



Focus sur la pose de l'ensemble des voies veineuses

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Plan: 5 variables

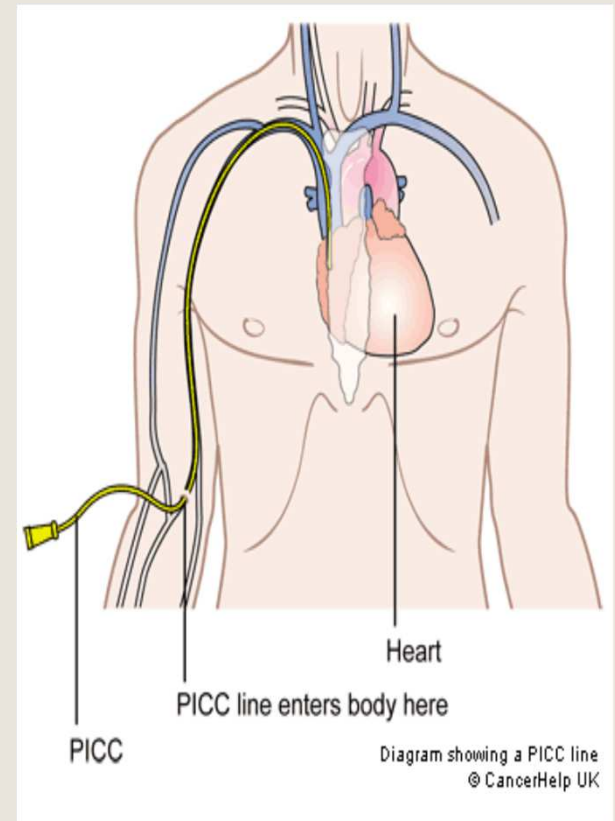
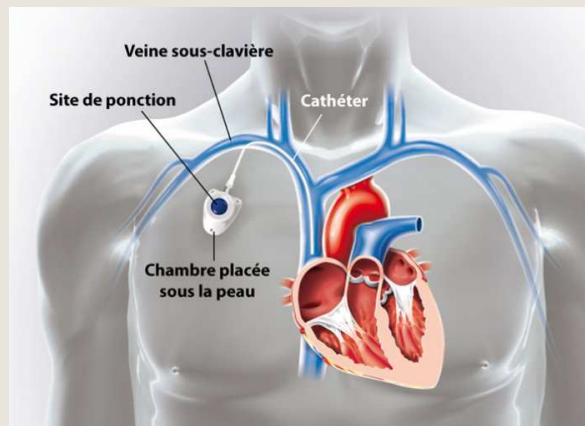
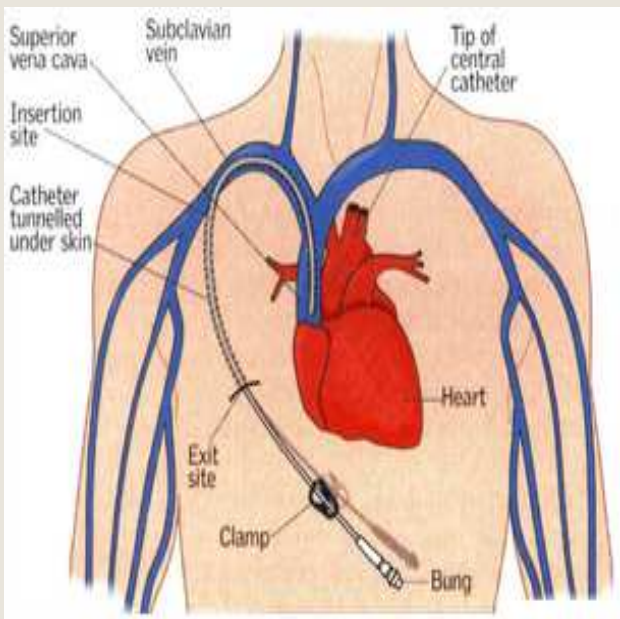
1. Type de voie
2. Repère pour la ponction
3. Type de cathétérisme
4. Tunnellisation
5. Positionnement du cathéter



Type de voie



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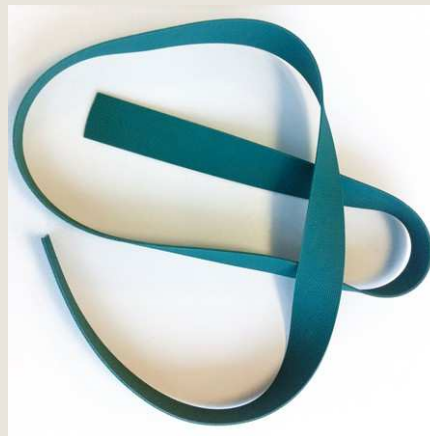
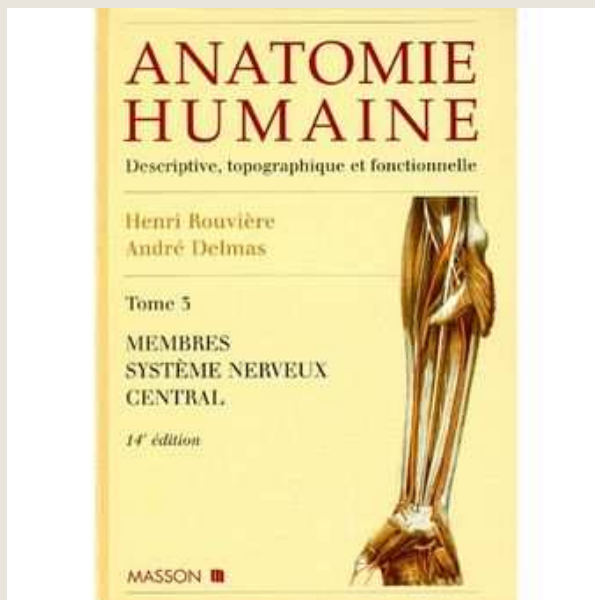


Repère pour la ponction

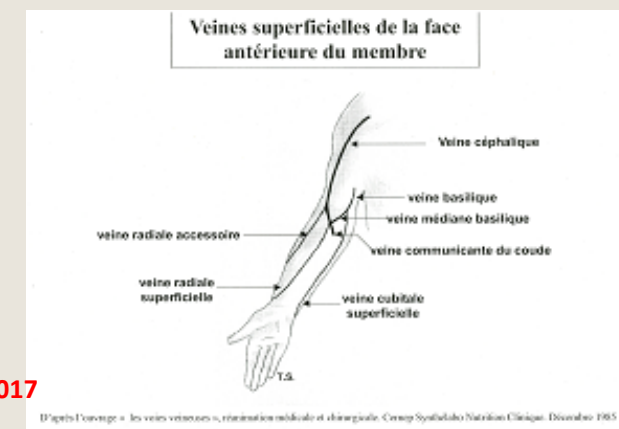
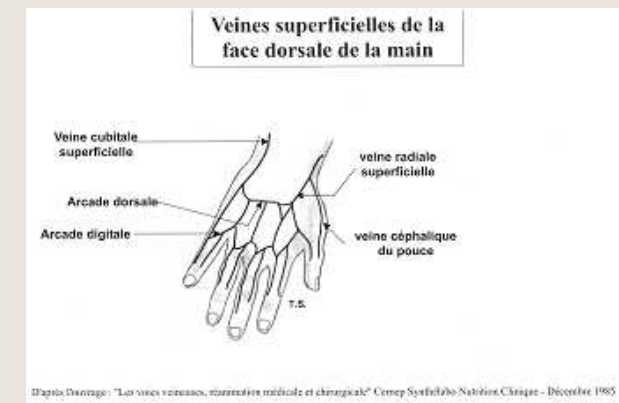
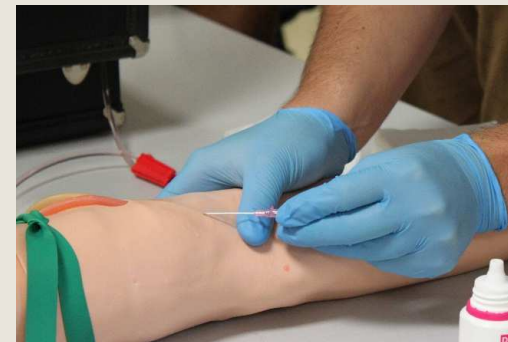


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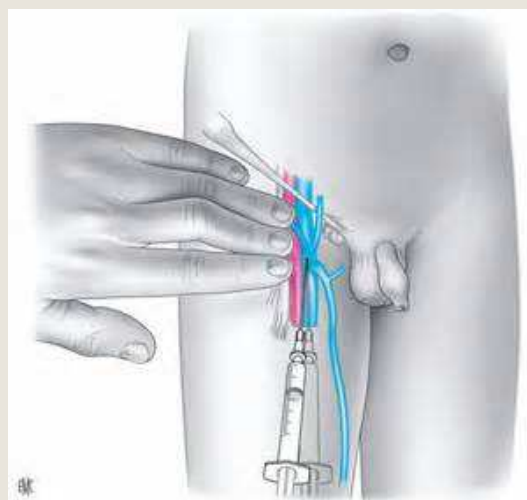
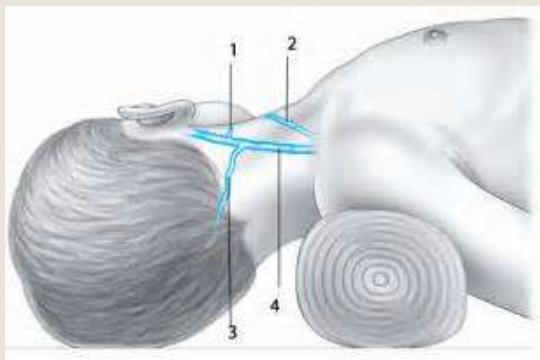
Repère visuel



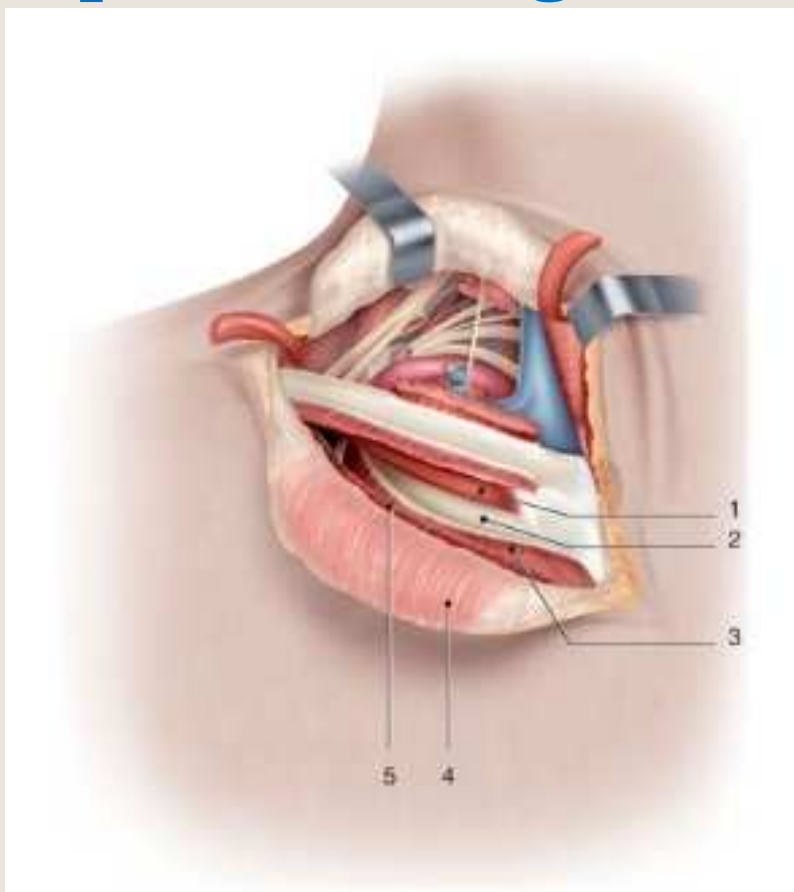
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Repère anatomique



Repère chirurgical



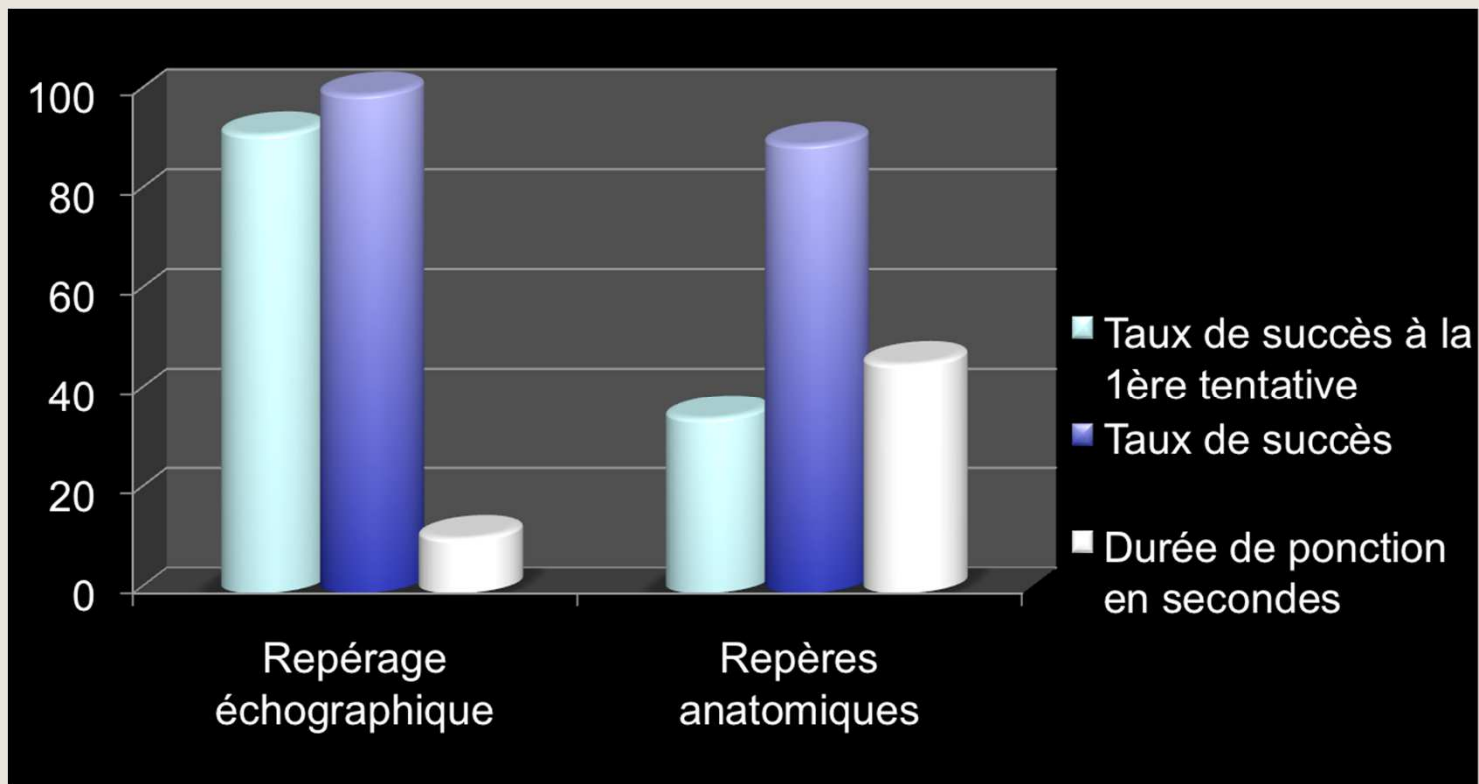
1. Isolation de la veine
2. Incision de la paroi
3. Introduction du cathéter dans la veine

Repère échographique





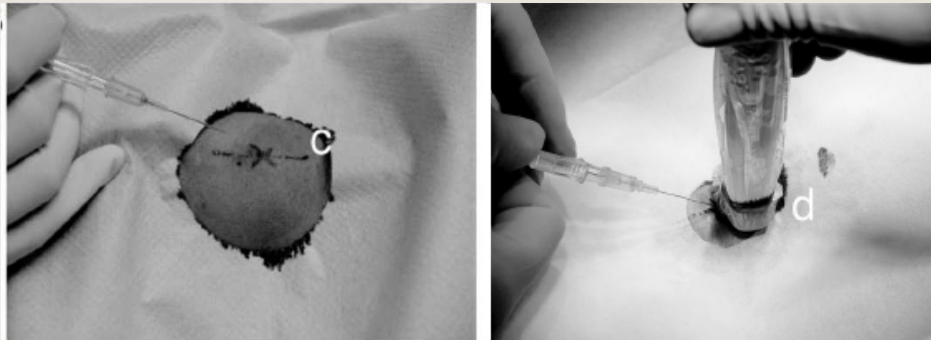
Repère échographique, évidence



Denys BG Circulation 1993



Repère échographique, carte ou GPS?



	Skin-marking Group (n = 27)	Real-time Group (n = 33)	P Value*
Puncture attempts			
Success at first attempt	14, 52% (34–69)	23, 70% (53–83)	0.19
Success <3 attempts	20, 74% (53–83)	33, 100% (89–100)	<0.01
Complications	2, 7% (2–23)	0, 0% (0–10)	0.20

Hosokawa Anesthesiology 2007

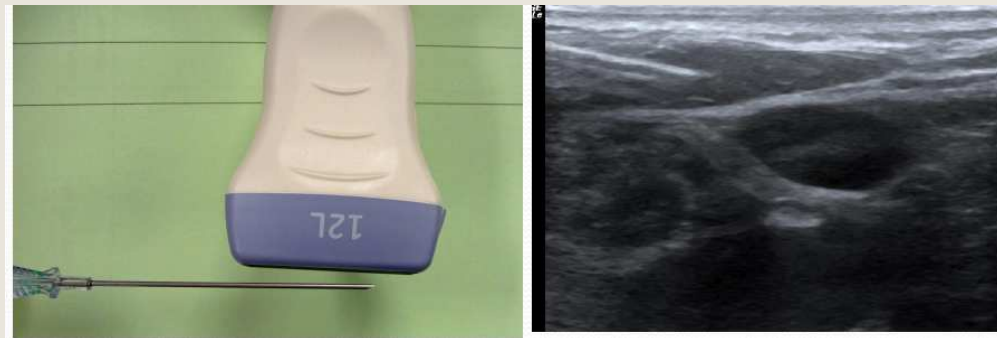


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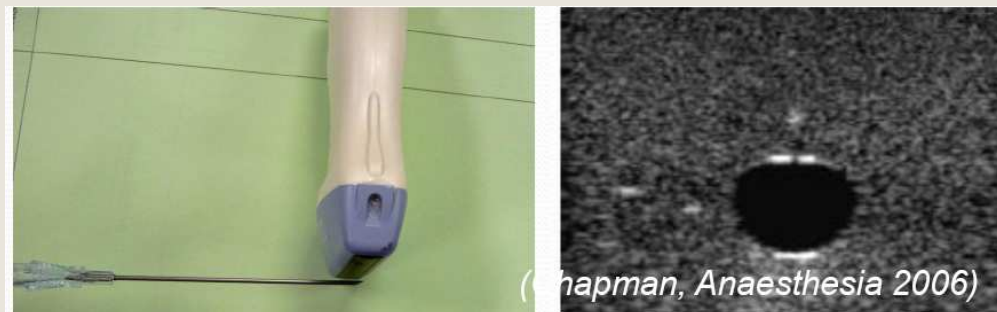
Repère échographique, définitions



- In plane:



- Out of plane:



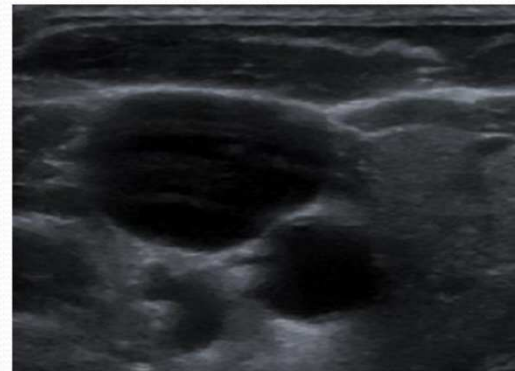
Repère échographique, définitions

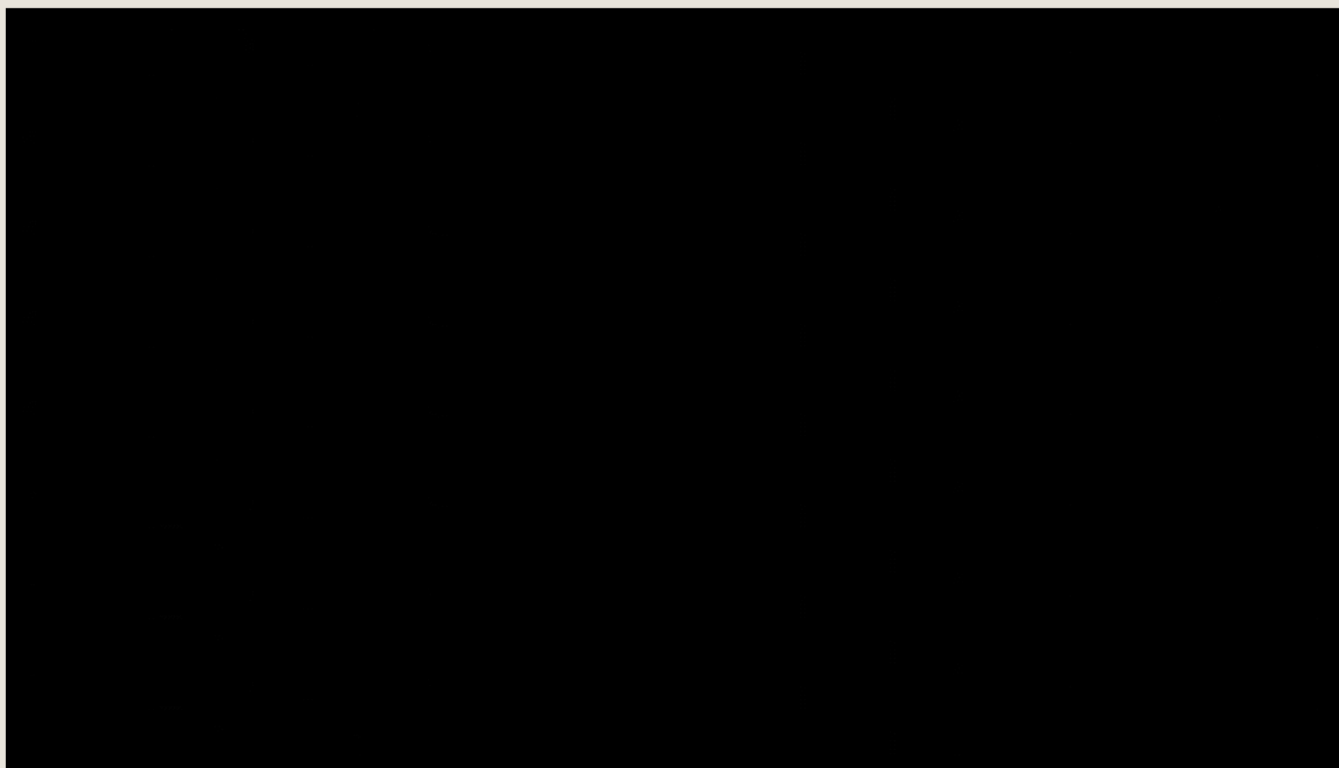


- Plan longitudinal:



- Plan transversal:

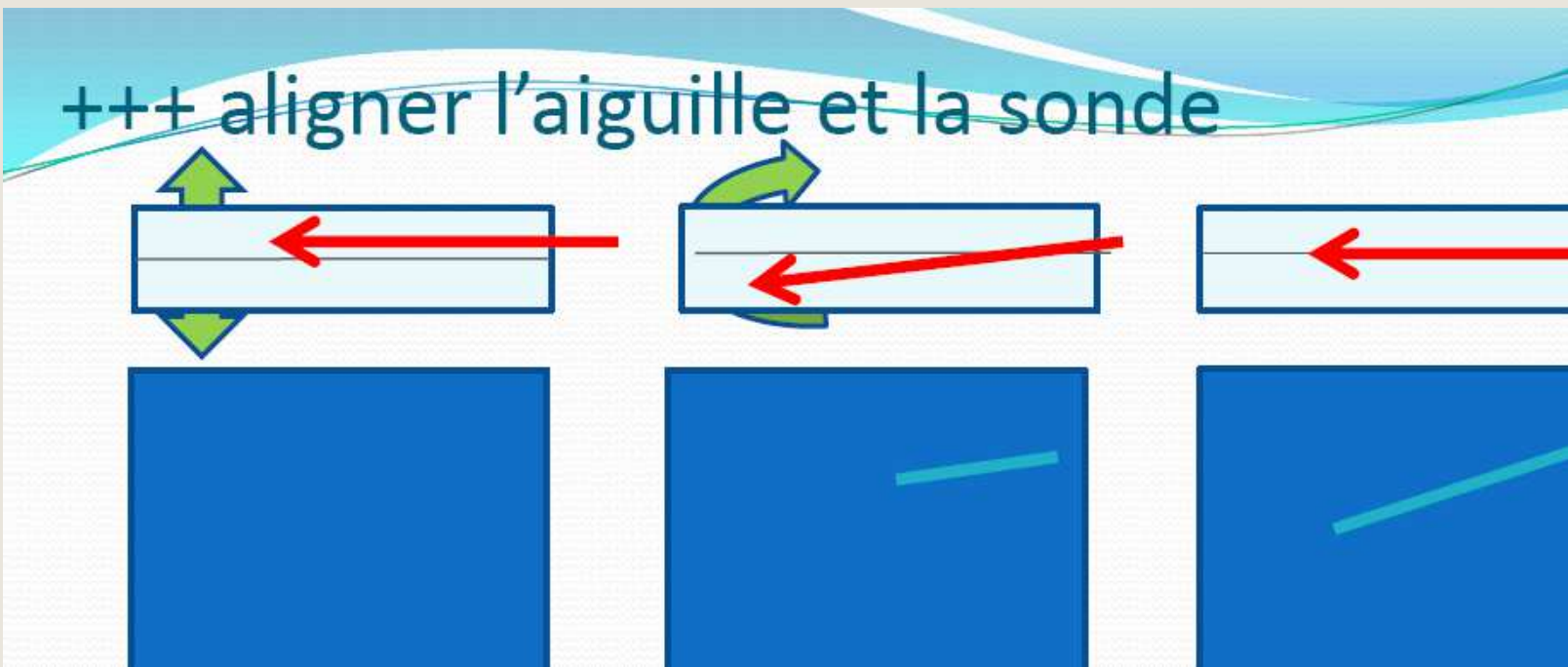




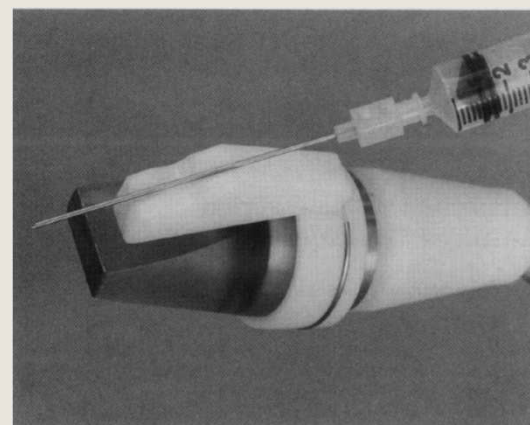
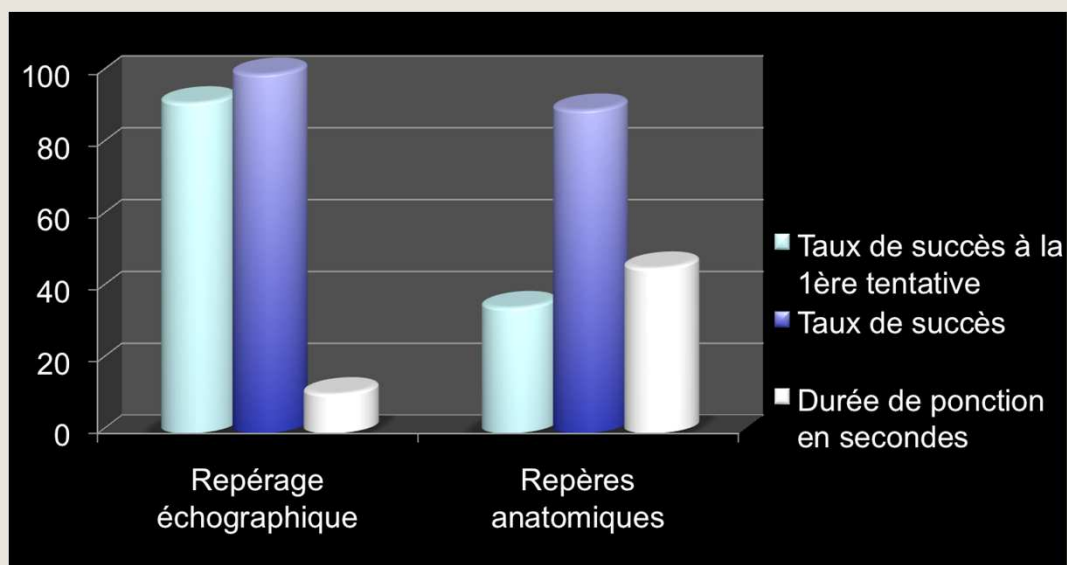
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Repère échographique, le Hic!!

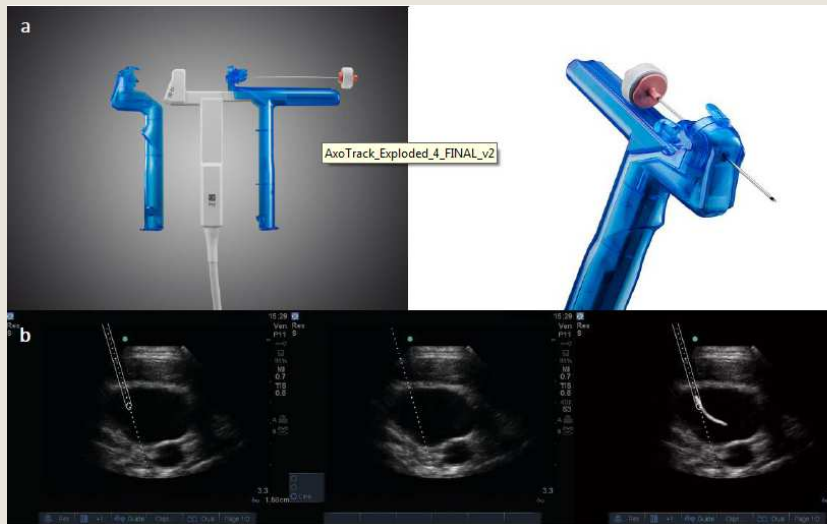


Place des dispositifs en échographie



Denys BG Circulation 1993

Place des dispositifs en échographie



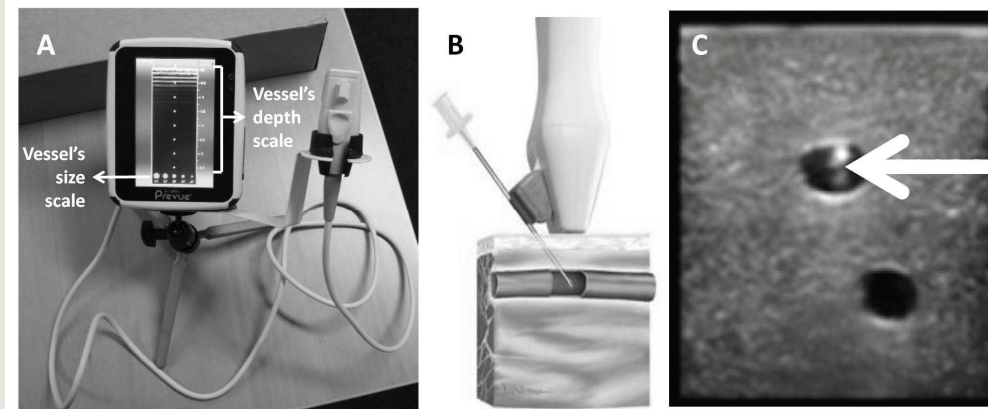
		Time between skin contact and first puncture	Time between first puncture and success	Needle passes
Internal jugular	Classic approach	11 ± 8	17 ± 26	1.3 ± 0.6
	Experimental approach	20 ± 19 *	15 ± 19	1.4 ± 0.6
Axillary vein	Classic approach	19 ± 9	32 ± 27	1.6 ± 0.8
	Experimental approach	19 ± 14	11 ± 9 *	1.2 ± 0.4 *

Alves, Minerva Anesthesiologica 2016

Place des dispositifs en échographie

Prevue TM

Bigé N, *Minerva Anesthesiol.* 2016



	Internal jugular vein		Axillary vein	
	Standard US	Site-Rite Prevue+ TM	Standard US	Site-Rite Prevue+ TM
Time between skin contact and first puncture	8.6 (1.9-127.2)	12.7 (2.3-109)	23.2 (1.3-191.4)	19 (4.9-150.3)
Time between first puncture and success	7 (0.6-101.1)	4.7 (1.0-47)	15 (3.2-600)	6.9 (2.5-105) ^a
Number of attempts	1 (1-2)	1 (1-2)	1 (1-7)	1 (1-3) ^b
Success at first attempt	38 (88%)	38 (88%)	24 (57%)	34 (81%) ^c



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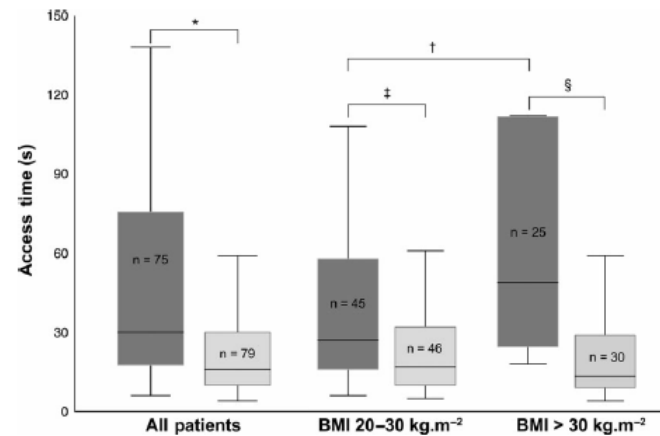


Place des dispositifs en échographie



Ultrasound-guided catheterisation of the subclavian vein: freehand vs needle-guided technique¹²

T. Maecken,¹ L. Heite,² R. Wolf,¹ D. K. Zehn³ and D. I. Litz¹

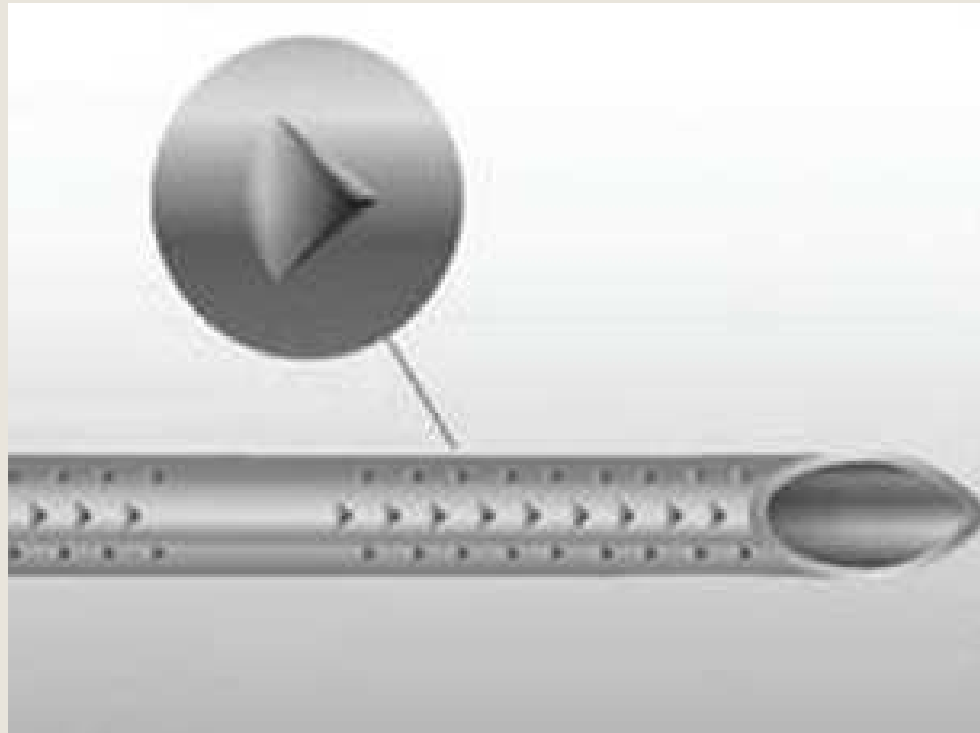


	Main libre	Guidage	p
Succès 1ere ponction	67%	81%	0,04
Succès 2 ^{nde} ponction	83%	95%	0,04



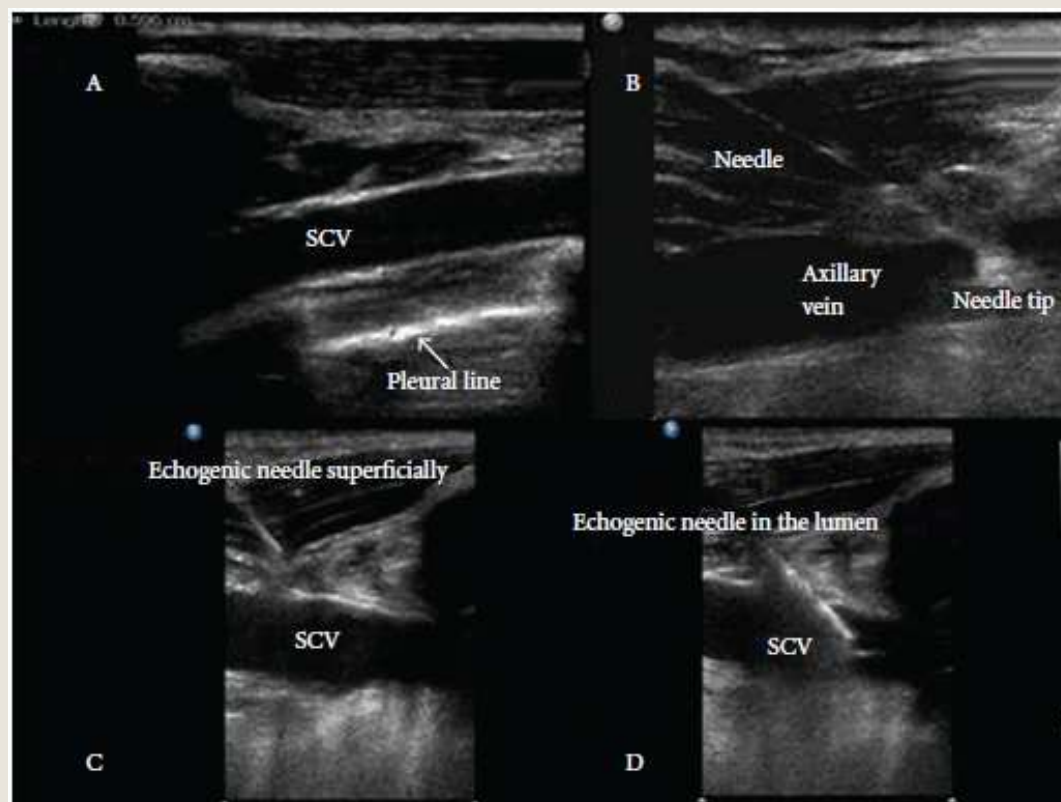
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La bonne aiguille?



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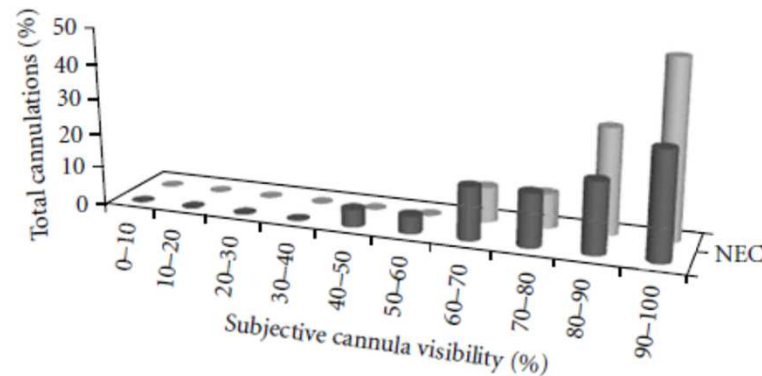
La bonne aiguille?



Research Article

Optimization of Cannula Visibility during Ultrasound-Guided Subclavian Vein Catheterization, via a Longitudinal Approach, by Implementing Echogenic Technology

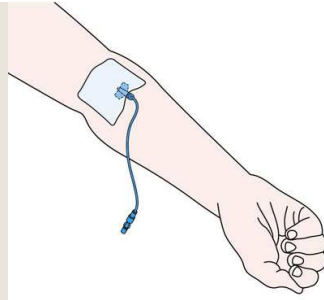
Konstantinos Stefanidis,¹ Mariantina Fragou,²
Nicos Pentilas,² Gregorios Kouraklis,³ Serafim Nanas,⁴ Richard H. Savel,⁵
Ariel L. Shiloh,⁵ Michel Slama,^{6,7} and Dimitrios Karakitsos²



Outcome measures	EC group (n = 40)	NEC group (n = 40)
Access time (sec)	12.1 ± 6.5 (5.5–20.4)*	18.9 ± 10.9 (9.5–29.4)
Success rate (%)	40 (100%)	40 (100%)
Average number of attemptsartery puncture	1 ± 0.3 (1–1.5) 0 (0%)	1.1 ± 0.5 (1–1.8) 1 (2.5%)
Hematoma	0 (0%)	1 (2.5%)
Pneumothorax	0 (0%)	0 (0%)
Hemothorax	0 (0%)	0 (0%)
Catheter misplacement	0 (0%)	0 (0%)
Damage of the brachial plexus	0 (0%)	0 (0%)
Phrenic nerve injury	0 (0%)	0 (0%)
Technical difficulty (scale 1 to 10)	4.5 ± 1.5*	7.5 ± 1.5



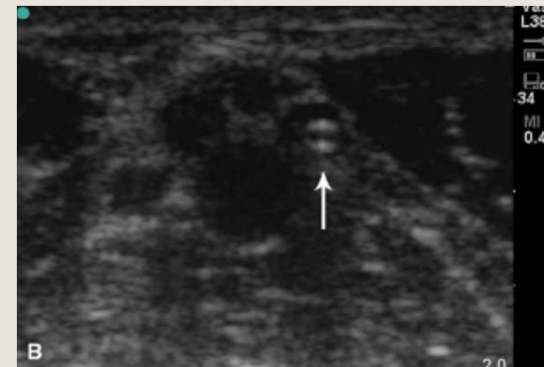
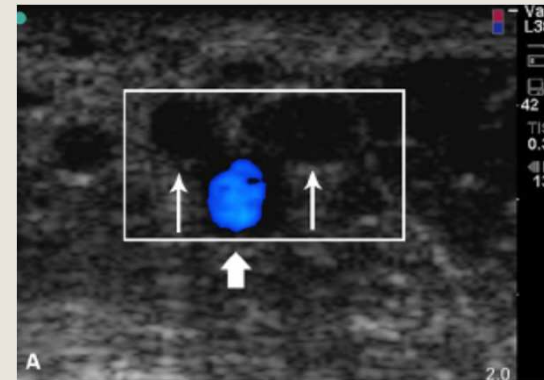
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- Etude prospective
- 3 échecs infirmiers chez patients à risque
- 60 patients

Patient Data	Ultrasonography ($\pm$ SD) (N=39)	Control (N=21)
IVDA, No. (%)	11 (28)	5 (24)
Chronic medical condition, No. (%)	19 (49)	12 (57)
Obesity, No. (%)	9 (23)	4 (19)
Success, No. (%)	38 (97)	7 (33)
Total time, minutes, median	13 $\pm$ 25.4	30 $\pm$ 21.3
Time of attempt, minutes, median	4 $\pm$ 5.6	15 $\pm$ 11.8
No. of sticks	1.7 $\pm$ 0.7	3.7 $\pm$ 2
Patient satisfaction	8.7 $\pm$ 1.6	5.7 $\pm$ 3.2

IVDA, Intravenous drug abuse.



Costantino, Ann Emerg Med 2005



CHEST

Consensus Statement



American College of Chest Physicians/ La Société de Réanimation de Langue Française Statement on Competence in Critical Care Ultrasonography*

*Paul H. Mayo, MD; Yannick Beaulieu, MD; Peter Doelken, MD;
David Feller-Kopman, MD; Christopher Harrod, MS; Adolfo Kaplan, MD;
John Oropello, MD; Antoine Vieillard-Baron, MD; Olivier Axler, MD;
Daniel Lichtenstein, MD; Eric Maury, MD; Michel Slama, MD;
and Philippe Vignon, MD*

Objective: To define competence in critical care ultrasonography (CCUS).

Design: The statement is sponsored by the Critical Care NetWork of the American College of Chest Physicians (ACCP) in partnership with La Société de Réanimation de Langue Française (SRLF). The ACCP and the SRLF selected a panel of experts to review the field of CCUS and to develop a consensus statement on competence in CCUS.

Results: CCUS may be divided into general CCUS (thoracic, abdominal, and vascular), and echocardiography (basic and advanced). For each component part, the panel defined the specific skills that the intensivist should have to be competent in that aspect of CCUS.

Conclusion: In defining a reasonable minimum standard for CCUS, the statement serves as a guide for the intensivist to follow in achieving proficiency in the field.

(CHEST 2009; 135:1050–1060)

Key words: critical care; echocardiography; imaging; ultrasonography

Abbreviations: ACCP = American College of Chest Physicians; CCE = critical care echocardiography; CCUS = critical care ultrasonography; GCCUS = general critical care ultrasonography; IVC = inferior vena cava; LV = left ventricle, ventricular; RV = right ventricle, ventricular; SRLF = La Société de Réanimation de Langue Française; TEE = transesophageal echocardiography; TTE = transthoracic echocardiography; 2D = two-dimensional



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Massimo Lamperti
Andrew R. Bodenham
Mauro Pittiruti
Michael Blaivas
John G. Augoustides

International evidence-based recommendations on ultrasound-guided vascular access

Medical literature on ultrasound vascular access was reviewed from January 1985 to October 2010. The GRADE and the GRADE-RAND methods were utilised to develop recommendations. *Results:* The recommendations following the conference suggest the advantage of 2D vascular screening prior to cannulation and that real-time ultrasound needle guidance with an in-plane/long-axis technique optimises the probability of needle placement. Ultrasound guidance can be used not only for central venous cannulation

but also in peripheral and arterial cannulation. Ultrasound can be used in order to check for immediate and life-threatening complications as well as the catheter's tip position. Educational courses and training are required to achieve competence and minimal skills when cannulation is performed with ultrasound guidance. A recommendation to create an ultrasound curriculum on vascular access is proposed. This technique allows the reduction of infectious and mechanical complications. *Conclusions:* These definitions and

recommendations based on a critical evidence review and expert consensus are proposed to assist clinicians in ultrasound-guided vascular access and as a reference for future clinical research.

Keywords Central venous access · Ultrasound guidance · Arterial cannulation · Vascular access · Critical care ultrasound · RAND · GRADE · Guideline · Evidence-based medicine





British Journal of Anaesthesia **110** (3): 347–56 (2013)
Advance Access publication 29 January 2013 · doi:10.1093/bja/aes499

BJA

Evidence-based consensus on the insertion of central venous access devices: definition of minimal requirements for training

N. Moureau¹, M. Lamperti^{2*}, L. J. Kelly³, R. Dawson⁴, M. Elbarbary⁵, A. J. H. van Boxtel⁶ and M. Pittiruti⁷

W_R2 Didactic Education on
Ultrasound-guided Technique

Education for using ultrasound for vein access and assessment is a component of any CVAD insertion course. Education includes: physics of ultrasound, image optimization, image analysis, anatomical assessment of both normal and variant anatomy, and simulation skills training. Landmark techniques are also components of CVAD education programmes in case circumstances arise that do not permit the use of ultrasound. Educational programmes emphasize the indisputable benefit of ultrasound for CVAD insertion

B

Perfect consensus, strong

W_R9 Ultrasound Simulation

A simulation practice on ultrasound anatomy is included in the curriculum of CVAD placement training

B

Perfect consensus, strong



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Recommandations formalisées d'experts



Recommandations sur l'utilisation de l'échographie lors de la mise en place des accès vasculaires

Guidelines on the use of ultrasound guidance for vascular access

Paul. J. Zetlaoui^a, Hervé. Bouaziz^b, Sébastien. Pierre^{c,*}, Eric. Desruennes^d, Nicolas. Fritsch^e, Denis. Jochum^f, Frédéric. Lapostolle^g, Thierry. Pirotte^h, Stéphane. Villiersⁱ

^aService d'Anesthésie-Réanimation, Hôpital de Bicêtre, 78 Rue du Général Leclerc, 94275 Le Kremlin-Bicêtre

^bService d'Anesthésie-Réanimation Chirurgicale - Hôpital Central, CO n°4, 54035 Nancy

^cUnité d'Anesthésiologie, Institut Universitaire du Cancer Toulouse – Oncopole, Toulouse



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Type de cathétérisme

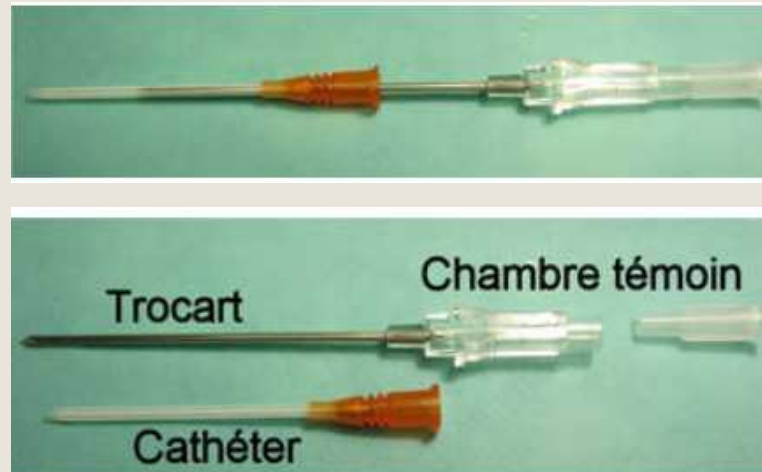


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Cathétérisme

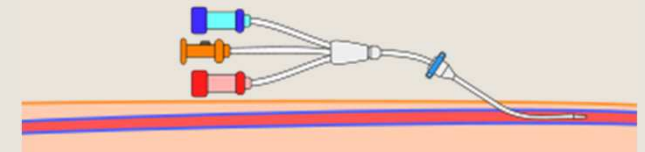
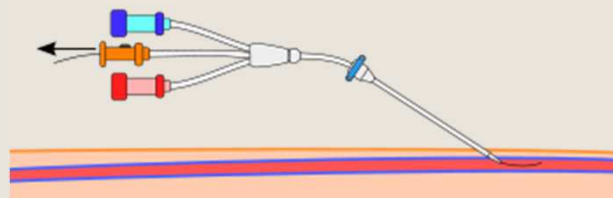
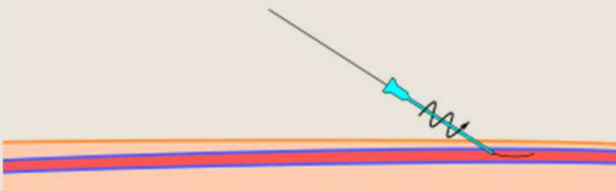
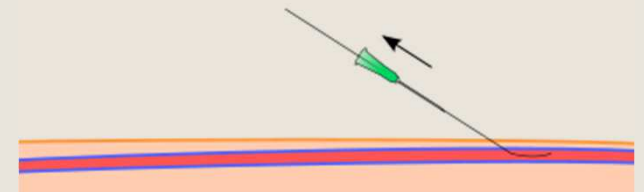
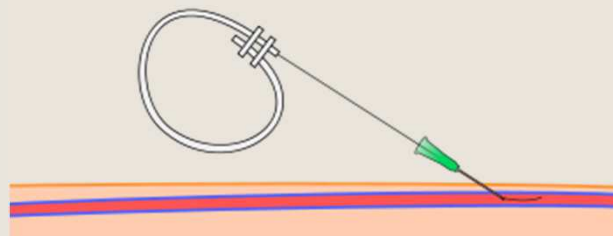
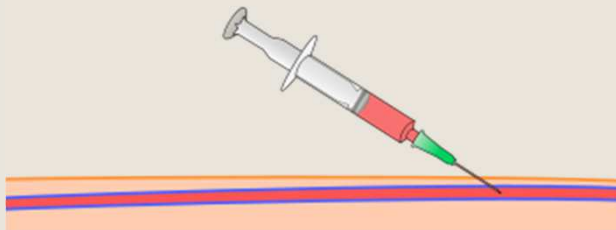


► Direct



Cathétérisme

► Seldinger: +/- transfixiant



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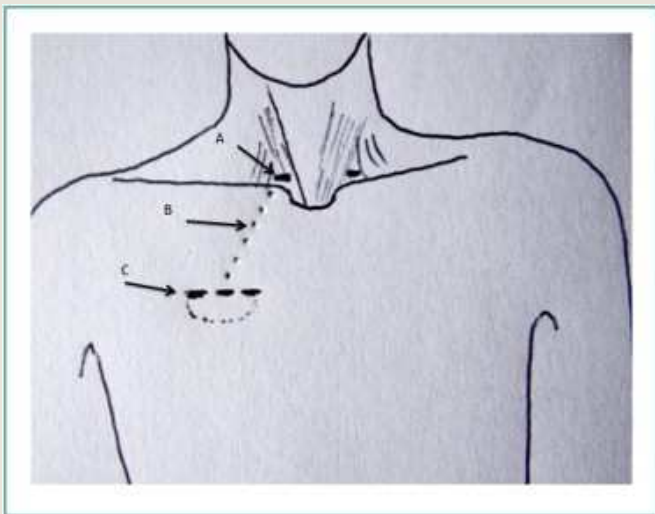


Tunnellisation



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Tunnellisation





Positionnement du cathéter



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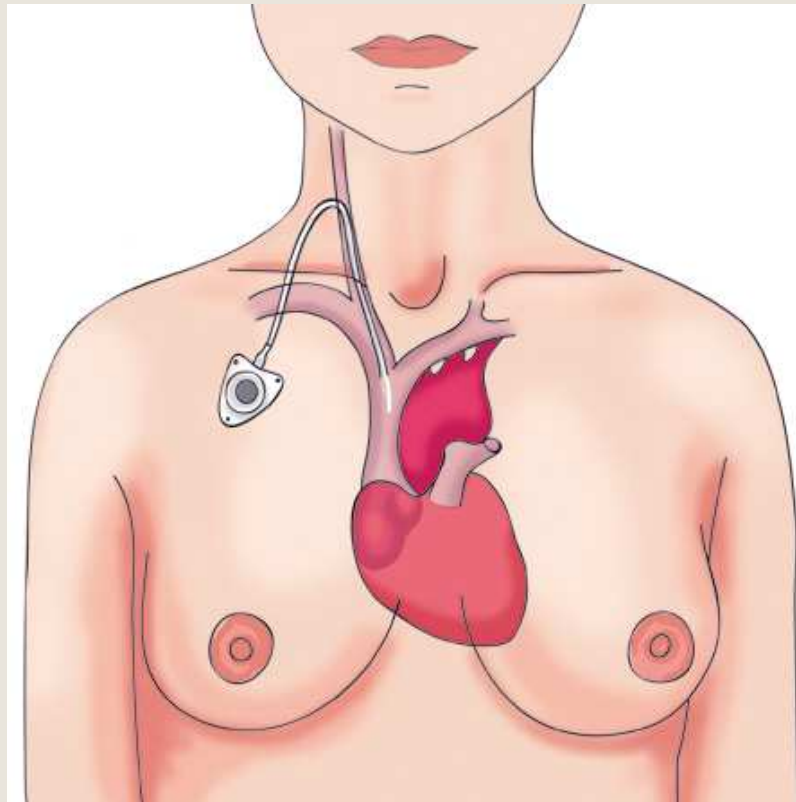
Objectif du cathéter veineux central

- ▶ Extrémité: 1/3 inférieur SVC, à la jonction atrio-cavale ou dans la portion supérieure de l'atrium droit.

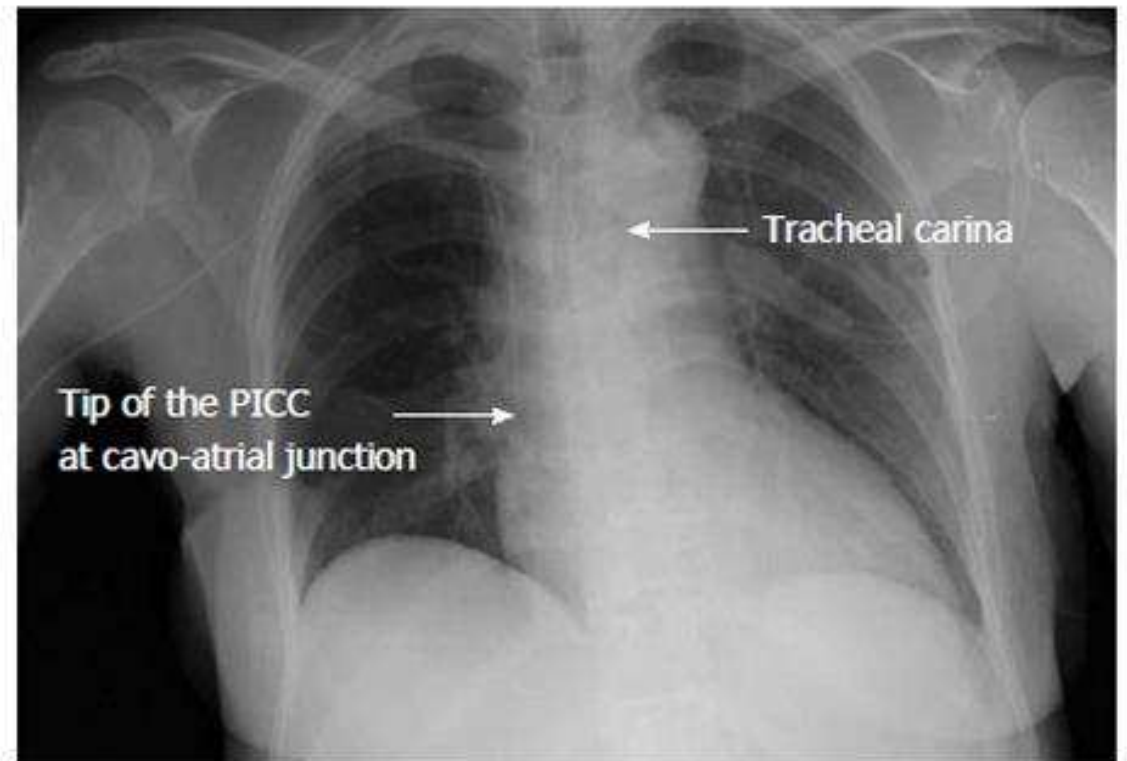


Positionnement cathéter central

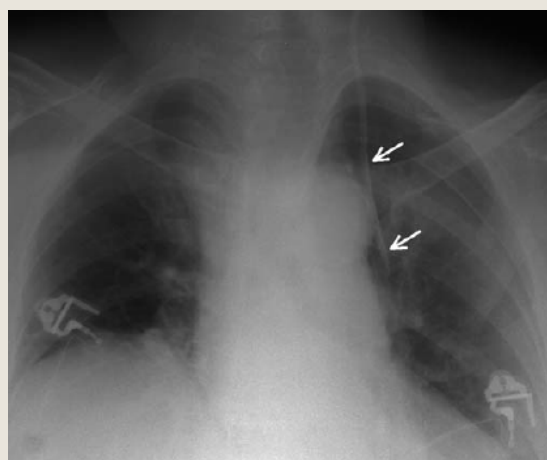
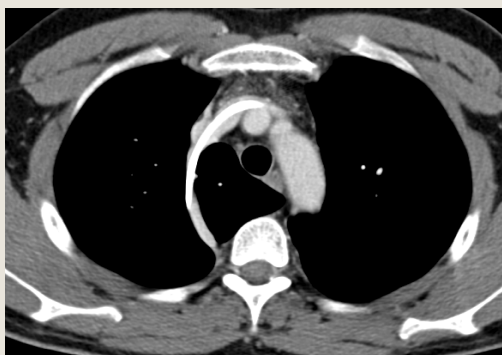
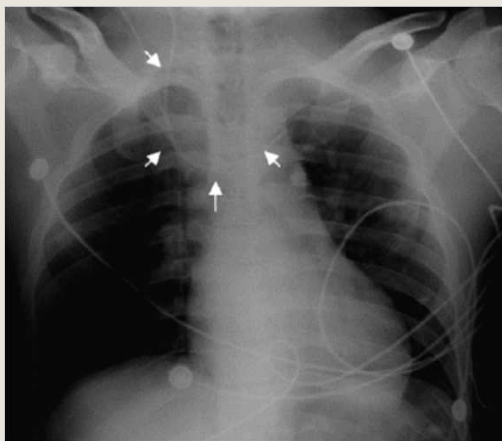
- ▶ 2 indicateurs:
 - ▶ Progression du guide
 - ▶ Extrémité distale



Positionnement cathéter



Positionnement cathéter



Sandroni, ICM 2003



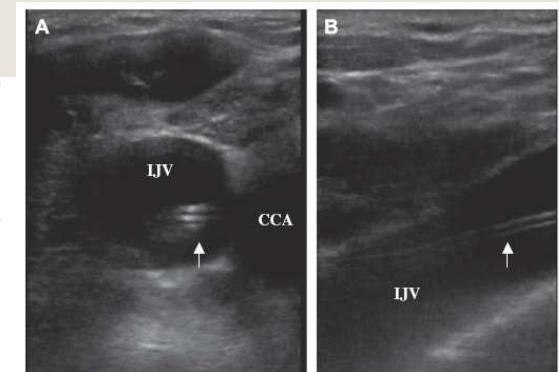
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Positionnement cathéter

► Echographie?

	ICU Catheters (n = 56)	Catheters from Other Wards (n = 29)
Pneumothorax	0	1
Aberrant position	3	1
Intracardiac position	3	3
Inferior vena cava placement	0	0



Sensitivity: 100%; feasibility 99%, training 2 hours, time required for the procedure: 6.8 mn vs 80.3 mn

Maury,, AJRCCM 2001



Positionnement cathéter

- ▶ 202 patients
- ▶ Agitated saline bubbled enhanced transthoracic echocardiography (ASBTE)
- ▶ 19mL de serum salé dans seringue 20mL agités

rapidly injected through the distal lumen of the catheter. After that, a dense echo became visible in the right atrium immediately (Fig. 1B). In case of catheter misplacement, the opacification appeared with delay and decreased echogenicity (Fig. 2A).

Agitated Saline Bubble–Enhanced Transthoracic Echocardiography: A Novel Method to Visualize the Position of Central Venous Catheter

Ming Wen, MD; Konrad Stock, MD; Uwe Heemann, MD; Mario Aussieker, MD;
Claudius Küchle, MD

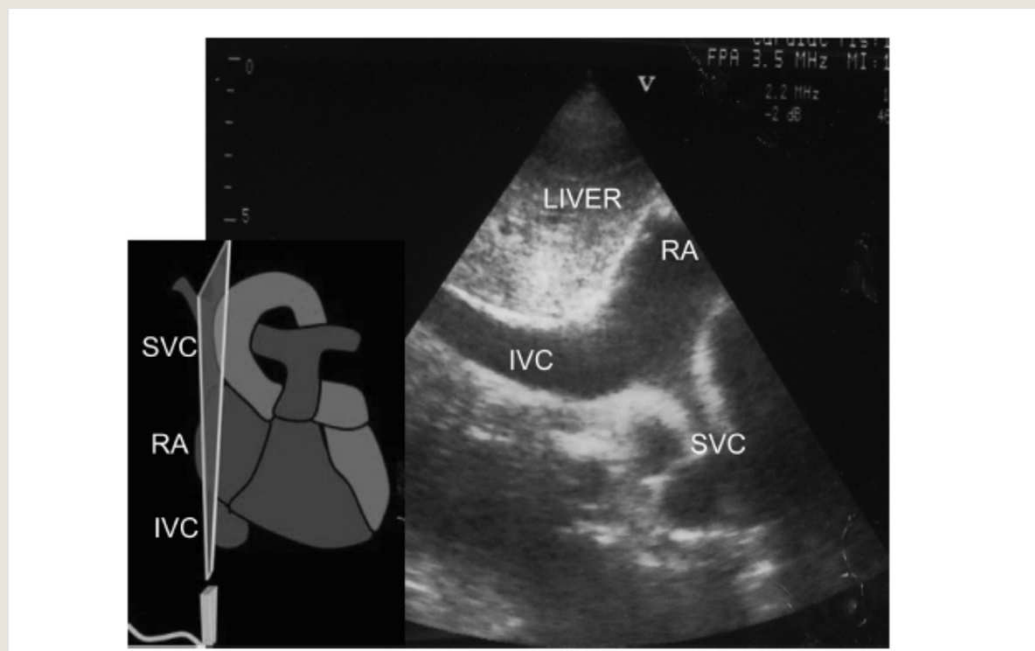
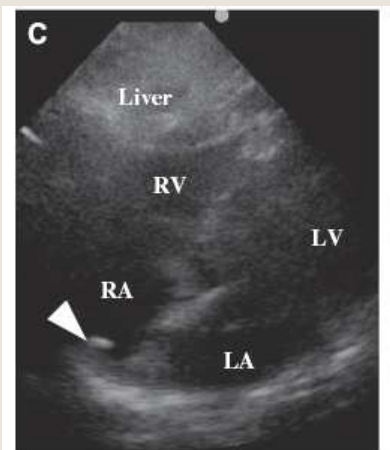
[*Crit Care Med* 2014; 42:e231–e233]



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Ultrasound localization of central vein catheter and detection of postprocedural pneumothorax: An alternative to chest radiography*

Antonella Vezzani, MD; Claudia Brusasco, MD; Salvatore Palermo, MD; Claudio Launo, MD; Mario Mergoni, MD; Francesco Corradi, MD, PhD



Crit Care Med 2010; 38:533–538



Positionnement cathéter:

- un contrôle de la radiographie du thorax doit être effectué après la pose d'un cathéter veineux sous-clavier afin de rechercher l'absence de pneumothorax et de contrôler la bonne position du cathéter ;
- afin d'éviter toute érosion endovasculaire et effraction intrapéricardique, l'extrémité des cathéters veineux insérés dans le territoire cave supérieur doit être située au niveau de la carène. En cas de mauvaise position, le cathéter doit être retiré de quelques centimètres ;



14 CONFIRMATION OF CENTRAL LINE PLACEMENT

After insertion, a chest X-ray is required to confirm the tip is in the correct position except for short femoral catheters. The tip of a Central Line (excluding femoral lines in adults) should lie in the superior vena cava, outside the right atrium in order to prevent arrhythmias or atrial perforation. Pneumothorax should also be excluded for jugular or subclavian line insertions.

Prior to this, other methods may be used to confirm venous placement, (e.g. manometry, ultrasound, transduction, image intensifier).



- Confirm the final position of the catheter tip as soon as clinically appropriate.
 - Methods for confirming the position of the catheter tip include chest radiography, fluoroscopy, or continuous electrocardiography.

C'est grave Docteur?



TECHNIQUES AND PROCEDURES

Mechanical Complications of Central Venous Catheters

Lewis A. Eisen, MD*
Mangala Narasimhan, DO*
Jeffrey S. Berger, MD†
Paul H. Mayo, MD*
Mark J. Rosen, MD*
Roslyn F. Schneider, MD†

	All Catheters (n = 385)	Subclavian (n = 218)	Internal Jugular (n = 40)	Femoral (n=127)	P
Complications	129 (33.2)	85 (39.0)	13 (32.5)	31 (24.4)	.022
Pneumothorax	5 (1.3) (n = 258)	5 (2.3)	0	N/A	.144
Arterial puncture	18 (4.7)	7 (3.2)	2 (5.0)	9 (7.1)	.257
Incorrect position	14 (3.6)	14 (6.4)	0	0	.004
Hemothorax	1 (0.3) (n = 258)	1 (0.5)	0	N/A	.361
Subcutaneous hematoma	3 (0.8)	1 (0.5)	0	2 (1.6)	.440
Death	1 (0.3)	0	1 (2.5)	0	.361
Failure to place	86 (22.3)	57 (26.1)	10 (25.0)	19 (15.0)	.051

Predictor	OR	95% CI	P Value
More than 2 punctures	3.60	1.98-2.67	<.01
Subclavian vs other sites	2.55	1.03-6.29	.043
Female gender	1.78	1.09-2.91	.022
PGY supervisor			.312
PGY operator			.724

Plus de 2 tentatives

54% de risque de complications
mécaniques

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Quid de l'intra-osseuse?



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DECLARATION LIENS D'INTERÊT



- ▶ Vygon
- ▶ Astellas
- ▶ MSD