ICU Vascular Approach

(PICC, CVC, Midline, HD catheter)

Wooshik Kim, MD

Department of Thoracic & Cardiovascular Surgery
National Medical Center

국립중앙의료원
national medical center

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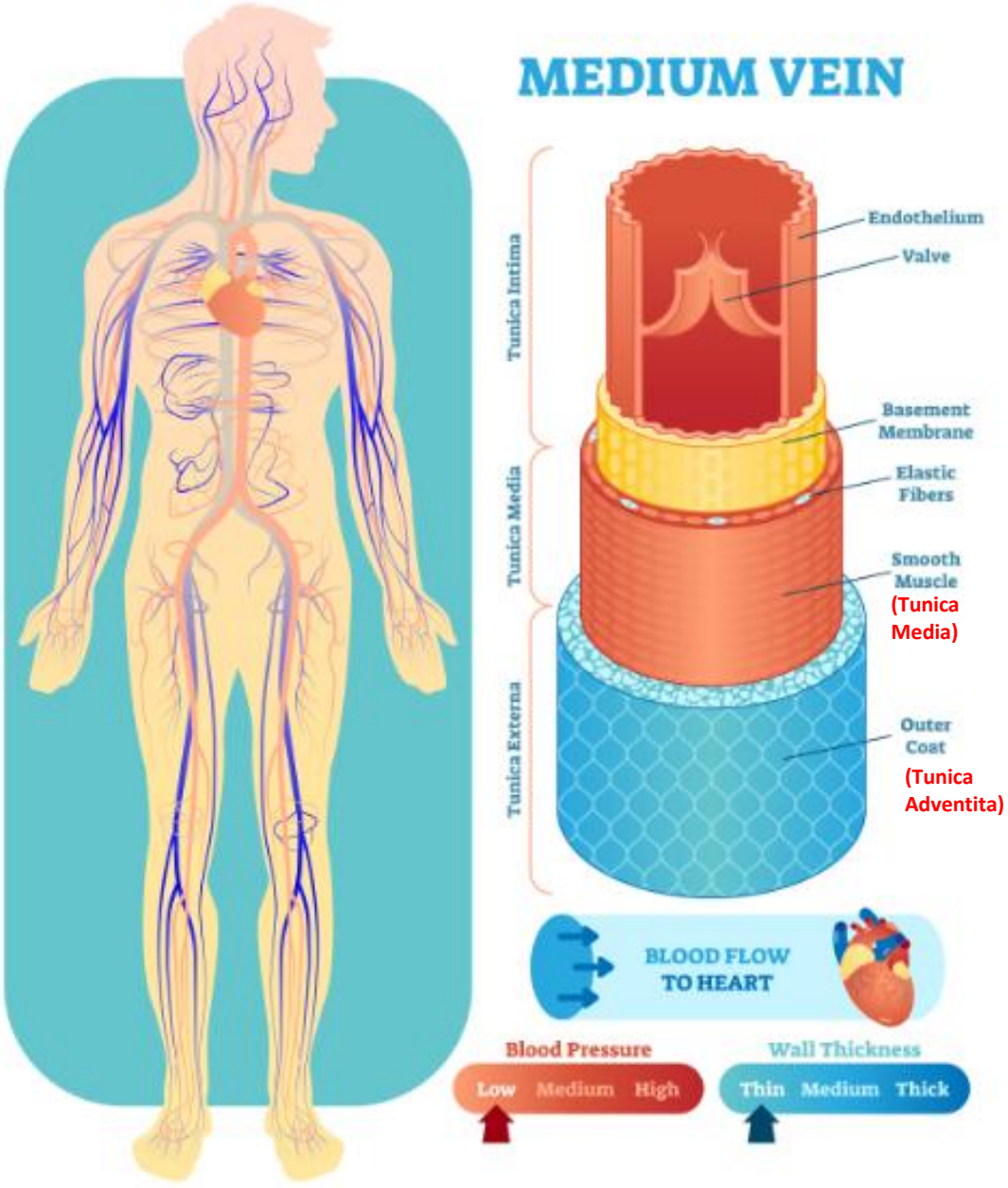

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혈관보호지지

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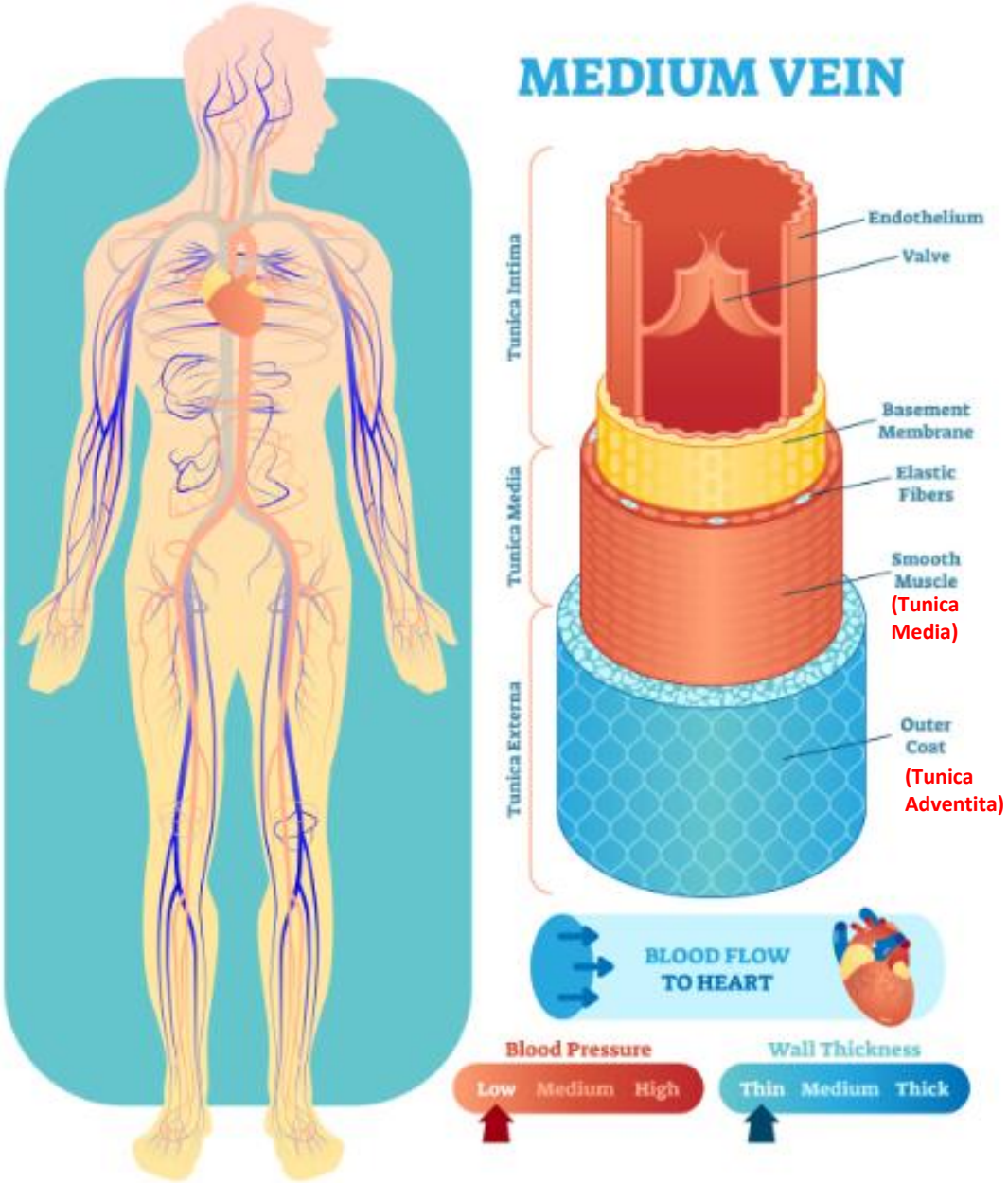

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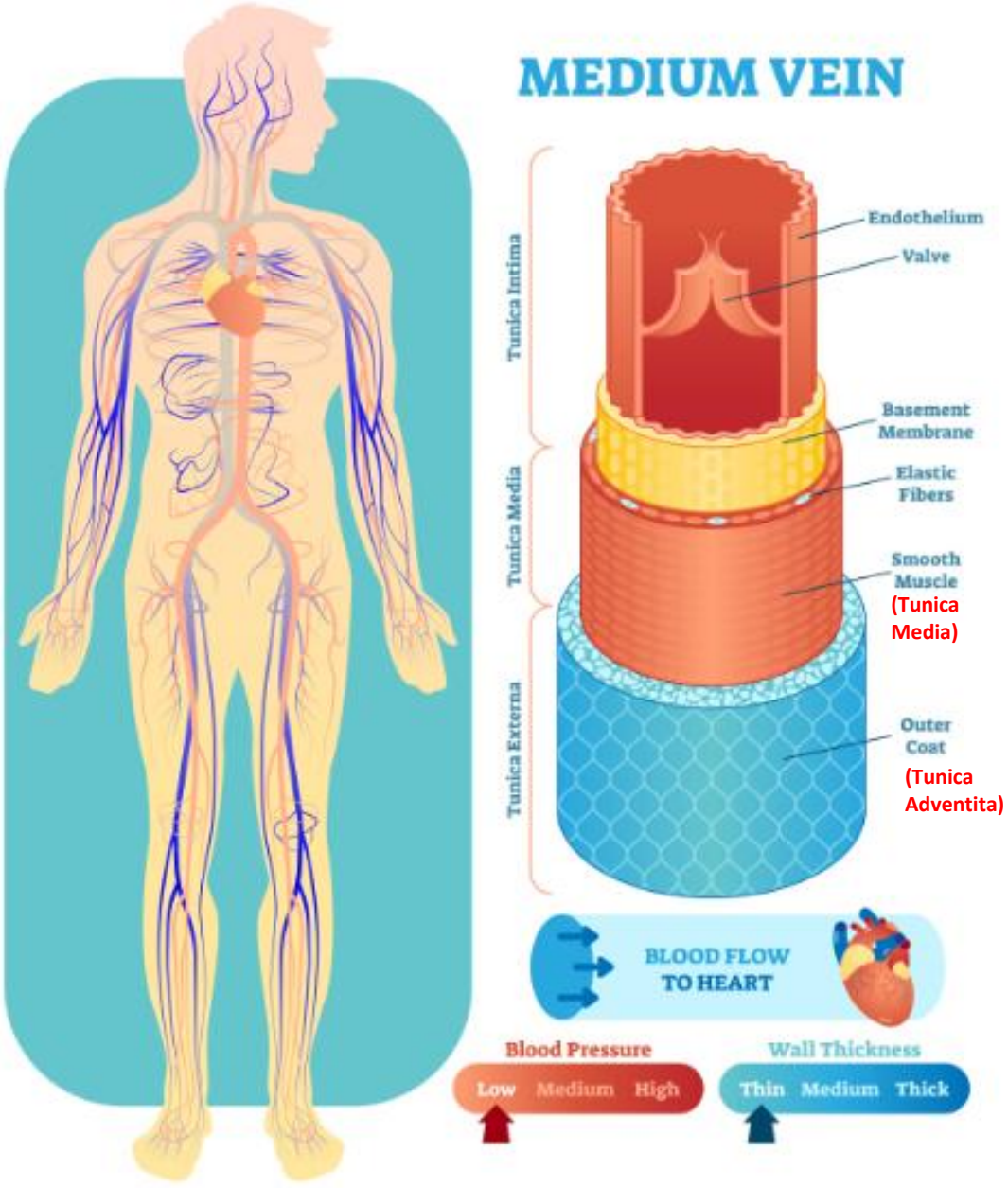

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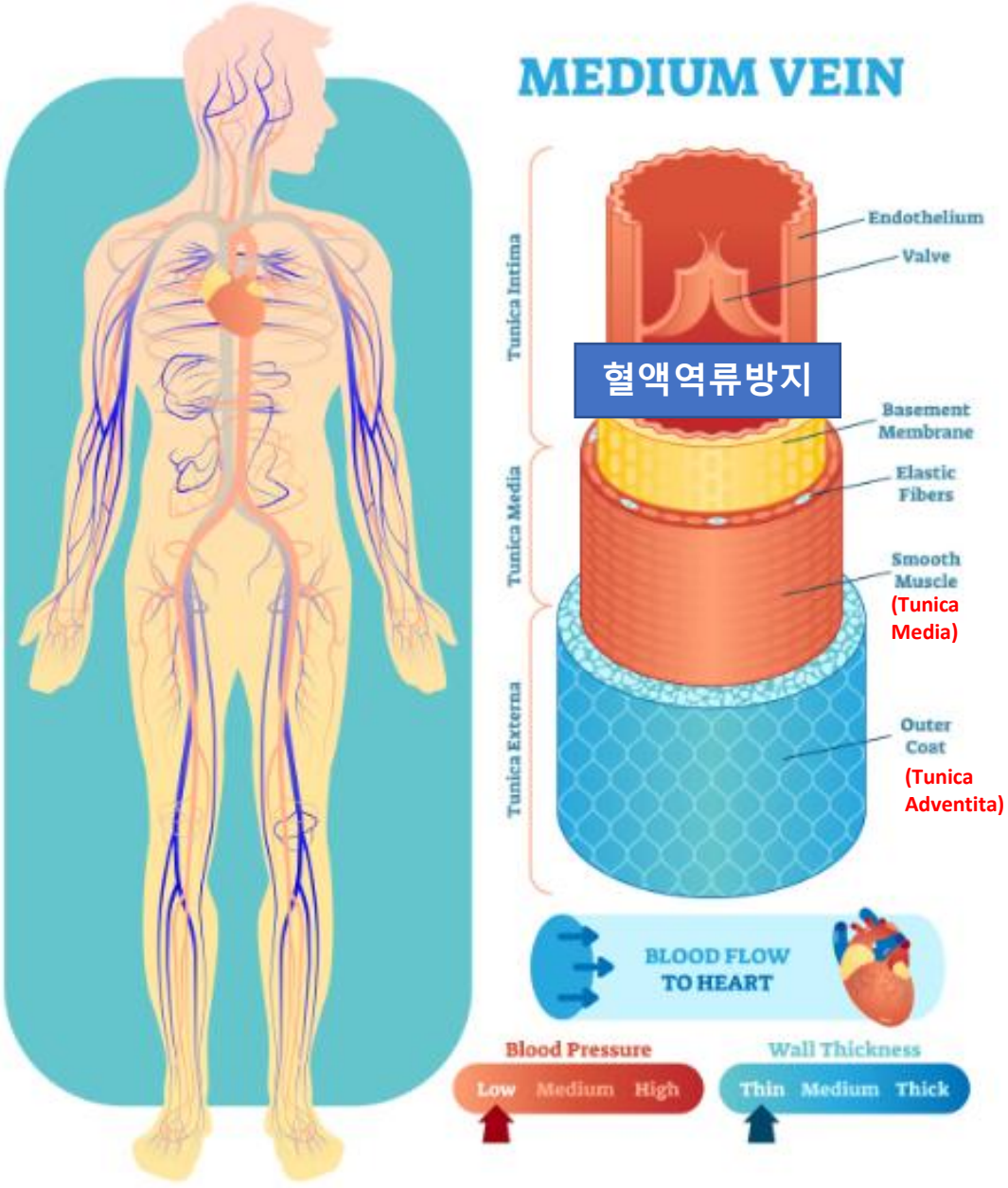

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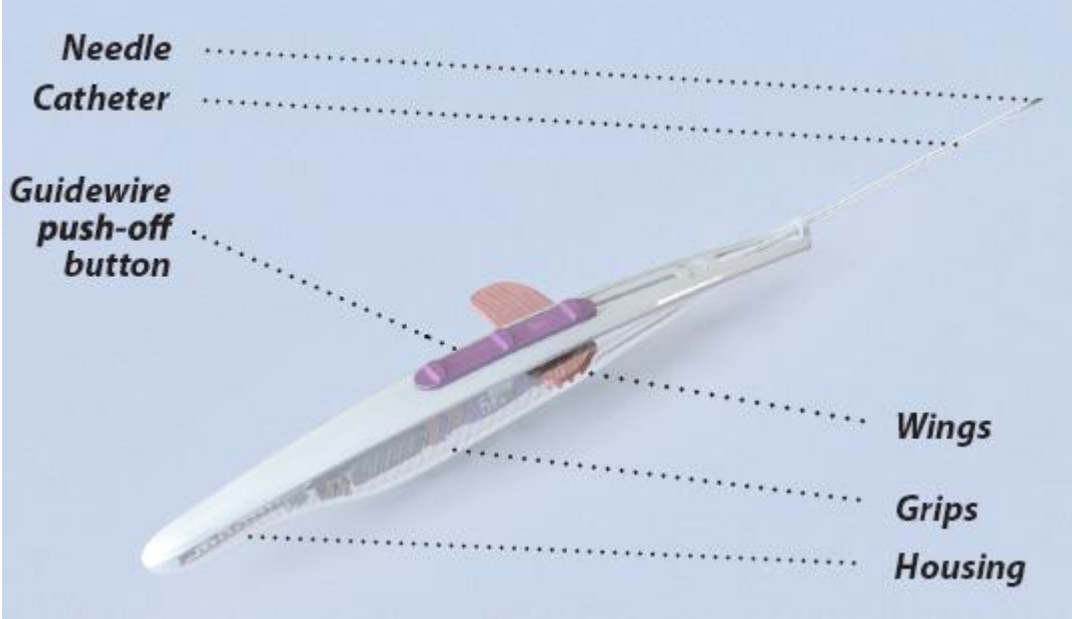
혈관	정맥의 특성	동맥의 특성
정의	산소가 없는 혈액을 심장으로 운반한다. 혈관벽이 얇다 탄력이 적다. 잘 눌려지며 팽창된다. 혈관의 위치가 밖으로 보이거나 깊게 있다. 혈액 역류를 막기 위해 밸브를 가지고 있다. 혈액의 색이 진하고 어둡고 맥박이 없다.	심장에서 산소화된 혈액이 운반된다. 혈관벽이 두껍다. 혈관벽이 탄력적이다. 잘 눌려지지 않는다. 일반적으로 깊은 위치에 있다. 밸브가 없다. 혈액의 색이 밝고 맥박을 있다.
내막	가장 안쪽의 벽 한 겹으로 되어 부드럽고 편평한 내피세포 내피층의 손상이나 이물질의 유입으로 염증반응을 일으켜 정맥염이나 혈전증이 생긴다.	가장 안쪽의 벽 한 겹으로 된 부드럽고 편평한 내피세포
중막	근육, 탄력 조직으로 수축과 이완 역활	근육, 탄력조직이 정맥보다 두껍고 단단하다.
외막	가장 바깥 쪽의 벽 결합조직으로 구성, 지지 역할, 혈관보호	가장 바깥 쪽의 벽 결합조직이 정맥보다 더 두껍다.

PowerGlide Pro™ midline Catheter: Device investigated

- 18G-20G
- Polyurethane Power injectable
- 8 and 10cm long
- Wire integrated
- No touch technology
- Blind technique adoptable
- Easy to use ofr nurse able to place cannula
- Don’t need for a huge sterile area (no wire)
- Longer dwell time
- External length



GAUGE SIZE	CONTRAST MEDIA[1] TEMPURATURE	CONTRAST MEDIA[1] VISCOSITY	MAX FLOW (mL/sec)	INJECTOR SAFETY CUT-OFF (PSI)
18 GA	Warmed (37°C)	11.8 cP	7	325 Max
20 GA			5	
22 GA			2	

Blood collection fron PowerGlide Pro midline Catheter

Designed to improve and maintain a consistent aspiration flow rate without catheter collapse.[1]

• Vein Access in Hospitalized Patient

- 90 % of hospitalized patients require a PIV treatment
- Prefer a peripheral access if there is no proper indication to a central access
- Use short cannula as first option for peripheral access estimated to be required for < 7 days
- Use mini-midline as first option for peripheral access estimated to be required for **>7 days** or **in Difficult IV Access patient**

• Midline Catheter

- Catheter inserted from a peripheral vein (Basilic, Brachial, Cepahlic vein) in the arm area under ultrasound guidance
- Allow catheter dwell time for up to **29days**
- Catheter length 8-10cm / 18G, 20G
- Material polyurethane
- Self installed guidewire designed to assist with insertion success

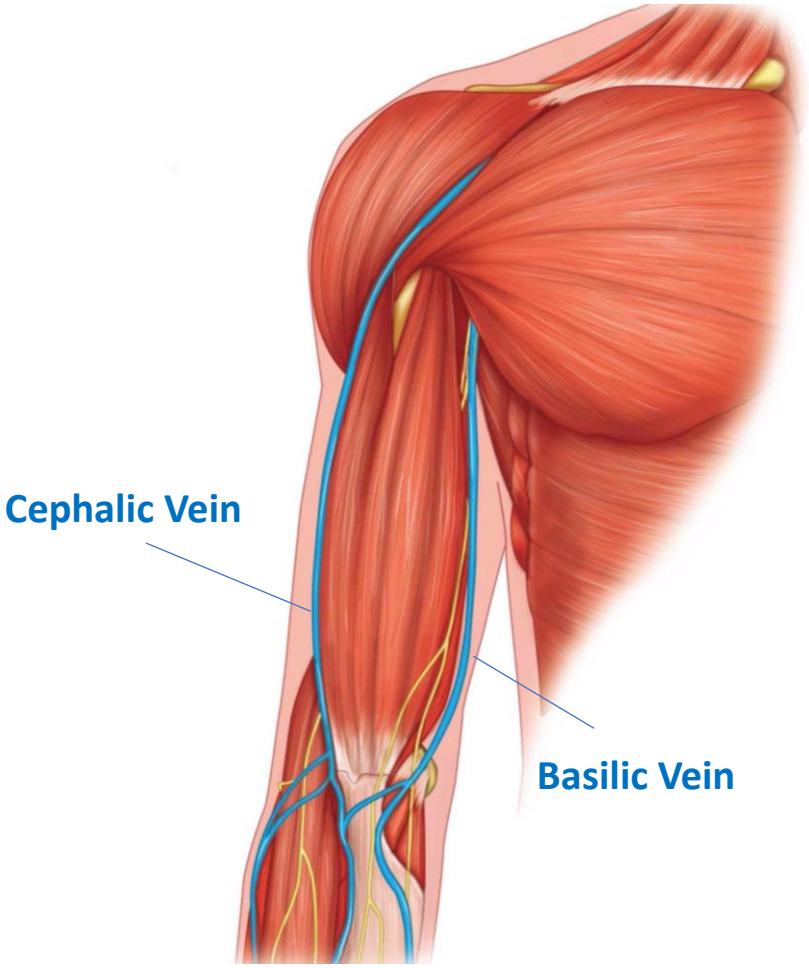
• Midline Catheter Benefits

- Difficult IV access patient
- Allow power application of a contrast agent for CT
- Can be inserted at the bedside
- Reduced complication rate
- Preserve peripheral vascular system(reduced venous depletion)
- No need for post procedural x-ray
- Short learning curve

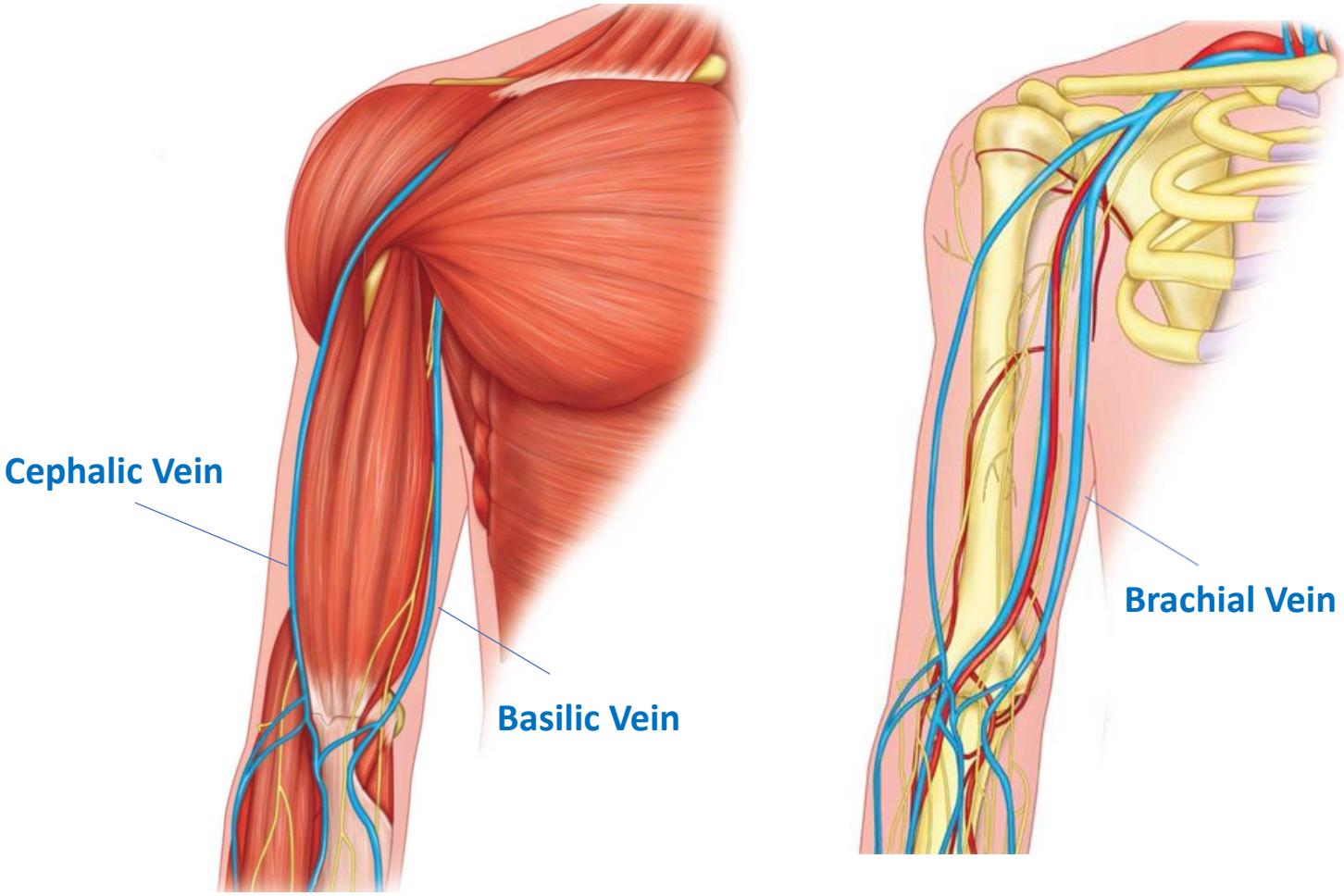
• Midline Catheter Limitation

- Infusion or medications with pH below 5 or over 9
- Osmolarity over 600 mOsm/L
- Total parenteral nutrition
- Irritating and vescicant drugs (ex. Daunorubicin, Doxorubicin)
- Any drug potentially associated with endothelial damage, independently from pH or osmolarity
- Not optimal for repeated blood samples

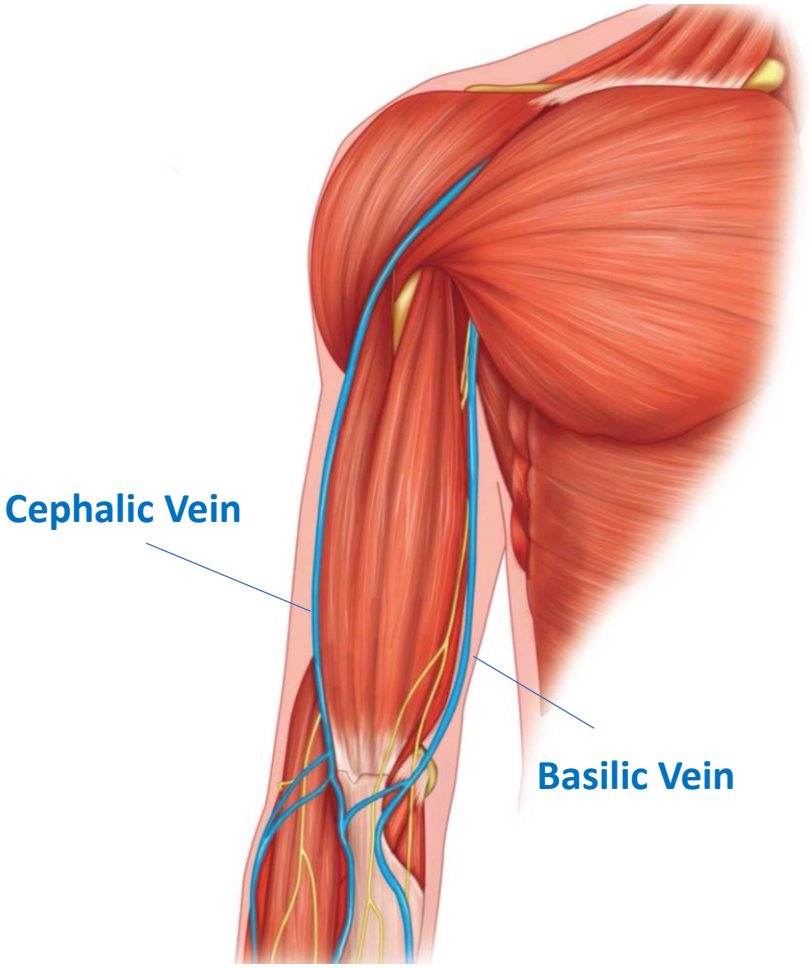
Vascular Anatomy

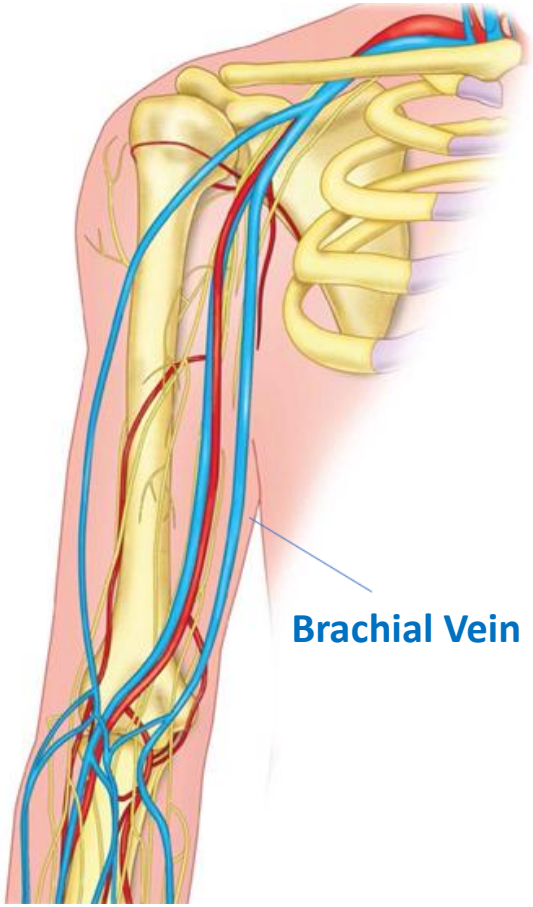


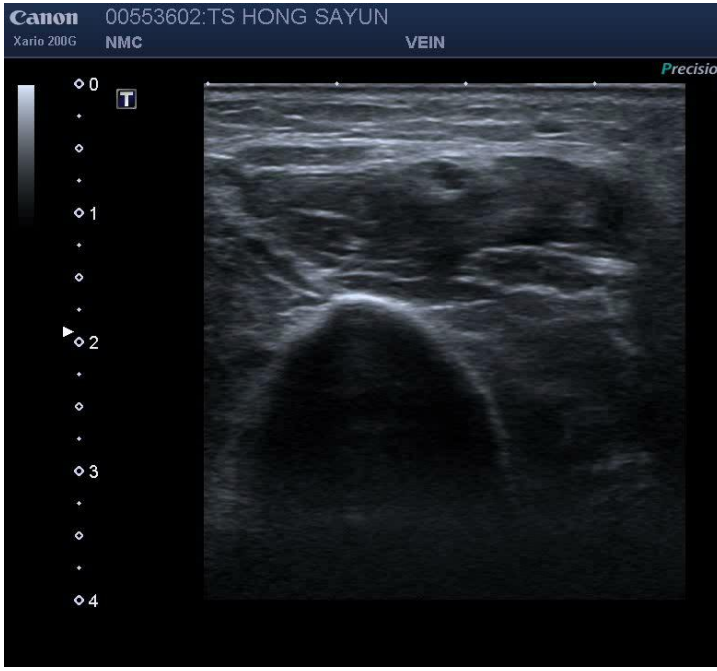
Vascular Anatomy



Vascular Anatomy







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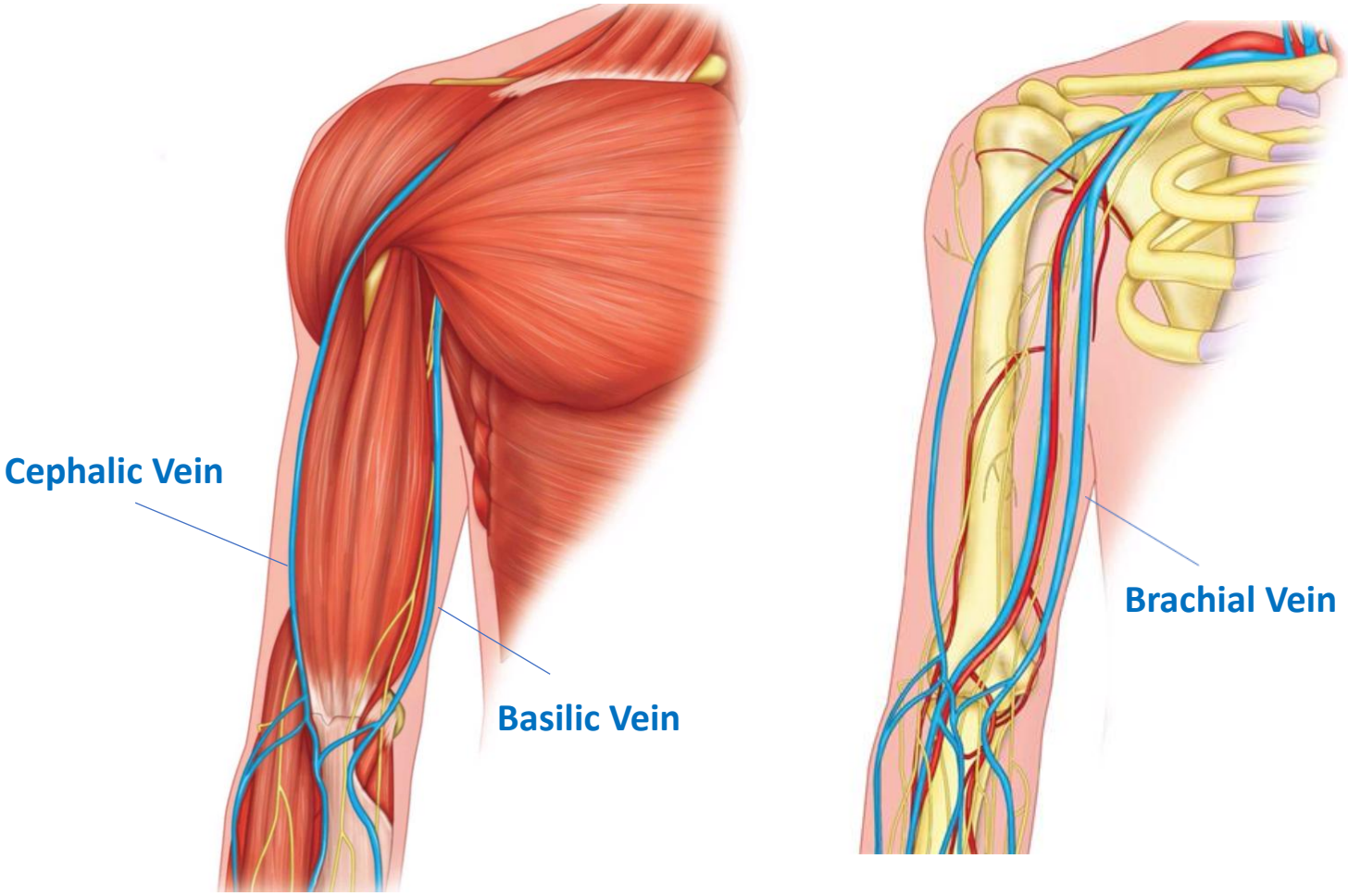

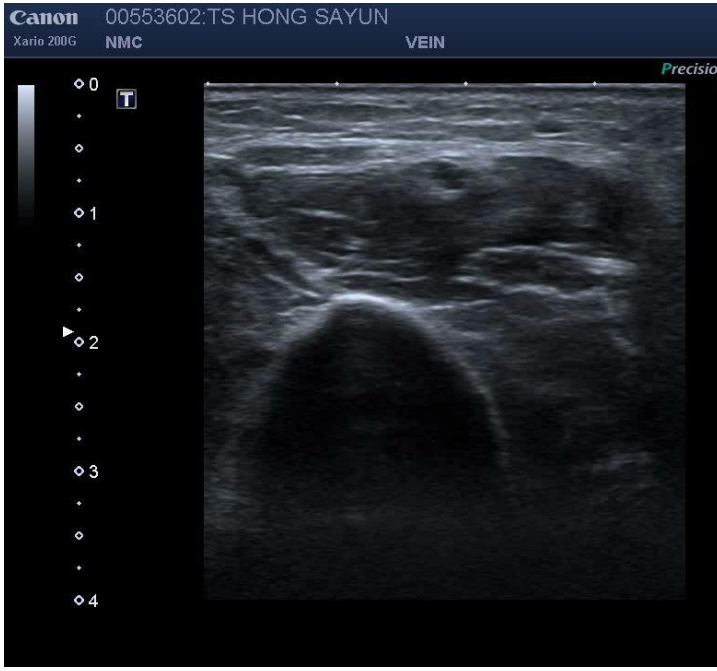

Basilic Vein (55%) > Brachial Vein (28%) > Cepahlic vein (17%)

J Infus Nurs 2015;38(5):351-357

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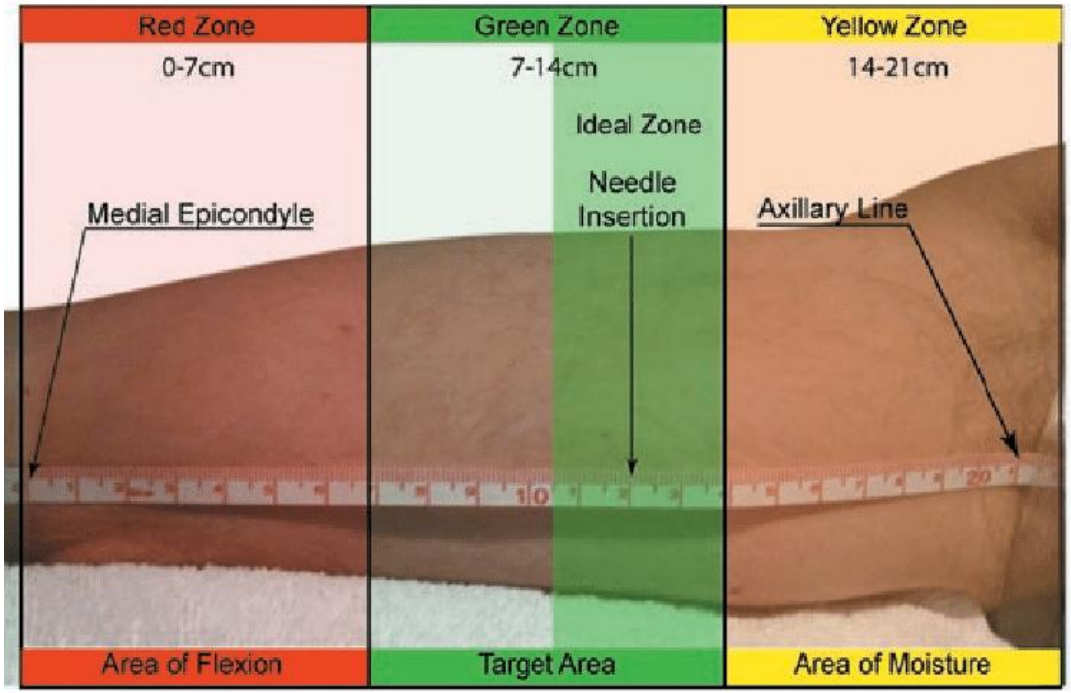
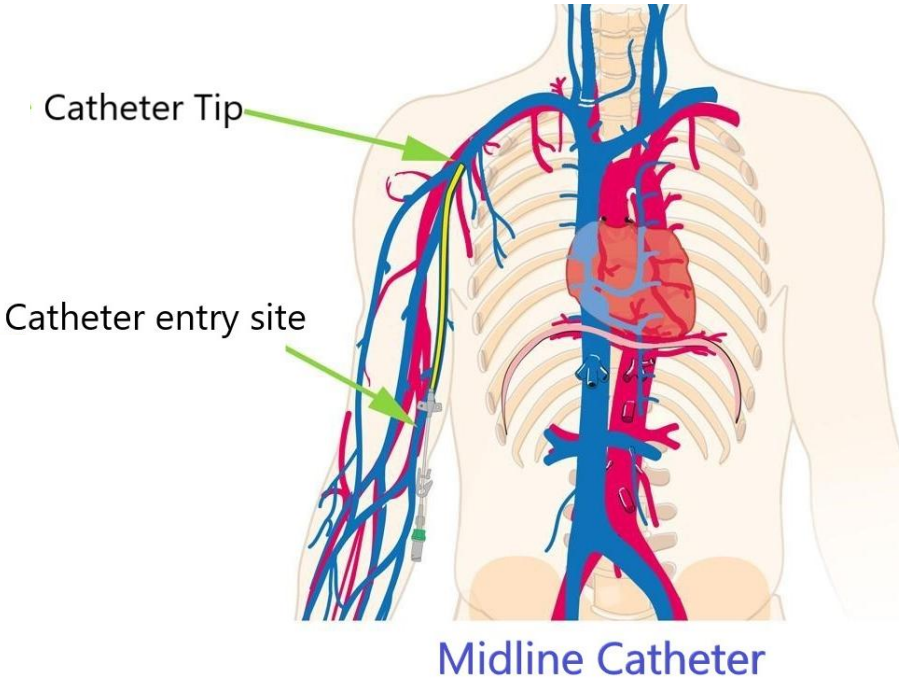
Where to insert





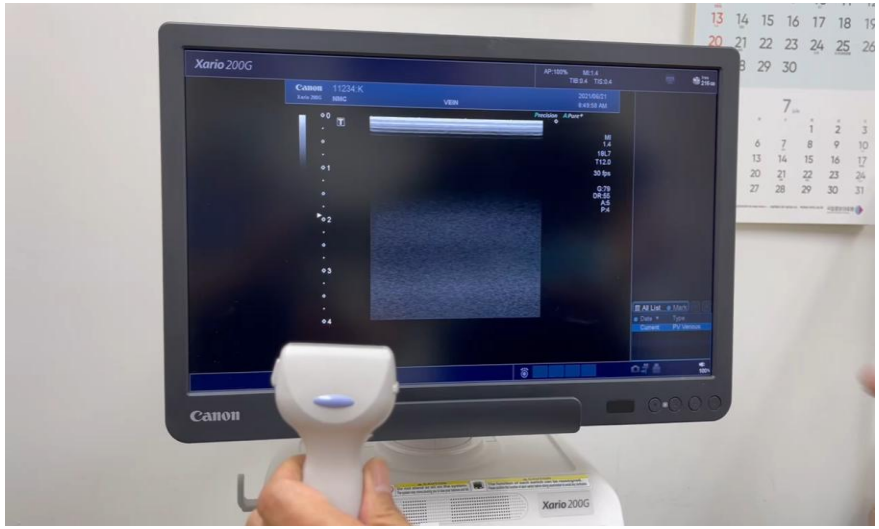
A *systematic approach* to *determine* the *ideal insertion site* for *PICCs* in the *upper arm* J Vascular Access2011 16(3):156-165

Step by Step Ultrasound technique in Midline insertion

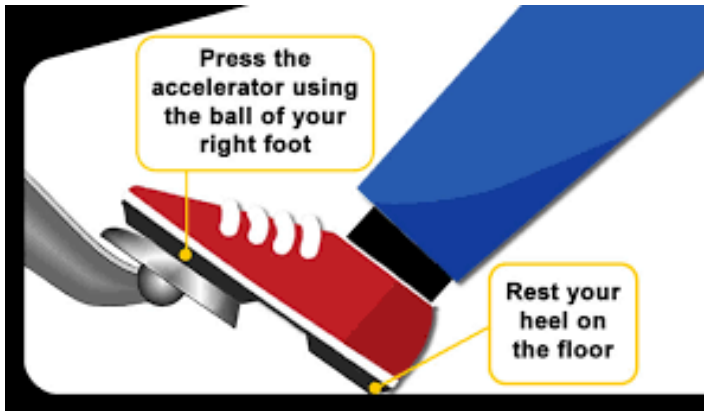
1. Setup for the Ultrasound before cannulation

2. Probe Selection & Orientation

- Linea probe
- 10-15 MHz transducer (superficial veins)
  : High frequency, low penetration
- Probe Marker on screen



3. Hand Stabilization



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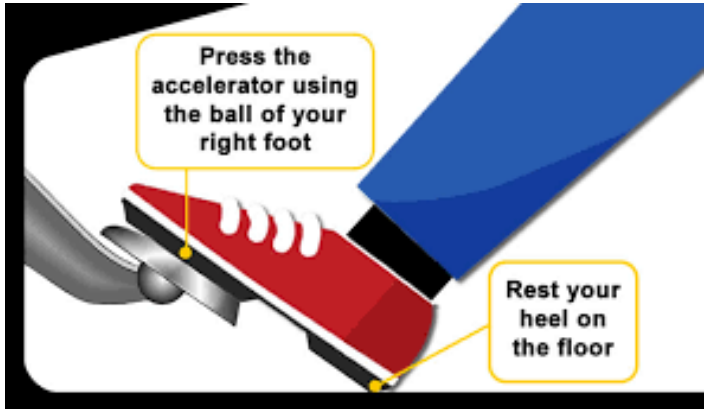

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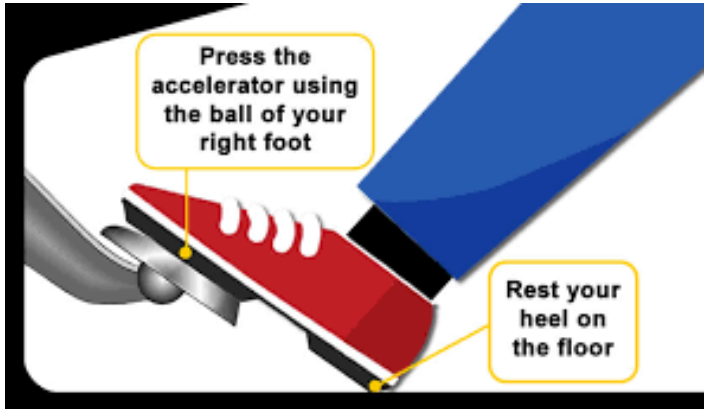
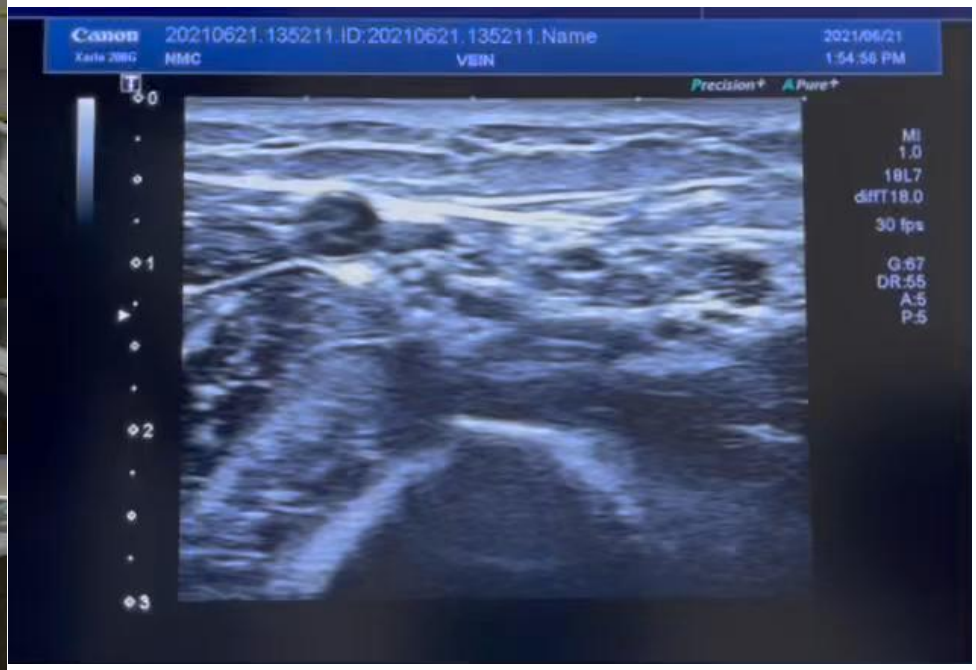


4. Adjust Depth and Gain to optimize Image

- Adjust gain to identify vessel and surrounding tissue
- Adjusting Focus



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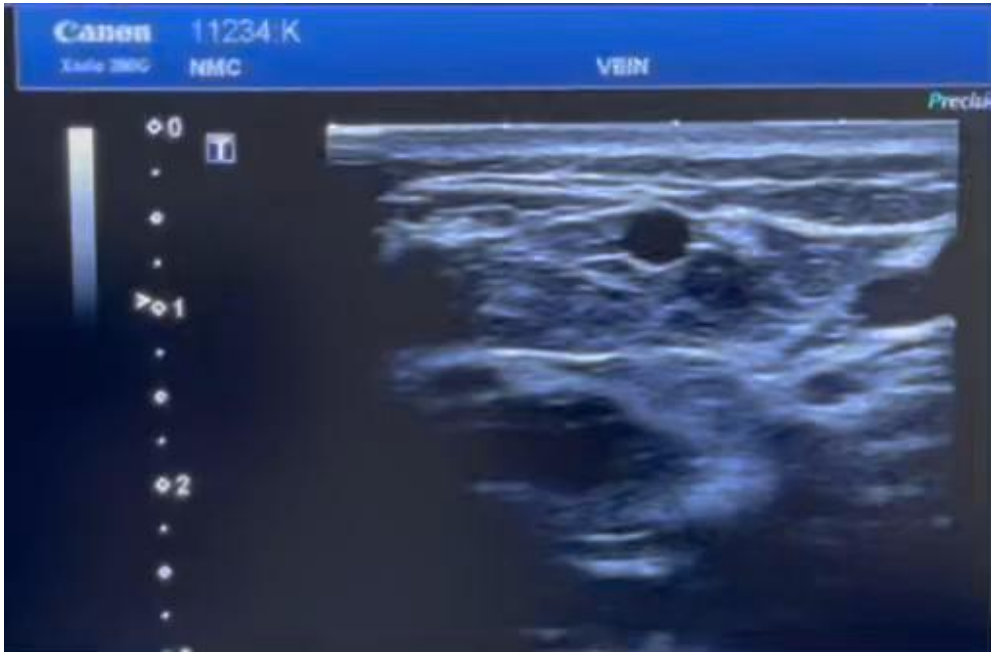
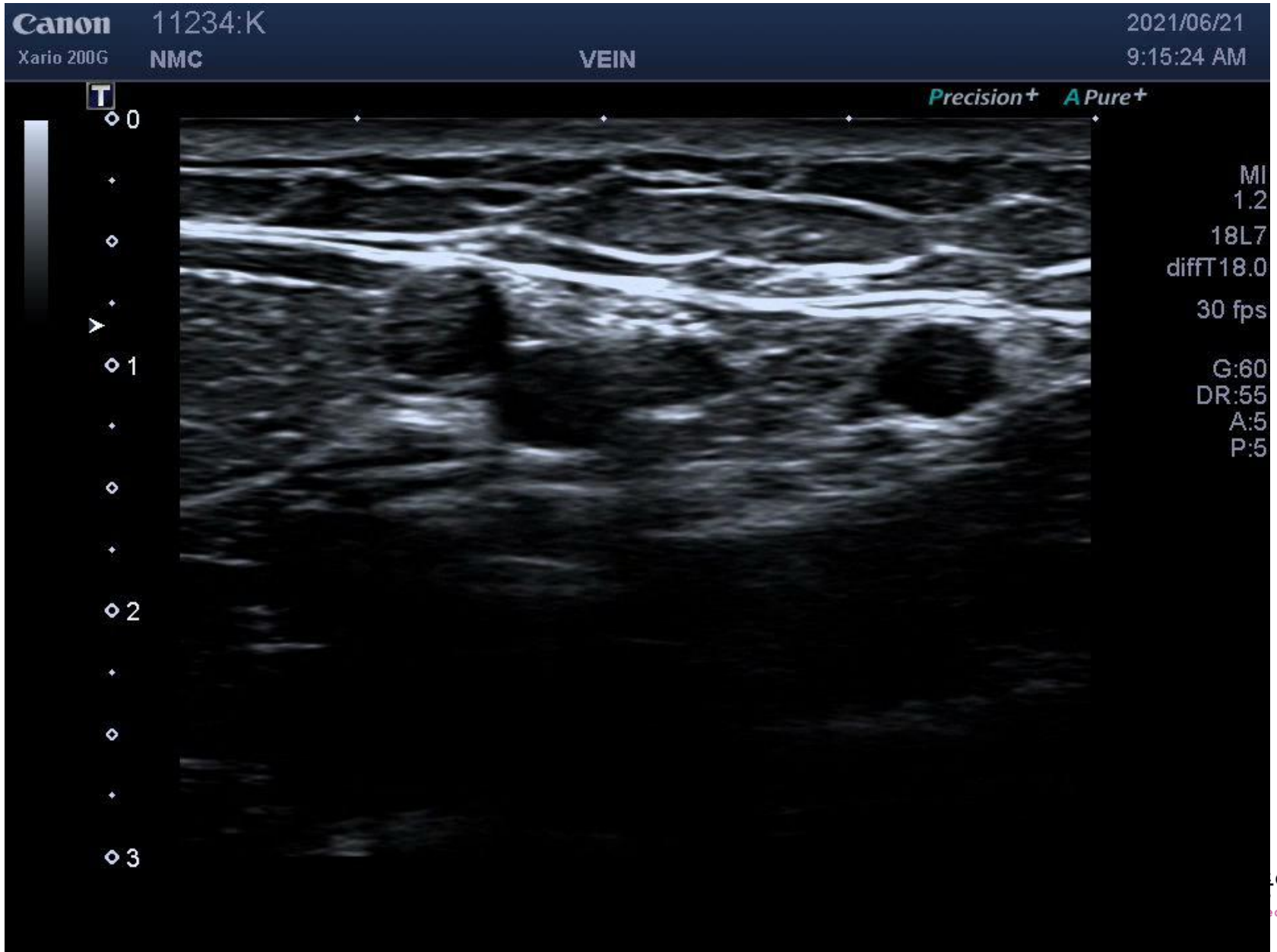


5. Color Doppler and Spectral doppler



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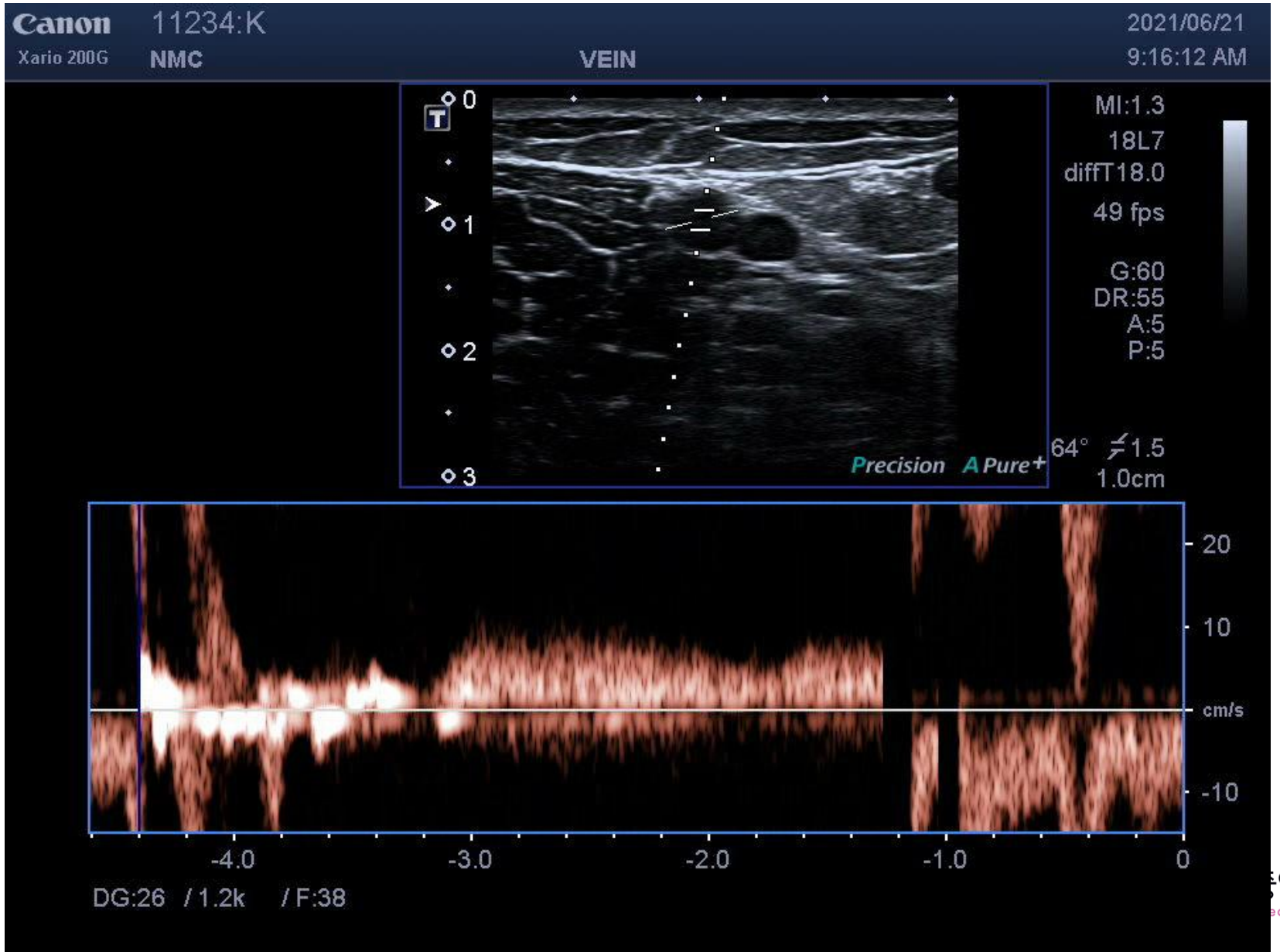
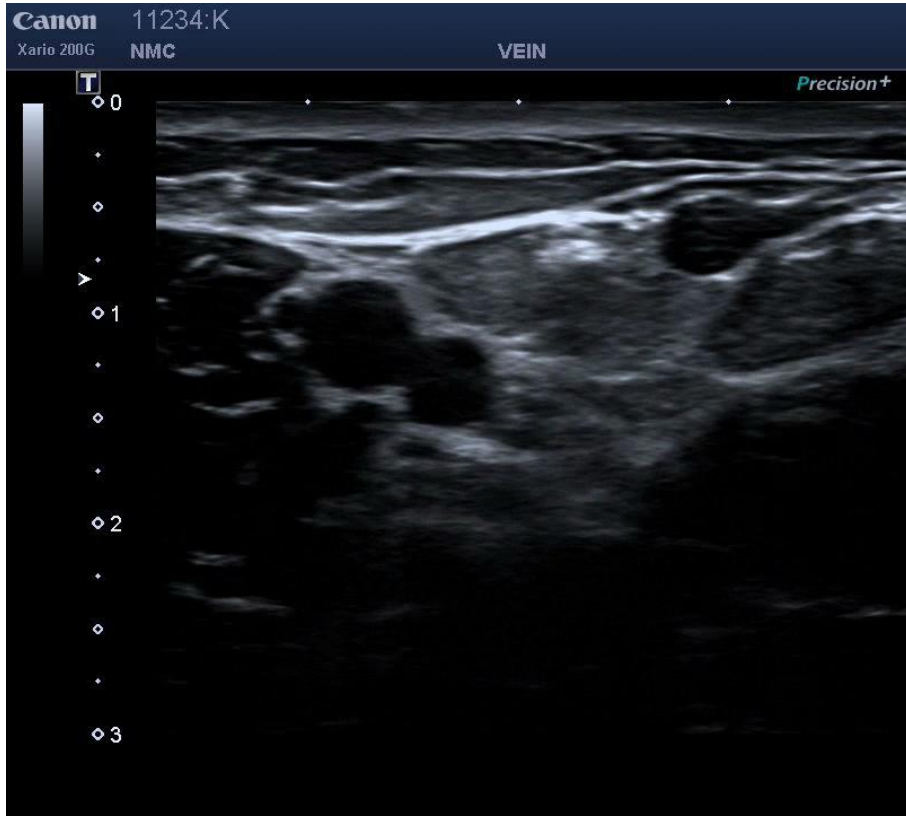


6. Identify anatomy of insertion site and localize the vein

- Identify anatomic structures vein, artery, nerve
- Check for anatomic variations
- Select the most appropriate vessel to cannulate
  - vessel size(Catheter/vein ratio), shape, depth



☞ What gauge?

18 G (3.9Fr) – 1.3 mm

20 G (3.3Fr) – 1.1 mm

22 G (2.8Fr) – 0.9 mm

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Infusion Therapy Standards of Prsctice, INS 2016

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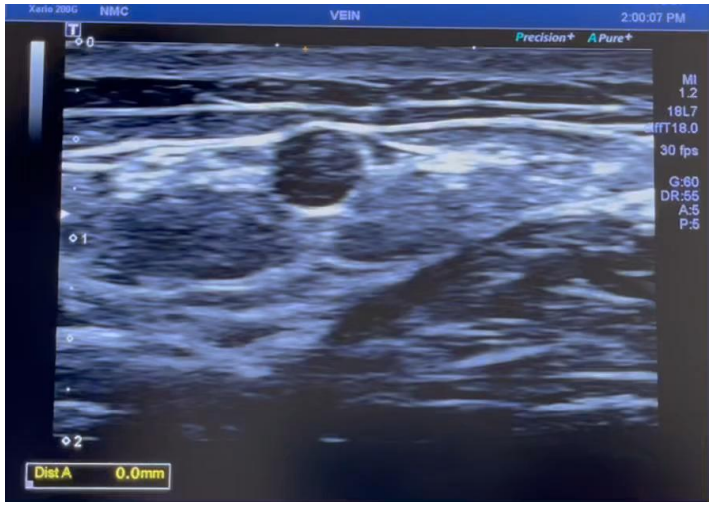
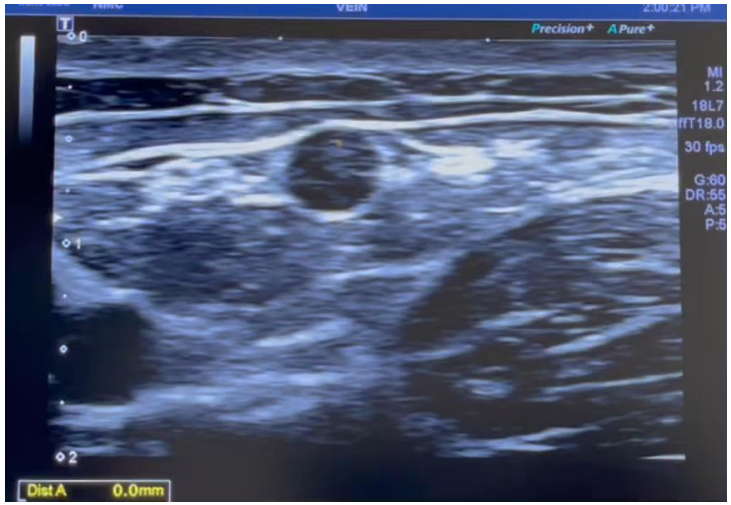
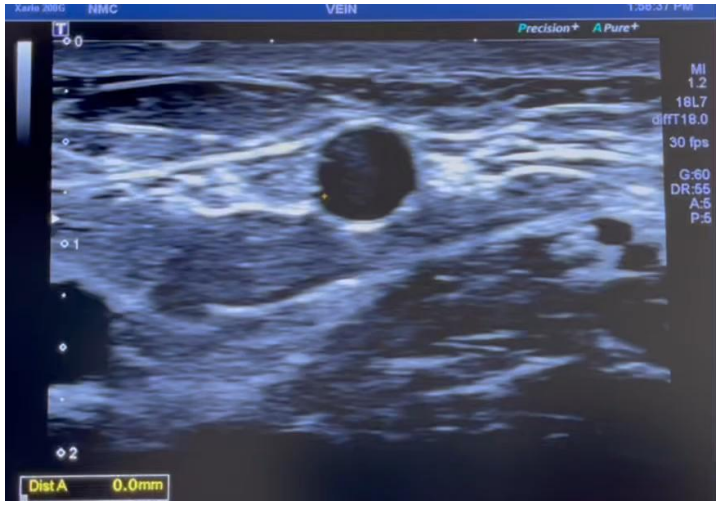


Skin to vein depth



Before tourniquet apply



After tourniquet apply

7. Find the best access point

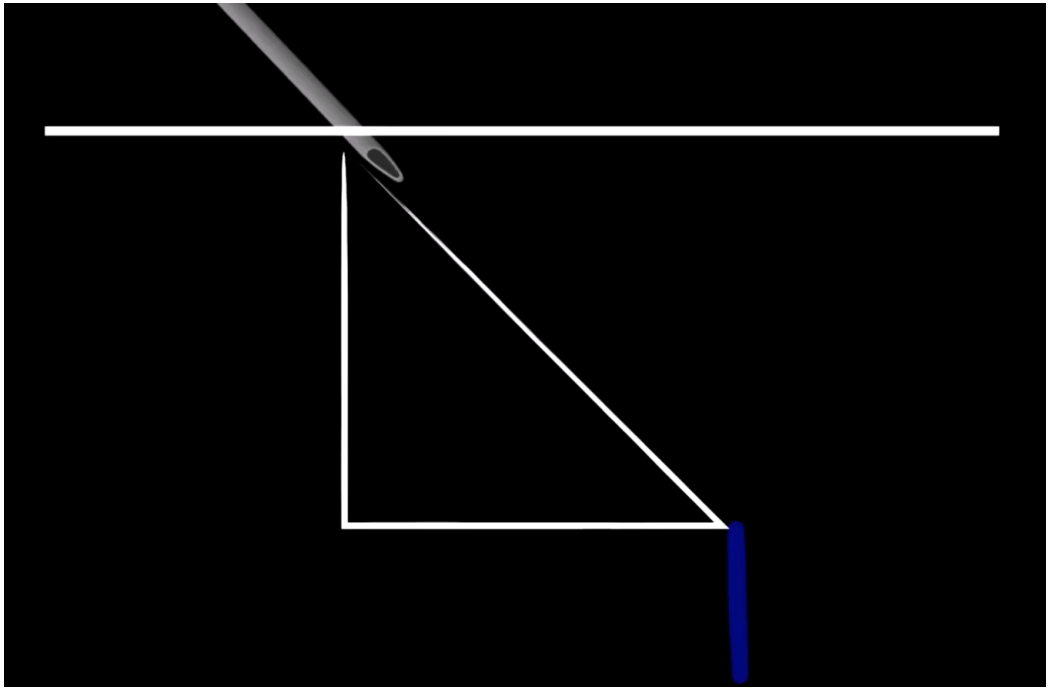
- Preferably access at straight vein
- Avoid tortuosity and vein valve
- Midline terminates distally at the axillary vein

6. Preparing the Probe

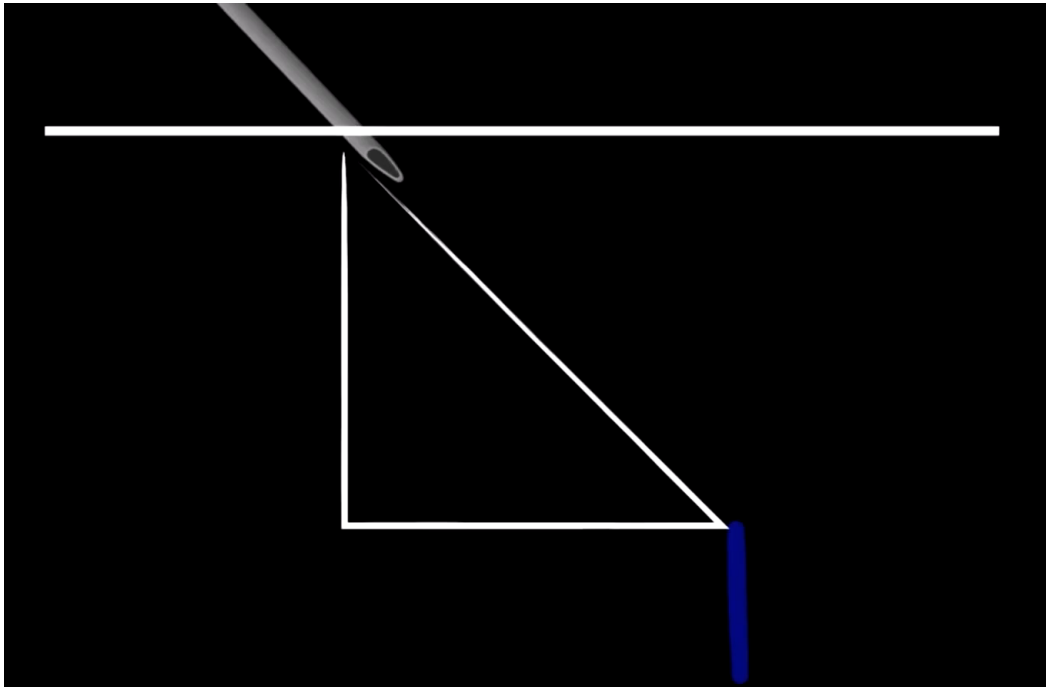
7. Use real time US guidance for puncture of the vein

- Lidocaine injection to avoid vasoconstriction
- Use a short axis / out of plane or a long axis / in-plane approach
- Try to consistently identify the tip of the needle during the needle approach to the vein and puncture the vein

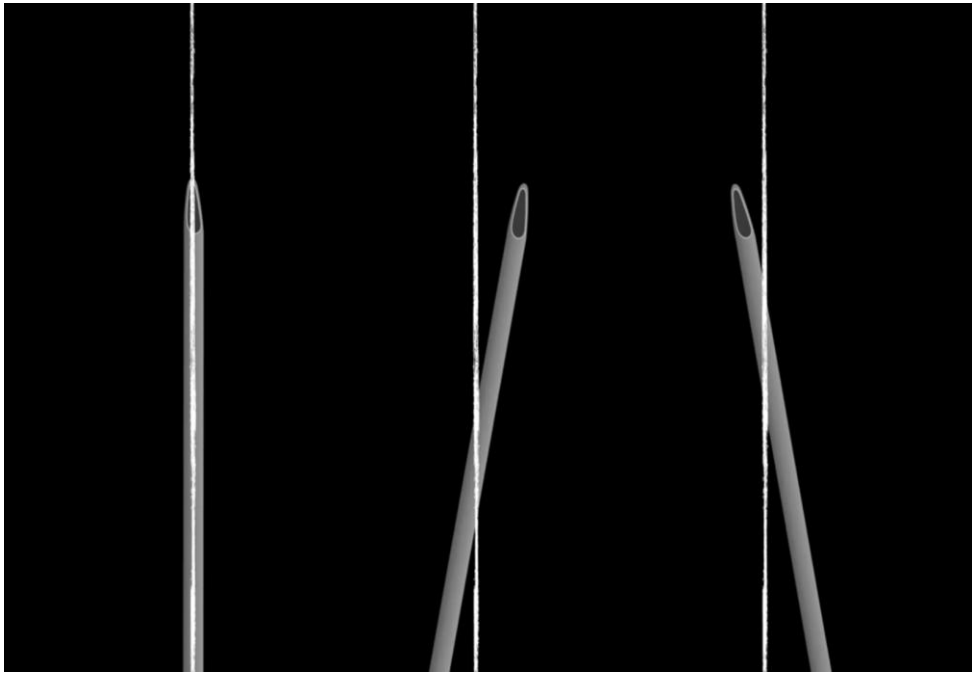
- **Short axis / Out of plane**



- **Short axis / Out of plane**



- **Long axis / In-plane approach**



Comparison of Short- vs Long-axis Technique for Ultrasound-guided Peripheral Line Placement: A Systematic Review and Meta-analysis

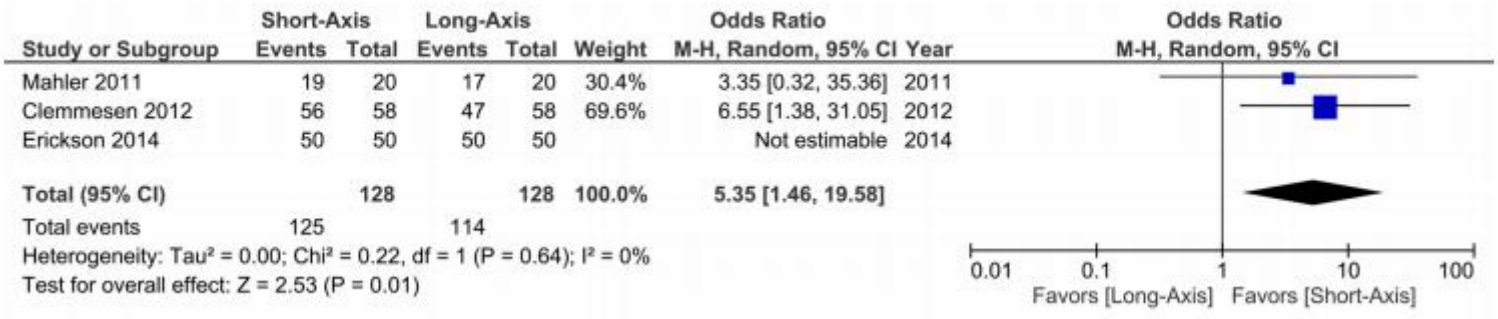
Michael Gottlieb [1], Dallas Holladay [2], Gary D. Peksa [3]

Journal of the Association for Vascular Access (JAVA), Volume 25, No. 4.

- Short-axis technique : 125 of 128 total placements (97.7%)

  Vs.

  Long-axis technique : 114 of 128 total placements (89.1%)



Study or Subgroup	Short-Axis Events	Short-Axis Total	Long-Axis Events	Long-Axis Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Mahler 2011	19	20	17	20	30.4%	3.35 [0.32, 35.36]	2011
Clemmesen 2012	56	58	47	58	69.6%	6.55 [1.38, 31.05]	2012
Erickson 2014	50	50	50	50		Not estimable	2014
Total (95% CI)		**128**		**128**	**100.0%**	**5.35 [1.46, 19.58]**	
Total events	125		114				

Heterogeneity: Tau² = 0.00; Chi² = 0.22, df = 1 (P = 0.64); I² = 0%

Test for overall effect: Z = 2.53 (P = 0.01)

7. Stop and start all over, if you lost your needle tip

- Stop moving both hands especially don’t advance the catheter
- Flatten the needle tip
- Move one hand at a time
- Slide the probe up and down the axis of the vein until you see the needle tip
- Jiggle the needle – check local tissue movement

8. Confirm the needle position in vein

- Confirm that needle tip is placed centrally in the vein before advancing the guide wire

- Always check the posterior wall

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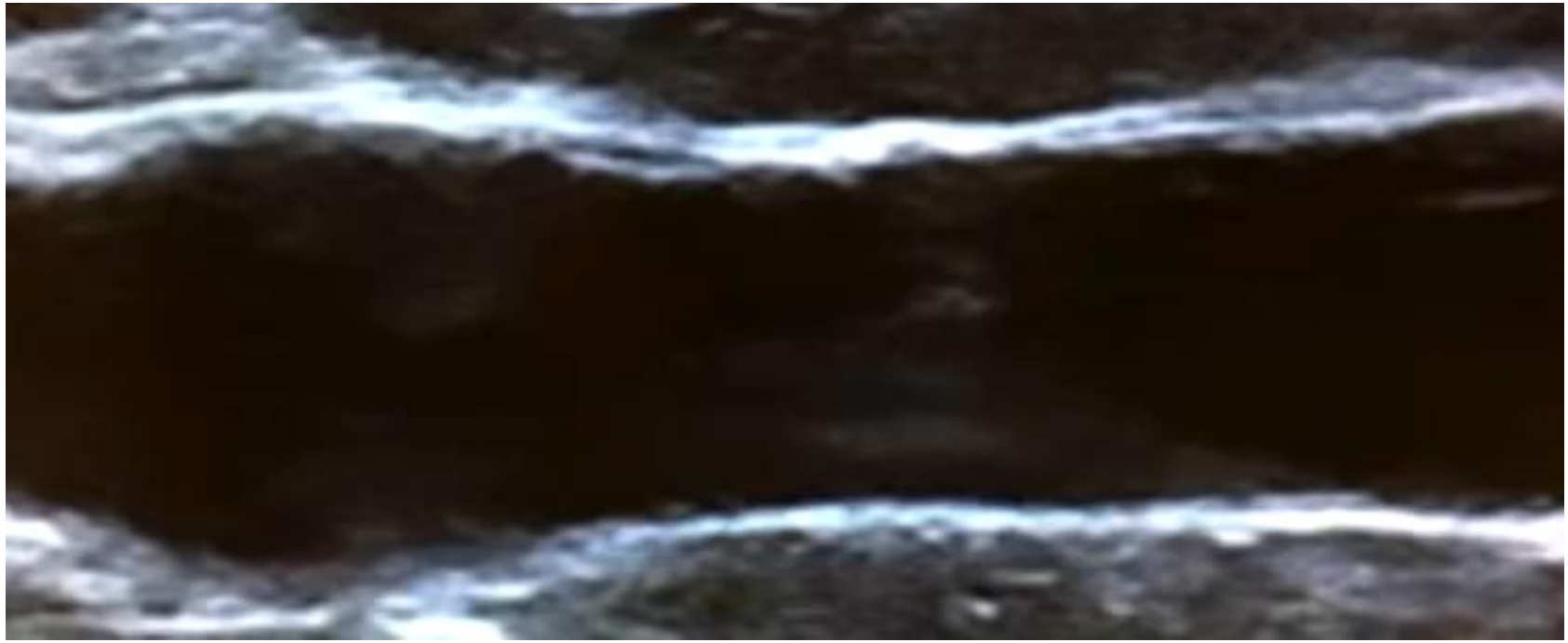
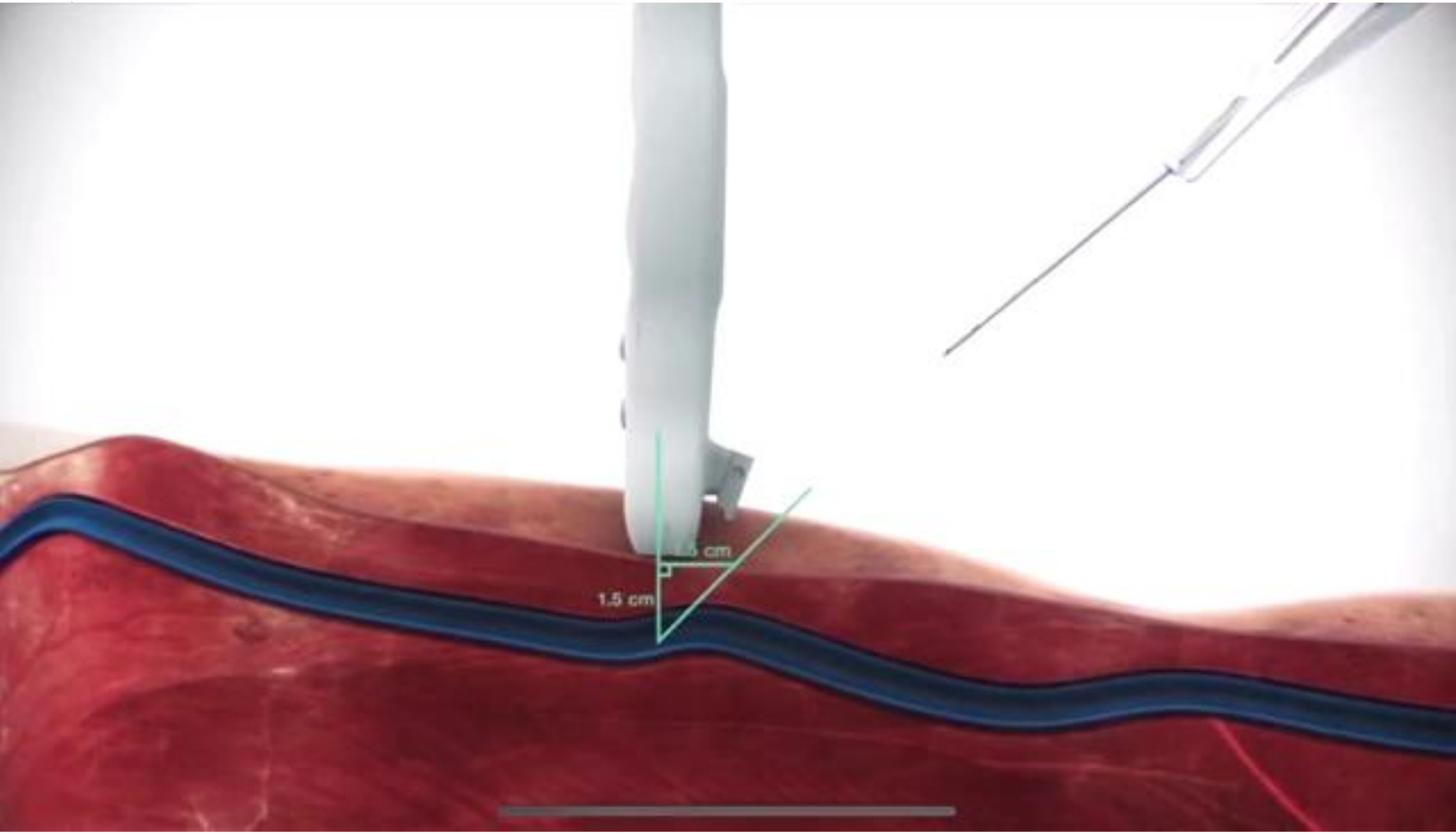
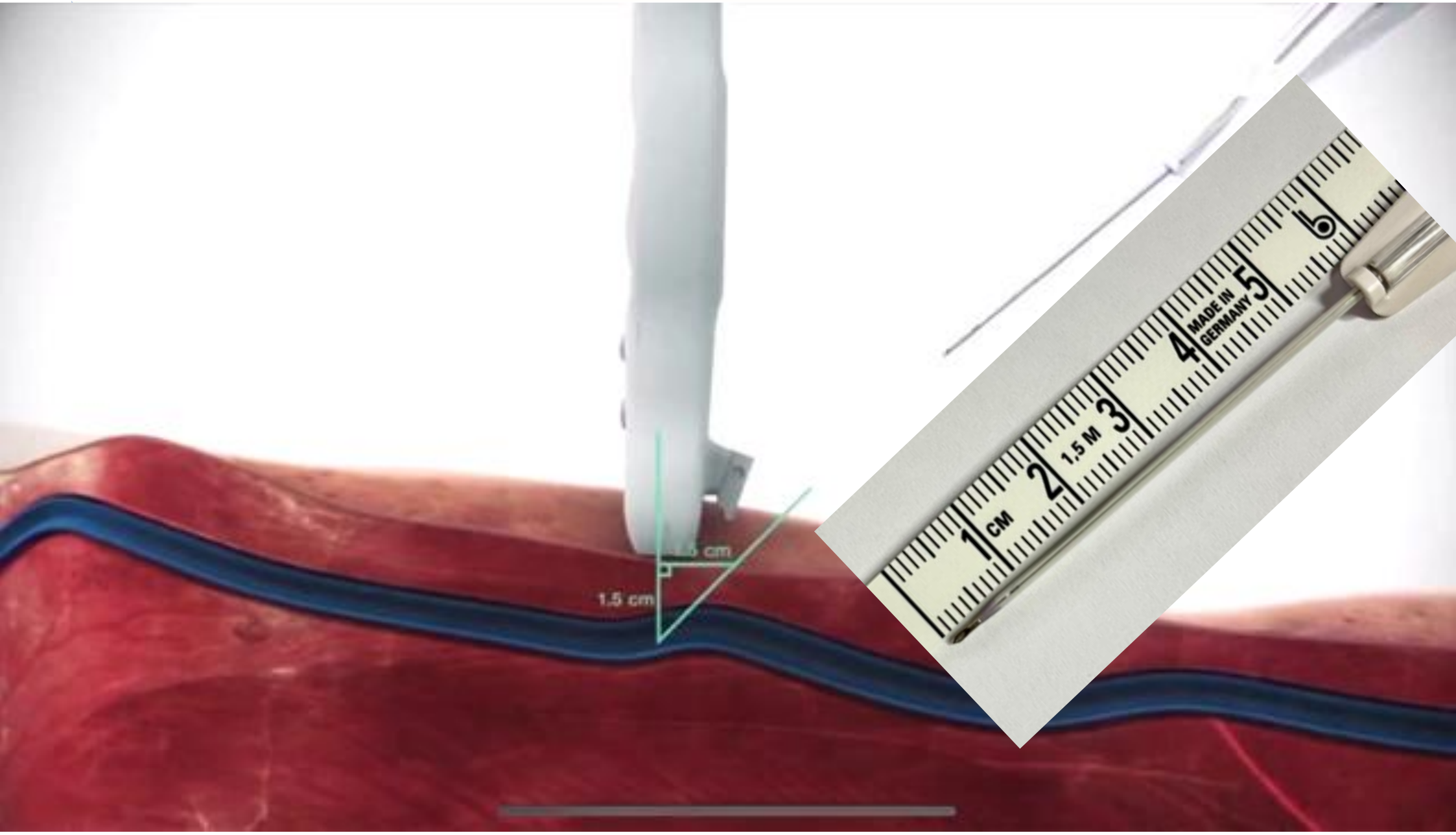
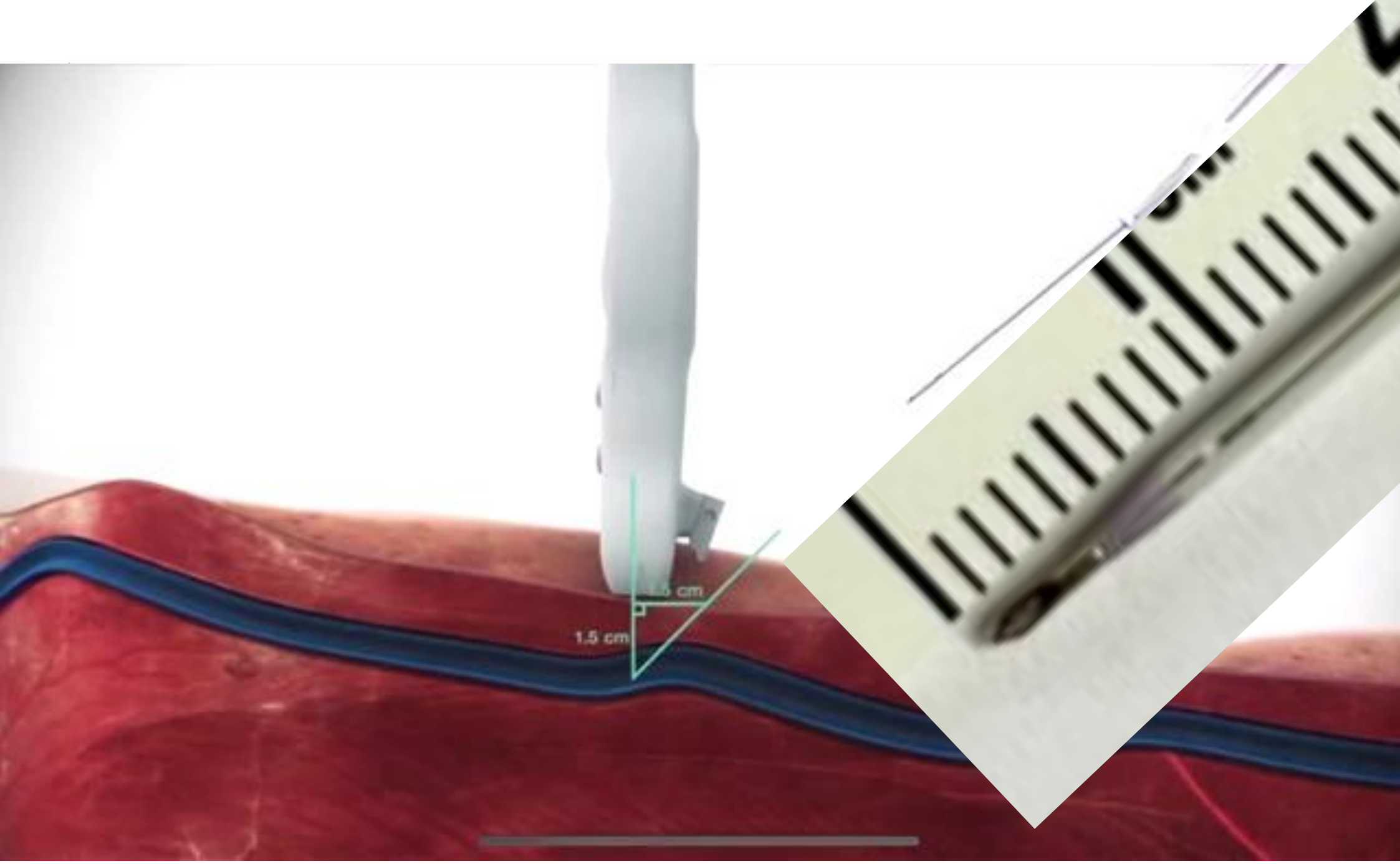


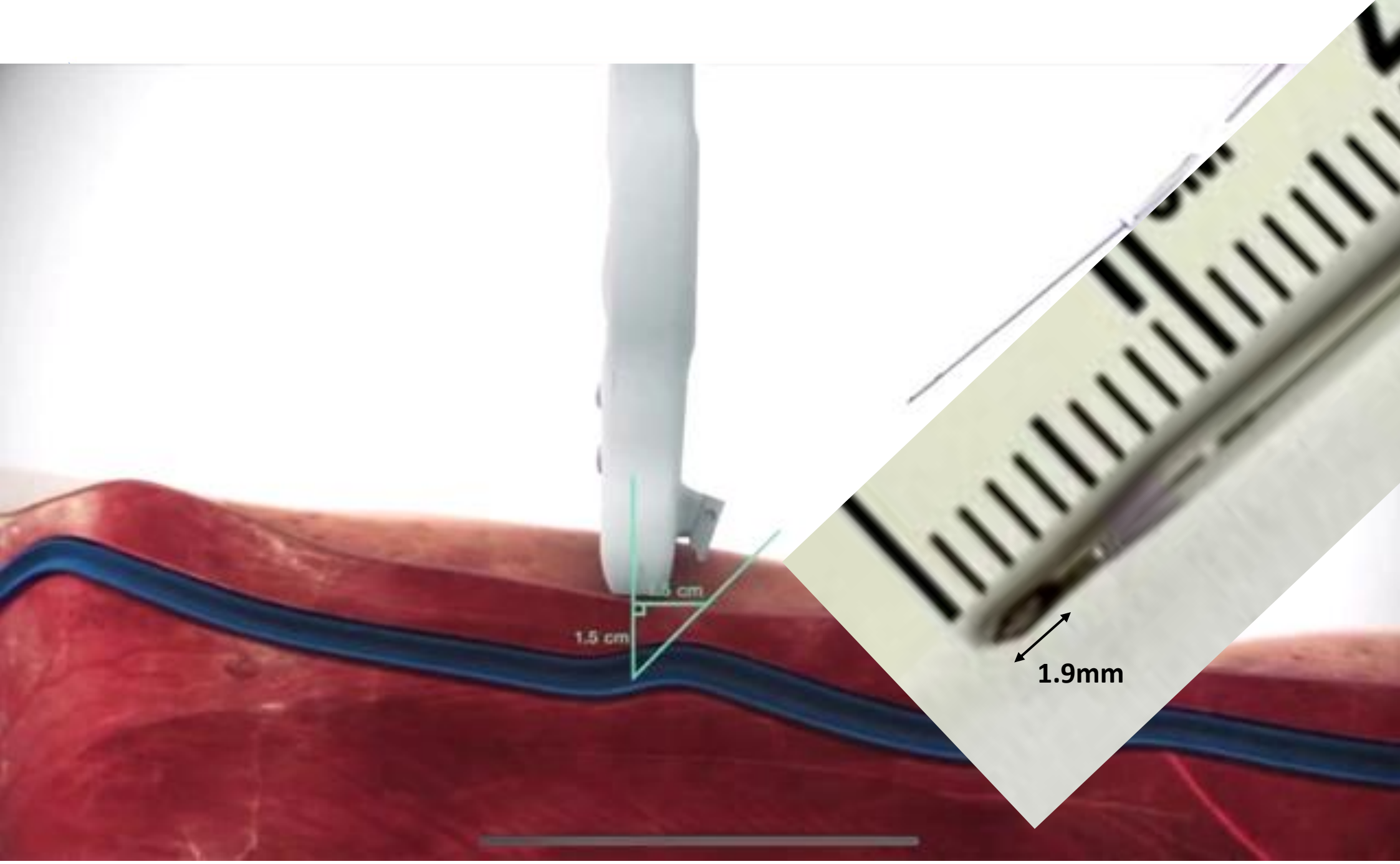
9. Confirm catheter position in vein

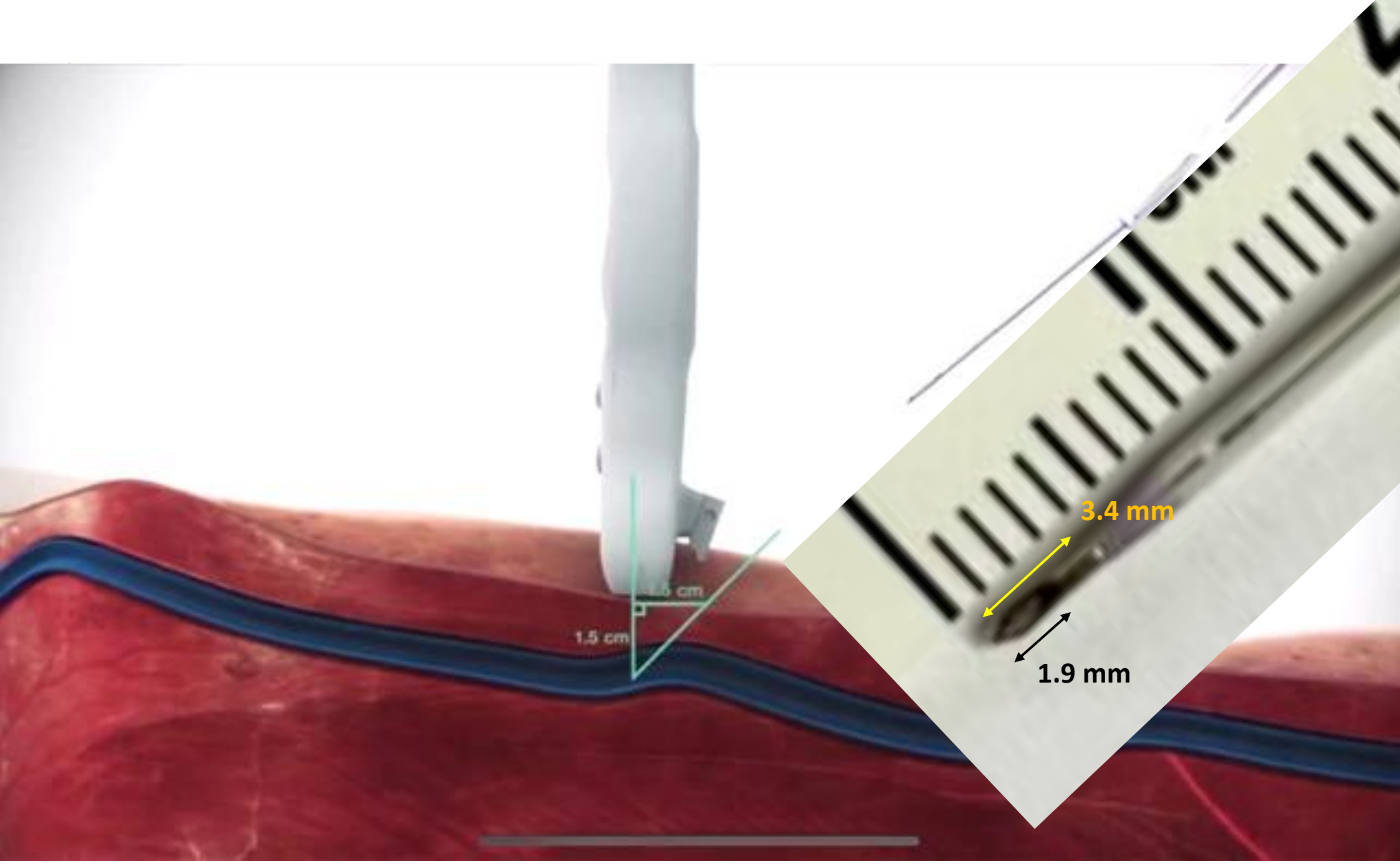
- Confirm the correct position of the midline catheter in the vein






1.5 cm


1.5 cm
1.9mm



Midline Catheter Bacilic Vein Insertion

JVA | The Journal of Vascular Access

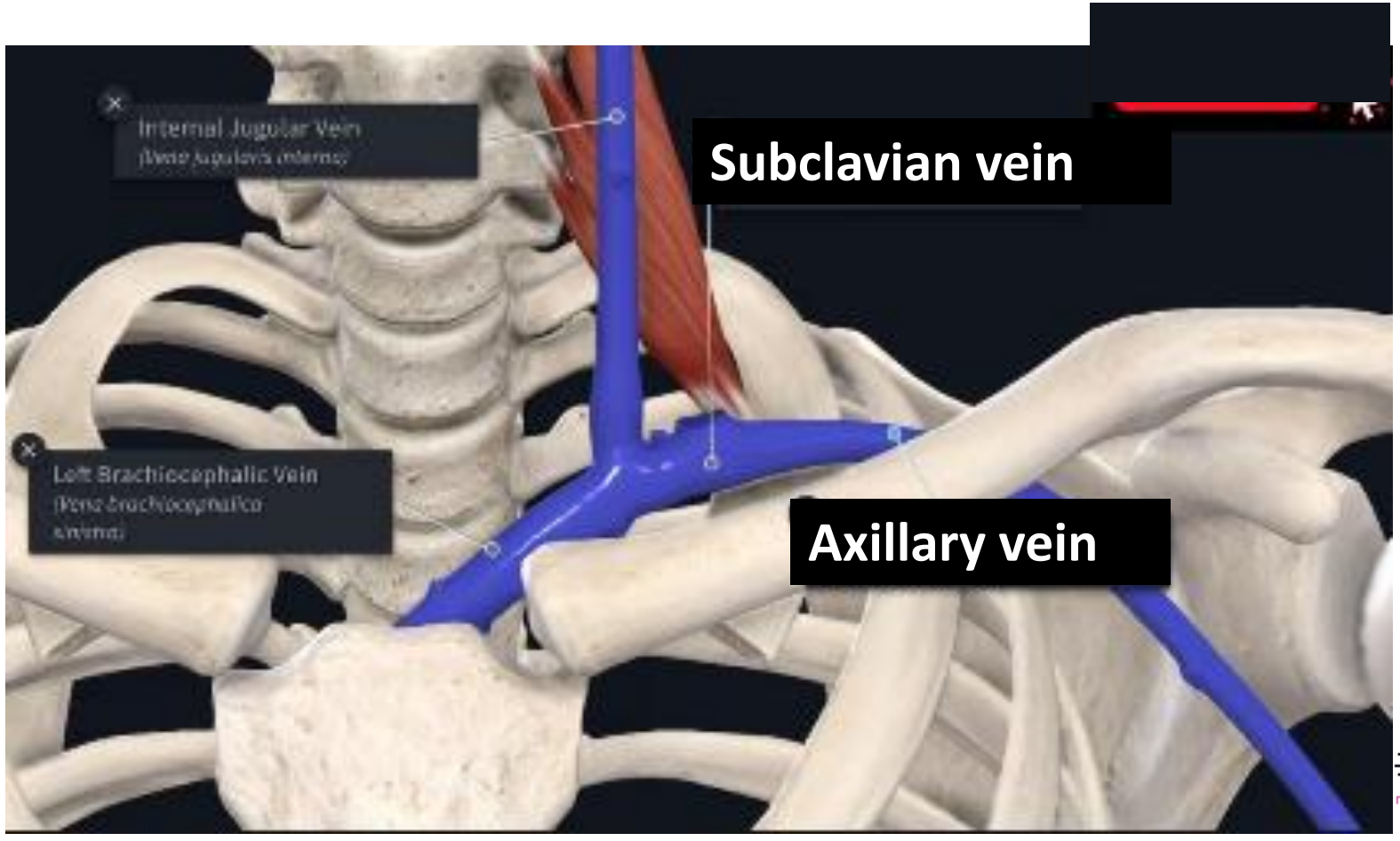
Ultrasound-guided tip location of midline catheters

The Journal of Vascular Access
1–5

DOI: 10.1177/1129729820907250
journals.sagepub.com/home/jva
SAGE

Stefano Elli[1], Mauro Pittiruti[2], Valentina Pigozzo[1],

- Group 1- Tip in subclavian vein
- Group2 – Tip at the Axillary/Subclavian transition area
- Study group – Tip in the Axillary vein



Techniques in vascular access

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Ultrasound-guided tip location of midline catheters

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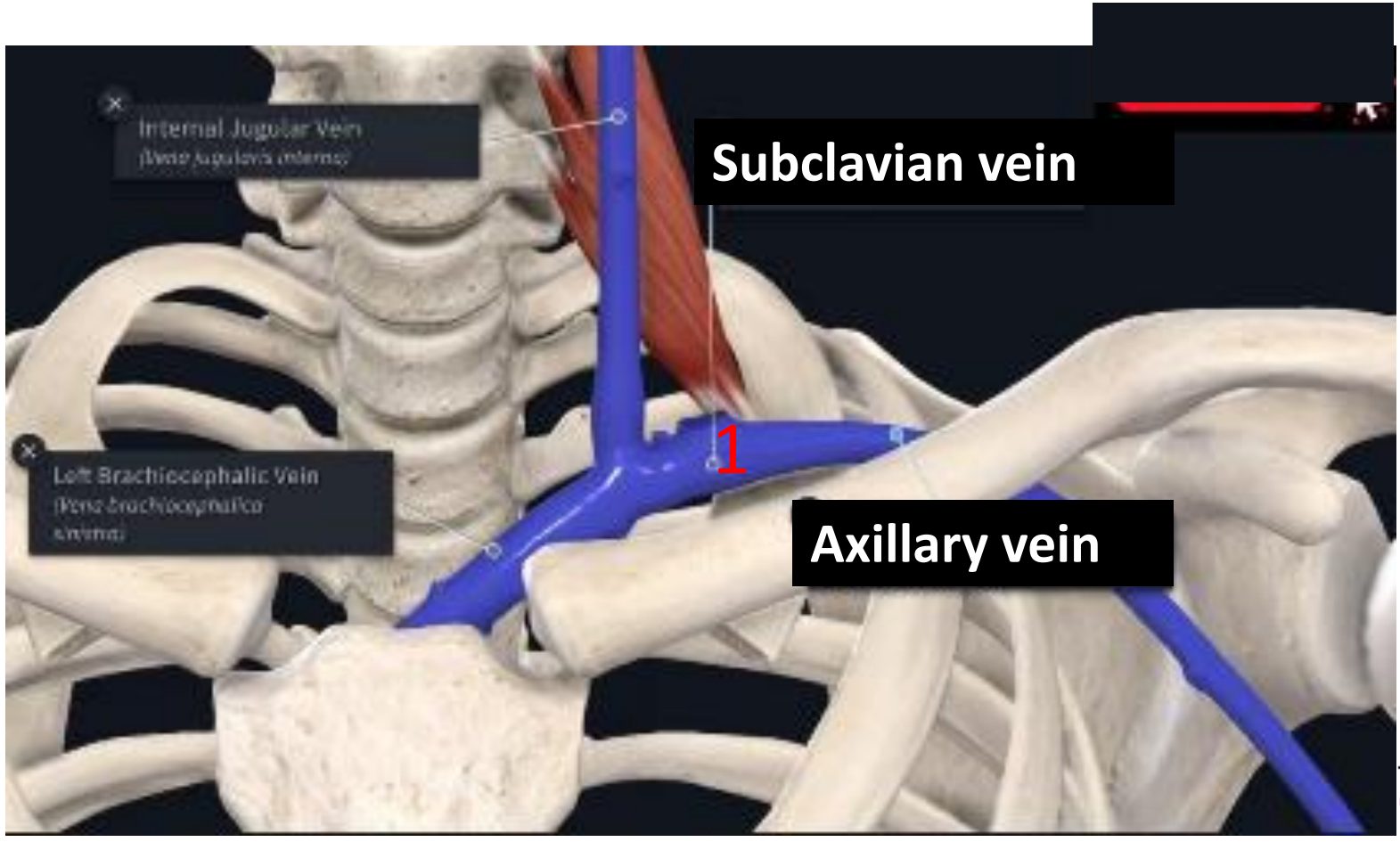

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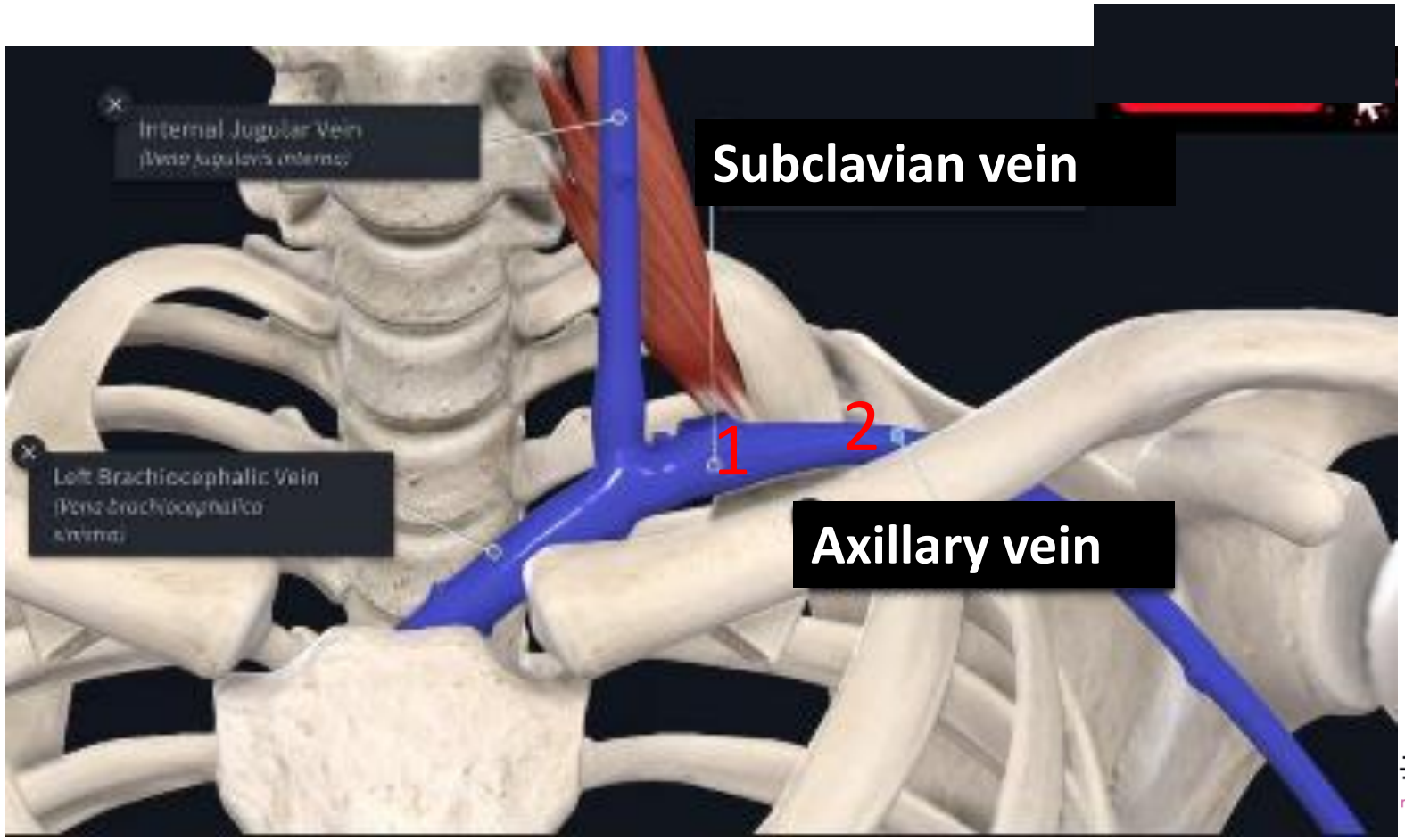

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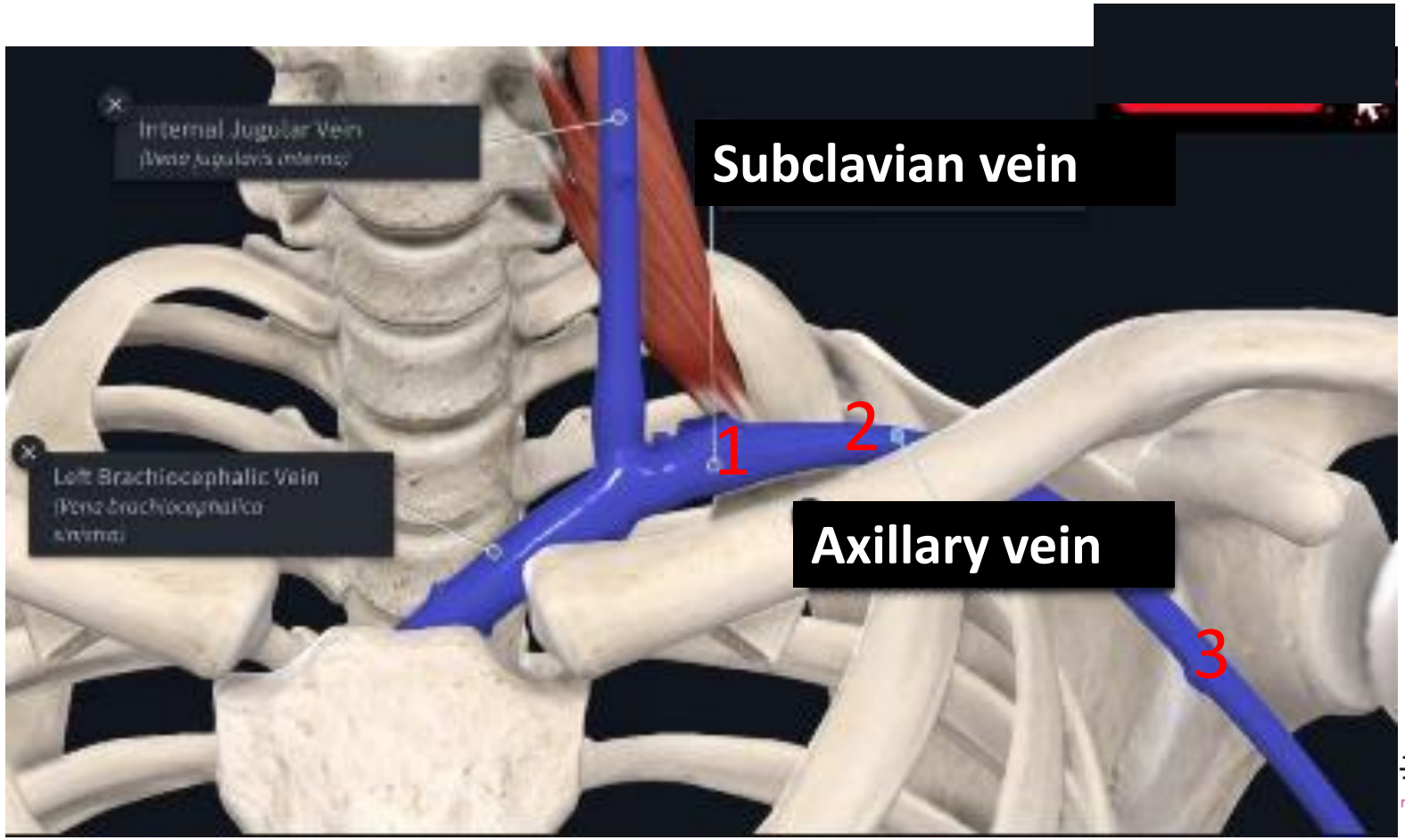

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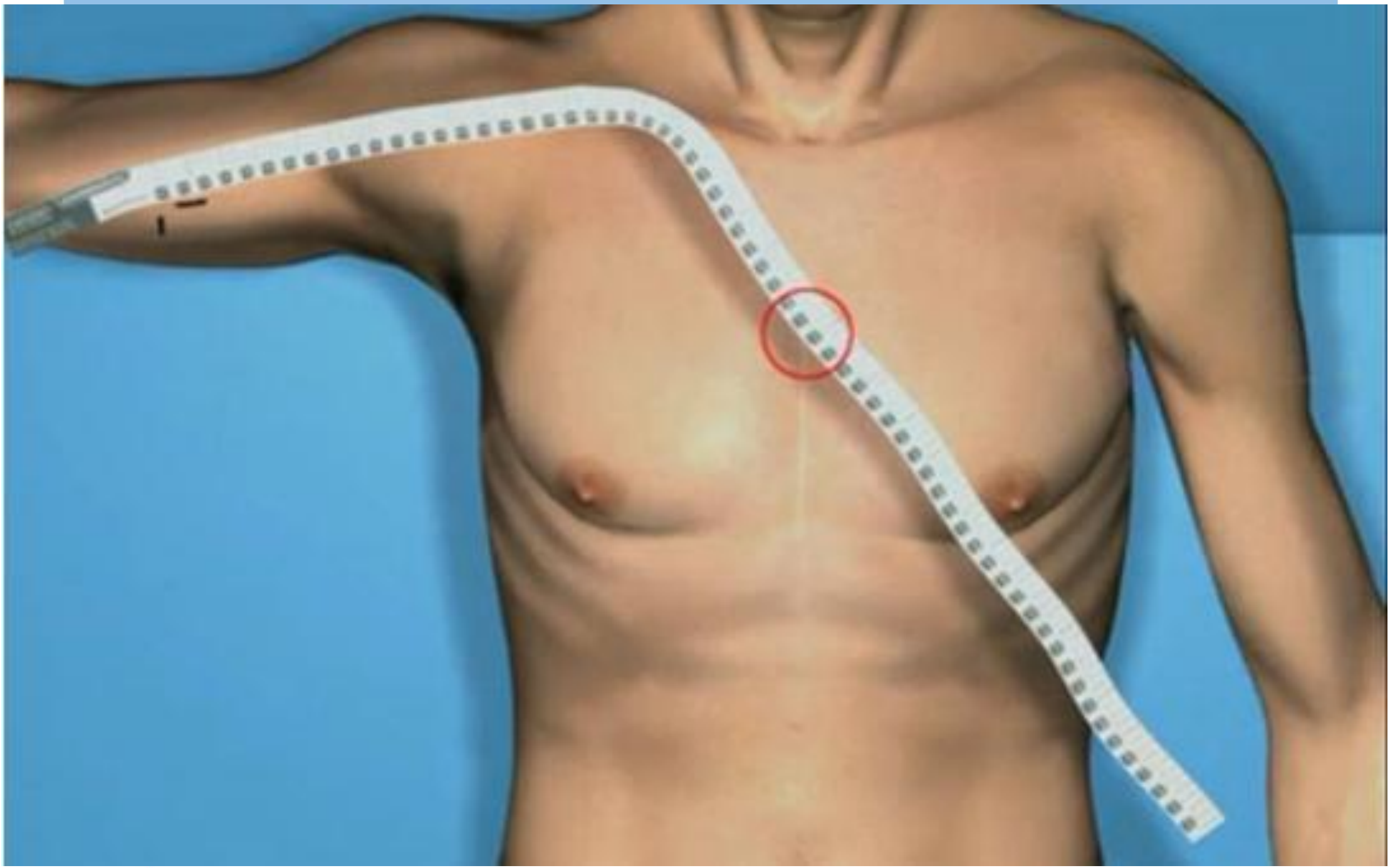
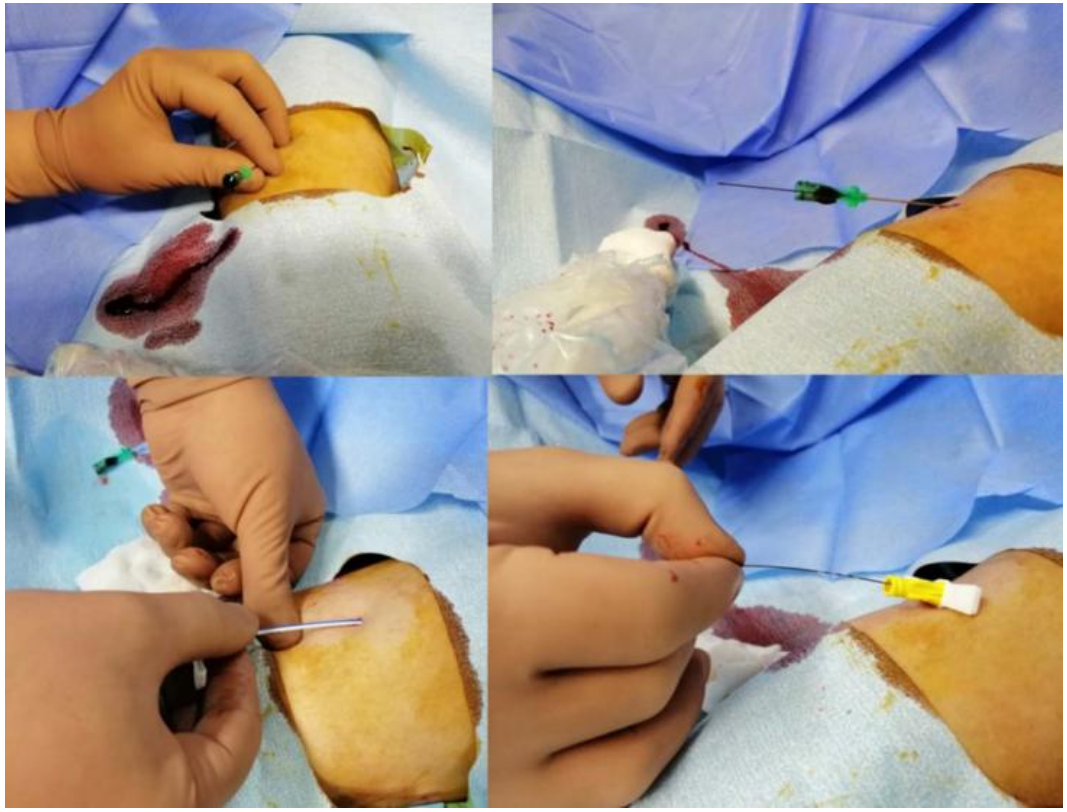
Table 1. Main characteristics of the sample and CRT rate observed.

	Control group 1	Control group 2	Study group	p value
MCs (n)	412	111	458	
Age (mean ± SD)	67.2 ± 17.6	67.8 ± 16.9	67.6 ± 17.5	ns
Sex = M (%)	54.12	45.9	51.64	ns
Medical/surgical disease (%)	86.4/13.6	88.2/11.8	85.5/14.5	ns
CRT (n)	10	10	12	
CRT (%)	2.42	9	2.62	
CRT: group 1 vs study group	10		12	0.852
CRT: group 2 vs study group		10	12	0.002

MCs: Midline catheters; SD: standard deviation; CRT: catheter-related venous thrombosis.



PICC placement



Central Venous Catheter (CVCs)

- Subclavian Vein / IJV / Femoral Vein

- Subclavian Vein
  : lower rates of CLABSI & thrombosis
  : decreased contamination risk in pations with trachesotomy
  : increased rate of mechanical Cx.

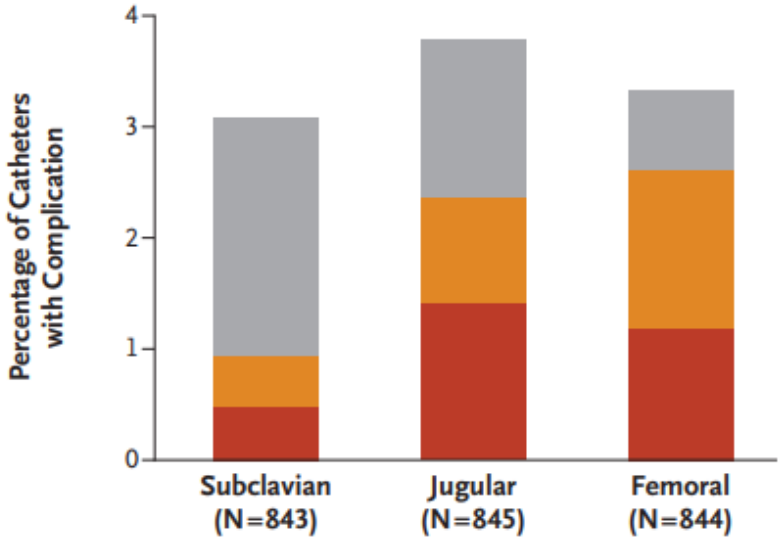
- US-guided IJV
  : Now considered as Gold standard technique

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intravascular Complications of Central Venous Catheterization by Insertion Site

Jean-Jacques Parienti, M.D., Ph.D., Nicolas Mongardon, M.D.,
Bruno Mégarbane, M.D., Ph.D., Jean-Paul Mira, M.D., Ph.D.,
Pierre Kalfon, M.D., Ph.D., Antoine Gros, M.D., Sophie Marqué, M
Marie Thuong, M.D., Véronique Pottier, M.D., Michel Ramakers, M
Benoît Savary, M.D., Amélie Seguin, M.D., Xavier Valette, M.D
Nicolas Terzi, M.D., Ph.D., Bertrand Sauneuf, M.D.,
Vincent Cattoir, Pharm.D., Ph.D., Leonard A. Mermel, D.O.,
and Damien du Cheyron, M.D., Ph.D., for the 3SITES Study Grou



	Subclavian (N=843)	Jugular (N=845)	Femoral (N=844)
Mechanical (grade ≥3)	18 (2.1%)	12 (1.4%)	6 (0.7%)
Symptomatic deep-vein thrombosis	4 (0.5%)	8 (0.9%)	12 (1.4%)
Bloodstream infection	4 (0.5%)	12 (1.4%)	10 (1.2%)

Figure 2. Complications in the Three-Choice Comparison, According to Insertion-Site Group.

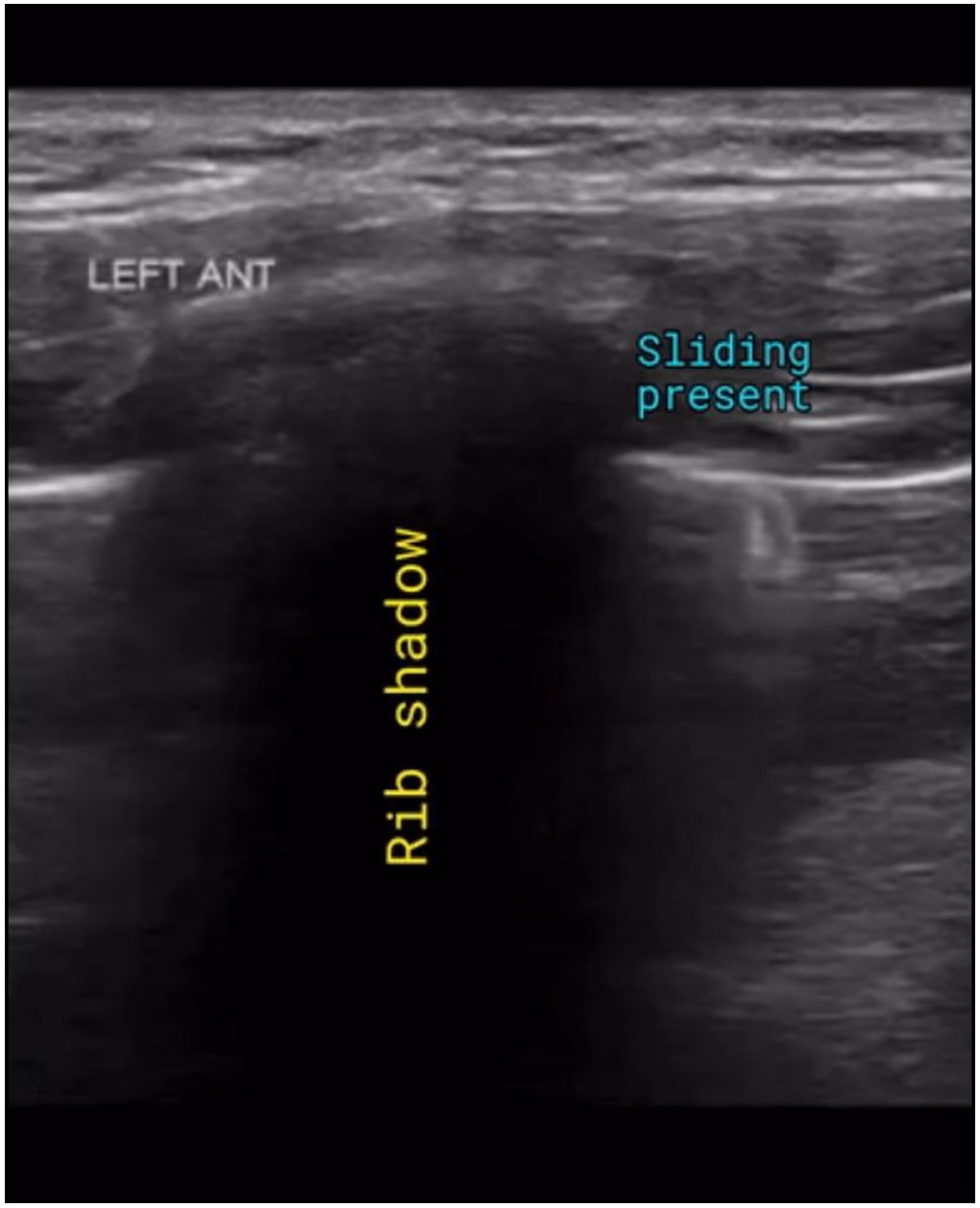
The primary end point (the composite of symptomatic deep-vein thrombosis and bloodstream infection) differed significantly among the insertion-site groups (P=0.02 by the log-rank test), as did the principal safety secondary end point (mechanical complications) (P=0.047 by the chi-square test).

- **Internal Jugular Vein inspection**

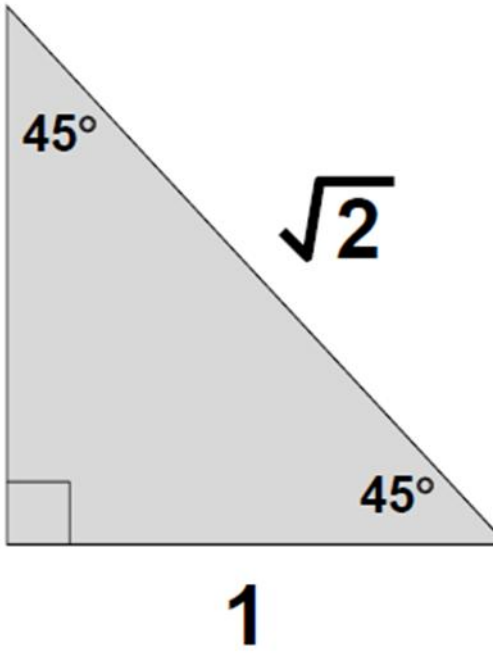
- **Internal Jugular Vein inspection**

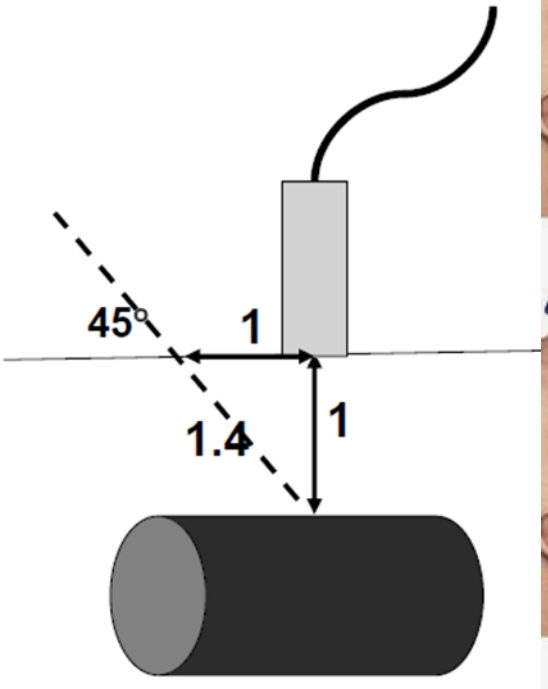
- **Internal Jugular Vein inspection**

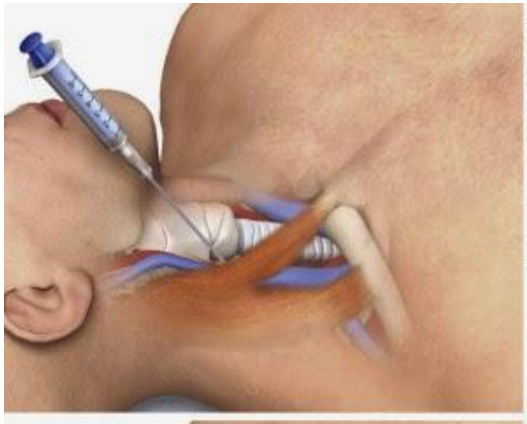
- **Check the Lung sliding pre & post procedure**



- **Internal Jugular Vein Access**







ANTERIOR APPROACH

Insert needle along the medial edge of the sternocleidomastoid, 2–3 fingerbreadths above the clavicle.

Entry angle = 30° to 45°.

Aim towards the ipsilateral nipple.

Note: Palpate the carotid artery during venipuncture. The artery may be slightly retracted medially.

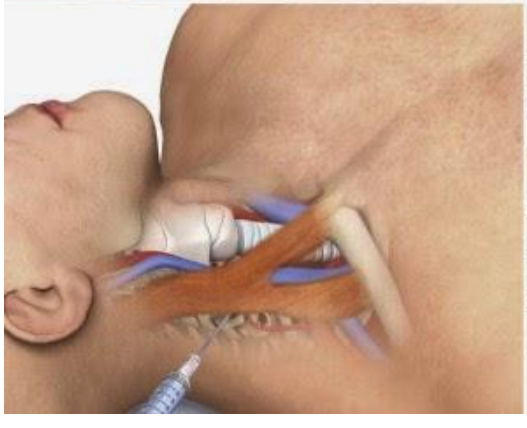
CENTRAL APPROACH

Insert needle at the apex of the triangle formed by the heads of the sternocleidomastoid muscle and the clavicle.

Entry angle = 30°.

Aim towards the ipsilateral nipple.

Note: Estimate the course of the IJ vein by placing three fingers lightly over the carotid artery as it runs parallel to the vein. The vein lies just lateral to the artery, albeit often minimally so.



POSTERIOR APPROACH

Insert needle at the posterior (lateral) edge of the sternocleidomastoid, midway between the mastoid process and the clavicle.

Entry angle = 45°.

Aim towards the suprasternal notch.

Note: Avoid the external jugular vein, which crosses the posterior SCM border. During needle advancement, apply pressure to the SCM to lift the body of the muscle. The vein is usually reached at a depth of 7 cm.

- **Hemodialysis Catheter**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