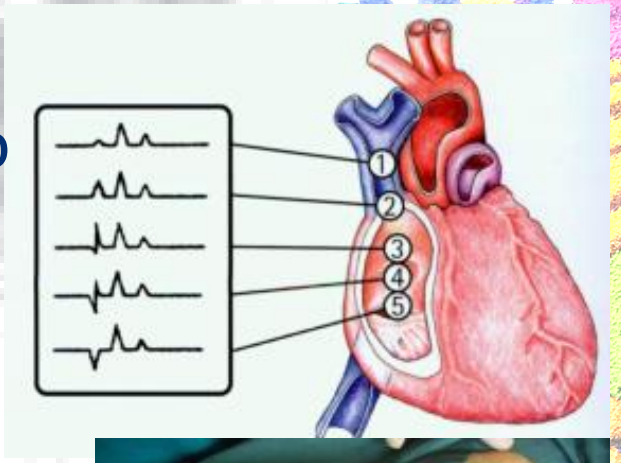
Il Cateterismo Venoso Centrale: presidi, peculiarità e l'impiego globale dell'ECOGRAFO

Dott. Elisei Daniele
U.O. Anestesia e Rianimazione
AREA VASTA 3, MACERATA

Impianto

Cosa è cambiato?

- Tecnica della ECOGUIDA
- Tecnica del posizionamento ECG guidato
- Massimi presidi di barriera
- Scelta accurata dei materiali
- Standardizzazione di metodi e percorsi



Ecografia ed accessi vascolari

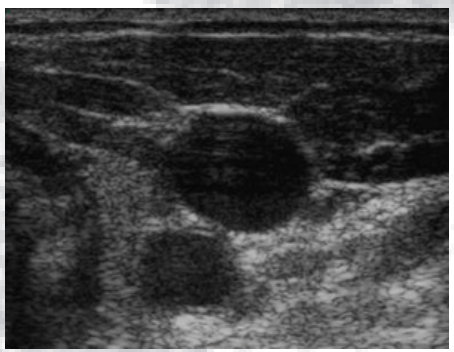
Negli ultimi 10 anni una gran quantità di letteratura ha dimostrato che la guida ecografica migliora i risultati del cateterismo vascolare in termini di:

- Tasso globale di successo della manovra e tasso di successo al primo tentativo
- Tempo medio per il completamento della procedura
- Tasso di complicanze
- Numero di tentativi
- Costi

- Studi randomizzati "storici"
- Metanalisi
  - Randolph 1996
  - Rothschild 2001
  - Keenan 2002
  - Calvert 2003
- Studi randomizzati recenti
- Position papers (ACS 2008, AVA 2008)
- Linee guida internazionali: AHRQ 2011, NICE 2002, BCSH 2006, EPIC 2007, ESPEN 2009, INS 2011, CDC 2011

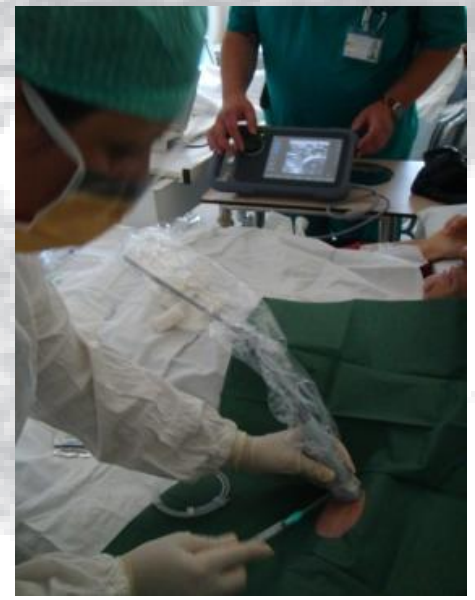
Ecografia ed accessi vascolari

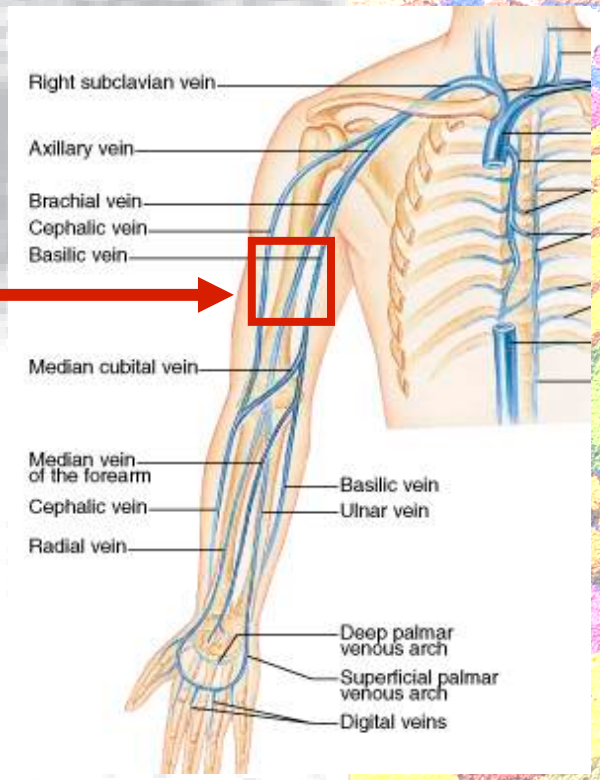
L'ecoguida è ormai universalmente riconosciuta come uno strumento essenziale in ausilio all'incannulamento venoso centrale



Ecografia ed accessi vascolari

Il PICC moderno è nato insieme all'ecoguida, poiché le vene da aggredire non sono visibili, né palpabili, né individuabili tramite reperi anatomici





Commentary *Critical Care* 2006, **10**:175

Can you justify not using ultrasound guidance for central venous access?

Andrew R Bodenham

Department of Anaesthesia, Leeds General Infirmary, Leeds, LS1 3EX, UK

Corresponding author: A R Bodenham, Andy.Bodenham@leedsth.nhs.uk

Published: 22 November 2006
This article is online at http://ccforum.com/content/10/6/175

Critical Care 2006, **10**:175 (doi:10.1186/cc5079)

See related research by Karakitsos *et al.*, http://ccforum.com/content/10/6/R162

IERI …

If a complication occurs and a legal litigation develops, you could be asked:
- could this complication have been prevented using US ?
- if yes, why didn't you use US ?

"In the past, it was possible to defend clinicians who did not use ultrasound on the basis that it was not yet routine or of proven benefit, but I believe that this position will become increasingly untenable in the future."

Ultrasound-guided central venous catheter placement: The new standard of care?* David Feller-Kopman, MD Crit Care Med 2005 Vol. 33, No. 8

Ultrasonographic Guidance for all Central Venous Catheter Insertions: A "Desirable Practice Alternative." or the New Standard of Care?

Mark J. Ault, MD 720 Annals *of* Emergency Medicine Volume 49, NO. 5 : May 2007

Pro: Ultrasound Should Be the Standard of Care for Central Catheter Insertion

John G.T. Augoustides, MD, FASE, FAHA, and Albert T. Cheung, MD

Journal of Cardiothoracic and Vascular Anesthesia, Vol 23, No 5 (October), 2009: pp 720-724

ULTRASOUND:
TOWARDS A NEW STANDARD OF CARE

J Patient Saf. 2014 Aug 12. [Epub ahead of print]

Deep Needle Procedures: Improving Safety With Ultrasound Visualization.

Peabody CR[1], Mandavia D.

health care providers at the patient's bedside. Point-of-care ultrasound assistance now aids providers with real-time diagnosis and with visualization for procedural guidance. This is especially true for common deep needle procedures such as central venous catheter insertion, thoracentesis, and paracentesis.There is now mounting evidence that clinician-performed point-of-care ultrasound improves patient safety, enhances health care quality, and reduces health care cost for deep needle procedures. Furthermore, the miniaturization, ease of use, and the evolving affordability of ultrasound have

THE COCHRANE LIBRARY
Independent high-quality evidence for health care decision making

[Intervention Review]

Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization

Authors' conclusions

Based on available data, we conclude that two-dimensional ultrasound offers gains in safety and quality when compared with an anatomical landmark technique. Because of missing data, we did not compare effects with experienced versus inexperienced operators for all outcomes (arterial puncture, haematoma formation, other complications, success with attempt number one), and so the relative utility of ultrasound in these groups remains unclear and no data are available on use of this technique in patients at high risk of complications. The results for Doppler ultrasound techniques versus anatomical landmark techniques are also uncertain.

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2015, Issue 1

http://www.thecochranelibrary.com

Pubblicato in *Cochrane Library*, Gennaio 2015

Main results

Altogether 13 studies enrolling 2341 participants (and involving 2360 procedures) fulfilled the inclusion criteria. The quality of evidence was very low (subclavian vein N = 3) or low (subclavian vein N = 4, femoral vein N = 2) for most outcomes, moderate for one outcome (femoral vein) and high at best for two outcomes (subclavian vein N = 1, femoral vein N = 1). Most of the trials had unclear risk of bias across the six domains, and heterogeneity among the studies was significant.

For the subclavian vein (nine studies, 2030 participants, 2049 procedures), two-dimensional ultrasound reduced the risk of inadvertent arterial puncture (three trials, 498 participants, risk ratio (RR) 0.21, 95% confidence interval (CI) 0.06 to 0.82; P value 0.02, I^2 = 0%) and haematoma formation (three trials, 498 participants, RR 0.26, 95% CI 0.09 to 0.76; P value 0.01, I^2 = 0%). No evidence was found of a difference in total or other complications (together, US, USD), overall (together, US, USD), number of attempts until success (US) or first-time (US) success rates or time taken to insert the catheter (US).

For the femoral vein, fewer data were available for analysis (four studies, 311 participants, 311 procedures). No evidence was found of a difference in inadvertent arterial puncture or other complications. However, success on the first attempt was more likely with ultrasound (three trials, 224 participants, RR 1.73, 95% CI 1.34 to 2.22; P value < 0.0001, I^2 = 31%), and a small increase in the overall success rate was noted (RR 1.11, 95% CI 1.00 to 1.23; P value 0.06, I^2 = 50%). No data on mortality or participant-reported outcomes were provided.

Authors' conclusions

On the basis of available data, we conclude that two-dimensional ultrasound offers small gains in safety and quality when compared with an anatomical landmark technique for subclavian (arterial puncture, haematoma formation) or femoral vein (success on the first attempt) cannulation for central vein catheterization. Data on insertion by inexperienced or experienced users, or on patients at high risk for complications, are lacking. The results for Doppler ultrasound techniques versus anatomical landmark techniques are uncertain.

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2015, Issue 1

http://www.thecochranelibrary.com

Pubblicato in *Cochrane Library*, Gennaio 2015

Official Journal of the European Society of Intensive Care Medicine and the European Society of Pediatric & Neonatal Intensive Care

EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE

INTENSIVE CARE MEDICINE

Intensive Care Med
DOI 10.1007/s00134-012-2597-x

CONFERENCE REPORTS AND EXPERT PANEL

Massimo Lamperti
Andrew R. Bodenham
Mauro Pittiruti
Michael Blaivas
John G. Augoustides
Mahmoud Elbarbary
Thierry Pirotte
Dimitrios Karakitsos
Jack LeDonne
Stephanie Doniger
Giancarlo Scoppettuolo
David Feller-Kopman
Wolfram Schummer
Roberto Biffi
Eric Desruennes
Lawrence A. Melniker
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access

2012

Consensus GAVeCeLT - WINFOCUS - WoCoVA

Raccomandazioni nell'adulto…

Ultrasound vascular access in adults		
Domain code	Suggested definition	Level of evidence
D4.SD2.S1	Ultrasound guidance should be routinely used for short-term central venous access in adults	A
D4.SD2.S2	Ultrasound guidance should be routinely used for long-term central venous access in adults	A
D4.SD2.S3	PICCs should be routinely inserted at mid arm level by ultrasound guidance using micro introducer technique	A
D4.SD2.S4	Use of ultrasound guidance should be taken into consideration for any kind of peripheral intravenous line when difficult access is anticipated	B
D4.SD2.S5	Ultrasound-guided arterial catheterization improves first-pass success and should be used routinely in adults	A
D4.SD2.S6	Ultrasound can accurately detect pneumothorax and should be routinely performed after central venous catheter cannulation when the pleura could have been damaged	B
D4.SD2.S7	CEUS (contrast-enhanced ultrasound) is a valid method for detecting a central venous catheter tip in the right atrium	B
Cost-effectiveness of the use of ultrasound for vascular cannulation		
D5.S1–3	Ultrasound-guided vascular access has to be used because it results in clinical benefits and reduced overall costs of care makes it cost-effective	A

Nel bambino e nel neonato…

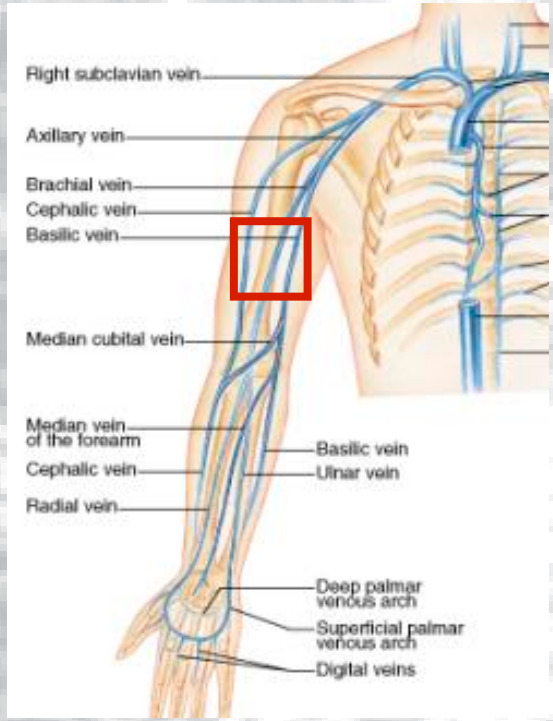
Ultrasound vascular access in neonates and children

Domain code	Suggested definition	Level of evidence
D4.SD1.S1–2	Ultrasound guidance should be routinely used for short- and long-term central venous access in children and neonates	A
D4.SD1.S3	Ultrasound vessel imaging with ultrasound assistance as "a minimum" should be routinely performed before internal jugular vein puncture in neonates	A
D4.SD1.S4	In neonates, ultrasound screening should be used before subclavian vein puncture. Ultrasound-guided puncture should be considered for catheterization using the supra-clavicular route, but this technique requires experienced operators	C
D4.SD1.S5	Ultrasound vessel screening should be routinely used before femoral vein puncture. Ultrasound-guided femoral puncture is recommended to decrease inadvertent arterial puncture	B
D4.SD1.S6	Ultrasound guidance can be considered when difficult peripheral venous access is required in areas such as the antecubital fossa and ankle. Blind deep antecubital fossa puncture should disappear	C
D4.SD1.S7	Ultrasound-guided arterial catheterization improves first-pass success and should be used routinely in children and neonates	A
D4.SD1.S8	After central venous catheter placement in paediatric patients including neonates, the ultrasound equipment should remain easily accessible at the patient's bedside to detect early life-threatening catheter-related complications such as pneumothorax, cardiac tamponade and hemothorax	B
D4.SD1.S9	There is no ideal site for cannulation in children; the best site should be determined after ultrasound examination	A

Sterility during ultrasound vascular procedures

Domain code	Suggested definition	Level of evidence	Degree of consensus	Strength of recommendation
D8.S1	Sterile techniques should always be used during the placement of a vascular access device, including hand washing; sterile full body drapes; wearing of sterile gowns, gloves, caps and masks covering both the mouth and nose. Probe and cable sterility have to be maintained using sterile gel and appropriate probe and cable shields	A	Very good	Strong
Prevention of infectious and mechanical complications with ultrasound-guided cannulation				
D8.S2	Ultrasound guidance should be used in order to decrease the rate of CRBSI in adults and children	C	Very good	Strong
D8.S3–4	A multi-faceted strategy, including the use of ultrasound guidance with specific preventive and educational measures and the promotion of good practices applied by both medical and nursing staff, is suggested in order to reduce the incidence of CRBSI	B	Good	Strong
D8.S5	Ultrasound guidance should be used to avoid cannulation of thrombotic sites	A	Very good	Strong
D8.S6	Ultrasound guidance, by reducing puncture attempts, technical failure rates and mechanical complications, has to be preferred because of a reduced incidence of catheter-related thrombosis	A	Very good	Strong

A breve, medio e lungo termine



Ecoguida:
accesso venoso periferico

IMAGING/ORIGINAL RESEARCH

Ultrasonography-Guided Peripheral Intravenous Access Versus Traditional Approaches in Patients With Difficult Intravenous Access

Thomas G. Costantino, MD
Aman K. Parikh, MD
Wayne A. Satz, MD
John P. Fojtik, MD

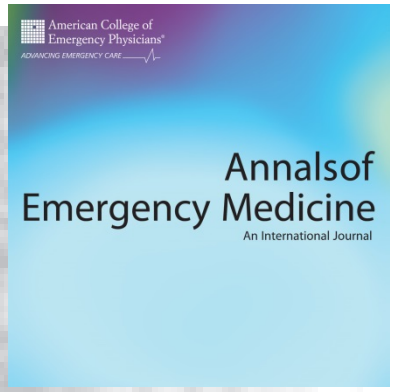
From the Drexel University College of Medicine, Department of Emergency Medicine, Philadelphia, PA (Costantino, Parikh, Fojtik); and Temple University School of Medicine, Department of Emergency Medicine, Philadelphia, PA (Costantino, Satz).

Volume 46, NO. 5 : November 2005

Table. Patient demographics and variables across groups.

Patient Data	Ultrasonography (±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±25.4	30±21.3
Time of attempt, minutes, median	4±5.6	15±11.8
No. of sticks	1.7±0.7	3.7±2
Patient satisfaction	8.7±1.6	5.7±3.2

IVDA, Intravenous drug abuse.



Annals *of* Emergency Medicine
An International Journal

ACAD EMERG MED • December 2004, Vol. 11, No. 12 • www.aemj.org

Emergency Nurses' Utilization of Ultrasound Guidance for Placement of Peripheral Intravenous Lines in Difficult-access Patients

Larry Brannam, MD, RDMS, Michael Blaivas, MD, RDMS,
Matthew Lyon, MD, RDMS, Michael Flake, RN

- Prospective, observational study in ED
- 321 difficult-to-stick pts
- 280 (87%) successful placements
- 9 (22%) received EJV
- 20 (49%) had peripheral access by another nurse or physician

... e nei trapianti …

1: Curr Opin Organ Transplant. 2009 Jun;14(3):281-5.

Quality improvement: ultrasonography-guided venous catheterization in organ transplantation.

Sabate A, Koo M.

Department of Anaesthesiology and Reanimation, Hospital Universitari de Bellvitge, IDIBELL, Universitat de Barcelona, Barcelona, Spain. asabatep@bellvitgehospital.cat

Il nuovo concetto che emerge dalla pratica clinica è:

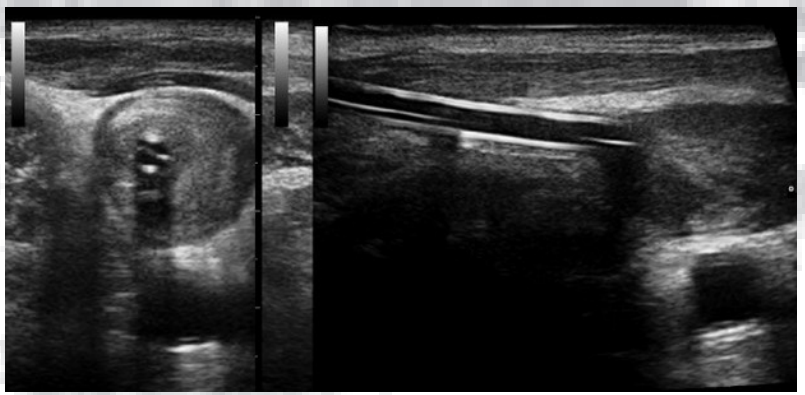
USO ‘ GLOBALE’ DELL’ECOGRAFO

Ovvero:

- Per la scelta della vena
- Per la venipuntura
- Per la corretta direzione del catetere
- Per la esclusione di complicanze da venipuntura
- Per la verifica della posizione della punte

L'ECOGRAFIA

E' una metodica di diagnostica per immagini che si basa sull'impiego di onde meccaniche di elevata frequenza (ultrasuoni), frequenza compresa tra 2 e 20 MHz



Il principio fisico su cui si basa è quello di "leggere" le riflessioni che gli ultrasuoni subiscono nell'attraversare i tessuti biologici

Esame rapido delle vene a livello sopra/ sottoclaveare : VGI, VAs, VS, VAn

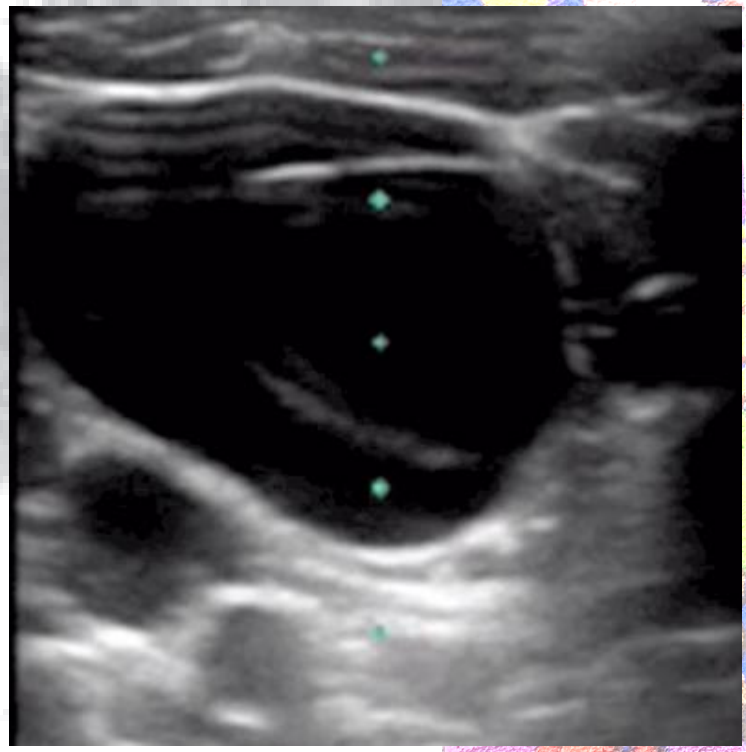
Six steps RaCeVA

(Rapid Central Vein Assessement)

- Mid neck – IJV / CA
- Lower neck – Lower IJV (valve) + SA
- Tilting – BCV
- Lateralization – SV and SA (more laterally)
- Below clavicula (lateral 1/3) – AV+cephalic / AA (short axis)
- Anticlockwise rotation – AV (long axis)

IIa. Sonda alla base del collo

- VGI + valvole



IIb. Sonda alla base del collo

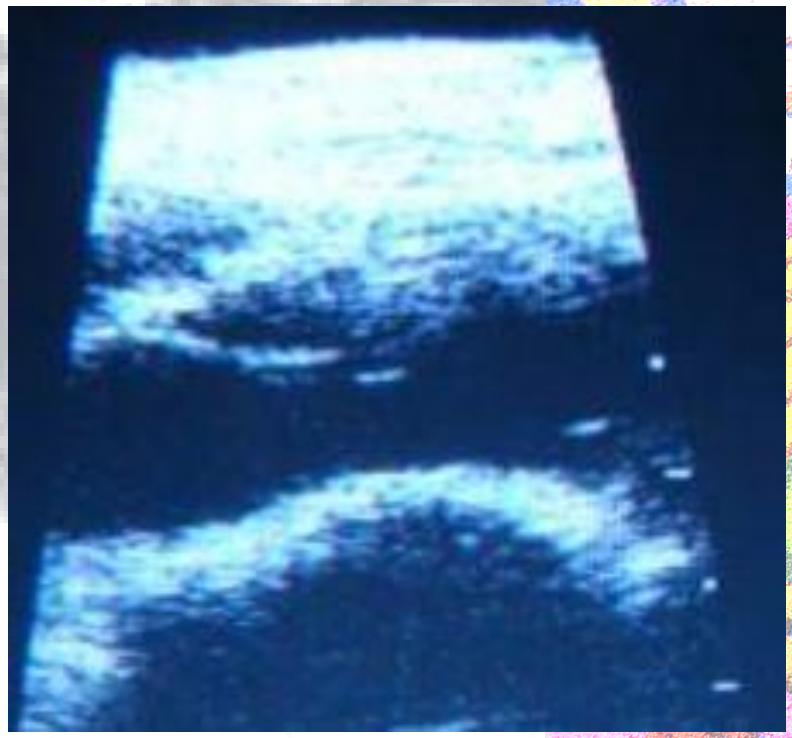
- VGI + VGE + Art Succl

III. Tilting verso il mediastino

- Vena brachiocefalica

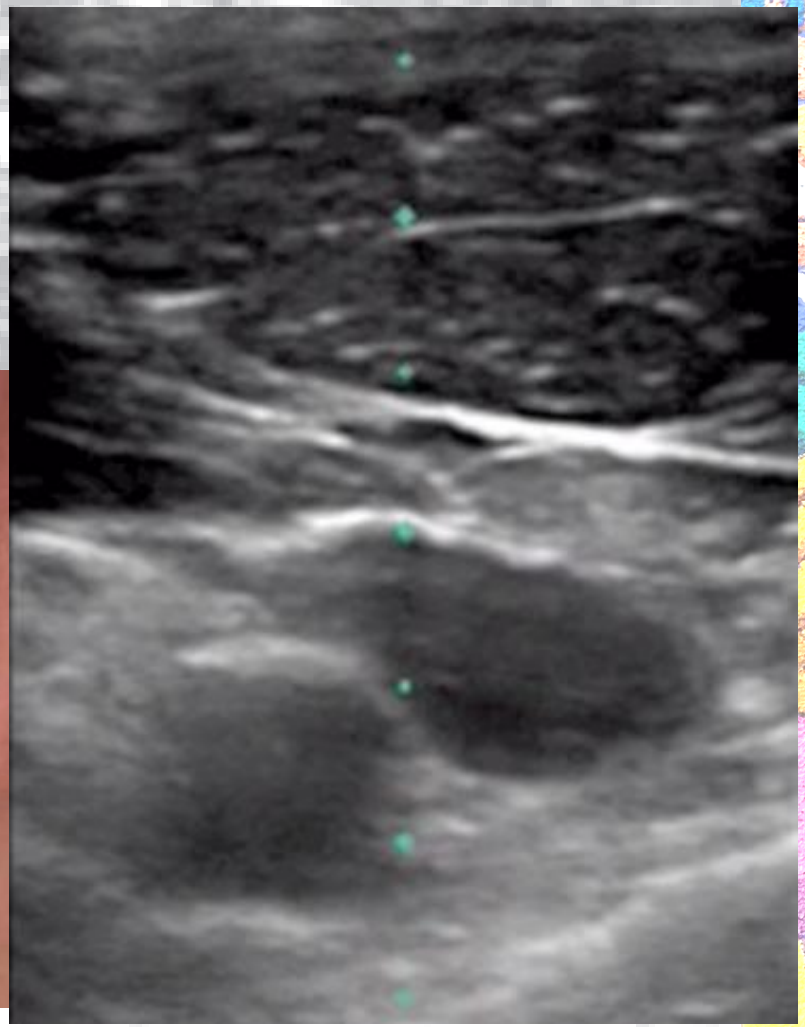
IV. Scorrimento laterale

- Vena succlavia (via sovraclaveare)



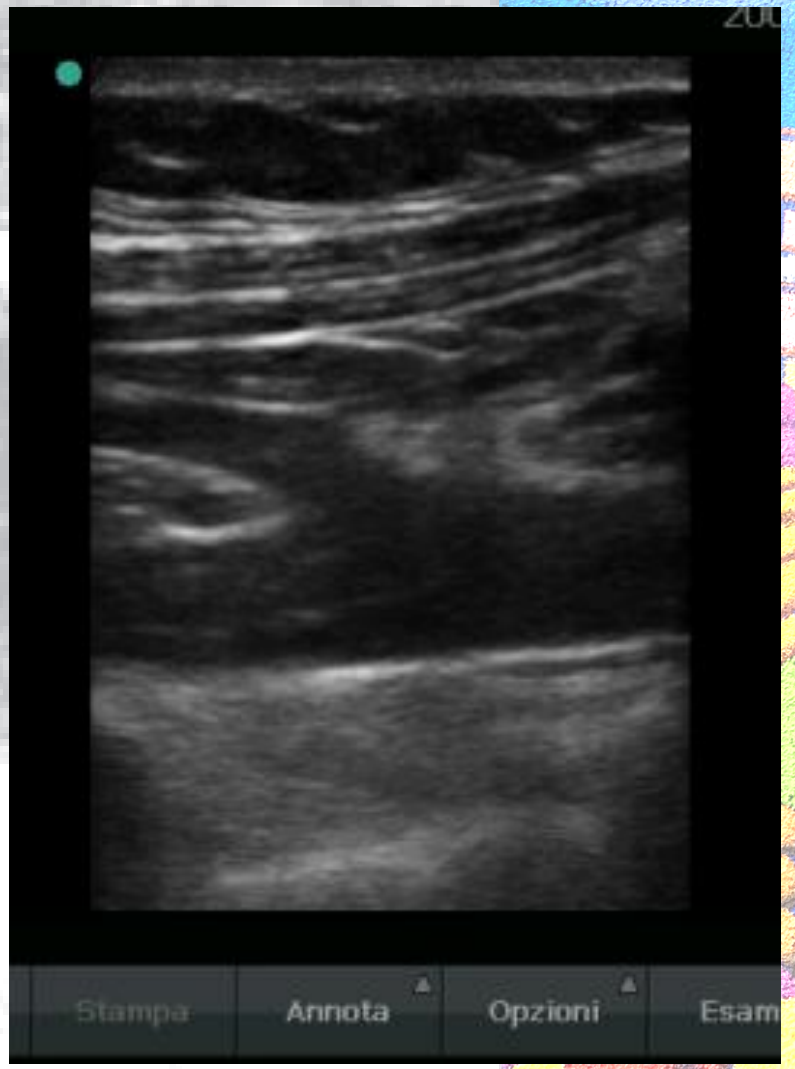
V. Sonda sottoclavicolare
(scansione asse corto)

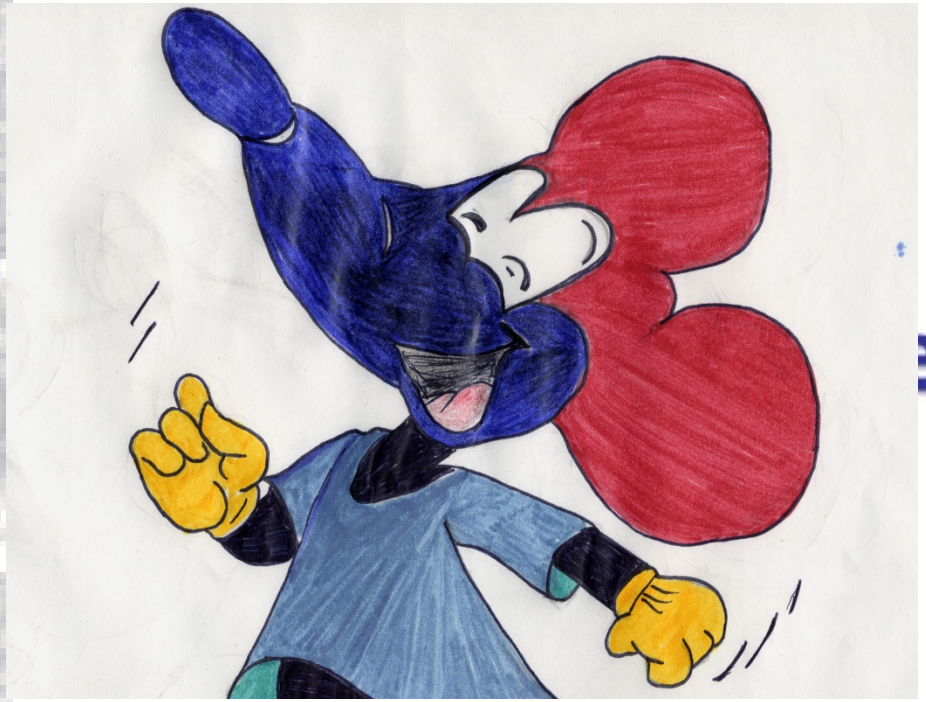
- Vena ascellare
- Vena cefalica

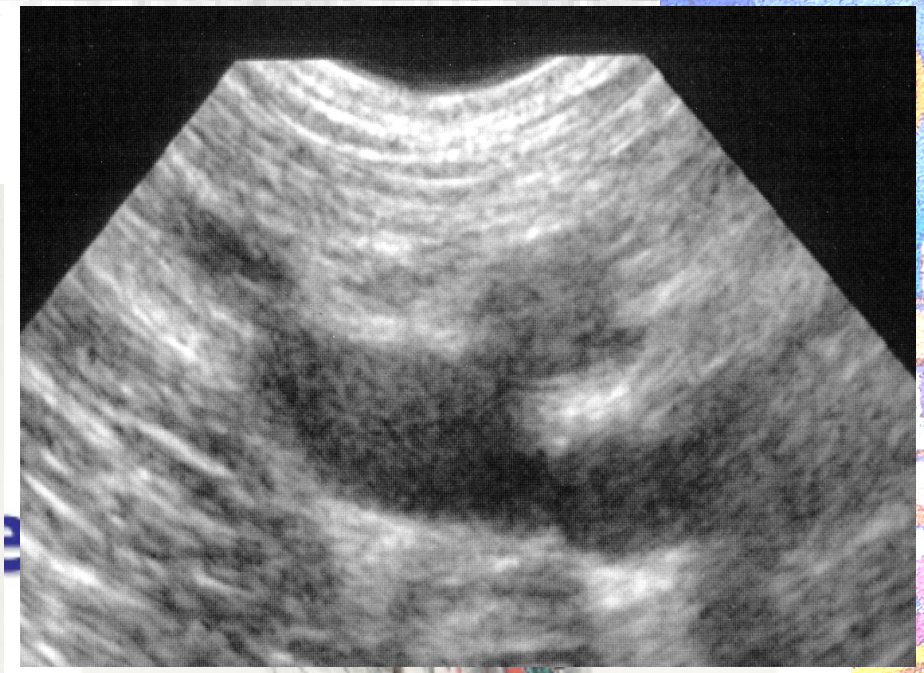


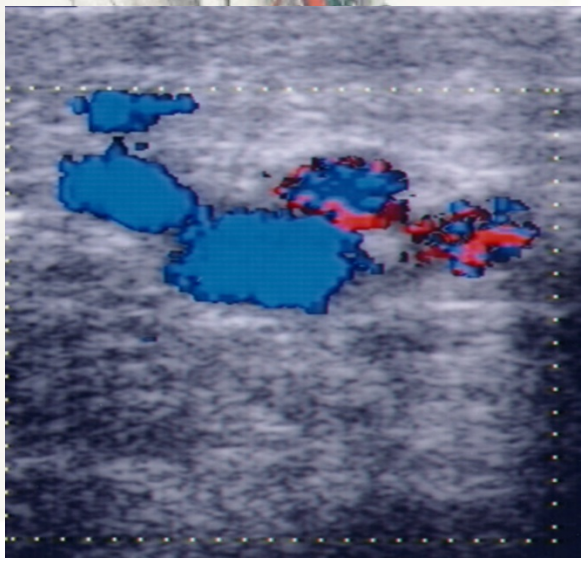
VI. Sonda sottoclavicolare
(scansione asse lungo)

- Vena ascellare
- Vena cefalica









CVC breve termine in Terapia Intensiva

Posizionamento PICC Catetere Venoso Centrale ad Inserzione Periferica

Impianto CVC lungo termine
PORT-A-CATH
e
CVC Tunnellizzato

- **Verifica della posizione della punta del CVC normoposizionato**

- **Verifica della posizione della punta del CVC: malposizionamento primario**

- **Esclusione di *complicanze immediate* da venipuntura centrale**

Journal of Ultrasound in Medicine
The multidisciplinary medical ultrasound journal

J Ultrasound (2013) 16:161–170
DOI 10.1007/s40477-013-0046-5

REVIEW

Ultrasonography as a guide during vascular access procedures and in the diagnosis of complications

A. Vezzani · T. Manca · A. Vercelli · A. Braghieri · A. Magnacavallo

CHEST
Original Research
PULMONARY PROCEDURES

Diagnosis of Pneumothorax by Radiography and Ultrasonography

A Meta-analysis

Wu Ding, MM; Yuehong Shen, MM; Jianxin Yang, MM; Xiaojun He, MM; and Mao Zhang, MD

JVasc Access 2010; 11 (3): 181-190 REVIEW

Simulation training for vascular access interventions

Ingemar J.A. Davidson[1], Min C. Yoo[1], Daniel G. Biasucci[2], Patrick Browne[3], Cathy Dees[4], Bart Dolmatch[1], Maurizio Gallieni[5], Antonio La Greca[2], James R. Korndorffer[6], Billy Nolen[7], Sandy O'Rear[1], Eric Peden[8], Mauro Pittiruti[2], Gary Reed[1], Daniel Scott[1], Douglas Slakey[6]

The **hands-on simulation with the biological vascular access model** consists of performing several ultrasound-guided punctures of a vein or a dialysis access.

PHASE 1 – ULTRASOUND IMAGING

- Step 1: probe orientativo
- Step 2: hand stabilization + static and dynamic evaluation of the vein (short axis scan)
- Step 3: shift to long axis scan of the vein

PHASE 2 – US GUIDED NEEDLE MANIPULATION

- Step 4: static visualization of the needle and its tip
- Step 5: dynamic visualization of the needle and its tip without venous target
- Step 6: techniques of US guided venipuncture

PHASE 3 – CATHETER INTRODUCTION

- Step 7: complete simulation of field preparation, catheter introduction, securement and medication + US visualization of catheter within the lumen

Nuova consapevolezza

- Le complicanze ‘precoci’ possono essere azzerate grazie ad una scrupolosa tecnica di impianto ECOGUIDATA
- Un gran numero di complicanze ‘tardive’ (infezioni, trombosi, dislocazioni, etc.) riconoscono la loro causa primaria o una concausa importante in una tecnica di impianto non appropriata, NON ECOGUIDATA
- Una tecnica di impianto appropriata ECOGUIDATA contribuisce a rendere lineare e ottimale il percorso terapeutico del paziente
- Indispensabile la formazione di un «team» medico-infermieristico dedicato