

Abdominal Trauma

아주대학교병원 경기남부 권역 외상센터
외상외과
강병희

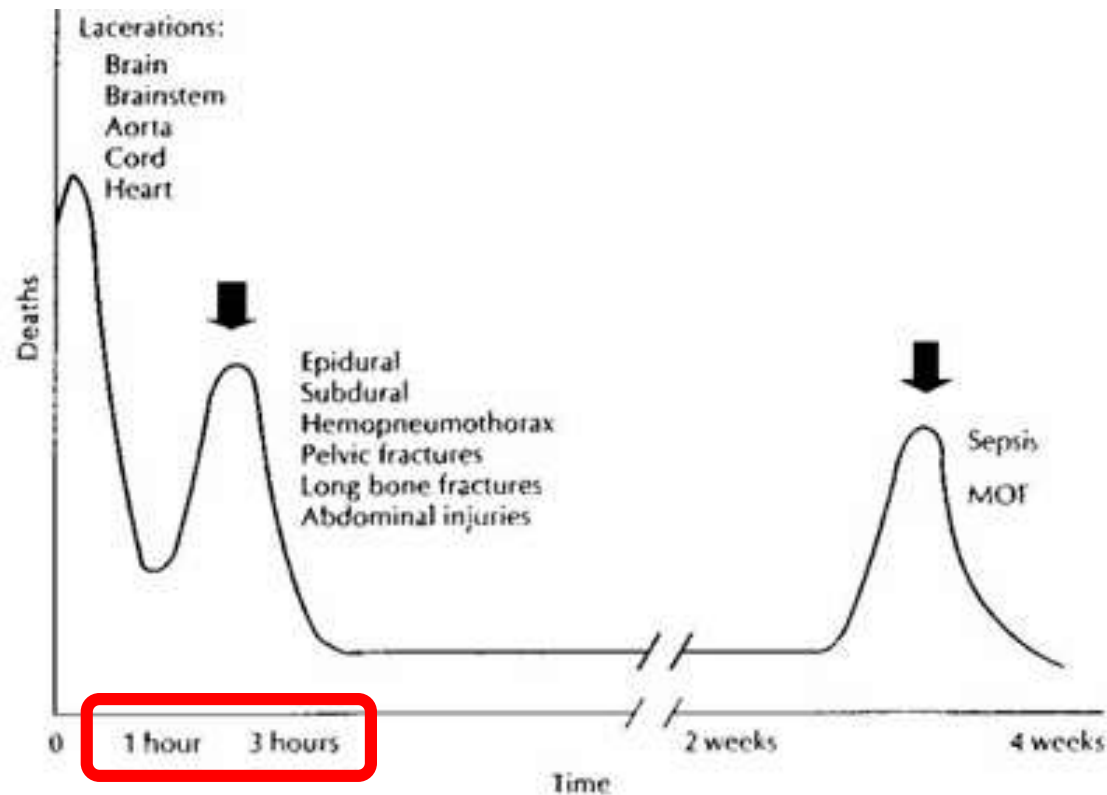
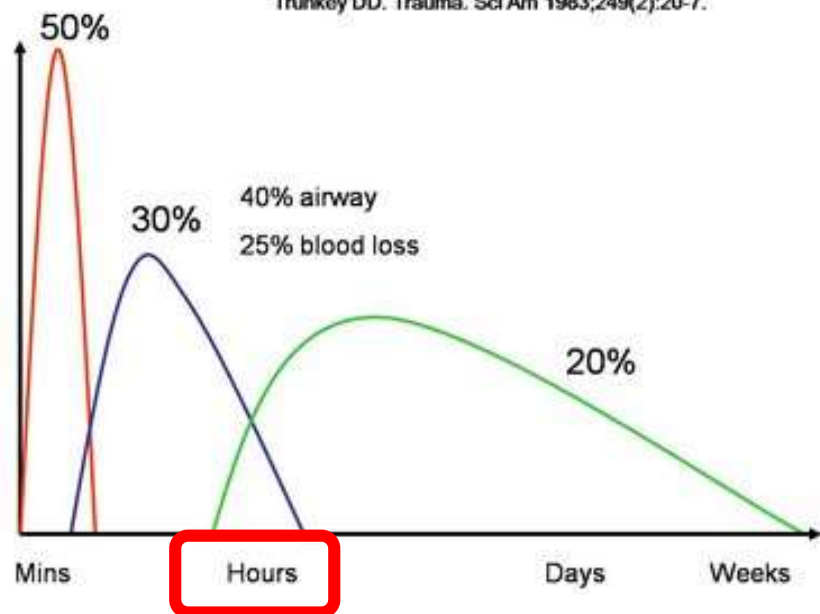




- 의사는 질병이 아닌 환자를 치료해야 합니다.
- **외상외과** 의사는 질병이 아닌 **바이탈**을 치료해야 합니다.

Trimodal Distribution of Death

Trunkey DD. Trauma. Sci Am 1983;249(2):20-7.

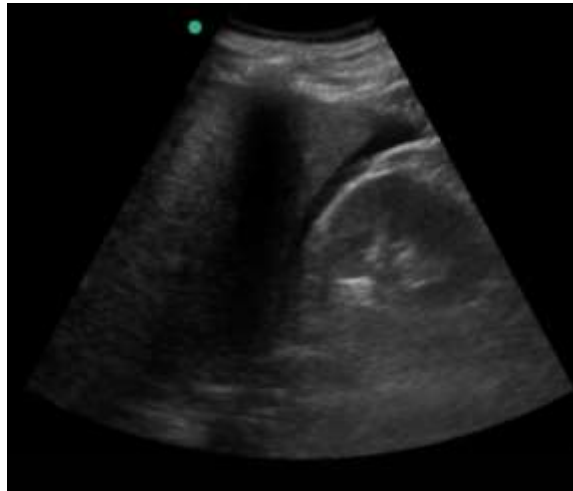


Source of Bleeding (Hemorrhagic Shock)



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- Chest / **Abdomen/Pelvic** / Extremity / External



Abdominal Trauma



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- Internal Organ
 - Solid Organ
 - Hollow Viscus
- Major Vessel
- Muscle / Soft tissue
- Bone (Spine/Pelvic)

Life-Threatening Injury

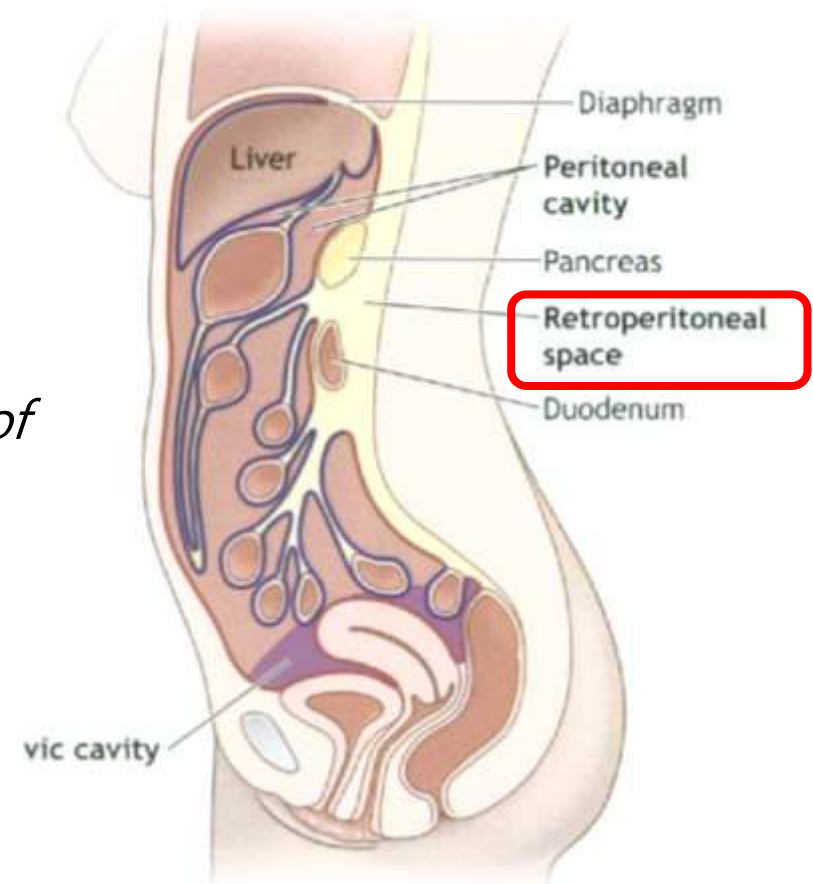


Abdominal Trauma



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*Injuries to the **retroperitoneal** visceral structures are difficult to recognize because the area is remote from physical examination, and injuries do not initially present with signs or symptoms of peritonitis.*



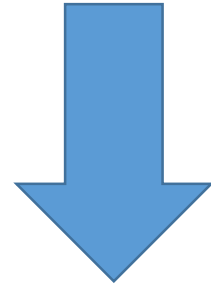
TREATMENT



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Definite diagnosis

?



Proper Treatment

Planned Operation



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- CT
- Enteroscopy / Biopsy
- PET-CT / MRI

- Pre-operative evaluation for G/A

절제 범위
재건 범위
해부학적 변이
타과적 진료

Shock



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- Airway
- Breath
- Circulation
 - IV line / Fluid / Transfusion (MTP?)
- Disability
- Exposure
 - Temperature control



(Hemorrhagic) Shock



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No **time** for evaluation

Source of bleeding

어느 장기가 문제인데? (간? 비장? 장간막?)

어느 체계가 문제인데? (간쪽? 좌하복부?)

어느 부분이 문제인데? (가슴? 배? 골반?)

피가 나는 것은 맞아? (신경학적 쇼크?)

Injury Mechanism



- Why is the mechanism of injury important?

TABLE 5-1 ■ Truncal and Cervical Injuries from Restraint Devices	
RESTRAINT DEVICE	INJURY
Lap Seat Belt <ul style="list-style-type: none">• Compression• Hyperflexion	<ul style="list-style-type: none">• Tear or avulsion of mesentery• Rupture of small bowel or colon• Thrombosis of iliac artery or abdominal aorta• Chance fracture of lumbar vertebrae• Pancreatic or duodenal injury
Shoulder Harness <ul style="list-style-type: none">• Sliding under the seat belt ("submarining")• Compression	<ul style="list-style-type: none">• Intimal tear or thrombosis in innominate, carotid, subclavian, or vertebral arteries• Fracture or dislocation of cervical spine• Intimal tear or thrombosis in subclavian artery• Rib fractures• Pulmonary contusion• Rupture of upper abdominal viscera
Air Bag <ul style="list-style-type: none">• Contact• Contact/deceleration• Flexion (unrestrained)• Hyperextension (unrestrained)	<ul style="list-style-type: none">• Corneal abrasions• Abrasions of face, neck, and chest• Cardiac rupture• Cervical or thoracic spine fracture• Cervical spine fracture



Injury Mechanism



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Injury Mechanism



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- 차에 앞 뒤로 끼어있는 상태에서 구조됨



Diagnostic Methods



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- Physical Examination
- X-ray
- Ultrasonography
- Diagnostic peritoneal lavage
- **Computed tomography**

Diagnostic Methods (CT)



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- Computed Tomography (**BEST** if possible)



Diagnostic methods (CT)



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- 화물차 운전자로 교통사고 이후 핸들에 끼인 채 발견
- 구급대 접촉 시 혈압 130mmHg 이었으나 곧 60mmHg로 감소, 산소포화도 측정되지 않음
- 사고 기준 1시간 이후 병원 도착, 의식은 alert, 복통 호소 BP86/58 - HR 114
- 내원 14분 후 두부, 흉부, 복부 CT 시행 위하여 CT실 이동하였으며 촬영 중 지속적으로 불안정한 모습 보여 Ativan 및 etomidate 투여
- 내원 45분 이후 혼수 상태로 빠져 기관 내 삽관 시행하였으며 내원 55분 후 C-line insertion, pRBC 2pint 수혈 시작함.
- 저혈압 지속되었으며 내원 1시간 25분 후 수술실 이동하여 소장 절제 및 혈관 결찰술 시행함. 수술은 4시간 정도 걸렸으며 이후 DIC, shock 등으로 승압제, 수혈 등에도 반응 없어 사망함

2018 경기도 예방가능사망률 조사



Diagnostic methods



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- Physical Examination
- X-ray
- Ultrasonography
- Diagnostic peritoneal lavage
- Computed tomography

FAST(Focused Assessment Sonography for Trauma)



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- Advantage
 - FAST
 - Non-invasive
- Disadvantage
 - Operator-dependent
 - Bowel gas / emphysema
 - Missed bowel/pancreas/solid organ injury



Diagnostic Peritoneal Lavage



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- Advantage
 - FAST
 - Detect Bowel injury
- Disadvantage
 - Invasive
 - Low specificity
 - Missed retroperitonealinjury



Hemorrhagic Shock



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No **time** for evaluation

Source of bleeding

어느 장기가 문제인데? (간? 비장? 장관막?)

어느 체계가 문제인데? (간쪽? 좌하복부?)

어느 부분이 문제이다 (배)

피가 나는 것은 맞는 것 같다

Bleeding 만 확인
손상 부위/정도는 알 수 없음

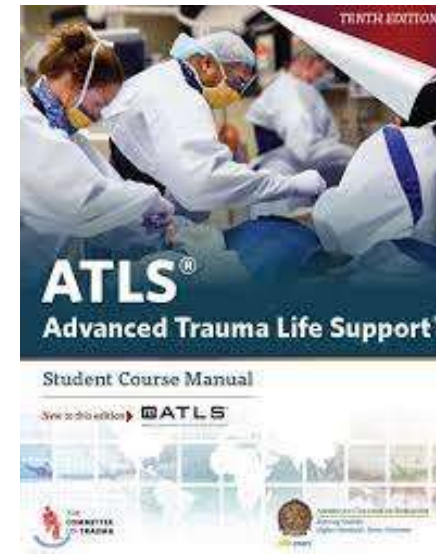


Indication of Laparotomy



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- Hypotension + FAST/DPL (+)
- **Hypotension without another source of bleeding**
- Hypotension + penetrating injury
- Evisceration
- GI bleeding + penetrating injury
- Peritonitis
- Free air or rupture of hemidiaphragm
- CT → indication of laparotomy
- DPL → GI content or vegetable fiber



Laparotomy



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- Bleeding control
- Contamination control

- Definite surgery if possible
- **DAMAGE CONTROL SURGERY**

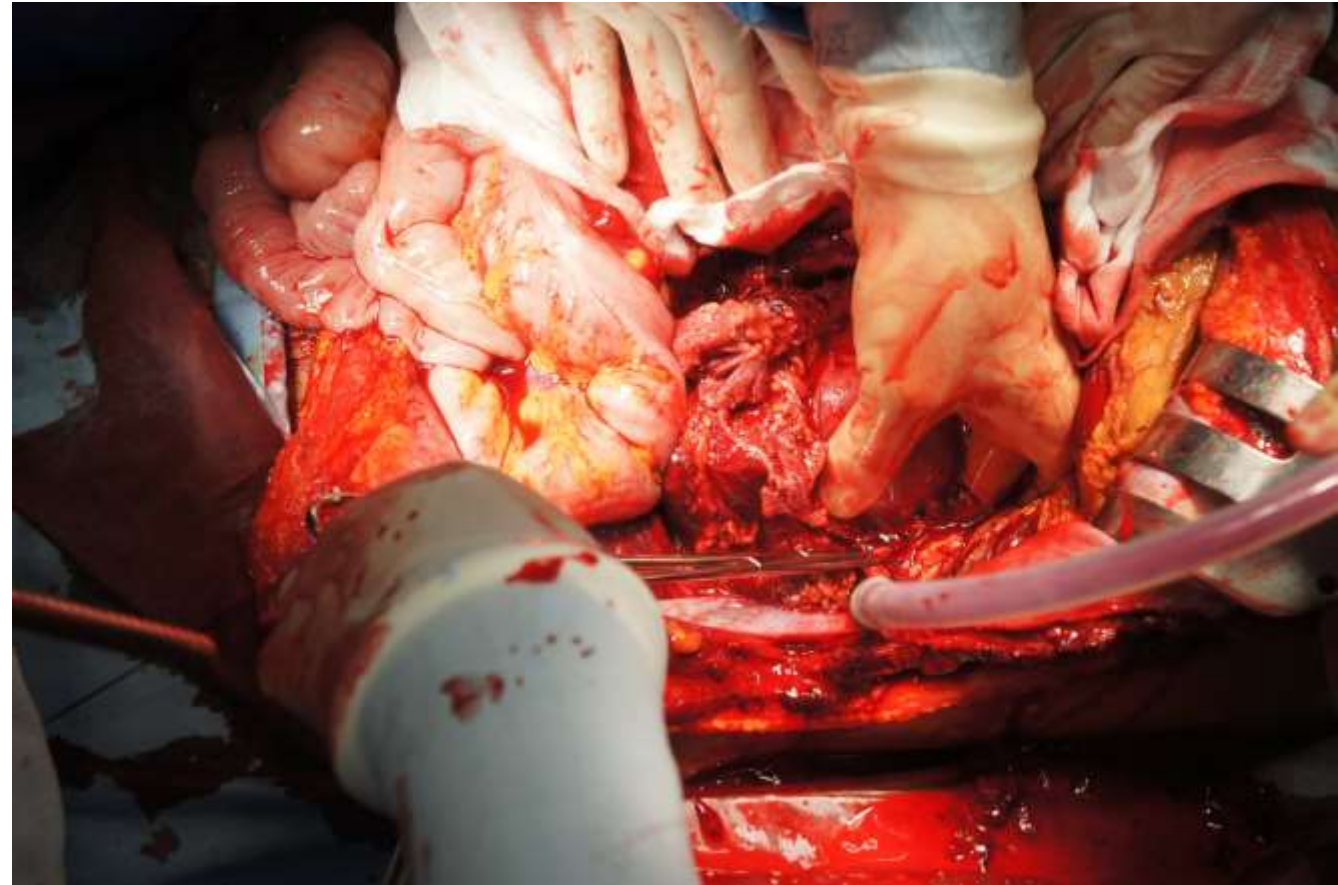
Explo-laparotomy

Is it accurate?



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- Intra-peritoneum
 - Blood stained
- Retroperitoneum
 - Duodenum / pancreas
 - Major vessel
- Solid organ
 - Intra-organ damage



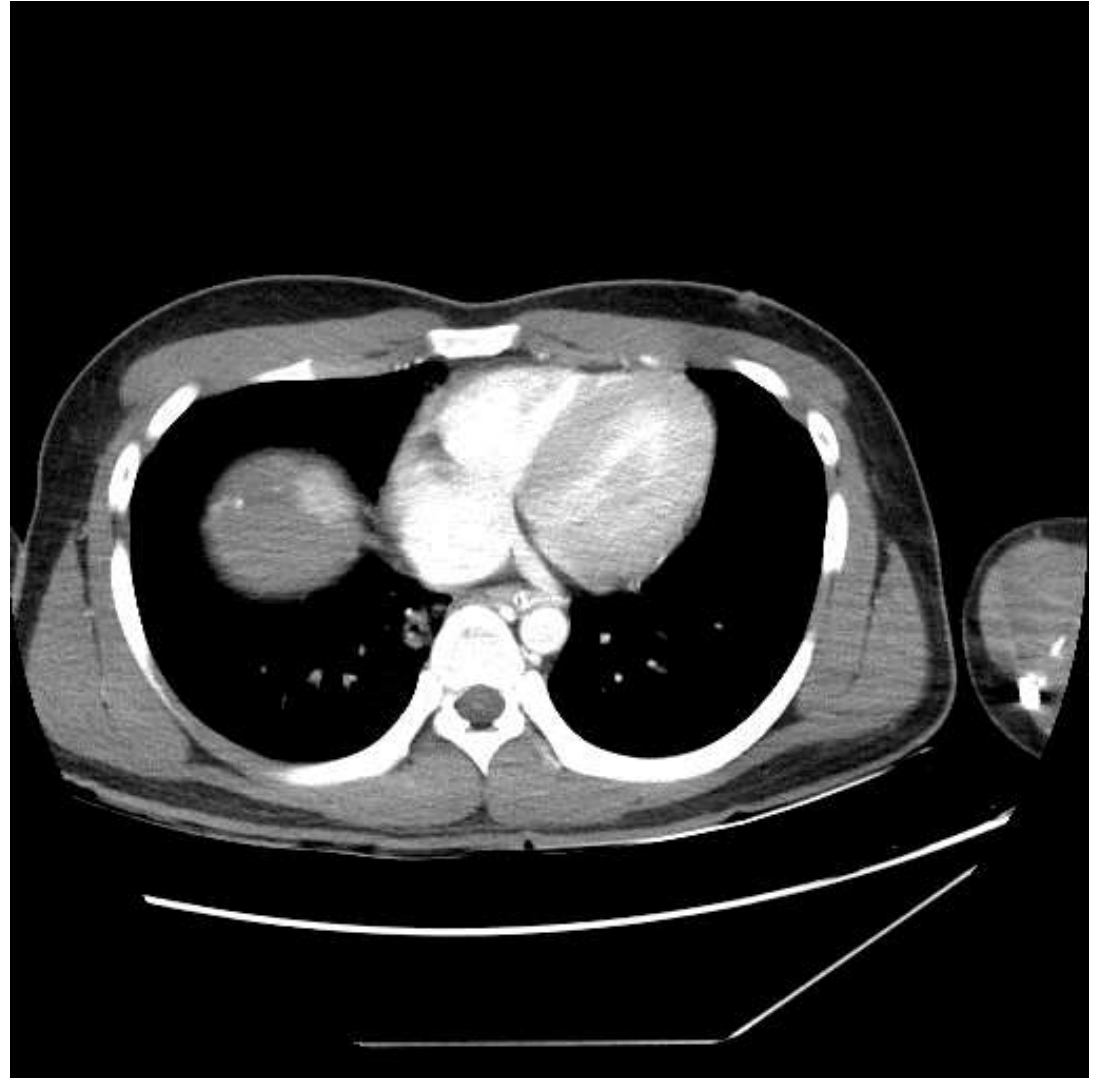
CASE

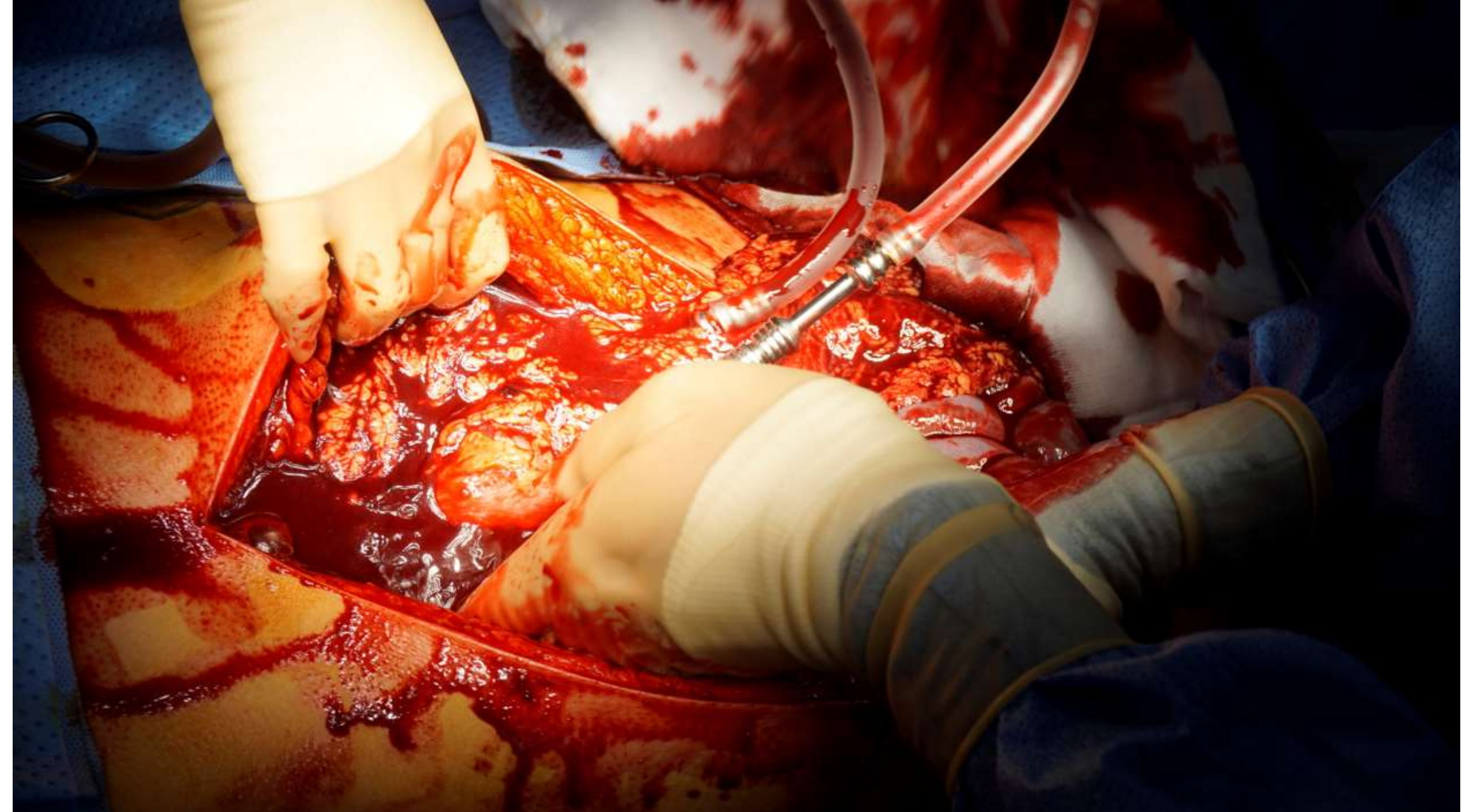
22/M

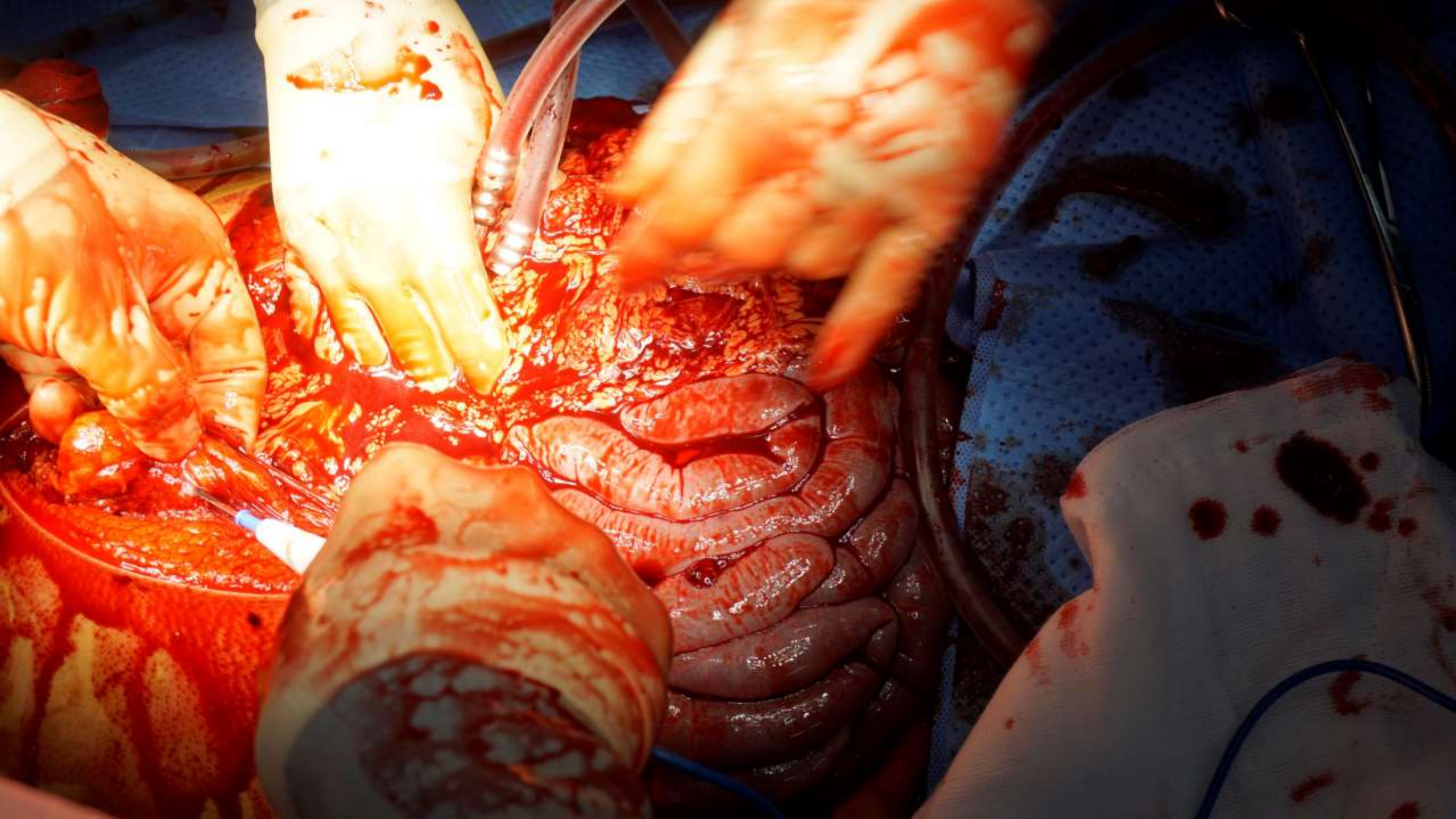
Motorcycle TA

Liver injury

Motorcycle TA

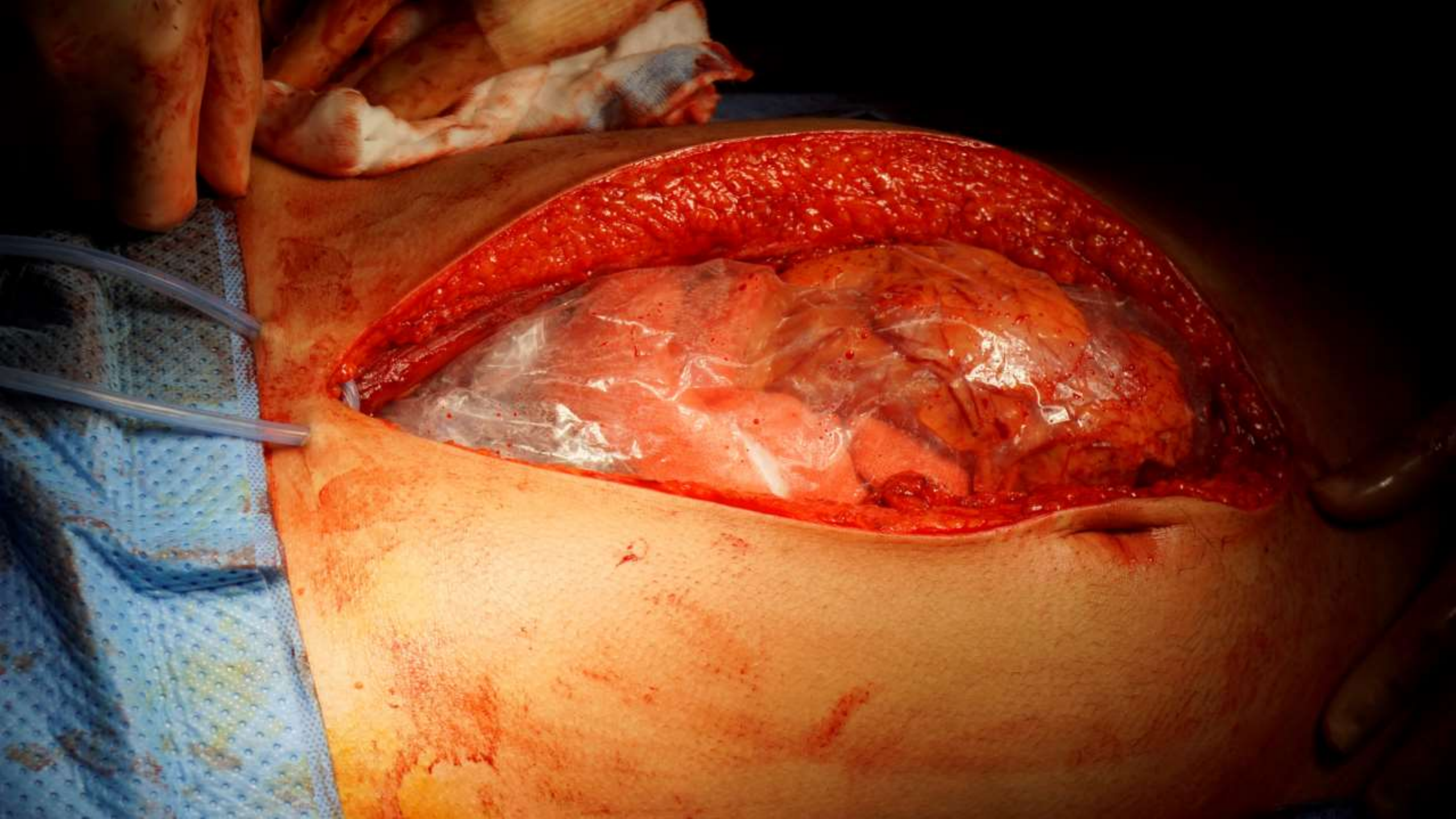












Rot 0°
Ang 0°
FD 48 cm



0:00
1:83
3:43:10

1
44-12

Rot +0°
Ang -0°
FD 48 cm

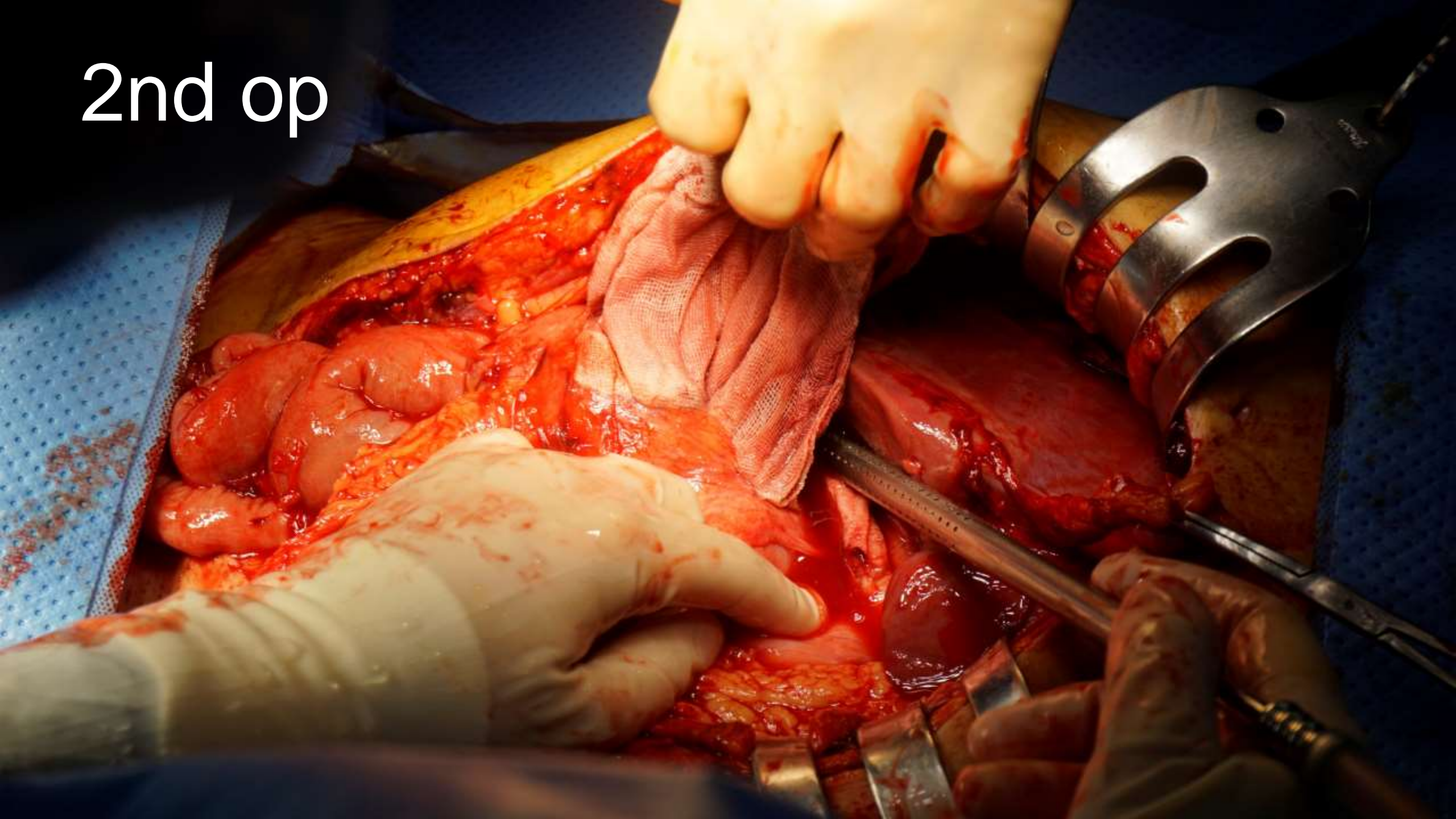


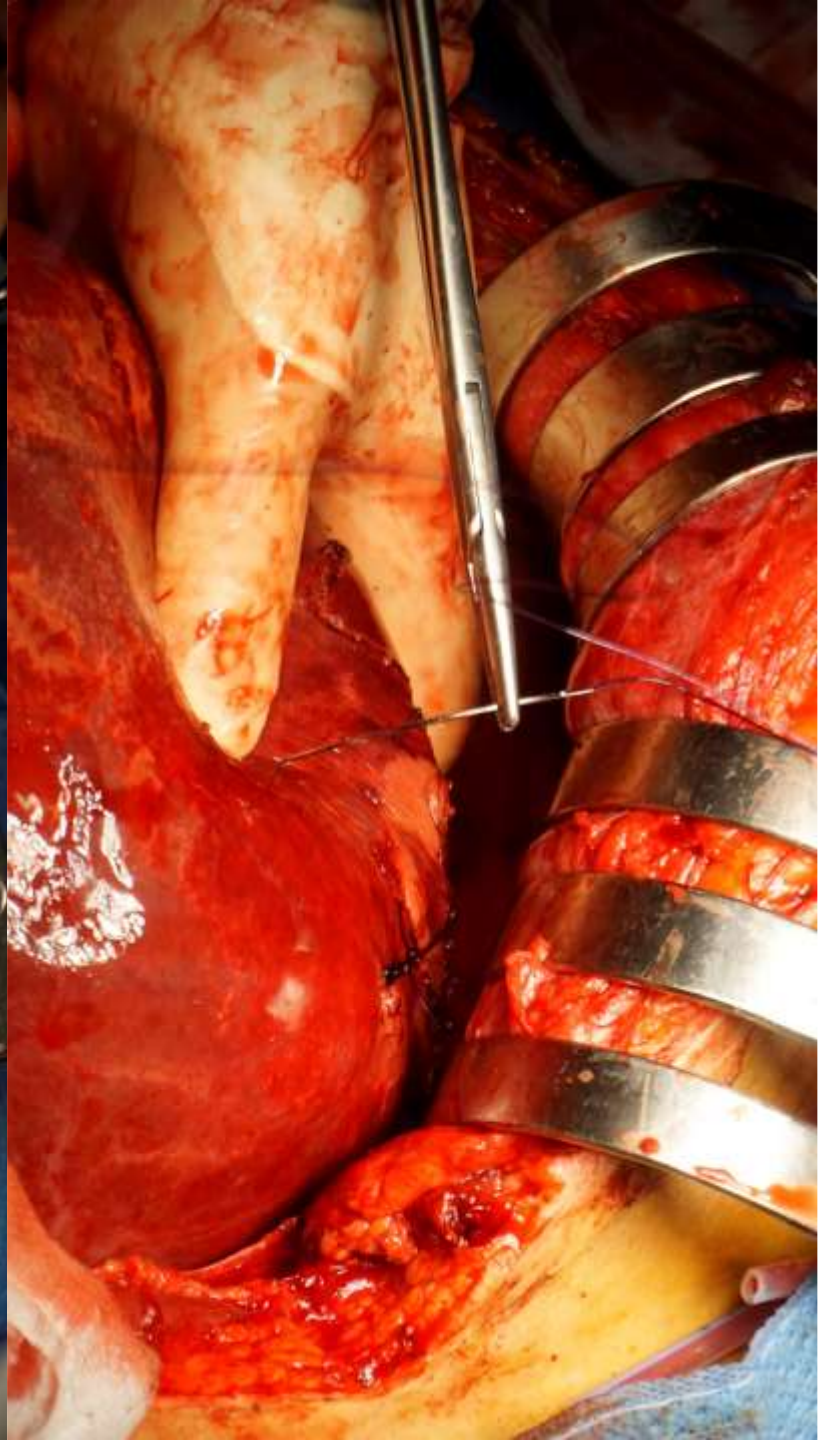
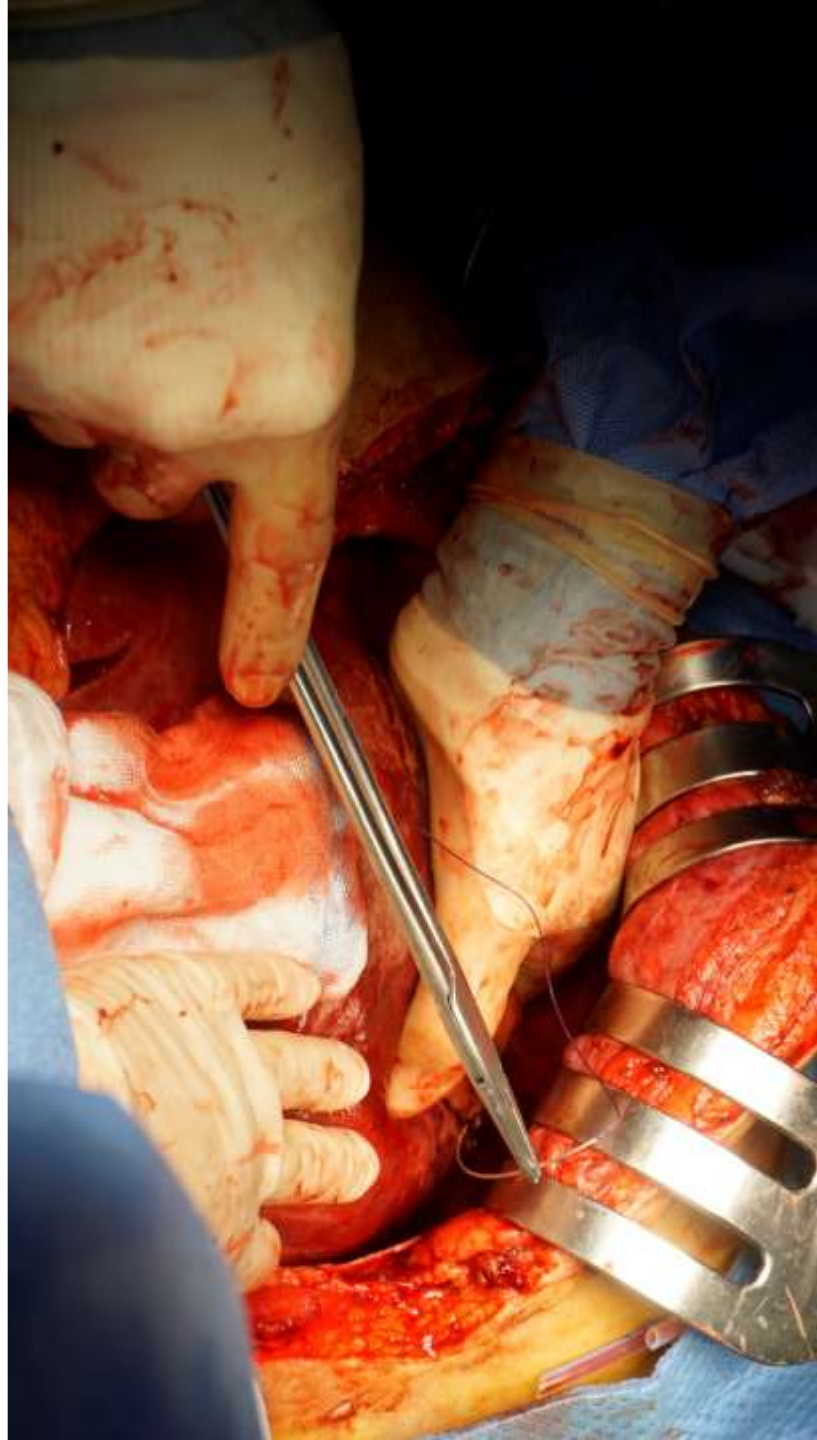
POST EMB
glue inj.
gelfoam inj.
k3 coll 3 x 3 - 7
concerto coil 3 x 4 - 1

0:00
4:35:00

22
1

2nd op







Post OP



1 year FU

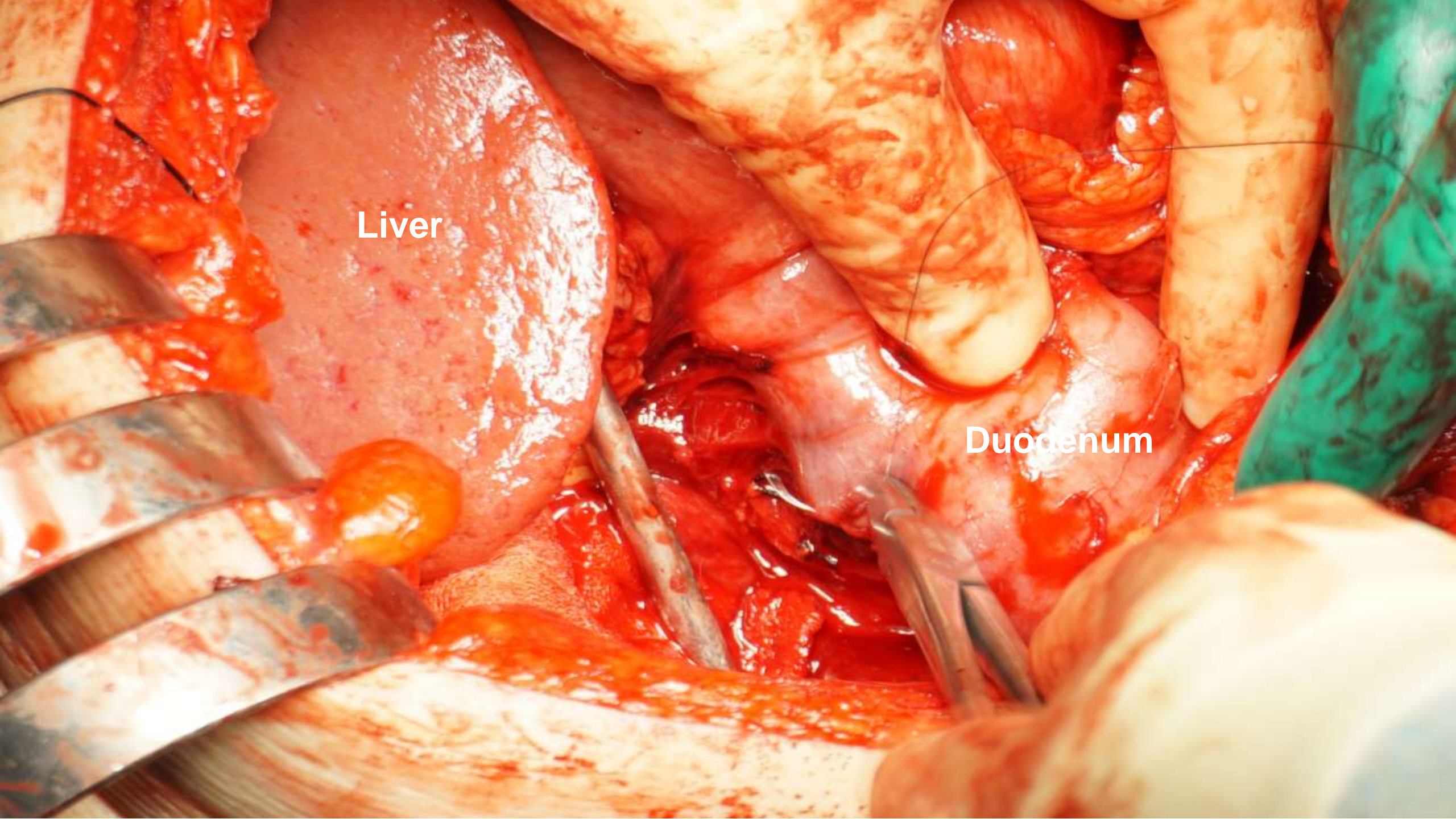


In car TA M/55

Pancreas head injury

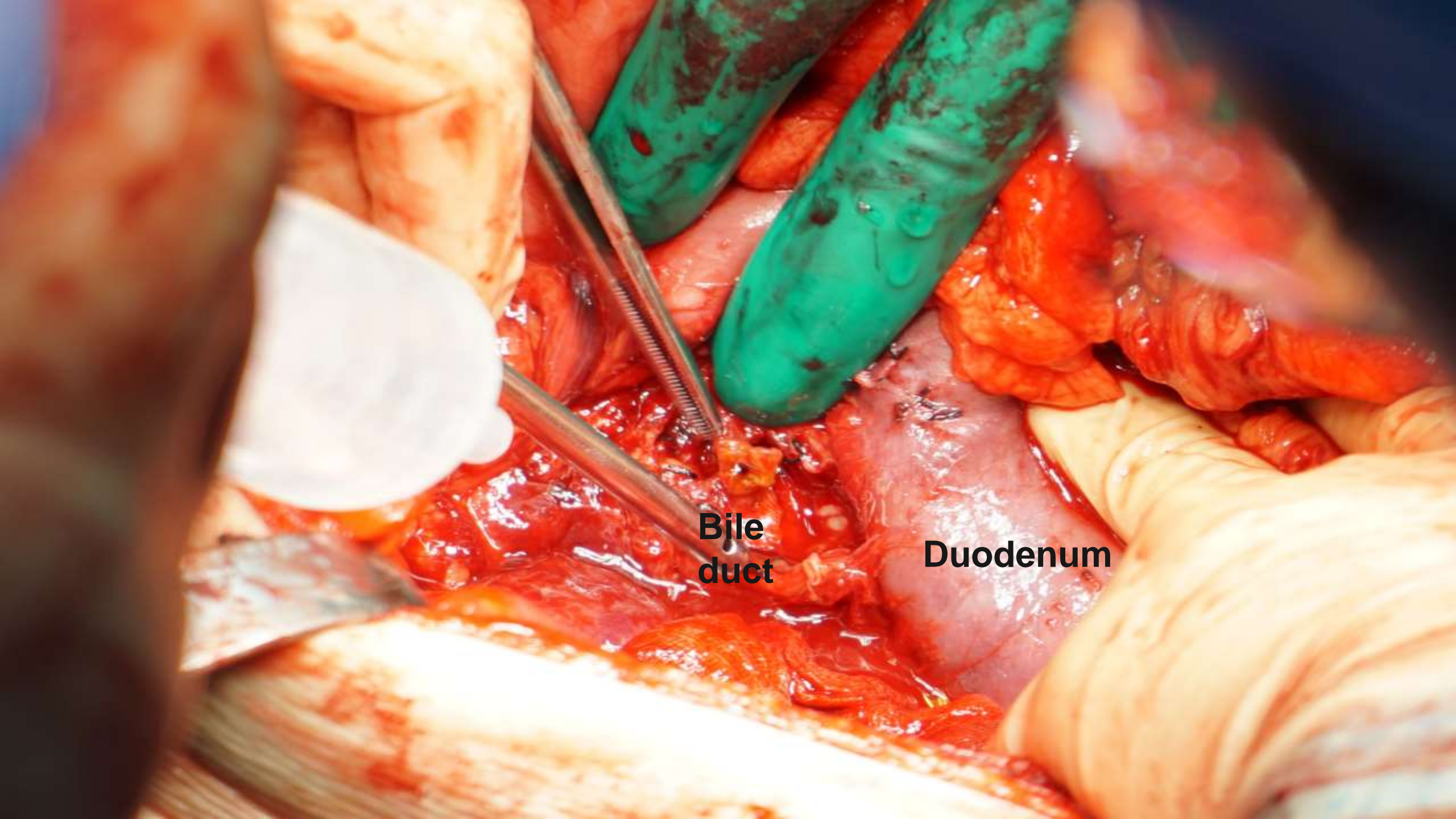
Durdenal injury

Liver injury



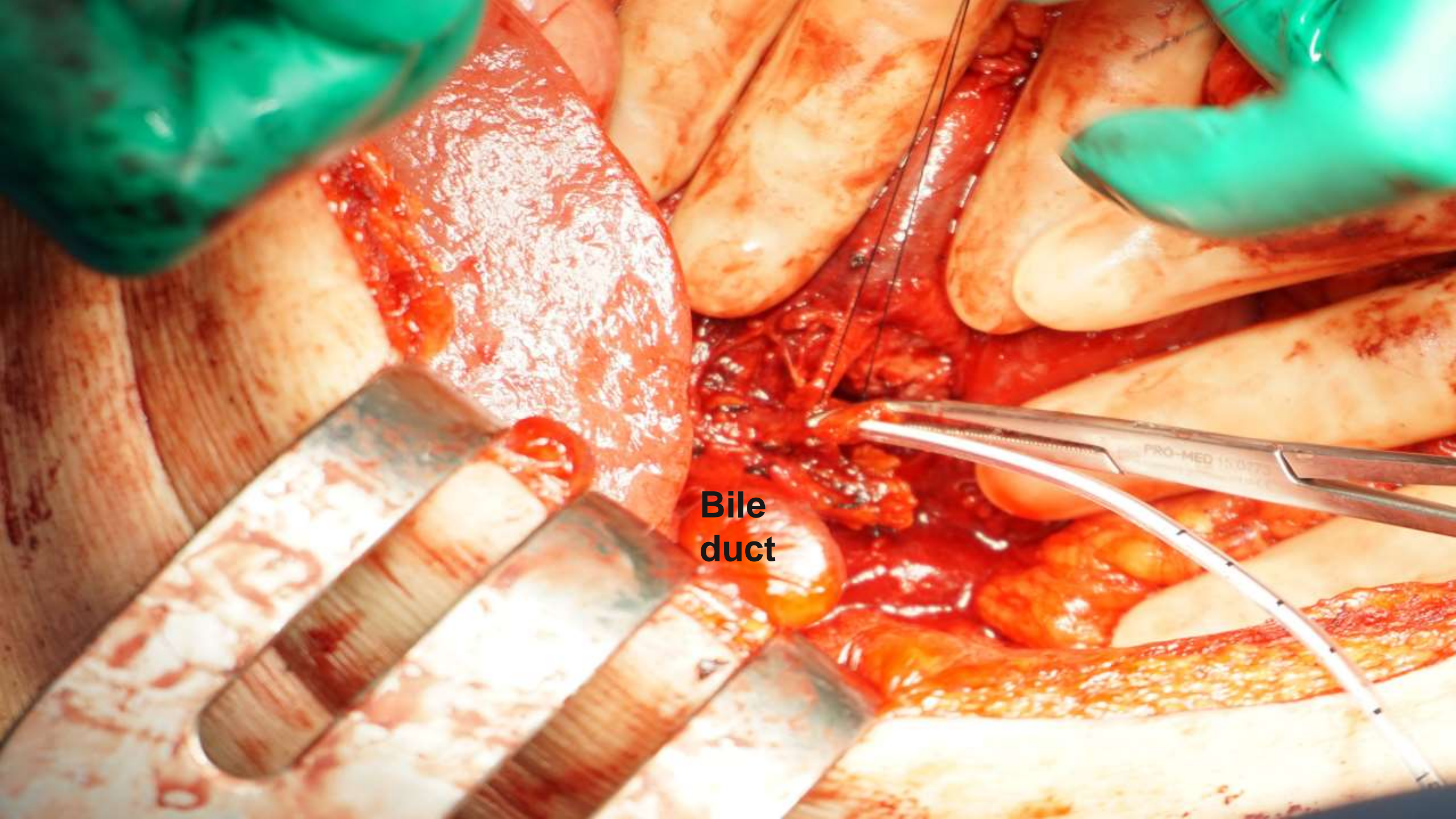
Liver

Duodenum



**Bile
duct**

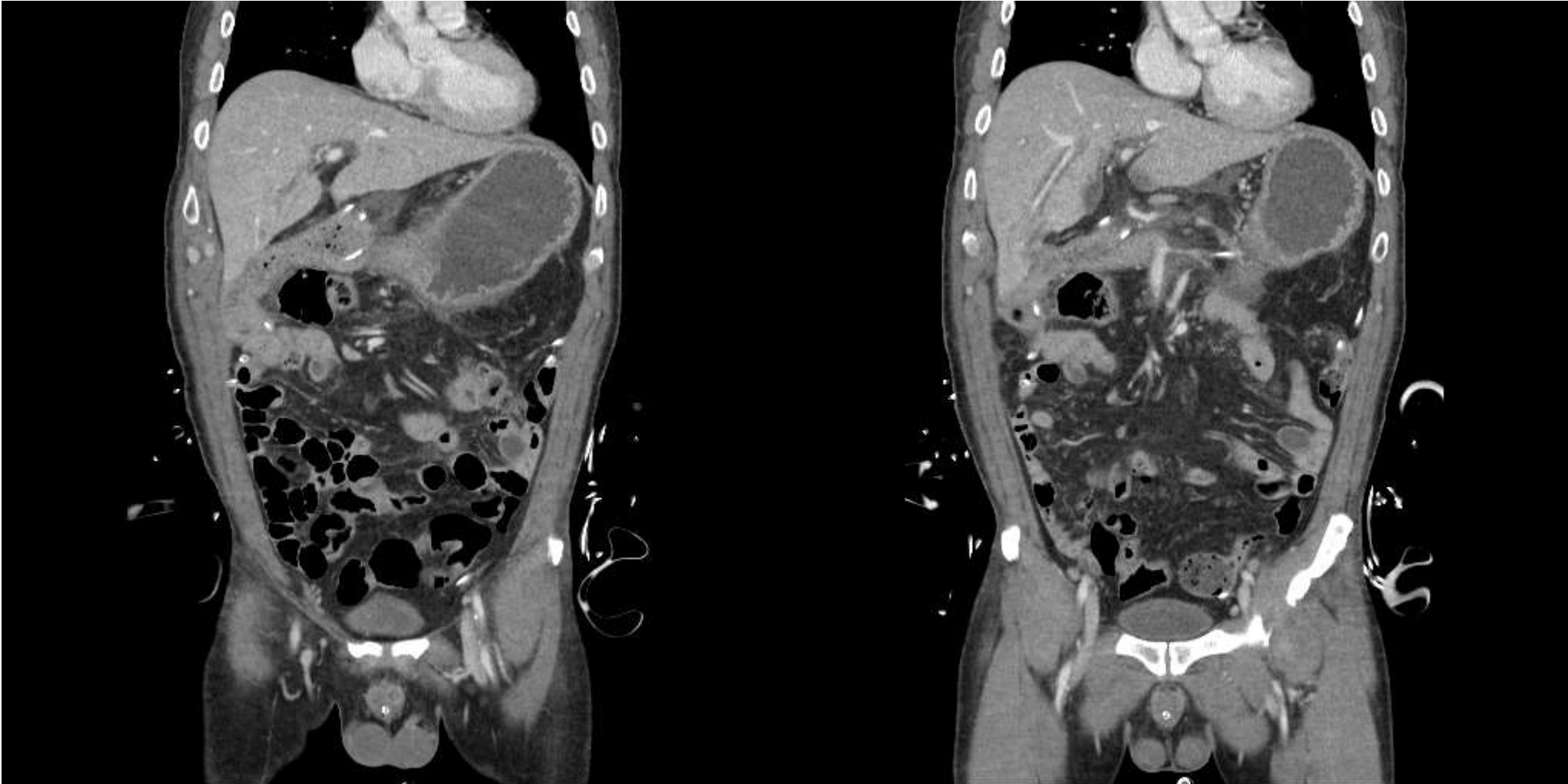
Duodenum



**Bile
duct**

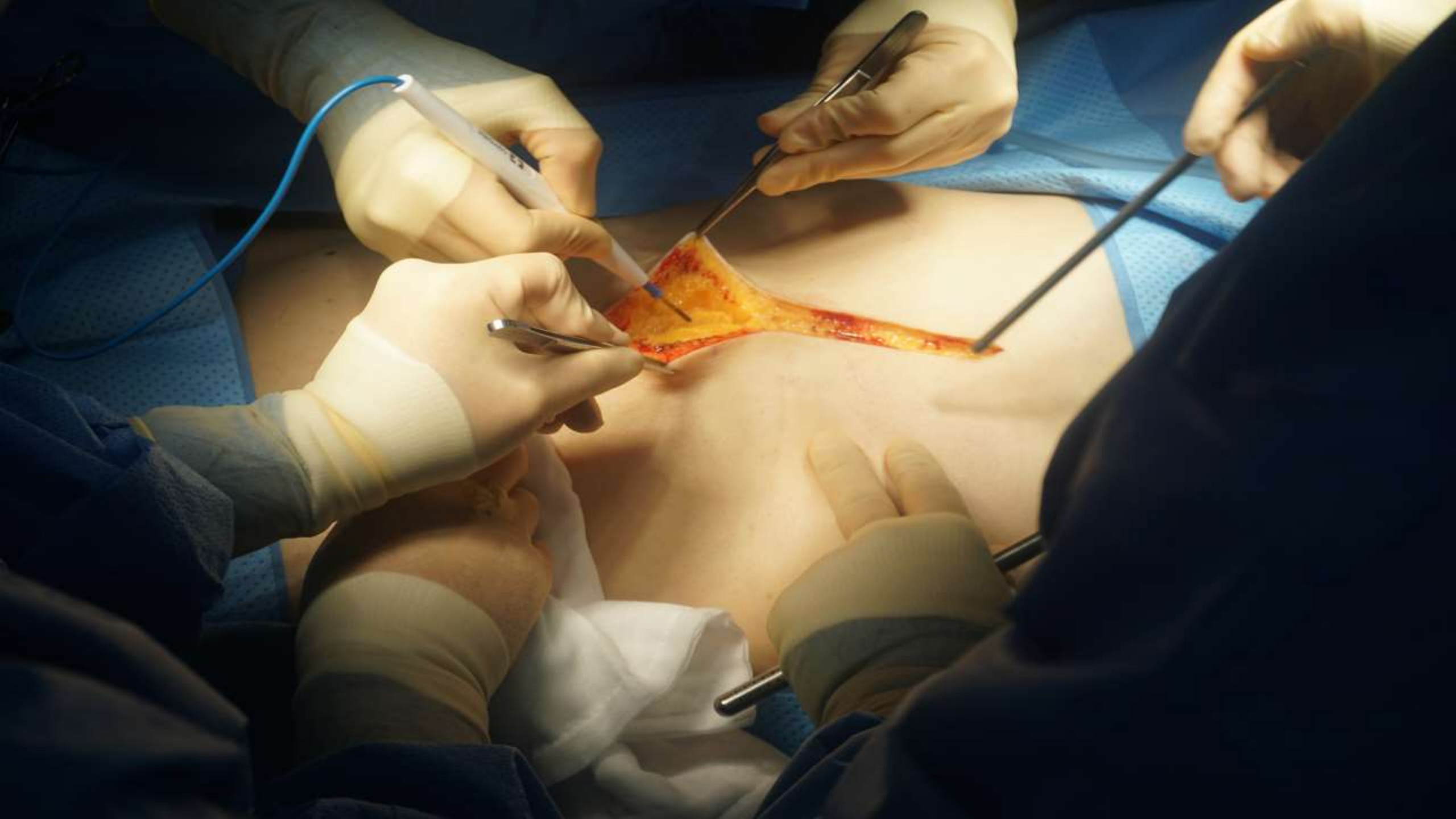


After total pancreatectomy with Pancreas surgeon

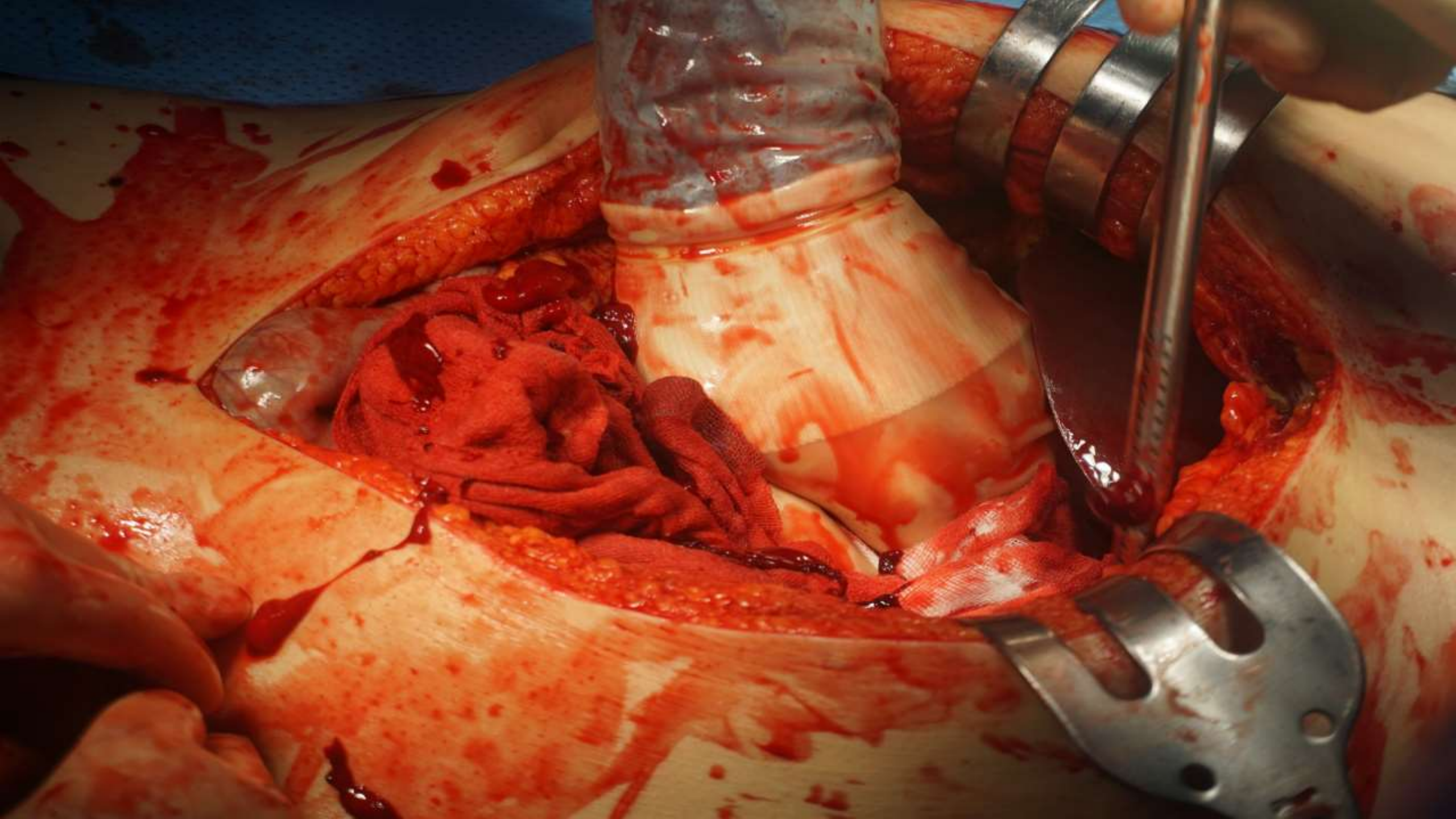


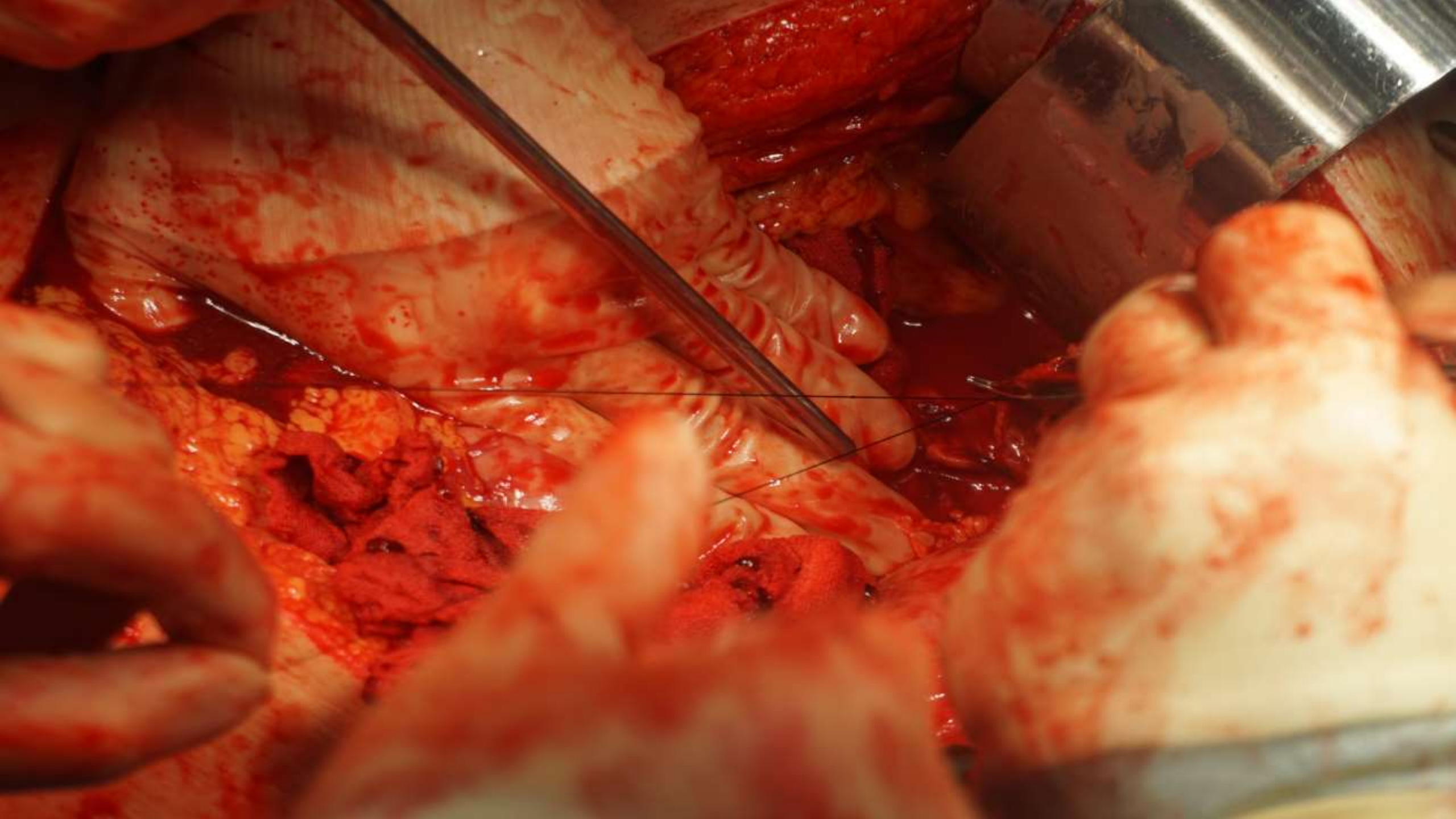
57/M

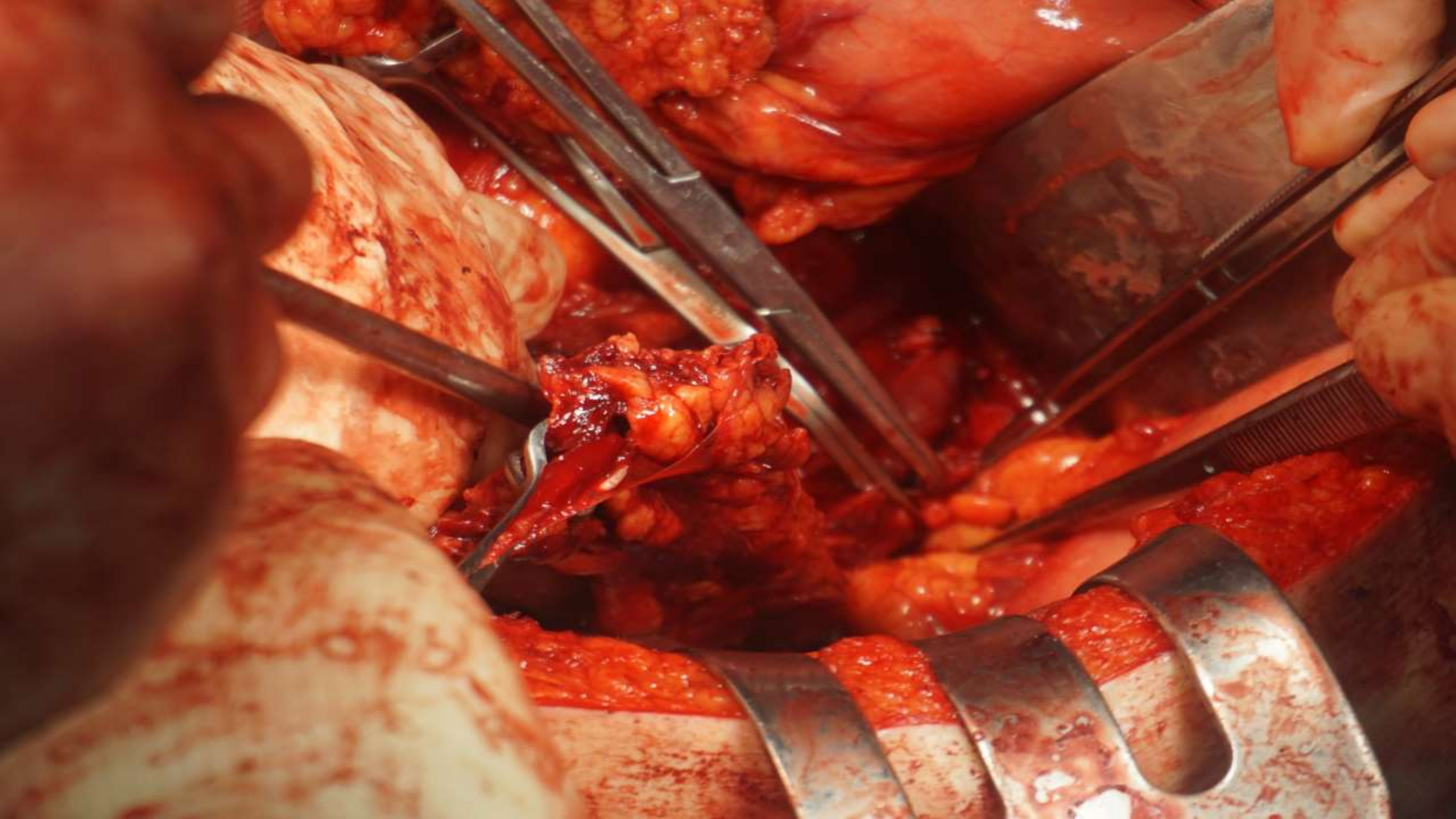
Pancreas injury



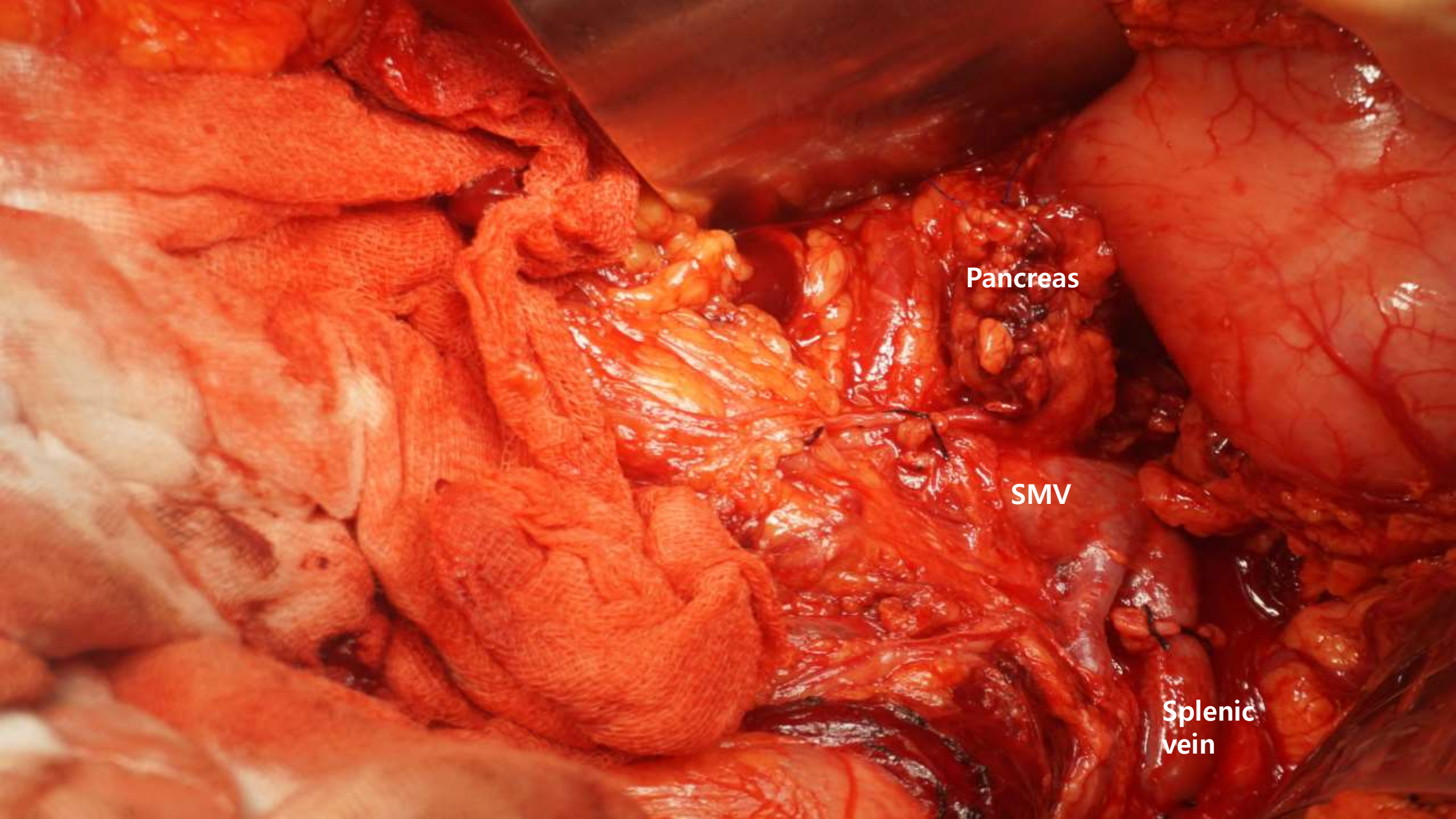












Pancreas

SMV

Splenic vein

2220022357
Fluoroscopy
8075-1-6
1024x1024

Abdomen
ERCP

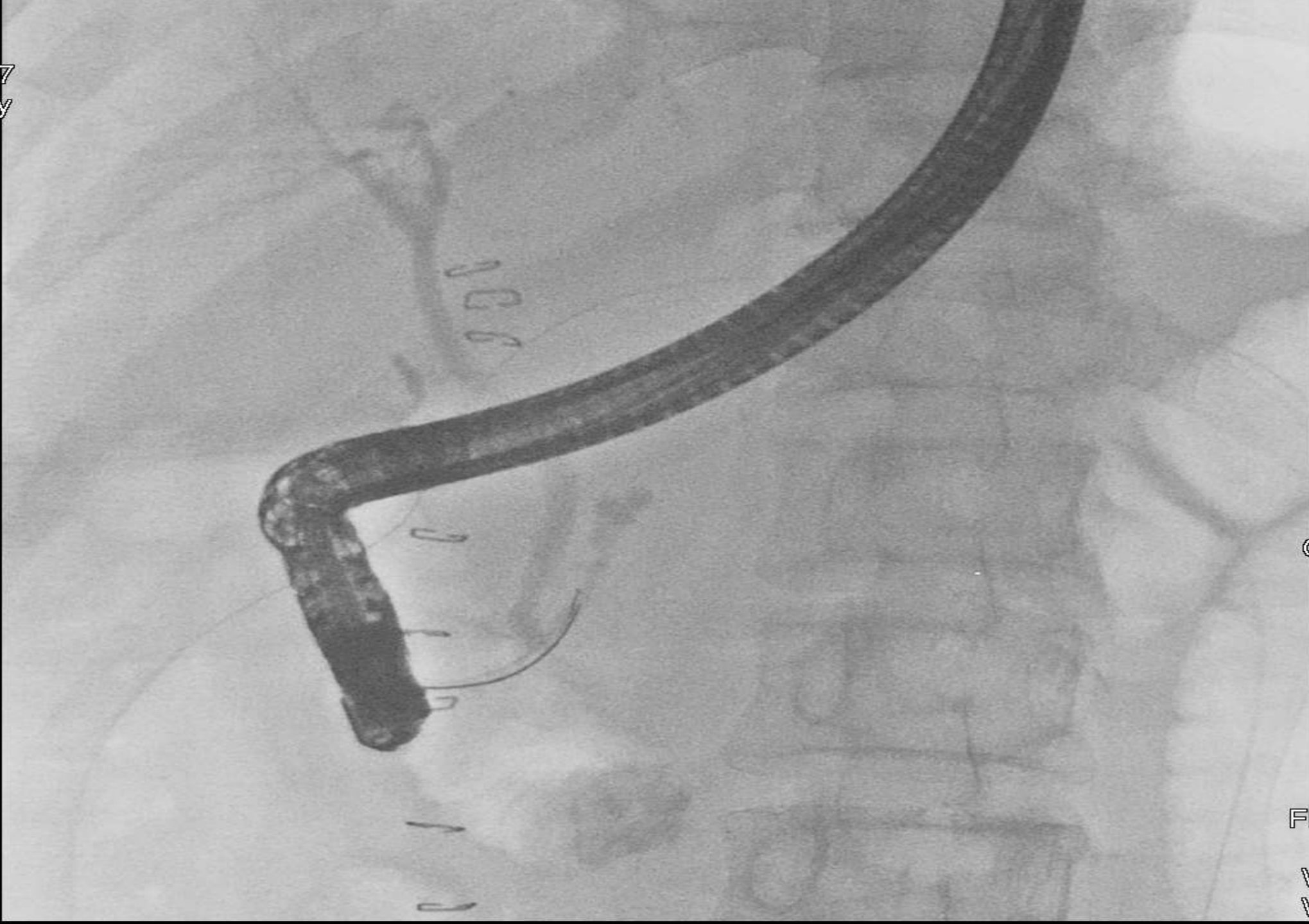
Mid

GAMMA M1
EDGE BP2
Medium
30.0cm
80 kV
25 mA
8.5 ms

DR:Single

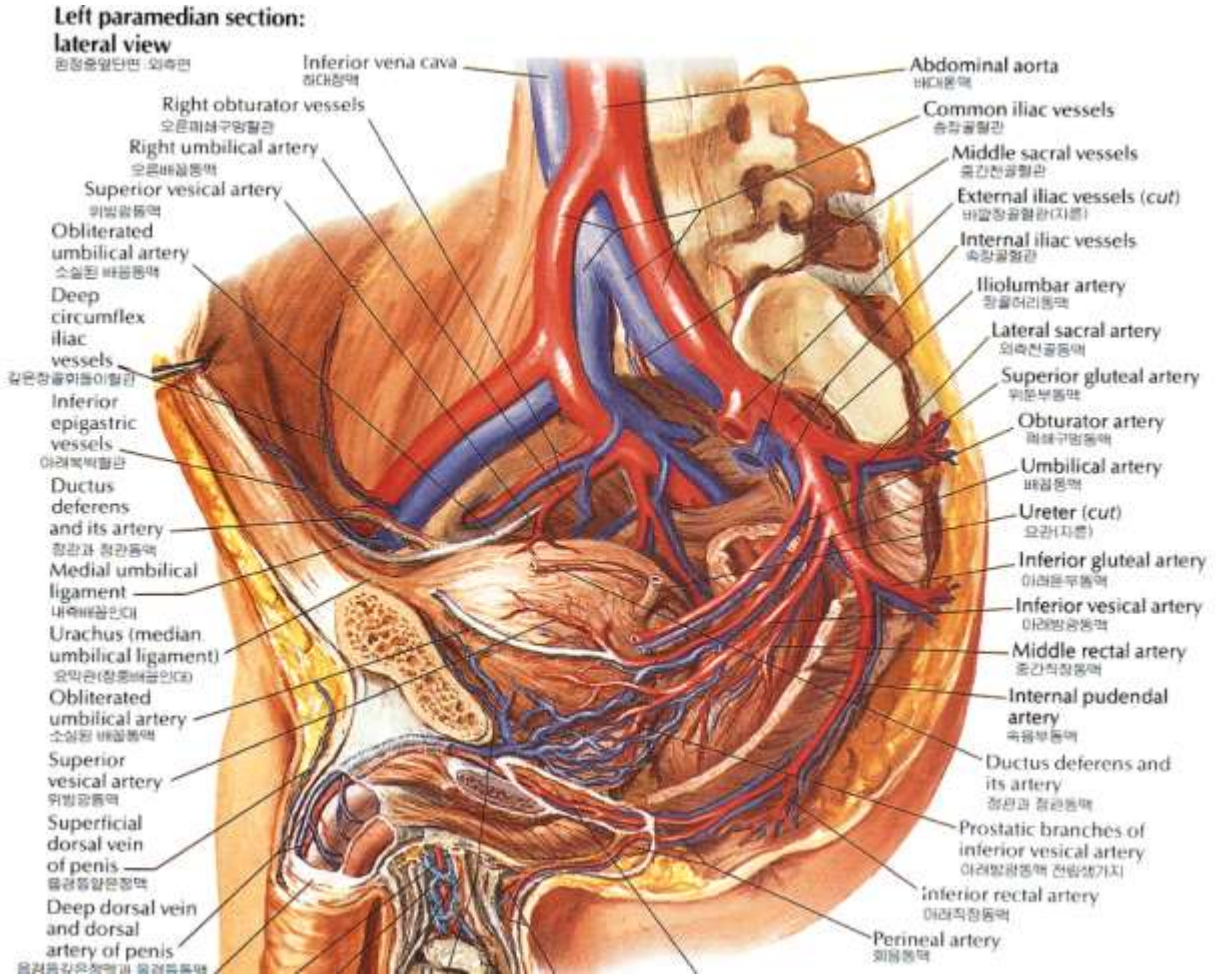
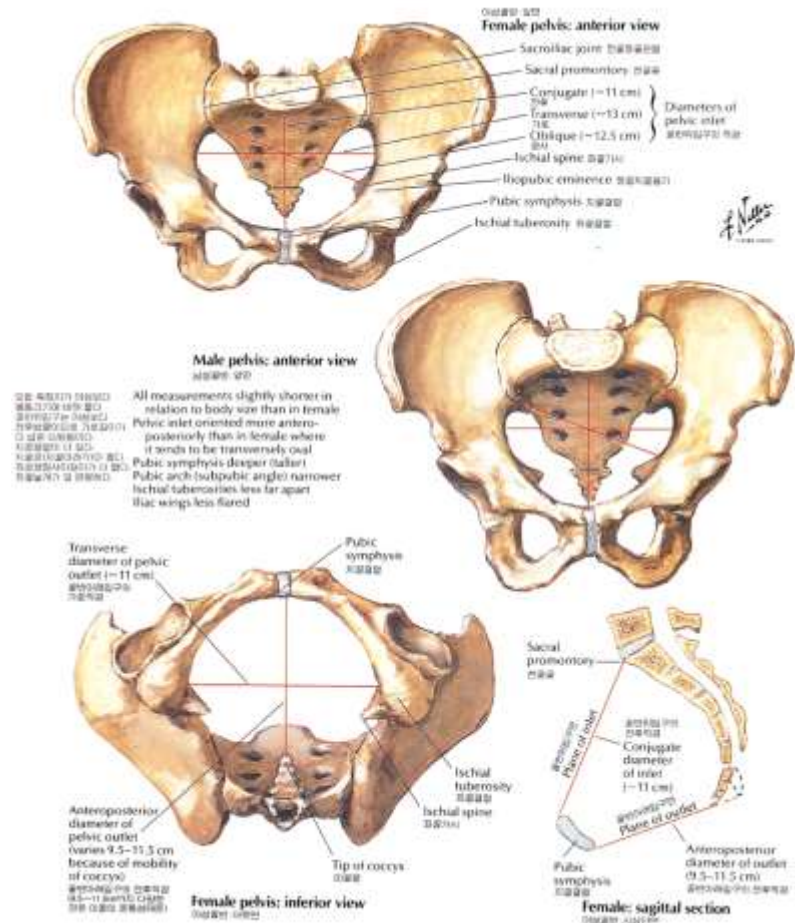
Fluoro Image

W2: 4000
W1: 0





Pelvic Trauma



Pelvic trauma



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High mortality

Multi-disciplinary
approach



Rapid response

High Resources

Diagnosis



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- X-ray
- Computed tomography



Pelvic fracture and injuries

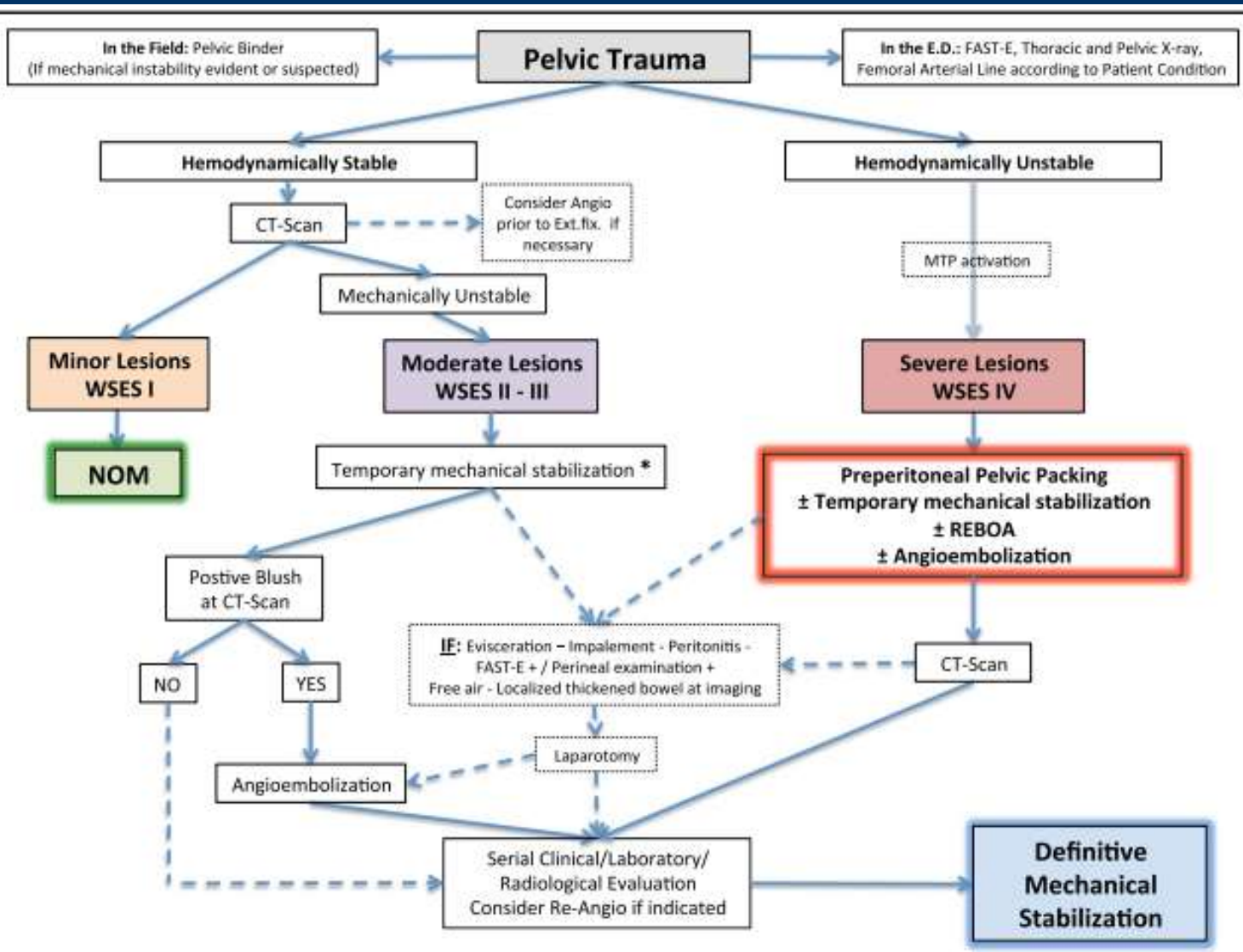


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- Blood loss
 - Fractured bone surfaces
 - Pelvic venous plexus
 - Pelvic arterial injury
 - Extrapelvic sources

X-ray로 출혈의 원인까지는
확인 불가능





PPP – venous bleeding / Extraplevic source

Mechanical stabilization – bone

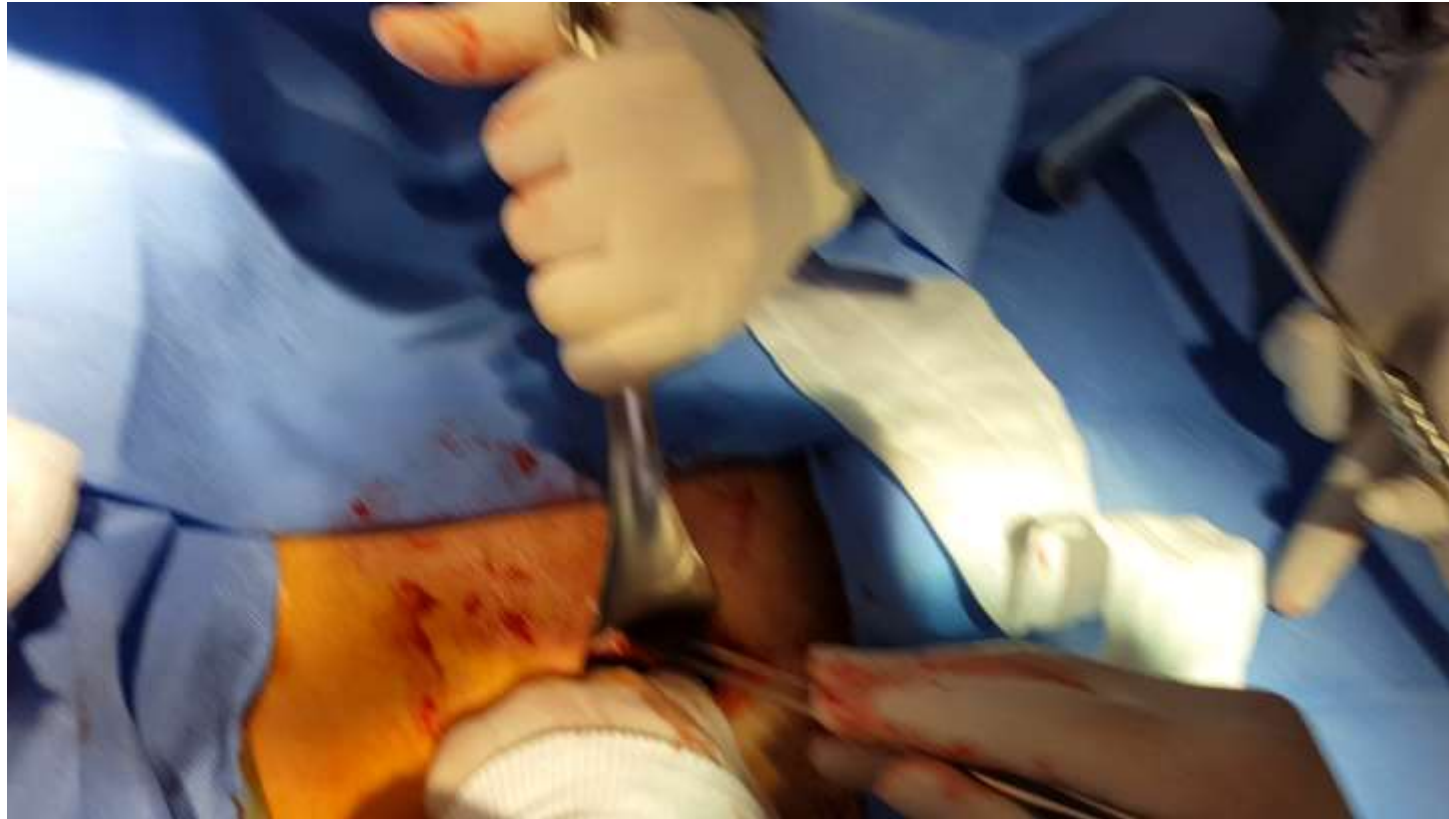
Angioembolization/REBOA – arterial bleeding

Pelvic trauma: WSES classification and guidelines

Preperitoneal packing (PPP)



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Mechanical stabilization



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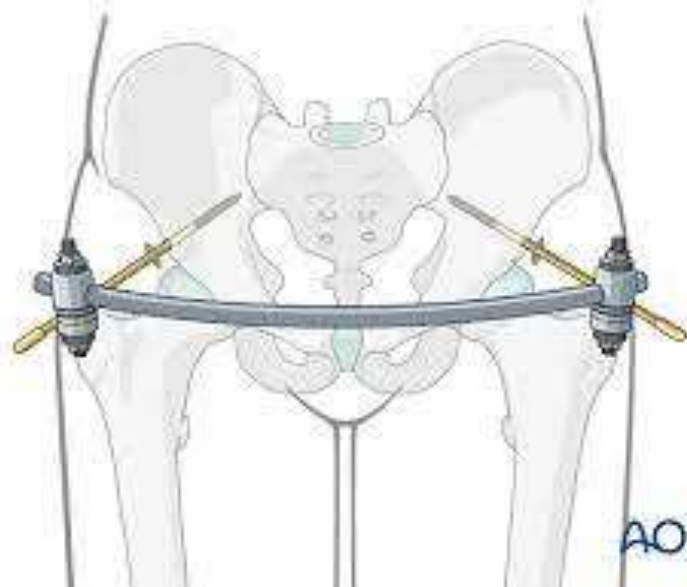
A Sam Pelvic Sling



B Pelvic Binder



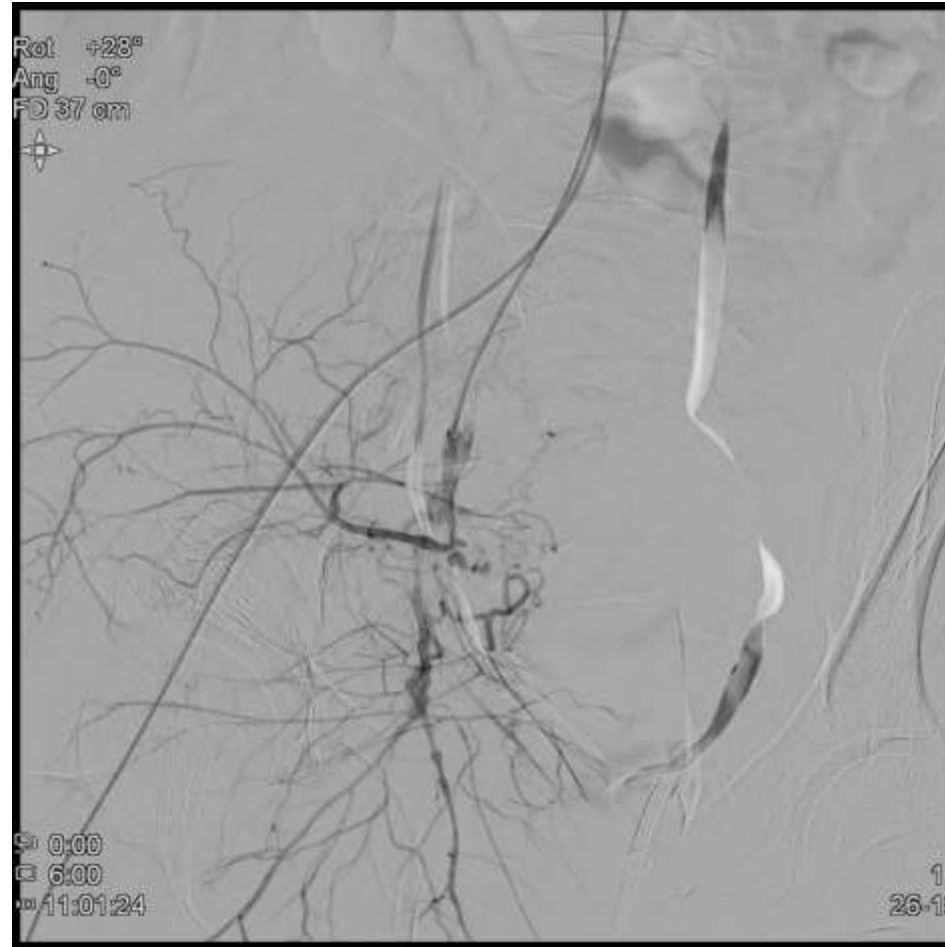
C T-Pod



Angiography



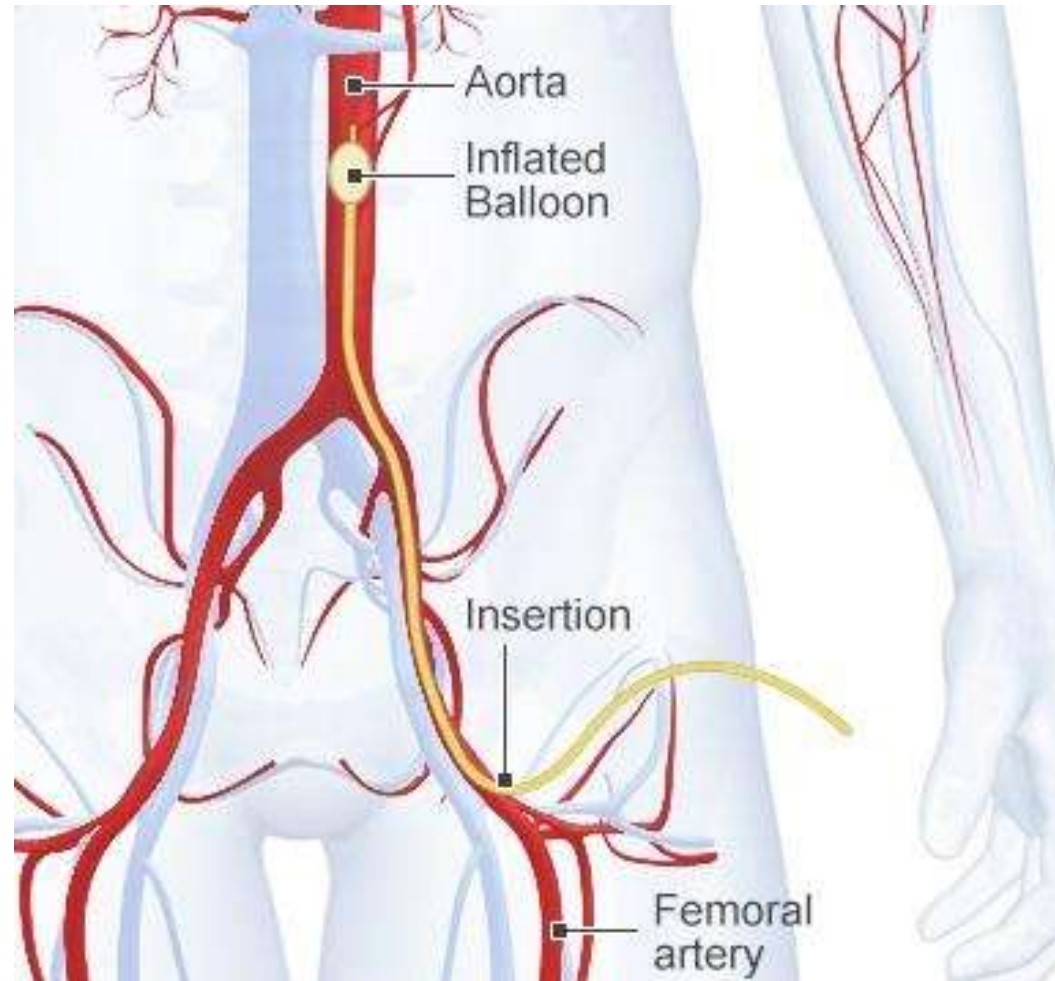
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Resuscitative Endovascular Balloon Occlusion of Aorta (REBOA)



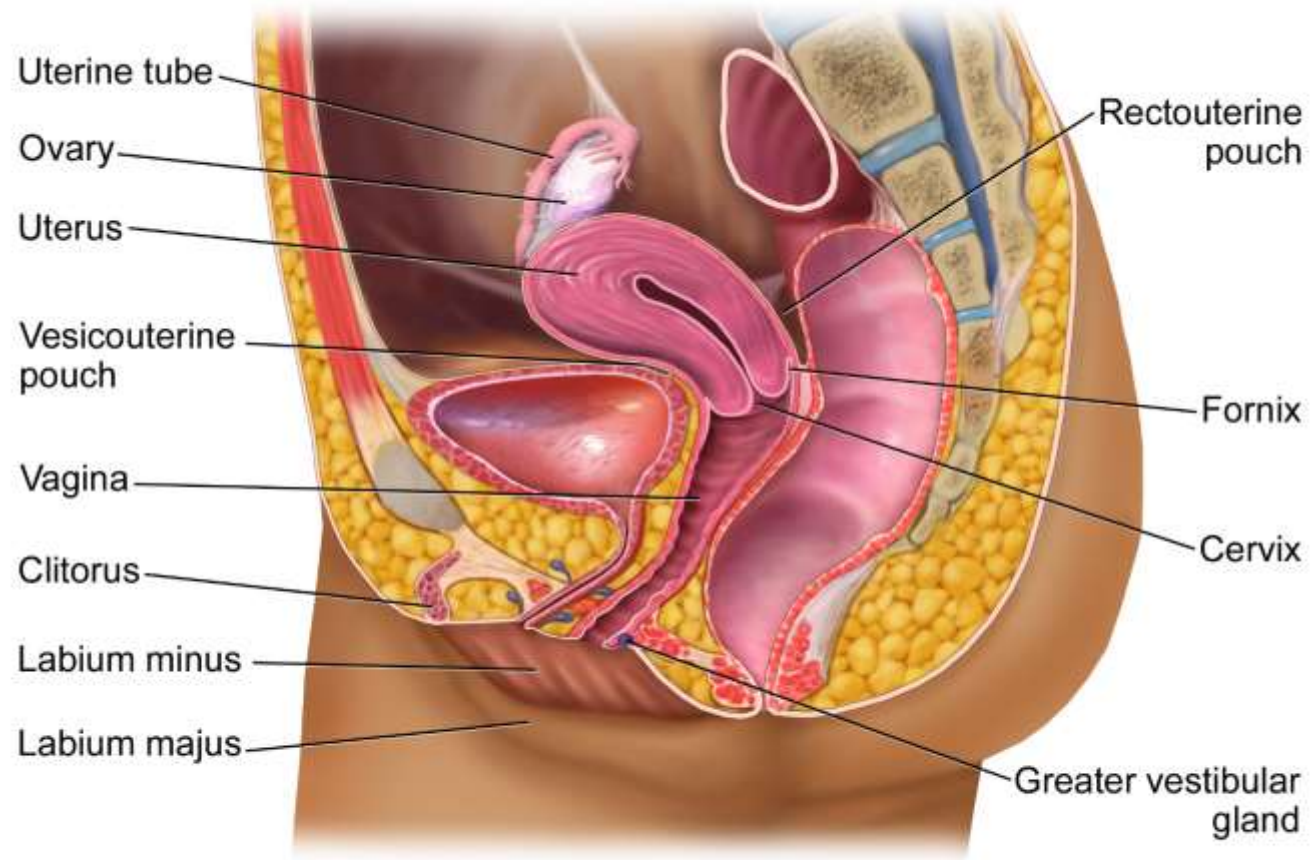
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Pelvic fracture associated Injury



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The Female Reproductive System

CASE

Pelvic Injury

In car TA 53/M



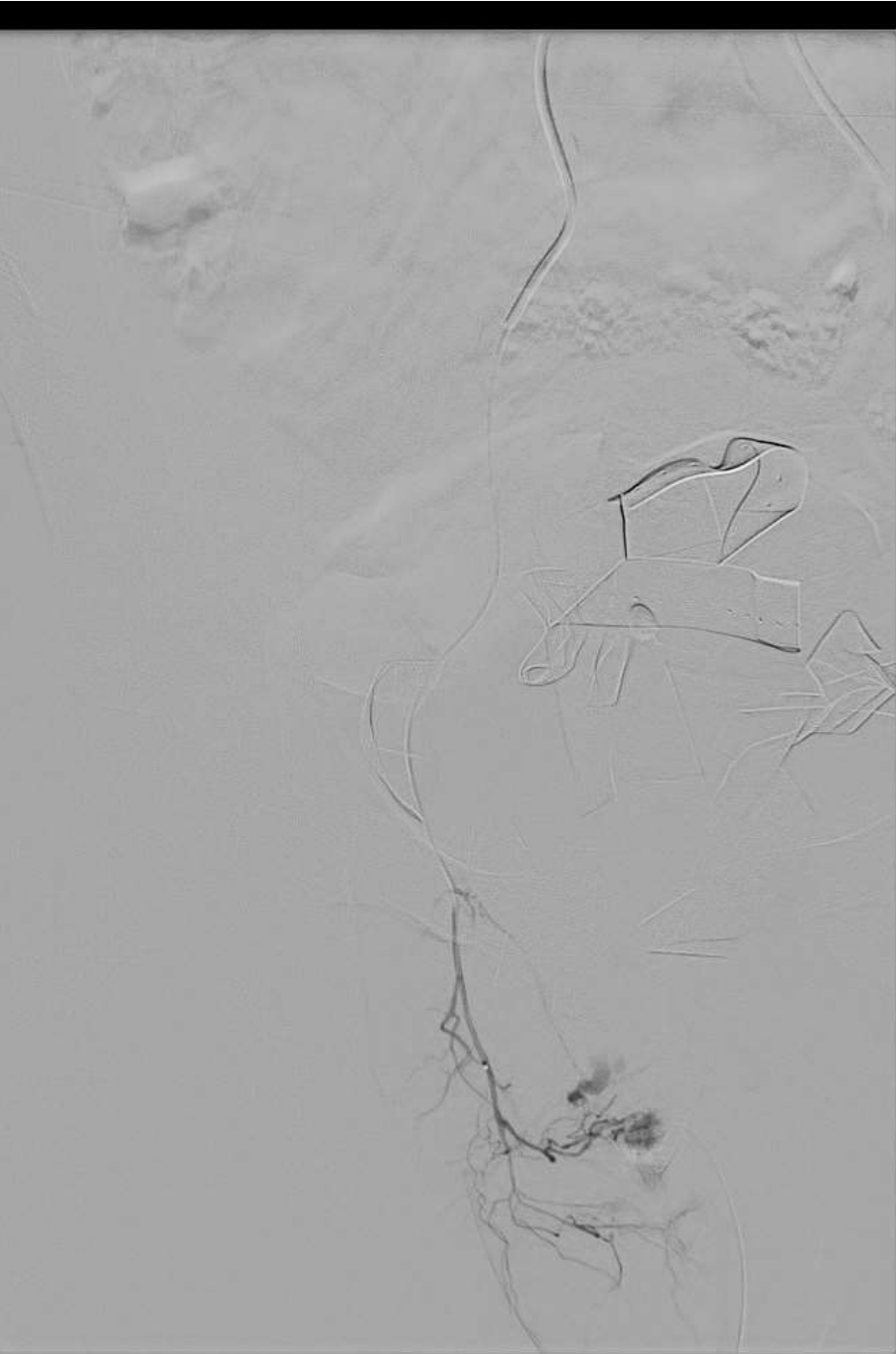
Hypotension

Lt. Femur fracture
FAST negative



®

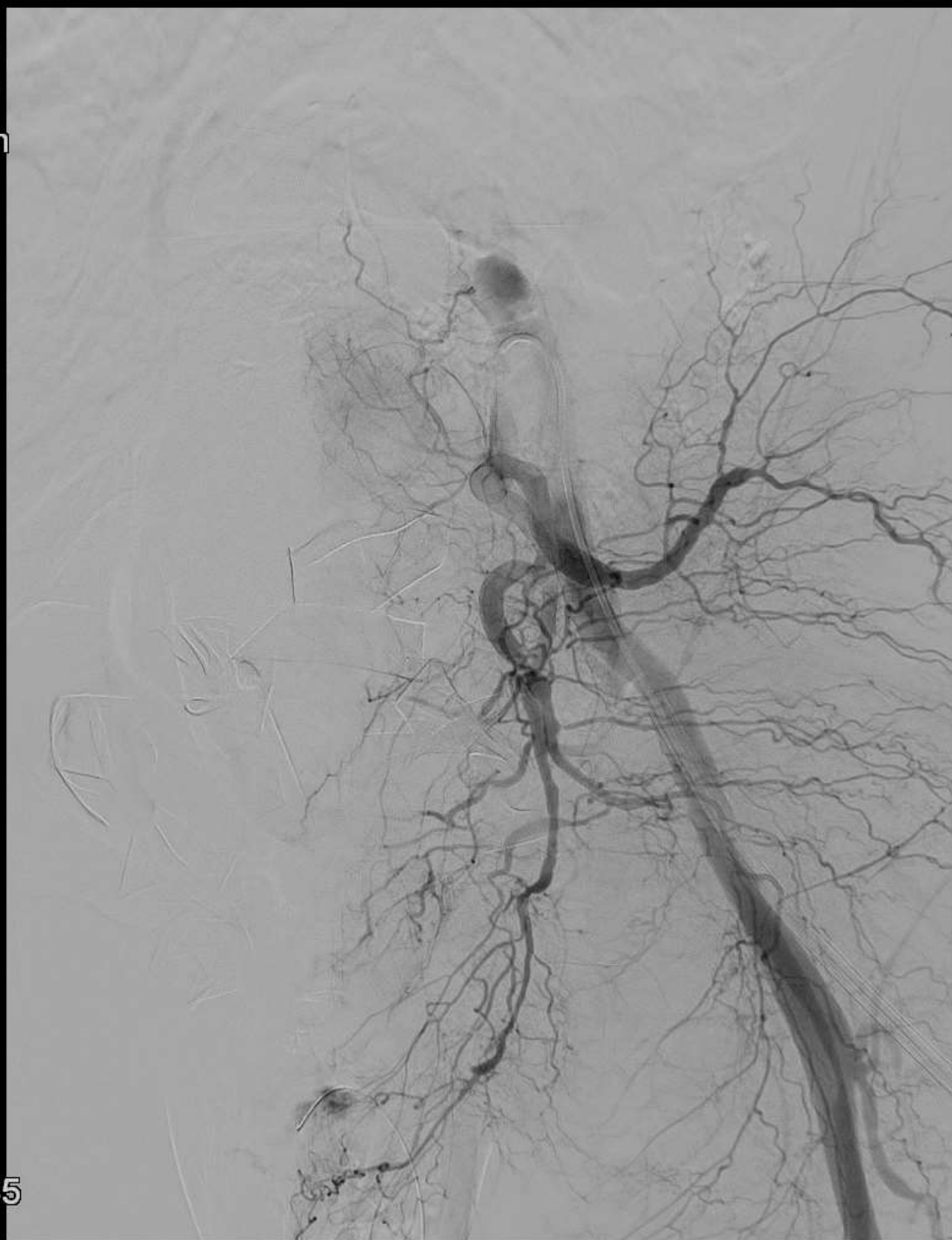
REBOA



Rot 0°
Ang 0°
FD 48 cm



0:00
10:00
13:00 8:38:45



10
27-23

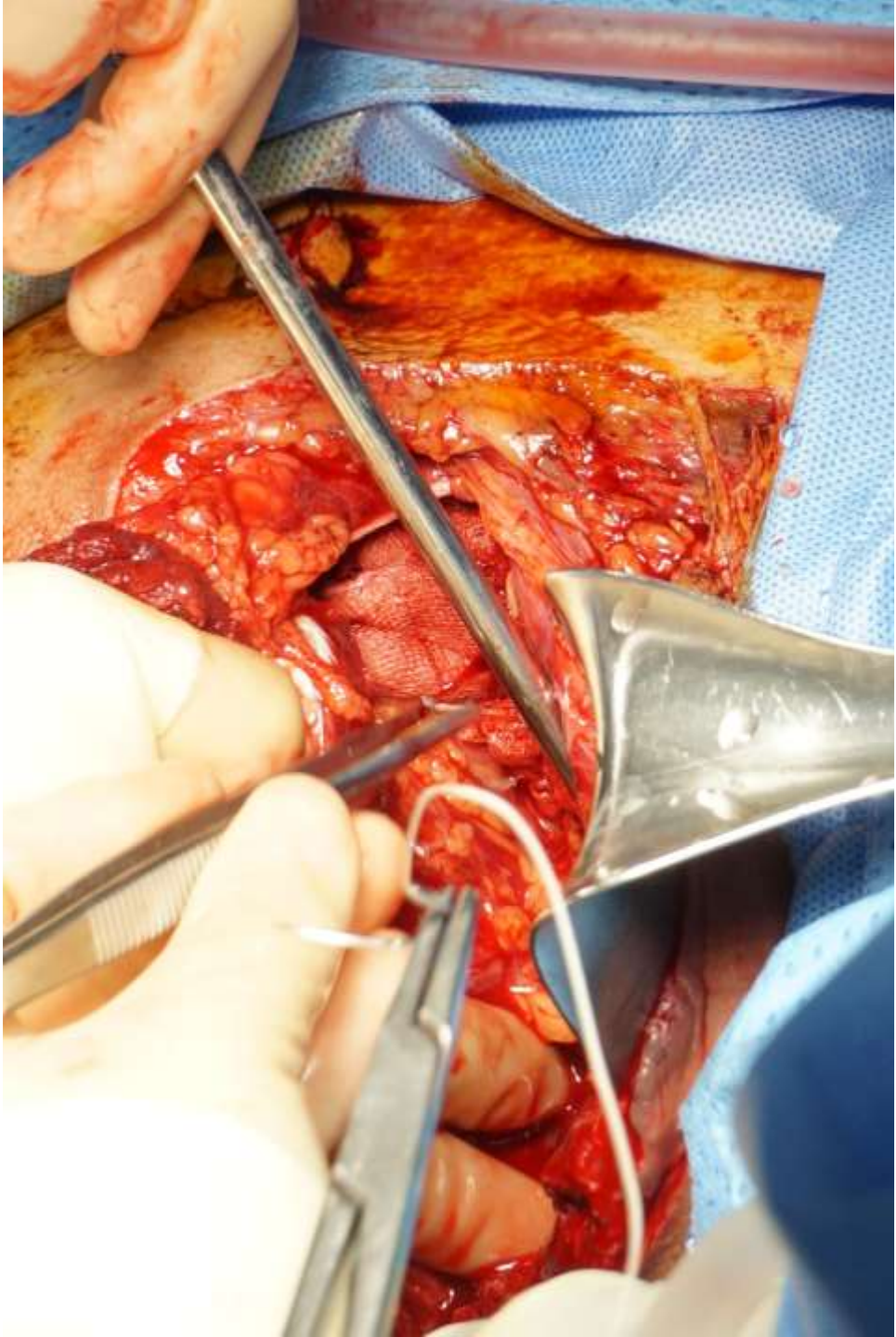




FALL F/14

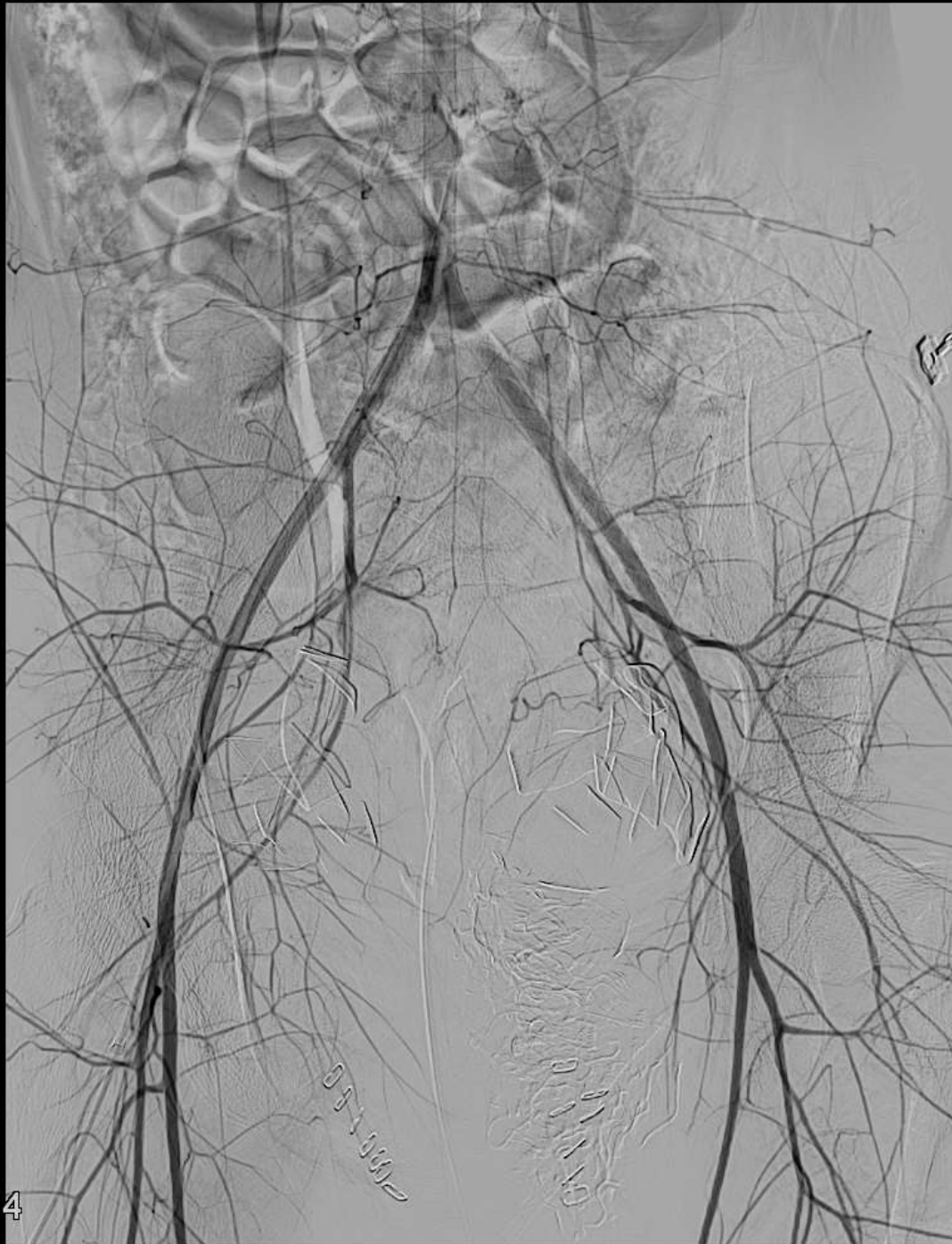








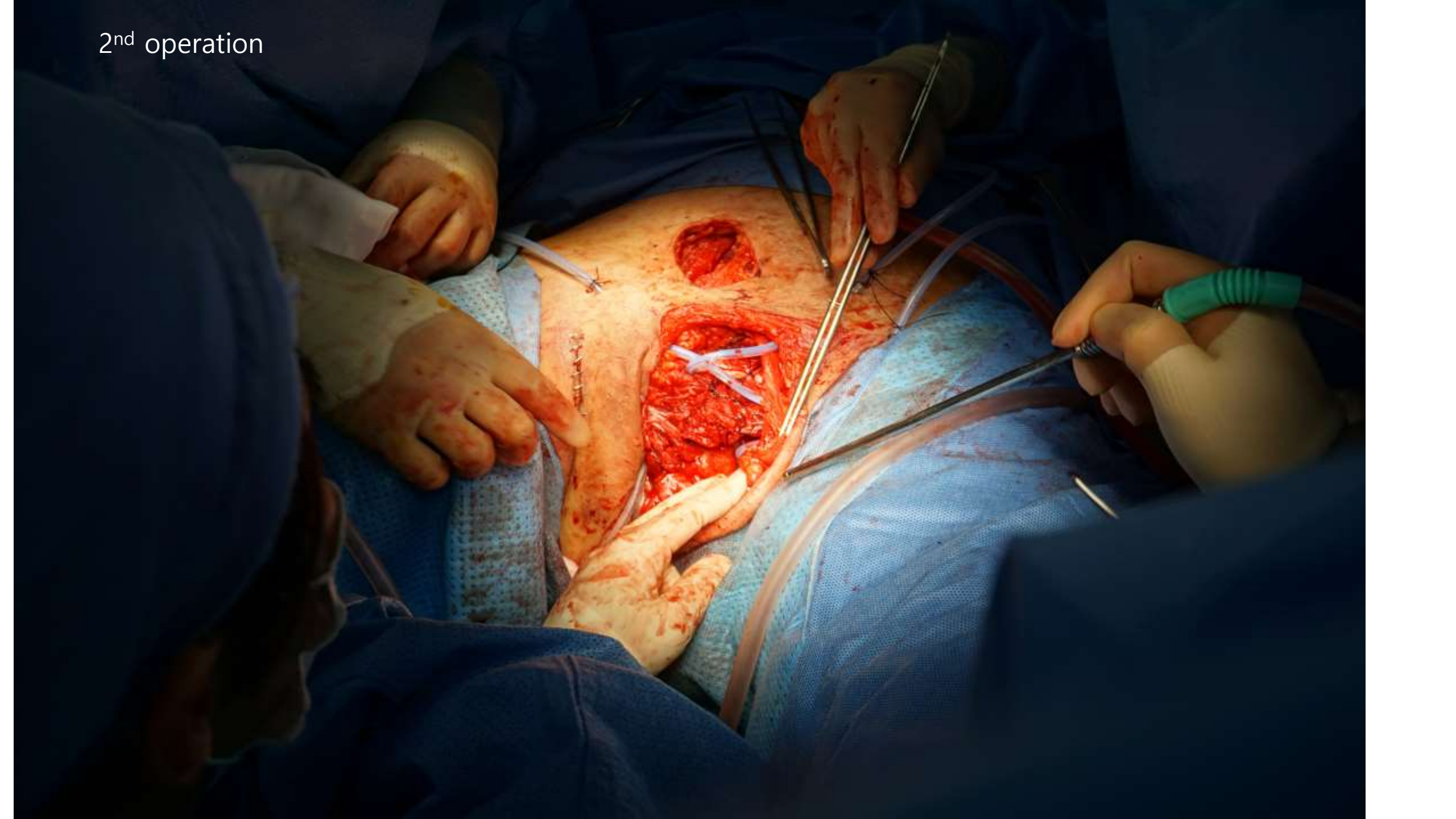
Rot -0°
Ang 0°
FD 48 cm



0 0:00
□ 4:50
» 22:32:14

1
47-28

2nd operation





+Loop
ileostomy





Conclusion



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- Early Resuscitation
 - ABCDE
- Early Treatment
 - Great Threat First
 - Definite Diagnosis Later