Corsi educazionali teorico pratici

GAVeCeLT
Un progetto educazionale GAVeCeLT

GdS Accessi Vascolari Neonatali

15 Maggio | 09.00-13.00 ■ SALA DEL **PONTE**

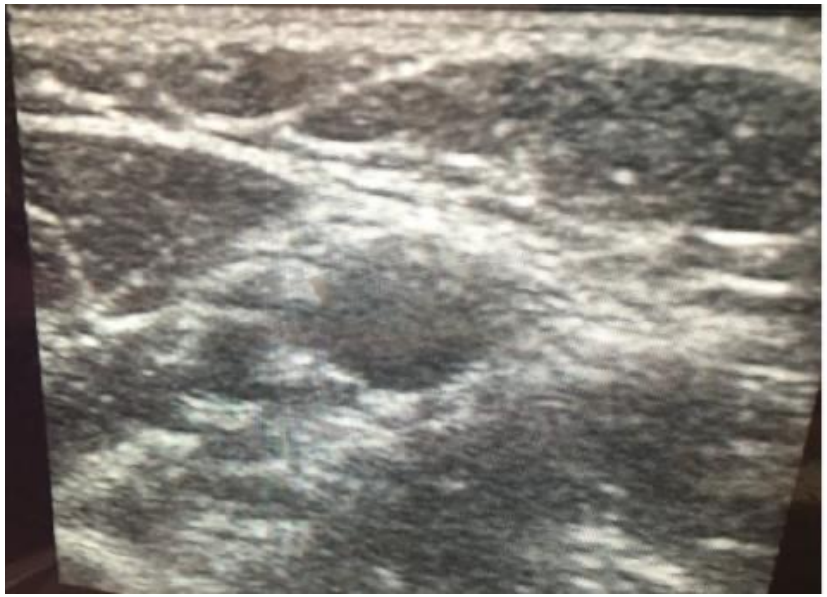
A

NEONATALE
L'ecografia nell'impianto e gestione degli accessi venosi nel neonato

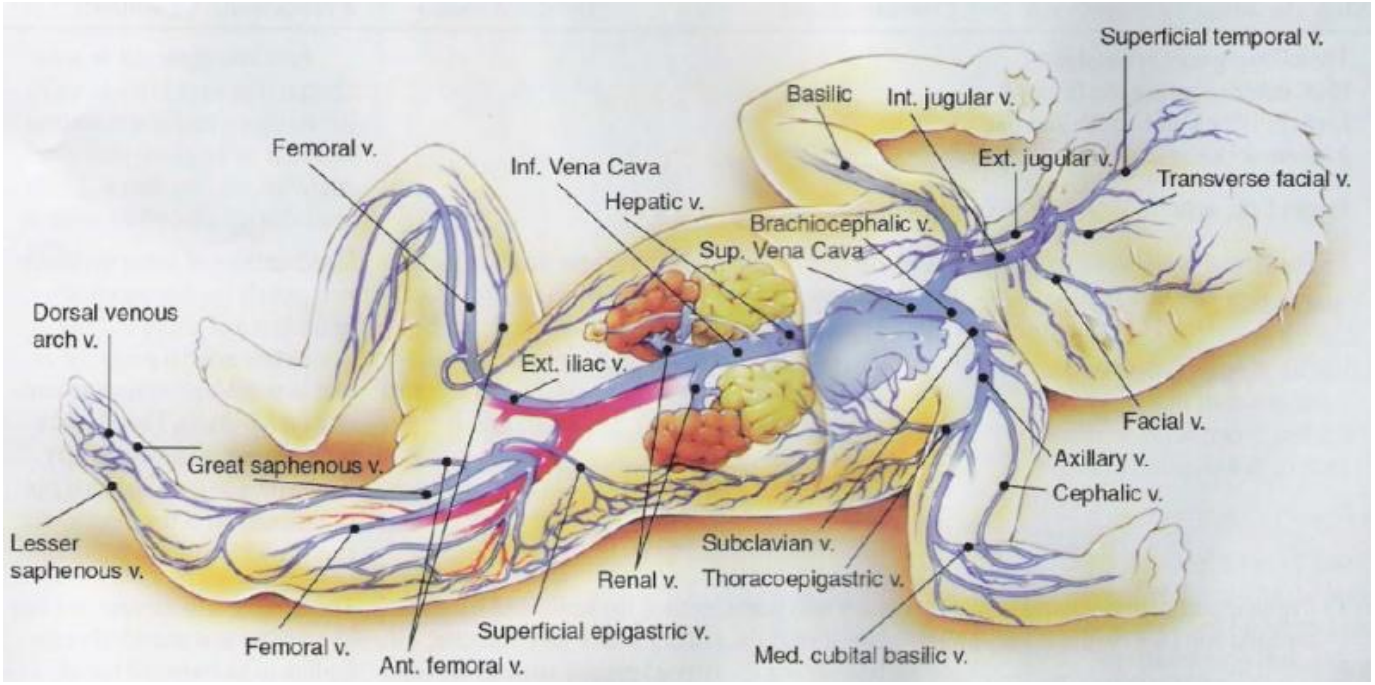
- Utilizzo dell'ecografo nel posizionamento di cateteri epicutaneo-cavali nel neonato (30') - **Vito D'Andrea**

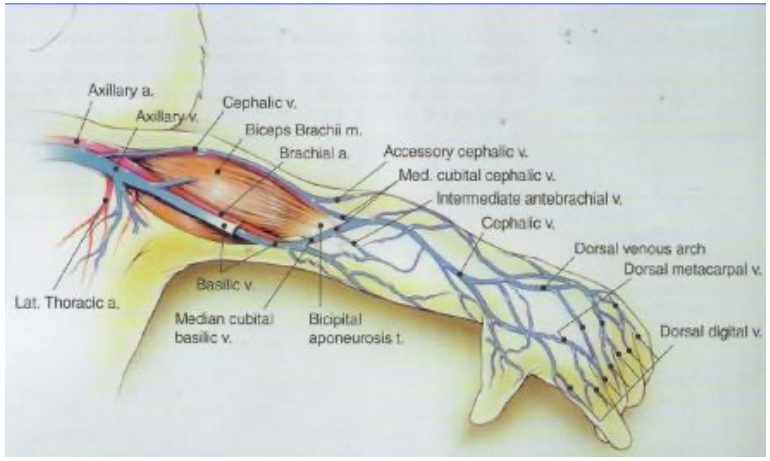
Definizione

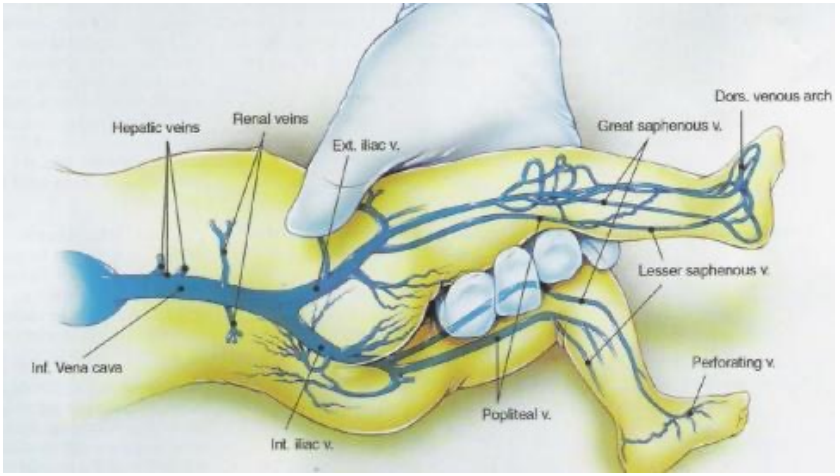
- PICC



- ECC

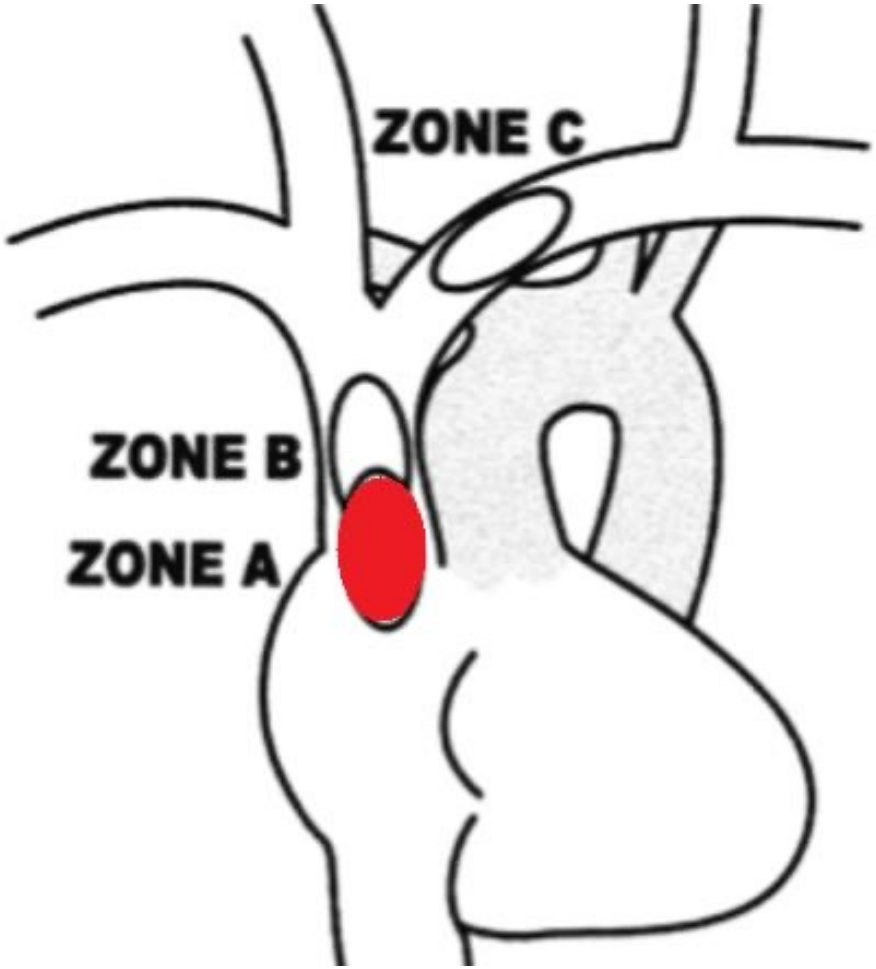

Superficial temporal v.
Basilic
Int. jugular v.
Femoral v.
Inf. Vena Cava
Ext. jugular v.
Transverse facial v.
Hepatic v.
Brachiocephalic v.
Sup. Vena Cava
Dorsal venous arch v.
Ext. iliac v.
Facial v.
Great saphenous v.
Axillary v.
Cephalic v.
Lesser saphenous v.
Subclavian v.
Renal v.
Thoracoepigastric v.
Superficial epigastric v.
Femoral v.
Ant. femoral v.
Med. cubital basilic v.

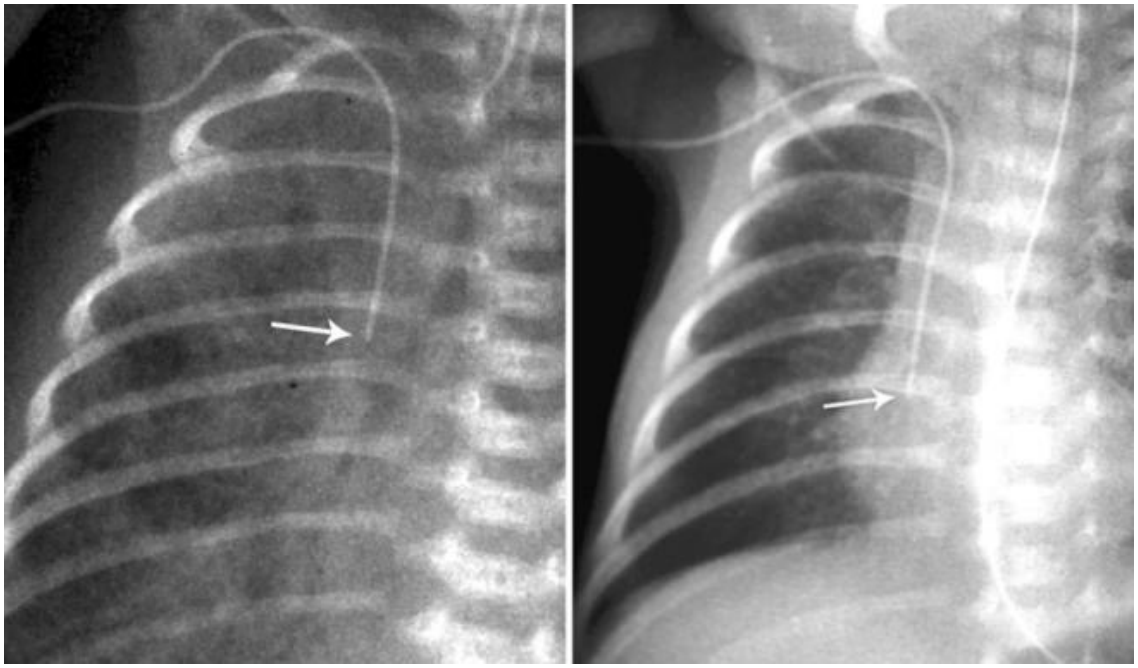

Axillary a.
Axillary v.
Cephalic v.
Biceps Brachii m.
Brachial a.
Accessory cephalic v.
Med. cubital cephalic v.
Intermediate antebrachial v.
Cephalic v.
Dorsal venous arch
Dorsal metacarpal v.
Basilic v.
Lat. Thoracic a.
Median cubital basilic v.
Bicipital aponeurosis t.
Dorsal digital v.


Hepatic veins
Renal veins
Ext. iliac v.
Dors. venous arch
Great saphenous v.
Lesser saphenous v.
Inf. Vena cava
Perforating v.
Popliteal v.
Int. iliac v.

Vein	All (n = 100)	500-1000g (n = 20)	1001-1500g (n = 20)	1501-2000g (n = 20)	2001-2500g (n = 20)	2501-3000g (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
L AxVc	2.0 ± 0.4 (1.3-3.2)	1.6 ± 0.2 (1.3-1.9)	1.9 ± 0.5 (1.3-2.8)	2.0 ± 0.3 (1.4-2.2)	2.2 ± 0.2 (1.9-2.5)	2.5 ± 0.4 (2.0-3.2)	0.93
R AxVa	1.6 ± 0.4 (0.8-2.4)	1.2 ± 0.3 (0.8-1.5)	1.5 ± 0.3 (1.0-1.9)	1.5 ± 0.3 (1.1-2.1)	1.8 ± 0.3 (1.3-2.2)	2.1 ± 0.2 (1.5-2.4)	0.92
L AxVa	1.6 ± 0.4 (0.8-2.6)	1.2± 0.2 (0.8-1.7)	1.5 ± 0.4 (1.0-2.1)	1.7 ± 0.3 (1.0-2.1)	1.8 ± 0.2 (1.4-2.1)	2.0 ± 0.3 (1.6-2.6)	0.91
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
L BrV	1.1 ± 0.4 (0.6-1.9)	0.9 ± 0.2 (0.7-1.3)	0.8 ± 0.2 (0.6-1.0)	1.0 ± 0.2 (0.7-1.3)	1.2 ± 0.1 (1.0-1.4)	1.6 ± 0.2 (1.3-1.9)	0.90
R BaV	1.0 ± 0.3 (0.5-1.5)	0.7 ± 0.2 (0.5-1.1)	1.0 ± 0.2 (0.7-1.2)	0.9 ± 0.2 (0.6-1.2)	1.2 ± 0.2 (0.7-1.4)	1.3 ± 0.1 (1.1-1.5)	0.91
L BaV	1.0 ± 0.3 (0.5-1.5)	0.7 ± 0.1 (0.5-1.0)	0.9 ± 0.1 (0.7-1.1)	0.9 ± 0.1 (0.6-1.1)	1.3 ± 0.2 (0.8-1.5)	1.3 ± 0.1 (1.1-1.5)	0.92
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
L FeV	2.3 ± 0.7 (1.1-3.5)	1.4 ± 0.3 (1.1-1.9)	2.1 ± 0.5 (1.6-2.9)	2.0 ± 0.4 (1.4-2.6)	2.9 ± 0.2 (2.5-3.3)	3.1 ± 0.2 (2.9-3.5)	0.91
R SaV	1.3 ± 0.5 (0.5-2.3)	0.8 ± 0.2 (0.5-1.2)	1.0 ± 0.3 (0.7-1.8)	1.3 ± 0.2 (0.9-1.5)	1.7 ± 0.4 (1.2-2.3)	1.8 ± 0.3 (1.3-2.3)	0.88
L SaV	1.3 ± 0.5 (0.4-2.3)	0.8 ± 0.2 (0.4-1.1)	1.1 ± 0.2 (0.7-1.5)	1.2 ± 0.2 (0.8-1.4)	1.8 ± 0.3 (1.4-2.3)	1.8 ± 0.3 (1..4-2.3)	0.89

Barone G et al. Systematic Ultrasound Evaluation of the Diameter of Deep Veins in the Newborn: Results and Implications for Clinical Practice. Neonatology. 2019





Fletcher & Bodenham,BJA 2000

WHY IS TIP LOCATION IMPORTANT?

	N°	Rimoz Non elettiva
Central catheters	413	7.5%
Non central cathet.	83	18.1%

Xiaohe Yu,Bio Med Research Intern, 2018

	N°	Complicanze	Durata catet
Central catheters	97	19%	17.7 gg
Non central cathet.	79	49%	11.4 gg

Goldwasser, Pediatr Radiol 2017

	N°	Complicanze	Rimozione Non elettiva
Central catheters	203	29%	27%
Non central cathet.	116	47%	45%

Jain, J of Perinatology, 2013

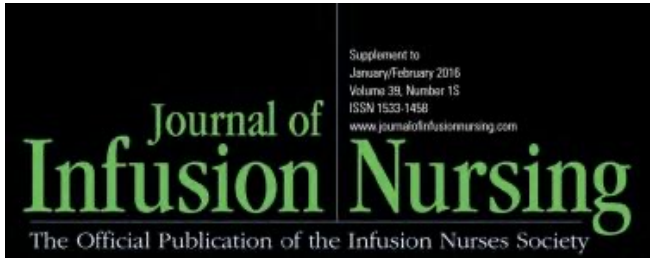
	N°	Complicanze
Central catheters	889	15,9 per 1000 line days
Non central cathet.	91	51.7 per 1000 line days

Colacchio, J of Perinatology, 2012

Tip location..US

E. Confirm the catheter tip location by radiography, echocardiography, or ultrasonography before catheter use.

5. Neonatal echocardiography may be superior to chest and abdominal radiography for identifying malpositioned catheters or in extremely low-birth-weight neonates.[24,25] (V)



Real-Time Ultrasound Tip Location Reduces Malposition and Radiation Exposure during Epicutaneo-Caval Catheter Placement in Neonates

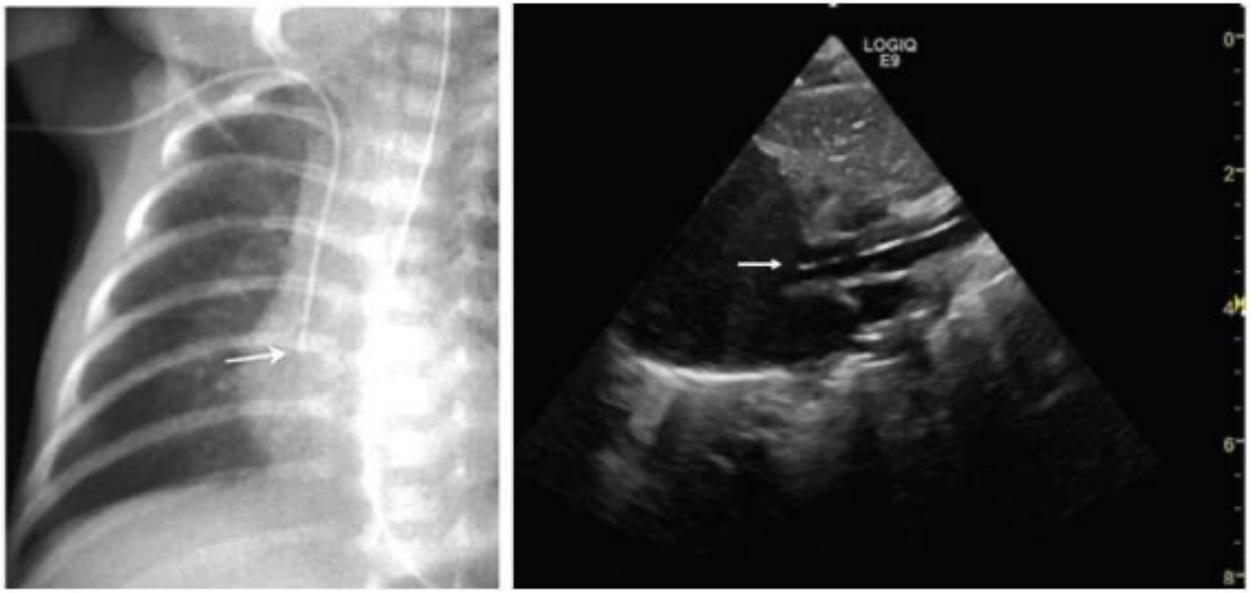
Vito D'Andrea, MD[1,*] Giorgia Prontera, MD[1,*] Francesco Cota, MD[1] Rosellina Russo, MD[2]
Giovanni Barone, MD[3] Giovanni Vento, MD[1]

Objective Epicutaneo-caval catheters (ECCs) are essential for the care of sick infants who require long-term medical and nutritional management. The aim of this study was to investigate the use of real-time ultrasound as an alternative to X-rays to reduce the incidence of primary malpositions during catheter insertion.

Study Design Data on ECCs were retrospectively collected in a tertiary neonatal intensive care unit. Catheter were analyzed considering the tip location technique (standard chest–abdominal radiograph vs real-time ultrasound)

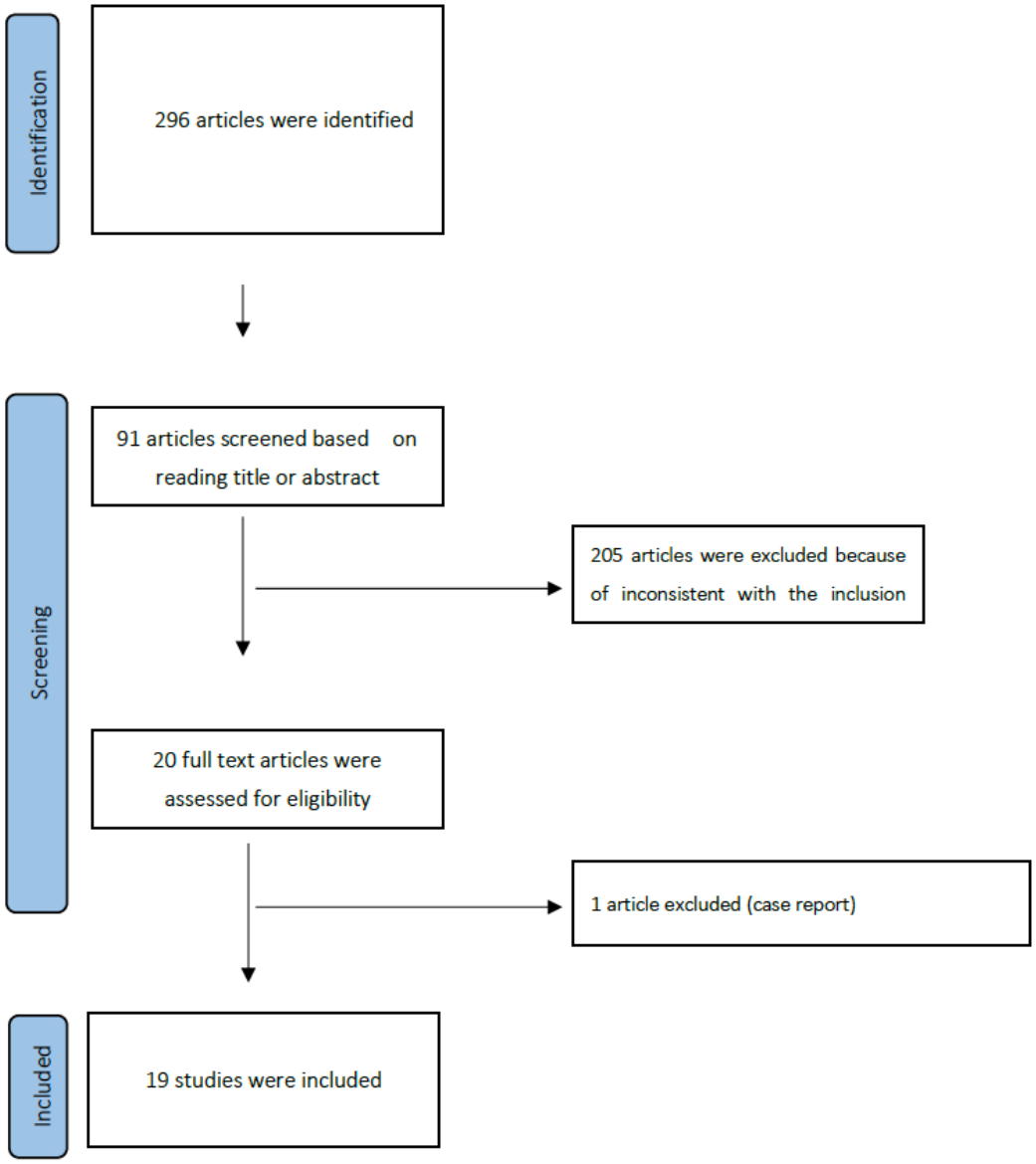
Results A total of 248 ECCs were analyzed. Of these, 118 catheters had primary malposition (47.6%). The tip of 165 catheters was assessed using standard chest–abdominal X-rays and 107 (64.8%) were found to be in an inappropriate location. In the group of 83 catheters that were placed using real-time ultrasound for tip location, only 11 catheters (13.2%) had primary malposition. The rate of malposition among the two groups showed a statistically significant difference ($p < 0.001$). Hypothetically, 300 chest X-rays could have been saved if real-time ultrasound had been used to locate the tip, reducing radiation exposure to infants.

Conclusion The use of a real-time ultrasound may be beneficial in reducing primary catheter malpositions compared with conventional radiography. In addition, secondary malpositions and catheter-related complications can be monitored over time.



	X-ray	RT-US	*p*-Value
Primary malposition	107 (65.4%)	11 (13.25%)	<0.001
Single repositioning	79 (47.88%)	10 (12.5%)	<0.001
Multiple repositioning	28 (16.97%)	1 (1.2%)	<0.001
Removal reason			
Dislocation	4 (2.4%)	–	0.304
Phlebitis	10 (6.1%)	5 (6%)	1
Infection	20 (12.1%)	15 (18.1%)	0.246
Malposition	7 (4.2%)	–	0.099
Occlusion	6 (3.6%)	4 (4.8%)	0.736
Rupture	15 (9.1%)	3 (3.6%)	0.193
Extravasation	7 (4.2%)	1 (1.2%)	0.274
Cardiac tamponade	1 (0.6%)	1 (1.2%)	1

US vs RX


Identification
296 articles were identified
Screening
91 articles screened based on reading title or abstract
205 articles were excluded because of inconsistent with the inclusion
20 full text articles were assessed for eligibility
1 article excluded (case report)
Included
19 studies were included

US vs RX

Study or Subgroup	US Events	US Total	XR Events	XR Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Diemer et al, 1987	9	9	9	9	5.6%	1.00 [0.82, 1.22]	1987
Madar et al, 1996	17	1919	19	19	2.8%	0.01 [0.01, 0.01]	1996
Ohki et al, 2000	48	57	57	57	6.5%	0.84 [0.75, 0.95]	2000
Kuschel et al, 2008	33	44	39	44	5.6%	0.85 [0.69, 1.03]	2008
Brissaud et al, 2010	32	36	36	36	6.4%	0.89 [0.79, 1.01]	2010
Katheria et al, 2013	48	48	48	48	7.1%	1.00 [0.96, 1.04]	2013
Tauzin et al, 2013	109	109	109	109	7.1%	1.00 [0.98, 1.02]	2013
Johnson et al, 2016	10	10	10	10	5.8%	1.00 [0.83, 1.20]	2016
Saul et al, 2016	10	11	10	11	4.8%	1.00 [0.77, 1.30]	2016
Telang et al, 2017	31	33	33	33	6.6%	0.94 [0.85, 1.04]	2017
Oleti et al, 2018	27	40	13	40	2.7%	2.08 [1.27, 3.41]	2018
Motz et al, 2018	11	11	11	11	6.0%	1.00 [0.85, 1.18]	2018
Zaghlou et al, 2018	23	23	21	23	6.2%	1.09 [0.94, 1.27]	2018
Motz et al, 2019	30	30	30	30	6.9%	1.00 [0.94, 1.07]	2019
Shabeer et al, 2021	38	40	40	40	6.8%	0.95 [0.87, 1.04]	2021
Ren et al, 2021	32	32	32	32	7.0%	1.00 [0.94, 1.06]	2021
Huang et al, 2021	166	307	141	307	6.1%	1.18 [1.00, 1.38]	2021
Total (95% CI)		2759		859	100.0%	0.88 [0.79, 0.97]	
Total events	674		656				

Heterogeneity: $Tau^2 = 0.04$; $Chi^2 = 414.35$, df = 16 ($P < 0.00001$); $I^2 = 96\%$
Test for overall effect: $Z = 2.55$ ($P = 0.01$)

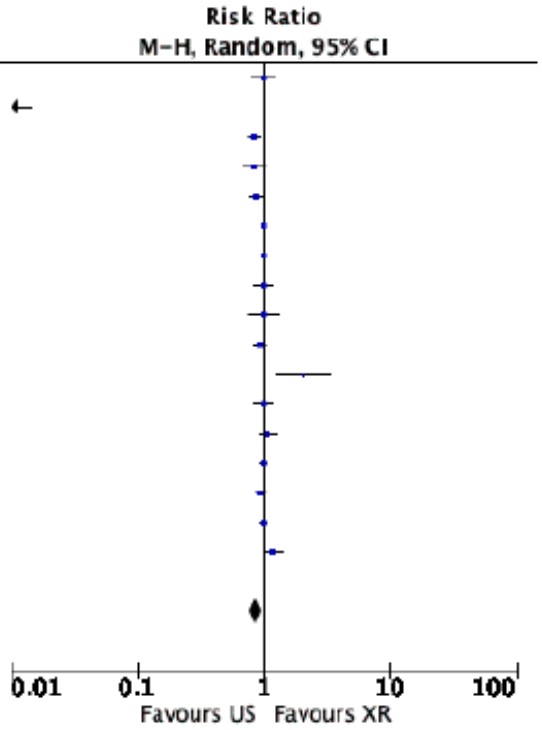


Fig. 2: Tip visualization at US and X-ray

US vs RX

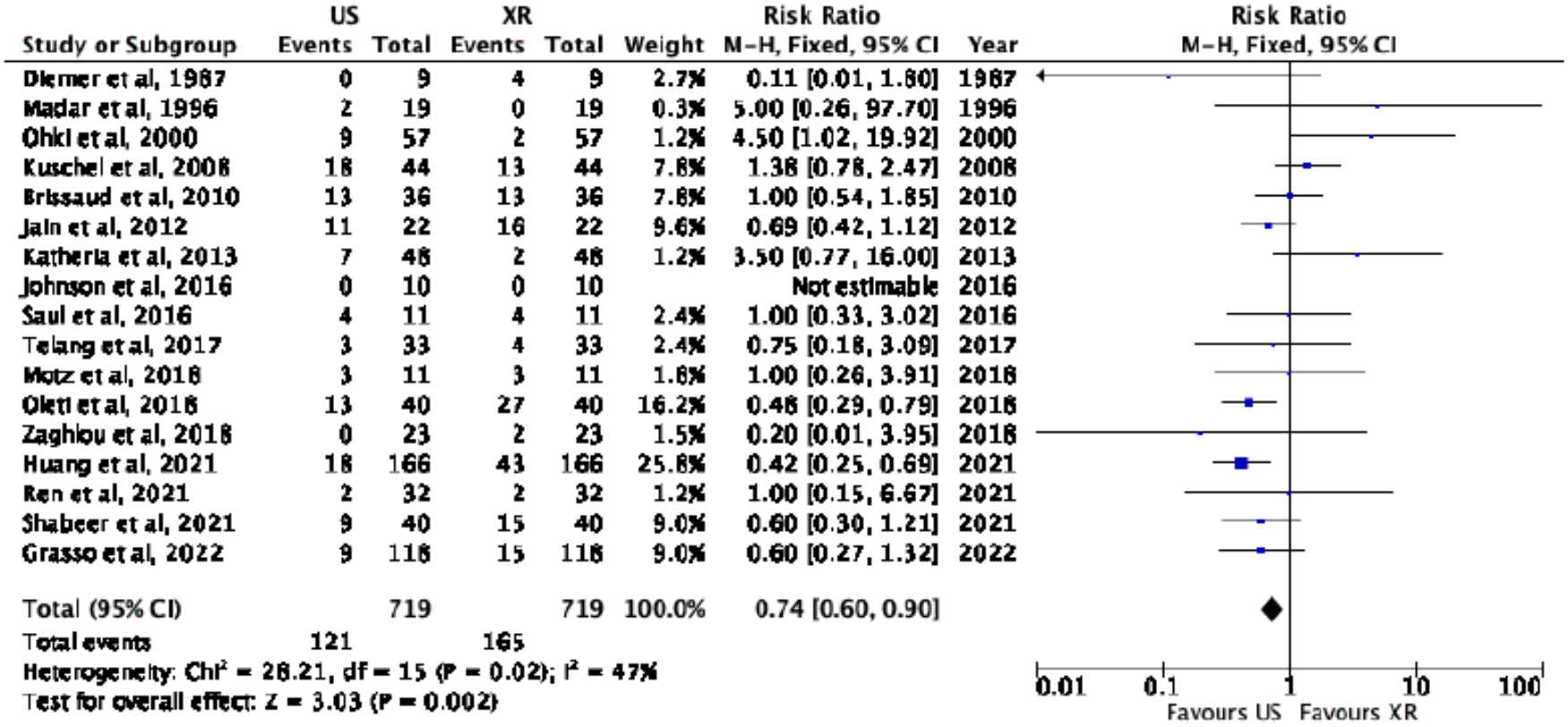
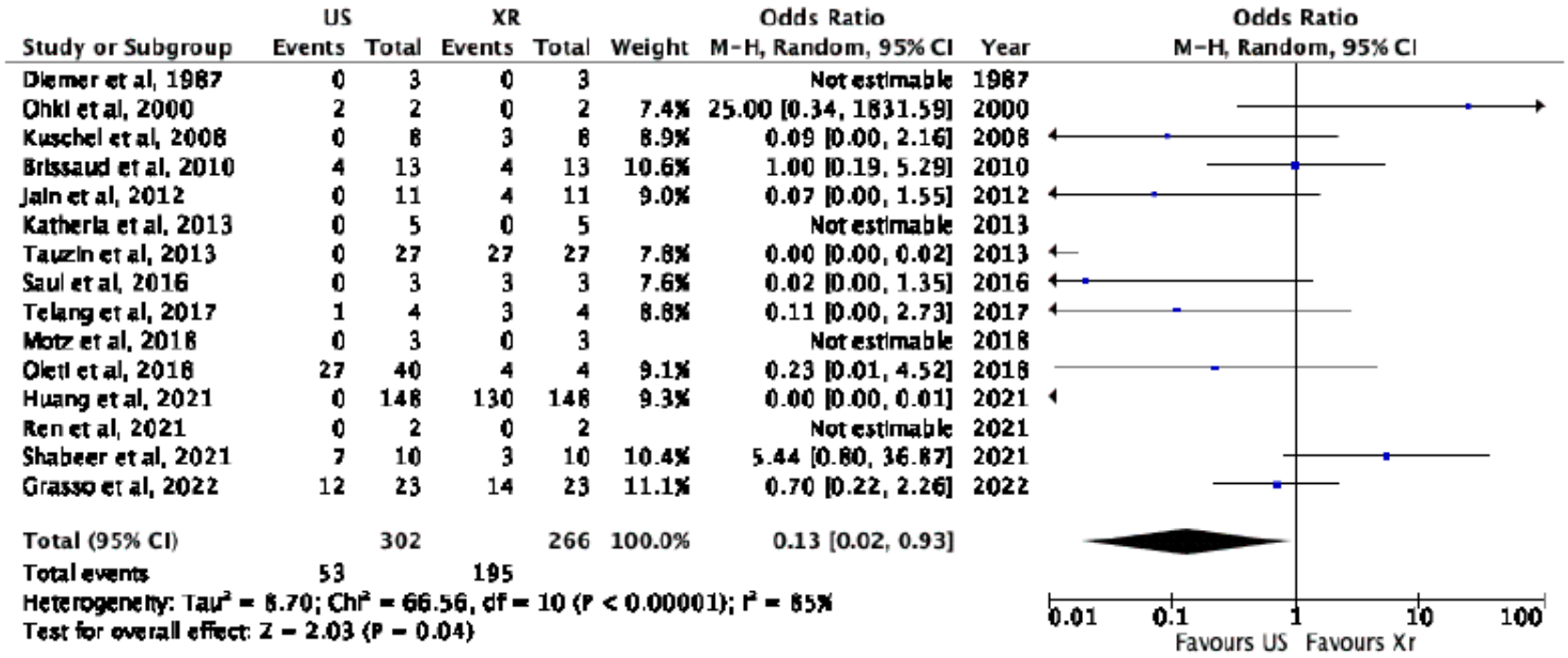


Fig. 3: correct TIP position at Us and X-ray

US vs RX



Study or Subgroup	US Events	US Total	XR Events	XR Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Diemer et al, 1987	0	3	0	3		Not estimable	1987
Ohki et al, 2000	2	2	0	2	7.4%	25.00 [0.34, 1831.59]	2000
Kuschel et al, 2008	0	8	3	8	8.9%	0.09 [0.00, 2.16]	2008
Brissaud et al, 2010	4	13	4	13	10.6%	1.00 [0.19, 5.29]	2010
Jain et al, 2012	0	11	4	11	9.0%	0.07 [0.00, 1.55]	2012
Katheria et al, 2013	0	5	0	5		Not estimable	2013
Tauzin et al, 2013	0	27	27	27	7.8%	0.00 [0.00, 0.02]	2013
Saul et al, 2016	0	3	3	3	7.6%	0.02 [0.00, 1.35]	2016
Telang et al, 2017	1	4	3	4	8.8%	0.11 [0.00, 2.73]	2017
Motz et al, 2018	0	3	0	3		Not estimable	2018
Oleti et al, 2018	27	40	4	4	9.1%	0.23 [0.01, 4.52]	2018
Huang et al, 2021	0	148	130	148	9.3%	0.00 [0.00, 0.01]	2021
Ren et al, 2021	0	2	0	2		Not estimable	2021
Shabeer et al, 2021	7	10	3	10	10.4%	5.44 [0.80, 36.87]	2021
Grasso et al, 2022	12	23	14	23	11.1%	0.70 [0.22, 2.26]	2022
Total (95% CI)		302		266	100.0%	0.13 [0.02, 0.93]	
Total events	53		195				

Heterogeneity: $Tau^2 = 8.70$; $Chi^2 = 66.56$, $df = 10$ ($P < 0.00001$); $I^2 = 85\%$
Test for overall effect: $Z = 2.03$ ($P = 0.04$)

Fig. 4: malposition visualized at US and X-ray

US vs RX

Study or Subgroup	US Mean	US SD	US Total	X-ray Mean	X-ray SD	X-ray Total	Weight	Mean Difference IV, Fixed, 95% CI	Year
Brissaud 2010	12.3	5.2	36	27	7.3	36	79.1%	−14.70 [−17.63, −11.77]	2010
Katheria 2013	69	49	48	99	49	48	1.8%	−30.00 [−49.60, −10.40]	2013
Huang 2021	2.43	0.68	166	120.18	43.06	141	13.4%	−117.75 [−124.86, −110.64]	2021
Shabeer 2021	50.75	18.25	40	109	30	40	5.7%	−58.25 [−69.13, −47.37]	2021
Total (95% CI)			290			265	100.0%	−31.29 [−33.89, −28.69]	

Heterogeneity: $Chi^2 = 715.28$, $df = 3$ ($P < 0.00001$); $I^2 = 100\%$

Test for overall effect: $Z = 23.55$ ($P < 0.00001$)

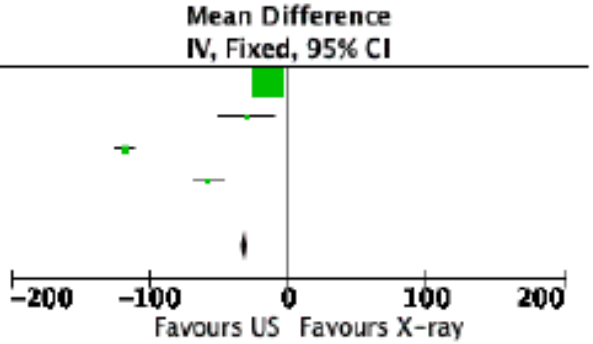


Fig.5: timing of TIP location for US and X-ray

Editorial

JVA | The Journal of Vascular Access

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

The Journal of Vascular Access
1–10

DOI: 10.1177/11297298211007703
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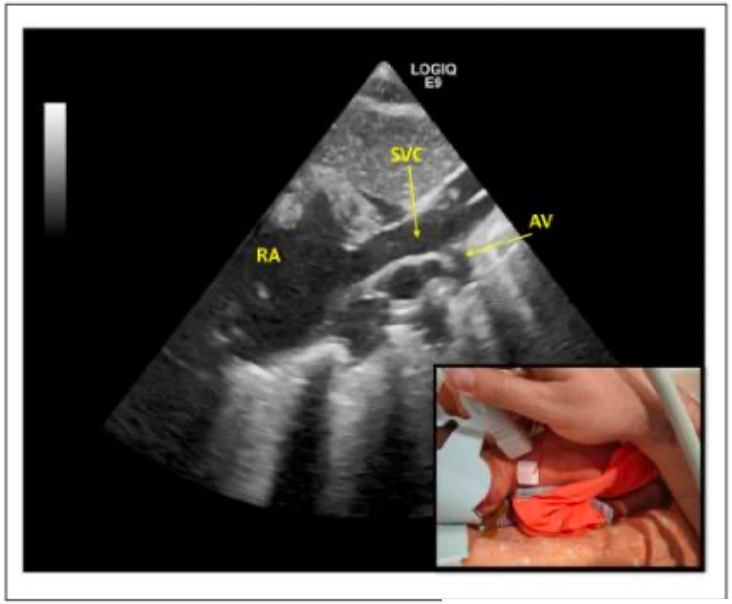
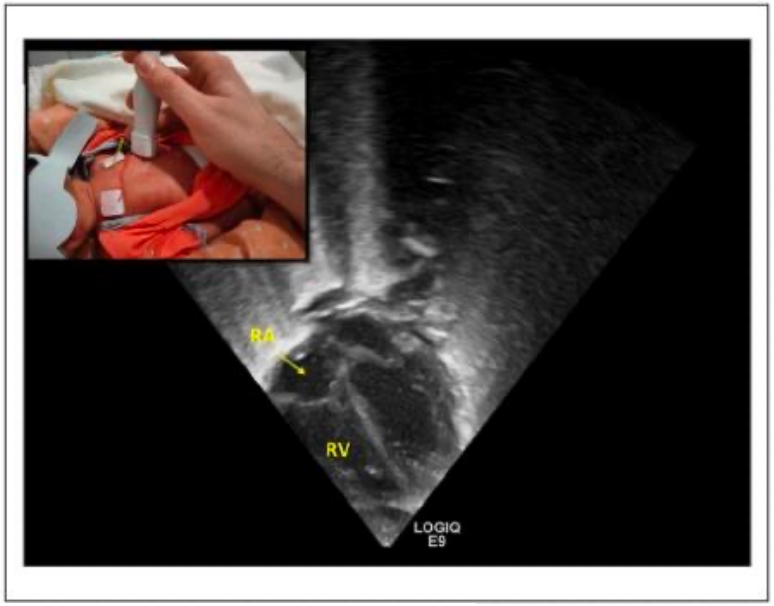
SAGE

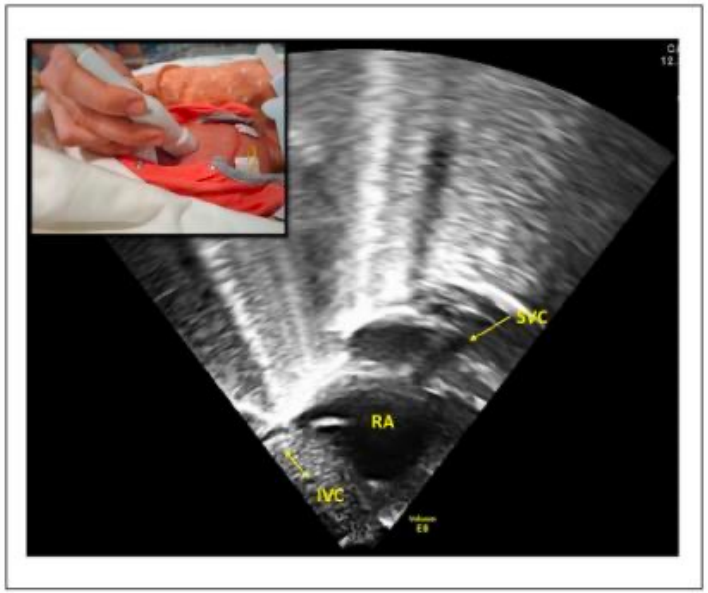
Giovanni Barone[1], Mauro Pittiruti[2], Daniele G Biasucci[3], Daniele Elisei[4], Emanuele Iacobone[4], Antonio La Greca[2], Geremia Zito Marinosci[5] and Vito D'Andrea[6]

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


LOGIQ
E9
SVC
AV
RA


RA
RV
LOGIQ
E9


SVC
RA
IVC

Protocollo Echo Tip per gli ECC inseriti dagli arti superiori e dallo scalpo

Il protocollo Echotip prevede il posizionamento ecoguidato dell'ECC mediante l'ausilio dell'ecografia sia come strumento di **tip navigation** che come strumento di **tip location**:

Tip navigation:

Sonda: lineare hockey stick, impostare una frequenza di 10-14MHz

Finestra acustica: usare le finestre acustiche previste dal RaCeVa e dal RaPeVa.

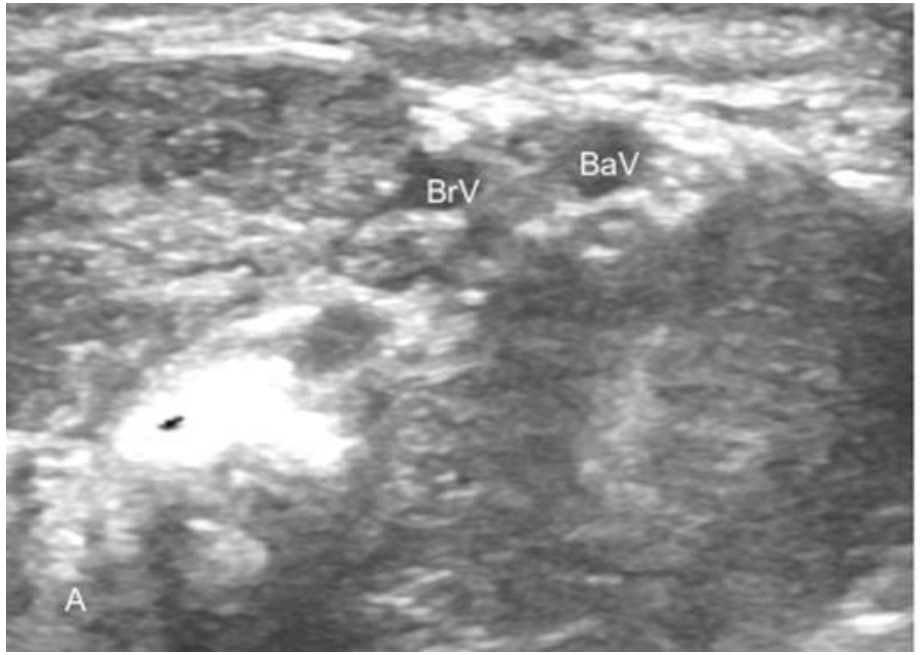
Procedura:

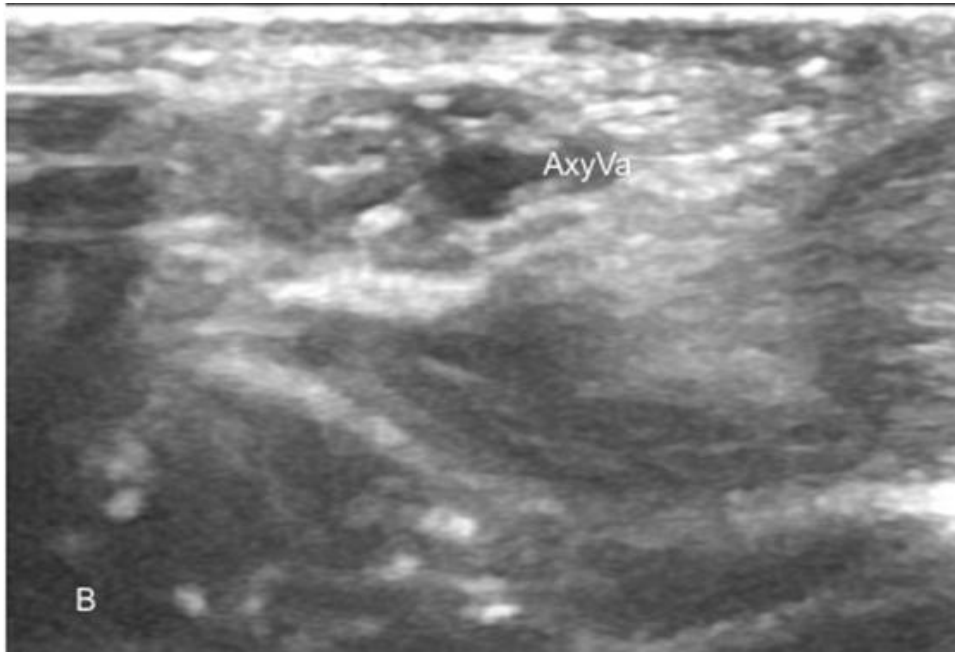
Il RaPeVA va utilizzato in caso di difficile progressione del CVC nelle vene profonde dell'arto superiore.

In caso di ECC inserito dagli arti superiori il RaCeVa permette di fare una corretta tip navigation del CVC durante il suo passaggio dalla vena succlavia, nella vena anonima e da qui nella VCS. Consente inoltre di prevenire malposizioni primarie (es vena anonima controlaterale o vena giugulare interna).

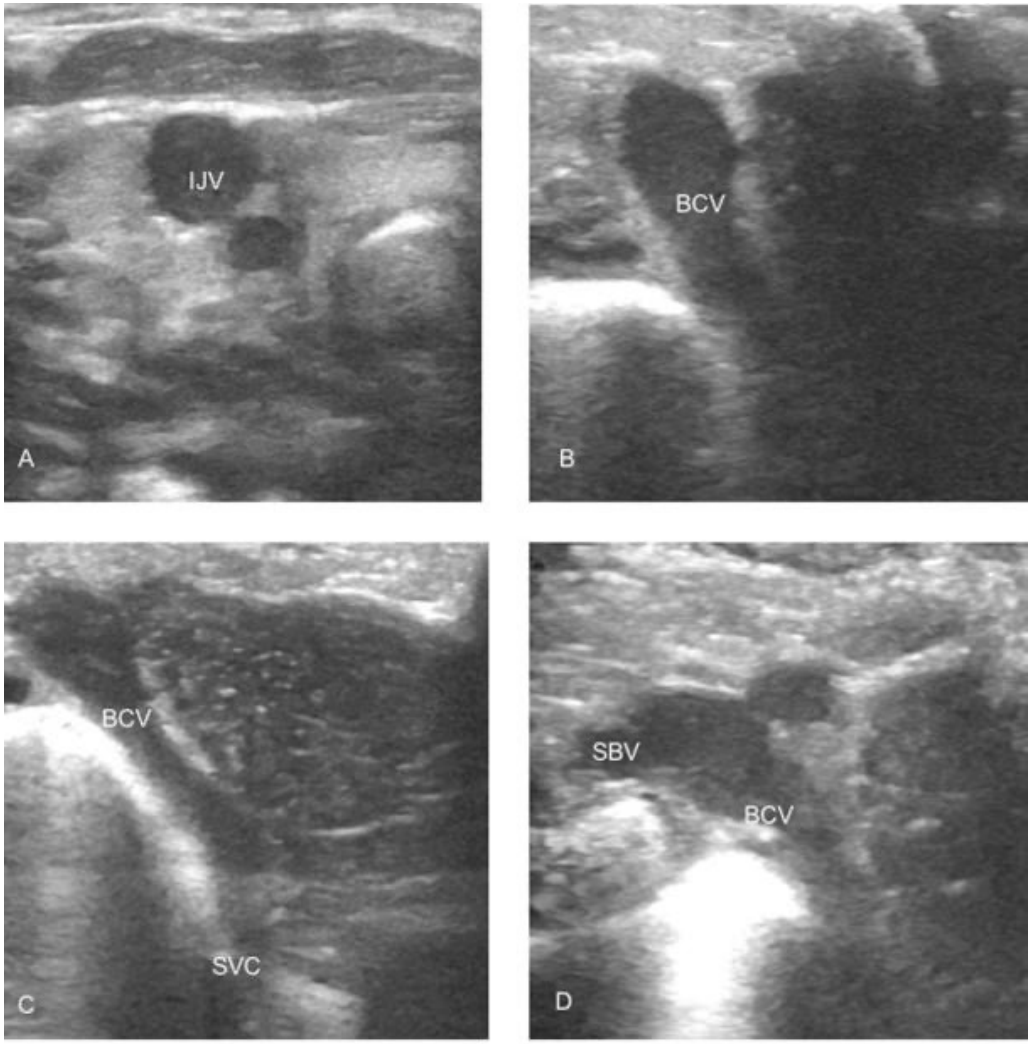
In caso di ECC inserito dallo scalpo il RaCeVa permette di fare una corretta tip navigation del CVC durante il suo passaggio dalla vena giugulare interna, nella vena anonima e da qui nella VCS

RaPeVa





RaCeVa



Protocollo Echo Tip per gli ECC inseriti dagli arti superiori e dallo scalpo

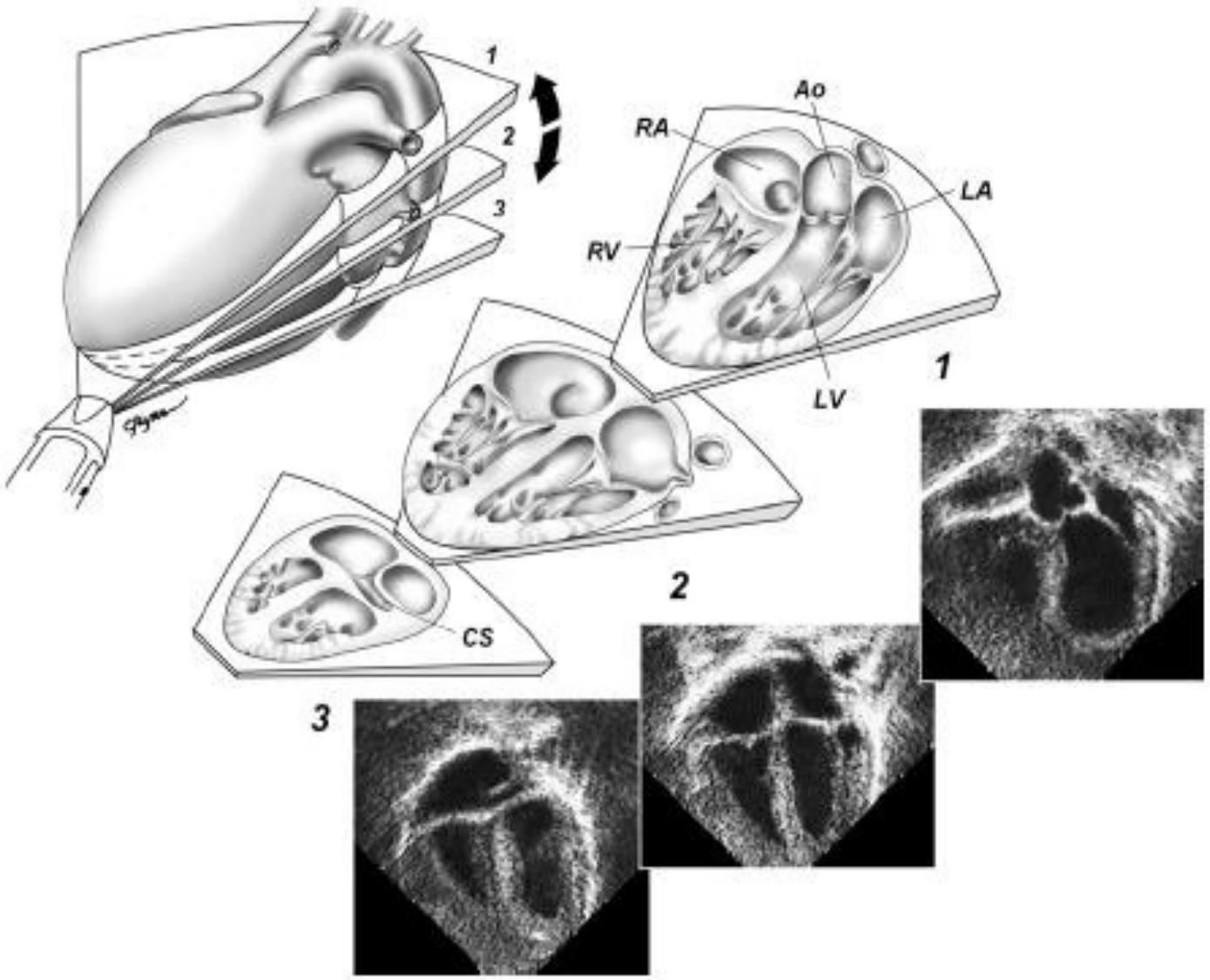
Il protocollo Echotip prevede il posizionamento ecoguidato dell'ECC mediante l'ausilio dell'ecografia sia come strumento di **tip navigation** che come strumento di **tip location**:

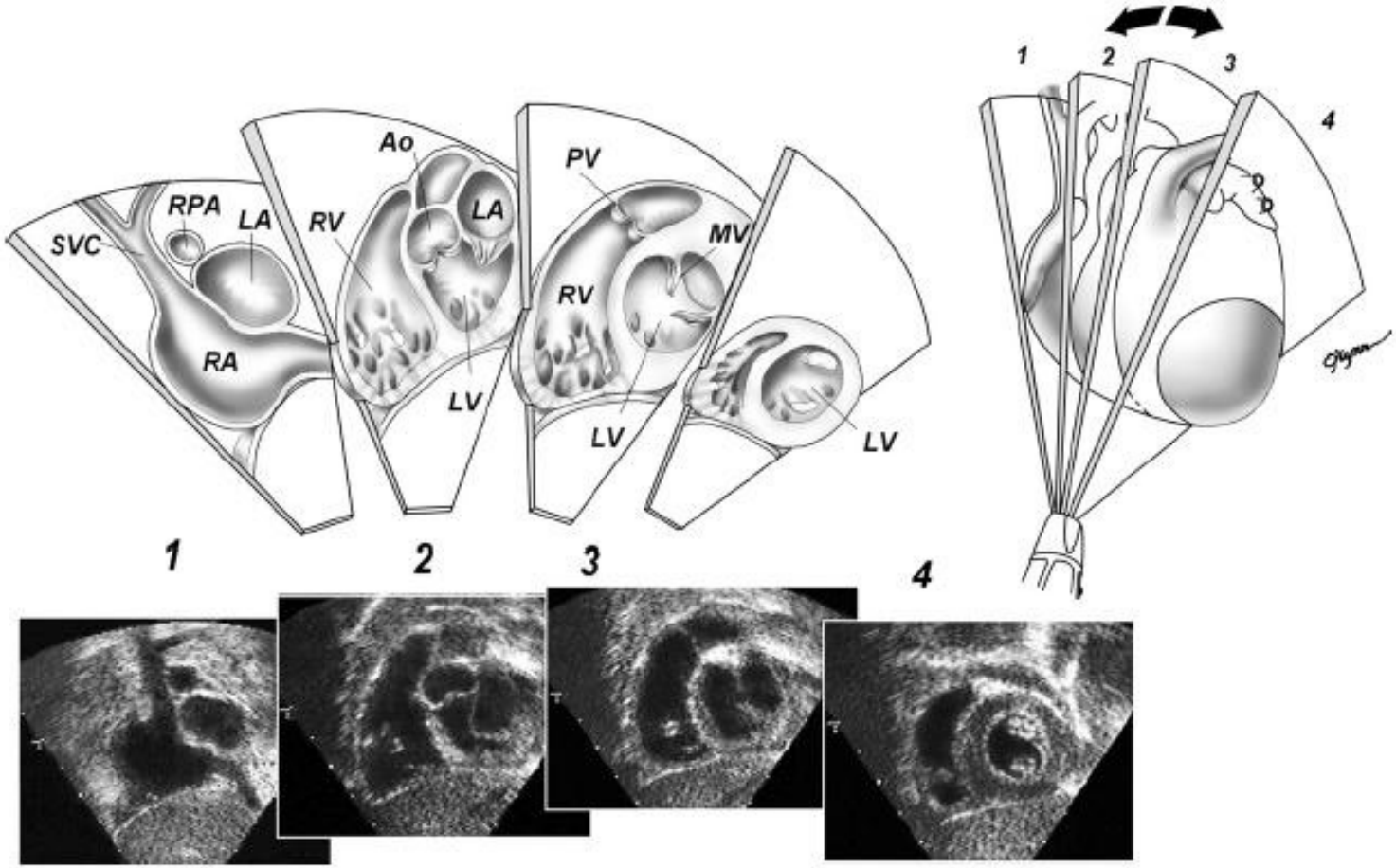
Tip location:

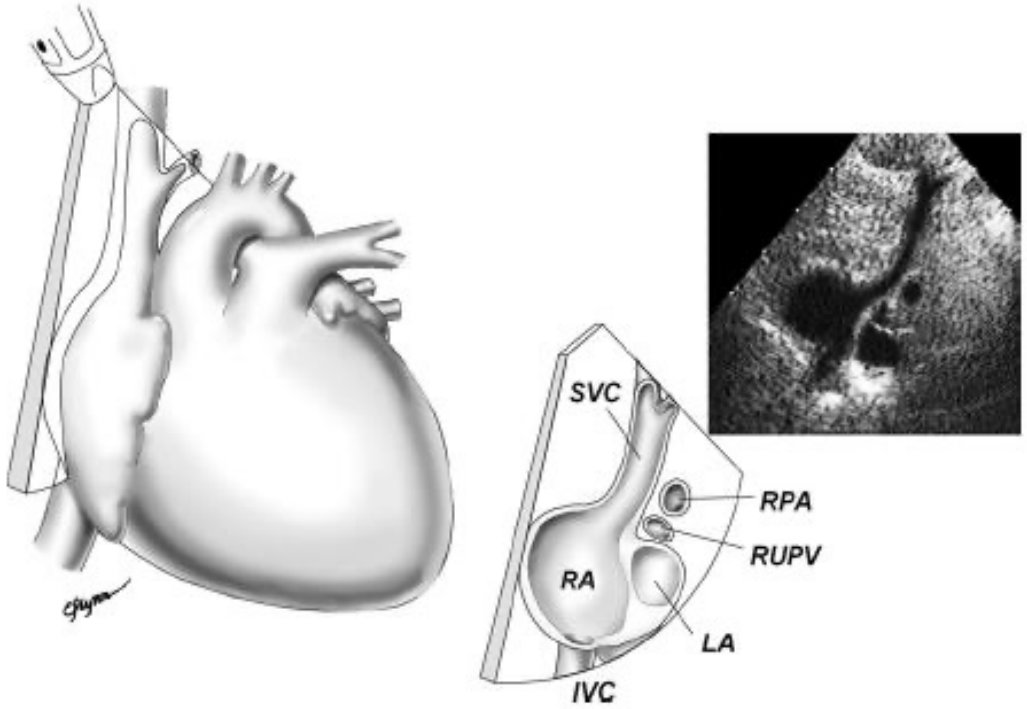
Sonda: microsettoriale, impostare una frequenza tra 7-8 MHz

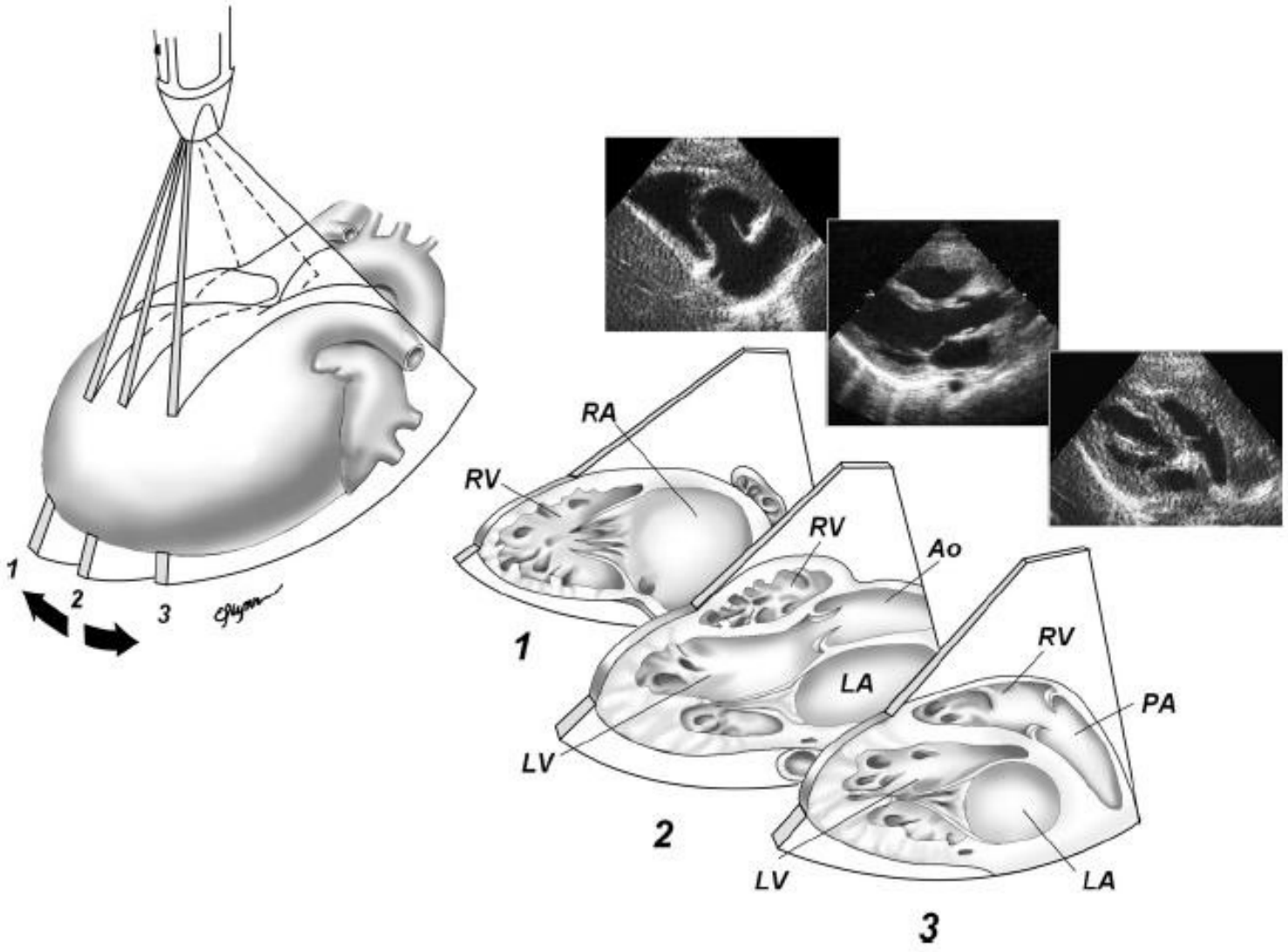
Finestra acustica: usare almeno 3 proiezioni: parasternale asse lungo della VCS; 4 camere apicale; sottocostale bicavale.

Procedura: Una volta posizionata la punta del catetere all'interno della zona target (giunzione tra VCS e atrio di destra) eseguire un flush rapido di soluzione fisiologica da 0.5-1 ml al fine di confermare la posizione della punta


1
2
3
Ao
RA
LA
RV
LV
CS
1
2
3


SVC
RPA
LA
RA
RV
Ao
LA
LV
PV
RV
MV
LV
LV
1
2
3
4
1
2
3
4


SVC
RPA
RUPV
RA
LA
IVC


1
2
3
RA
RV
RV
Ao
1
LA
RV
PA
LV
2
LV
LA
3


LOGIQ
E9
2
4
6
8

Protocollo Echo Tip per gli ECC inseriti dagli arti inferiori

Il protocollo Echotip prevede il posizionamento ecoguidato dell'ECC mediante l'ausilio dell'ecografia sia come strumento di **tip navigation** che come strumento di **tip location**:

Tip navigation:

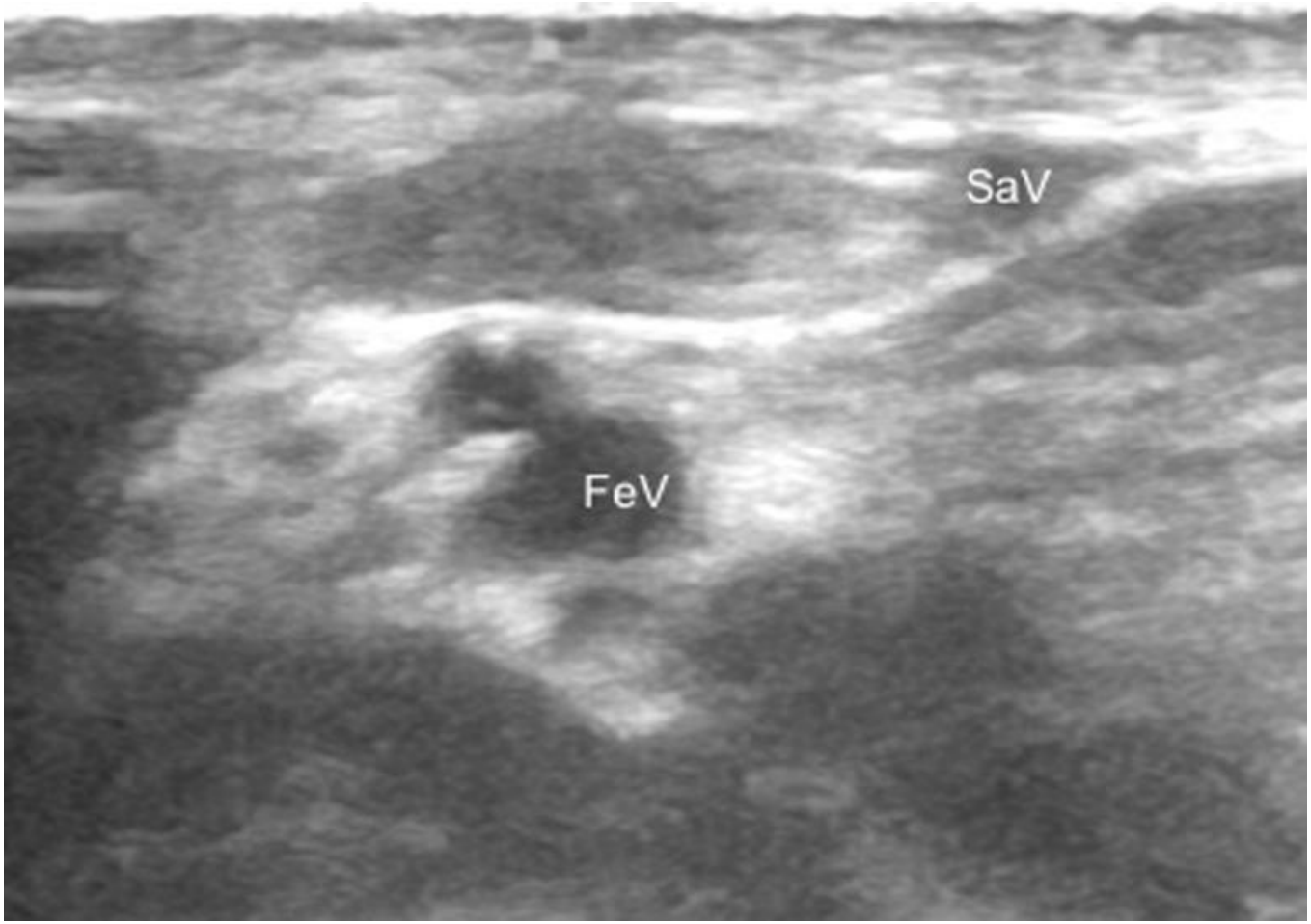
Sonda: lineare hockey stick, impostare una 10-14MHz; microsettoriale 7-8 MHz.

Finestra acustica: usare la visualizzazione in asse corto e asse lungo della vena femorale.

Procedura:

Durante il posizionamento di un ECC dagli arti inferiori è possibile seguire la progressione della punta nella vena femorale e nella vena iliaca

Asse corto



Protocollo Echo Tip per gli ECC inseriti dagli arti inferiori

Il protocollo Echotip prevede il posizionamento ecoguidato dell'ECC mediante l'ausilio dell'ecografia sia come strumento di **tip navigation** che come strumento di **tip location**:

Tip location:

Sonda: microsettoriale, impostare una frequenza tra 7-8 MHz

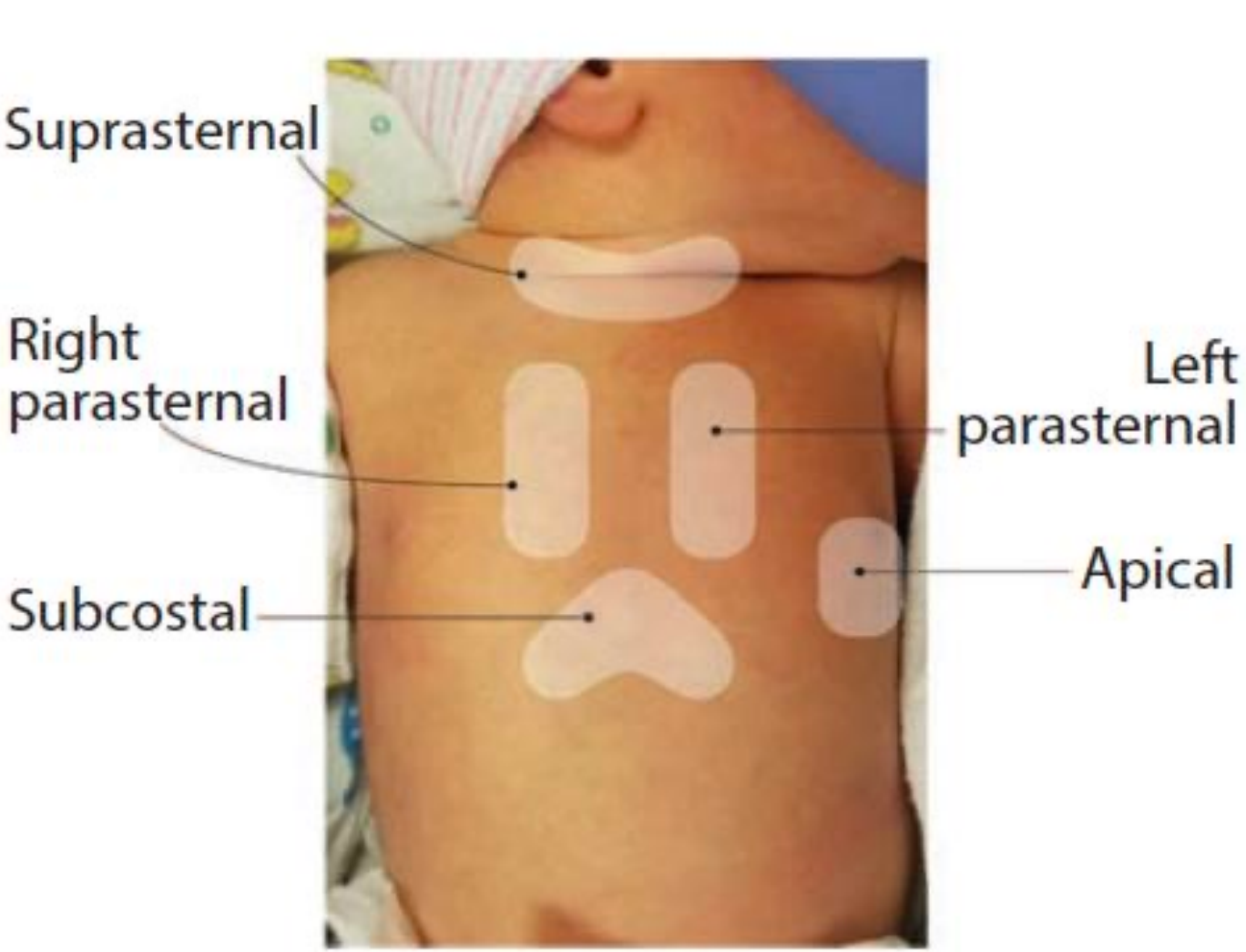
Finestra acustica: sottocostale longitudinale sagittale: visualizzare la vena cava inferiore, l'atrio di destra e la vena cava superiore.

Procedura: Una volta posizionata la punta dell'ECC all'interno della zona target eseguire un flush rapido di soluzione fisiologica da 0.5-1 ml al fine di confermare la posizione della punta

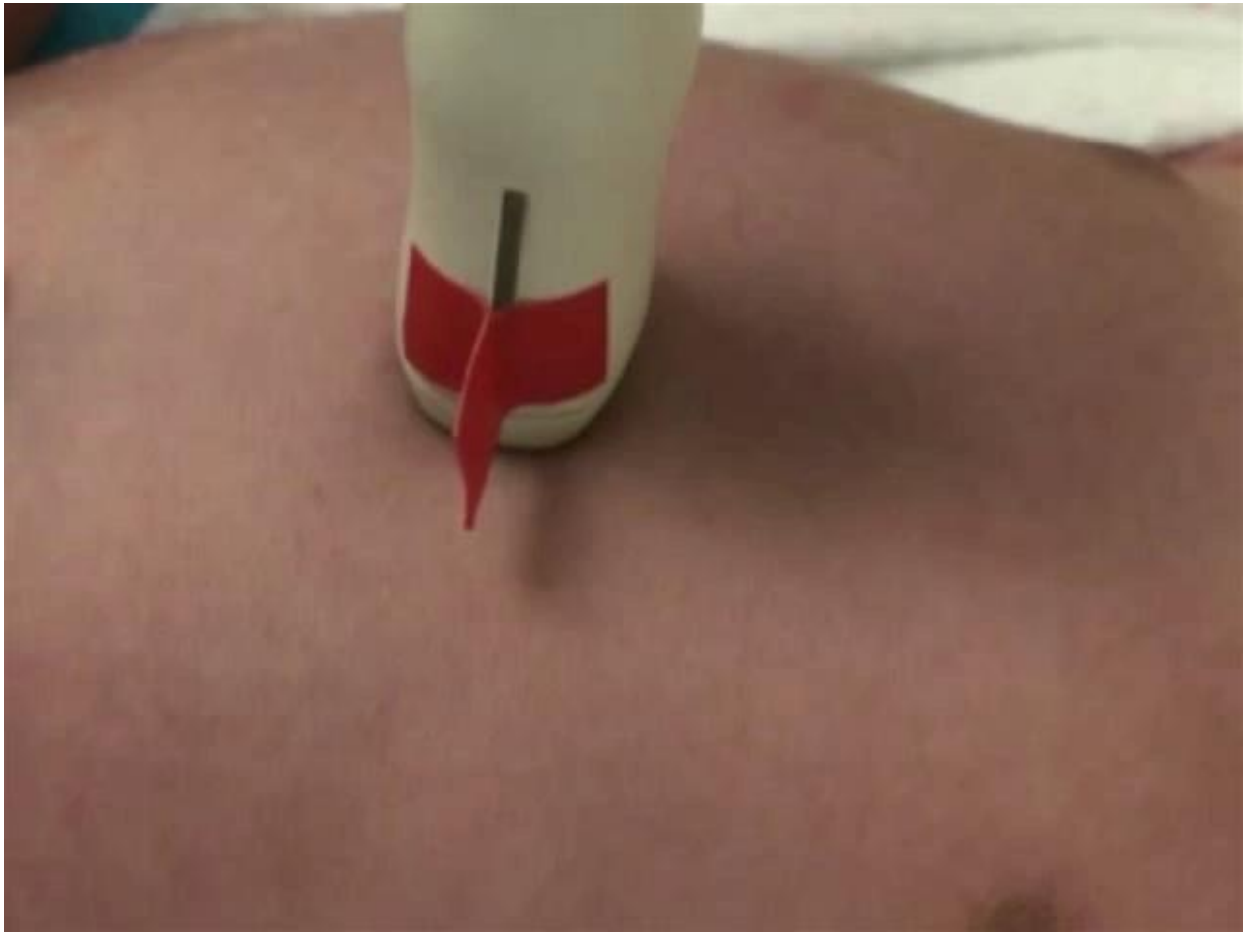
Protocollo Echo Tip

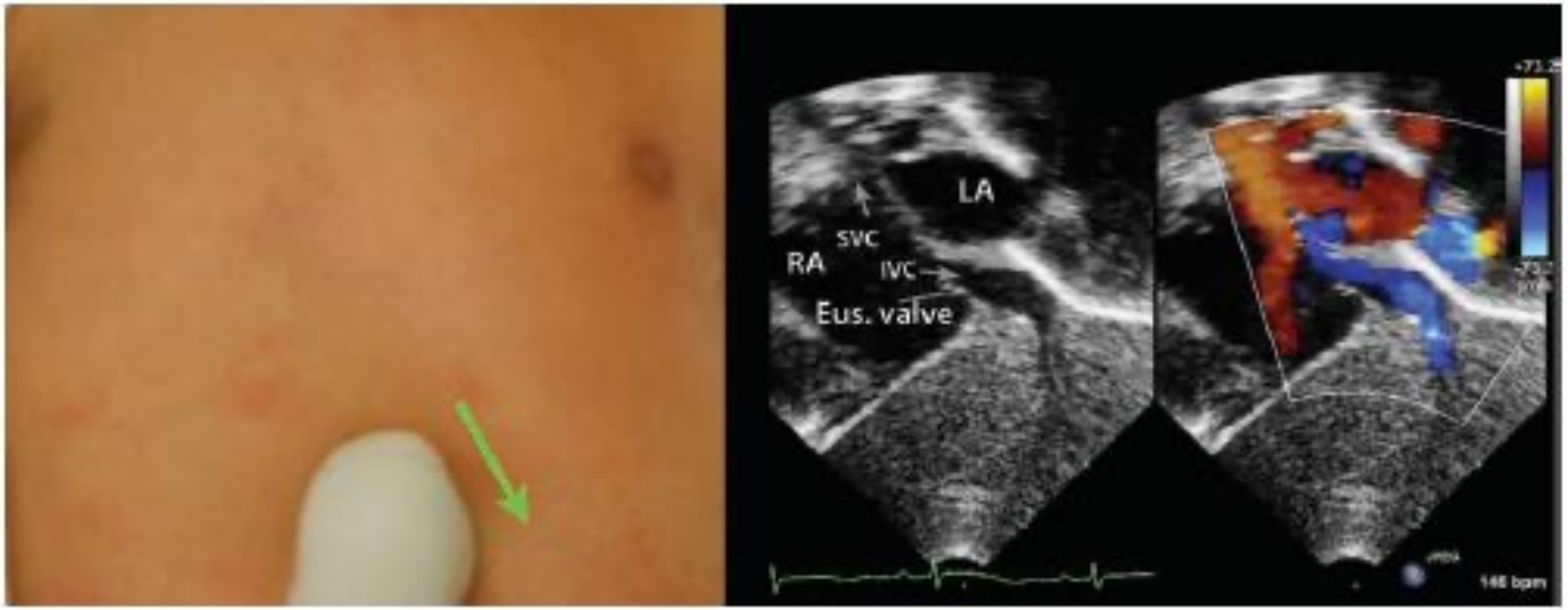
Il protocollo Echotip prevede il posizionamento ecoguidato dell'ECC mediante l'ausilio dell'ecografia sia come strumento di **tip navigation** che come strumento di **tip location**:

A distanza di 24-48 ore dalla posizionamento dell'ECC controllare la posizione della punta per escludere eventuali malposizioni secondarie.

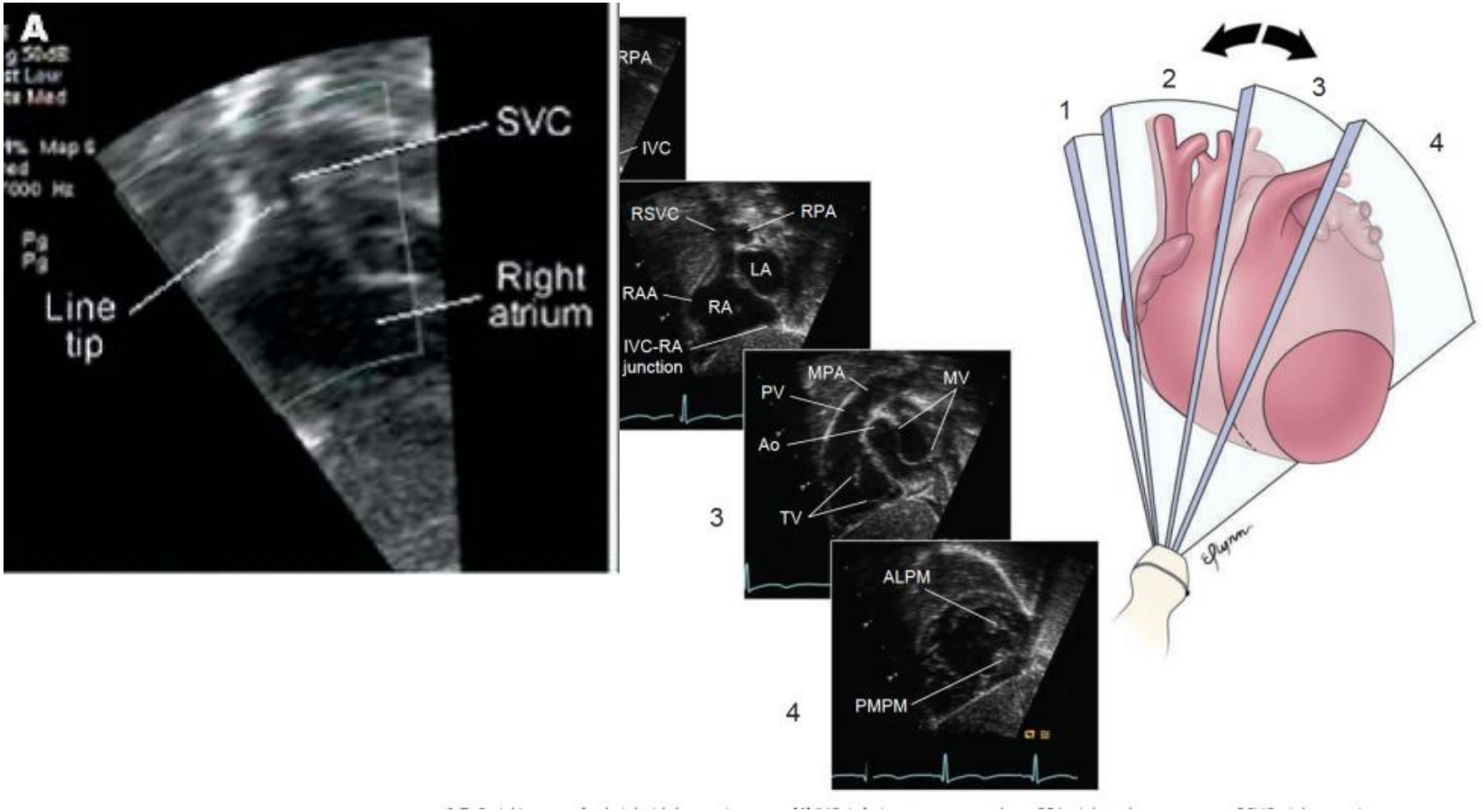

Suprasternal
Right parasternal
Subcostal
Left parasternal
Apical

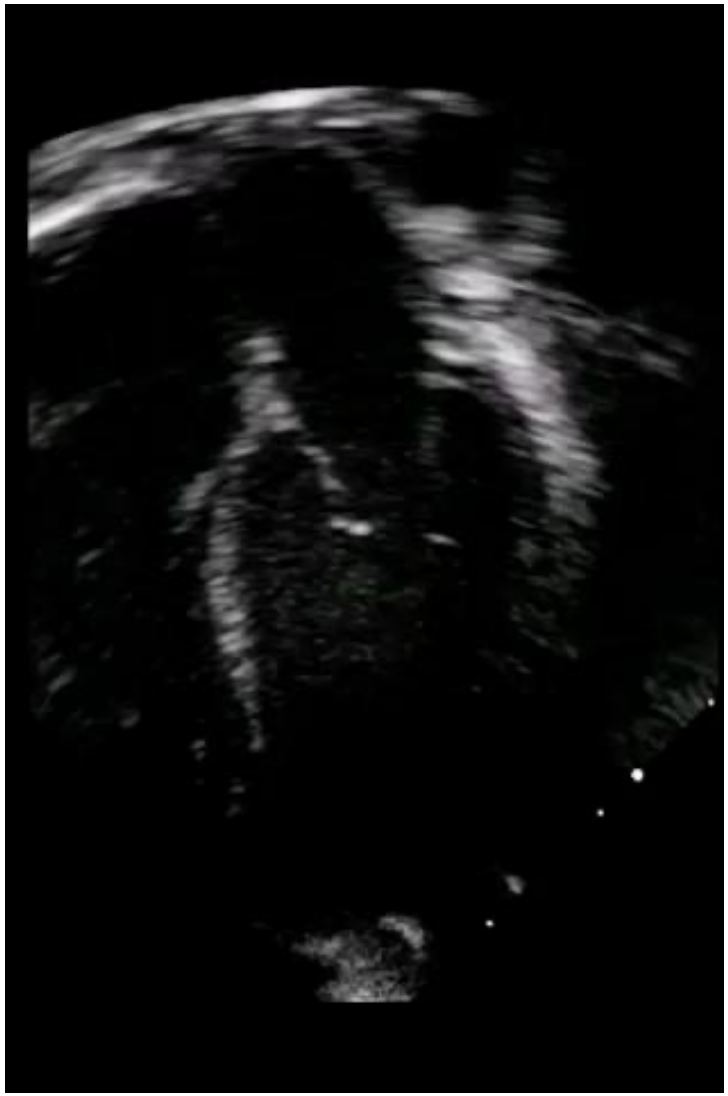

Tilt
Rotation
Angulation

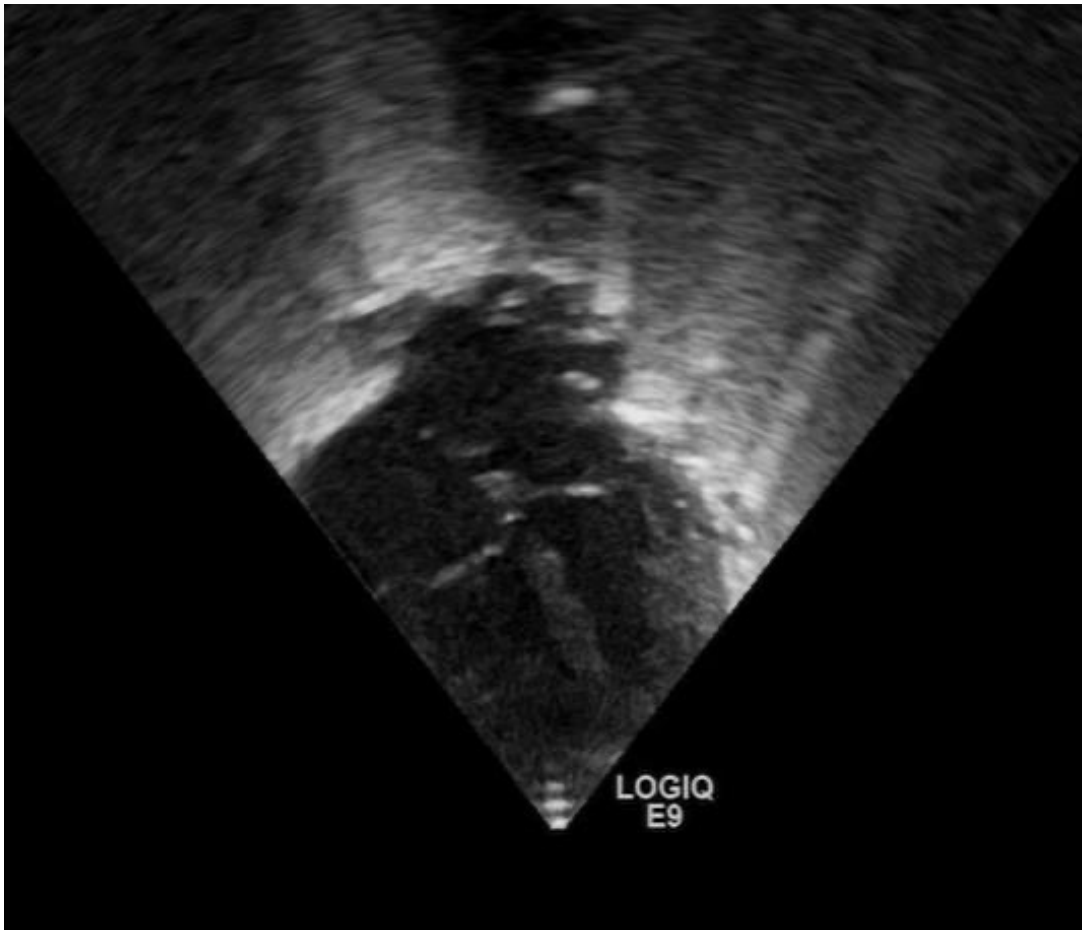



LA
SVC
RA
IVC
Eus. valve
146 bpm

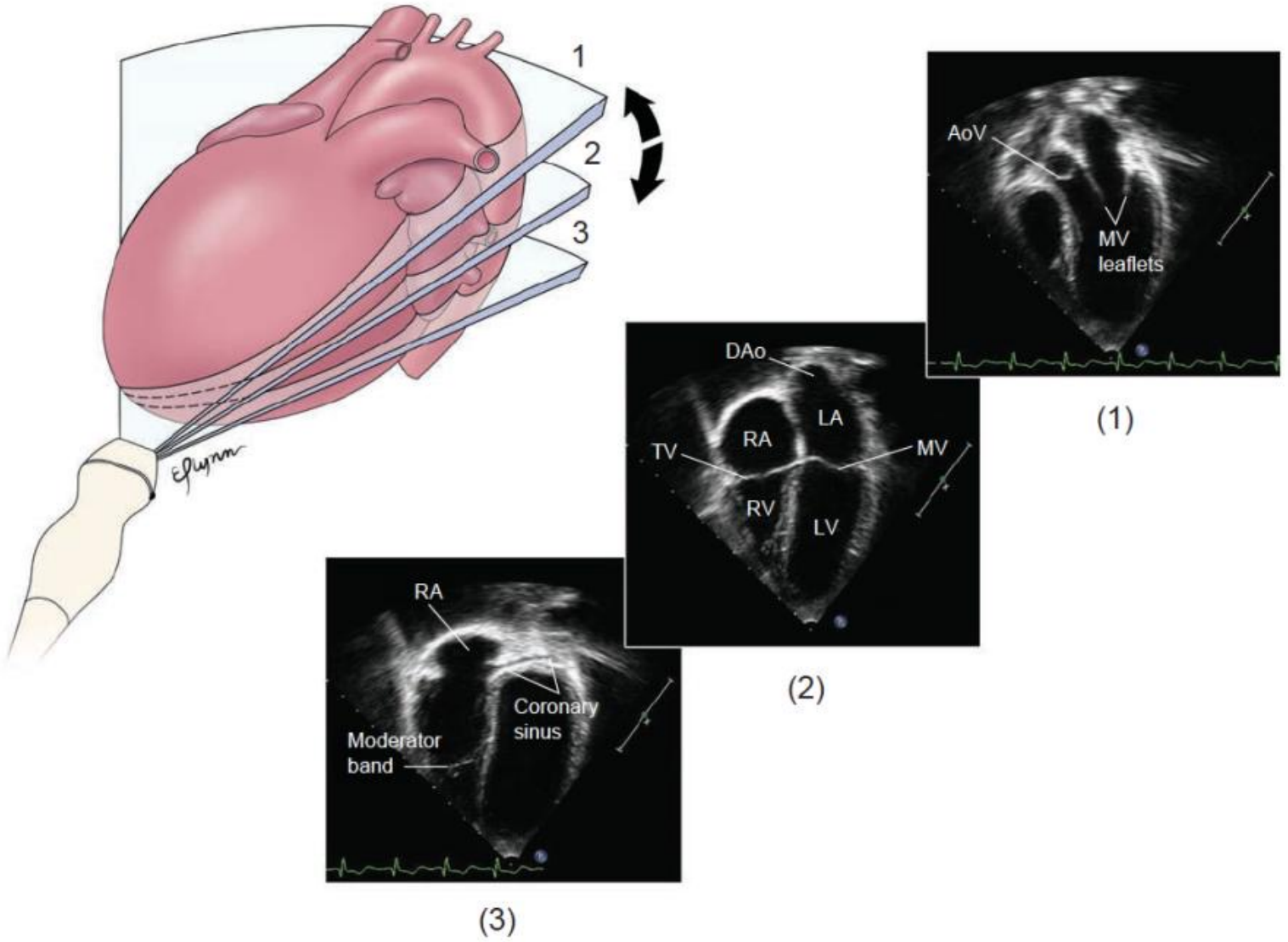
TnEcho

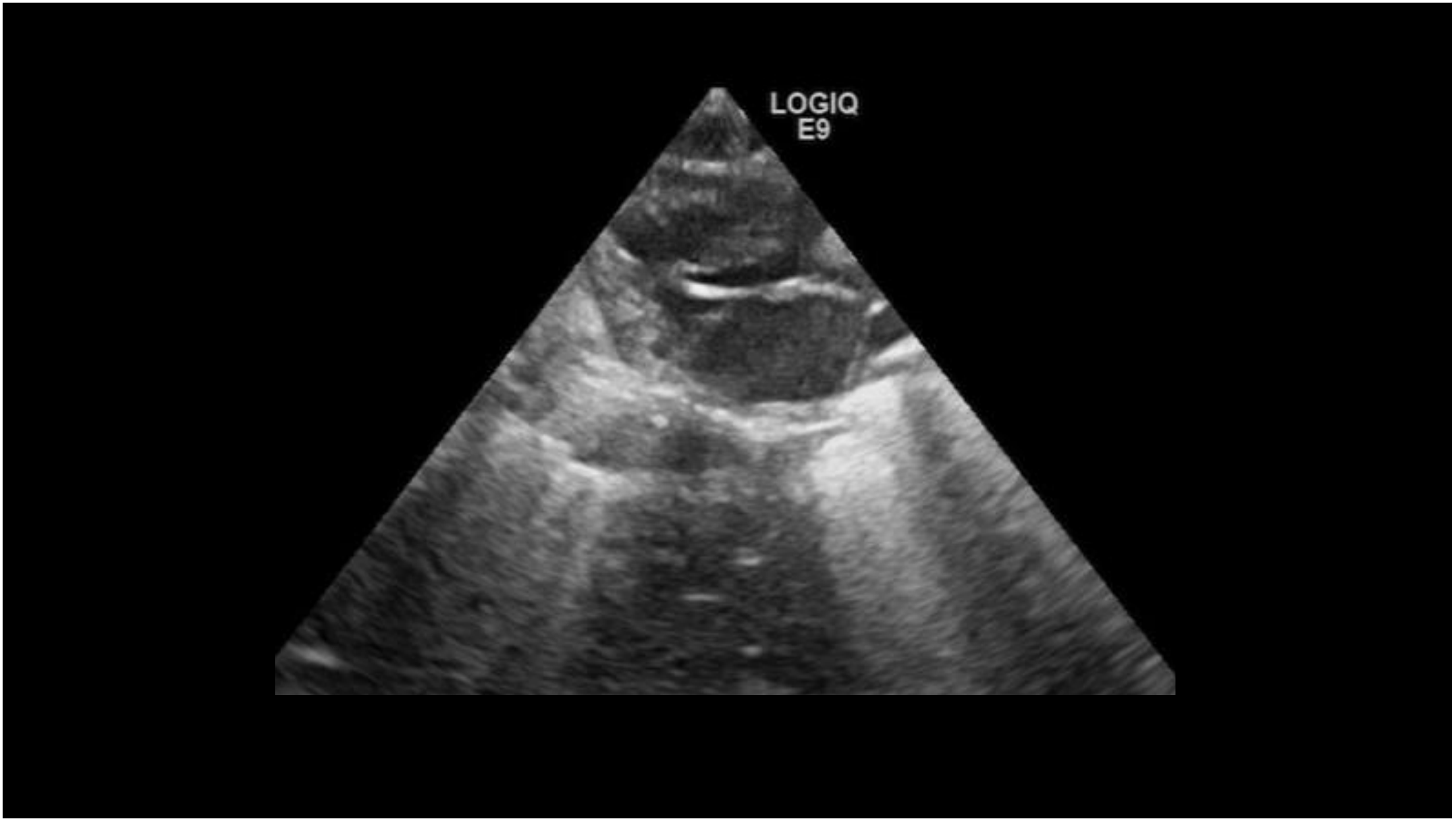

A
SVC
Right atrium
Line tip
RPA
IVC
RSVC
RPA
LA
RAA
RA
IVC-RA junction
3
MPA
MV
PV
Ao
TV
4
ALPM
PMPM
1
2
3
4




LOGIQ
E9

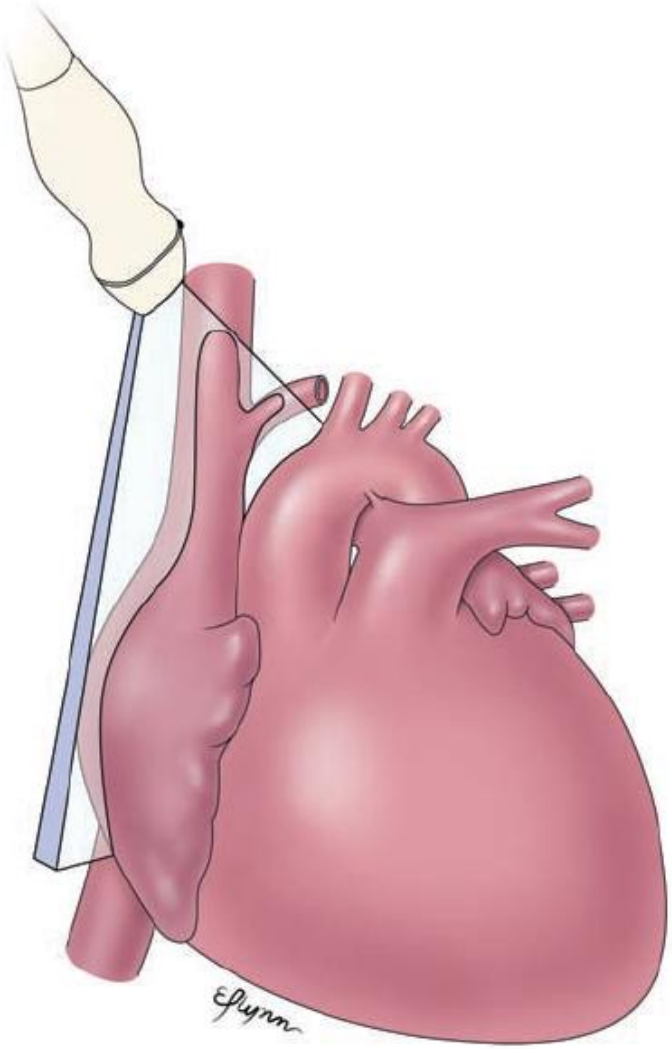
TnEcho

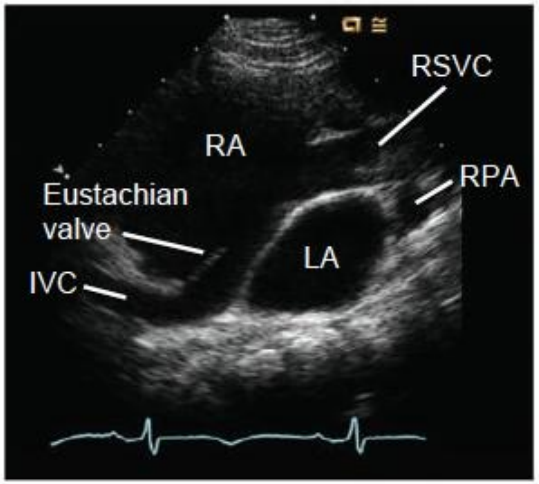

1
2
3
AoV
MV
leaflets
(1)
DAo
LA
RA
TV
MV
RV
LV
(2)
RA
Coronary
sinus
Moderator
band
(3)

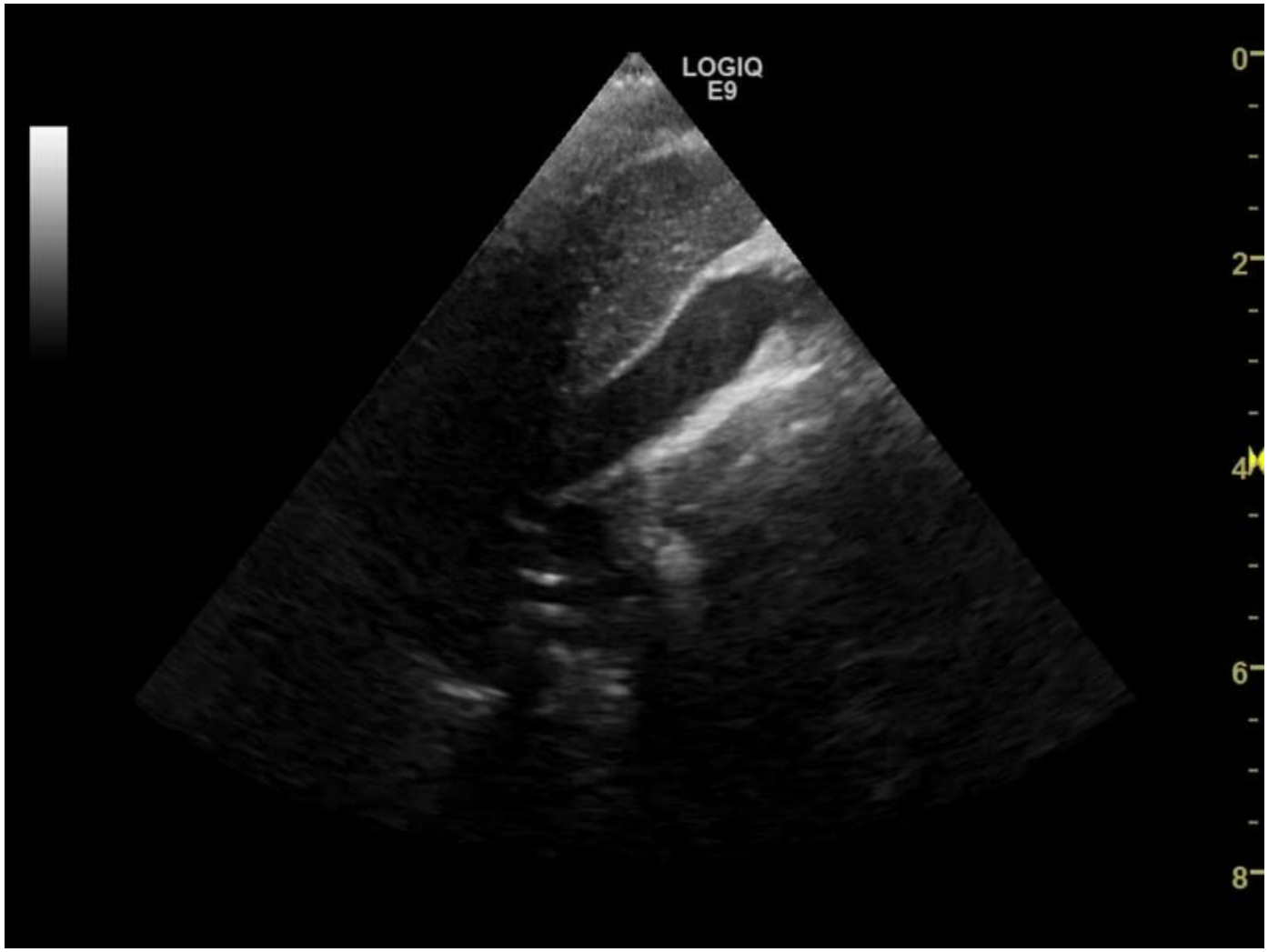

LOGIQ
E9


made with mematic

TnEcho






LOGIQ
E9
0
2
4
6
8


LOGIQ
E9
0
2
4
6
8

“Ultrasound”

Table 1 Ultrasonography during catheter insertion

	Population	*n* RTUS-guided insertions	US operator	Probe	Technique	Tips visualized by US	Average time savings with US	Average manipulations per patient prevented with US	Average XRs per patient saved with US
Brissaud et al (2010)[16]	BW: 1,305 (620–3,550) g GA: 30 (26–40) wk	36 PICCs	Pediatric intensivist	Not specified	Not specified	89%	15 min	Not reported	Not reported
Katheria et al (2013)[15]	Weight at procedure: 1,185 ± 538 g. CGA 31 ± 4 wk	20 PICCs	Neonatologists	13 MHz linear	UE: right parasternal sagittal view. LE: subcostal sagittal view. Saline or nonionic, isotonic contrast used	90%	30 min	1	1

Abbreviations: BW, birth weight; CGA, corrected gestational age; GA, gestational age; LE, lower extremity; PICC, peripherally inserted central catheter; RTUS, real-time ultrasound; SAX, short axis; UAC, umbilical artery catheter; UE, upper extremity; US, ultrasound; UVC, umbilical venous catheter; XR, radiograph.
Note: Population expressed as ranges, means ± standard deviation, and median (range).

Ultrasonography for Central Catheter Placement in the Neonatal Intensive Care Unit—A Review of Utility and Practicality. Am J Per 2015

Table 2 Ultrasonography after catheter insertion

	Population	*n*	US operator	Probe	Technique	Tips visualized by US	Clinical utility
Madar and Deshpande (1996)[17]	BW: 1,210 (640–3,530) g GA: 28 (23–40) wk	18 UACs, 3 UVCs, 19 PICCs	Not specified	7.5 MHz	Suprasternal, subcostal, and parasternal SAX views	95%	US detected two venous catheters passed through the foramen ovale which was not evident on XR
Ohki et al (2000)[7]	"Neonates"	57 PICCs	Not specified	10 and 12 MHz	Not specified	95%	US could detect 78% of cases of catheter tip dislodgement by changes in extremity position
Jain et al (2012)[6]	BW: 833 (710–1,930) g GA: 26.5 (25.4–28.8) weeks.	22 PICCs	Neonatologists	10 MHz	UE: Subcostal, parasternal LAX, high parasternal, and apical views. LE: subcostal sagittal view. Saline contrast used	100%	XR incorrectly deemed 4 of 11 malpositioned tips in good position, and 5 of 11 well-positioned tips in bad position. In nine infants, a second XR was avoided with US-guided manipulation
Tauzin et al (2013)[8]	BW: < 1,800 g Weight: ~1,130 (828–1,452) g CGA: 27–33 weeks.	109 PICCs	"US specialist"	12 MHz	Subcostal, apical, parasternal LAX, high parasternal, and abdominal parasternal views	100%	US evaluation determined 25% of PICCs extended into the heart even though deemed to be in good position by XR. 21% PICCs repositioned after US evaluation without complications

Abbreviations: BW, birth weight; CGA, corrected gestational age; GA, gestational age; LAX, long axis; LE, lower extremity; PICC, peripherally inserted central catheter; SAX, short axis; UAC, umbilical artery catheter; UE, upper extremity; US, ultrasound; UVC, umbilical venous catheter; XR, radiograph.
Note: Population expressed as ranges, means ± standard deviation, and median (range).

Pediatr Surg Int
DOI 10.1007/s00383-016-3959-1

ORIGINAL ARTICLE

Insertion of peripherally inserted central catheters in neonates less than 1.5 kg using ultrasound guidance

Kevin N. Johnson[1] · Tina Thomas[1] · Jason Grove[2] · Marcus D. Jarboe[1,2]

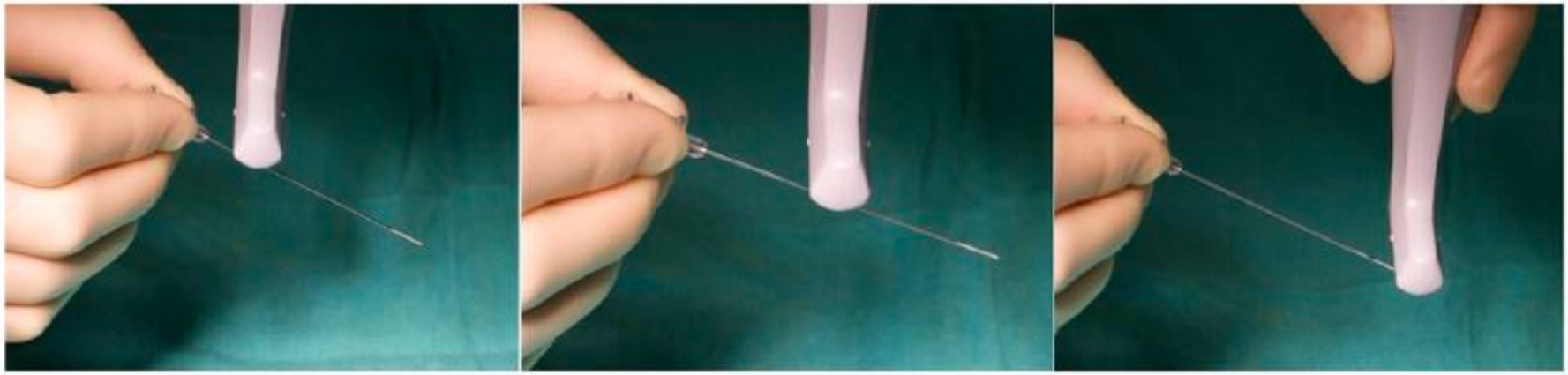
Background Neonates commonly require central access, and in those with very low or extremely low birthweight this can be challenging. Described here is a technique that uses ultrasound guidance in the placement of peripherally inserted central catheters (PICC) in neonates and an analysis of outcomes.

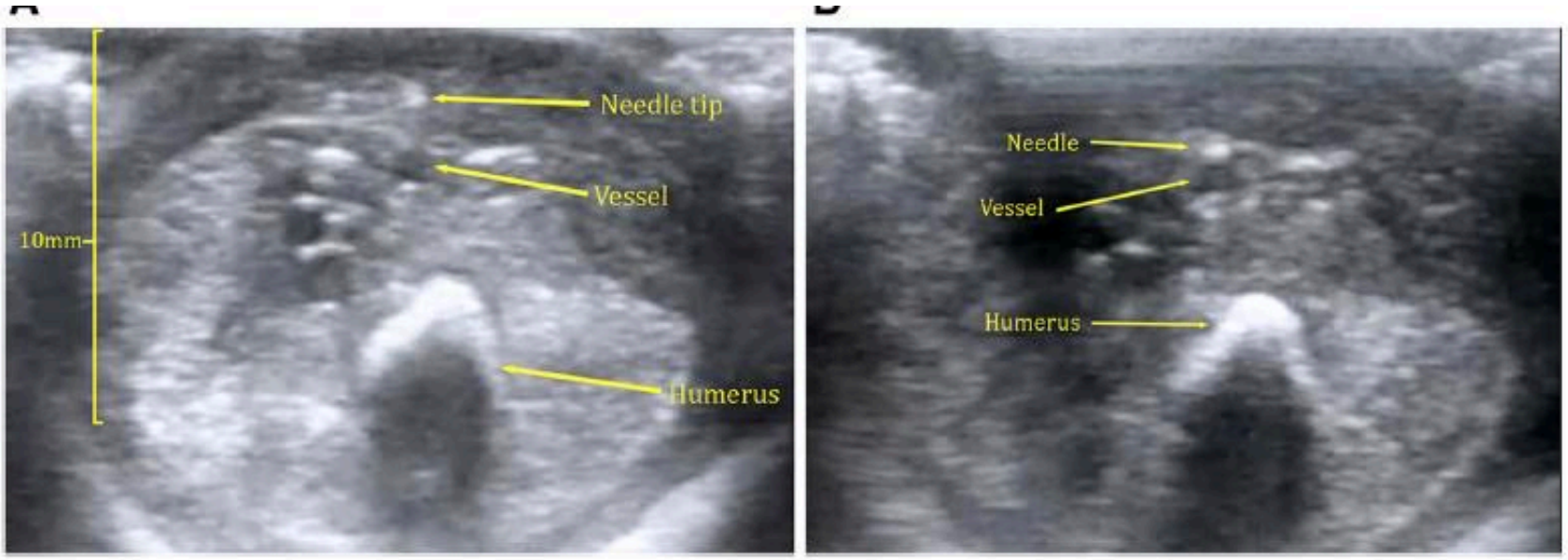
Methods A retrospective chart review was conducted of all patients below 1500 g that underwent placement of a peripherally inserted central catheter under ultrasound guidance between January 1, 2012, and December 31, 2014 at a single center. All patients had multiple previous attempts at PICC placement by experienced NICU vascular access nurses prior to referral. Complications were determined based on clinical and procedural notes.

Results A total of ten patients were found during the study period. The average estimated gestational age was 29.8 weeks (range 26–38 weeks).The average weight at the time of PICC insertion was 968 g (range 485–1390 g). All attempts at placement were successful. There were no complications directly related to PICC insertion.

Conclusion Ultrasound guided PICC line placements using ultrasound is an effective technique, which can be applied

	Mean	Range
Estimated gestational age	29.8 weeks	26–38 weeks
Weight	968 g	485–1390 g
PICC diameter	8 1.9 Fr (80 %), 2 2.6 Fr (20 %)	
Environment where placed	5 placed in OR, 5 placed at bedside	
Placement-related complications	None	
Multiple previous failed attempts	100 %	
Success rate	100 %	
Long-term complications	1 DVT, no line infections	




Needle tip
Vessel
10mm
Humerus
Needle
Vessel
Humerus

Ultrasound to guided epicutaneo-caval catheter insertion in newborn infants

Xiao-Ling Ren[1], Man Wang[1,2], Yu-Ru Wei[1,2] and Jing Liu[1*]

[1]Department of Neonatology and NICU, Beijing Chao-Yang Hospital, Capital Medical University, Beijing, China, [2]Department of Neonatology and NICU, Beijing Chao-Yang District Maternal and Child Healthcare Hospital, Beijing, China

Objective: Recently, ultrasound (US) has been increasingly used for epicutaneo-caval catheter (ECC) tip positioning; however, the selection of blood vessels for ECC still depends on the operator's subjective judgment. This study aimed to explore the value of US in decision-making regarding the great saphenous vein (GSV), tip navigation, and tip location of ECC.

Methods: Catheterization through the GSV of the lower extremity was selected. The running condition of the GSV was assessed by using US, and the angle between the GSV and the femoral vein was observed and measured. We selected the GSV with a smaller angle to the femoral vein for ECC catheterization.

Results: ECC catheterization under ultrasound guidance increased the success rate at the time of catheterization from 82.5% to 100% (increased by 17.5%) and shortened the catheterization time from 56.1 $\pm$ 5.30 min to 31.5 $\pm$ 2.58 min on average (shortened by 44%). The incidence rate of catheter-related complications decreased by 58.2% catheter days from 6.80/1,000 to 2.84/1,000.

Conclusion: ECC insertion under the guidance of US has numerous advantages, including significantly improving the success rate of one-time catheterization, shortening the time of catheterization, and reducing catheter-related complications.

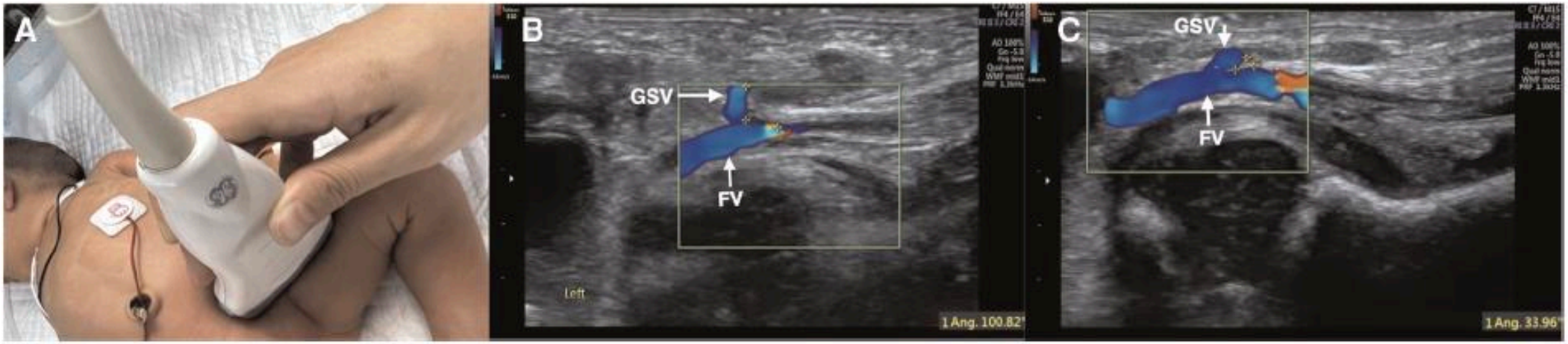


FIGURE 1
Color Doppler ultrasound measuring the angle between GSV and FV. Color Doppler ultrasound was used to assess the course conditions of bilateral GSV. The probe is placed in the groin (A). Measuring the angle between GSV and FV (B: angle = 100°; C: angle = 33.9°). The GSV on one side with a smaller angle between the two veins was selected for catheterization (C).

TABLE 3 Success rate of one-time catheterization between two groups.

Groups	Patients	Success	Success rate (%)	Increased by (%)
US-guided group	126	126	100	17.5
Non-US-guided guided	40	33	82.5	

US, ultrasound.

Original Research Article

Distal superficial femoral vein versus axillary vein central catheter placement under ultrasound guidance for neonates with difficult access: A randomized clinical trial

Yanzhe Tan[1], Lifei Liu[1], Zhenzhen Tu[1], Ying Xu[1], Jia Xie[2] and Ping Ye[1]

Abstract

Background: Epicutaneo-caval catheters (ECCs) are extensively used in premature and ill neonates. This prospective, randomized, observational study aimed to compare the outcomes of ECC placement in the distal superficial femoral and axillary veins in neonates with difficult ECC access.

Methods: In a neonatal intensive care unit at a tertiary referral center, 60 neonates with difficult ECC access were randomized into two groups with catheters placed using the ultrasound-guided modified dynamic needle tip positioning (MDNTP) technique: distal superficial femoral vein (DSFV) and axillary vein (AV) groups.

Results: The first attempt success rate was significantly higher in the DSFV group than in the AV group [23/30 (76.7%) vs 11/30 (36.7%), $p = 0.001$; odds ratio (OR), 0.176; 95% confidence interval (CI) 0.057–0.543]. The mean procedural duration was significantly shorter in the DSFV group than in the AV group [mean: 308.5 (standard deviation: 81.1) s vs 522.74 (134.8) s, $t = -7.17$, $p < 0.001$]. The incidence of complications was significantly lower in the DSFV group than in the AV group [4/30 (13.3%) vs 12/30 (40.0%), $p = 0.019$; OR, 4.333; 95% CI 1.203–15.604]. The number of attempts was significantly fewer in the DSFV group than in the AV group ($p = 0.012$).

Conclusions: The distal superficial femoral and axillary veins are two alternative and safe access points for ECC placement in premature neonates (weight < 2.5 kg) with difficult access. However, access through the distal superficial femoral vein was quicker, easier, and had fewer complications than through the axillary vein.

Original Research Article

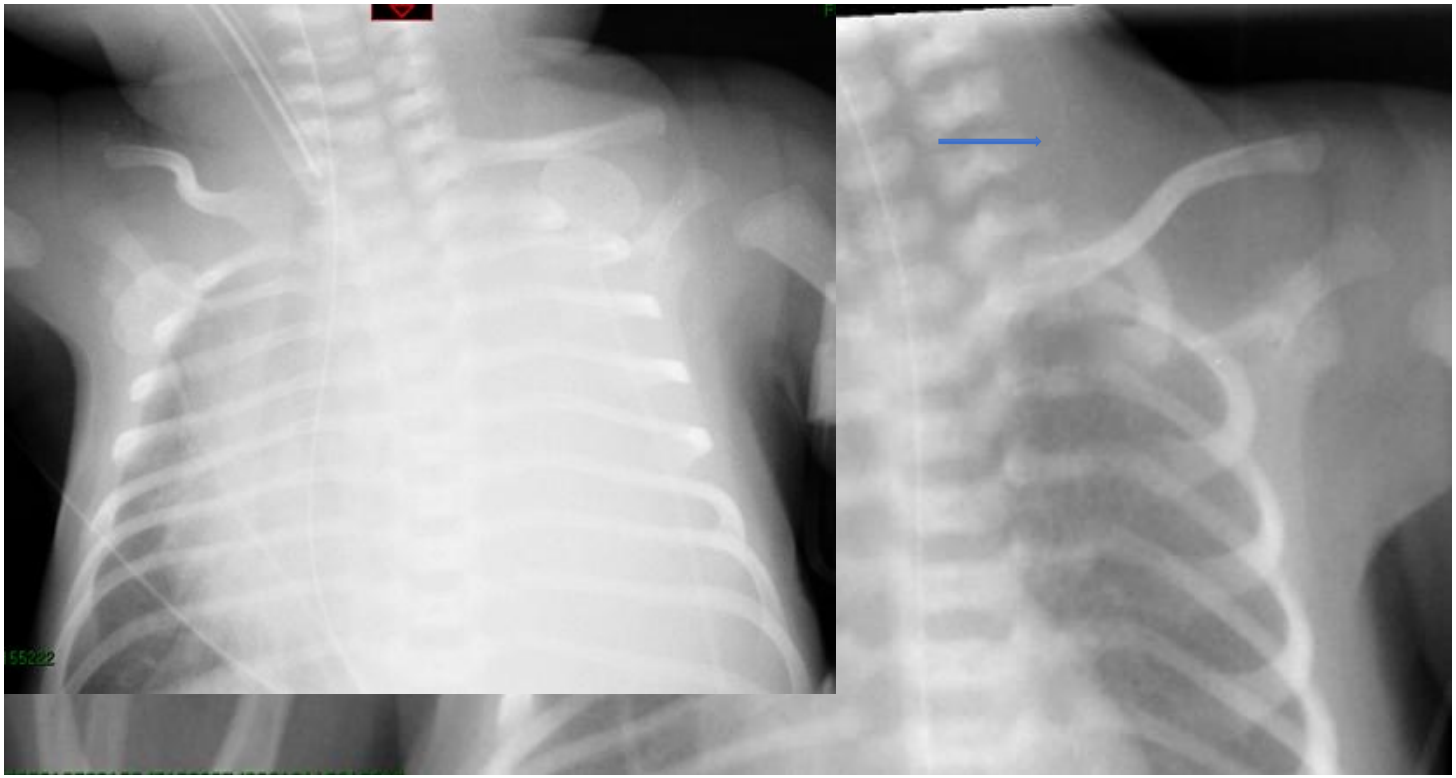
Distal superficial femoral vein versus axillary vein central catheter placement under ultrasound guidance for neonates with difficult access: A randomized clinical trial

Yanzhe Tan[1], Lifei Liu[1], Zhenzhen Tu[1], Ying Xu[1], Jia Xie[2] and Ping Ye[1]

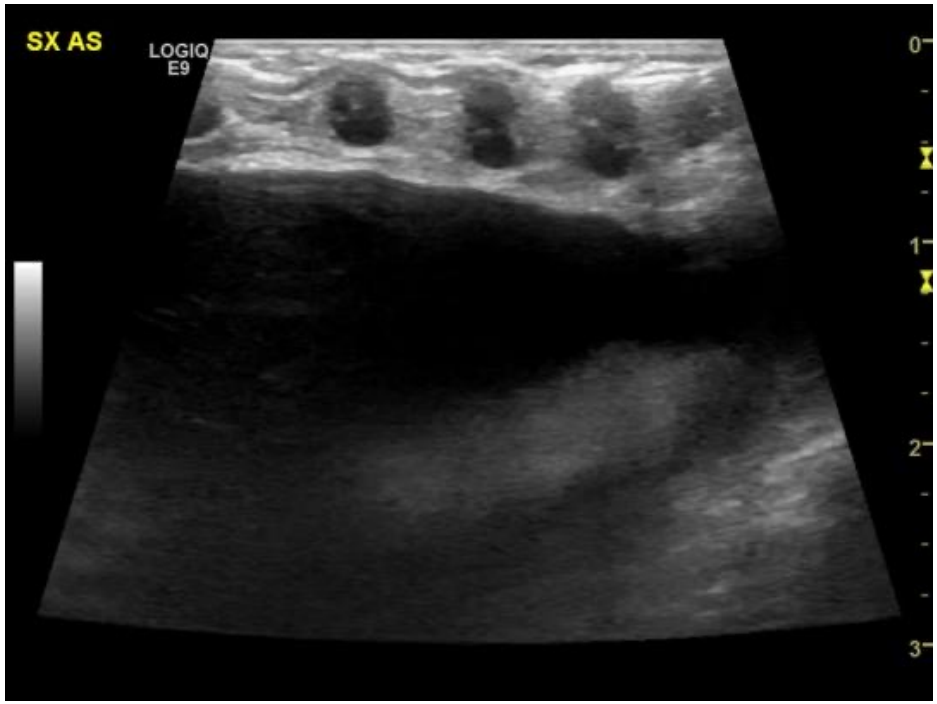
	DSFV group ($n=30$)	AV group ($n=30$)	Statistic	Statistic	p Value
Sex					
Male, *n* (%)	15 (50%)	17 (56.7%)	χ^2	0.2679*	0.6048
Female, *n* (%)	15 (50%)	13 (43.3%)			
Gestational age (weeks)					
Mean (SD)	32.3 (1.9)	32.7 (2.3)	T	−0.88†	0.3813
Minimum–maximum	28.7–36.3	28.6–36.6			
Age at insertion time (days)					
Mean (SD)	15.6 (6.9)	16 (6.1)	T	−0.22†	0.8291
Minimum–maximum	2–27	4–28			
Weight (kg)					
Mean (SD)	1.6 (0.5)	1.6 (0.5)	T	−0.05†	0.9571
Minimum–maximum	0.8–2.4	0.9–2.4			
Vein diameter (mm)					
Median (Q1–Q3)	1.05 (0.9–1.2)	1.1 (1–1.2)	Z	−0.6165#	0.5376
Minimum–Maximum	0.8–1.3	0.8–1.3			
Venous depth (mm)					
Median (Q1–Q3)	6.5 (6–7)	2.1 (1.9–2.2)	Z	6.6594#	<0.0001
Minimum–maximum	5.1–7.9	1.7–2.3			

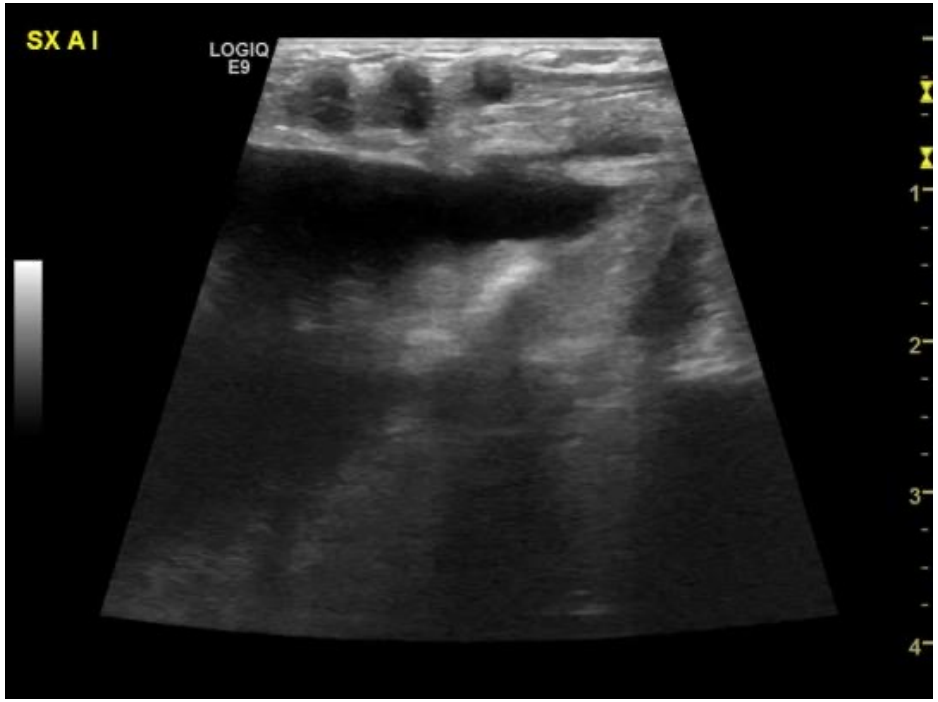

重庆医科大学附属儿童医院
04/29/20 02:24:16PM
ADM 02
MI 0.8
TIs 0.1
L10-22
picc
FR 24
AO% 100
CHI
Frq 22.0
Gn 37
S/A 3/3
Map F/1
D 1.5
DR 63
0.5
1.0
1.5
ARTERIA FEMORALIS
DISTAL SUPERFICIAL FEMORAL VEIN

US e complicanze…caso 1

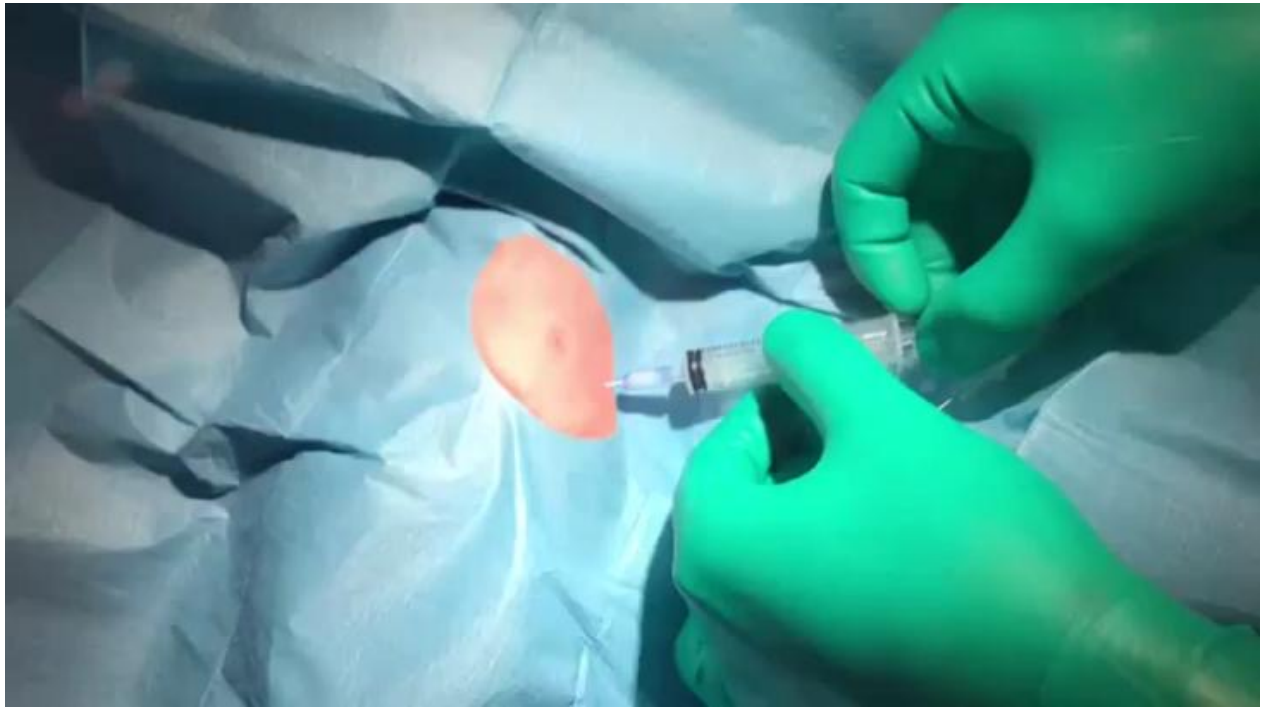


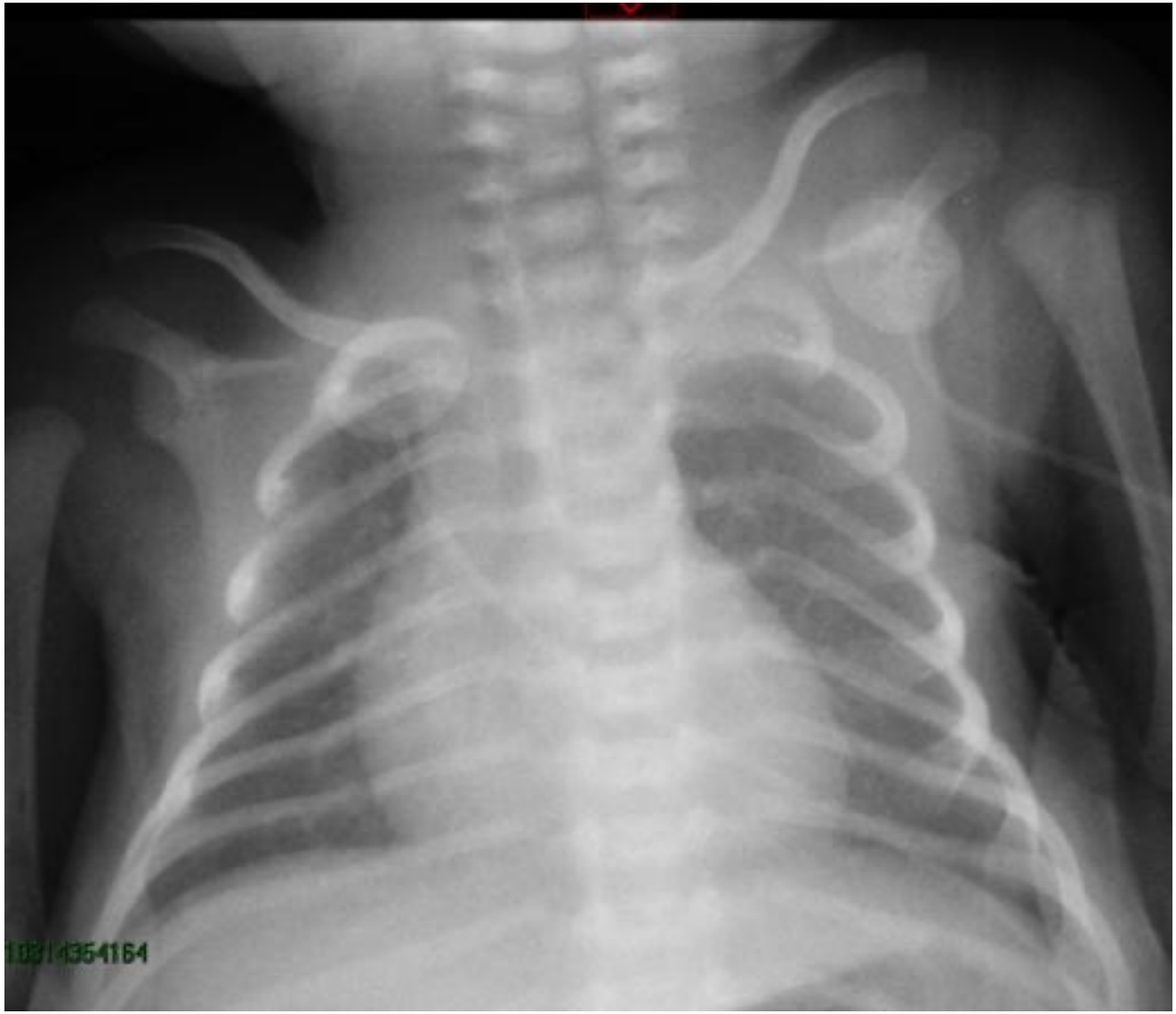
US e complicanze…caso 1



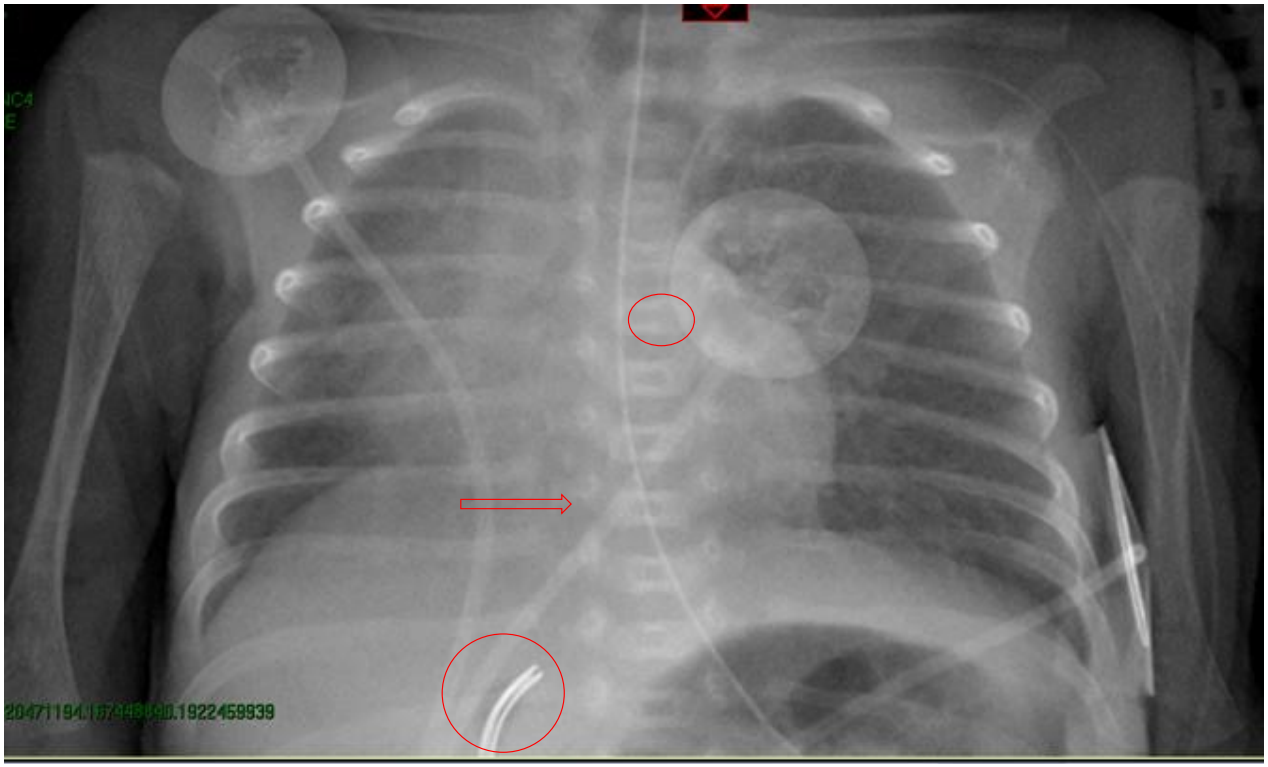

SX A I
LOGIQ
E9
1
2
3
4

US e complicanze…caso 1





US e complicanze…caso 2

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LOGIQ
E9


LOGIQ
E9

THM

- Uso globale dell' ecografo
- Protocollo ecografico standardizzato
- Abbandonare la radiologia tradizionale


рахмат
danke
謝謝
ngiyabonga
spas
teşekkür ederim
Баярлалаа
mersi
kia ora
barka
welalin
tack
mahalo
tapadh leat
спасибо
faafetai lava
vinaka
спасибі
blagodaram
dank je
misaotra
matondo
paldies
grazzi
thank you
gracias
nanni
nandri
kiitos
dankie
dhanyavad
maururu
köszönöm
aciü
хвала
asante
manana
bedankt
bayarlalaa
gràçie
hvala
dankon
akun
obrigada
tenki
murakoze
enkosi
djiere dieuf
tau
mochchakkeram
дякую
mamnun
dziękuję
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gratias ago
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go raibh maith agat
chokrane
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obrigado
mèsi
didi madloba
ありがとう
tanemirt
grazie
arigatô
takk
dakujem
trugarez
najis tuke
terima kasih
rahmet
kam sah hamnida
rahmat
ευχαριστώ
diolch
dhanyavadagalu
shukriya
mercê
мерси
তোমাকে ধন্যবাদ
감사합니다
xièxie
merci