Managing Complication (HOW?) How to fix PD Catheter Mechanical Complications

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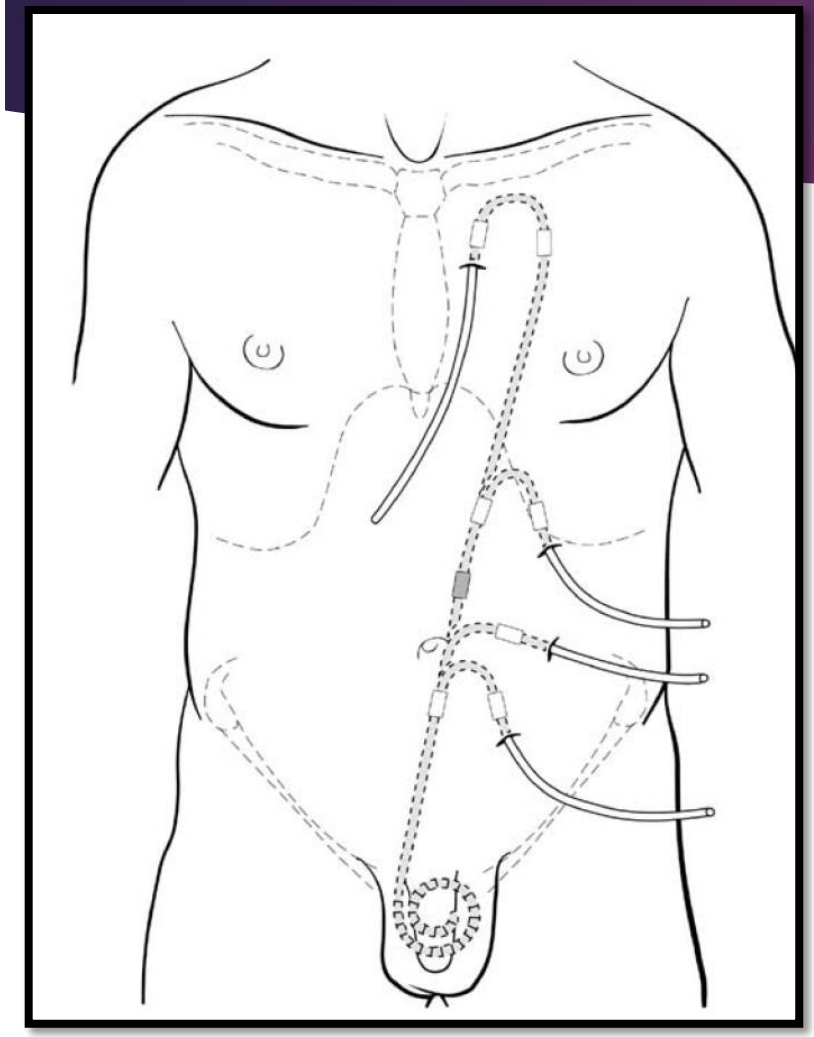
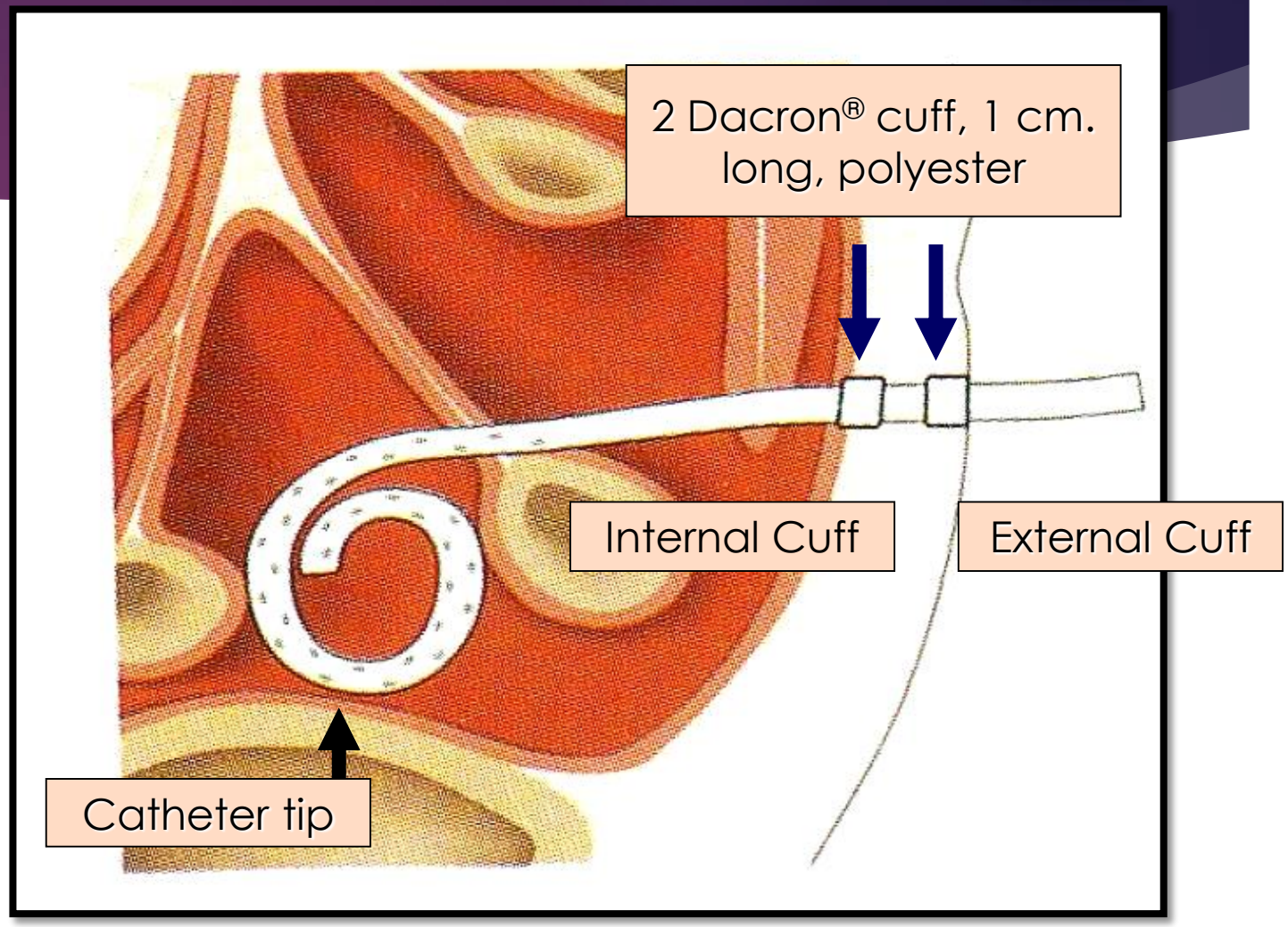
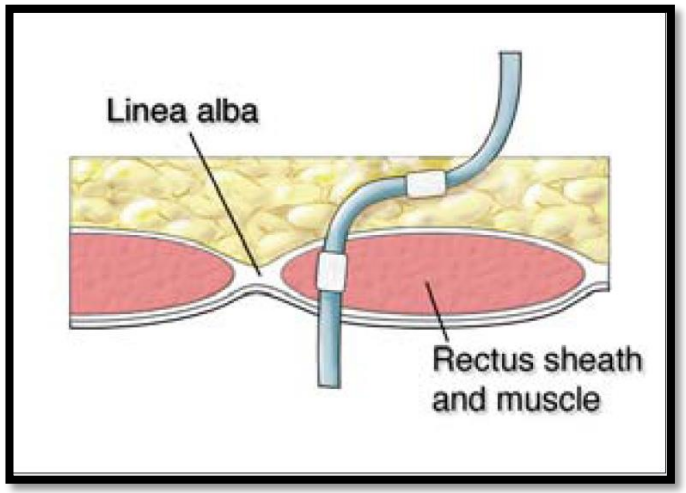
Where to create an access for PD?





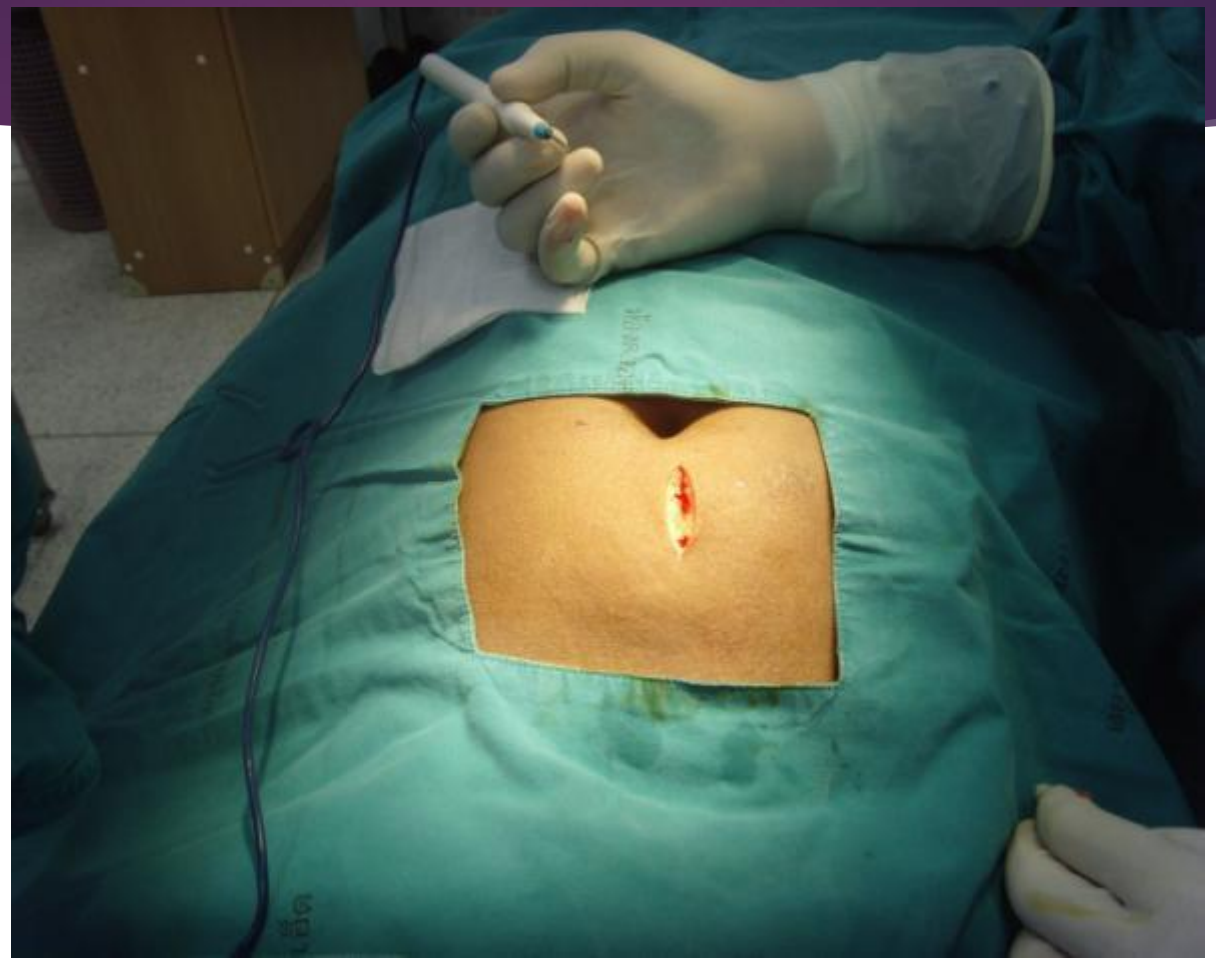
Location of Deep Cuff

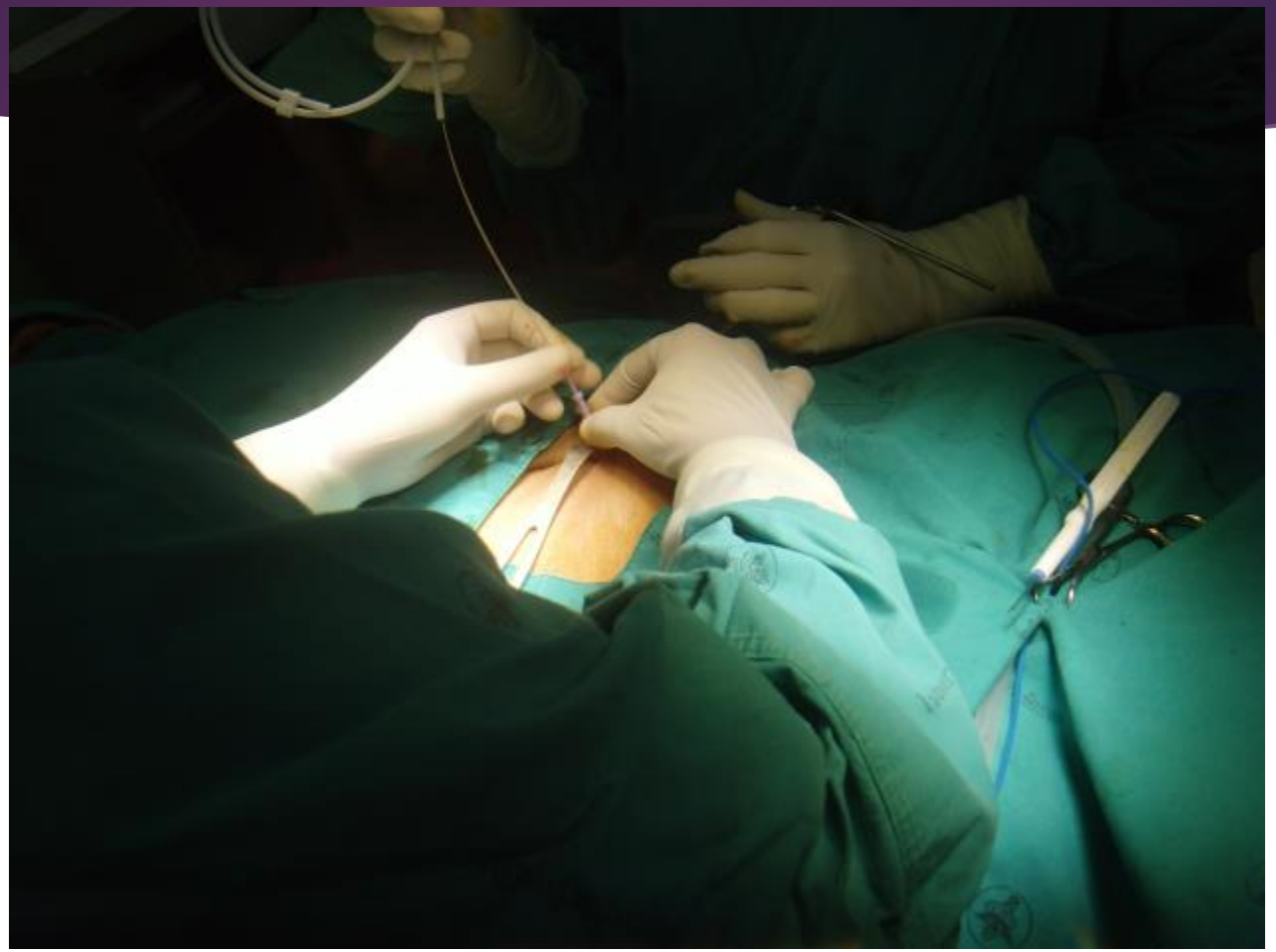
- The catheter enters the **peritoneal** cavity just distal to the deep cuff.
- Deep cuff should be located at a place that allows the tip of the catheter to be in the deep pelvis.
- Paramedian – this ensures that the catheter is not going through but linea alba (increases risk for leaks)

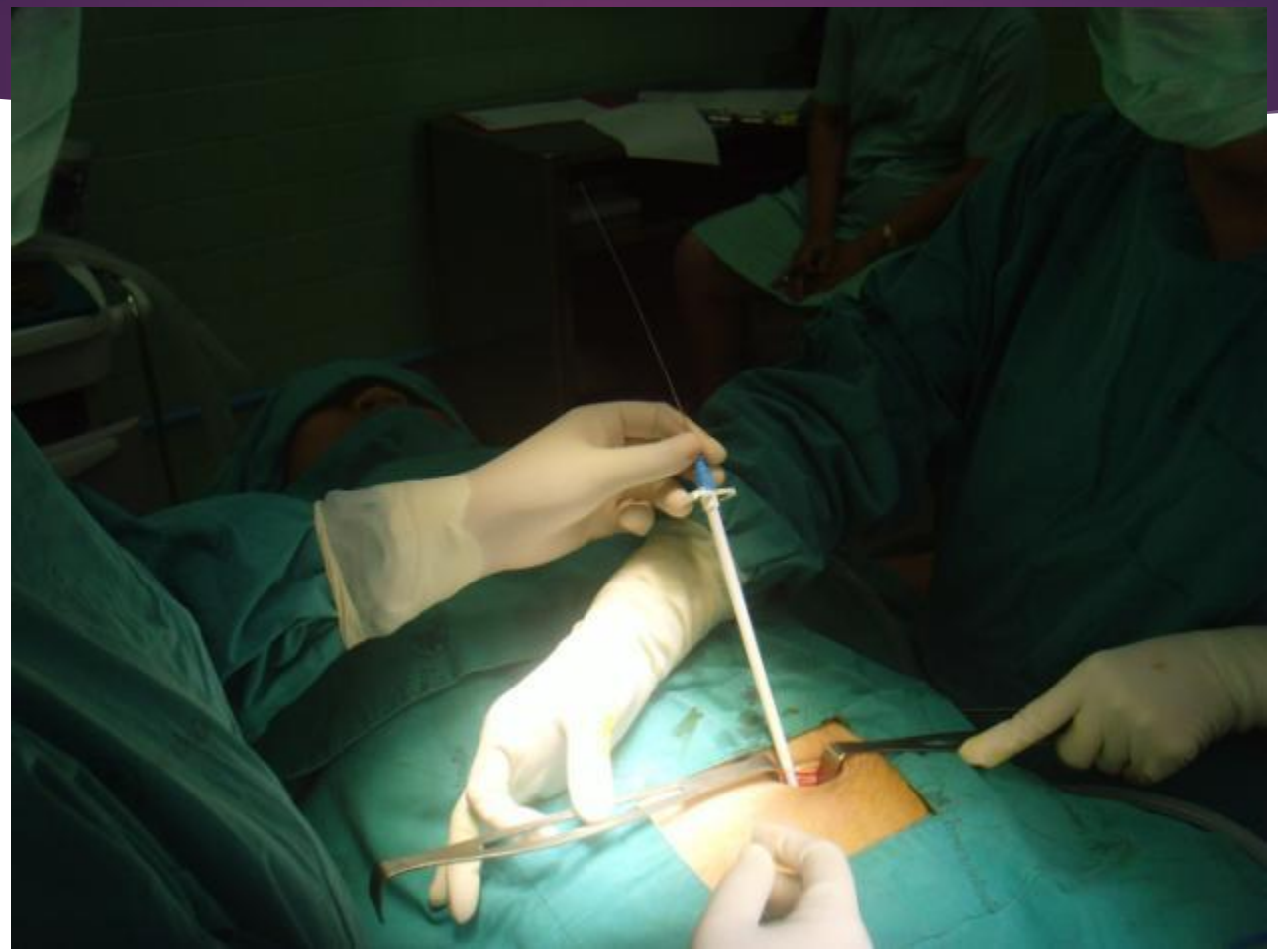


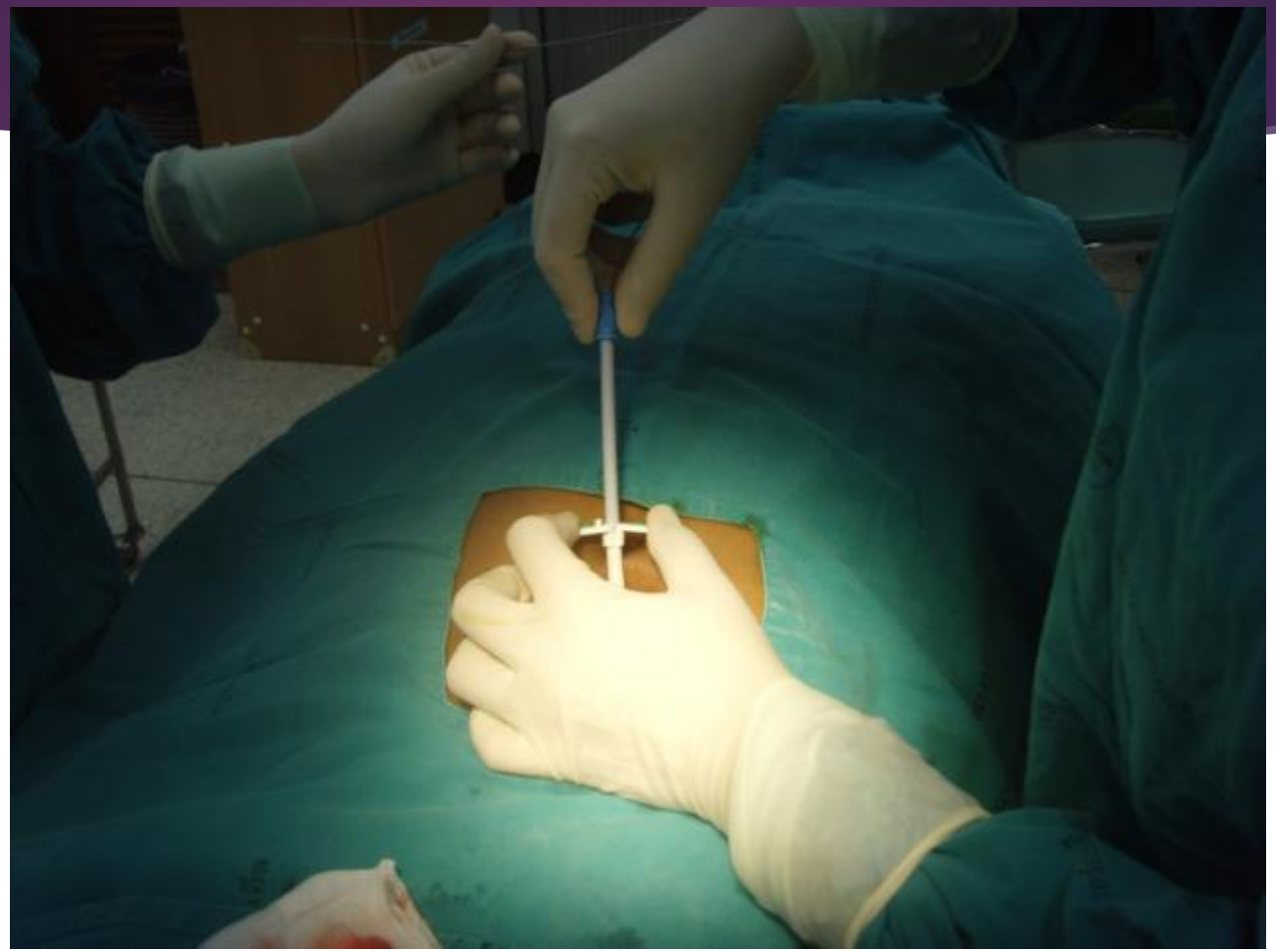
Methods of placement of PD catheters:

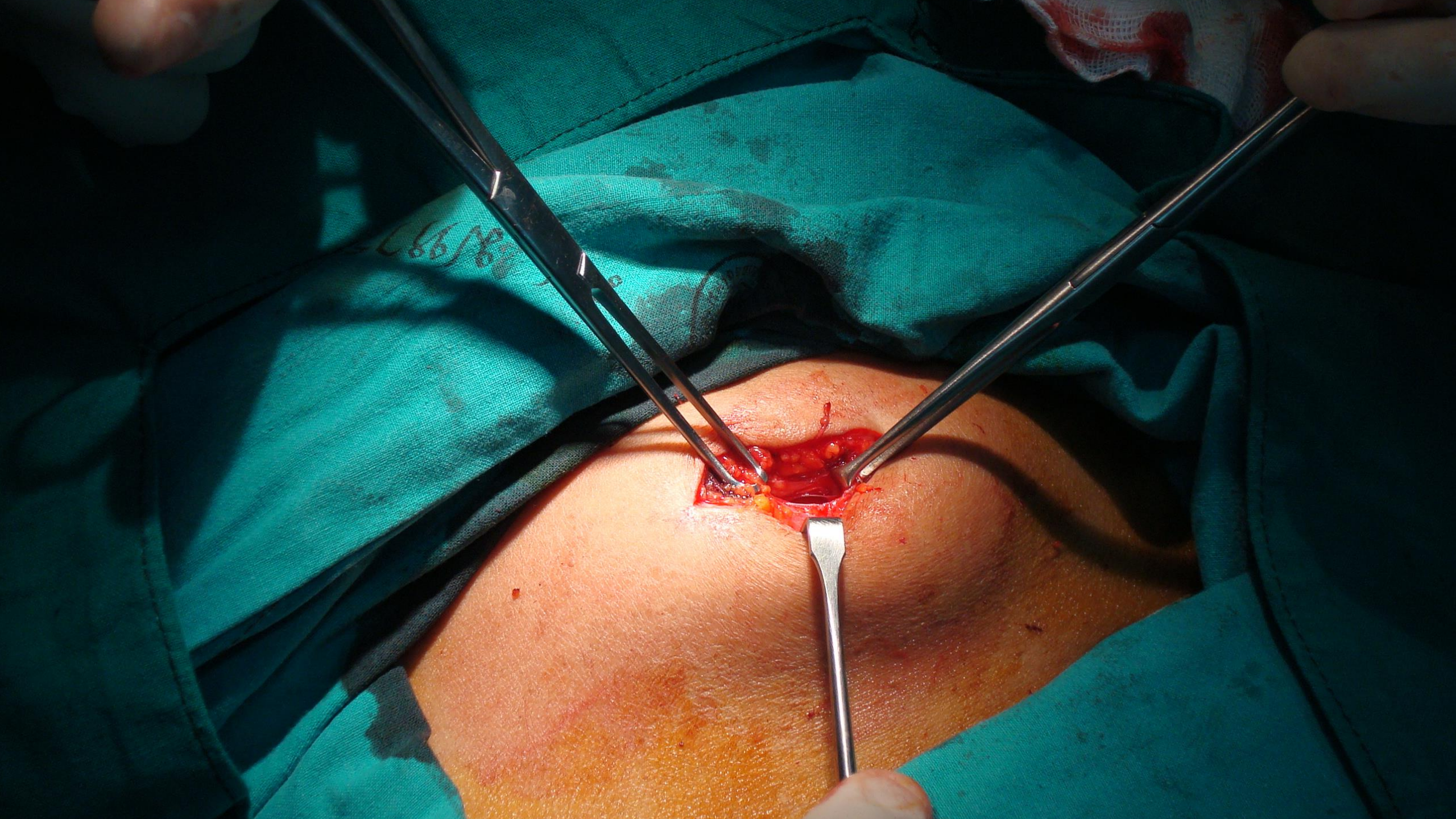
- Percutaneous, blind (with/without fluroscopy)
- Direct visualization:
  - Open, surgical dissection
  - Laparoscopic (local anesthesia, using nitrous oxide or heliuminsuffulation)

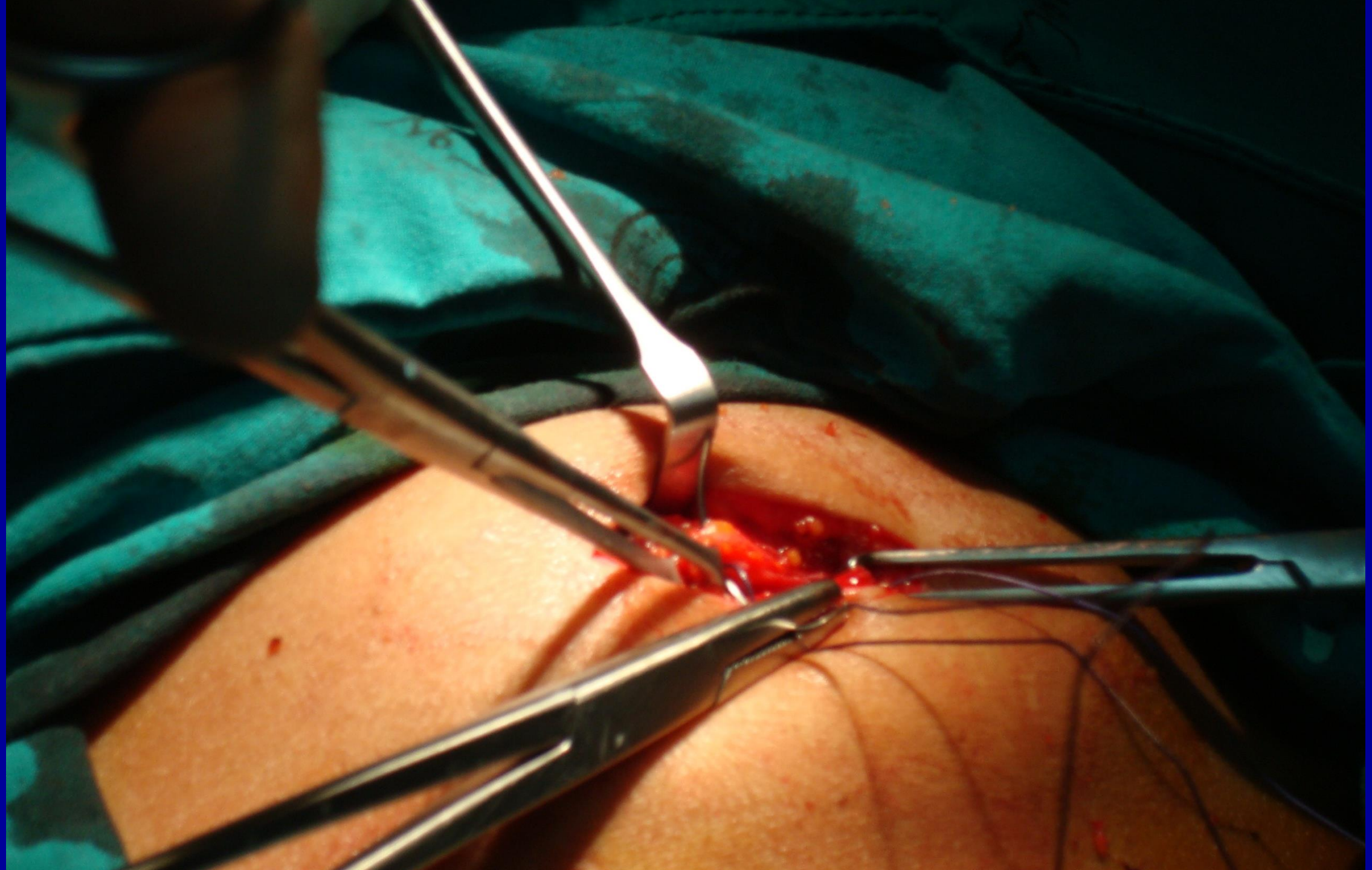


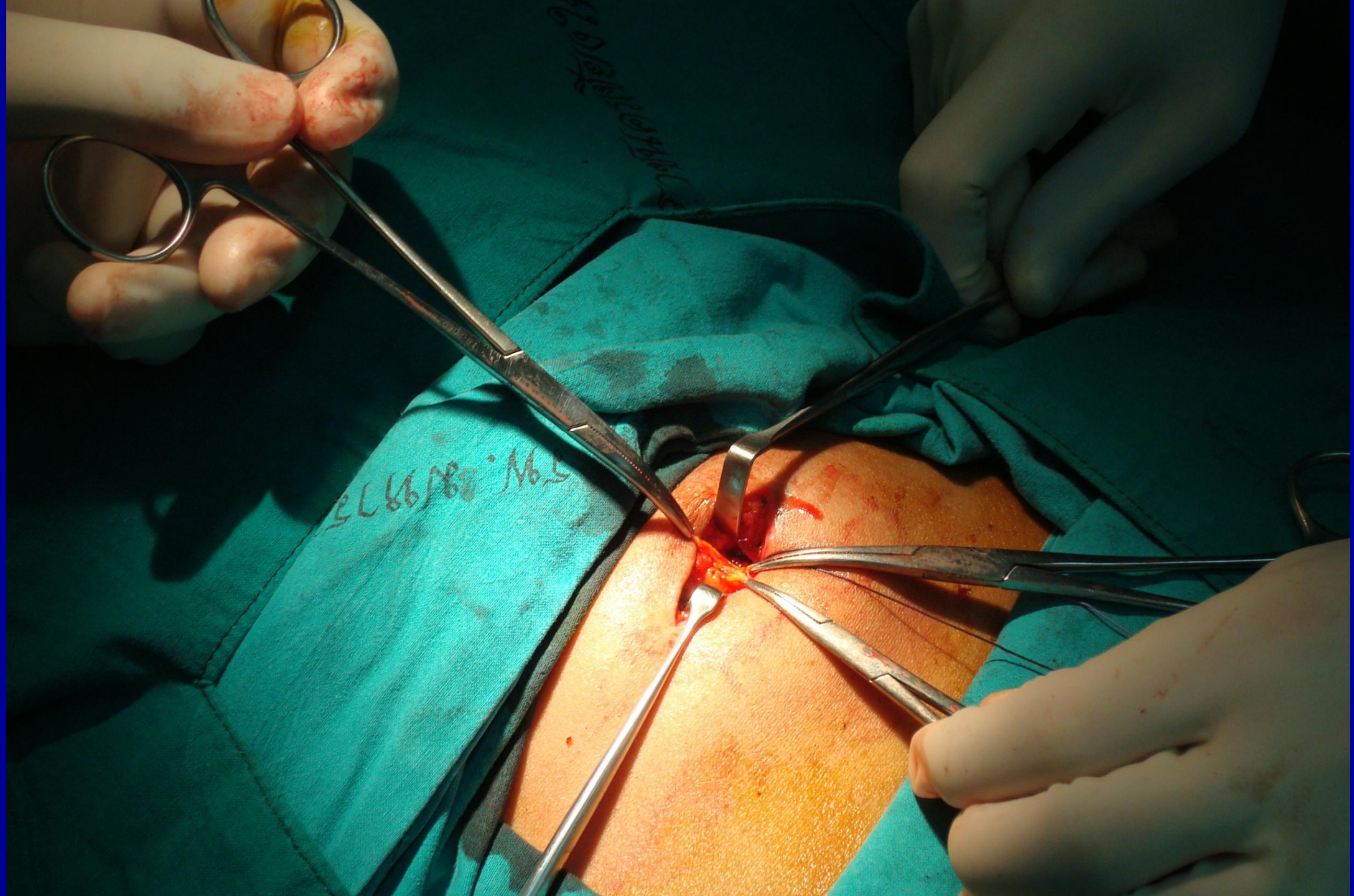


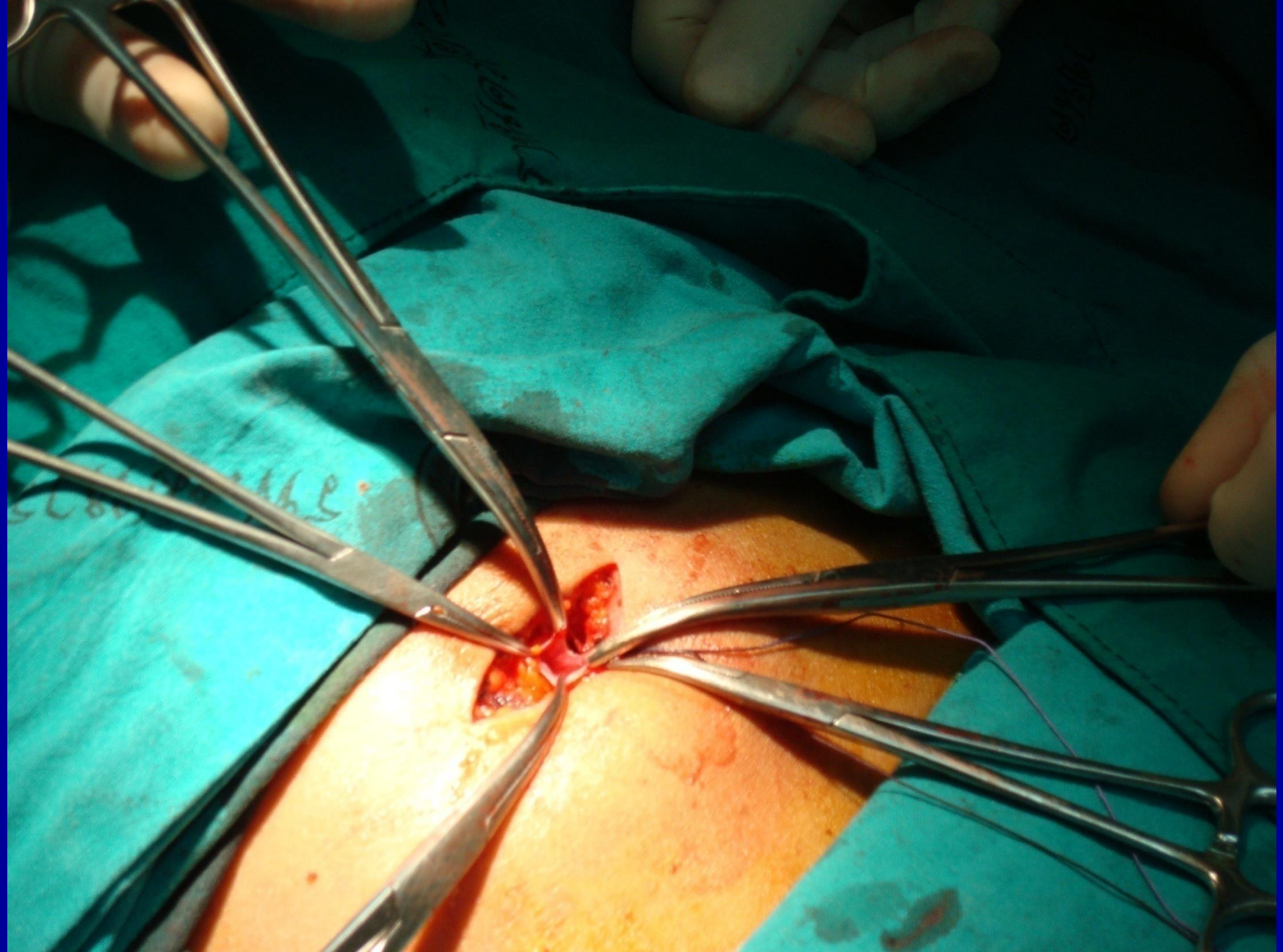


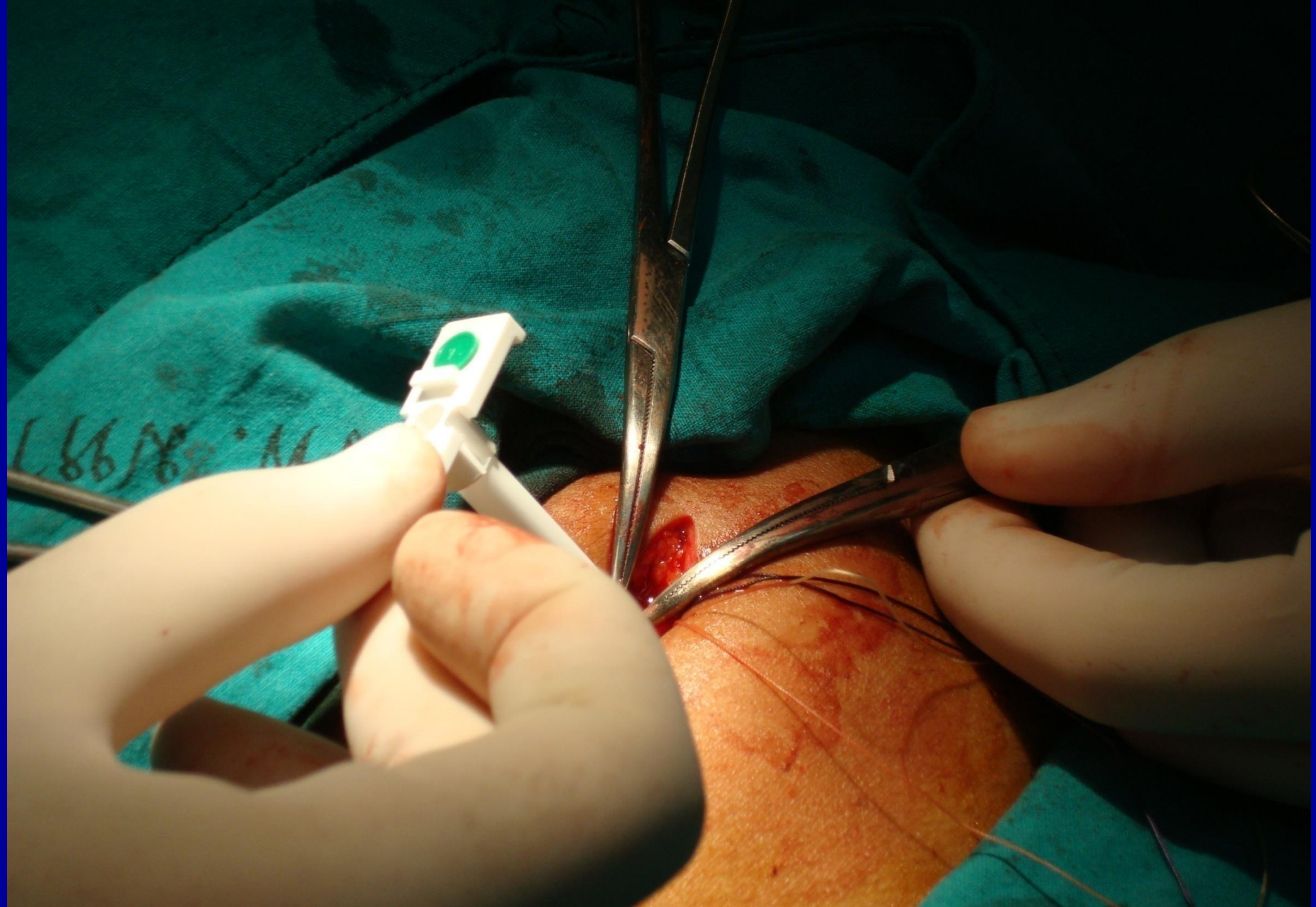












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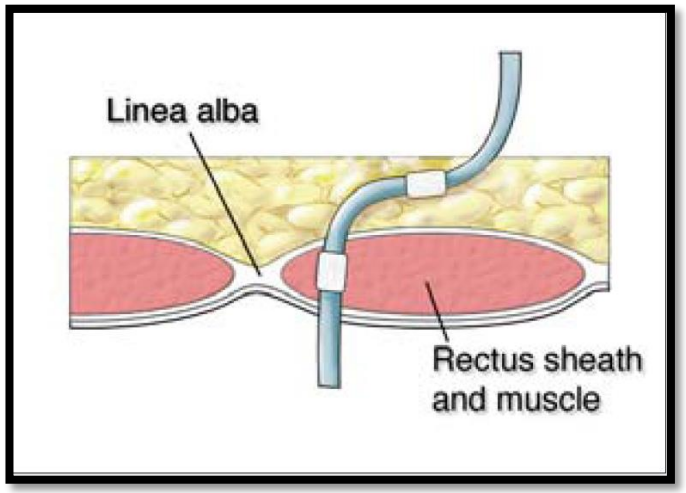


- Catheter malfunction, defined as mechanical failure in dialysate inflow or outflow.
- Outflow failure occurs in 4%-34.5% of PD
  - CATHETER FLOW OBSTRUCTION
  - OMENTAL WRAPPING
  - CATHETER TIP MIGRATION
  - FIBRIN OR BLOOD CLOTS WITHIN THE CATHETER
  - PERICATHETER LEAKAGE

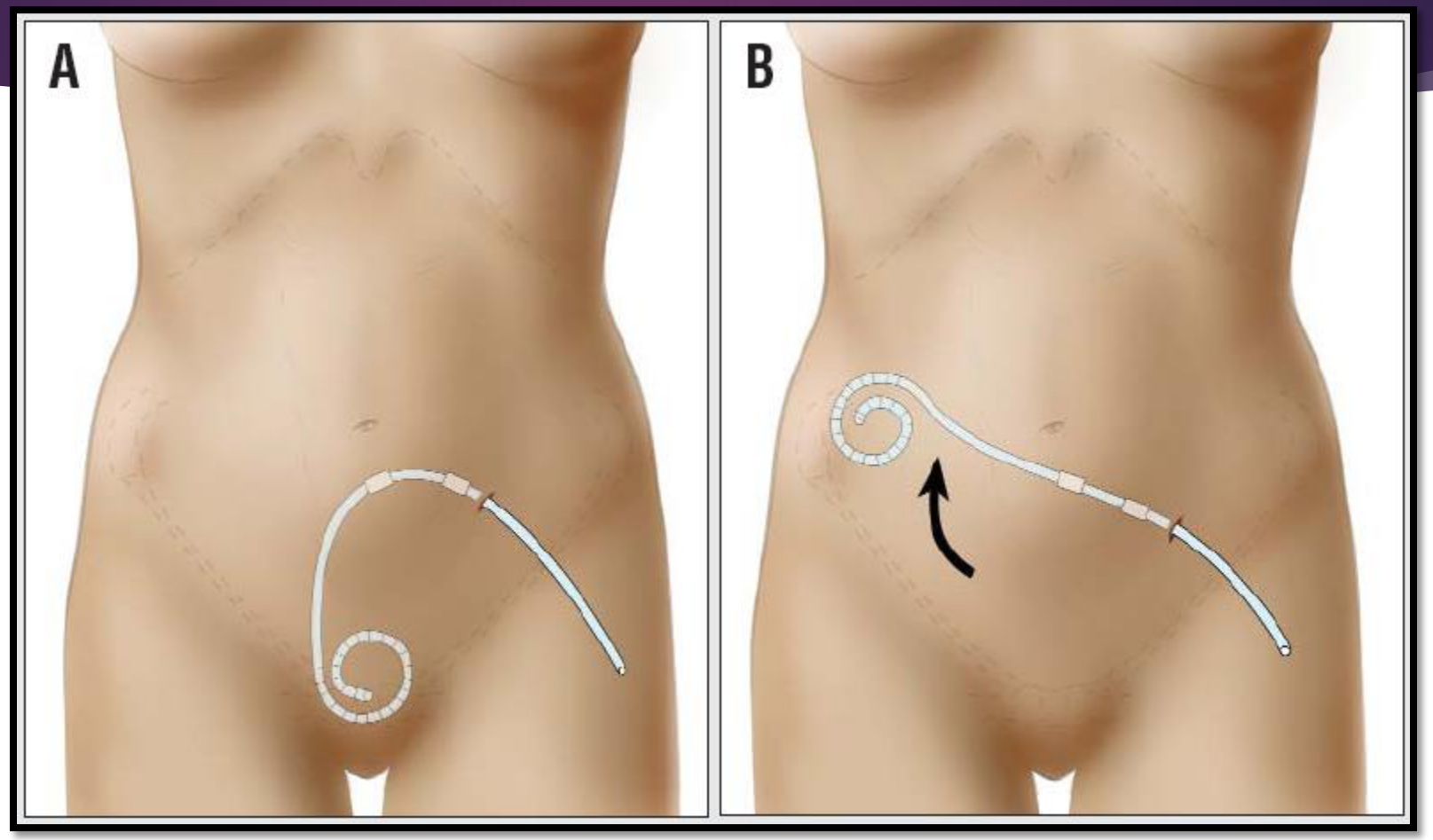
CATHETER FLOW OBSTRUCTION

- Omental wrapping
- Catheter tip migration
- Catheter obstruction due to fibrin or blood clots within the catheter lumen
- Kinking of the catheter
- Small bowel wrapping
- Occlusion by fimbriae and intraperitoneal adhesions

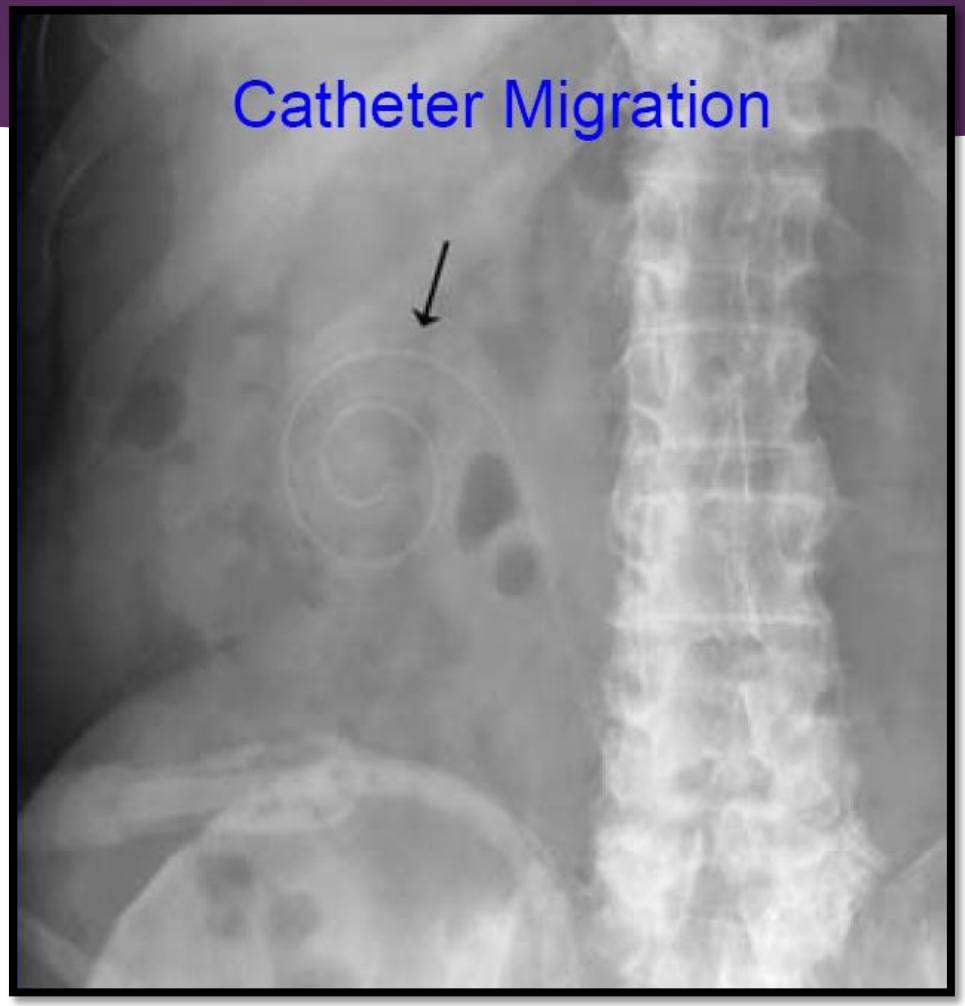
Diagnosis of outflow failure

- Lack of noninvasive methods
- Laparoscopy is highly accurate in its diagnosis of CAPD complications caused by obstruction
- Change in body position, rapid saline infusion, cathartics, enemas, the classic use of fibrinolytics, and fluoroscopic
- The rescue procedures should not be delayed beyond a few days after noticing the malfunction if concervative treatments are ineffective.
- Open rescue surgery can lead to new adhesion formation
- Laparoscopic rescue procedures have many advantages

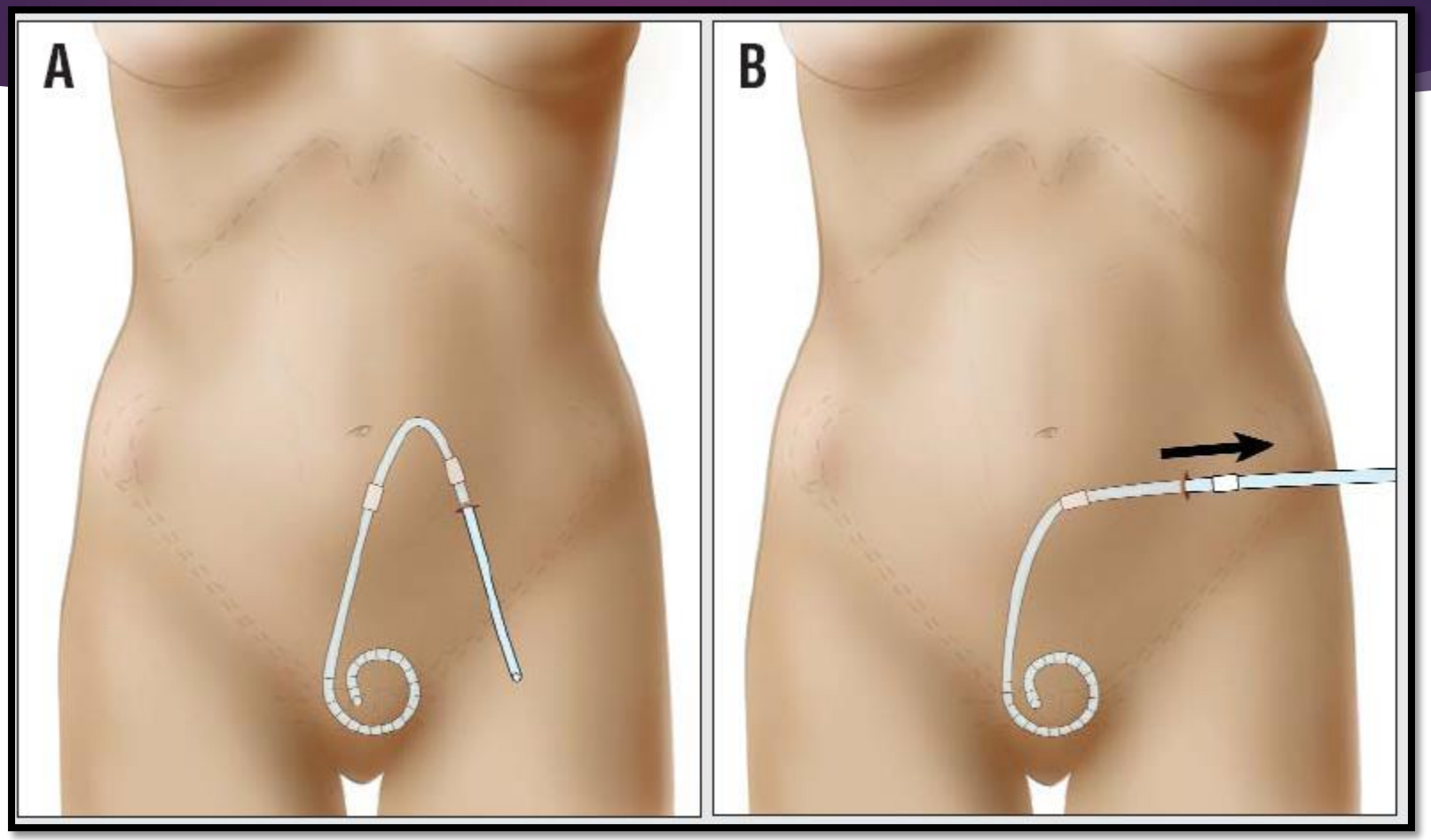
Catheter Migration



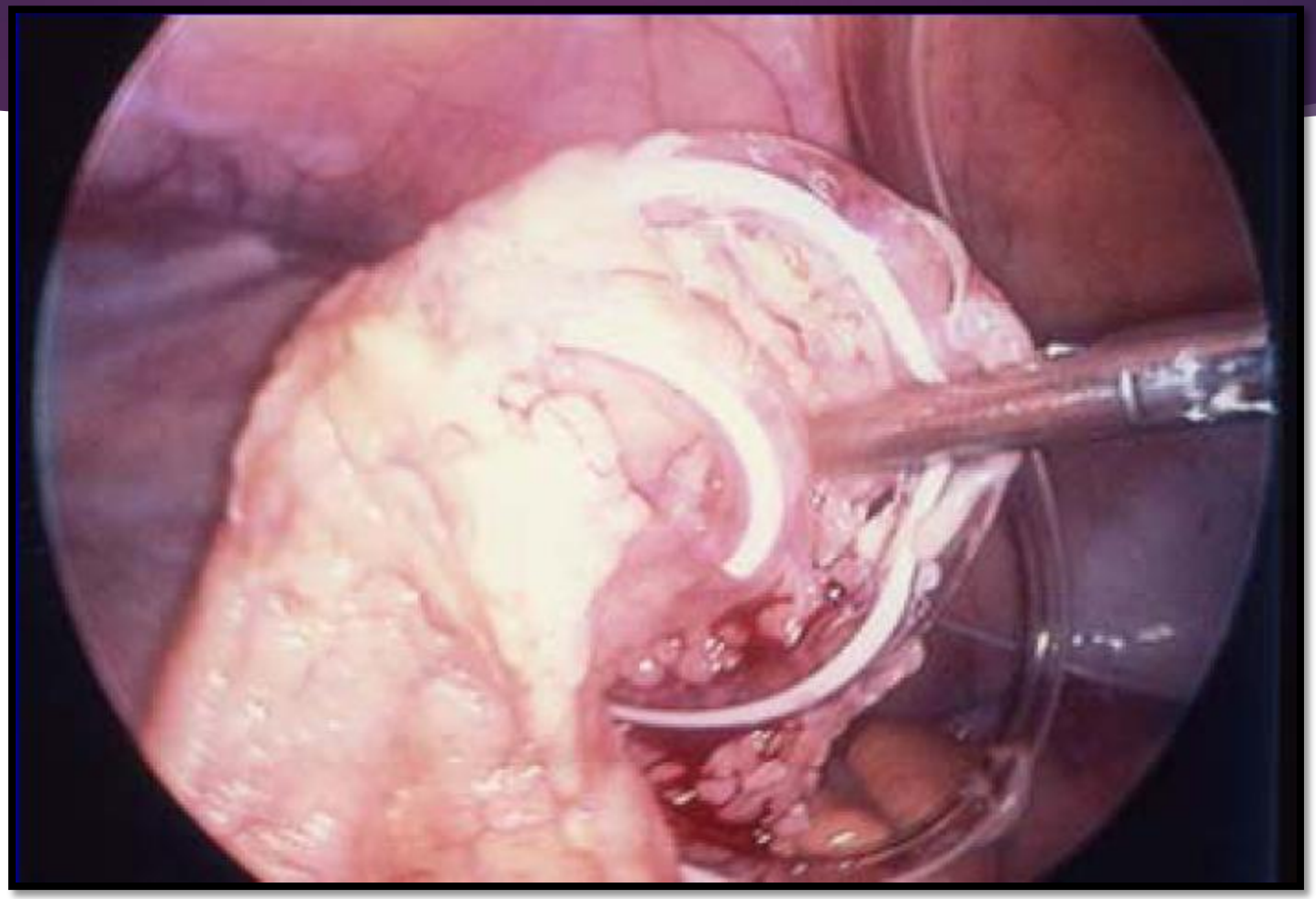
Catheter Migration



Superficial Cuff Extrusion



Omental Wrap



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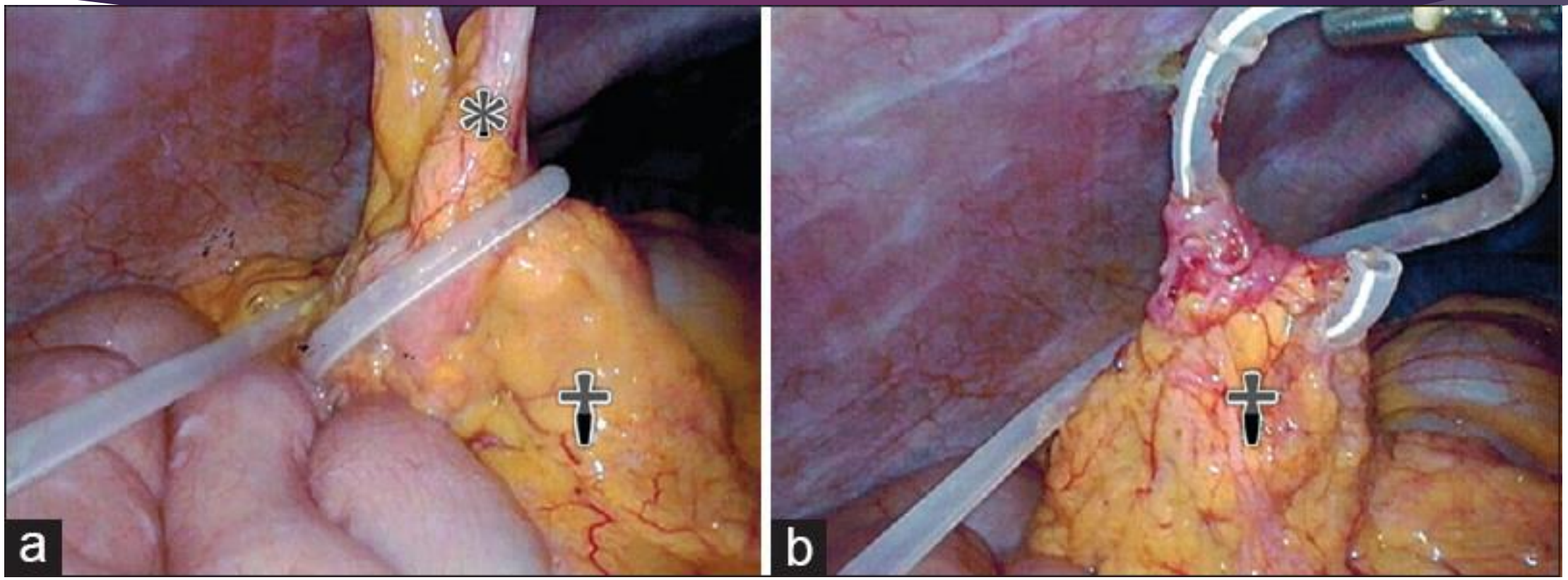
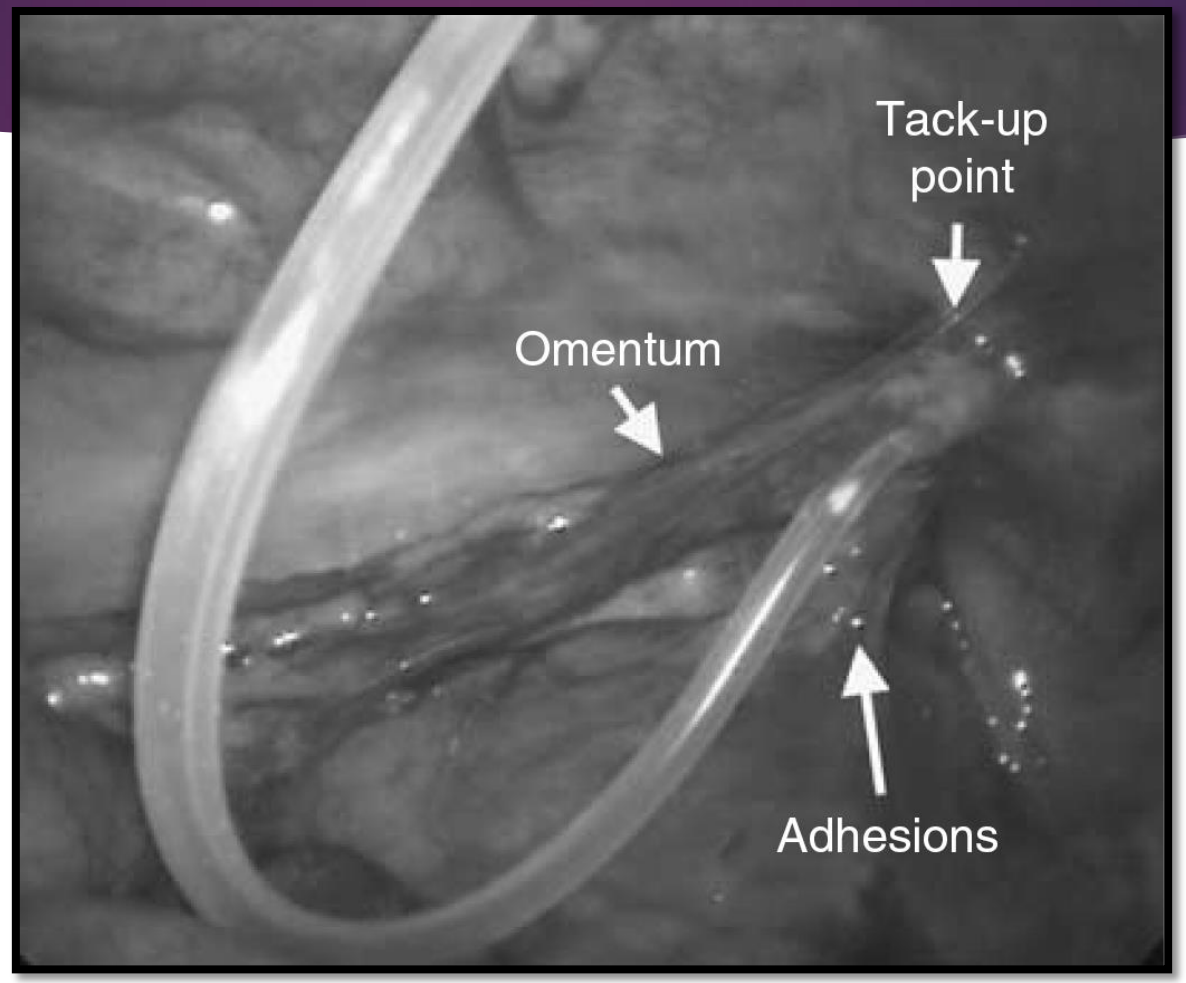


Omental Adhesion



Guidelines for laparoscopic peritoneal dialysis access surgery

Advanced laparoscopic techniques to avoid catheter dysfunction

1. **Laparoscopic lysis of adhesions should be incorporated to reduce catheter dysfunction. (+++Evidence, Strong recommendation)**
2. **Laparoscopic suture fixation of the PD catheter may reduce catheter dysfunction but additional evidence is needed. (++Evidence, Weak recommendation)**
3. **Rectus sheath tunneling helps prevent migration and may be superior to suture fixation since it does not require added ports and instruments. (++Evidence, Weak recommendation)**

Surg Endosc (2014) 28:3016–3045

Guidelines for laparoscopic peritoneal dialysis access surgery

4. **Omentopexy** in adults is a safe adjunct to laparoscopic PD catheter insertion and should be incorporated either routinely or selectively to reduce catheter dysfunction. (+++Evidence, Weak recommendation)
5. **Omentectomy** should be considered in pediatric patients undergoing PD catheter placement (++ Evidence,Weak recommendation)
6. **The combination of lysis of adhesions, rectus sheath tunneling, and omentopexy** in combination offers the lowest rate of postoperative PD catheter dysfunction and should be a preferred technique in adults. (+++Evidence, Strong recommendation)

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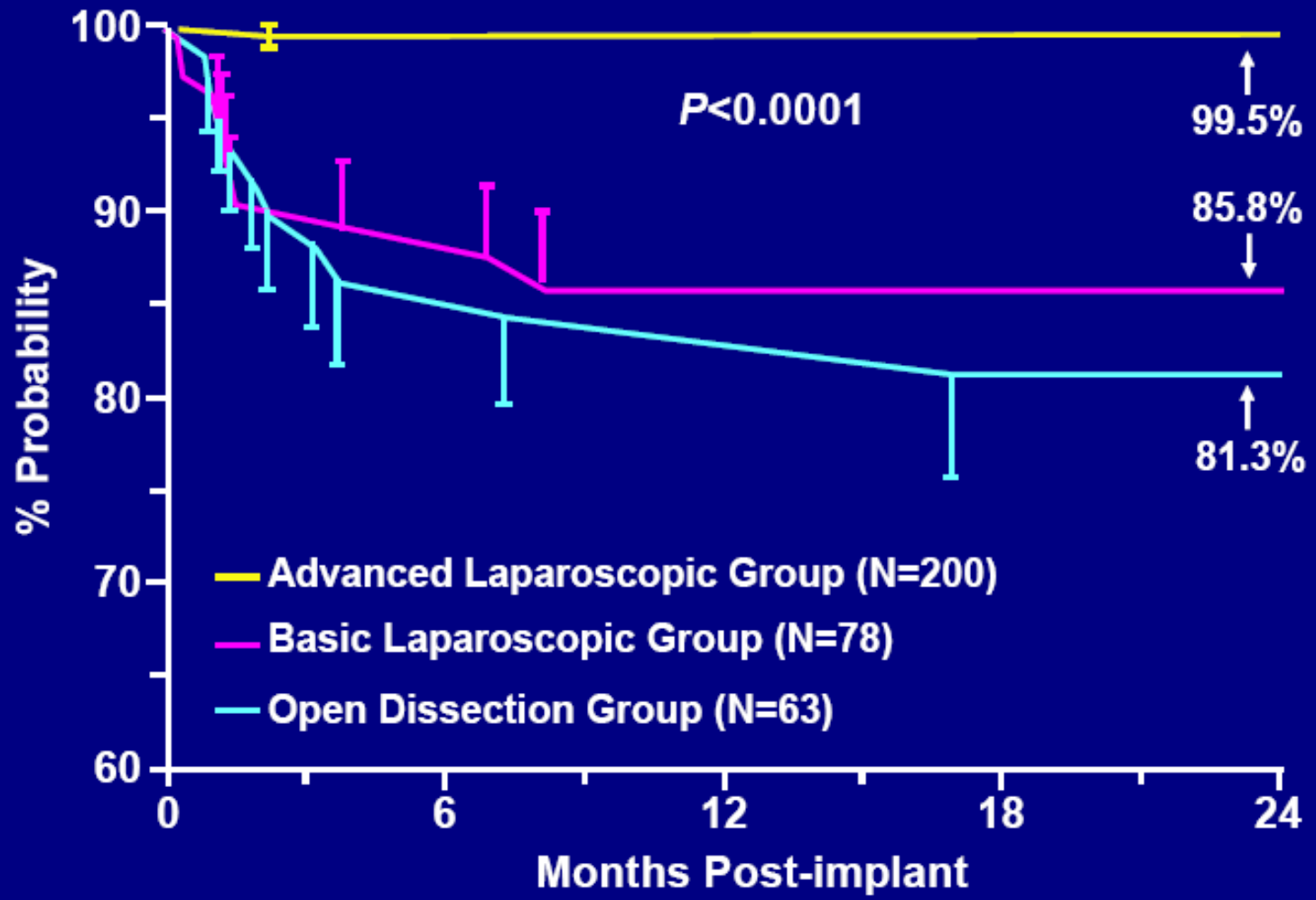
Probability of Remaining Free of Mechanical Flow Obstruction



Crabtree et al. *Am Surg*. 2005;71(2):135-43.

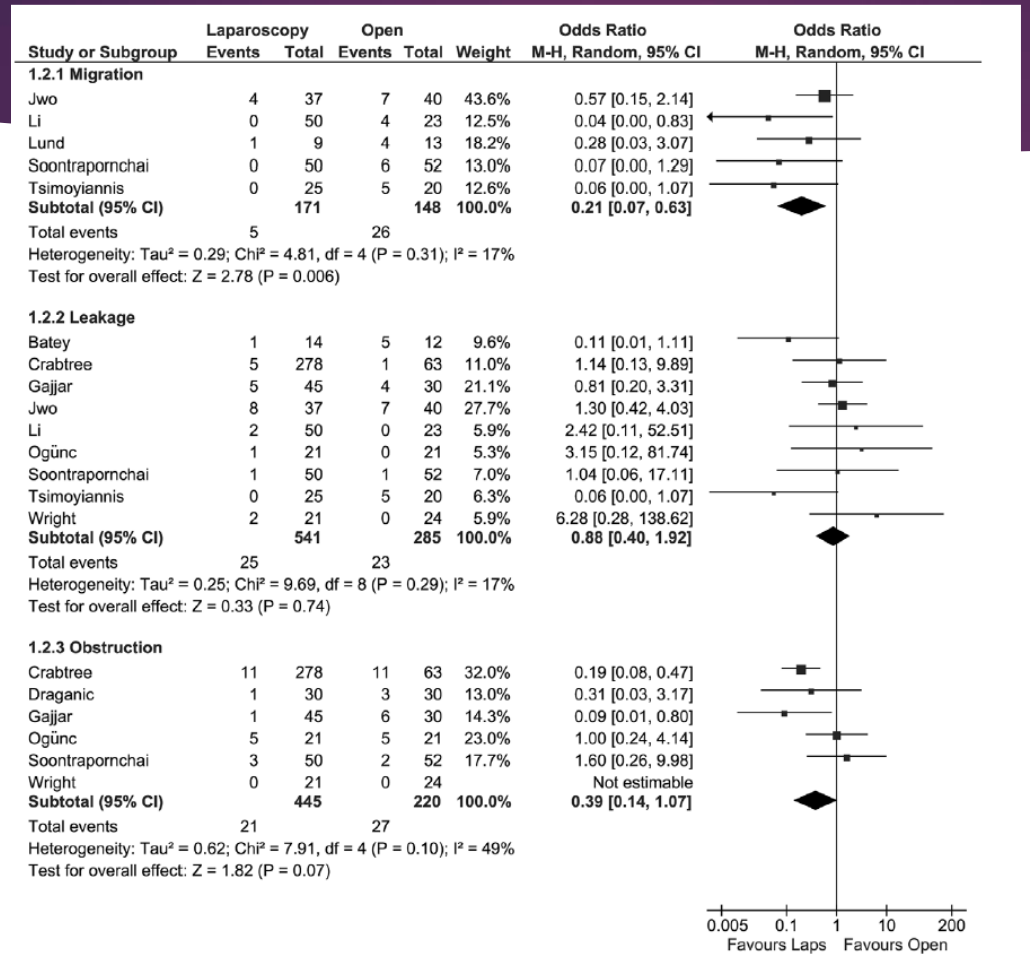
Surgical Technique-Related Complications of Peritoneal Dialysis Catheter Implantation

	Open Dissection	Basic Laparoscopy	Advanced Laparoscopy
Catheter Obstruction	17.5%	12.8%	0.5%
Pericatheter Leak	1.6%	1.3%	2%*
Pericatheter Hernia	1.6%	0%	0%
Cuff Extrusion	N/A	3.9%	0%
Follow-up (Months ± SD)	23.3 ±18.1	26.9 ±21.2	21.8 ±16.3

*Transient leak. No catheter loss.

Crabtree et al. Am Surg. 2005 71(2):135-43.

Laparoscopic versus Open Peritoneal Dialysis Catheter Insertion: A Meta-Analysis

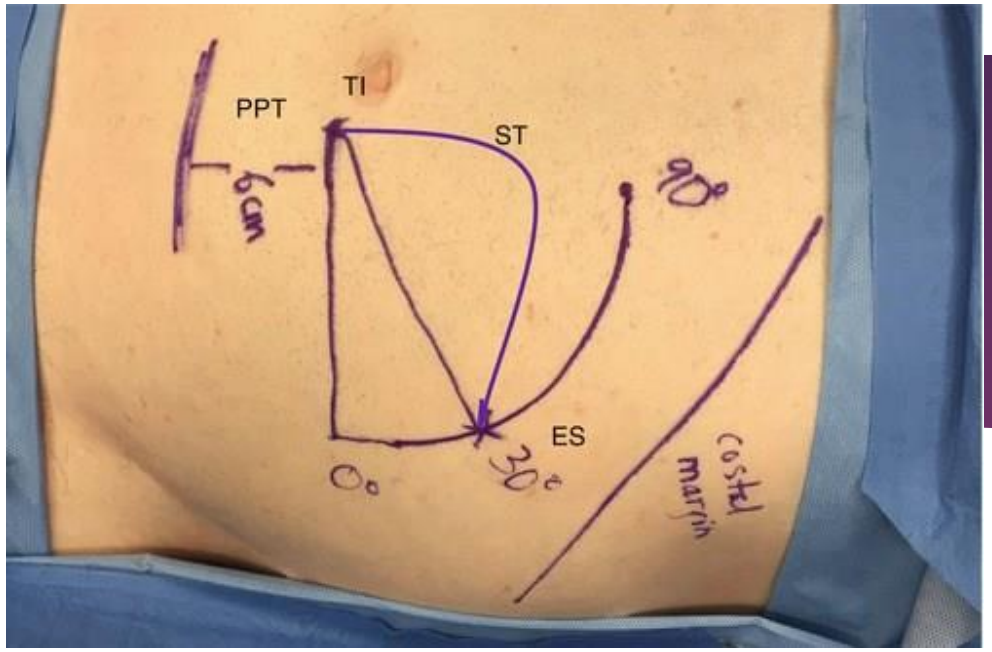


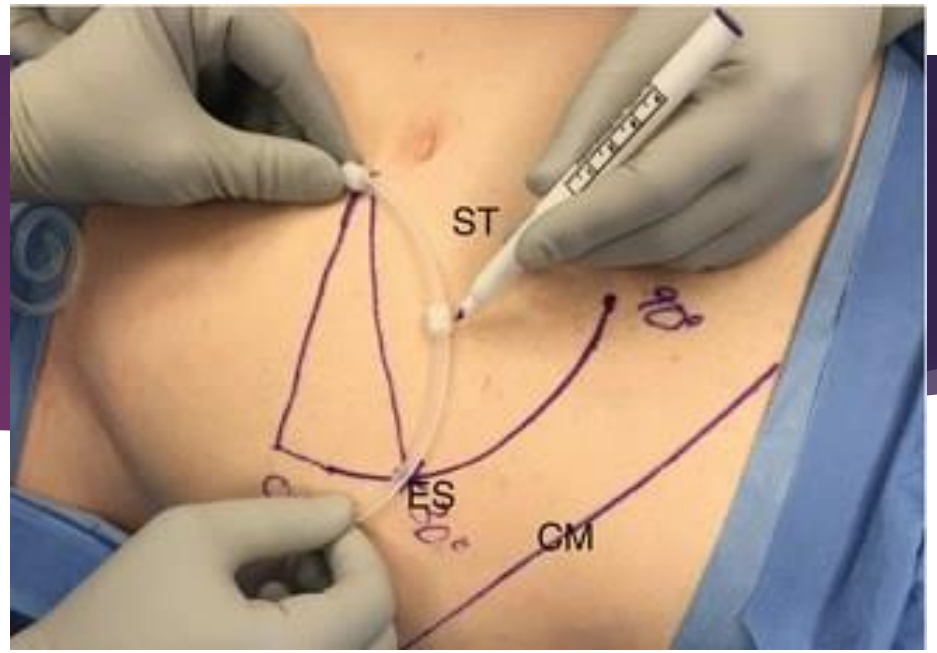
Study or Subgroup	Laparoscopy Events	Total	Open Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
1.2.1 Migration						
Jwo	4	37	7	40	43.6%	0.57 [0.15, 2.14]
Li	0	50	4	23	12.5%	0.04 [0.00, 0.83]
Lund	1	9	4	13	18.2%	0.28 [0.03, 3.07]
Soontrapornchai	0	50	6	52	13.0%	0.07 [0.00, 1.29]
Tsimoyiannis	0	25	5	20	12.6%	0.06 [0.00, 1.07]
Subtotal (95% CI)		**171**		**148**	**100.0%**	**0.21 [0.07, 0.63]**
Total events	5		26			
Heterogeneity: Tau² = 0.29; Chi² = 4.81, df = 4 (P = 0.31); I² = 17%						
Test for overall effect: Z = 2.78 (P = 0.006)						
1.2.2 Leakage						
Batey	1	14	5	12	9.6%	0.11 [0.01, 1.11]
Crabtree	5	278	1	63	11.0%	1.14 [0.13, 9.89]
Gajjar	5	45	4	30	21.1%	0.81 [0.20, 3.31]
Jwo	8	37	7	40	27.7%	1.30 [0.42, 4.03]
Li	2	50	0	23	5.9%	2.42 [0.11, 52.51]
Ogünc	1	21	0	21	5.3%	3.15 [0.12, 81.74]
Soontrapornchai	1	50	1	52	7.0%	1.04 [0.06, 17.11]
Tsimoyiannis	0	25	5	20	6.3%	0.06 [0.00, 1.07]
Wright	2	21	0	24	5.9%	6.28 [0.28, 138.62]
Subtotal (95% CI)		**541**		**285**	**100.0%**	**0.88 [0.40, 1.92]**
Total events	25		23			
Heterogeneity: Tau² = 0.25; Chi² = 9.69, df = 8 (P = 0.29); I² = 17%						
Test for overall effect: Z = 0.33 (P = 0.74)						
1.2.3 Obstruction						
Crabtree	11	278	11	63	32.0%	0.19 [0.08, 0.47]
Draganic	1	30	3	30	13.0%	0.31 [0.03, 3.17]
Gajjar	1	45	6	30	14.3%	0.09 [0.01, 0.80]
Ogünc	5	21	5	21	23.0%	1.00 [0.24, 4.14]
Soontrapornchai	3	50	2	52	17.7%	1.60 [0.26, 9.98]
Wright	0	21	0	24		Not estimable
Subtotal (95% CI)		**445**		**220**	**100.0%**	**0.39 [0.14, 1.07]**
Total events	21		27			
Heterogeneity: Tau² = 0.62; Chi² = 7.91, df = 4 (P = 0.10); I² = 49%						
Test for overall effect: Z = 1.82 (P = 0.07)						

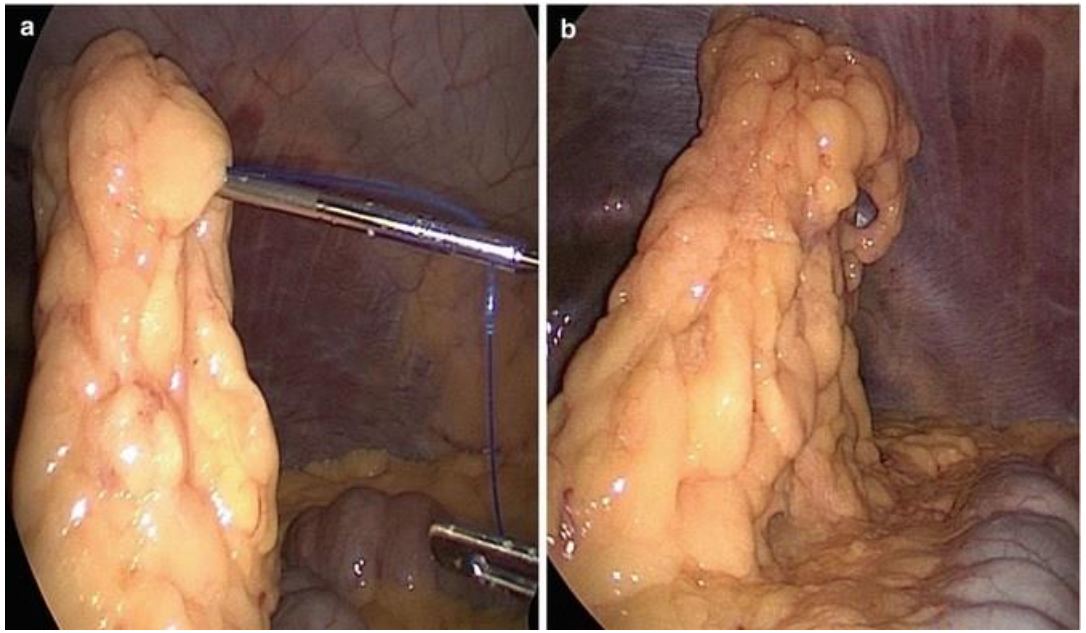
Odds Ratio M-H, Random, 95% CI

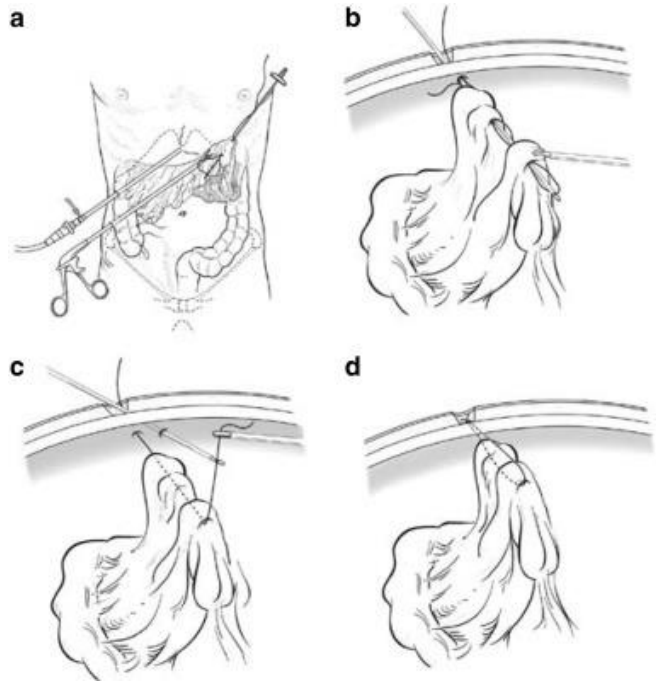
0.005 0.1 1 10 200

Favours Laps Favours Open


PPT
TI
ST
6cm
90°
ES
30°
0°
costal margin


ST
90°
ES
CM


a
b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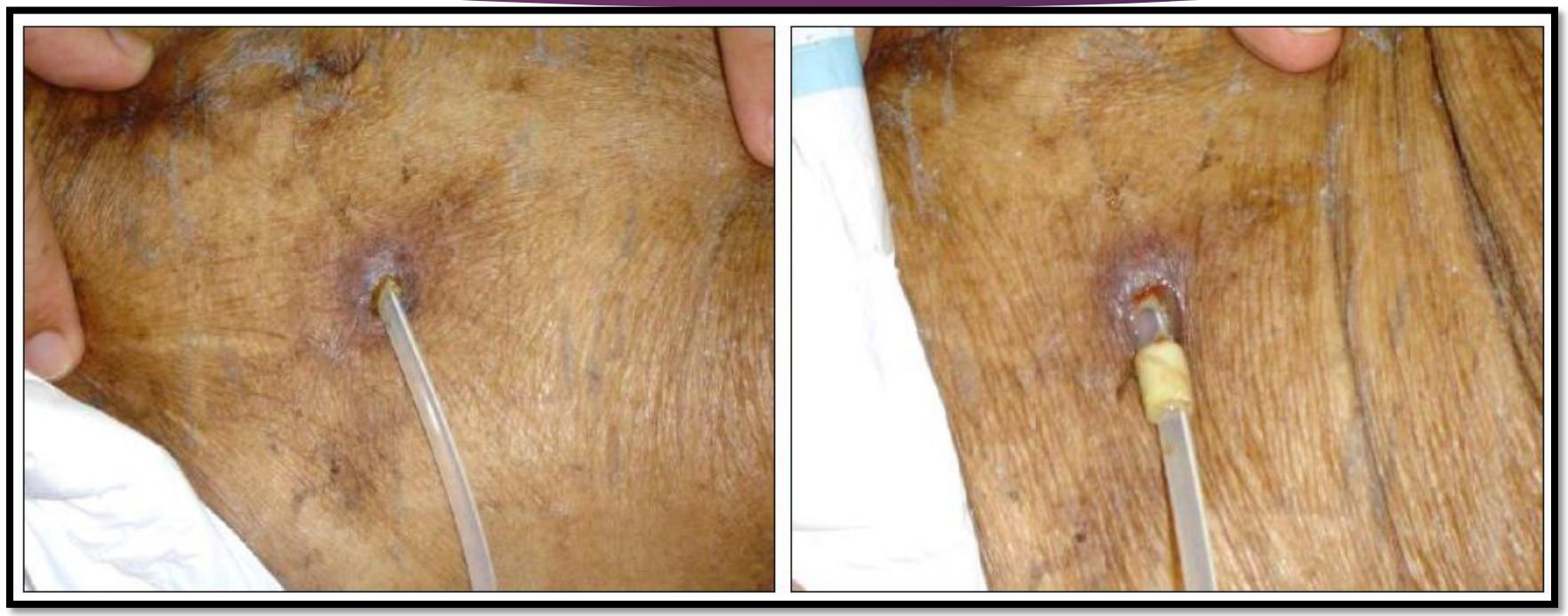
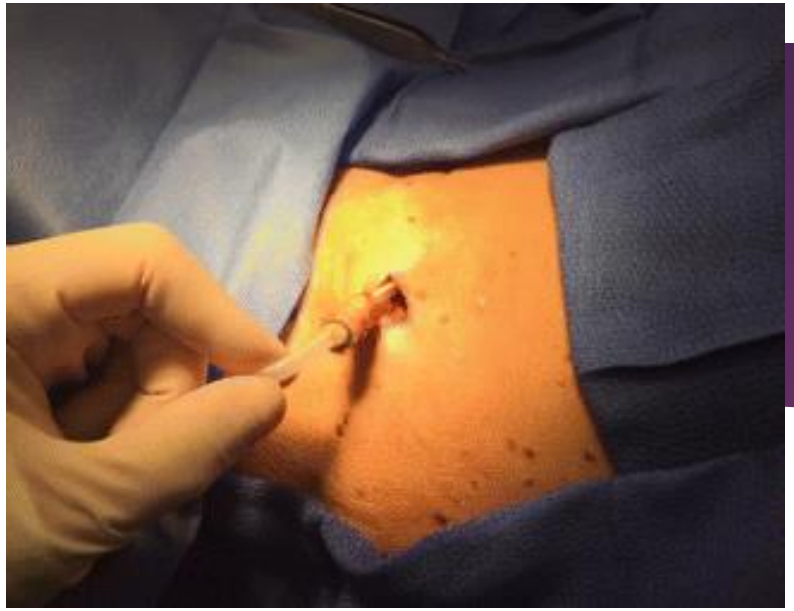
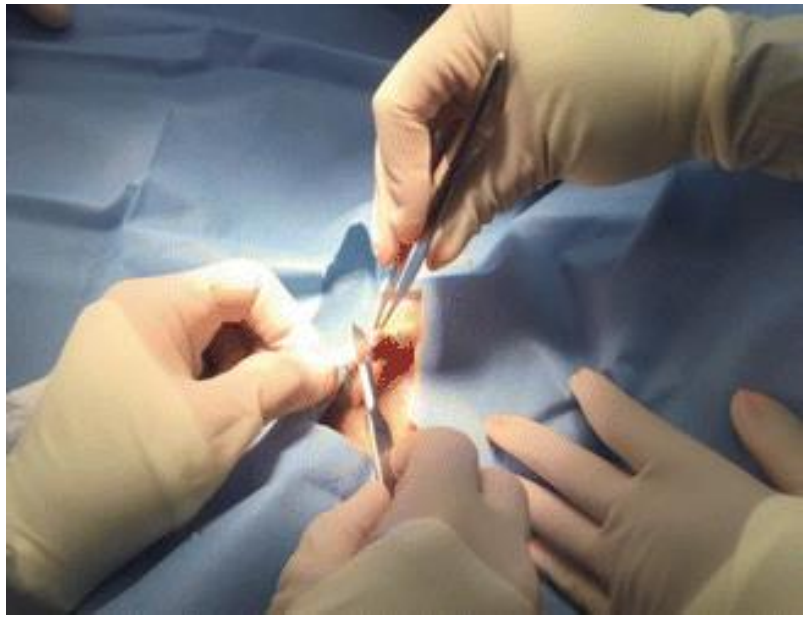
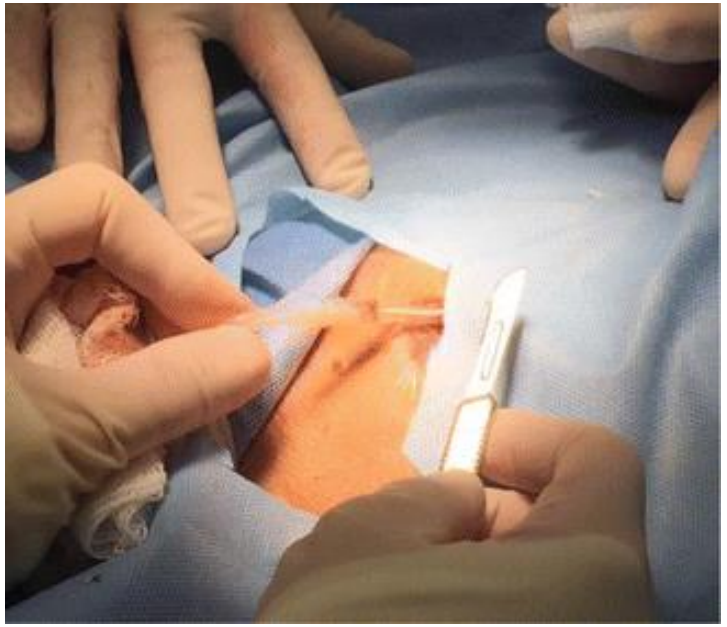
Pericatheter Leakage

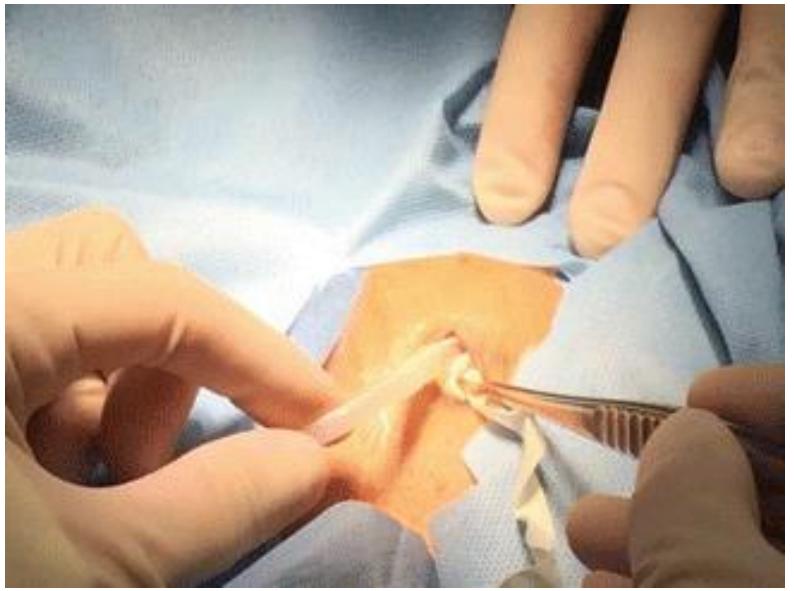
Superficial Cuff Extrusion











Reducing Rate of Complications

- Concerns about catheter tip migration, omental wrap, and cuff extrusion are more reliably addressed by *proper implantation technique* than complicated catheter designs
- Catheter designs cannot compensate for a poorly performed implantation procedure

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- Change in body position, rapid saline infusion, cathartics, enemas, the classic use of fibrinolytics, and fluoroscopic
- Open rescue surgery can lead to new adhesion formation
- Laparoscopic rescue procedures have many advantages