ULTRASOUND GUIDED CENTRAL CATHETERS (CICCS AND FICCS) IN NEONATES

GIOVANNI BARONE

INFERMI HOSPITAL RIMINI

Ultrasound guided central catheters (CICCs and FICCs) in neonates

- I have no conflict of interest in relation to this presentation

ULTRASOUND GUIDED CENTRAL CATHETERS (CICCS AND FICCS) IN NEONATES

- Many studies (mostly Europeas), with a lot of variability
  - Type of catheter (silicon vs. polyurethane vs. power injectable polyurethane)
  - Aseptic technique (type of antiseptic; MBP vs. no MBP; etc.)
  - Site of venipuncture (brachiocephalic vs. internal jugular vs. subclavian etc.)
  - Tip location (IC-ECG vs. ECHOTIP vs. X-ray)
  - Choice of the exit site (tunnel vs. no tunnel)
  - Securement (sutures vs. sutureless device vs. subcutaneous anchorage)
  - Protection of the exit site (glue vs. no glue)

Supraclavicular Approach to Ultrasound-Guided Brachiocephalic Vein Cannulation in Children and Neonates

Zied Merchaoui[1†], Ulrik Lausten-Thomsen[1,2†], Florence Pierre[1], Maher Ben Laiba[1], Nolwenn Le Saché[1] and Pierre Tissieres[1,2]*

[1] Pediatric and Neonatal Intensive Care Unit, Paris South University Hospitals, Le Kremlin-Bicêtre, Assistance Publique Hôpitaux de Paris, Paris, France, [2] Institute of Integrative Biology of the Cell, CNRS, CEA, University of Paris Sud, Paris Saclay University, Gif-sur-Yvette, France

Supraclavicular Ultrasound-Guided Catheterization of the Subclavian Vein in Pediatric and Neonatal ICUs: A Feasibility Study

Anne-Sophie Guilbert, MD[1]; Lorenço Xavier, MD[1]; Clément Ammouche, MD[1]; Philippe Desprez, MD[1]; Dominique Astruc, MD[2]; Pierre Diemunsch, PhD[3]; Jocelyne Bientz, MD[1]

Pediatr Surg Int (2010) 26:815–818
DOI 10.1007/s00383-010-2616-3

ORIGINAL ARTICLE

Ultrasound-guided percutaneous insertion of 2.7 Fr tunnelled Broviac lines in neonates and small infants

G. S. Arul · H. Livingstone · P. Bromley · J. Bennett

Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

Ultrasound-guided supraclavicular cannulation of the brachiocephalic vein in infants: a retrospective analysis a case series

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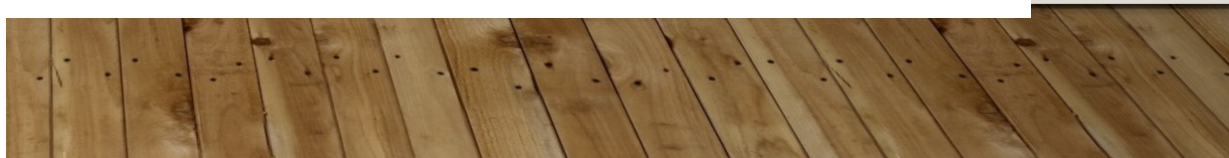
1 Department of Anaesthesia, Klinikum Klagenfurt, Klagenfurt, Austria
2 Department of Anaesthesia, Krankenhaus Spittal/Drau, Spittal/Drau, Austria
3 Department of Statistics, University of Klagenfurt, Klagenfurt, Austria
4 Department of Anatomy, Medical University of Graz, Graz, Austria

Ultrasound-Guided Subclavian Vein Cannulation in Low Birth Weight Neonates

Ulrik Lausten-Thomsen, MD, PhD[1]; Zied Merchaoui, MD[1]; Cécile Dubois, MD[1,2]; Sergio Eleni Dit Trolli, MD[1,3]; Nolwenn Le Saché, MD[1]; Mostafa Mokhtari, MD[1,4]; Pierre Tissières, MD, PhD[1–3]



CORRESPONDENCE

Retrospective evaluation of 599 brachiocephalic vein cannulations in neonates and preterm infants

Christian Breschan[1,*], Gudrun Graf[1], Christoph Arneitz[2], Haro Stettner[3], Stefan Neuwersch[1], Christian Stadik[4], Markus Koestenberger[1], Sandra Holasek[5] and Rudolf Likar[1]

[1]Department of Anaesthesia, Klinikum Klagenfurt, Klagenfurt, Austria, [2]Department of Pediatric Surgery, Klinikum Klagenfurt, Klagenfurt, Austria, [3]Department of Statistics, University of Klagenfurt, Klagenfurt, Austria, [4]Department of Neurorehabilitation, Krankenhaus Hermagor, Klagenfurt, Austria and [5]Institute of Pathophysiology, Medical University of Graz, Graz, Austria

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BJA 2022

Keywords: brachiocephalic vein; central venous catheter; intravenous cannula; neonates; preterm infants; ultrasound

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*Corresponding author. E-mail: christian.breschan@kabeg.at

Keywords: brachiocephalic vein; central venous catheter; intravenous cannula; neonates; preterm infants; ultrasound

- Success 97.8%
- Arterial puncture 0.5%
- No pneumothorax

(no insertion bundle)

ULTRASOUND GUIDED CENTRAL CATHETERS (CICCS AND FICCS) IN NEONATES TODAY

- A well-defined, standardized *insertion bundle* (SICA-Ped)
  1. Choice of the site of venipuncture by pre-procedural US evaluation (RaCeVA/RaFeVA)
  2. Appropriate asepsis (hand hygiene + 2% CHG in 70% IPA + MBP)
  3. US-guided venipuncture + US control after venipuncture (r/o PNX; tip navigation)
  4. Intra procedural tip location (IC-ECG and/or ECHOTIP)
  5. Tunneling
  6. Securement by subcutaneous anchorage
  7. Protection of the exit site with cyanoacrylate glue and semipermeable transparent membrane


securacath
4FR


securacath
Softa

FIRST DESCRIPTION OF THE SICA-PED BUNDLE (10 YEARS AGO)

Current Drug Targets, 2012, *13*, 961-969

Ultrasound Guided Central Vascular Access in Neonates, Infants and Children

Mauro Pittiruti*

Department of Surgery, Catholic University, Largo Francesco Vito 1, 00168 Roma, Italy

2012

J Vasc Access 2013; 14 (4): 318-319
DOI: 10.5301/jva.5000158

EDITORIAL

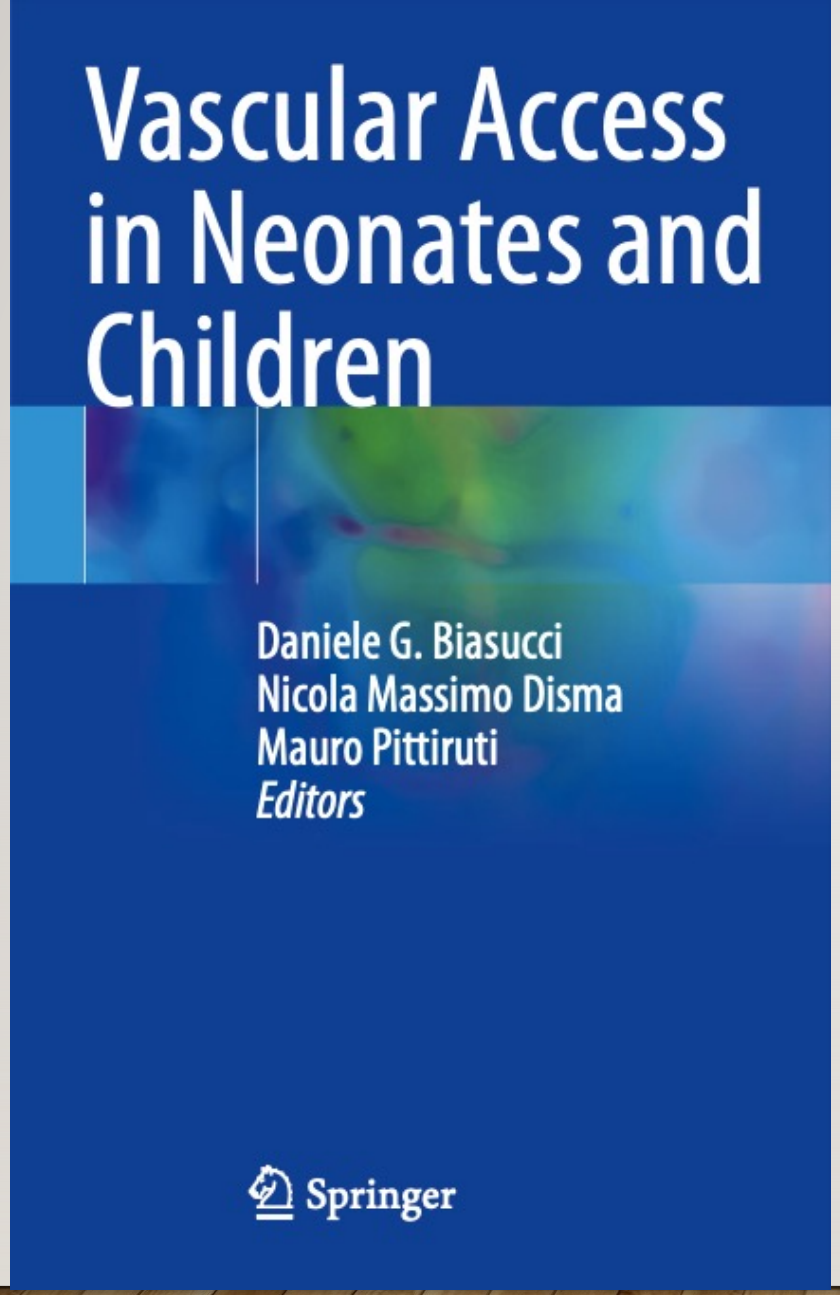
Central venous catheters in neonates: old territory, new frontiers

Invited commentary to *Peripherally inserted central venous catheters in critically ill premature neonates*, by Ozkiraz et al, J Vasc Access 2013;14(4):320-324

Mauro Pittiruti

Department of Surgery, Catholic University Hospital, Rome - Italy

2013



Chapter 12

Ultrasound Guided Venous Access in Neonates

Christian Breschan and Mauro Pittiruti

WHY DO WE NEED AN INSERTION BUNDLE?

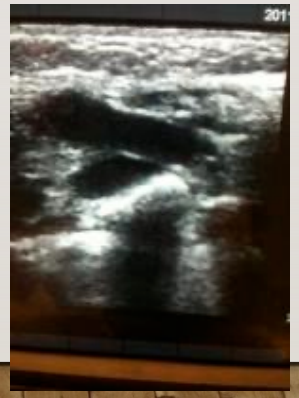
- To optimize the maneuver, assembling all the evidence-based strategies apt to minimize the risk of insertion-related complications
- To facilitate the diffusion of such strategies in all NICUs
- To standardize and facilitate the training

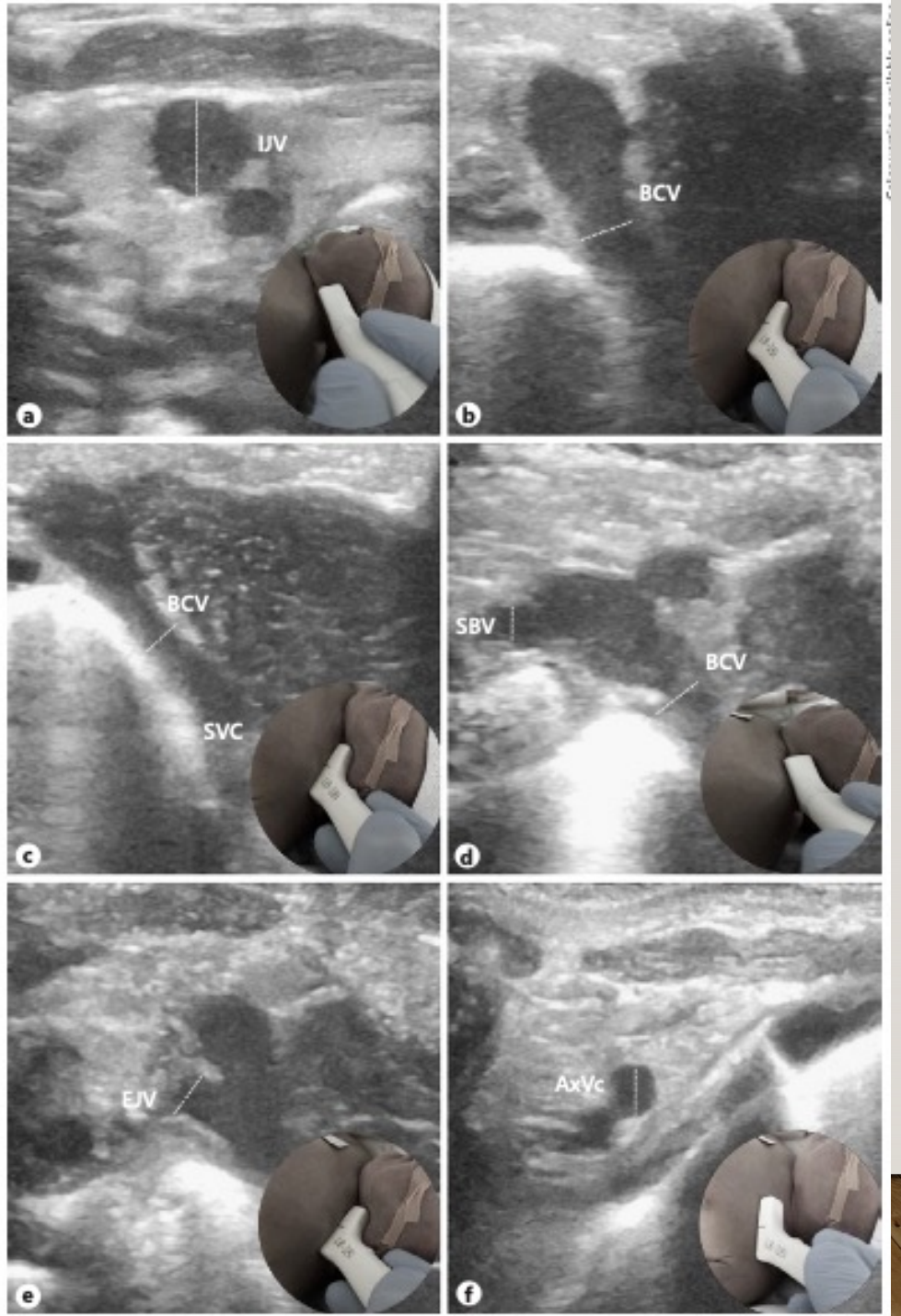
I) CHOICE OF THE SITE OF VENIPUNCTURE BY PRE-PROCEDURAL US EVALUATION (RACEVA/RAFEVA)

- The choice of the vein should not be based on the subjective preference of the operator
- **The site of venipuncture should be chosen after an US scan of the veins** of the supra/infraclavear region (RaCeVA – Rapid Central Vein Assessment) and of the inguinal-femoral region (RaFeVA – Rapid Femoral Vein Assessment)
- The easiest venipuncture = the safest venipuncture
  - As regards CICCs, the brachiocephalic vein is the easiest to puncture
  - As regards FICCs, the common femoral vein is the easiest to puncture

D4.SD1.S9	There is no ideal site for cannulation in children; the best site should be determined after ultrasound examination	A

RaCeVA – Rapid Central Vein Assessment

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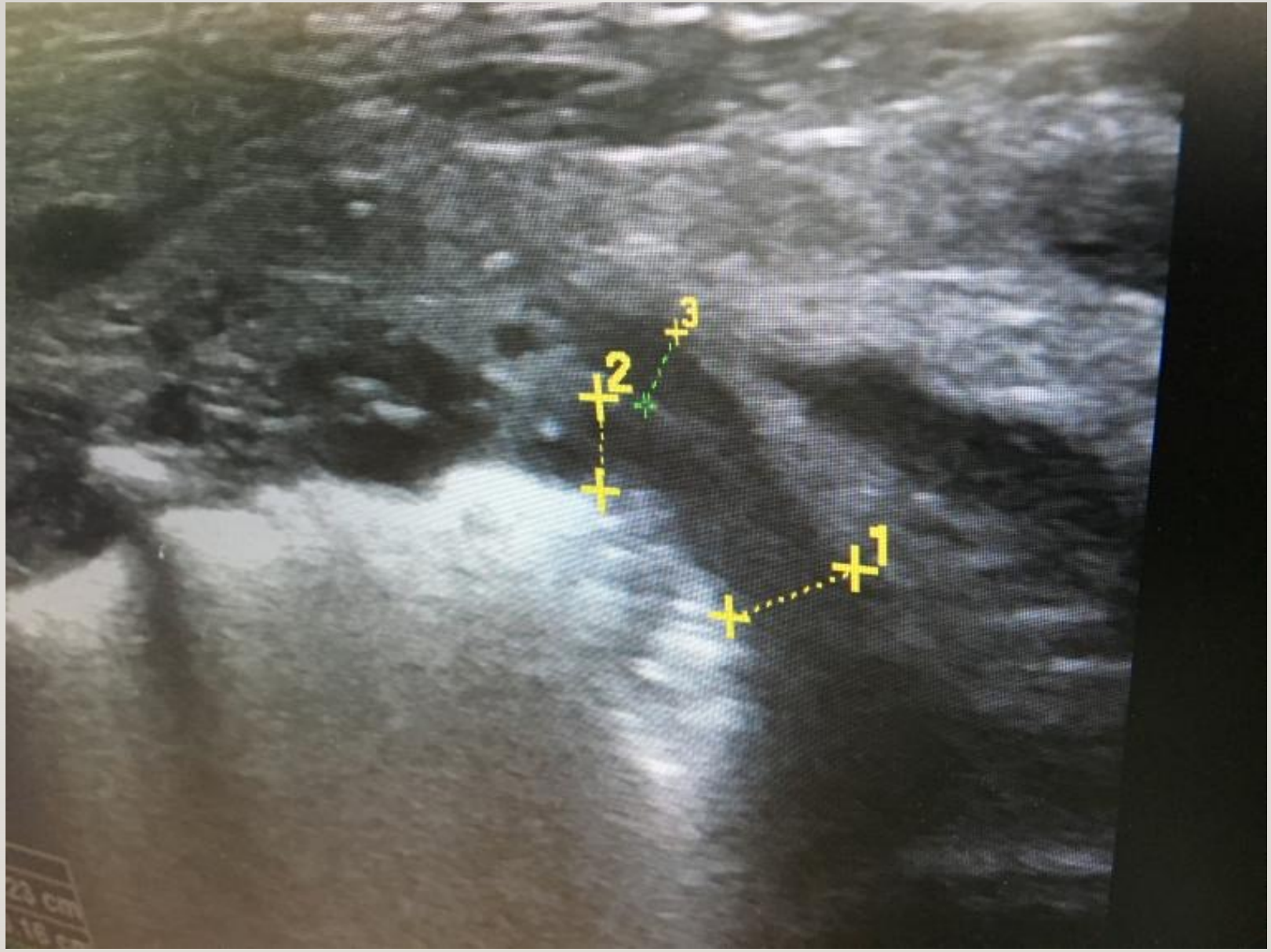
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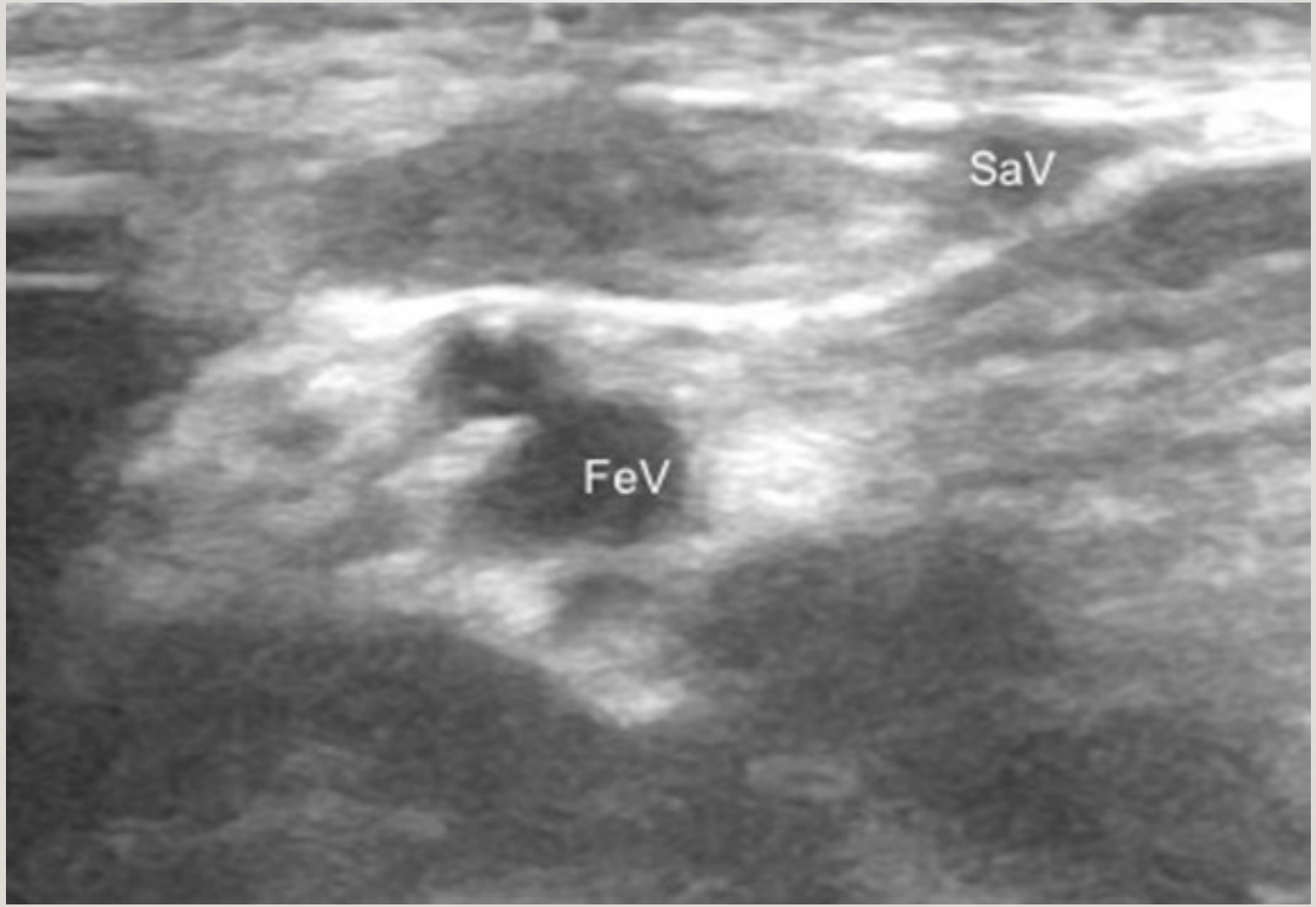
SaV
FeV

Original Paper

Neonatology

Neonatology 2019;115:335–340
DOI: 10.1159/000496848

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A Systematic Ultrasound Evaluation of the Diameter of Deep Veins in the Newborn: Results and Implications for Clinical Practice

2018

Giovanni Barone[a] Vito D'Andrea[a] Giovanni Vento[a] Mauro Pittiruti[b]

[a]Neonatal Intensive Care Unit, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy; [b]Department of Surgery, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy

Vein	Whole cohort ($n = 100$)	500–1,000 g ($n = 20$)	1,001–1,500 g ($n = 20$)	1,501–2,000 g ($n = 20$)	2,001–2,500 g ($n = 20$)	2,501–3,000 g ($n = 20$)	ICC
R IJV	3.1±0.8 (1.8–6.0)	2.4±0.5 (1.8–3.1)	2.8±0.5 (2.0–3.3)	3.0±0.6 (2.1–4.2)	3.2±0.3 (2.8–3.6)	4.2±0.7 (3.2–6.0)	0.85
L IJV	3.2±0.8 (1.9–7.0)	2.5±0.4 (1.9–3.1)	2.7±0.5 (2.0–3.4)	3.2±0.6 (2.2–4.4)	3.2±0.2 (2.8–3.6)	4.4±0.9 (3.3–7.0)	0.87
R BCV	3.6±0.6 (2.6–5.7)	3.0±0.3 (2.6–3.6)	3.3±0.3 (2.7–3.7)	3.4±0.3 (2.7–3.6)	3.8±0.4 (3.1–4.2)	4.5±0.6 (3.7–5.7)	0.96
L BCV	3.5±0.8 (2.0–7.5)	3.0±0.3 (2.2–3.3)	2.9±0.4 (2.0–3.6)	3.4±0.5 (2.4–4.2)	3.5±0.3 (2.9–4.1)	4.6±0.9 (3.5–6.5)	0.97
R SBV	1.8±0.6 (0.8–3.0)	1.1±0.3 (0.8–1.7)	1.5±0.3 (1.2–2.2)	1.8±0.3 (1.3–2.3)	2.0±0.3 (1.5–2.4)	2.5±0.4 (2.0–3.0)	0.91
L SBV	1.8±0.6 (0.8–3.2)	1.1±0.3 (0.8–1.6)	1.4±0.3 (0.8–1.7)	1.8±0.3 (1.3–2.2)	2.0±0.3 (1.5–2.3)	2.5±0.3 (1.9–3.2)	0.92
R EJV	1.3±0.3 (0.8–2.2)	1.0±0.2 (0.8–1.3)	1.3±0.2 (0.9–1.5)	1.2±0.2 (0.9–1.5)	1.3±0.2 (1.0–1.5)	1.7±0.3 (1.1–2.2)	0.89
L EJV	1.4±0.4 (0.6–2.4)	0.9±0.2 (0.6–1.2)	1.2±0.3 (0.8–1.5)	1.4±0.2 (1.1–1.7)	1.5±0.2 (1.2–1.7)	1.8±0.2 (1.5–2.4)	0.90
R AxVc	1.9±0.5 (1.2–3.5)	1.5±0.1 (1.2–2.0)	1.7±0.4 (1.3–2.3)	1.8±0.3 (1.3–2.2)	2.0±0.3 (1.5–2.3)	2.5±0.5 (1.9–3.5)	0.91
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R BrV	1.0±0.3 (0.5–2.1)	0.9±0.2 (0.7–1.2)	0.8±0.2 (0.5–1.0)	0.8±0.2 (0.6–1.1)	1.1±0.1 (0.9–1.3)	1.5±0.2 (1.2–2.1)	0.89
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R FeV	2.3±0.7 (1.1–3.5)	1.4±0.2 (1.1–1.8)	2.1±0.4 (1.3–2.7)	2.2±0.3 (1.8–2.6)	2.8±0.4 (2.1–3.4)	3.2±0.2 (2.9–3.5)	0.89
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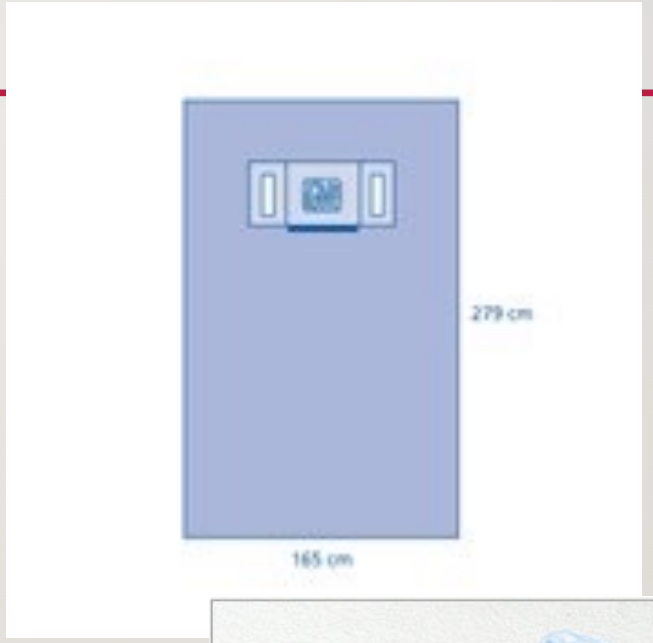
2) APPROPRIATE ASEPSIS (HAND HYGIENE + 2% CHG IN 70% IPA + MBP)

1. **Hand hygiene**
2. **Skin antisepsis with 2% chlorhexidine in 70% IPA**

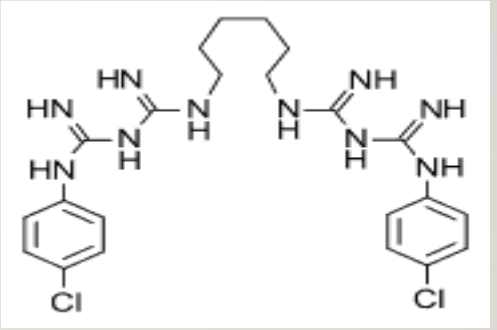
   Using one-dose disposable applicators with known quantity of antiseptic
3. **Maximal barrier precautions (berret, mask, sterile gloves, sterile gown, wide sterile field, proper sterile cover of the US probe)**

HAND HYGIENE

MBP



2% CHG IN 70% IPA

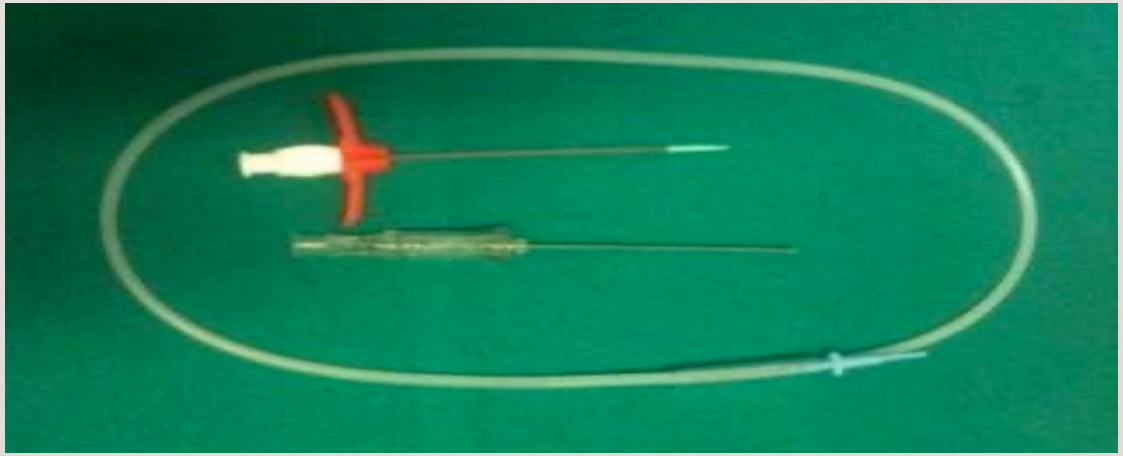


3) US-GUIDED VENIPUNCTURE + US CONTROL AFTER VENIPUNCTURE (R/O PNX + TIP NAVIGATION)

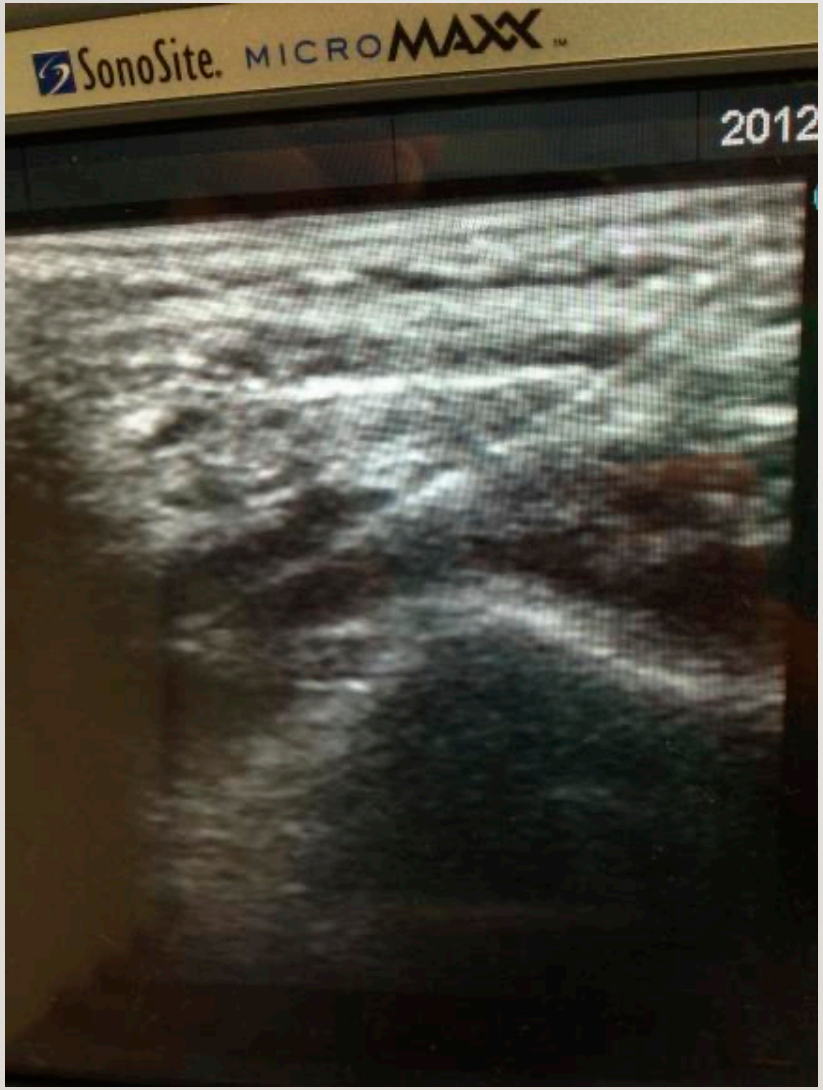
- US-guided venipuncture adopting micro-introducer kits (21G needle + 0.018" nitinol floppy straight tip guidewire ì micro-introducer-dilator)
- For CICCs, always use an in-plane approach
- After the venipuncture, with the same linear probe:
  - Check the persistence of the pleural sliding (= no PNX)
  - Check the correct direction of the guidewire (tip navigation)

Kits for micro-introduction :

- 21 G echogenic needles
- soft straight tip 0.018’’ guide-wire
- 3,5 or 4,5 Fr micro-introducer-dilator



Needle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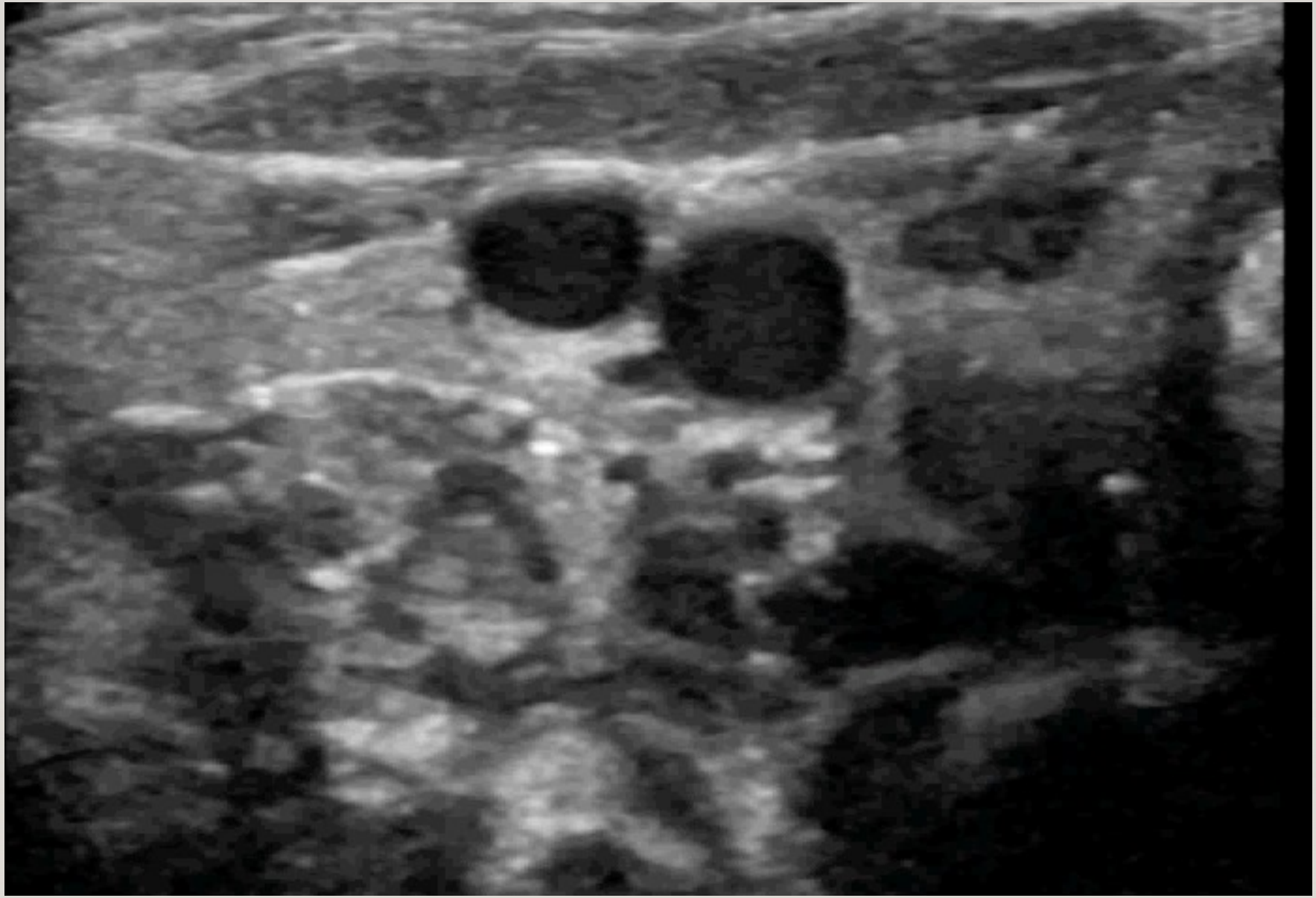
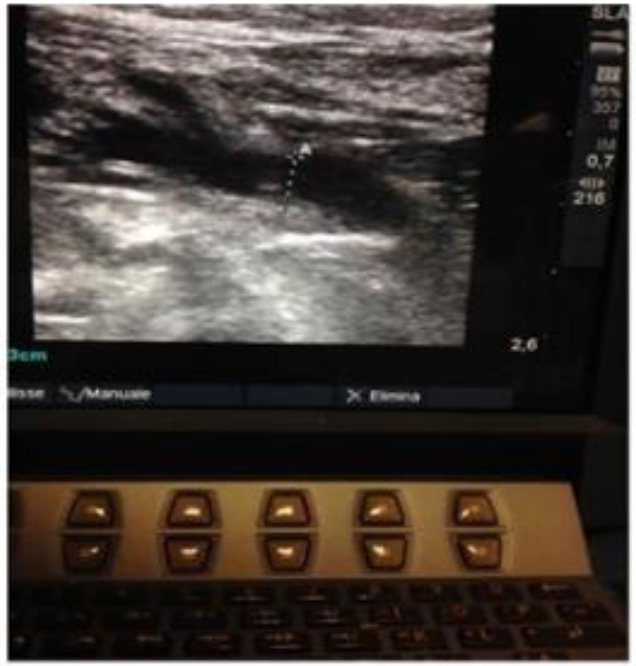
2012

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Manuale
Elimina


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2013Nov09
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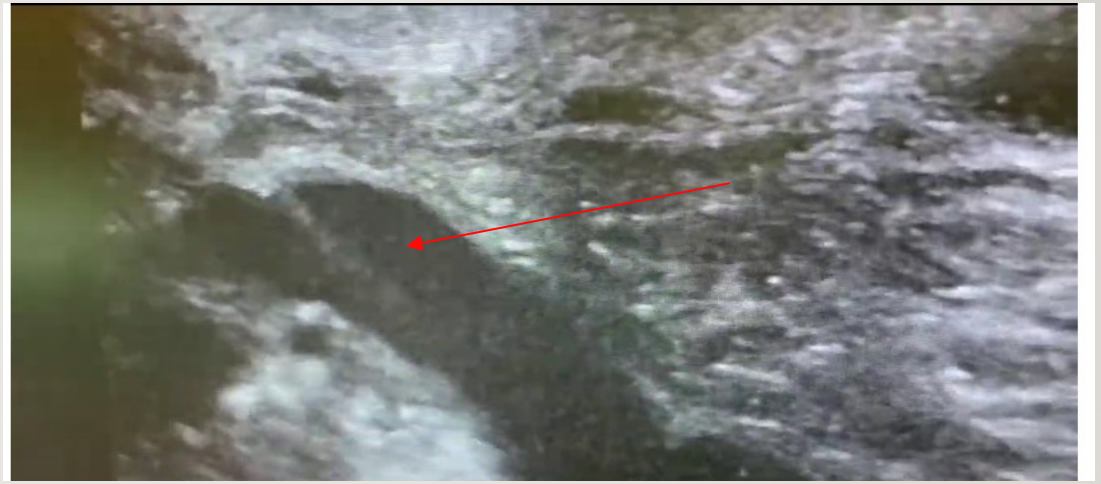
Tip navigation

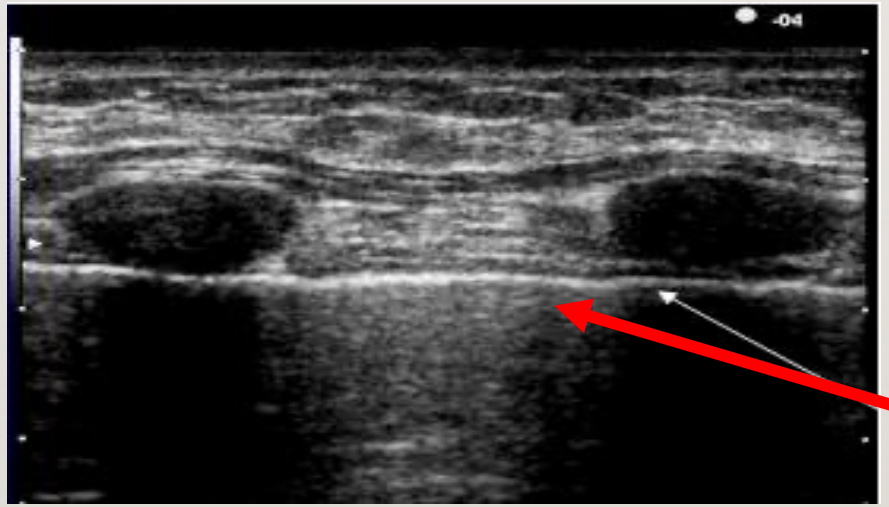
Ultrasound is constantly used to assess the direction of the guidewire, soon after its insertion in the needle

Wrong direction !

Tip navigation 2



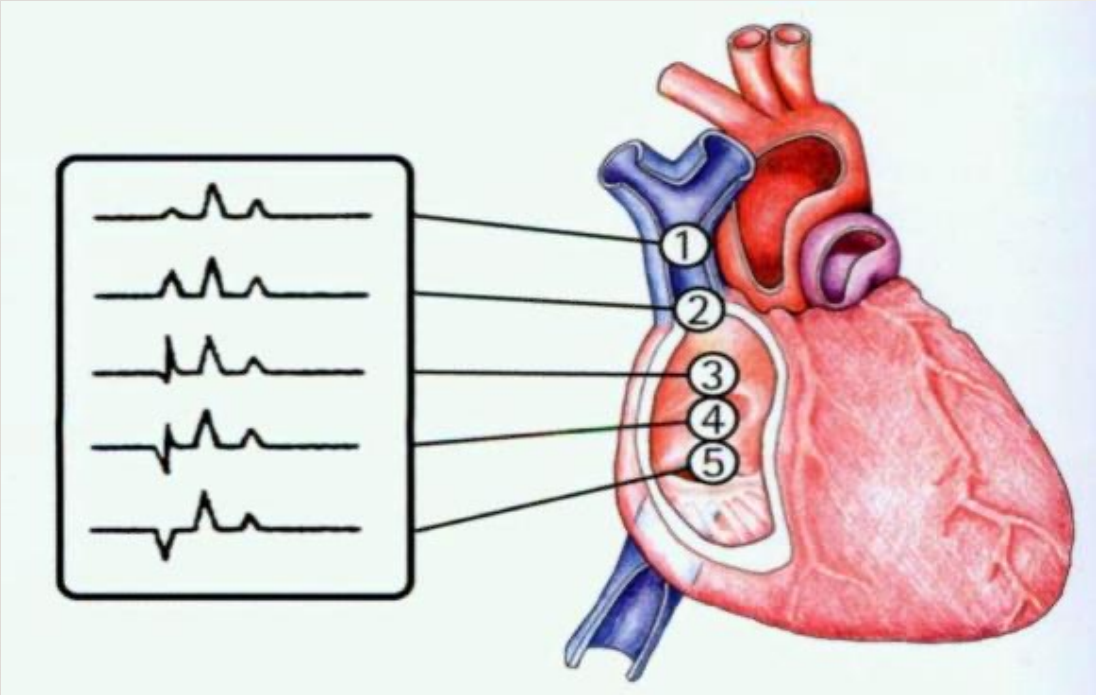
After the puncture, the possible presence of pneumothorax or other pleura-pulmonary damage is excluded by ultrasound scan of the intercostal spaces.



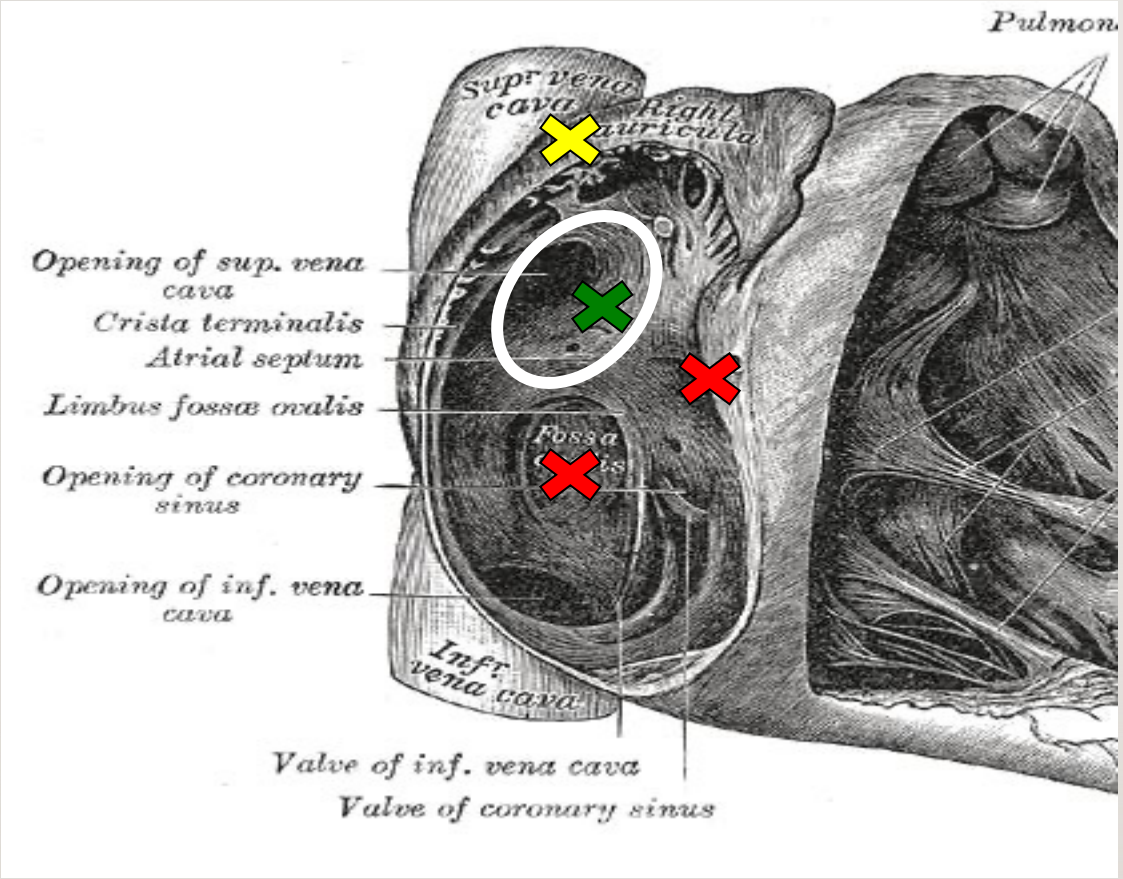
4) INTRA PROCEDURAL TIP LOCATION (IC-ECG AND/OR ECHOTIP)

- Current guidelines (ESA 2020, INS 2024) recommend that **tip location must be intra-procedural**
- The most accurate, simplest, safest, and cheapest intraprocedural methods of tip location are **intracavitary ECG and ECHOTIP:** both have 100% applicability and 100% feasibility for CICCs/FICCs in the neonate
  - The antiquate strategy of 'blind' placement of the central line with post-procedural tip location by x-ray is currently considered senseless.
  - After intra-procedural tip location by IC-ECG and/or ECHOTIP, post-procedural x-ray is currently considered senseless.

IC-ECG METHOD



- Intracavitary ECG (lead II)
- The intracavitary electrode is the tip of the catheter
- Based on changes of P wave during the progression of the catheter into the central veins
- CAVO-ATRIAL JUNCTION: maximal peak of the P wave (Stas, Yeon, Schummer, Pittiruti/La Greca, etc,) (= CRISTA TERMINALIS)



P increasing

Maximal P

P decreasing and/or diphasic

JVA | The Journal of Vascular Access

Editorial

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

Giovanni Barone[1], Mauro Pittiruti[2], Daniele G Biasucci[3], Daniele Elisei[4], Emanuele Iacobone[4], Antonio La Greca[2], Geremia Zito Marinosci[5] and Vito D'Andrea[6]

2021

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

2021

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

2021


6.0cm
2D
67%
C 50
P Off
AGen
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X2
5
4
3
2
1
G
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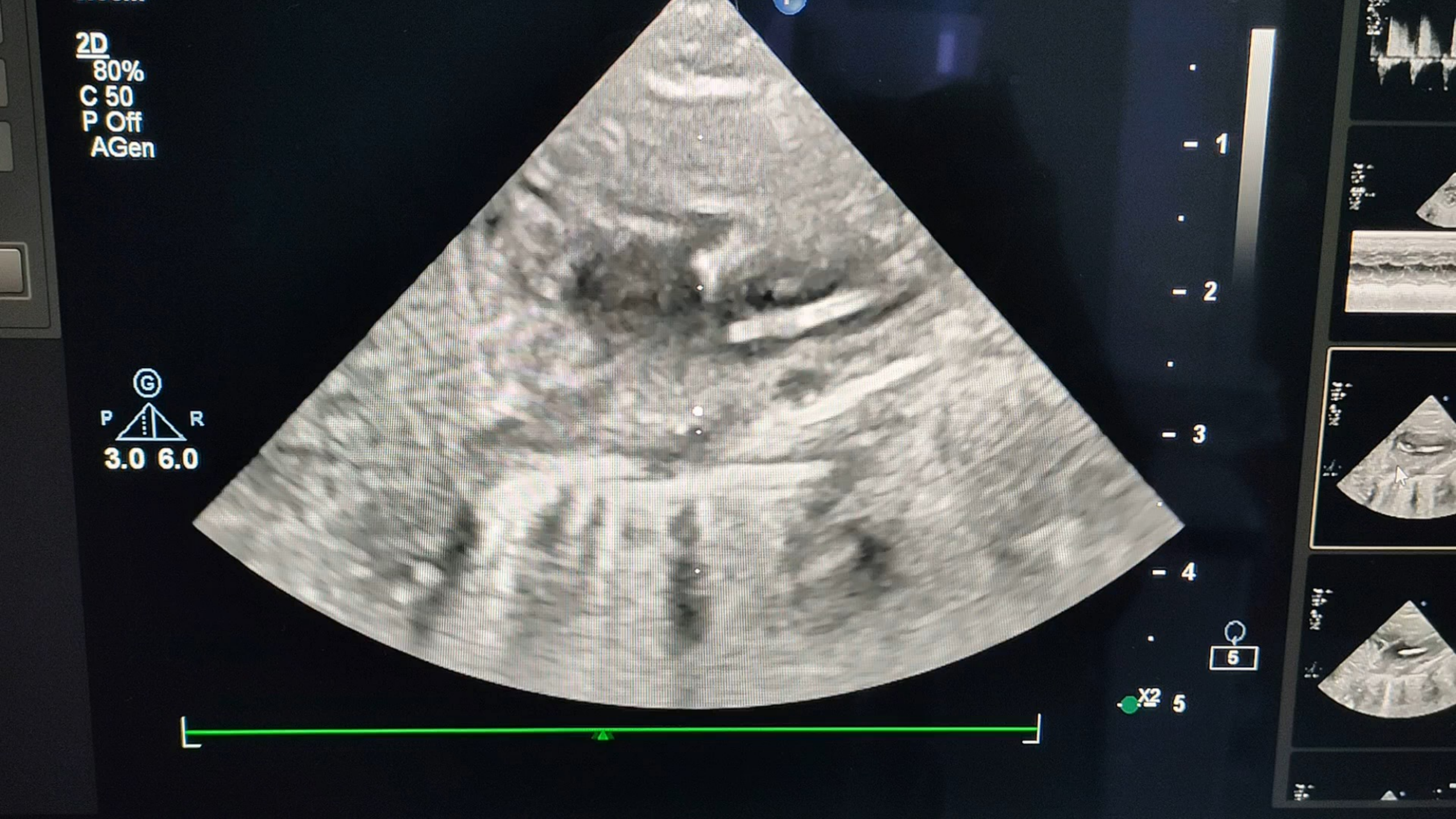
3.0 6.0
15


2D
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X2 5


Precision+

JVA The Journal of Vascular Access

Original research article

The intracavitary ECG method for tip location of ultrasound-guided centrally inserted central catheter in neonates

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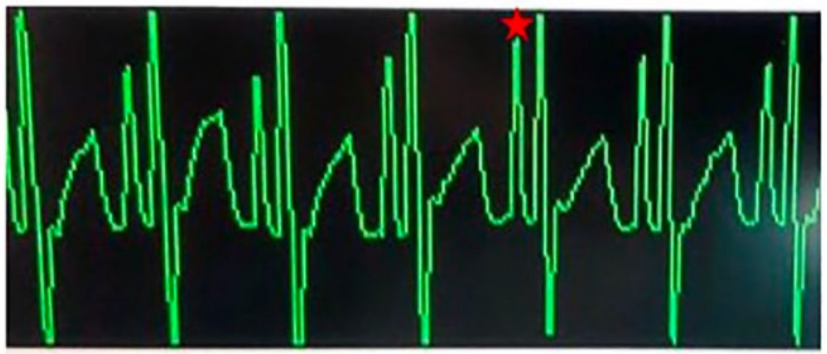
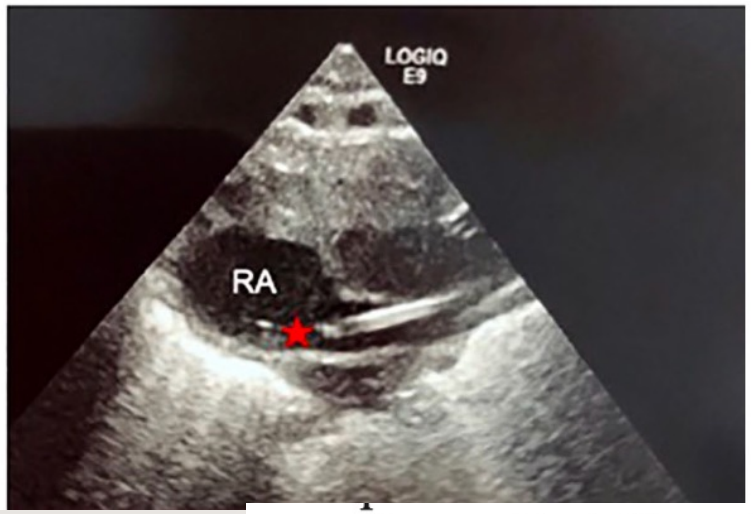
Vito D'Andrea[1], Lucilla Pezza[1], Giorgia Prontera[1], Gina Ancora[2], Mauro Pittiruti[3], Giovanni Vento[1] and Giovanni Barone[2]

2022





The applicability of IC-ECG was 100%, since a P wave was evident on the surface ECG of all neonates recruited for the study.

The feasibility of IC-ECG was also 100%, since a peak of the P wave was identified during all procedures.

The match between IC-ECG based tip location and ultrasound-based tip location was optimal, since all catheters were properly located at the CAJ as judged by ultrasound. All catheter tips were identified at ultrasound tip location, using one or more of the windows as described above.

Review

JVA The Journal of Vascular Access

A narrative review on tip navigation and tip location of central venous access devices in the neonate: Intracavitary ECG or real time ultrasound?

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Miria Natile[1], Gina Ancora[1], Vito D'Andrea[2], Mauro Pittiruti[3] and Giovanni Barone[1]

Table 1. Tip location by intracavitary ECG.

Vascular Access Device	Applicability	Feasibility	Accuracy
UVC	Applicable, but not recommended	Yes	Low
ECC – upper limbs	Applicable, but not recommended	Not always feasible	High
ECC – lower limbs	Not always applicable	Not always feasible	Low
CICC	Applicable and highly recommended	Yes	High
FICC	Not always applicable	Not always feasible	Low

IC-ECG = never applicable for tip navigation.

Table 2. Tip location by real time ultrasound.

Vascular Access Device	Applicability	Feasibility	Accuracy
UVC	Applicable, highly recommended	Yes	High
ECC – upper limbs	Applicable, recommended	Yes	High
ECC – lower limbs	Applicable, recommended	Yes	High
CICC	Applicable	Yes	High
FICC	Applicable, recommended	Yes	High

5) TUNNELING

- Tunneling (a) minimizes bacterial contamination via the extra-luminal route, (b) allows to choose an exit site in an 'ideal' location
- **Tunneling CICCs/FICCs in the neonate is easy, rapid and safe**
  - The catheters must be inserted using the modified Seldinger technique.
  - As regards CICCs, the catheter is usually tunneled to the infraclavicular area (but other tunneling - chest-to-arm or chest-to-back – are possible).
  - As regards FICCs, the catheter is usually tunneled to mid-thigh.


CVP

Rapid Assessment of Vascular Exit Site and Tunneling Options (RAVESTO): A new decision tool in the management of the complex vascular access patients

Matthew D Ostroff[1], Nancy Moureau[2] and Mauro Pittiruti[3]

CICC (supraclavicular puncture)	Tunnel to infraclavicular area	Long term intravenous treatment in non-hospitalized patients (antibiotics, parenteral nutrition, chemotherapy); expected difficulties in management of the exit site in hospitalized patients (beard, humidity, tracheostomy, instability, etc.)
	Tunnel to arm	Compromised skin integrity of the chest area; oral or endotracheal secretions over chest; implanted device on ipsilateral chest; chest surgery; contracted shoulder; etc.
	Tunnel to back	Cognitive disorder resulting in device removal; contraindication to chest or arm exit site

6) SECUREMENT BY SUBCUTANEOUS ANCHORAGE

- Subcutaneous anchorage (Securacath) is the most reliable securement, and it can be adopted for all neonatal CICCs/FICCs of 3-4-5Fr.
- **Subcutaneous anchorage – if appropriately placed – nullifies the risk of dislodgment**

BJN 2019

Clinical experience of a subcutaneously anchored sutureless system for securing central venous catheters

Mauro Pittiruti, Giancarlo Scoppettuolo, Laura Dolcetti, Davide Celentano, Alessandro Emoli, Bruno Marche and Andrea Musarò

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
https://doi.org/10.1080/14767058.2021.1922377

2021

Taylor & Francis
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SHORT REPORT

Securement of central venous catheters by subcutaneously anchored suturless devices in neonates

Vito D'Andrea[a], Giovanni Barone[b], Lucilla Pezza[a], Giorgia Prontera[a], Giovanni Vento[a] and Mauro Pittiruti[c]

[a]Department of Woman and Child Health and Public Health, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Roma, Italy; [b]Neonatal Intensive Care Unit, Azienda Sanitaria Romagna, Infermi Hospital Rimini, Rimini, Italy; [c]Department of Surgery, Fondazione Policlinico Universitario "Agostino Gemelli" IRCCS - Università Cattolica del Sacro Cuore, Rome, Italy


POLYTEX
SecurAcath
3F
HOLD
LIFT
Health Line Intl. Corp

7) PROTECTION OF THE EXIT SITE WITH CYANOACRYLATE GLUE AND SEMIPERMEABLE TRANSPARENT MEMBRANE

Protection implies two strategies

- **CYANOACRYLATE GLUE**

  – butyl-cyanoacrylate or octyl-butyl-cyanoacrylate

  - minimal quantities should be used (0.15-0.25 ml)

  - the glue seals the exit site but also the puncture site

- **SEMIPERMEABLE TRASPARENT MEMBRANES**

  - in neonates, use membraned with MVTR > 1500 g/m2/day

The antiquate strategy of covering the exit site with gauze and tape is currently regarded as unreasonable, and should be abandoned.

Ten years of clinical experience with cyanoacrylate glue for venous access in a 1300-bed university hospital

Mauro Pittiruti, Maria Giuseppina Annetta, Bruno Marche, Vito D'Andrea and Giancarlo Scoppettuolo

BJN 2022

2021

JVA The Journal of Vascular Access

Original research article

Comparing test methods for moisture-vapor transmission rate (MVTR) for vascular access transparent semipermeable dressings

The Journal of Vascular Access
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Paul Bainbridge[1], Paul Browning[2], Stéphanie F Bernatchez[3], Casey Blaser[3] and Guido Hitschmann[1]

Dressing	MVTR liquid (inverted method)	MVTR vapor (upright method)
A	4089	1682
B	845	773
C	1225	1079
D	1047	976
E	1031	936
F[b]	30,530	2838
G	5164	1644

Dressing	MVTR liquid (inverted method)	MVTR vapor (upright method)
A Tegaderm Advanced	4089	1682
B	845	773
C	1225	1079
D	1047	976
E	1031	936
F[b] IV 3000	30,530	2838
G SorbaView	5164	1644


securacath
4F
MOLD
LIFT


securacath
3F
LIFT
INDWELLABLE
19GA
3FR

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH OPTIMAL CLINICAL RESULTS

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO IMMEDIATE COMPLICATIONS**

Original research article

JVA The Journal of Vascular Access

Centrally inserted central catheters in preterm neonates with weight below 1500 g by ultrasound-guided access to the brachio-cephalic vein

The Journal of Vascular Access
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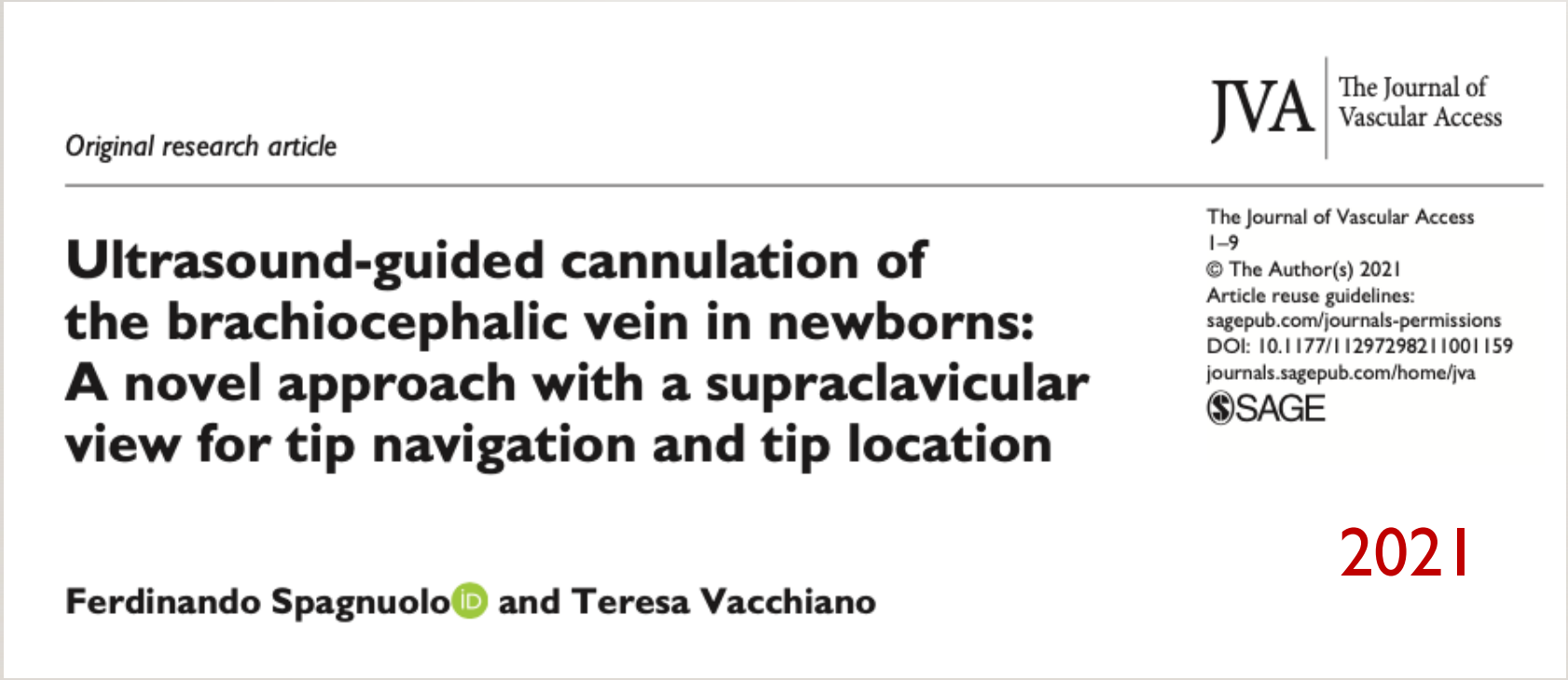
Giovanni Barone[1], Mauro Pittiruti[2], Gina Ancora[1], Giovanni Vento[3], Francesca Tota[4] and Vito D'Andrea[3]

2020

30 insertions
100% success
No arterial puncture
No pneumothorax

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO IMMEDIATE COMPLICATIONS**



Original research article

JVA The Journal of Vascular Access

Ultrasound-guided cannulation of the brachiocephalic vein in newborns: A novel approach with a supraclavicular view for tip navigation and tip location

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2021

Ferdinando Spagnuolo and Teresa Vacchiano

40 insertions
100% success
No arterial puncture
No pneumothorax

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO IMMEDIATE COMPLICATIONS**

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
https://doi.org/10.1080/14767058.2021.1922377

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SHORT REPORT

Securement of central venous catheters by subcutaneously anchored suturless devices in neonates

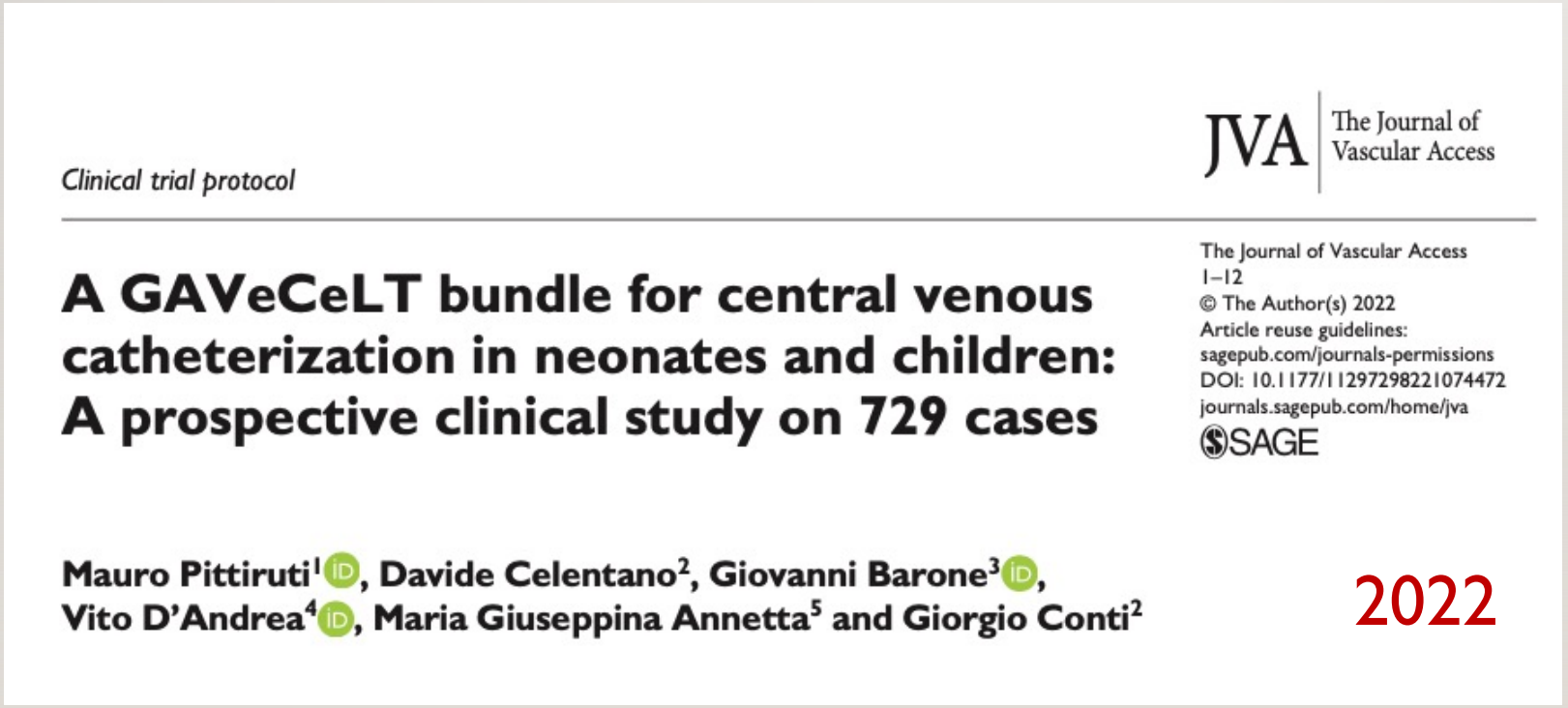
Vito D'Andrea[a], Giovanni Barone[b], Lucilla Pezza[a], Giorgia Prontera[a], Giovanni Vento[a] and Mauro Pittiruti[c]

[a]Department of Woman and Child Health and Public Health, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Roma, Italy; [b]Neonatal Intensive Care Unit, Azienda Sanitaria Romagna, Infermi Hospital Rimini, Rimini, Italy; [c]Department of Surgery, Fondazione Policlinico Universitario "Agostino Gemelli" IRCCS - Università Cattolica del Sacro Cuore, Rome, Italy

2021

72 insertions
100% success
No arterial puncture
No pneumothorax

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO IMMEDIATE COMPLICATIONS**



Clinical trial protocol

JVA The Journal of Vascular Access

A GAVeCeLT bundle for central venous catheterization in neonates and children: A prospective clinical study on 729 cases

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Mauro Pittiruti[1], Davide Celentano[2], Giovanni Barone[3], Vito D'Andrea[4], Maria Giuseppina Annetta[5] and Giorgio Conti[2]

2022

68 insertions
100% success
No arterial puncture
No pneumothorax

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO IMMEDIATE COMPLICATIONS**

Original research article

JVA The Journal of Vascular Access

The intracavitary ECG method for tip location of ultrasound-guided centrally inserted central catheter in neonates

The Journal of Vascular Access
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Vito D'Andrea[1], Lucilla Pezza[1], Giorgia Prontera[1], Gina Ancora[2], Mauro Pittiruti[3], Giovanni Vento[1] and Giovanni Barone[2]

2022

105 insertions
100% success
No arterial puncture
No pneumothorax

THE CONSISTENT APPLICATION OF THIS BUNDLE IS ASSOCIATED WITH **ZERO LATE COMPLICATIONS**

- *Follow up* at two weeks (68 neonates - Pittiruti, JVA 2022) and at three months (30 neonates - Barone, JVA 2020):

  no catheter-related bloodstream infection

  no catheter-related thrombosis

  no dislodgment

  no lumen occlusion

WHICH NEONATES SHOULD BENEFIT OF AN US-GUIDED CICC OR FICC?

- Critically ill neonates
- Neonates candidate to long term venous access (> 2 weeks)

See the recommendations of the DAV-Expert

Which neonates should benefit of an US-guided CICC or FICC?

Original research article

Centrally inserted central catheters in preterm neonates with weight below 1500 g by ultrasound-guided access to the brachio-cephalic vein

Giovanni Barone[1], Mauro Pittiruti[2], Gina Ancora[1], Giovanni Vento[3], Francesca Tota[4] and Vito D'Andrea[3]

Table 4. Differences between epicutaneo-caval catheters (ECCs) and central inserted central catheters (CICCs).

	CICC	ECC
Venipuncture	Deep veins	Superficial veins
Ultrasound guidance	Yes	No
Catheter diameter	3–4 Fr	1–2.7 Fr
Sedation required	Yes	No
Power injectability	Yes	No
Maximal flow rate	60 mL/min	1 mL/min
Infusion of blood products	Yes	No
Monitoring of central venous pressure	Yes	No
Monitoring of SvO_2	Yes	No
Blood sampling	Yes	No
Tunneling	Yes	No
Tip location by intracavitary ECG	Yes	Yes
Limited dwell time	No	Yes
Possibility of CRBSI diagnosis by DTP	Yes	No

European Journal of Pediatrics
https://doi.org/10.1007/s00431-023-04984-4

REVIEW

The neonatal DAV-expert algorithm: a GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access in newborns

Giovanni Barone[1] · Vito D'Andrea[2] · Gina Ancora[1] · Francesco Cresi[3] · Luca Maggio[4] · Antonella Capasso[5] · Rossella Mastroianni[6] · Nicola Pozzi[7] · Carmen Rodriguez-Perez[8] · Maria Grazia Romitti[9] · Francesca Tota[10] · Ferdinando Spagnuolo[11] · Francesco Raimondi[5] · Mauro Pittiruti[12]

2023

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Appropriate indications for the use of centrally inserted central catheters (CICC) and femorally inserted central catheters (FICC)

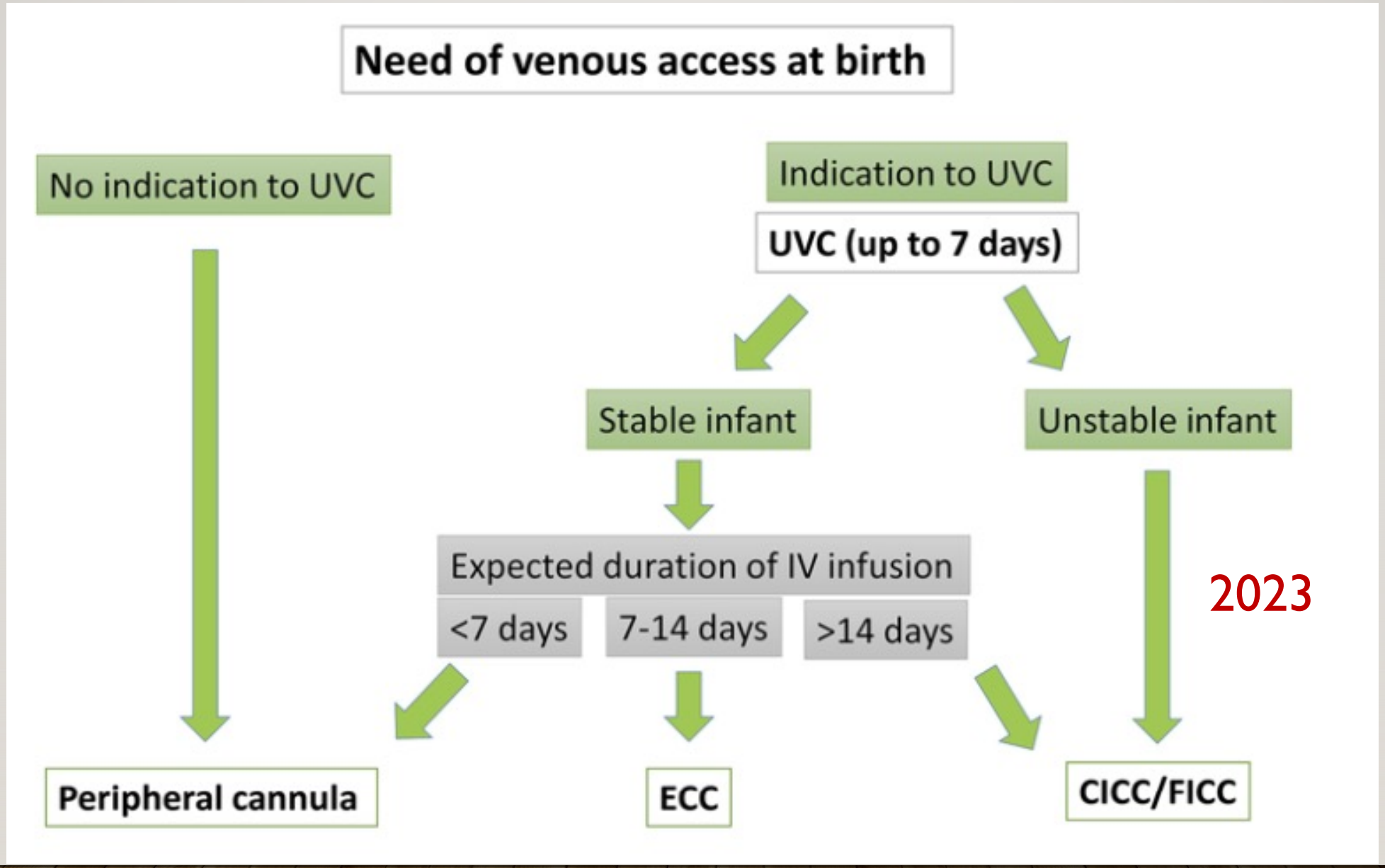
Panel recommendations.

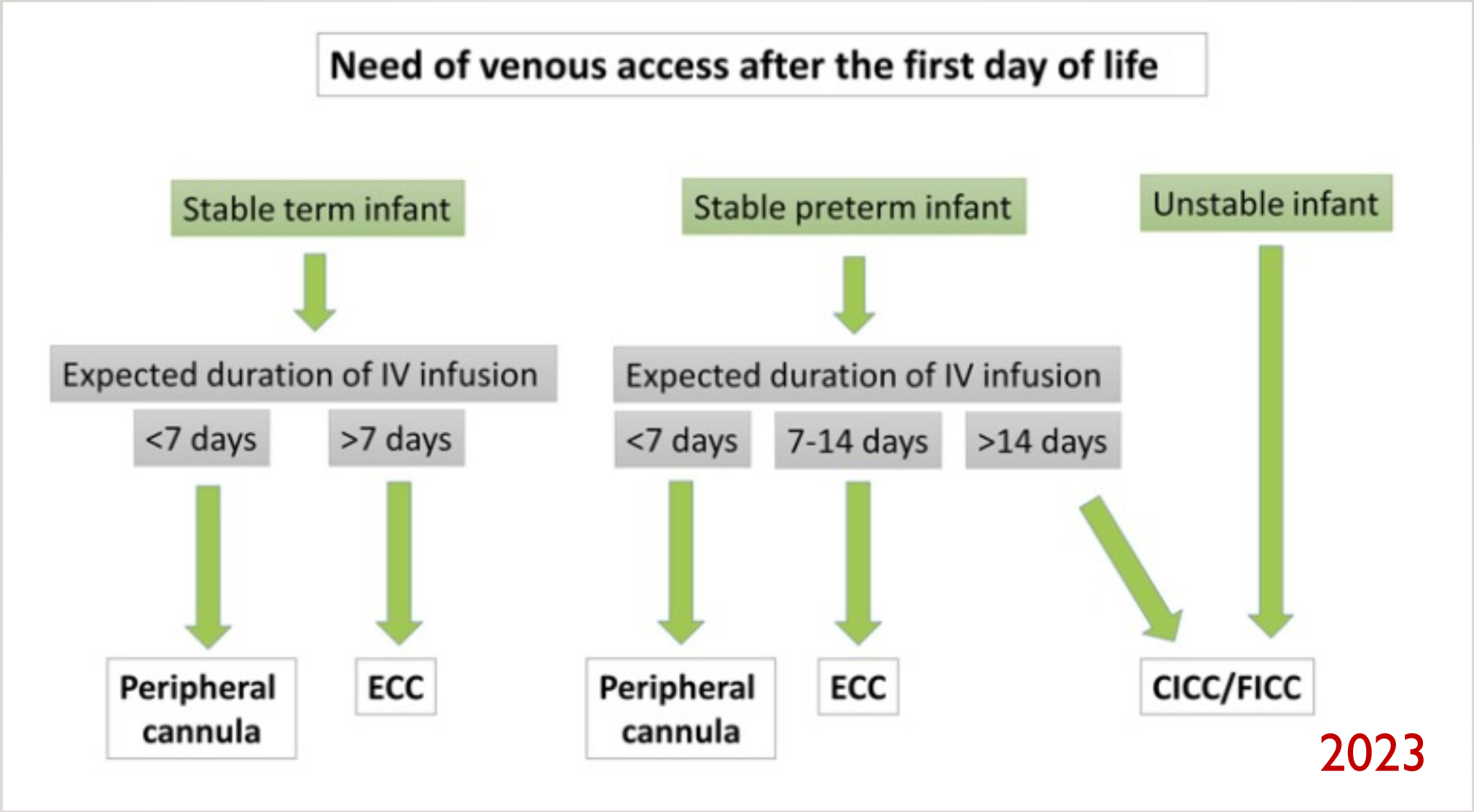
1. Indications for ultrasound-guided CICCs or FICCs include the following: (a) newborns (at any gestational age) with hemodynamic instability developed after the first 24 h of life, or even within the first 24 h of life, if UVC insertion is not feasible or if the UVC cannot be placed in a proper position; (b) newborns who need or might need rapid fluid repletion (in emergency and/or before major surgery); (c) newborns with major malformation pathologies requiring surgery (e.g., major exomphalos; esophageal atresia); (d) stable newborns requiring a central line, if ECC cannot be placed in a proper position; (e) newborns requiring repeated blood samplings; (f) newborns requiring multiple transfusions; (g) CICCs or FICCs should also be considered in stable preterm newborns with an expected duration of PN longer than 2 weeks.
2. Ultrasound-guided CICCs and FICCs should be preferably power injectable and made of polyurethane. Calibers between 3 and 4Fr are usually appropriate, depending on the size of the vein being cannulated.
3. Consider the benefit of tunneling all ultrasound-guided CICC/FICC, especially in elective conditions.

Appropriate indications for the use of centrally inserted central catheters (CICC) and femorally inserted central catheters (FICC)

Special considerations.

- Even though is always advisable to tunnel the catheter, in some situations, this maneuver can be impractical, for example, because of the limited duration of sedation in extremely low birth weight infants, or because of the difficulty of using the modified Seldinger technique in babies weighing less than 750 g, or because of insufficient training of the operator.
- Neonates, especially preterm ones, might need repeated peripheral venous cannulations sometimes this leads to a progressive exhaustion of available veins. In this context, an ultrasound-guided CICC or FICC might be considered even though a central line is not strictly indicated.


Need of venous access at birth
No indication to UVC
Indication to UVC
UVC (up to 7 days)
Stable infant
Unstable infant
Expected duration of IV infusion
<7 days
7-14 days
>14 days
2023
Peripheral cannula
ECC
CICC/FICC


Need of venous access after the first day of life
Stable term infant
Expected duration of IV infusion
<7 days
>7 days
Peripheral cannula
ECC
Stable preterm infant
Expected duration of IV infusion
<7 days
7-14 days
>14 days
Peripheral cannula
ECC
Unstable infant
CICC/FICC
2023

ULTRASOUND GUIDED CENTRAL CATHETERS (CICCS AND FICCS) IN NEONATES TODAY: ADOPT SICA-PED BUNDLE!

1. Choice of the site of venipuncture by pre-procedural US evaluation (RaCeVA/RaFeVA)
2. Appropriate asepsis (hand hygiene + 2% CHG in 70% IPA + MPB)
3. US-guided venipuncture + US control after venipuncture (r/o PNX; tip navigation)
4. Intra procedural tip location (IC-ECG and/or ECHOTIP)
5. Tunneling
6. Securement by subcutaneous anchorage
7. Protection of the exit site with cyanoacrylate glue and semipermeable transparent membrane

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

WoCoVA
World Congress Vascular Access

SIN
Società Italiana di Neonatologia

GAVePed
Gruppo Accessi Venosi Pediatrici

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