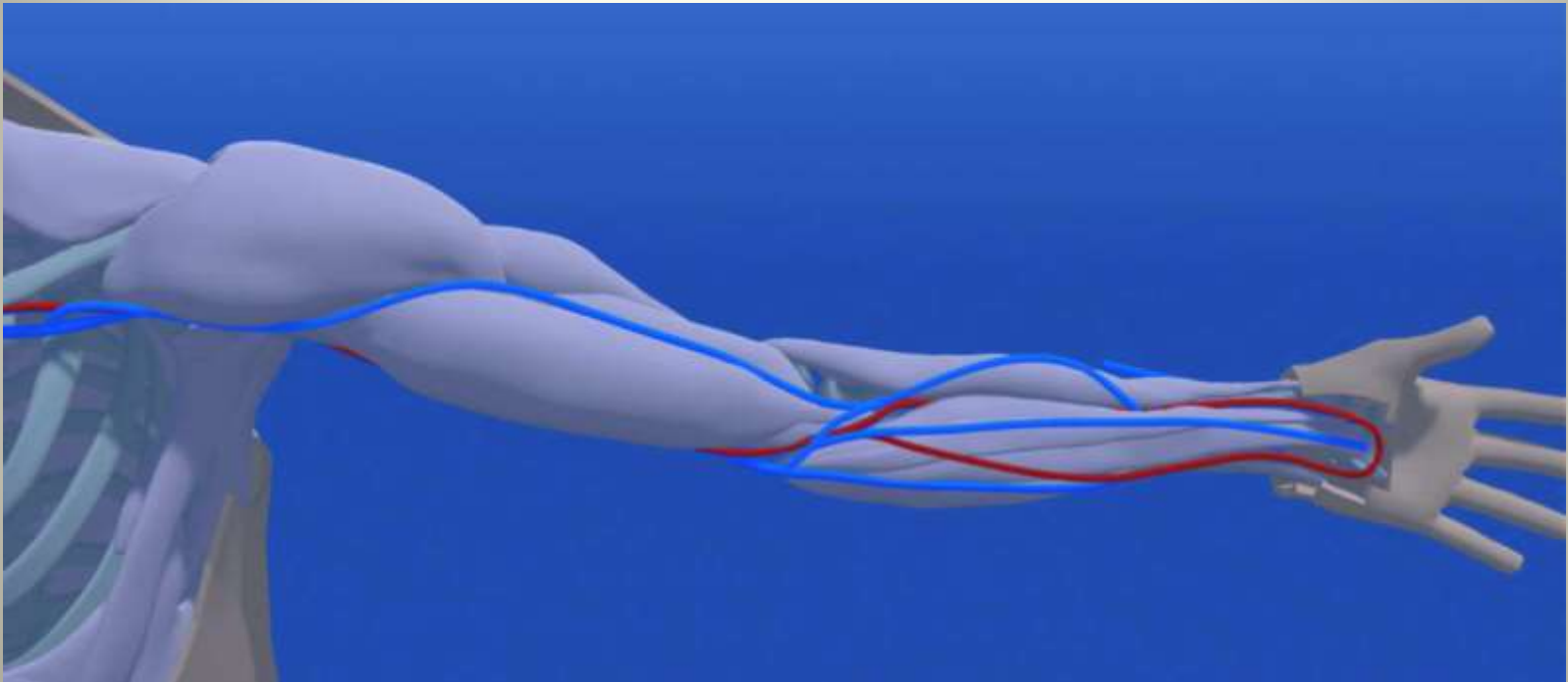
FAV RADIO-CEPHALIQUE au POIGNET



FAV RC TABATIERE

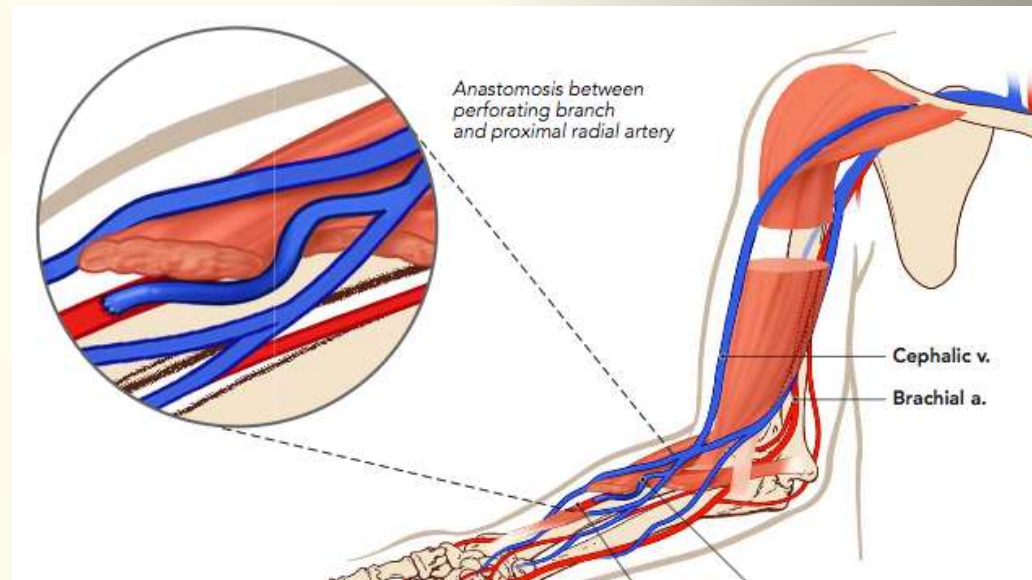
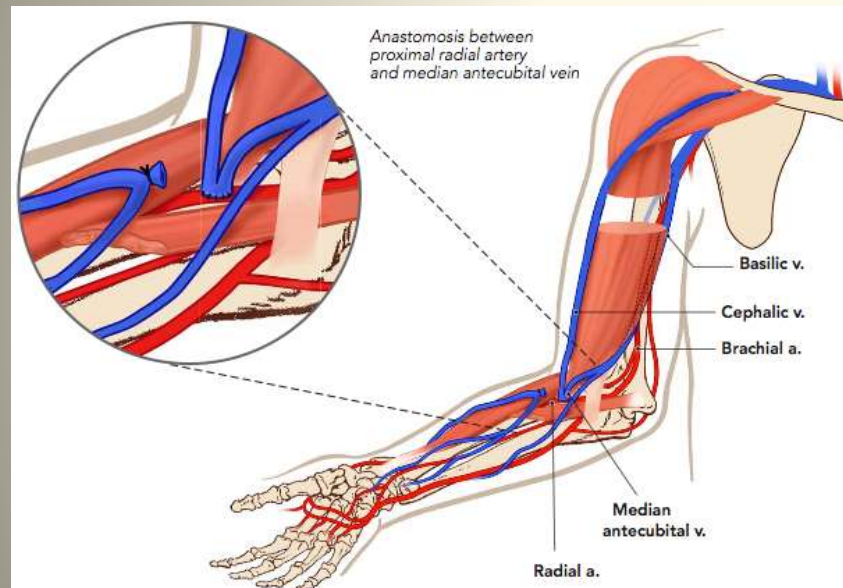


TIERS MOYEN DE L'AVT BRAS



Mauvaise qualité de la veine céphalique ou de l'artère au poignet

TIERS SUPERIEUR DE L'AVT BRAS



ANASTOMOSE QUASIMENT AU COUDE

AR → PERFORANTE OU M VEINEUX

FAV DE GRATZ : RISQUE D'HYPERDEBIT

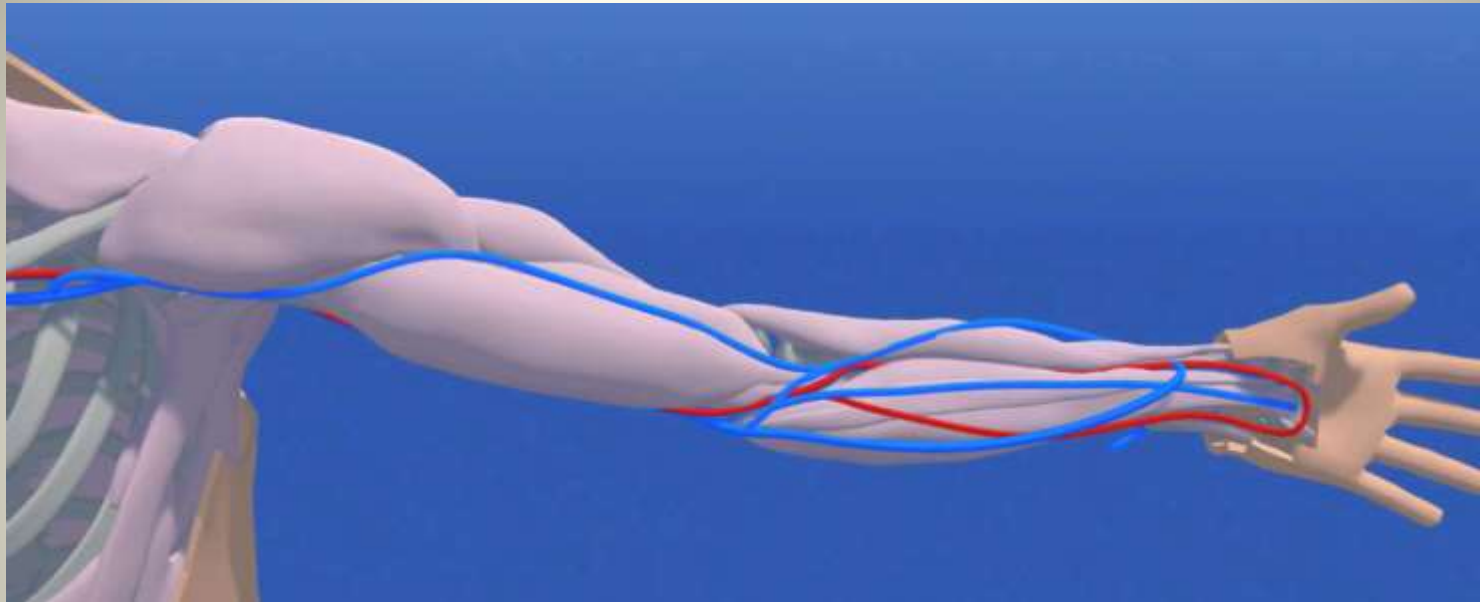
TRANSPOSITION CEPHALIQUE EN LOOP



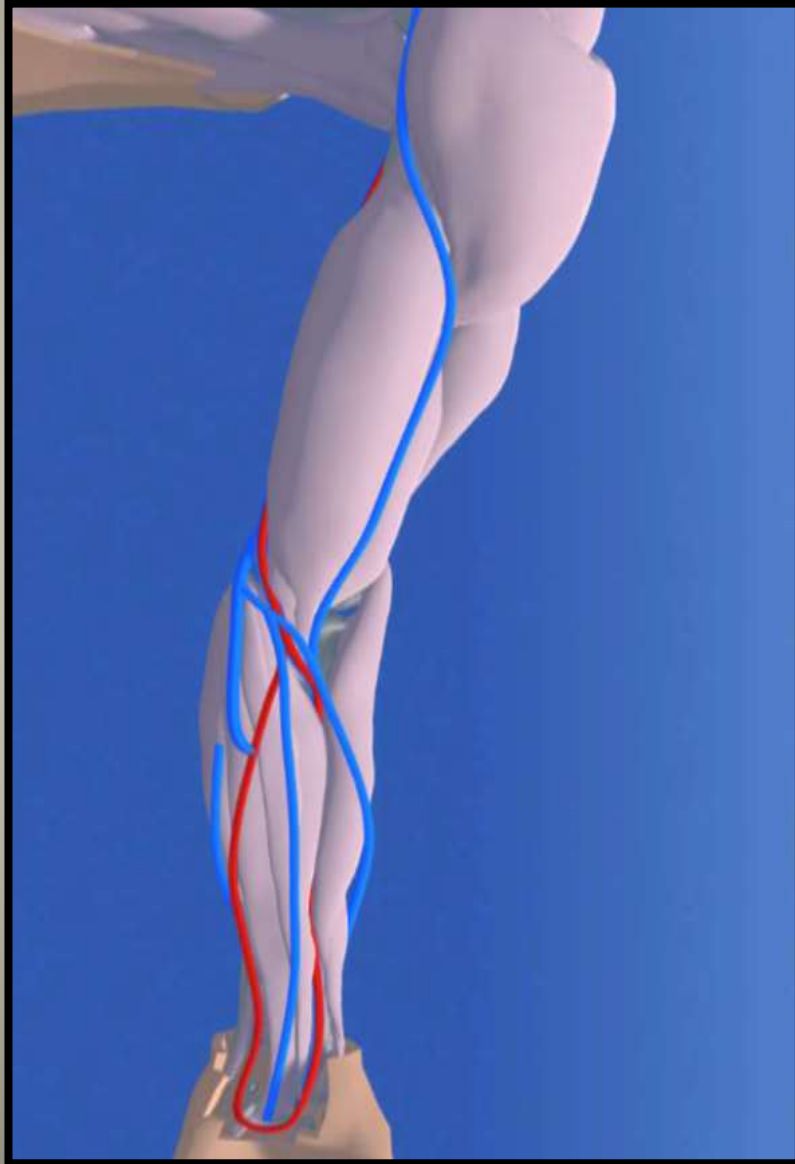
**UTILE CHEZ DIABETIQUE
MAUVAIS QUALITE DE AR DISTALE
OBESITE
DIMINUE LE VOL**

FAV RADIO BASILIQUE

TRANSPOSITION ANTERIEURE



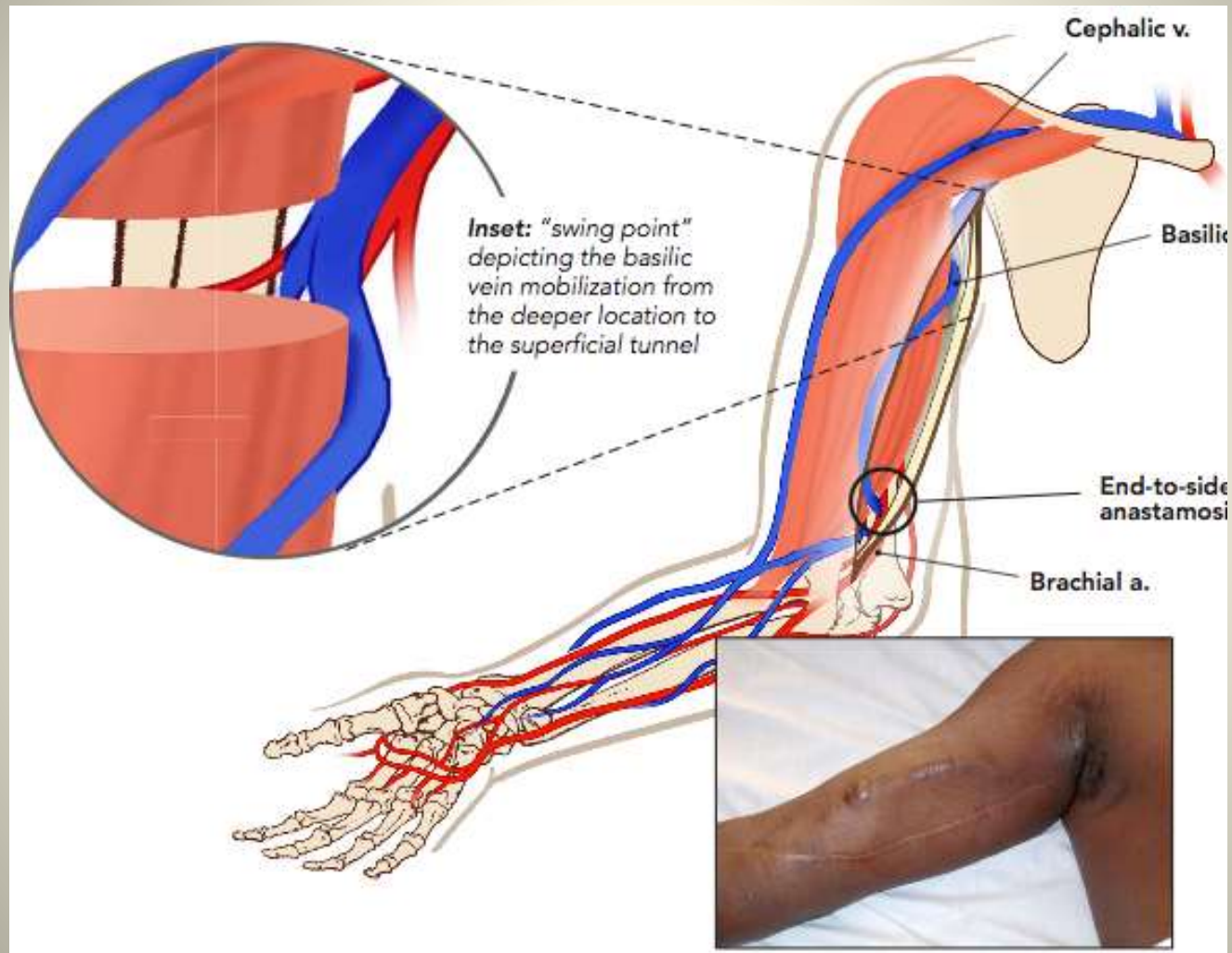
FAV ULNO-BASILIQUE



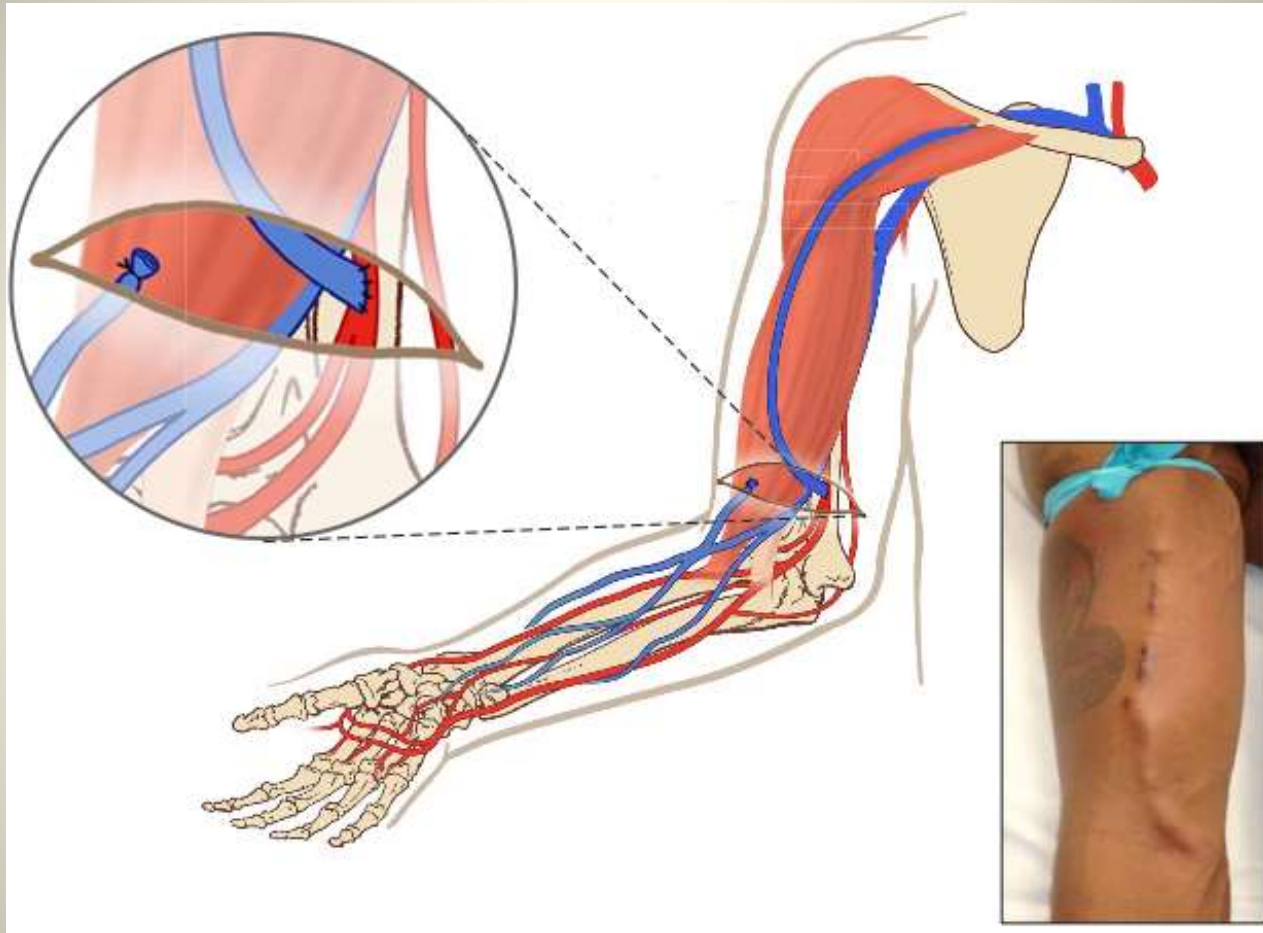
FAV AU BRAS

- FAV BRACHIO-CEPHALIQUE
- FAV BRACHIO-BASILIQUE
- FAV BRACHIO-BRACHIALE

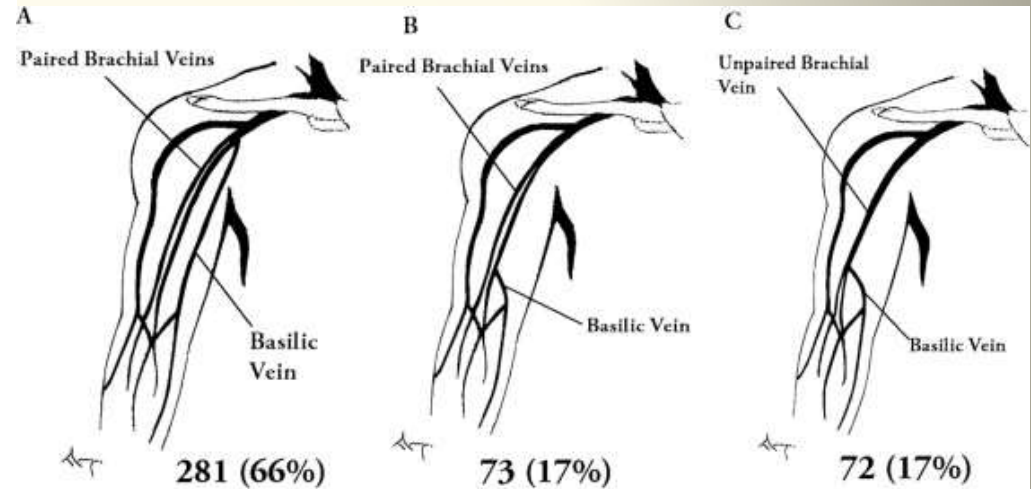
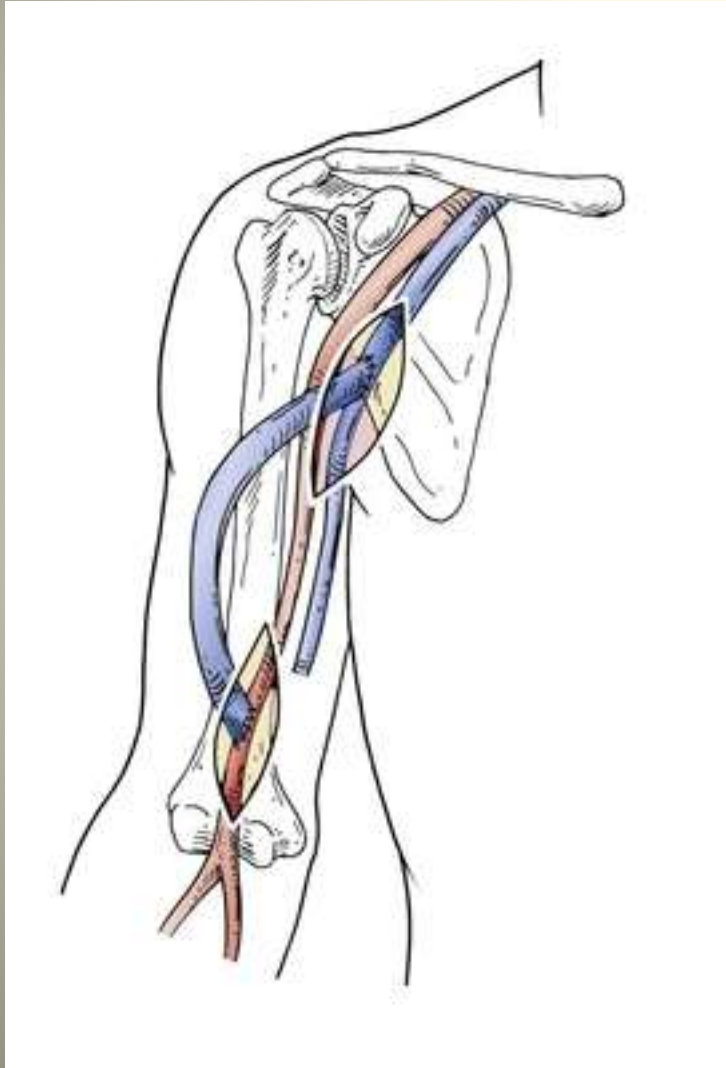
FAV BRACHIO-BASILIQUE



FAV BRACHIO-CEPHALIQUE



TRANSPOSITION DE LA VEINE BRACHIALE



PONTAGE ARTERIO VEINEUX

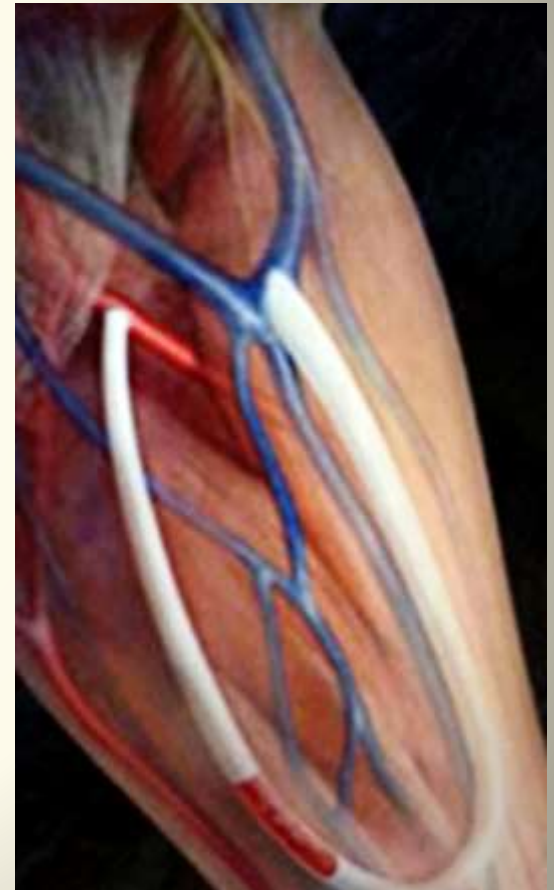
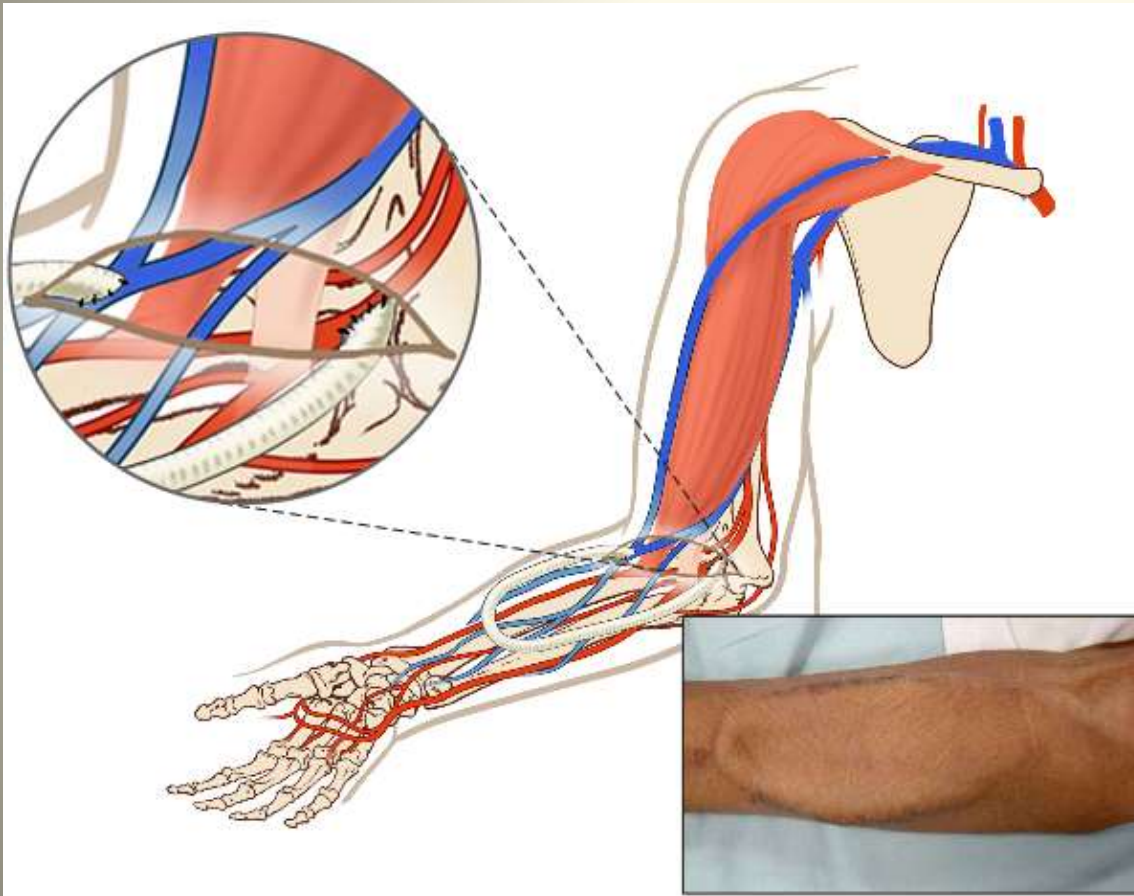
TYPE

- EN LOOP
- EN LIGNE

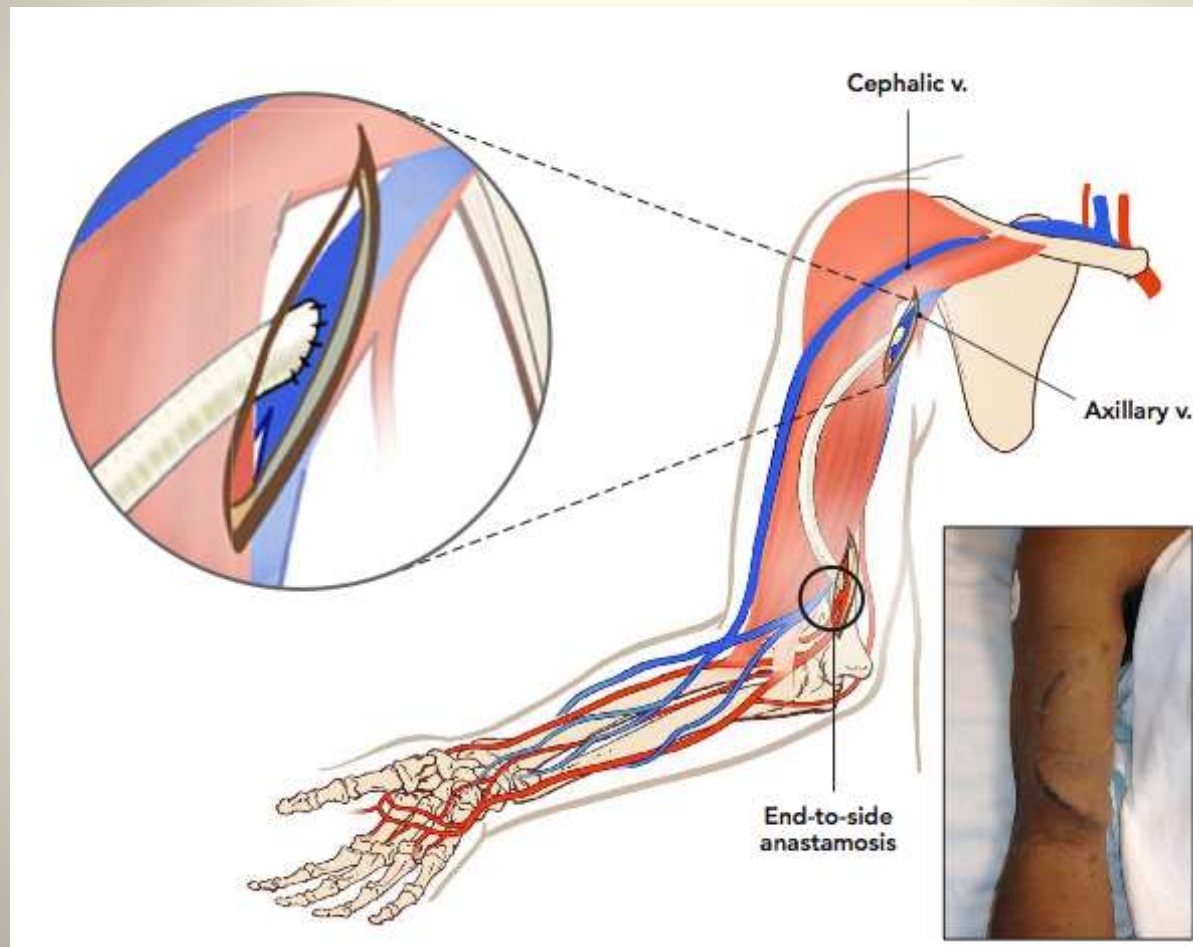
MATERIAUX

- PTFE
- BIO-PROTHESE
Humacyte -Bioprotec

PAV LOOP AVT BRAS



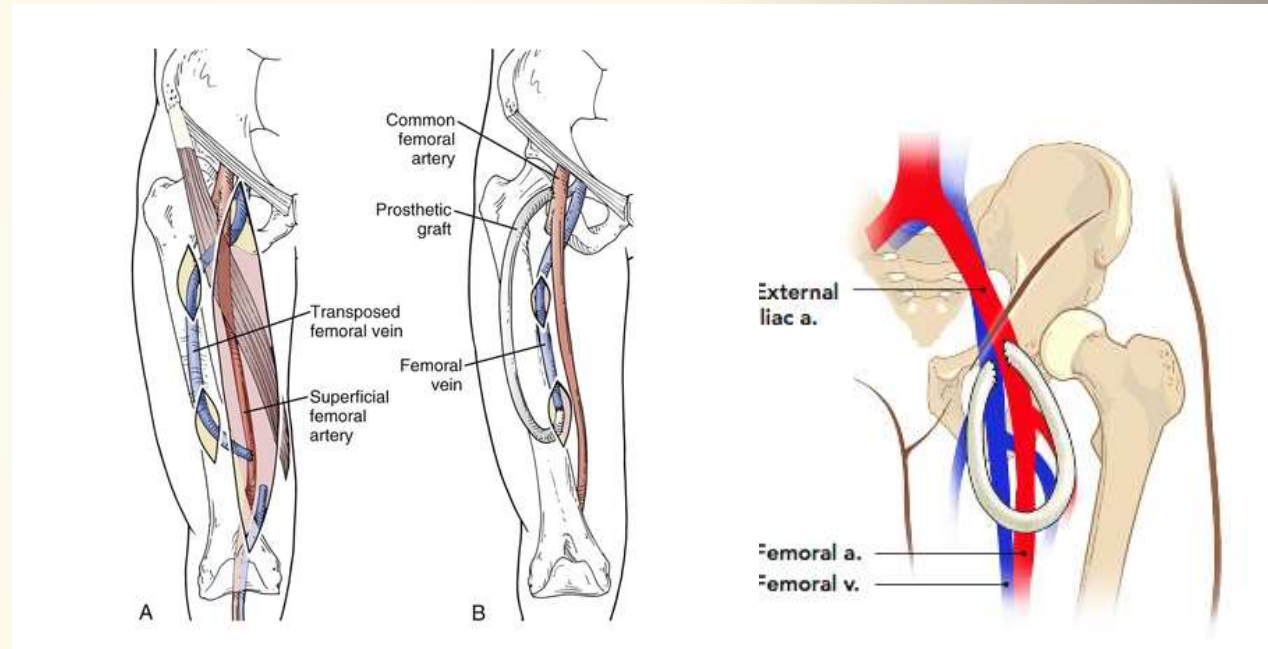
PAV EN LIGNE AU BRAS



FAV et PAV CUISSE

- **TRANSPOSITION VFS**
- **LOOP GVS**
- **PTFE LOOP**
- **PTFE en LIGNE**

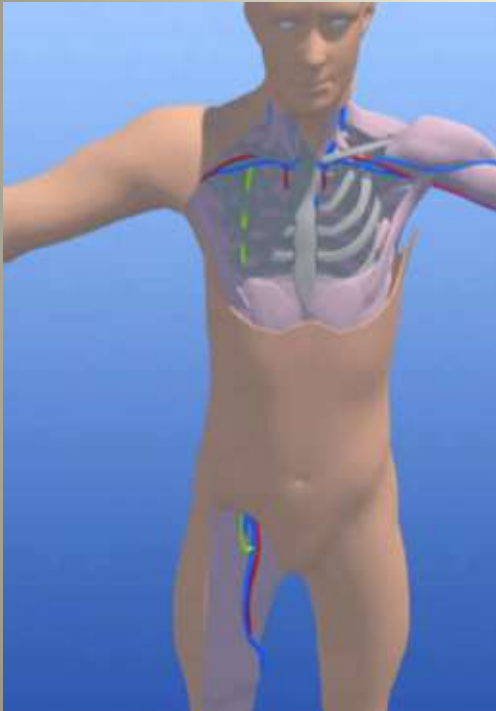
FAV et PAV CUISSE



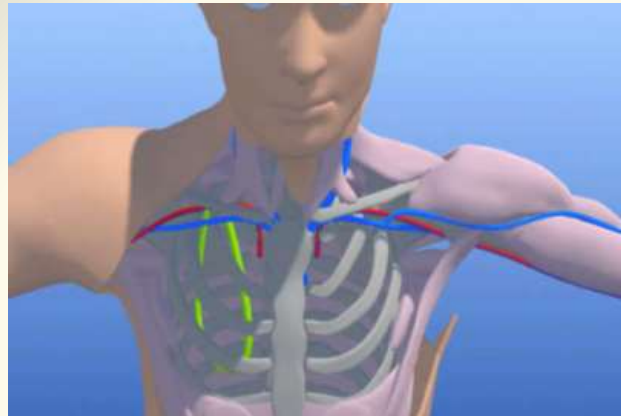
TRANSPOSITION VFS PTFE en LIGNE

PTFE LOOP

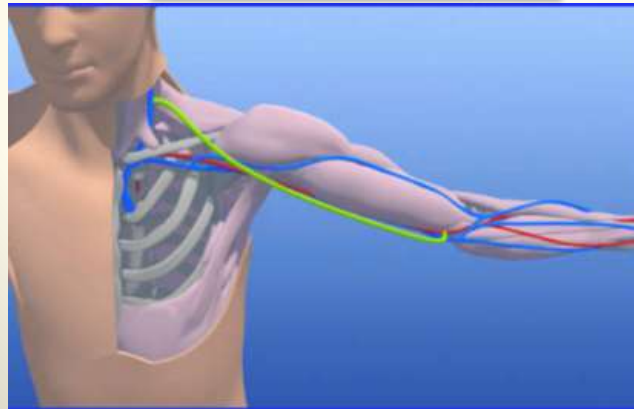
MONTAGES « EXOTIQUES »



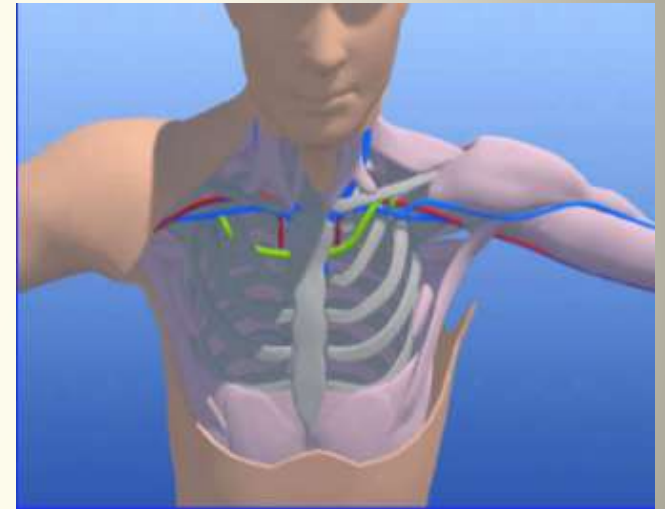
PAF



LOOP AXILLAIRE

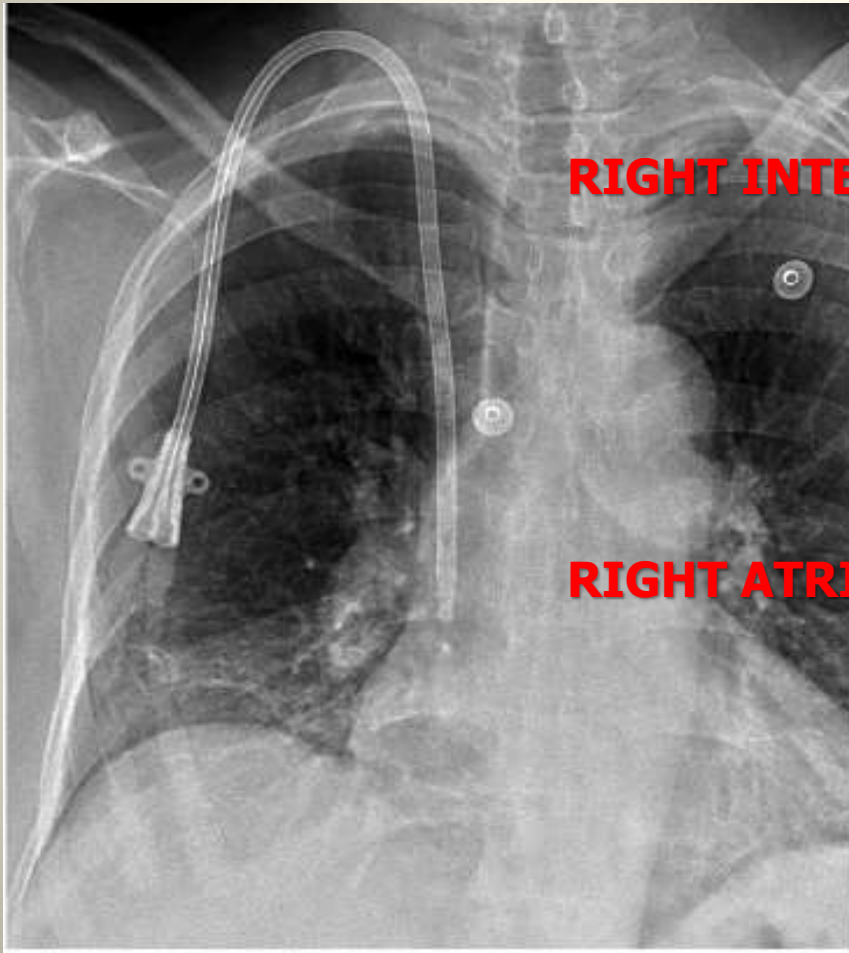


PONTAGE HUMERO JUGULAIRE



PONTAGE INTER AXILLAIRE

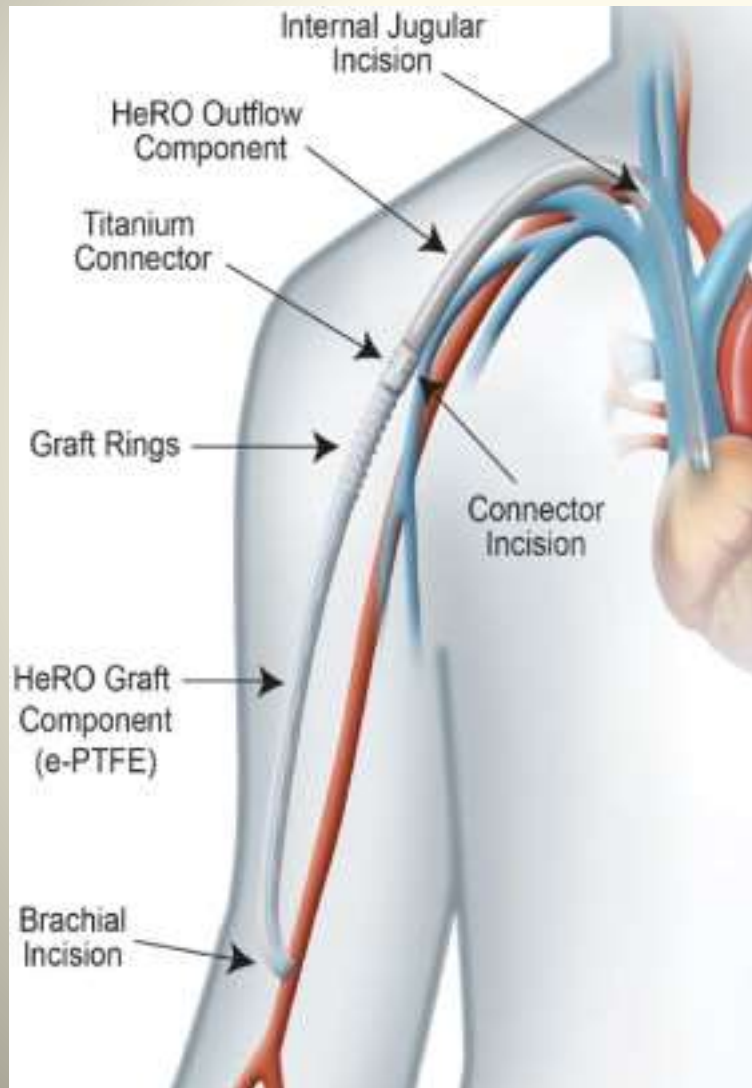
CATHETER TUNELISE



RIGHT INTERNAL JUGULAR VEIN

RIGHT ATRIUM

COMPOSITE



HeRO GRAFT

HEMODIALYSIS RELIABLE OUTFLOW

PROTHESE PREMIER CHOIX

- PAS DE VAISSEAUX NATIFS UTILISABLE
- DIALYSE URGENTE
- INTOLERANCE AU KT
- ATTENTE DE GREFFE PREEMPTIVE
- PATIENT EN FIN DE VIE
- PATIENT A RISQUE D'ECHEC DE MATURATION
- PATIENT AVEC FAV BOUT DE COURSE ET DON'T LE SAUVETAGE OBERE LA SUITE

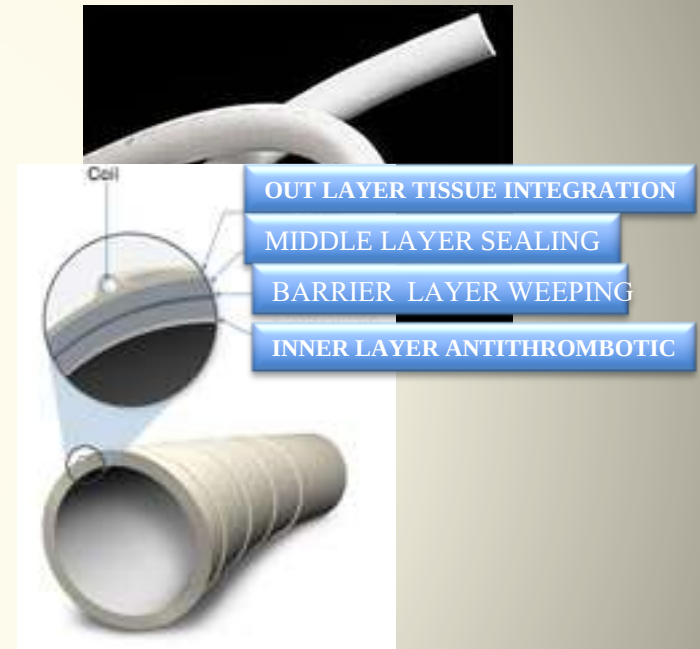
PROTHESE UTILISABLE RAPIDEMENT

- **FACILE A POSER**
- **PIQUABLE EN 24H**
- **BONNE INCORPORATION**
- **NON THROMBOGENE**
- **RESISTANTE A L'INFECTION**
- **FACILE A PIQUER**
- **PAS DE SAIGNEMENT**
- **NE SUINTE PAS**
- **PAS DE FAUX ANEURISME**

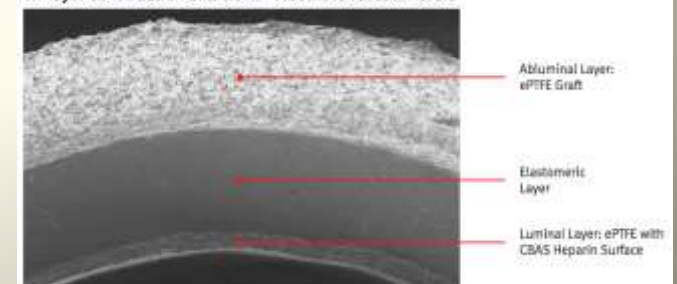
EARLY ACCESS GRAFTS

FLIXENE (Atrium)	ePTFE*	Trilaminate
RAPIDAX (Vascutek)	ePTFE**	Trilaminate
AVFLO (Nicast)	Polyurethane	Nano technologie
ACUSEAL(Gore)	ePTFE*	Trilayer
VECTRA (Thoratec)	Polyurethane ePTFE *	Composite

***:PTFE EXPANSE**



Tri-layer construction of a GORE® ACUSEAL Vascular Graft



EXPLORATION PRINCIPES

ULTRASONOGRAPHIE

- **DOPPLER CONTINU :CW 4 à 10 Mhz**
- **MODE B TEMPS REEL: 3 à 18 Mhz**
- **DUPLEX SCAN**
- **DOPPLER COULEUR ET ENERGIE**
- **TM DOPPLER COULEUR**
- **E-TRACKING**

EXAMEN ECHOGRAPHIE-DOPPLER

Torse nu

Température chaude ($>20^{\circ}\text{C}$)

Position assise avec & sans garrot

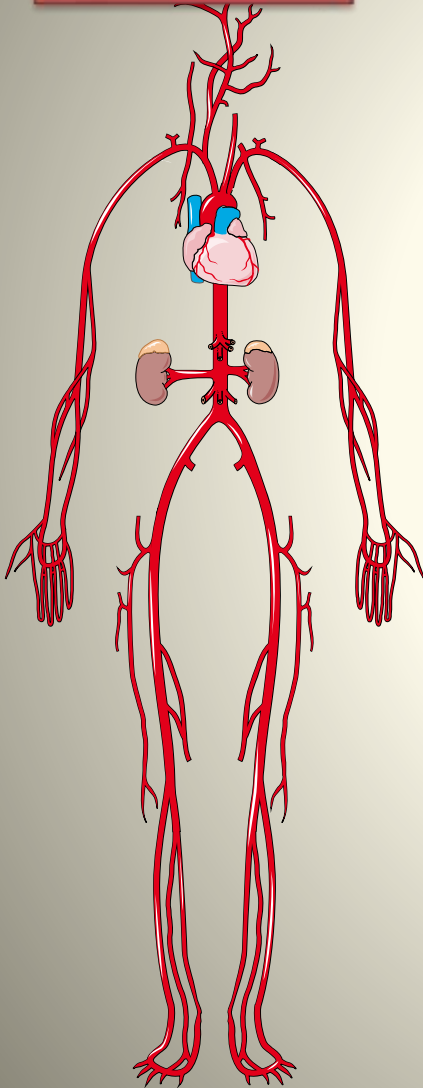


ADJUVANTS

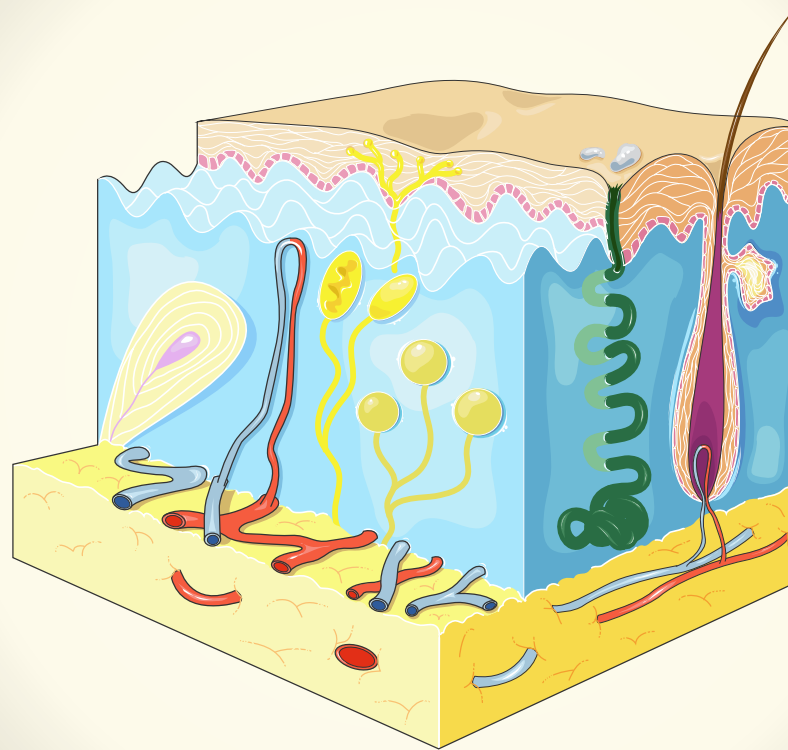
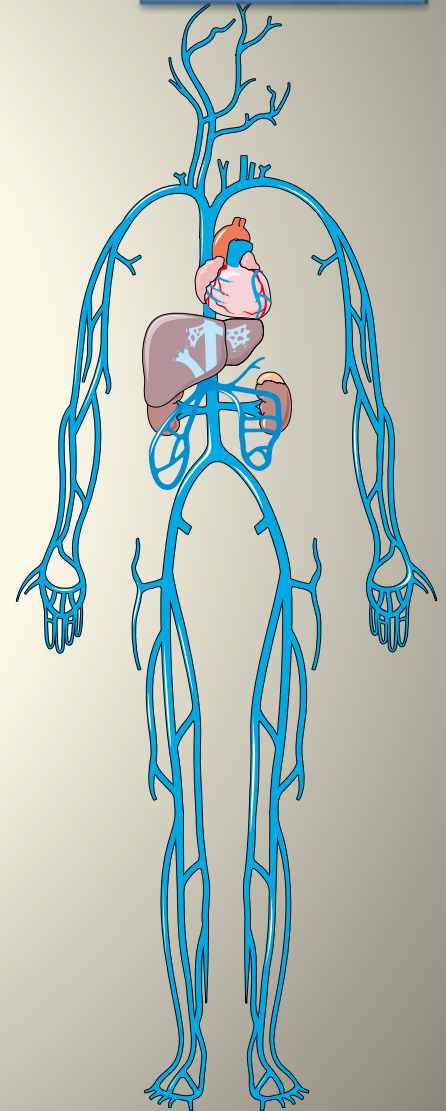


BILAN à 3 VOLETS

ARTERIEL



VEINEUX



PARTIES MOLLES

EXPLORATION ARTERIELLE

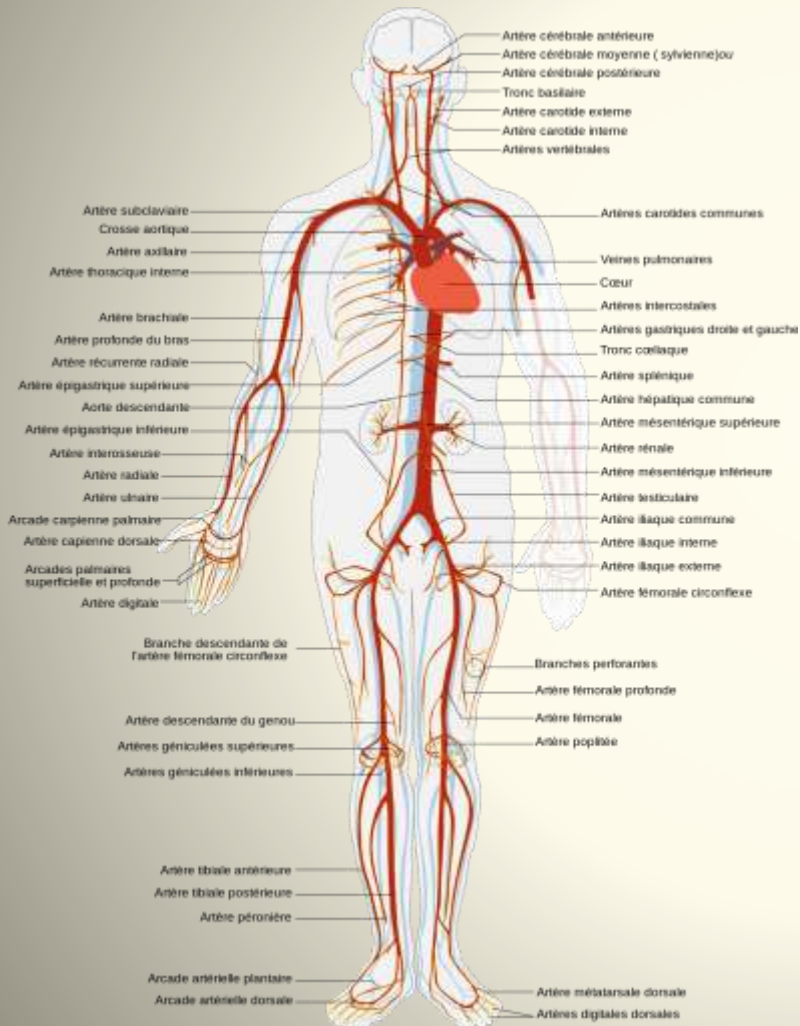
**La maturation d'une FAV nécessite idéalement un réseau artériel en bon état
car**

Le débit de l'artère donneuse doit augmenter de 10 à 30 fois suivant le site d'AAV

Les altérations vasculaires de l'IRC peuvent compromettre la maturation

Ce qui justifie un bilan à adapter aux risques

LES ARTERES



GUIDE PAR LE CONTEXTE:

- AGE
- ORIGINE DE L'IR
- FACTEURS DE RISQUES
- ANTECEDENTS CV
- PRECEDENTS ABORDS

EXPLORATION ARTERIELLE

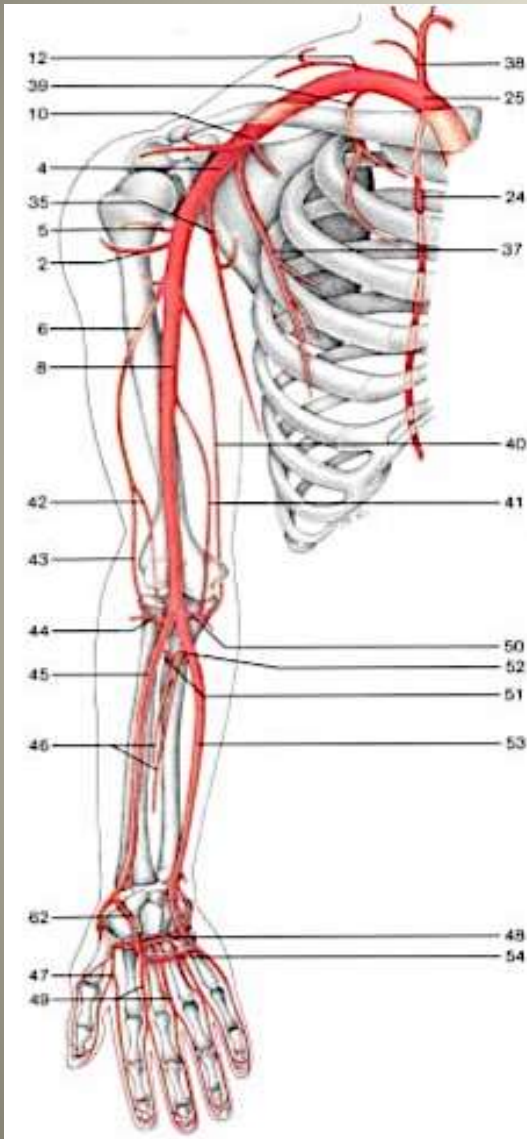
COMPLEMENT DE L'EXAMEN CLINIQUE

- EXPLORATION DE TOUS LES AXES
- ETAT PARIETAL/CALCIFICATIONS
- CALIBRE
- QUANTIFICATION DES STENOSES
- EPREUVES POSITIONELLES
- TEST DE COMPRESSION
- EPREUVES D'HYPERHEMIE

Sensitivity and specificity of US for detection of vascular alterations is near 95%

Wittenberg G Ultraschall Med.1998

BILAN ARTERIEL EXHAUSTIF+++++



PATIENT à RISQUE

- **US DE LA CROSSE JUSQU' AUX ARTERES DIGITALES**
- **PRISE DES PRESSIONS DIGITALES**
- **TEST DE COMPRESSION :ALLEN +/-**
- **TEST D'HYPERHEMIE**

EXPLORATION ARTERIELLE

- **STENOSE**
- **OCCLUSION SEGMENTAIRE**
- **DISSECTION :IATROGENE**
- **ECTASIE**
- **BOUCLE ET KINKING**
- **VARIETES ANATOMIQUES**
- **RECHERCHE D'ARTERITE DIGITALE**
- **CALIBRE ARTERIEL**

VARIATIONS ANATOMIQUES

Double brachial, i.e., superficial and deep: 12 à 15%

Brachialis superficialis superior.

Brachialis inferior.

Superficial and deep reunite.

Superficial continues as the radial,
without anastomosis.
with anastomosis.

Superficial brachial continues as the:

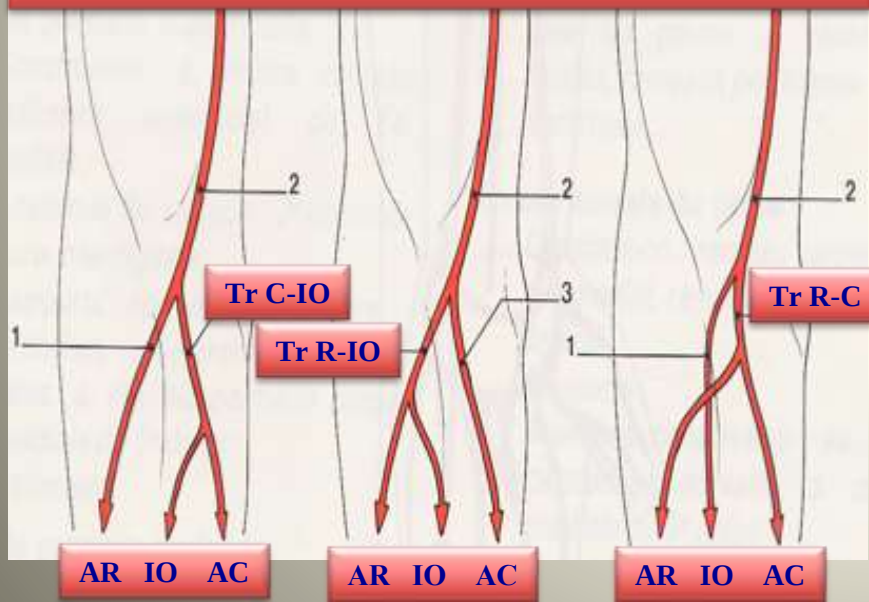
Ulnar,

Median,

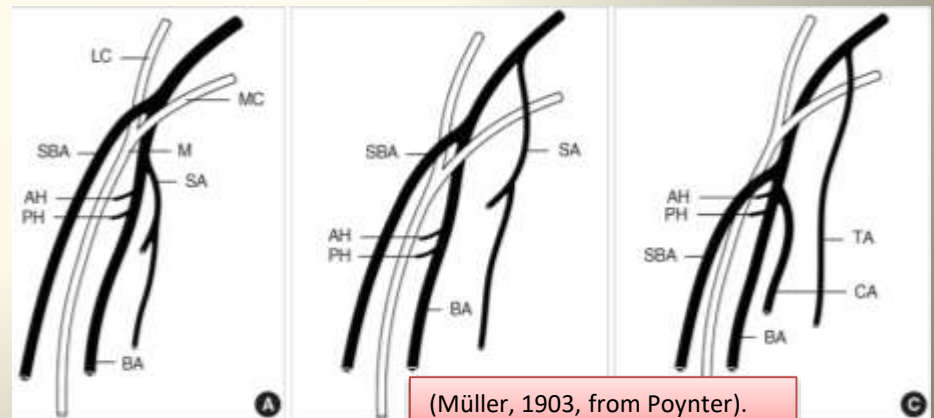
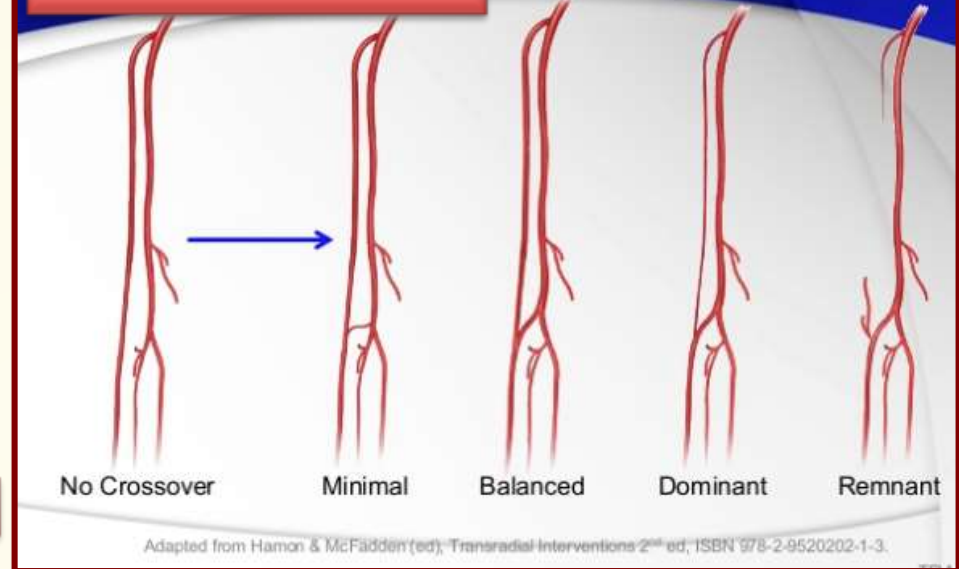
Ulnar and Median.

Superficial brachial as the radial and superficial antibrachial

VARIATION DE DISTRIBUTION des ARTERES MB SUP

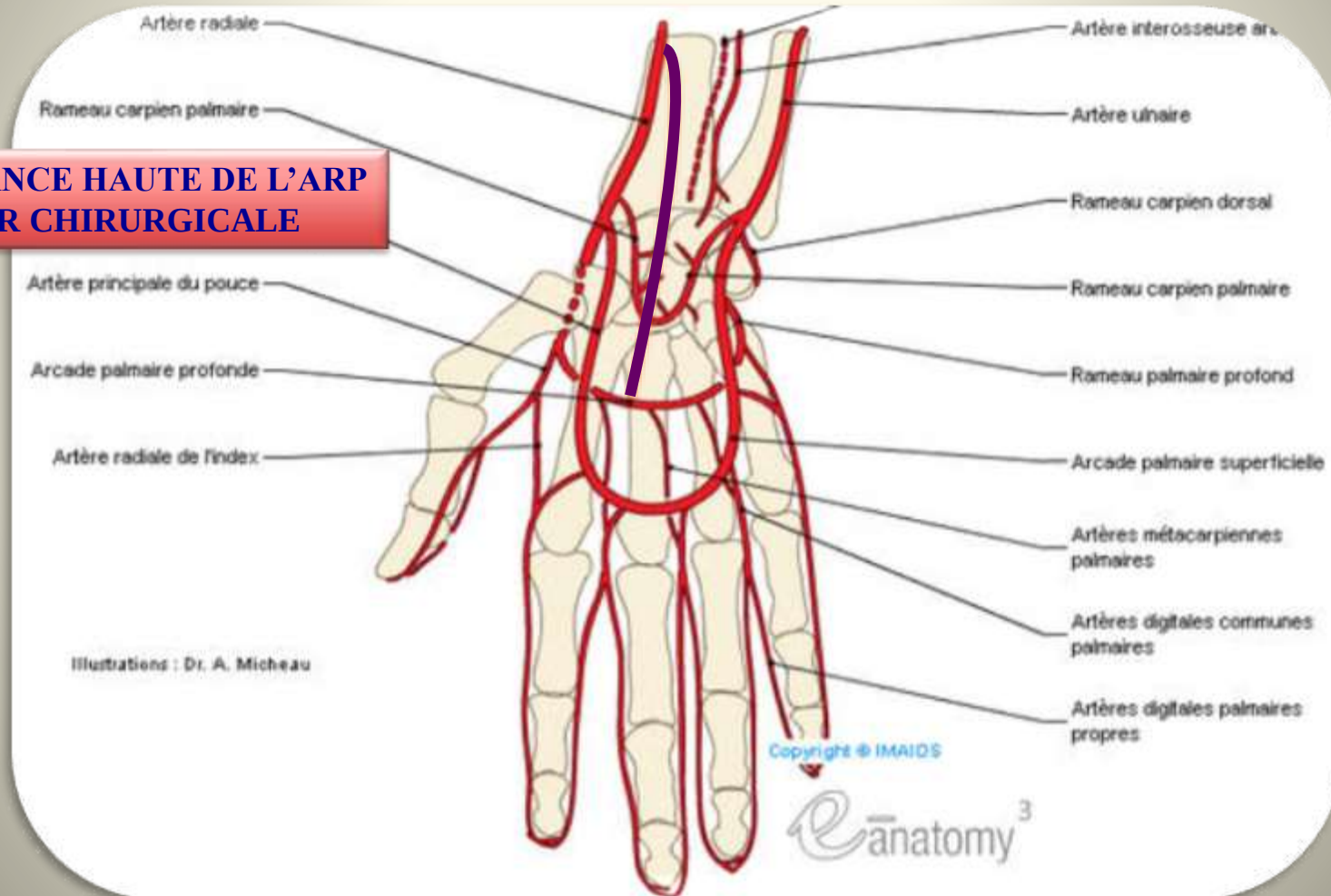


BIFURCATION HAUTE DE AH



VASCULARISATION DE LA MAIN

**NAISSANCE HAUTE DE L'ARP
ERREUR CHIRURGICALE**



ARCADE PALMAIRE SUPERFICIELLE

1. Closed arch 42%



a. "normal" situation as described in textbooks (radioulnar type)
b. medianoulnar type



c. radiomedianoulnar type
d. profundoulnar type (the branch of the radial artery comes from the dorsal side or from the deep palmar arch)

La disposition « normale » ne concerne que 35% des sujets !

36. Superficial palmar arch

75

2. Incomplete arch 58%



a. all four common palmar digital arteries from the ulnar artery
b. the first originates from the radial, the others from the ulnar artery

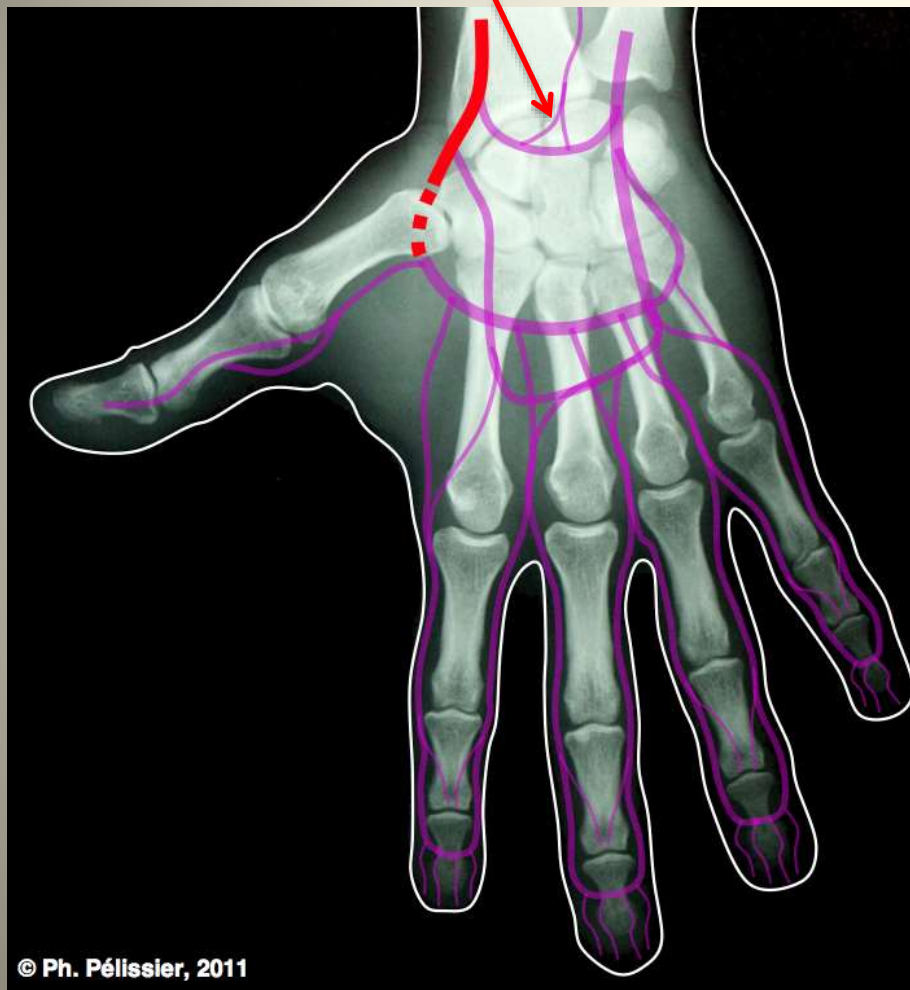


c. the first two common palmar digital arteries originate from the radial, the other two from the ulnar artery
d. the median artery continues as the second common palmar digital artery

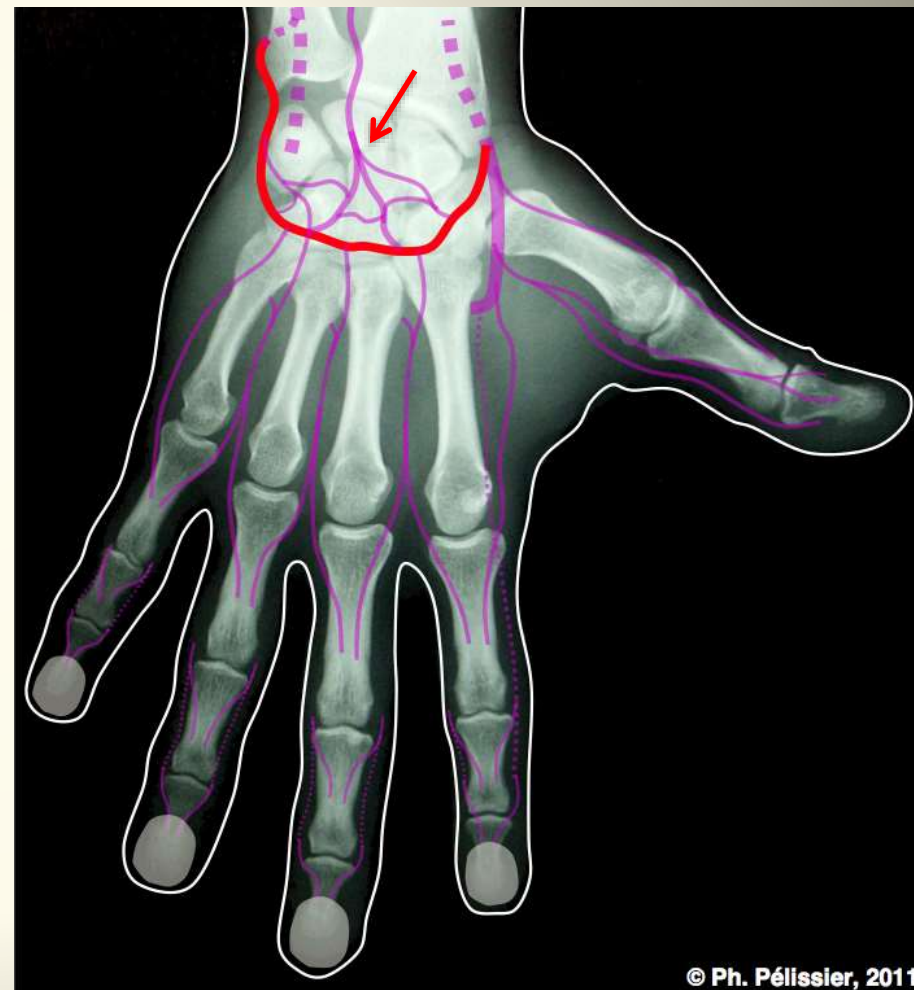


e. the first two common palmar digital arteries are branches of the median artery, the others branch from the ulnar artery

ARCADES ACCESSOIRES

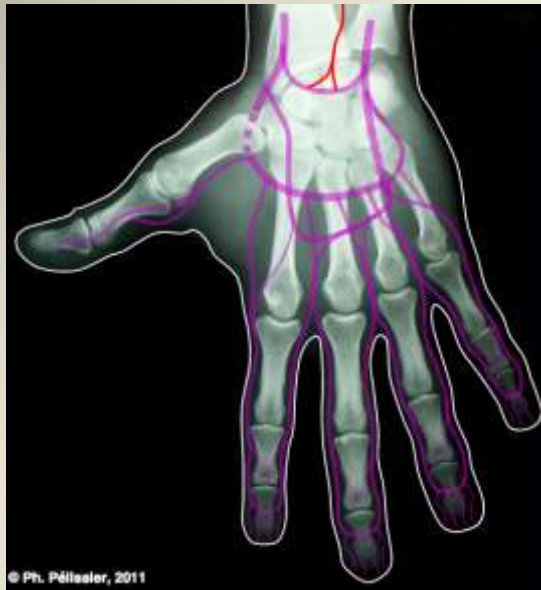


Arcade du Carpe
IO antérieure

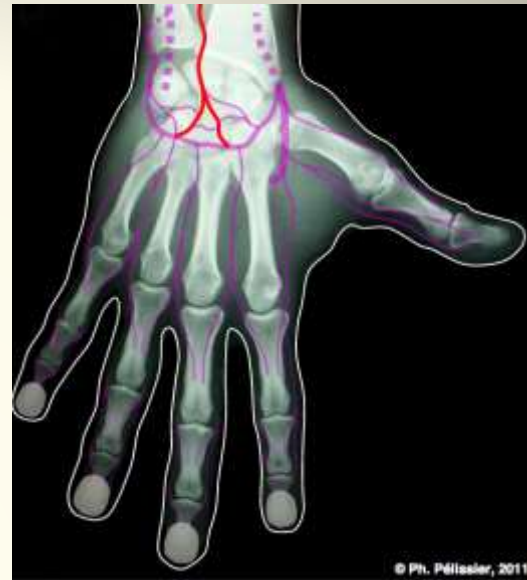


Arcade dorsale
IO postérieure

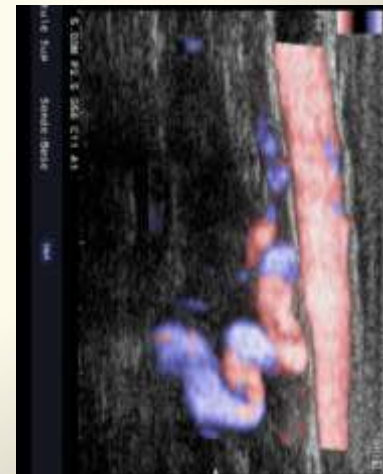
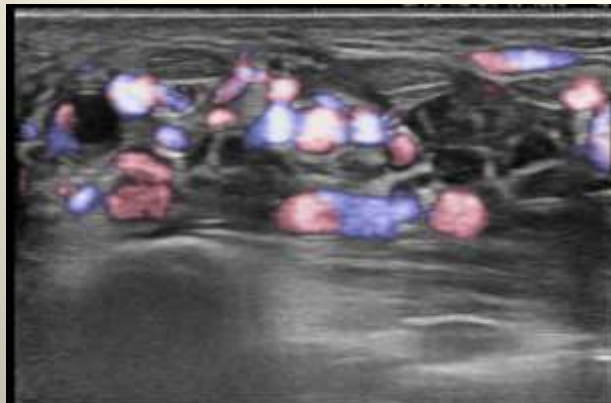
ARCADES DU CARPE



FACE PALMAIRE



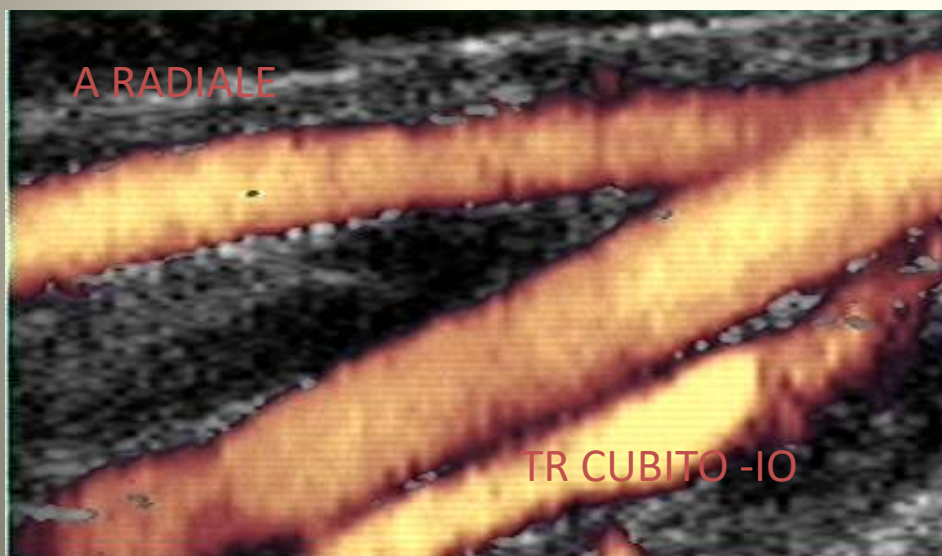
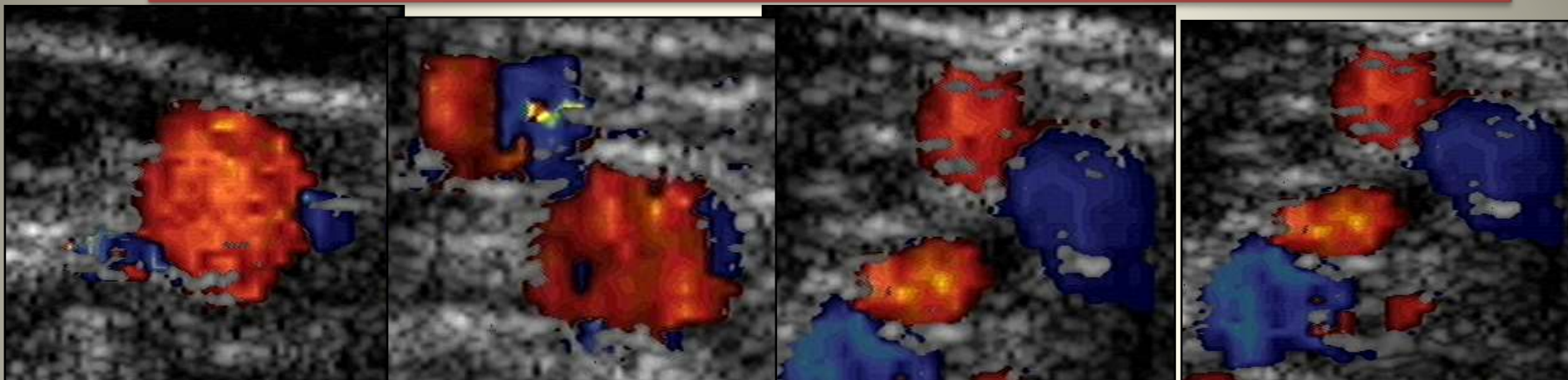
FACE DORSALE



DUPLICATION DE L'ARTERE BRACHIALE

BRAS -----

-----COUDE

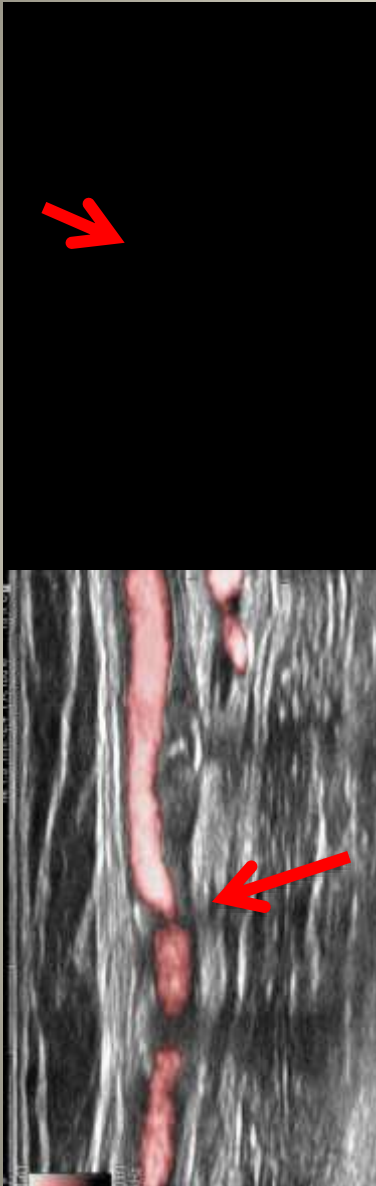


STENOSE



BIFURCATION HAUTE DE L'ARTERE BRACHIALE

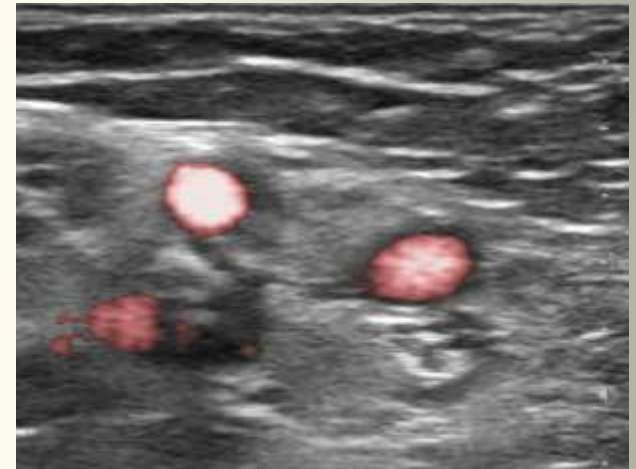
AR PATHOLOGIQUE



COUPE LONGITUDINALE



PLAQUES CALCIFIEES ➔

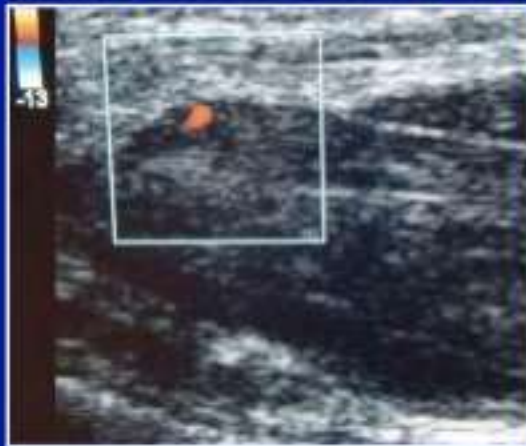


COUPE TRANSVERSALE

L'ARTERE RADIALE
EST TOUJOURS LA
PLUS SUPERFICIELLE

TEST D'ALLEN SOUS US

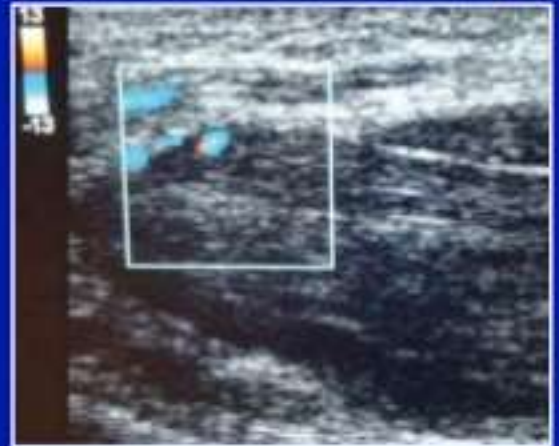
**Color Doppler
of palmar artery**



**Occlusion of radial artery
while imaging arch**



**Reversed flow
Flow via ulnar artery**



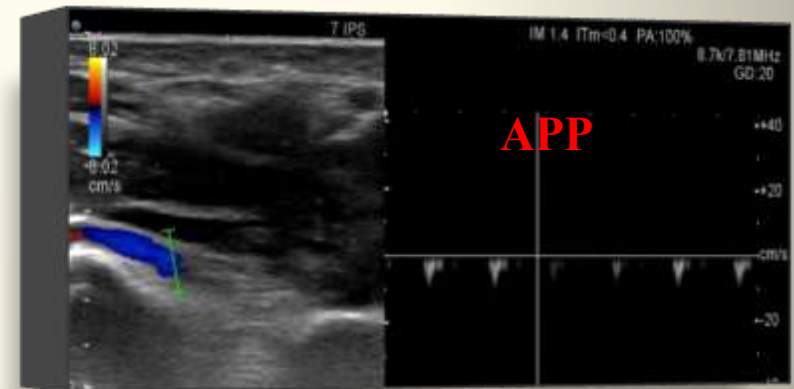
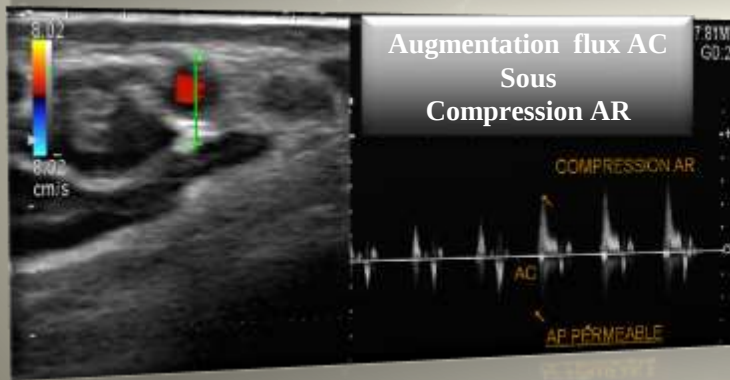
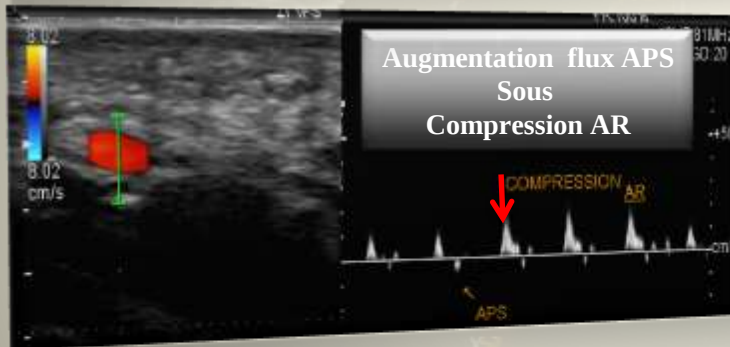
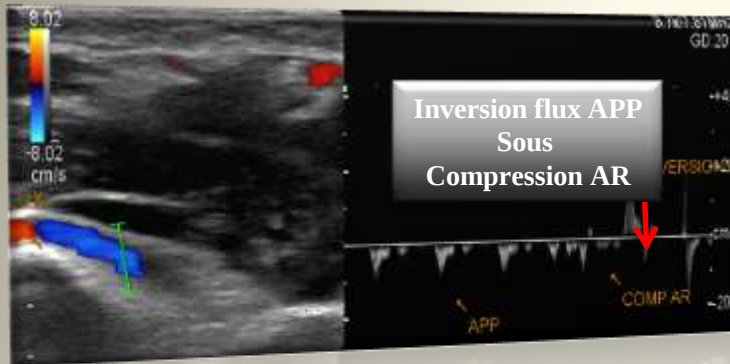
US may may improve accuracy of Allen's test

First reported in 1973

Mozersky DJ et al. Am J Surg. 1973 ; 126 : 810 – 812.

Levitov A et. Critical care ultrasonography. McGraw-Hill Medical, NY, USA, 2009.

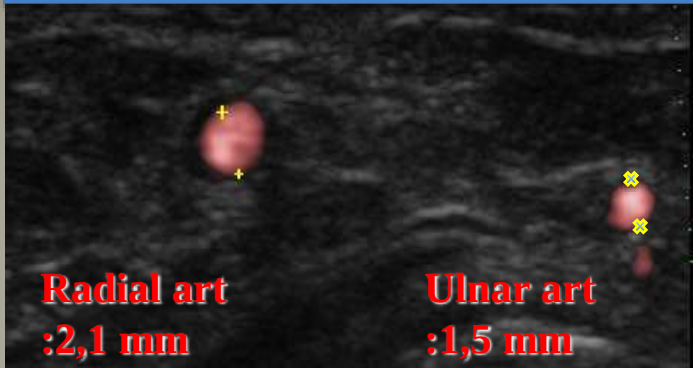
TEST REACTIVITE DES ARCADES PALMAIRES



Inversion flux APP
Sous
Compression AR

DIAMETRE ARTERIEL

DIAMETRE
intima à intima



WONG	1998	>1.6 mm
LEMSON	1998	>2.3 mm
SILVA	1998	>2.0mm
BRIMBLE	2001	>1.5mm
MALOVRTH	2002	>1.6mm
BOURQUELOT	2010	1mm

MAIS

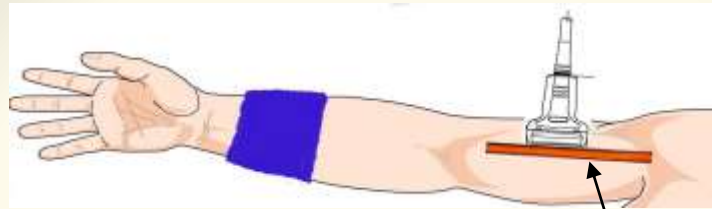
LE DIAMETRE N'EST PAS TOUT

SOUPLESSE et CAPACITE VASOMOTRICE +++++

FLOW MEDIATED DILATATION :FMD

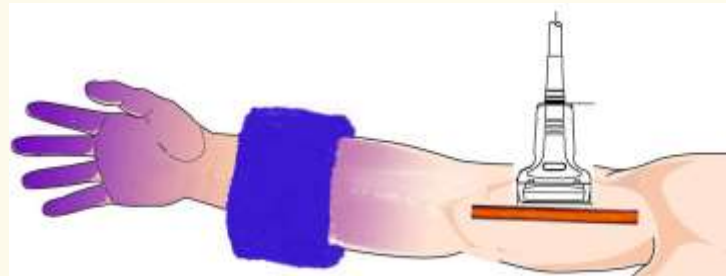
Réponse post ischémique traduit la résistance artériolaire médiée par le NO

Baseline



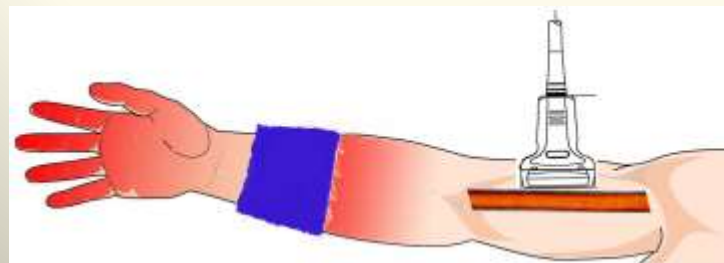
200mmHg ou >50mmHg PA

Cuff inflation



5 minutes

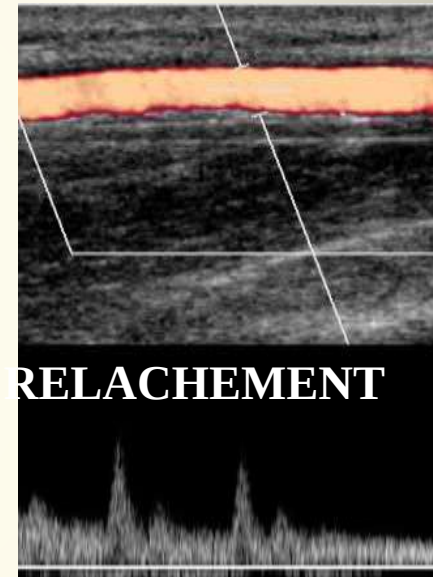
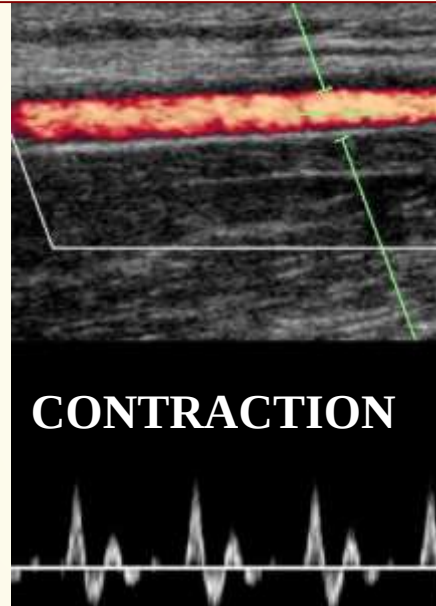
Release Cuff



**Etude des flux Doppler:IR
Calibre arteriel**

RESPONSE VASO DILATATRICE

- TEST D'EFFORT
- HYPEHEMIE POST ISCHEMIQUE SOUSGARROT
- HOT PACK
- NITROGLYCERINE:0,4 mg sub lingual



RI of 0.7 after release of the fist indicates that arterial blood flow will not increase sufficiently so that the chance of successful creation of an AVF is reduced

Malovrh M. Am J Kidney Dis 2002

Negative impact of preexisting intimal hyperplasia

Kim YO, Am J Kidney Dis 2003.

Reactive hyperemia after exercise or after application of hot pack

Parmar J, ejvs.2006

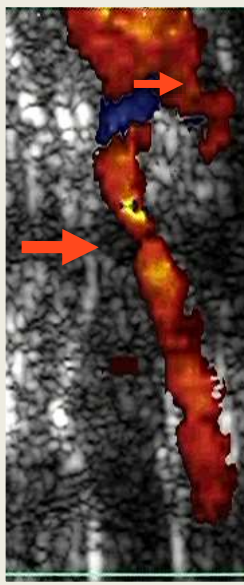
Allon M Kidney Int. 2001

LESIONS ATHEROMATEUSES

ST MODEREE

BR ART

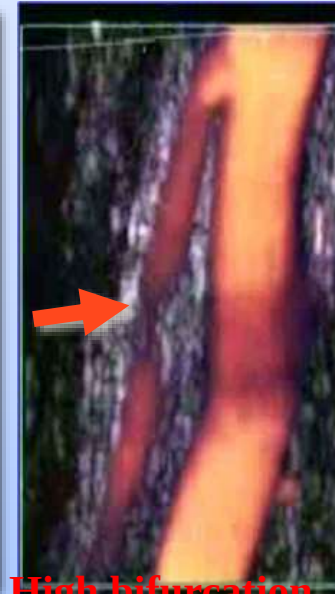
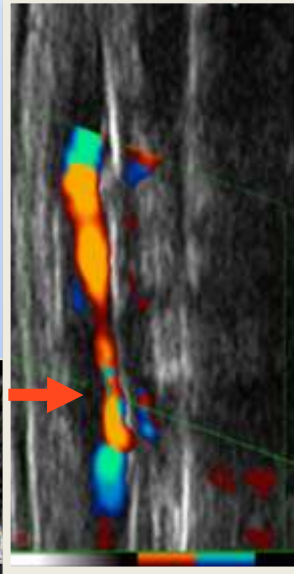
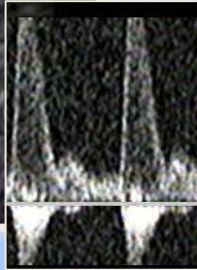
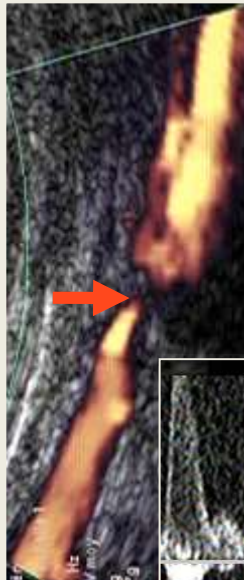
RAD ART



STENOSE SERREE

BR ART

RAD ART



OCCCLUSION ARTERIELLE

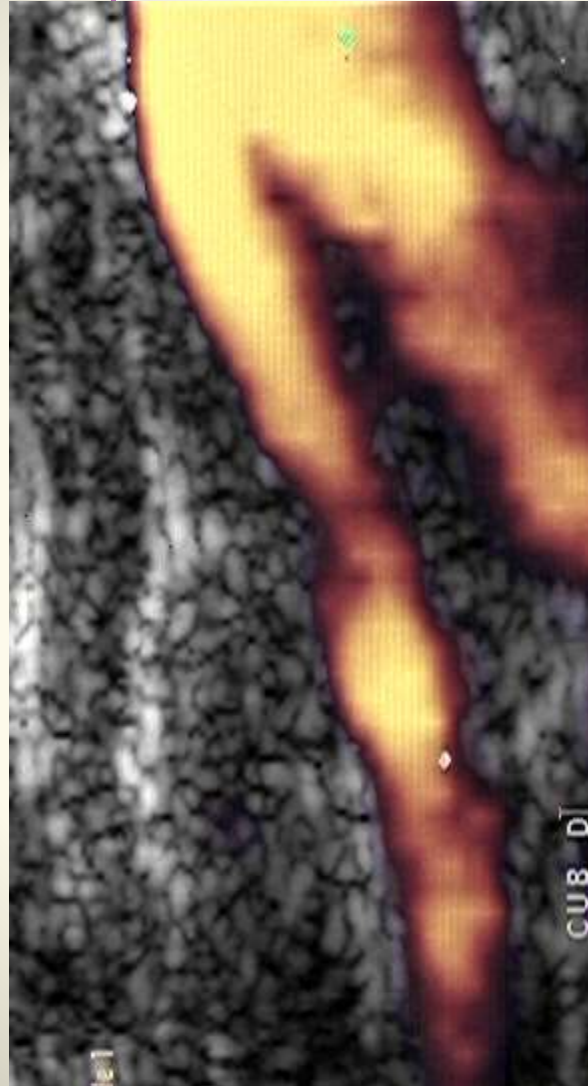
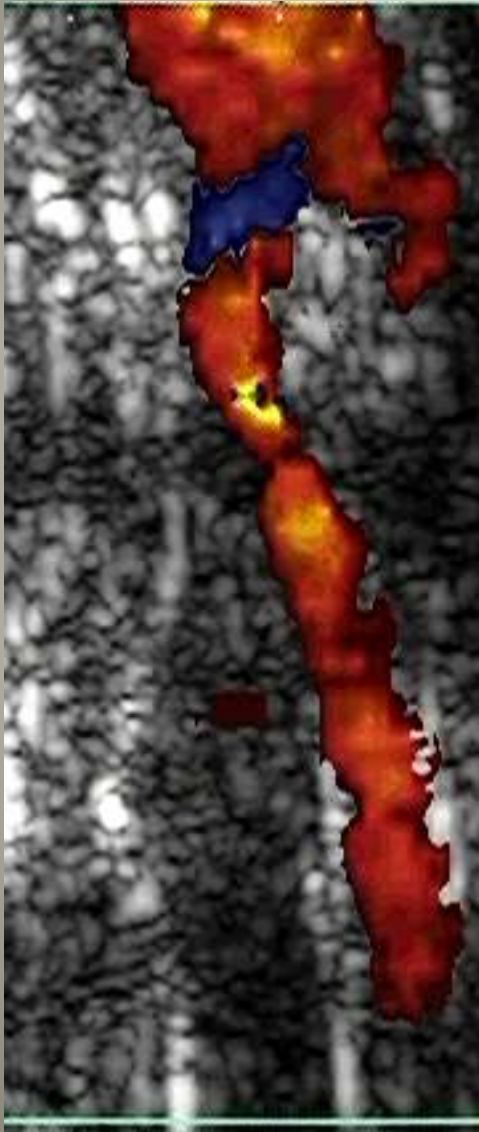


LES CALCIFICATIONS AUGMENTENT DE LA RACINE AUX EXTREMITES

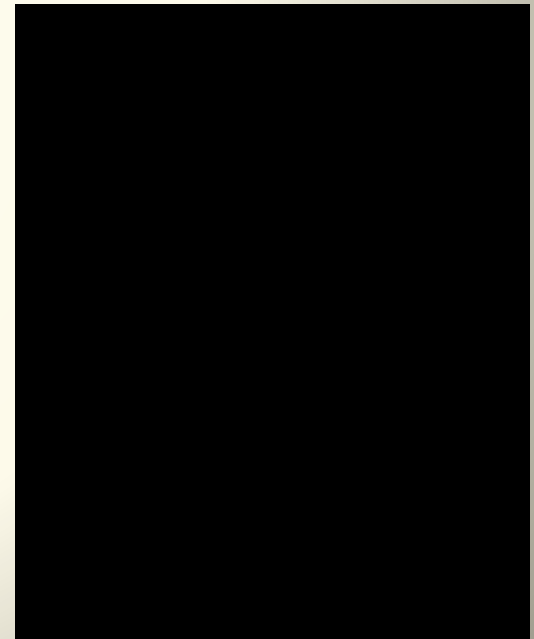
LES LESIONS ARHEROSCLEREUSES PREDOMINENT AU TIERS DISTAL DE L'AVANT BRAS

STENOSE FOCALISEE/ STENOSE DIFFUSE

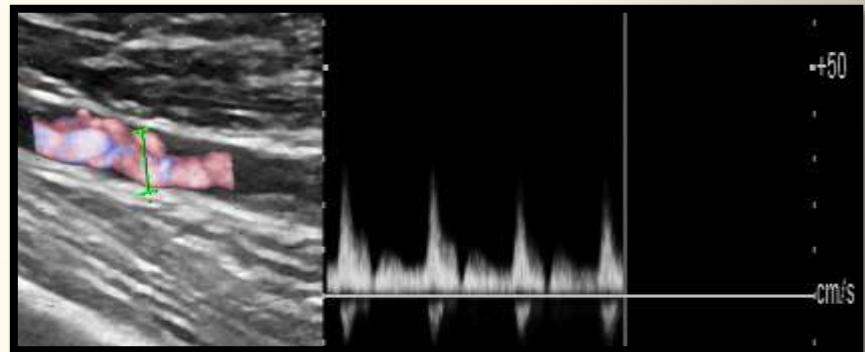
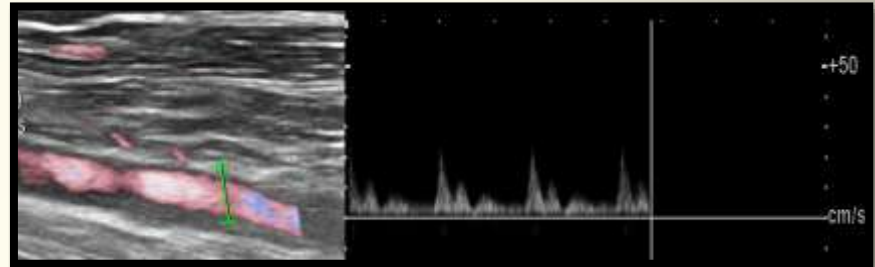
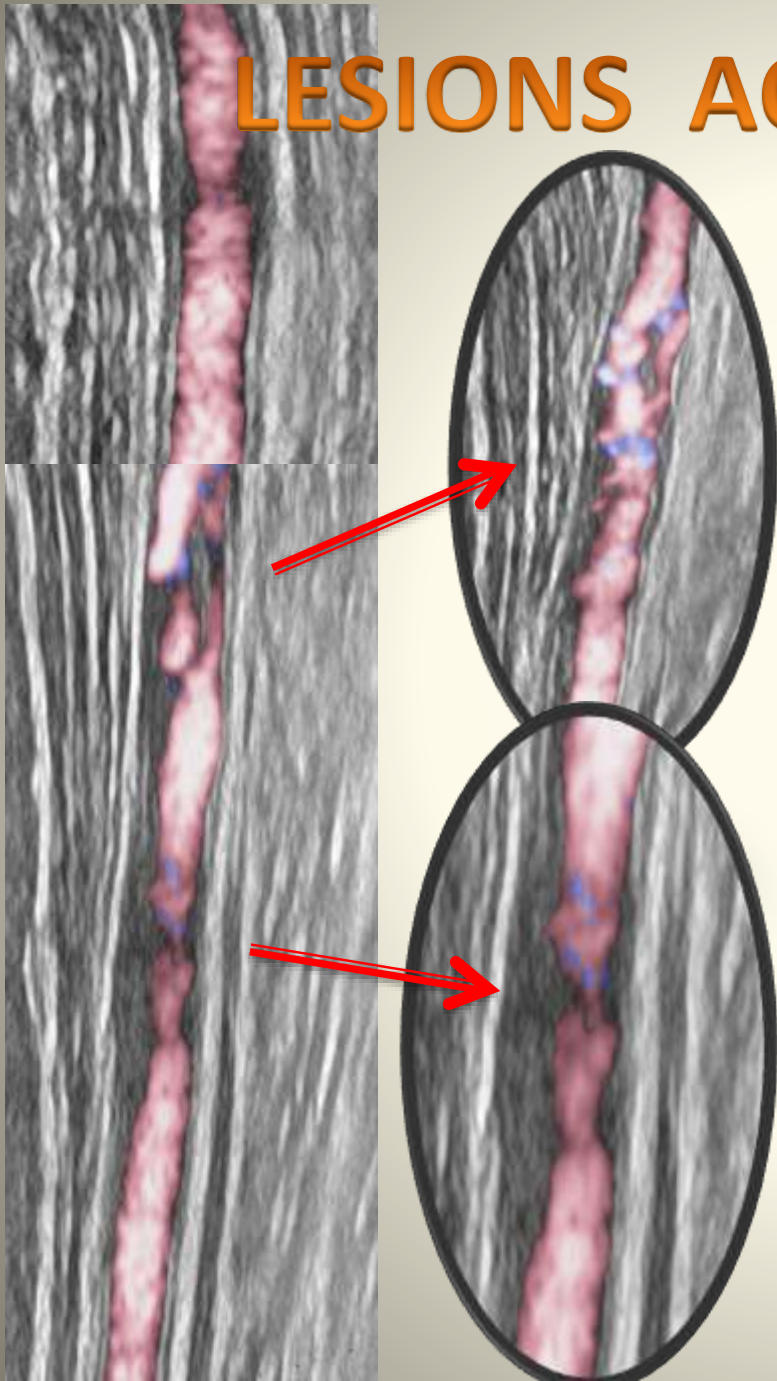
STENOSE 50/60% ARTERE CUBITALE



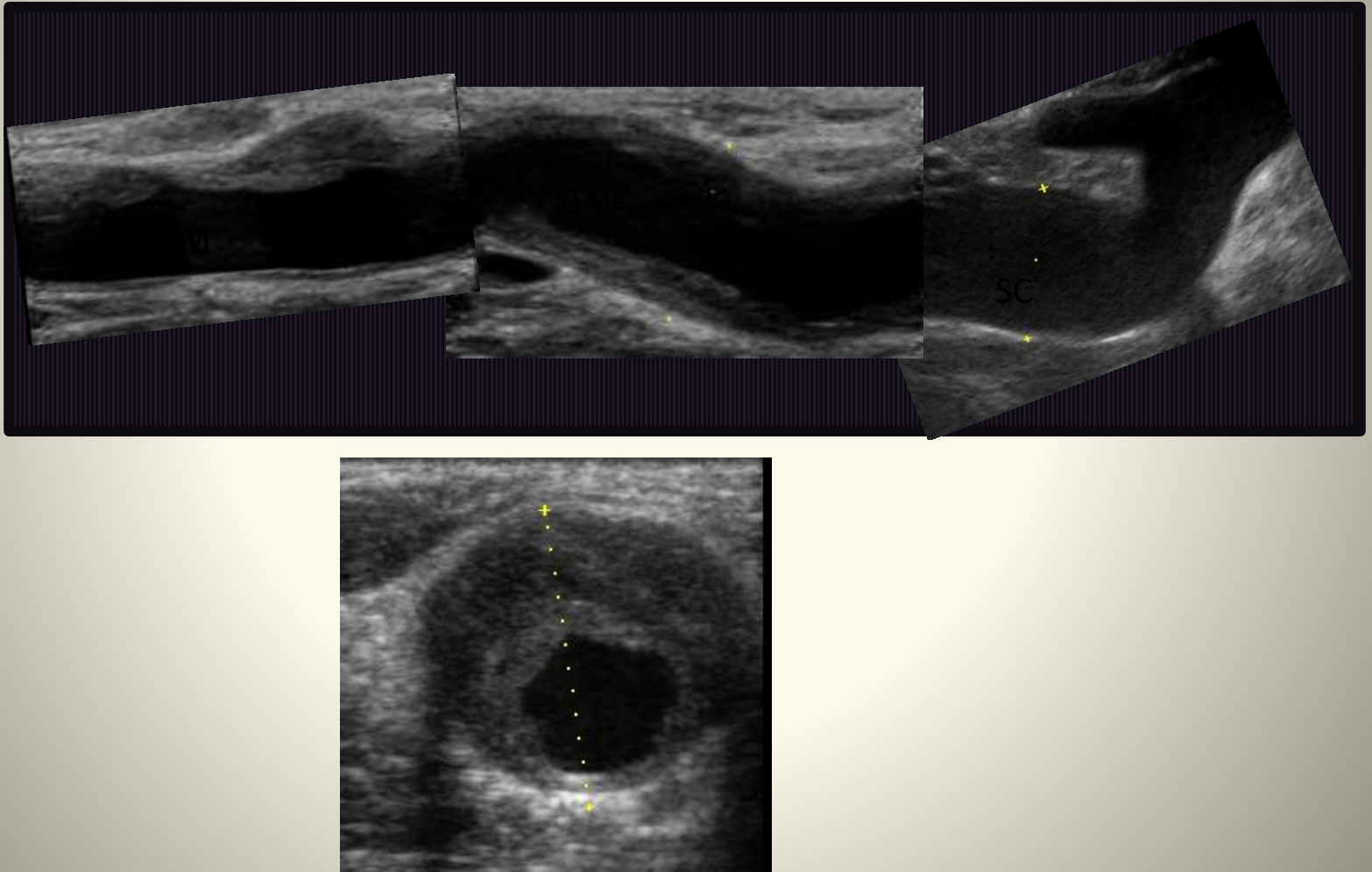
STENOSE DIFFUSE
1/3 DISTL AR



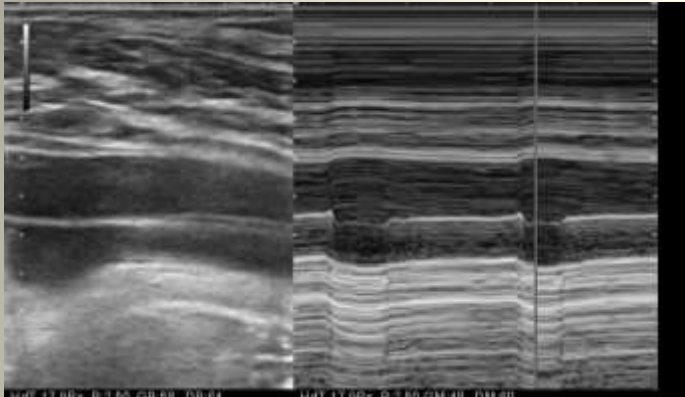
LESIONS AC ASYMPTOMATIQUE



DEGENERESCENCE ANEURISMALE

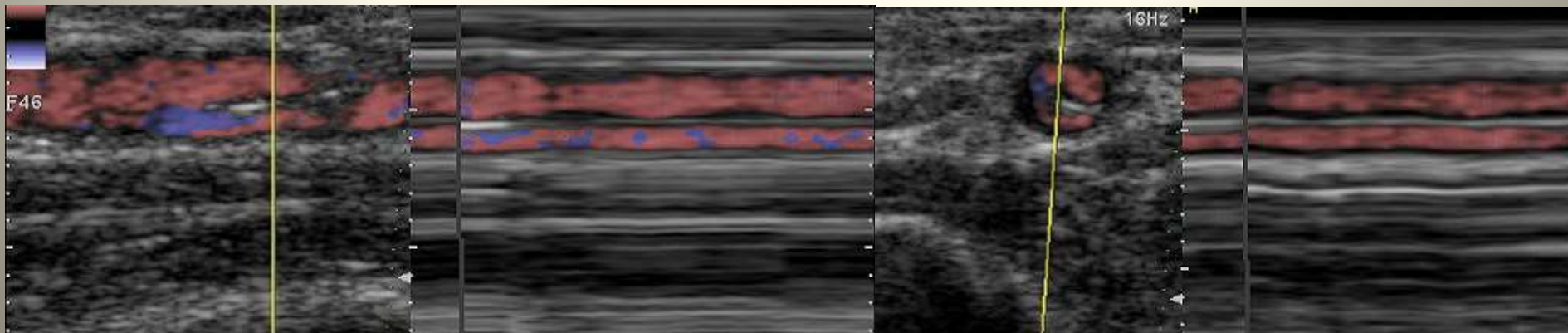


DISSECTION HUMERALE



MODE B /TM

**POST KT/CORO/ATL
TM+++++**



TM DOPPLER COULEUR

**ISCHEMIE
et
ABORDS VASULAIRES**

ETIOLOGIES DES ISCHÉMIES DIGITALES

OVERLAP AVEC ETIOLOGIE DE IR

- 1) Prises médicamenteuses
- 2) Maladies vibratoires et trauma répétés
- 3) Maladies systémiques et connectivites
 - Sclérodermie, CREST, Sjögren, Sharp, Dermatomyosite, LED, Cryoglobulinémie
- 4) Artérite distale juvénile (tabac+++)
- 5) Sd du défilé cervicothoracique
- 6) Sd d'hyperviscosité, Sd myeloprolifératifs, Thrombophilie...
- 7) Iatrogènes : KT artériels, **Fistules**
- 8) Causes cardiogéniques (embolies distales)
- 9) Causes infectieuses
- 10) Cancer



PRISE DES PRESSIONS DIGITALES

PRESSIONS DIGITALES

Fondamentales dans le diagnostic de l'ischémie main

Evaluation du risque ischémique

Mesure au troisième doigt ipsilatéral à l'accès vasculaire

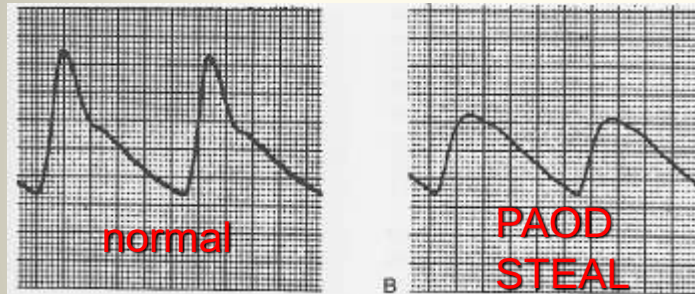
Photopléthysmographie à IR

Laser Doppler

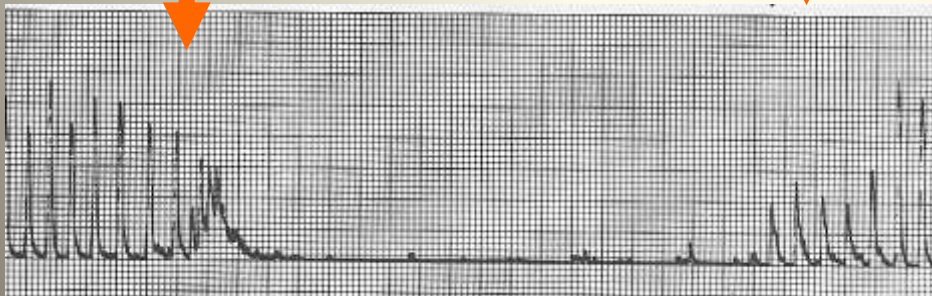
PLETHYSMOGRAPHIE/PHOTOPLETHYSMOGRAPHIE

La PPG grâce à une cellule photoélectrique (capteur) détecte les variations du flux sanguin dans la circulation cutanée.

Prise de pression

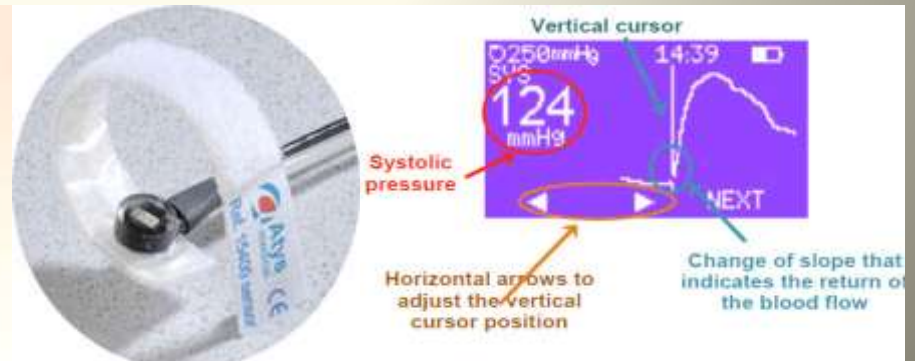
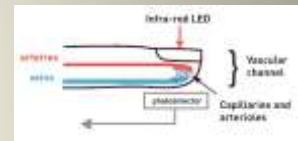


Prise de pression



PHOTOPLETHYSMOGRAPHY (PPG) OPERATING METHOD

- Light from LED is directed towards the skin where it is absorbed and scattered in tissues
- Detect blood volume changes in the microvascular bed
- Photosensor is placed on the distal pad of the finger detects the backscattered light
- Occlusion cuff inflated automatically is wrapped on the proximal part of the finger
- Deflated slowly at a controlled rate.
- During deflation, resumption of blood flow downstream from the cuff is detected by the PPG sensor



PARAMÈTRES DE PRESSION ÉTUDIÉS

(BDP) :BASAL DIGITAL PRESSURE

(DBI) :DIGITAL BRACHIAL INDEX

< 0,7

Sensibilité 90/100% pour le diagnostic positif d'artériopathie

PRISE DE PRESSION SOUS TEST D'ALLEN :FAV AU POIGNET

PRESSION DIGITALE/DBI

		Pression systolique à l'orteil (mmHg)																				
		30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190				
Pression humérale (mmHg)	230	0,13	0,17	0,22	0,26	0,30	0,35	0,39	0,43	0,48	0,52	0,57	0,61	0,65	0,70	0,74	0,78	0,83	230			
	220	0,14	0,18	0,23	0,27	0,32	0,36	0,41	0,45	0,50	0,55	0,59	0,64	0,68	0,73	0,77	0,82	0,86	220			
	210	0,14	0,19	0,24	0,29	0,33	0,38	0,43	0,48	0,52	0,57	0,62	0,67	0,71	0,76	0,81	0,86	0,90	210			
	200	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	200			
	190	0,16	0,21	0,26	0,32	0,37	0,42	0,47	0,53	0,58	0,63	0,68	0,74	0,79	0,84	0,89	0,95	1,00	190			
	180	0,17	0,22	0,28	0,33	0,39	0,44	0,50	0,56	0,61	0,67	0,72	0,78	0,83	0,89	0,94	1,00	1,06	180			
	170	0,18	0,24	0,29	0,35	0,41	0,47	0,53	0,59	0,65	0,71	0,76	0,82	0,88	0,94	1,00	1,06	1,12	170			
	160	0,19	0,25	0,31	0,38	0,44	0,50	0,56	0,63	0,69	0,75	0,81	0,88	0,94	1,00	1,06	1,13	1,19	160			
	150	0,20	0,27	0,33	0,40	0,47	0,53	0,60	0,67	0,73	0,80	0,87	0,93	1,00	1,07	1,13	1,20	1,27	150			
	140	0,21	0,29	0,36	0,43	0,50	0,57	0,64	0,71	0,79	0,86	0,93	1,00	1,07	1,14	1,21	1,29	1,36	140			
	130	0,23	0,31	0,38	0,46	0,54	0,62	0,69	0,77	0,85	0,92	1,00	1,08	1,15	1,23	1,31	1,38	1,46	130			
	120	0,25	0,33	0,42	0,50	0,58	0,67	0,75	0,83	0,92	1,00	1,08	1,17	1,25	1,33	1,42	1,50	1,58	120			
	110	0,27	0,36	0,45	0,55	0,64	0,73	0,82	0,91	1,00	1,09	1,18	1,27	1,36	1,45	1,55	1,64	1,73	110			
	100	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00	1,10	1,20	1,30	1,40	1,50	1,60	1,70	1,80	1,90	100			
	90	0,33	0,44	0,56	0,67	0,78	0,89	1,00	1,11	1,22	1,33	1,44	1,56	1,67	1,78	1,89	2,00	2,11	90			

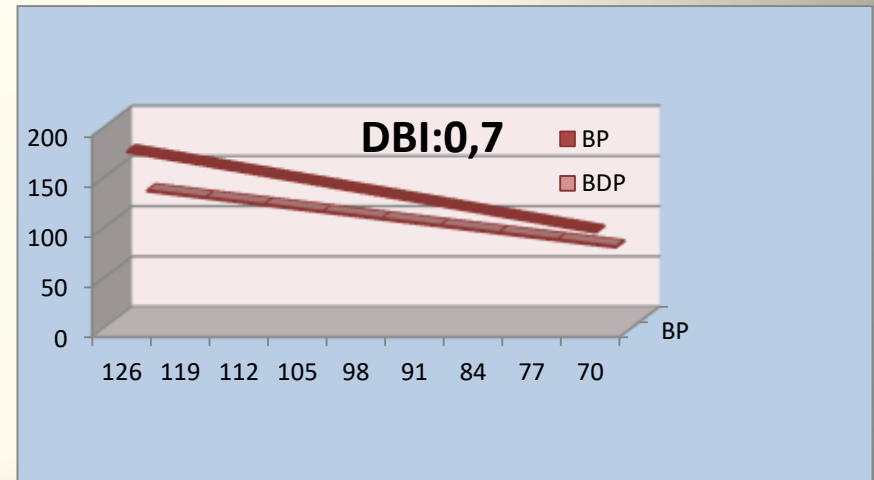
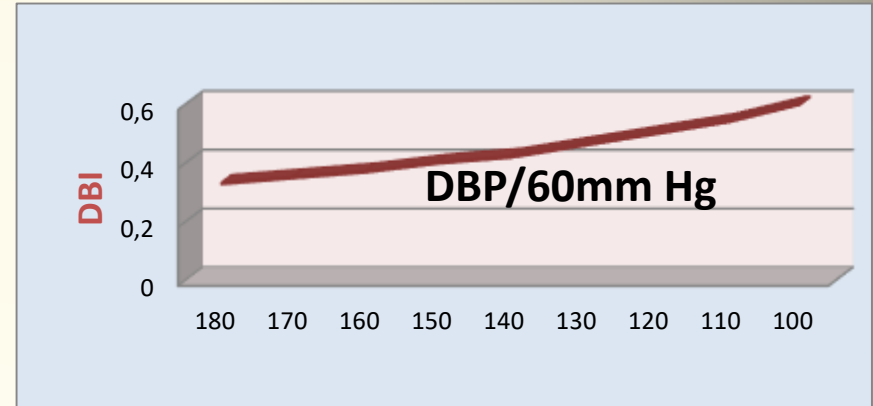
DBI :PERTE DE CHARGE

ISCHEMIE CRITIQUE
BDP < 30mmHg

	IPSO < 0,64 pathologique
	IPSO = 0,64 - 0,7 valeur limite
	0,7 < IPSO < 1 Normal
	IPSO > 1 Risque de médiacalcosse

CORRELATION BDP/DBI/BP

BLOOD PRESSURE mm Hg	BDP mm Hg	DBI	BDP mm Hg	DBI
180	60	0,33	126	0.7
170	60	0,35	119	0.7
160	60	0,37	112	0.7
150	60	0,4	105	0.7
140	60	0,42	98	0.7
130	60	0,46	91	0.7
120	60	0,5	84	0.7
110	60	0,54	77	0.7
100	60	0,6	70	0.7

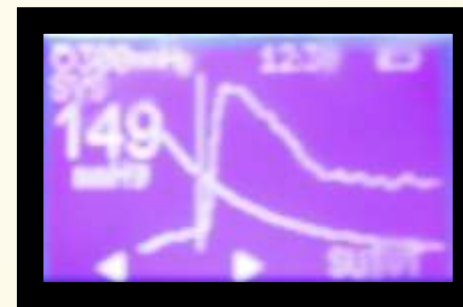


TEST de COMPRESSION avant CREATION

MESURE DES PRESSIONS SOUS TEST D'ALLEN



Compression AR



PERMEABILITE et VALEUR des AP et de L'ARTERE CUBITALE

L'ARTERE CUBITALE EST LA CLEF DU RISQUE ISCHEMIQUE

PREDICTION DU VOL ISCHEMIQUE

[Ann Vasc Surg.](#) 2000

Steal syndrome complicating hemodialysis access procedures: can it be predicted?

[Goff CD¹](#), [Sato DT](#), [Bloch PH](#), [DeMasi RJ](#), [Gregory RT](#), [Gayle RG](#), [Parent FN](#), [Meier GH](#), [Wheeler JR](#)

Abstract

The development of steal syndrome distal to an arteriovenous fistula (AVF) created for hemodialysis access remains a significant clinical problem. This study was undertaken to determine the role of intraoperative noninvasive testing in the prediction and management of steal syndrome following arteriovenous fistula creation. First, in order to determine a threshold digital/brachial index (DBI) for patients at risk for steal syndrome, we performed a retrospective review of patients who had had the DBI measured and who developed symptoms (steal syndrome) following AVF creation. This was followed by a prospective evaluation of the ability of the DBI to predict which patients undergoing AVF surgery would develop steal syndrome. A DBI < 0.6 identifies a patient at risk for steal syndrome. Intraoperative DBI cannot be used to predict which patient will develop steal syndrome; however, if revision is indicated, the DBI should be increased to > 0.6 . Failure to accomplish this puts the patient at risk for continued steal syndrome.



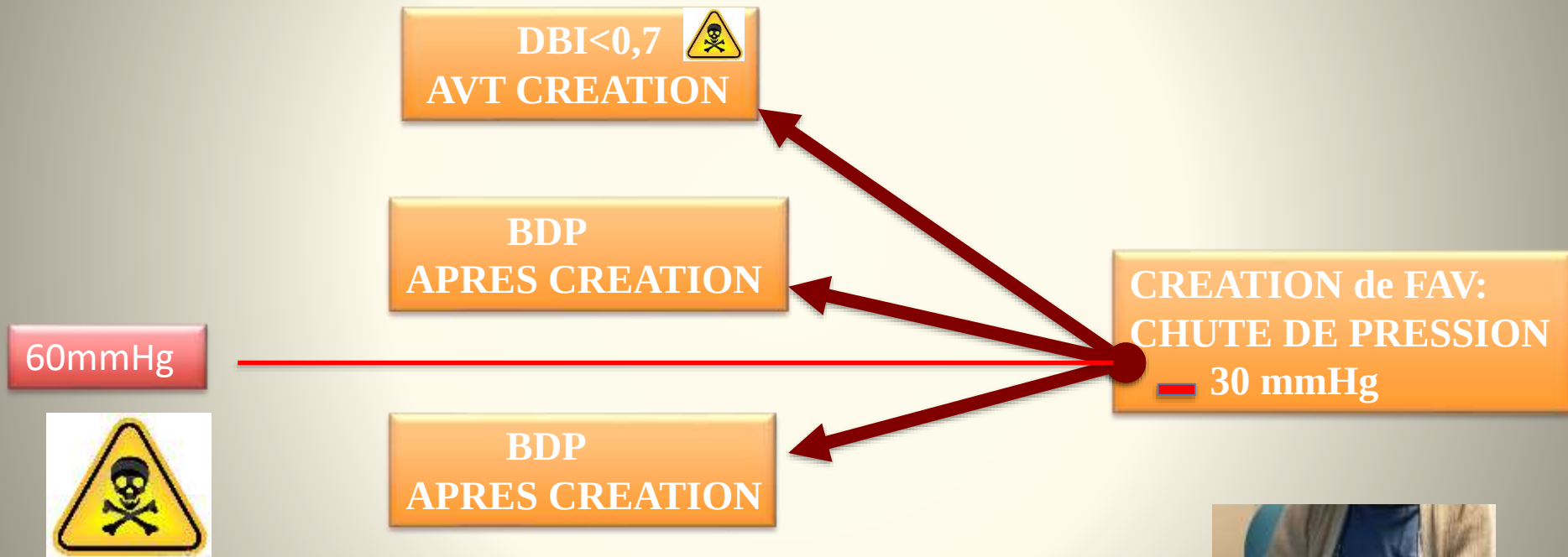
Educational Article

Strategies for Predicting and Treating Access Induced Ischemic Steal Syndrome

G.S. Tynan-Cuisinier², S.S. Berman^{1, 2}, , 

Access induced ischemia is an uncommon but devastating complication for patients maintained on hemodialysis. A number of clinical risk factors have been identified to select patients at risk. Intraoperative measurement of the digital–brachial index may further distinguish at-risk patients when the **DBI<0,45**. Once clinically significant steal has developed, surgical strategies to treat this problem should ideally reverse the ischemia while maintaining uninterrupted access for hemodialysis. To date, the distal revascularization–interval ligation or DRIL procedure has been the most consistently successful tactic in achieving these dual objectives. A number of alternative strategies have recently been proposed and will be discussed.

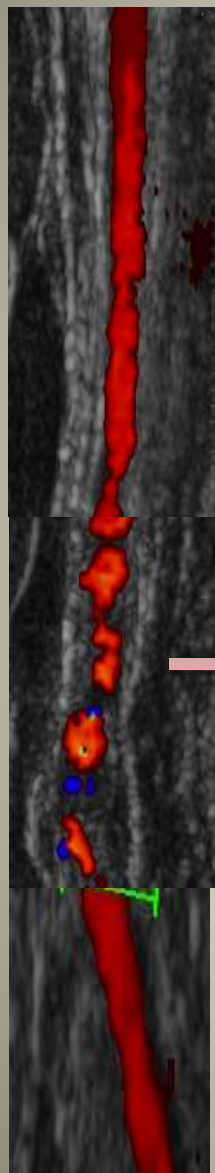
PREDICTION et PREVENTION de L'ISCHEMIE



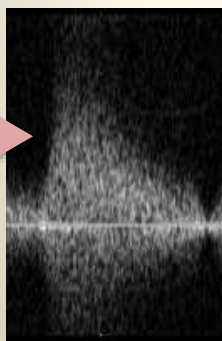
EVITER le DESASTRE



RISQUE ISCHEMIQUE : GESTION de CREATION et TRAITEMENT



Stenose AR distale
AC:Occluse ou sténose++



LOW DIGITAL PRESSURE



DOUBLE
PEINE

LESIONS DES ARTERES DE L'AVANT BRAS

FAV
DISTALE

RM

ISCHEMIE

ATL
FERMETURE
DRIL DISTAL

FAV
COUDE

MAT

ISCHEMIE

DRIL
PAI

CONCLUSION

PRISE DES PRESSIONS DIGITALES BASALES:

$DBI < 0,6$

$BDP - 30 \text{ mmHg} < 60 \text{ mm de Hg}$

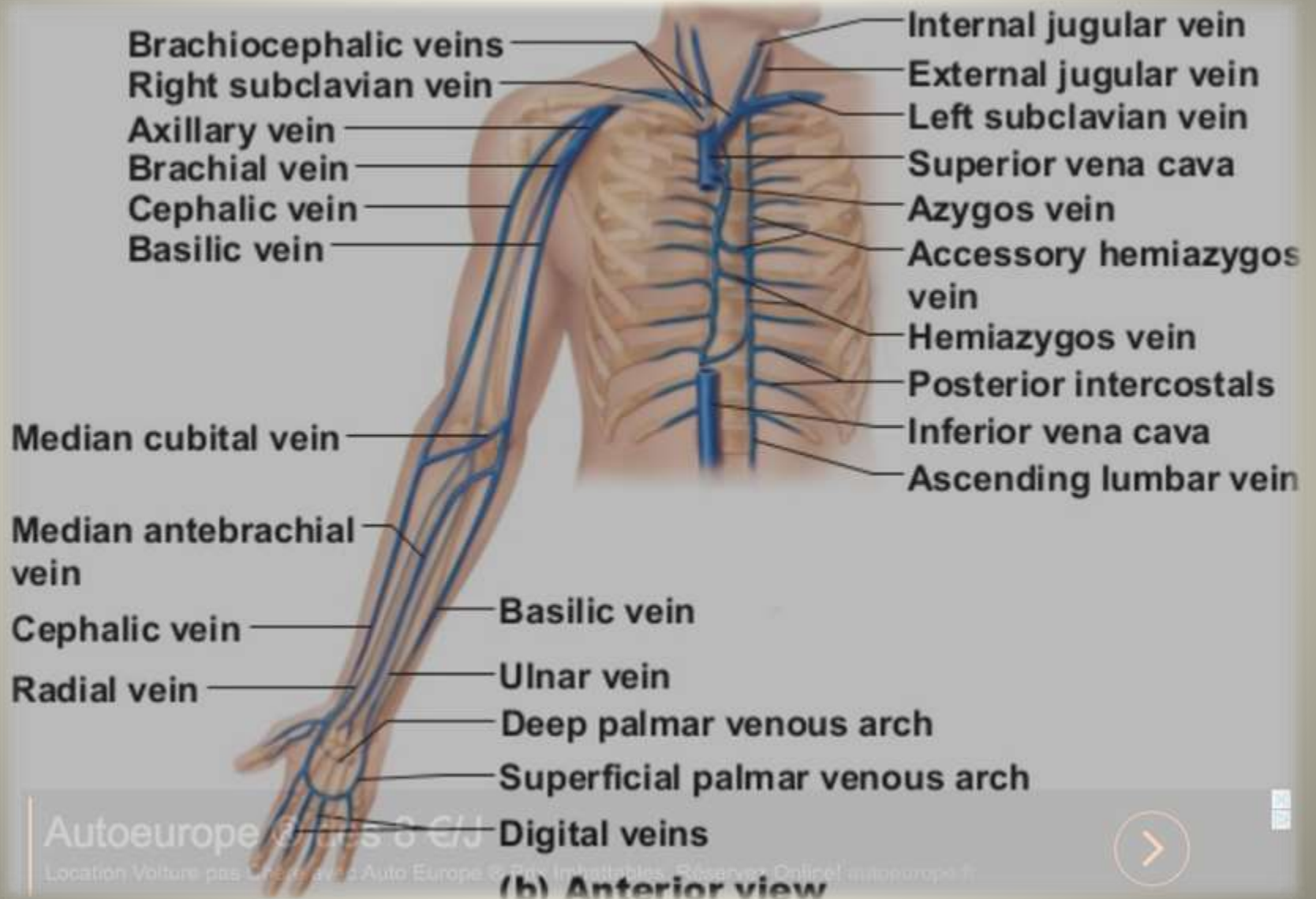
$BDP \text{ sous compression distale} < 60 \text{ mm de Hg}$



REDISCUTER LA STRATEGIE

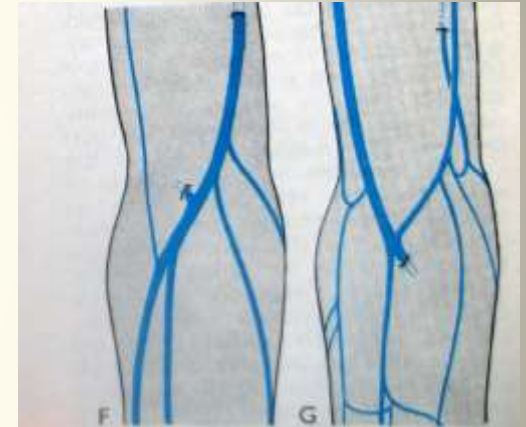
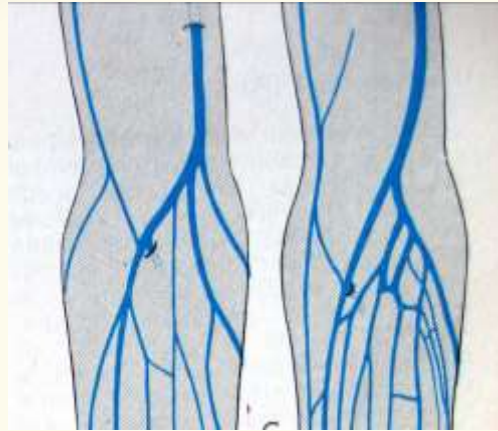
EXPLORATION VEINEUSE

ANATOMIE



VARIATIONS DU M VEINEUX

Constitutionnelle ou acquise?



VC

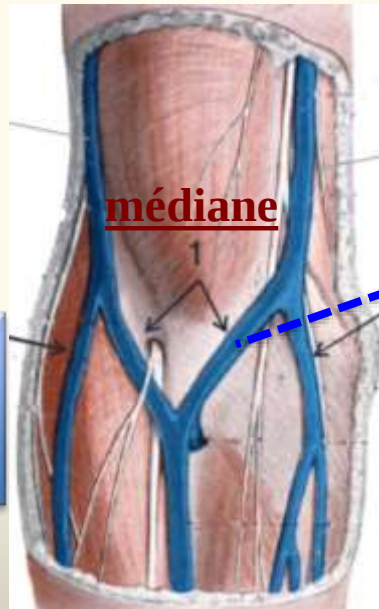
VB

médiane

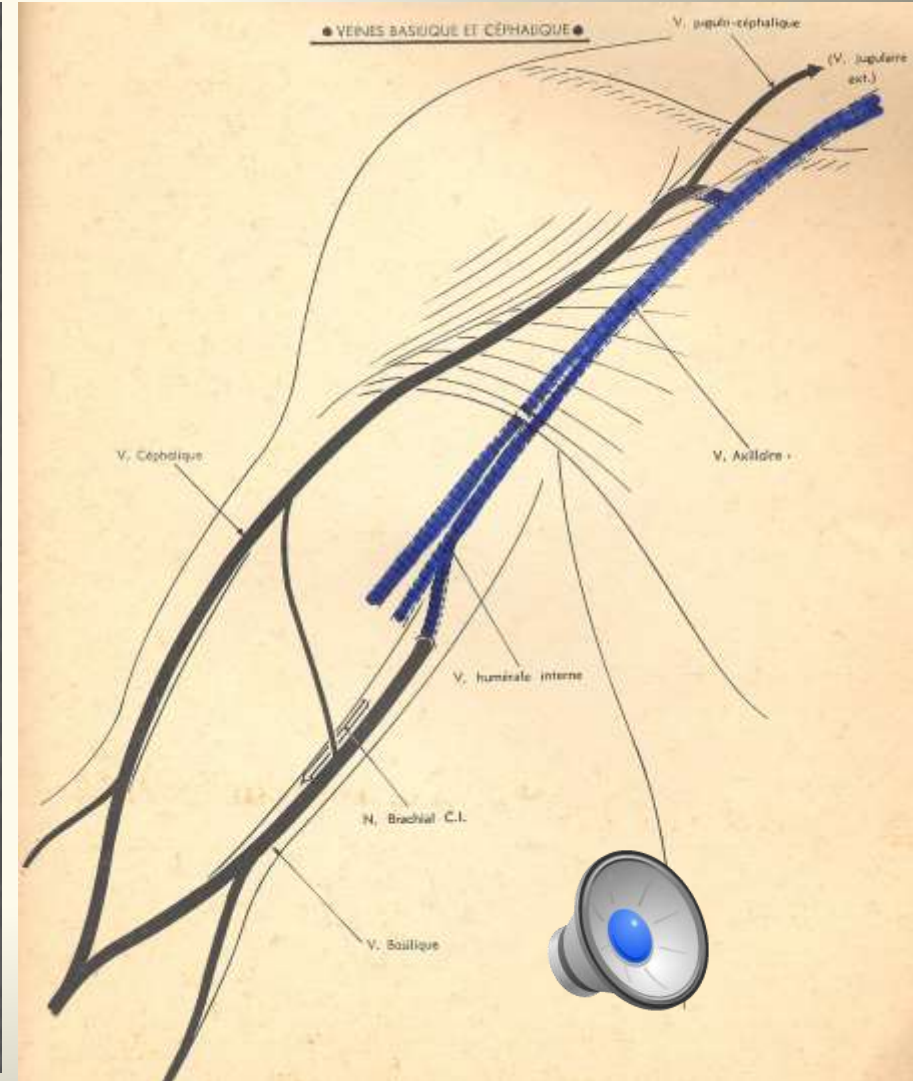
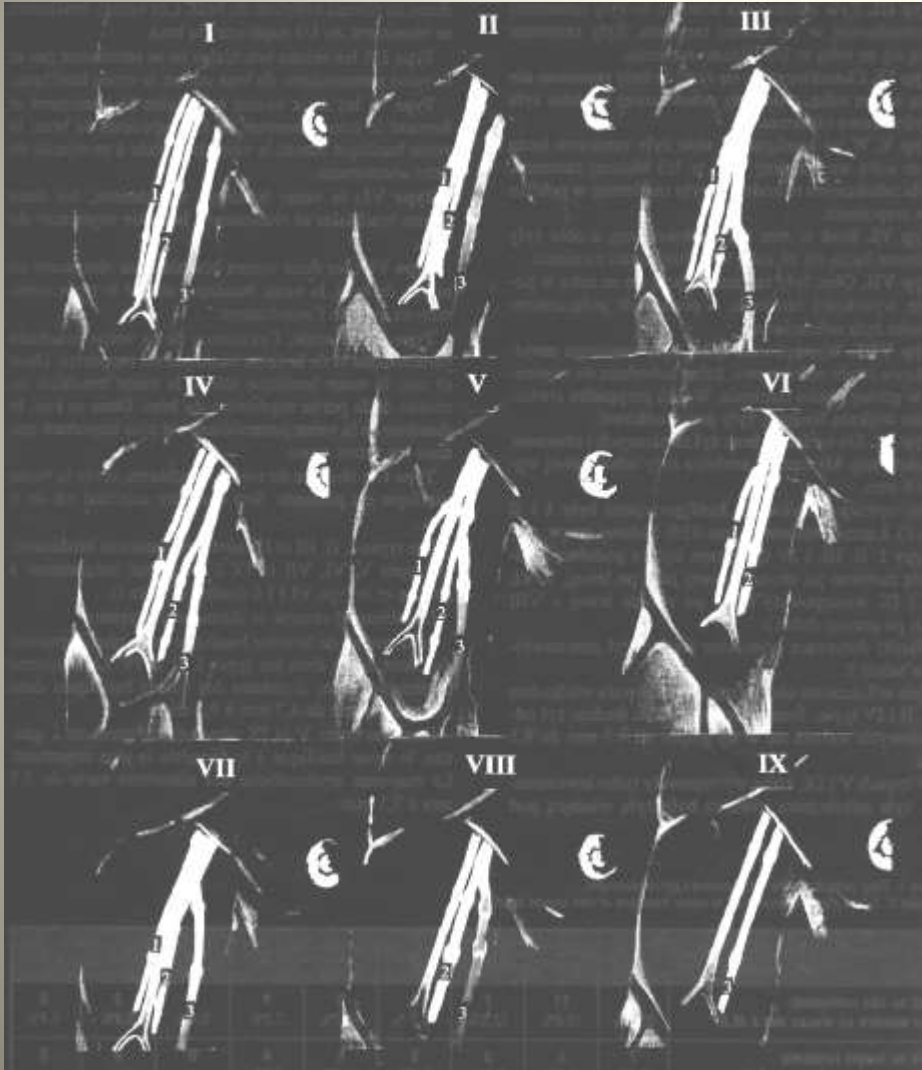
Racine externe
ou
Racine latérale

Racine interne
ou
Racine latérale

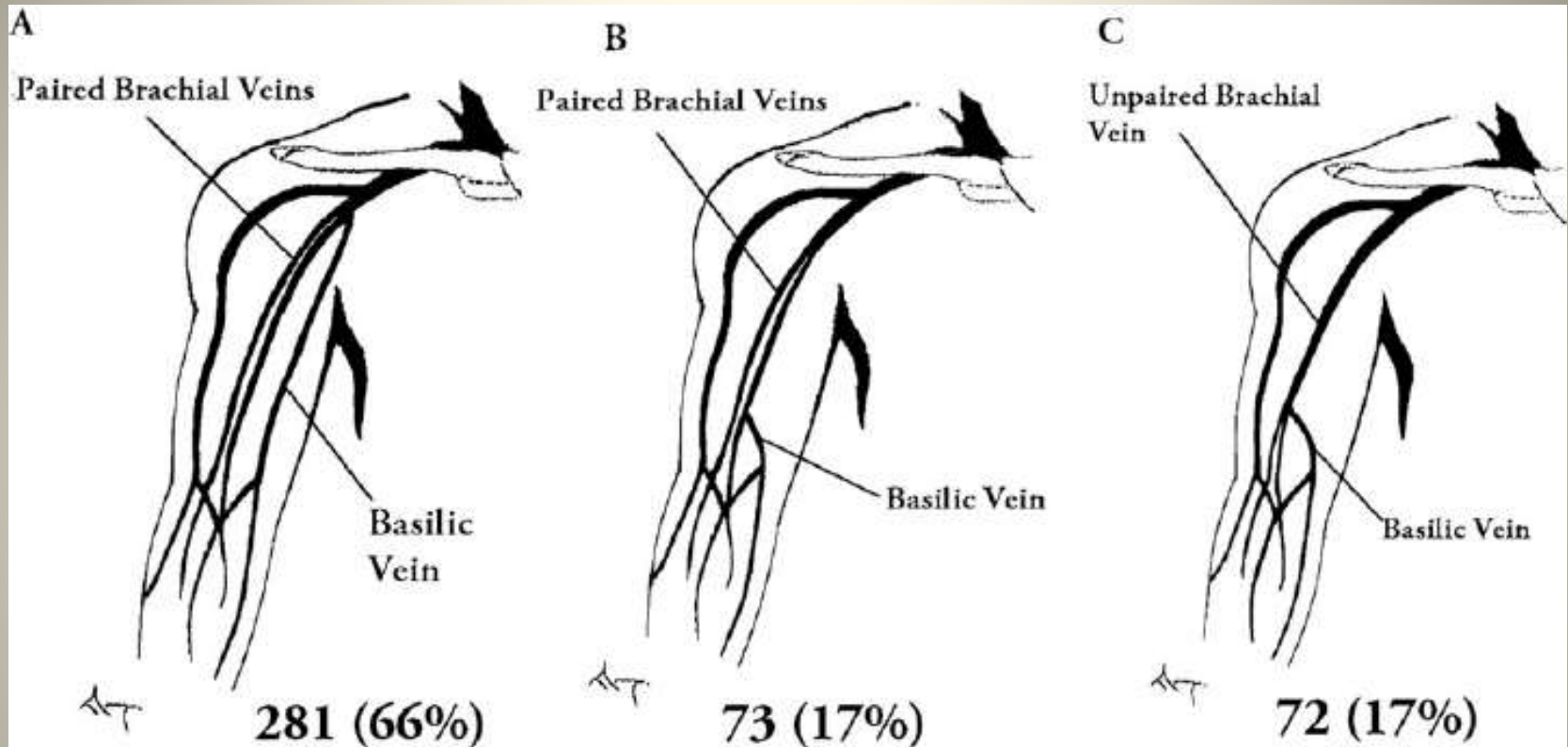
Médian cubital vein



SYSTEMATISATION DE LA V. BASILIQUE

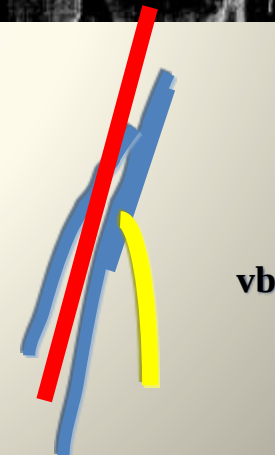
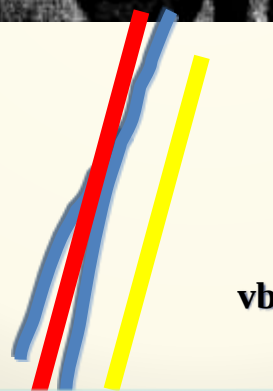
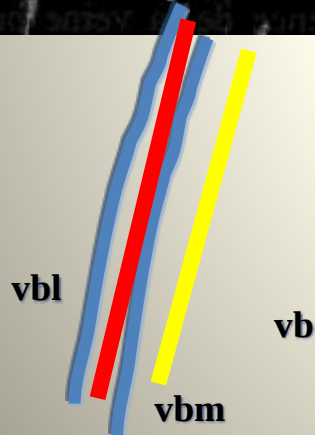


SYSTEMATISATION DE L'AXE BRACHIO-BASILIQUE

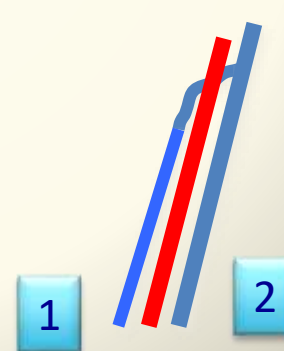
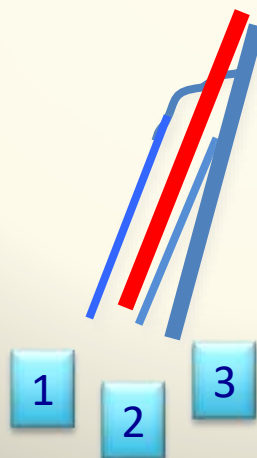
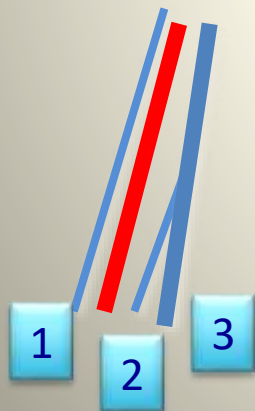


[Prevalence of variant brachial-basilic vein anatomy and implications for vascular access planning.](#)
Anaya-Ayala JE. J Vasc Surg. 2011

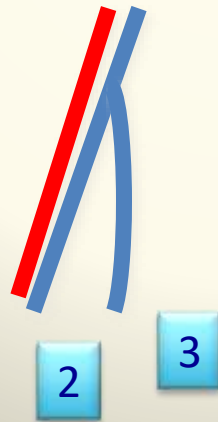
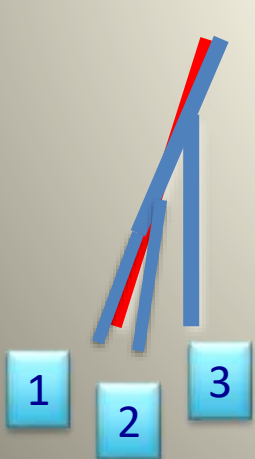
BRAS 3 SEGMENTS :DISTAL -MEDIAN -PROXIMAL



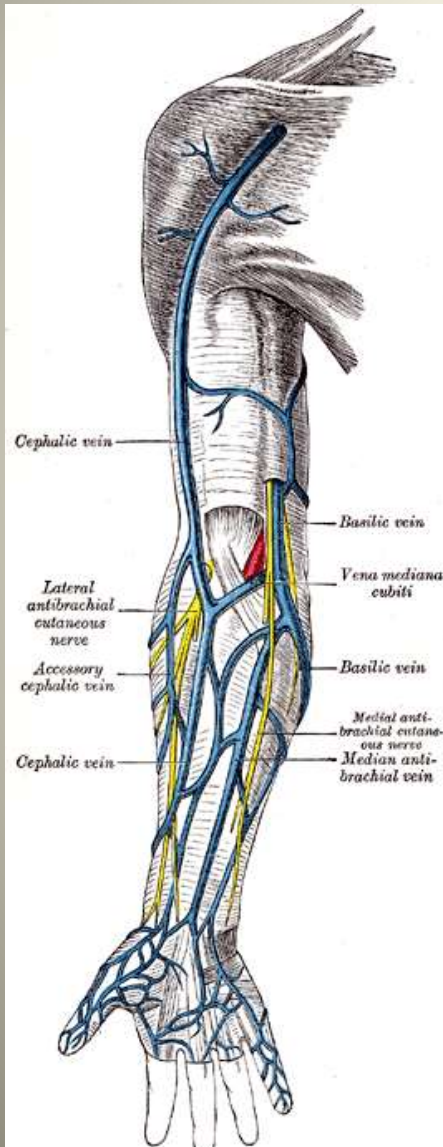
1-vbl:veine brachiale laterale
2-vbml:veine brachiale médiale
3-Vb:veine basilique



1-vbl:veine brachiale laterale
2-vbml:veine brachiale médiale
3-Vb:veine basilique



VEINE CEPHALIQUE



AU BRAS

VEINE CEPHALIQUE AU BRAS OU BRACHIALE

- Verticale dans le sillon bicipital externe
- Sous-aponévrotique oblique dans le sillon deltoïdo-pectoral
- Traverse l'aponévrose cribriforme
- Débouche dans la veine axillaire

A L'AVT BRAS

VEINE CEPHALIQUE à L'AVT BRAS BRAS OU ANTEBRACHIALE

- Elle naît de la partie latérale du réseau veineux dorsal de la main
- Face antérieure de l'avt bras
- Souvent dupliquée
- Anastomose avec la V céphalique accessoire

EXPLORATION VEINEUSE

COMPLEMENT DE L'EXAMEN CLINIQUE

EXPLORATION DE TVP et TVS

ETAT PARIETAL/SCLEROSE

QUANTIFICATION DES STENOSES

EPREUVES POSITIONNELLES

EXAMEN SOUS GARROT/ CALIBRE DES VEINES

SITUATION /APONEVROSE et PROFONDEUR/ PEAU

CALIBRE

CONTINUITE

CARTOGRAPHIE/+/ -MARQUAGE

EVALUATION CLINIQUE



EVALUATION CLINIQUE INSUFFISANTE

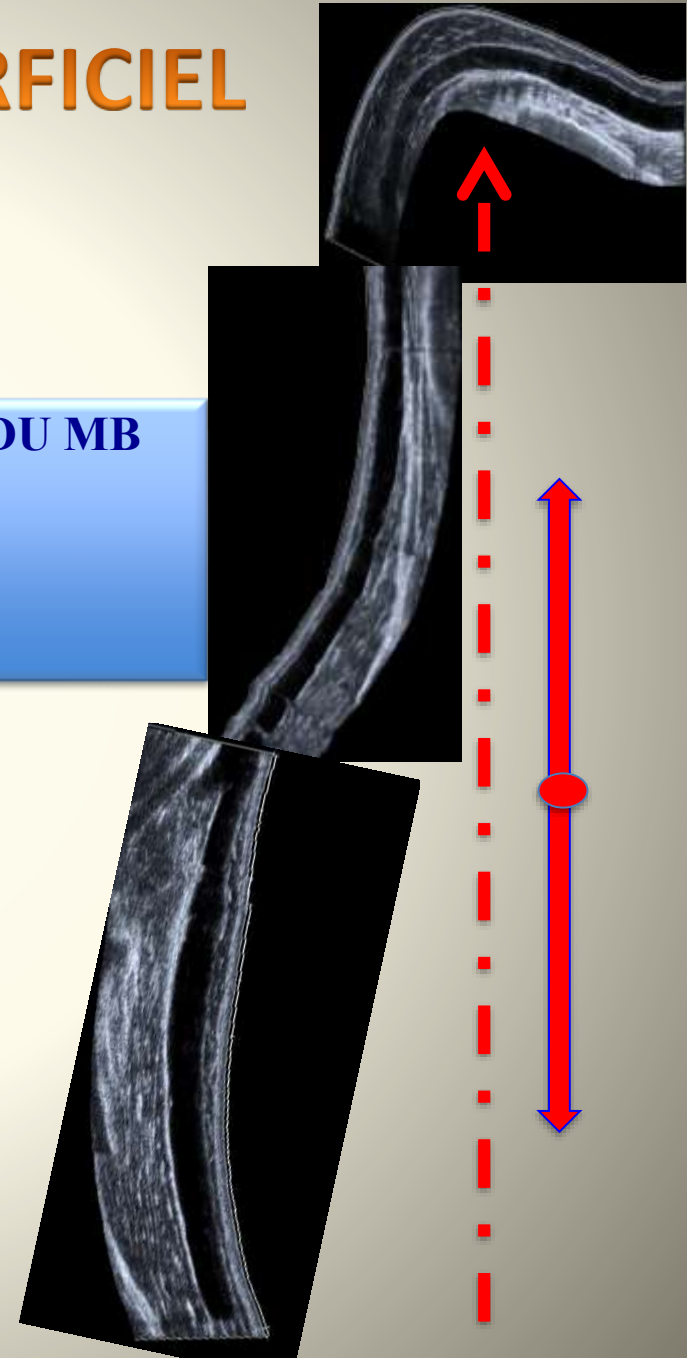


PERMEABILITE VEINEUSE

- **FLUX SPONTANE ++++**
- **MODULATION RESPIRATOIRE**
- **COMPRESSIBLE**
- **AUGMENTE SOUS COMPRESSION D'AVAL: PERMEABILITE D'AMONT**
- **VALSALVA +: REPLETION AUGMENTE
ARRET DU FLUX VEINEUX
PERMEABILITE D'AMONT et D'AVAL**

SYSTEME VEINEUX SUPERFICIEL

- EX DEPUIS :LE POIGNET JUSQU'A LA RACINE DU MB
- OU DEPUIS: LA PERFORANTE BRACHIALE
- RECONSTRUCTION POSSIBLE



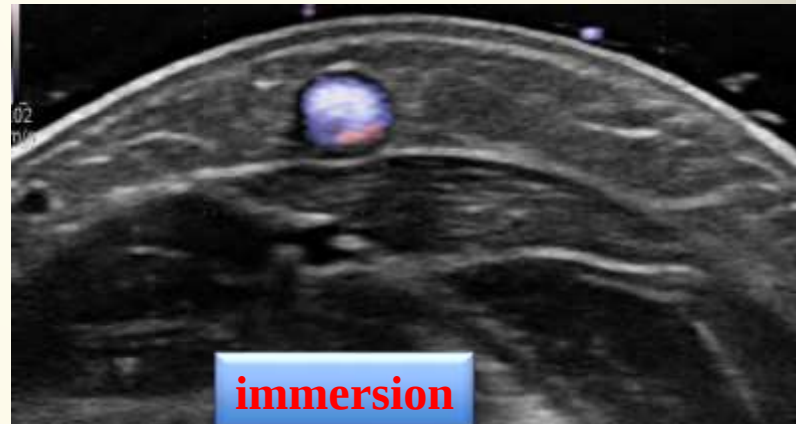
PAROI VEINEUSE NORMALE



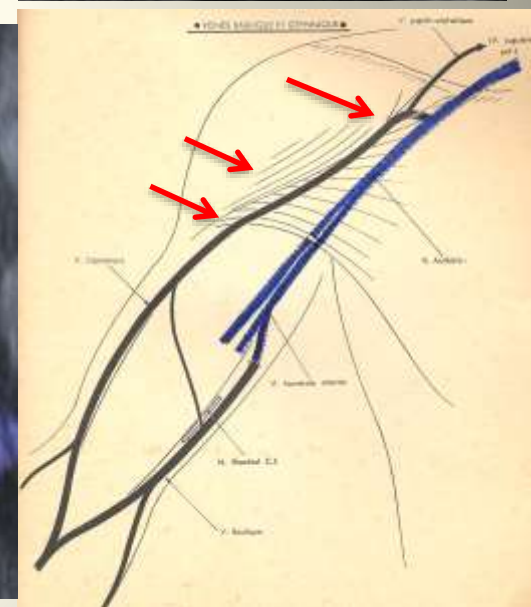
- PAROI FINE ECHOGENE
- LUMIERE VIDE D'ECHO
- FACILEMENT COMPRESSIBLE
- DILATABLE SOUS GARROT
- VALVULES FINES ET LIBRES

FLUX LIBRE PAS de GARROT

V Cephalique:1.3 mm
AVT BRAS /PERFORANTE

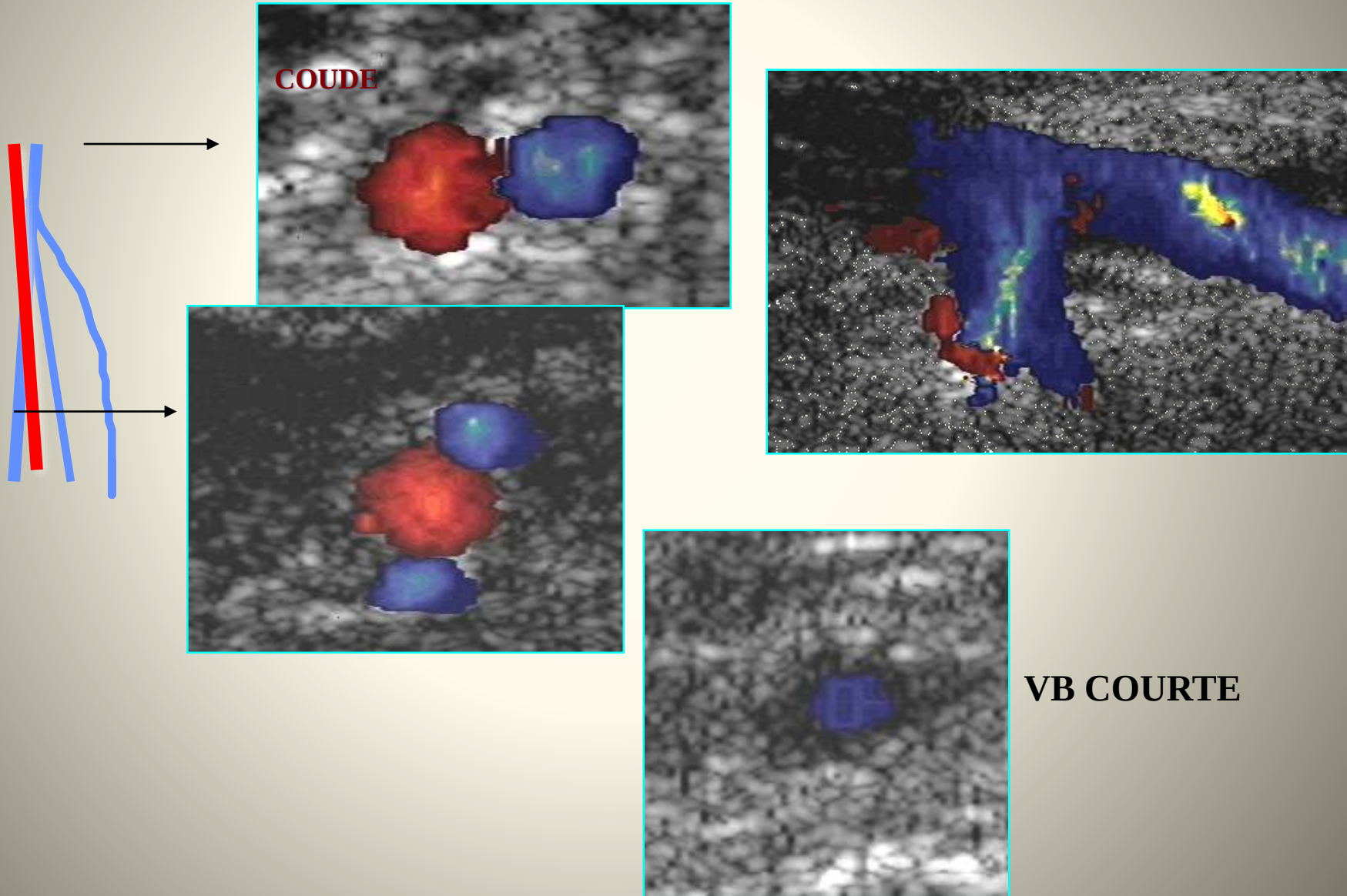


MISE EN EVIDENCE D'UN FLUX SPONTANE :MEILLEUR FACTEUR QUE LE DIAMETRE

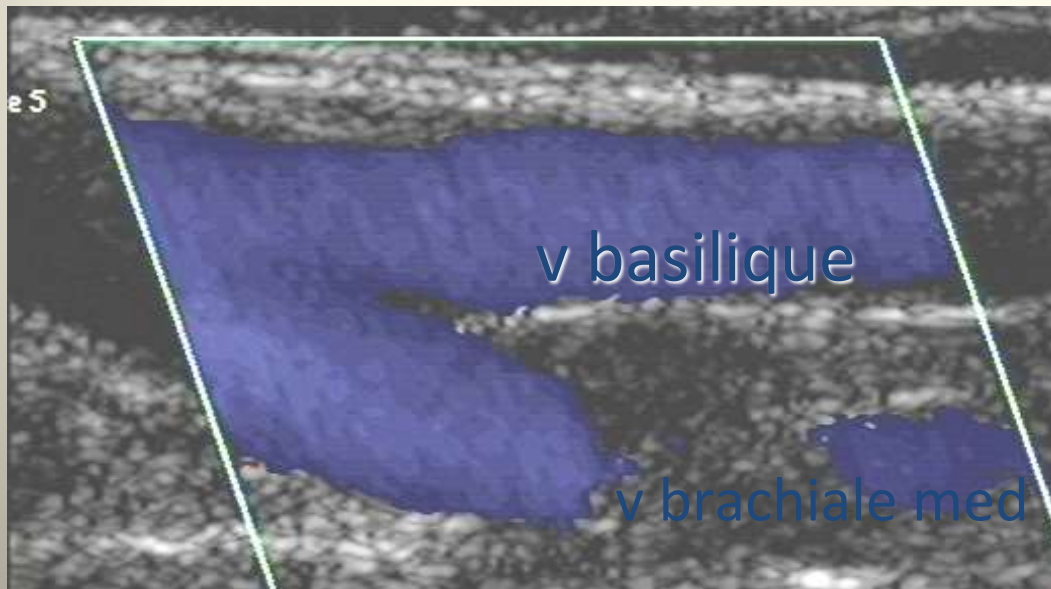
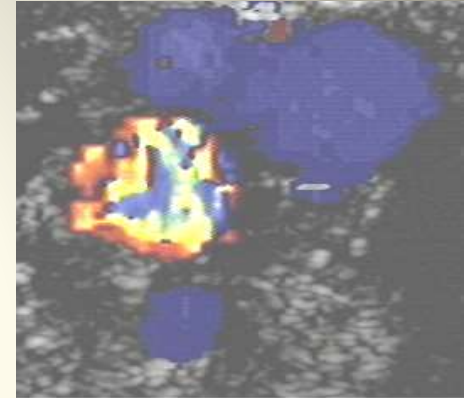
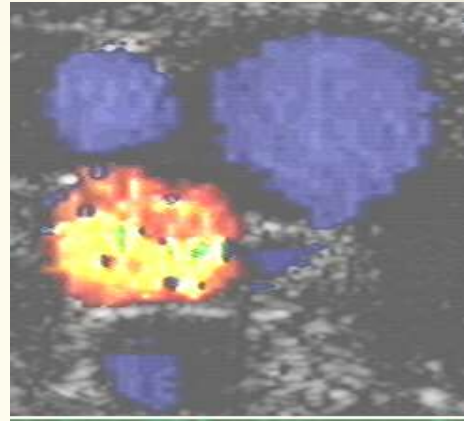
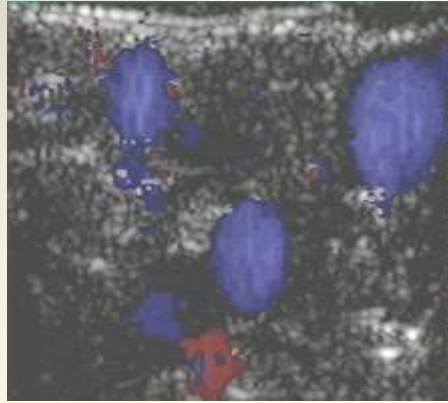
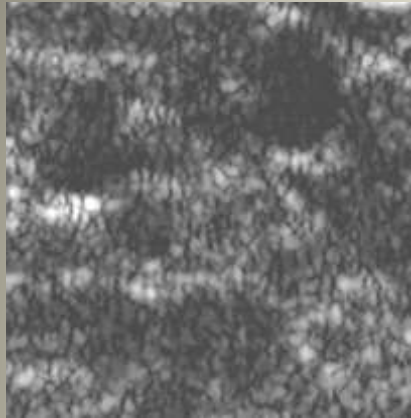


- **DUPLICATION SEGMENTAIRE**
- **CONVERGENCE HAUTE DES RACINES**
- **PENETRATION FASCIALE** →
- **DUPLICATION DE CROSSE**
- **CROSSE RETROCLAVICULAIRE**
- **TERMINAISON SUS CLAVICULAIRE-JUGULAIRE**

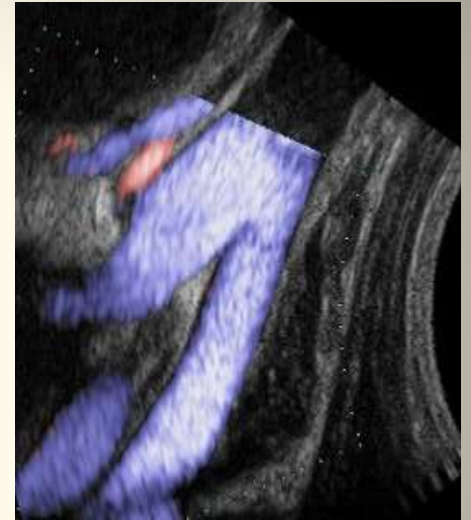
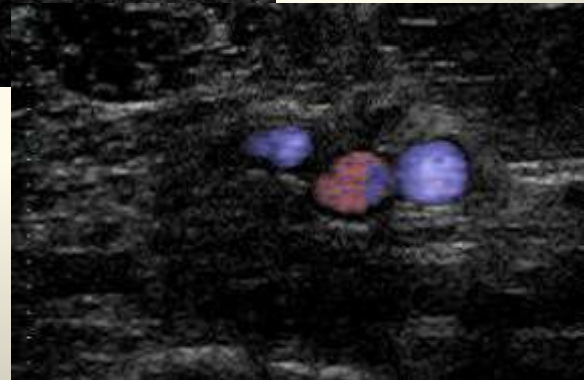
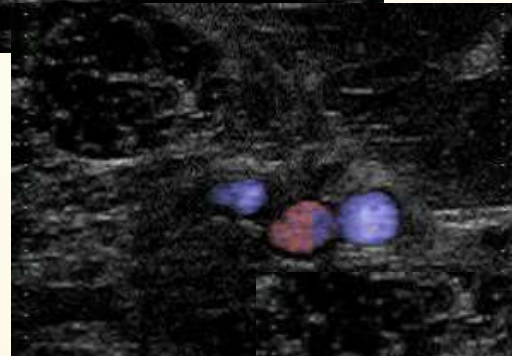
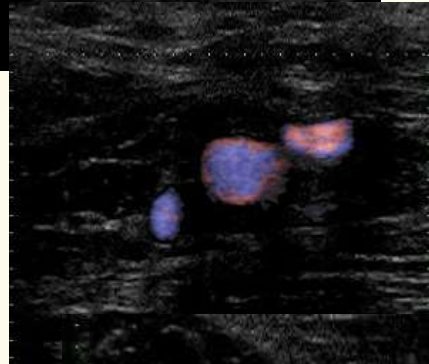
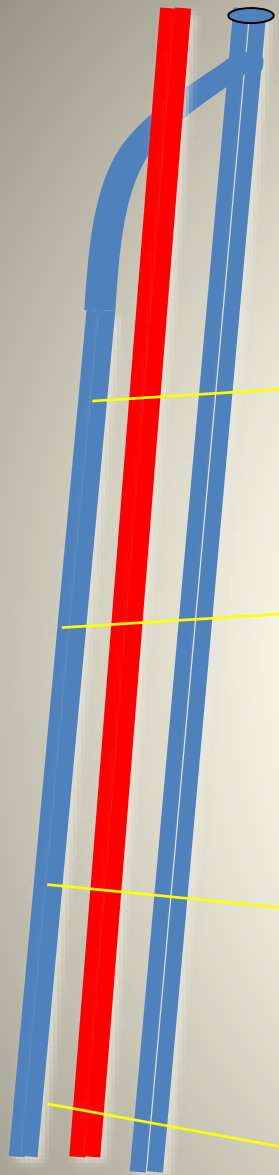
TRONC BRACHIO BASILIQUE UNIQUE AU COUDE



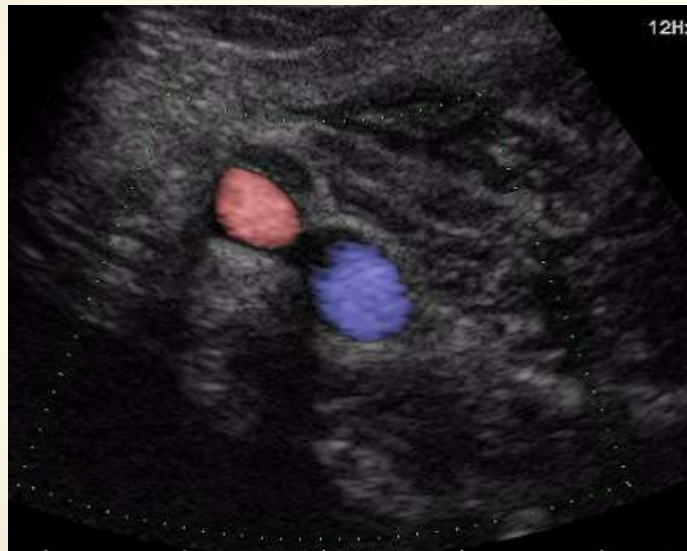
V. BASILIQUE V.BRACHIALE MEDIALE 1/3SUP



V BRACHIALES



TWIST VEINEUX



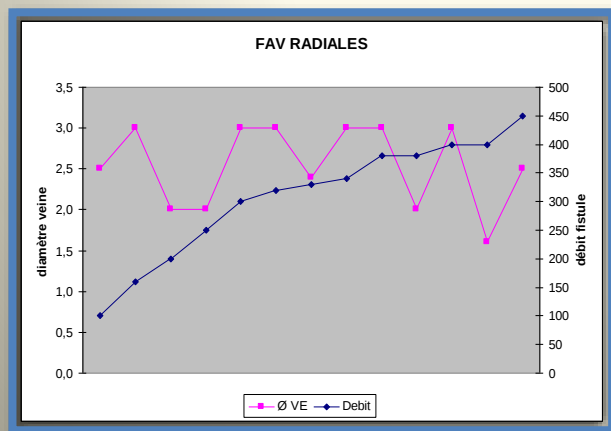
MSG

VBL DOMINANTE



DIAMETRE des VEINES SUPERFICIELLES

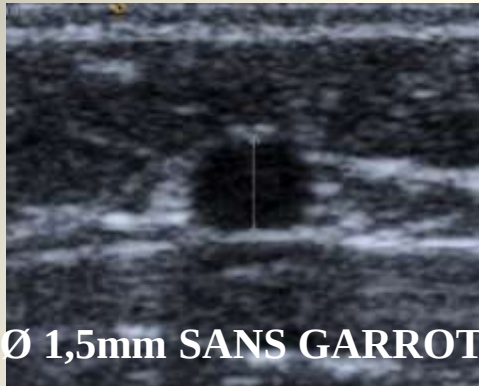
AUTEUR	ANNEE	DIAMETRE	% DE SUCCES
WONG	1996	< 1.6mm	early failure
LEMSON	1998	< 2 mm	
SILVA	1998	2.5 mm	83%
MENDES	2002	2 mm	76%
MALOVRTH	2002	IDV 60%	80%
TORDOIR	2003	1,6 mm	86%
BOURQUELOT	2010	AUCUN	93%
FERRING	2010	1,6	
USTA	2013	2,7	



**PAS de RELATION LINEAIRE
DEBIT/CALIBRE PRE OP
(donnees personnelles)**

DISTENSIBILITE VEINEUSE

VEINE CEPHALIQUE à L'AVT BRAS



**AUGMENTATION PAR 2 DU DIAMETRE =
AUGMENTATION PAR 4 DE LA SURFACE DE SECTION**

➤ **VENOUS DISTENSIBILITY : PREDICTION OF MATURATION AND LONGEVITY**

van der Linden J, *Am J Kidney Dis* 2006

➤ **SUCCESSFUL AVF HAD A SIGNIFICANTLY GREATER PREOPERATIVE IDV AFTER VENOUS CONGESTION (3.35 ± 1.15 MM VERSUS 2.45 ± 1.26 MM) THAN PATIENTS WITH UNSUCCESSFUL AVF**

Malovrh M. *Am J Kidney Dis*. 2002.

ETAT PARIETAL ET VALVULAIRE

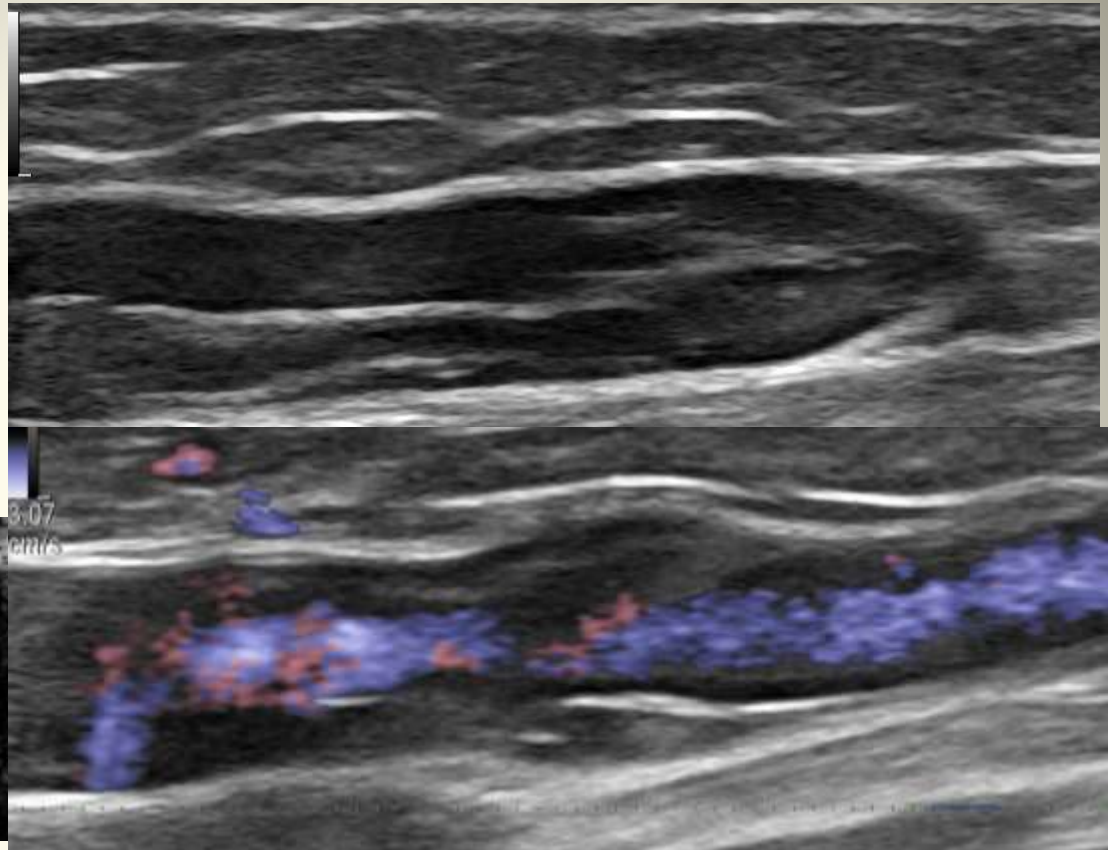
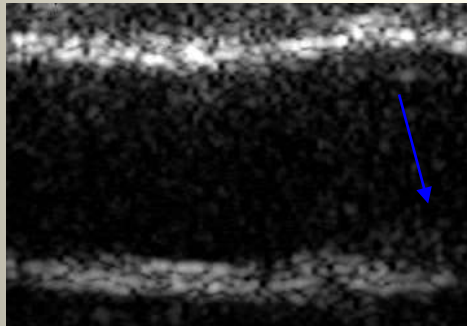
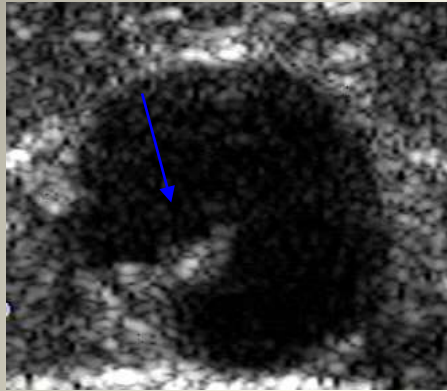
LESIONS

- SYNECHIE INTIMALE
- PACHY SLEROSE
- FIBROSE VALVULAIRE
- SYNECHIE VALVULAIRE
- ECTASIE
- OCCLUSIONS

CAUSES

- SEQUELLE DE THROMBOSE
- SEQUELLE DE PONCTION
- CHIMIOOTHERAPIE
- PERFUSION
- PRECEDENTE FAV
- CICATRICES
- PICC LINE

LESIONS PARIETALES VEINEUSE

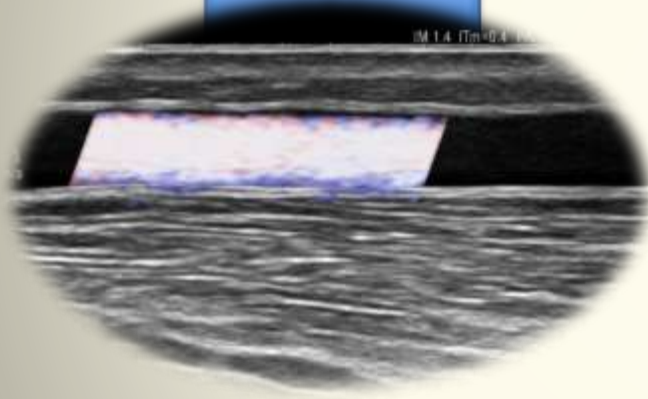


SEQUELLE DE THROMBOSE OU DE PONCTION

- IMAGE ENDOLUMINALE SOUVENT MOBILE OU PEDICULEE
- IMAGE DE FLAP
- ASSOCIEE A UNE PACHY SLEROSE PARIETALE

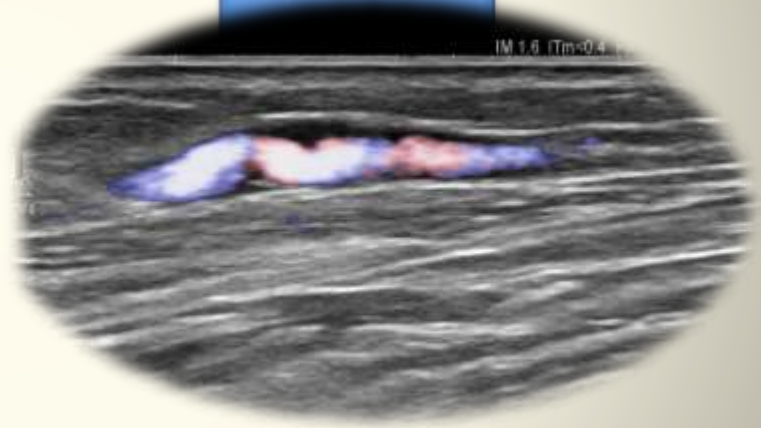
IMAGERIE SANS GARROT :FLUX LIBRE AVANTAGE US /PHLEBOGRAPHIE

AVT BRAS



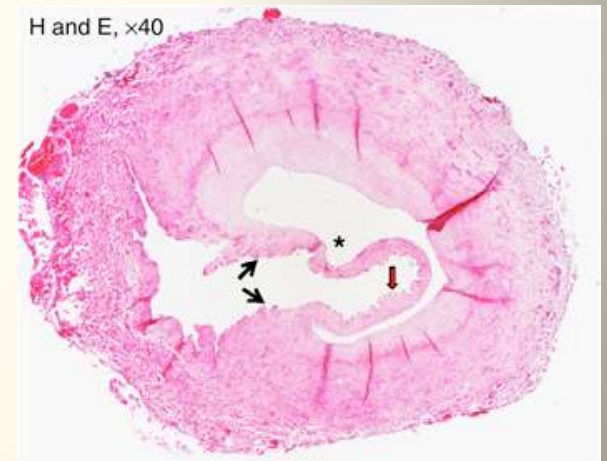
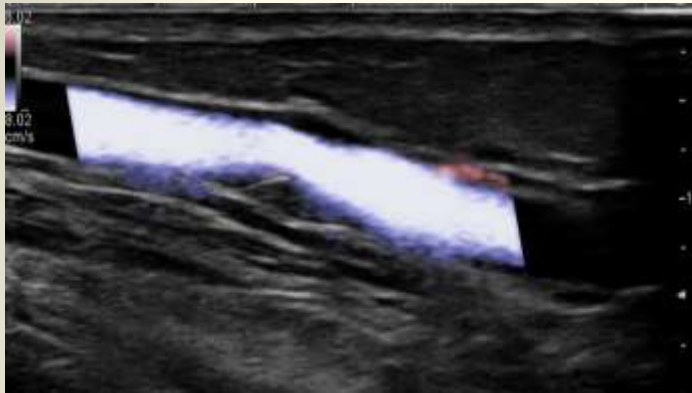
VEINE CEPHALIQUE NORMALE
FLUX SPONTANE

AVT BRAS

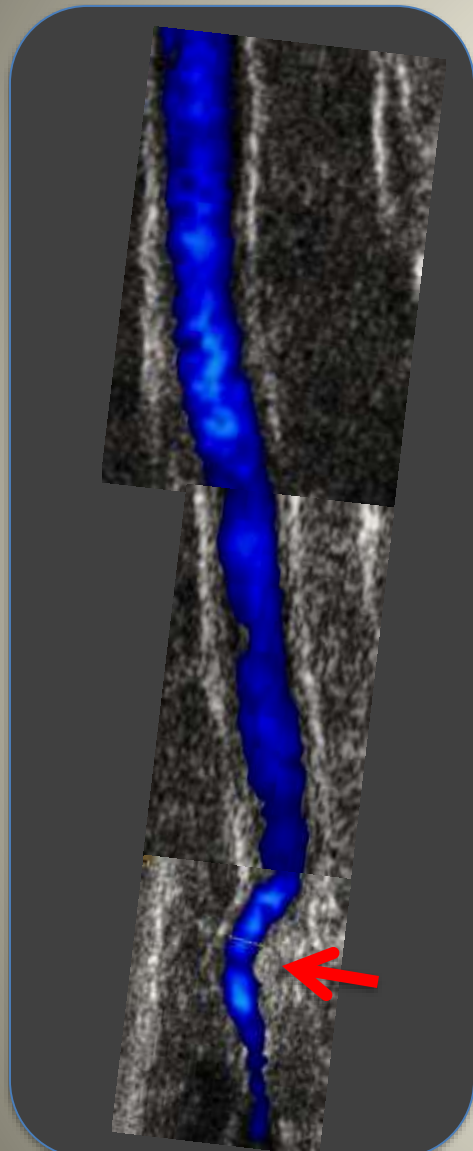


STENOSE VEINE CEPHALIQUE
FLUX SPONTANE

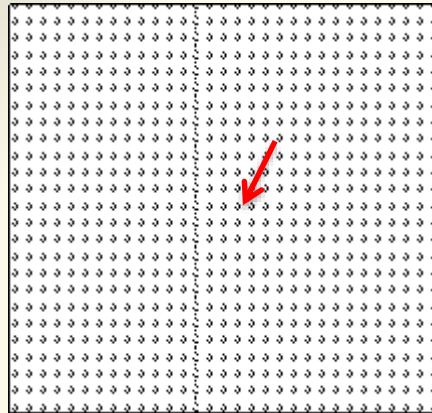
SYNECHIE et FIBROSE VALVULAIRES



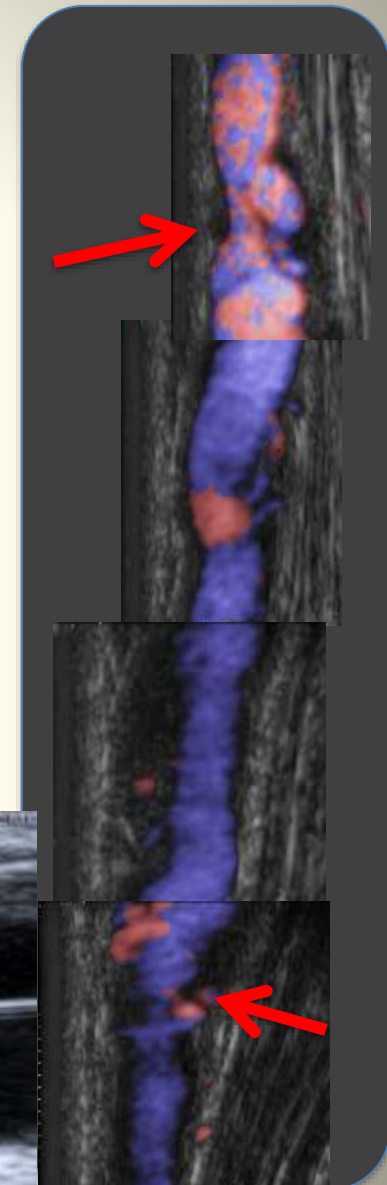
De LA LESION à la STENOSE



V CEPHALIQUE à L'AV BRAS
STENOSE au POIGNET

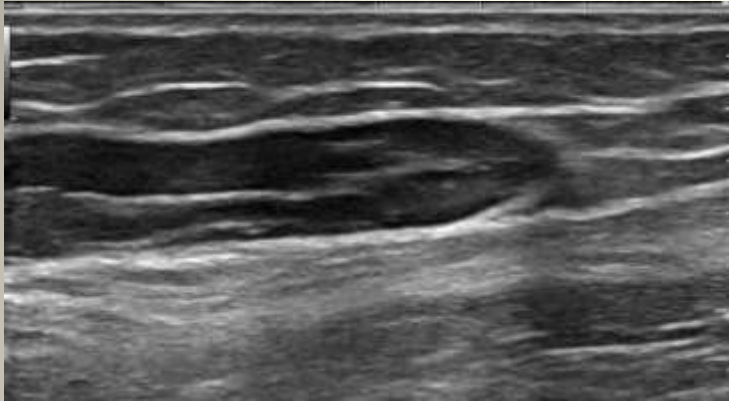


Sclerose valvulaire
Segments epaissis
Tortuosites

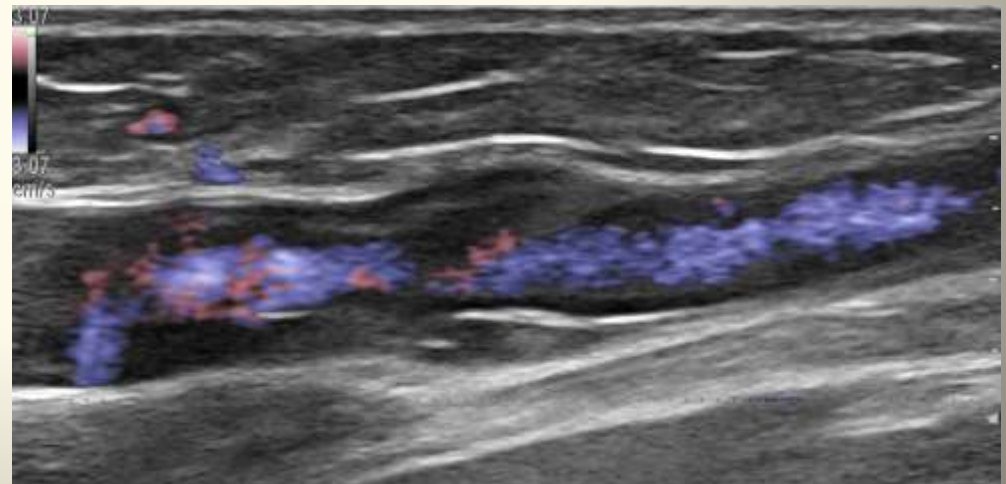


V BASILIQUE au Bras

SYNECHIES MIXTE VALVULAIRE ET INTIMALE STENOSE VEINEUSE



FLUX LIBRE
VIDANGE DE LA MAIN



PHLEBOGRAPHIE CO2 :INCONVENIENTS



- SURESTIMATION DU DIAMETRE
- SOUS OU SURESTIMATION DE STENOSE
- PAS DE MARQUAGE
- CONFUSION V.BASILIQUE /V.BRACHIALE
- DEFAUT D'OPACIFICATION DE VEINE LIBRE

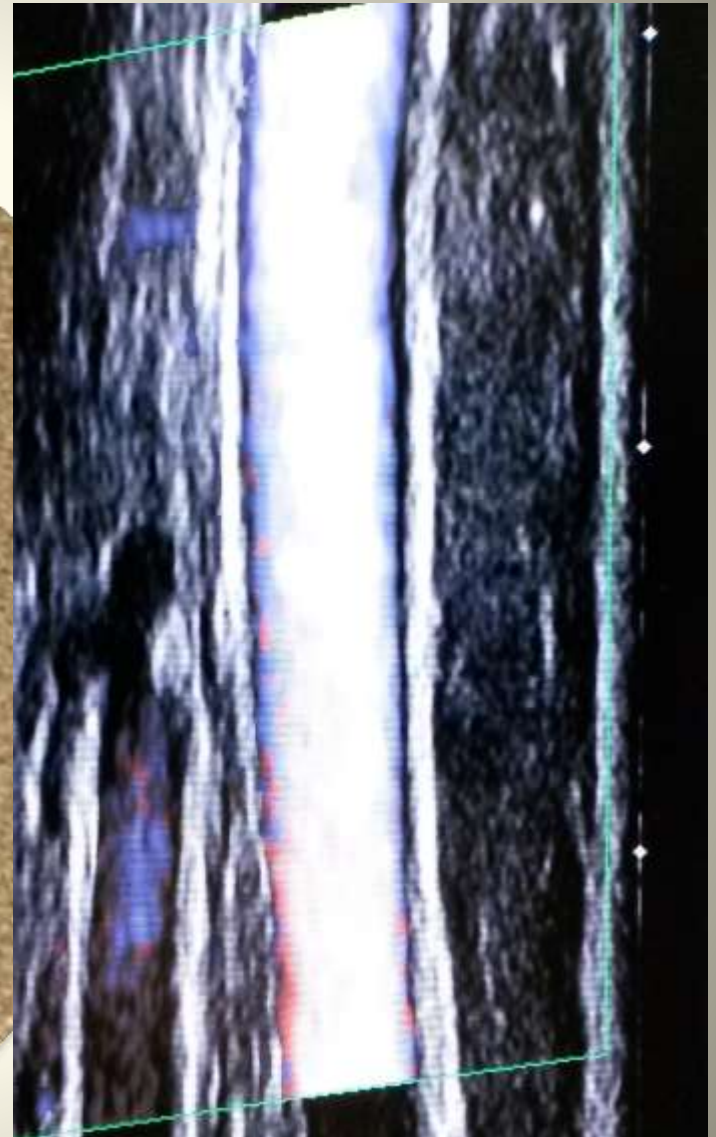
PHLEBOGRAPHIE CO2



Lumiere et paroi normales



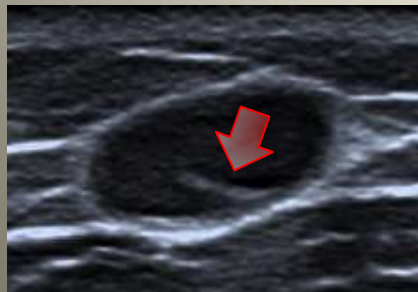
IMAGES LACUNAIRES:
Δ:STENOSE



FLUX NORMAL

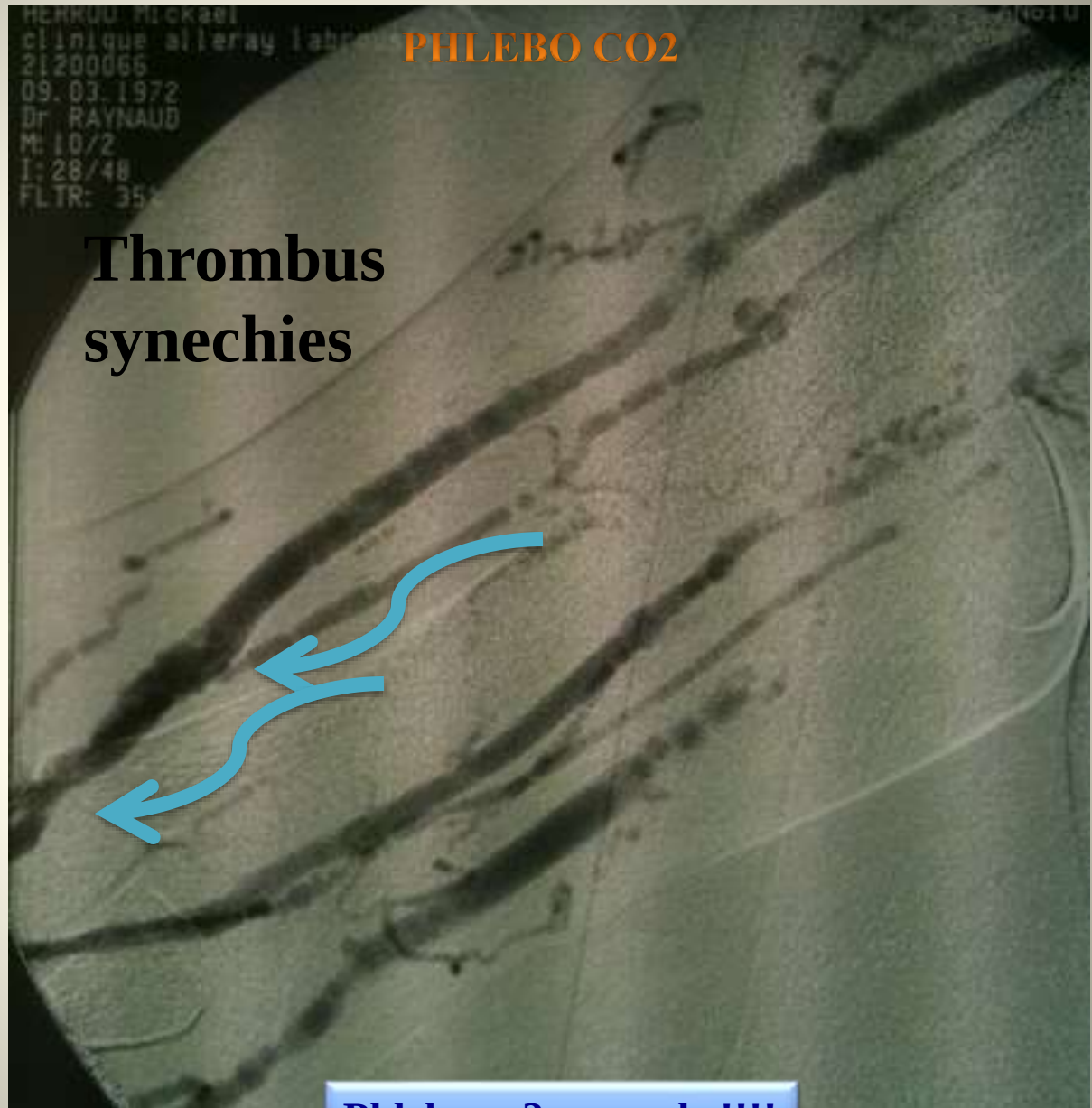
US

Thrombus
synechies



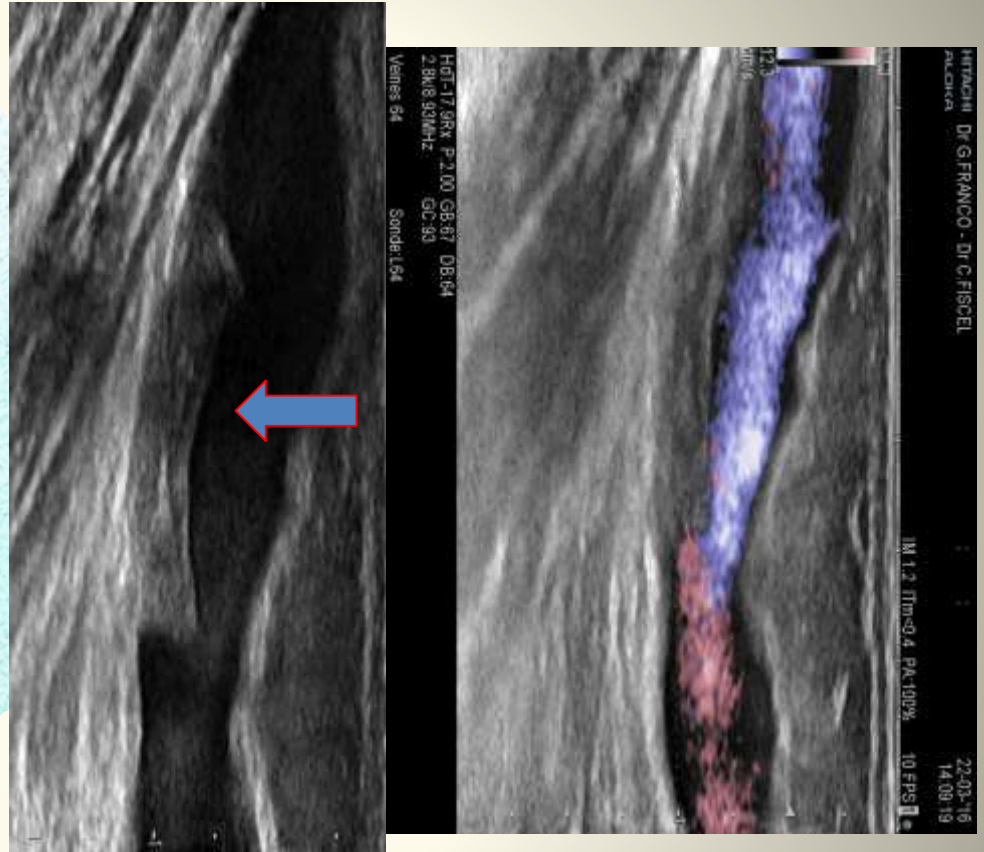
VEINE CEPHALIQUE

PHLEBO CO2



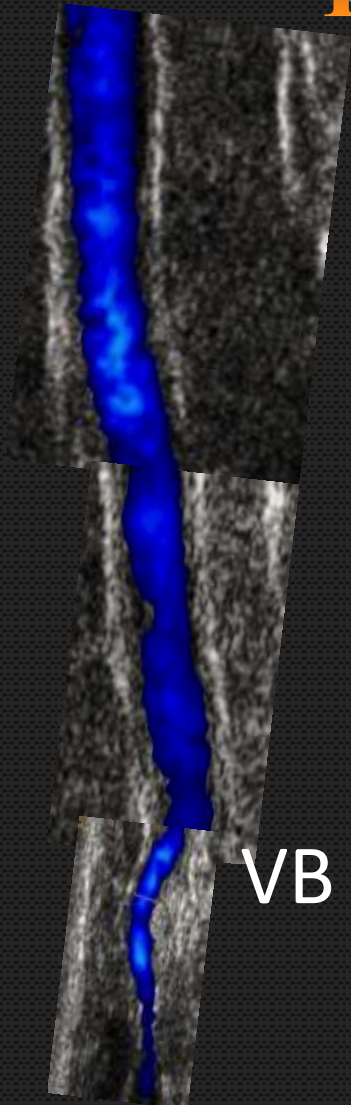
Phlebo co2 normale !!!!

THROMBUS NON VU A LA PHLEBO CO2



CR:PLEBO NORMALE

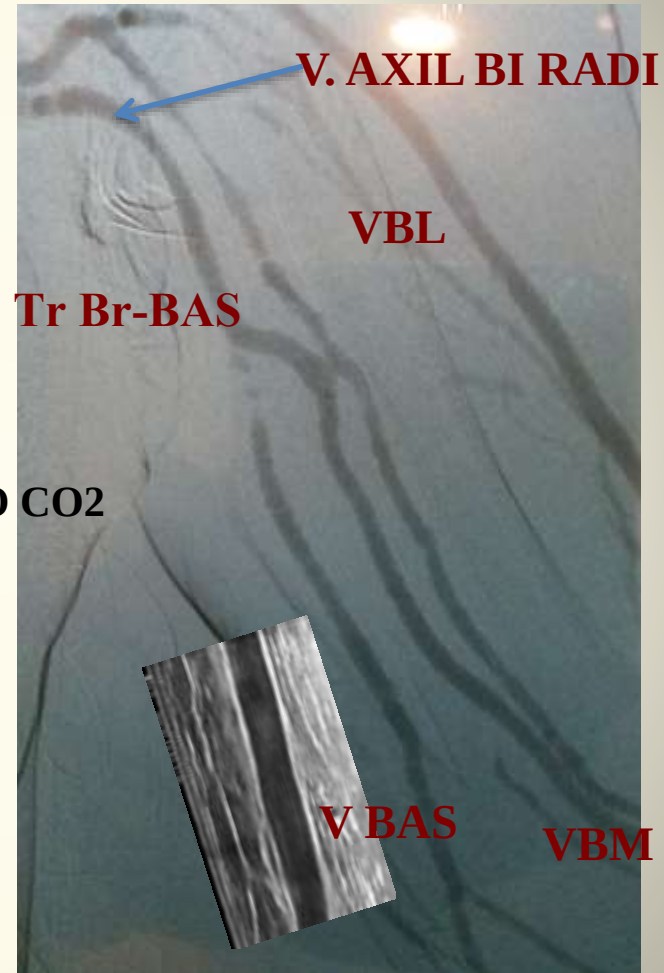
DEFAUT D'OPACIFICATION



- **US VISUALISE DES VEINES NON OPACIFIEES**
- **EN CAS**
- **DE DESTRUCTION DES RACINES**
- **CEPHALIQUE OU BASILIQUE**

DEFAUT D'IDENTIFICATION

- US IDENTIFIE DES VEINES SOIT DISANT ABSENTE
- DESTRUCTION DE LA RACINE MEDIANE
- VEINE BASILIQUE NORMALE:US
- DECRIE COMME ABSENTE à la PLEBO CO2



**VEINES
PROXIMALES
CERVICALES
et
CENTRALES**

INDICATION

- **PARTIE INTEGRANTE DU BILAN AVANT CREATION D'ABORD VASCULAIRE**
- **BILAN ISOLE AVANT POSE D'UNE VOIE CENTRALE**

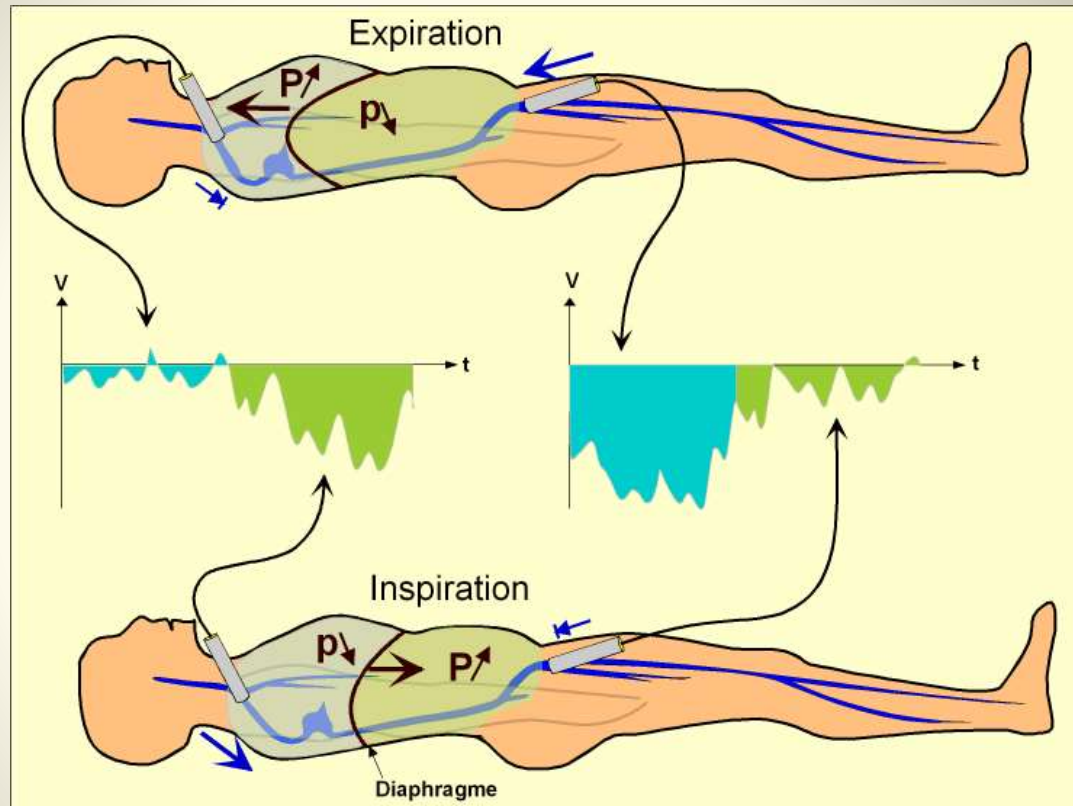
STENOSE et THROMBOSE des VEINES PROXIMALES et CENTRALES

CIRCONSTANCES:

- **KT++++++ 1/3 des CAS**
- **Syndrome du DTB**
- **TUMEURS**
- **TRAUMA**
- **I.C. CONGESTIVE**
- **CHIRURGIE THORACIQUE**
- **POST CREATION FAV**

- **KT SC ++++++**
- **JI**
- **PM**
- **Defibrillateurs**
- **PORT à cath**

FLUX VEINEUX CENTRAL SUS DIAPHRAGMATIQUE

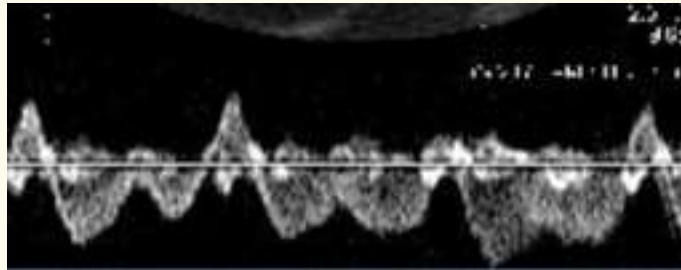


MODULATION RESPIRATOIRE INVERSE MI

VALSALVA : ARRET-REPLETION

VSC/ VJE /VJI/ TVI

DOPPLER



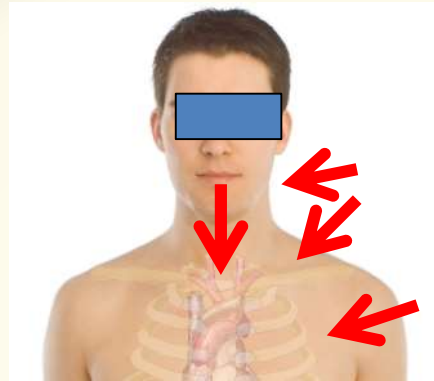
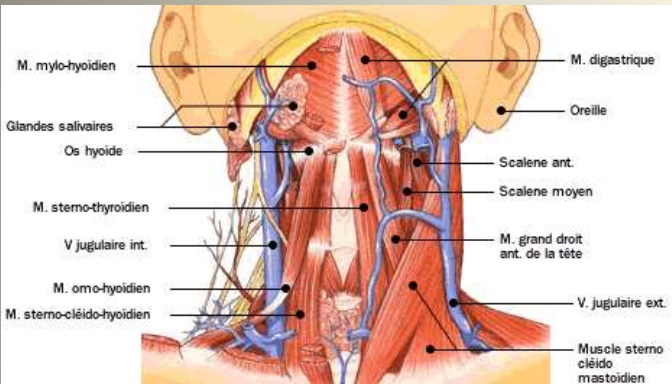
**FLUX POLY PHASIQUE
MODULATION RESPIRATOIRE
et
ATRIALE**

Absence de modulation : sensibilité 79% pour détecter lésions centrales

Rose SC. J Vasc Interv Radiol. 1998

VEINES PROXIMALES ET CENTRALES

JI-JE-VAX-VSC-TVBC-TVI



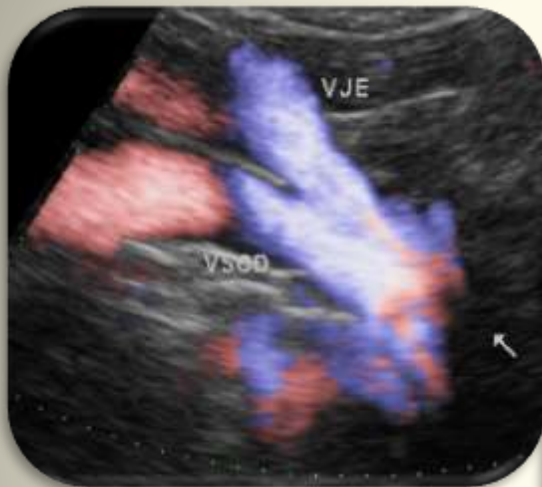
VOIE D'ABORD

- **SILLON DELTO PECTORAL**
- **CREUX SOUS CLAVICULAIRE**
- **SUS CLAVICULAIRE**
- **SUPRA STERNALE**
- **GOUTTIERE CERVICALE**

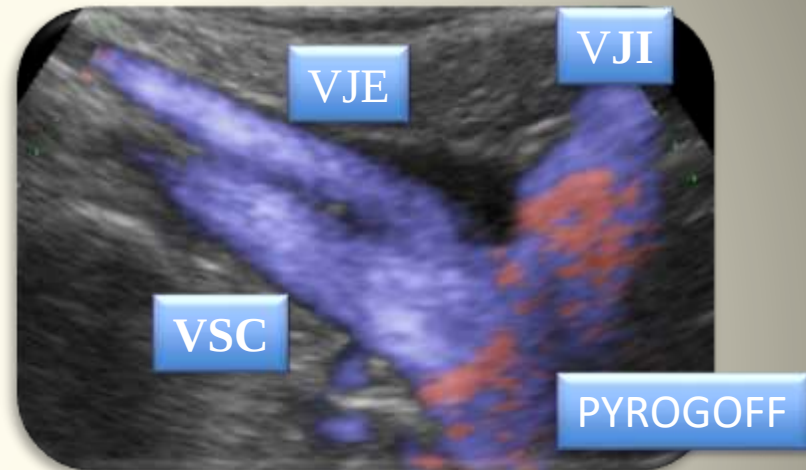
ASTUCES

- **EN DÉCUBITUS**
SURÉLÉVATION DE L'OMOPLATE (COUSSIN)
ADDUCTION DE L'ÉPAULE MAIN SUR L'OMBILIC
TRENDELENBOURG
- **EN POSITION ASSISE**
PENCHÉ EN AVT
- **VALASALVA : REPLETION JI**
- **PASSAGE DECUBITUS / ASSIS: VIDANGE JI**

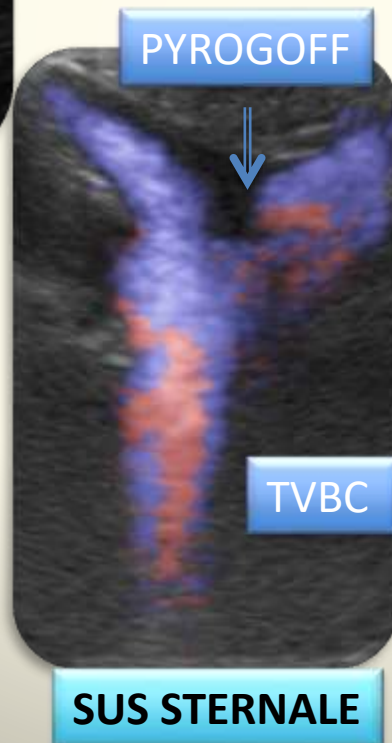
VSC/ VJE /VJI/ TVI



SUS CLAVICULAIRE 1



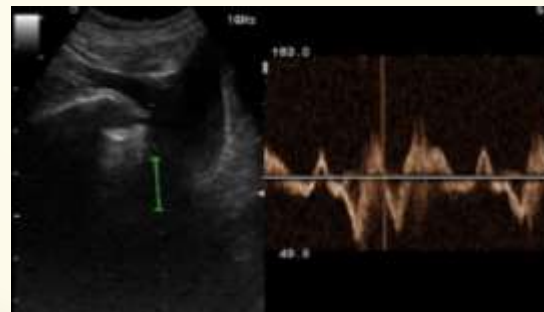
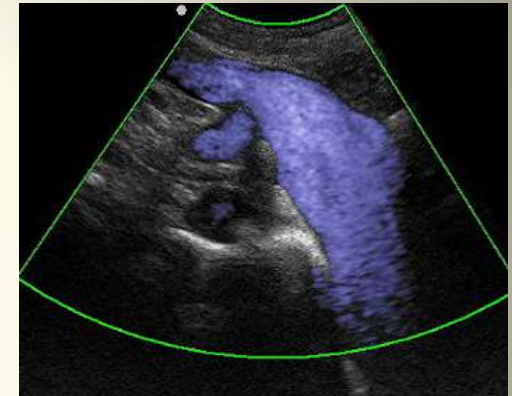
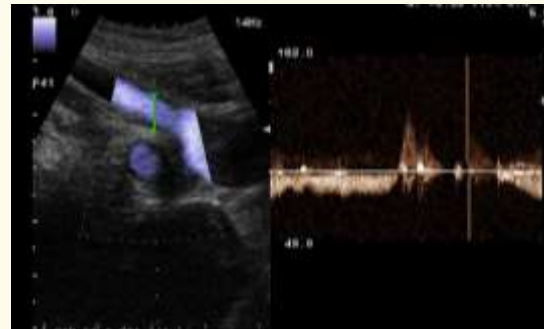
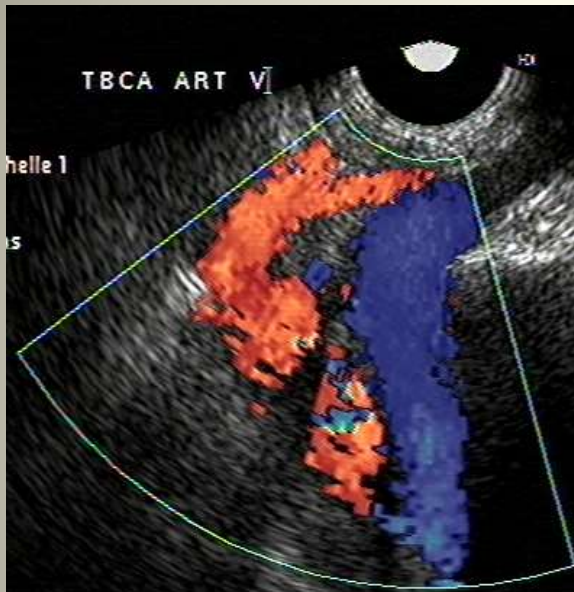
SUS CLAVICULAIRE 2



SUS STERNALE

LIMITES US : VEINES CENTRALES COMPLETES

TRONC VEINEUX BRACHIO CEPHALIQUE



Acces direct complet rare
Signes indirects +/- constants

STENOSE des VEINES PROXIMALES et CENTRALES

LIMITES:

CARDIOPATHIE

HTAP

➤ SIGNES DIRECTS DE STENOSE /THROMBOSE:

TURBULENCE /ALIASING /VARIANCE en DOPPLER COULEUR

RAPPORT DES VITESSES >2 en PW

VENTURI:COLLAPUS PARIETAL

ABSENCE DE SIGNAL PW CFM

➤ SIGNES INDIRECTS

REFLUX DANS LA COLLATERALITE:

SC - JI -JE- THORAX/ VAX

PERTE DE MODULATION RESPIRATOIRE

FLUX MONOPHASIQUE

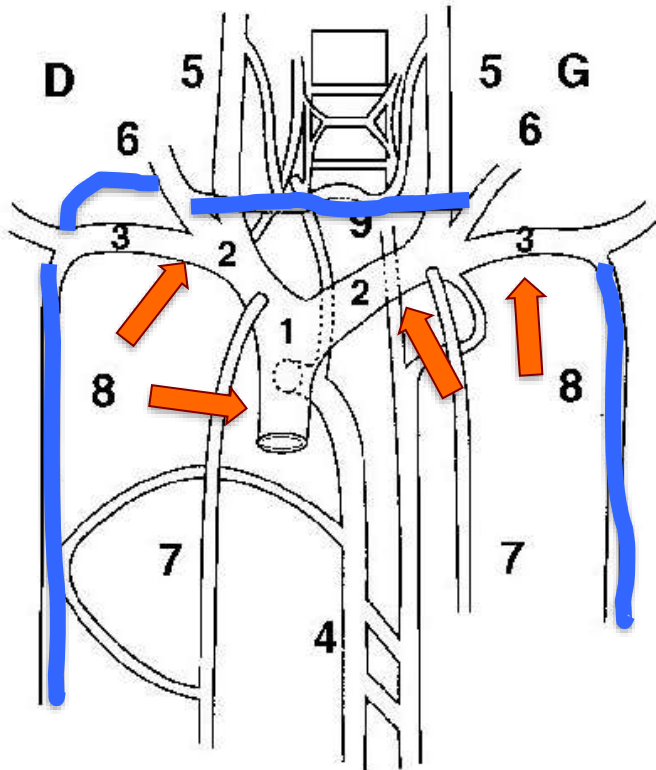
PERTE DE PHASICITE des CALBRES

➤ ASYMETRIE DE CALIBRE DES VJI

➤ STASE D'AMONT

➤ MAUVAISE VIDANGE VJI EN POSITION ASSISE

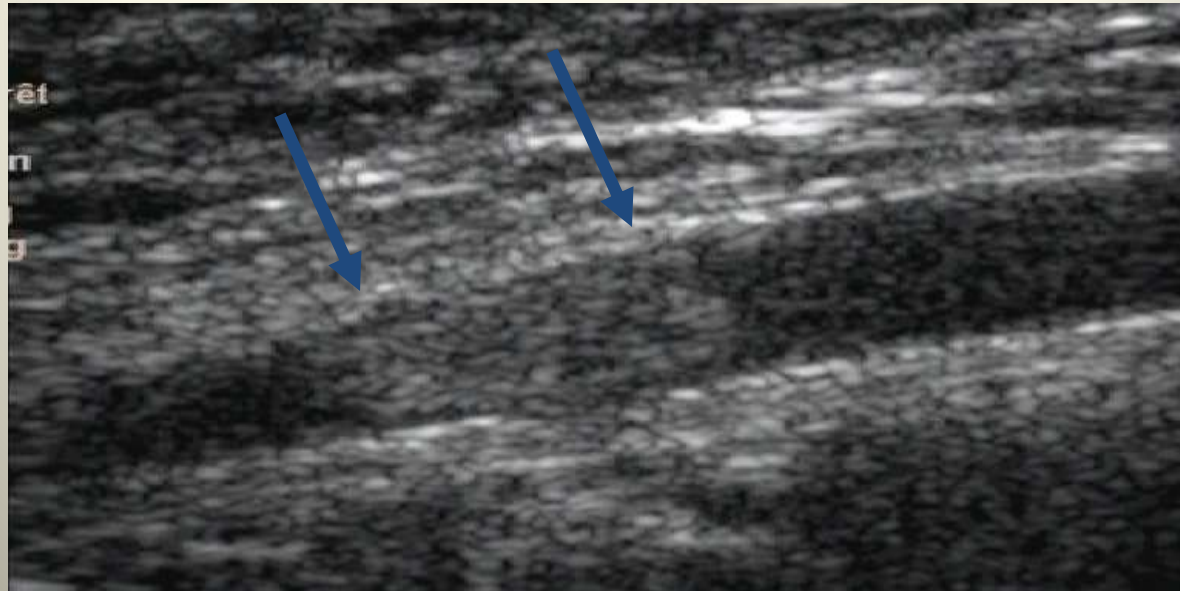
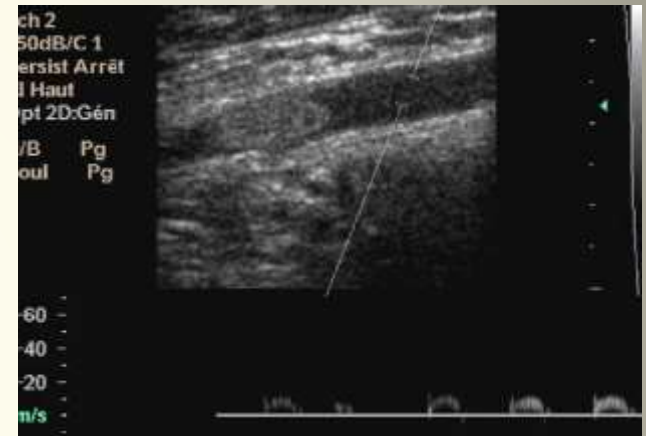
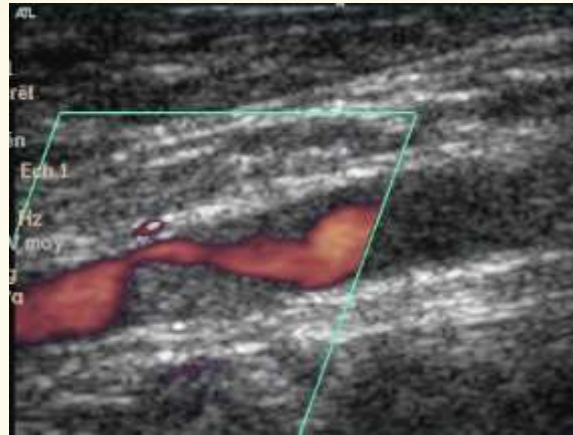
SUPPLEANCES



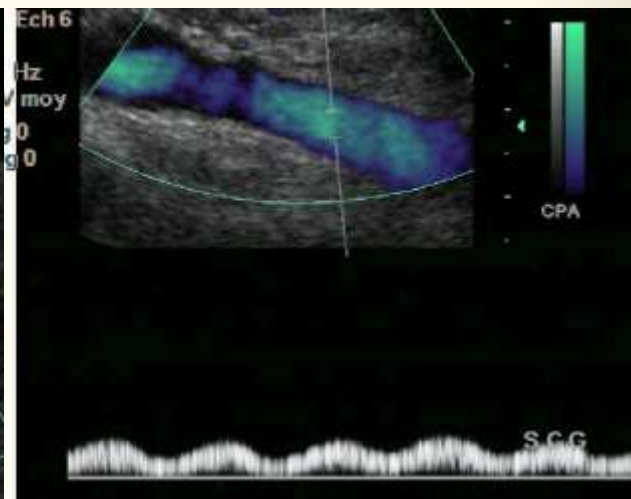
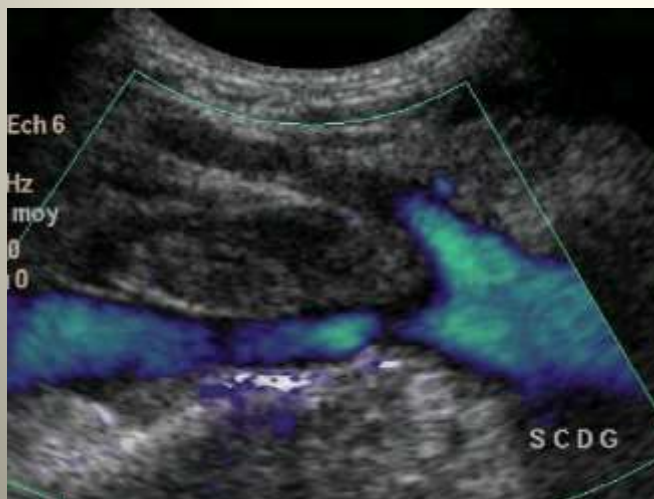
- 1: V. cave sup
- 2 : V. innominée
- 3 : V. sous clavière
- 4 : V. azygos
- 5 : V.jugulaire interne
- 6 : V. jugulaire externe
- 7 : V. mammaire interne
- 8 : V. thoracique latérale
- 9 : Arche jugulaire antérieure

STENOSE VEINEUSE SERREE AX-SCD

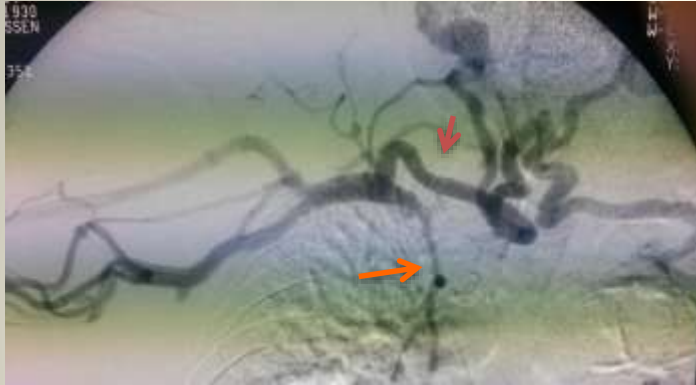
THROMBUS INCOMPLETEMENT OCCLUSIF



STENOSE VEINEUSE ASSEZ SERREE SCG SUR THROMBUS

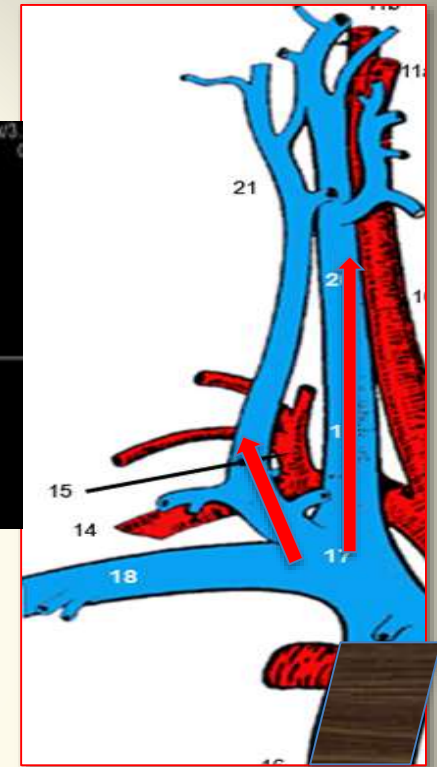
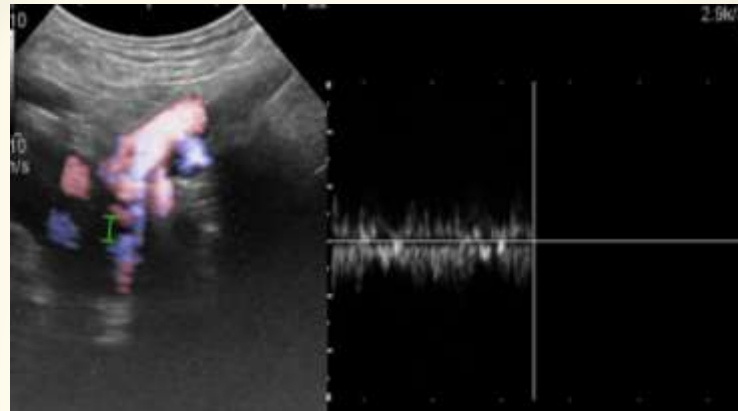
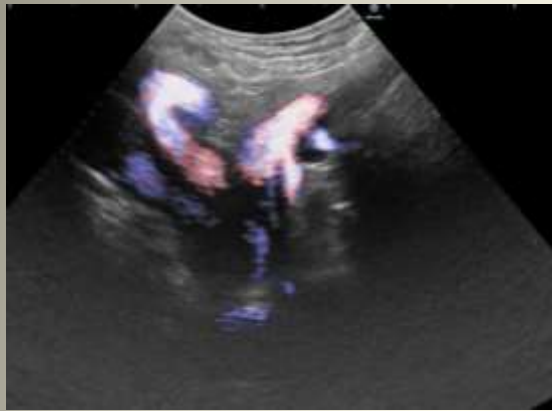


OCCLUSION DU TVBC



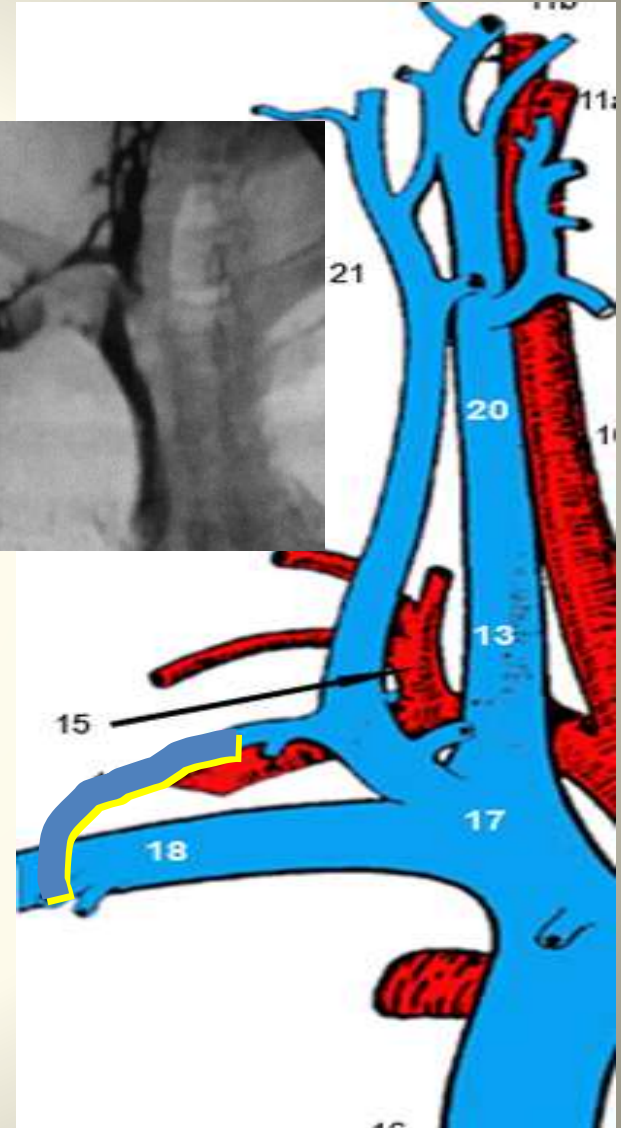
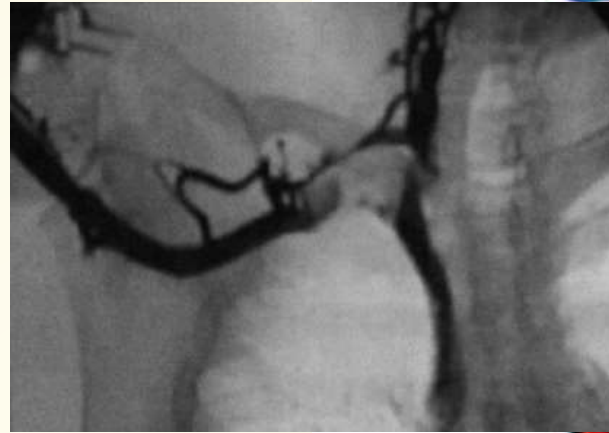
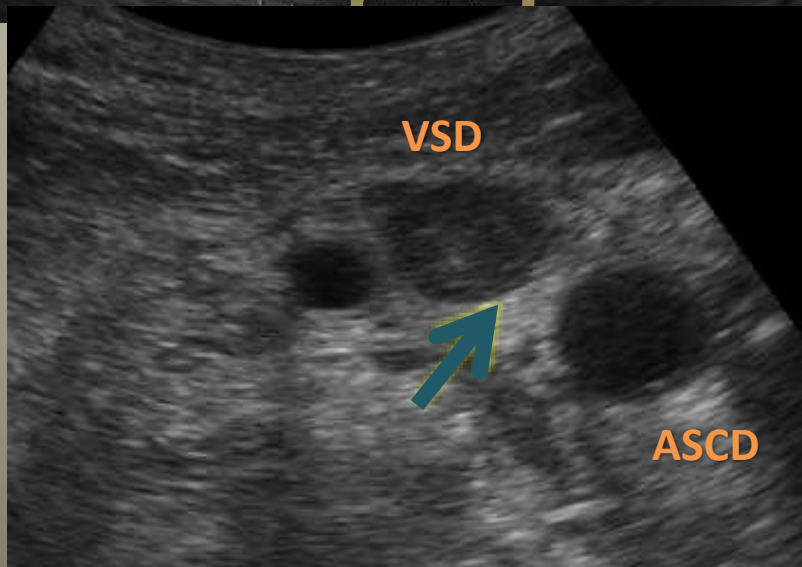
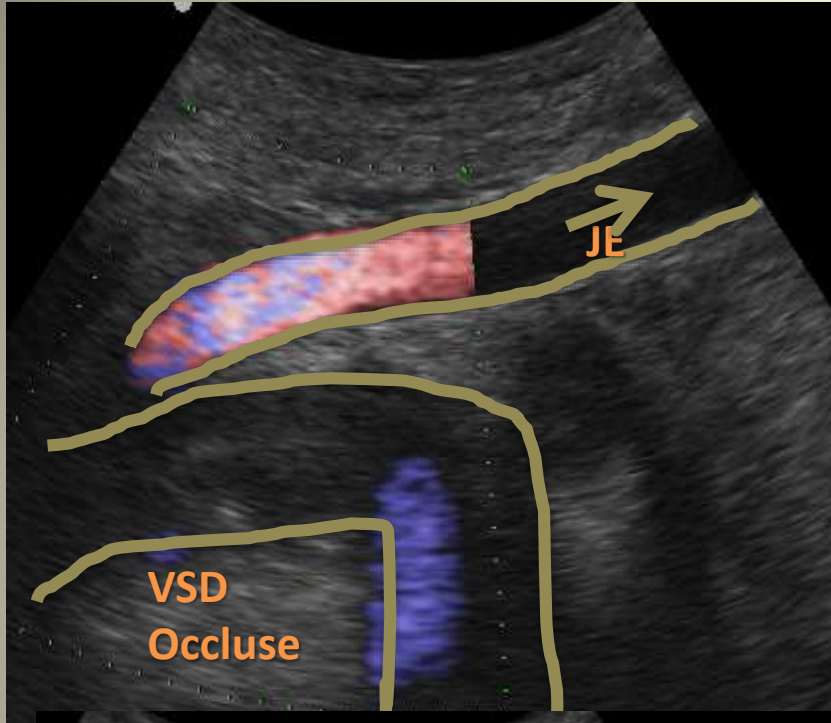
COLLATERALITE ACTIVE INTER SC
VJI STENOSEE OU OCCLUSE
DISPARITION DE LA MODULATION RESPIRATOIRE DU FLUX
DISPARITION DE LA PHASICITE RESPIRATOIRE DES CALIBRES
STASE D'AMONT

OCCLUSION DU TVBC

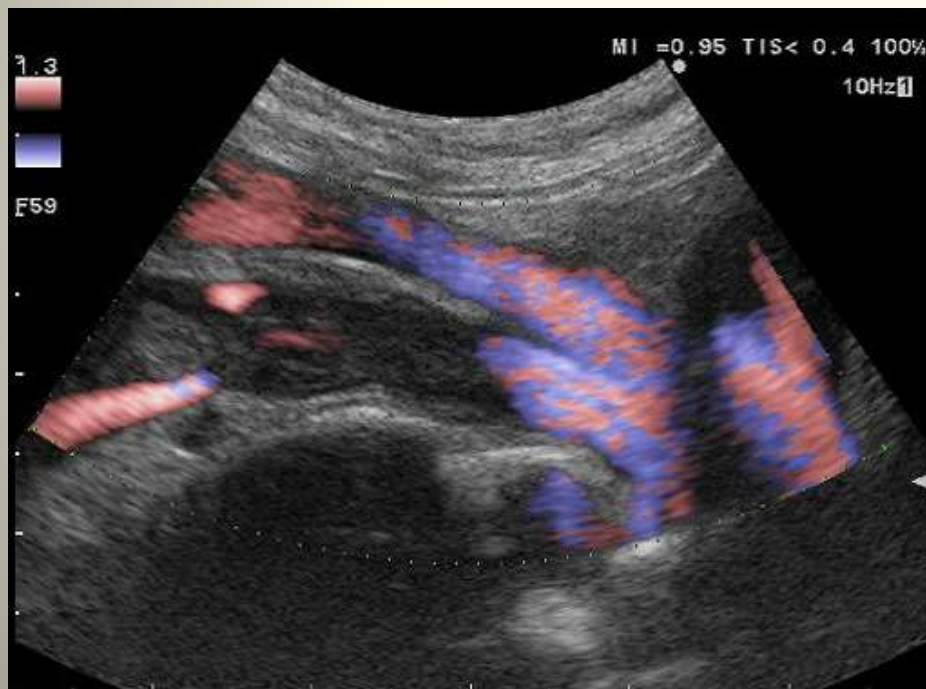


**VJI et JE PERMEABLE à CONTRE COURANT
DISPARITION DE LA MODULATION RESPIRATOIRE DU FLUX
DISPARITION DE LA PHASICITE RESPIRATOIRE DES CALIBRES
FLUX JUGULAIRE +/- PULSE
STASE D'AMONT**

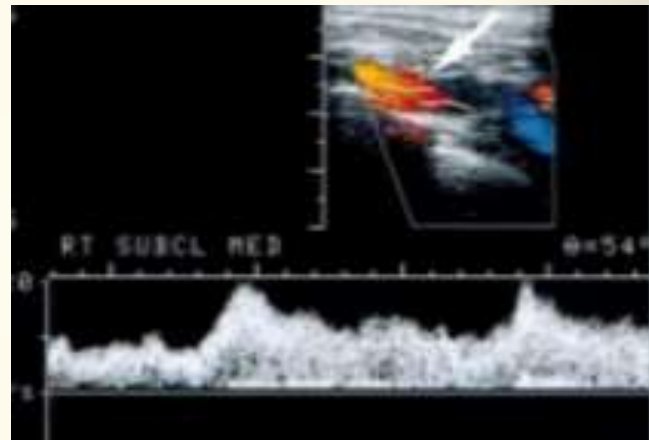
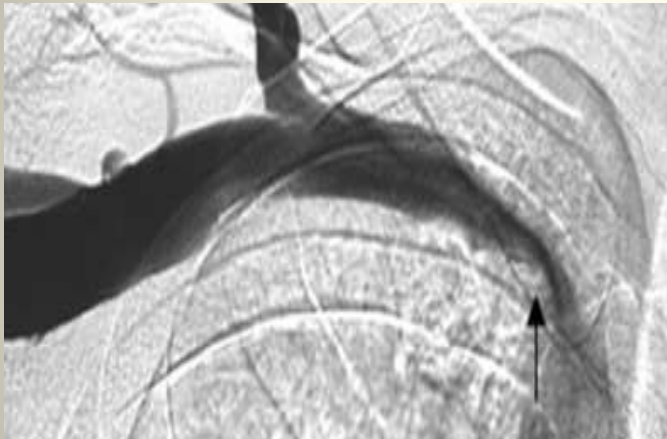
PIÉGE : COLLATÉRALITE



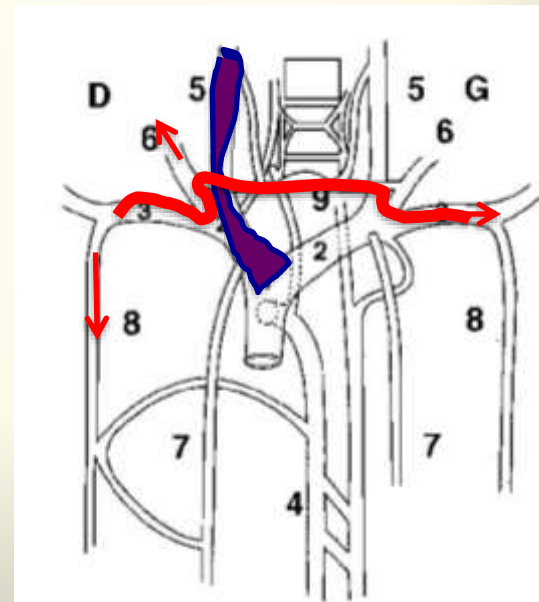
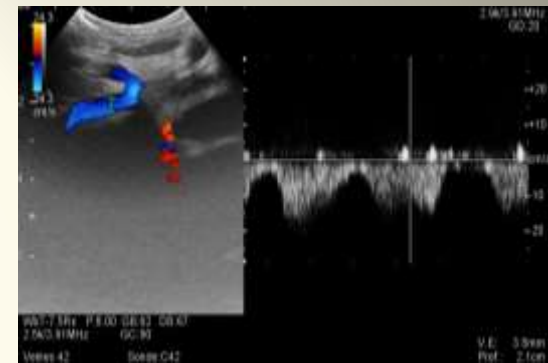
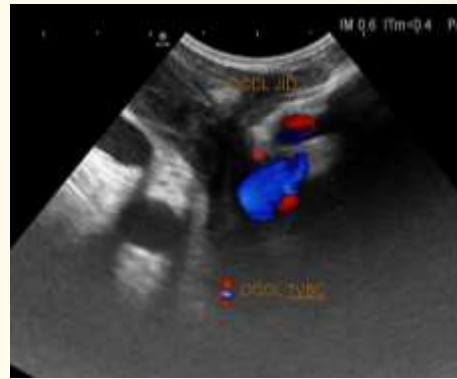
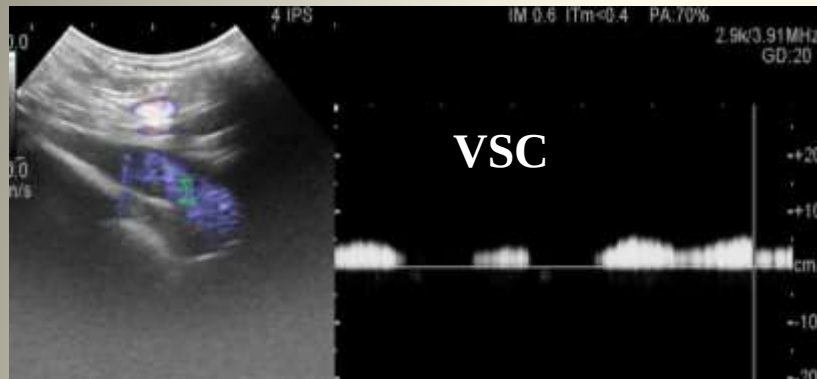
STENOSE VSCD SUR THROMBUS COLLATERALLITE



STENOSE PYROGOFF



OCCLUSION TVBC et JJ



LESIONS des VEINES PROXIMALES et CENTRALES

US: Sensibilité 81% et spécificité 97% POUR LESIONS CENTRALES

Passman MA. J Vasc Surg. 1998

US: Sensibilité et spécificité 82% POUR LESIONS AXILO-SOUS -CLAVIERES

Baarslag HJ. Ann Intern Med. 2002

Labropoulos n.. J Vasc Surg. 2007

US: Sensibilité 81% et spécificité 97% POUR LESIONS PROXIMALES et CENTRALES

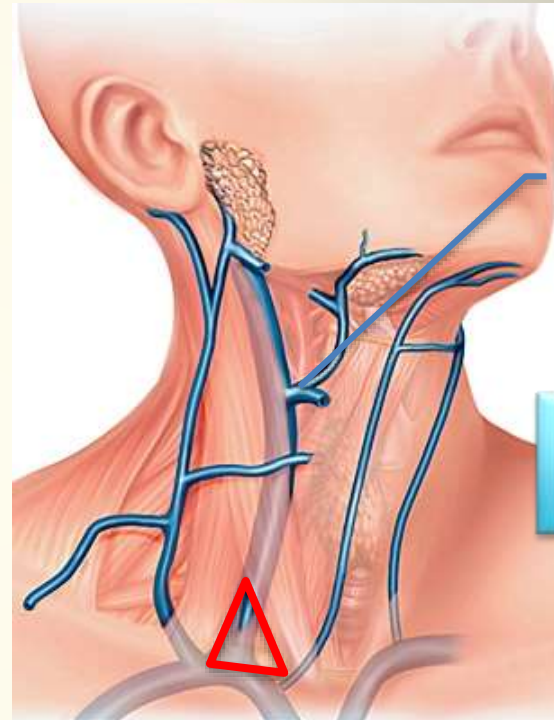
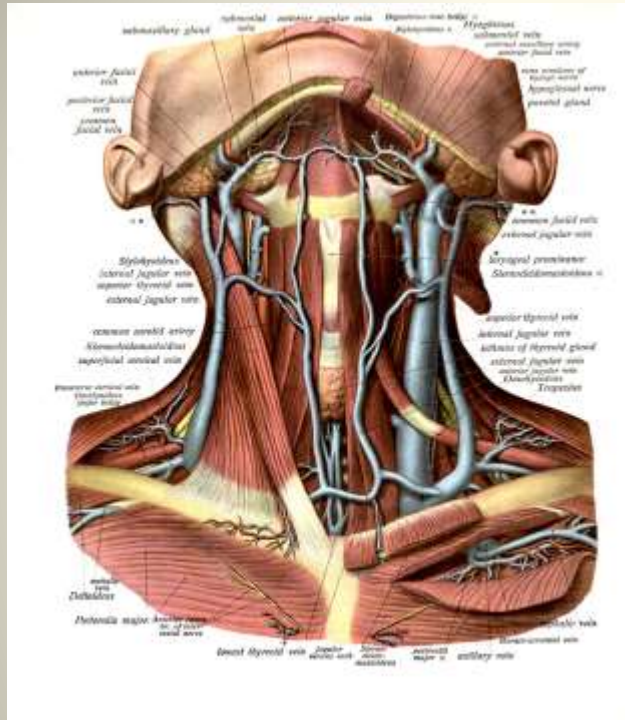
Rad MP. Saudi J Kidney Dis Transpl. 2015

**PHLEBOGRAPHIE RESTE LE GOLD STANDART
Pour les
VEINES CENTRALES**

VEINE JI

- **EXPLOREE AVANT POSE DE KT**
- **SUIVI DU KT**
- **AVANT NOUVEAU KT**

VEINE JI



Tr de
FARABOEUF

Triangle de Sédillot
- 2 Chefs du SCM
- Clavicule

Dimensions :diamètre de 15 mm – longueur 12 à 15 cm

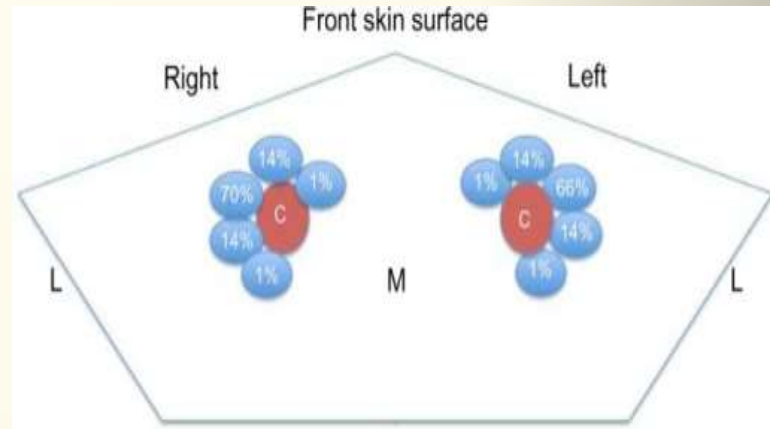
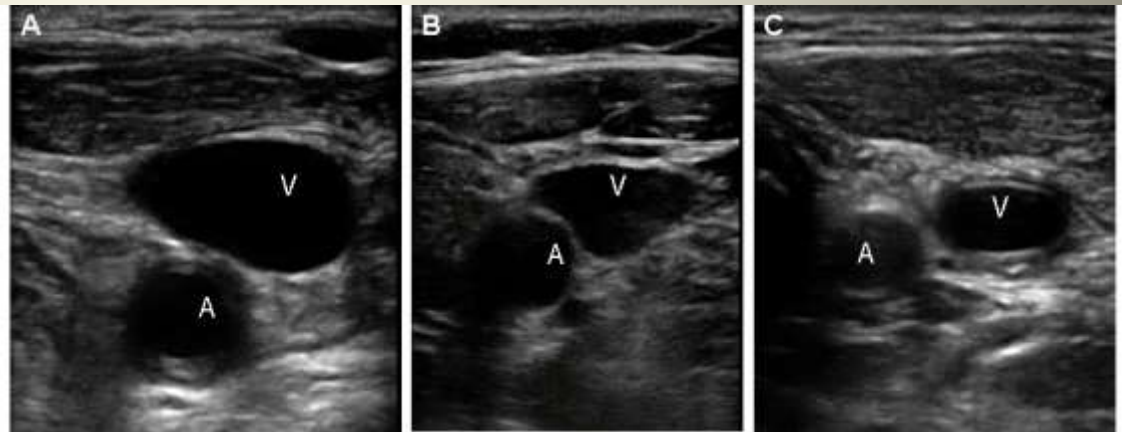
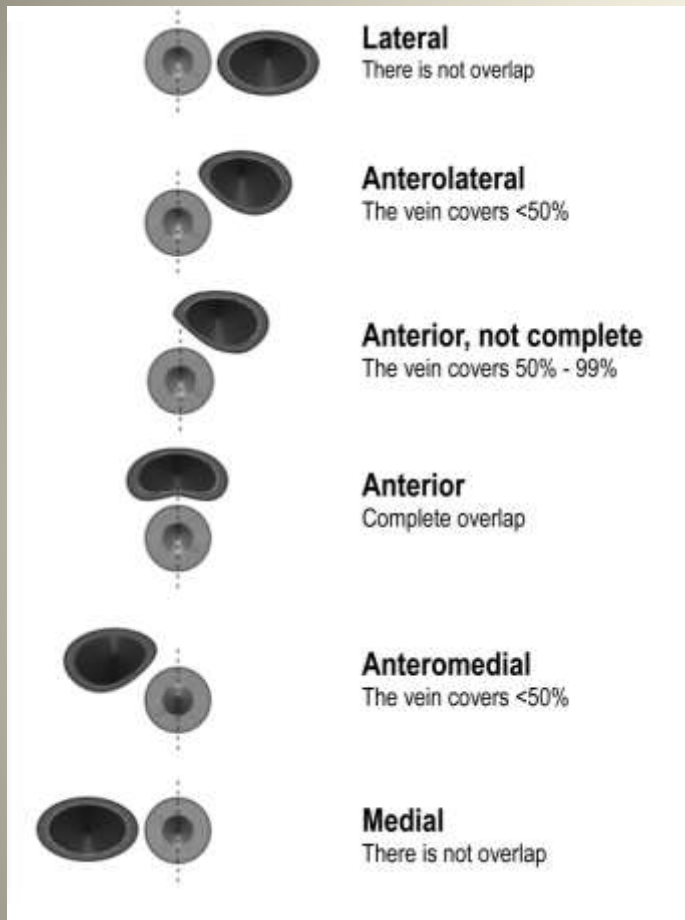
Trajet: -émerge du trou déchiré postérieur, en arrière et en dehors de la CI

-descend obliquement en bas et en avant, en dedans du bord externe de la CI

-se termine derrière l'extrémité interne de la clavicule,

-recouverte par le SCM sauf dans sa partie terminale dans le triangle de Sédillot

VARIATION de la VJI

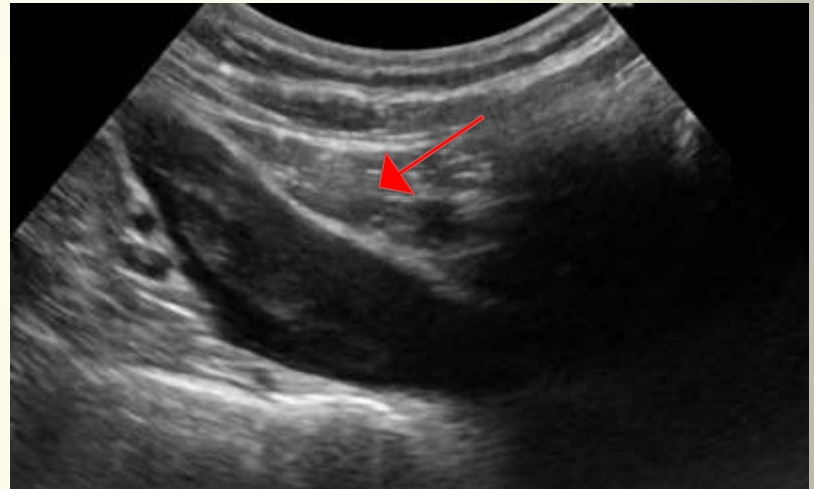
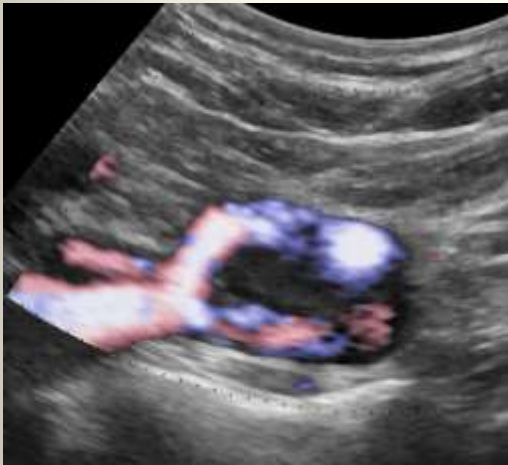


Umaña M.Colomb Med (Cali). 2015

Roth B.Paediatr Anaesth. 2008

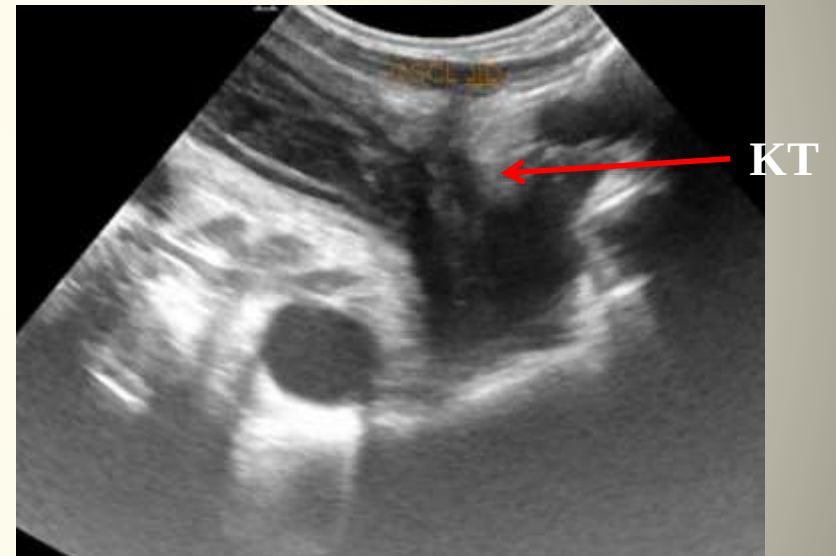
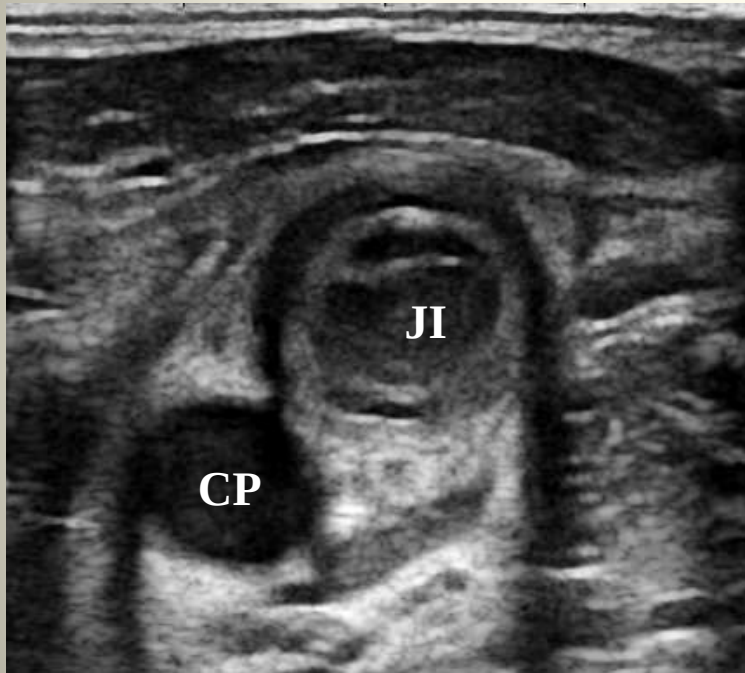
Shoja MM.Ann Anat. 2008

STENOSE JI SUR THROMBUS



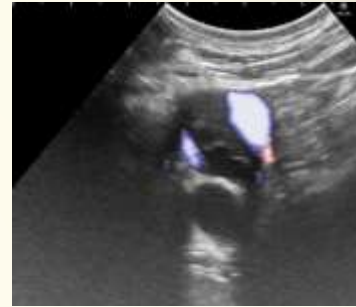
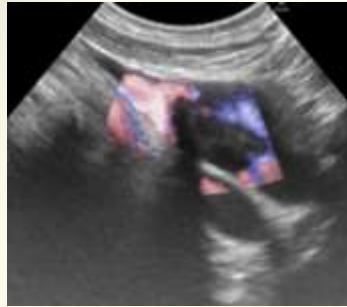
**ABLATION DE KT
SYNECHIES ET THROMBUS ADHERENT**

THROMBOSE COMPLETE JI

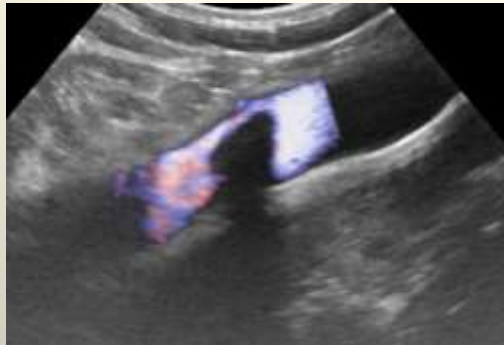


THROMBUS SUR KT JJ

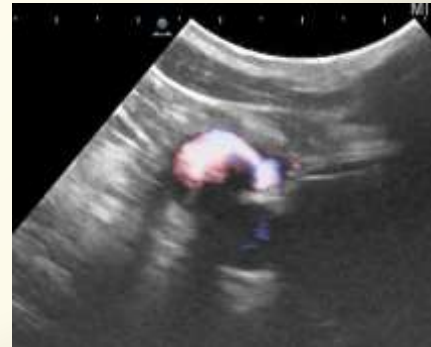
THROMBUS NON ADHERENT



COUPE LONG



COUPE TRANS

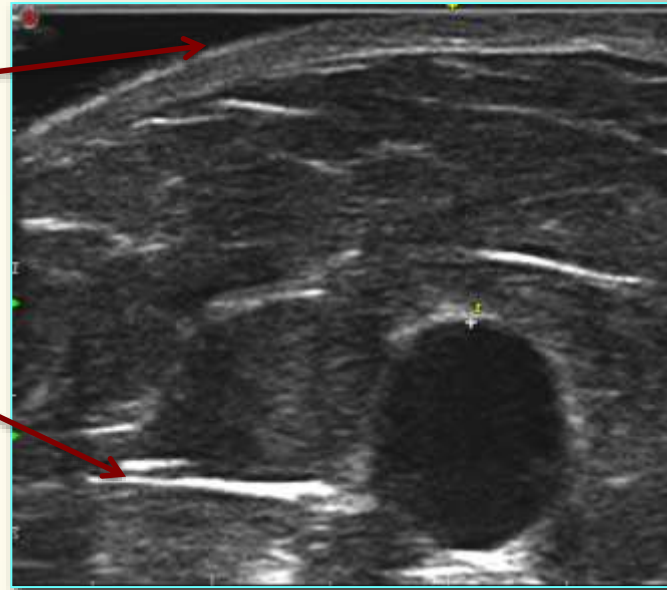


THROMBUS ADHERENT

PARTIES MOLLES

PARTIES MOLLES

PEAU
DERME
HYPODERME
GAINE CONJONCTIVE
FASCIA



SONDES > 12MhZ
GEL +++++ en SUSPENSION
COUPES TRANSVERSES ETAGEES

EVALUATION DES PARTIES MOLLES

- **Profondeur des veines**
- **Texture des parties molles**

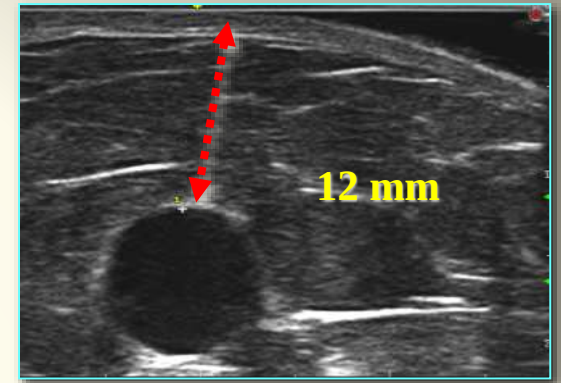
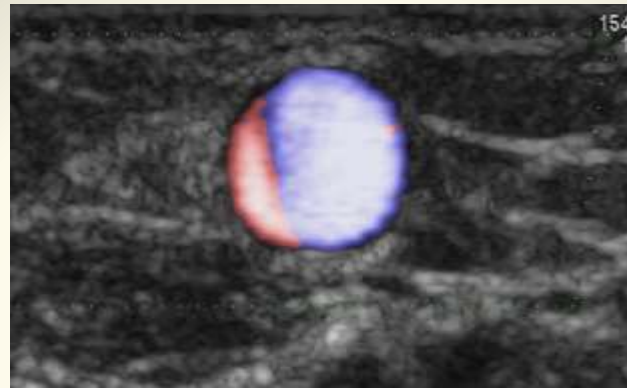


SUPERFICIALISATION SI EPAISSEUR > 5/6mm

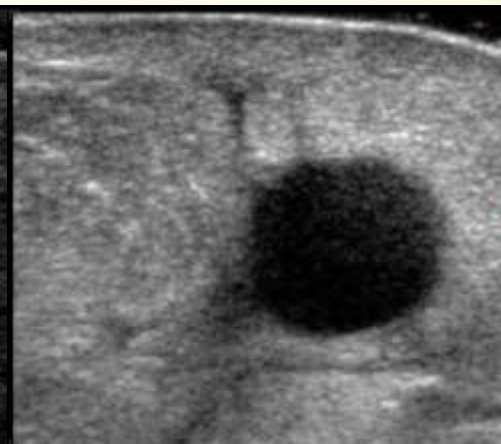
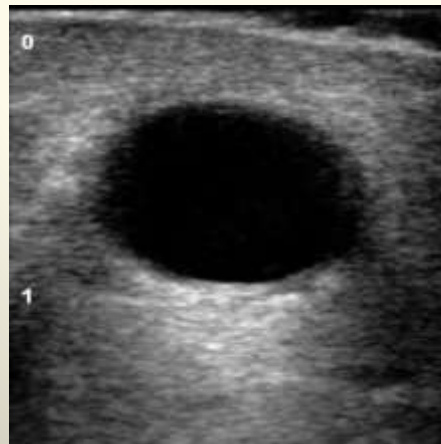
33% des RM PAS de LESIONS à la FISTULOGRAPHY

TORDOIR J.Nephrol Dial Transplant (2003)

EVALUATION DES PARTIES MOLLES



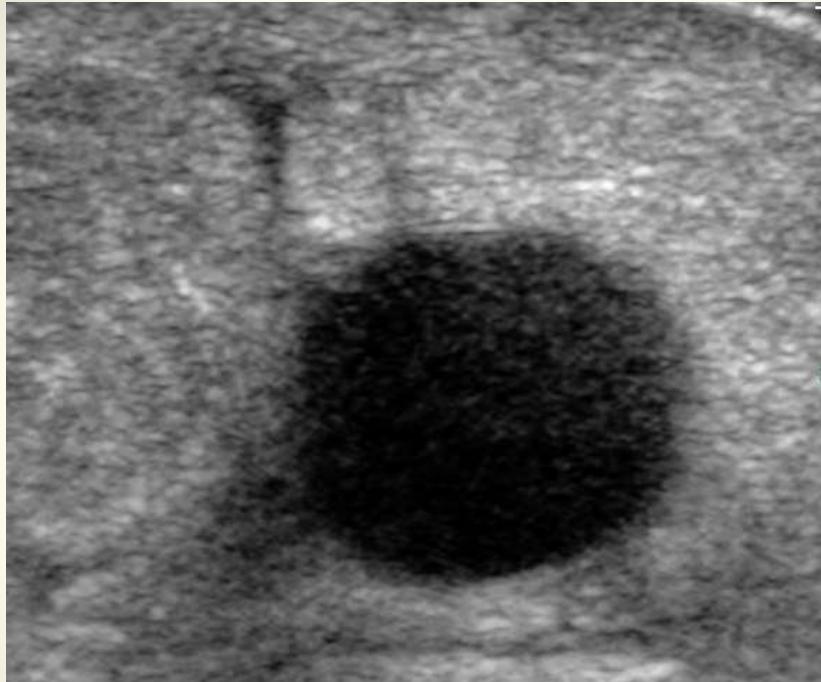
PROFONDEUR



LIPODERMATOSCLEROSES

Texture DES PARTIES MOLLES

ROLE DU TISSUS ADIPEUX



Adipose phenotype predicts early human autogenous arteriovenous hemodialysis remodeling

MAURO CR.J VASC SURG,2014

VEINE NORMALE DANS TISSUS ADIPEUX

PATIENT OBESE



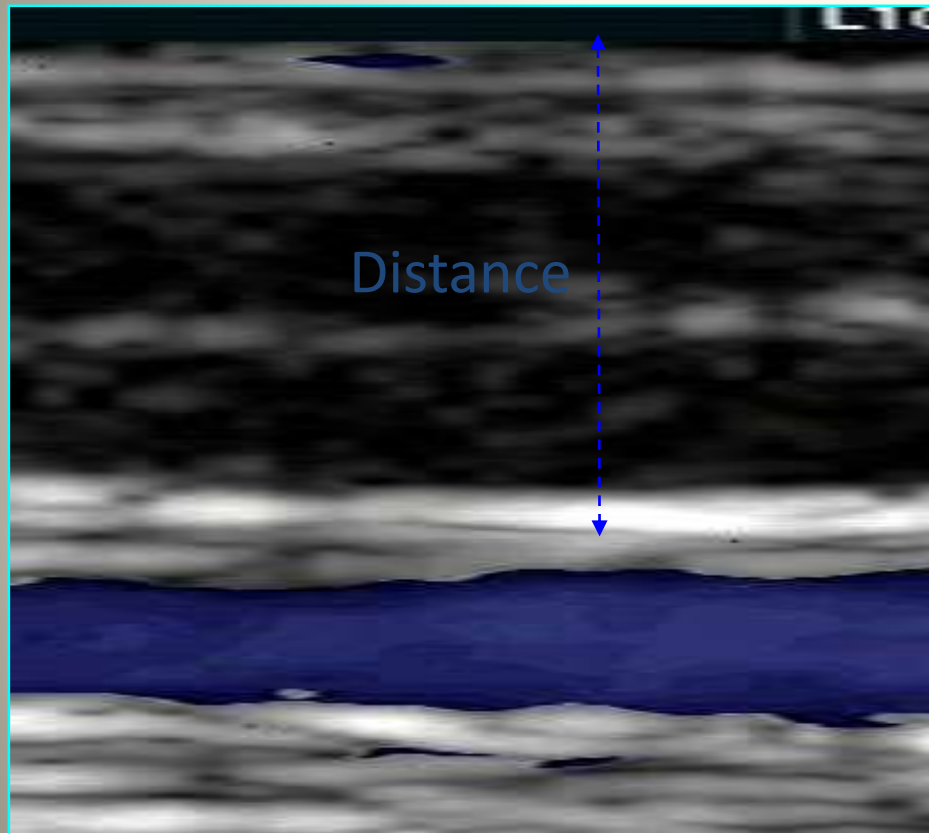
LIPOSCLEROSE



Preoperative US scanning increases options for AVF
by identifying veins that are not clinically assessable
Successful rate similar in obese and non obese

Vassalotti JA, Clin Nephrol 2002

SITUATION/PROFONDEUR



ETAT DES PARTIES MOLLES

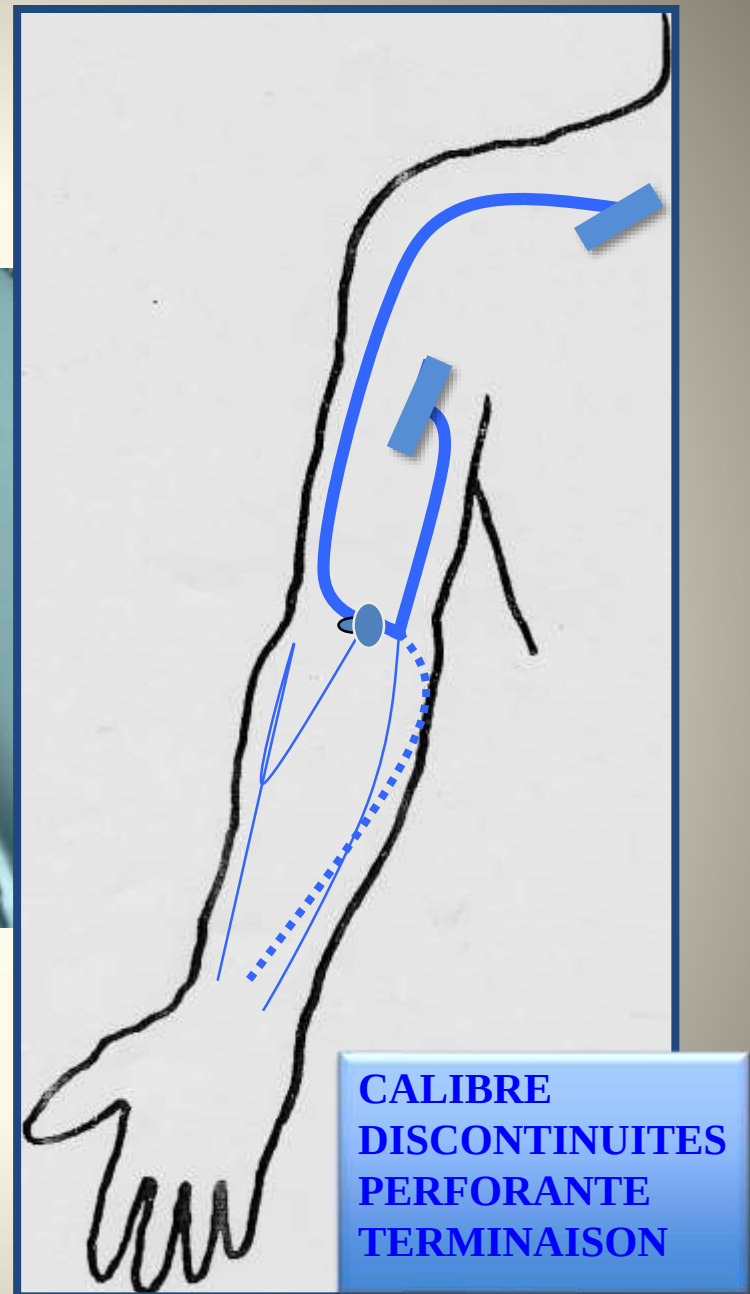
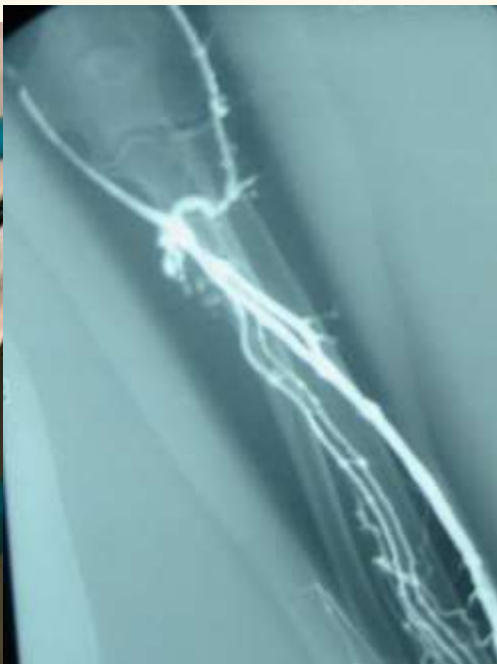
COMPTE RENDU D'EXAMEN

SYNTHESE DESCRIPTIVE

- **ETAT ARTERIEL et Ø**
- **ETAT VEINEUX et Ø**
- **PARTIES MOLLES**

- **VEINES CENTRALES**
- **VEINE JUGULAIRES**

CARTOGRAPHIE MARQUAGE



CARTOGRAPHIE « OFFICIELLE »

Bilan pré création d'accès vasculaire

Nom : R..... Prénom: C..... né(e) le: 15/09/1955 date: 08/06/2012

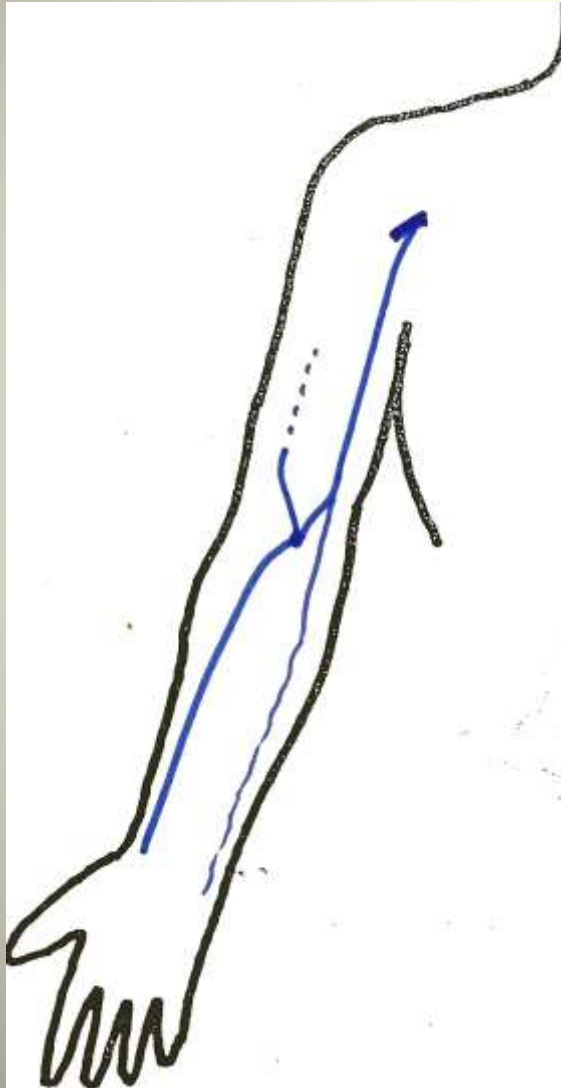
droitier X gaucher Médecin: Dr

ATCD & Fact. Risque : DS type II

Calibre interne (<D>) / longueur (long) ou profondeur (prof)

<u>Droit</u>		<u>Gauche</u>
	Art sous clavière	
	V sous clavière	
perméable	Art axillaire	perméable
perméable	V axillaire	perméable
perméable	V humérale	perméable
4 mm	V céphalique	2,3 mm
6 mm, longueur 12 cm	V basilique	5 mm, longueur 12 cm
4,5 mm	Art brachiale	5 mm
6,5 mm	V méd. céphalique	3,5 mm
1,8 mm	V méd. Basilique	4,8 mm
	V com. postérieure	
2 mm	Art radiale	2 mm
1,6 mm	V radiale sup.	4 mm
fonctionnelle	Art cubitale	fonctionnelle
	V cubitale	

CARTOGRAPHIE et CR



SHEMA COMPLETE LE CR ECRIT

----- OCCLUSION
——— NORMAL
~~~~~ IRREGULIER

# EQUATION DU RISQUE DE NON MATURATION DE FAV

Table 3. Clinical use of the scoring system<sup>a</sup>

| Variable         | Points | Score | Variable Definitions                                                                                                                                               |
|------------------|--------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Age $\geq 65$ yr | +2     |       | Age at time of fistula creation                                                                                                                                    |
| PVD              | +3     |       | Documented lower extremity revascularization, digit or extremity amputation, history of claudication and ischemic extremity changes or gangrene                    |
| CAD              | +2.5   |       | Documented coronary stenosis by angiography or history of myocardial infarction or previous coronary revascularization by angioplasty, stenting, or bypass surgery |
| White            | -3     |       | Not of black, Asian, aboriginal, or other non-European descent                                                                                                     |
| Baseline score   |        | +3    | All patients are given baseline score of 3                                                                                                                         |
| Total            |        |       | Sum of scores                                                                                                                                                      |

<sup>a</sup>The total score could range from 0 to 10.5.

Table 4. An example use of the FTM predicted risk categories<sup>a</sup>

| Score      | Risk Category <sup>b</sup> | Clinical Application <sup>c</sup>                                                                                                                                                                                                           |
|------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <2.0       | Low risk: 25%              | PE <sup>d</sup> $\pm$ duplex ultrasound; create AVF                                                                                                                                                                                         |
| 2.0 to 3.0 | Moderate risk: 35%         | PE, <sup>d</sup> duplex ultrasound $\pm$ venogram; create AVF                                                                                                                                                                               |
| 3.1 to 6.9 | High risk: 50%             | Arteriogram + venogram and appropriate preoperative intervention as necessary; create AVF with very close postoperative monitoring (e.g., weekly or biweekly), and anticipate the need for aggressive intervention to facilitate maturation |
| $\geq 7.0$ | Very high risk: 70%        | Consider another form of permanent access (e.g., graft); continue to avoid catheter use                                                                                                                                                     |

<sup>a</sup>All patients with risk factors for central vein stenosis should have a venogram regardless of score. AVF, arteriovenous fistula; PE, physical examination.

<sup>b</sup>Because of the similarity in risks for patients who have fistula primary failure and those that fail to mature (see Figure 1), the risks have been rounded for ease of use.

<sup>c</sup>These are untested possible applications that will require prospective trial evaluation.

<sup>d</sup>Physical exam.

## LOGICAL PREDICTION of FTM and SECONDARY PROCEDURES

| SOFT TISSUE          | ARTERY | VEIN | MATURATION | SOLUTION                        | SECONDARY PROCEDURES |
|----------------------|--------|------|------------|---------------------------------|----------------------|
| THICKNESS<br><5/6 MM | N      | N    | MATURATION | CANNULATION                     | 0                    |
|                      | N      | S    | FTM        | REDO/PTA                        | 1                    |
|                      | S      | N    | FTM        | REDO/PTA                        | 1                    |
|                      | S      | S    | FTM        | PTA                             | DOUBLE PTA           |
| THICKNESS<br>>5/6 MM | N      | N    | MATURATION | SUPERFICIALISATION              | 1                    |
|                      | N      | S    | FTM        | REDO/ PTA<br>SUPERFICIALISATION | 1/2                  |
|                      | S      | N    | FTM        | REDO/ PTA<br>SUPERFICIALISATION | 1/2                  |
|                      | S      | S    | FTM        | NEW AVF                         | 2/3                  |

**N:normal-S:stenosis-PTA:angioplasty-REDO:surgical repair**

# CONCLUSION

- **US UTILE AU BILAN PRE ET POST FAV**
- **EVITE CERTAIN ECUEIL DE LA CLINIQUE**
- **GUIDE LE CHOIX DU SITE ET DU TYPE DE MONTAGE**
- **COMPLETE OU SE SUBSTITUE AUX EX INVASIFS**
- **PREVISION DU RISQUE ISCHÉMIQUE**
- **LIMITE :VEINES CENTRALES**

# FAV REDO

**ECHEC CREATION FAV :POURQUOI?**

**RETOUR HD : REJET**

**REFAIRE BILAN**

**STRATEGIE FONCTION DU CONTEXTE**

# HOMME de 16 ans

## ECHO-DOPPLER PULSE ET COULEUR PERIPHERIQUE SUP. :

Homme de 16 ans

Artères normales

### A gauche:

Première fistule radio-céphalique occluse.

Occlusion étendue très organisée jusqu'à 1 cm de la perforante.

Occlusion thrombotique de la seconde fistule sur 5 cm ,  
puis perméabilité de la veine antébrachiale utilisée de 3,5 mm de diamètre.

Réseau basilique à l'avant-bras et au bras normal.

Veine céphalique brachiale interrompue.

### A droite :

Belle veine céphalique de 2,5 mm au poignet, 3,5 mm au coude.

Veine céphalique au bras filiforme.

Belle médiane basilique, puis veine basilique de 5 mm formant  
un tronc brachio-basilique au tiers moyen du bras.

Veine basilique à l'avant bras de 1,8 mm au poignet, 2,5 mm au coude.

Prochaine FAV sous AVK ?

2 FAV  
DISTALES  
OCCLUSES

# DISCUSSION

- HOME JEUNE
- GREFFE POSSIBLE
- PRESERVER LES FAV PROXIMALES POUR PLUS TARD
- FAV SOUS AVK
- SUR LE MB NON DOMINANT
- LE PLUS DISTAL POSSIBLE

**FAV RC ACCESSOIRE à DISCUTER**

# HOMME 28 ans

## ECHO-DOPPLER PULSE ET COULEUR PERIPHERIQUE SUPERIEUR & CERVICAL

### A DROITE :

Hypoplasie de l'artère cubitale.

Axes artériels correctement perméables, l'artère radiale ayant 1,8 mm, l'artère cubitale de 1 mm.

Veine céphalique détruite jusqu'à 2 cm du coude.

Veine céphalique accessoire dédoublée de 3 mm de diamètre de paroi normale.

Médiane céphalique régulière.

Veine céphalique au bras régulière de 3,5 mm, correcte perméable jusqu'à la crosse.

Médiane basilique régulière dédoublée.

Veine basilique à l'avant-bras régulière dupliquée au tiers moyen de 2 mm au poignet, 3 mm au coude, puis 3,8 mm au bras, se drainant au tiers moyen dans la veine brachiale médiale.

Veine jugulaire interne et Pyrogoff perméable avec thrombus sur le LT.

Pas d'obstacle au niveau du TVBC.

### A GAUCHE :

AXES ARTERIELS NORMAUX

FAV huméro-céphalique de 1800 ml/mn de débit moyen.

Anastomose artérioveineuse normale.

Veine céphalique sans sténose intermédiaire.

Stent de l'arche terminale de la veine céphalique, sans hyperplasie mais avec déformation au pôle supérieur par le trousseau fibreux du défilé .

Veine basilique consommée.

Pas d'anomalie des veines centrales.

**Discuter une réduction de débit en reportant l'anastomose sur l'artère radiale proximale  
Si nouvel hyperdébit curable par LARP**



**A DROITE :**

Hypoplasie de l'artère cubitale.

Axes artériels correctement perméables, l'artère radiale ayant 1,8 mm, l'artère cubitale de 1 mm.

Veine céphalique détruite jusqu'à 2 cm du coude.

Veine céphalique accessoire dédoublée de 3 mm de diamètre de paroi normale.

Médiane céphalique régulière.

Veine céphalique au bras régulière de 3,5 mm, correcte perméable jusqu'à la crosse.

Médiane basilique régulière dédoublée.

Veine basilique à l'avant-bras régulière dupliquée au tiers moyen de 2 mm au poignet, 3 mm au coude, puis 3,8 mm au bras, se drainant au tiers moyen dans la veine brachiale médiale.

Veine jugulaire interne et Pyrogoff perméable avec thrombus sur le LT.

Pas d'obstacle au niveau du TVBC.

**A GAUCHE :**

**AXES ARTERIELS NORMAUX**

FAV huméro-céphalique de 1800 ml/mn de débit moyen.

Anastomose artérioveineuse normale.

Veine céphalique sans sténose intermédiaire.

Stent de l'arche terminale de la veine céphalique, sans hyperplasie mais avec déformation au pôle supérieur par le trousseau fibreux du défilé .

Veine basilique consommée.

Pas d'anomalie des veines centrales.

# DISCUSSION

- HOME JEUNE
  - GREFFE POSSIBLE
  - PRESERVER LES NOUVELLES FAV PROXIMALES POUR PLUS TARD
  - SUR LE MB NON DOMINANT
  - LE PLUS DISTAL POSSIBLE
- 
- **Discuter une réduction de débit en reportant l'anastomose sur l'artère radiale proximale**
  - **RUDI**
  - **Si nouvel hyperdébit curable par LARP**

# HOMME 38 ANS

## ECHO-DOPPLER PULSE ET COULEUR PERIPHERIQUE SUP. & CERVICAL :

### A droite :

Bifurcation haute de l'artère humérale.

Hypoplasie de l'artère radiale qui est occluse au bras et à l'avant bras.

Tronc C-IO correct au coude.

Artère cubitale occluse au poignet.

Deux PTFE occlus.

La veine céphalique est perméable au tiers supérieur de l'avant-bras et se draine dans la veine basilique au coude.

La veine céphalique est occluse au tiers inférieur du bras, reprise ensuite par la collatéralité.

La veine basilique à l'avant-bras est normale, de 3 mm se drainant dans la veine basilique au bras, 4,5 mm puis dans la veine axillaire.

Veine jugulaire interne et Pyrogoff normaux.

Sténose modérée au niveau du TVBC sur le KT.

### A gauche :

Bifurcation haute de l'artère humérale.

Hypoplasie de l'artère radiale au bras puis occluse au poignet.

Artère cubitale de 3 mm, normale.

2 PTFE au bras implantés sur la jugulaire interne qui est totalement thrombosée.

Veine céphalique de 3 mm au poignet, 3,2 mm à l'avant-bras jusqu'au coude, n'ayant visiblement pas été disséquée au poignet.

Médiane basilique régulière dans la cicatrice.

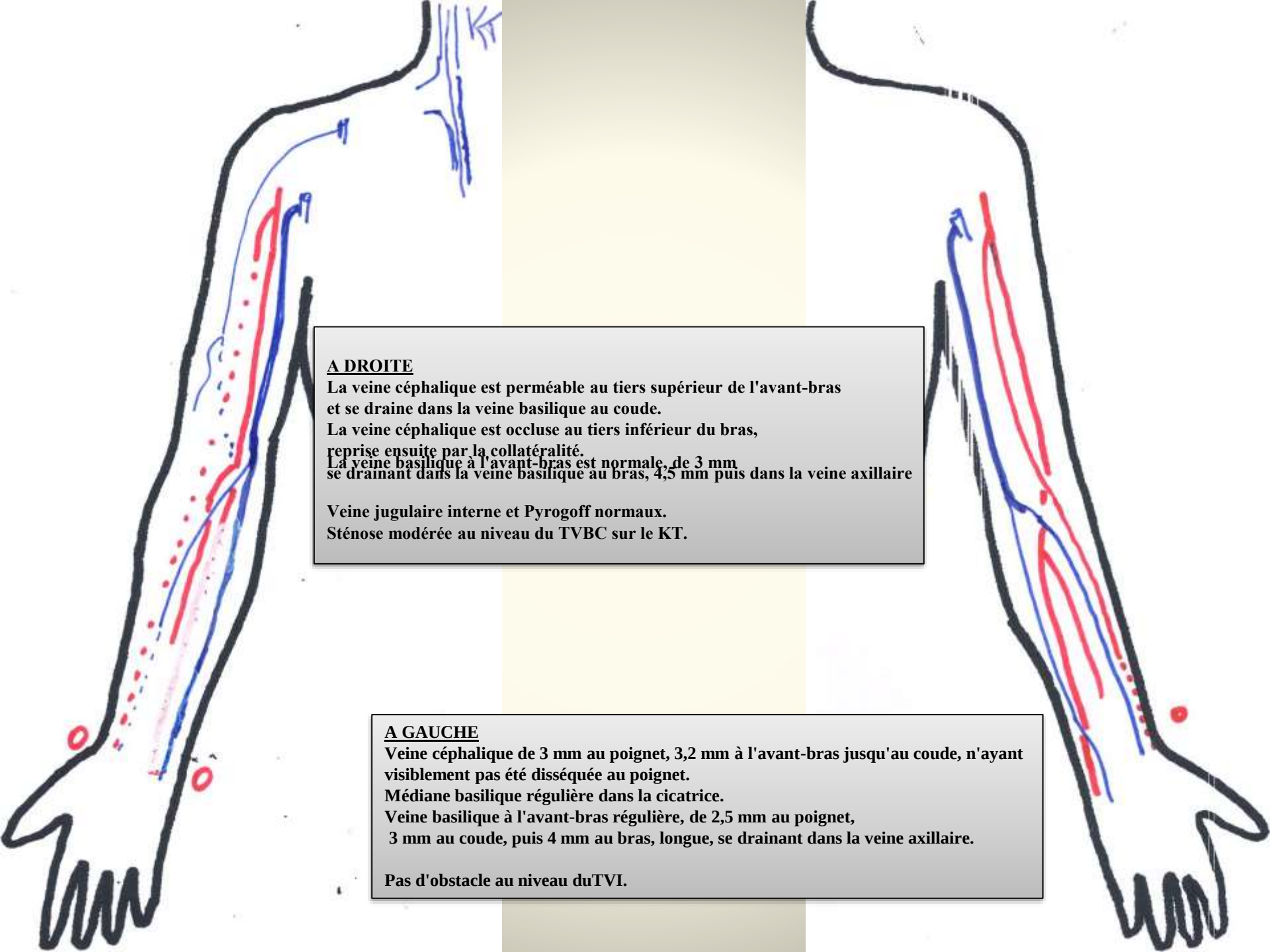
Veine basilique à l'avant-bras régulière, de 2,5 mm au poignet, 3 mm au coude, puis 4 mm au bras, longue, se drainant dans la veine axillaire.

Pas d'obstacle au niveau du TVI.

**Parties molles de 6 mm à l'avant-bras, d'échostructure normale.**

# HOMME 38 ANS

- 2 PONTAGES OCCLUS DE CHAQUE COTE
- BIFURCATION HAUTE AH BILAT
- ARD=O ETENDUE
- ACD DISTALE=O
- ARG DISTALE=O



#### A DROITE

La veine céphalique est perméable au tiers supérieur de l'avant-bras et se draine dans la veine basilique au coude.

La veine céphalique est occluse au tiers inférieur du bras,

reprise ensuite par la collatéralité.

La veine basilique à l'avant-bras est normale, de 3 mm, se drainant dans la veine basilique au bras, 4,5 mm puis dans la veine axillaire

Veine jugulaire interne et Pyrogoff normaux.

Sténose modérée au niveau du TVBC sur le KT.

#### A GAUCHE

Veine céphalique de 3 mm au poignet, 3,2 mm à l'avant-bras jusqu'au coude, n'ayant visiblement pas été disséquée au poignet.

Médiane basilique régulière dans la cicatrice.

Veine basilique à l'avant-bras régulière, de 2,5 mm au poignet,

3 mm au coude, puis 4 mm au bras, longue, se drainant dans la veine axillaire.

Pas d'obstacle au niveau du TVI.

# DISCUSSION

- HOME JEUNE
  - GREFFE POSSIBLE
  - PRESERVER LES NOUVELLES FAV PROXIMALES POUR PLUS TARD
  - SUR LE MB NON DOMINANT
  - LE PLUS DISTAL POSSIBLE
- 
- **Discuter FAV RC sur l'artère radiale au tiers moyen de l'avt bras**
  - **Superficialisation probable**

# THERMAL ANASTOMOSIS



# CONCLUSION I

**« Il faut allier le pessimisme de l'intelligenc  
avec  
l'optimisme du savoir faire »**

**A.GRAMSCI revisité par G.FRANCO**



THANK YOU  
FOR YOUR ATTENTION