



Il protocollo ISAC-Ped per l'inserimento di PICC, CICC e FICC

Maria Giuseppina Annetta

***Insertion bundle* - definizione**

- Poche e chiare raccomandazioni basate su evidenze scientifiche, capaci di agire sinergicamente per fornire massima sicurezza, efficacia ed economicità di una determinata procedura

Insertion bundle - obiettivo

- **Ridurre al minimo le complicanze correlate al posizionamento di un catetere venoso centrale:**
 - **PICC - CICC - FICC**
 - Complicanze legate alla venipuntura: fallimento della puntura, punture ripetute, danno nervoso, puntura arteriosa
 - Malposizionamenti primari
 - Aritmie
 - Trombosi venose catetere-correlata
 - Infezioni catetere-correlate
 - Dislocazione

PICC

Editorial

JVA | The Journal of
Vascular Access

The SIP protocol update: Eight strategies, incorporating Rapid Peripheral Vein Assessment (RaPeVA), to minimize complications associated with peripherally inserted central catheter insertion

Fabrizio Brescia¹ , Mauro Pittiruti² ,
Timothy R Spencer³  and Robert B Dawson⁴

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Editorial

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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

CICC

Editorial

JVA | The Journal of
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The SIF protocol: A seven-step strategy to minimize complications potentially related to the insertion of femorally inserted central catheters

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

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FICC

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

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**Mauro Pittiruti¹ , Davide Celentano², Giovanni Barone³ ,
Vito D'Andrea⁴ , Maria Giuseppina Annetta⁵ and Giorgio Conti²**

ISAC-Ped

Impianto Sicuro dell'Accesso Centrale Pediatrico

Si applica a tutti i CVC inseriti in vene profonde (CICC, PICC, FICC): in pratica, a tutti gli accessi centrali ecoguidati del bambino e del neonato, con la sola esclusione di ECC e CVO

ISAC-Ped

1. Scelta ragionata della vena mediante esame ecografico sistematico (RaCeVA – RaPeVA - RaFeVA)
2. Tecnica asettica appropriata: igiene delle mani, massime protezioni di barriera e antisepsi cutanea con clorexidina 2% in IPA 70%
3. Utilizzo dell'ecografo per la venipuntura ecoguidata della vena prescelta e per il successivo controllo ecografico della assenza di pneumotorace o di altre complicanze legate alla inserzione
4. Verifica intra-procedurale della posizione centrale della punta mediante la tecnica dell'ECG intracavitario e/o mediante ecocardiografia
5. Tunnellizzazione del catetere per ottenere l'exit site in posizione ottimale
6. Protezione del sito di emergenza mediante colla in cianoacrilato
7. Stabilizzazione del catetere mediante 'sutureless device' e membrana trasparente semipermeabile.

La filosofia che sta dietro all'ISAC-Ped (1)

- **Abbandono della fluoroscopia**
- **Abbandono della venolisi**
- **Abbandono della puntura alla cieca**
- **Abbandono del controllo radiologico**
- **Abbandono dei punti di sutura**

La filosofia che sta dietro all'ISAC-Ped (2)

- **Uso globale dell'ecografo**
 - Scelta della vena
 - Puntura ecoguidata
 - Esclusione complicanze immediate
 - Tip navigation
 - Tip location
 - Esclusione complicanze tardive non infettive
- **Uso dell'ECG intracavitario**
- **Importanza cruciale dell'exit site**

1) Scelta ragionata della vena mediante esame ecografico sistematico (RaCeVA-RaPeVA-RaFeVA)

ISAC Ped

Vantaggio della scelta ragionata della vena mediante esame ecografico sistematico

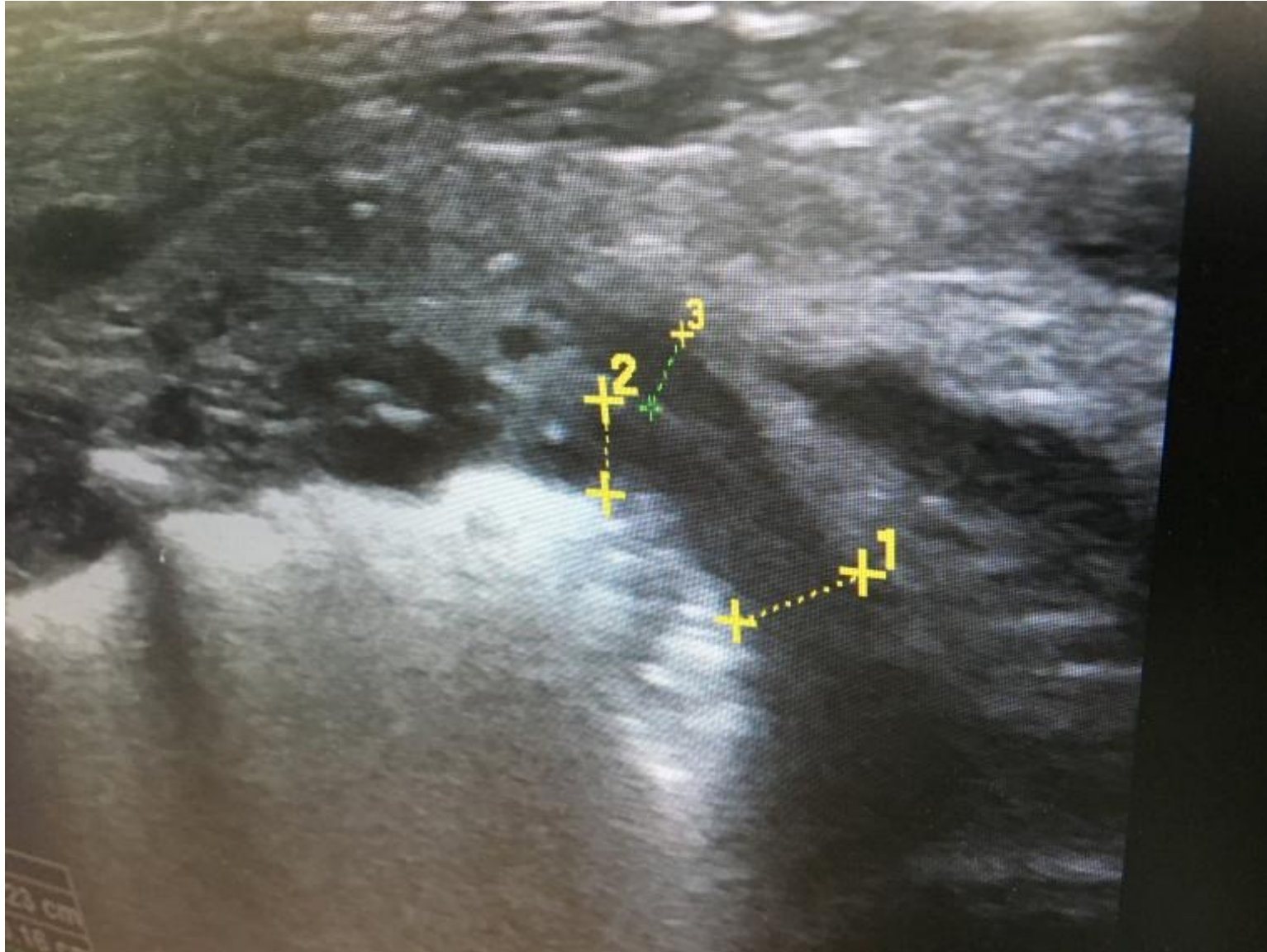
Scelta della vena migliore (più facile, più sicura)
e di calibro adeguato al catetere:

- Riduzione del rischio di insuccessi e complicanze
- Riduzione del rischio trombotico

Scopo di RaCeVA-RaPeVA-RaFeVA

- Escludere situazioni patologiche
 - Trombosi
 - Variazioni anatomiche
- Valutare le vene più adatte per la venipuntura
 - calibro
 - profondità
 - collapsabilità
 - vicinanza con strutture 'da evitare'

Misurare le vene !



Calibro della vena

Il diametro esterno del catetere deve essere $\frac{1}{3}$ del diametro interno della vena

Per cateteri 3Fr: vene di 3mm o più

Per cateteri 4Fr: vene di 4mm o più

Per cateteri 5Fr: vene di 5mm o più

.....

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

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^aNeonatal Intensive Care Unit, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy; ^bDepartment of Surgery, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy

Table 1. Measurements of the diameters of the most relevant deep veins in the 5 weight groups

Vein	Whole cohort (<i>n</i> = 100)	500–1,000 g (<i>n</i> = 20)	1,001–1,500 g (<i>n</i> = 20)	1,501–2,000 g (<i>n</i> = 20)	2,001–2,500 g (<i>n</i> = 20)	2,501–3,000 g (<i>n</i> = 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
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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 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
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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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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
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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 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
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Caliber of the deep veins of the arm in infants and neonates: The VEEIN study (Vascular Echography Evaluation in Infants and Neonates)

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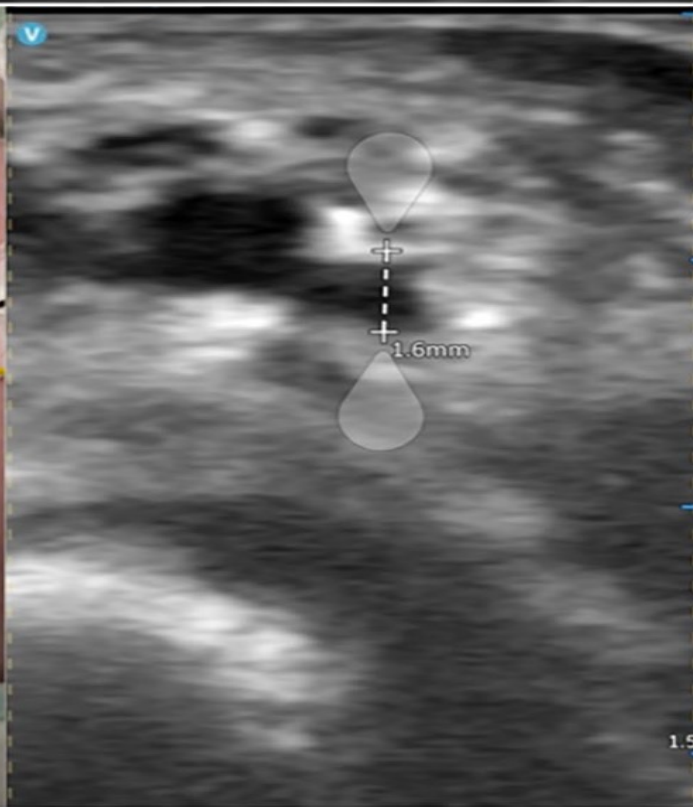
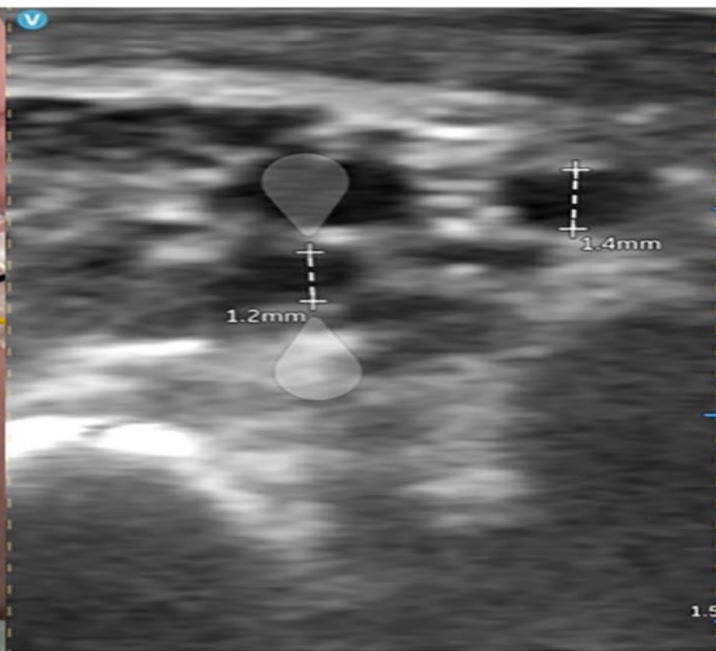


Table 1. Patients included in the study.

	Group 1	Group 2	Group 3	Group 4	Group 5
	2.5–4 kg	4.1–7 kg	7.1–10 kg	10.1–15 kg	15.1–20 kg
Number	51	49	52	50	50
Males/females	38/13	24/25	35/17	38/12	29/21
Age, median (range)	0.56 months (1 day–4.6 months)	3.6 months (0.49–14.8)	16 months (0.2–34.5)	2.6 years (0.62–8.3)	4.8 years (2.7–9.8)
Weight, median (range)	3 kg (2.5–4)	5.6 kg (4.1–7)	10 kg (8–10)	13.2 kg (10.2–15)	18.5 kg (15.3–20)
Height, median (range)	49 cm (36–54)	60 cm (43–74)	82 cm (62–100)	93 cm (79–120)	110 cm (70–140)

Table 4. Veins with internal diameters >3 mm in the different groups of children.

	Brachial vein (scan 1)		Basilic vein (scan 1)		Cephalic vein (scan 1)		Axillary vein (scan 2)	
	Right	Left	Right	Left	Right	Left	Right	Left
Group 1 ($n=51$)	–	–	–	–	–	–	3 (5.8%)	2 (3.9%)
Group 2 ($n=49$)	–	–	–	–	–	–	15 (30.6%)	14 (28.5%)
Group 3 ($n=52$)	–	–	7 (13.4%)	4 (7.6%)	–	–	35 (67%)	35 (67%)
Group 4 ($n=50$)	–	–	13 (26%)	14 (28%)	–	–	41 (82%)	41 (82%)
Group 5 ($n=50$)	4 (8%)	8 (16%)	27 (54%)	27 (54%)	5 (10%)	3 (6%)	47 (94%)	47 (94%)

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

Timothy R Spencer¹ and Mauro Pittiruti²

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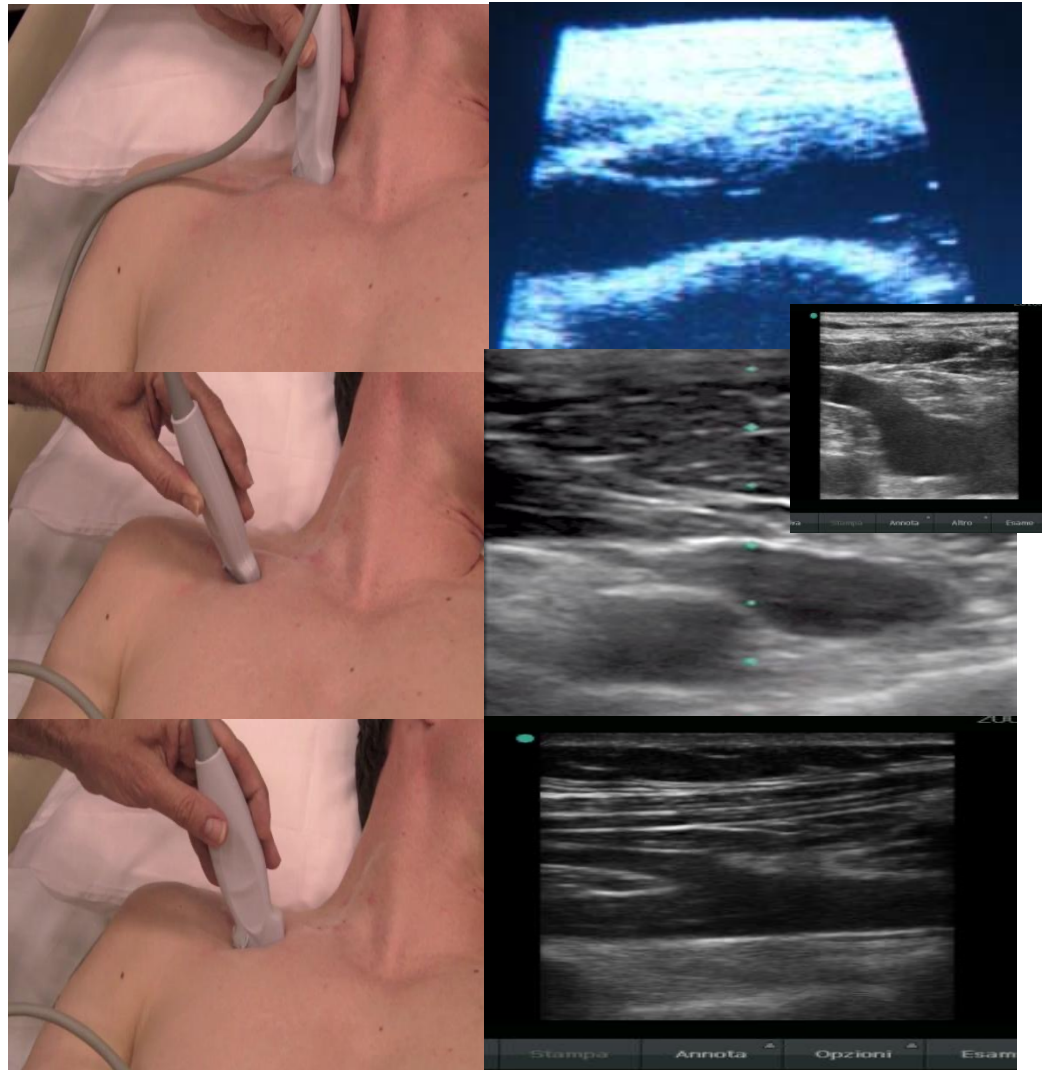
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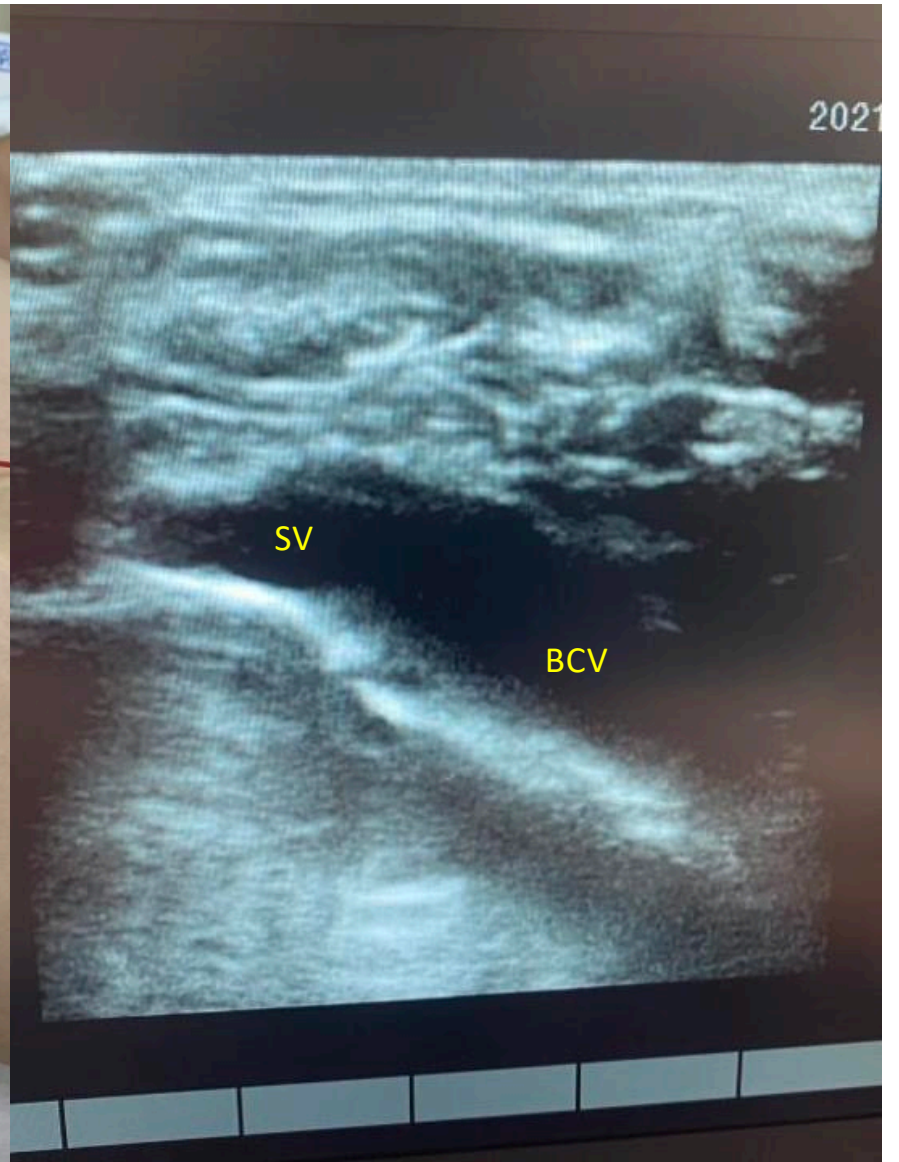
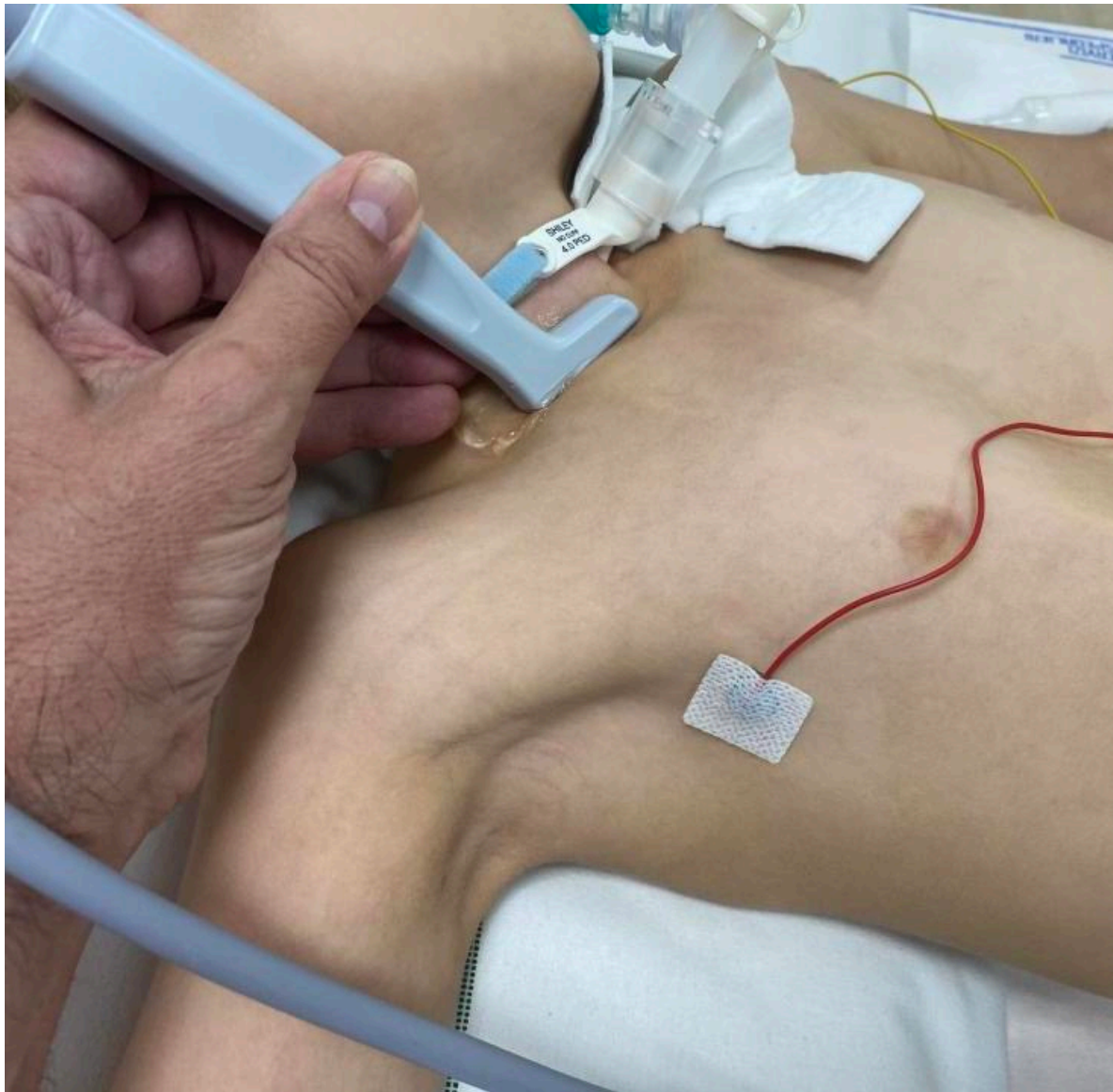
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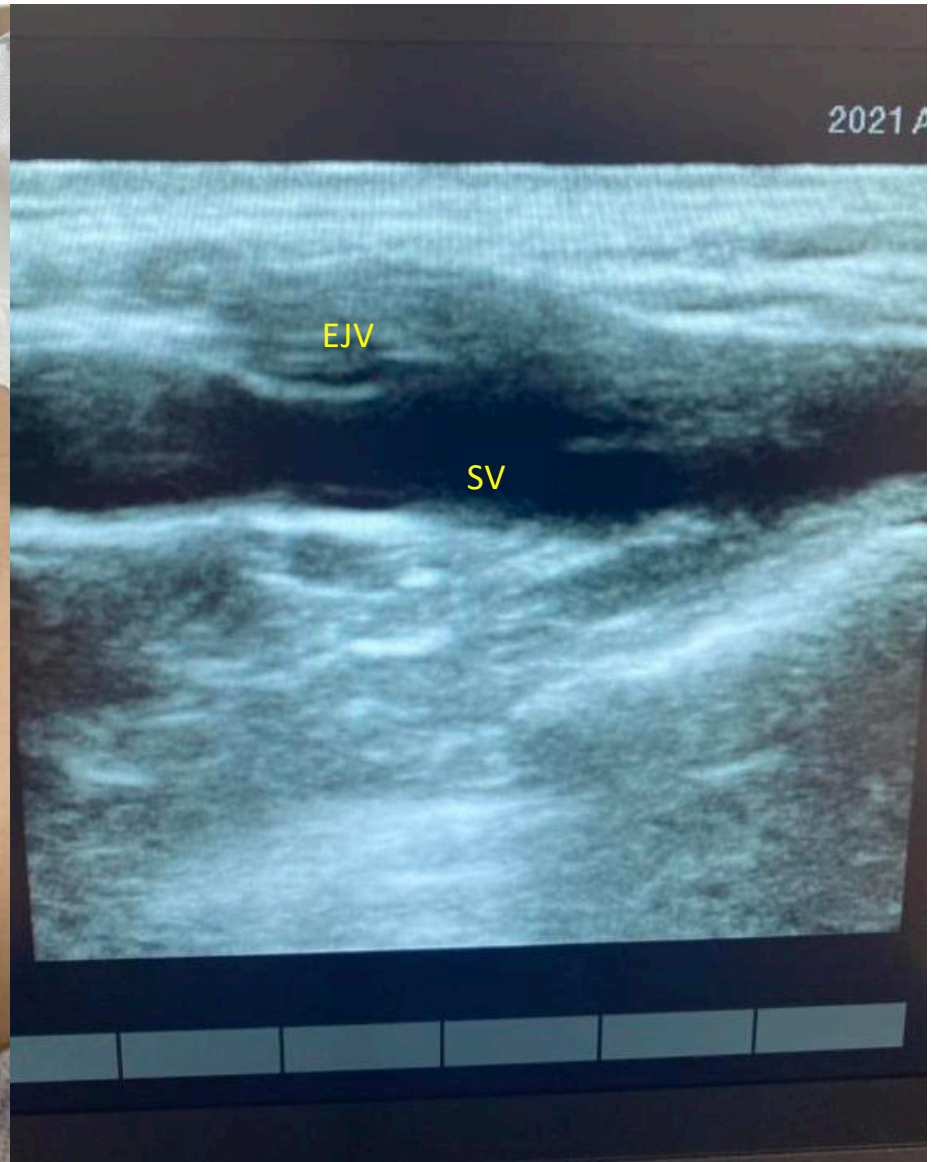
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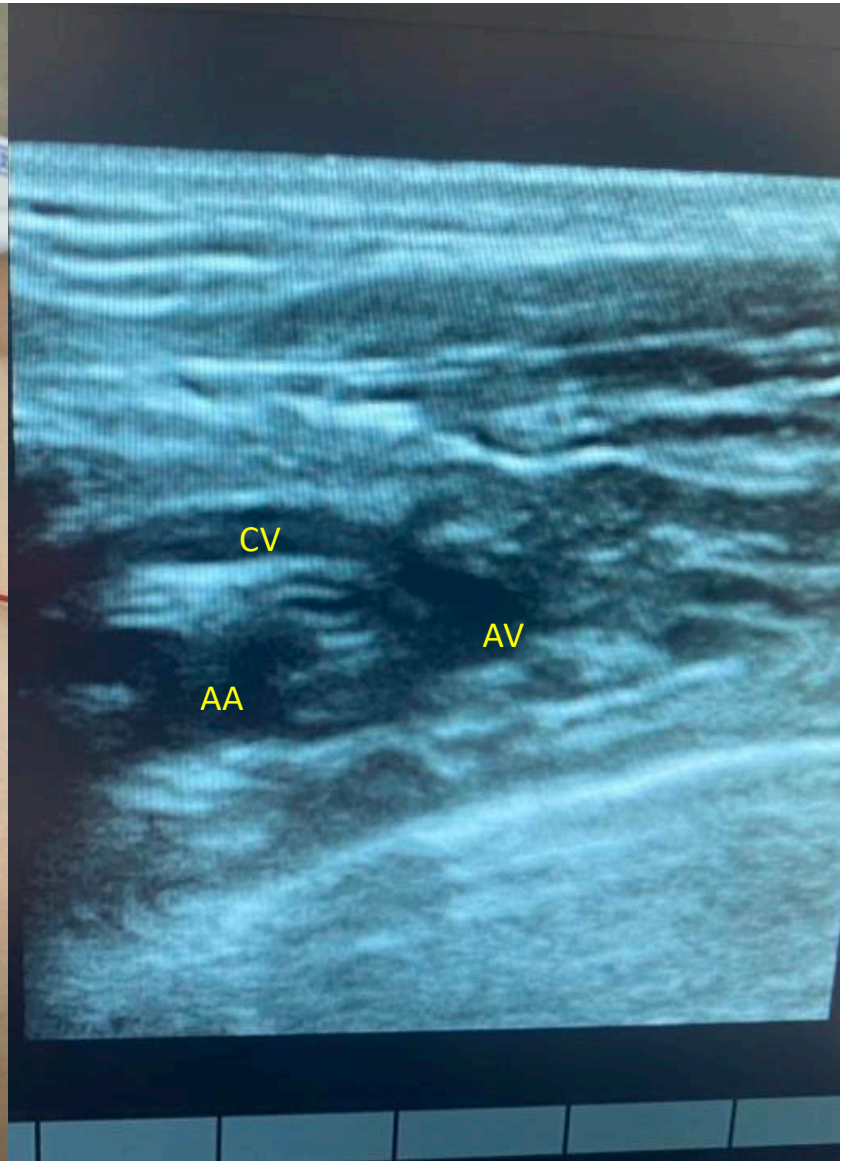




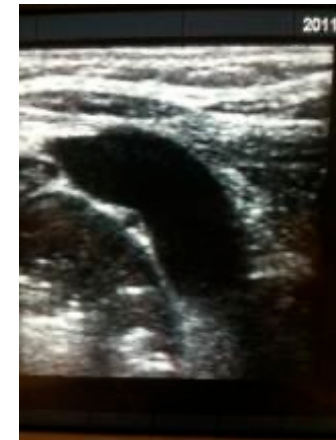








RaCeVA – Rapid Central Vein Assessment



Vena anonima Con tunnellizzazione



CICC

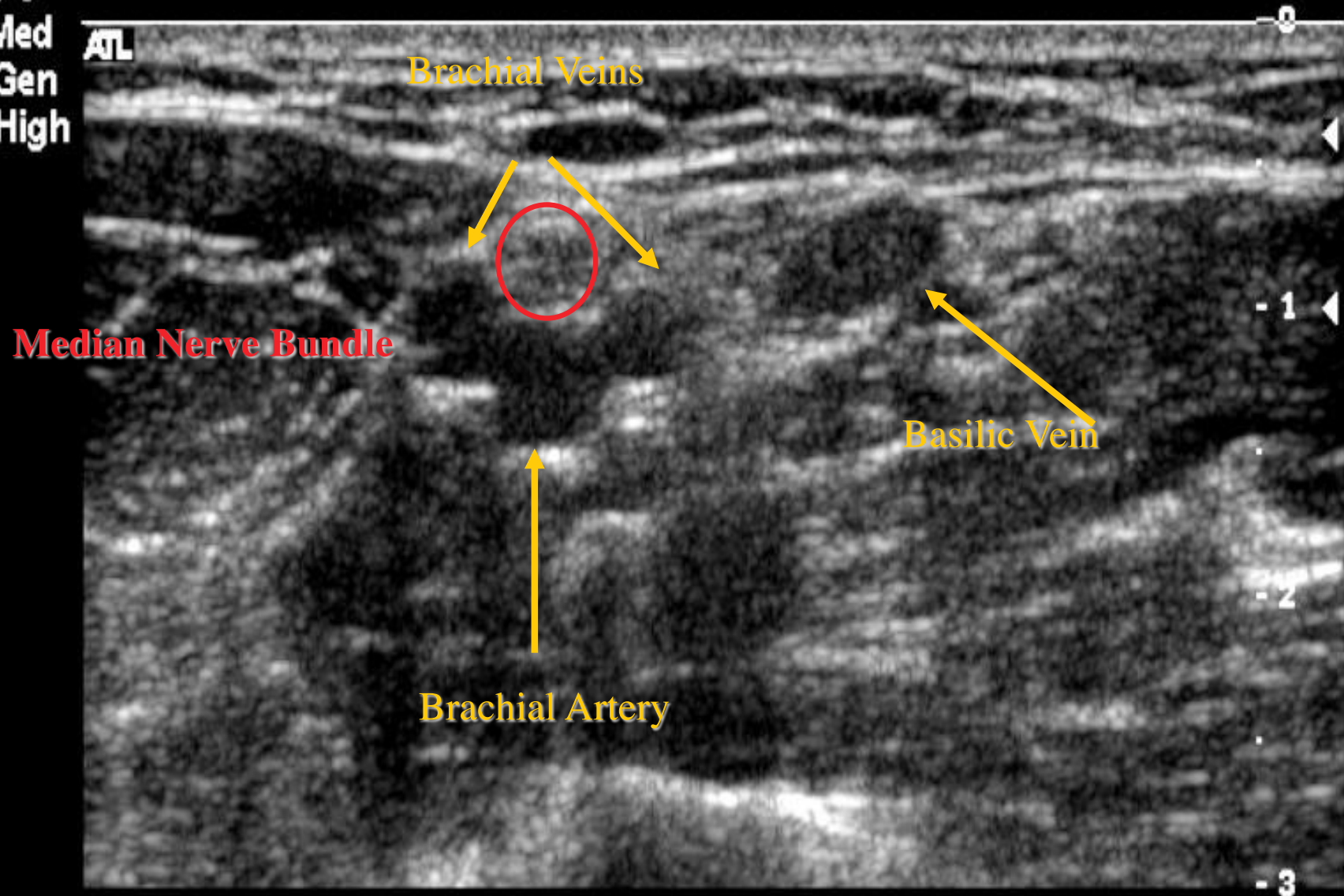


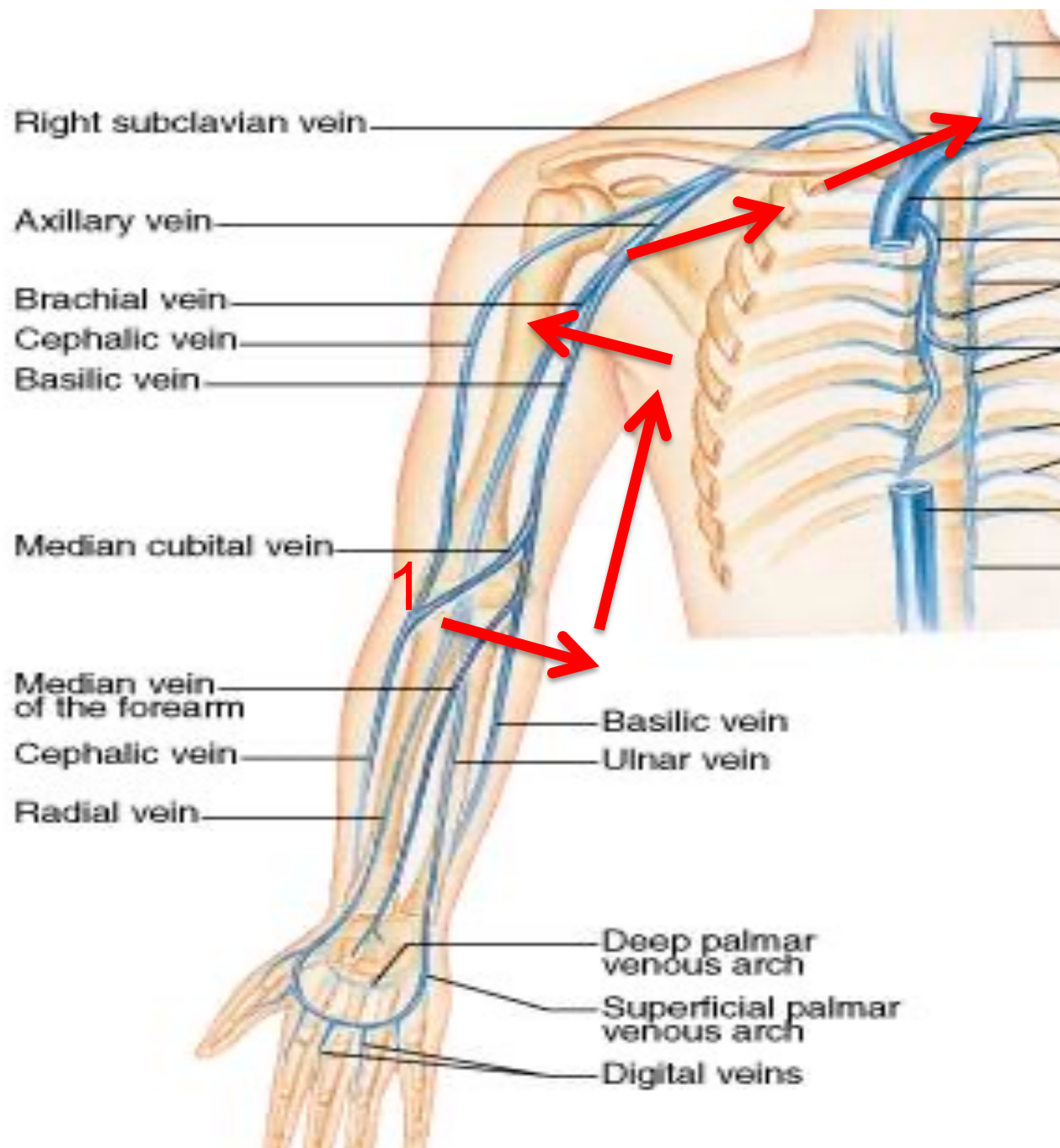
RaPeVA

Studio delle vene profonde del braccio
secondo un protocollo preciso:

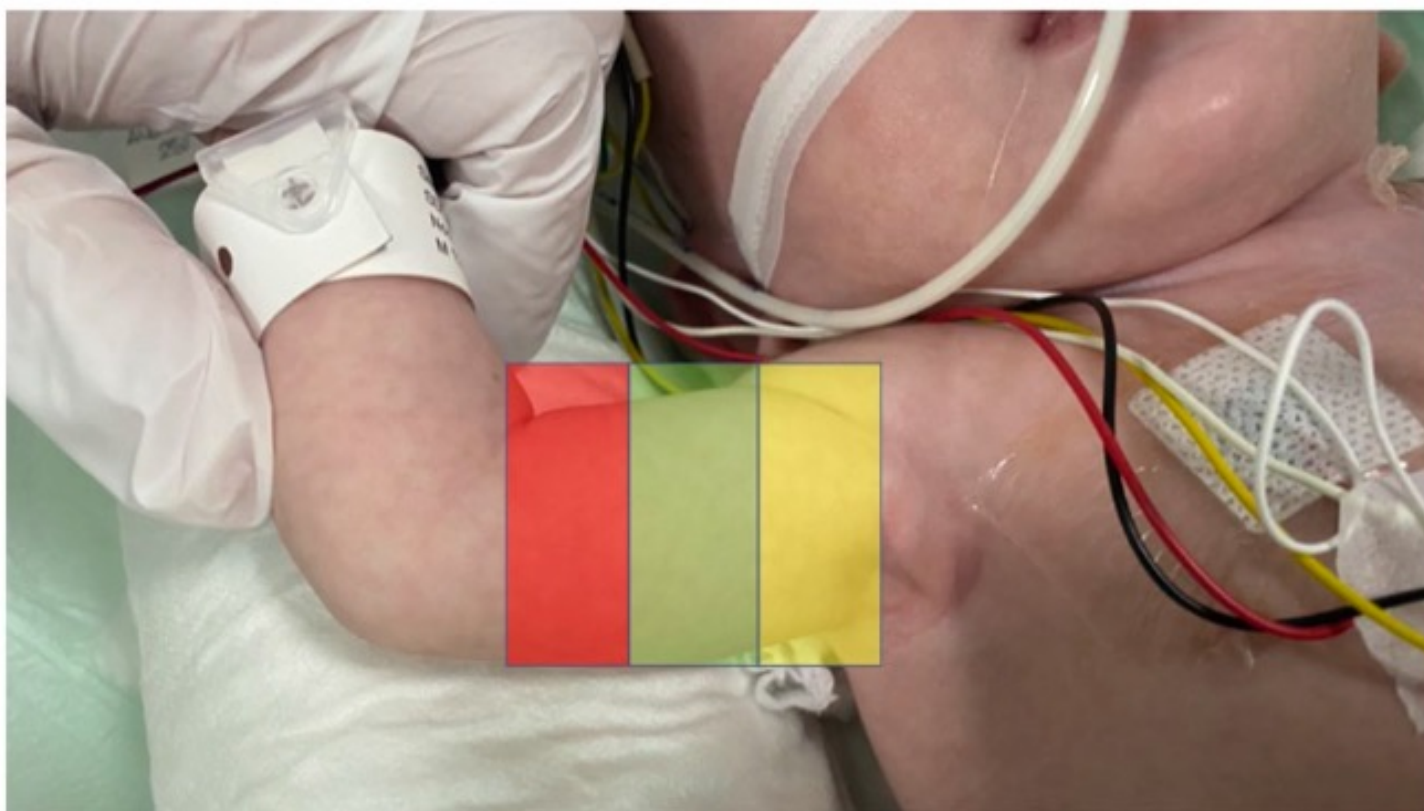
Rapid Peripheral Vein Assessment

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





RaPeVA





Vena basilica destra
Senza tunnellizzazione

V.Basilica/ascellare



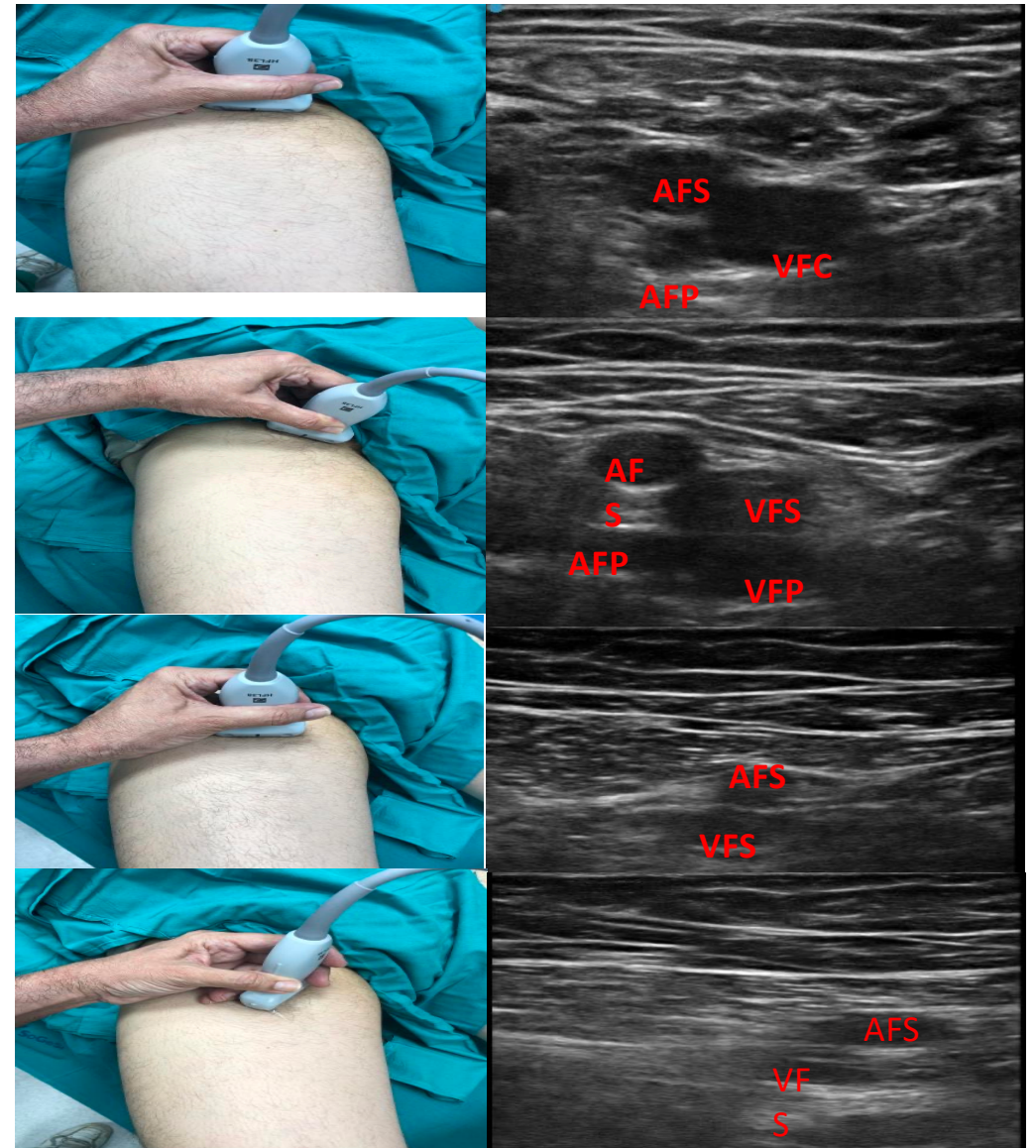
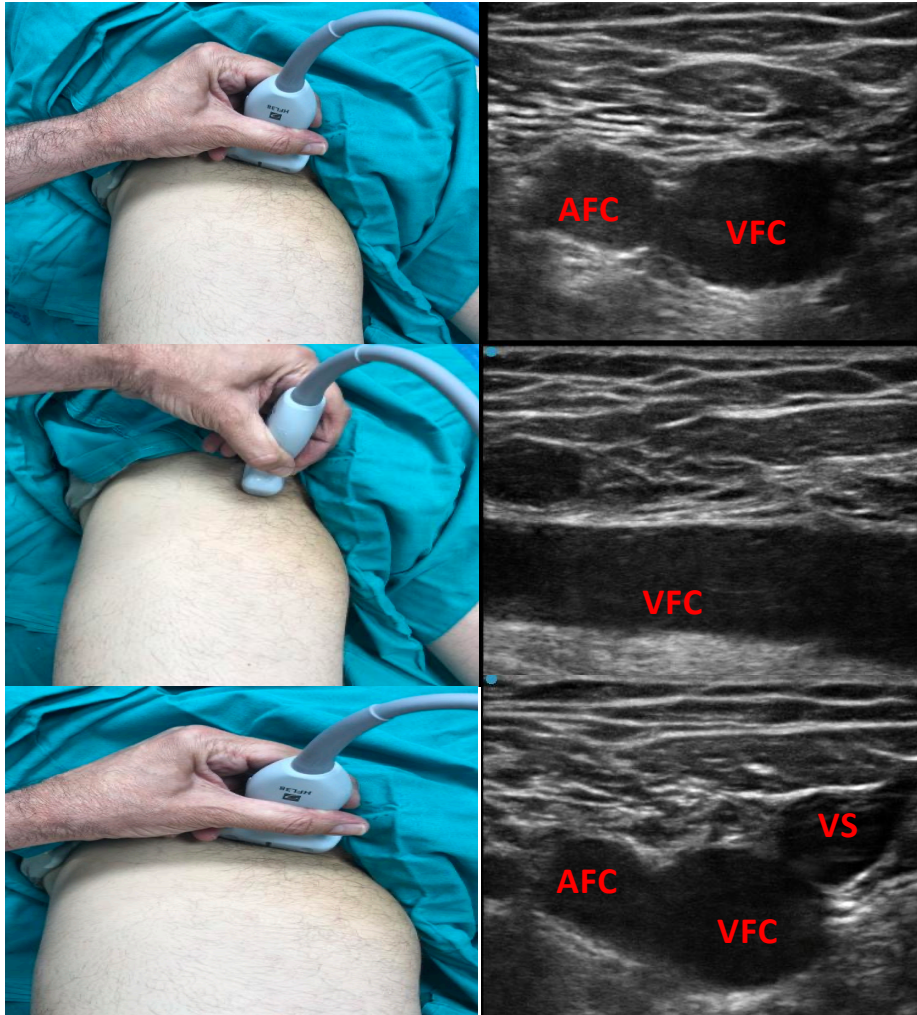
RaFeVA

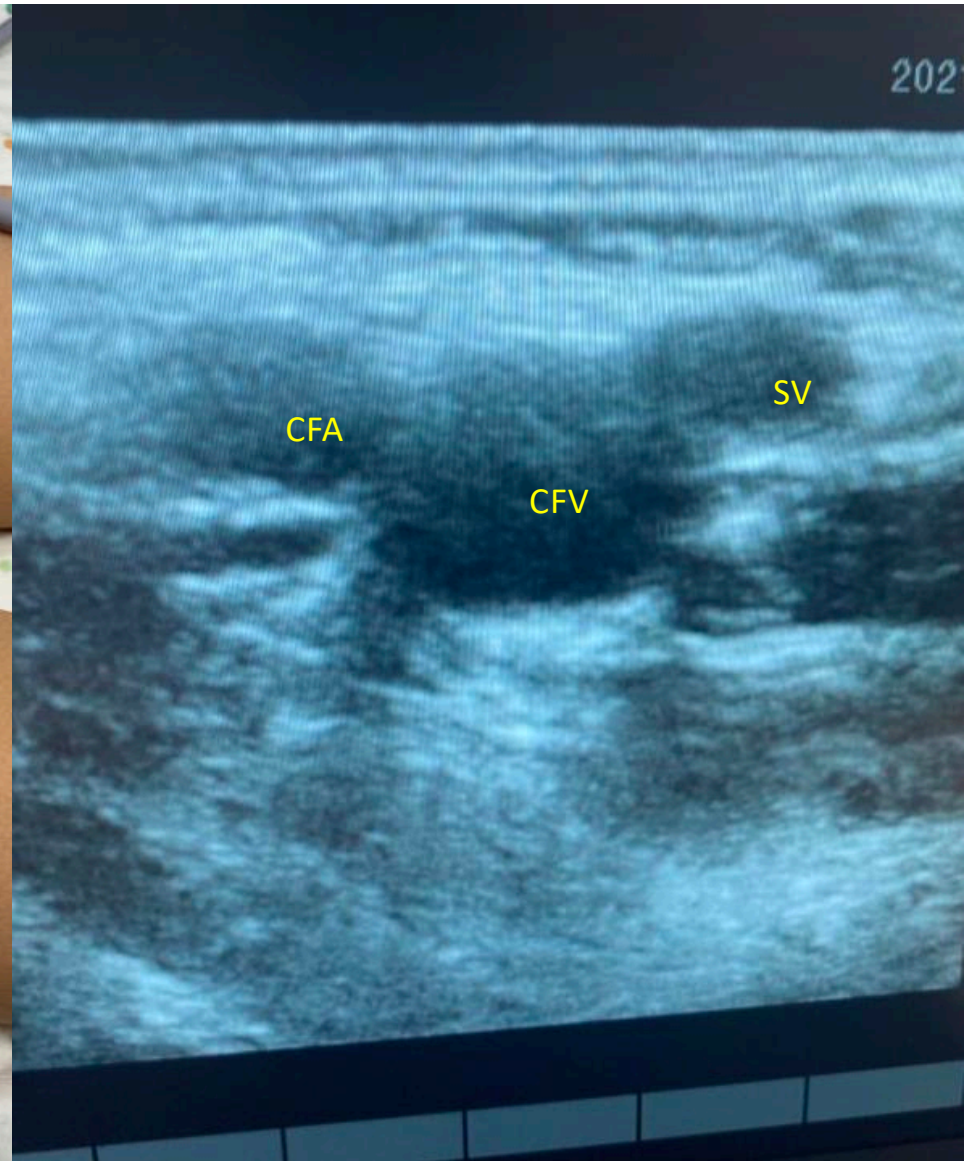
Rapid Femoral Vein Assessment

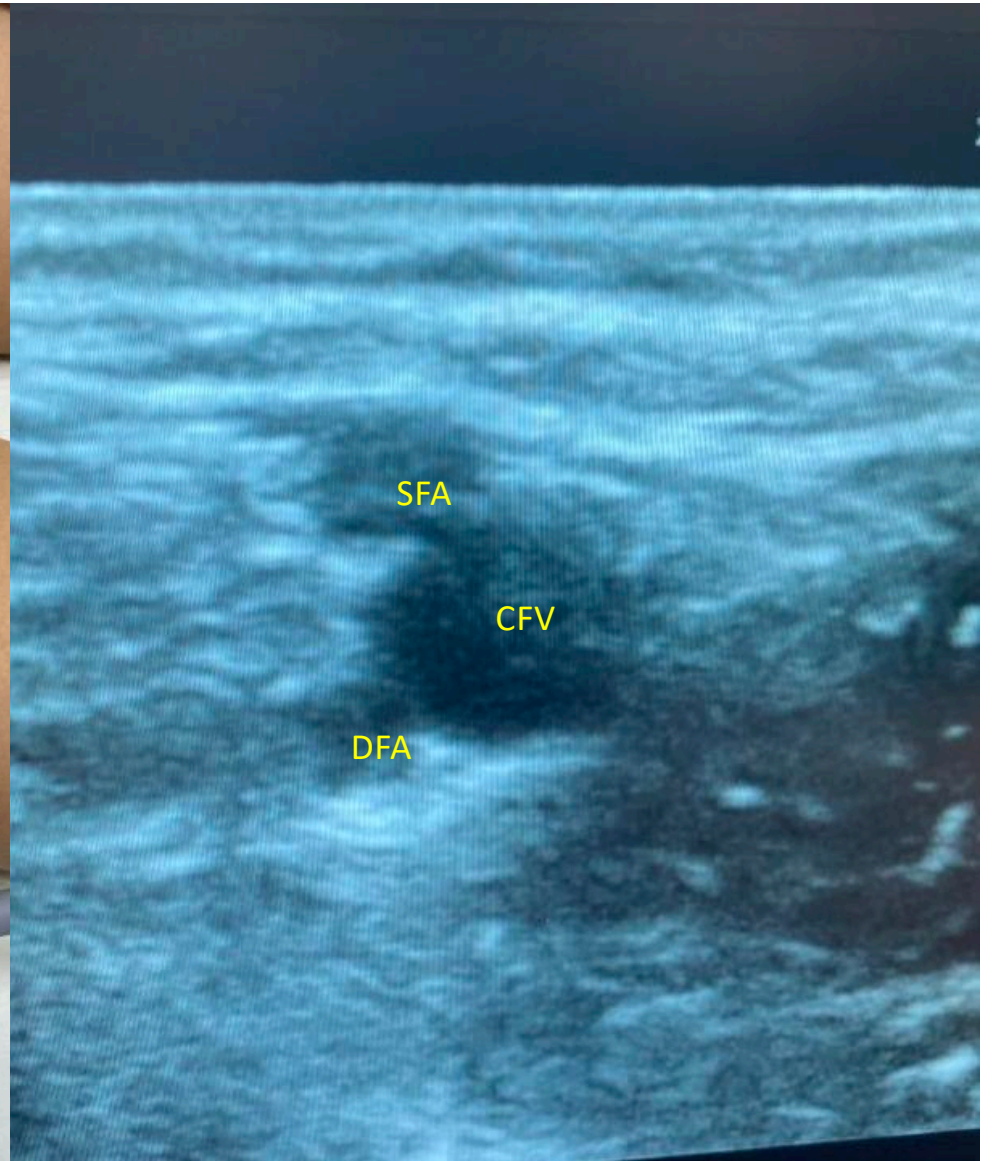
RaFeVA

- Esplorazione sistematica delle vene della zona inguinale e della coscia, al fine di valutarne pervietà/calibro e di scegliere il sito migliore di venipuntura.
- Spostamento della sonda ecografica verso il basso, dall'inguine fino a metà coscia

RaFeVA









Vena femorale comune Senza tunnellizzazione



Vena femorale Con tunnellizzazione



2) Tecnica asettica appropriata: igiene delle mani, massime protezioni di barriera e antisepsi cutanea con clorexidina 2% in IPA 70%

Igiene delle mani

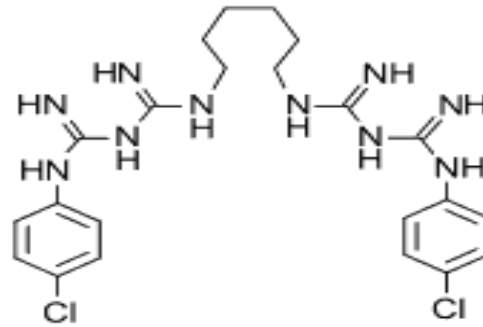


Pulizia delle mani

Massime precauzioni di barriera



Clorexidina 2% in alcool



Clorexidina 2% in IPA 70%

E' l'antisettico di prima scelta:

- In tutti i **bambini** e nei **neonati a termine**
- Anche nei **neonati prematuri**, però:
 - Attenzione alla dose (usare applicatori)
 - Non strofinare
 - Rimuovere l'eccesso di antisettico dopo 30 sec.

ISAC Ped

**Vantaggi della tecnica asettica appropriata:
igiene delle mani, massime protezioni di
barriera e antisepsi cutanea con clorexidina 2%
in IPA 70%**

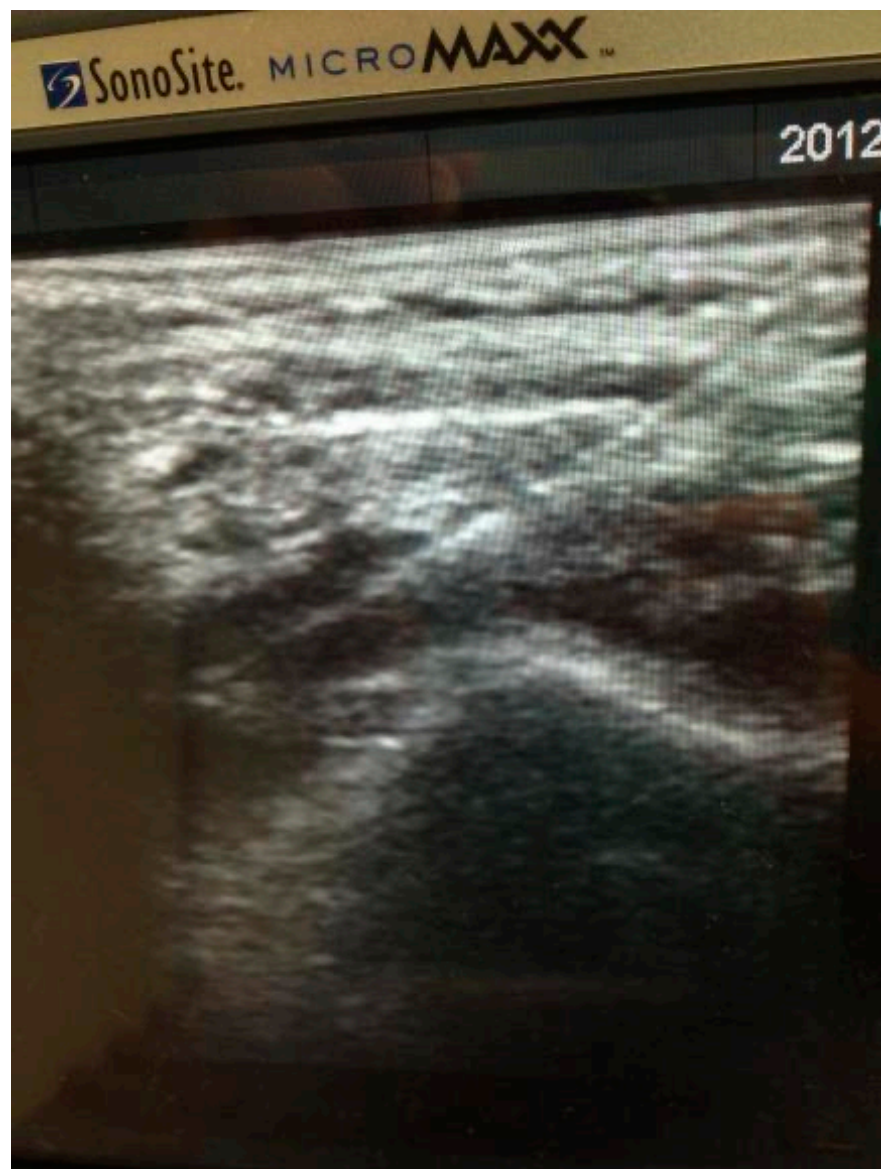
- Riduzione del rischio di infezioni precoci

3) Utilizzo dell'ecografo per la venipuntura ecoguidata della vena prescelta e per il successivo controllo ecografico della assenza di pneumotorace o di altre complicanze immediate legate alla inserzione

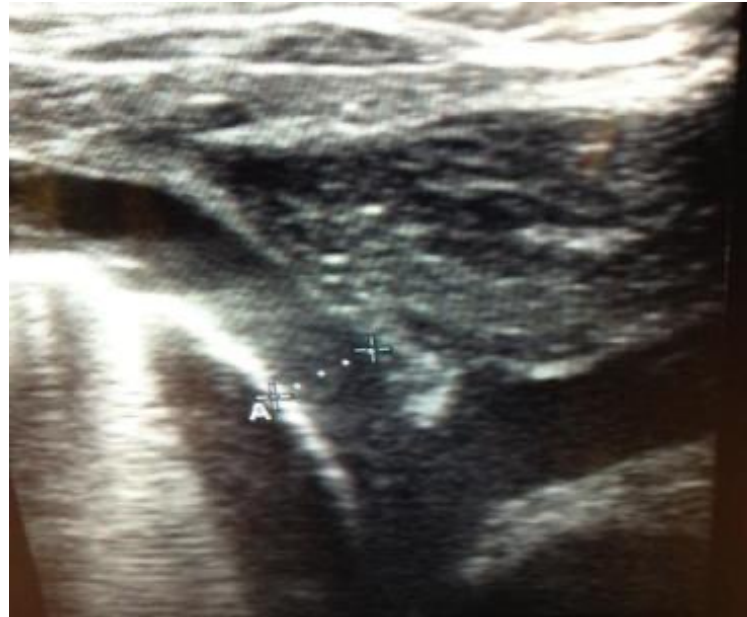
Massimo Lamperti
Andrew R. Bodenham
Mauro Pittiruti
Michael Blaivas
John G. Augoustides
Mahmoud Elbarbary
Thierry Pirotte
Dimitrios Karakitsos
Jack LeDonne
Stephanie Doniger
Giancarlo Scoppettuolo
David Feller-Kopman
Wolfram Schummer
Roberto Biffi
Eric Desruennes
Lawrence A. Melniker
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access





- Different PICCs can be used (silicon, polyurethane, power injectable polyurethane), single and double lumen
- The calibre - 3Fr or 4Fr or 5Fr - is chosen considering the diameter of the vein (vein mm = or > cath Fr)



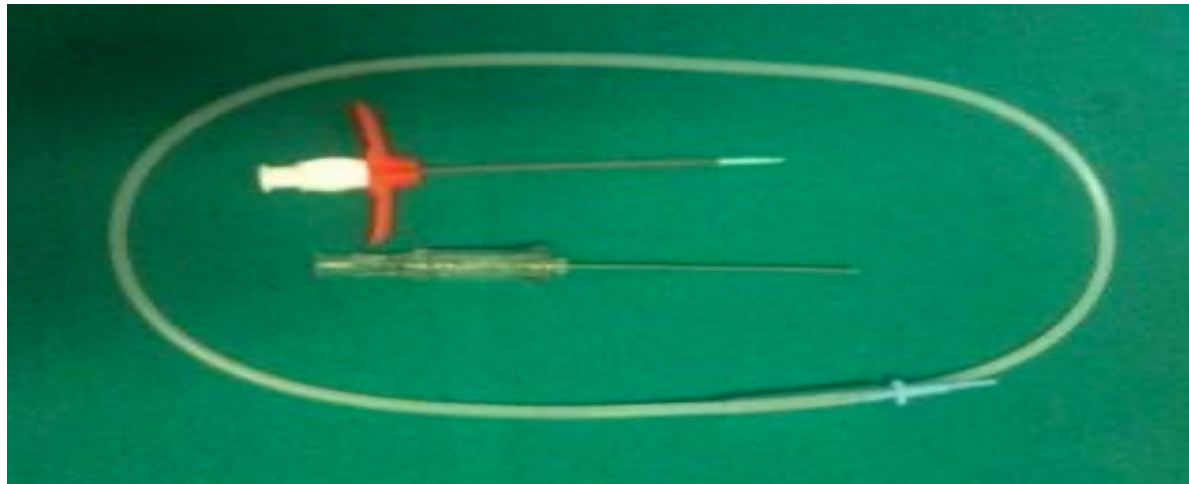
Key point

Check the diameter of the vein !



Kits for micro-introduction :

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



Tip location

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



Wrong direction !

guidewire



Micro
introducer



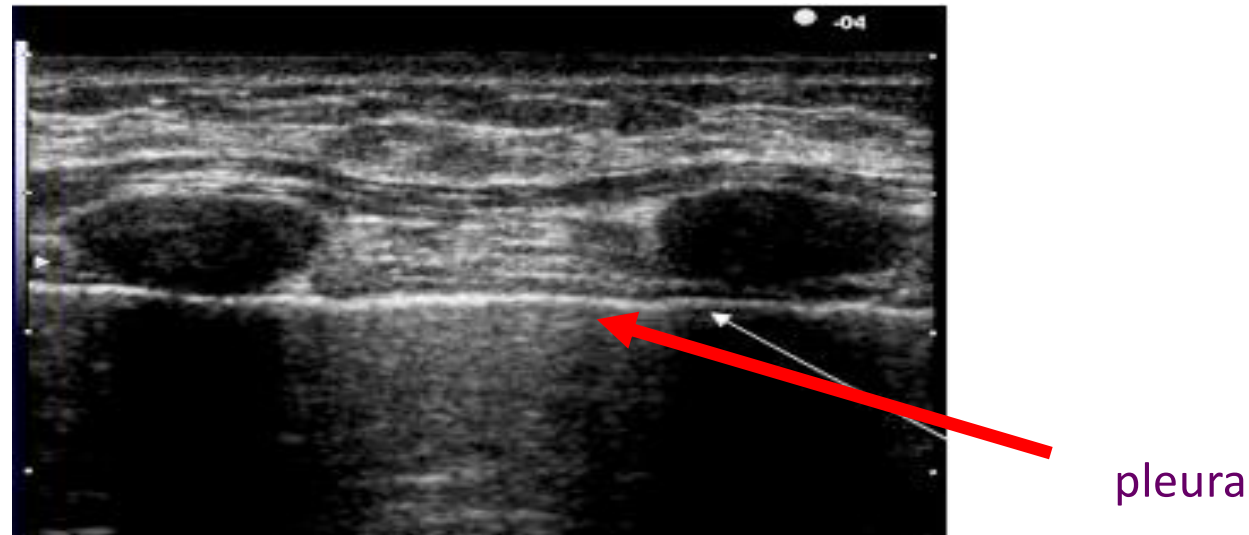
Catheter



Tip navigation by US

- **US is not just for puncture !**
- US control of the direction of guidewire and/or catheter (**tip navigation by US**) is particularly easy in neonates and infants
- Tip navigation by US should be implemented also in UVC and ECC !!

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



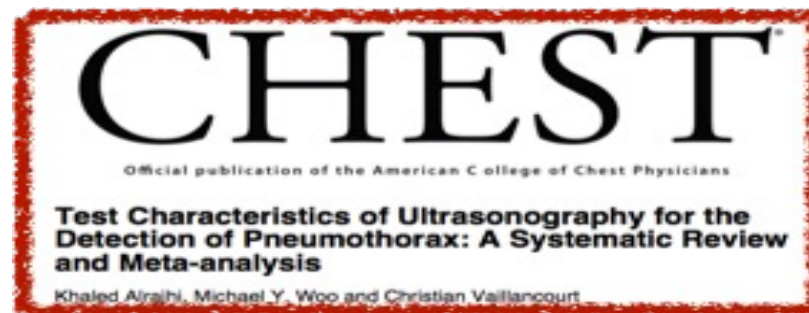
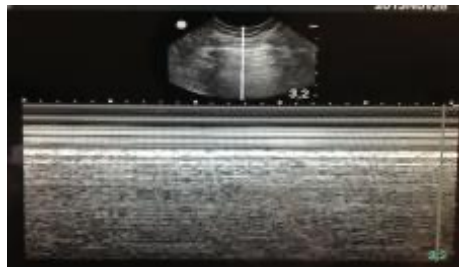
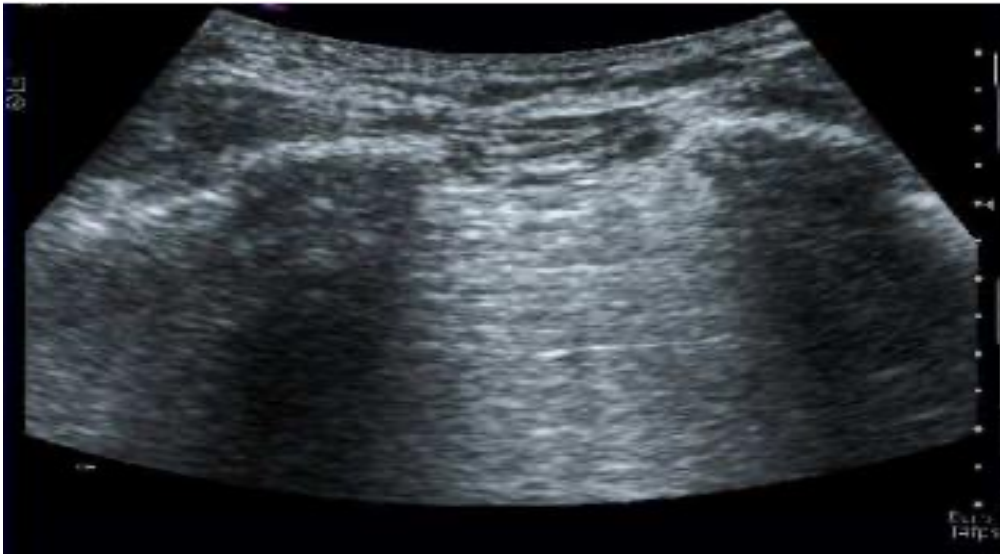


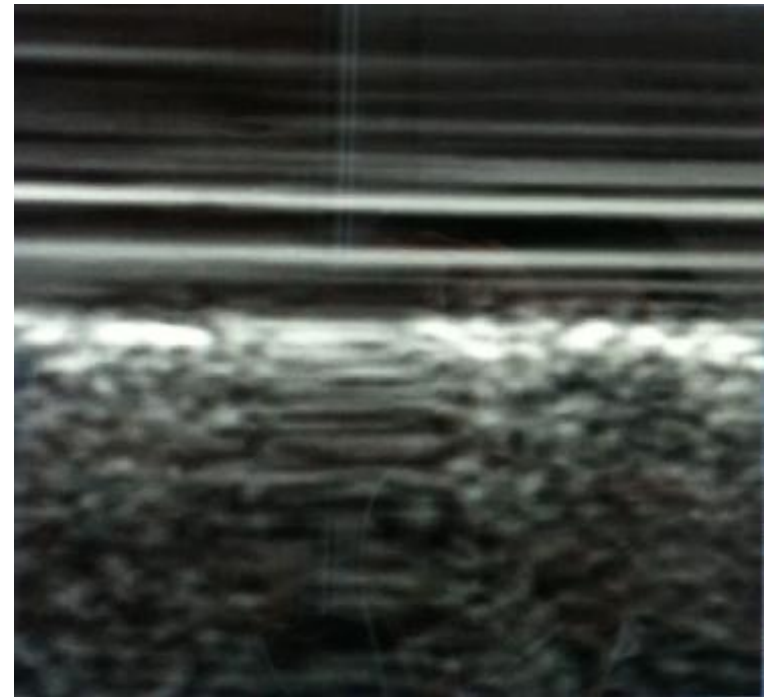
Table 2: Summary of sensitivity and specificity for included studies

Author	N	Ultrasonography		Chest X-ray	
		Sensitivity	Specificity	Sensitivity	Specificity
Blaivas ¹⁴	176	98.1%	99.2%	75.5%	100.0%
Chung ¹⁵	97	88.2%	89.3%	47.1%	94.0%
Garofalo ¹³	184	95.7%	100%	-	-
Kirkpatrick ¹¹	133	48.8%	98.7%	20.9%	99.6%
Rowan ¹⁶	27	100%	93.8%	36.4%	100.0%
Soldati ¹⁷	186	98.2%	100%	53.6%	100.0%
Soldati ¹⁸	109	92.0%	99.5%	52.0%	100.0%
Zhang ¹⁹	135	86.2%	97.2%	27.6%	100.0%

Sliding Sign = No PNX

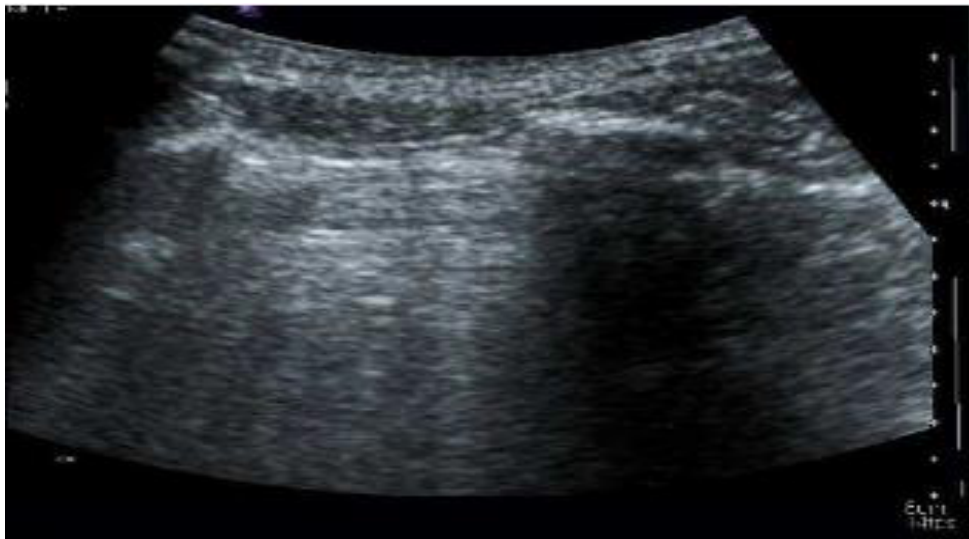


B - mode

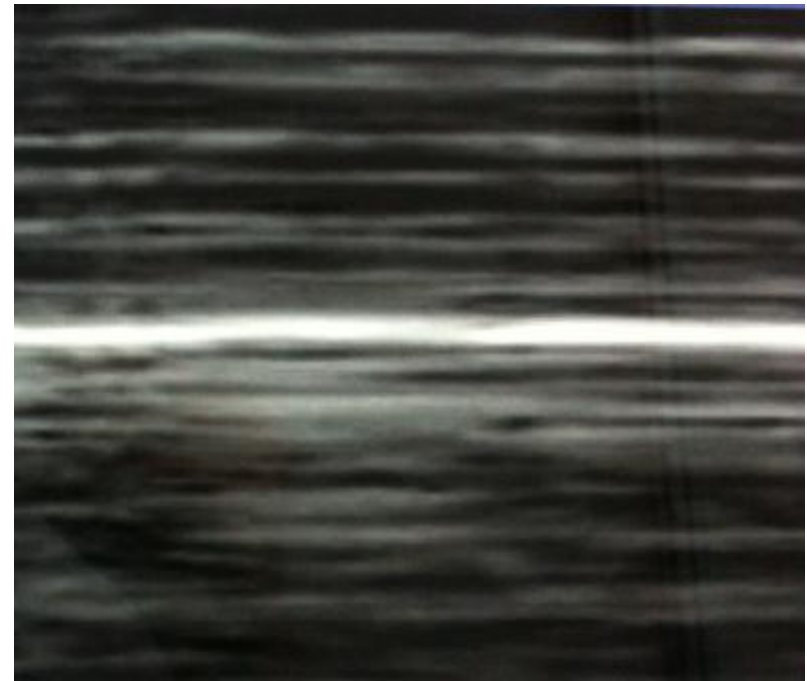


M - mode: seashore sign

No Sliding Sign: PNX!



B - Mode



M - mode: barcode sign

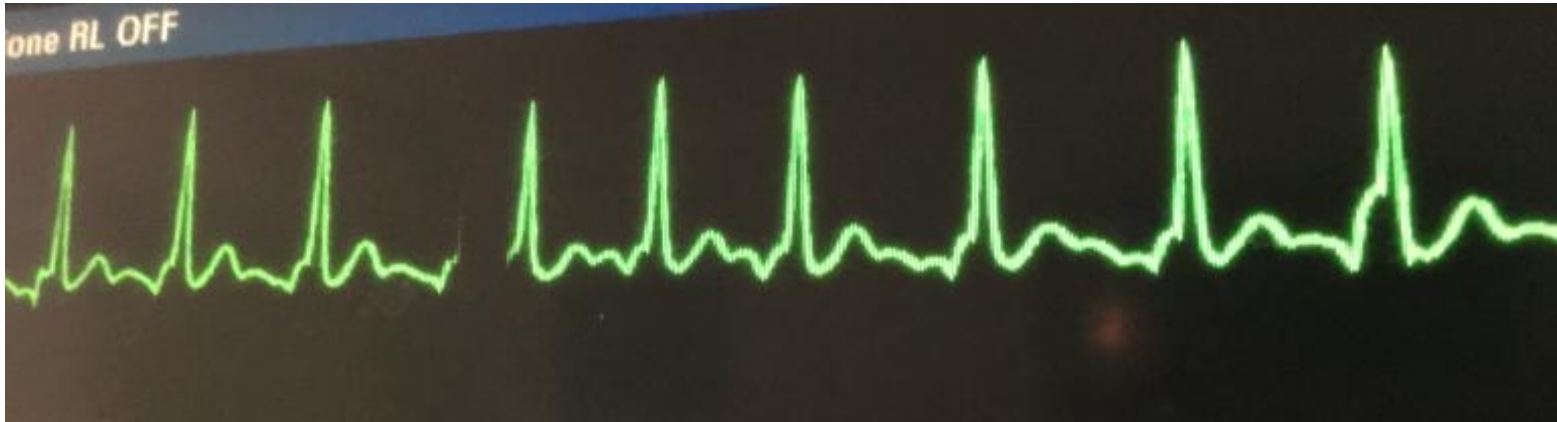
ISAC Ped

Vantaggi dell'utilizzo dell'ecografo per la venipuntura ecoguidata della vena prescelta e per il successivo controllo ecografico della assenza di pneumotorace o di altre complicanze immediate legate alla inserzione

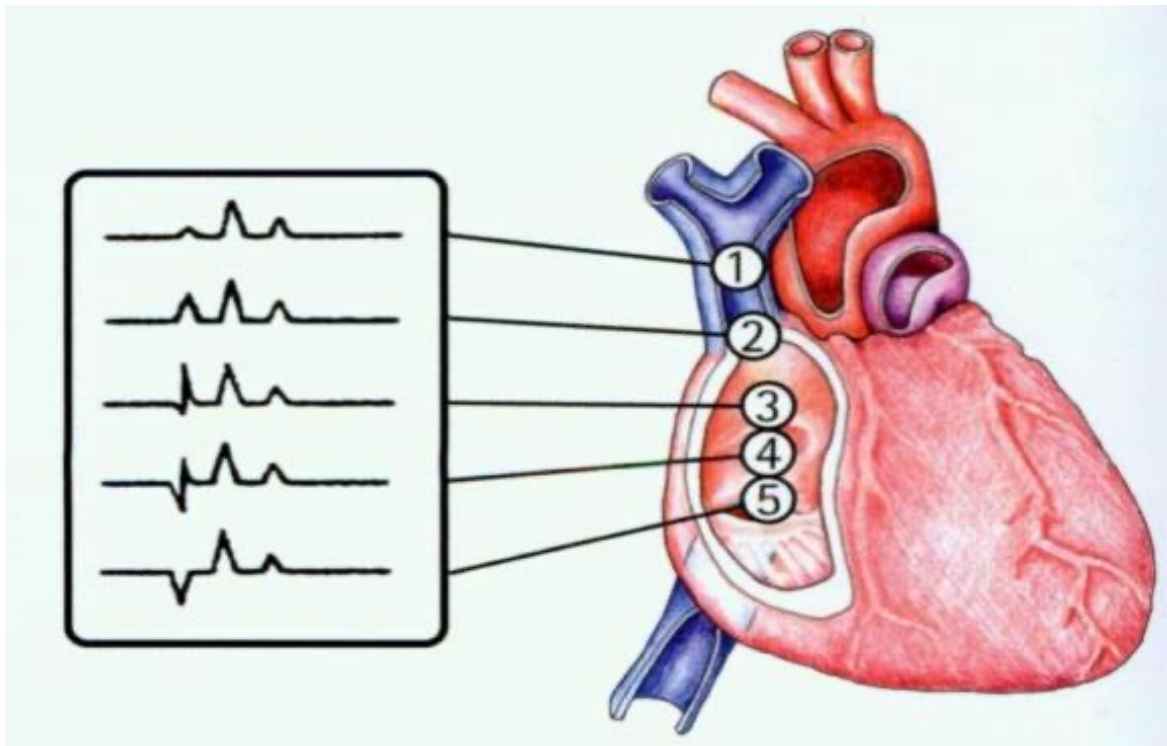
- riduzione del rischio di insuccesso
- riduzione dei tempi
- riduzione delle complicanze legate alla puntura
- riduzione del rischio di infezioni
- riduzione del rischio di trombosi

4) Verifica intra-procedurale della posizione centrale della punta mediante la tecnica dell'ECG intracavitario e/o mediante ecocardiografia

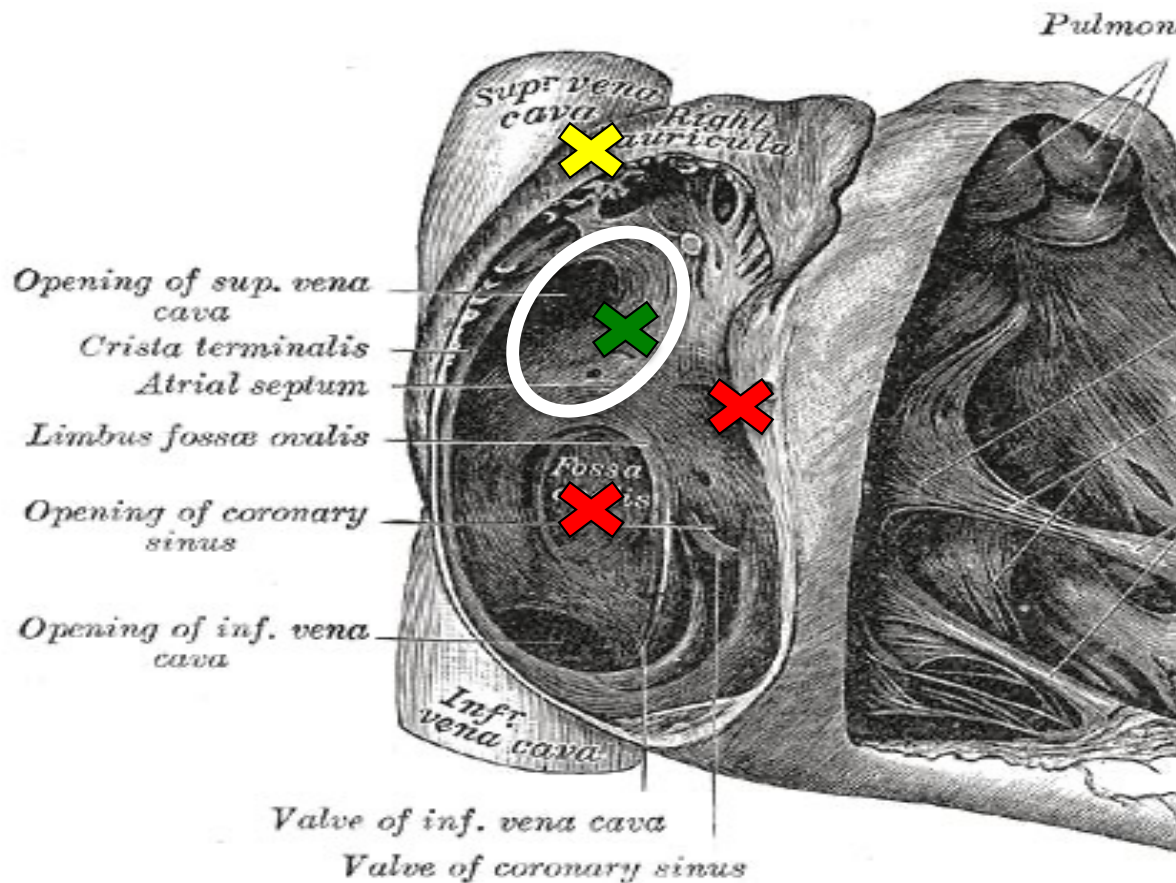
IC-ECG per la tip location



IC-EKG 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**

IC-EKG in children/neonates: does it work ?

- Yes, it works
- Rationale:
 - Surface landmark = unreliable in children
 - Chest X-Ray = more difficult to interpretate
 - Repositioning because of malposition = more expensive
- Critical issues:
 - Never use IC-EKG with guidewire technique (risky)
 - P changes are faster and occur in shorter space
 - X-Ray criteria for CAJ are unclear



GAVeCeLT pediatric ECG Study

JVA
ISSN 1129-7298

J Vasc Access 2014; 00 (00): 000-000
DOI: 10.5301/jva.5000281

ORIGINAL ARTICLE

The intracavitary ECG method for positioning the tip of central venous access devices in pediatric patients: results of an Italian multicenter study

Francesca Rossetti¹, Mauro Pittiruti², Massimo Lamperti³, Ugo Graziano⁴, Davide Celentano⁵, Giuseppe Capozzoli⁶

¹Department of Anesthesia, Children's Hospital 'Meyer', Firenze - Italy

²Department of Surgery, Catholic University Hospital, Roma - Italy

³Department of Neuroanesthesia, Neurological Institute 'Besta', Milano - Italy

⁴Department of Surgery, Children's Hospital 'Santobono', Napoli - Italy

⁵Pediatric Intensive Care Unit, Catholic University Hospital, Roma - Italy

⁶Department of Anesthesia and Intensive Care, Ospedale Civile di Bolzano, Bolzano - Italy

Applicability

99.4 %

- In **2** children out of **309**, the P wave was not identified on the surface ECG, so that IC-ECG was not performed
 - One child 2 mo. old
 - One child 5 yr old

Feasibility

99.4 %

- In **2** cases out of **307** no elevation of the P wave could be identified:
 - One child 1 mo. old
 - One child 2 yr old

Accuracy

95.8%

—	Gr. A	96.2%
—	Gr. B	95%
—	Gr. C	96.8%

In all cases of mismatch but one, tip position as estimated with IC-EKG was too low as estimated by radiological criteria (from +1cm to +5cm).

In the **95** cases performed with a dedicated ECG monitor (Nautilus) accuracy was **98.8%**

Safety

100%

- No complication directly or indirectly related to the IC-EKG method

- In the pediatric population, the IC-EKG method is applicable and feasible in almost all patients (**> 99%**)
- As compared with the radiological methods, the accuracy of the IC-EKG method is very high **95.8%**, and even higher if performed with a dedicated monitor (**98.8%**)
- The IC-EKG method is **100%** safe also in children

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

**Vito D'Andrea¹ , Lucilla Pezza¹, Giorgia Prontera¹,
Gina Ancora², Mauro Pittiruti³ , Giovanni Vento¹
and Giovanni Barone² **

The Journal of Vascular Access

1–6

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DOI: 10.1177/11297298211068302

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The intracavitary electrocardiography method for tip location of jugular internal vein access device in infants of less than 5 kg: A pilot study

The Journal of Vascular Access

1–5

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Rossella Mastroianni, Antonella Capasso and Gaetano Ausanio

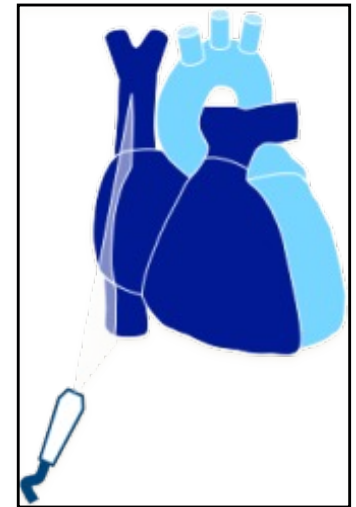
- After the IC-ECG tip location, the correct position of the tip can also be verified by echocardiography (TTE)



Tip location by echocardiography (TTE)

TTE : trans-thoracic echocardiography

- Accuracy depending on the method used and on the operator
- Widely used in Europe more than in USA
- Ideal in neonates and children
- May be difficult in some adult patients



TTE for tip location: does it work?

Apical four chamber view

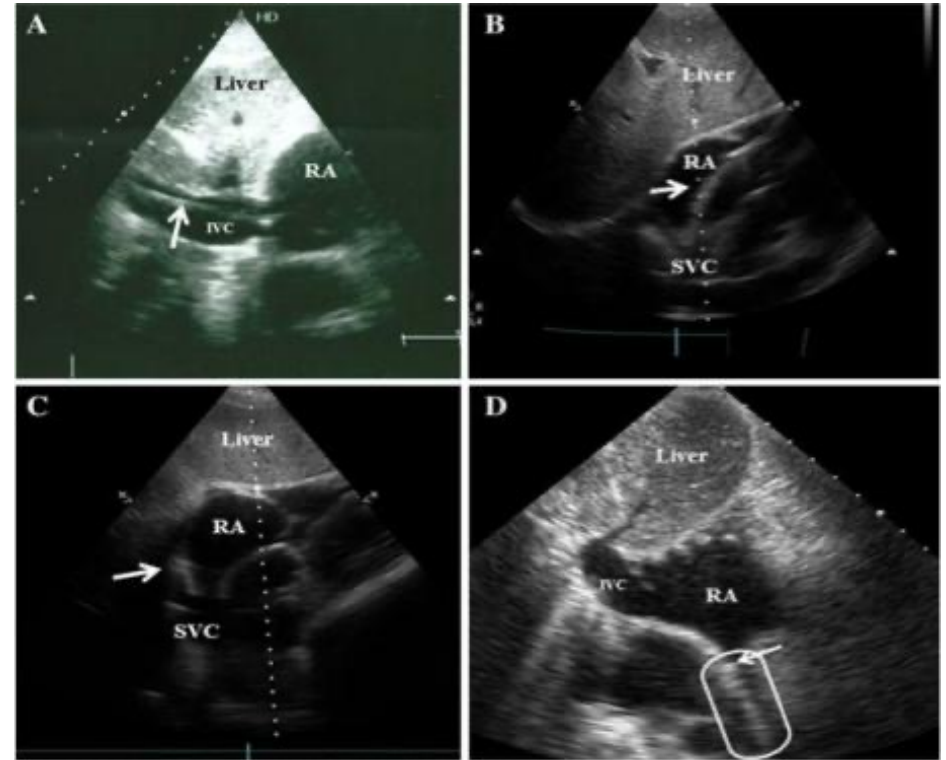
- Easy to perform
- Visualization of the tip only if it is inside the right atrium
- Indirect visualization by CEUS (evidence of contrast flow within 1-2 sec after injection = tip is in the lower 1/3 of SVC)



TTE for tip location: does it work?

Subcostal 'bi-caval' view

- Requires training
- Direct visualization of the tip in RA, SVC or IVC
- May be difficult or impossible in some conditions (obesity, COPD, abdominal surgery)



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 

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

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

We do not need routine x-ray

Tip position can be verified during the procedure with IC-EKG and/or echocardiography.

These methods are easier, safer, faster and more accurate than fluoroscopy or chest x-ray.

ISAC Ped

Vantaggi della verifica intra-procedurale della posizione centrale della punta mediante la tecnica dell'ECG intracavitario e/o mediante ecocardiografia

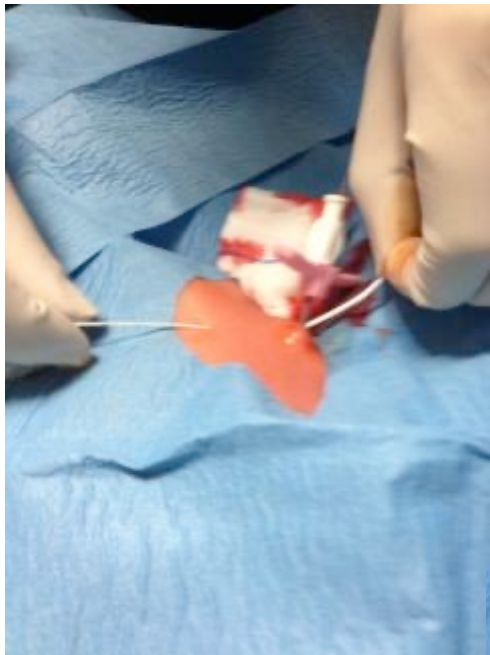
- azzeramento del rischio di malposizioni primarie
- riduzione del rischio trombotico
- riduzione del rischio di aritmie
- riduzione del rischio di lesioni vasali

5) Tunnellizzazione del catetere per ottenere il sito di emergenza in posizione ottimale

Tunnellizzare se indicato



Tunnellizzare













Comments

Tunnelling of central lines is a simple technique that allows us to achieve simultaneously:

- **an optimal site for venepuncture** (which minimizes the risk of puncture-related complications)
- **and an optimal exit site** (which reduces the risk of late complications).

Please, avoid exit site at the neck!



Please, avoid exit site at the neck!



ISAC Ped

Vantaggi della tunnellizzazione del catetere per ottenere l'exit site in posizione ottimale

- riduzione del rischio infettivo
- riduzione del rischio di dislocazione
- riduzione del rischio di trombosi

6) Protezione del sito di emergenza mediante colla in cianoacrilato

Glue !!!!



Comments

Glue is a simple, safe, inexpensive tool for closing the skin at the puncture site and sealing the skin around the catheter at the exit site.

- **Stops extraluminal contamination**
- **Stops bleeding/oozing at the exit site**
- **Secures the catheter for 7-10 days**

ISAC Ped

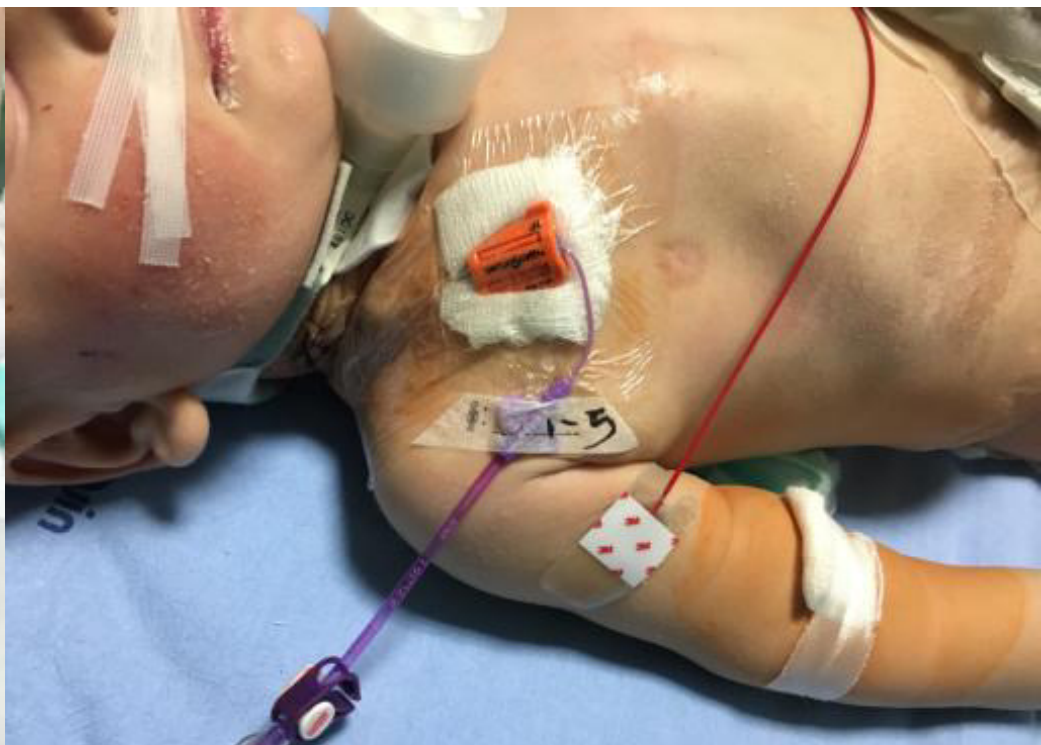
Vantaggi della protezione del sito di emergenza mediante colla in cianoacrilato

- riduzione del rischio di sanguinamento dell'exit site
- riduzione del rischio infettivo
- stabilizzazione temporanea del catetere

7) Stabilizzazione del catetere mediante 'sutureless device' e membrana trasparente semipermeabile.

Glue + sutureless device + transparent dressing

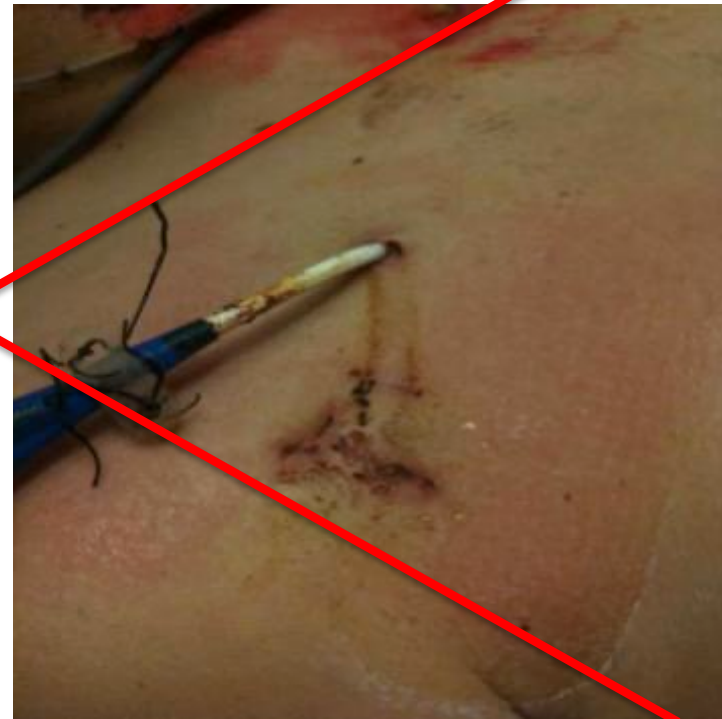




Please, avoid sutures....



Please, avoid sutures....



ISAC Ped

Vantaggi della stabilizzazione del catetere mediante 'sutureless device' e membrana trasparente semipermeabile.

- riduzione del rischio di infezioni
- riduzione del rischio di dislocazione
- riduzione del rischio di trombosi

Quindi

Il protocollo ISAC-Ped è strutturato in modo tale da minimizzare tutte le complicanze potenzialmente legate alla inserzione:

precoci

tardive

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

**Mauro Pittiruti¹ , Davide Celentano², Giovanni Barone³ ,
Vito D'Andrea⁴ , Maria Giuseppina Annetta⁵ and Giorgio Conti²**

The Journal of Vascular Access

1–12

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La nostra esperienza con ISAC-Ped

729 cateteri in pazienti pediatrici

- **68** in neonati (0-30 gg)
- **173** in lattanti (1-12 mesi)
- **488** in bambini (1 – 18 anni)

Tutti inseriti da un piccolo numero di operatori specificamente addestrati

Età 1 - 30gg

Table I – Central Venous Access Devices in Neonates

	CICC	FICC	TOTAL
	n=67	n=1	n=68
Vein			
Right brachiocephalic	61		61
Left brachiocephalic	5		5
Right internal jugular	1		1
Right femoral		1	1
Technique			
Tunneling	67	1	68 (100%)
Ultrasound-based tip location	22		22 (32.3%)
Exchange by guidewire	1		1 (1.5%)
Catheter caliber (Fr=French)			
3 Fr	57		57
3 Fr *§	3		3
4 Fr	7		7
5 Fr	1		1
Lumen			
Single lumen	59	1	60
Double lumen	8		8
Patients			
Mean age (days)	10.1 $\pm$ 8.9	2	10 $\pm$ 8.8
Mean weight (Kg)	2.76 $\pm$ 0.7	3.4	2.77 $\pm$ 0.7
Gender (M/F)	26/41	0/1	26/42

Neonati

- **67 CICC** (quasi tutti in vena anonima destra)
- **1 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un terzo dei casi, anche tip location mediante ECOCARDIO)

Tutti tunnellizzati

Neonati

- **67 CICC** (quasi tutti in vena anonima destra)
- **1 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un terzo dei casi, anche tip location mediante ECOCARDIO)

Tutti tunnellizzati

**NESSUNA COMPLICANZA
LEGATA ALLA MANOVRA DI INSERZIONE**

Età 1 – 12 mesi

Table II - Central Venous Access Devices in Infants

	CICC	FICC	TOTAL
	n=155	n=18	n=173
Vein			
Right brachiocephalic	124		124
Left brachiocephalic	21		21
Right internal jugular	4		4
Left internal jugular	2		2
Right external jugular	1		1
Left external jugular	1		1
Right axillary	1		1
Left axillary	1		1
Right femoral		13	13
Left femoral		5	5
Technique			
Tunneling	149	8	157 (90.8%)
Ultrasound-based tip location	46	6	52 (30%)
Exchange by guidewire	3	2	5 (2.9%)
Catheter caliber (Fr=French)			
2.7 Fr *§	2	1	3
3 Fr	93	14	107
3 Fr *	4		4
4 Fr	50	2	52
5 Fr	4	1	5
5.5 Fr *§	2		2
Lumen			
Single lumen	120	17	137
Double lumen	35	1	36
Patients			
Mean age (months)	4.55 ₊₃	4.05 _{+2.5}	4.49 _{+2.9}
Gender (M/F)	95/60	12/6	107/66

Lattanti

- **155 CICC** (quasi tutti in vena anonima)
- **18 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un terzo dei casi, anche tip location mediante ECOCARDIO)

Nel 95% tunnellizzati

Lattanti

- **155 CICC** (quasi tutti in vena anonima)
- **18 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un terzo dei casi, anche tip location mediante ECOCARDIO)

Nel 95% tunnellizzati

**NESSUNA COMPLICANZA
LEGATA ALLA MANOVRA DI INSERZIONE**

Età 1 – 18 anni

Table III - Central Venous Access Devices in Children

	CICC	FICC	PICC	TOTAL
	n=196	n=13	n=279	n=488
Vein				
Right brachiocephalic	174			174
Left brachiocephalic	17			17
Right internal jugular	1			1
Left internal jugular				
Right axillary	3		69	72
Left axillary	1		17	18
Right basilic			139	139
Left basilic			28	28
Right brachial			21	21
Left brachial			5	5
Right femoral		12		12
Left femoral		1		1
Technique				
Tunneling	196	5	85	286 (58.6%)
Ultrasound-based tip location	45	4	25	74 (15.2%)
Exchange by guidewire	4	1	30	35 (7.2%)

Età 1 – 18 anni

	CICC	FICC	PICC	TOTAL
	n=196	n=13	n=279	n=488
Catheter caliber (Fr=French)				
2.7 Fr *§			2	2
3 Fr *	2			2
3 Fr	56	3	113	172
4 Fr	76	2	115	193
5 Fr	34	4	47	85
5 Fr §	6			6
5.5 Fr *§	8			8
6 Fr	2			2
6.6 Fr *#	4			4
7 Fr *§	9			9
11.5 Fr@		4		4
Lumen				
Single lumen	122	4	174	300
Double lumen	70	9	105	184
Triple lumen	4			4
Patients				
Mean age (yr)	4.24±3.8	7.85±5.3	8.9±5	7±51
Gender (M/F)	129/67	7/6	169/110	305/183

Bambini

- **279 PICC**
- **196 CICC** (quasi tutti in vena anonima)
- **13 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un quarto dei casi, anche tip location mediante ECOCARDIO)

Nel 70% tunnellizzati

Bambini

- **279 PICC**
- **196 CICC** (quasi tutti in vena anonima)
- **13 FICC**

Tutti inseriti con ECOGUIDA

Tip location sempre con IC-ECG (in un quarto dei casi, anche tip location mediante ECOCARDIO)

Nel 70% tunnellizzati

**NESSUNA COMPLICANZA
LEGATA ALLA MANOVRA DI INSERZIONE**

**Questo è quello che può darvi la adozione di un
protocollo di inserzione come lo ISAC-Ped**

NO puntura arteriosa

NO emotorace

NO pneumotorace

NO malposizioni primarie

NO trombosi venosa

NO infezioni precoci

Complicanze tardive

3.7%

Table IV - Post-procedural complications

	Neonates (n=68)	Infants (n=173)	Children (n=488)
Dislodgment	-	1 (0.6%)	2 (0.4%)
Local ecchymosis	-	2 (1.16%)	7 (1.4%)
Infection of the exit site	-	-	1 (0.2%)
Local pain at the exit site	-	-	14 (2.9%)

Catheter-related complications in onco-hematologic children: A retrospective clinical study on 227 central venous access devices

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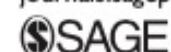
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La nostra esperienza con ISAC-Ped

**227 cateteri in pazienti pediatrici oncologici
(età compresa tra 2 mesi e 17 anni)**

- **175** PICC
- **50** CICC
- **2** FICC

**Tutti inseriti da un piccolo numero di operatori
specificamente addestrati, utilizzando il
protocollo ISAC-Ped**

NESSUNA COMPLICANZA IMMEDIATA O PRECOCE LEGATA ALLA MANOVRA DI INSERZIONE

BASSA INCIDENZA DI COMPLICANZE TARDIVE:

Table 2. Incidence of catheter-related complications (6-month follow up).

	n	%	n/1000 cath.days	Removal
Symptomatic catheter-related thrombosis (CRT)	2/227	0.9		-
Exit site infection	5/227	2.2	0.12	-
Catheter colonization	20/227	8.8	0.51	6
Catheter-related blood stream infection (CRBSI)	22/227	9.7	0.56	16
Tip migration	12/227	5.2		12
Catheter rupture	4/227	1.7		4
Accidental dislodgment:	20/227	8.8		
- skin-adhesive device	17/163	10.4		17
- subcutaneous anchorage	3/64	4.6		3
Lumen occlusion	20/227	8.8		-

Guidelines of the Italian Association of Pediatric Hematology and Oncology for the management of the central venous access devices in pediatric patients with onco-hematological disease

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Table 3. BUNDLE for CVAD positioning.

Implant BUNDLE

- a) Hand washing, aseptic technique, and maximum barrier protection during the procedure.⁵⁹ Hand washing before the procedure must be done with alcoholic gel or with disinfectant soap if visibly dirty or contaminated. The maximum precautions are also meant for the sterile and adequately length coverage of the ultrasound probe.⁴⁰
 - b) Appropriate selection of the insertion site: an ultrasound scan of all veins of the arm and neck is performed bilaterally before the procedure.⁴⁶
 - c) Choice of the most appropriate vein in terms of caliber, collapsibility, depth and proximity to structures at risk.⁴⁶
 - d) Use of 2% chlorhexidine in 70% isopropyl alcohol for skin disinfection before insertion. Sterile single-dose applicators are recommended.³
 - e) US-guided system.⁴³
 - f) Use the intracavitary ECG method to check the position of the catheter tip.⁷³
 - g) Use non-cuffed external catheter stabilization systems (or cuffed until cuff stabilization), of the sutureless or subcutaneous implant type.^{74,75}
 - h) Use of cyanoacrylate glue for the protection of the exit site
 - i) Use of transparent semipermeable dressings wherever possible.
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Grazie dell'attenzione

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