

TEMA

**Sistema vascular:
Directrices de visualización
para reducción de tiempo
y dolor"**

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Italia



Técnicas de visualización

Las tecnologías de visualización son de suma importancia para cualquier operador que se ocupe del acceso vascular.

Técnicas de visualización

La visualización correcta no sólo es una ventaja en términos de **tiempo de maniobra y dolor del paciente**, sino también:

- **Mayor eficacia** de la maniobra
- **Menos complicaciones inmediatas**
- **Menos complicaciones a distancia**
- **Menor coste**

Por lo tanto:

- **Mayor rentabilidad**

2021

Sociedad de enfermería de infusión – Normas de práctica 2021

Infusion Therapy Standards of Practice

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4th Edition

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INS

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One Corporate Drive, Norwood, NJ 07062
www.ins-nurses.org

Standard

22.1 Vascular visualization technology is employed to increase insertion success of the most appropriate, least invasive vascular access device (VAD), minimizing the need to escalate to an unnecessary, more invasive device and to reduce insertion-related complications.

Seguridad de los pacientes
Eficacia clínica
Relación coste-eficacia

Técnicas de visualización

¿Qué técnicas de visualización?

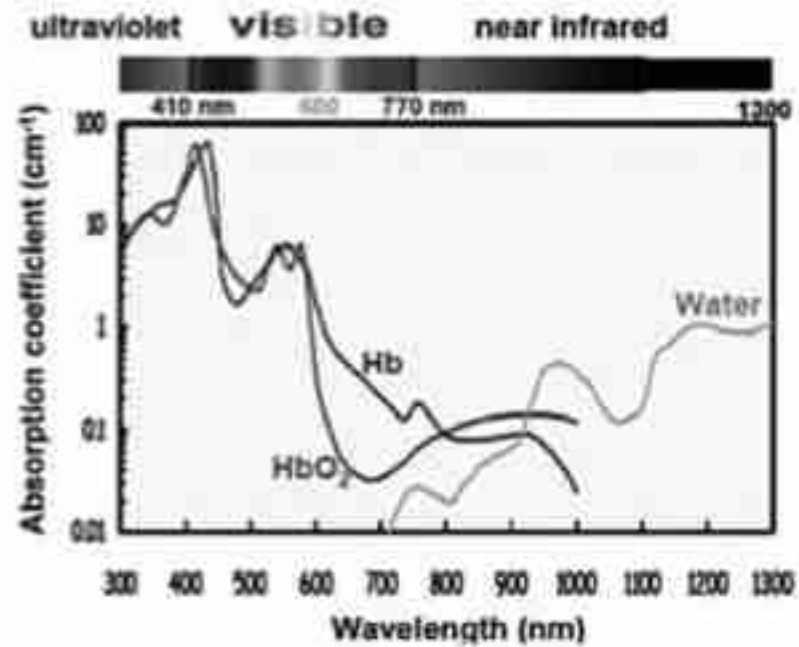
- Tecnología de infrarrojos
- Ultrasonido

Tecnología de infrarrojos (NIR)

Tecnología de infrarrojos (NIR)

Visualización, punción y canulación de venas superficiales

- Especialmente en recién nacidos y niños
- Basado en la absorción selectiva de la longitud de onda de 760 nm por la hemoglobina desaturada (áreas con absorción = sistema venoso)
- Sólo es útil para las venas superficiales (penetración de la onda < 7 mm)
- Disponibles comercialmente como varios dispositivos



VeinViewer – Vision



AccuVein



Vasculuminator



Veinsite



Visualización de las venas superficiales



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- D. Use near infrared (nIR) light technology to aid in locating viable superficial peripheral venous sites and decreasing procedure time for peripheral intravenous catheter (PIVC) insertion.
1. Available technology includes hands-free devices that capture an image of the veins and reflect it back to the skin's surface or to a screen.
 2. Use nIR light technology to assess peripheral venous sites and facilitate more informed decisions about vein selection (ie, bifurcating veins, tortuosity of veins, palpable but nonvisible veins, location of venous valves). The use of nIR technology has been associated with enhanced first-time insertion success and decreased procedural time compared to traditional visual assessment and palpation in some populations, such as neonates.¹²⁻¹⁴ (II)

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Tecnología de infrarrojos (NIR)

Ventajas del NIR

- No se ve afectado por factores de la piel del niño (edema, decoloración, ictericia, etc.)
- No se ve afectado por factores dependientes del operador (agudeza visual, daltonismo, etc.)
- No se ve afectado por factores ambientales (iluminación, color de la luz, etc.)

Tecnología de infrarrojos (NIR)

Beneficios:

- Reducción del número de venipunciones en recién nacidos y lactantes, sobre todo en casos de emergencia
- Menos dolor
- Maniobra más rápida

Indicaciones:

- Estudio de las venas superficiales del recién nacido
- Muestras de sangre y hemocultivos
- Inserción de agujas cortas
- Inserción de catéteres epicutáneos - cava

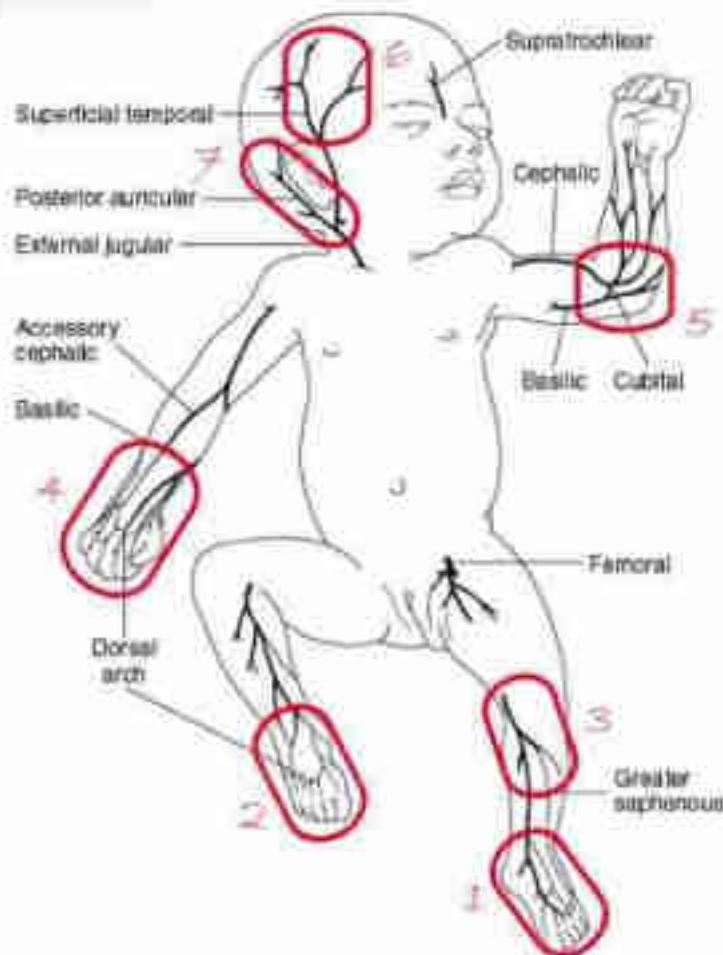
Tecnología de infrarrojos (NIR)

El NIR también es útil para estudiar
las venas superficiales del recién
nacido antes del procedimiento

RaSuVA

Rapid Superficial Vein Assessment

Evaluación rápida de las venas superficiales



- (1) medial malleolus,
- (2) lateral malleolus,
- (3) popliteal fossa,
- (4) back of the hand and wrist,
- (5) antecubital fossa,
- (6) anterior scalp veins,
- (7) posterior scalp veins.

Examen sistemático
de todas las venas
superficiales

Examen sistemático de todas las venas superficiales
A simple vista y con tecnología NIR

RaSuVA



Tecnología de infrarrojos (NIR)

Debemos distinguir tres aspectos de la maniobra:

- visualización
- punción
- canulación

NIR = probada eficacia en la **visualización** de la vena y su **punción**

La **canulación** de la vena, en cambio, requiere una forma de entrenamiento especial (problema: visión "plana" de las estructuras).



Ideal para muestras de sangre



Tecnología de infrarrojos (NIR)

¿El papel actual de la tecnología NIR?

- Eficacia probada para el estudio de las venas, la visualización y la venopunción (toma de muestras de sangre)

Problemas:

- Eficacia probada para la canulación en neonatos y lactantes sólo si DIVA
- Todavía no se ha identificado el itinerario de entrenamiento.
- Aún no se ha establecido la rentabilidad

Ultrasonido

Hay muchos tipos de ecógrafos disponibles, con varias sondas
Algunos portátiles, otros de bolsillo e inalámbricos



Hay muchos tipos de ecógrafos disponibles, con varias sondas
Algunos portátiles, otros de bolsillo e inalámbricos



Hay muchos tipos de ecógrafos disponibles, con varias sondas
Algunos portátiles, otros de bolsillo e inalámbricos

ATI
Ecografi WIRELESS
www.atimilano.com

CERBERO US
CERBERO



Ultrasonido

Ultrasonido = papel central en todos los aspectos del acceso vascular

- catéteres arteriales periféricos
- accesos venosos periféricos
- accesos venosos centrales

...y no sólo para la inserción de catéteres...

Ultrasonido y catéteres arteriales periféricos

Ultrasonido y catéteres arteriales periféricos

Catéteres arteriales periféricos

- Estudio de la arteria antes del procedimiento
- Inserción de catéteres guiada por ultrasonidos
- Diagnóstico de las complicaciones de la punción

Hematoma

Disección de la pared

Trombosis arterial



- (2) We recommend the use of ultrasound guidance for radial artery catheterisation in all adult hypotensive, hypovolaemic and haemodynamically unstable patients, and in those with vascular diseases and small arteries with a weak and/or thin pulse, as it has been shown to be more effective in reducing complications, the time to successful cannulation and the number of attempts, and in increasing overall success and first-time success rate (**1B**).
- (3) We recommend the use of ultrasound guidance in all adults needing femoral artery catheterisation, as it has been shown to be safer by reducing major and minor complications, and it increases both overall success and first-time success rates, and reduces the time to successful cannulation (**1B**).

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Massimo Lampert, Daniele Guerra Bassotti, Nicola Diem, Mauro Finelli, Christian Bruchner, Davide Valsecchi, Matteo Subiet, Vilma Trizaski, Andrius Macas, Jean-François Estébe, Régis Fiebert, Emmanuel Boeselli and Philip Hopmann

2020

Directrices de la Sociedad Europea de Anestesia

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Masimo Lampert, Daniele Guarno Bassotti, Nicola Dente, Mauro Pitrilli, Christian Bracciar, Davide Valse, Matteo Subiet, Vilma Trzasko, Andrius Macas, Jozsef Fekete, Regis Fazer, Emmanuel Boeselli and Philip Hopkins

2020

Utilizar la ecografía para los catéteres de la arteria radial en todas las condiciones difíciles

Utilizar siempre la ecografía para los catéteres de la arteria femoral

- (2) We recommend the use of ultrasound guidance for radial artery catheterisation in all adult hypotensive, hypovolaemic and haemodynamically unstable patients, and in those with vascular diseases and small arteries with a weak and/or thin pulse, as it has been shown to be more effective in reducing complications, the time to successful cannulation and the number of attempts, and in increasing overall success and first-time success rate (**1B**).
- (3) We recommend the use of ultrasound guidance in all adults needing femoral artery catheterisation, as it has been shown to be safer by reducing major and minor complications, and it increases both overall success and first-time success rates, and reduces the time to successful cannulation (**1B**).

Ultrasonido y catéteres arteriales periféricos

2020

EJA

Eur J Anaesthesiol 2020; **37**:344–376

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Massimo Lamperti, Daniele Guerino Biasucci, Nicola Disma, Mauro Pittiruti, Christian Bressan, Davide Vailati, Matteo Subert, Vilma Traškaitė, Andrius Macas, Jean-Pierre Estebe, Regis Fuzier, Emmanuel Boselli and Philip Hopkins

We recommend the use of ultrasound guidance for routine arterial cannulation in children, as it increases the success rate (**1B**).

Utilizar siempre la ecografía para los catéteres arteriales en los niños

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INS

Infusion Nurses Society

One Corporate Drive, Norwood, NJ 07042
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Use ultrasound guidance for arterial puncture and catheter insertion in adults and children.

1. Ultrasound-guided insertion of the radial artery has been associated with higher first-attempt success and lower failure rate compared to palpation, with no significant difference in time to insertion or hematoma formation in adult and pediatric patients.^{24,37,40-42} (I)
2. Use real-time, ultrasound-guided femoral arterial line insertion, as it has been associated with reduced hematoma formation and vascular complications.^{10,24,37,43} (I)

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INS

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2. Use real-time, ultrasound-guided femoral arterial line insertion, as it has been associated with reduced hematoma formation and vascular complications.^{10,24,37,43} (I)

Utilizar siempre la ecografía para todos los catéteres arteriales

Ultrasonido y accesos venosos periféricos

Ultrasonido y accesos venosos periféricos

Acceso venoso periférico

- Estudio de las venas del brazo antes del procedimiento
- Inserción de catéteres venosos periféricos guiada por ecografía
- Verificación por ultrasonido de la posición de la punta
- Diagnóstico de trombosis venosa o vaina fibroblástica

2020

Directrices de la Sociedad Europea de Anestesia

- (3) We recommend the use of ultrasound guidance for peripheral vein cannulation in adults with moderate to difficult venous access, both in emergency and elective situations, as it is safer and more effective in terms of a reduction of complications, improved overall success rate and reduced time to achieve vascular access (1C).
- (4) We recommend the use of ultrasound scanning before peripheral vein cannulation in order to evaluate the location of a vein as well as its diameter and depth. This will enable the choice of the most appropriate length and diameter of peripheral vascular access device and the safest puncture site, so as to reduce the risks of accidental dislodgment and extravasation, phlebitis and thrombus formation (1C).

EJA

Eur J Anaesthesiol 2020; 37:344–376

GUIDELINES

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Utilizar el ultrasonido en la inserción de catéteres periféricos en pacientes DIVA

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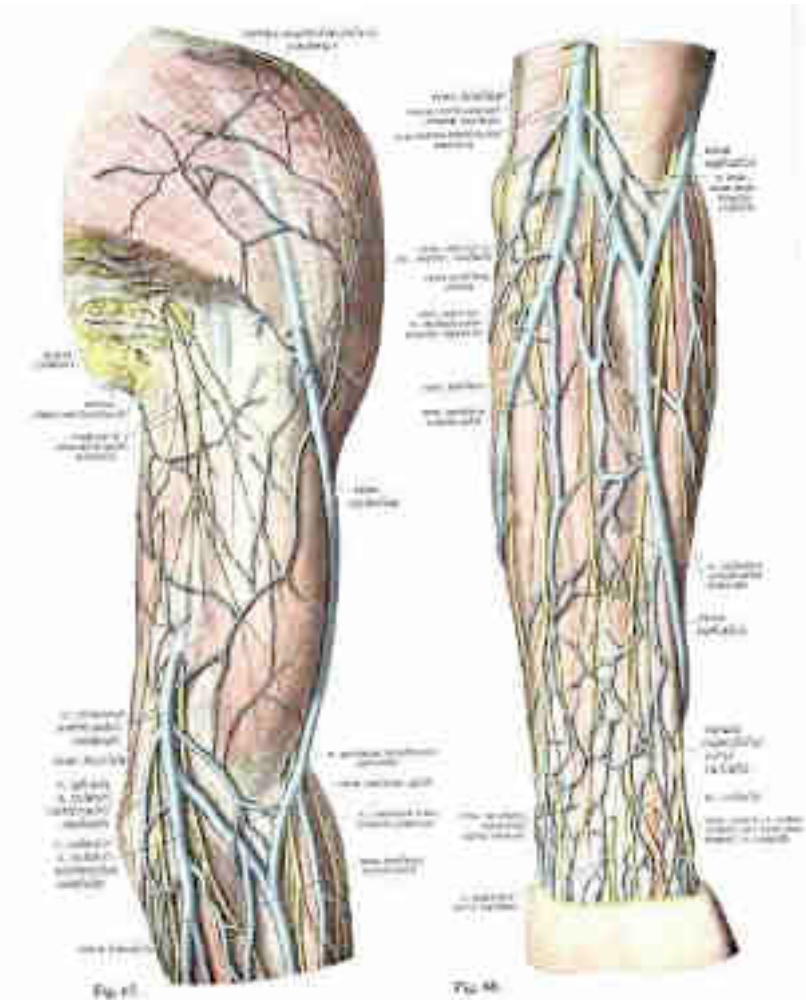
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Use ultrasound for PIVC and midline catheter insertion.

1. Adults: studies report fewer venipuncture attempts and decreased escalation to central vascular access device (CVAD) insertion.^{5,18-23} (I)
 - a. Short PIVC: use ultrasound in adult patients with difficult intravenous access (DIVA).^{5,6,8,10,24-27} (I)
 - b. Long PIVC: insertion with ultrasound may reduce failure due to an increased ratio of catheter within the vessel; 1 study demonstrated a reduction in catheter failure rate (when $\geq 65\%$ of the catheter resided within the vein).²⁸ (IV)

Utilizar el ultrasonido en la inserción los catéteres periféricos cortos en pacientes DIVA

Utilizar siempre la ecografía para la inserción de catéteres largos periféricos y catéteres de línea media



Estudio de las venas del brazo antes de la maniobra

Venas del antebrazo

cefálica

basílica

Venas de la fosa antecubital

cefálica

antecubital

basílica

Venas del brazo

basílica

braquial

cefálica

Ultrasonido y
accesos
venosos
periféricos

Inserción de catéteres venosos periféricos guiada por ecografía

- Cánulas periféricas cortas (< 6 cm)
 - Antebrazo
 - Fosa antecubital
- Catéteres periféricos largos (6-15 cm)
 - Antebrazo
 - Brazo
- Catéteres de línea media (15-25 cm)
 - Brazo

2021

Directrices europeas
sobre accesos venosos periféricos

Review

JVA | The Journal of
Vascular Access

European recommendations on the proper indication and use of peripheral venous access devices (the ERPIUP consensus): A WoCoVA project

The Journal of Vascular Access
1–18

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DOI: 10.1177/11297298211023274

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Mauro Pittiruti¹ , Ton Van Boxtel² , Giancarlo Scoppettuolo¹, Peter Carr³, Evangelos Konstantinou⁴, Gloria Ortiz Miluy⁵, Massimo Lamperti⁶, Godelieve Alice Goossens⁷, Liz Simcock⁸, Christian Dupont⁹, Sheila Inwood¹⁰, Sergio Bertoglio¹¹ , Jackie Nicholson¹², Fulvio Pinelli¹³  and Gilda Pepe¹

- *insert PVADs at the forearm or upper arm, avoiding areas of flexion*
- *if insertion in the hand, in the external jugular vein, or at the lower limb is unavoidable (as in emergency), remove the PVAD within 24–48 h*
- *prepare the skin with 2% chlorhexidine in 70% isopropyl alcohol using 30 s friction and allowing 30 s to dry*
- *in DIVA patients, consider the use of NIR guidance for access to the superficial veins of the arm and/or of US guidance for access to the deep veins of the arm*
- *cover the exit site with sterile semipermeable transparent dressing*

- *insert PVADs at the forearm or upper arm, avoiding areas of flexion*
- *if insertion in the hand, in the external jugular vein, or at the lower limb is unavoidable (as in emergency), remove the PVAD within 24–48 h*
- *prepare the skin with 2% chlorhexidine in 70% isopropyl alcohol using 30 s friction and allowing 30 s to dry*
- *in DIVA patients, consider the use of NIR guidance for access to the superficial veins of the arm and/or of US guidance for access to the deep veins of the arm*
- *cover the exit site with sterile semipermeable transparent dressing*

En los pacientes DIVA, utilizar la tecnología NIR o los ultrasonidos para la inserción de los accesos venosos periféricos.

2018

Open Access

Original article

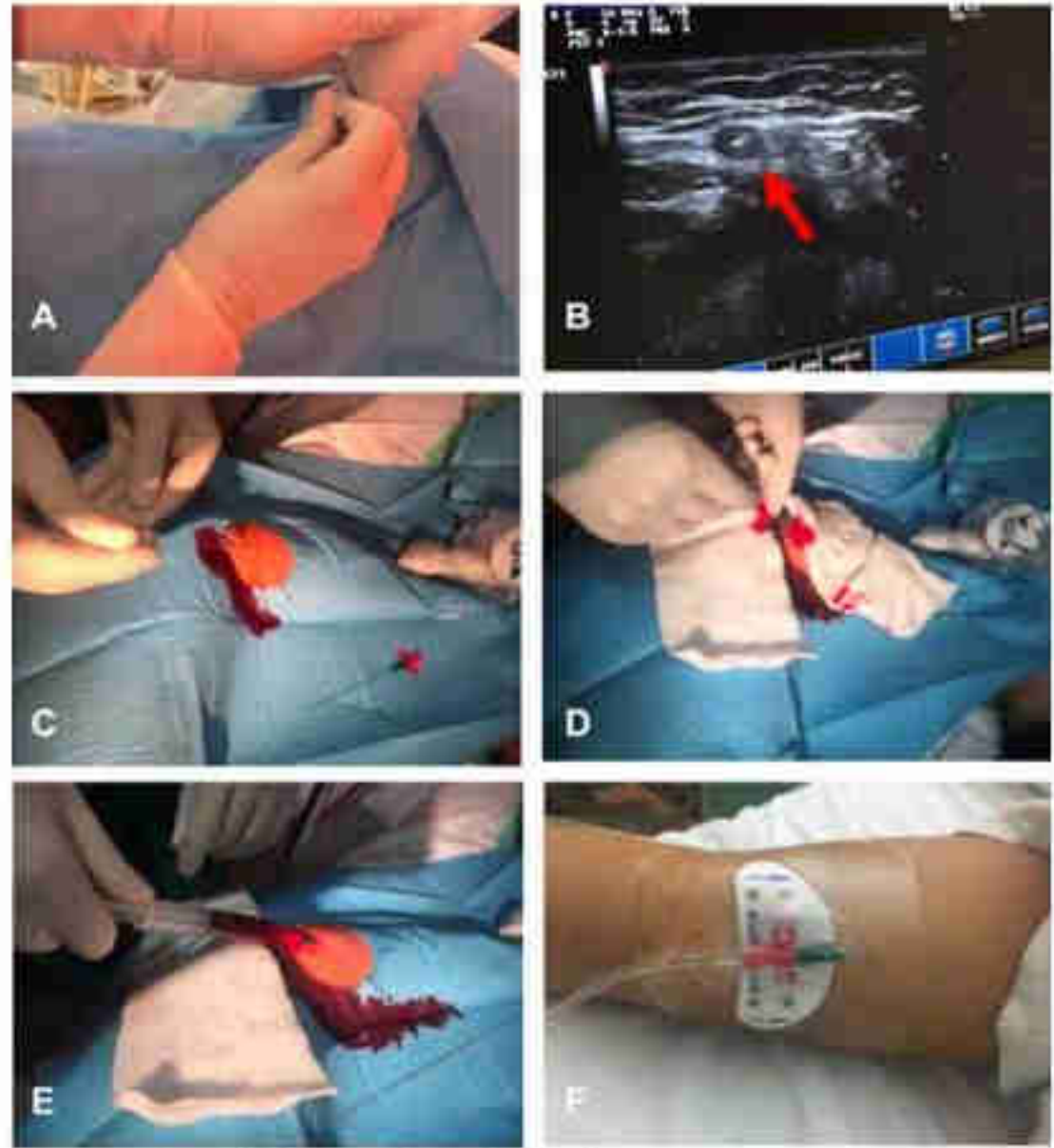
BMJ
Paediatrics
Open

Ultrasound-guided placement of long peripheral cannulas in children over the age of 10 years admitted to the emergency department: a pilot study

Angela Paladini,¹ Antonio Chiaretti,¹ Kidane Wolde Sellasie,² Mauro Pittiruti,³ Giovanni Vento¹

Inserción de catéteres periféricos largos guiada por ultrasonidos

Inserción de un catéter periférico largo guiada por ultrasonidos



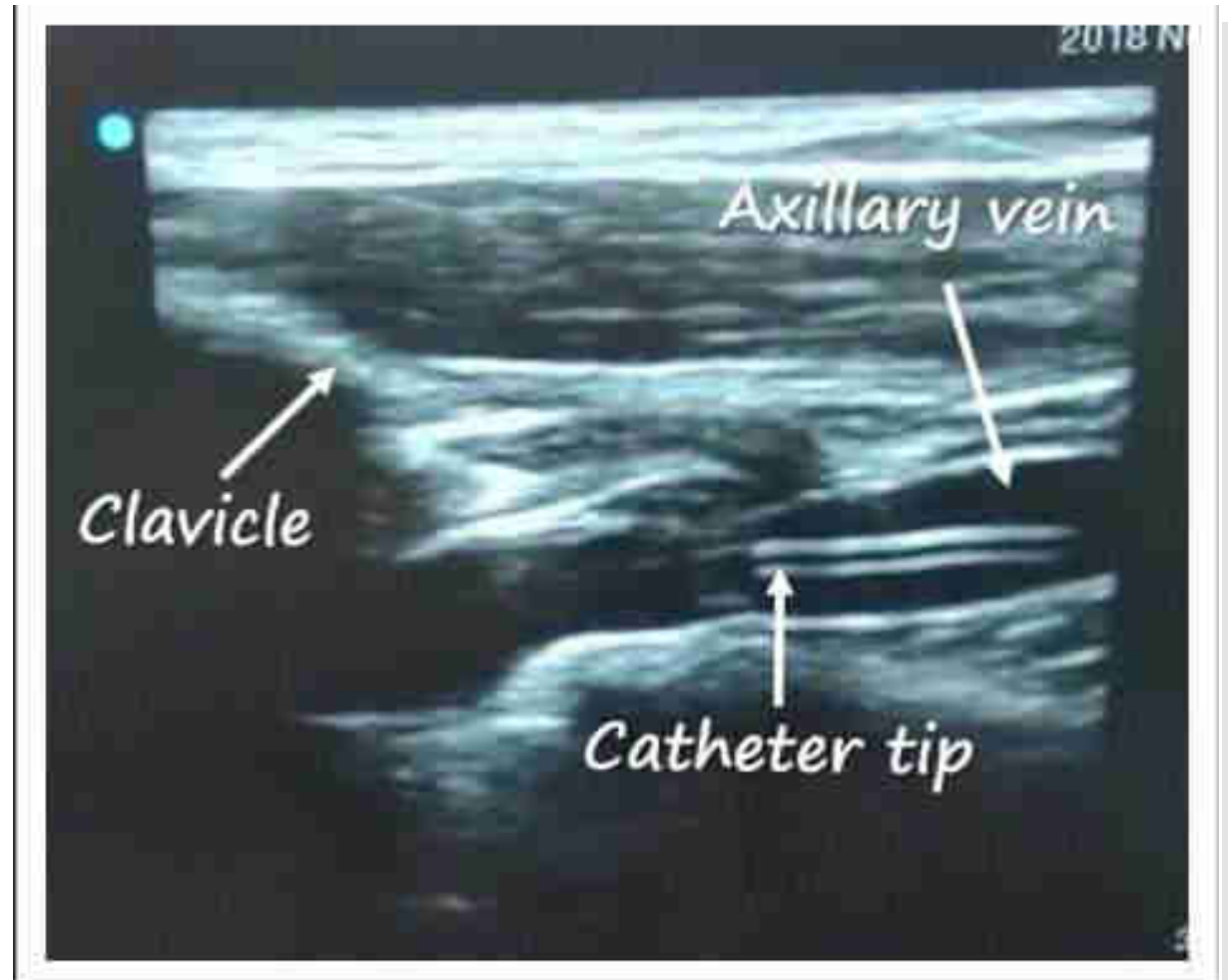
Ultrasonido y accesos venosos periféricos

Verificación por ultrasonido de la posición de la punta

- Catéteres de línea media
(visualización de la punta en el tramo
final de la vena axilar, antes de la
clavícula: posición ideal para la toma
de muestras y para reducir el riesgo
de trombosis)

sonda lineal

Catéter de línea media



Ultrasonido y accesos venosos periféricos

Diagnóstico de trombosis venosa o vaina fibroblástica

- Catéteres periféricos largos y catéteres
de línea media

 - Trombosis venosa en la punta (masa
hipoecogénica)

 - Vaina hiperecogénica alrededor del
catéter

Ultrasonido y accesos venosos centrales

Ultrasonido y accesos venosos centrales

Ultrasonido y accesos venosos centrales:

1. Estudio ecográfico de las venas antes del procedimiento
2. Anestesia local por ultrasonidos
3. Punción y canulación de venas profundas
4. Diagnóstico de las complicaciones de la punción
5. Verificación de la correcta dirección del catéter
6. Verificación de la posición de la punta
7. Diagnóstico de trombosis venosa o vaina fibroblástica
8. Diagnóstico de la malposición secundaria
9. Tratamiento de la extravasación

2020



Ultrasound-guided cannulation in adults

- (1) We suggest following a step-wise approach for ultrasound-guided vascular access device placement which includes: preprocedural ultrasound evaluation of the vessel; recognition of possible local disease; ultrasound-guided real-time puncture; verification of the direction of guidewires and catheters into the vessel towards the superior vena cava for centrally inserted central catheters or towards the inferior vena cava for femoral or groin catheters; verification of the correct position of the catheter tip; detection of possible postprocedural early and late complications (2B)

EJA

Eur J Anaesthesiol 2020; 37:544–536

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Massimo Lamportì, Daniele Querino Biasucci, Nicola Diem, Mauro Fytári, Christian Breckler, Davide Vozzi, Matteo Roberti, Vilma Tesákova, Andrew Macan, Juan-Pablo Saldaña, Regis Fournier, Emmanuel Bouali and Philip Hopfner

Utilizar los ultrasonidos:

- 1) Estudiar las venas antes del procedimiento
- 2) Venopunción
- 3) Diagnóstico de las complicaciones de la punción
- 4) Comprobación de la dirección correcta del catéter
- 5) Verificación de la posición de la punta

2020

Ultrasound-guided cannulation in children

- (1) For vascular access device placement in paediatric patients, we suggest the global use of ultrasound to assist all steps of the procedure that include preprocedural ultrasound evaluation of all possible options; recognition of possible local disease; ultrasound-guided real-time puncture; verification of the direction of guidewires and catheters in the vessel, and onwards towards the superior vena cava for centrally inserted central catheters, or onwards towards the inferior vena cava for femoral or groin catheters; verification of the correct position of the catheter tip; detection of possible postprocedural early and late complications (2B).

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Utilizar los ultrasonidos:

- 1) Estudiar las venas antes del procedimiento
- 2) Venopunción
- 3) Diagnóstico de las complicaciones de la punción
- 4) Comprobación de la dirección correcta del catéter
- 5) Verificación de la posición de la punta

The SIC protocol: A seven-step strategy to minimize complications potentially related to the insertion of centrally inserted central catheters

Fabrizio Brescia¹ , Mauro Pittiruti² , Matthew Ostroff³ ,
Timothy R Spencer⁴  and Robert B Dawson⁵

The Journal of Vascular Access
1-6

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DOI: 10.1177/11297298211036002

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Table 1. The seven steps of the SIC protocol.

Step 1	<i>Preprocedural evaluation</i> —choice of the vein by systematic ultrasound examination of the veins of the neck and of the supra/infraclavicular region (RaCeVA protocol) and choice of the ideal exit site (Central ZIM)
Step 2	<i>Appropriate aseptic technique</i> —hand hygiene, skin antiseptis with 2% chlorhexidine in 70% alcohol, maximal barrier precautions
Step 3	<i>Ultrasound-guided insertion</i> —ultrasound-guided venipuncture, ultrasound verification of the correct direction of the guidewire (tip navigation) and of the absence of pneumothorax (pleural scan)
Step 4	<i>Intra-procedural assessment of tip location</i> —verification of the central position of the tip by intracavitary ECG and/or by transthoracic echocardiography, using the "bubble test"
Step 5	<i>Adequate protection of the exit site</i> —reduction of the risk of bleeding and risk of contamination by sealing with cyanoacrylate glue
Step 6	<i>Proper securement of the catheter</i> —stabilization of the catheter using skin-adhesive sutureless devices, transparent dressing with integrated securement or subcutaneous anchorage
Step 7	<i>Appropriate coverage of the exit site</i> —use of semi-permeable transparent dressing, preferably with high breathability

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Utilizar los ultrasonidos:

- 1) Estudiar las venas antes del procedimiento
- 2) Venopunción
- 3) Diagnóstico de las complicaciones de la punción
- 4) Comprobación de la dirección correcta del catéter
- 5) Verificación de la posición de la punta

Ultrasonido y accesos venosos centrales

1) Estudio ecográfico de las venas antes del procedimiento

venas del brazo - RaPeVA

venas del cuello y del pecho - RaCeVA

venas de la ingle y del muslo - RaFeVA

Tres protocolos desarrollados por Gavecelt



B. Assess the anatomy prior to insertion when using ultrasound to identify vascular anomalies (eg, occlusion or thrombosis) and to assess vessel diameter.

Infusion Therapy Standards of Practice

Lisa A. Gerski, MS, RN, RNC-BC, CRNP, FAAN
Lynn Hadenway, MD, RN, WFD-BC, CRNP
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Sandra Broadhurst, MN, RN, CMAA(C)
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Mary Mancoske, MA, RN, CRNP, CAC, FAAN

3TH EDITION
REVISED 2017

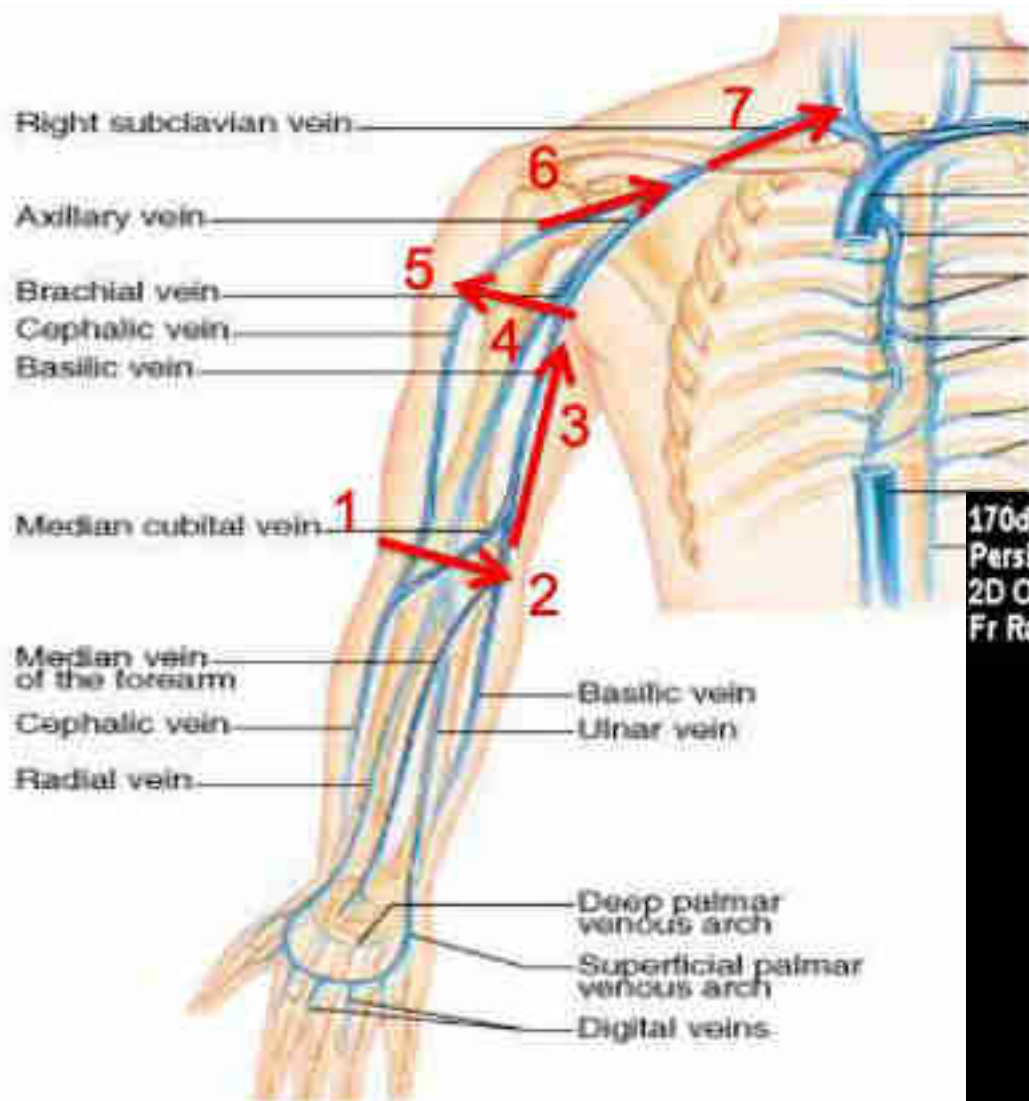
INS
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2021



Verificar el diámetro de las venas antes del procedimiento

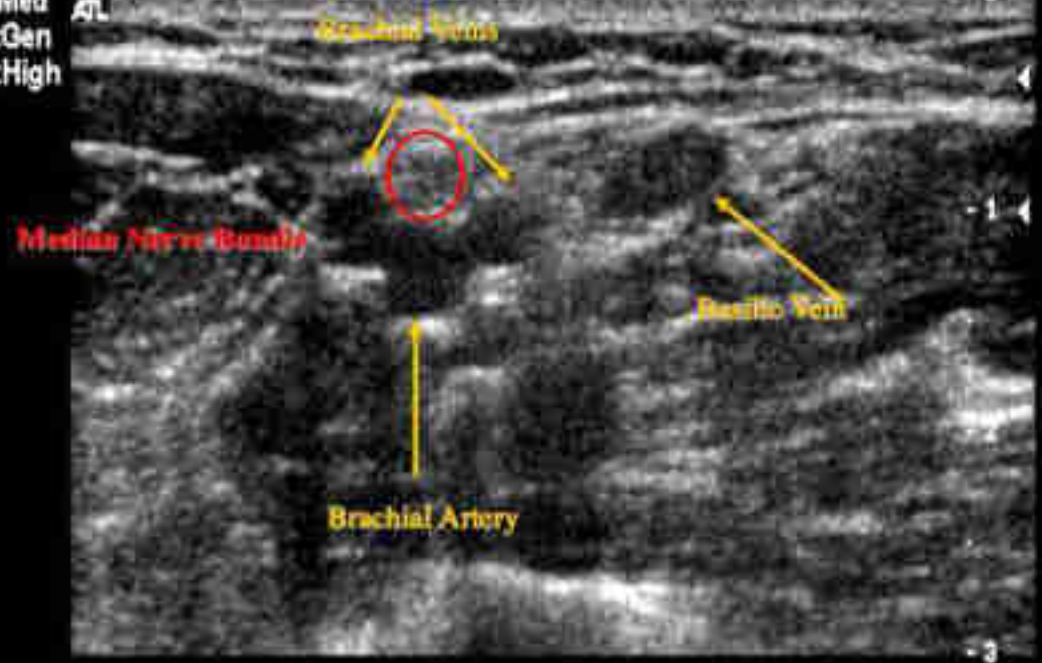


RaPeVA



Evaluación rápida de las venas periféricas

170dB/C 3
Persist Med
2D OptGen
Fr Rate:High



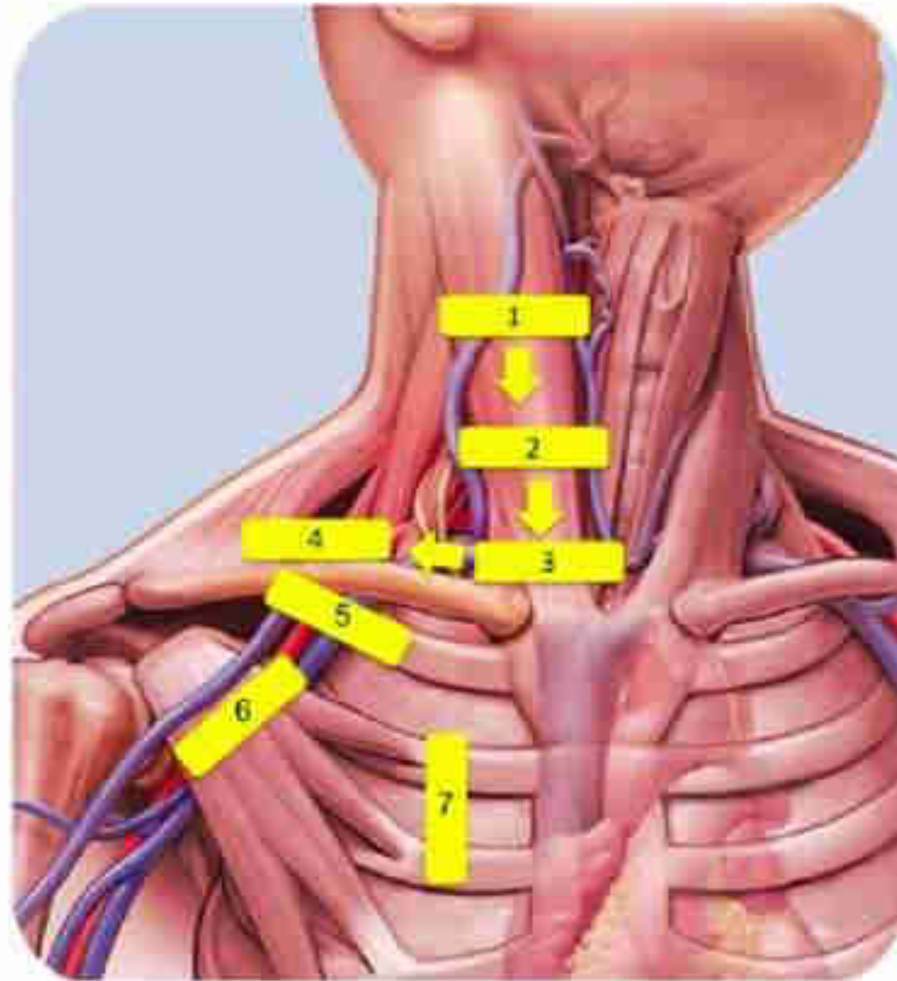
Rapid Central Vein Assessment (RaCeVA): A systematic, standardized approach for ultrasound assessment before central venous catheterization

Timothy R Spencer¹ and Mauro Pittiruti²

The Journal of Vascular Access
2019, Vol. 20(3) 239–249
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RaCeVA





(a)



(b)

Step 1



(a)



(b)

Step 2

Step 3



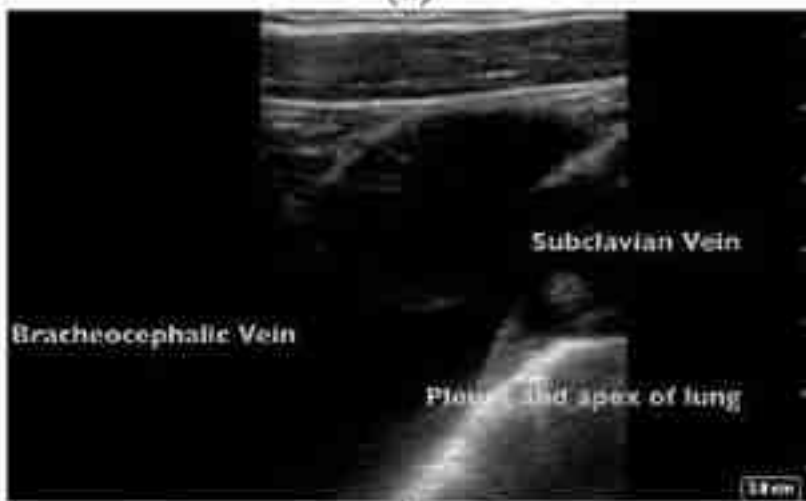
(a)



(a)



(b)



(b)

Step 4



(c)



(n)

Step 5



(b)



(a)

Step 6



(b)

RaCeVA en los recién nacidos

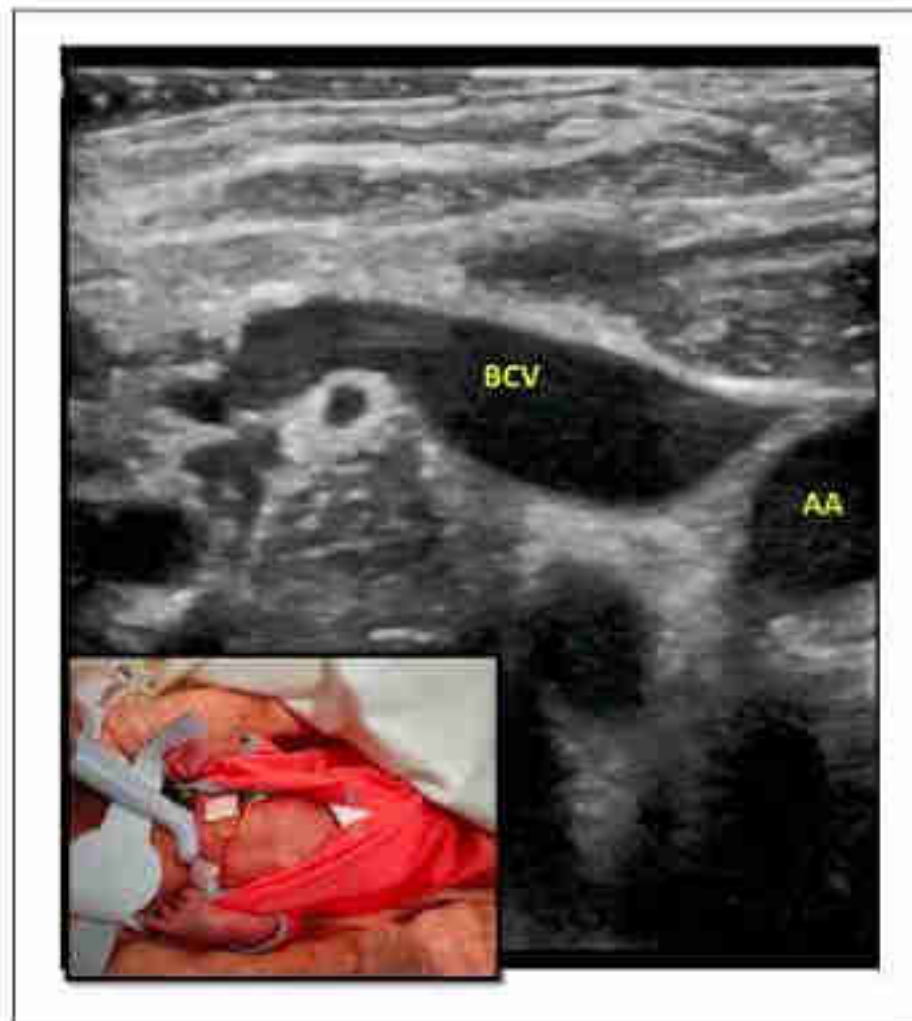


Figure 3. Shows part of the RaCeVA protocol. Left brachiocephalic vein (BCV) is visualized in long axis. Part of the aortic arch (AA) is also evident.

Rapid Femoral Vein Assessment (RaFeVA): A systematic protocol for ultrasound evaluation of the veins of the lower limb, so to optimize the insertion of femorally inserted central catheters

Fabrizio Brescia¹, Mauro Pittiruti², Matthew Ostroff³
and Daniele G Biasucci⁴

The Journal of Vascular Access
1–10

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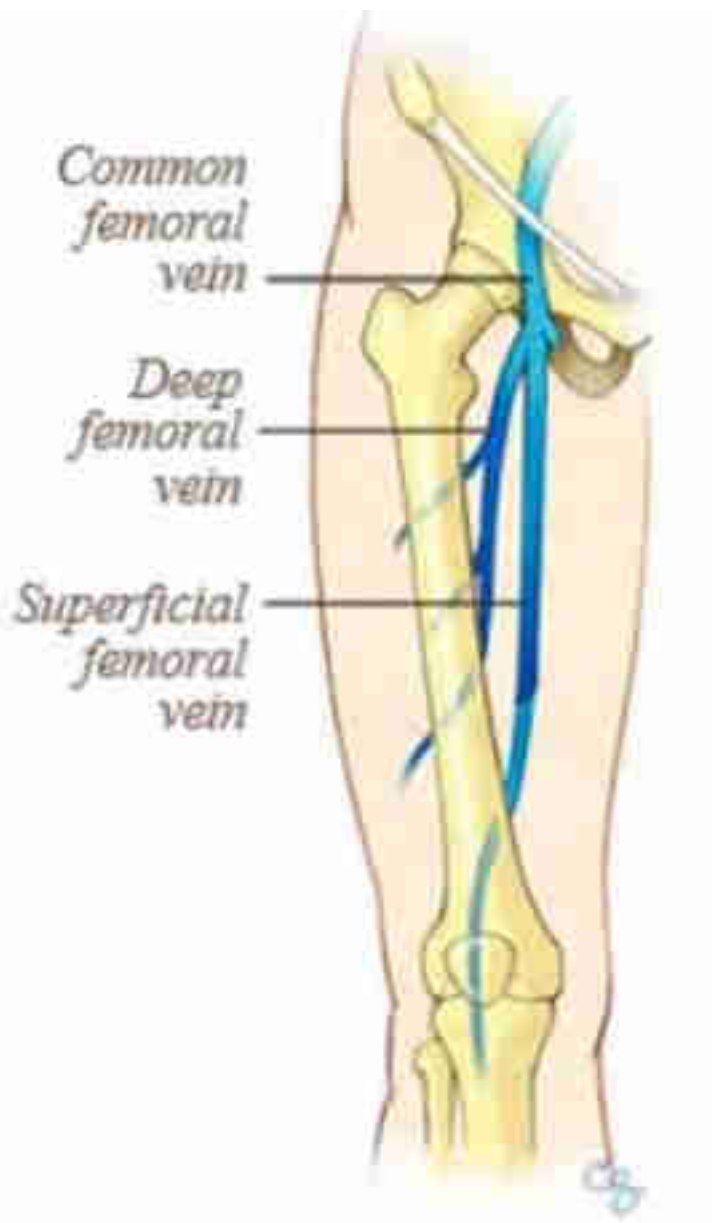
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Editorial

2020

JVA | The Journal of
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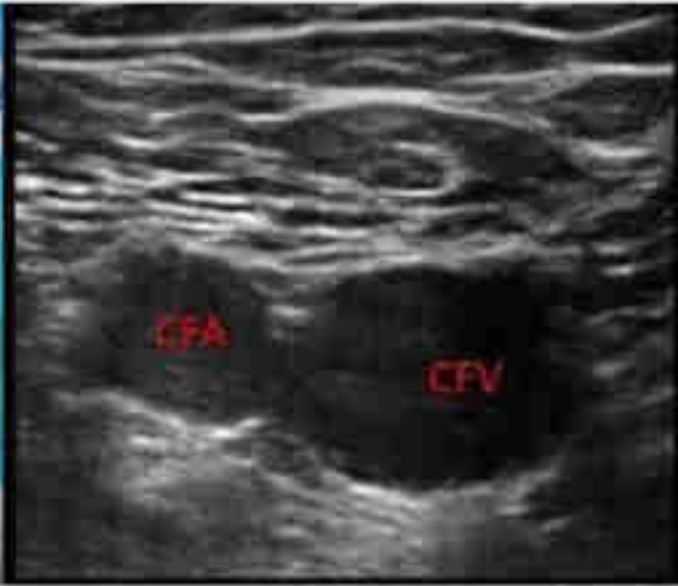
Rapid Femoral Vein Assessment (RaFeVA): A systematic protocol for ultrasound evaluation of the veins of the lower limb, so to optimize the insertion of femorally inserted central catheters

Fabrizio Brescia¹, Mauro Pittiruti², Matthew Ostroff³
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Evaluación rápida de las venas femorales

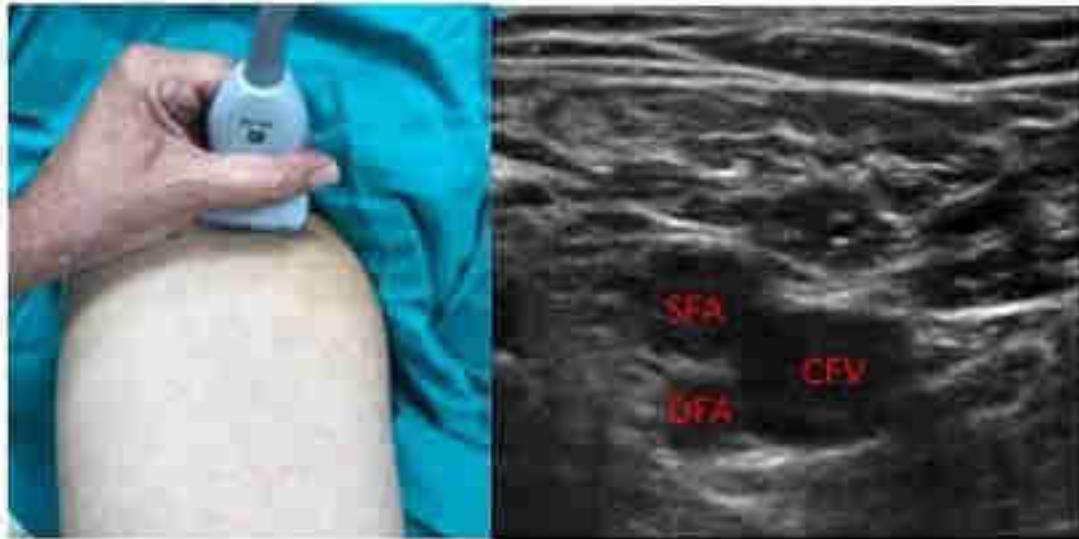
vena femoral común (ingle)
vena femoral superficial (muslo)



Step 1



Step 2



Step 3



Step 4



Step 5

Ultrasonido y
accesos
venosos
centrales

2) Anestesia local guiada por ultrasonidos



Mayor precisión
Menos dolor
Menor cantidad de anestesia

Ultrasonido y
accesos
venosos
centrales

3) Punción y canulación de venas profundas

- PICC
- CICC
- FICC

Cualquier acceso venoso central en niños y adultos debe ser colocado por ultrasonido

2021

Infusion Therapy Standards of Practice

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4TH EDITION

REVISED 2021

INS

Infusion Nurses Society
One Corporate Drive, Norwood, MA 02062
www.ins-nurses.org

- G. Use real-time ultrasound guidance and a systematic approach to insertion of CVADs in adults and children to improve insertion success rates, reduce number of needle punctures, and decrease insertion complication rates.^{9,10,37-39} (I)

Cualquier acceso venoso central en niños y adultos debe ser colocado por ultrasonido

Ultrasonido y accesos venosos centrales

Accesos venosos centrales guiados por ultrasonido

- En el recién nacido
 - CICC (vena anónima)
 - FICC (vena femoral común)
- En niños y adultos
 - PICC (vena del brazo)
 - CICC (abordaje infraclavicular: vena axilar)
 - CICC (abordaje supraclavicular: vena anónima, vena subclavia, vena yugular interna)
 - FICC (vena femoral común, vena femoral superficial)

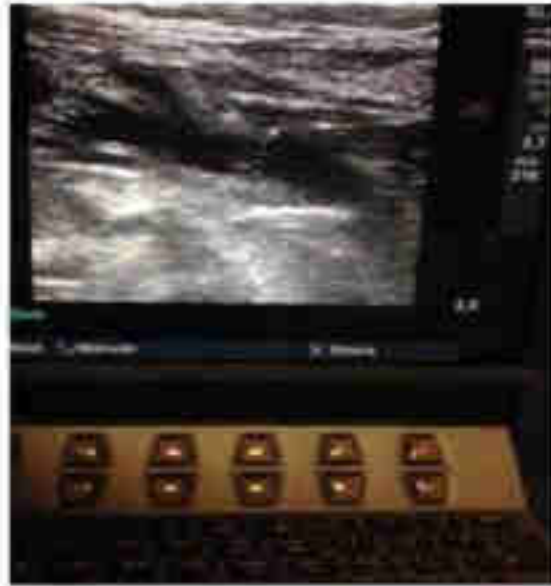
PICC



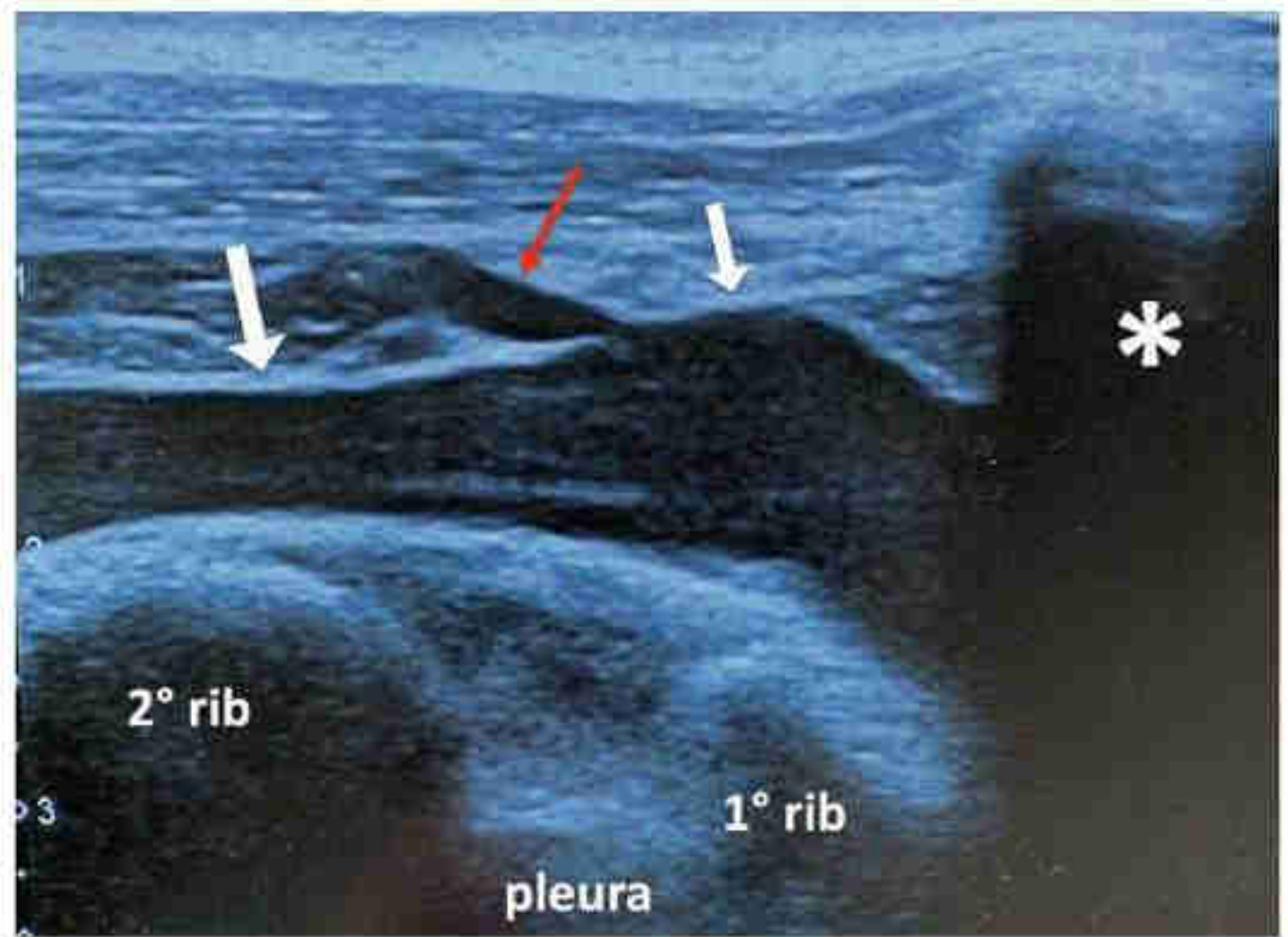
CICC en el
recién nacido
(vena
anónima)



CICC en el
recién nacido
(vena
anónima)



CICC en
adultos
(vena axilar)



Tres técnicas de punción venosa axilar con ecoguía



Received: 17 February 2020 | Revised: 23 April 2020 | Accepted: 20 May 2020

DOI: 10.1111/dme.13961

DEVICES

PACE  WILEY

Ultrasound-guided venipuncture for implantation of cardiac implantable electronic devices: A single-center, retrospective study

Giovanni Deluca¹ | Vincenzo F. M. Massari¹ | Francesco Musico² | Isabella Rosa¹ |
Giuseppe Modugno¹ | Antonio Davide Scardigno¹ | Leonardo Valente¹ |
Pasquale Di Leo¹ | Gianluca Ceravolo²  | Mauro Pittiruti³

También para la
colocación de
marcapasos



FICC
(punción de la
vena femoral
común)



FICC (punción de la vena femoral común)



Figure 1. Ultrasound visualization of right superficial femoral artery and right superficial femoral vein at mid-thigh, in short axis: the vein is placed below the artery, slightly lateral.



Figure 3. Visualization of the vein in short axis, using wireless probe.



Figure 4. Venipuncture with 21G needle:

Ultrasonido y
accesos
venosos
centrales

4) Diagnóstico inmediato de las complicaciones de la punción

- Hematomas perivenosos
- Hematomas intramurales
- Neumotórax
- Hemotórax

2020

Verificación inmediata de la ausencia de neumotórax tras la venopunción subclavia o axilar

We recommend performing pleural and lung ultrasound (PLUS) to rule out potential pleural-pulmonary complications (mainly pneumothorax) soon after the procedure in any difficult puncture of the subclavian or axillary vein and, particularly, if the patient complains of shortness of breath or discomfort that worsens after catheter placement (1B).

EJA

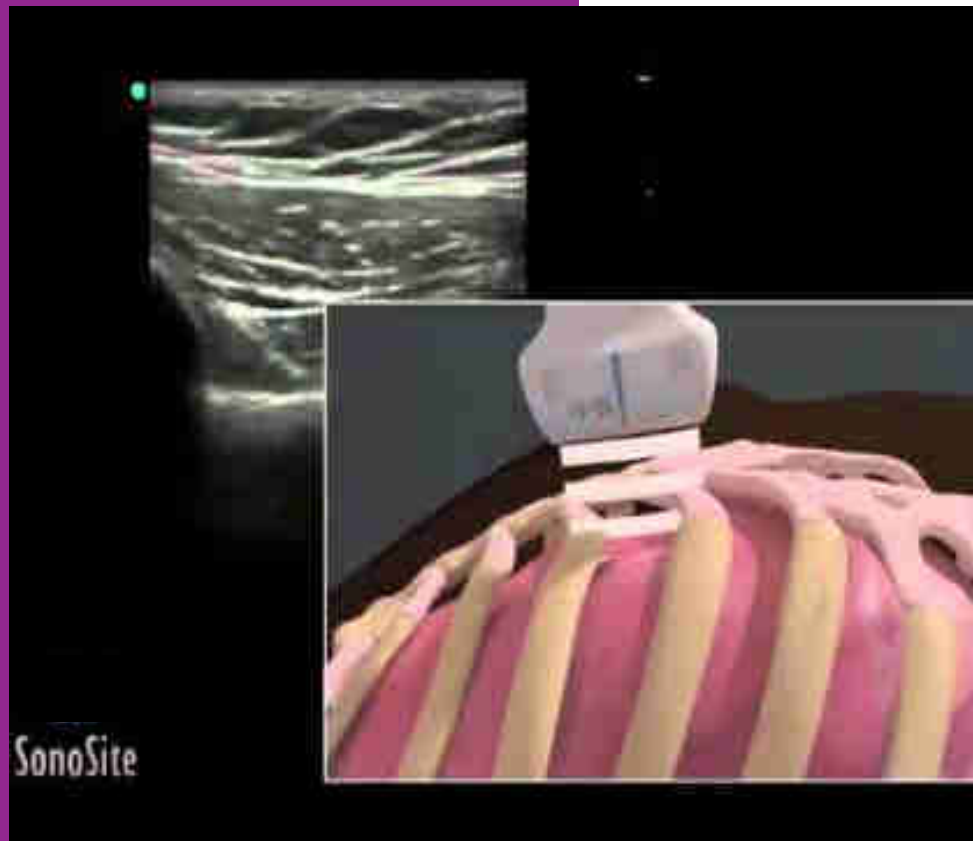
Eur J Anaesthesiol 2020; **37**:344–378

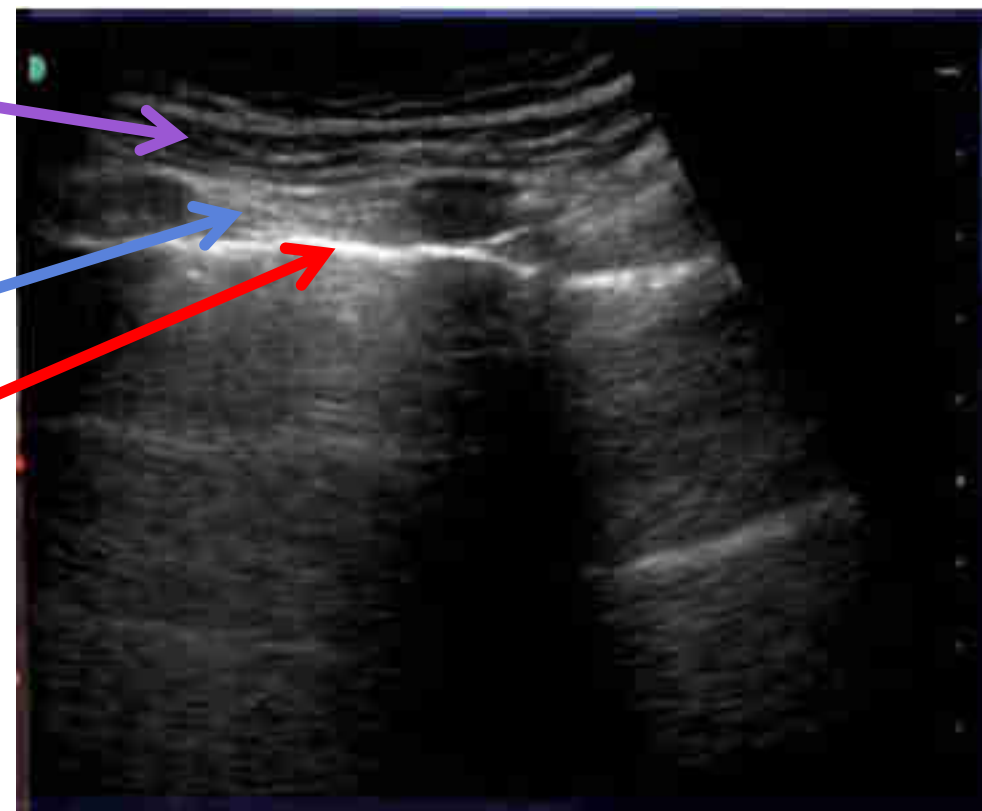
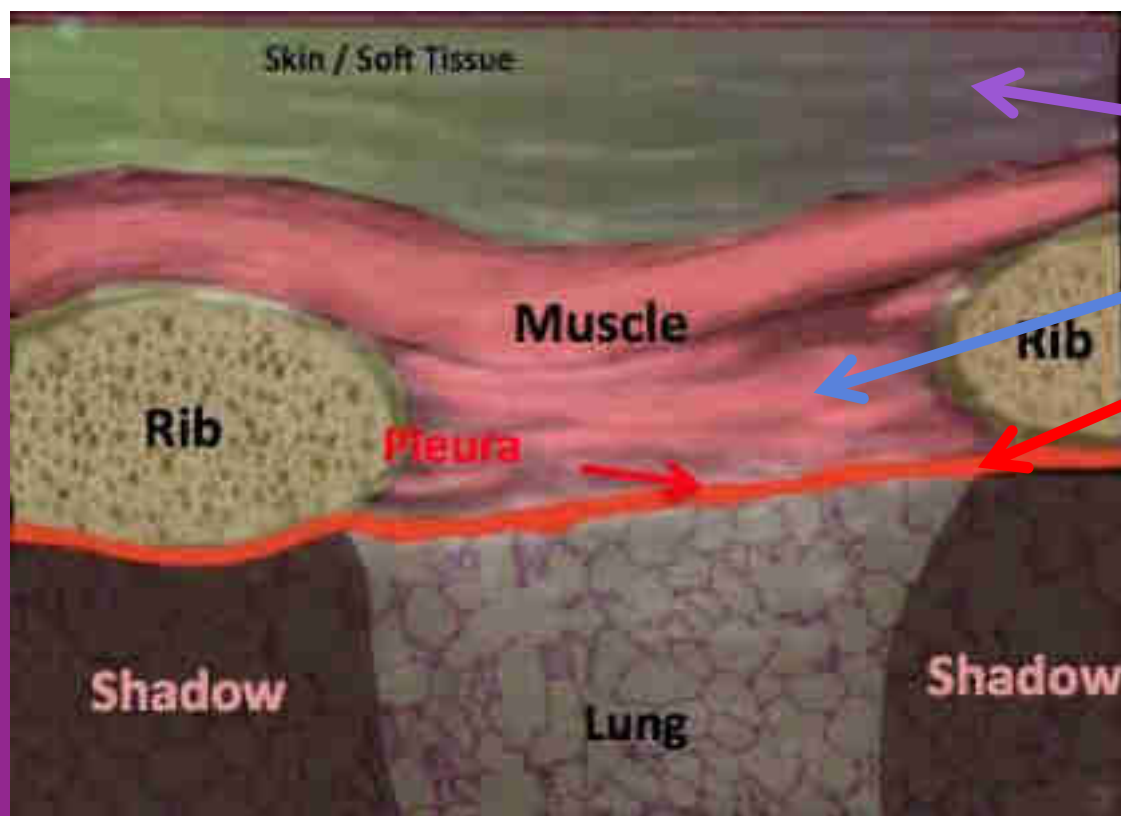
GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

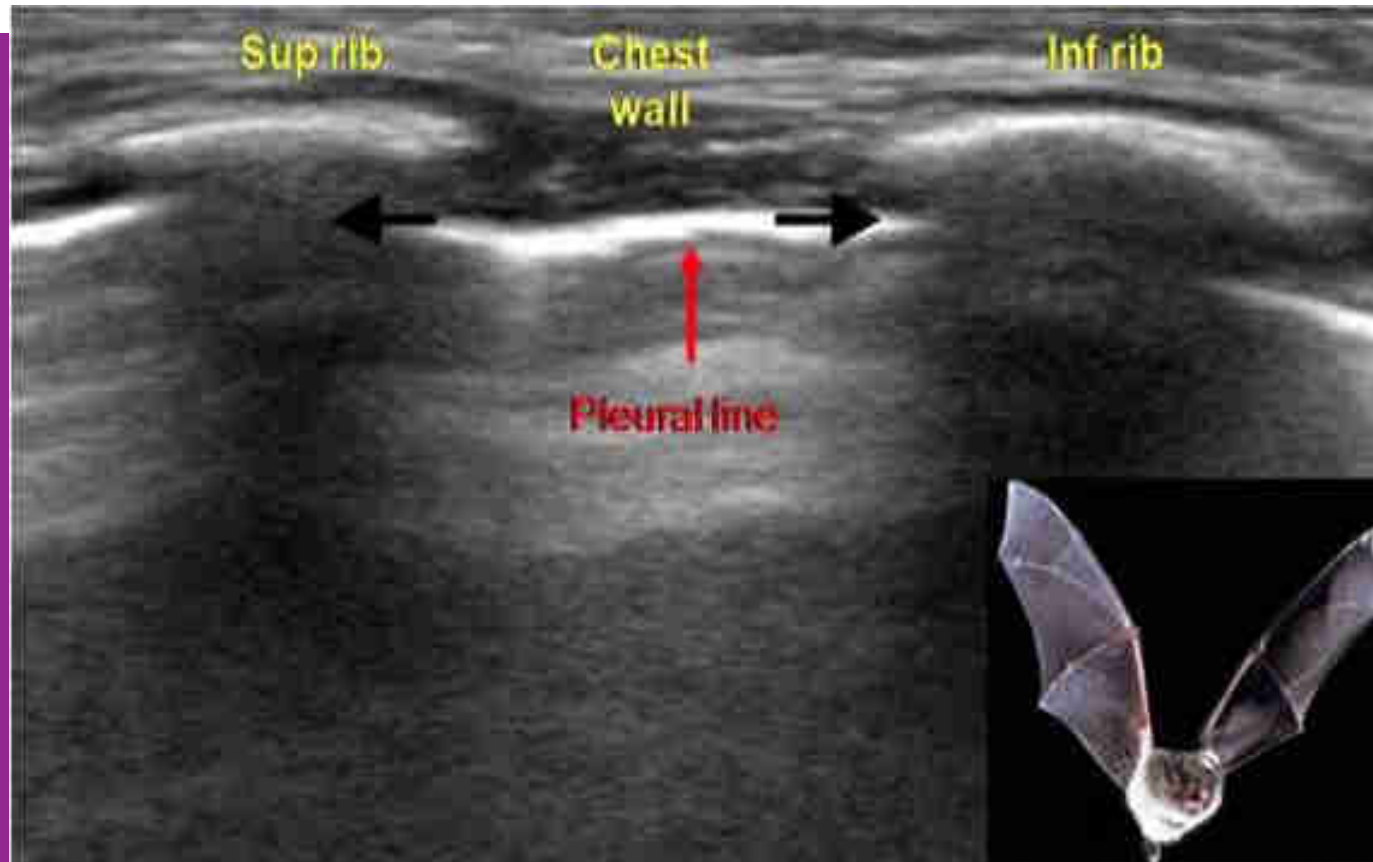
Massimo Lamperti, Daniele Guerino Blasucci, Nicola Dima, Mauro Pittiruti, Christian Breschan, Davide Vallati, Matteo Subert, Vilma Traškaitė, Andrius Macas, Jean-Pierre Estèbe, Régis Fuzier, Emmanuel Boselli and Philip Hopkins

Verificación inmediata de la ausencia de neumotórax tras la venopunción subclavia o axilar





Verificación inmediata de la ausencia de neumotórax tras la venopunción subclavia o axilar

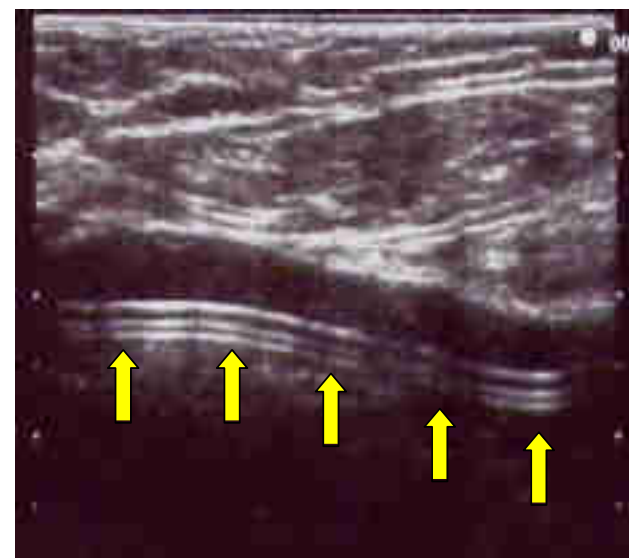
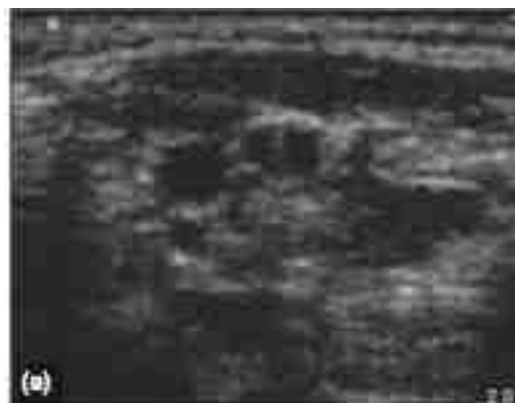


La visualización del movimiento de la pleura ("deslizamiento") excluye la presencia de neumotórax.

Ultrasonido y
accesos
venosos
centrales

**5) Verificación de la dirección
correcta de la guía metálica y del
catéter**
(tip navigation)

Navegación de
la punta con
sonda lineal

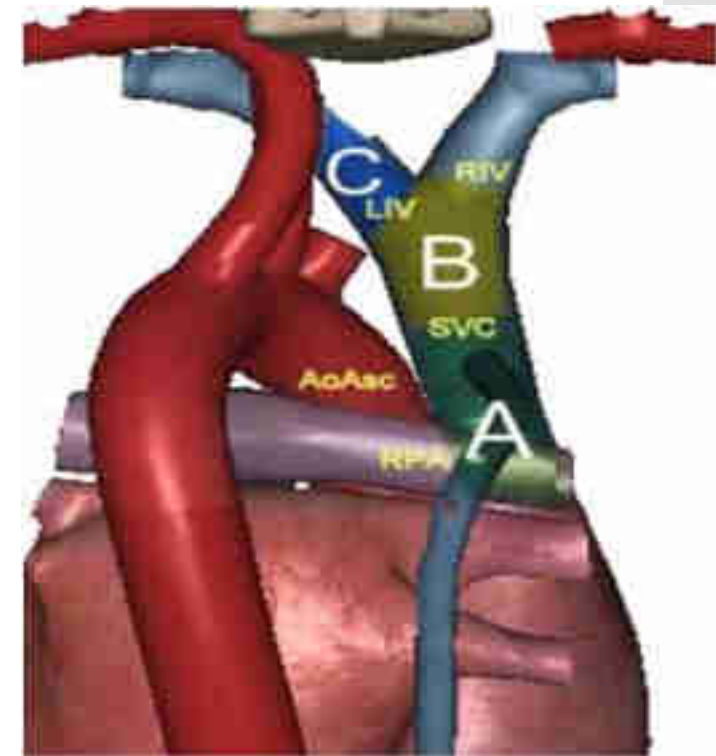
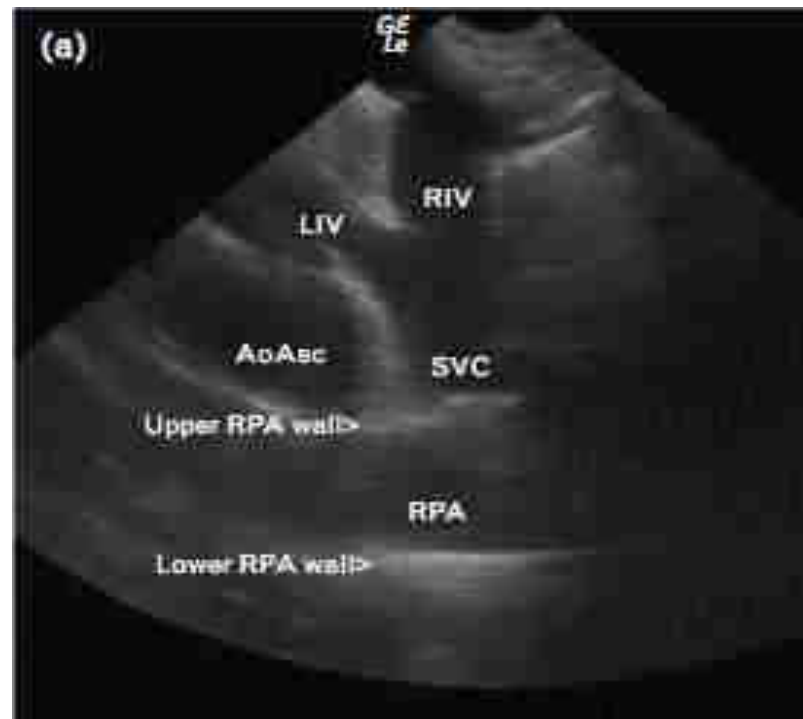


ORIGINAL ARTICLE

Ultrasound confirmation of central venous catheter position via a right supraclavicular fossa view using a microconvex probe*An observational pilot study*

Se-Chan Kim*, Inge Heise*, Alessandra Schmidt*, Georg Baumgarten, Pascal Knapfmann, Andreas Hoeffl and Stefan Weber

Navegación de
la punta con
sonda micro-
convex



Ultrasonido y
accesos
venosos
centrales

6) Verificación de la ubicación de la punta

(*'tip location'*)

- catéteres venosos umbilicales
- catéteres epicutáneo-cava
- PICC
- CICC
- FICC
- catéteres con reservorio
- catéteres de diálisis

2020

When an intracavity electrocardiogram is not applicable, we recommend using real-time ultrasound to detect and prevent central venous catheter malposition, as it has been shown to be well tolerated, feasible, quickly performed and interpreted at the bedside, and it is more accurate and faster than chest radiograph (1C).

We recommend combining and integrating vascular ultrasound (to assist in navigating the tips of guidewires and central venous lines) with transthoracic echocardiography (for tip location) (1C).

EJA

Eur J Anaesthesiol 2020; 37:144–156

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Maximo Langer, Denise Guerin-Bonnet, Nicole Dima, Maria Pittiraj, Christian Bruchan, David Vidal, Mathias Schen, Vito Trullone, Andrea Vicedi, Jean-Pierre Ezybat, Regis Furan, Emmanuel Bessolle and Philip Hooton

2020

When an intracavity electrocardiogram is not applicable, we recommend using real-time ultrasound to detect and prevent central venous catheter malposition, as it has been shown to be well tolerated, feasible, quickly performed and interpreted at the bedside, and it is more accurate and faster than chest radiograph (1C).

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EJA

Eur J Anaesthesiol 2020; 37:144–156

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Maximo Langer, Carlos Quintanilla, Nicolas Dumas, Mauro Pittirru, Christian Brechler, David Vidal, Mathias Schen, Vito Trullier, Andrea Vicedi, Jean-Pierre Eichel, Riggs Fureh, Emmanuel Boudet and Philip Hoozemans

Como segunda opción, si el método del ECG intracavitario no es aplicable, utilizar la verificación por ultrasonidos de la posición de la punta.

El ECG intracavitario y la ecografía son más precisos que la radiografía de tórax !

2020

When an intracavity electrocardiogram is not applicable, we recommend using real-time ultrasound to detect and prevent central venous catheter malposition, as it has been shown to be well tolerated, feasible, quickly performed and interpreted at the bedside, and it is more accurate and faster than chest radiograph (1C).

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EJA

Eur J Anaesthesiol 2020; 37:144–156

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Maximo Langer, Carlos Quintan-Bonafant, Nerea Dima, Maria Filizola, Christian Bruchman, David Vidal, Mathias Schen, Vitor Trindade, Andrea Vicens, Jean-Pierre Esvin, Roger Fureh, Emmanuel Boudet and Philip Hoozemans

Combinar la verificación de la dirección del catéter por ultrasonido con la verificación de la posición de la punta por ultrasonido

Transthoracic echocardiography as bedside technique to verify tip location of central venous catheters in patients with atrial arrhythmia

**Emanuele Iacobone¹ , Daniele Elisei¹, Diego Gattari¹,
Luigi Carbone¹ and Giuseppe Capozzoli²**

The Journal of Vascular Access
2020, Vol. 21(6) 861–867
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Como segunda opción, si el método del ECG intracavitario no es aplicable (fibrilación auricular), utilizar la verificación por ultrasonidos de la posición de la punta.

Ultrasonido y
accesos
venosos
centrales

Protocolos ECHOTIP

(navegación por la punta + localización de la punta)

Neo-ECHOTIP (recién nacidos)

ECHOTIP-Ped (niños)

ECHOTIP (adultos)

Tres protocolos desarrollados por Gavecelt



Neo-ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in neonates

Giovanni Barone¹ , Mauro Pittiruti² , Daniele G Biasucci³,
Daniele Elisei⁴, Emanuele Iacobone⁴ , Antonio La Greca²,
Geremia Zito Marinosci⁵ and Vito D'Andrea⁶ 

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 SAGE



Table 1. Summary of Neo-ECHO tip.

Catheter	Protocol	Probe	Windows
UVC	Tip navigation	Small sectorial probe, 7–8 MHz	Low subcostal longitudinal view
	Tip location	Small sectorial probe, 7–8 MHz	Subcostal longitudinal view
ECCs inserted via veins of the scalp or of the upper limbs	Tip navigation	Linear “hockey stick” probe, 10–14 MHz	Acoustic windows of RaCeVA and RaPeVA
	Tip location	Small sectorial probe, 7–8 MHz	Bi-caval view; four-chamber apical view; long axis view of SVC
ECCs inserted via veins of the lower limbs	Tip navigation	Linear “hockey stick” probe, 10–14 MHz	Short and long axis view of the femoral vein
	Tip location	Small sectorial probe, 7–8 MHz	Subcostal longitudinal view
CICC	Tip navigation	Linear “hockey stick” probe, 10–14 MHz	Acoustic windows of RaCeVA
	Tip location	Small sectorial probe, 7–8 MHz	Bi-caval view; four-chamber apical view; long axis view of SVC
FICC	Tip navigation	Linear “hockey stick” probe, 10–14 MHz and small sectorial probe	Short and long axis view of the femoral vein and subcostal longitudinal view
	Tip location	Small sectorial probe, 7–8 MHz	Subcostal longitudinal view

UVC: umbilical venous catheter; ECC: epicutaneo-caval catheter; RaCeVA: rapid central vein assessment; RaPeVA: rapid peripheral vein assessment; CICC: centrally inserted central catheter; FICC: femoral inserted central catheter.

Neo-ECHOTIP

ventana acústica apical
(cuatro cámaras)

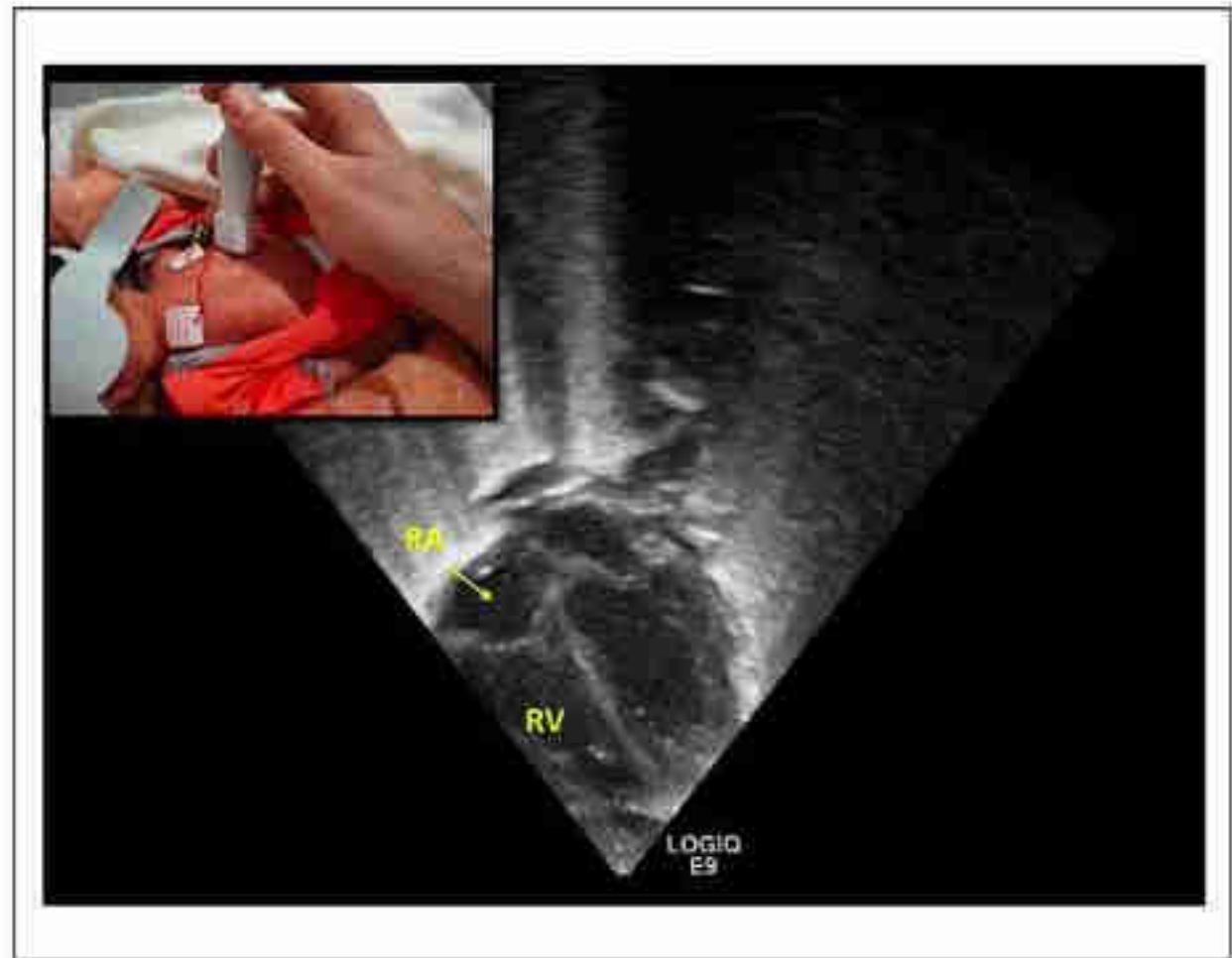


Figure 5. Four-chamber apical view. The four chambers of the heart are clearly visible. The right atrium (RA) and the right ventricle (RV) are visualized on the right side.

Neo-ECHOTIP

ventana acústica
subcostal (bi-cava)

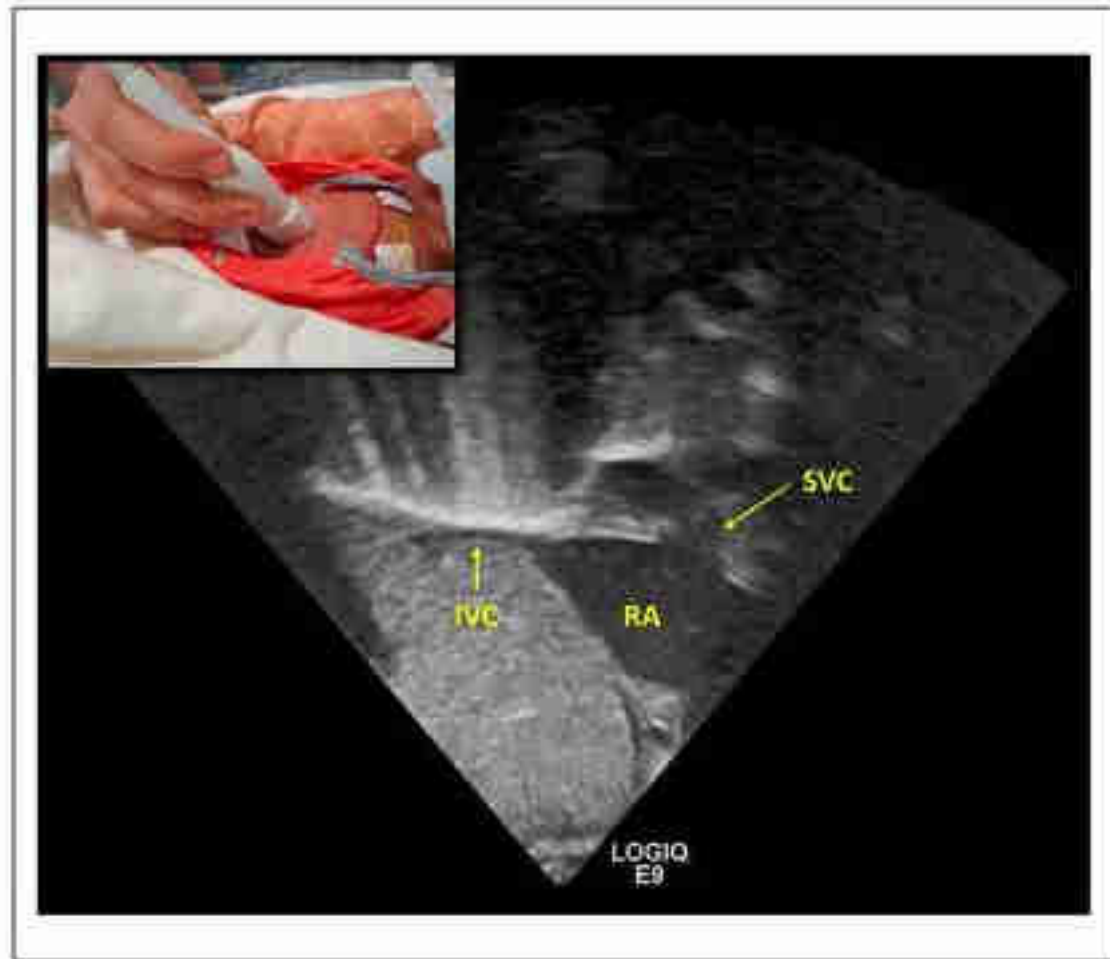


Figure 2. Subcostal longitudinal view. The inferior vein cave (IVC), the right atrium (RA) and the superior vein cave (SVC) are clearly visible.

ECHOTIP-Ped: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in pediatric patients

Geremia Zito Marinosci^{1*}, Daniele Guerino Biasucci^{2*} , Giovanni Barone³, Vito D'Andrea⁴ , Daniele Elisei⁵, Emanuele Iacobone⁵ , Antonio La Greca⁶ and Mauro Pittiruti⁶ 

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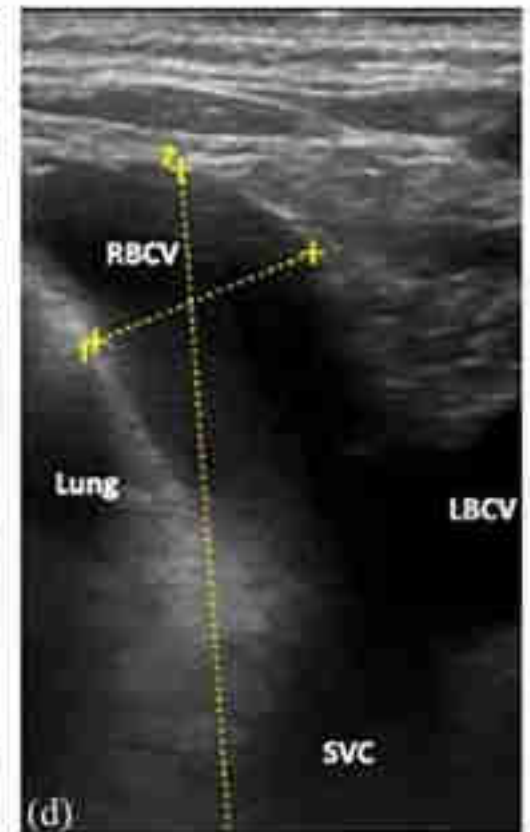
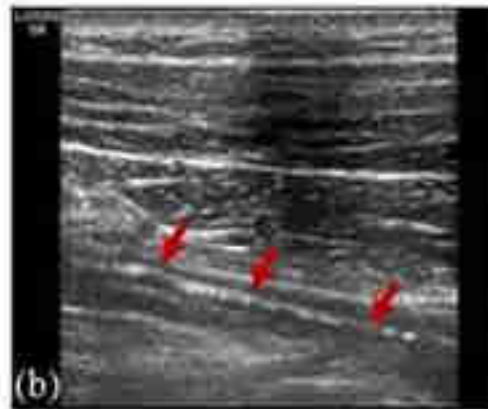
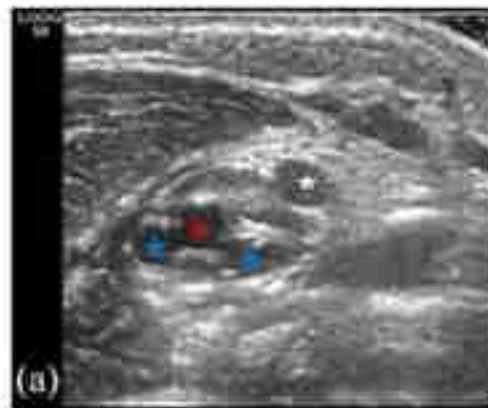
navegación por la punta + localización de la punta en los niños

Table 2. Summary of ECHOTIP-Ped.

CVC	Protocol	Probe	Windows
CICC	Tip navigation	Linear "hockey stick" probe, 10–14 MHz	Same acoustic windows as RaCeVA
	Tip location	Micro-convex probe, 4–8 MHz, or small sectorial probe, 3–7 MHz	Subcostal bi-caval view (recommended) or four-chambers apical view (as alternative option)
PICC	Tip navigation	Linear "hockey stick" probe, 10–14 MHz	Same acoustic windows as RaPeVA and RaCeVA
	Tip location	Micro-convex probe, 4–8 MHz, or small sectorial probe, 3–7 MHz	Subcostal bi-caval view (recommended) or four-chambers apical view (as alternative option)
FICC	Tip navigation	Linear "hockey stick" probe, 10–14 MHz, or micro-convex probe, 4–8 MHz	Short + long axis views of the femoral vein and external iliac vein; and short + long axis views of IVC
	Tip location	Micro-convex probe, 4–8 MHz	Subcostal longitudinal view of the IVC

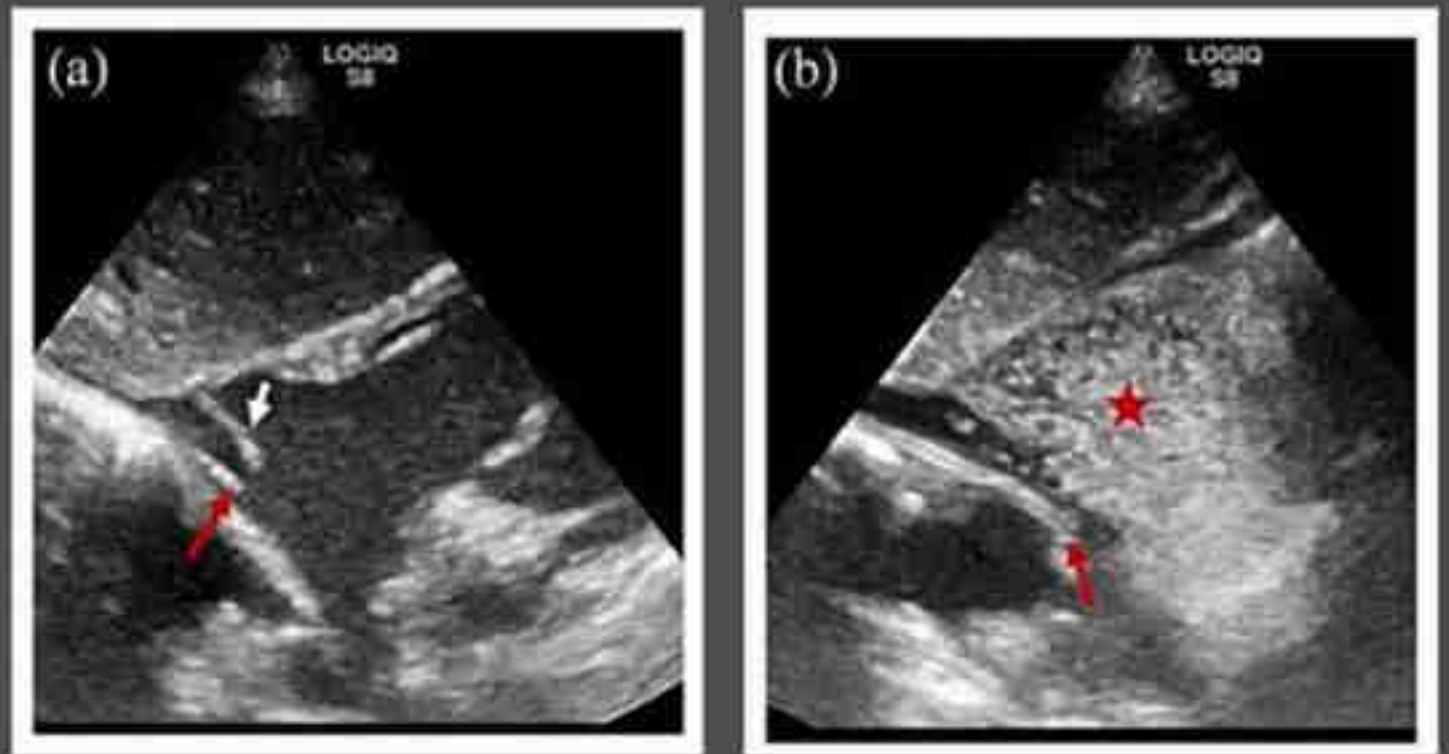
PICC: peripherally inserted central catheter; RaCeVA: rapid central vein assessment; RaPeVA: rapid peripheral vein assessment; CICC: centrally inserted central catheter; FICC: femoral inserted central catheter; IVC: inferior vena cava.

ECHOTIP-Ped



ECHOTIP-Ped

localización de la punta en los niños



JVA 2021, in press

Navegación de la punta y localización de la punta en pacientes adultos

ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in adult patients



Journal:	<i>The Journal of Vascular Access</i>
Manuscript ID	JVA-21-0408.R1
Manuscript Type:	Editorial
Date Submitted by the Author:	n/a
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ECHOTIP

ECHOTIP

2021

ECHOTIP protocol for CIOCs

	Probe	Technique
TIP NAVIGATION	7-12 MHz linear probe	Visualization of the cannulated vessel (wire/catheter inside the vein) Visualization of the deep vessels of neck and chest according to RaCeVA
TIP LOCATION	2-6 MHz sectorial probe as alternative option: 3-8 MHz convex probe	Immediate visualization (< 1 second) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

ECHOTIP protocol for PICCs

	Probe	Technique
TIP NAVIGATION	7-12 MHz linear probe	Visualization of the deep veins of the arm and of the infra/supraclavicular area according to: RaPeVA and RaCeVA
TIP LOCATION	2-6 MHz sectorial probe as alternative option: 3-8 MHz convex probe	Immediate visualization (< 2 seconds) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

ECHOTIP protocol for FIOCs

	Probe	Technique
TIP NAVIGATION	7-12 MHz linear probe (femoral vein and external iliac vein) 3-8 MHz convex probe (common iliac vein and IVC)	Visualization of the deep vessels of the lower limb according to RaFeVA Visualization of IVC in short and long axis views
TIP LOCATION	2-6 MHz sectorial probe as alternative option: 3-8 MHz convex probe	Visualization of bubbles after flushing - Tip in IVC: immediate visualization of bubbles in IVC - Tip in RA or at the junction RA/IVC: immediate visualization of bubbles in RA

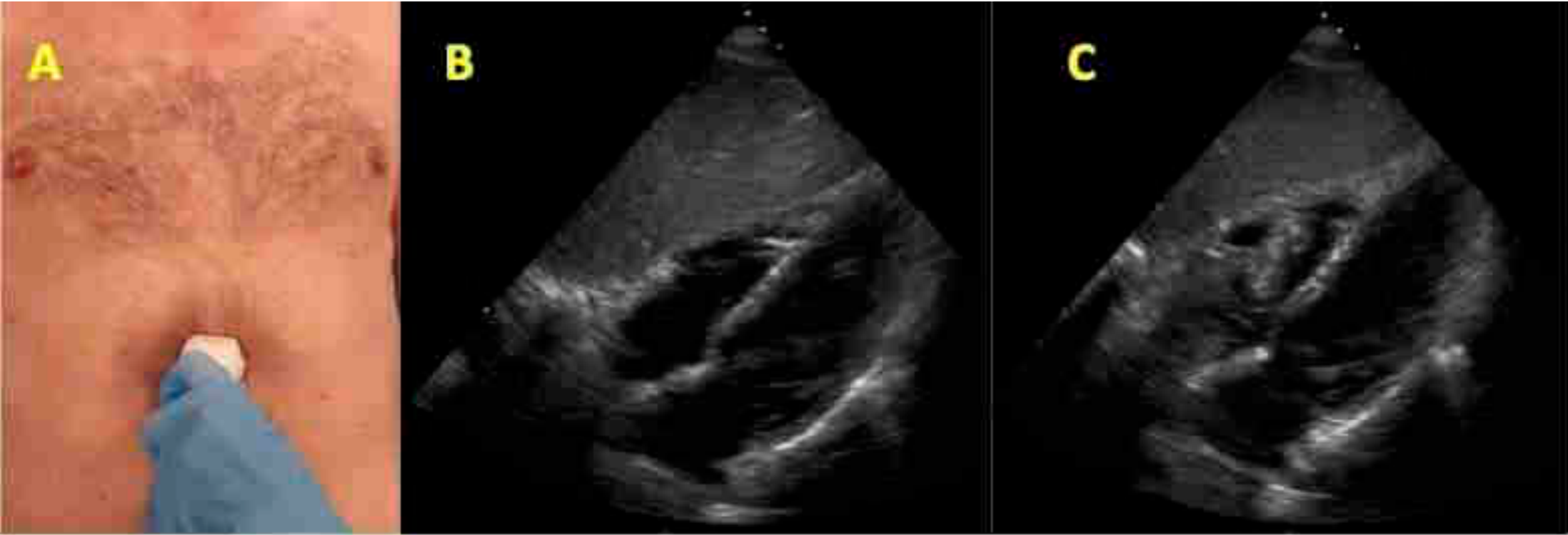
ECHOTIP

'bubble test'

La localización de la punta se consigue visualizando la aurícula derecha (a través de varias ventanas acústicas).

Al inyectar rápidamente solución salina en el catéter, si aparecen **burbujas en la aurícula derecha** inmediatamente o en un segundo, la punta del catéter está bien posicionada.

('bubble test')



'Bubble test'

ventana acústica subcostal (cuatro cámaras)

Navegación de la punta y localización de la punta en pacientes adultos



'Bubble test'

ventana acústica subcostal (bi-cava)

Navegación de la punta y localización de la punta en pacientes adultos



'Bubble test'

ventana acústica apical (cuatro cámaras)

Navegación de la punta y localización de la punta en pacientes adultos

Ultrasonido y
accesos
venosos
centrales

7) Diagnóstico de la trombosis venosa y de la vaina fibroblástica

2020

EJA

Eur J Anaesthesiol 2020; **37**:344–376

GUIDELINES

European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Massimo Lamperti, Daniele Guerino Biasucci, Nicola Disma, Mauro Pittiruti, Christian Breschan, Davide Vailati, Matteo Subert, Vilma Traškaitė, Andrius Macas, Jean-Pierre Estebe, Regis Fuzier, Emmanuel Boselli and Philip Hopkins

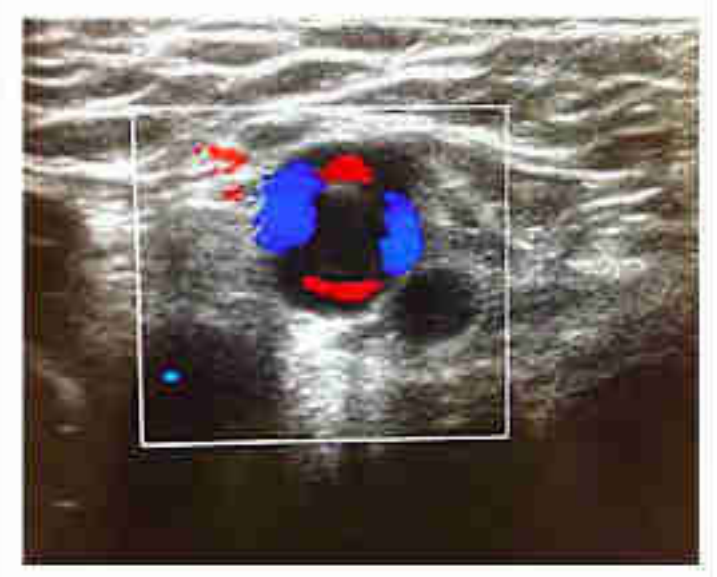
We recommend ultrasound for diagnosis and follow-up of catheter-related thrombosis (1C).

The fibroblastic sleeve, the neglected complication of venous access devices: A narrative review

The Journal of Vascular Access
1-13
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DOI: 10.1177/1129729820951035
jurnal.sagepub.com/home/jva
SAGE

2020

Giovanna Passaro , Mauro Pittiruti  and Antonio La Greca



Es importante distinguir la trombosis venosa de la vaina fibroblástica mediante ecografía.

Table 3. Main differences between catheter-related thrombosis (CRT) and fibroblastic sleeve (FS).

	CRT	FS
Etiopathogenesis	Endothelial damage	Foreign body reaction
Molecular trigger	Tissue thromboplastin	Fibronectin
Type of tissue	Thrombus	Connective tissue
Location	At the site of vein wall damage	Around the catheter
Evolution	Fibrosis/reabsorption	Reabsorption (?)
US imaging	Mass obstructing the vein Anechoic, and then hypo-echoic Mainly attached to the vein wall	Sleeve all around the catheter Hypo- or hyper-echoic Mainly attached to the catheter
Clinical manifestation	Signs and symptoms of venous obstruction + risk of catheter malfunction	Catheter malfunction
Risk of pulmonary embolism	Yes	No
Need for VAD removal	Rare (not responsive to therapy)	Rare (irreversible catheter malfunction)
Preventable with anticoagulants	Yes (not consistently)	No
Sensitive to thrombolysis	Yes (in the initial phase)	No
Pharmacological management	LMW heparin	None

VAD: venous access devices; US: ultrasound; LMW: low-molecular-weight.

Ultrasonido y
accesos
venosos
centrales

8) Diagnóstico de las malposiciones secundarias

2021

An ultrasound-based technique in the management of totally implantable venous access devices with persistent withdrawal occlusion

Sonia D'Arrigo¹, Maria Giuseppina Annetta¹
and Mauro Pittiruti²

Utilizar la prueba de la burbuja ('bubble test') también para excluir malposiciones secundarias

The Journal of Vascular Access
1-3
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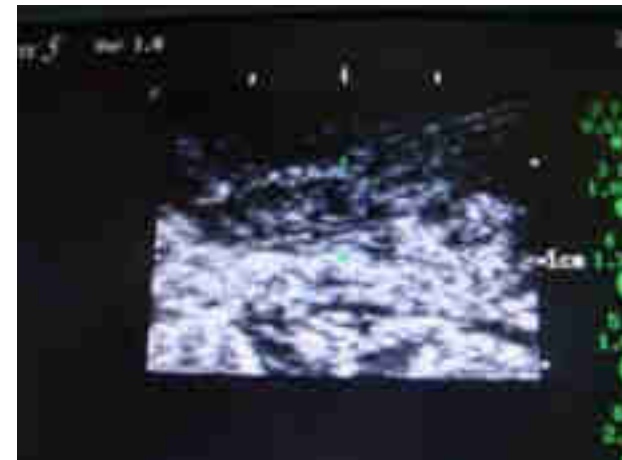
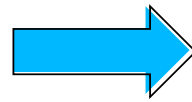


Ultrasonido y
accesos
venosos
centrales

9) Tratamiento de la extravasación



Aspiración guiada por
ultrasonidos de la
solución extravasada



Conclusión

Ultrasonido

Herramienta indispensable para cualquier clínico que se ocupe de los accesos venosos

Debemos tenerla a mano todos los días:

sondas inalámbricas portátiles

2020

Sondas inalámbricas
portátiles: ideales en el
paciente COVID

Pittiruti and Pinelli *Critical Care* (2020) 24:269
<https://doi.org/10.1186/s13054-020-02997-1>

Critical Care

COMMENTARY

Open Access

Recommendations for the use of vascular access in the COVID-19 patients: an Italian perspective



Mauro Pittiruti^{1*} , Fulvio Pinelli² on behalf of the GAVeCeLT Working Group for Vascular Access in COVID-19

Recommendations on the appropriate choice of insertion technique:

- Use ultrasound guidance for the insertion of any central venous access or midline catheter or peripheral arterial catheter [10–13].
- Prefer wireless ultrasound probes, as they allow maximal cleaning of the probe between patients and minimal risk of contamination. In the unavailability of wireless ultrasound probes, the best strategy is to dedicate an ultrasound device exclusively to maneuver on COVID-19 patients.

2020

Sondas inalámbricas
portátiles: ideales en el
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Critical Care

COMMENTARY

Open Access

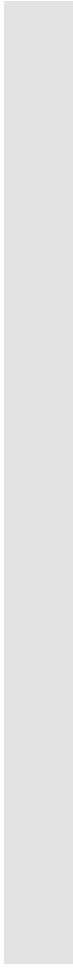


Recommendations for the use of vascular access in the COVID-19 patients: an Italian perspective

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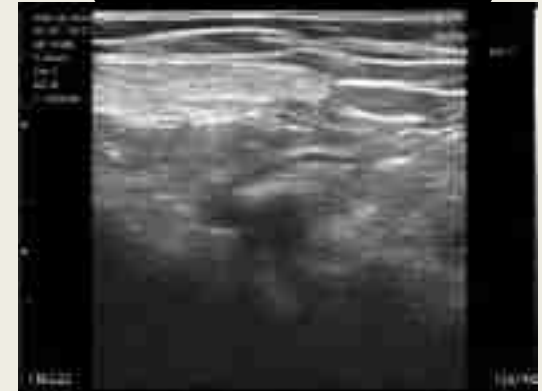


**Sondas inalámbricas portátiles
con tres transductores:
un instrumento para cada
necesidad**

Una sonda inalámbrica para todos los usos

**ONE WIRELESS PROBE
FOR ALL USES**

LINEAR PROBE



CONVEX PROBE



SECTOR PROBE





1



2



3



4

SONDA LINEAL

UNA Sonda INALÁMBRICA PARA CADA USO:

- 1) Venopunción de PICC**
- 2) Venopunción de CICC**
- 3) Diagnóstico de neumotórax (examen pleural)**
- 4) Navegación de punta (examen supraclavicular)**
- 5) Ubicación de la punta (examen subcostal)**
- 6) Ubicación de la punta (examen apical)**

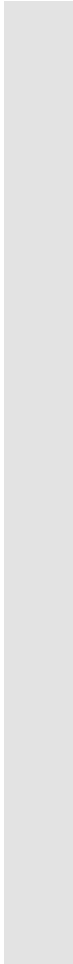


5



6

SONDA CONVEXA o SECTORIAL



Mensajes finales:

- 1) Recuerde que la ecografía no sólo se utiliza para la venopunción, sino también para muchas otras maniobras que forman parte del procedimiento de inserción.
- 2) Hoy en día, es impensable ocuparse de los accesos venosos sin dominar la ecografía.

2021

Infusion Therapy Standards of Practice

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4th Edition
Revised 2021

INS

Infusion Nurses Society
One Corporate Drive, Norwood, NJ 07068
www.ins-nurses.org

Assess and document clinician competency in the use of vascular visualization technology for insertion of VADs. This knowledge includes, but is not limited to, assessment of vessels, size, depth, location, potential complications, and adherence to and awareness of Aseptic Non Touch Technique (ANTT). See Standard 5, *Competency and Competency Assessment*; Standard 18, *Aseptic Non Touch Technique*.⁴⁵ (V)

Evaluar y documentar la eficiencia de cada operador en el uso de la tecnología de visualización vascular para la inserción de dispositivos de acceso venoso.

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Area Video



RaFeVA in neonato



RaCeVA in neonato



Posizionamento ECC in TIN



Posizionamento CVO in TIN



Posizionamento PICC-port Dignity con ecografo wireless ed ECG wireless



Posizionamento di ProPICC tunnelizzato con ecografo wireless ed ECG wireless

GRACIAS



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