EAPS
17-20 October, Vienna & Online
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Ultrasound-guided vascular access in newborns: basics and application

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pediatrician - neonatologist

NEVAT

Neonatal European Vascular Access Team

Nothing to disclose

NEVAT

https://neonat.org

7 RIGHTS OF VASCULAR ACCESS

Fundamentally every baby is entitled to receive care based on the best evidence, vascular access is no exception. Let's elevate neonatal vascular access care by prioritising the integration of best practices.

- THE RIGHT CARE TEAM
- THE RIGHT PATIENT
- THE RIGHT DURATION OF THERAPY AND DEVICE REMOVAL
- THE RIGHT COMFORT MEASURES
- THE RIGHT VASCULAR ACCESS DEVICE FOR INTENDED THERAPY
- THE RIGHT BLOOD VESSEL FOR DEVICE AND THERAPY
- THE RIGHT CARE OF THE INFUSION AND DEVICE

In collaboration with

European Society for Paediatric Research

NEVAT

EFCNI european foundation for the care of newborn infants

Safe Insertion of Arterial Catheters (SIA): An ultrasound-guided protocol to minimize complications for arterial cannulation

The Journal of Vascular Access
1–6

DOI: 10.1177/11297298231178064
journals.sagepub.com/home/jva
Sage

Timothy R Spencer[1], Guglielmo Imbriaco[2], Amy Bardin-Spencer[3], Keegan J Mahoney[4], Fabrizio Brescia[5], Massimo Lamperti[6] and Mauro Pittiruti[7]

Ultrasound guided percutaneous catheterization of the brachiocephalic vein by small caliber catheter: An alternative to epicutaneo-caval catheter in newborn and premature infants

The Journal of Vascular Access
2023, Vol. 24(3) 487–491

DOI: 10.1177/11297298211034311
journals.sagepub.com/home/jva
SAGE

Zied Merchaoui, Quitterie Laudouar, Clémence Marais, Luc Morin, Narjess Ghali, Ramy Charbel, Nada Seeman, Mostafa Mokhtari and Pierre Tissières

Ultrasound-Guided Umbilical Venous Catheter Insertion With Alignment of the Umbilical Vein and Ductus Venosus

Makoto Kishigami, MD, Tomoyuki Shimokaze, MD, PhD, Masahiro Enomoto, MD, PhD, Jun Shibasaki, MD, Katsuaki Toyoshima, MD, PhD

Systematic Review

The Role of Ultrasound in Epicutaneo-Caval Catheter Insertion in Neonates: Systematic Review, Meta-Analysis and Future Perspectives

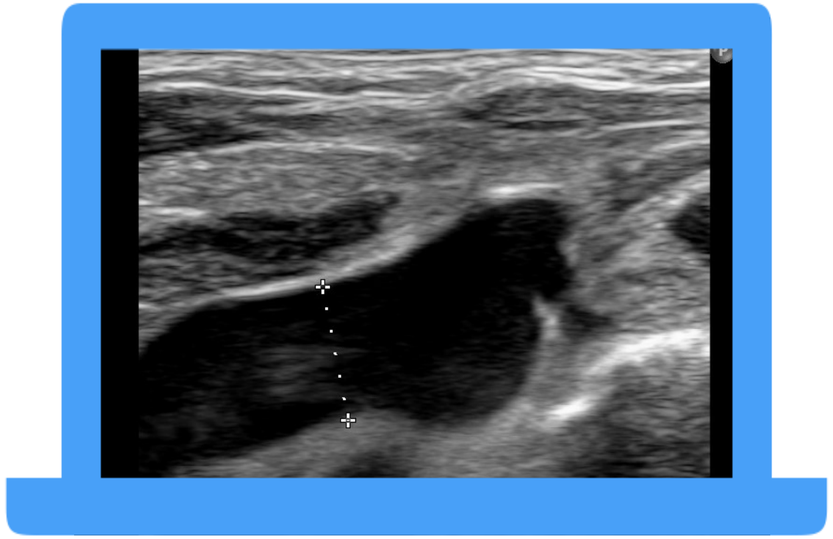
Vito D'Andrea [1,*], Valentina Cascini [2], Rosellina Russo [3], Alessandro Perri [1], Giorgia Prontera [1], Gina Ancora [4], Giovanni Vento [1], Gabriele Lisi [2,5] and Giovanni Barone [4]

Ultrasound-guided supraclavicular cannulation of the brachiocephalic vein may reduce central line–associated bloodstream infection in preterm infants

Ignacio Oulego-Erroz[1,2,3] · Alba Fernández-García[4] · Beatriz Álvarez-Juan[4] · Sandra Terroba-Seara[4] · Paula Alonso Quintela[3,4] · Antonio Rodríguez-Núñez[5]

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]



Piezoelectrical Principle

Voltage

P.E. crystal

ULTRASOUND WAVES

AMPLITUDE

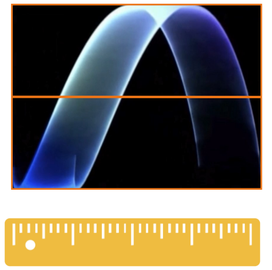
X2 = WAVE LENGTH

Number

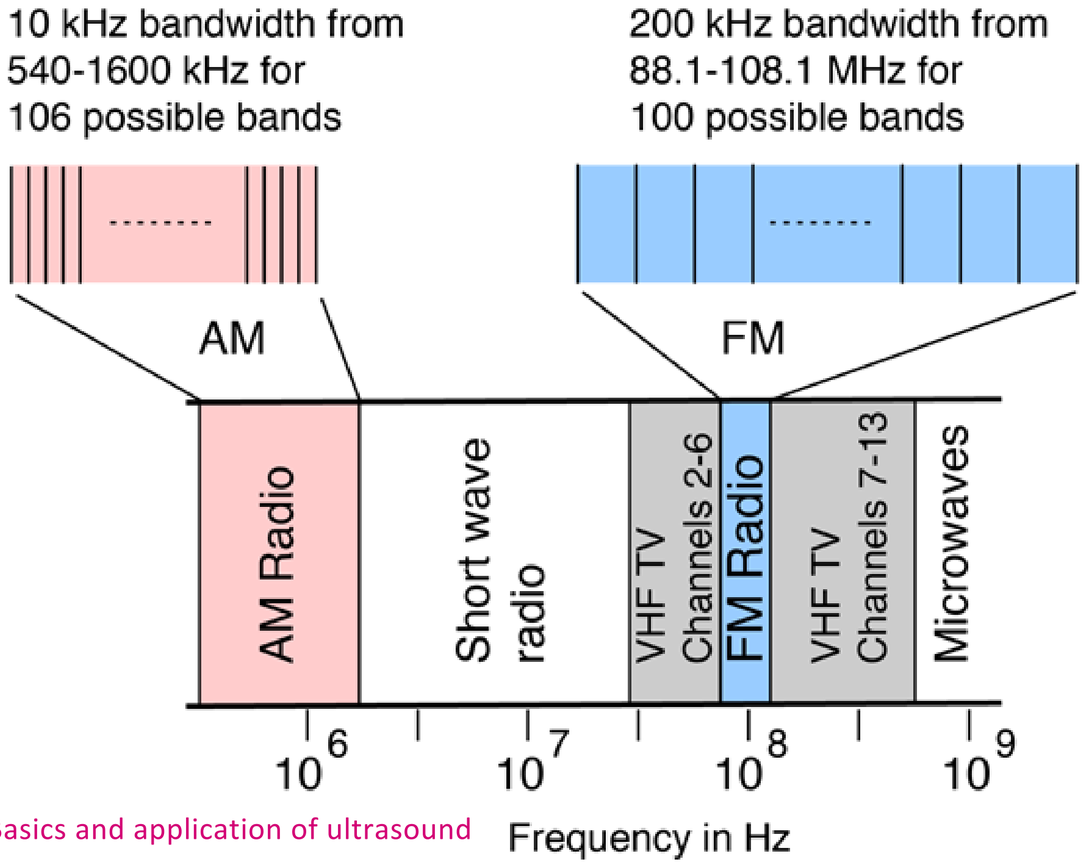
Seconds

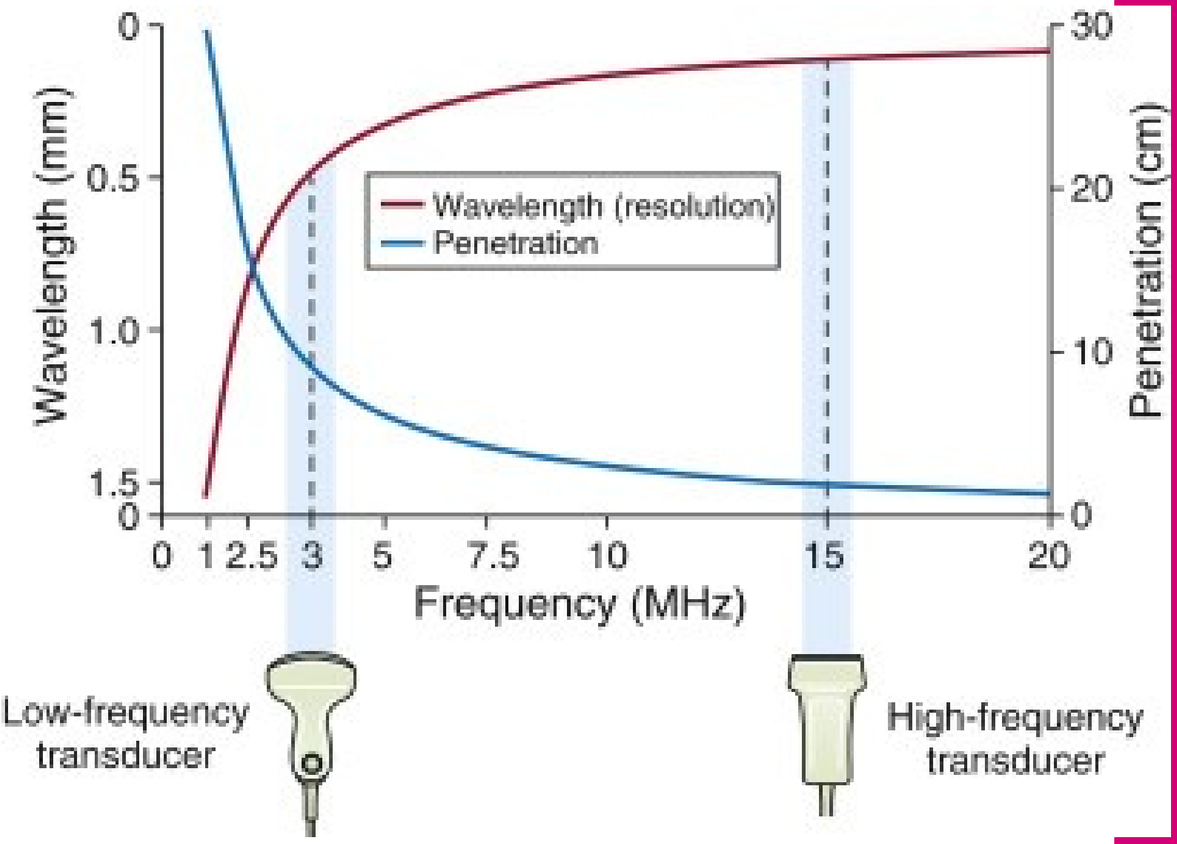
= Frequency ⟶ **Hertz**

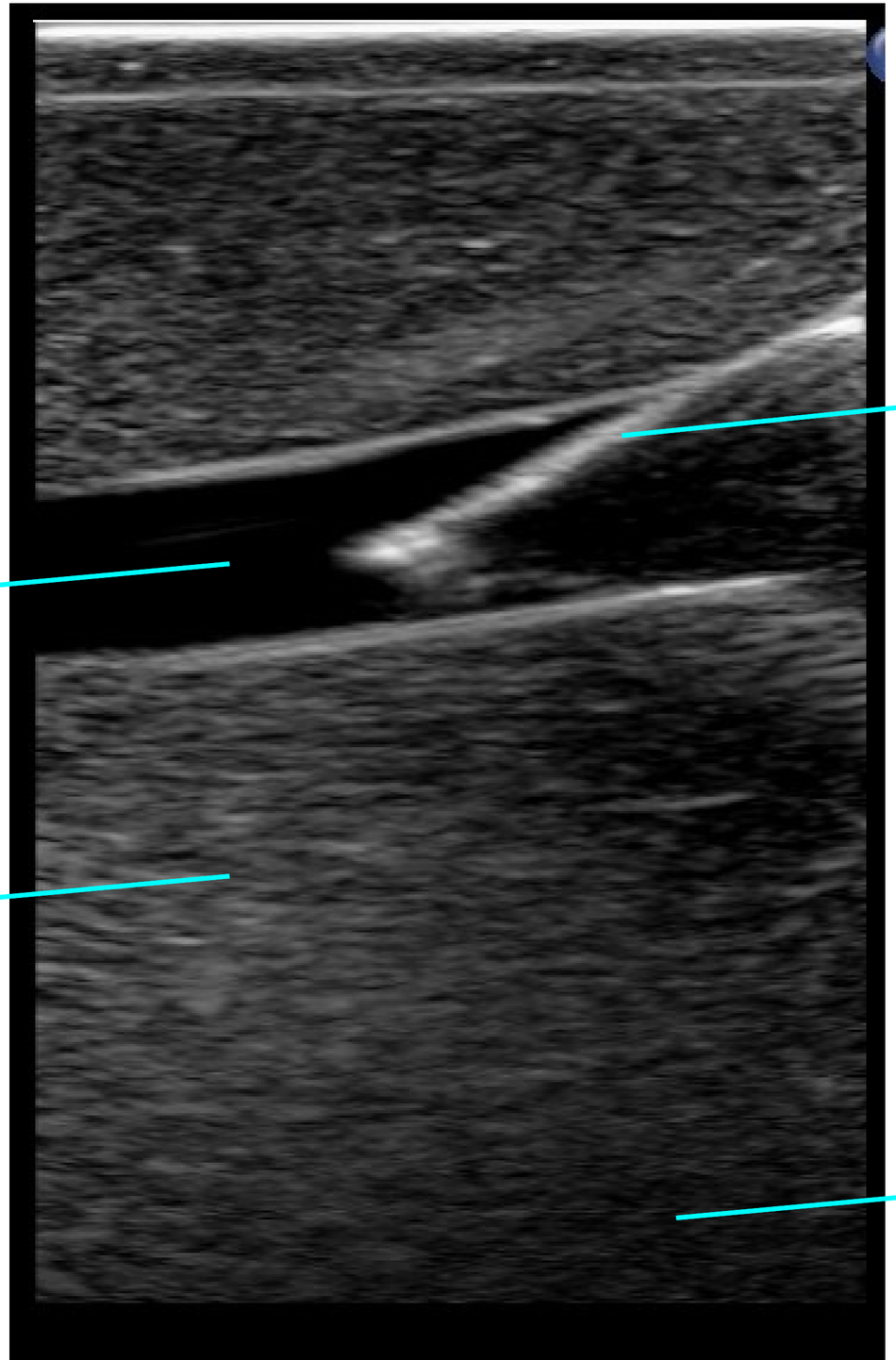
Sound velocity (Constant!) = Number / Seconds X



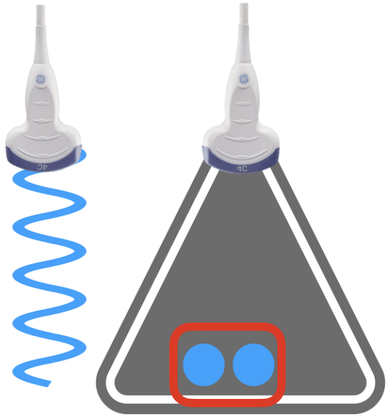
Frequency **Wavelength**



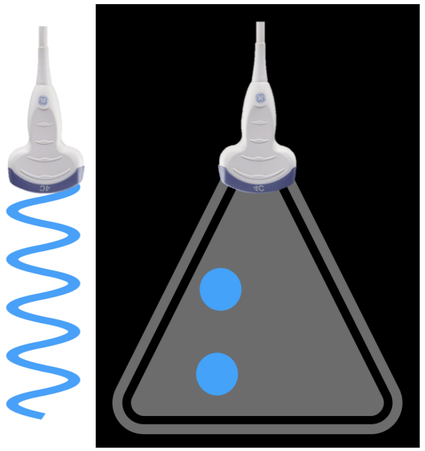



hyperechoic
anechoic
Iso-echoic
Hypo-echoic

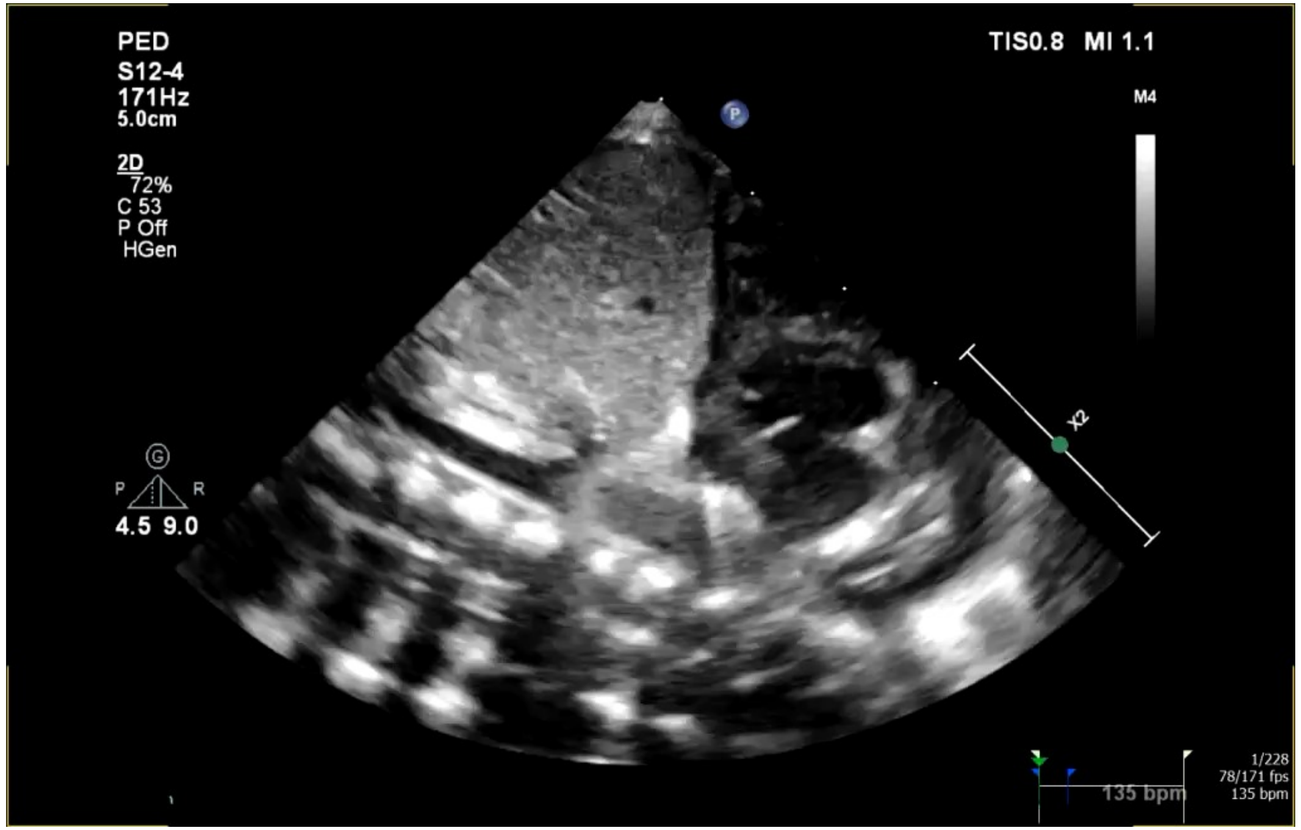
RESOLUTION



LATERAL



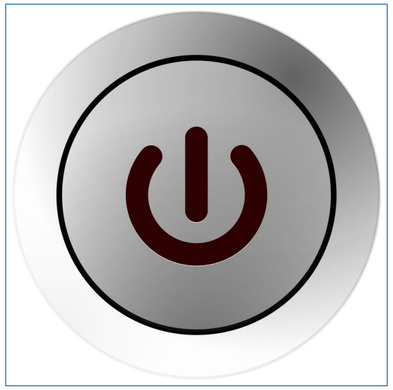
AXIAL



TEMPORAL

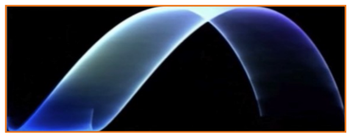
Equipment

Knobology

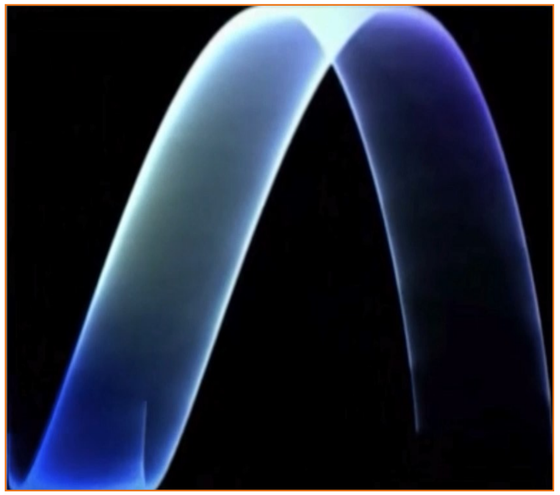


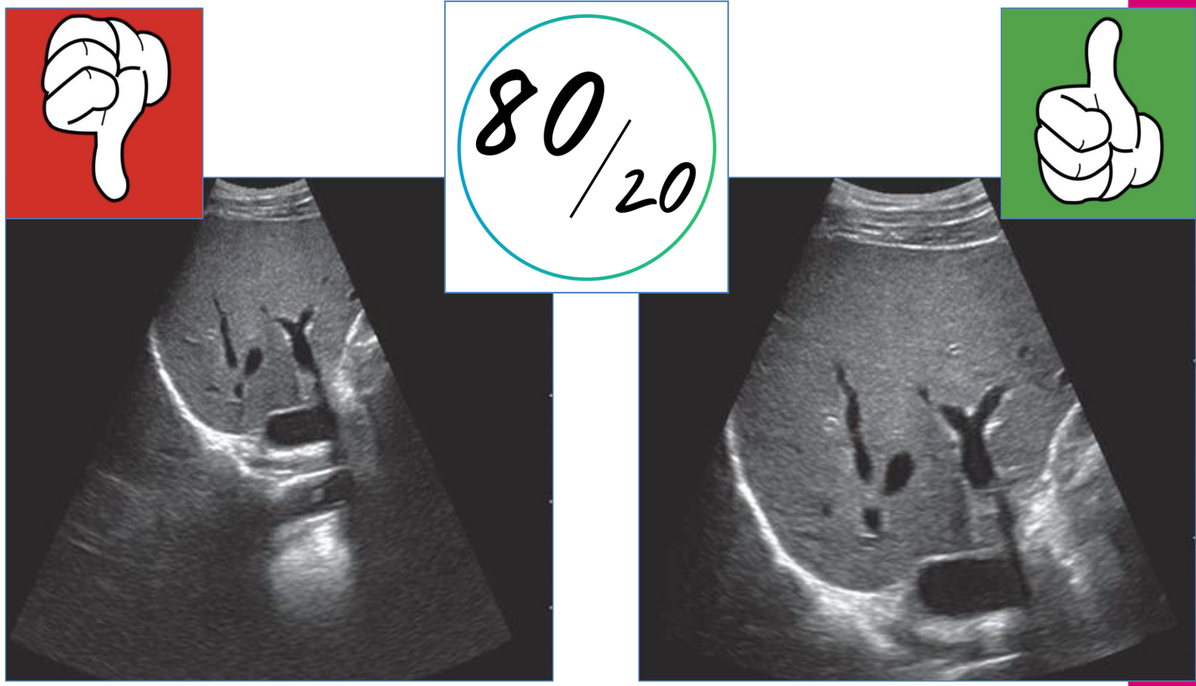
ON / OFF

DEPTH

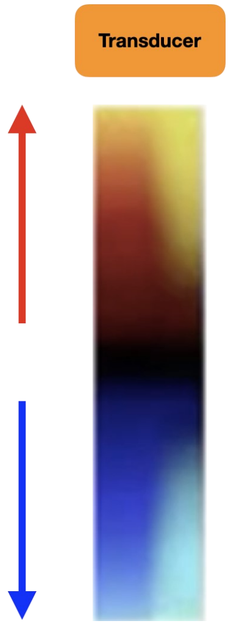


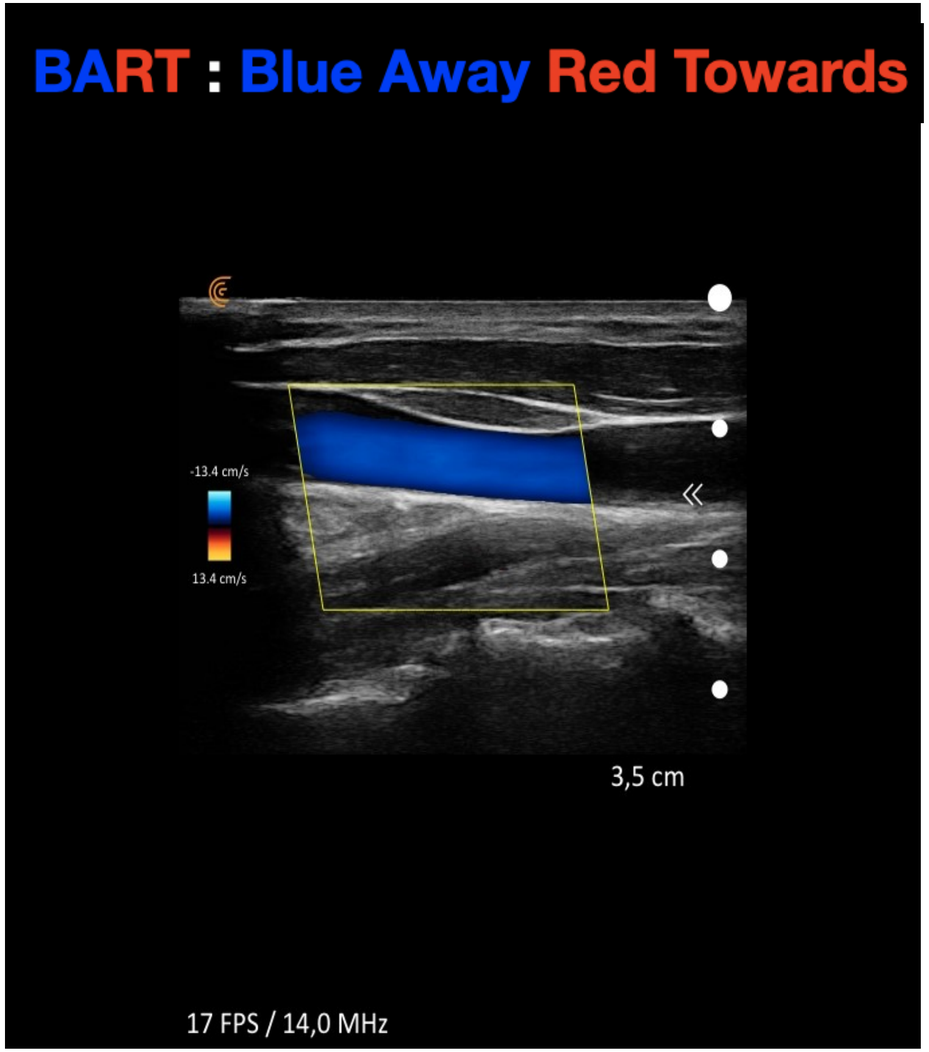
GAIN



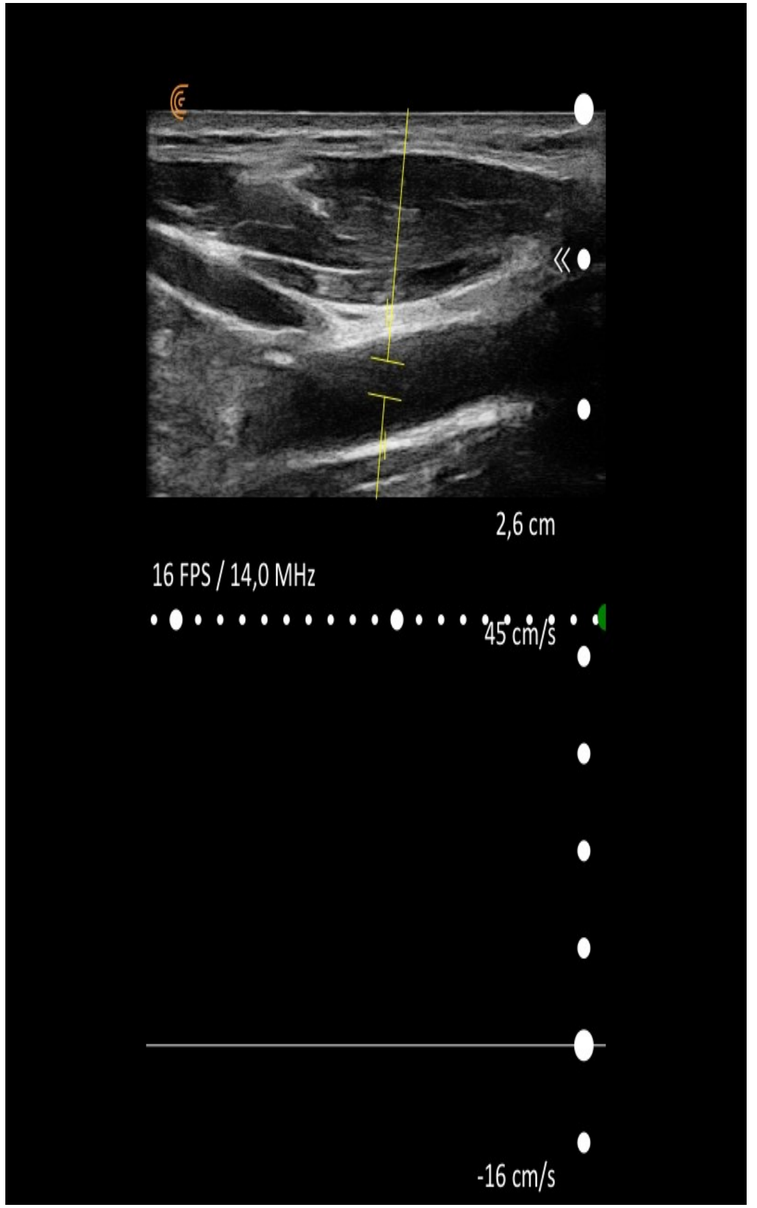


Color Doppler



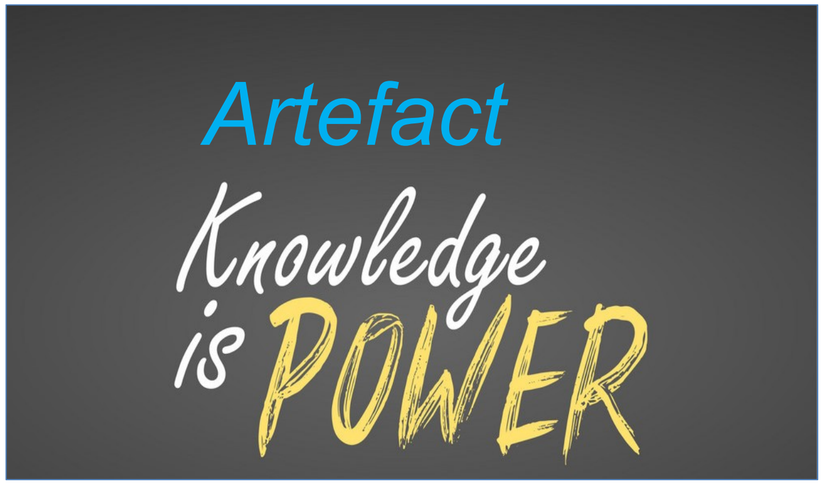


Pulse Wave

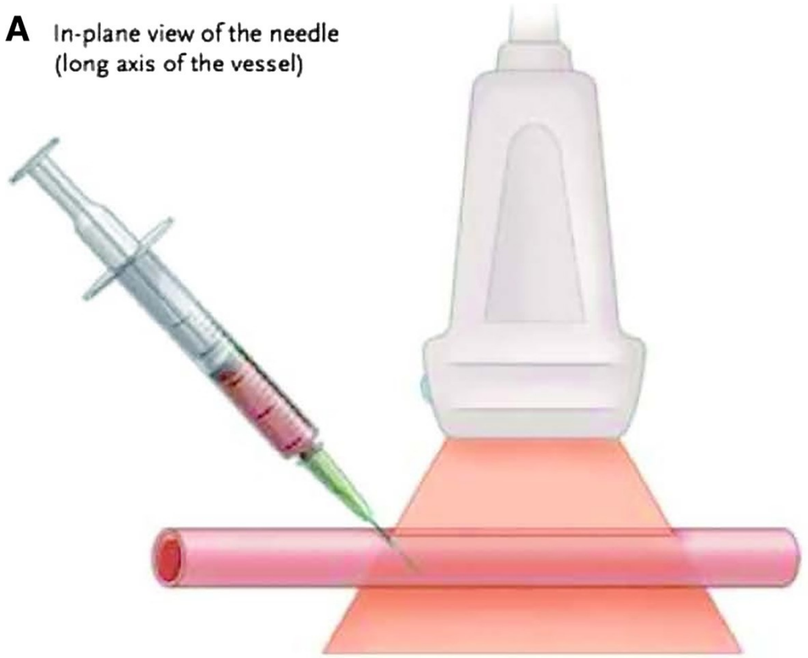


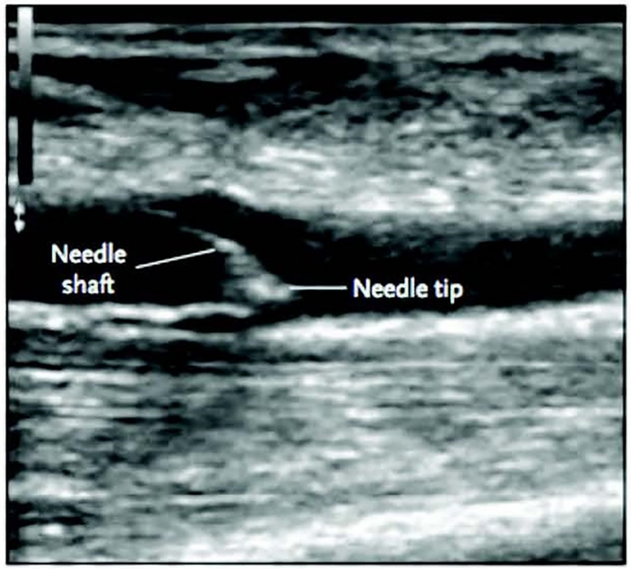
Artefacts

- Acoustic shadowing
- Acoustic enhancement
- Refraction
- Mirror artefact
- Reverberation
- Bundle artefacts (especially side lobe)

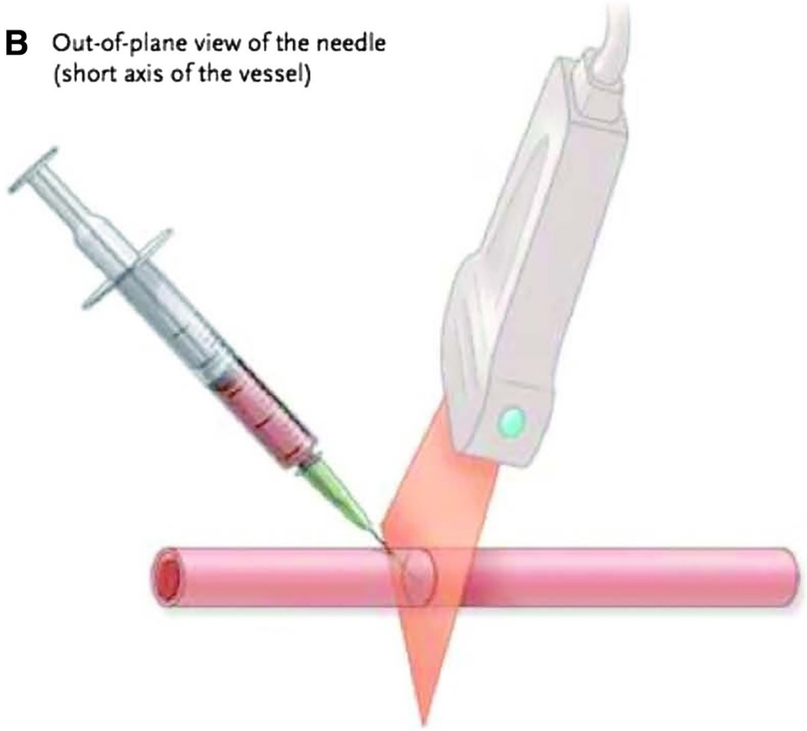


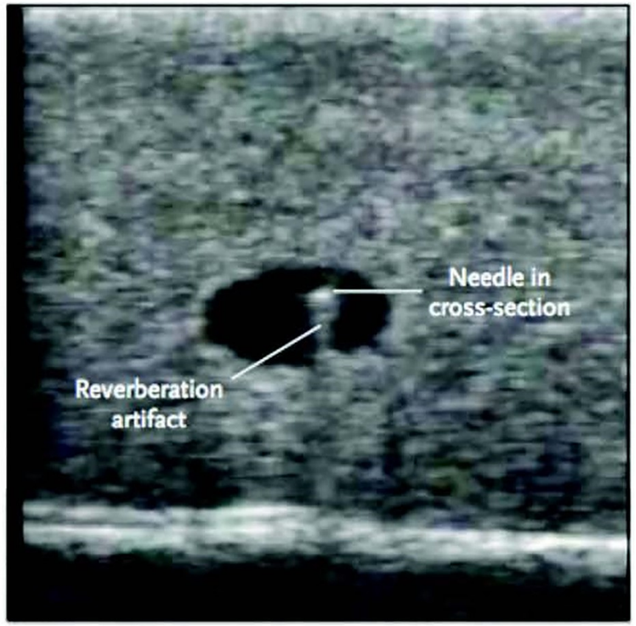
A In-plane view of the needle (long axis of the vessel)

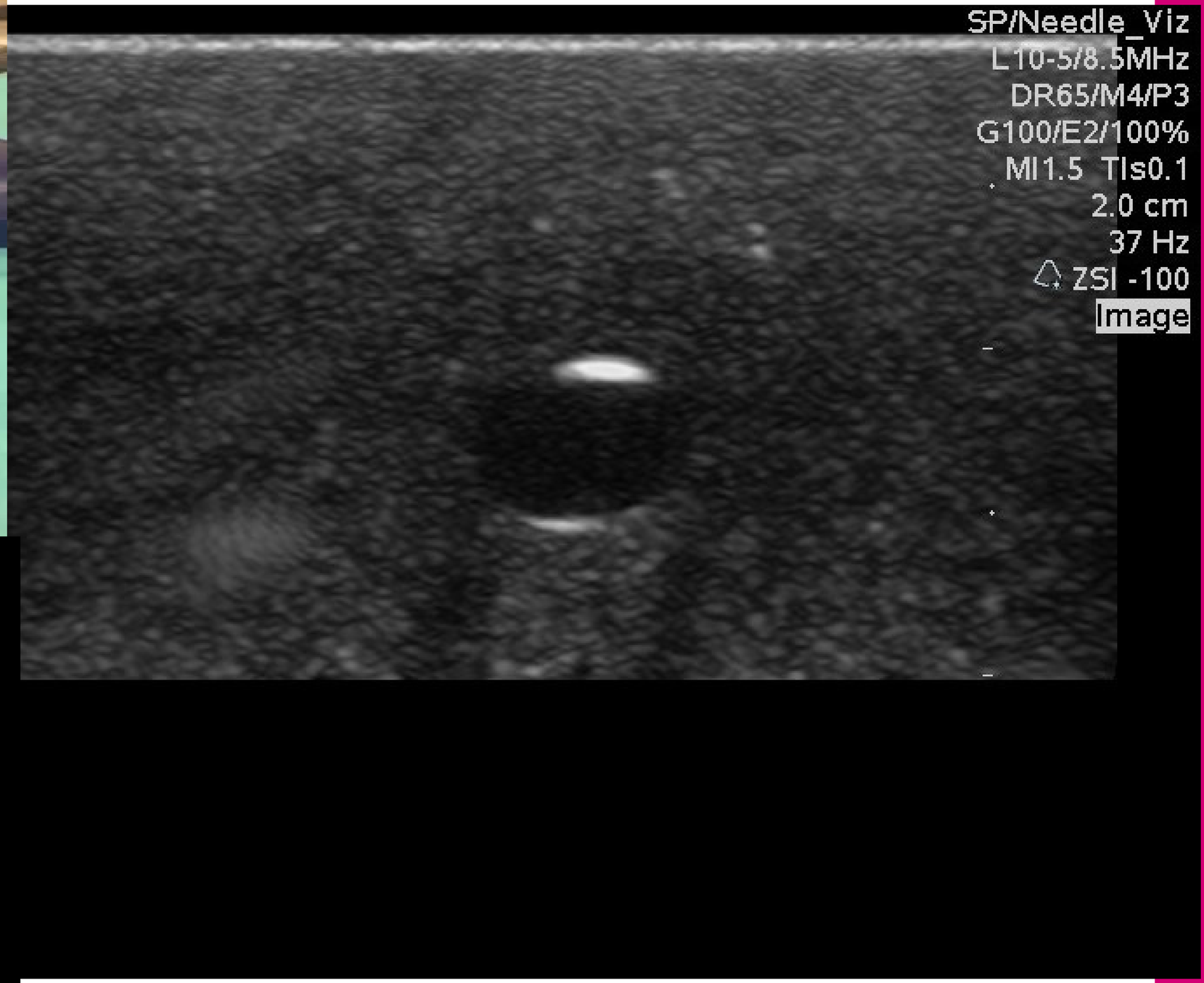


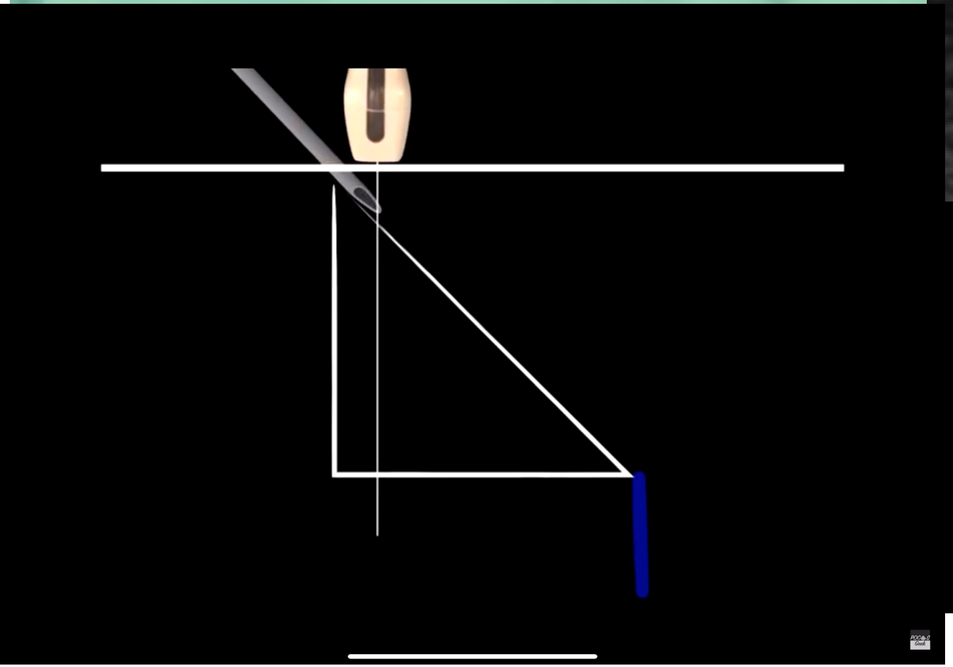


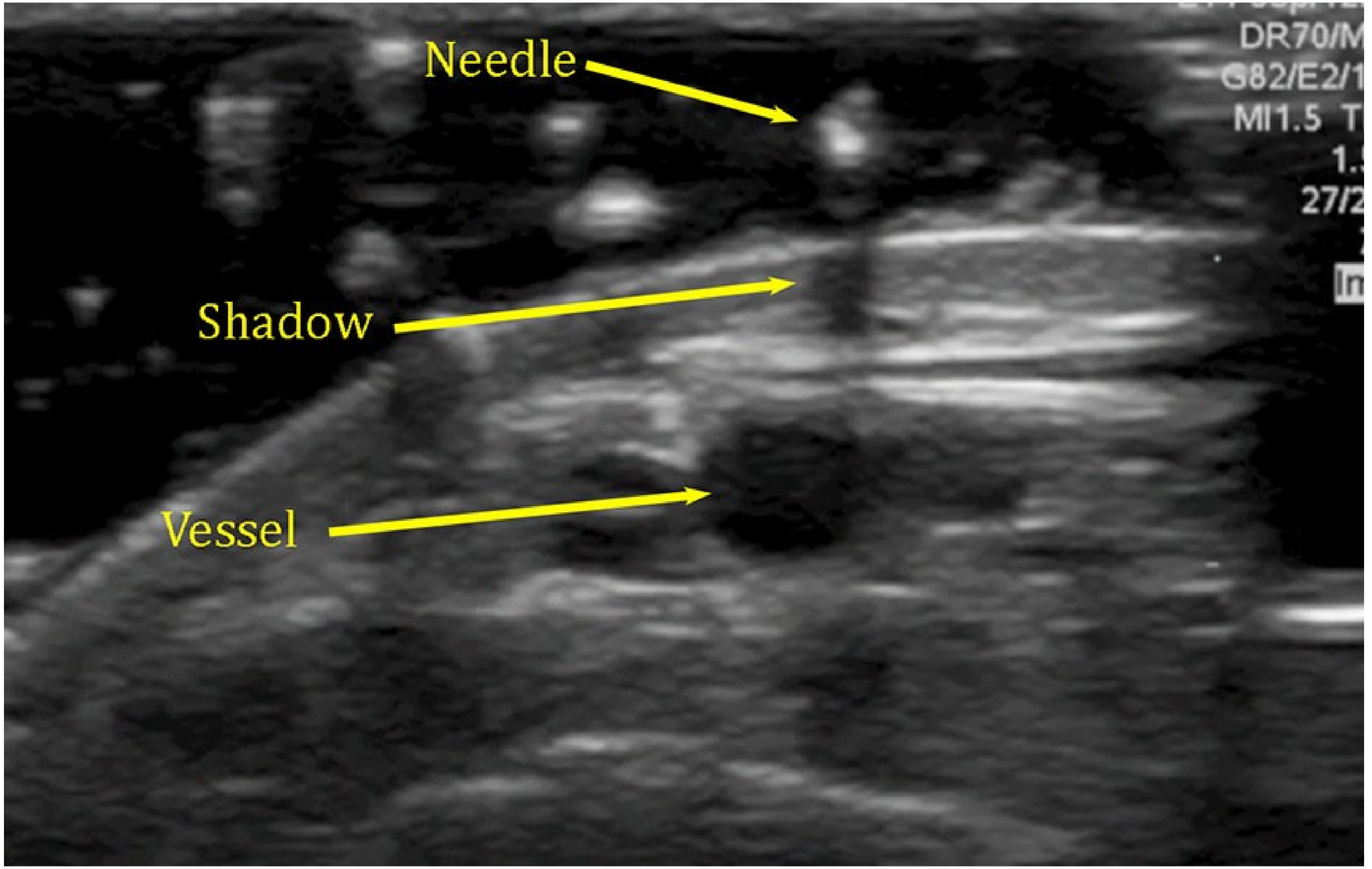
B Out-of-plane view of the needle (short axis of the vessel)





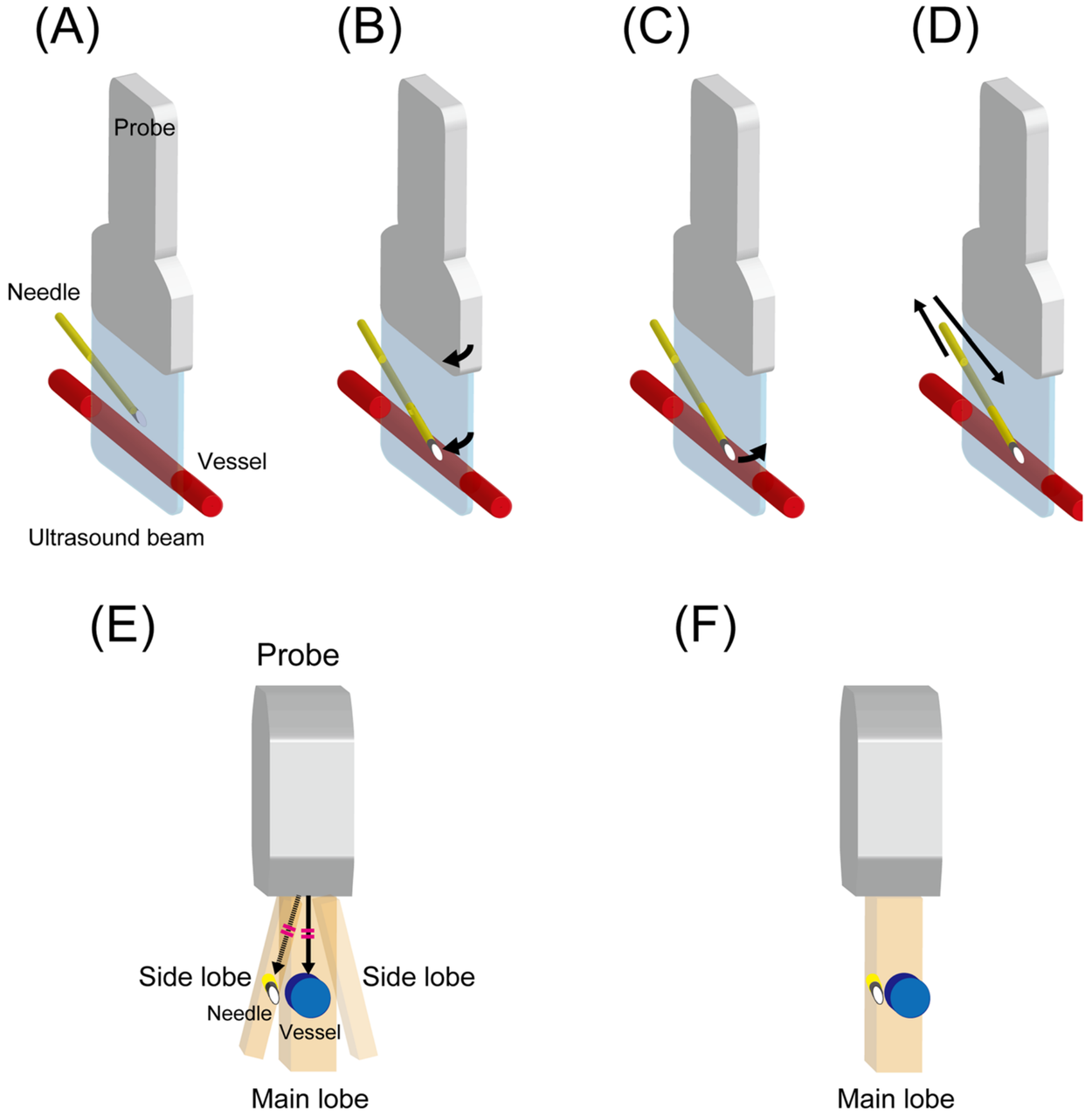

SP/Needle_Viz
L10-5/8.5MHz
DR65/M4/P3
G100/E2/100%
MI1.5 TIs0.1
2.0 cm
37 Hz
ZSI -100
Image




Needle
Shadow
Vessel


1,4 cm


60Hz
RS
2D
78%
Dyn R 60
P Low
Res
M4
X
G
P
R

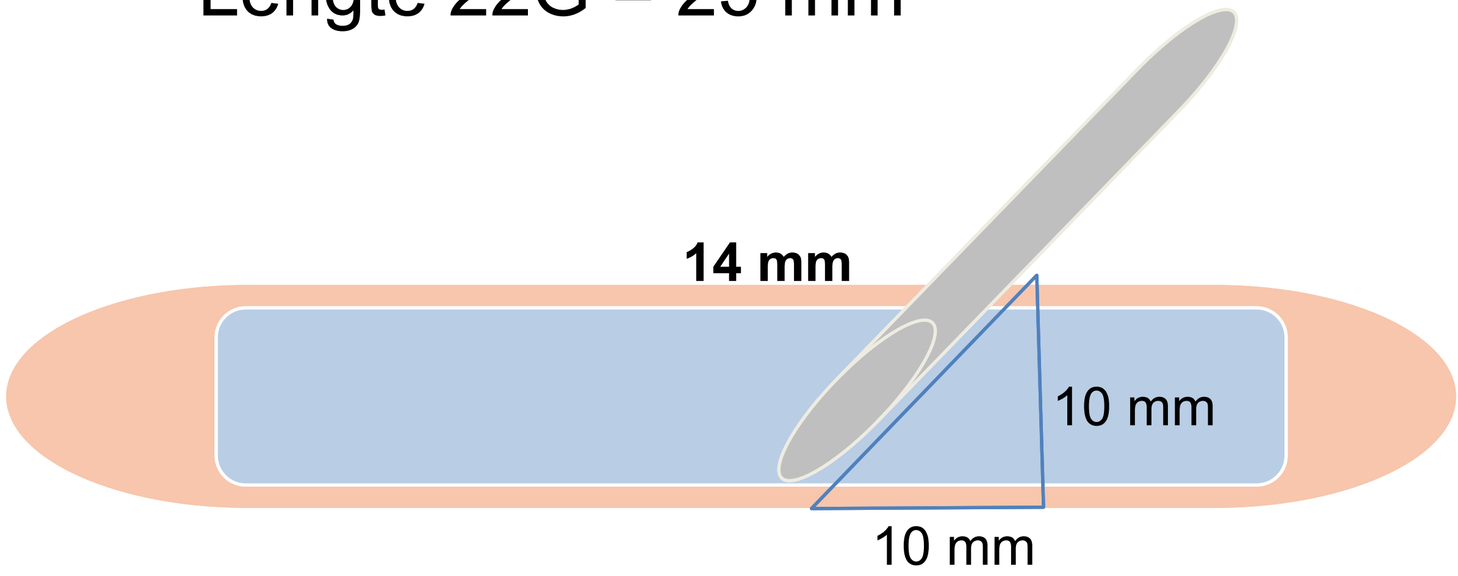


Nakayama et al. Critical Care (2020) 24:592 https://doi.org/10.1186/s13054-020-03305-7

Evaluation of the vessel trajectory:

- Angle
- distance
- diameter
- course
- obstruction

Lengte 24G / 26G = 19 mm
Lengte 22G = 25 mm



$$a^2 + b^2 = c^2$$

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

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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				
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)				

Values are expressed in millimeters as mean ± standard deviatic
jugular vein; BCV, brachiocephalic vein; SBV, subclavian vein; EJV,
vein at the axilla; BrV, brachial vein; BaV, basilic vein; FeV, femoral

French Catheter Scale ***Sizes are outside diameter**

French	Inches	mm
1	0.013	0.33
2	0.026	0.67
3	0.039	1.00
4	0.053	1.35
5	0.066	1.67
6	0.079	2.00
7	0.092	2.60
8	0.105	2.70
9	0.118	3.00
10	0.131	3.30

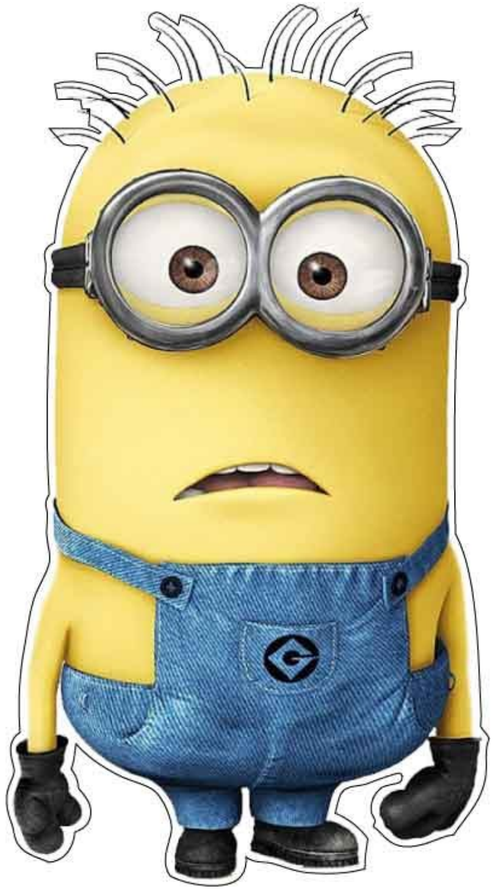
Barone et al. 2019

Applications

- RaCeVa; RaPeVa; RaFeVa
- Central Venous Catheters (CICC; PICC; FICC)
- Peripheral venous catheters
- Peripheral or central arterial catheters.
- Umbilical venous catheters
- Tip location and repositioning
- Detecting thrombi

5. the **right** CLINICIAN (TEAM)

1. Eye-hand coordination
2. Right equipment (linear transducer, resolution)
3. Know what you see and DON’T see
4. Consider getting fully POCUS proficient!
5. Make sure the patient is safe and comfortable



How I feel when I find someone who isn’t as excited by POCUS as I am

Thank you

https://neonat.org