# Complications of Hemodialysis Catheters

**Dr. Morteza Shahbandari, M.D.**

Assistant Professor of Vascular and Endovascular Surgery

Department of Surgery

School of Medicine

Isfahan University of Medical Sciences

# Disclosures

- I have no conflict of interests to disclose.

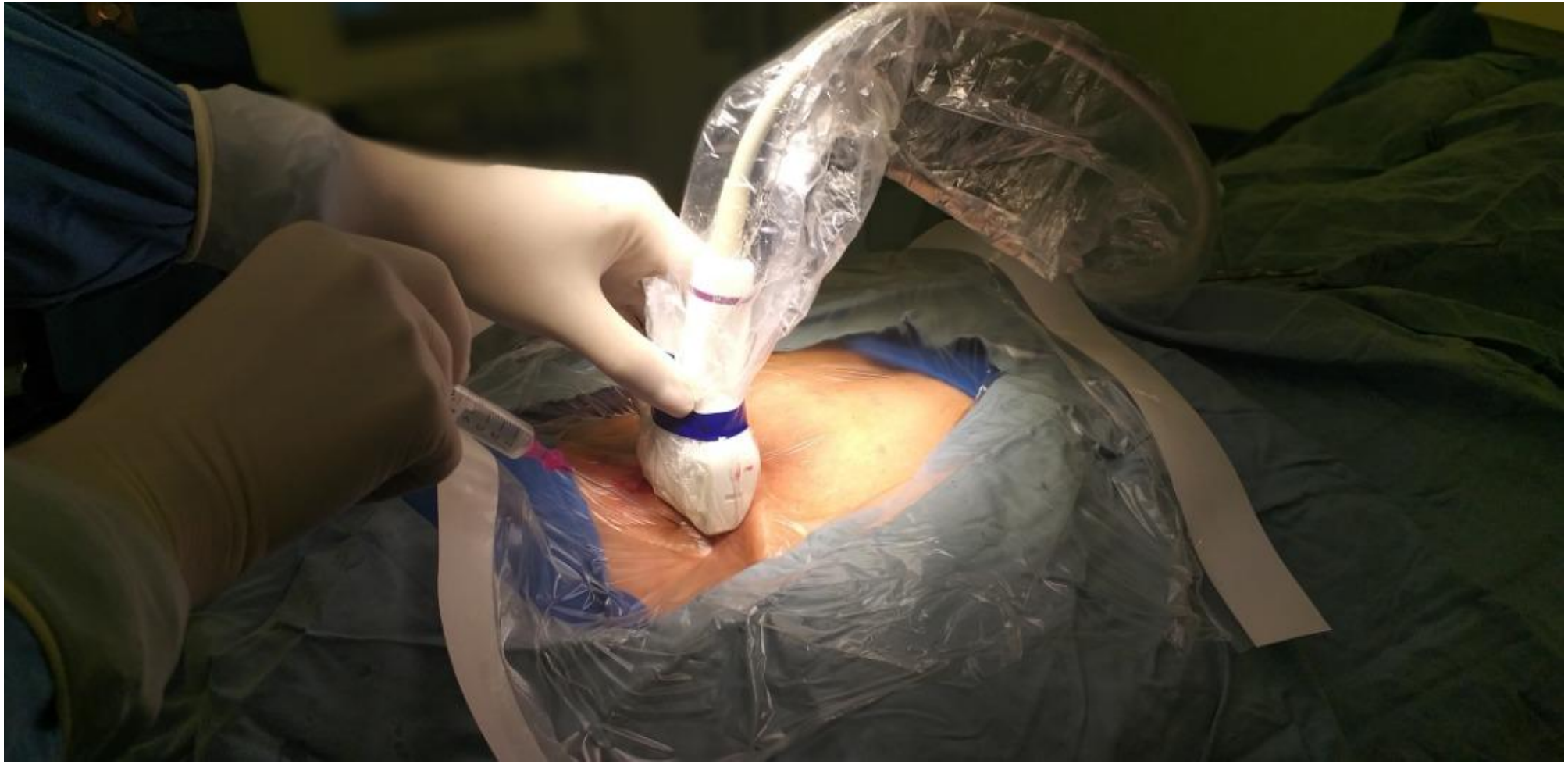
# Catheter Insertion Technique

1. Site selection
2. Fluoroscopy must be at hand
3. Patient position
4. LA & sedation
5. Prophylactic AB

# Catheter Insertion Technique

6. Close adherence to sterility
7. Sterile drape
8. No touch technique
9. Access under real-time US guidance
    - Jugular vein should be punctured just above the clavicle

# Procedure

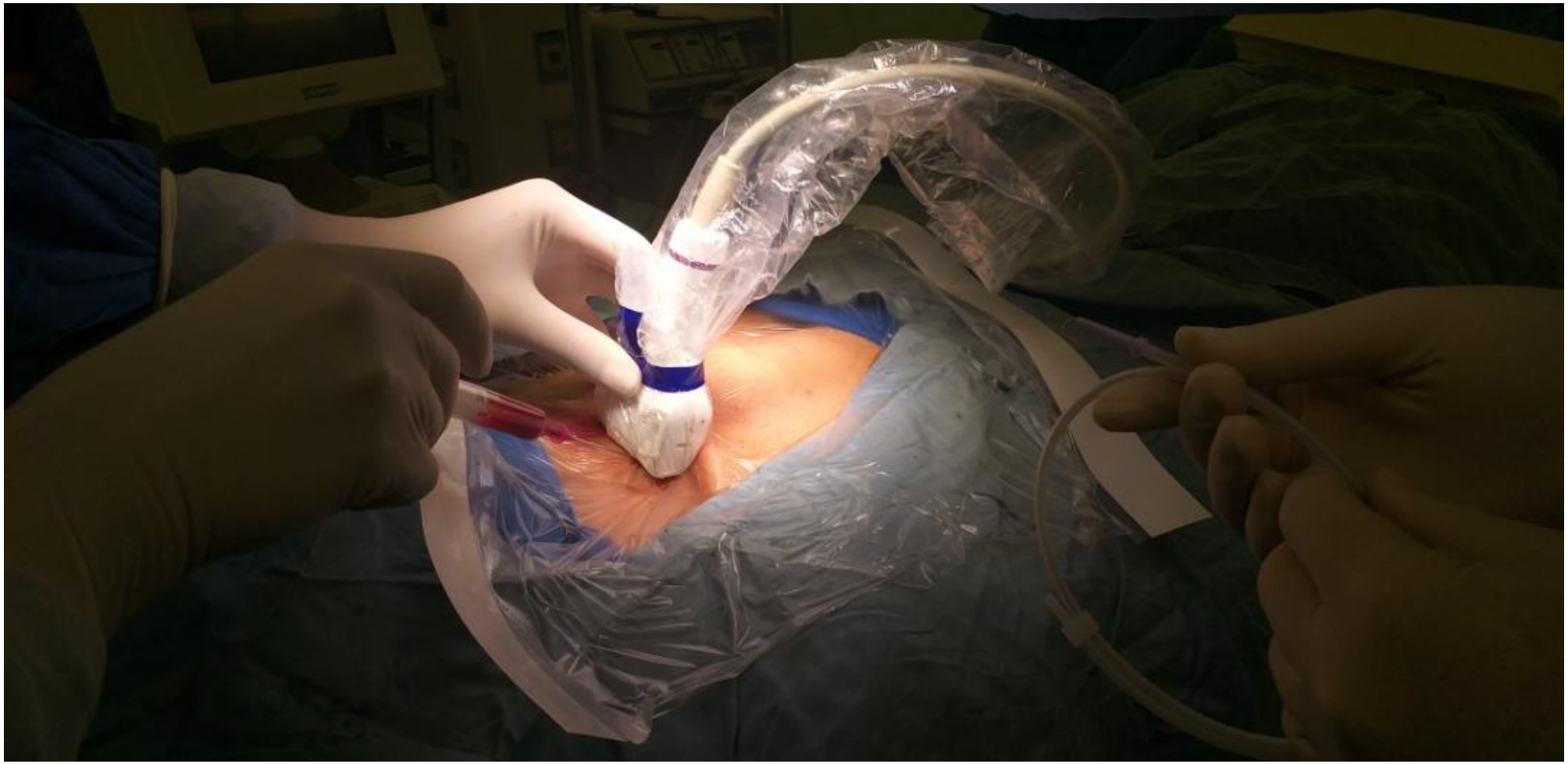


# US-guided access

# Catheter Insertion Technique

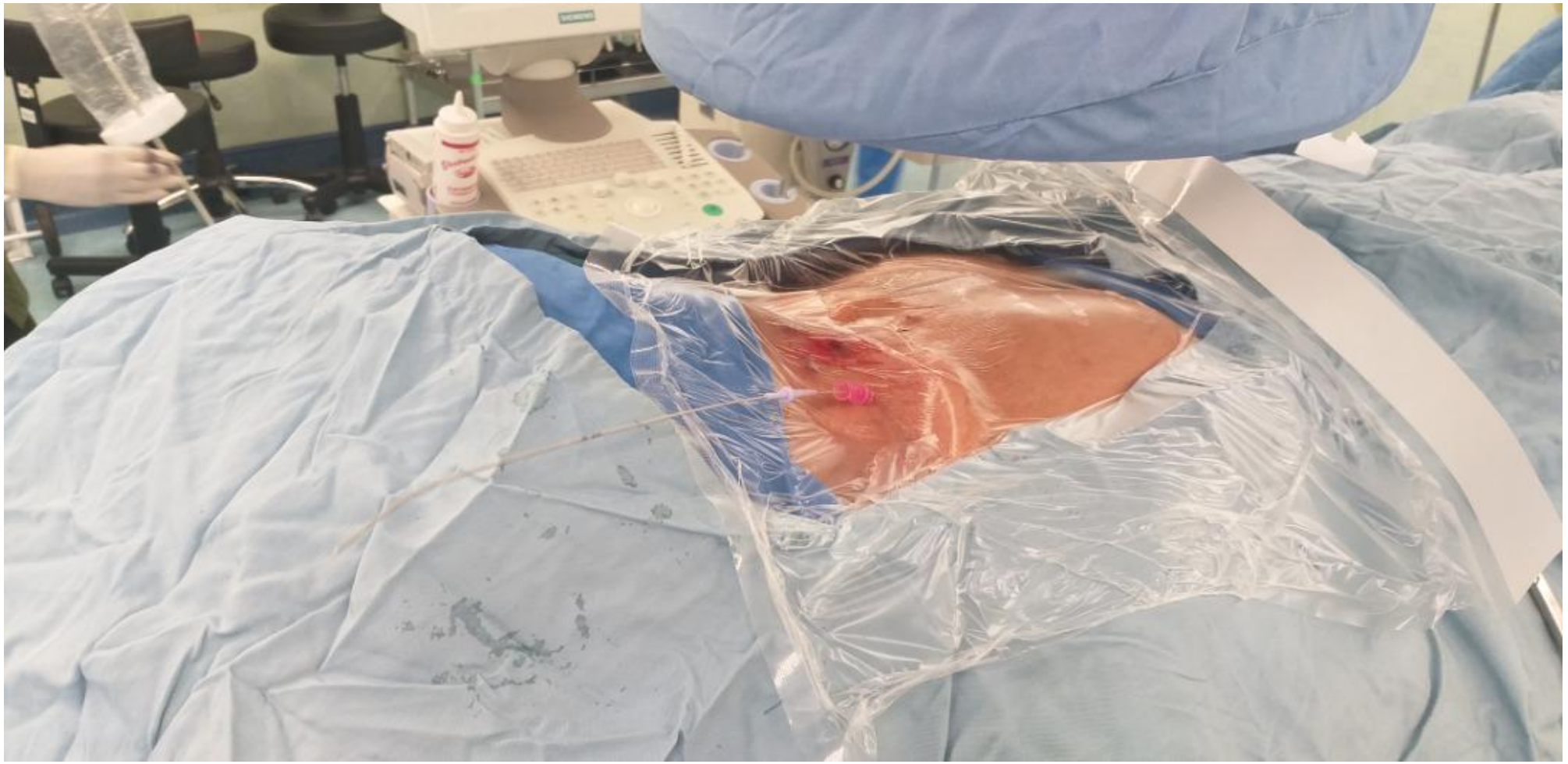
10. 0.035” guidewire introduction
11. Confirmation of wire position in SVC down to the IVC using fluoroscopy
12. 1-cm skin incision at the wire entry

# Procedure



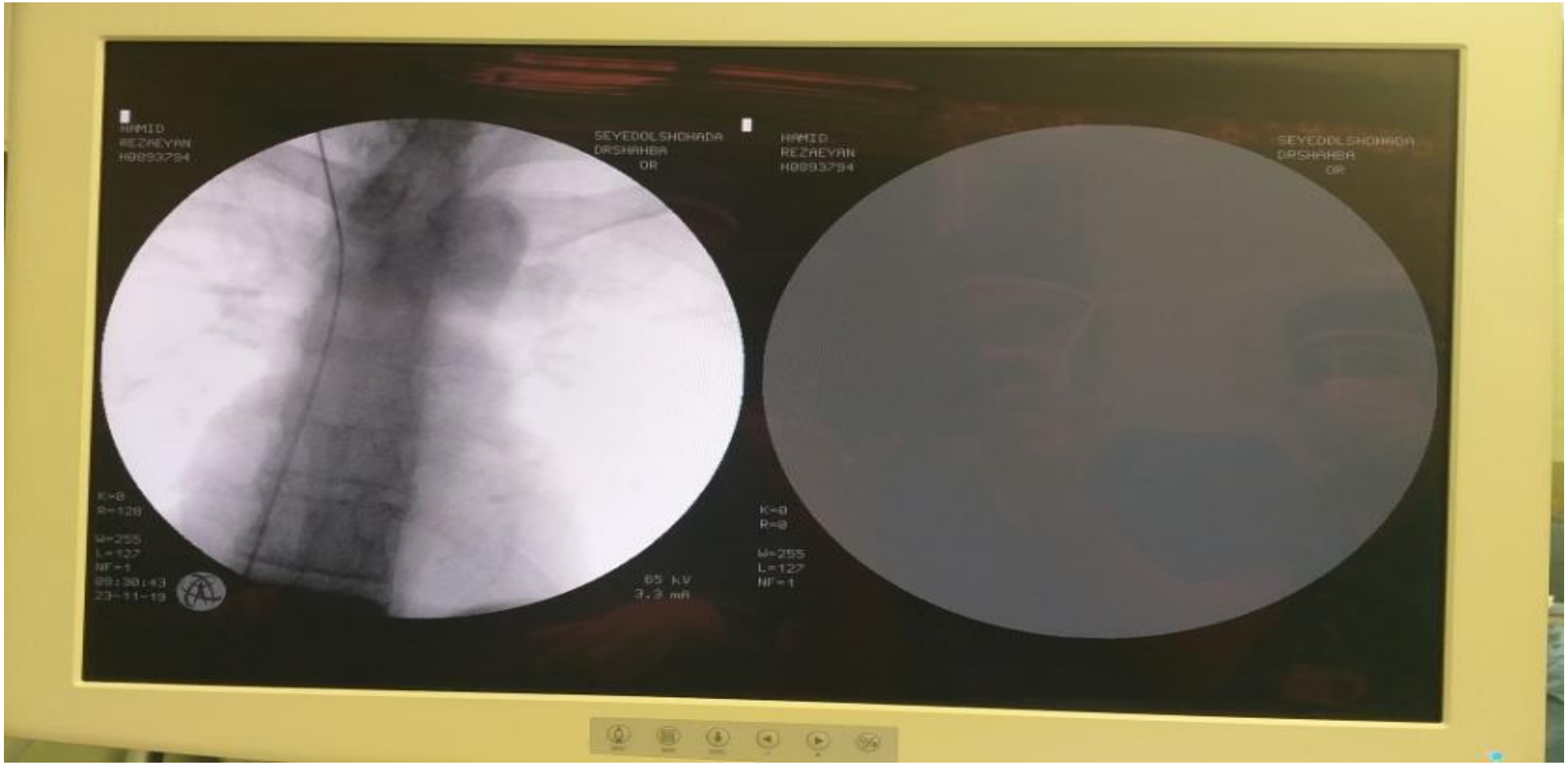
# Procedure

# Procedure



# Procedure

# Procedure


HAMID
REZAEYAN
H0093794
SEYEDOLSHOHADA
DRSHAHBA
OR
HAMID
REZAEYAN
H0093794
SEYEDOLSHOHADA
DRSHAHBA
OR
K=0
R=128
W=255
L=127
NF=1
09:30:43
23-11-19
65 kV
3.3 mA
K=0
R=0
W=255
L=127
NF=1

# Catheter Insertion Technique

13. Exit site incision
14. Access site dilation
    - Passage of all dilators and sheaths over the wire under fluoroscopic visualization
15. Subcutaneous tunneling

# Procedure

# Catheter Insertion Technique

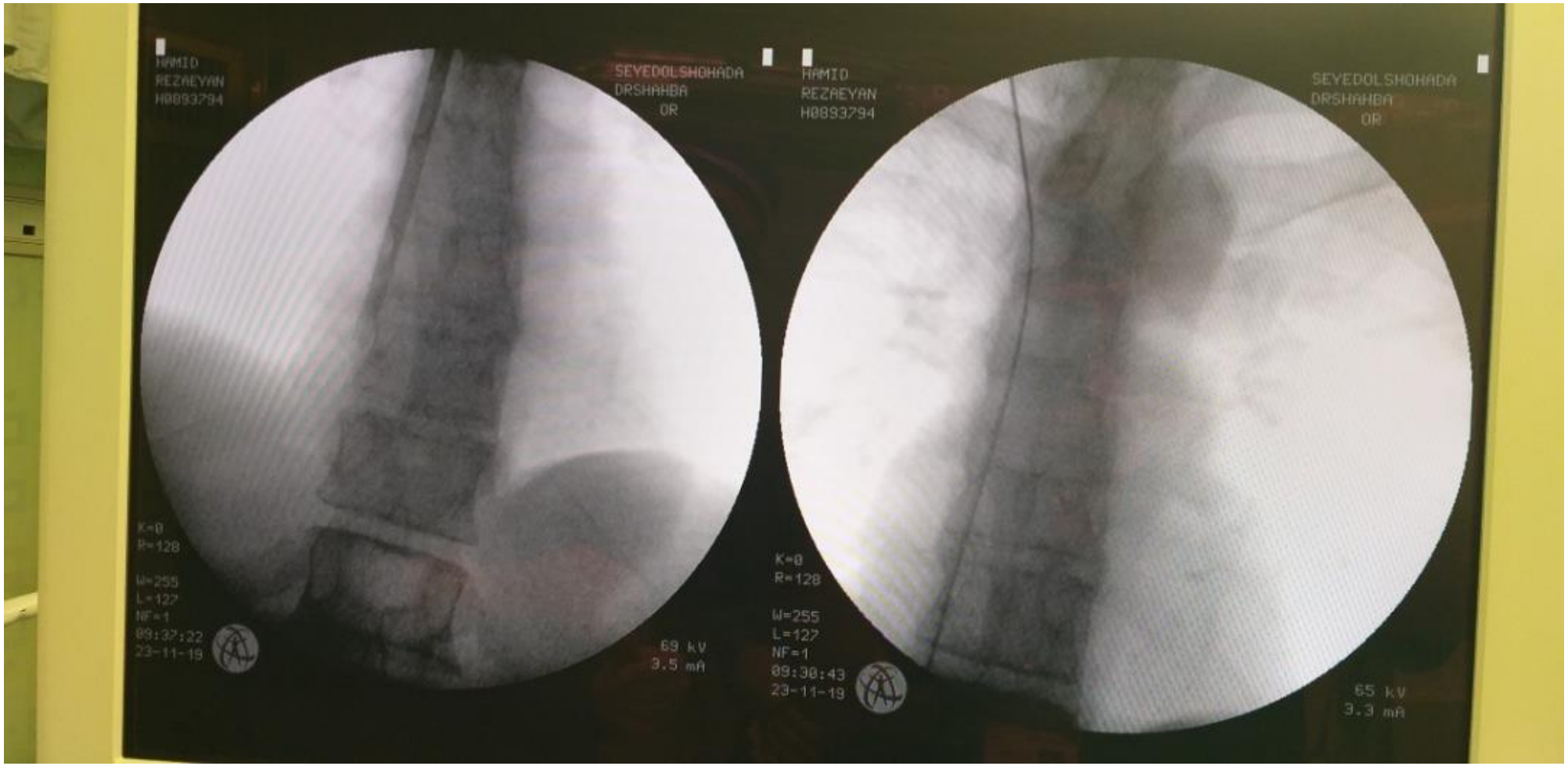
16. Peel-away sheath insertion
17. Introducer and wire removal
18. Catheter insertion through the peel-away sheath
19. Peel-away withdrawal

# Procedure

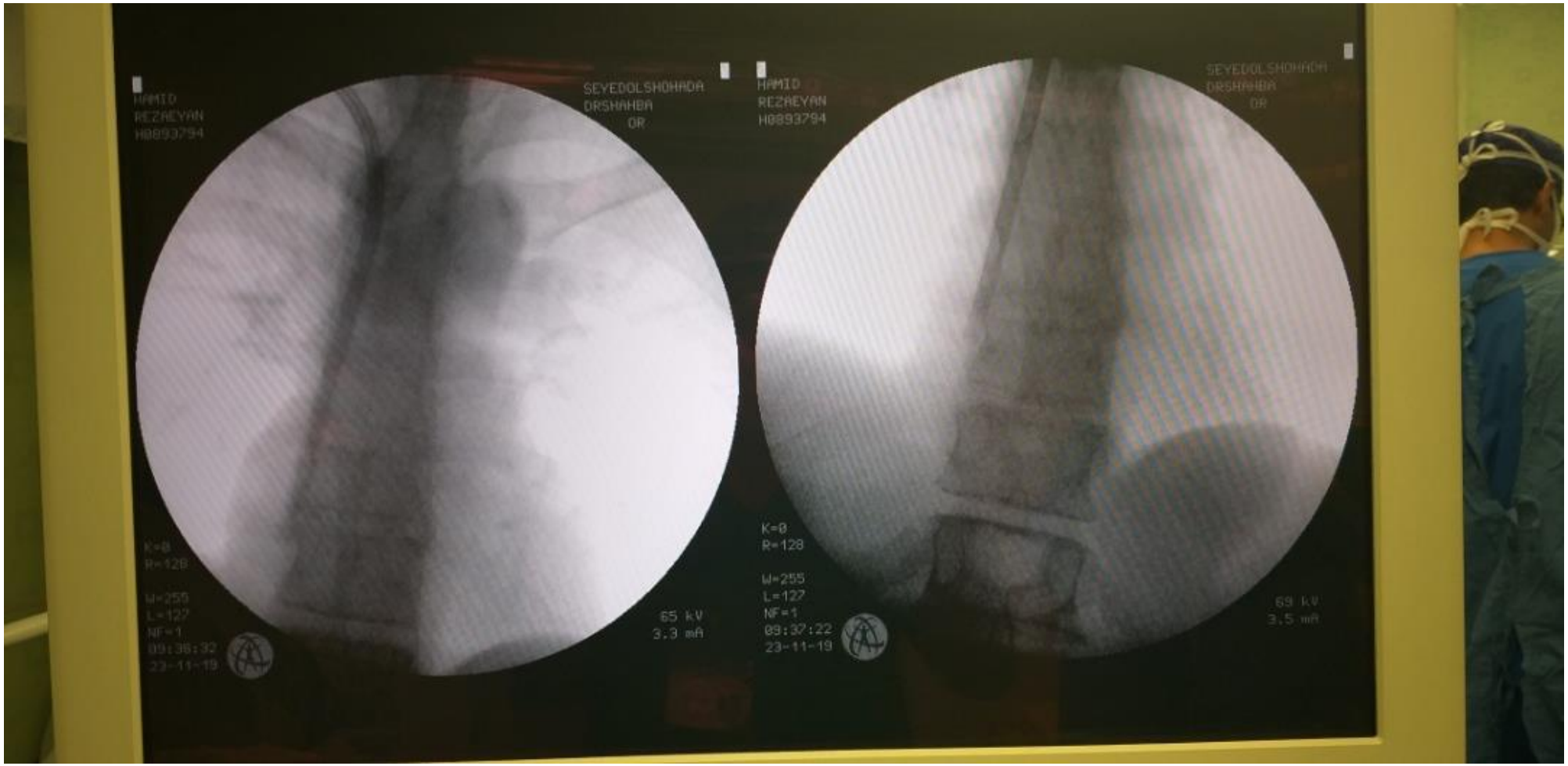
# Catheter Insertion Technique

20. Aspiration of both lumens (using a 20cc piston syringe)
21. Forceful flush with saline (using a 20cc piston syringe)
22. Confirmation of catheter’s tip and curve in case of flow resistance
23. Heparinization of lumens (1000 unit/mL)

# Procedure


HAMID
REZAEYAN
H0093794
SEYEDOLSHOHADA
DRSHAHBA
OR
K=0
R=128
W=255
L=127
NF=1
09:37:22
23-11-19
69 kV
3.5 mA
HAMID
REZAEYAN
H0093794
SEYEDOLSHOHADA
DRSHAHBA
OR
K=0
R=128
W=255
L=127
NF=1
09:30:43
23-11-19
65 kV
3.3 mA

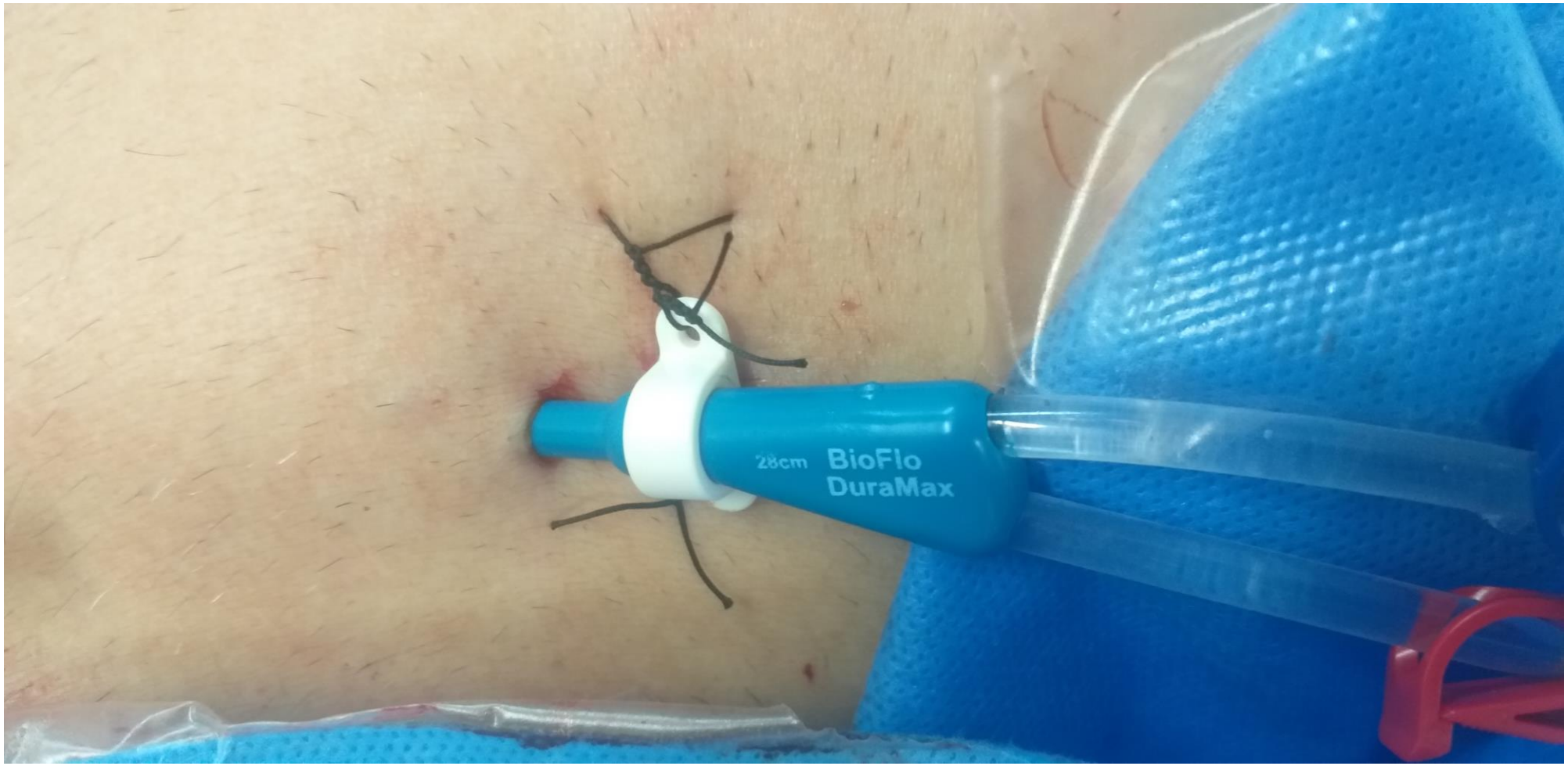
# Procedure


HAMID
REZAEYAN
H0893794
SEYEDOLSHOHADA
DRSHAHBA
OR
K=0
R=128
W=255
L=127
NF=1
09:36:32
23-11-19
65 kV
3.3 mA
HAMID
REZAEYAN
H0893794
SEYEDOLSHOHADA
DRSHAHBA
OR
K=0
R=128
W=255
L=127
NF=1
09:37:22
23-11-19
69 kV
3.5 mA

# Catheter Insertion Technique

24. Catheter fixation using 0 Silk suture
    - Avoid direct fixation to the skin
25. Skin closure
26. Occlusive dressing

# Procedure



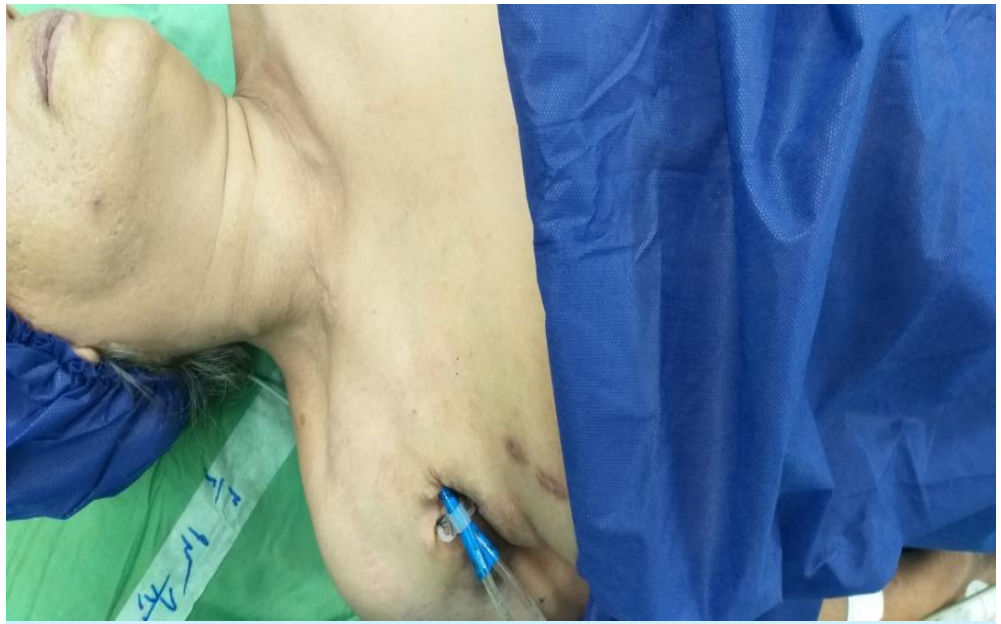
# Procedure

# Technical Errors

- Attempted open access obtainment in a HD patient with exhausted access sites due to central venous stenosis!

# Technical Errors

Wrong Access Site

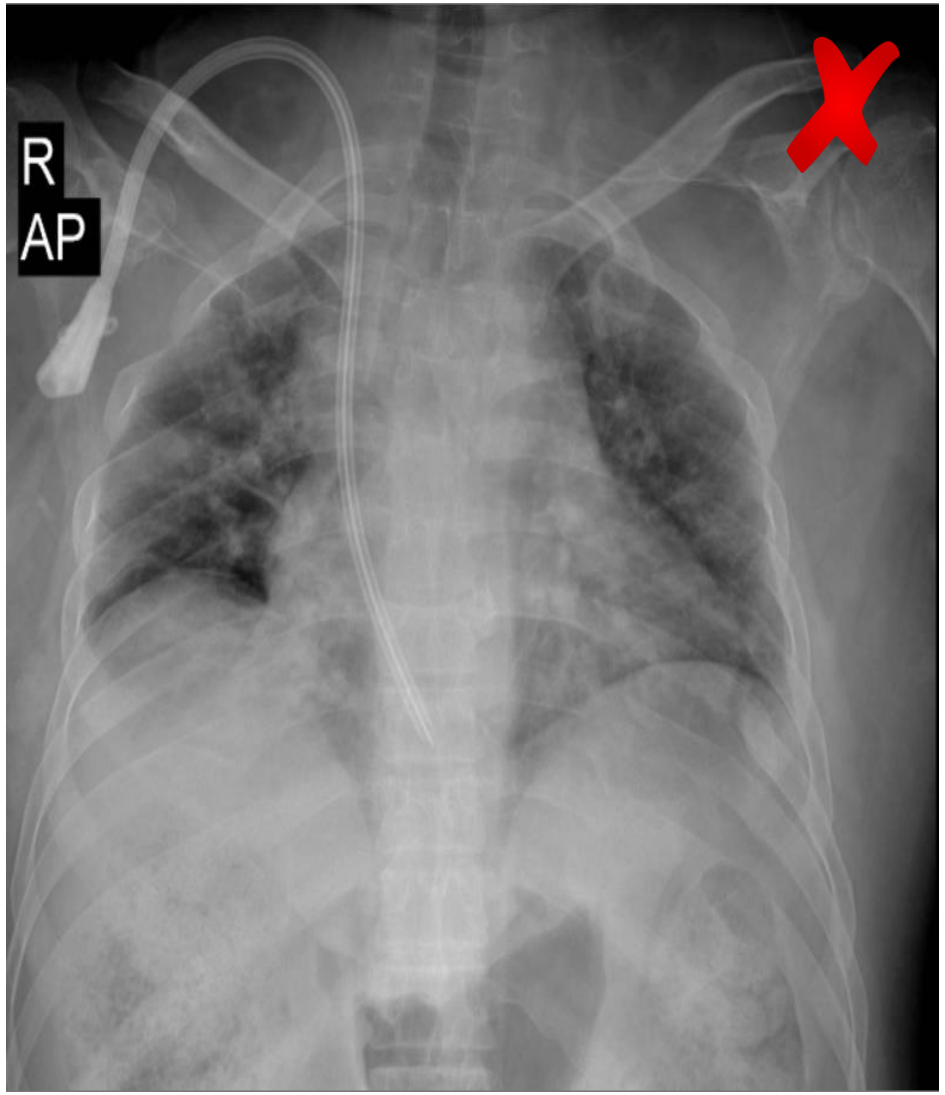


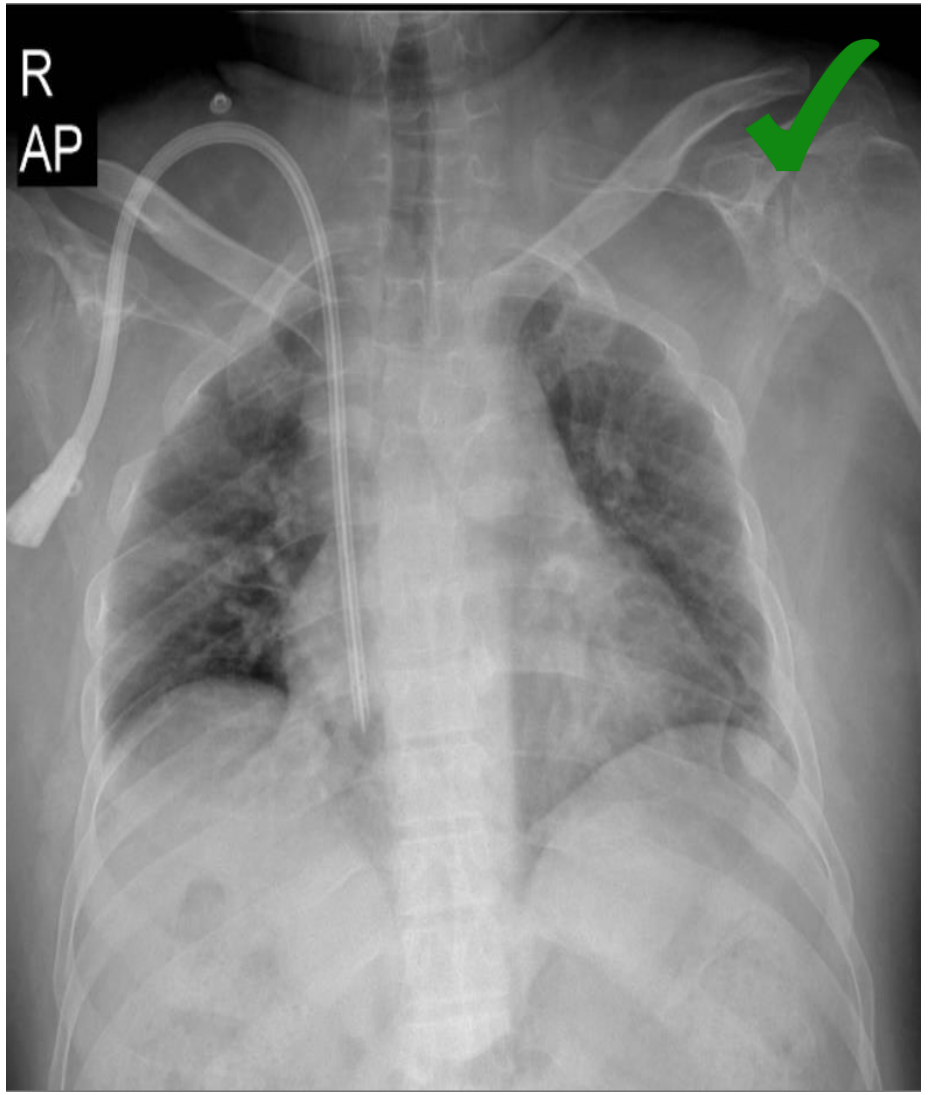
Wrong Exit Site

# Perioperative Care and Complications

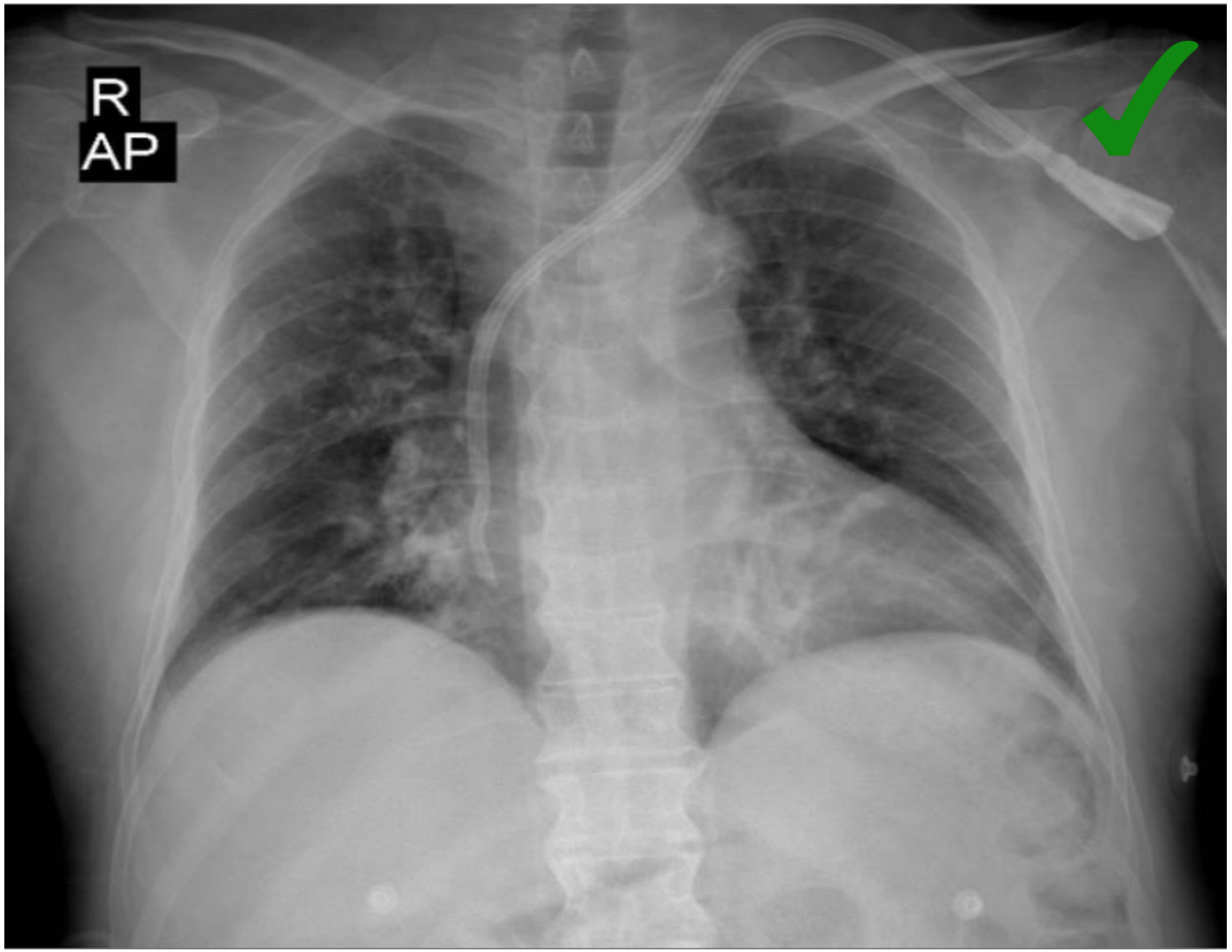
- Catheter misplacement
- Pneumothorax
- Hemothorax
- Wire embolism
- Cardiac arrythmia
- Cardiac perforation
- Thoracic duct laceration
- Nerve injuries

# Tip position

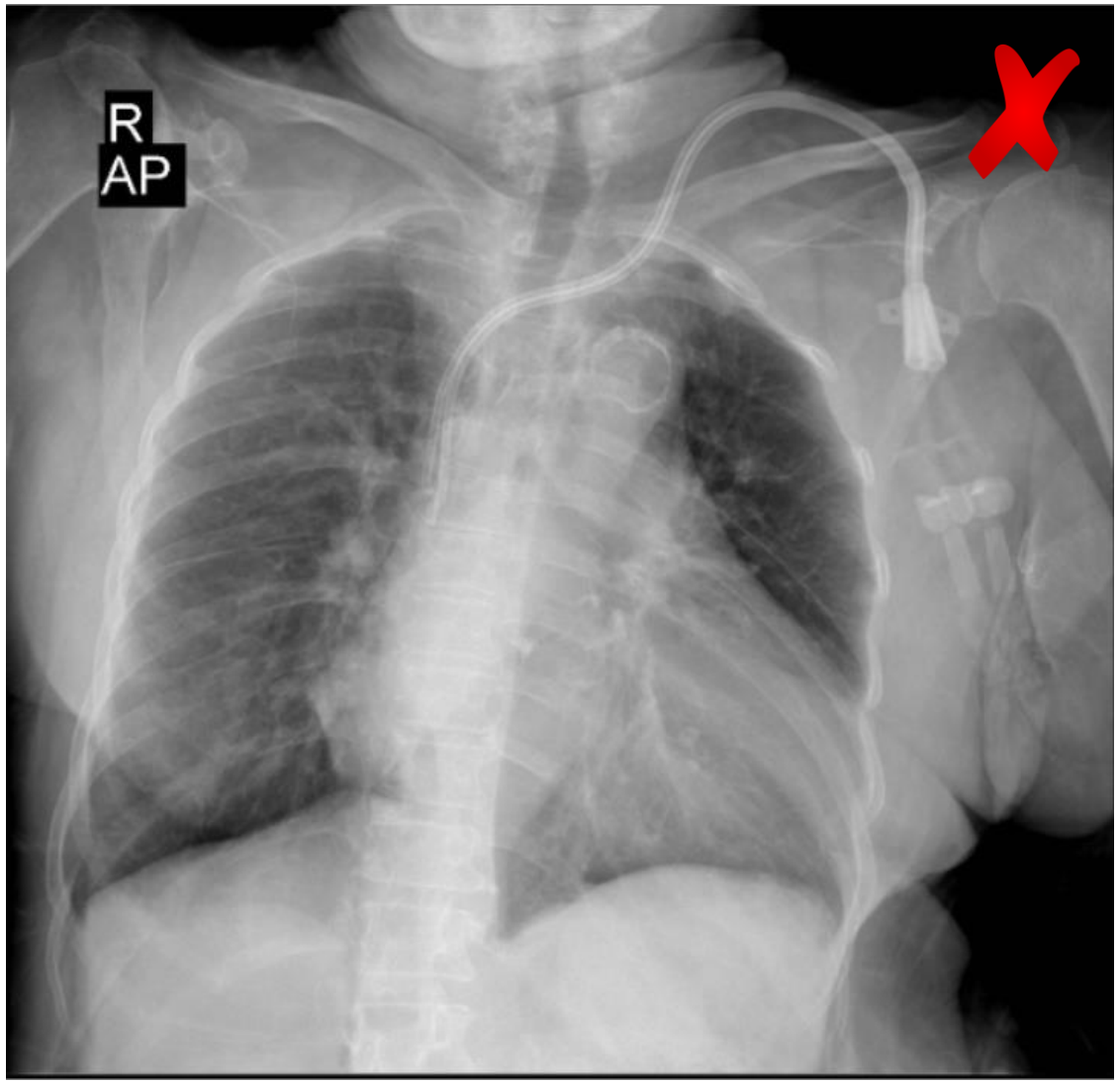


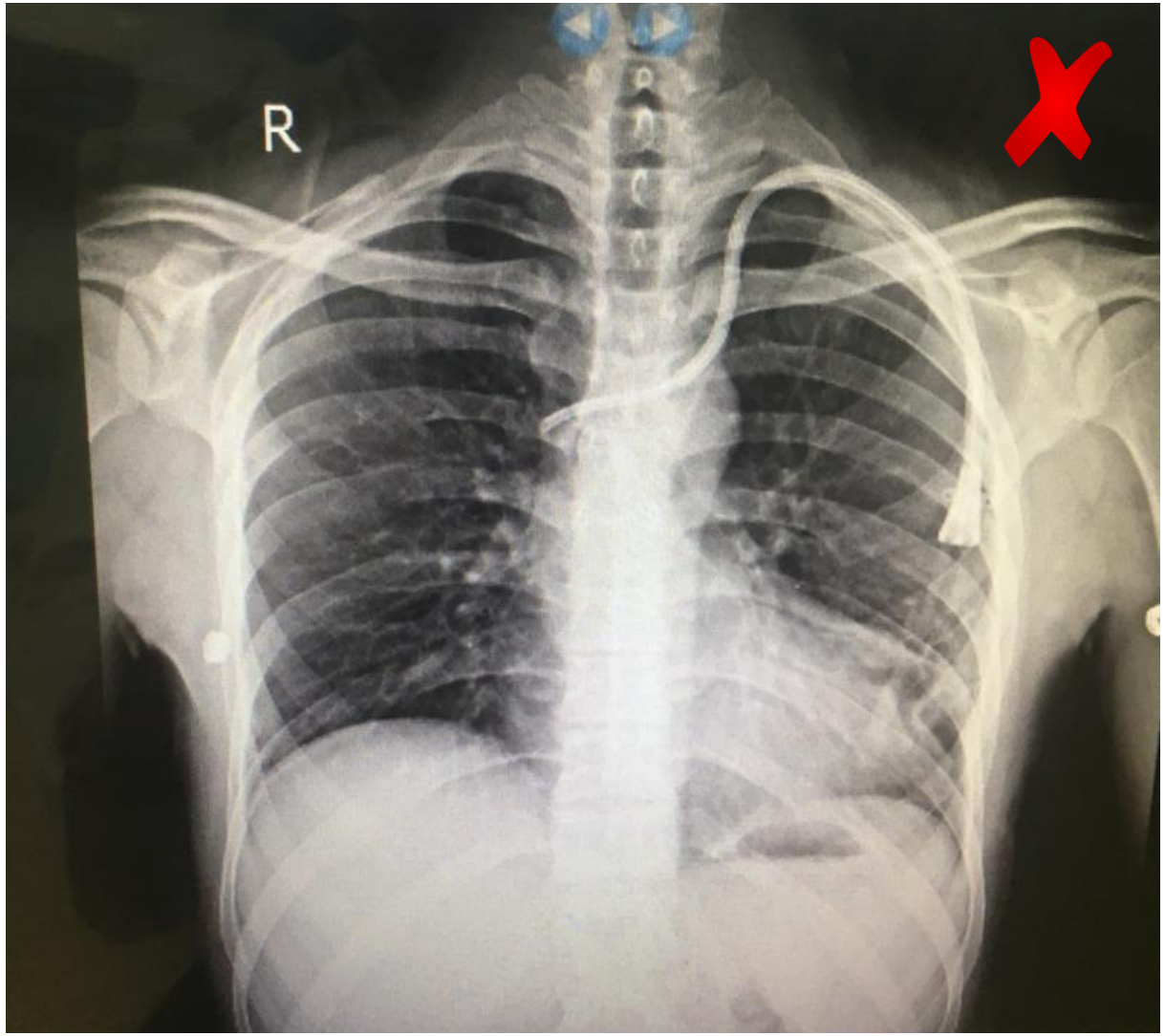
# Tip position



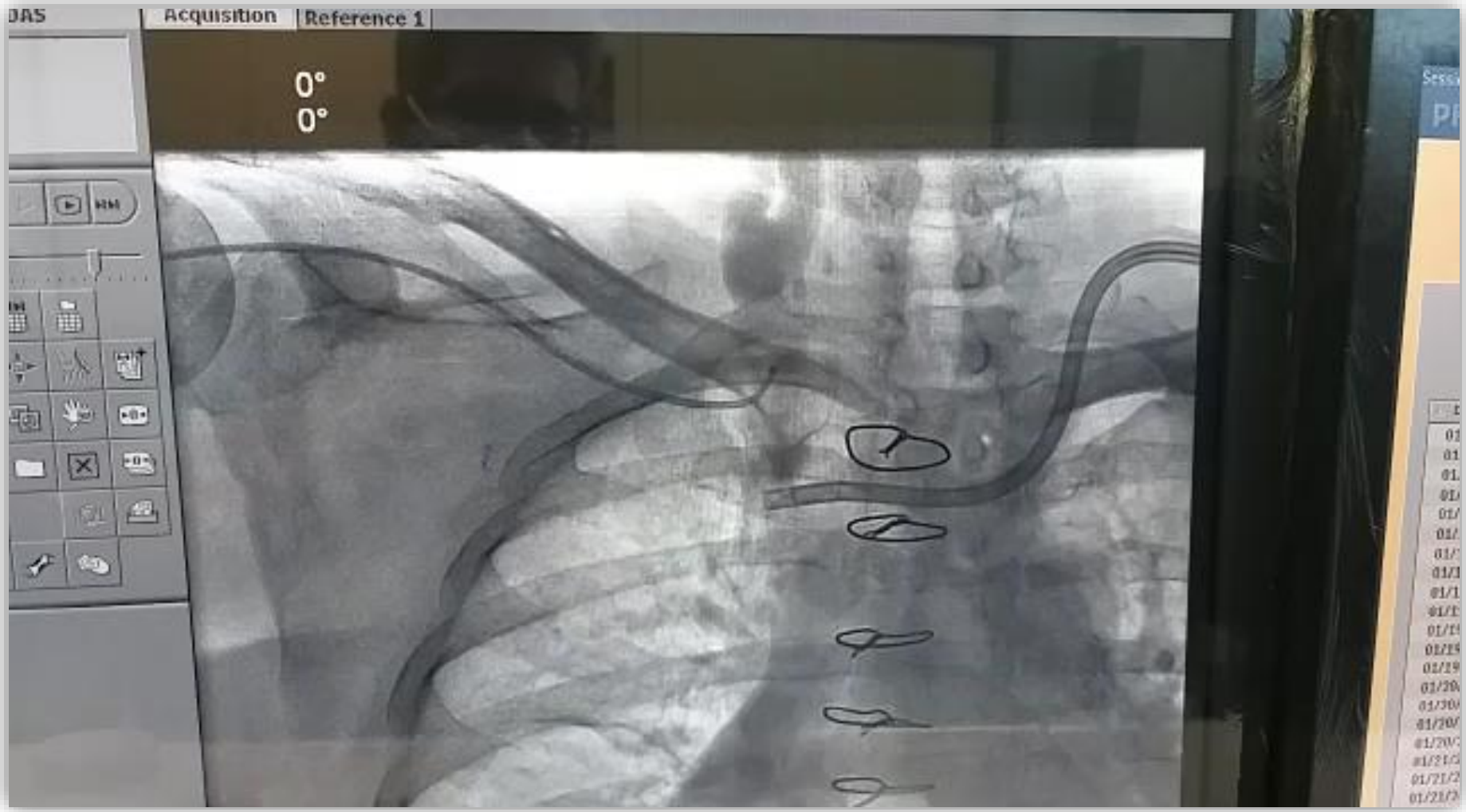
# Tip position



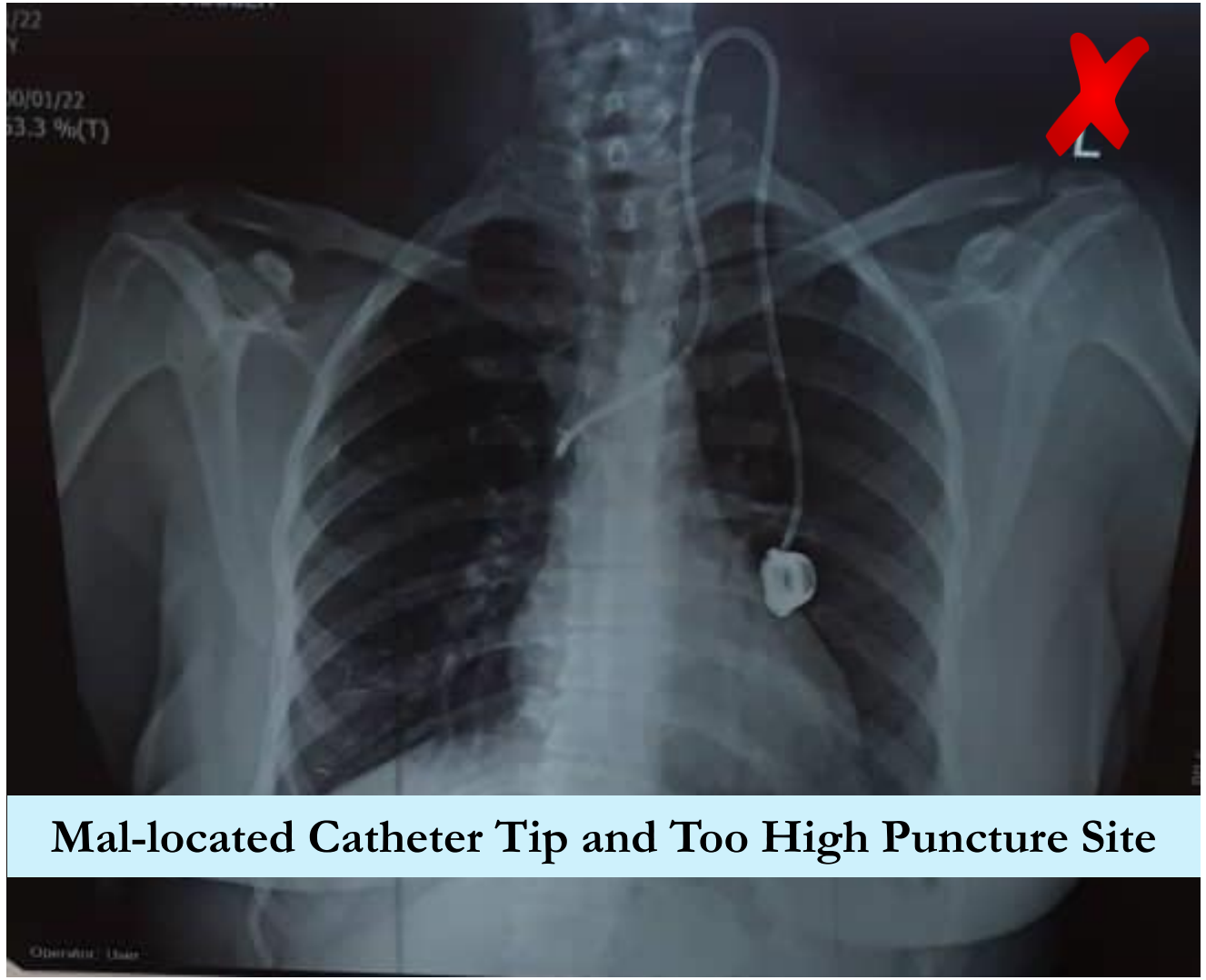
# Tip position



# Tip position

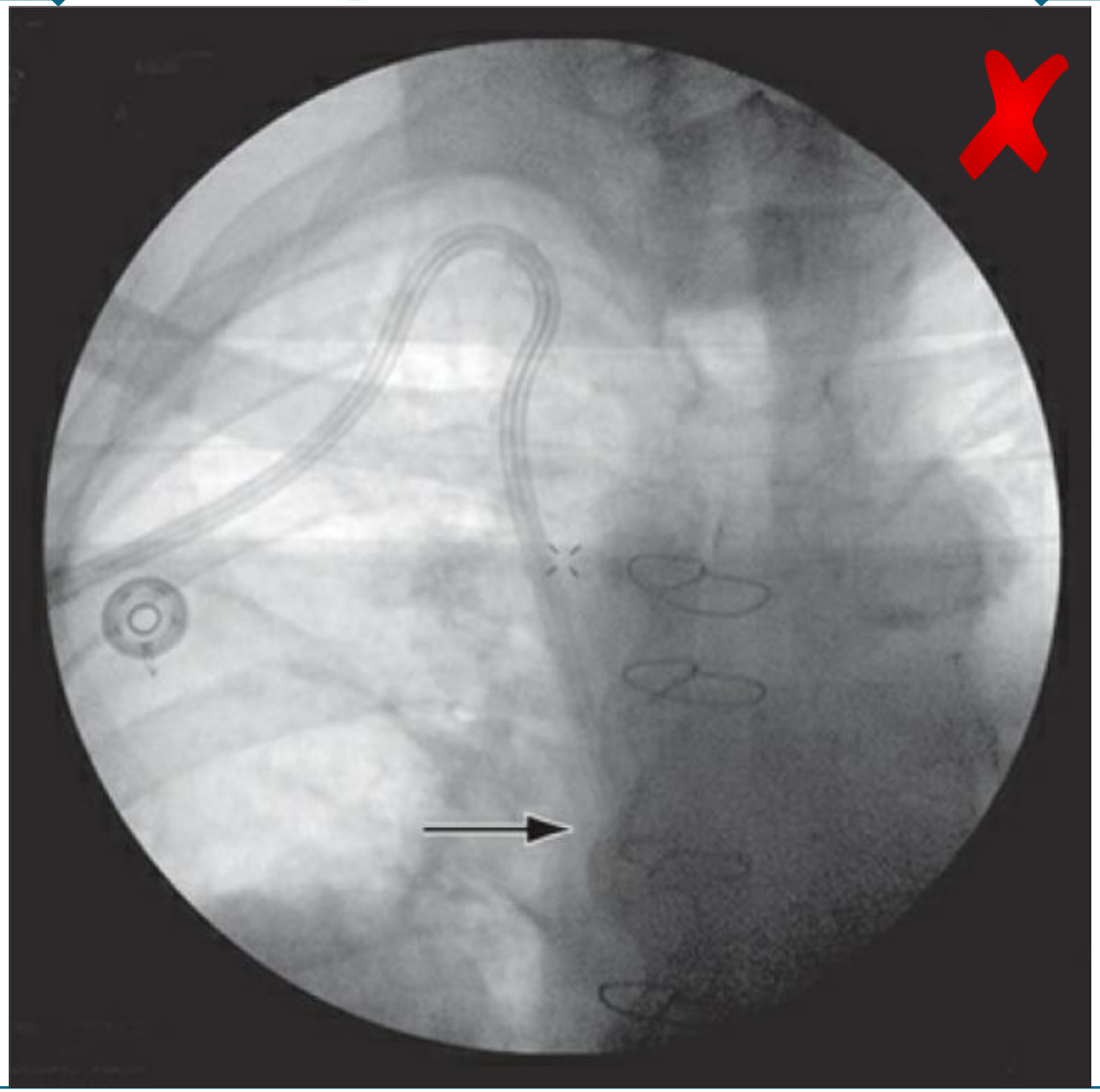


# Tip position

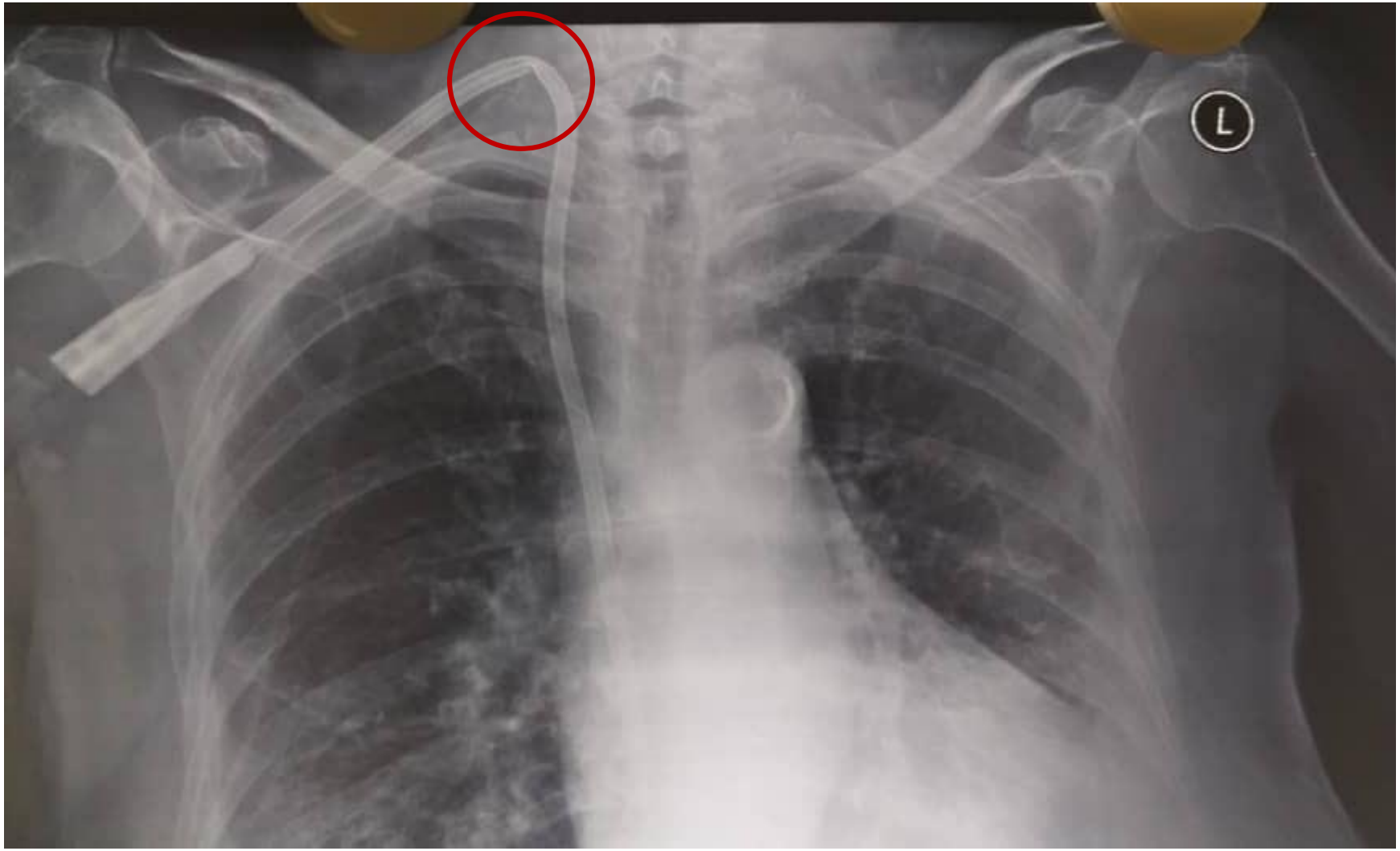


Mal-located Catheter Tip and Too High Puncture Site

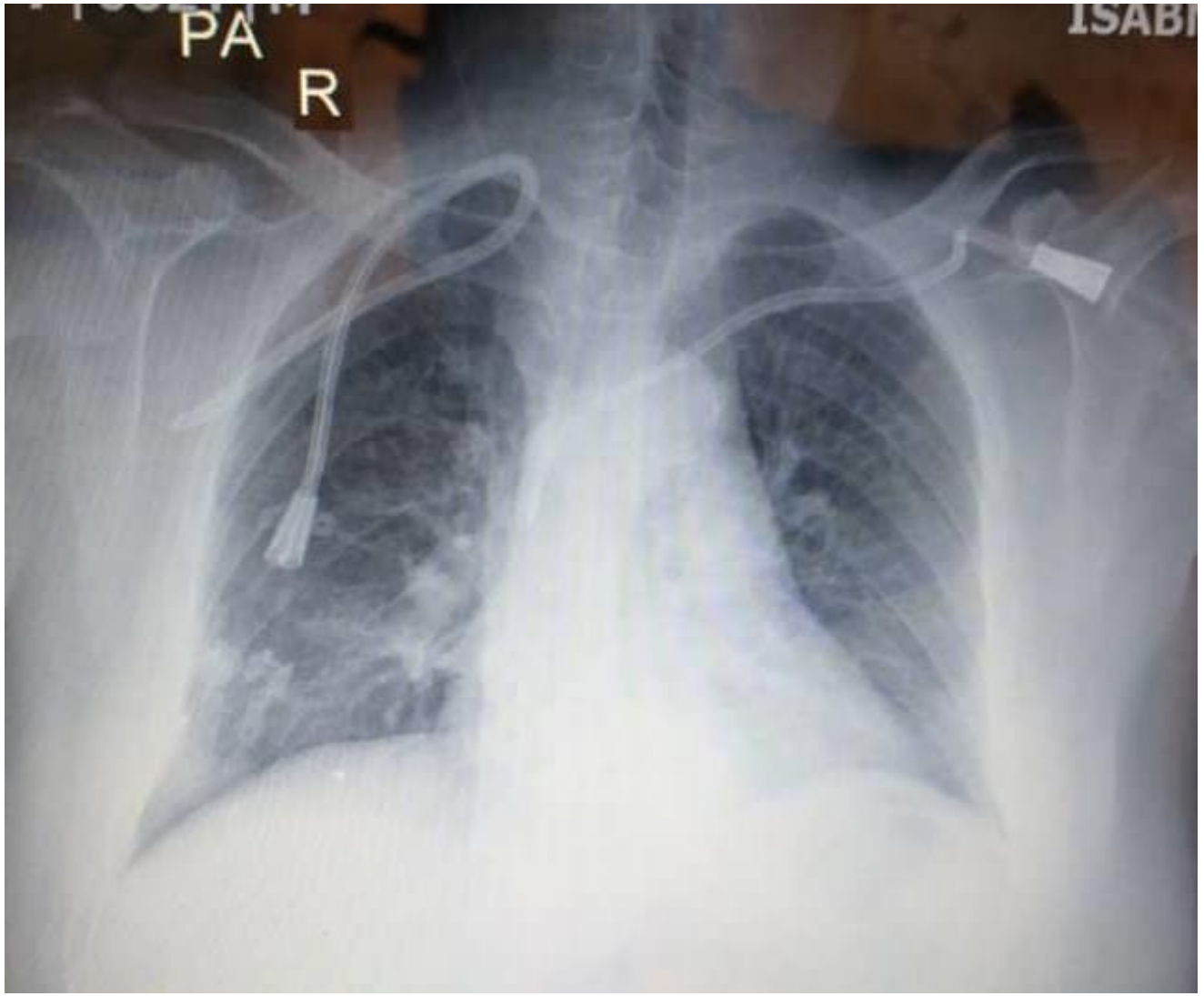
# High Puncture Site



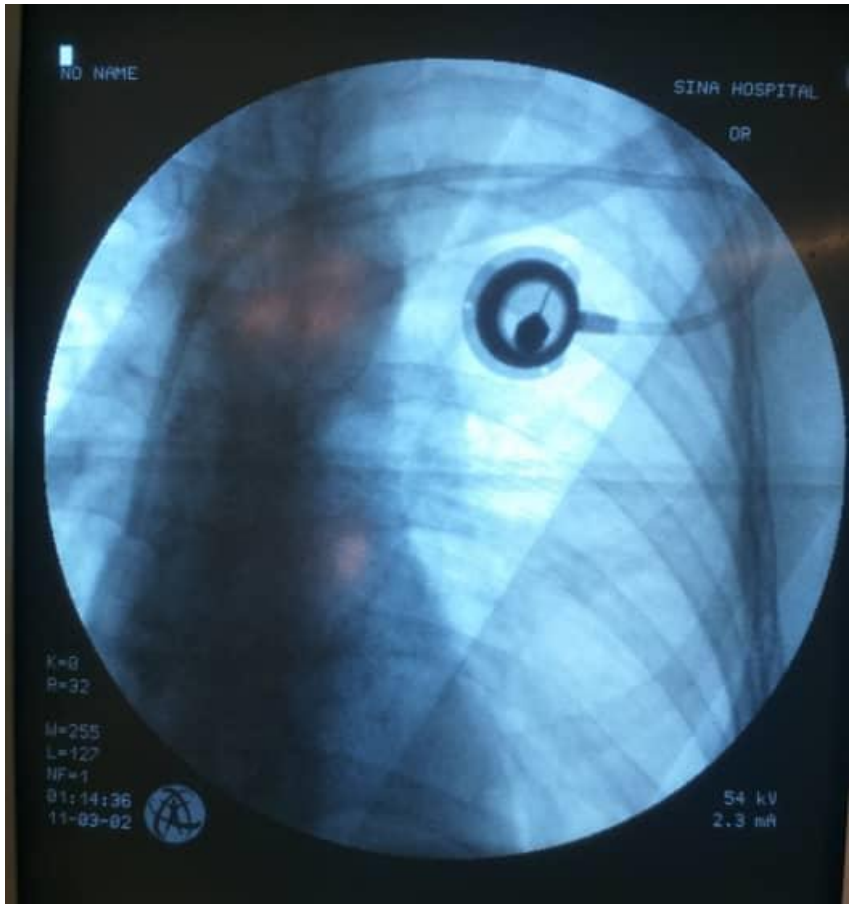
# Kinking



# Venous misplacement



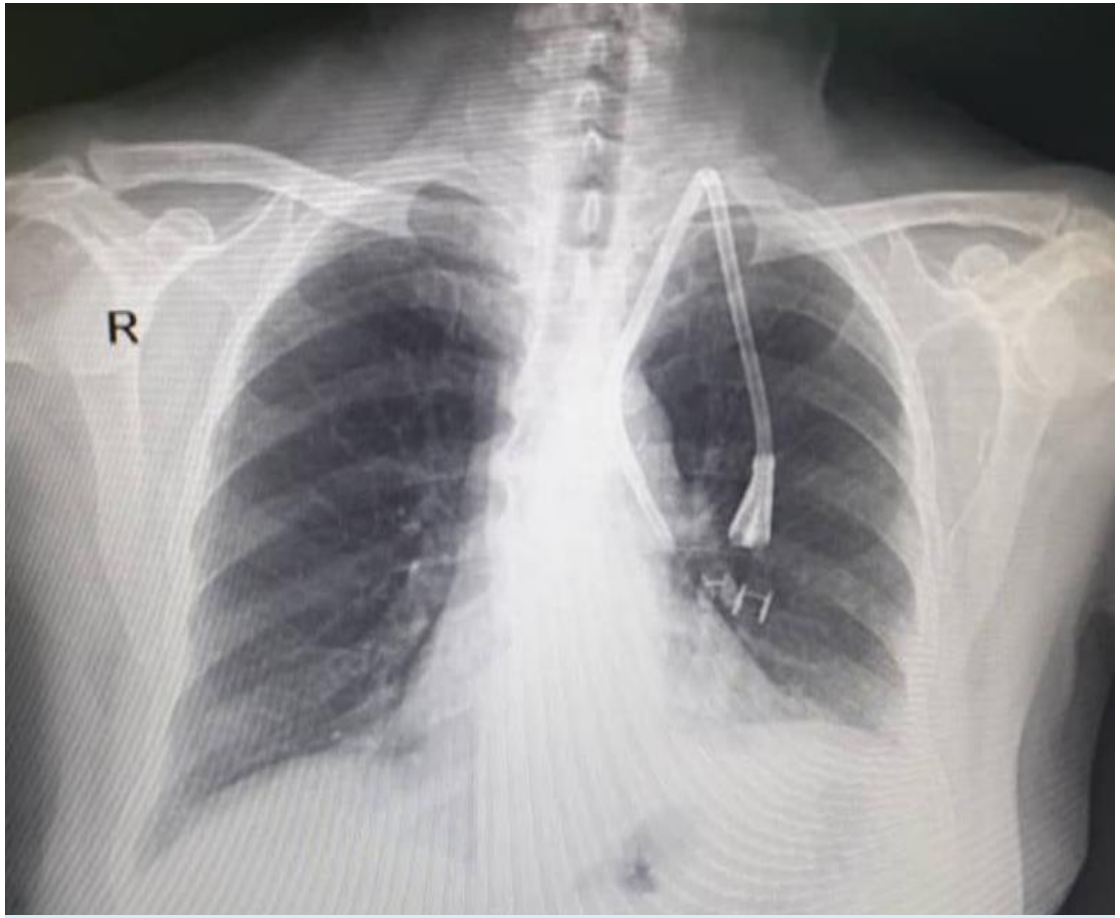
# Venous misplacement



# Intrapleural misplacement

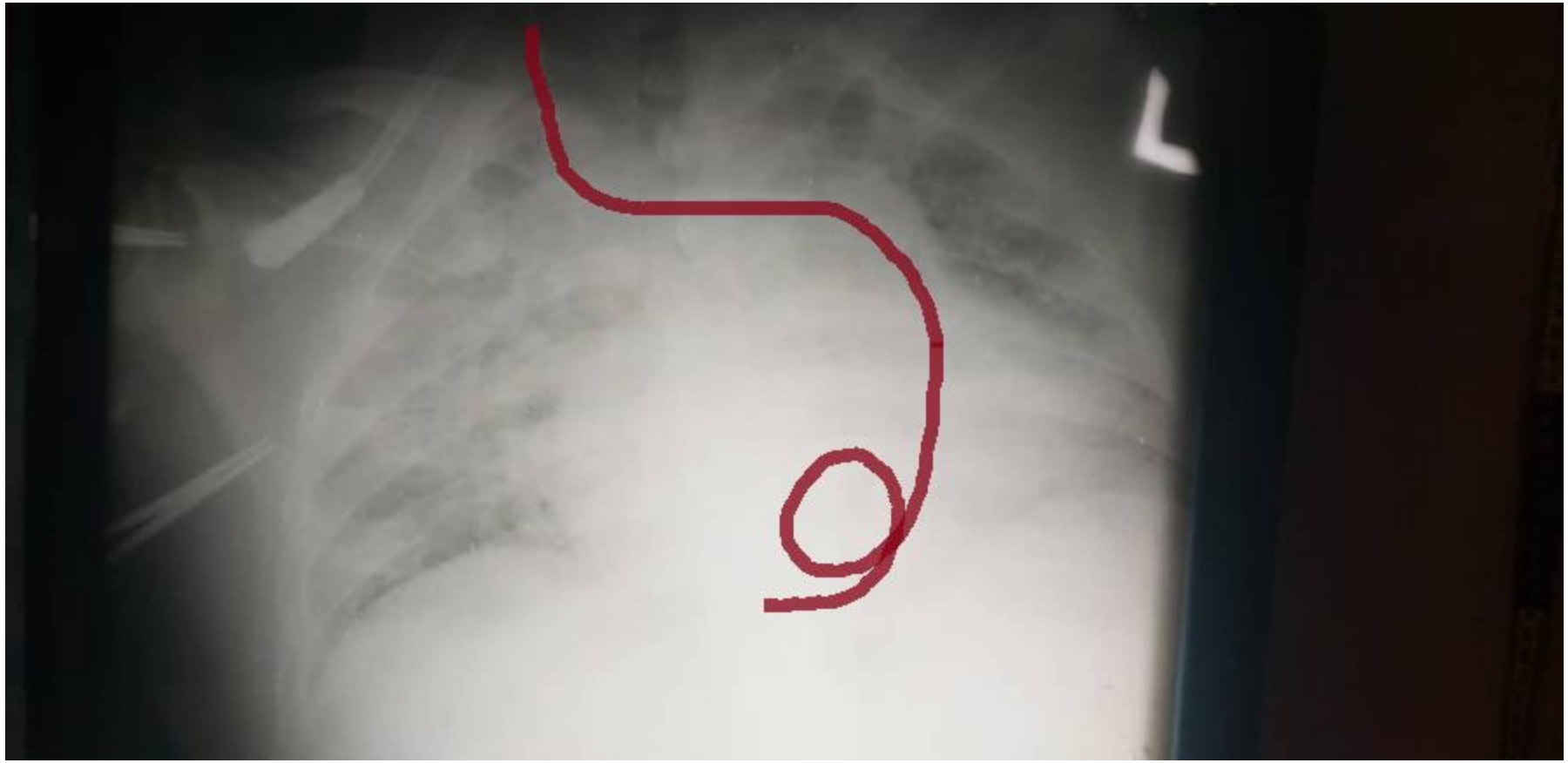
# Arterial misplacement

Inadvertent Carotid Artery Puncture



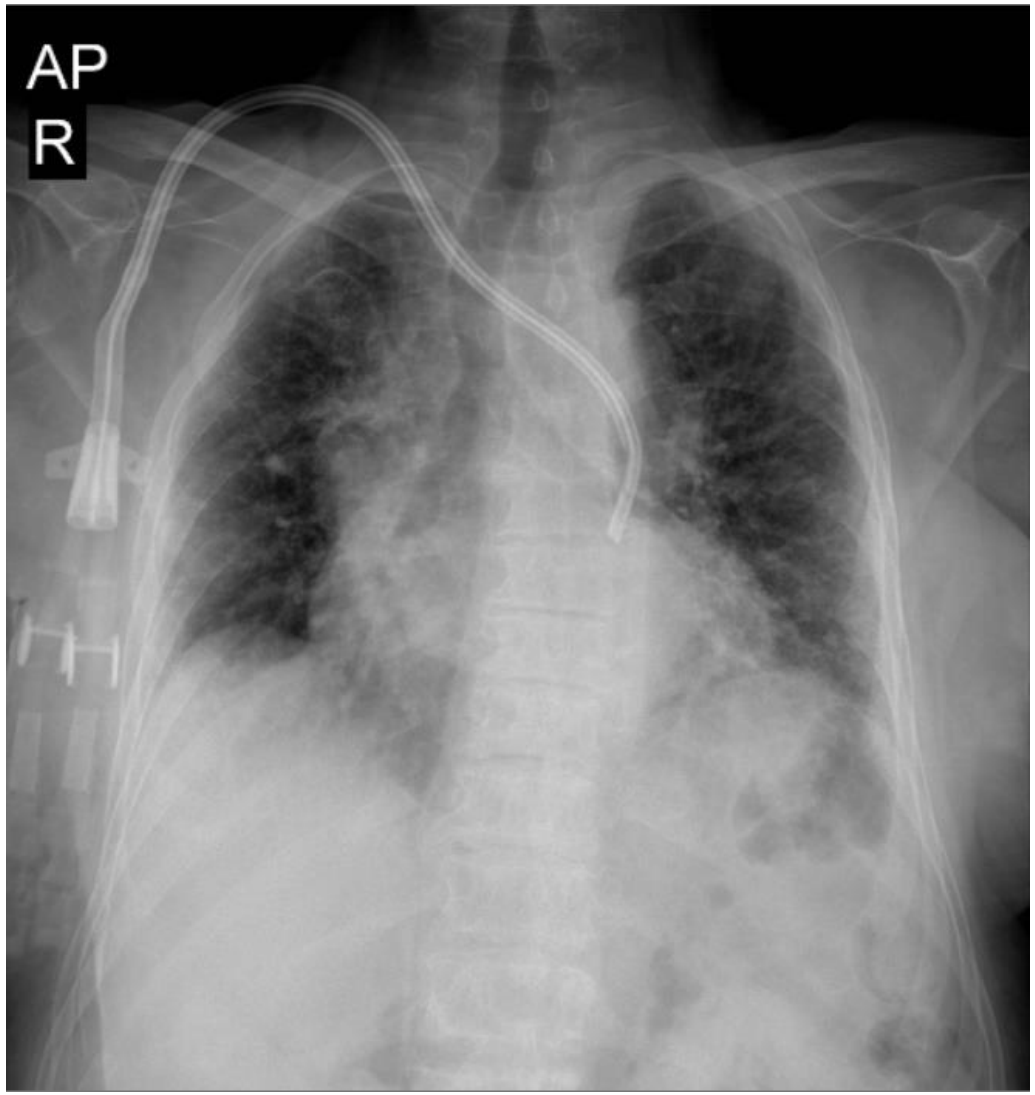

Catheter Tip in Descending Aorta

- 55-y/o male ESRD patient was referred for permcath insertion for the first time. Portable CXR was obtained as guidewire came across resistance in its course. Dx?

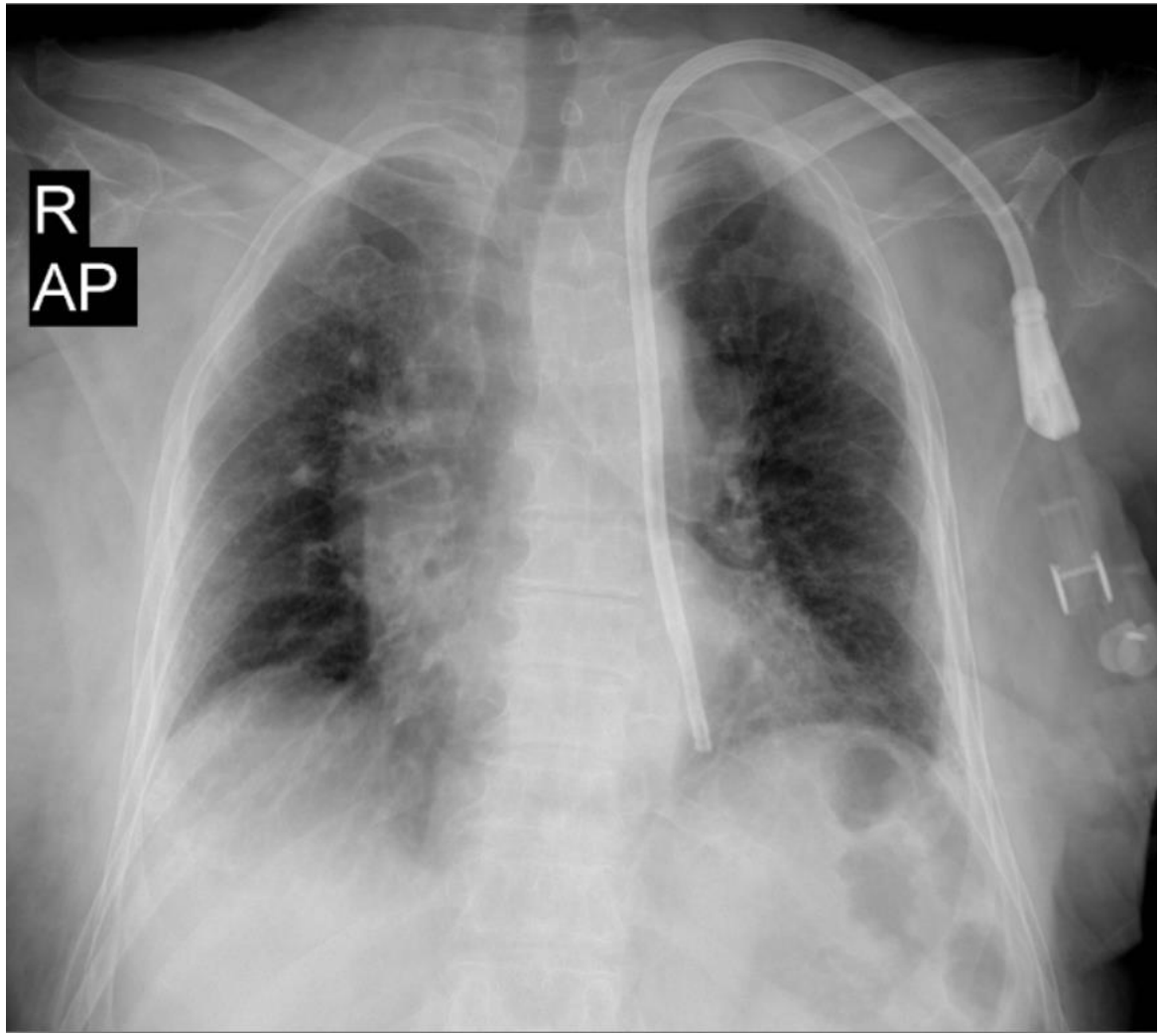


# LSVC

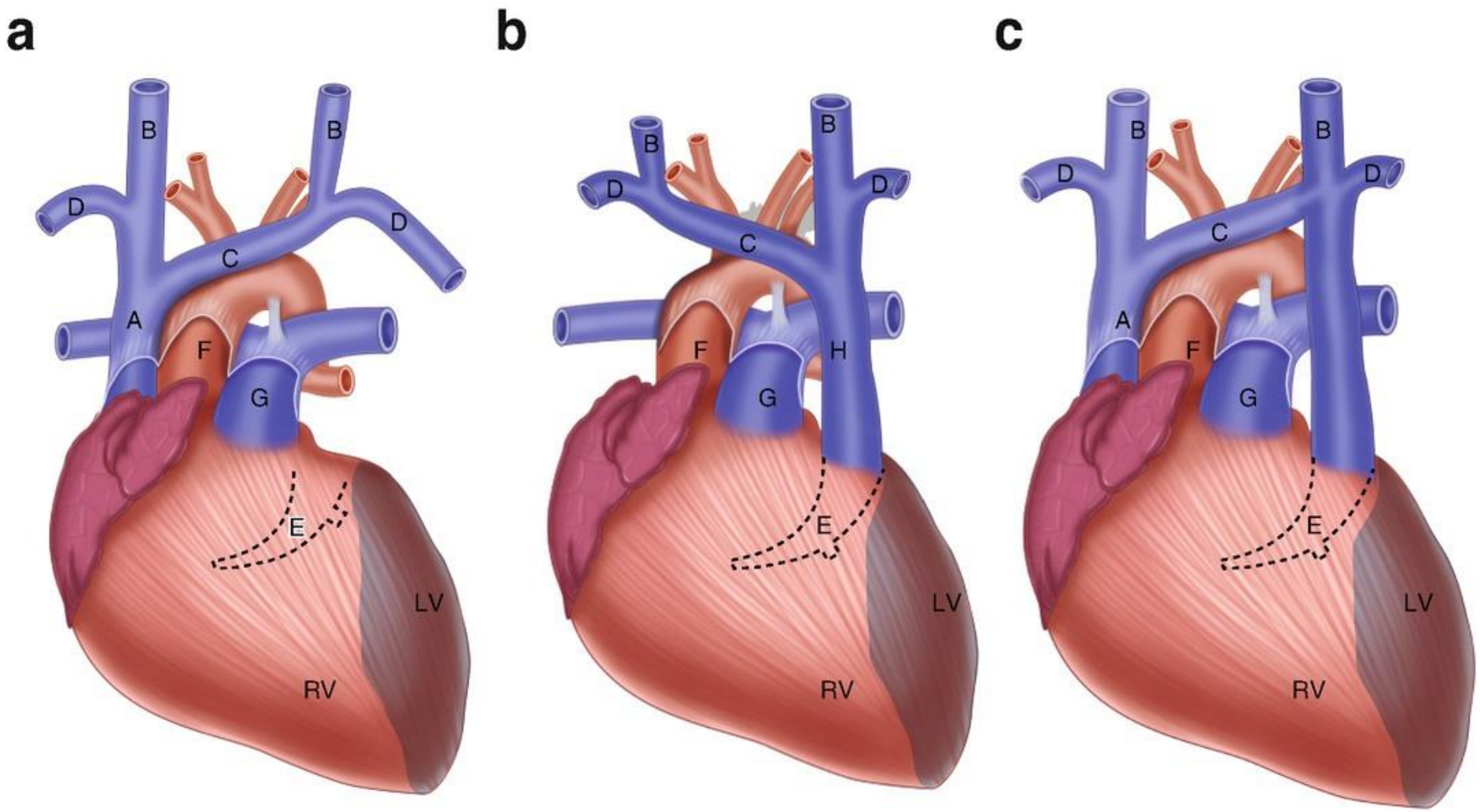
# LSVC



# LSVC

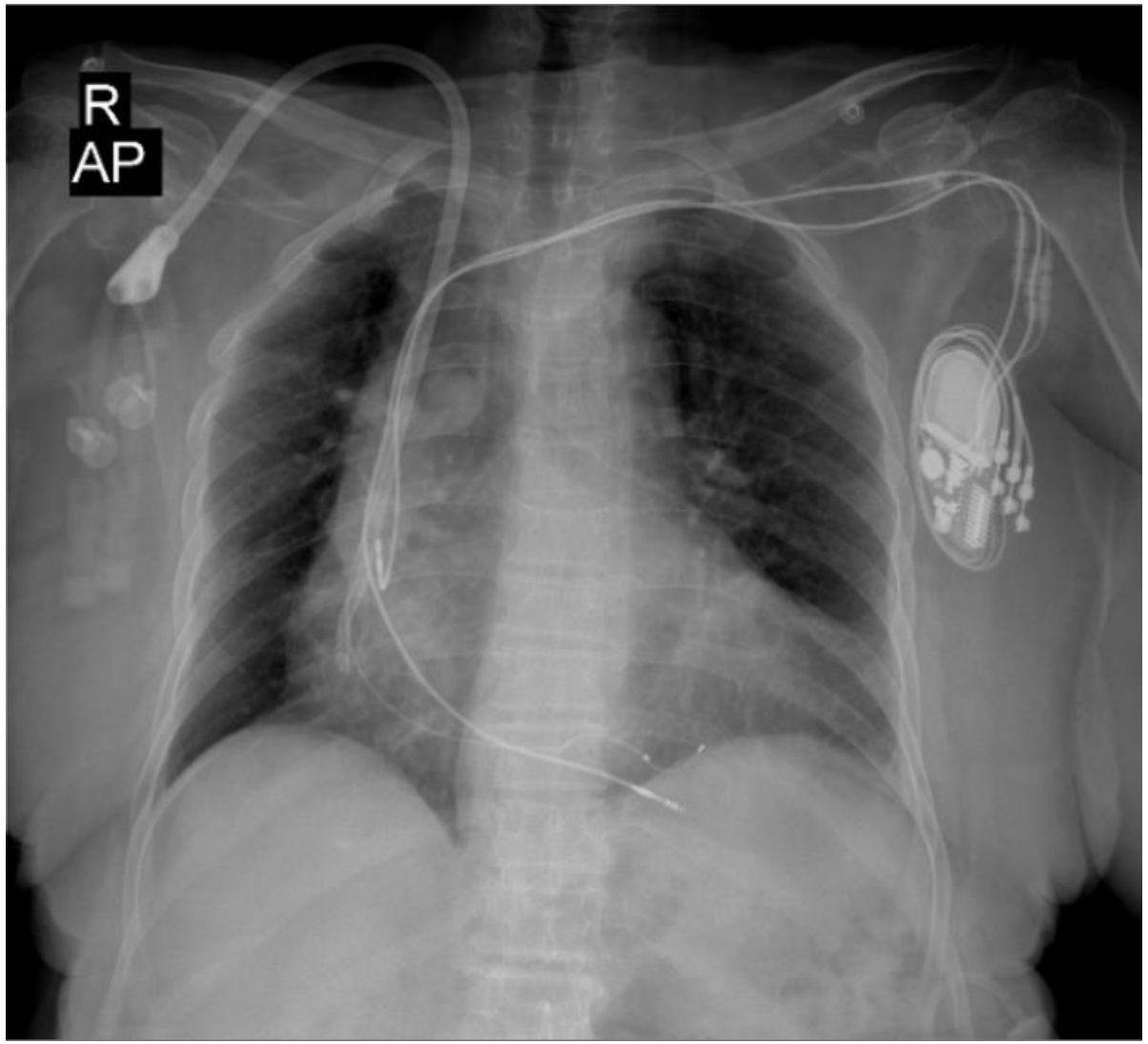



# LSVC



# Hemothorax

# Simultaneous ICD



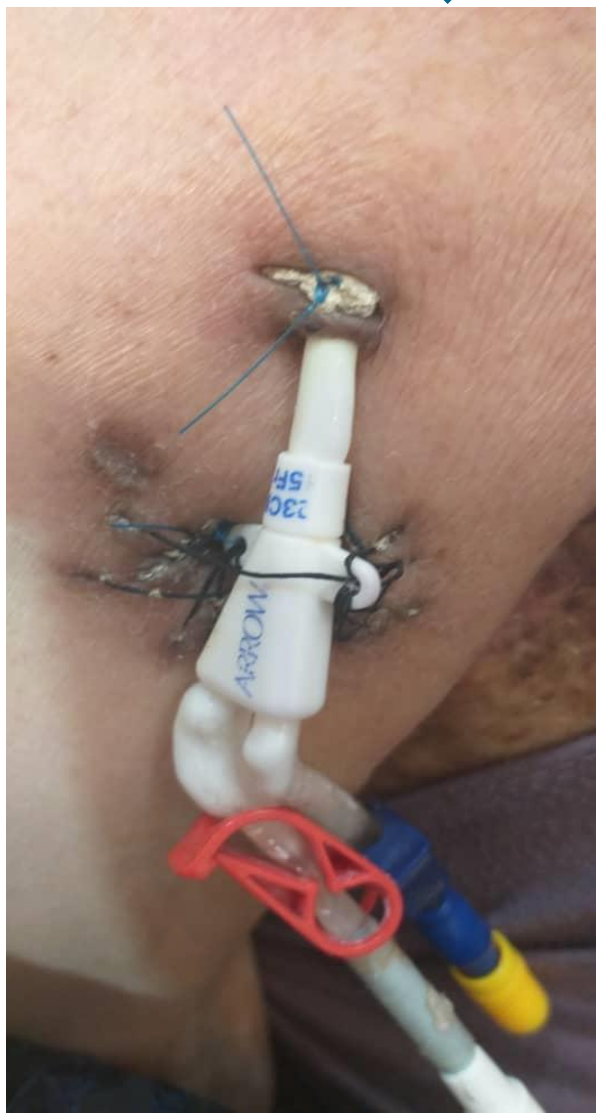
# Long-Term Care and Complications

- Catheter fall-off
- Skin reaction
- Air embolism
- Catheter embolism
- Catheter occlusion
- Central venous thrombosis/stenosis
- Stuck catheters
- Catheter-related infection

# Catheter Fixation Errors

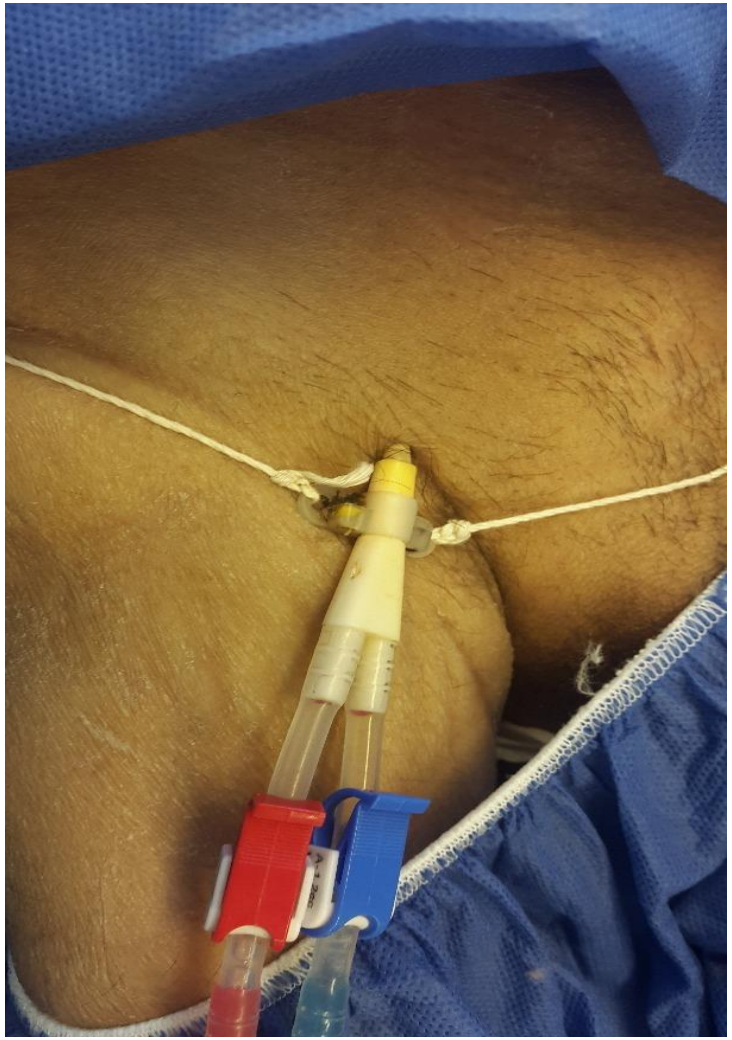


# Catheter Fixation Errors





- Young male patient on HD for 2 years using a Rt femoral temporary catheter



# Catheter Fall-off

- Failure of catheter’s cuff to incorporate in subcutaneous tissue results in tunnel infection and consequent catheter fall-off, which is commonly observed with Sliver-coated Palindrome™ catheters.

# Skin Closure Scar

# Skin Reaction

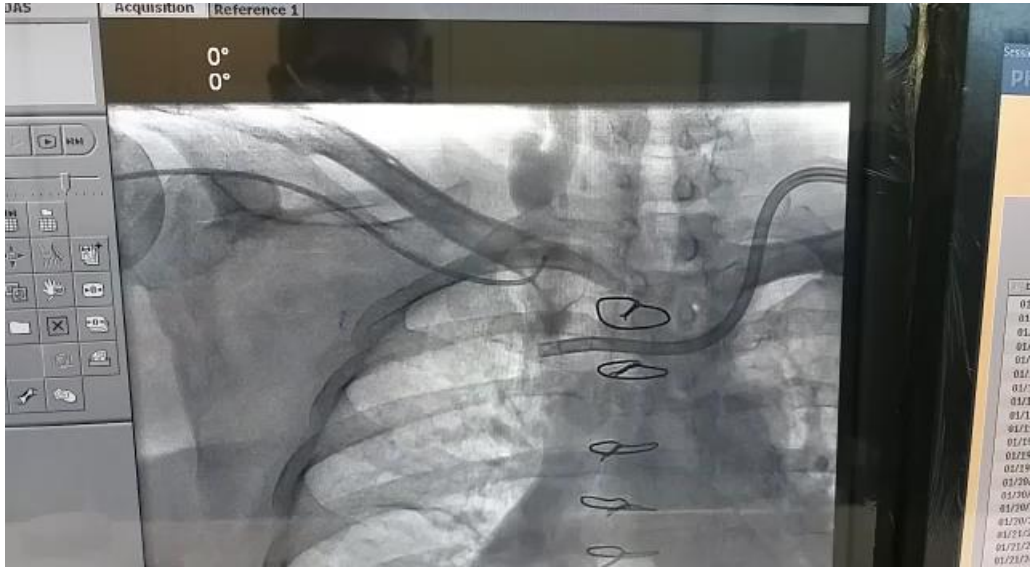
Pyoderma Gangrenosum after Chemotherapy Port Placement

# Superficial Tunnel

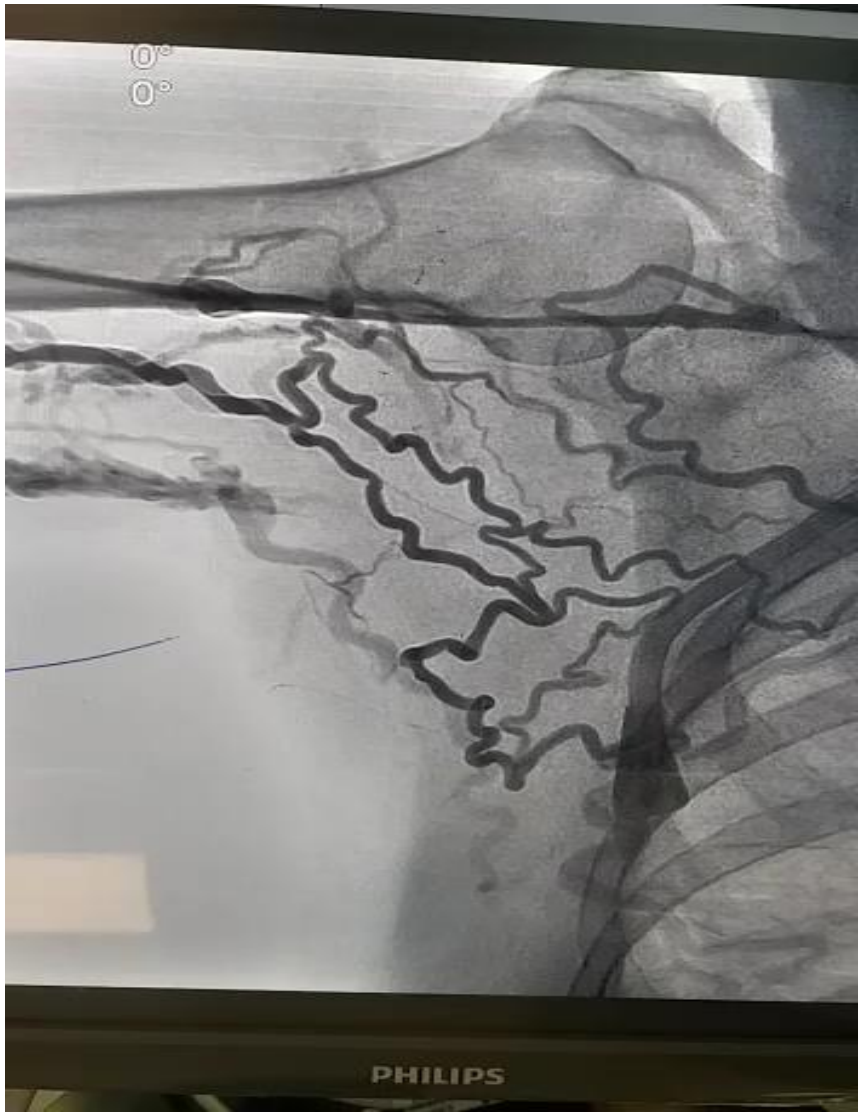
# Central Venous Stenosis

- ESRD patient on HD with a history of having only one Rt jugular tunneled HD catheter and Rt upper extremity AVF, who presented with severe arm swelling. Venoplasty failed. Contralateral arm AVG placed and ipsilateral AVF were ligated to resolve symptoms.

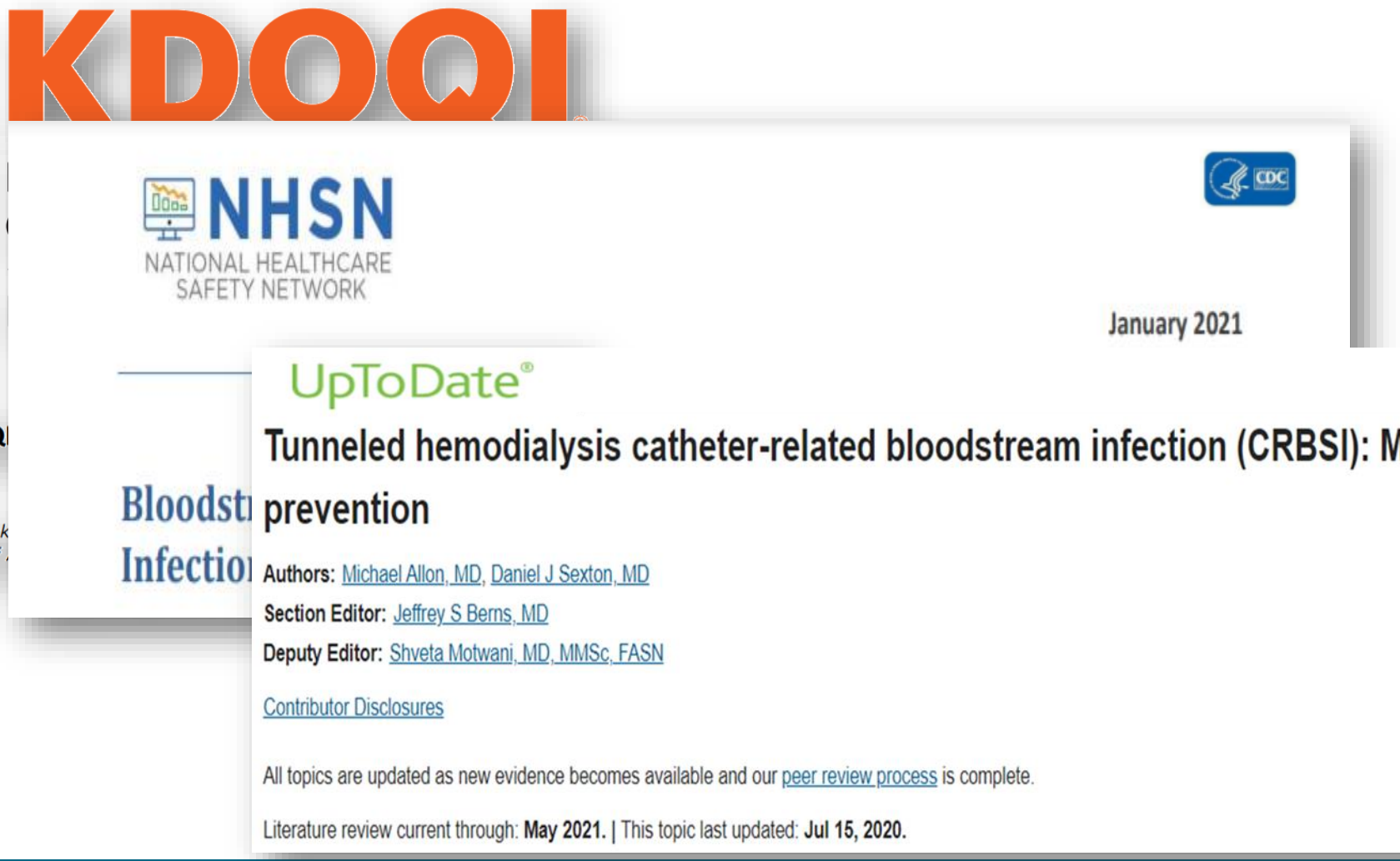
# Central Venous Stenosis




# Central Venous Stenosis



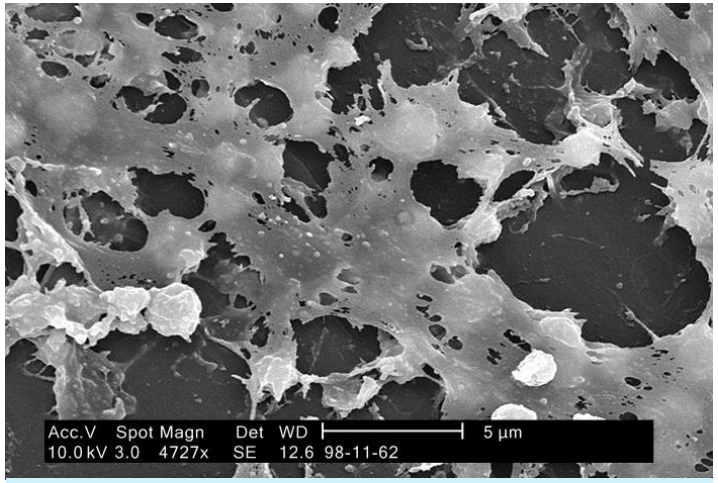
# Catheter-related Infections



# Catheter-related Infections

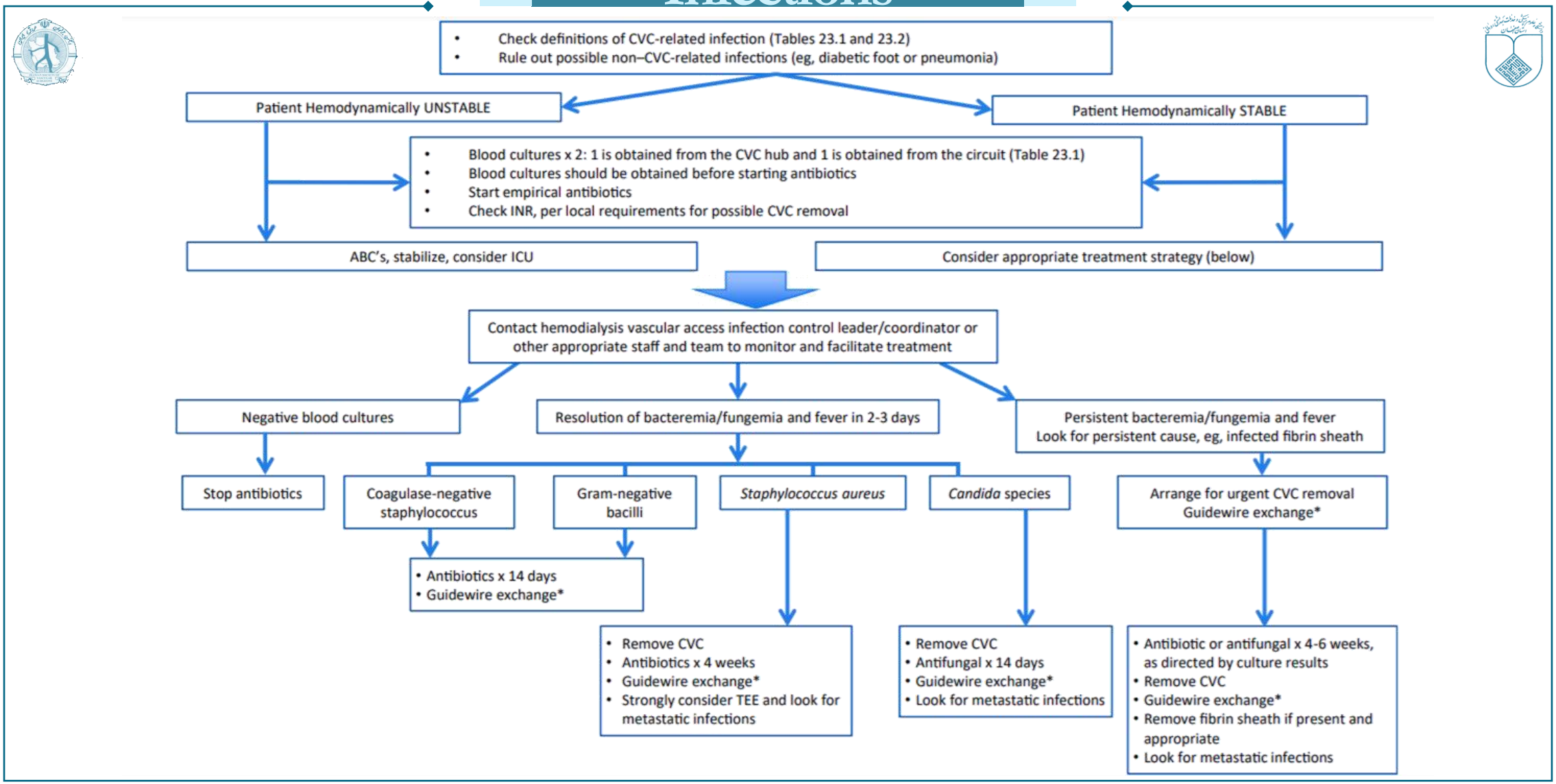
Exit Site Infection

Tunnel Infection




Bloodstream Infection

# Catheter-related Infections



# Treatment of Catheter-related Infections

- S. aureus 21% to 43%
- Initial empirical AB therapy → Culture results → Tailored AB therapy
- Evidence of disseminated fungal infection
- Persistent fungemia after catheter removal

} Amphotericin B or Caspofungin

# Treatment of Catheter-related Infections

- Tunnel infection → exchange over new noninvolved insertion site using the same access
- S aureus, Pseudomonas aeruginosa, fungi or mycobacteria → Catheter removal/ exchange

# Duration of AB Therapy

| Gram-negative bacilli or enterococcus bacteremia | Candida bacteremia | Uncomplicated S. aureus catheter-related bacteremia | Complicated bacteremia with septic thrombophlebitis or endocarditis | Complicated bacteremia with osteomyelitis |
|---|---|---|---|---|
| 7-14 days | minimum of 14 days | 4-6 weeks | 4-6 weeks | 6-8 weeks |

# Treatment of Catheter-related Infections

**Catheter removal is ideal**

**However;**

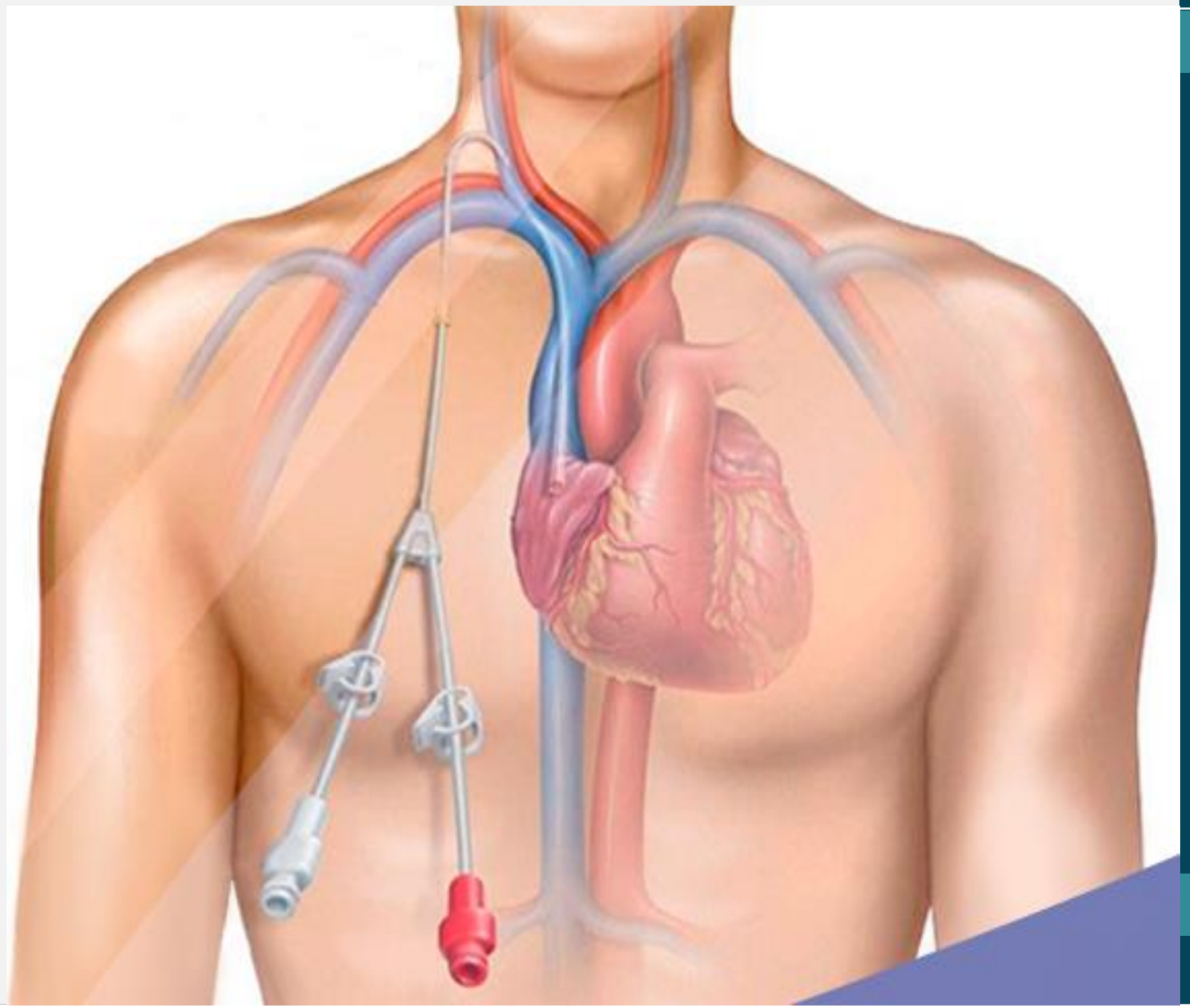
depending on the length of antibiotic therapy, this may or **may not be reasonable.**

Strategies for catheter salvage:

1. **Exchange over a wire**
2. **Catheter salvage with or without antibiotic lock**

# Thank You

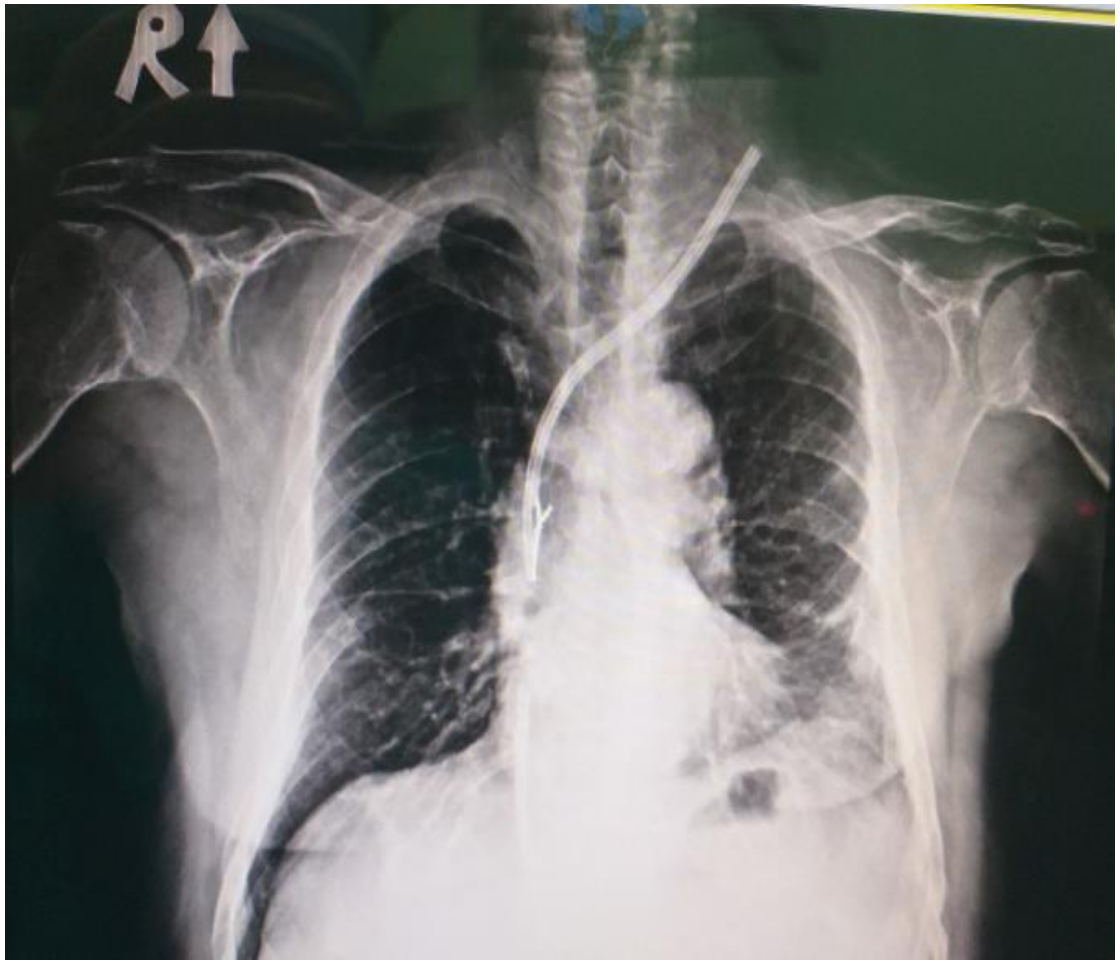
Email
mshahbandari@yahoo.com



# Panel Case-Discussion

# Case 1

A 58/y-o male patient on HD via Lt jugular catheter presented with catheter dysfunction and CVO. Catheter replacement over the guide of primary catheter was attempted; however, distal catheter was stuck. What should we do?



# Stuck Catheter

JVA | The Journal of Vascular Access

*Original research article*

## Solutions to stuck tunneled cuffed catheters in patients undergoing maintenance hemodialysis

The Journal of Vascular Access
1–6

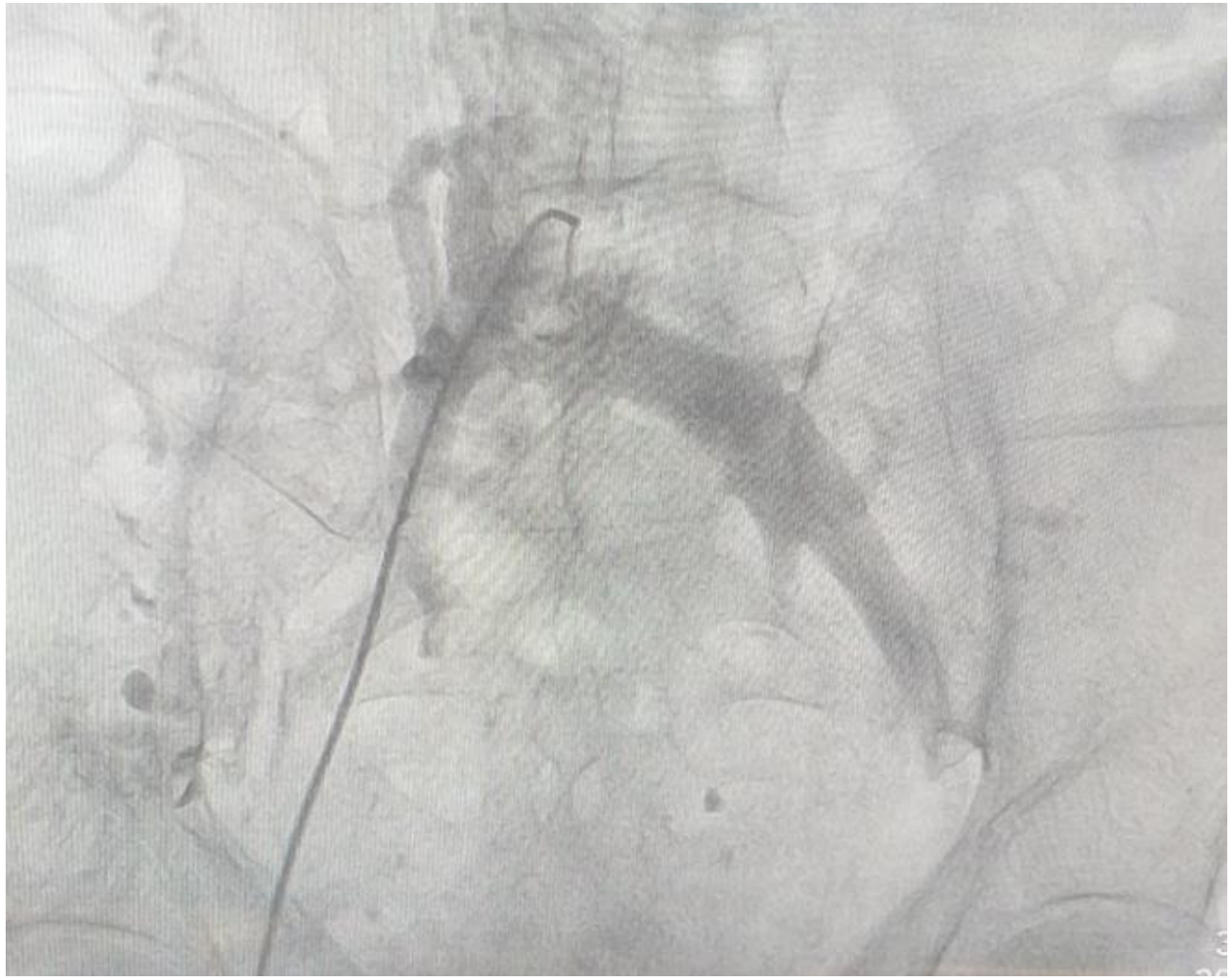
DOI: 10.1177/1129729820928163
journals.sagepub.com/home/jva
SAGE

**He Yongchun, Jiang Hua, Huang Xiaohan, Chen Jianghua and Zhang Ping**

- Thoracotomy
- Endoluminal percutaneous transluminal angioplasty with blunt dissection
- Embedded and left in situ

# Central Venous Occlusion

# Central Venous Occlusion

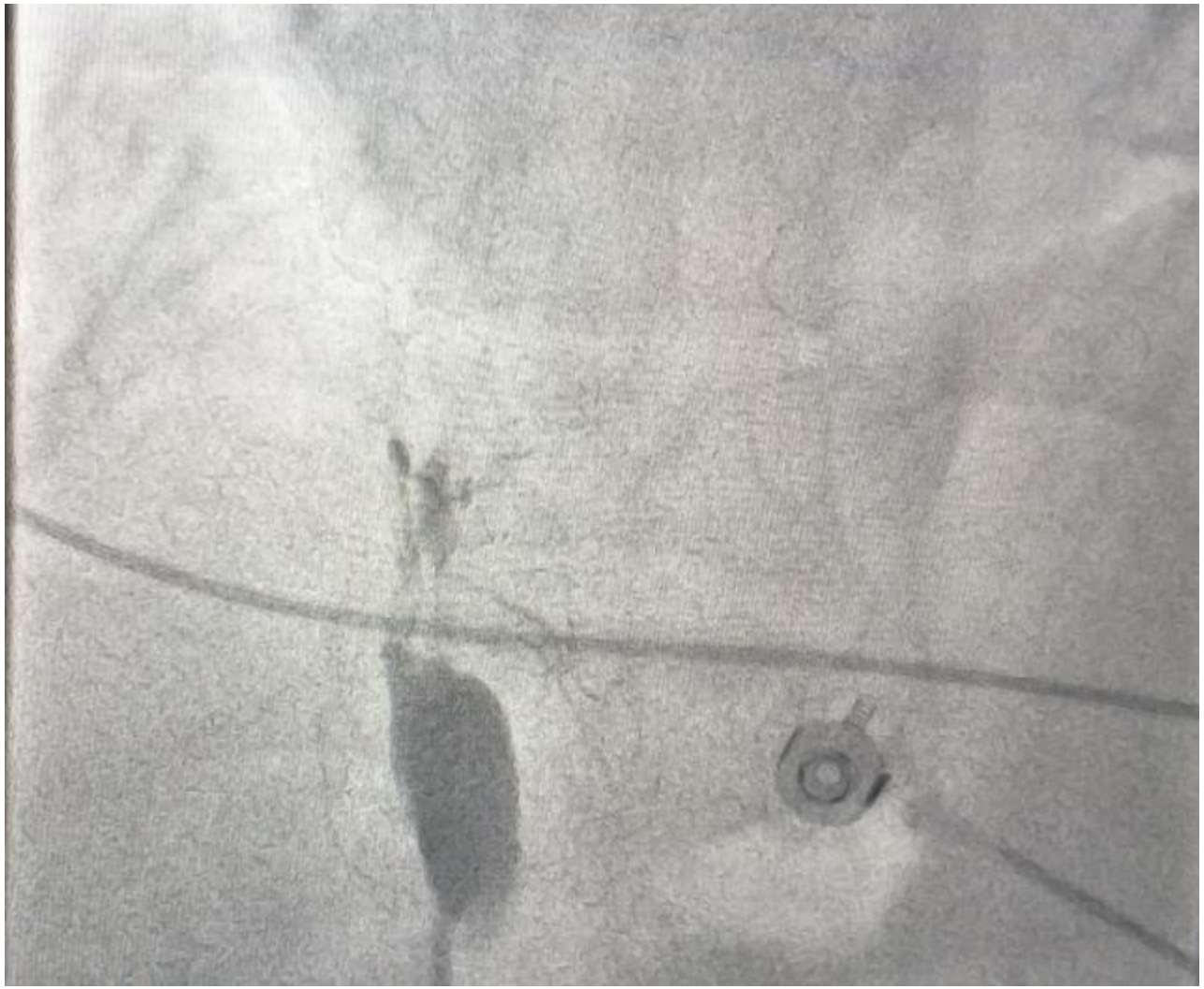


# Central Venous Occlusion

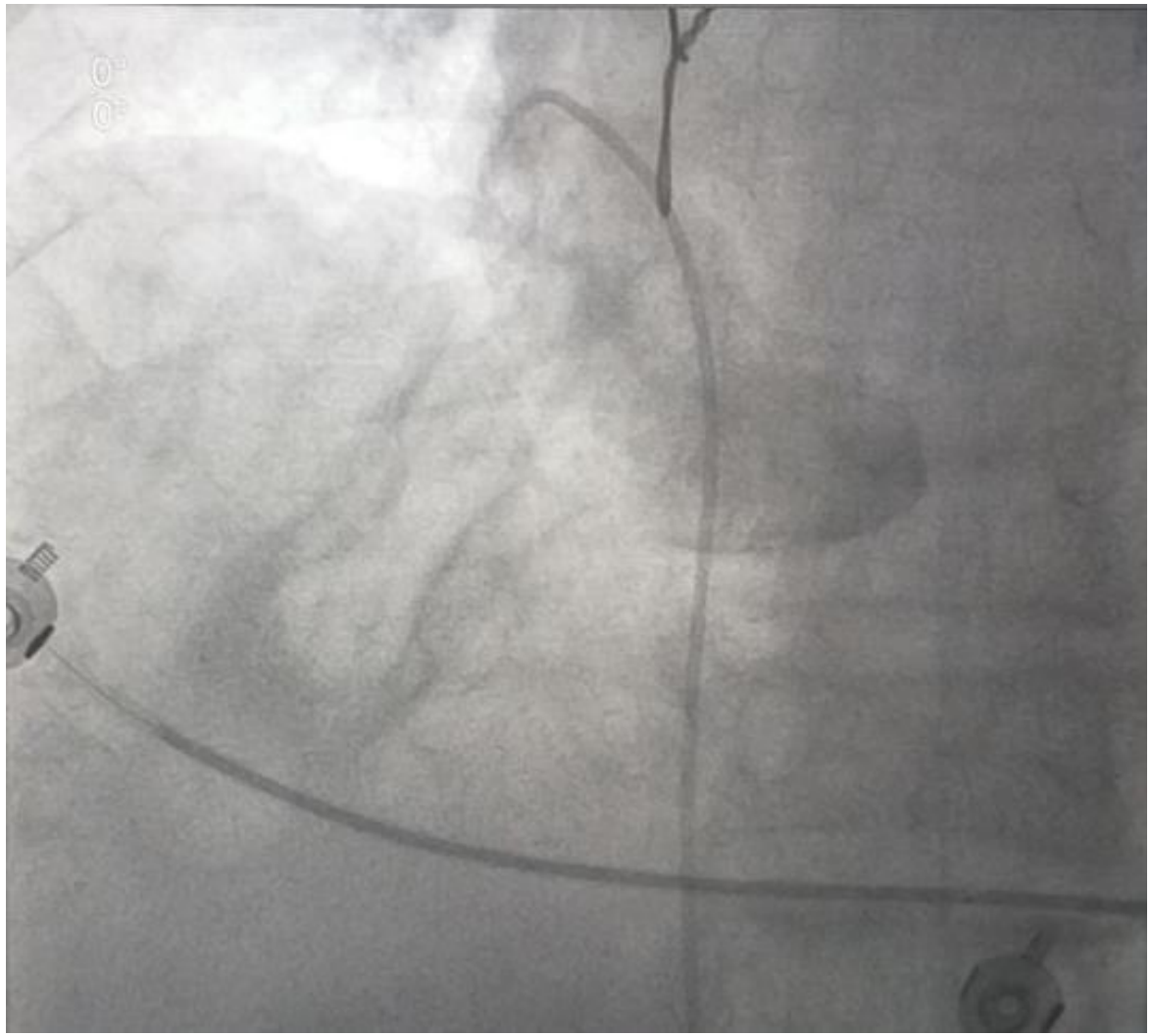
# Central Venous Occlusion

# Central Venous Occlusion

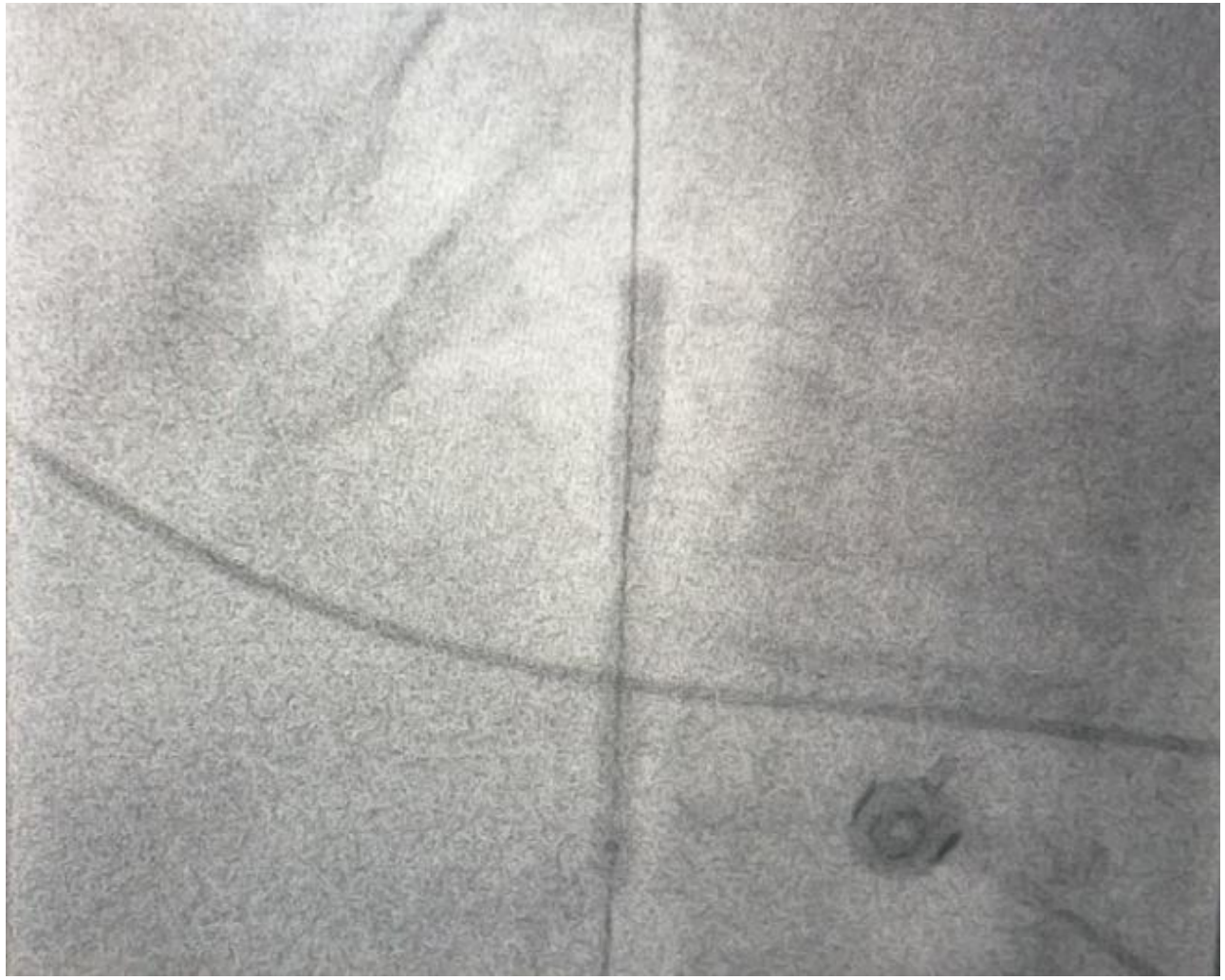
# Central Venous Occlusion



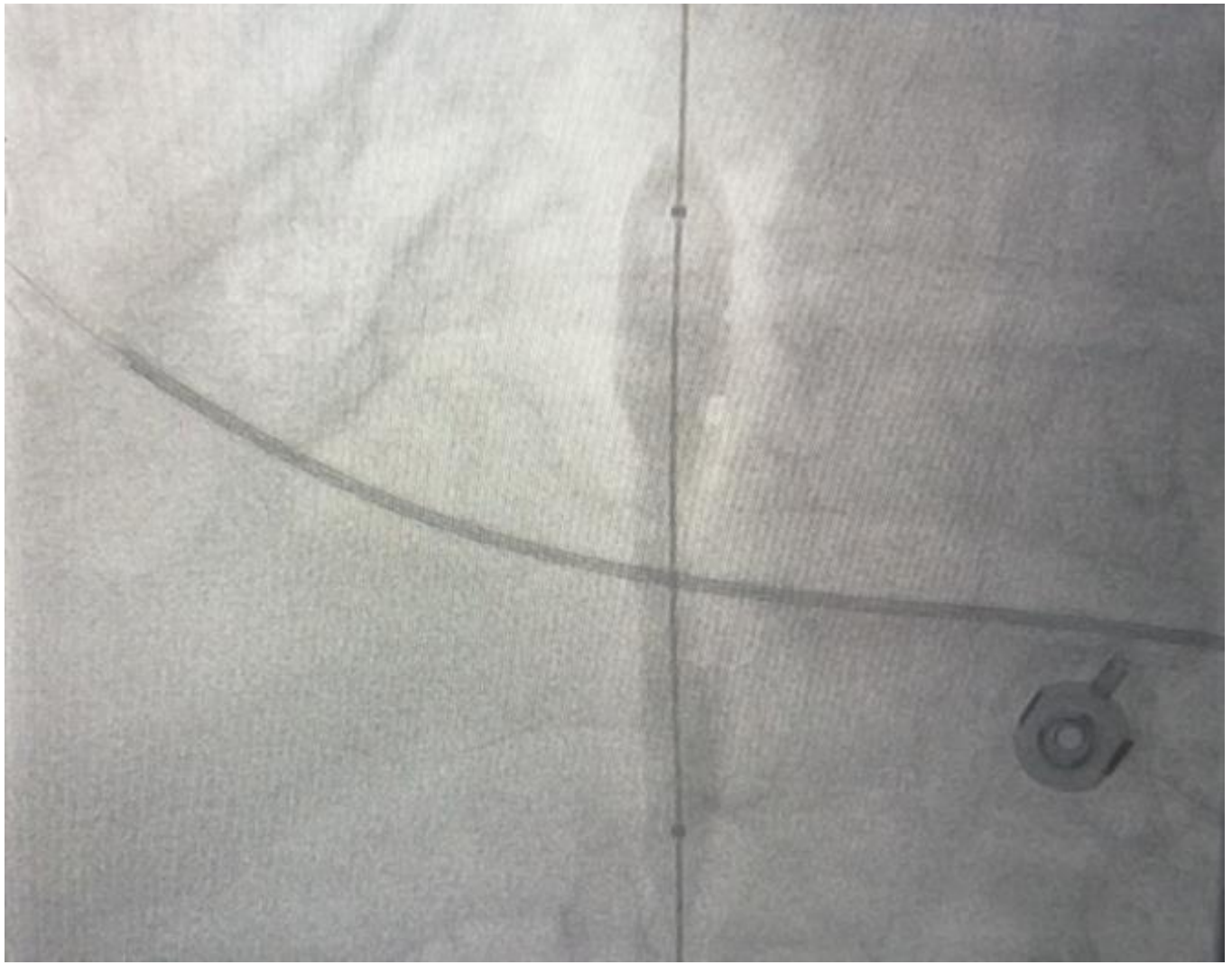
# Central Venous Occlusion



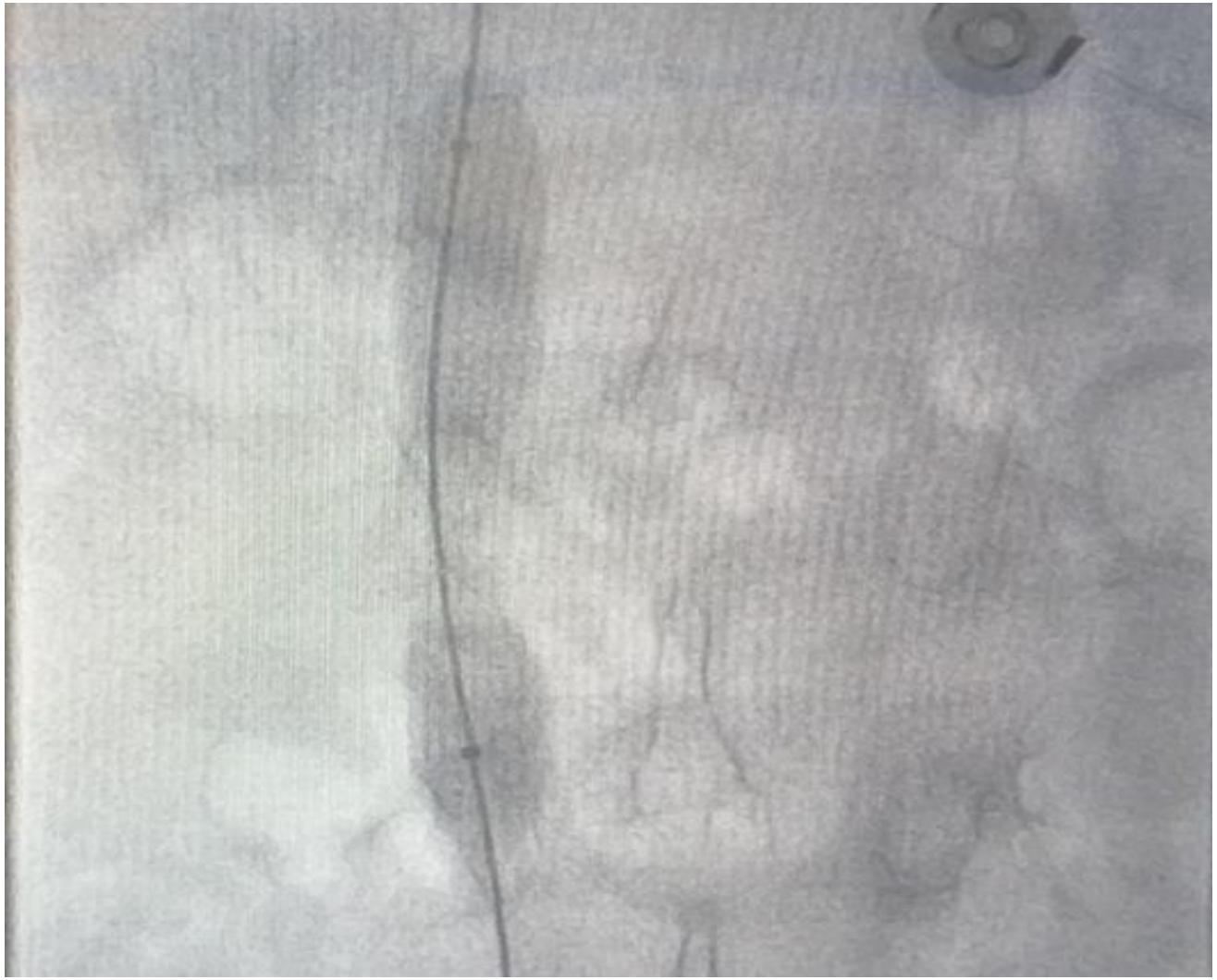
# Central Venous Occlusion



# Central Venous Occlusion

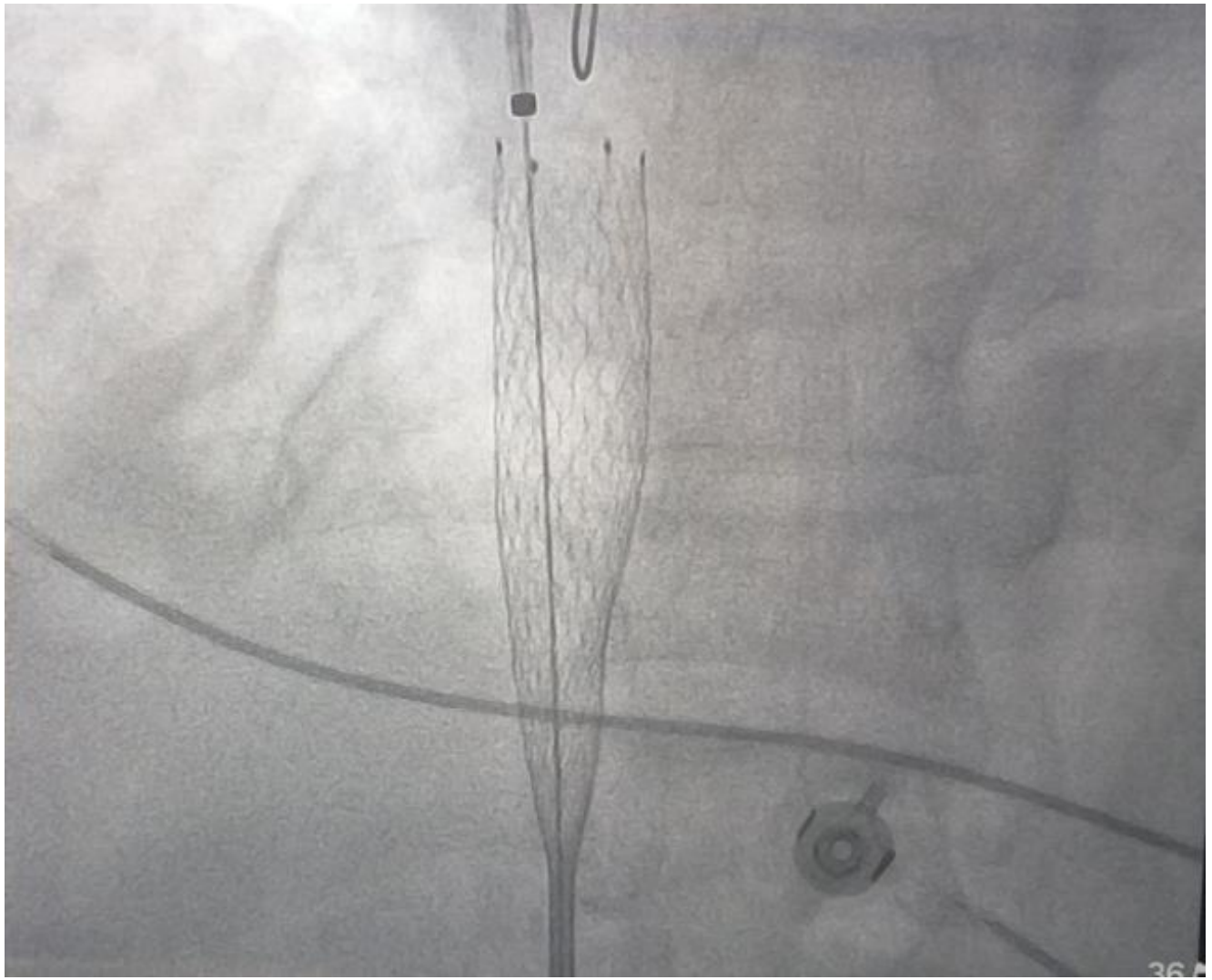


# Central Venous Occlusion

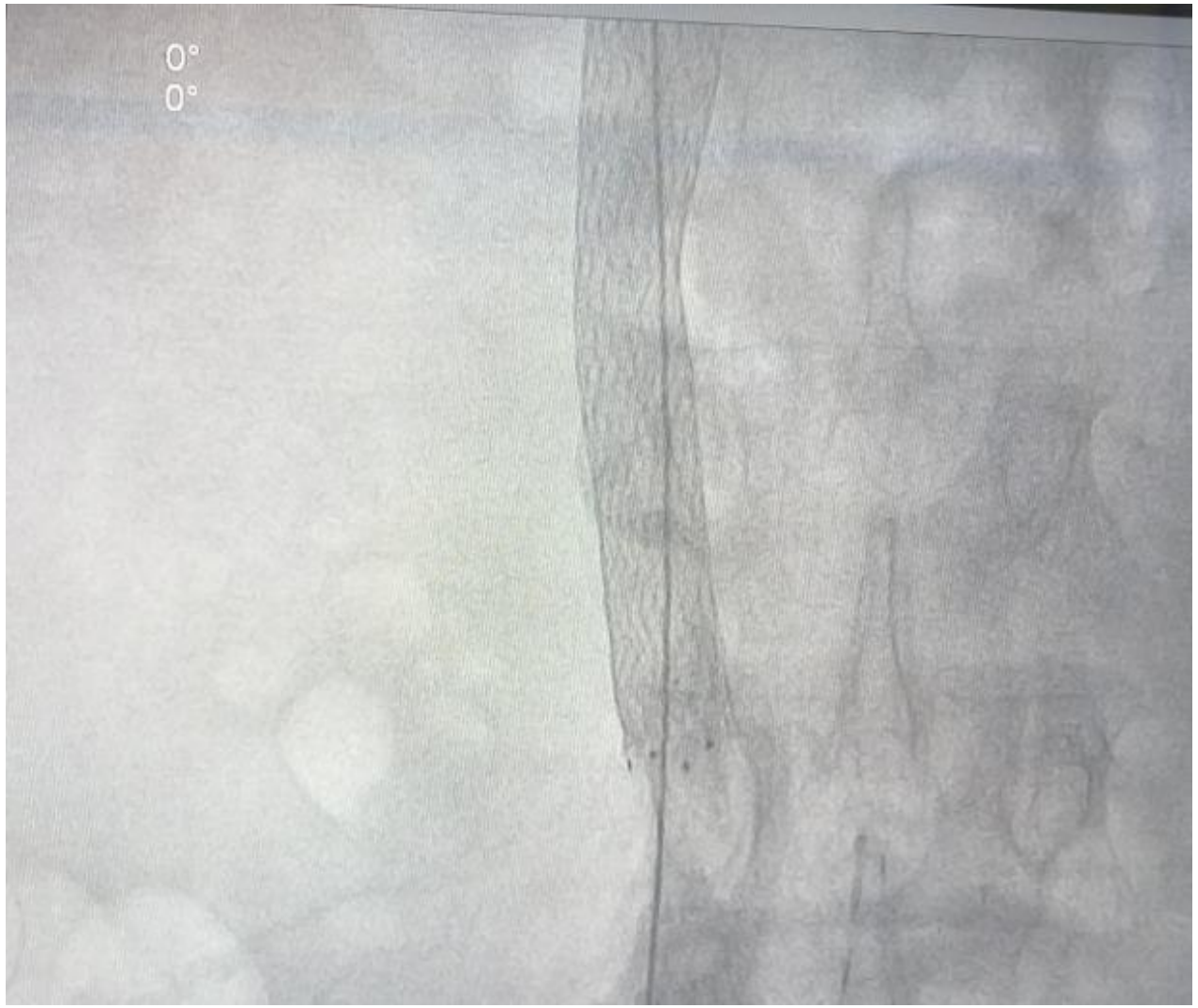


# Central Venous Occlusion

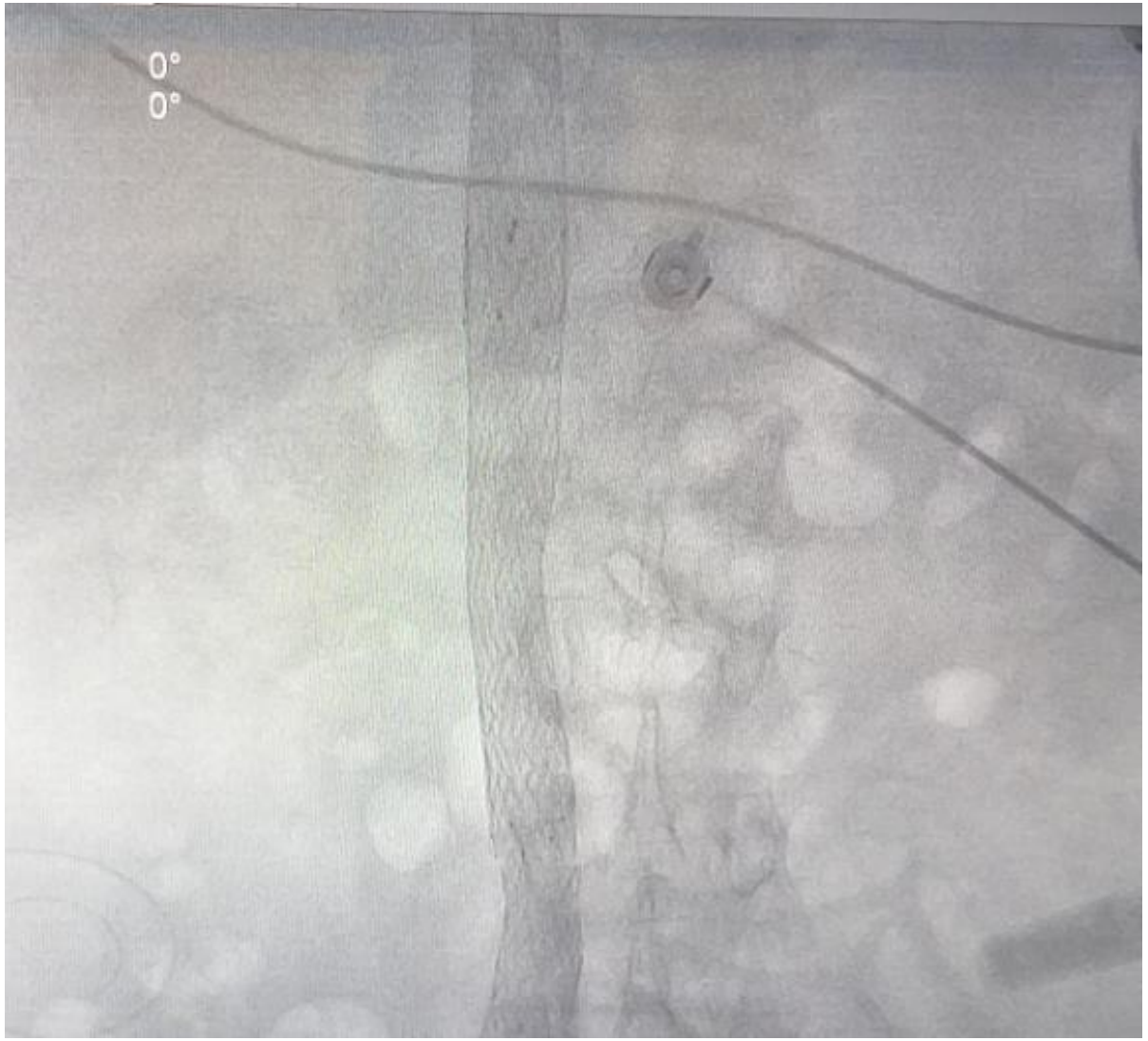
# Central Venous Occlusion



# Central Venous Occlusion

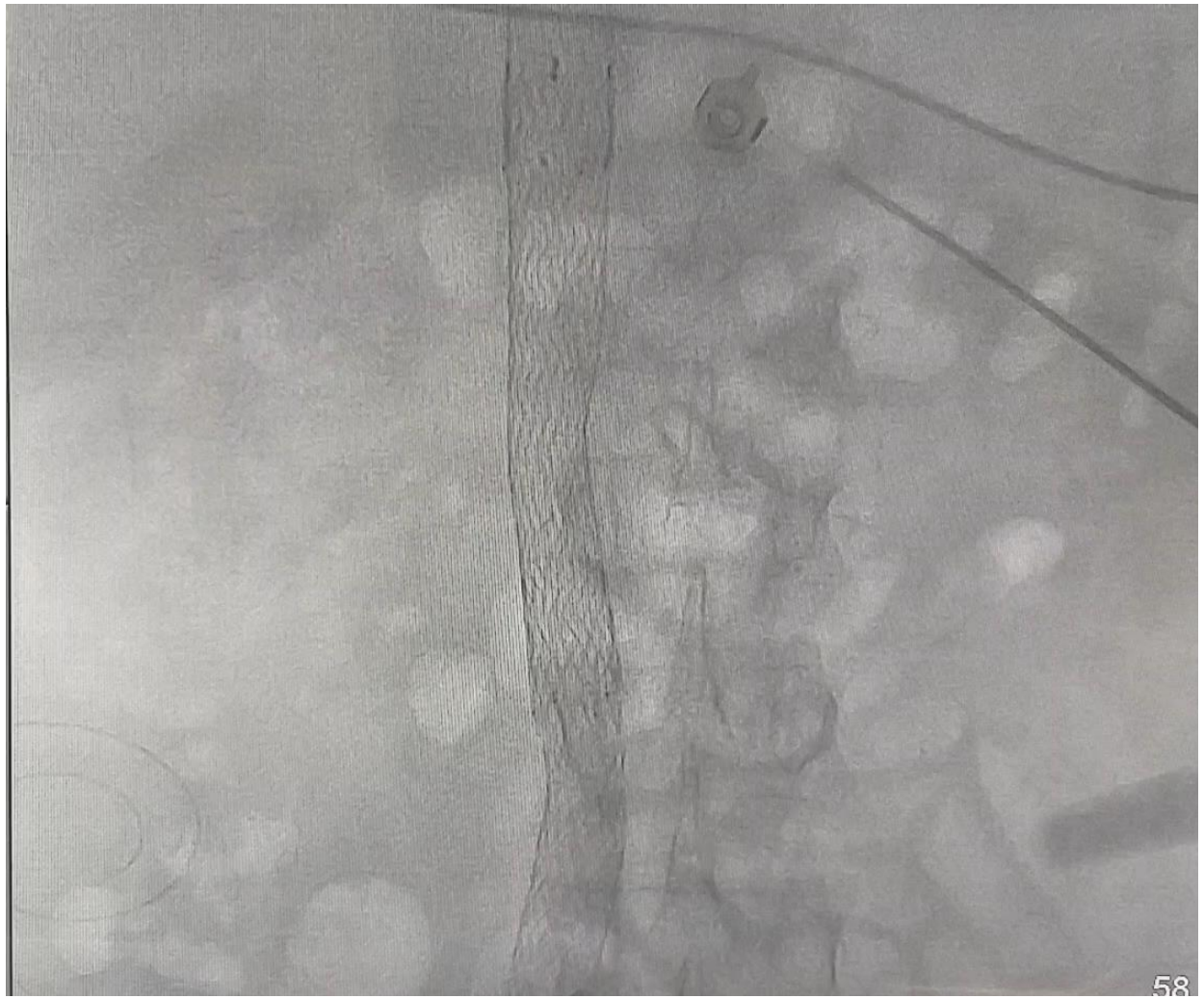


# Central Venous Occlusion



# Central Venous Occlusion

# Central Venous Occlusion



# Case 2

A 48/y-o female patient on HD currently via Rt jugular temporary catheter presented with catheter dysfunction. Guidewire did not pass through the Rt jugular vein and venography revealed thrombosis of Rt internal jugular. Lt side venous pathway is intact. Should we opt for the Lt side catheter?