Safe Femoral Access MCS

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Objective

Provide a systematic approach for safe large bore femoral access

Percutaneous approach to some vascular access complication

Few words about axillary access

My Disclosures:

Astrazeneca: speaker bureau

Edwards Life Sciences: Proctor

Medtronic: Proctor

Abiomed: Fellowship Grant support

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The Impact of Vascular Complications on Survival of Patients on Venoarterial Extracorporeal Membrane Oxygenation

Daizo Tanaka, MD, Hitoshi Hirose, MD, PhD, Nicholas Cavarocchi, MD, and John W. C. Entwistle, MD, PhD

Division of Cardiothoracic Surgery, Department of Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania

- Retrospective study
- 84 pt all canulated on bedside
- Major vascular complications requiring surgical intervention were seen in 17 (20%)
- 10 (12%) had compartment syndrome requiring prophylactic fasciotomy, 10 (12%) had bleeding or hematoma requiring surgical exploration

Ann Thorac Surg 2016;101:1729–34

Variable	With Vascular Complication	Without Vascular Complication	*p* Value
Medical resources			
Number of procedures	2.8 ± 2.1	1.3 ± 1.5	0.002[a]
PRBC transfusion (units)	20.0 ± 20.7	14.4 ± 17.0	0.25
Days on ECMO if survived	14.6 ± 6.7	10.6 ± 7.5	0.16
Length of stay if survived, days	33.0 ± 2.4	53.3 ± 63.0	0.10
Complications			
Cardiac complications	0	11 (16%)	0.11
Respiratory complications	5 (29%)	15 (22%)	0.54
Neurologic complications	7 (41%)	17 (25%)	0.23
Acute kidney injury	6 (35%)	15 (22%)	0.35
Disseminated intravascular coagulation	5 (29%)	2 (3%)	0.003[a]
Survival			
ECMO survival	8 (47%)	49 (73%)	0.08
Survived to discharge	3 (18%)	32 (48%)	0.02[a]
Median survival, days	11 (4–30)	48 (21-NA)	0.002[a]

[a] Statistically significant ($p < 0.05$).

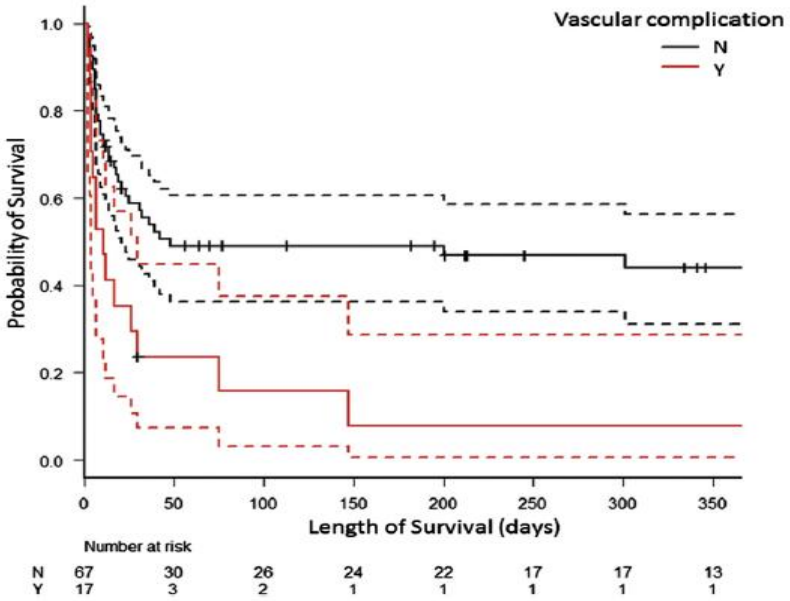

Fig 1. Kaplan-Meier survival curve of patients with (red lines) and without (black lines) vascular complication. Dashed lines show 95% confidence intervals.

Table 4. Impact of Each Vascular Complication (Cox Proportional Hazards Model)

Variable	Severity[a]	Hazard Ratio	95% Confidence Interval	*p* Value
All vascular complications	Major	2.52	1.37–4.63	0.003[b]
	Minor	1.22	0.54–2.77	0.63
Cannulation site bleeding/hematoma	Major	1.93	0.90–4.13	0.09
	Minor	1.12	0.44–2.86	0.81
Lower extremity ischemia	Major	3.03	1.50–6.10	0.002[b]
	Minor	1.37	0.42–4.46	0.60

[a] Major complications are those that required surgical intervention. Minor complications are those managed conservatively. [b] Statistically significant ($p < 0.05$).

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Vascular Complications of Extracorporeal Membrane Oxygenation: A Systematic Review and Meta-Regression Analysis

Deng Jia, MBBS[1]; Isabelle Xiaorui Yang, MBBS[1]; Ryan Ruiyang Ling, MBBS[1]; Nicholas Syn, MBBS[1]; Wynne Hsing Poon, MBBS[1]; Kavita Murughan, MD[2]; Chuen Seng Tan, PhD[3]; Andrew M. T. L. Choong, PhD, FRCS, FEBVS (Hons)[4–7]; Graeme MacLaren, MSc, FCICM[2,6]; Kollengode Ramanathan, FCICM[2,6]

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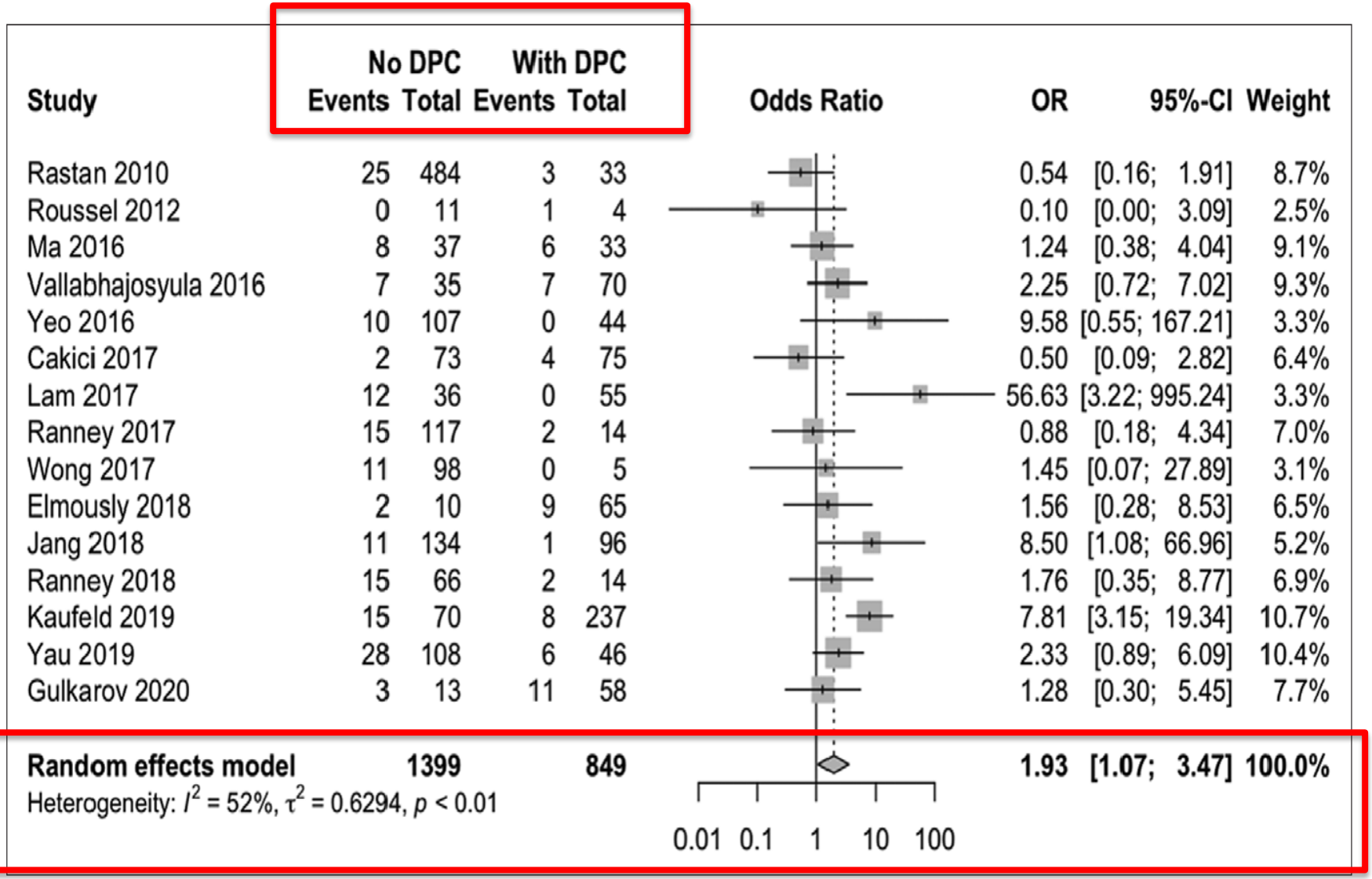

Figure 2. Forest plot for pooled odds ratio (OR) for limb ischemia between patients with and without distal perfusion cannula (DPC).

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Vascular Complication: 2,347 (38.3%) vascular complications were reported in 6,164 venoarterial ECMO patients and 95 (20.6%) similar complications in 459 venovenous ECMO patients (odds ratio, 2.35; 95% CI, 1.87–2.96; $p < 0.0001$).

Successful weaning off extracorporeal membrane oxygenation occurred in 60.6% of pooled patients; 46.2% were eventually discharged.

Pooled prevalences of vascular complications like significant bleeding 15.4%, limb ischemia 12.6%, and cannula site bleeding 12.6%

Meta-analysis showed that the use of distal perfusion cannula was associated with lower odds of limb ischemia (odds ratio, 1.93; 95% CI, 1.17-2.47; p = 0.03) Meta-regression showed that male sex, smoking, advanced age, and comorbidities contributed to higher in-hospital mortality, while distal perfusion cannula was protective.

Conclusions: Nearly a third of patients on extracorporeal membrane oxygenation develop vascular complications; elderly males with comorbidities appear vulnerable. The use of distal perfusion cannulas caused significant reduction in limb ischemia and mortality

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Percutaneous Decanulation

Martin-Tuffreau *et al. Crit Care* (2021) 25:93
https://doi.org/10.1186/s13054-021-03522-8

Critical Care

RESEARCH Open Access

Complete percutaneous angio-guided approach using preclosing for venoarterial extracorporeal membrane oxygenation implantation and explantation in patients with refractory cardiogenic shock or cardiac arrest

Anne-Sophie Martin-Tuffreau[1], François Bagate[2,3,4], Madjid Boukantar[1], Gabriel Saiydoun[5], Andrea Mangiameli[1], Laura Rostain[1], Gauthier Mouillet[1], Antonio Fiore[5], Olivier Langeron[6], Armand Mekontso-Dessap[2,3,4], Nicolas Mongardon[6,7], Thierry Folliguet[5], Emmanuel Teiger[1,7] and Romain Gallet[1,7*]

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complete percutaneous angio-guided ECMO implantation and explantation using preclosing

56 patients who underwent percutaneous VA-ECMO implantation for cardiogenic shock or refractory cardiac arrest

41 underwent preclosing. Total cannulation time was 20 (10–40) min.

Weaning from ECMO was possible in 22/41 patients (54%) and 12 (29%) patients were alive at day 30.

Significant vascular complications occurred in 2/41(5%) patients. Percutaneous decannulation was performed in 20 patients with 19/20 technical success rate. All femoral arteries and veins were properly closed using the pre-closing devices without bleeding on the angiographic control except for one patient in whom surgical closure of the artery was required

Step-By-Step ECMO-canulation in The CCL

Ultrasound Guided micro-puncture Access(Retro and Ategrade-A and V)-

Confirm with Fluoroscopy

Preclosing A and V(2 Proglide-A-1 for V)

Do not insert Arterial Cannula prior to obtaining the Antegrate perfusion sheath(5F kink resistant)

Male-male connector-connect the Arterial cannula to the Antegrate perfusion sheath

Secure sutures threads coiled around a compress and an occlusive dressing

Decannulation in the CCL

Contralateral sheath(up and over technique)

Peripheral PTA balloon 8-12 mm low pressure 1-2 atm for dry closure ready to inflate

ECMO circuit off –cannulas clamped-Cut the cannula- wire with a preferably an intermediate stiffness wire

Inflate the PTA balloon-Dry closure

Knot pusher on Perclose threads-

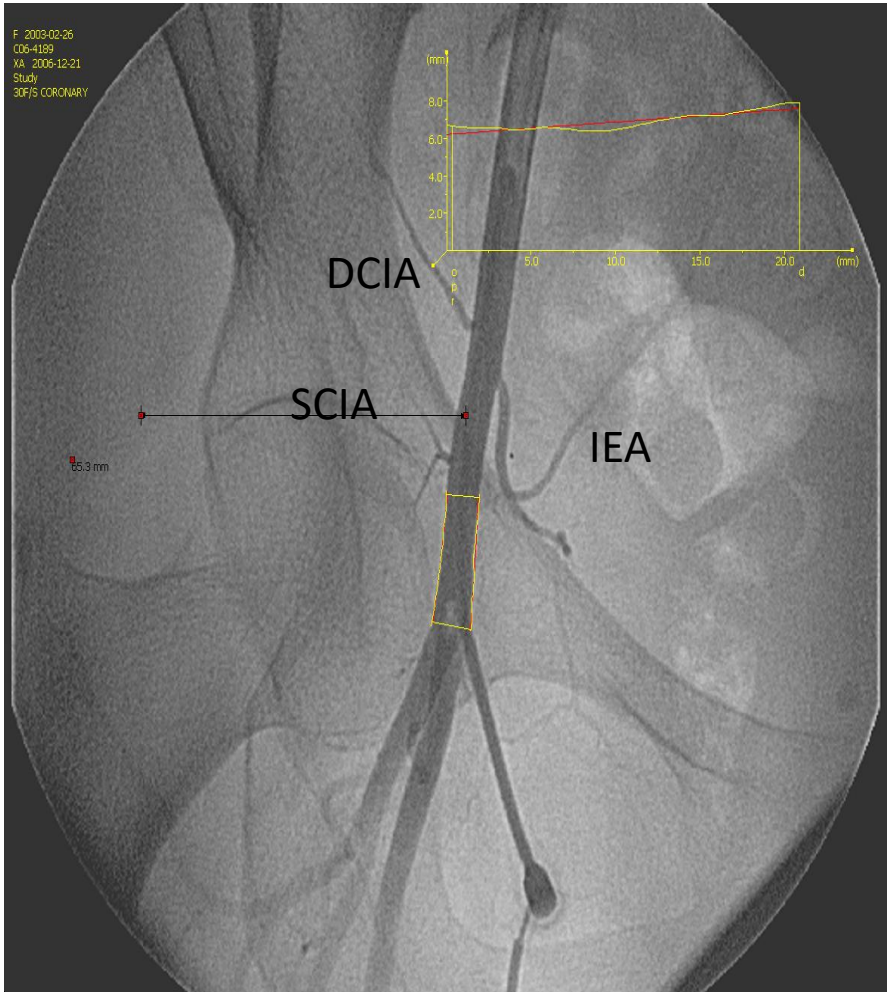
Image-If needed another Proglide or Angioseal-

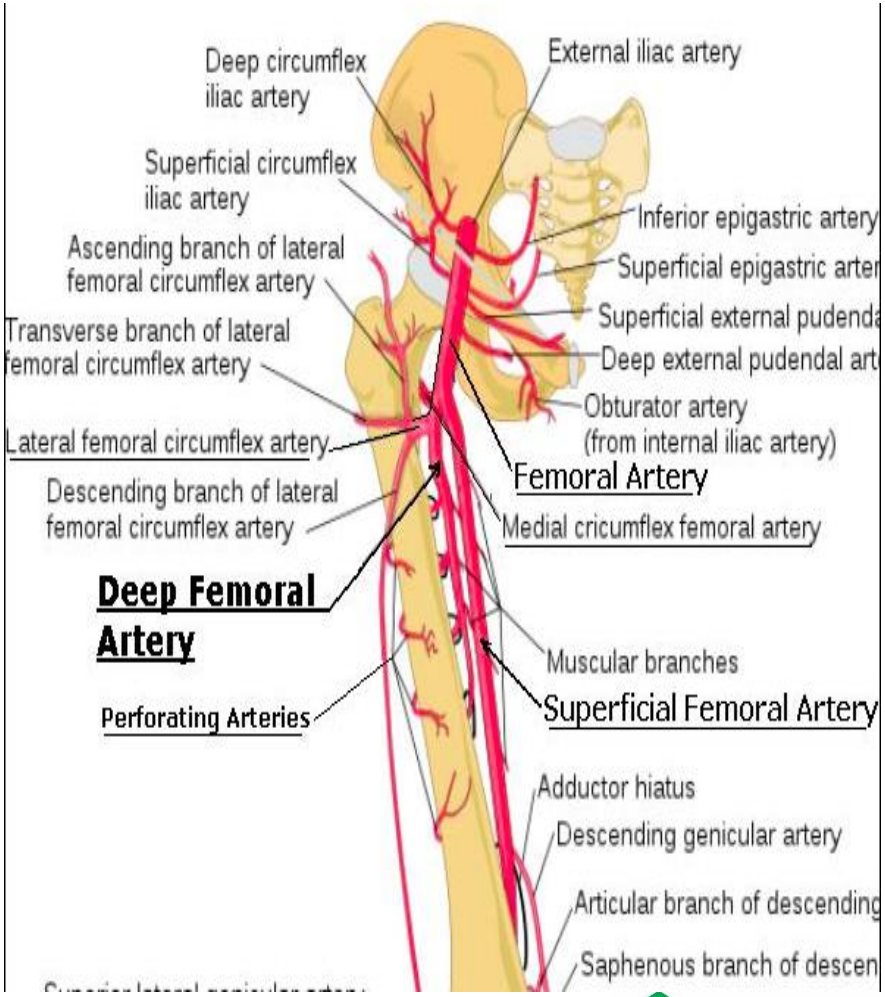
If needed Up and over Balloon tamponade or covered stent(might need to upsize the sheath)

Perclose or Angioseal the contralateral sheath-Angioseal antegrade sheath

Same for Venous cannula +/- Figure of 8 suture if needed

Femoral Artery Anatomy





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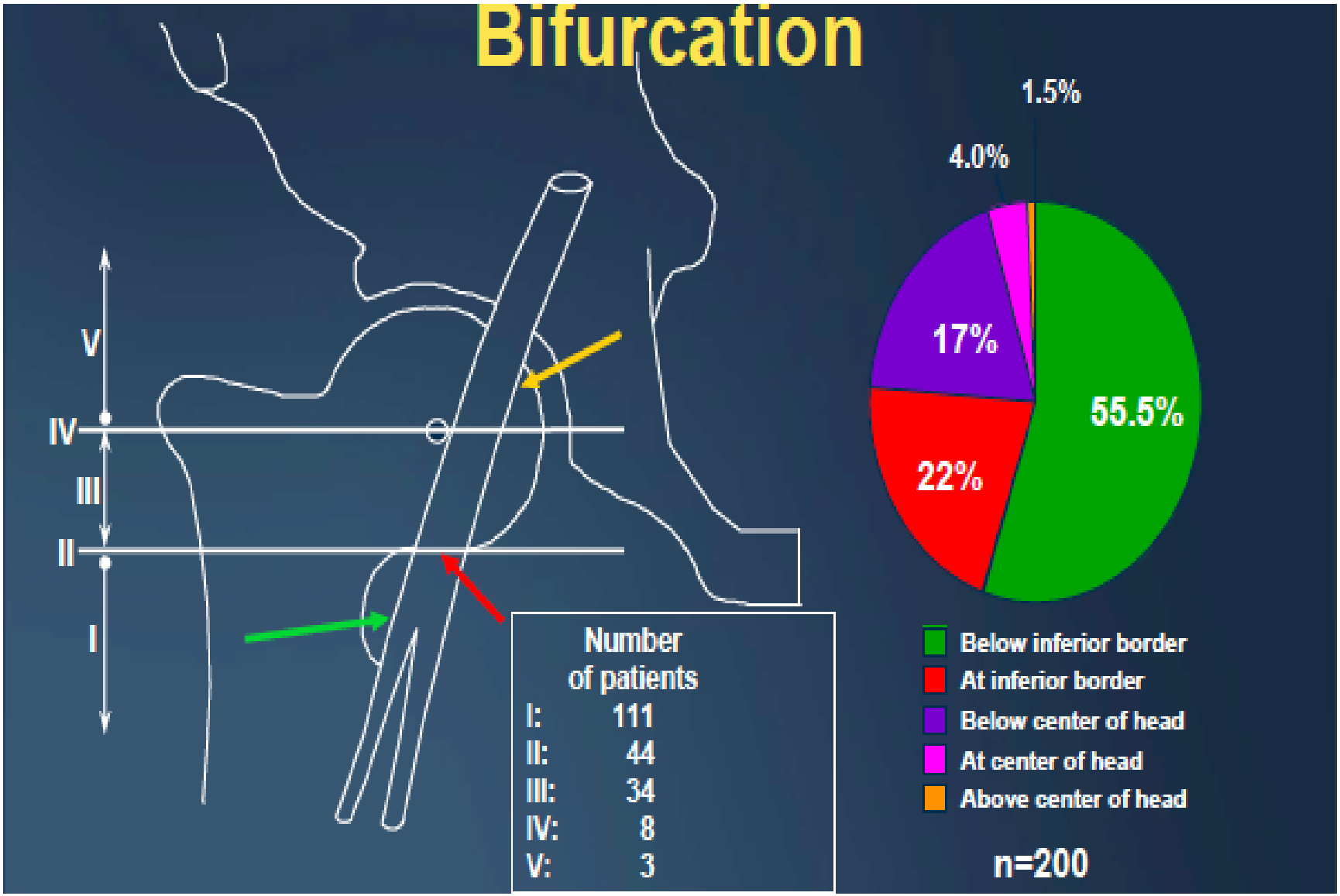

98.5 % the bifurcation is below the mid femoral head

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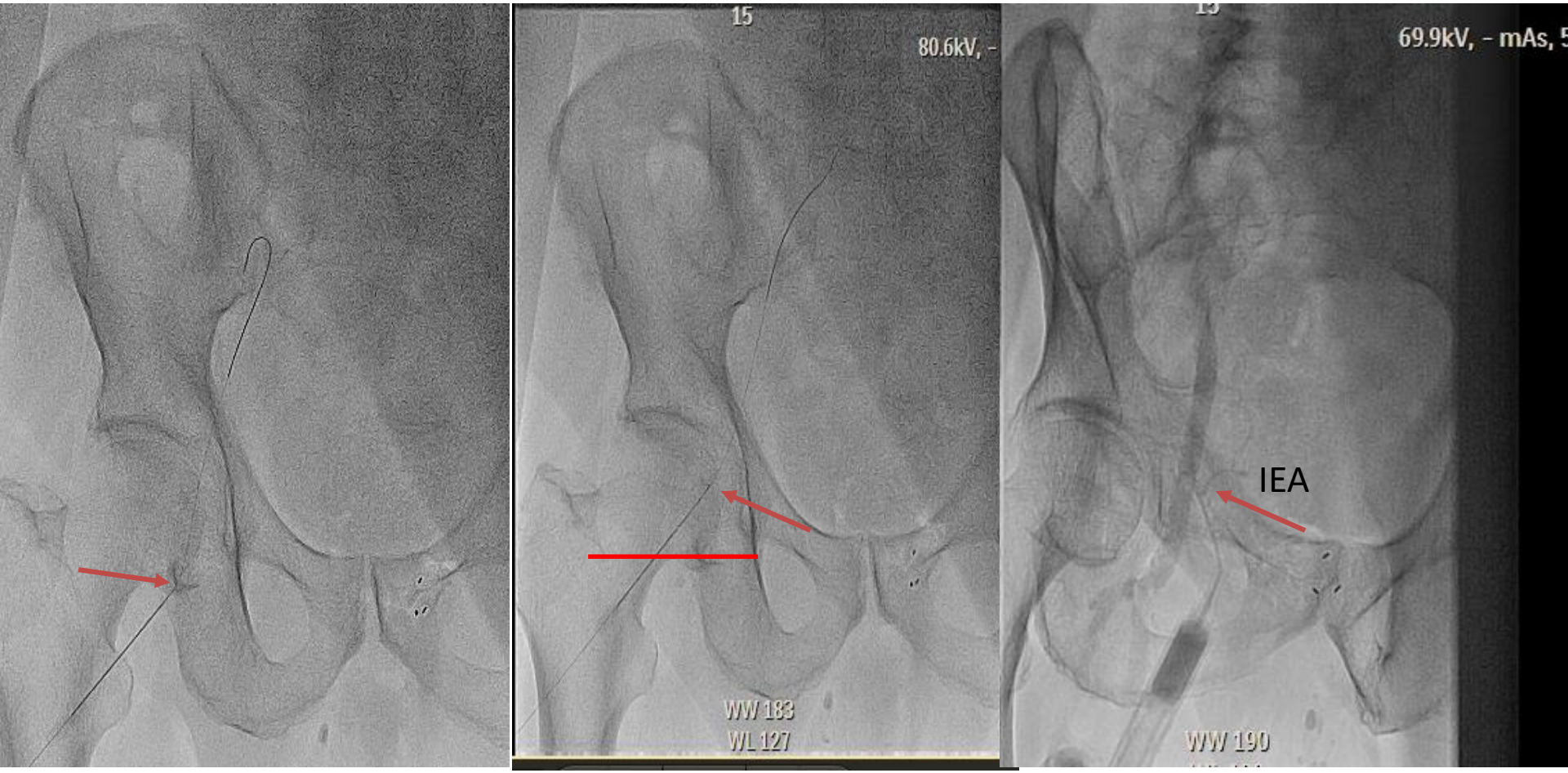

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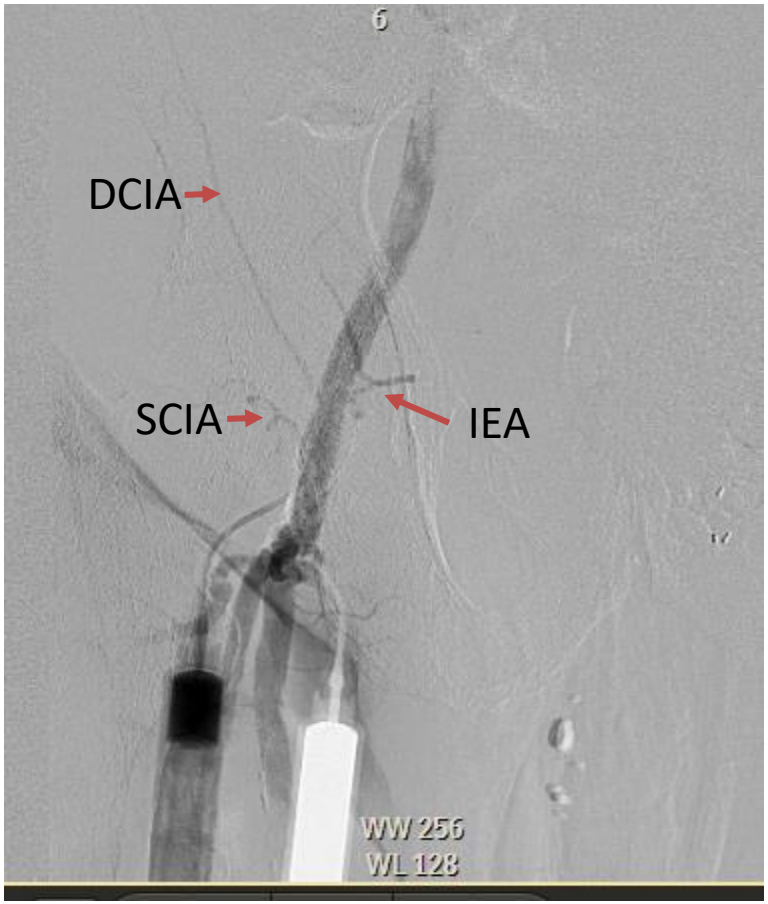

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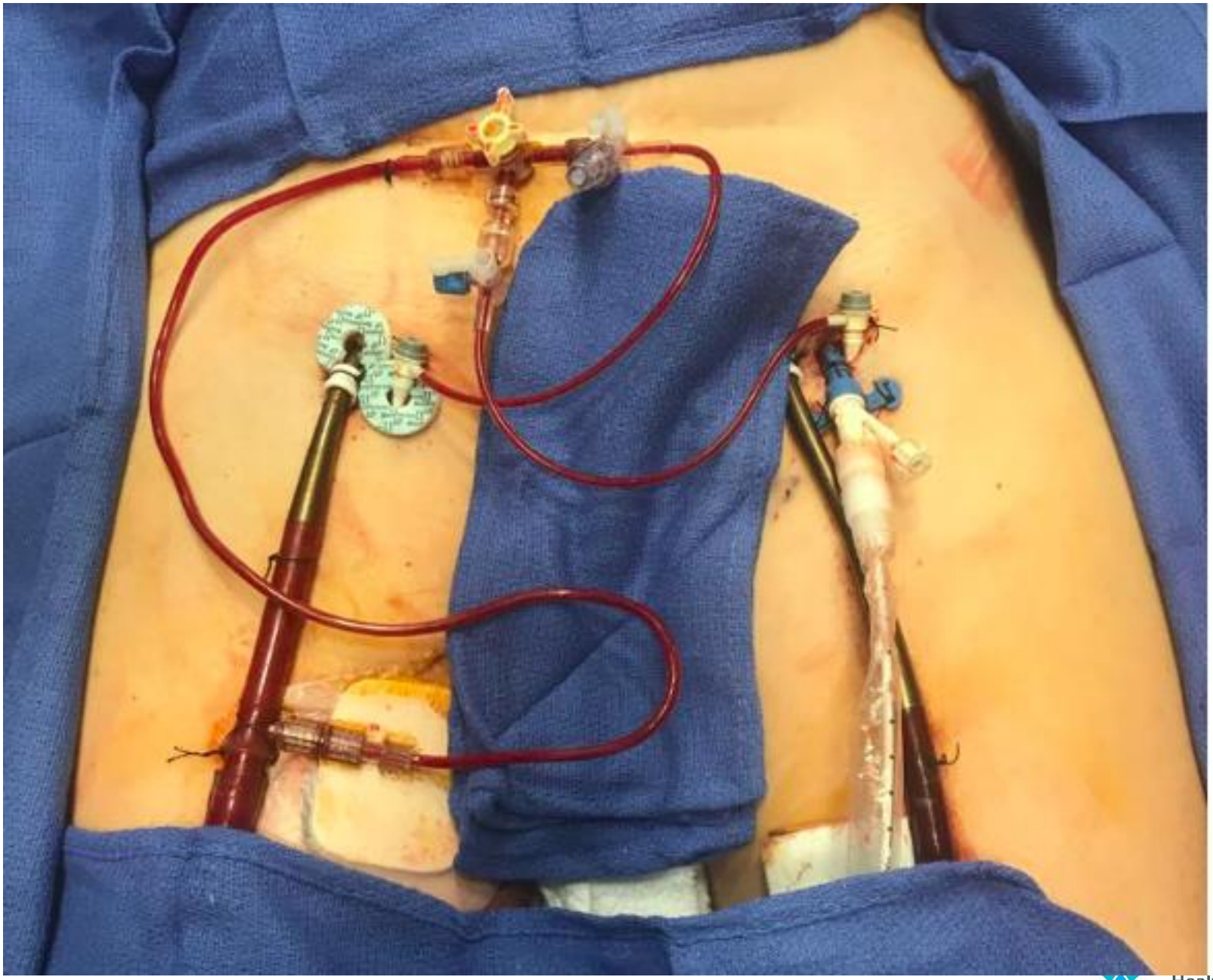


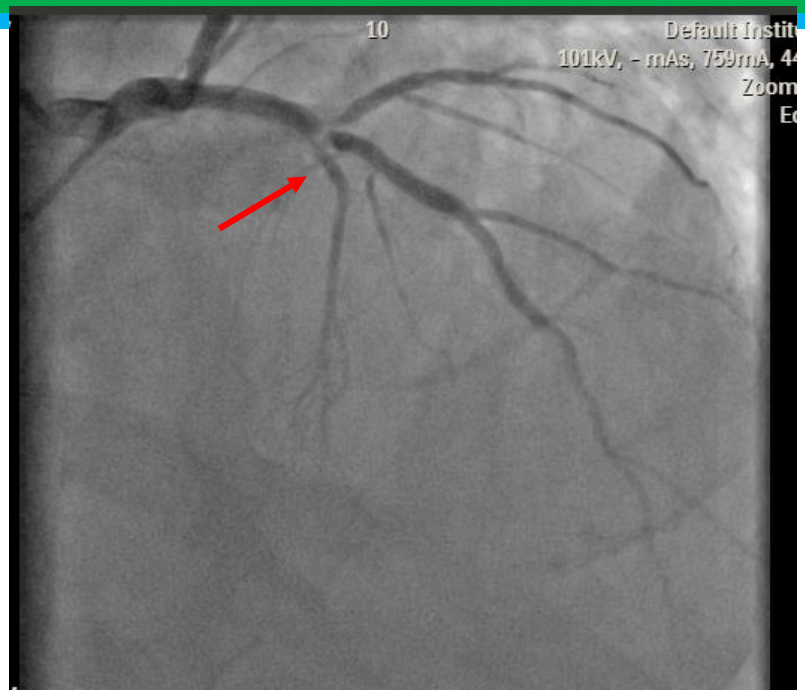
Case 1.

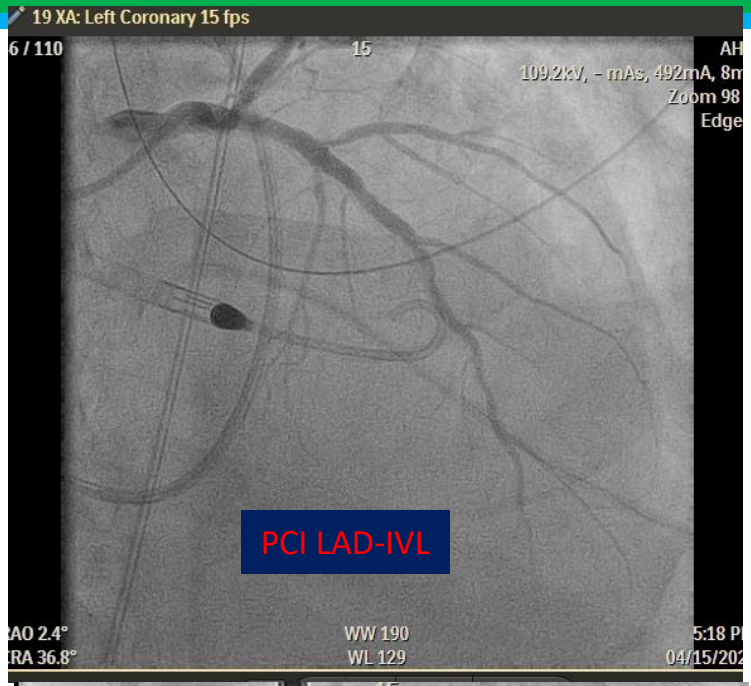
69-year-old male who presented to OSH NSTEMI-Severe LV dysfunction.

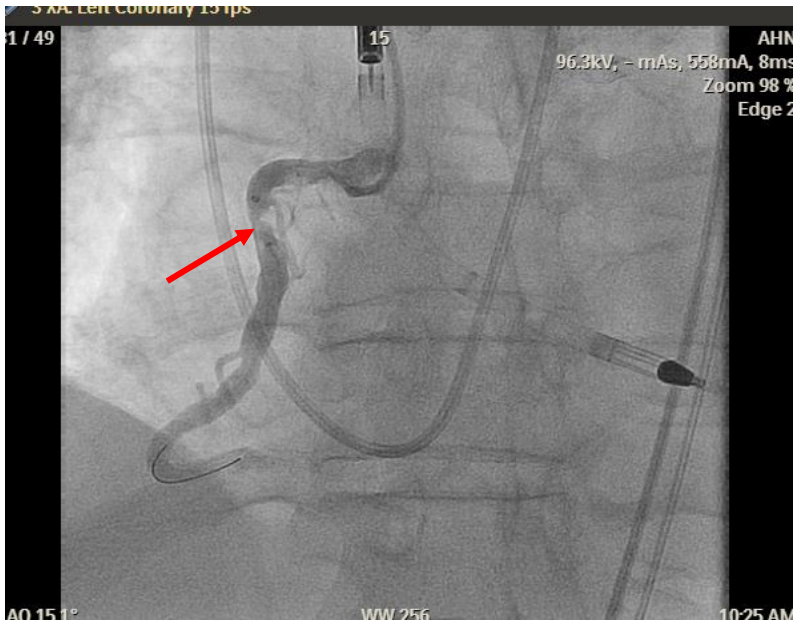
LAD-DIAG-RCA Complex Ca++

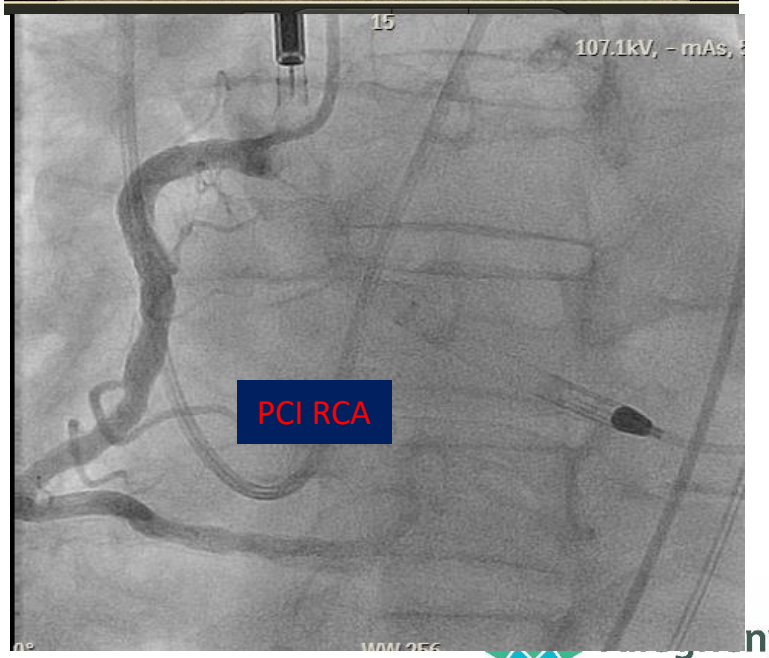
Impella placed for CS and was electively intubated.

HR -PCI versus CABG.Heart Team → HR PCI









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Case-1 Impella Removal

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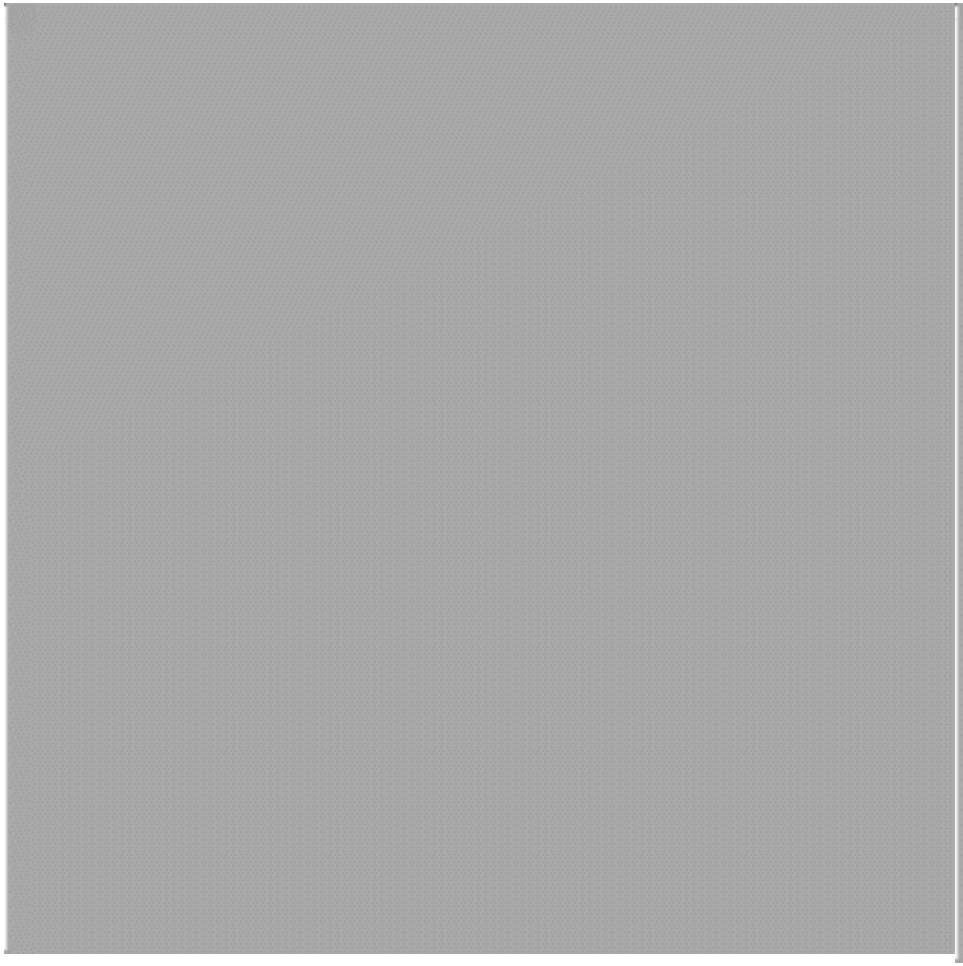
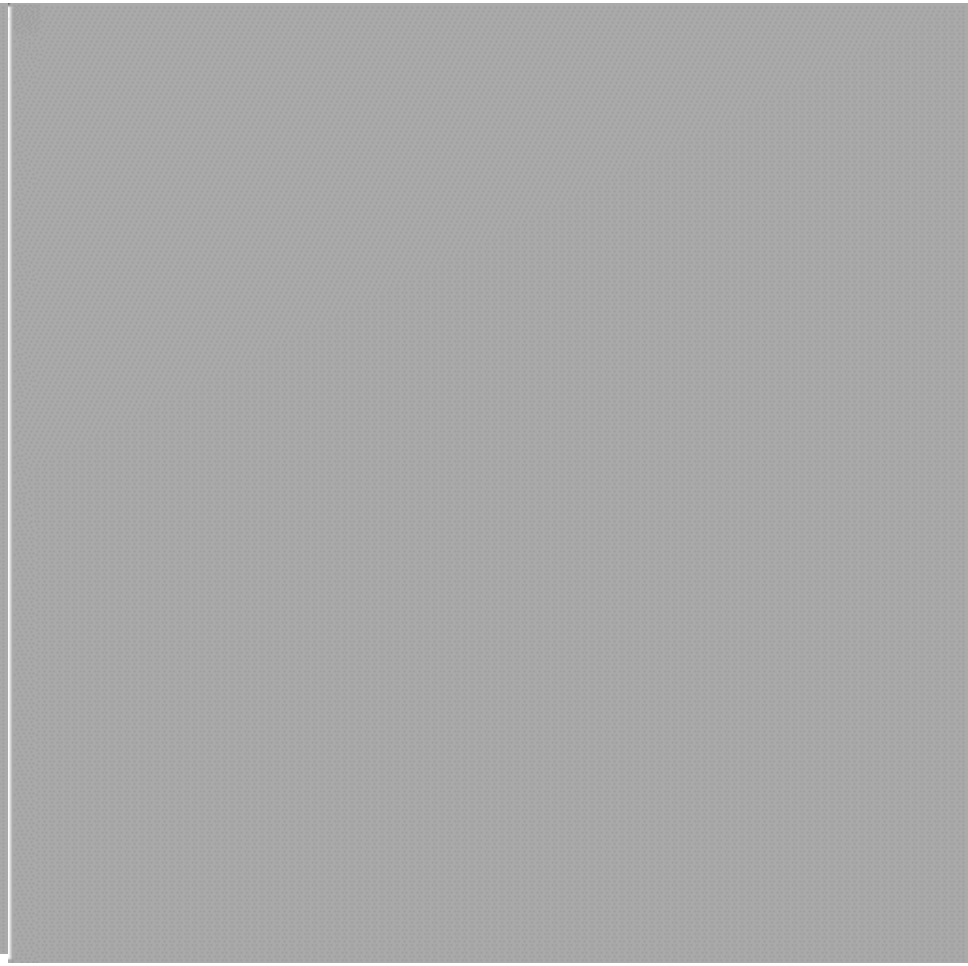
CAT 8 Penumbra





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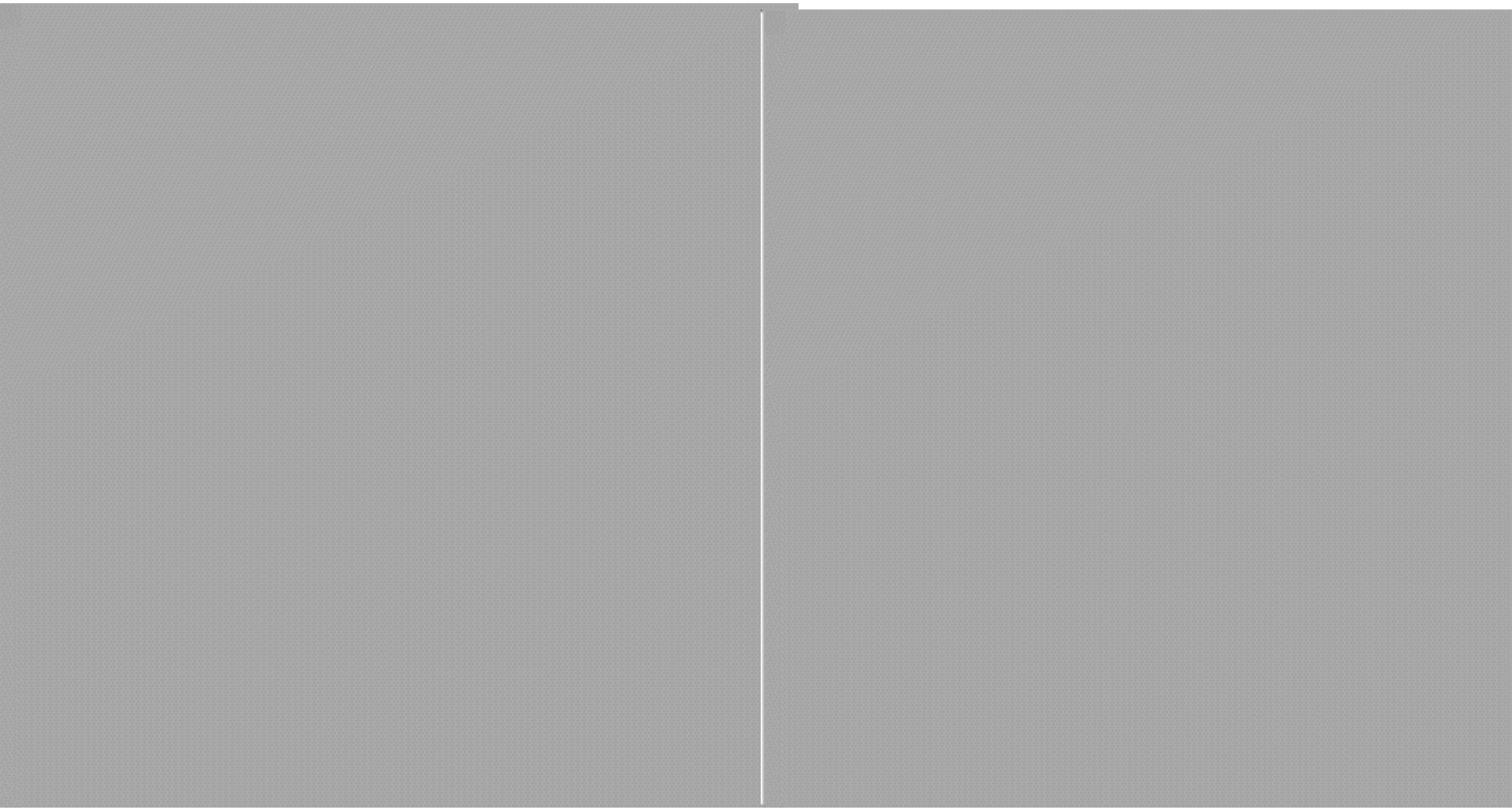
12 French lightening Penumbra catheter



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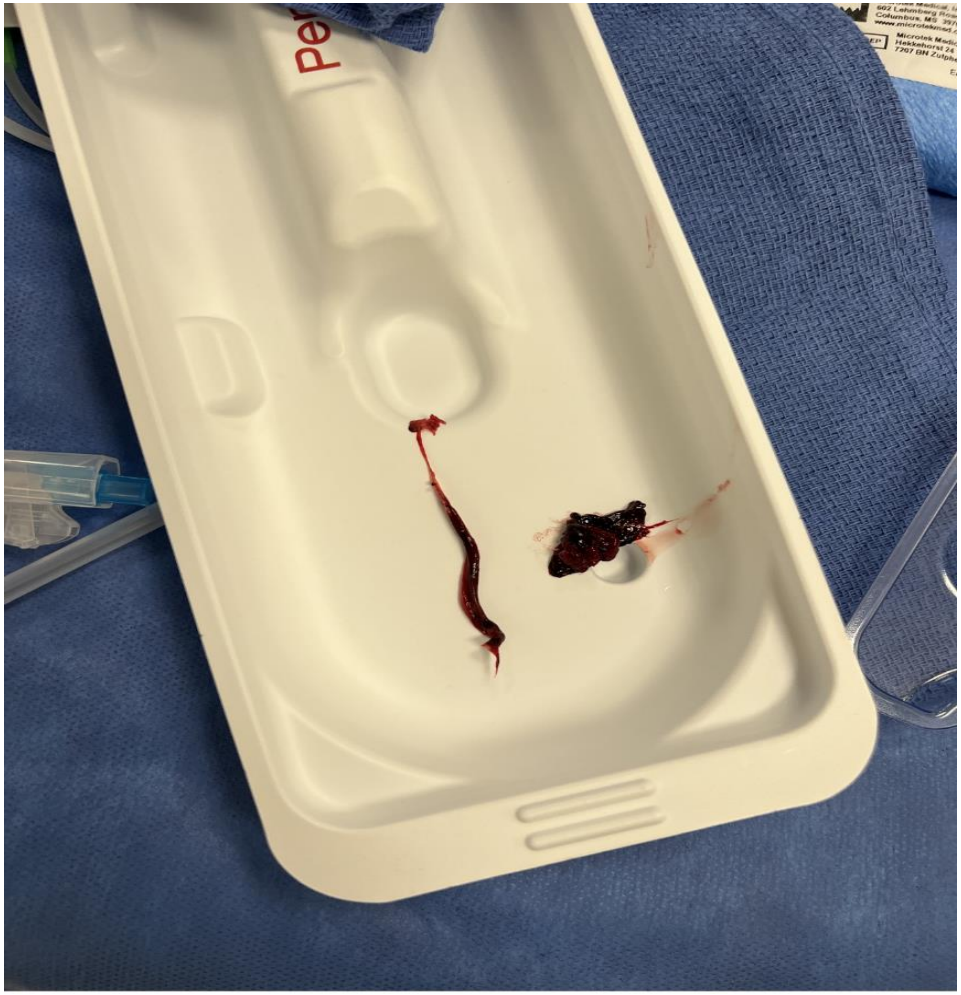

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Case 2
ECMO-APC

39-year-old female who presented to OSH with viral cardiomyopathy. cardiac arrest requiring CPR and was placed on peripheral Rt(V)Lt(A) ECMO

Rt CFA IABP Venting strategy.

Subsequently, she has developed right groin bleeding with retroperitoneal hematoma

right axillary Impella(CP) was placed(OR)

right groin bleeding(IABP site) (common femoral artery/external iliac artery/internal iliac artery) site was repaired by vascular surgery.

She was referred for possible antegrade sheath placement (left SFA-ECMO site)

She also continued to have significant bleeding from the right groin site and it was decided to perform a right iliac/femoral angiography

Antegrate Perfusion Cath

Courtesy M Chakravarthy M.D

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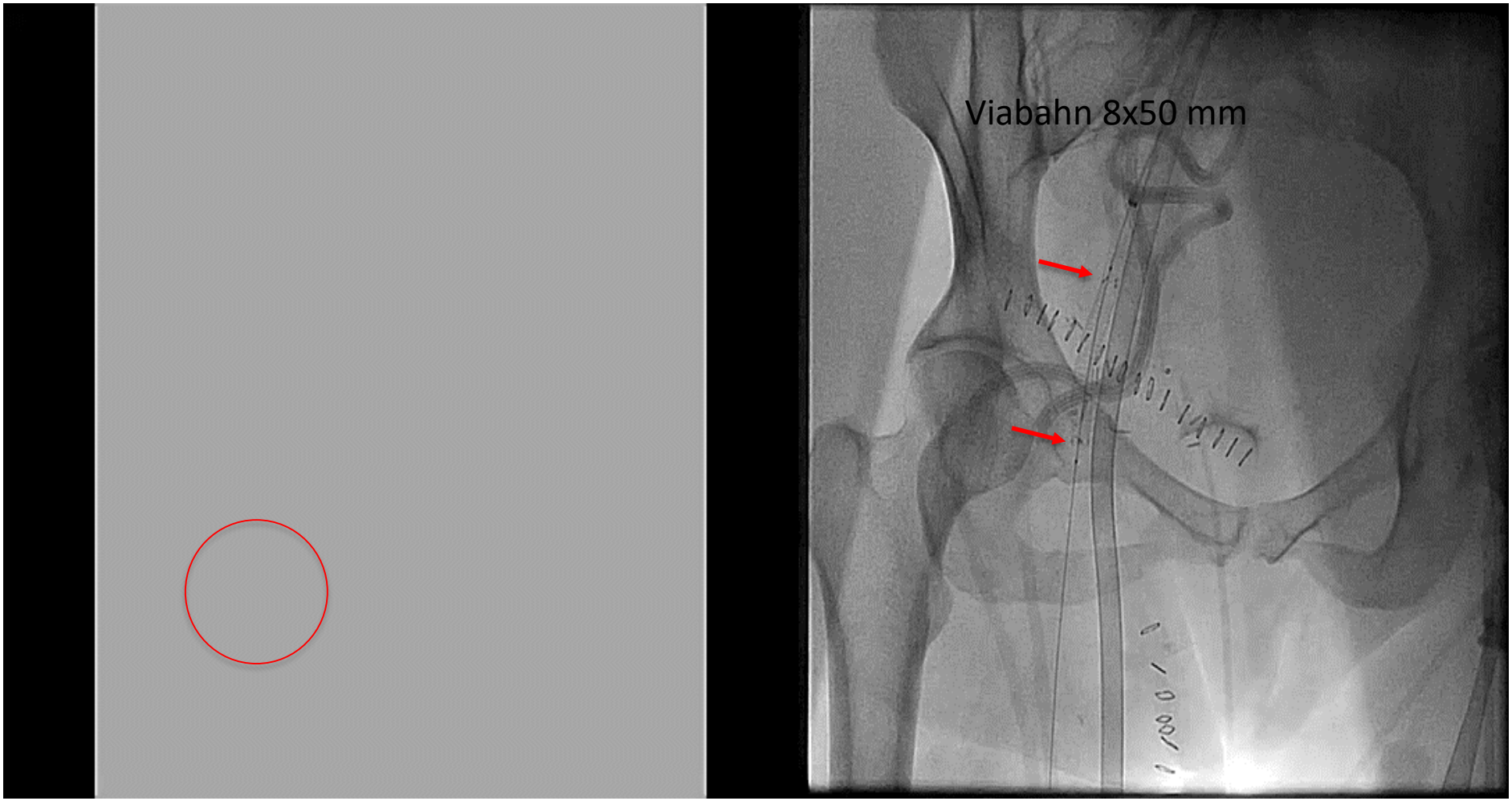

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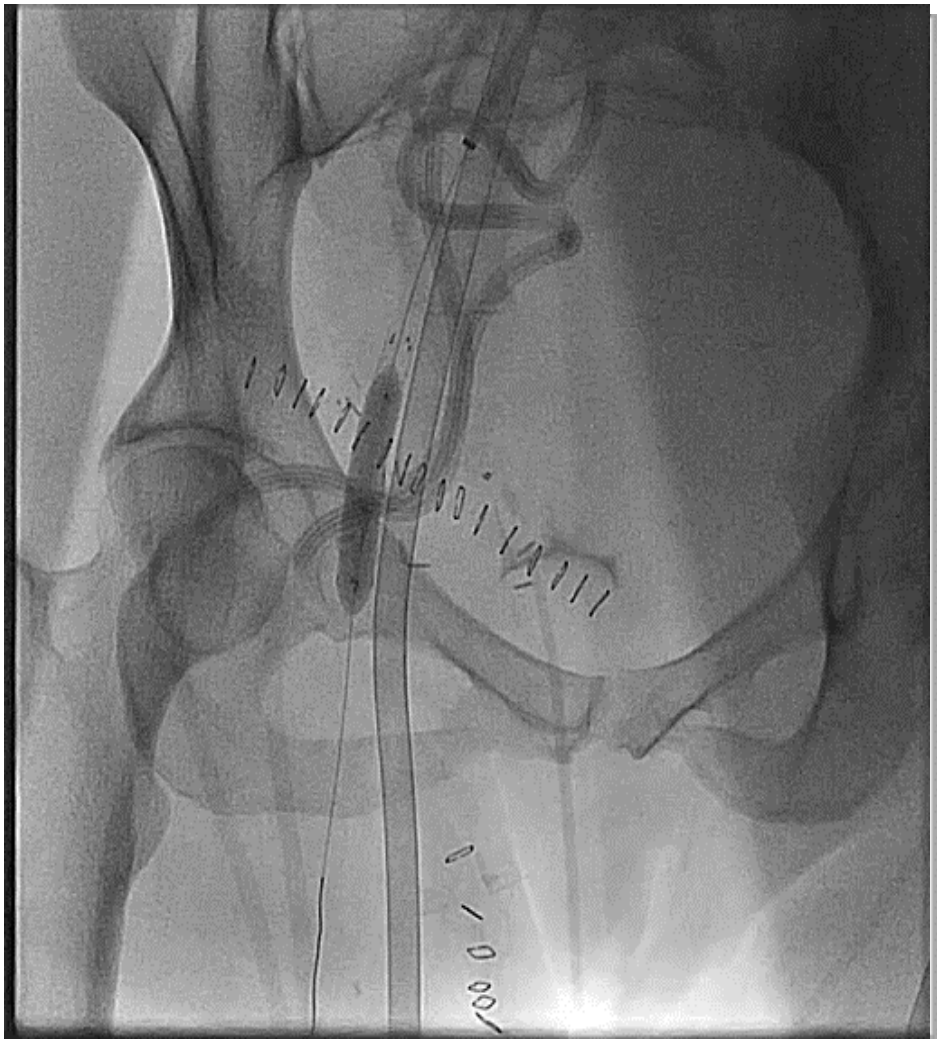

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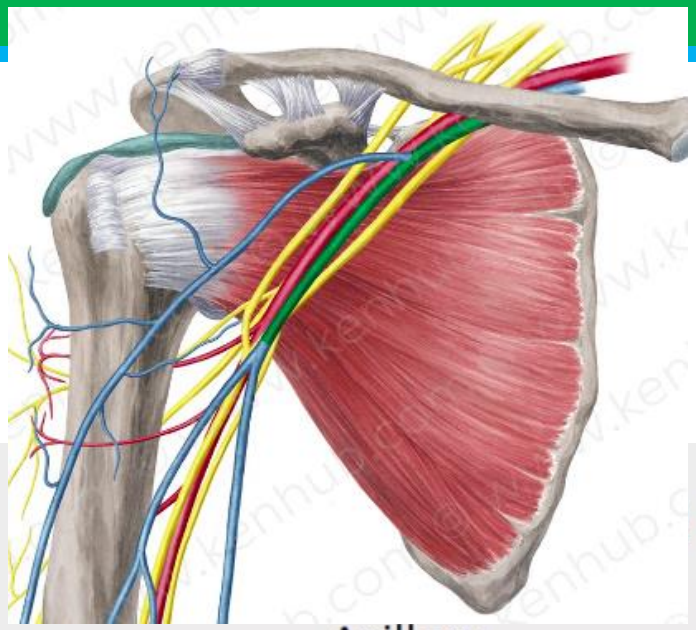
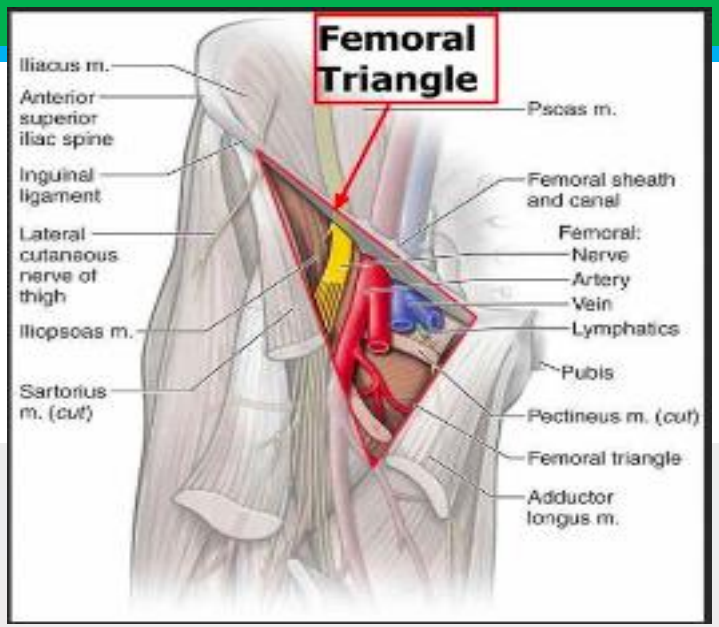
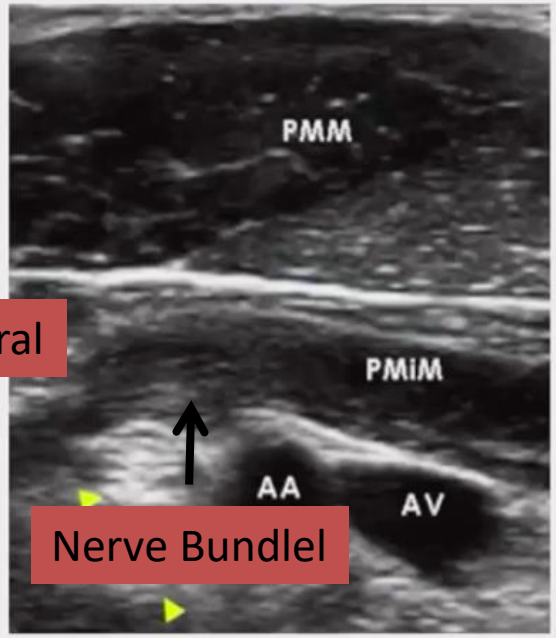
Percutaneous Axillary Access



Axillary

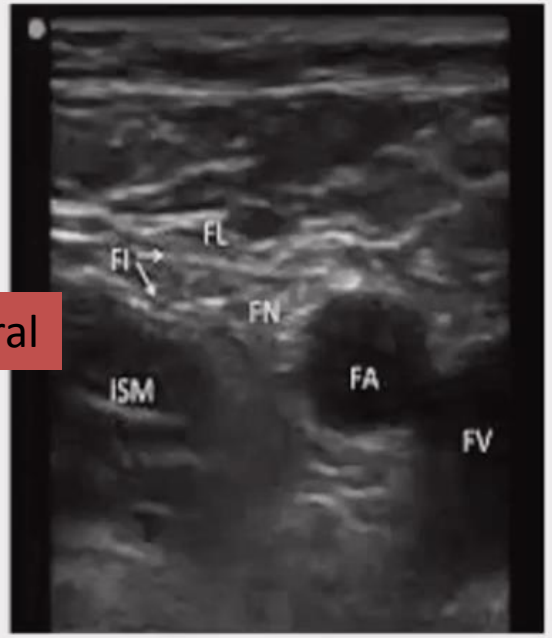


Femoral



lateral

Nerve Bundlel

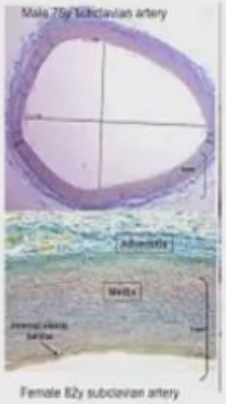


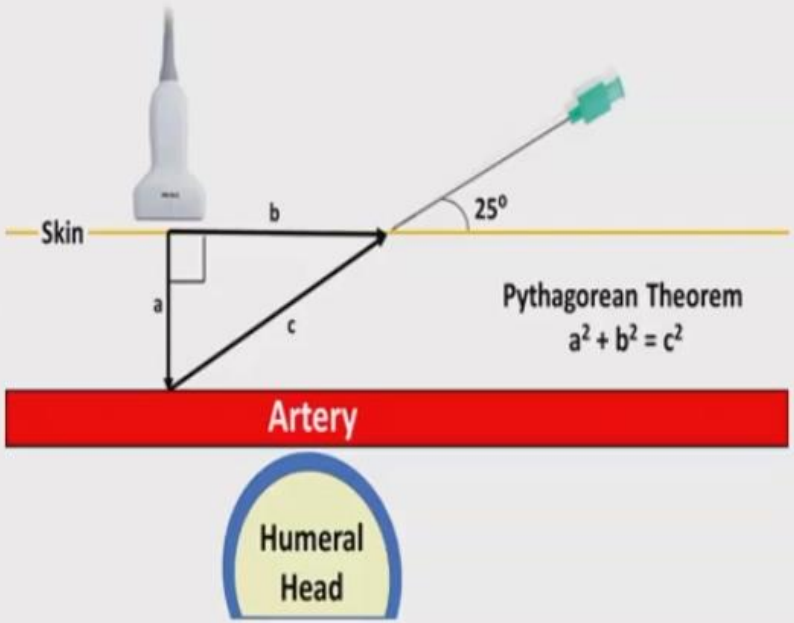
lateral

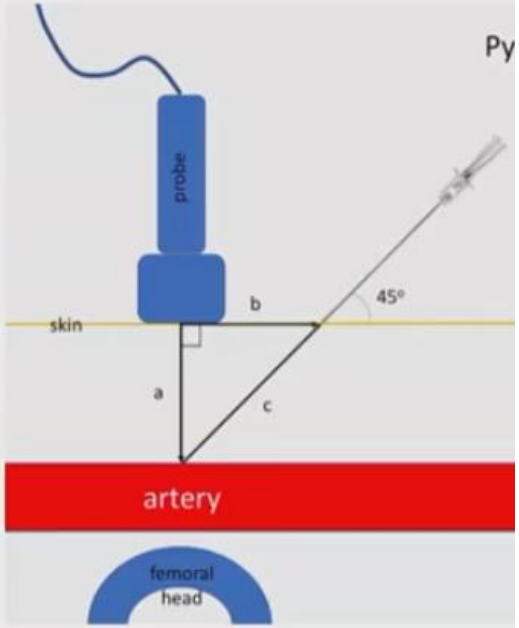
Medial

Medial

Axillary *vs* Femoral Access







Shallower Needle Angle is Key

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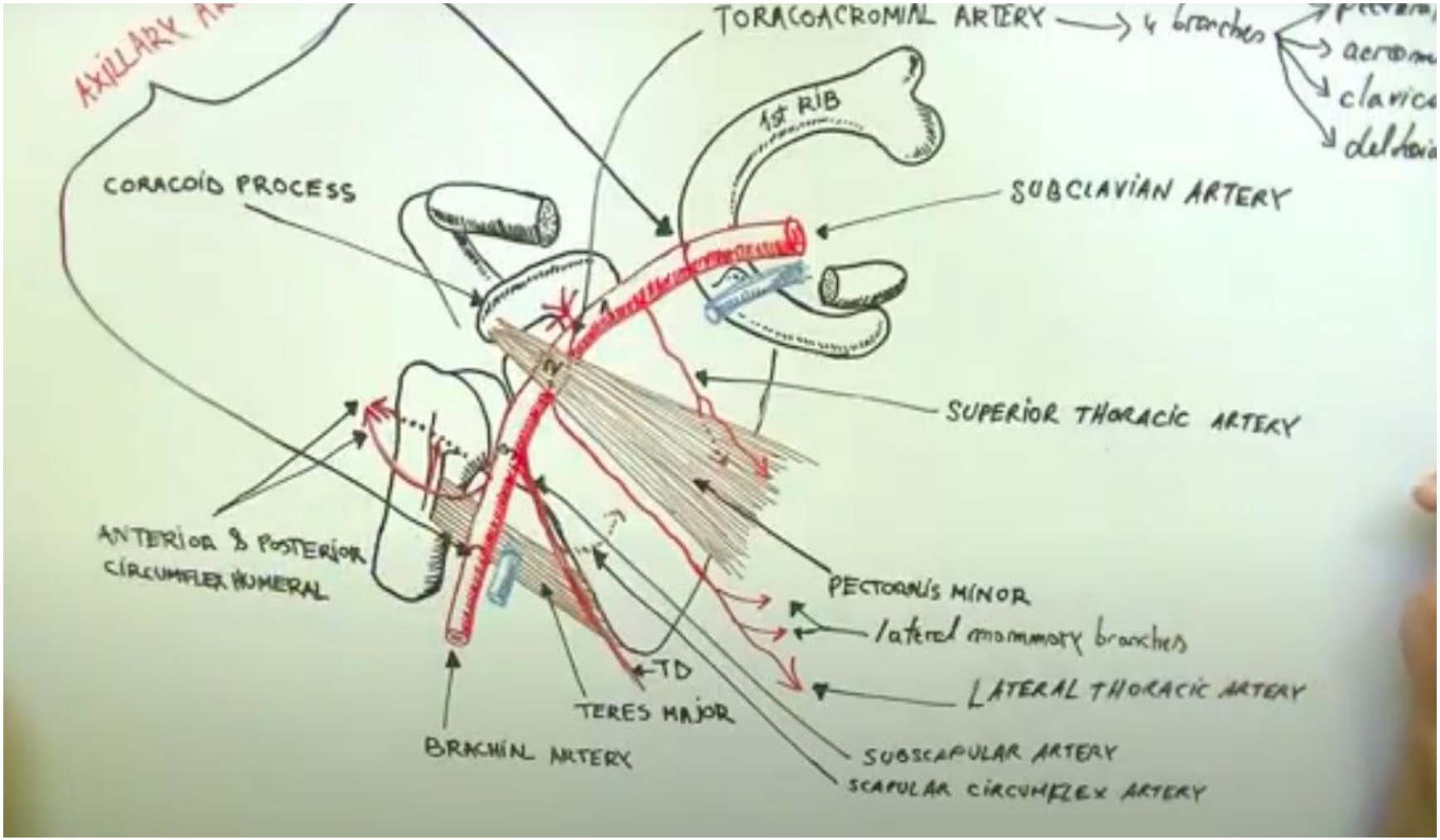

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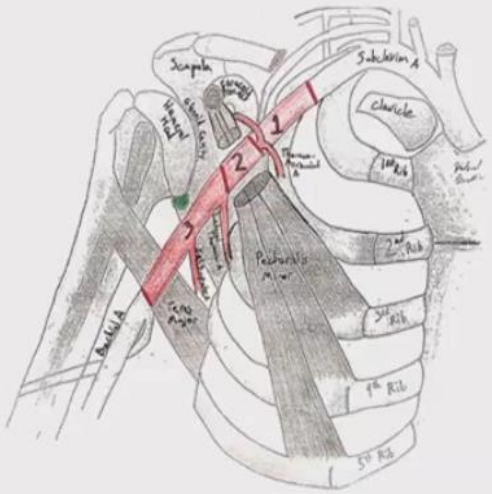
Glenoid Cavity Used as *Bony Landmark* to Reliably Obtain Safe Percutaneous Axillary Access

Figure 1: Axillary artery course and relationships



Parts of the axillary artery: Part 1 extends from the outer border of the first rib to the medial border of the pectoralis minor muscle and has one branch, the highest thoracic artery. Part 2 runs behind the pectoralis minor muscle and has two branches, the thoracoacromial proximally and the lateral thoracic artery distally. Part 3 runs from the lateral border of this muscle to the beginning of the brachial artery and it gives three branches, the subscapular, the posterior and the anterior circumflex humeral arteries. An inelastic fascia, the medial brachial fascial compartment, extends from the humorous and surrounds the neurovascular structures.

ORIGINAL CONTRIBUTION

Suggested Bony Landmarks for Safe Axillary Artery Access

Mohammad Thawabi, MD; Rajiv Taral, MD, MPH; Zain Khakwani, MD; Michael Sinclair; Marc Cohen, MD; Najam Wasty, MD

ABSTRACT: Objective. To identify a fluoroscopic bony landmark for safe percutaneous axillary artery cannulation. **Background.** No bony landmarks exist to guide safe percutaneous axillary artery cannulation, which is an important alternate access site for catheter-based procedures in selected patients. **Methods.** We retrospectively analyzed 57 consecutive percutaneous axillary artery sheath angiograms and attempted to correlate a fixed bony landmark to the proximal end of the third part of the artery. Proximal to this site, no cords of the brachial plexus traverse the anterior aspect of the vessel. Moreover, this site is proximal to the subscapular branch of the axillary artery, the first branch of its third part, and a sentinel component of the scapular anastomosis responsible for collateral blood flow to the arm. **Results.** With the arm abducted at 180°, the subscapular artery originated at or distal to the inferior border of the glenoid cavity, as seen on fluoroscopy in the anterior-posterior projection, in all patients. The origin was within 5 mm distal to the inferior border of the glenoid cavity in 17 patients (40%), 5-10 mm in 13 patients (33%), and between 10 mm and 20 mm in 7 patients (19%). **Conclusions.** With the arm abducted, the origin of the subscapular artery correlates well with the inferior-most aspect of the glenoid cavity of the scapula under fluoroscopy. Axillary artery cannulation medial to this bony landmark typically lands the sheath in the second part or proximal end of the third part of the artery, thereby theoretically sparing injury to the brachial plexus and the subscapular artery.

J INVASIVE CARDIOL 2018;XXX(x):xxx-xxx

KEY WORDS: axillary artery cannulation, large-bore catheters, high-risk PCI, subscapular artery

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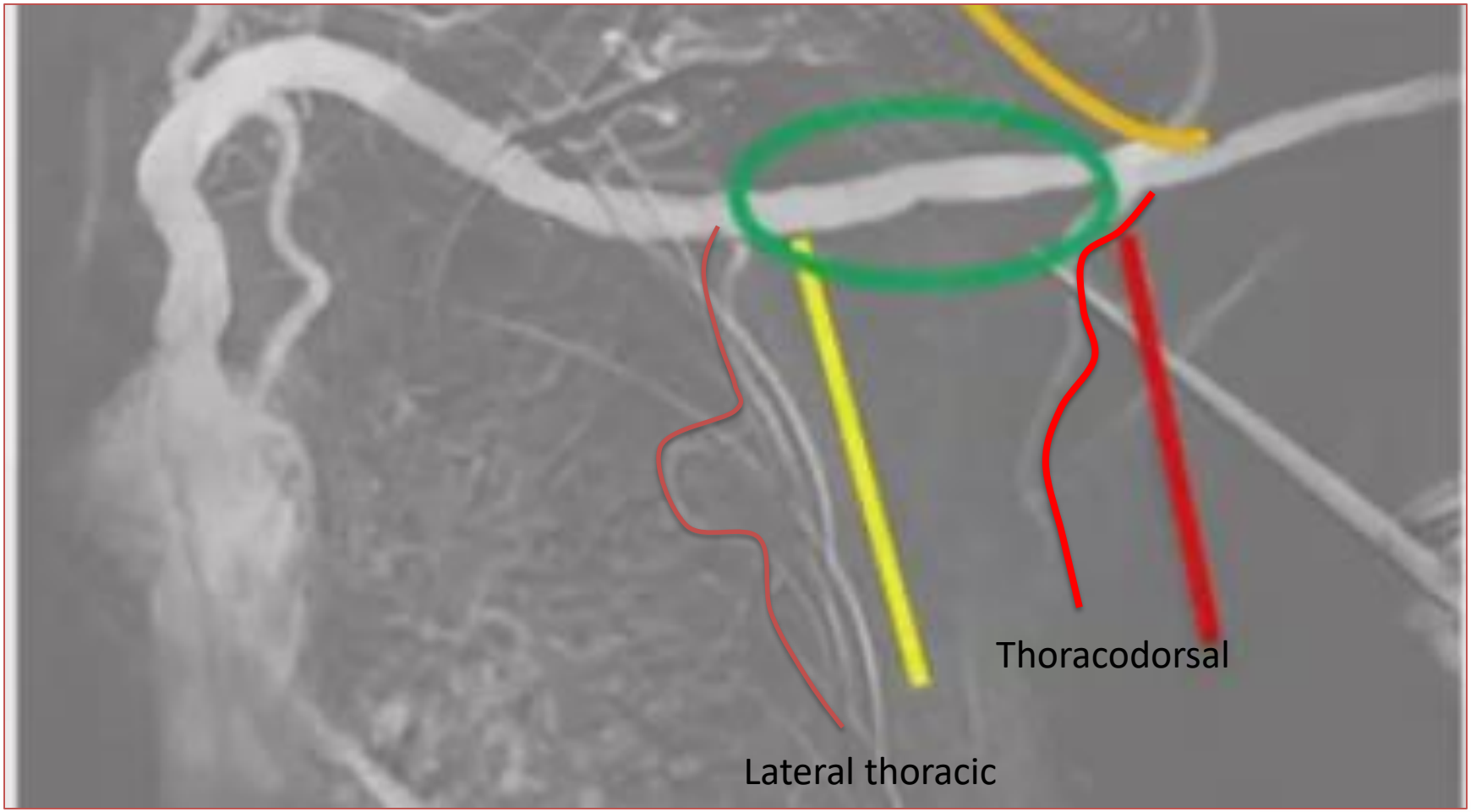
Access Site



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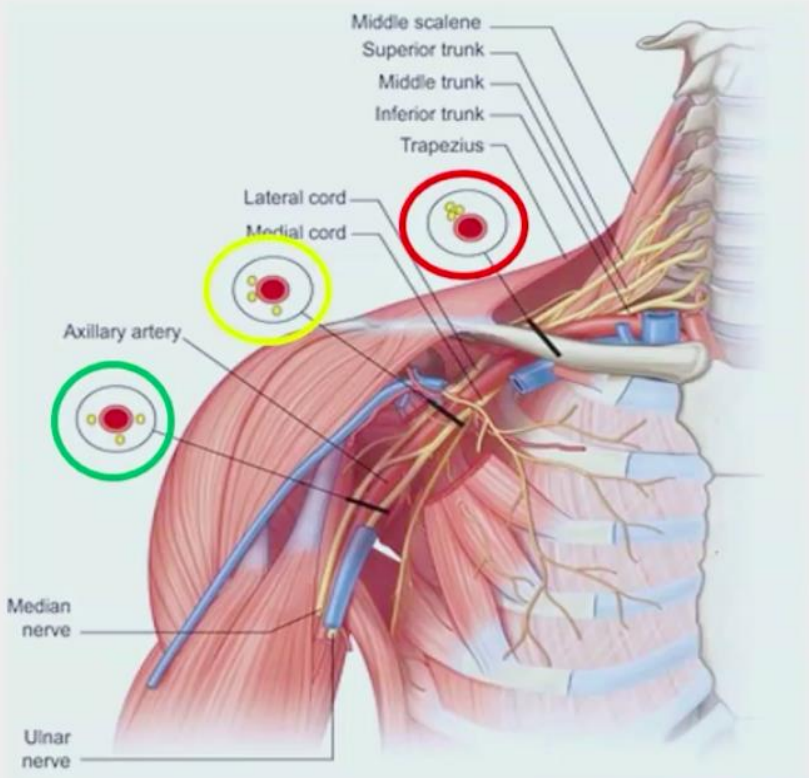
Axillary Anatomy

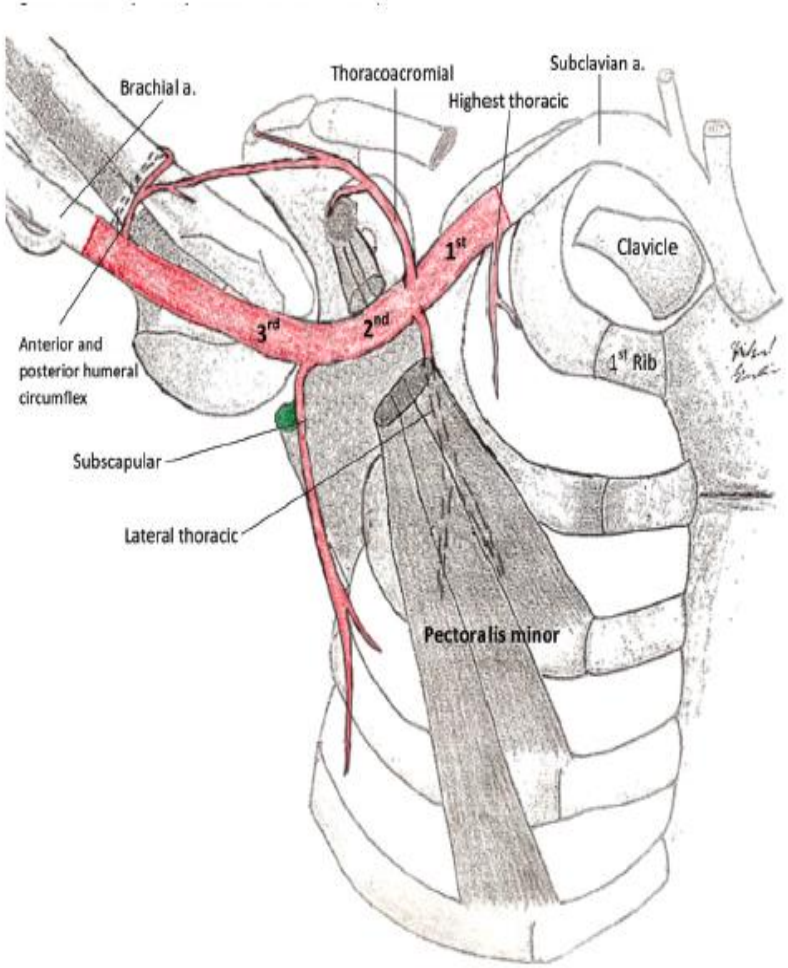
-Relationship of Brachial Plexus to Axillary Artery varies by location

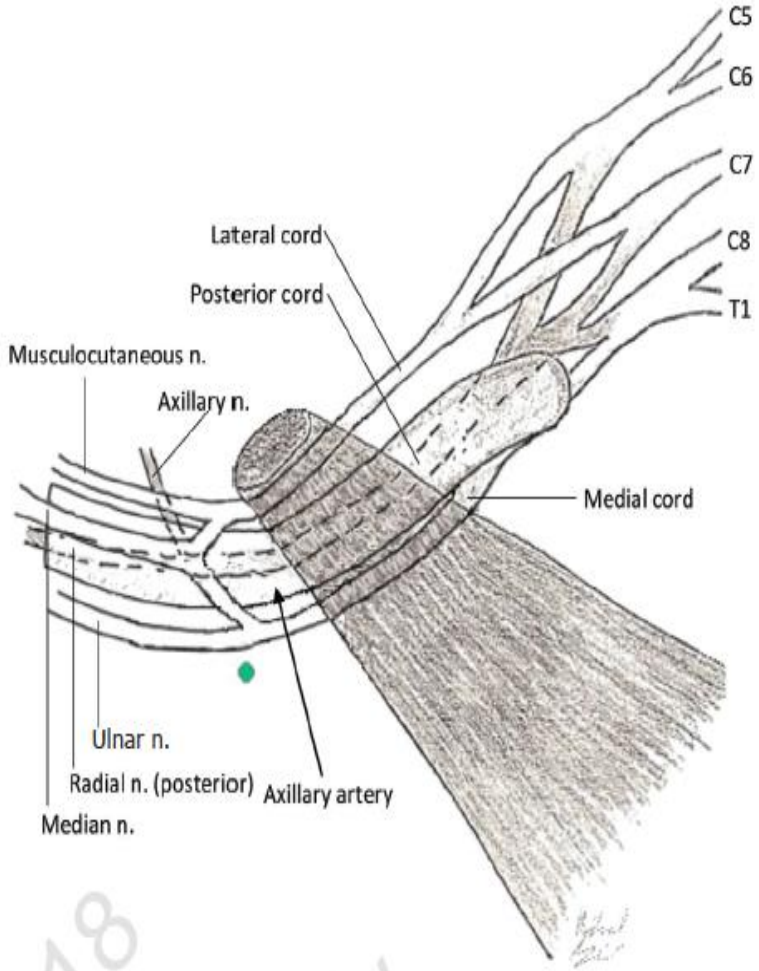
-Plexus is readily visualizable by ultrasound

-Average vessel diameter is 6.0mm-6.2mm

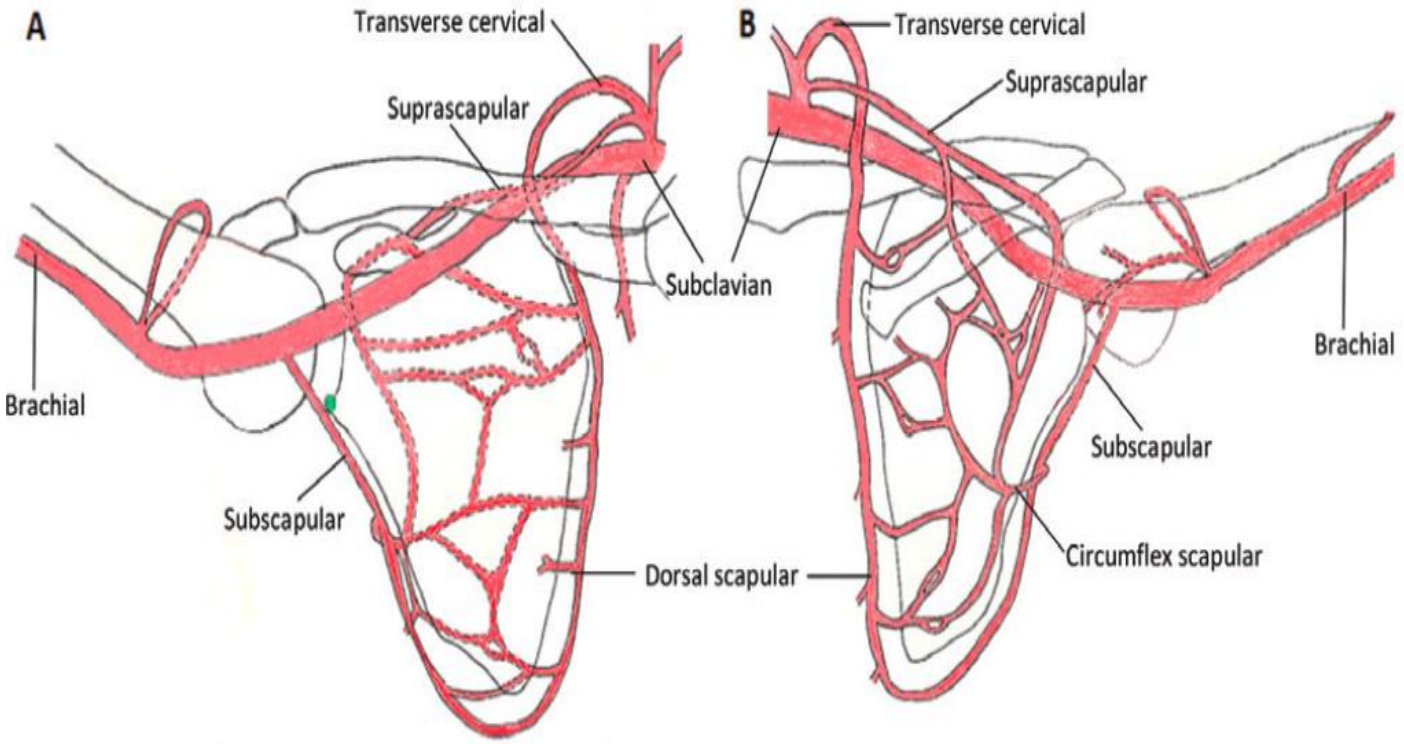
-AxA is infrequently diseased 2% vs 20% iliofemoral arteries







THAWABI, ET AL.



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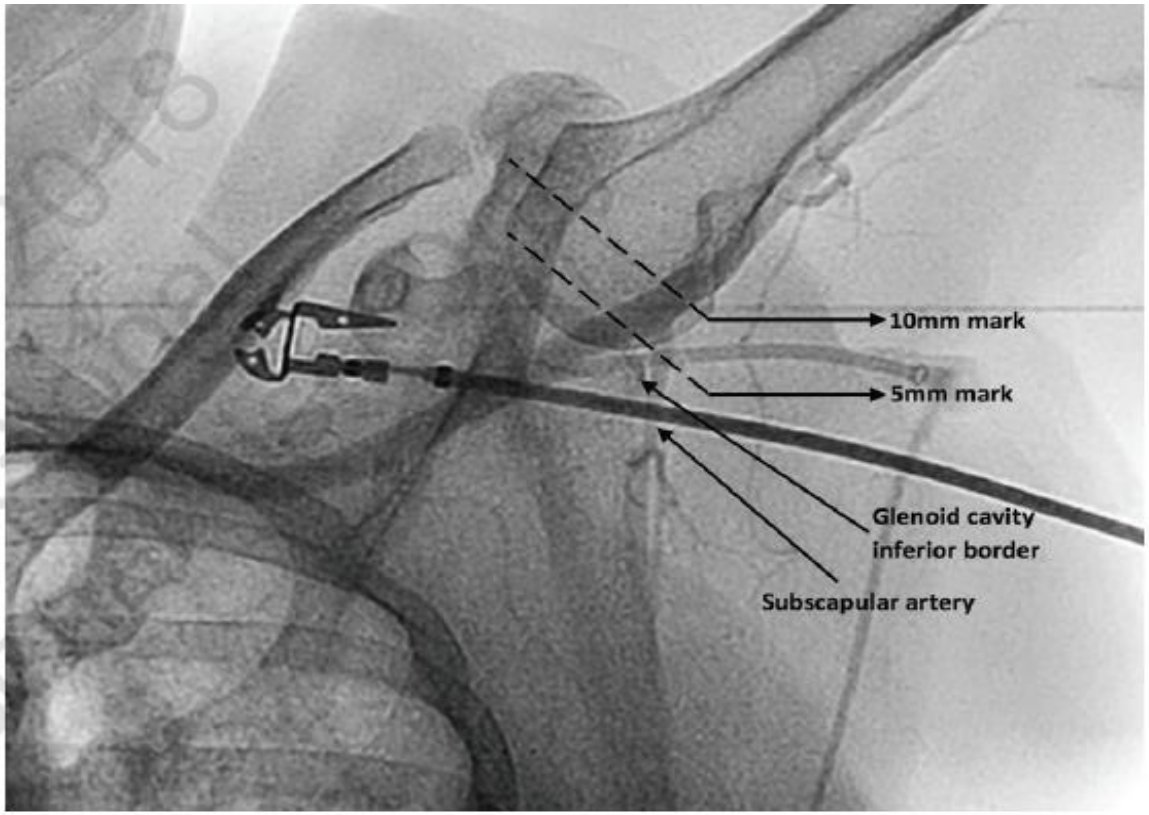
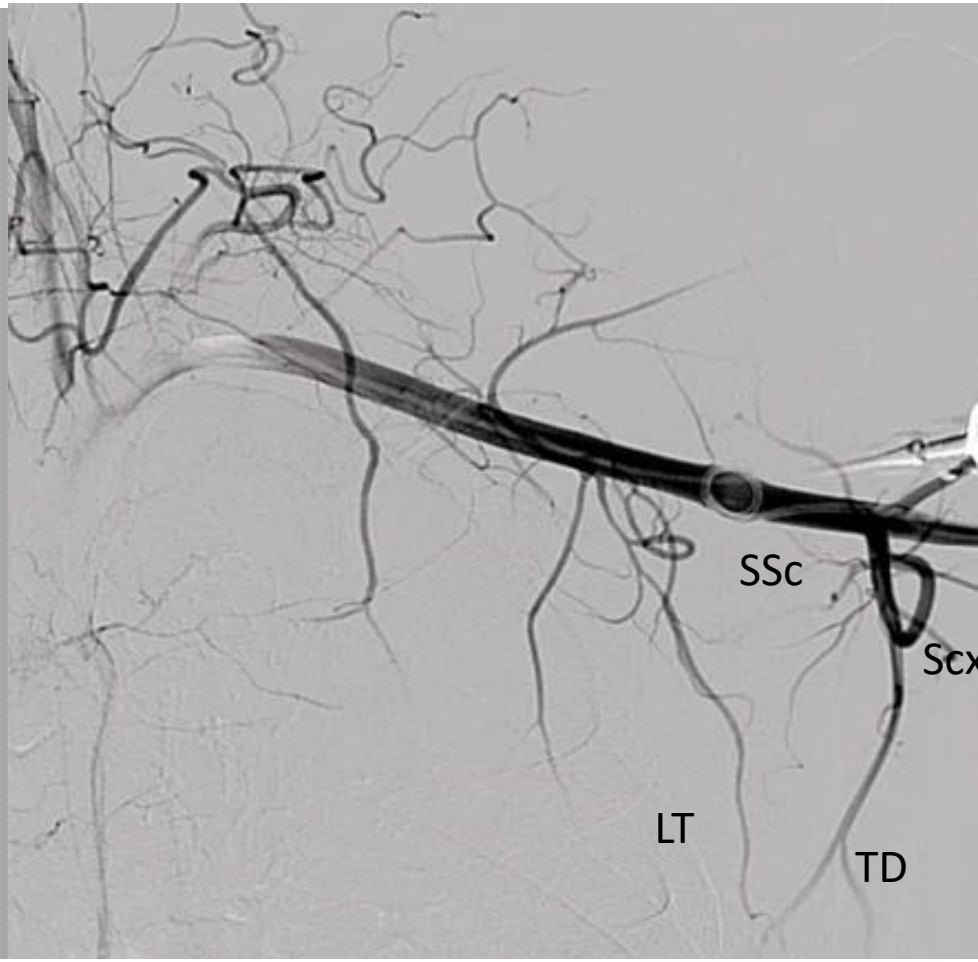
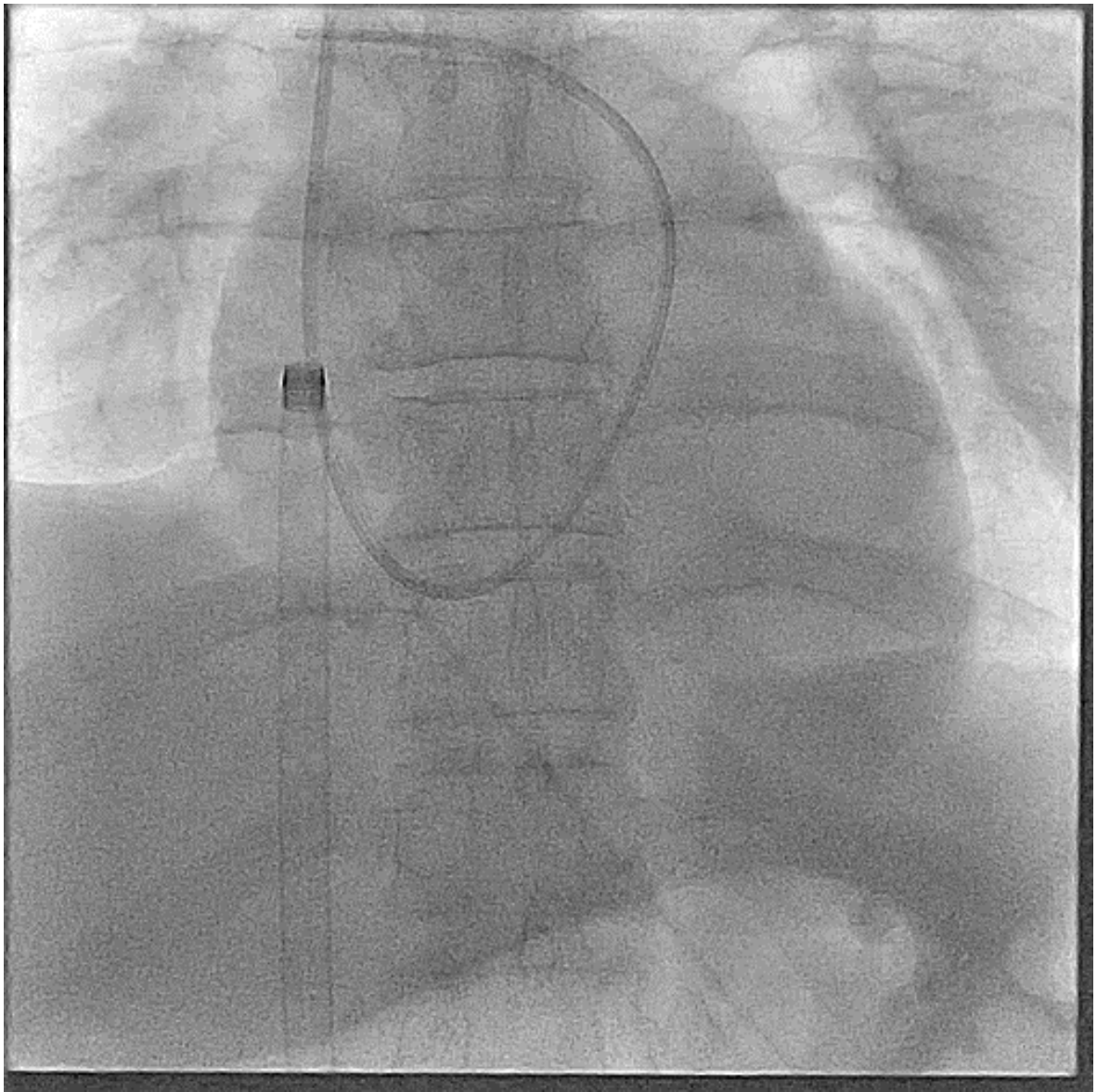


FIGURE 4. The relationship between the subscapular artery and the inferior border of the glenoid cavity. The subscapular artery is the first branch of the third part of the axillary artery, and closely correlates on fluoroscopy with the inferior-most part of the glenoid cavity. The subscapular artery originated within 5 mm of the inferior border of the glenoid cavity in 17 patients (46%), 5-10 mm in 13 patients (35%), and 10-20 mm in 7 patients (19%).

Axillary IABP



LT=Lateral Thoracic-SSC=Subscapular-SCx=Scapular Circumflex



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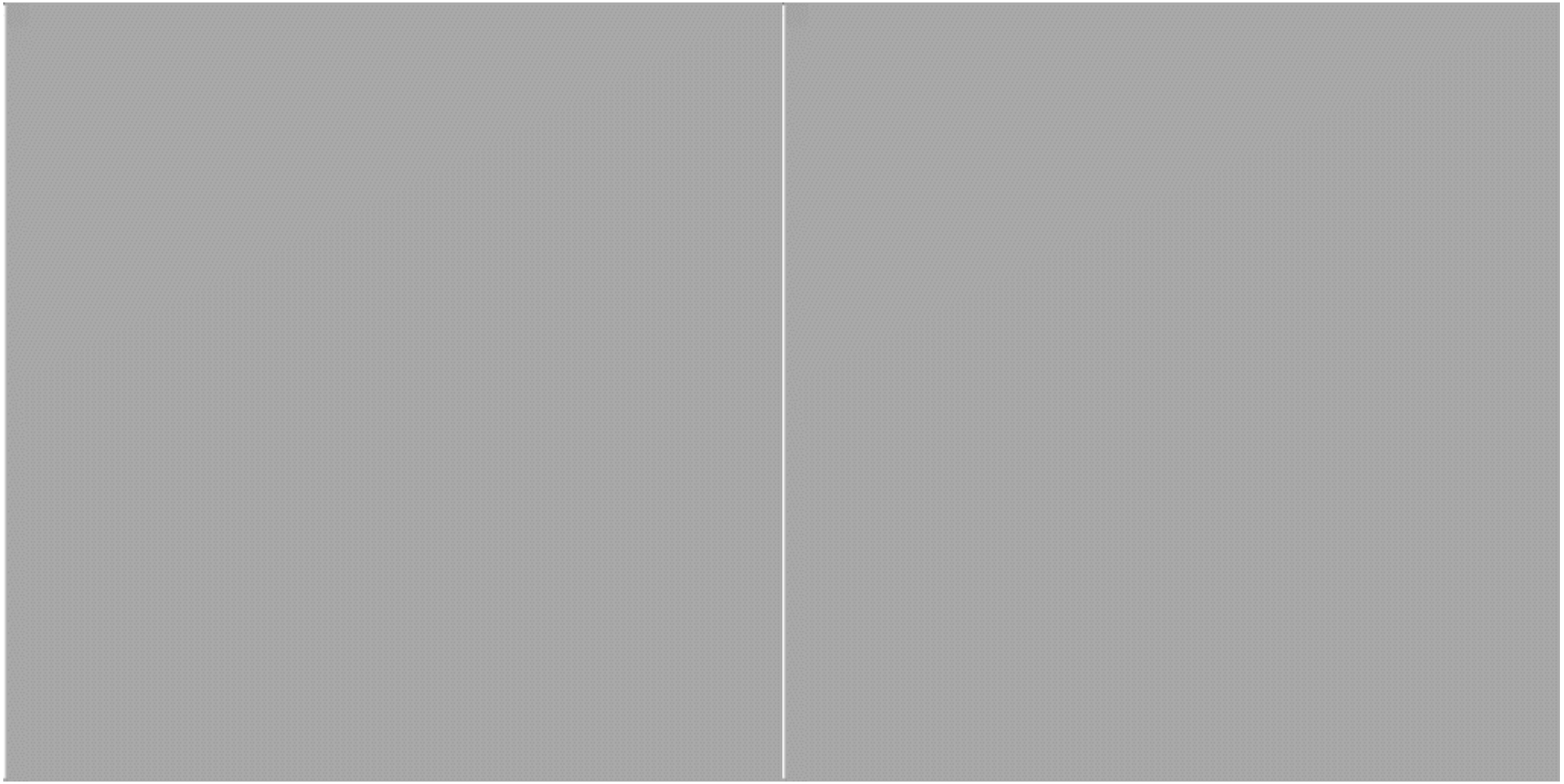
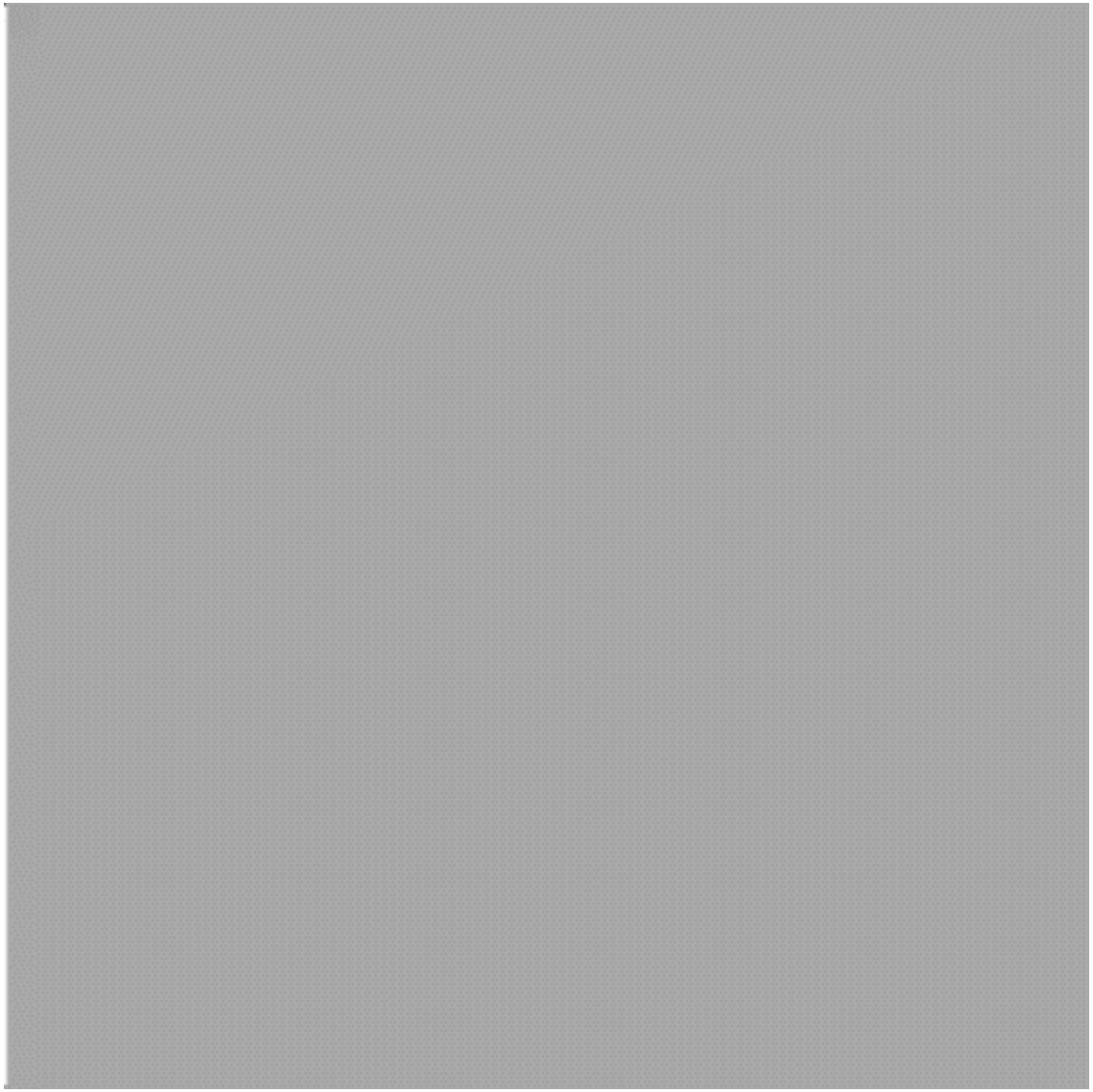


Allegheny Health Network



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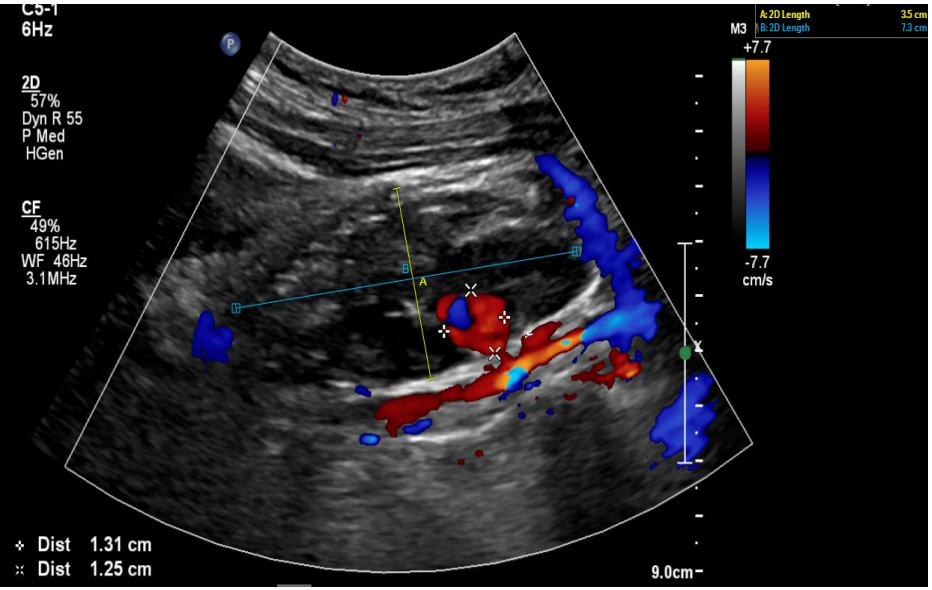
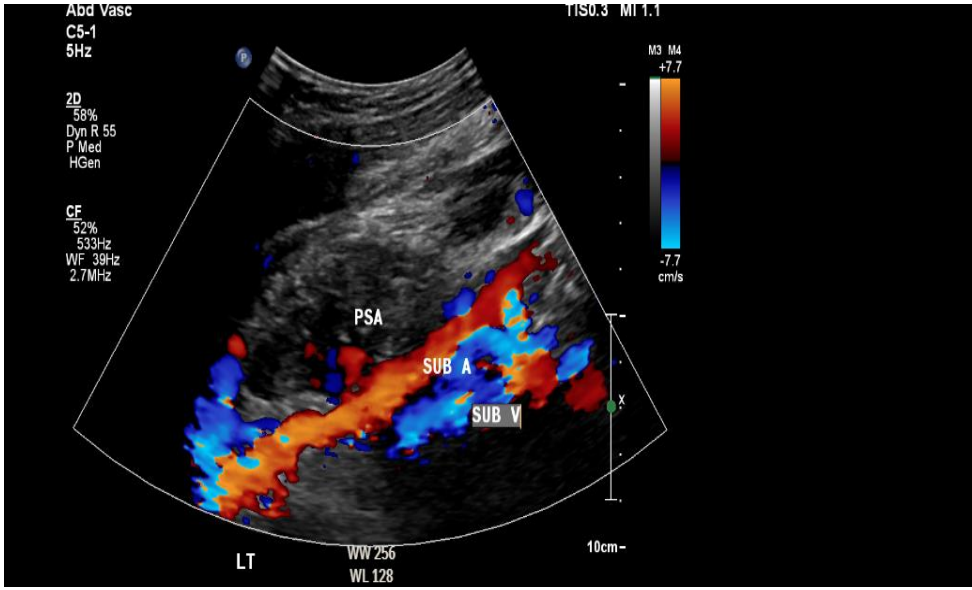
Partially Thrombosed PSA





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Conclusion

- **Preventing CLI is Key→ antegrade sheath**
- **Percutaneous approach if possible should be done in a controlled environment i.e CCL**
- **Decanulation could be done in the CCL-if preclosed**

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THANK YOU

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