WELCOME *To the*

2026 SYMPOSIUM

HD Catheter Placement
AV Access Creation
and
PD Placement

John F Lucas III, MD, FACS, FSVS

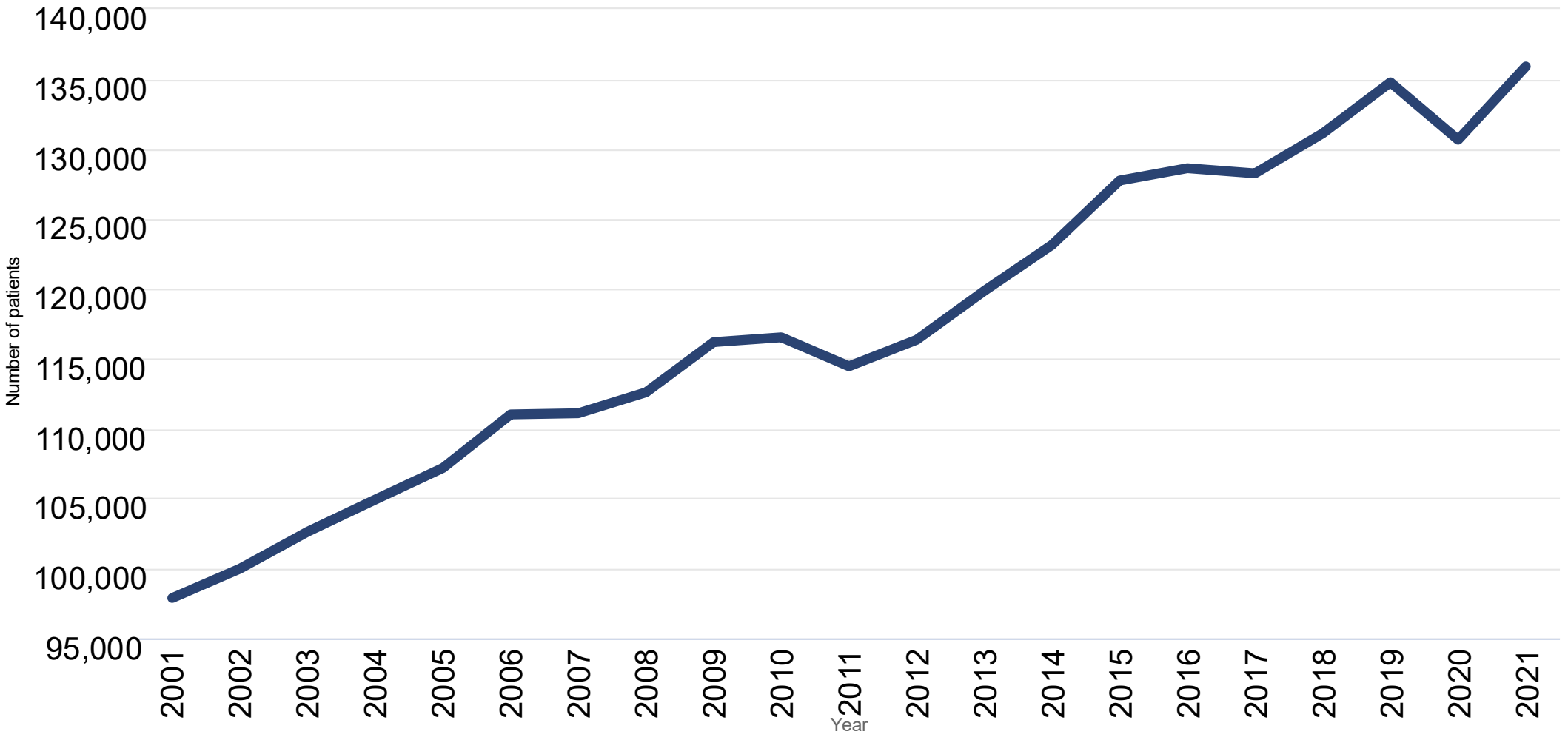
VASCULAR ACCESS SOCIETY OF THE AMERICAS VASA Access Excellence.

Disclosures

PI for Laminate Medical

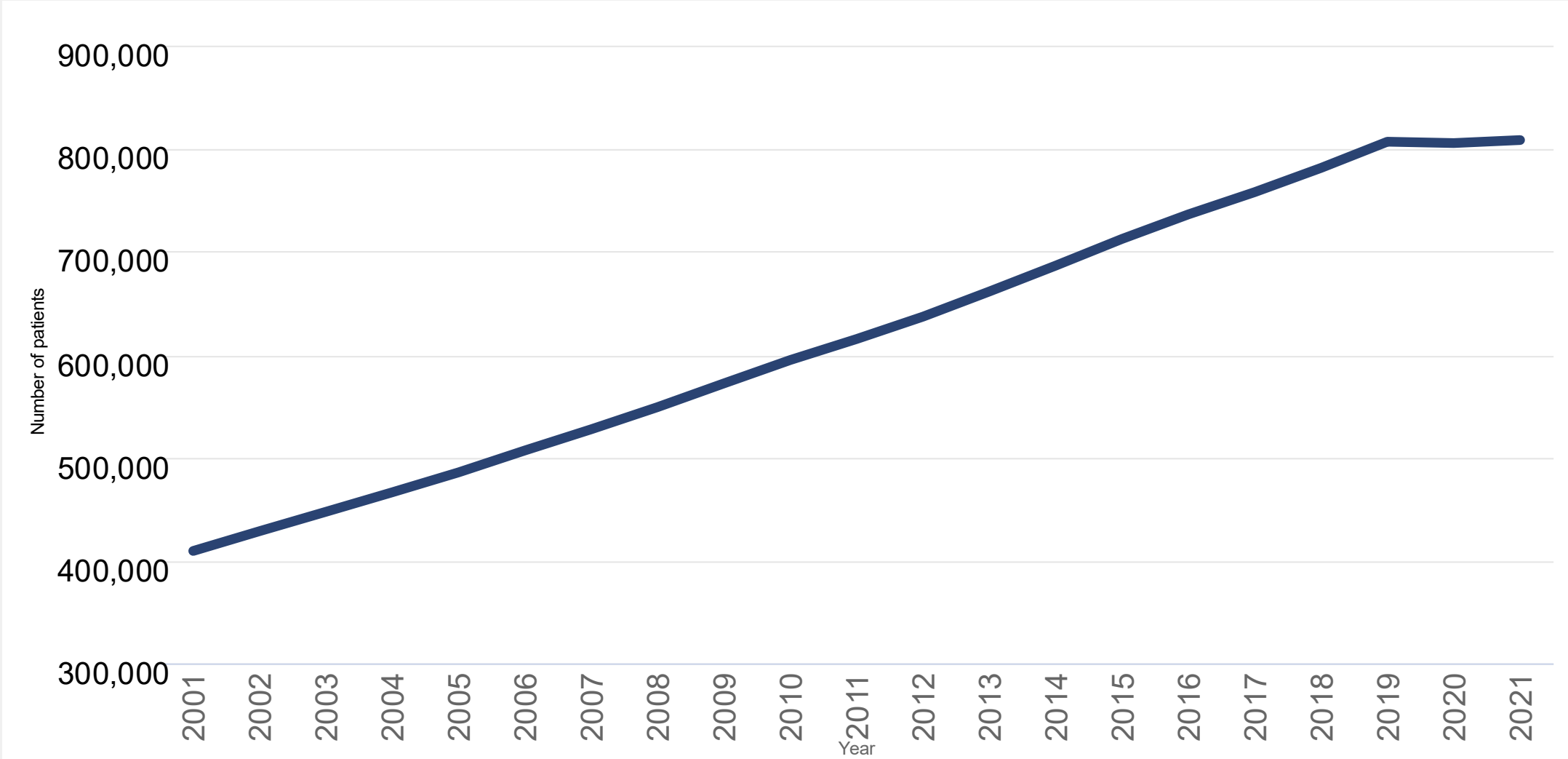
PI for Xeltis

New Patients Each Year with ESRD



Data Source: 2023 United States Renal Data System Annual Data Report

Patients with ESRD by Year

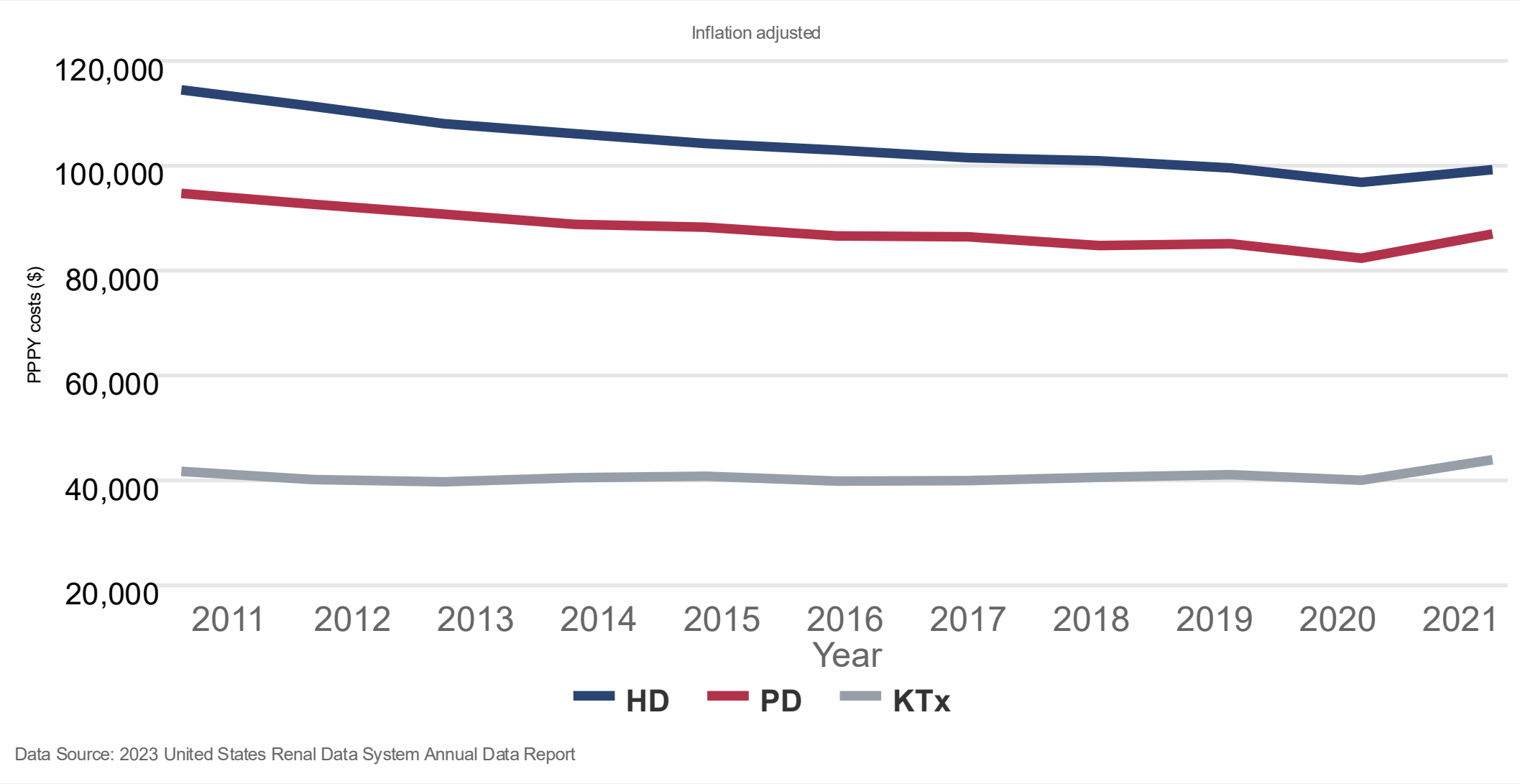


Data Source: 2023 United States Renal Data System Annual Data Report

Options to Remove Fluid and Metabolic Waste

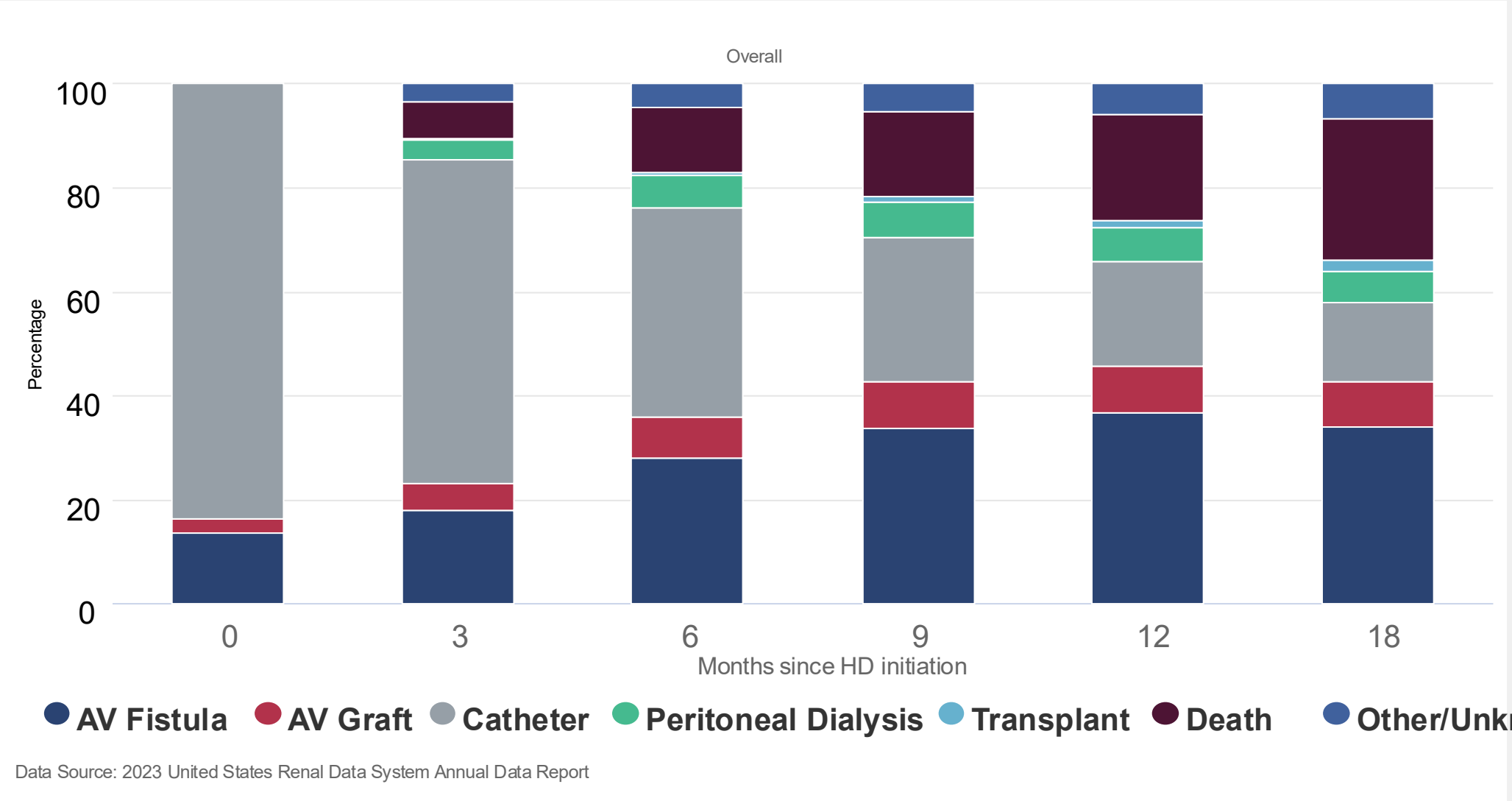
- Renal Transplant
- Hemodialysis
  - HD Catheter
  - Arteriovenous Graft
  - Arteriovenous Fistula
- Peritoneal Dialysis

Spending per Year by Modality



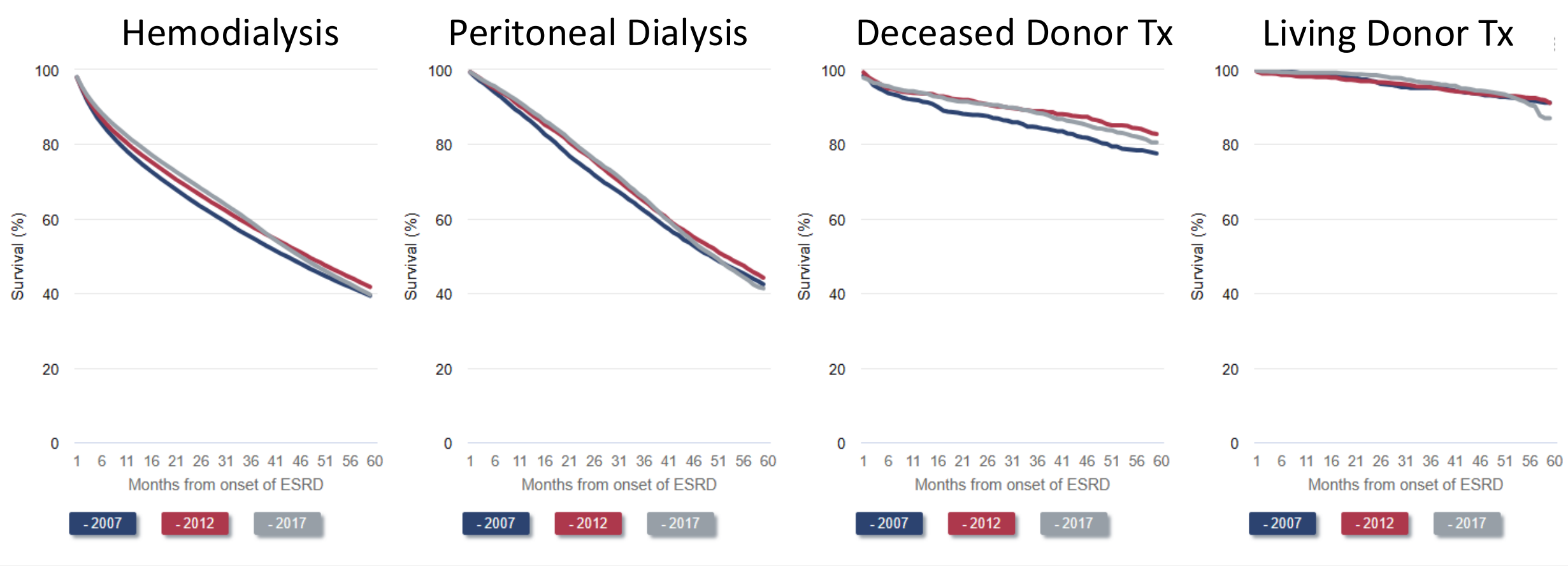
Data Source: 2023 United States Renal Data System Annual Data Report

Vascular Access in HD Patients over 18 Months



Data Source: 2023 United States Renal Data System Annual Data Report

Mortality by Modality First 5 Years



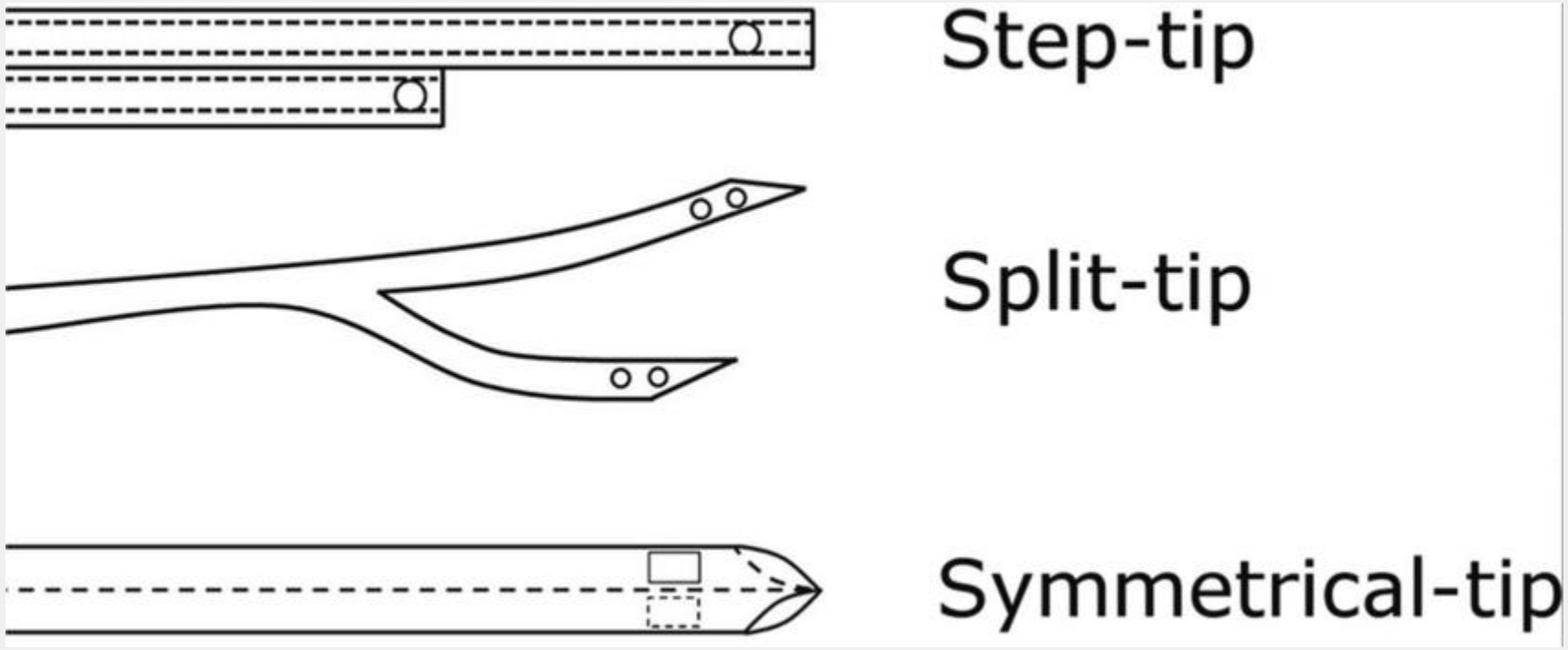
Catheters

Hemodialysis Catheters



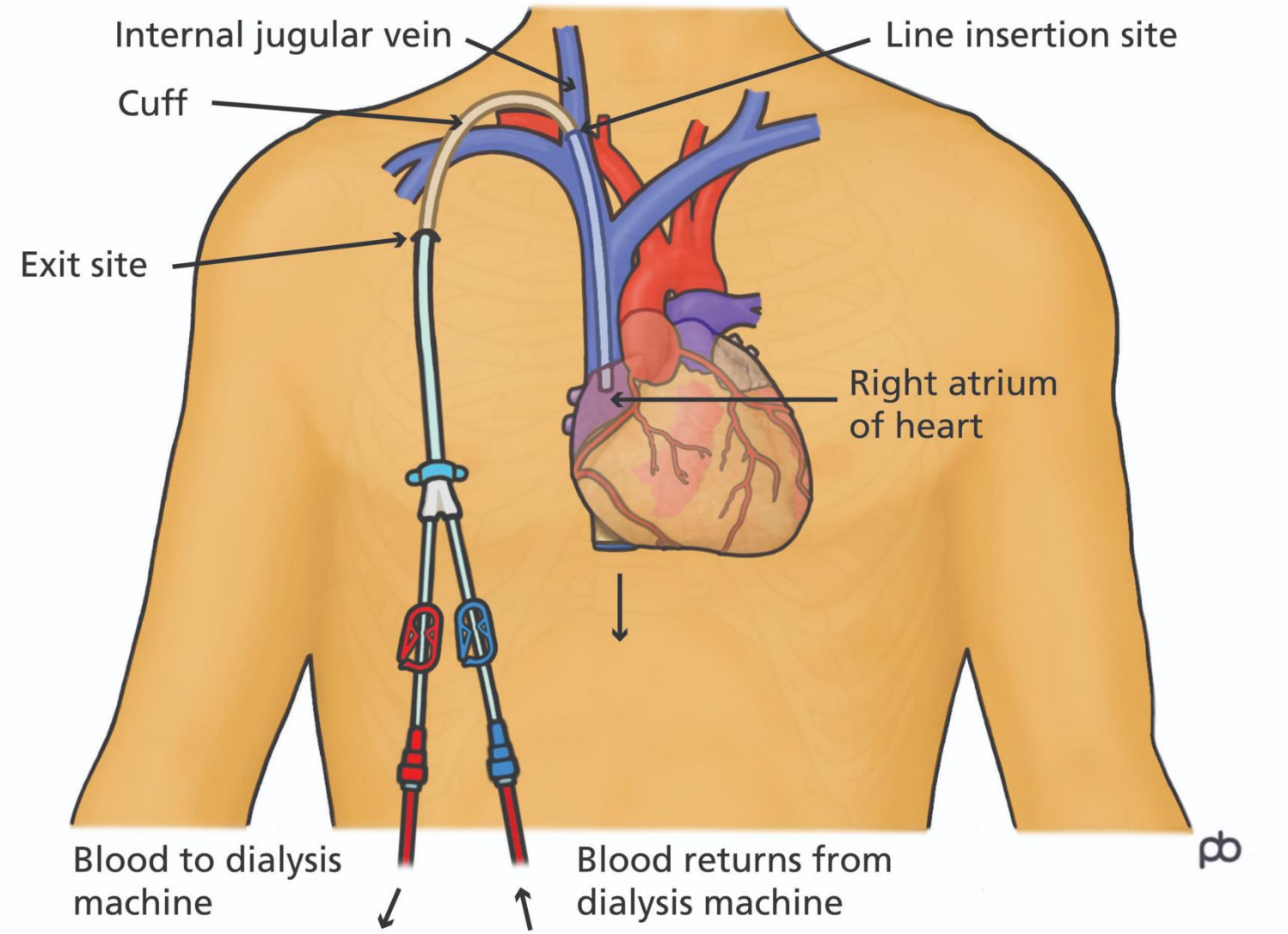


Catheter Tip Designs



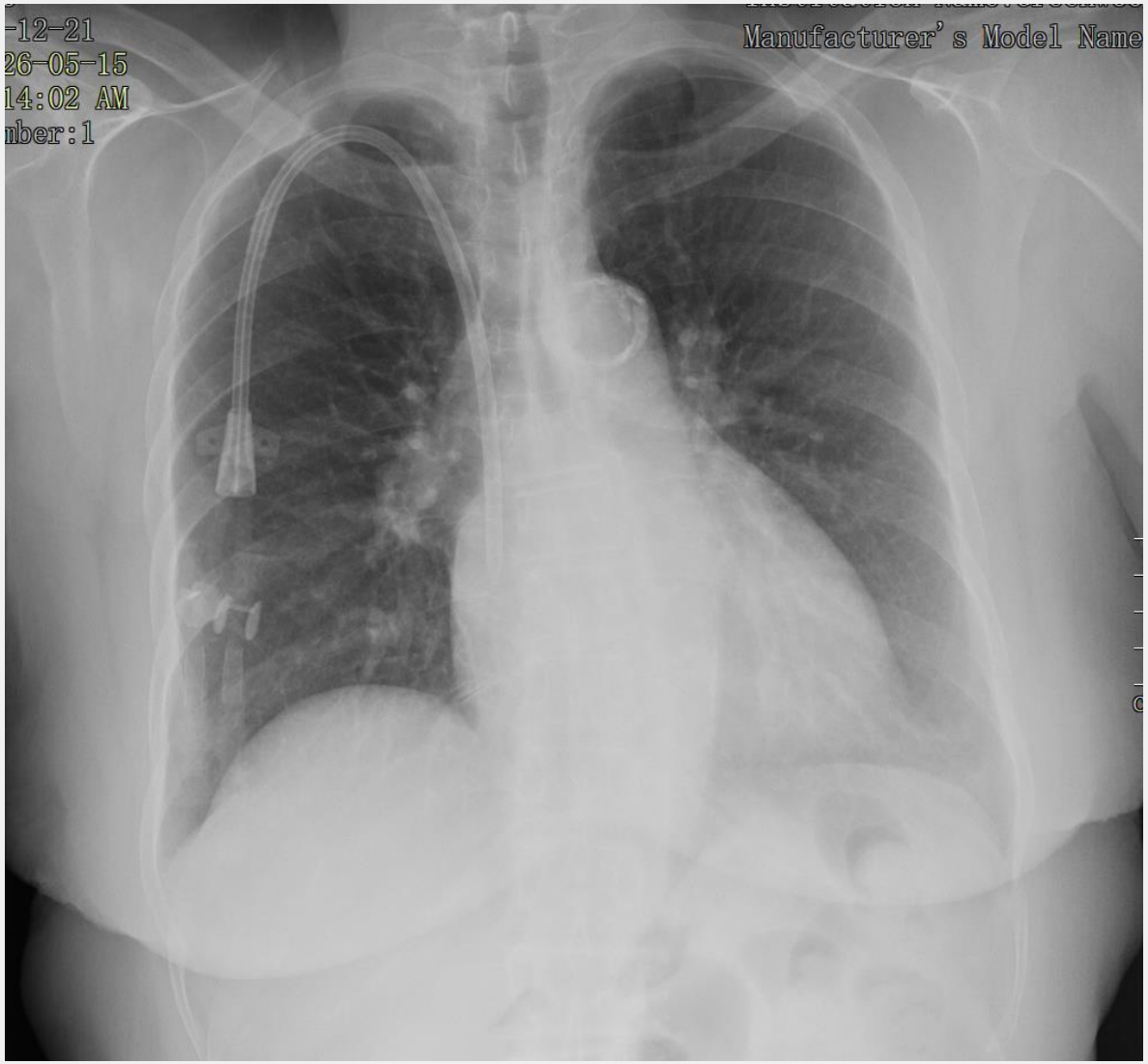
Innovations in Hemodialysis Access March 2023
DOI:10.5772/intechopen.110467
•In book: Updates on Hemodialysis

Tunneled Catheter

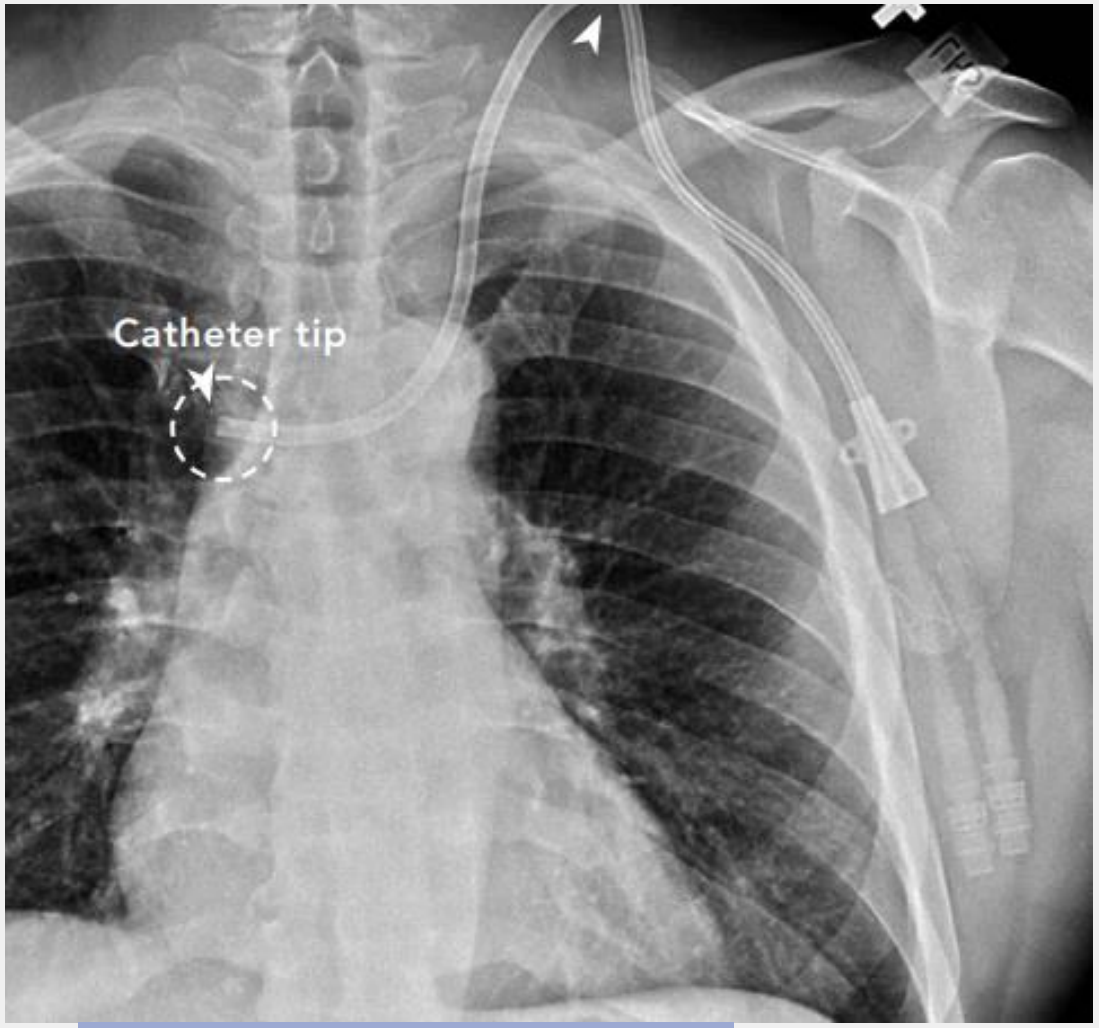


Leeds Teaching Hospitals NHS Trust

Tunneled Catheter

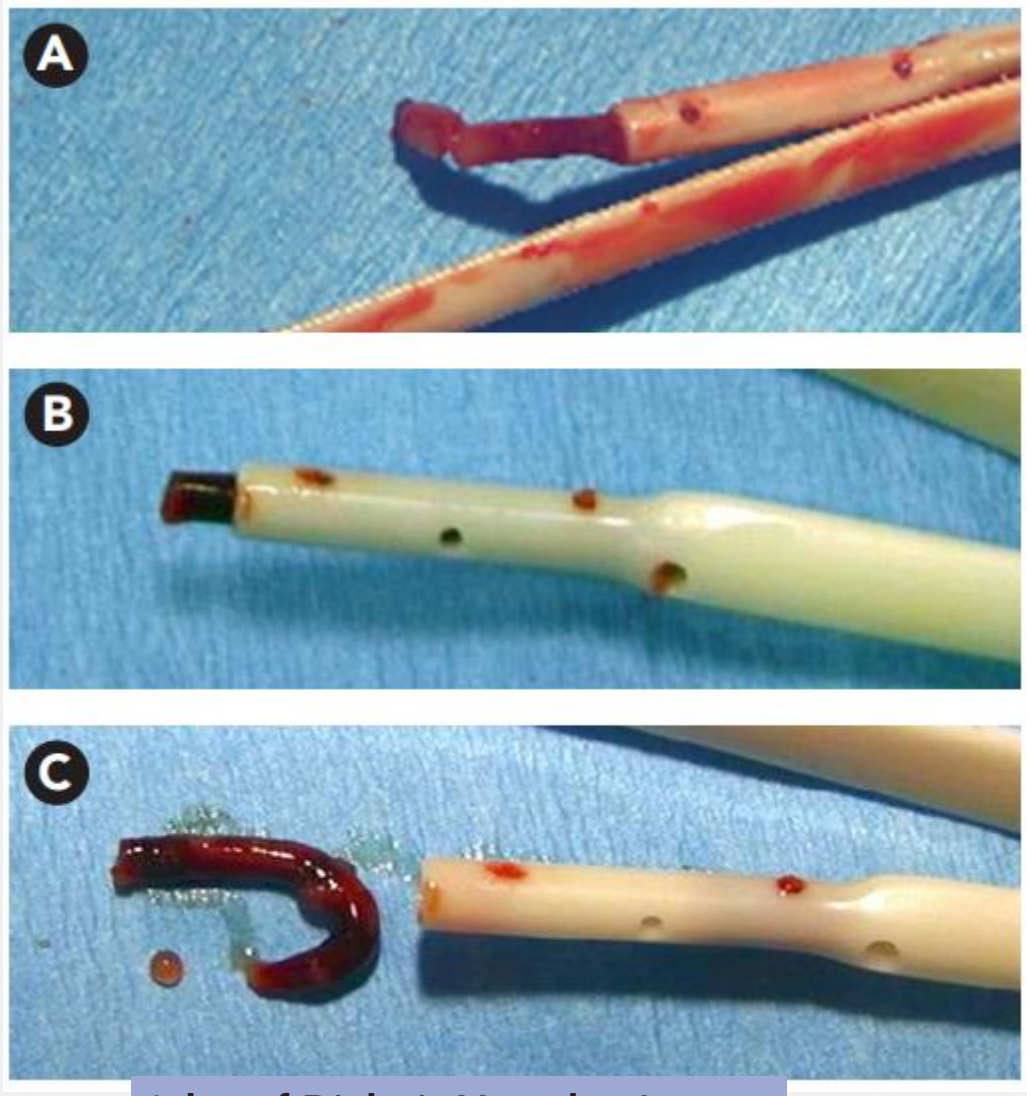


Tunneled Hemodialysis Catheter



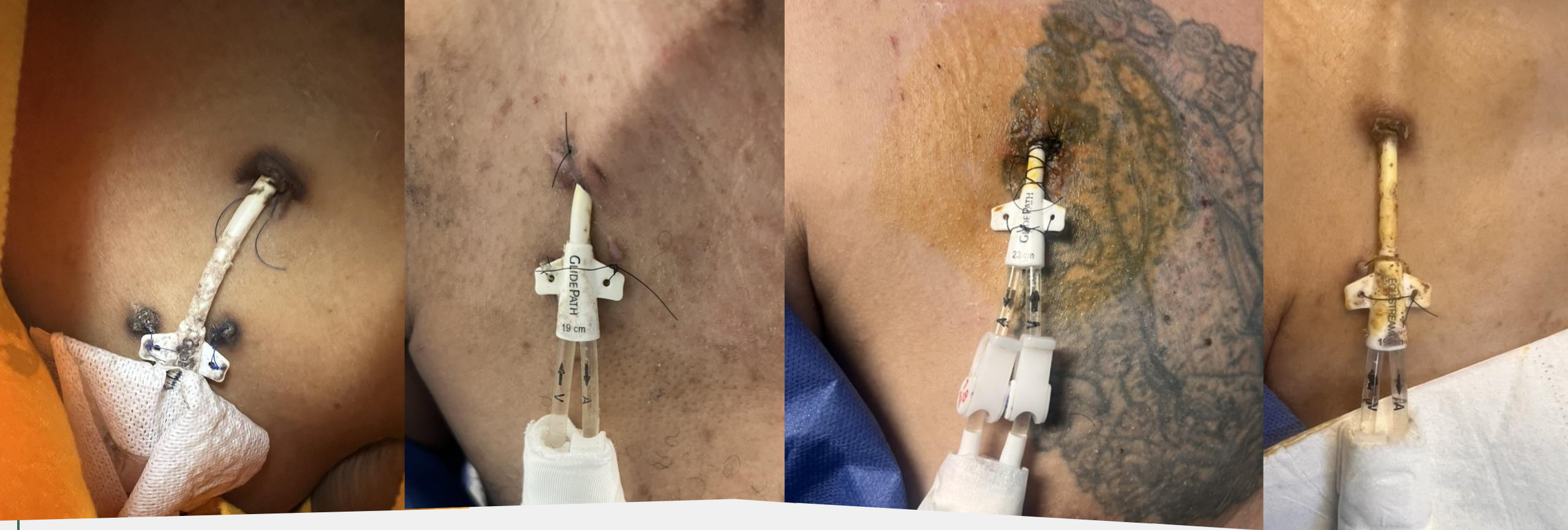
Atlas of Dialysis Vascular Access

Tushar J. Vachharajani, MD, FASN, FACP



Atlas of Dialysis Vascular Access

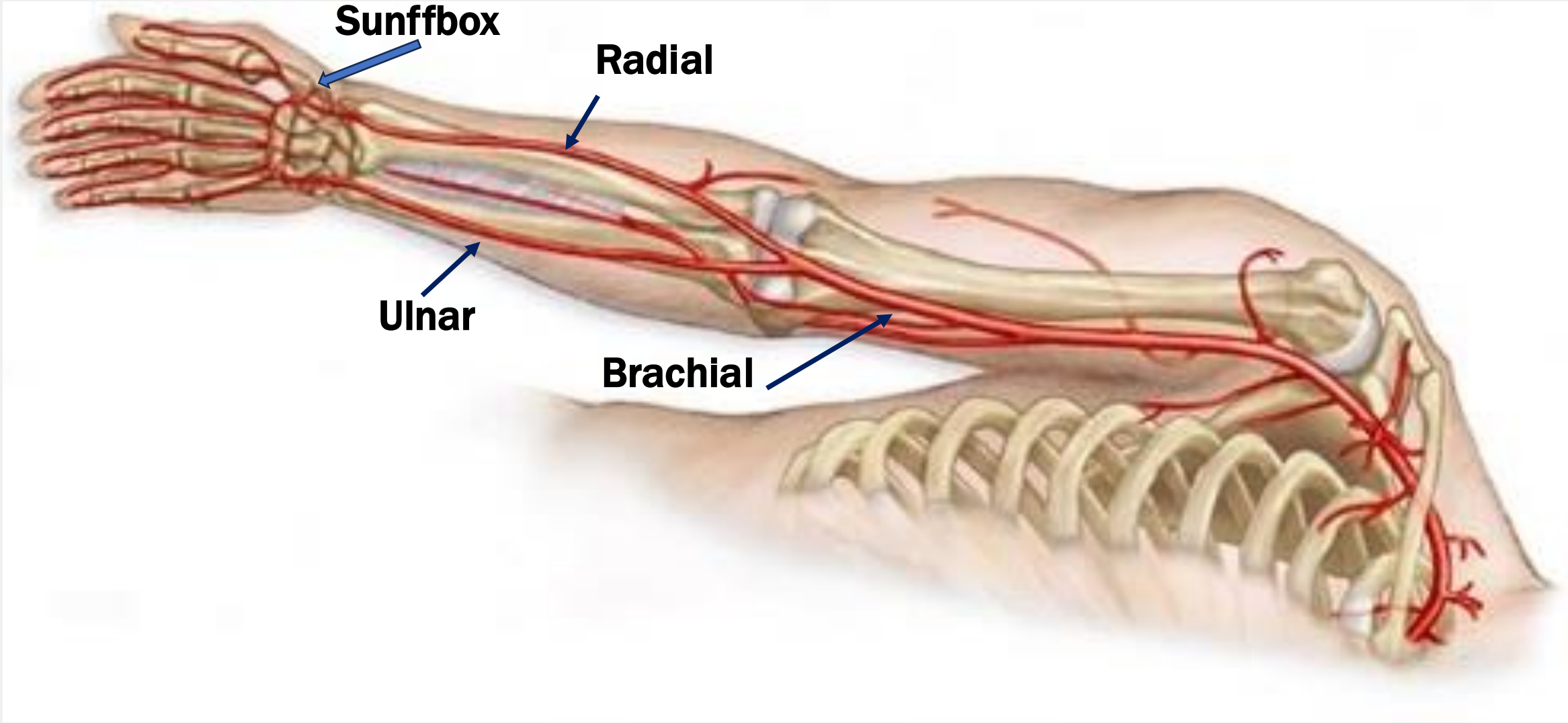
Tushar J. Vachharajani, MD, FASN, FACP



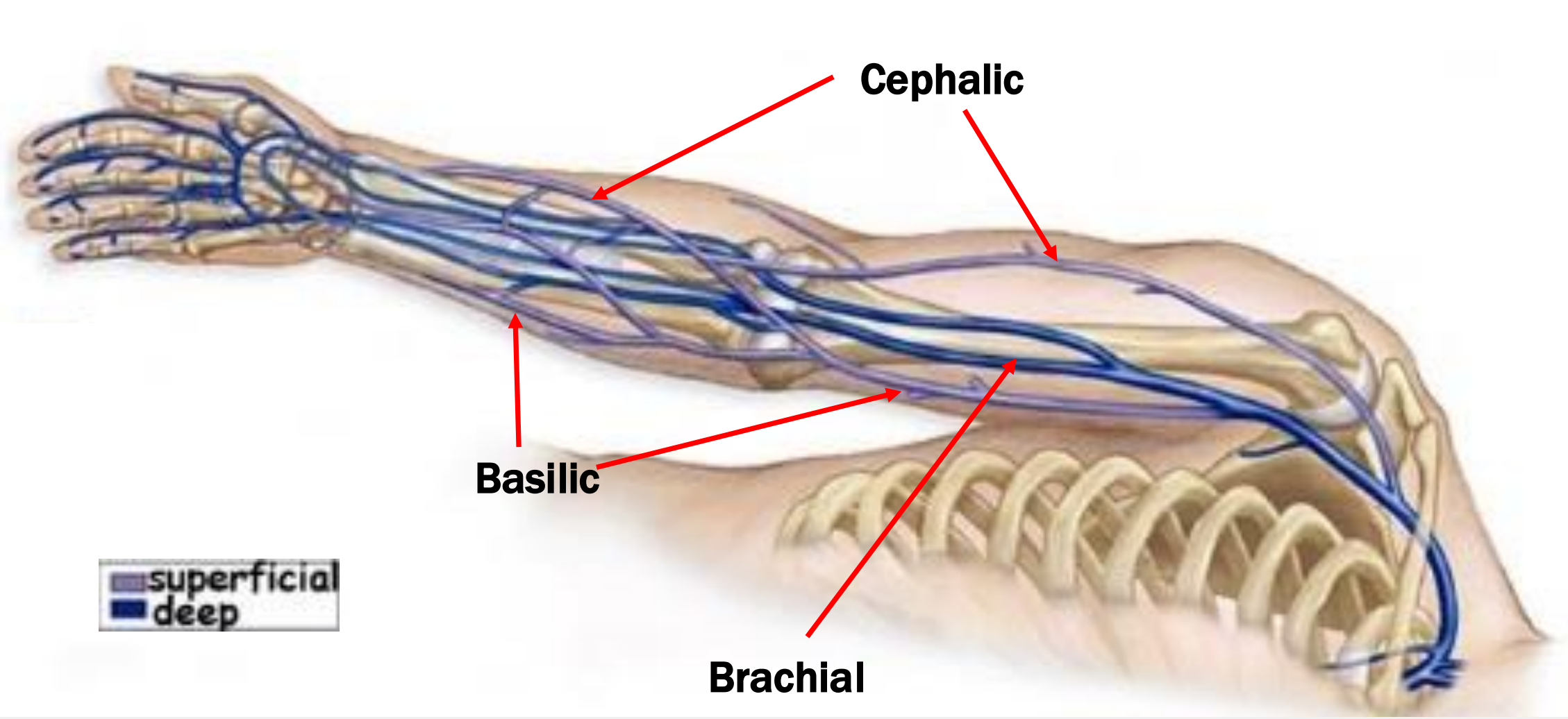
Exit Site Problems

HEMODIALYSIS – Fistulas and Grafts

Arterial Anatomy



Venous Anatomy



The Vascular Access Circuit

- Primary fistulas
- Primary transposed fistulas
- Grafts

The Vascular Access Circuit -Types of Access

- **Primary fistulas**
- Primary transposed fistulas
- Grafts

- Cephalic vein
  - Wrist
  - Forearm
  - Elbow
    - Above
    - Below

The Vascular Access Circuit -Types of Access

- Primary fistulas
- **Primary transposed fistulas**
- Grafts
  - Cephalic vein if too deep
  - Basilic vein
    - Forearm
    - Upper arm
  - Brachial vein
  - Femoral vein

The Vascular Access Circuit -Types of Access

- Primary fistulas
- Primary transposed fistulas
- **Grafts**
  - Forearm
    - Loop
    - Straight
  - Upper arm
    - Loop
    - Straight
  - Leg
    - Loop

The Vascular Access Circuit -Types of Access

- Primary fistulas
- Primary transposed fistulas
- **Grafts**
  - **PTFE**
  - **Bovine carotid artery**

- Forearm
  - Loop
  - Straight
- Upper arm
  - Loop
  - Straight
- Leg
  - Loop

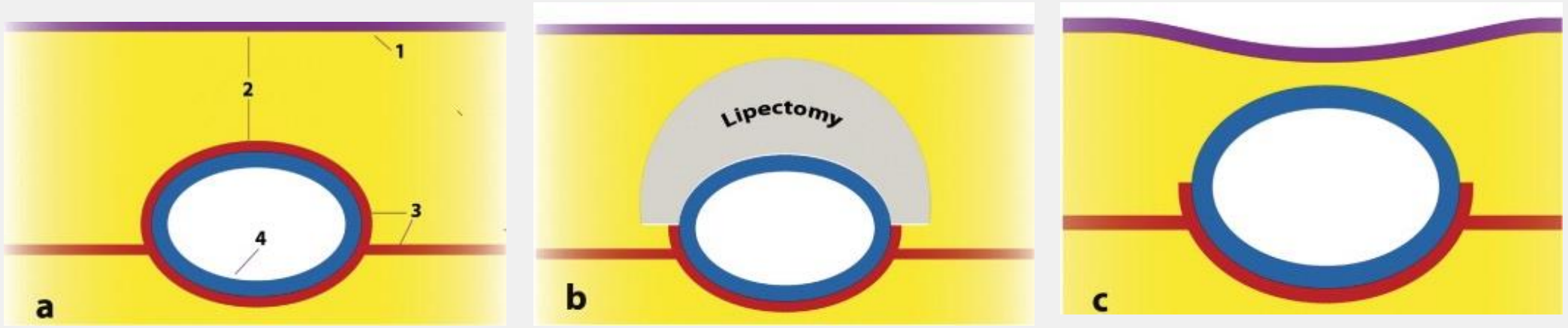
Brachiobasilic Transposition



Brachiobasilic Transposition



Lipectomy



Bourquelot, J. et al. Lipectomy as a new approach to secondary procedure superficialization of direct autogenous forearm radial-cephalic arteriovenous accesses for hemodialysis. Journal of Vascular Surgery. 2009 Aug;50(1):369-74. (http://www.jvascsurg.org/article/S0741-5214(09)00662-4/fulltext)

The Vascular Access Circuit - Problems

- Heart
- Artery
- Anastomosis
- AVF
- Outflow Veins

The Vascular Access Circuit

- **Heart**
- Artery
- Anastomosis
- AVF
- Outflow Veins

- Congestive heart failure
- Chronic low blood pressure
- Bradycardia
- Severe hypertension

The Vascular Access Circuit

- Heart
- **Artery**
- Anastomosis
- AVF
- Outflow Veins

- Atherosclerosis
  - Narrowed and limits flow
  - Stiff and will not increase flow
- Occlusion
  - Limits flow
  - Promotes steal
- High bifurcation of brachial artery

The Vascular Access Circuit

- Heart
- Artery
- **Anastomosis**
- AVF
- Outflow Veins

- Stenosis
- Aneurysm

The Vascular Access Circuit

- Heart
- Artery
- Anastomosis
- **AVF**
- Outflow Veins

- Rule of 6s
  - 600 ml/min flow
  - 6 mm in diameter
  - 6 mm or less from the surface
  - 6 inches of available length for cannulation
- Stenosis
  - Anastomosis
  - Swing segment
  - Cannulation segment

The Vascular Access Circuit

- Heart
- Artery
- Anastomosis
- AVF
- **Outflow Veins**

- Occlusion or Stenosis
  - Pacemaker
  - Defibrillator
  - Port-a-cath
  - Dialysis catheter
  - PIC lines
  - Cephalic arch

ACCESS EMERGENCIES

- Thrombosis
  - Emboli to brachial artery
- Bleeding
  - Needle hole
    - Thin area
    - Anticoagulation
    - Outflow stenosis or occlusion
  - Incision
    - Recent access creation think infection or false aneurysm
  - Aneurysm

Mobile Skin



Fixed Skin



Early Ulceration





Area Cannulation





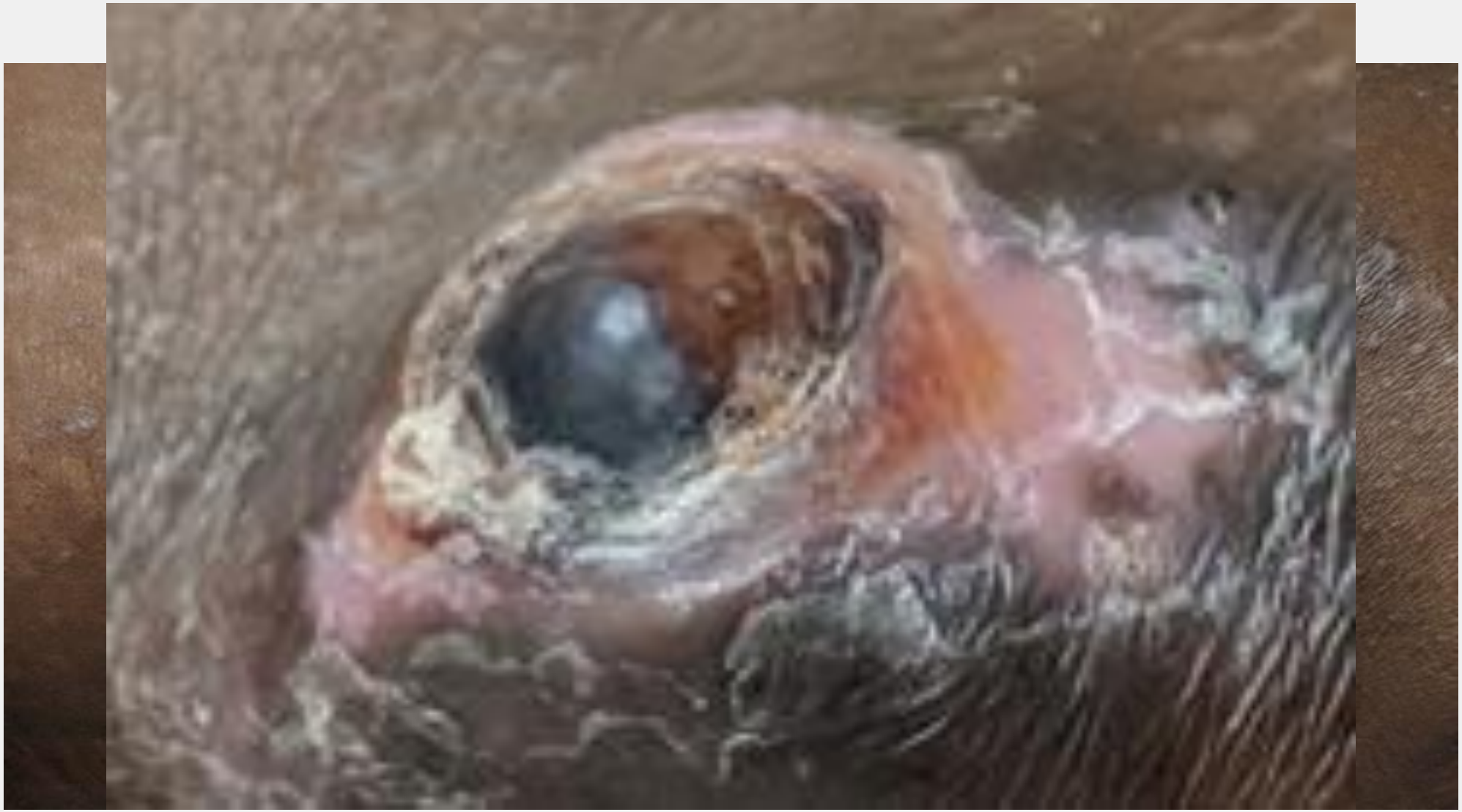
OFFICE VISITS
Patient, Focused
Patient, Expanded
Patient, Detailed
Patient, Comprehensive
Patient, Minimal
Patient, Focused
Patient, Expanded
Patient, Detailed
03/13/2018

Identify Other Cannulation Sites





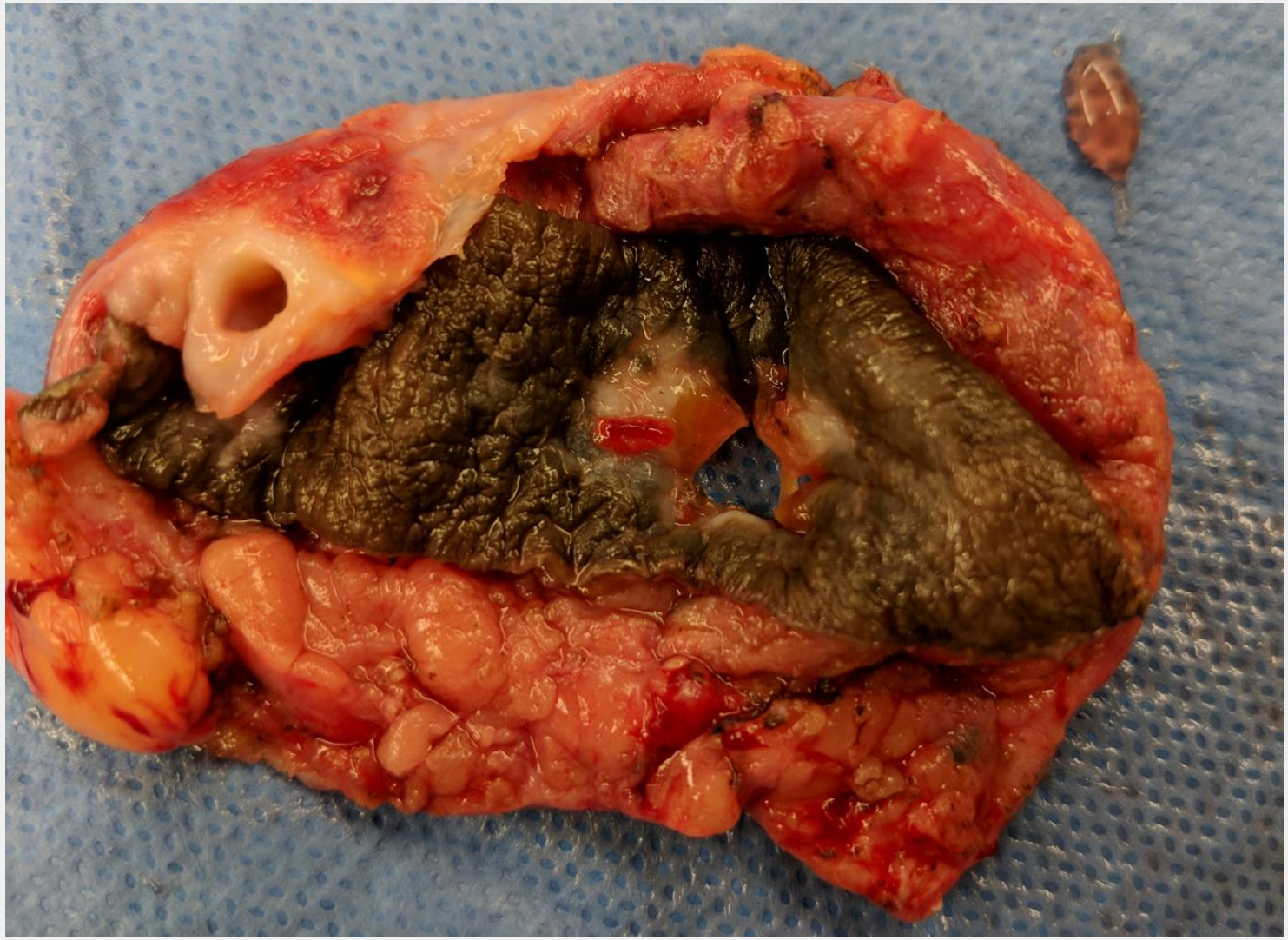




VASA Vascular Access Society of the Americas

Access Excellence.

MAY 20-22, 2026 • HILTON SALT LAKE CITY CENTER • SALT LAKE CITY, UTAH

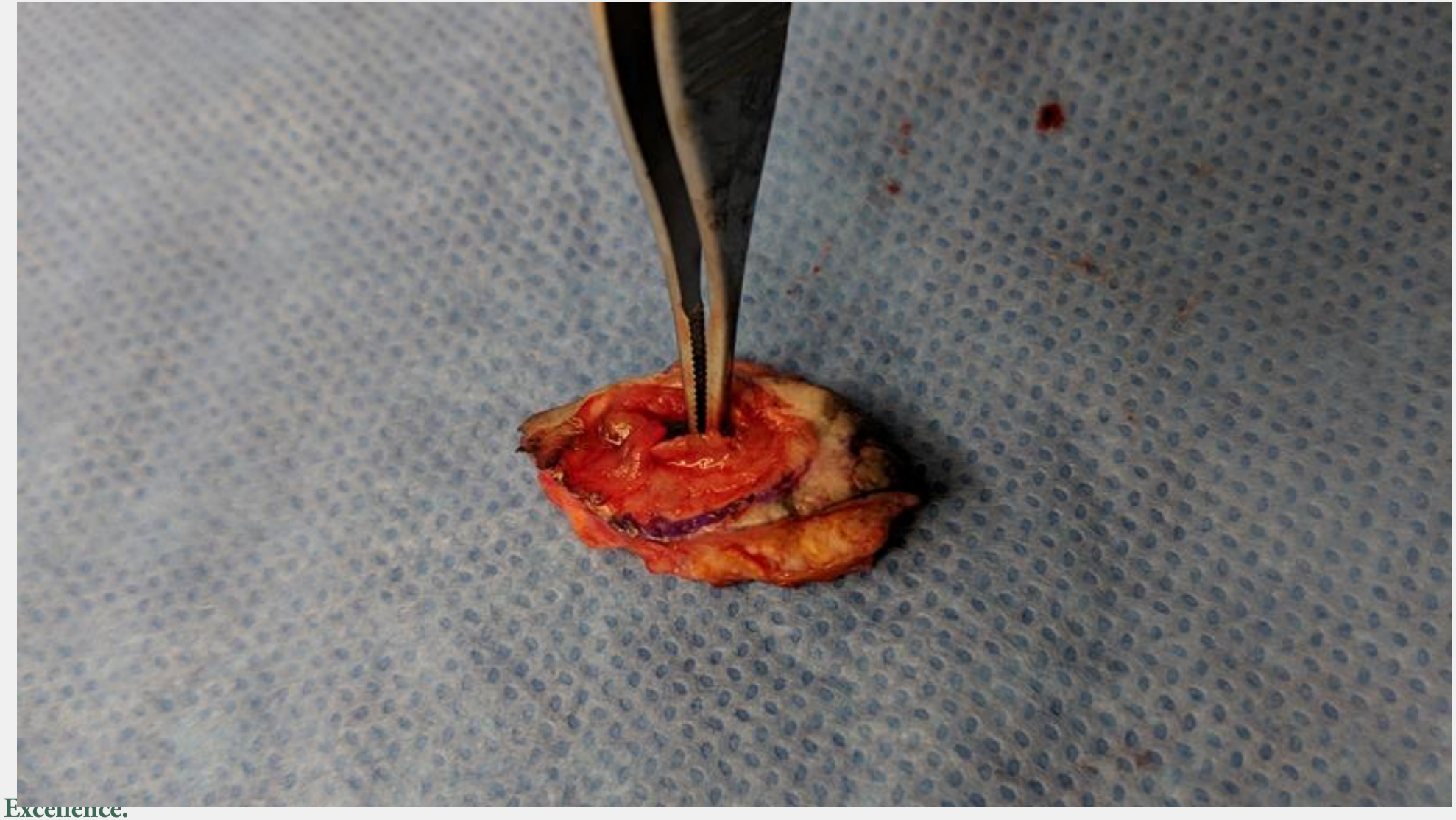




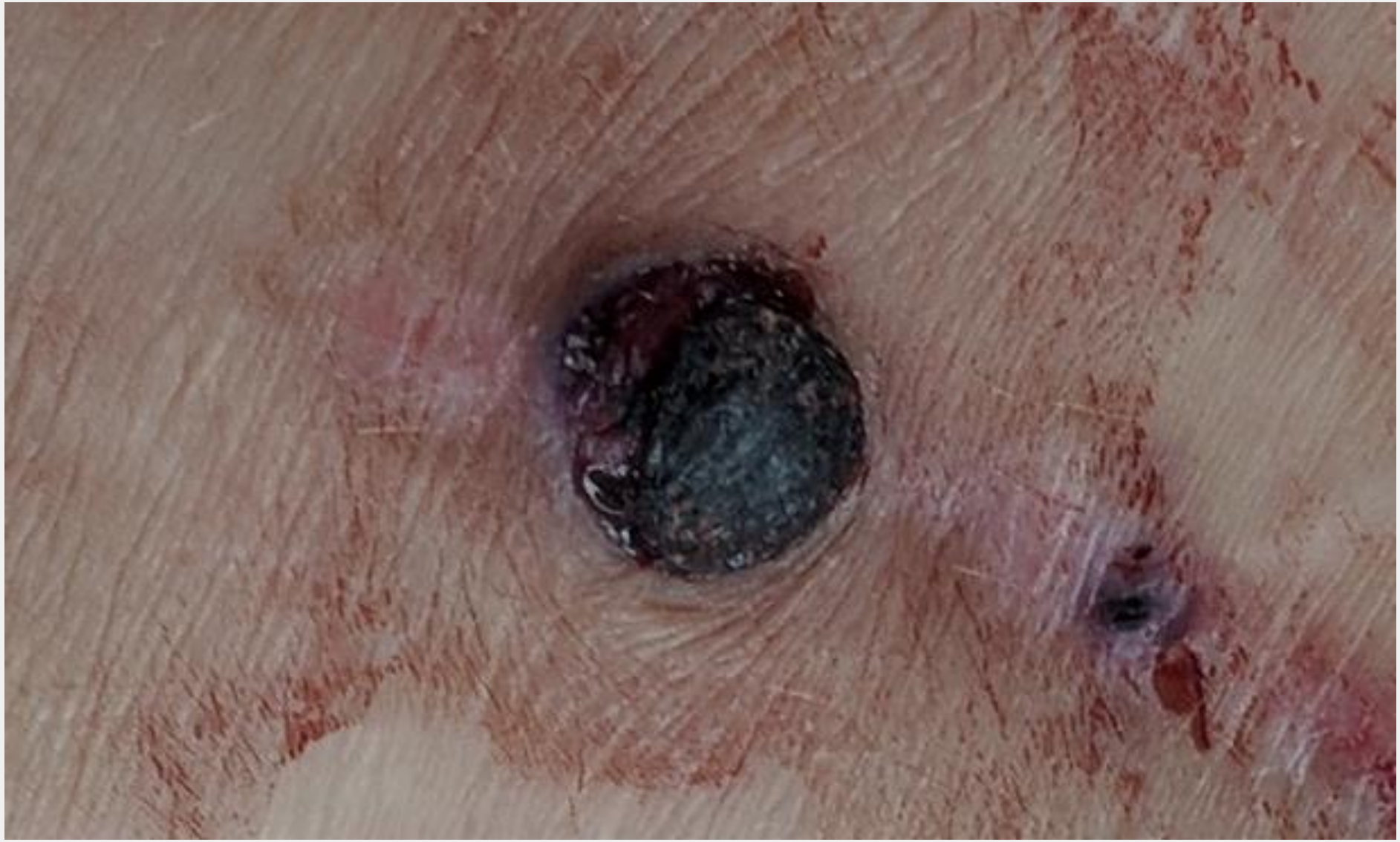


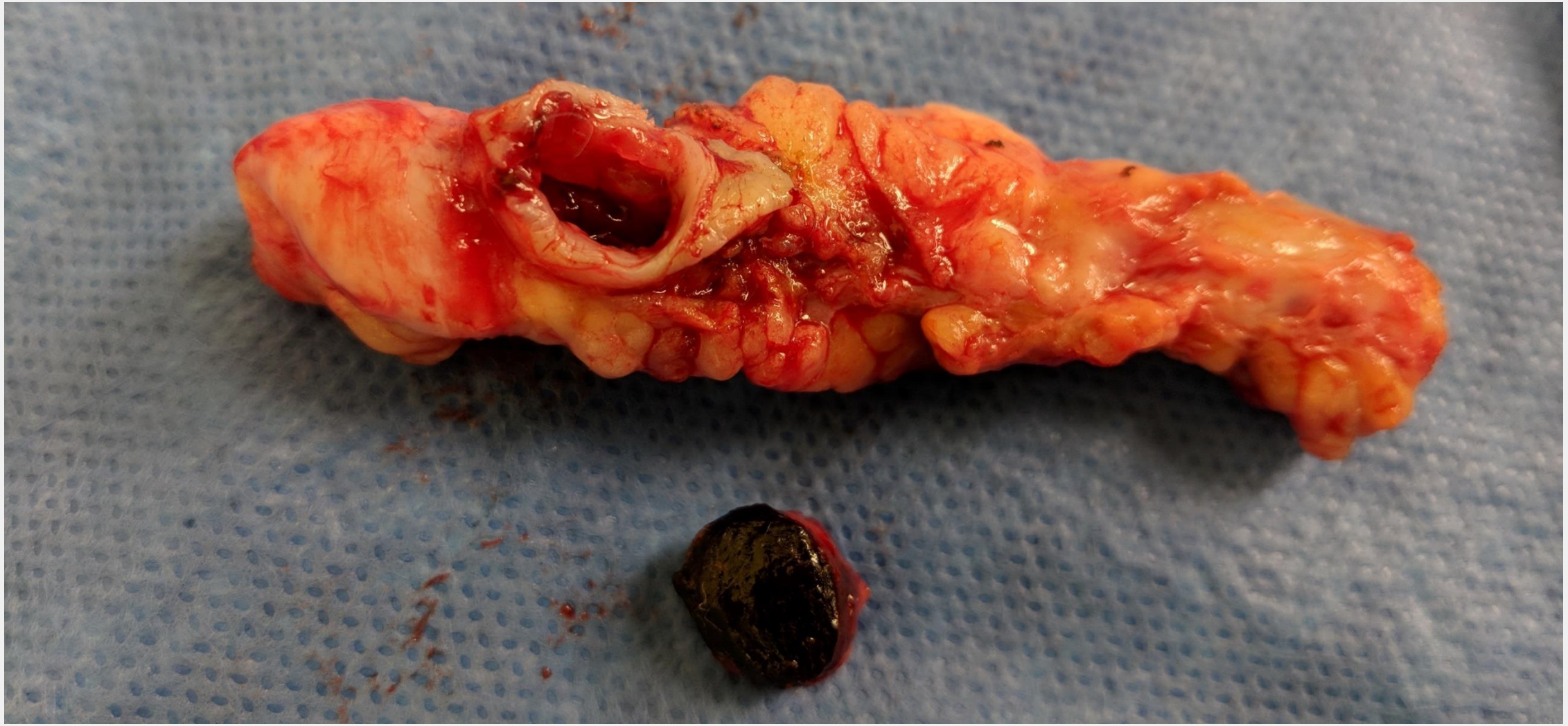




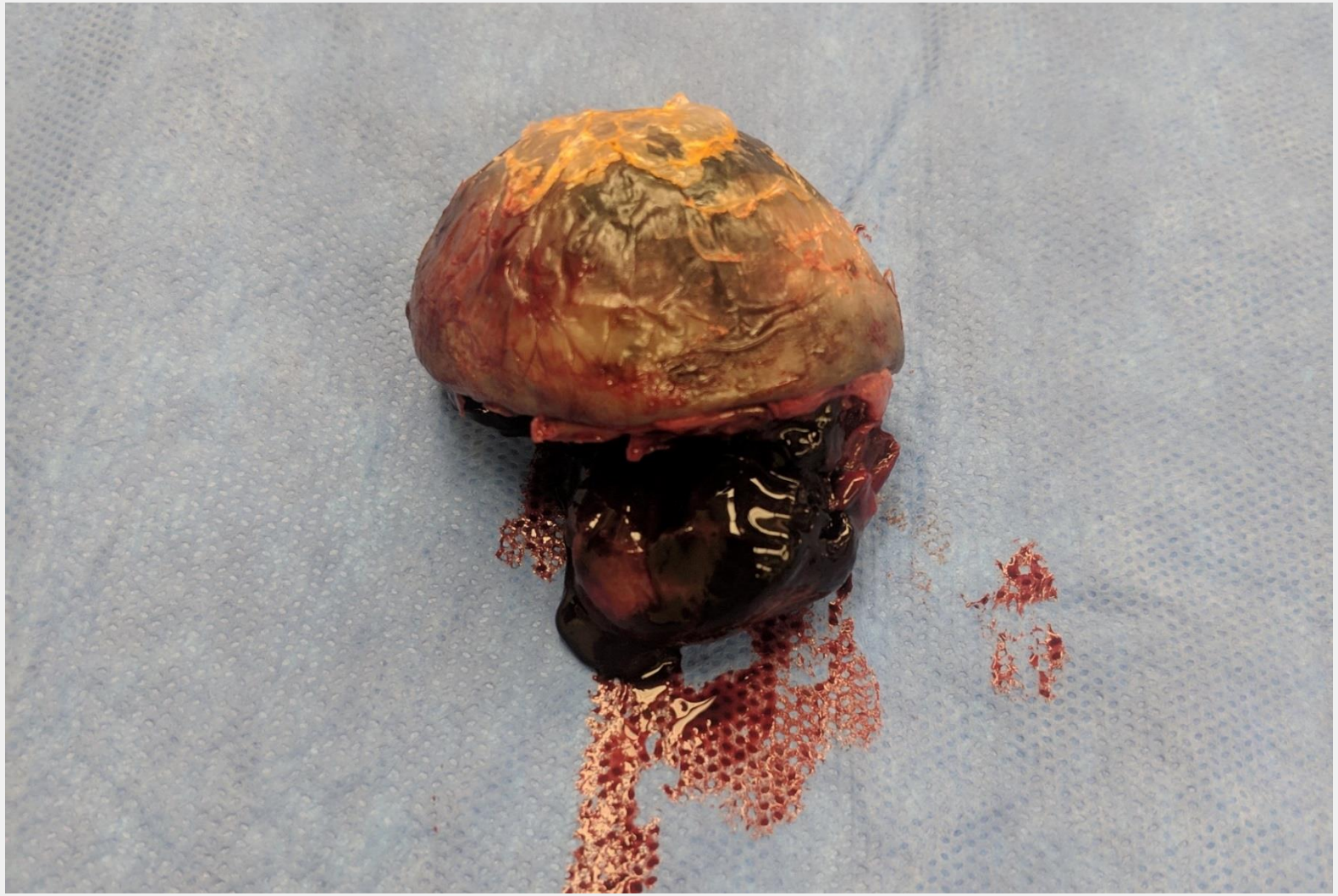














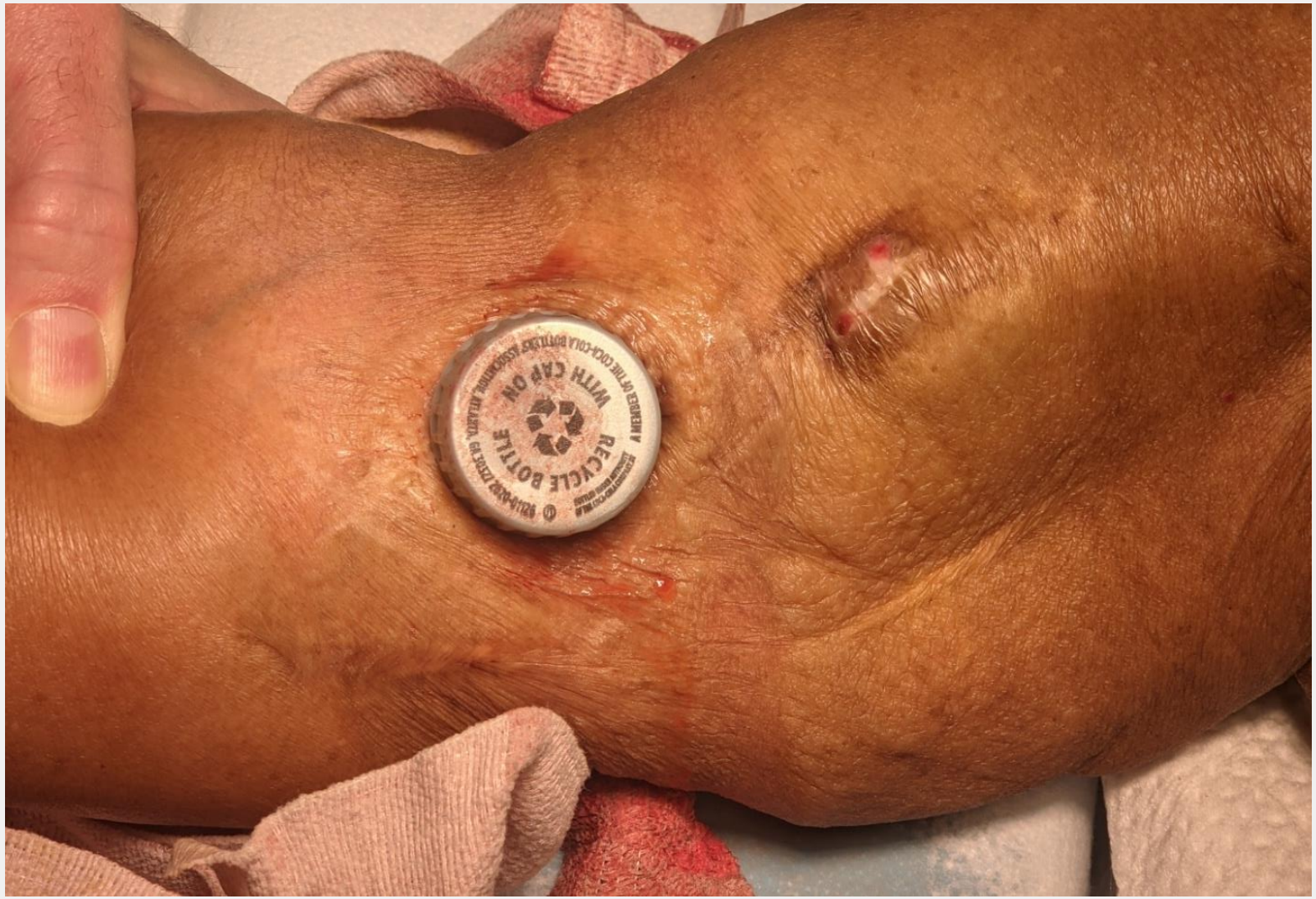




Bottle Caps


DEC 21
A MEMBER OF THE COCA-COLA BOTTLES' ASSOCIATION, ATLANTA, GA 30327 2017-01022

Bottle Cap



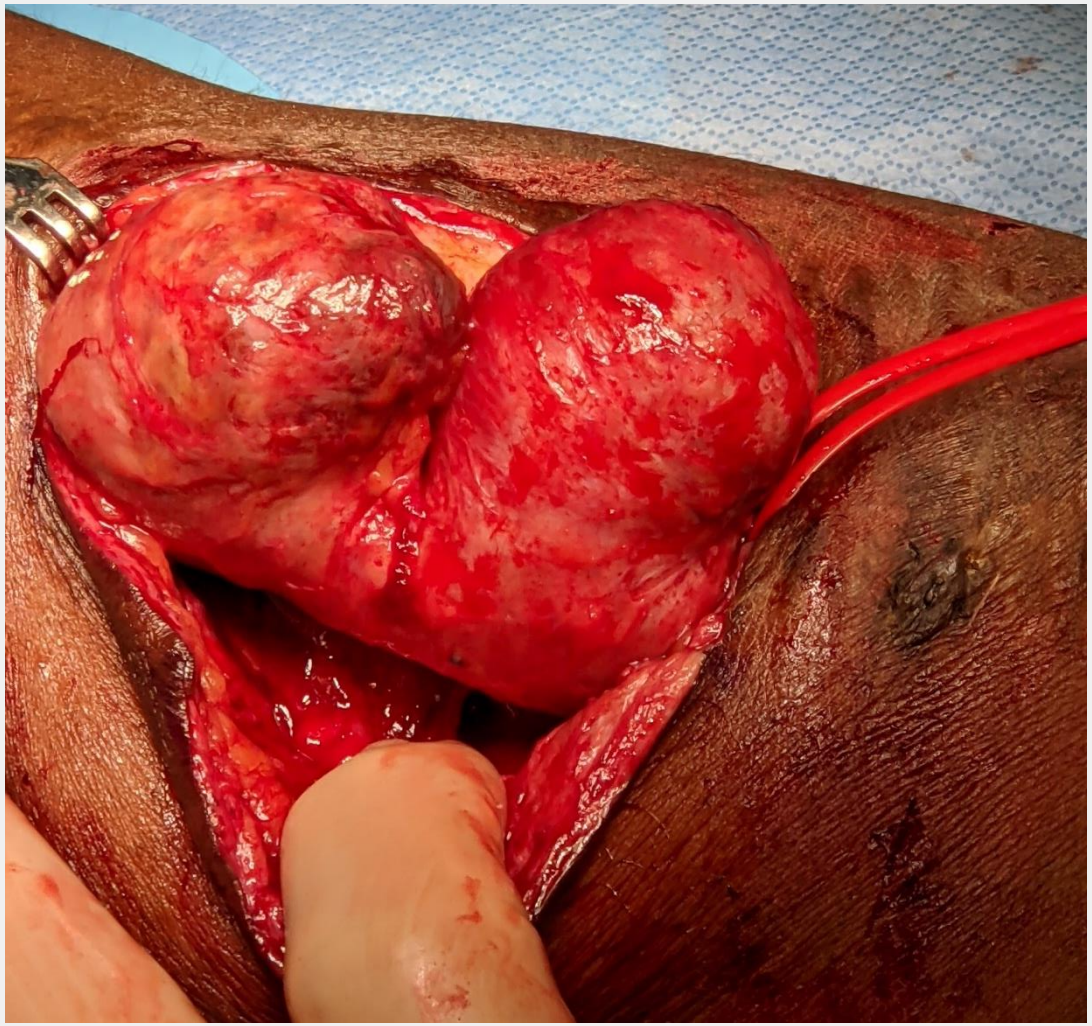
Bottle Cap



How not to use a Bottle Cap

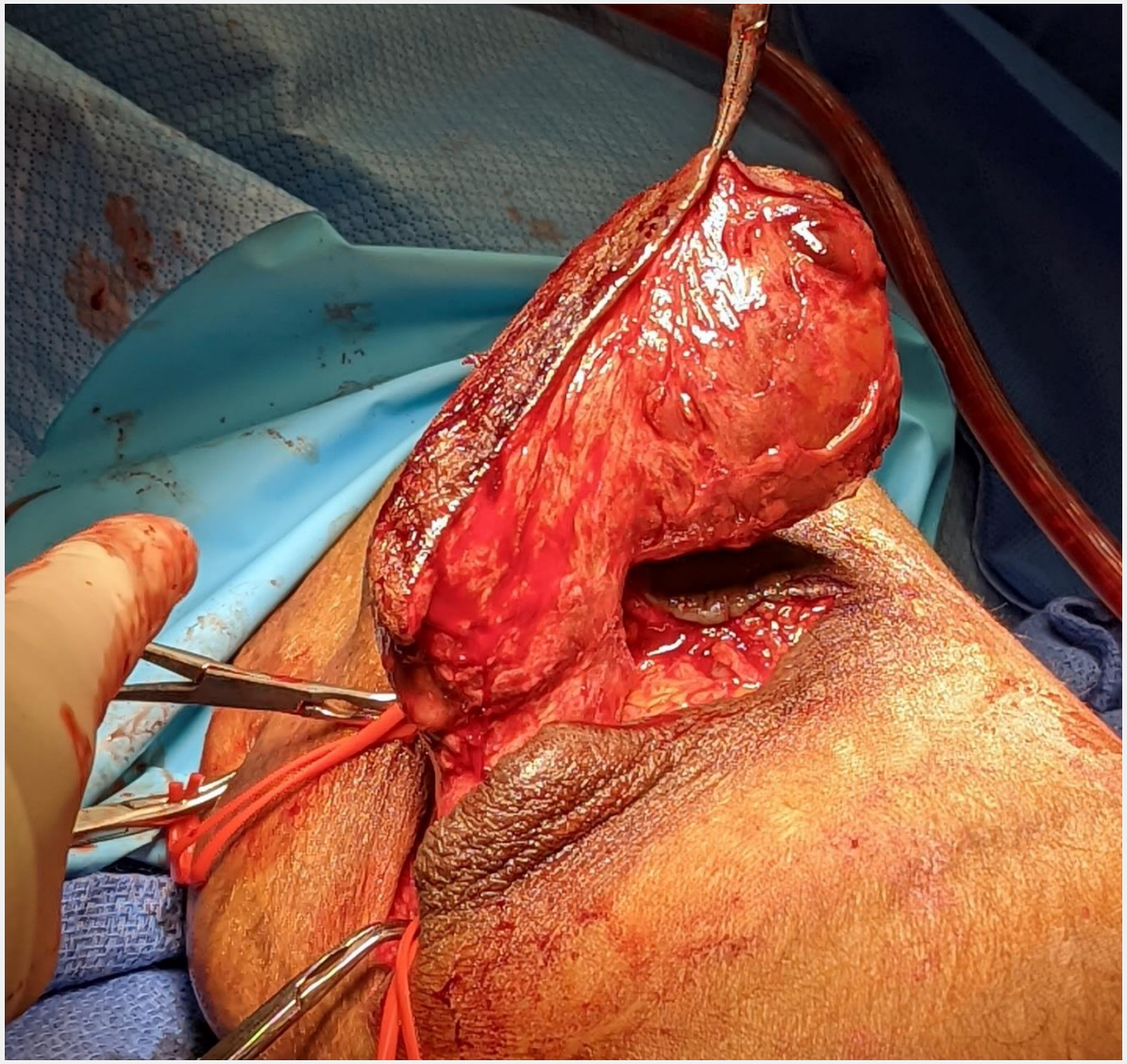


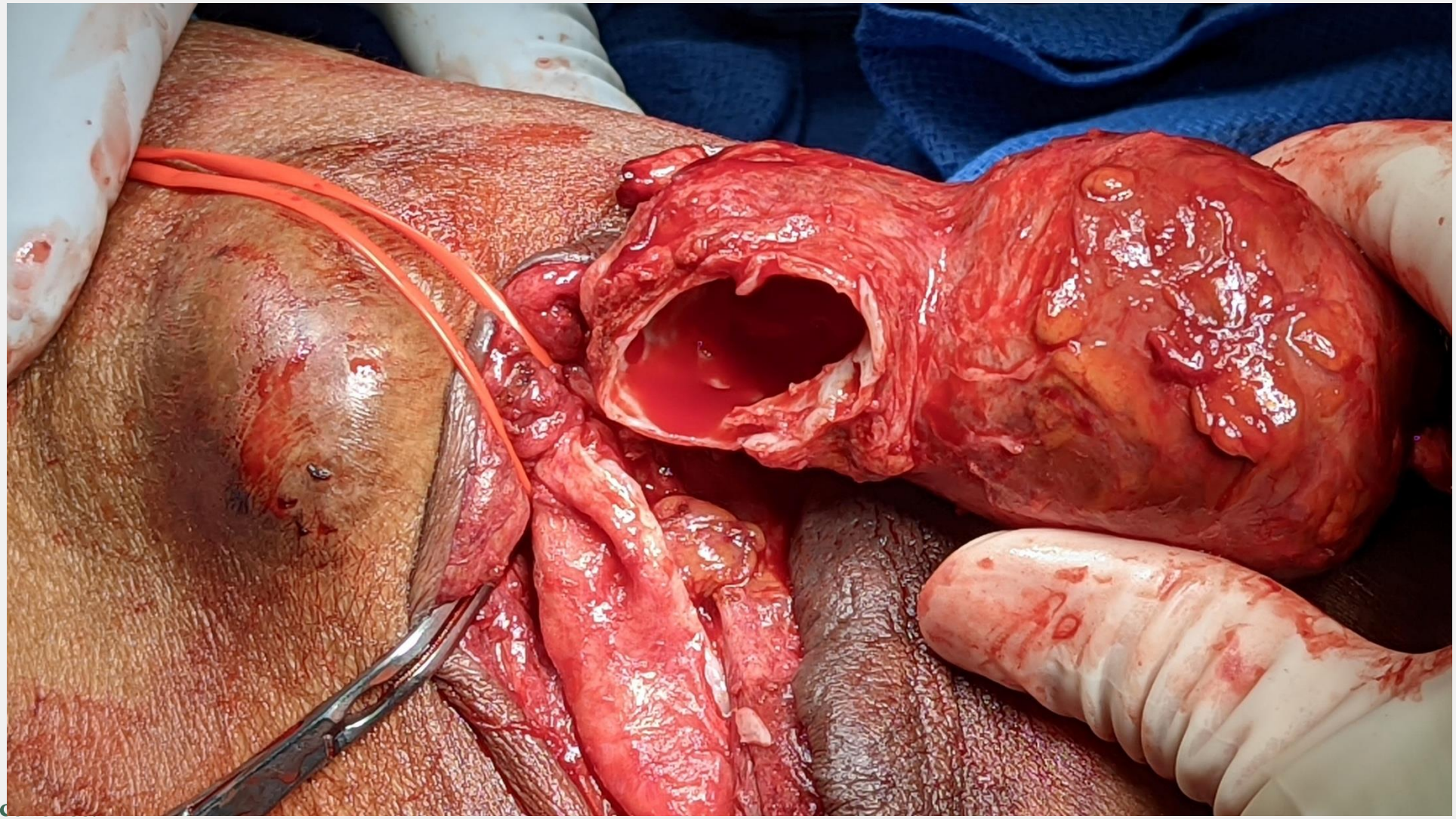
Aneurysm Grow From Needle Sticks



Aneurysm Grow From Needle Sticks



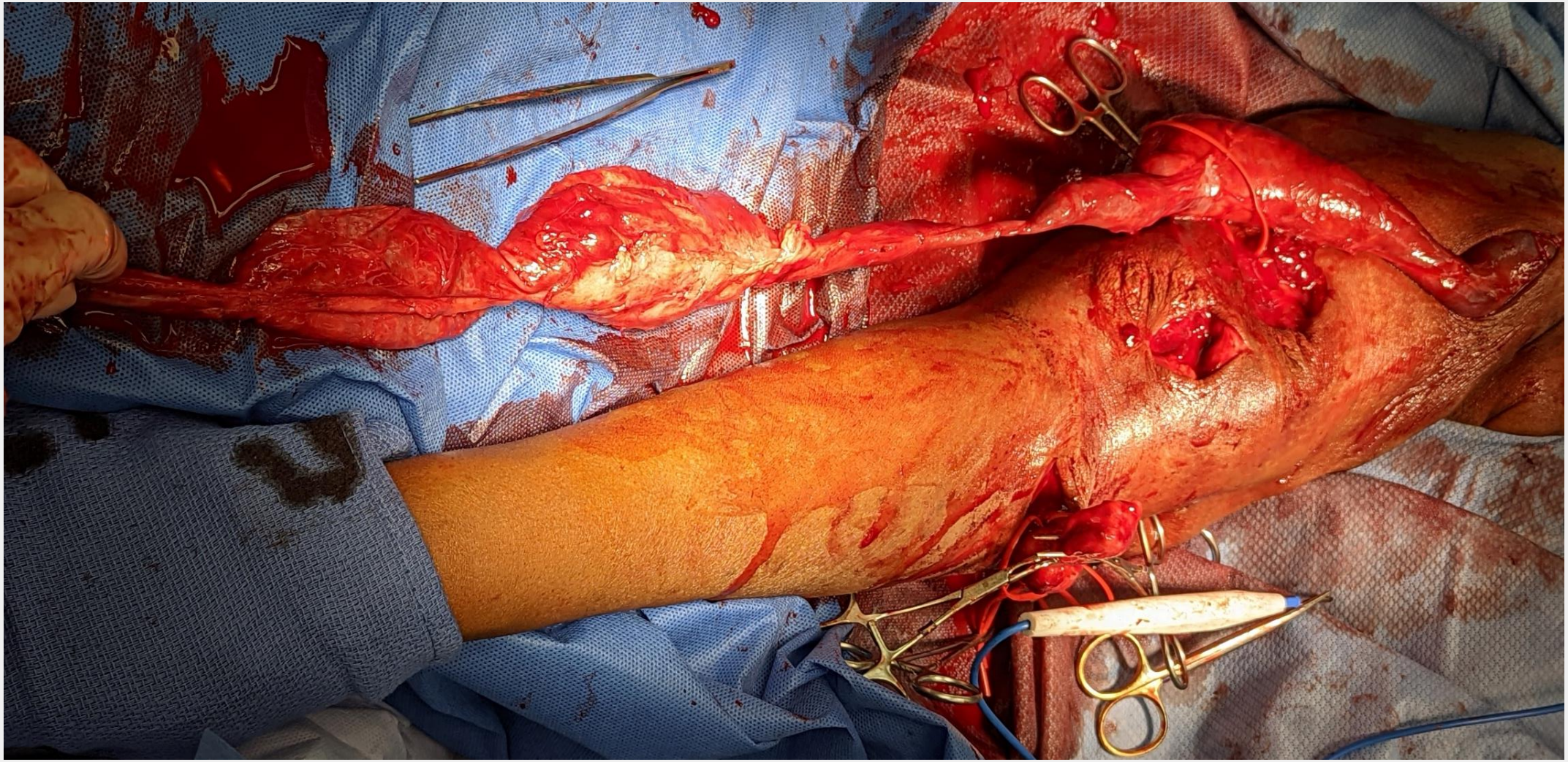






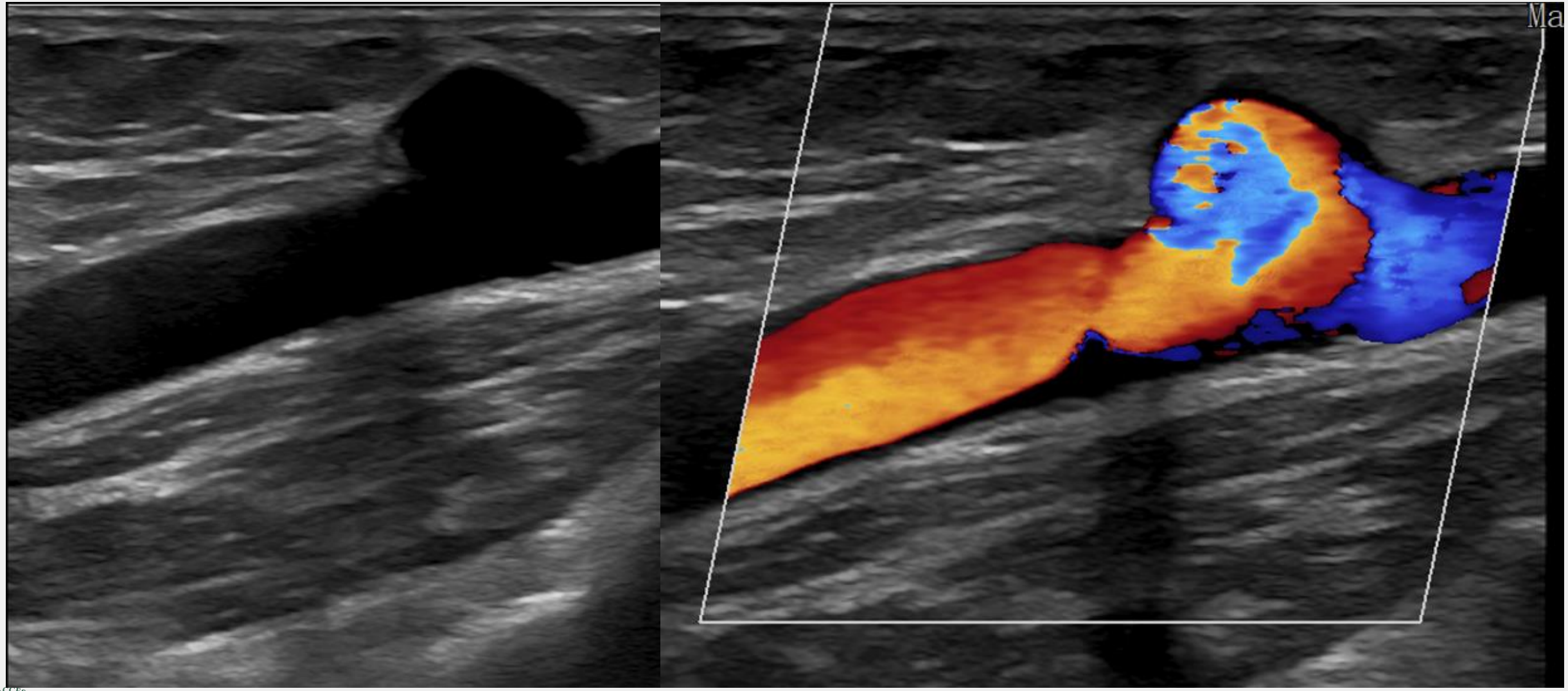




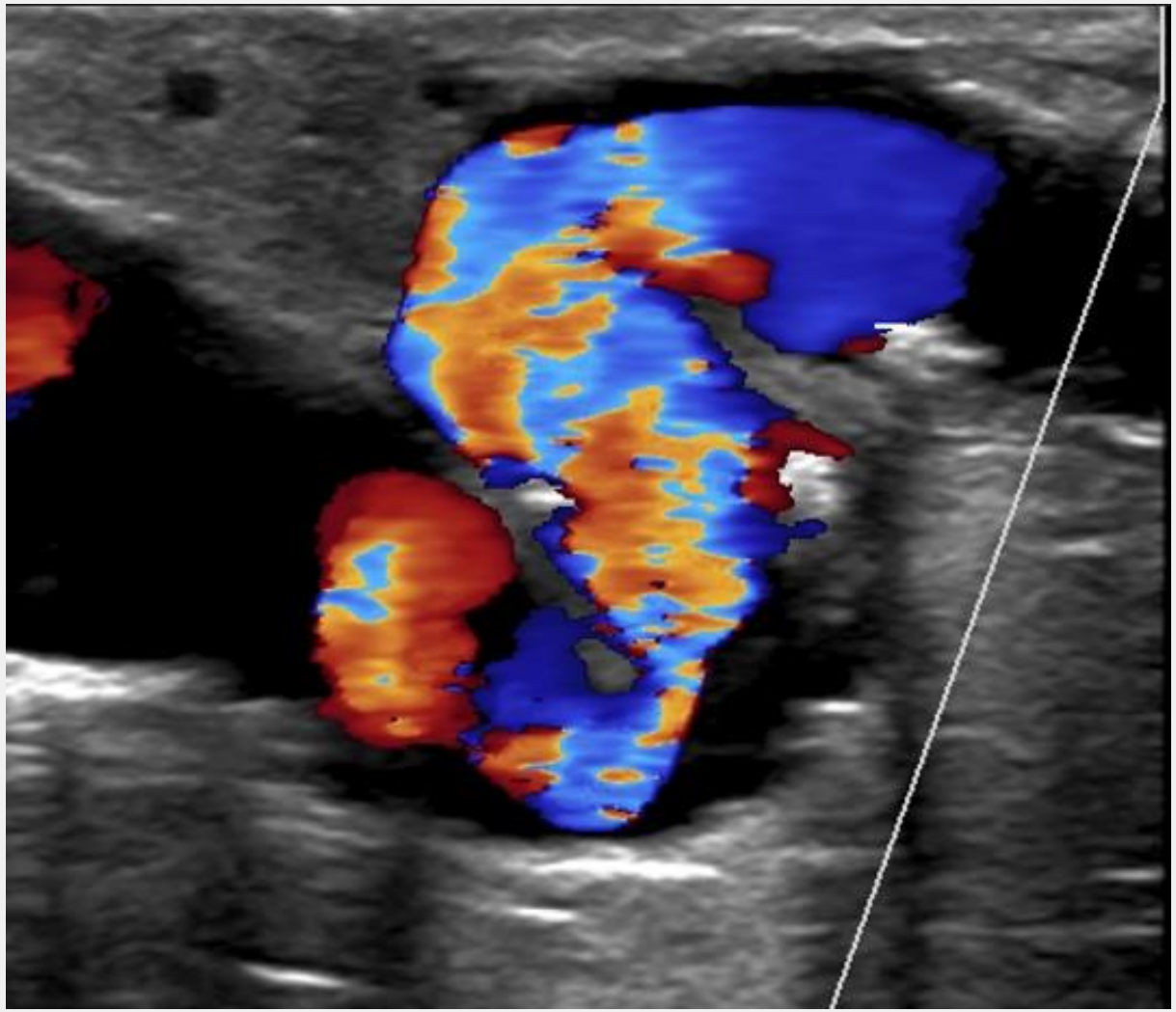


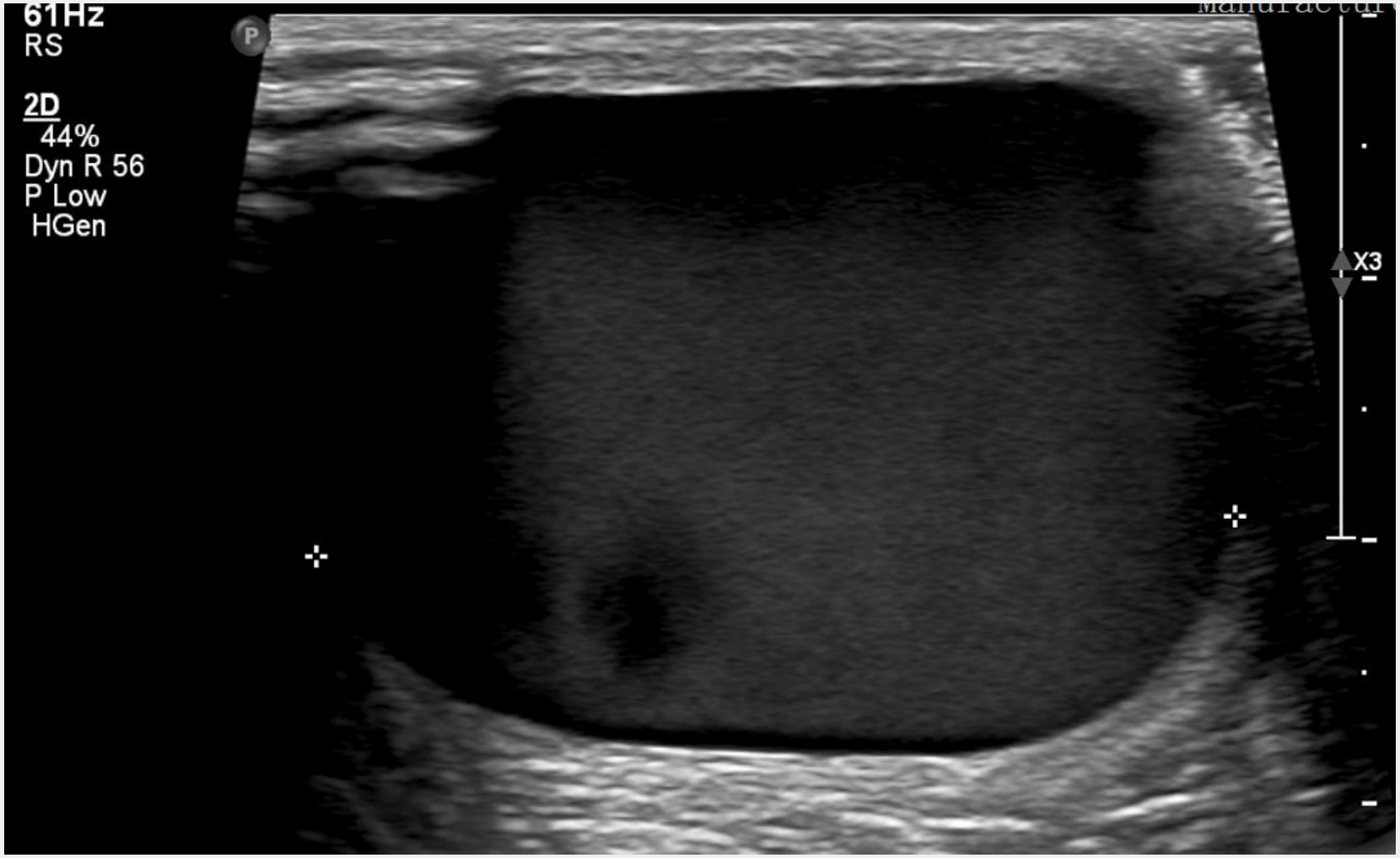


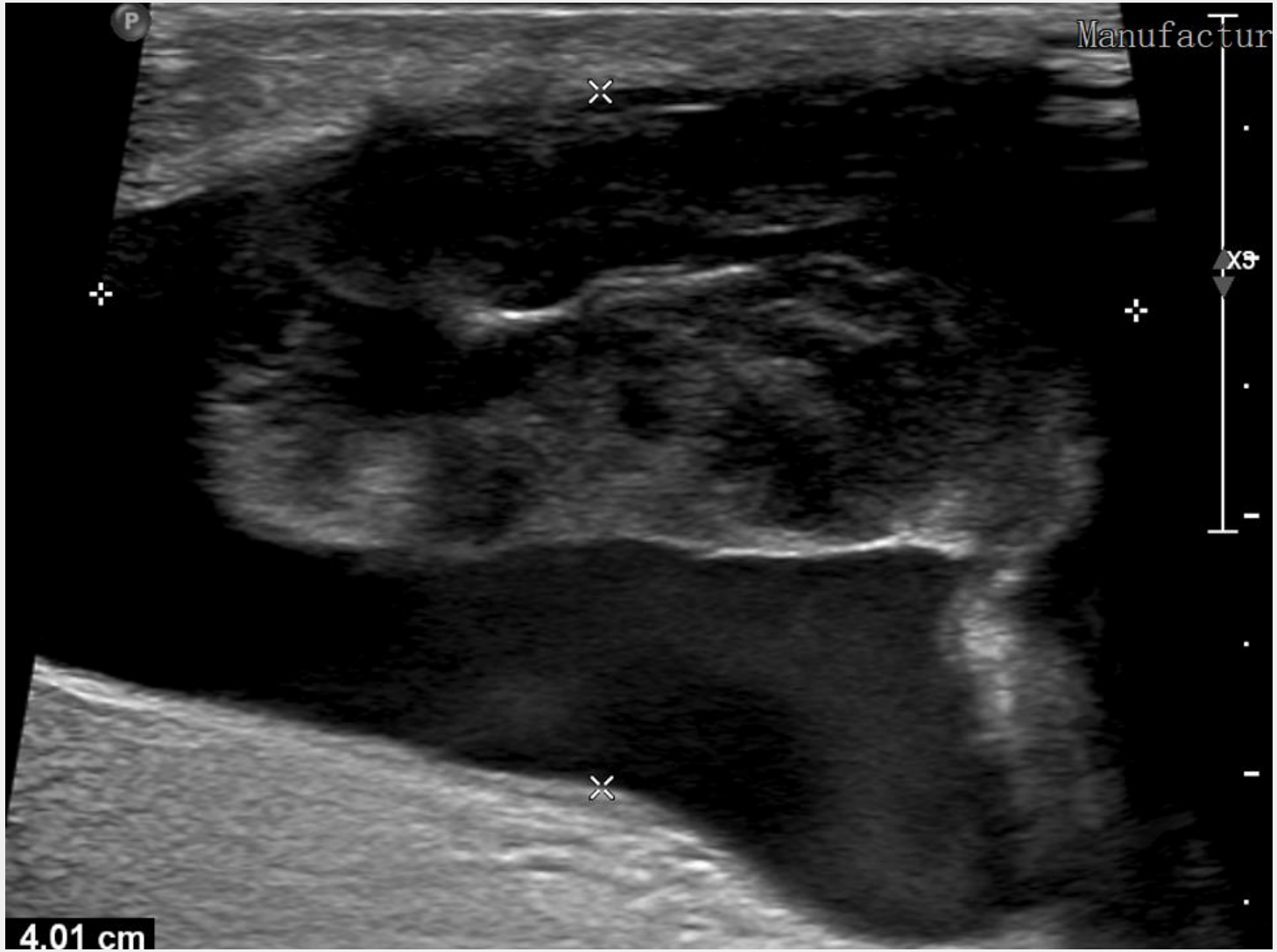
ULTRASOUND

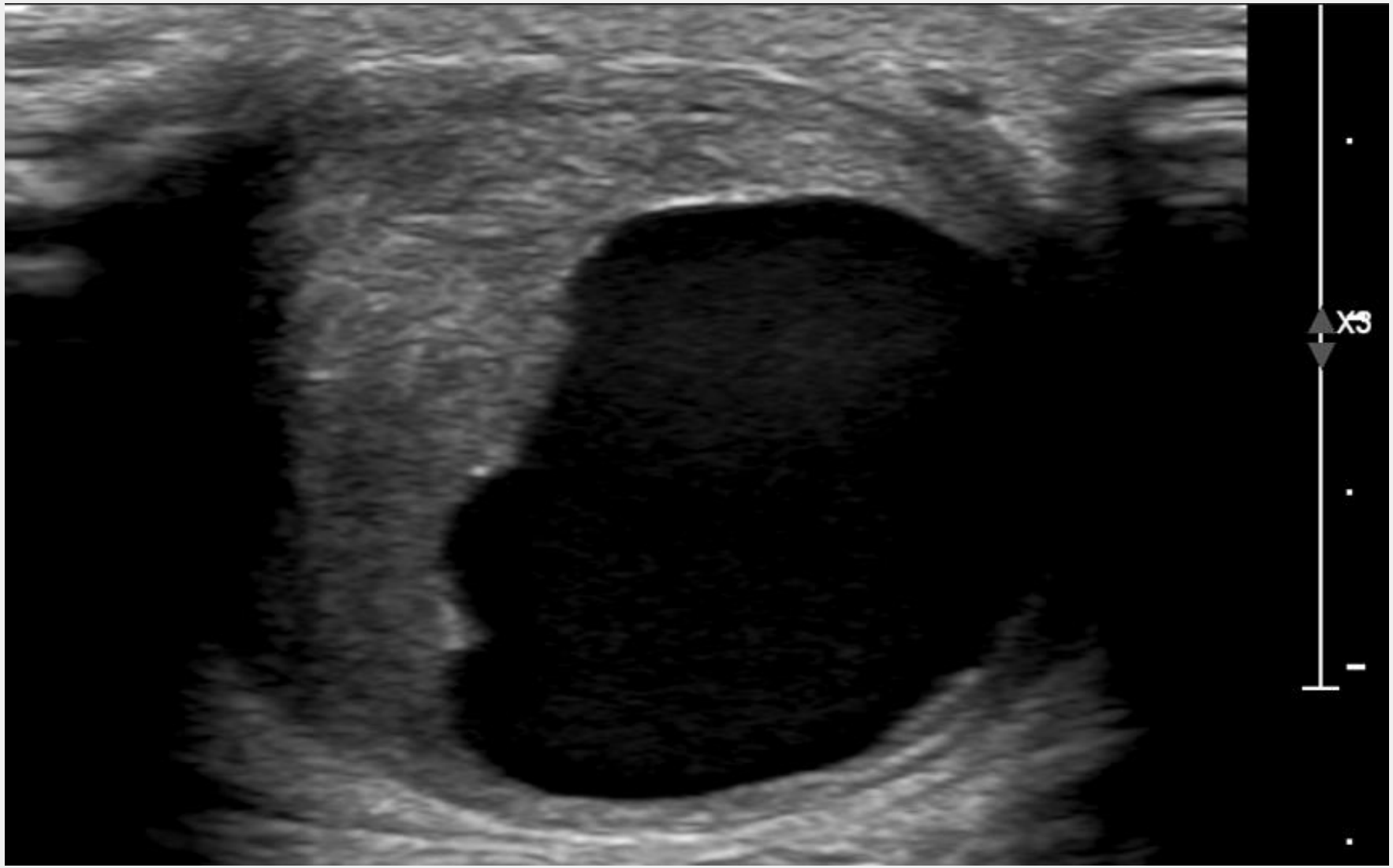

Ma


Manuf




61Hz
RS
2D
44%
Dyn R 56
P Low
HGen
X3


P
Manufactur
X9
4.01 cm

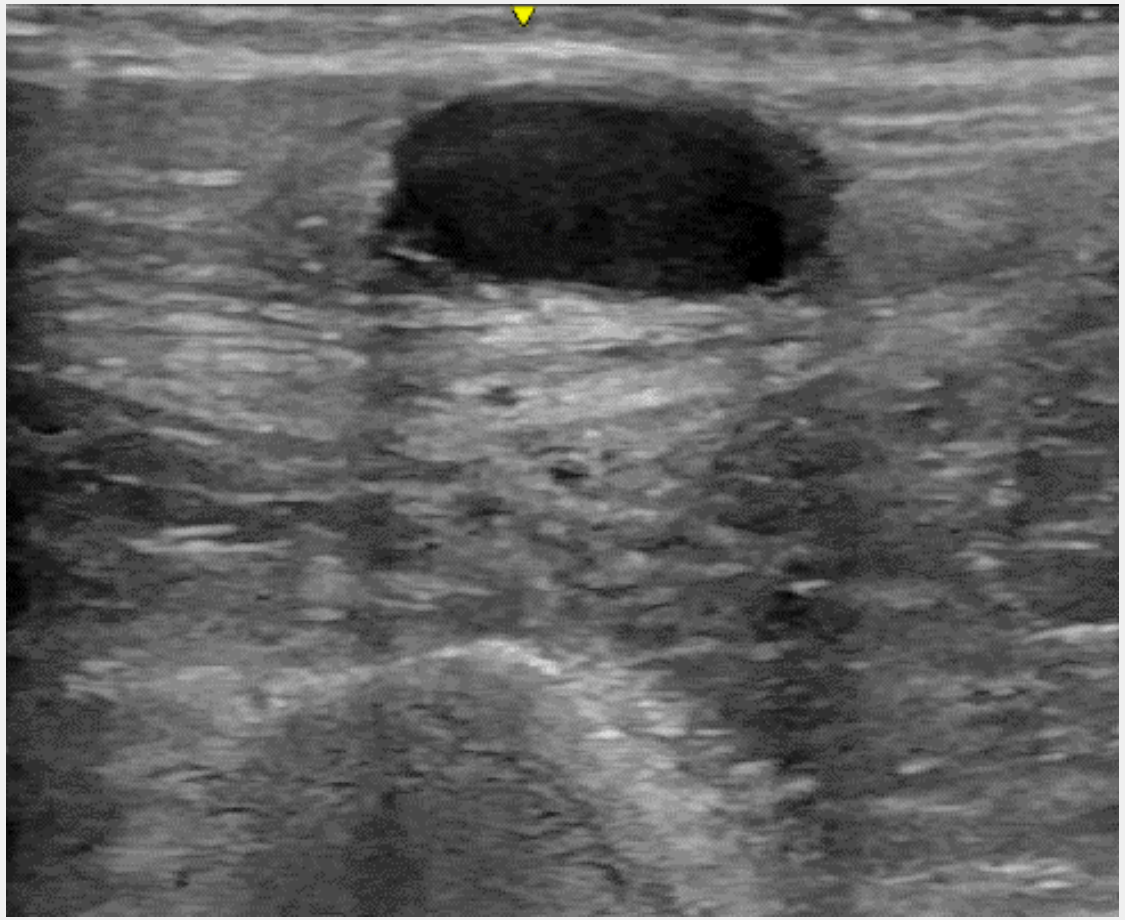

X3


Manufacture
X3



Use of Venous Tourniquet





Peritoneal Dialysis Catheter

The Good Catheter!

John F. Lucas III, MD, FACS
with thanks to Dr. Jack Work

Advantages of PD as the first dialysis modality

- Survival advantage over HD
- Associated with better Quality of Life
- Patient remains in workforce
- More freedom to travel
- Maintains residual renal function
- Less delayed function after renal transplant
- Better long-term allograft function
- Continuous dialysis
- Less expensive to Society
- No needle punctures
- Used as bridge to HD

Davidson el al J.Vascular Access 2007

The making of the Tenckhoff catheter



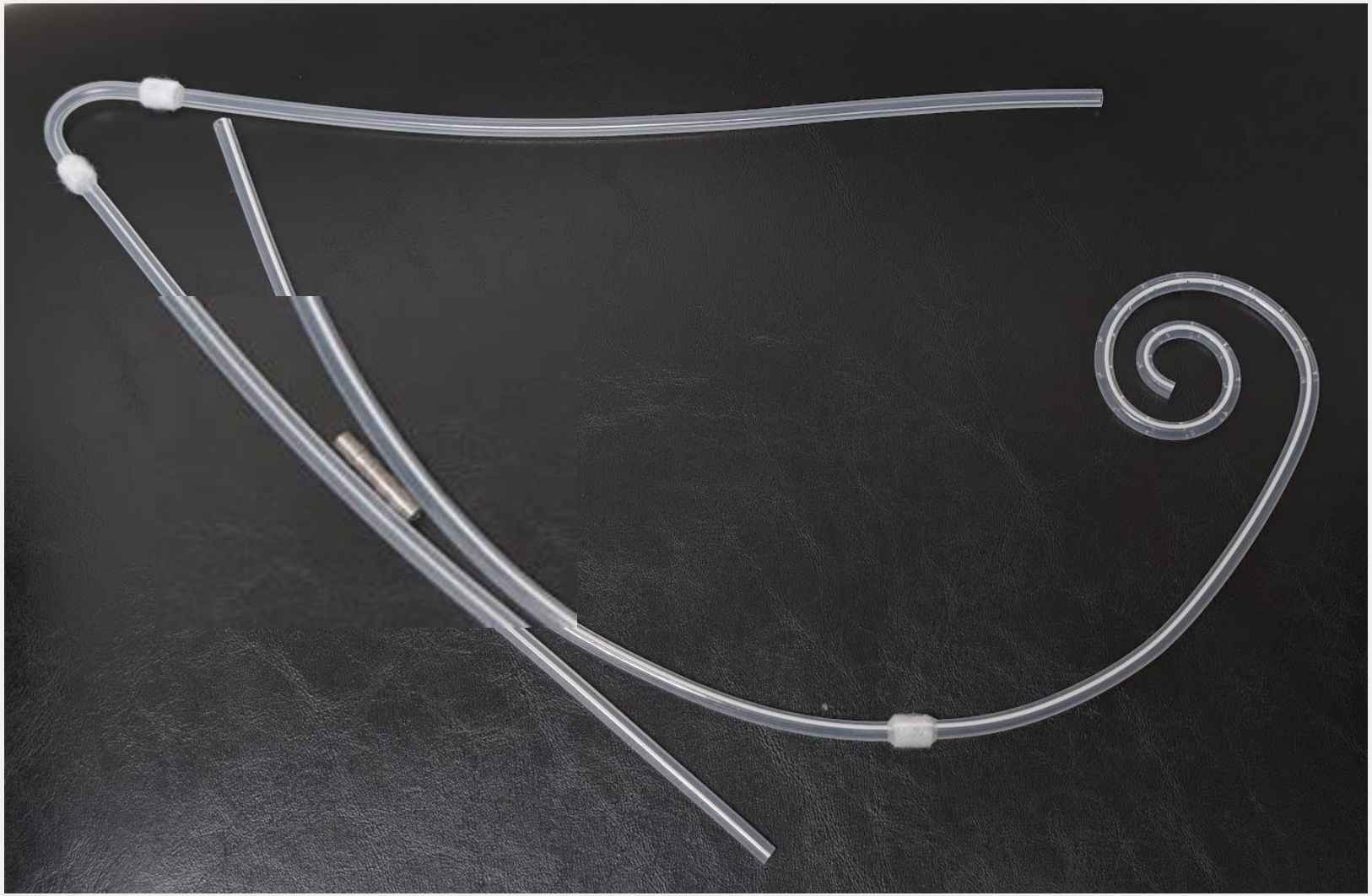
Gutch defined size of side holes and used straight silastic design 1964



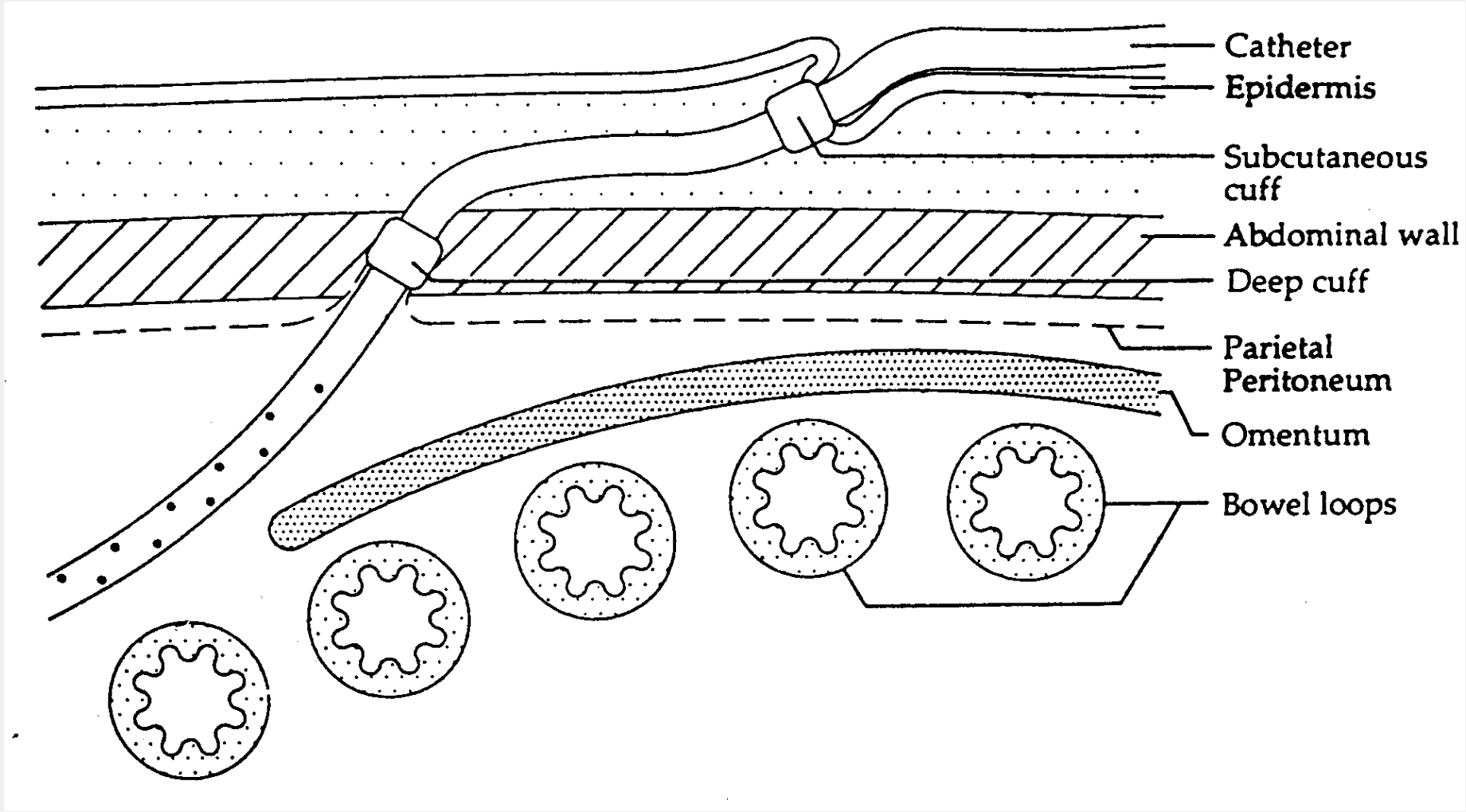
Palmer and Quinton laid the foundations for the basic catheter design and used a long subcutaneous tunnel 1964

McDonald also introduced a Dacron sleeve to his straight silastic catheter in 1968

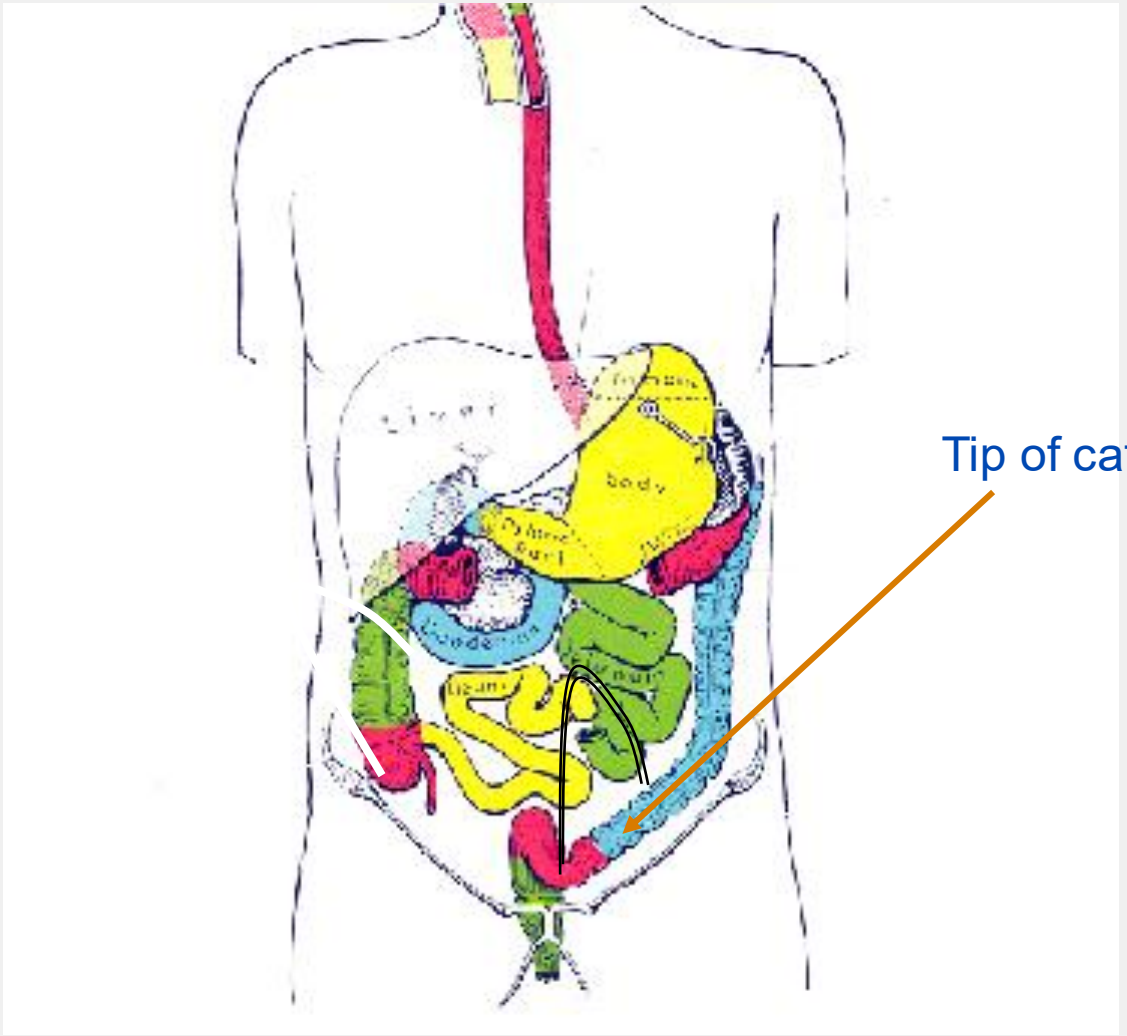
PD Catheter with Extension



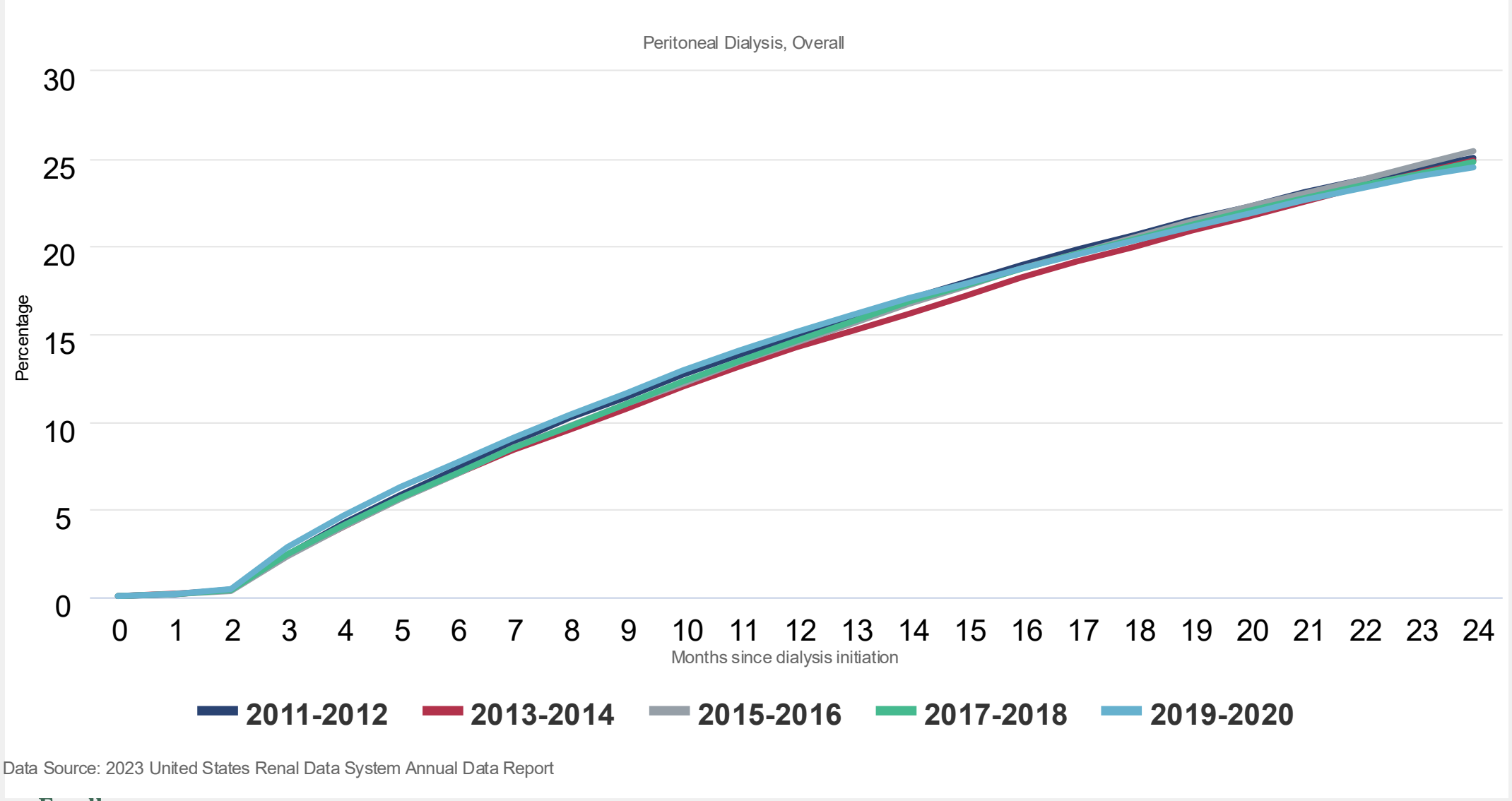
Optimal PD catheter placement



Primary placement sites



Conversion from Home to In-Center for PD

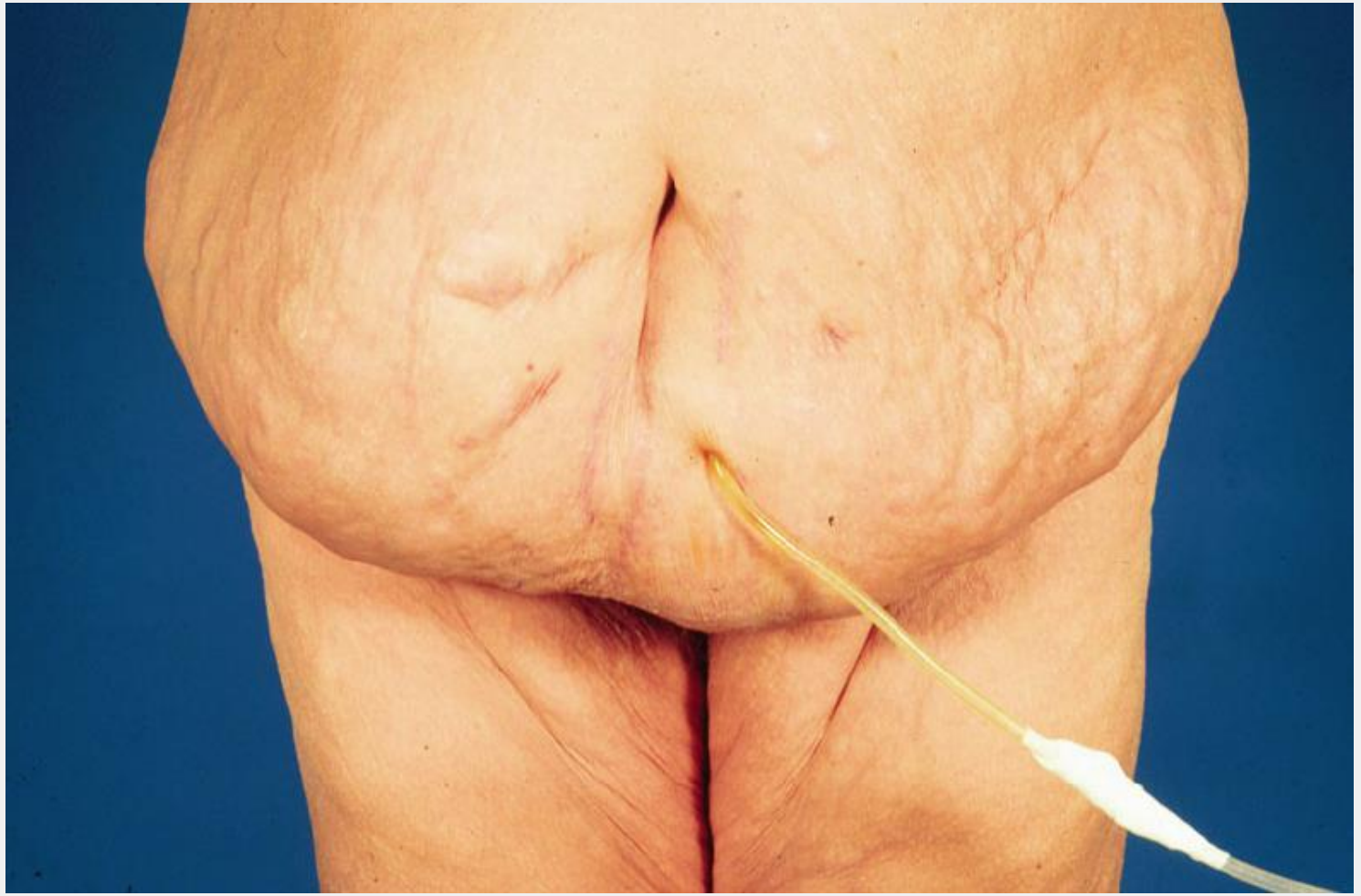


Data Source: 2023 United States Renal Data System Annual Data Report

Preoperative Management

- Evaluate for hernias, diastasis
- Assess patient for dexterity, vision, handedness, strength, motor skills
- Determine exit site position with patient sitting
- Avoid scars, beltline, skin folds, pressure points
- Prophylactic antibiotics

PD catheter in obese patient



PD Catheter Implantation

- Double cuffed catheters are better
- Paramedian implantation
- Deep cuff should be placed in abdominal wall muscle
- Subcutaneous cuff - 1 to 2 cm from skin
- Exit site to fit catheter diameter
- Exit should face downwards or laterally
- Intra-abdominal portion of catheter (pouch of Douglas)

Postoperative care

- Sterile gauze and tape not bio-occlusive dressing
- Hide catheter under the dressing and keep it dry
- Notify Home Training Unit from Recovery Room

Post Insertion Management

- Immediate use
- Small volumes (≤ 1L)
- Dry days
- Heparin optional
- Break-in period without use for at least 2 weeks

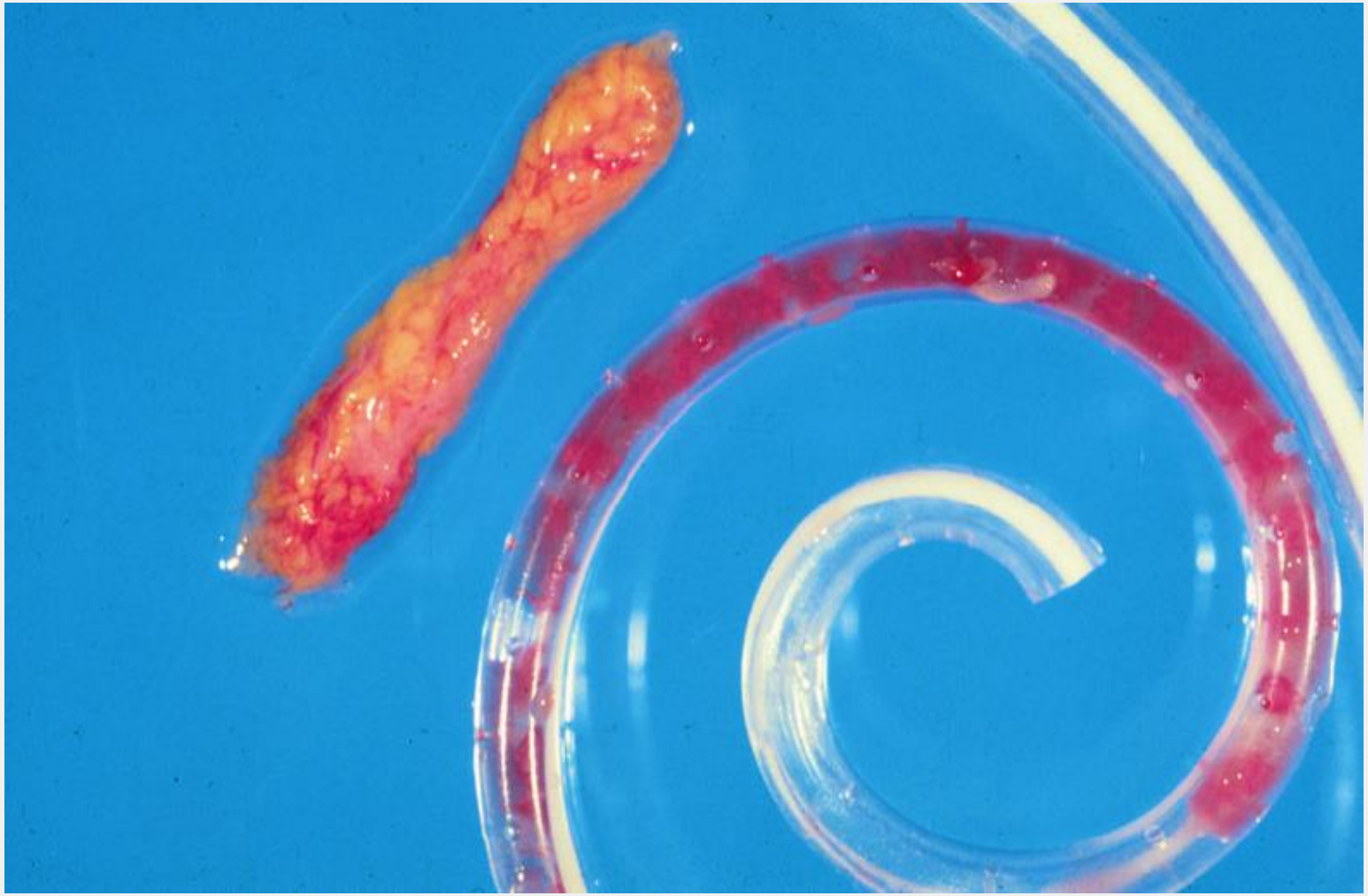
Complications of Peritoneal Dialysis Catheters

- Inadequate placement
- Pain
- Bleeding
- Perforations
- Leaks
- Hernia
- Infections

Peritoneal Catheter Malfunction

- Migration is not necessarily associated with malfunction
- Most common types
  - One-way obstruction
    - Omental wrapping
    - Malposition
    - Accordion clot (reversed one-way obstruction)
  - Total obstruction
    - Kinking of the catheter
    - Internal obstruction from clots (blood, fibrin, cryoglobulin, others)

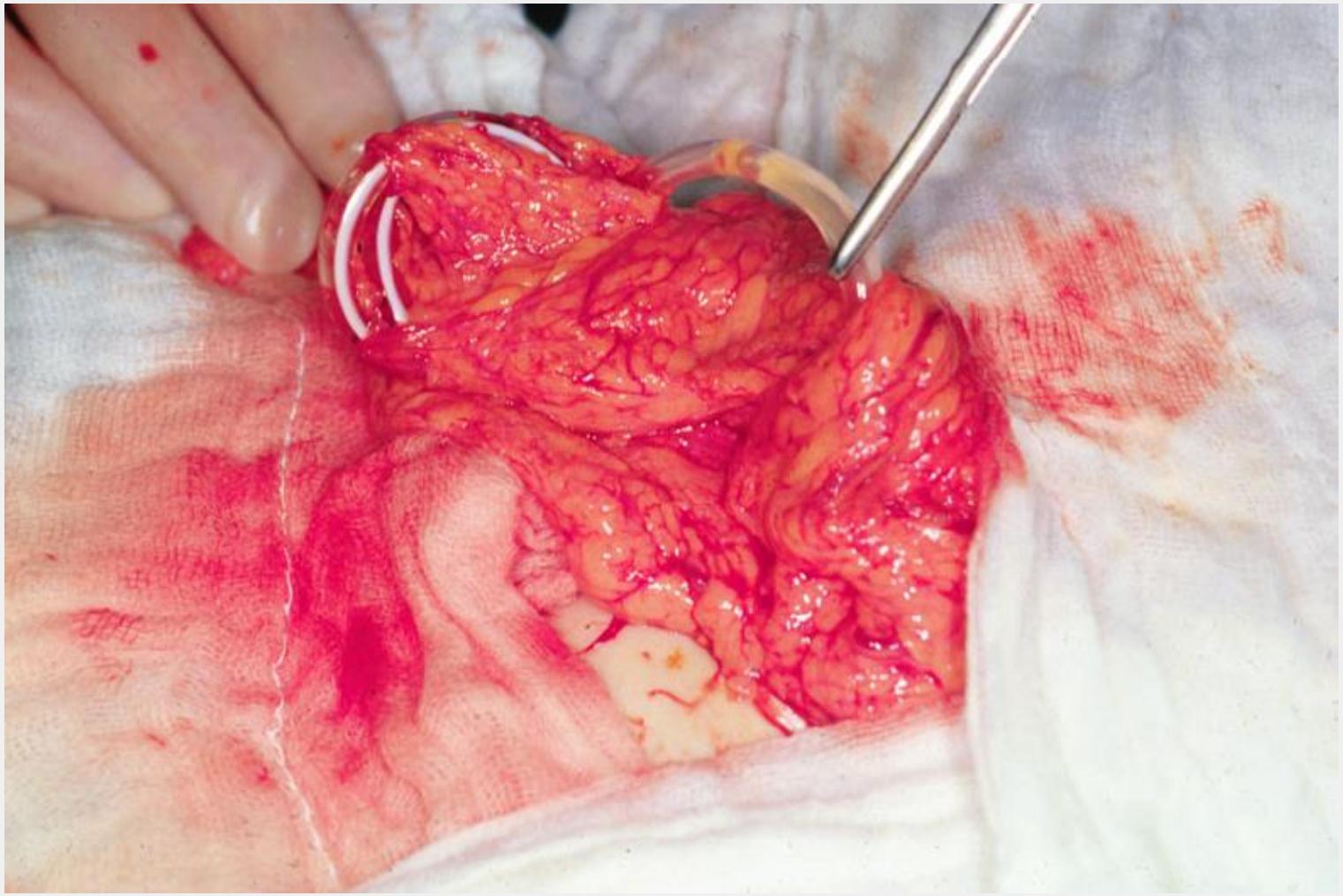
Total obstruction from clots



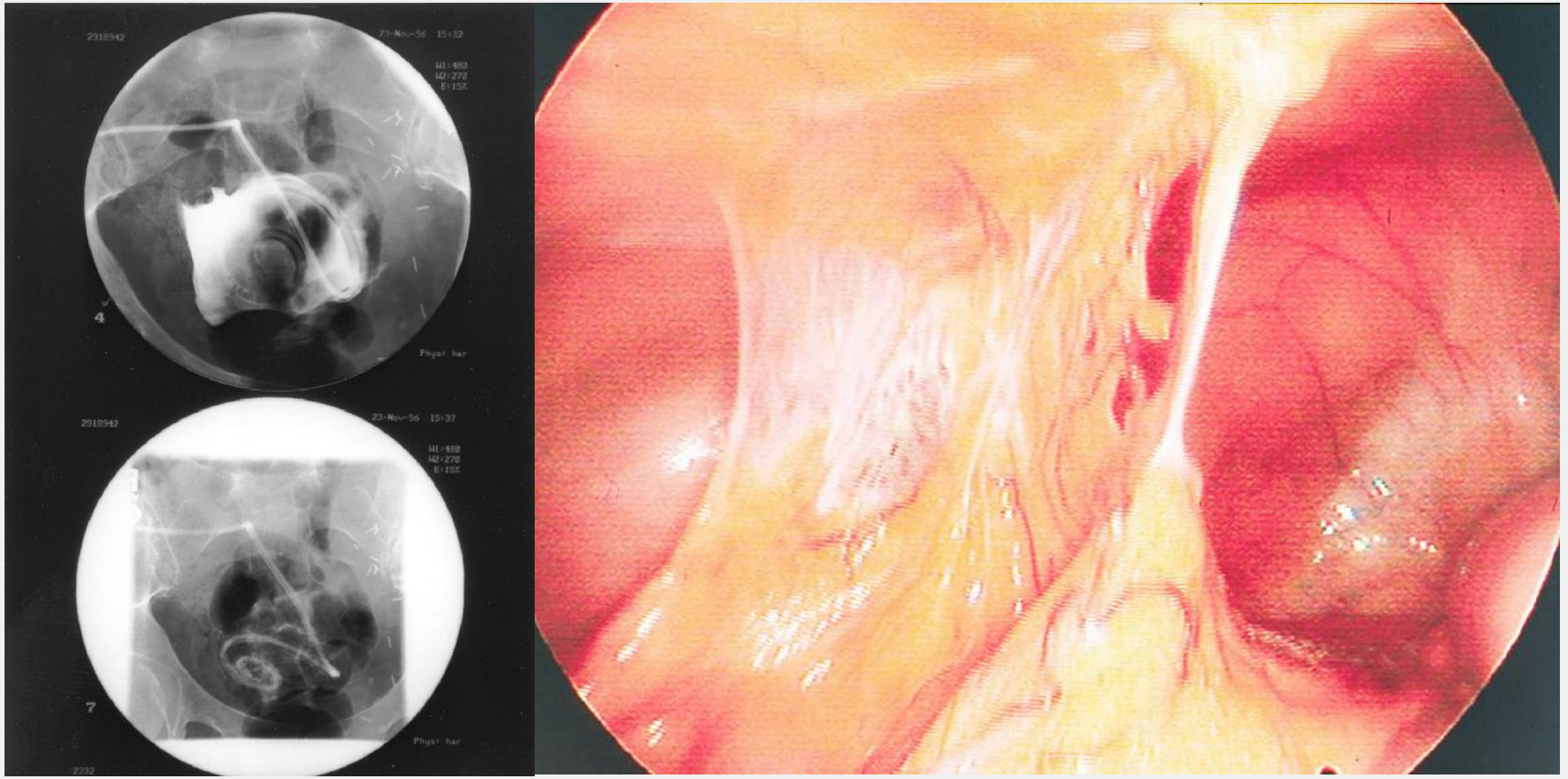
Peritoneal catheter malfunction-Therapy

- Observation
- Exercise
- Heparin infusion
- Enemas
- Urokinase/streptokinase, TPA irrigation
- Wire manipulation
  - Under fluoroscopy
  - Blindly
- Laparoscopy
- Surgical manipulation
- Replacement

Obstruction from omental wrapping

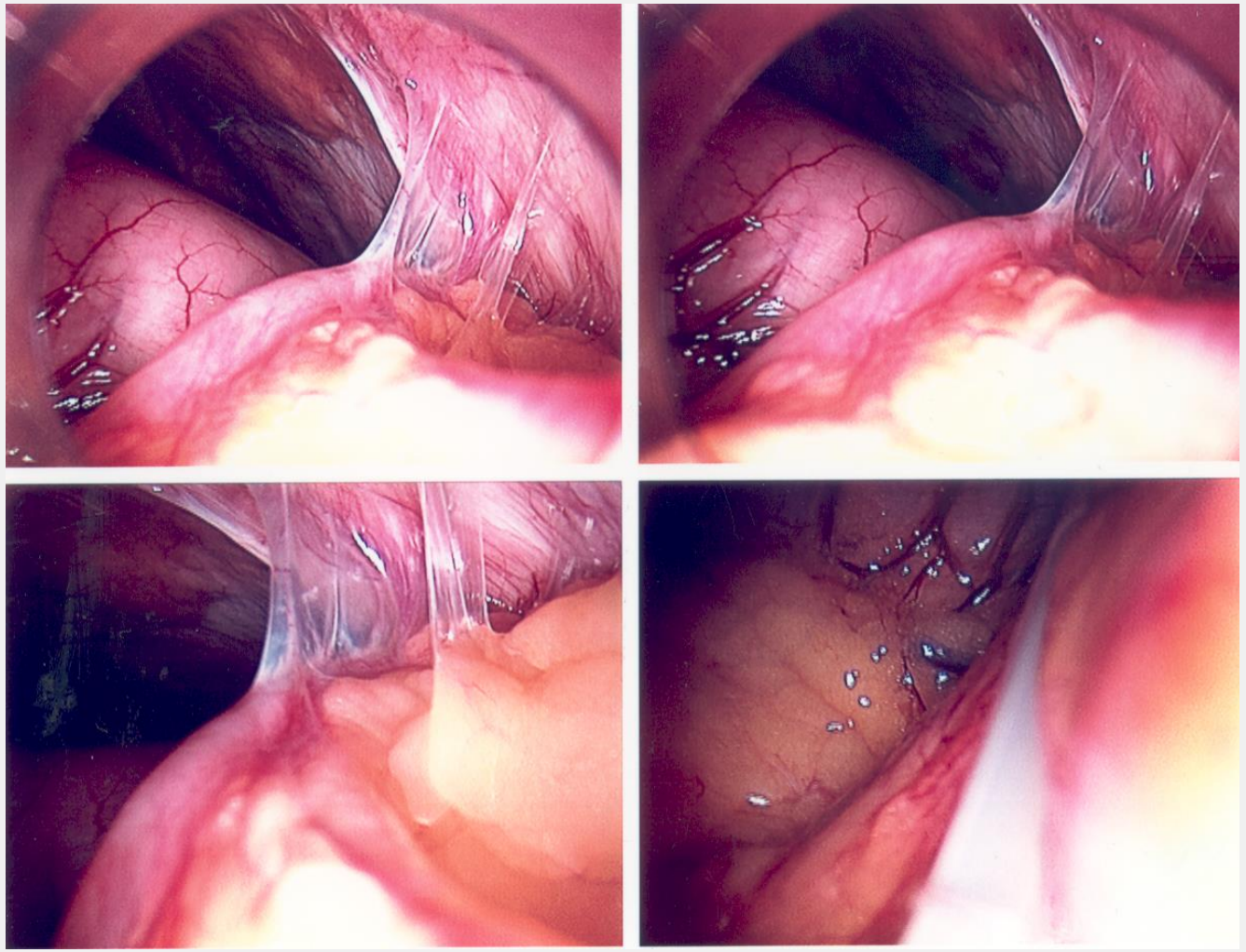


Compartmentalization



Diaz-Buxo JA. *Perit Dial Int* 17:209-210, 1997 Photomicrograph courtesy of JH Crabtree

Adhesions



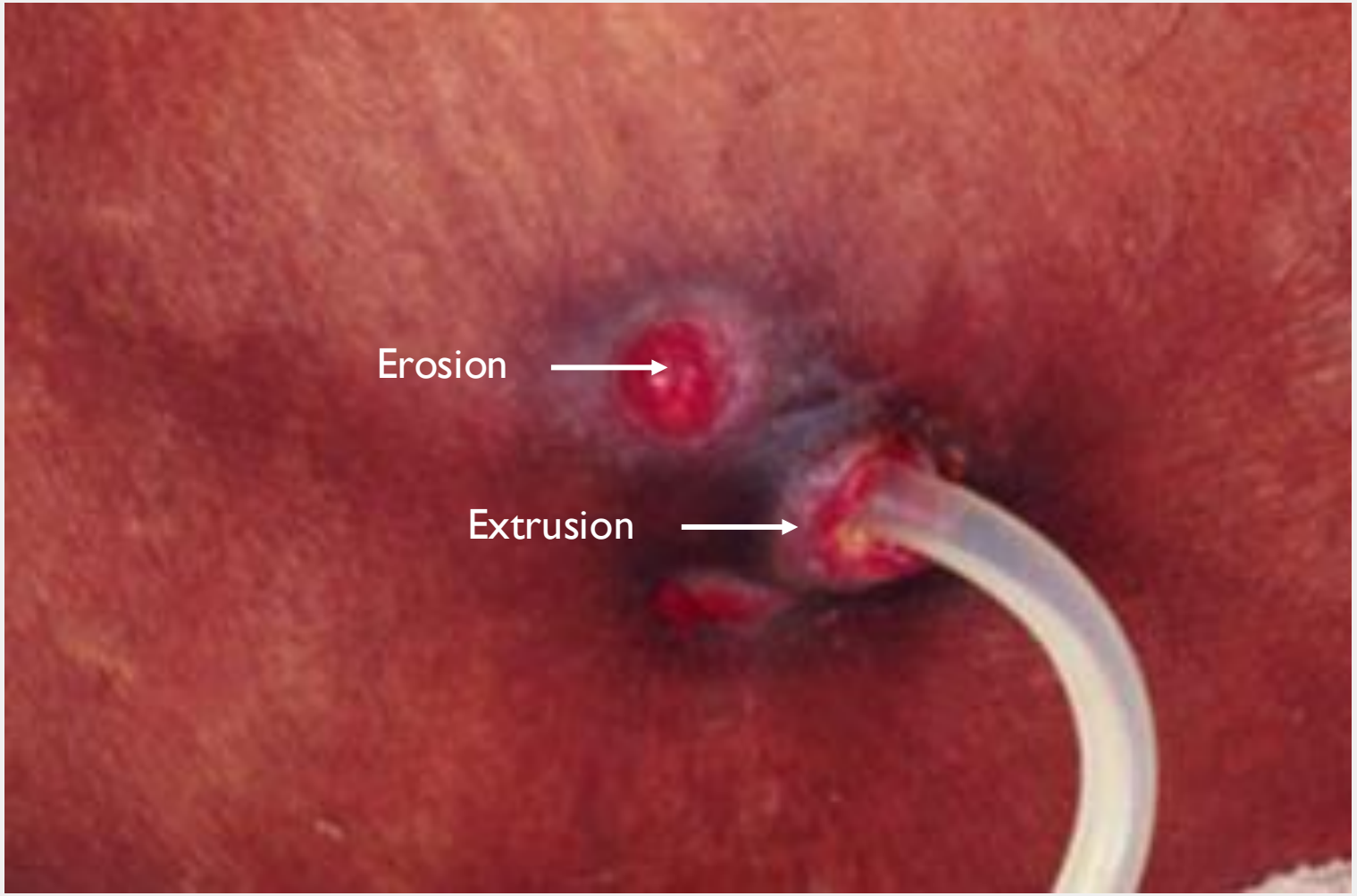
Leaks

- External
- Internal
  - Pre-peritoneal
  - Pleuroperitoneal (hydrothorax)
    - Traumatic
    - Congenital
  - Scrotal/labial (patent processus vaginalis)

Diagnosis of exit site infections and erosions

- Visual inspection
  - purulence,
  - drainage and
  - discoloration,
  - erosions,
  - extrusion of cuff
- Palpate cuff and tunnel for warmness, tenderness, mass and fluctuance
- Confirm presence of subcutaneous abscess with ultrasound

Catheter erosions and cuff extrusions



Treatment of exit site and tunnel infections

- Immediate Gram stain, culture and sensitivities on peri-exit smear
- Initiate empiric antibiotics
- Adjust antibiotics based on sensitivities
- Continue therapy until completely healed or a minimum of 2 weeks
- Cauterize or remove exuberant granulation tissue

Treatment of exit site and tunnel infections

- Cuff shaving
  - Complete removal of the superficial cuff when antibiotics do not resolve an infection
  - Peritonitis with the same organism in patients who undergo cuff shaving for S. aureus; may result in eventual removal of the catheter
- Topical Treatment
  - May be used in addition to systemic antibiotics in treatment of exit infections or initial therapy for low grade infection (equivocal).
  - Topical antibiotic therapy only not appropriate for exit infections

Conclusion

- Peritoneal Dialysis
  - Better for most patients
  - AVF for backup placed before dialysis initiated
  - Most drainage problems can be resolved
  - Foreign body – infections
- Arteriovenous fistulas
  - Need proper cannulation
  - Revaluate for new areas of cannulation
  - Refer to surgeon early when skin problems develop
- Hemodialysis catheters
  - Short term solution