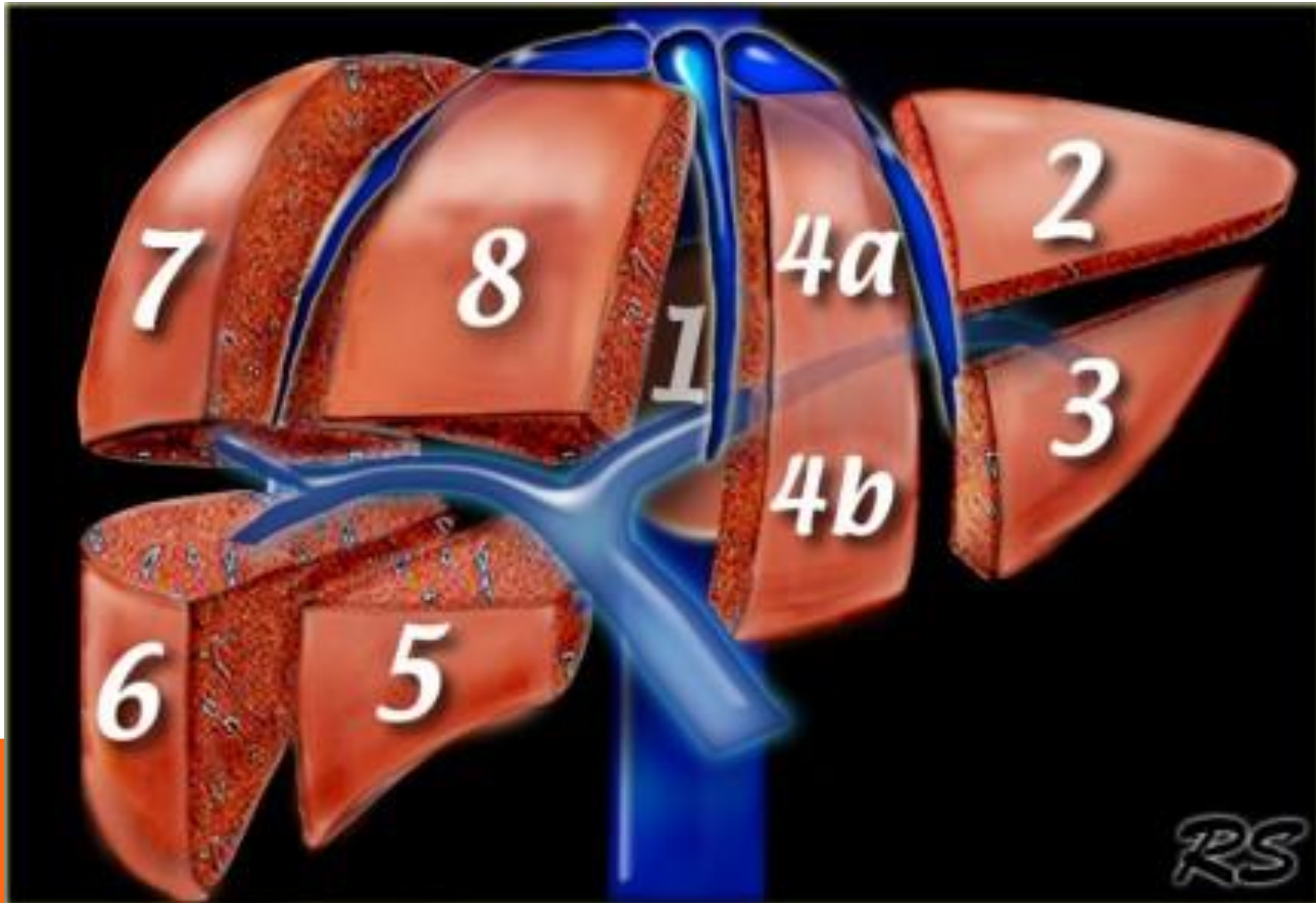
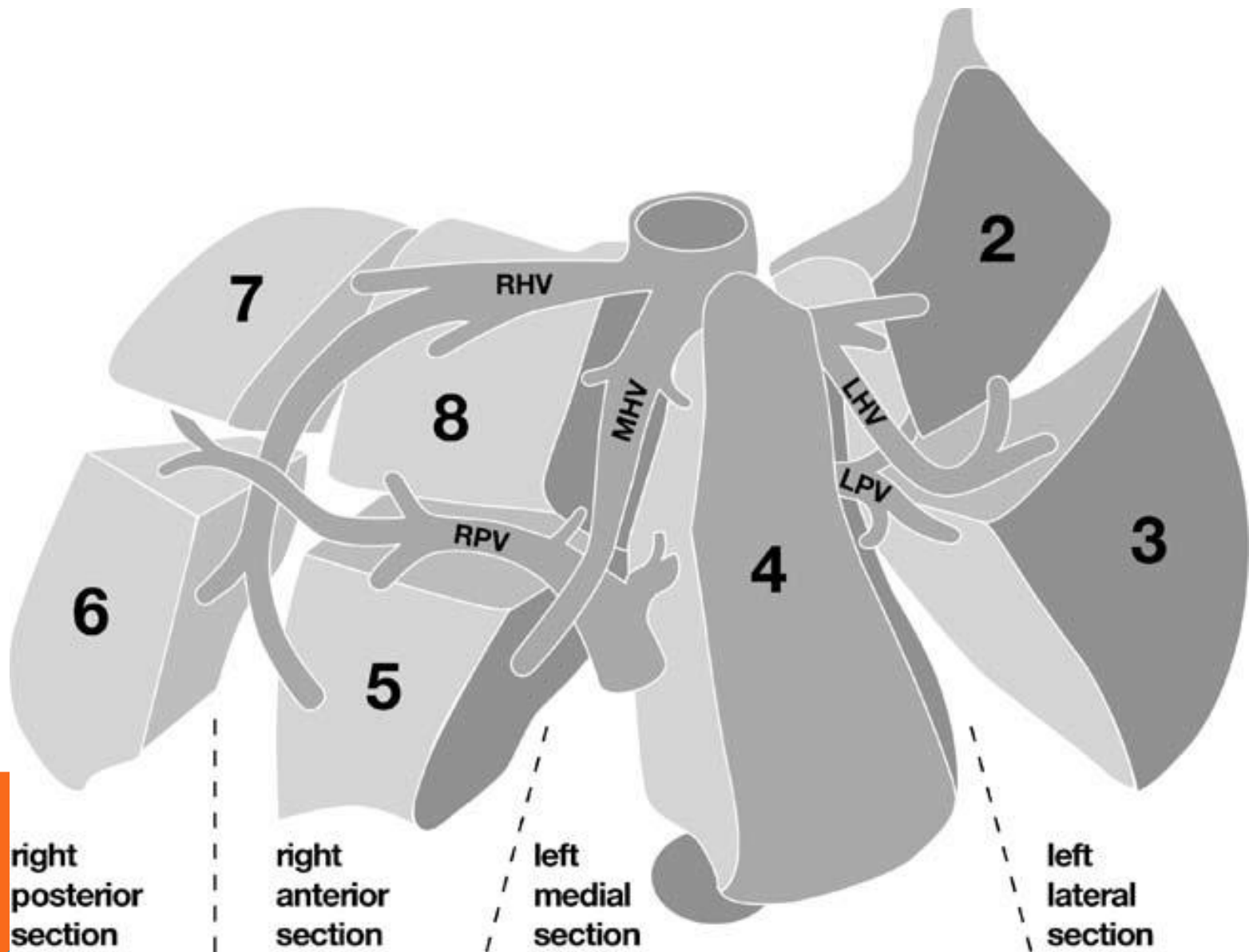


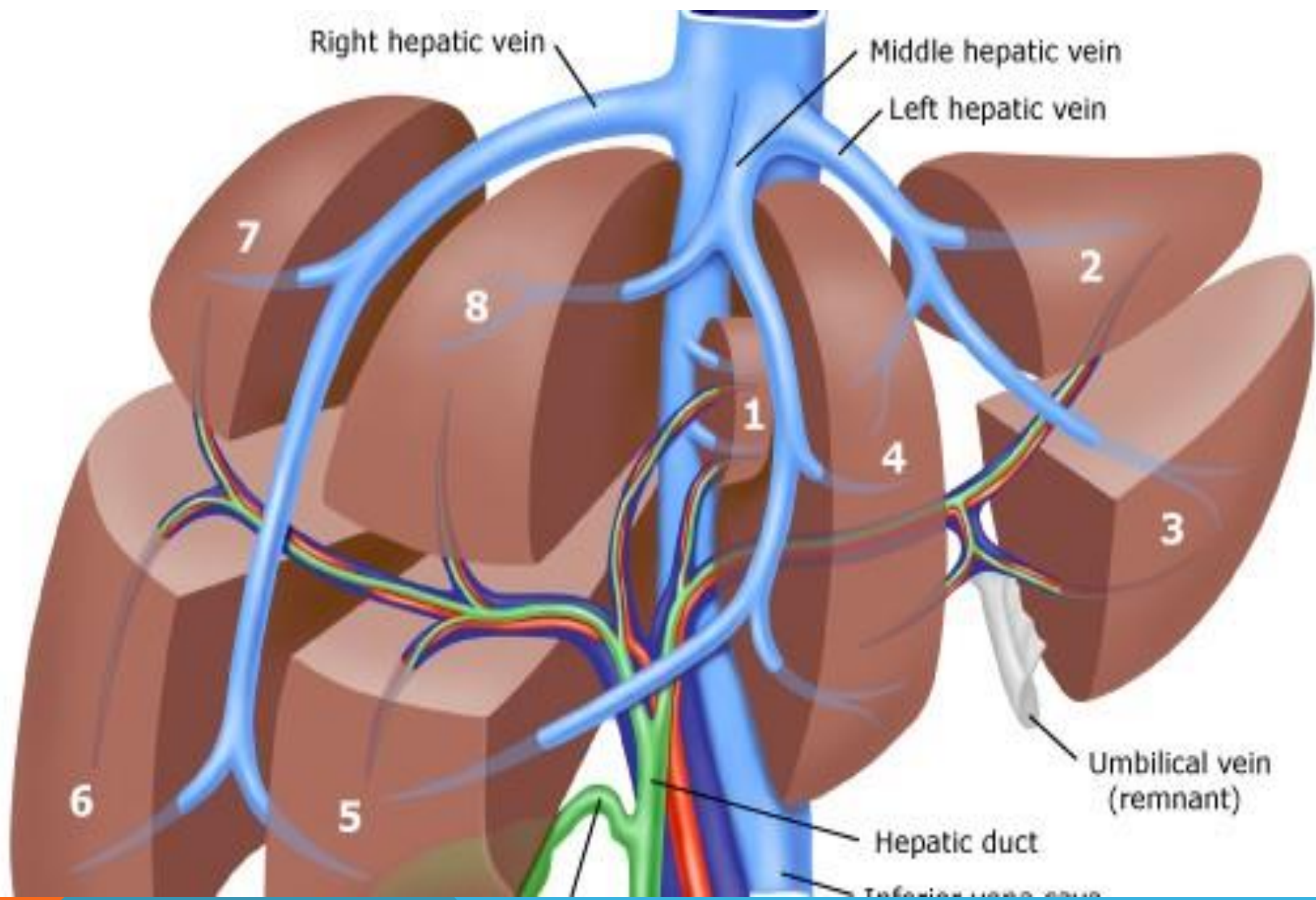
# LIVER SURGERY

**Dr. Abdulsalam Alsharabi**  
**Asst. Professor of Surgery**  
**Consultant Hepatobiliary and Transplant Surgeon**









# CLASSIFICATION


## Benign

Hemangioma  
Focal nodular  
hyperplasia  
Adenoma  
Liver cysts

## Malignant

1. Primary liver cancers
  - Hepatocellular carcinoma
  - Fibrolamellar carcinoma
  - Hepatoblastoma
2. Metastases

# BENIGN LIVER LESIONS

1. Hemangioma
  2. Focal nodular hyperplasia
  3. Adenoma
  4. Cysts
- 

# HEMANGIOMA

## CLINICAL FEATURES

The commonest liver tumor

5% of autopsies

Usually single small

Well demarcated capsule

Usually asymptomatic





# HEMANGIOMA

## DIAGNOSIS AND MANAGEMENT

### Diagnosis

US: echogenic spot, well demarcated

CT: venous enhancement from periphery to center

MRI: high intensity area

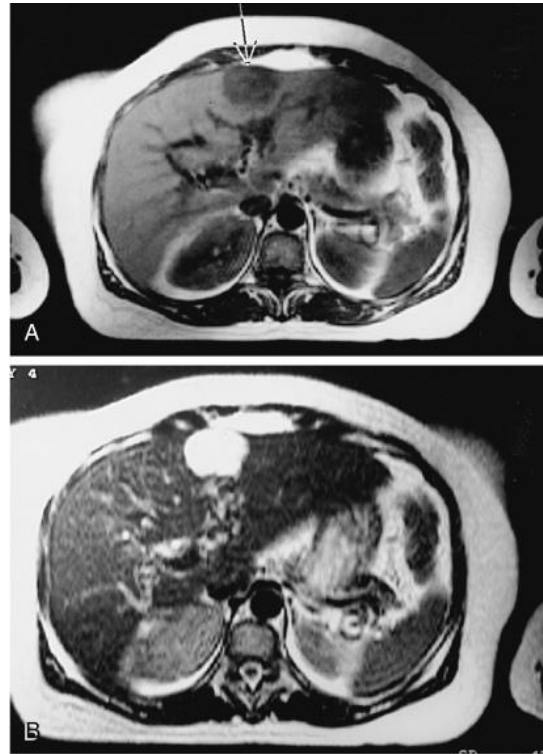
No need for FNA

### Treatment

No need for treatment



# CT/HEMANGIOMA



# **FOCAL NODULAR HYPERPLASIA (FNH) CLINICAL FEATURES**

Benign nodule formation of normal liver tissue

Central stellate scar

More common in young and middle age women

No relation with sex hormones

Usually asymptomatic

May cause minimal pain

# FOCAL NODULAR HYPERPLASIA (FNH) DIAGNOSIS AND MANAGEMENT

## Diagnosis:

US: Nodule with varying echogenicity

CT: Hypervascular mass with central scar

MRI: iso or hypo intense

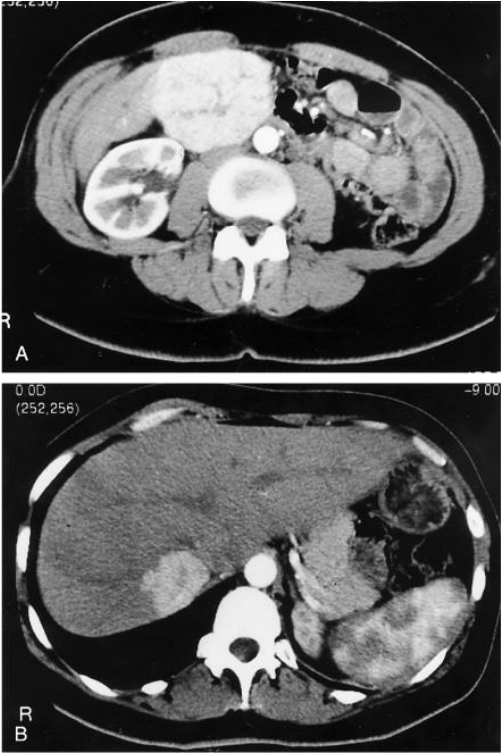
FNA: Normal hepatocytes and Kupffer cells with central core.

## Treatment:

No treatment necessary

Pregnancy and hormones OK

# CT/FNH





# HEPATIC ADENOMA

## CLINICAL FEATURES

Benign neoplasm composed of normal hepatocytes no portal tract, central veins, or bile ducts

More common in women

Associated with contraceptive hormones

Usually asymptomatic but may have RUQ pain

Mat presents with rupture, hemorrhage, or malignant transformation (very rare)

# HEPATIC ADENOMA

## DIAGNOSIS AND MANAGEMENT

### DX

US: filling defect

CT: Diffuse arterial enhancement

MRI: hypo or hyper intense lesion

FNA : may be needed

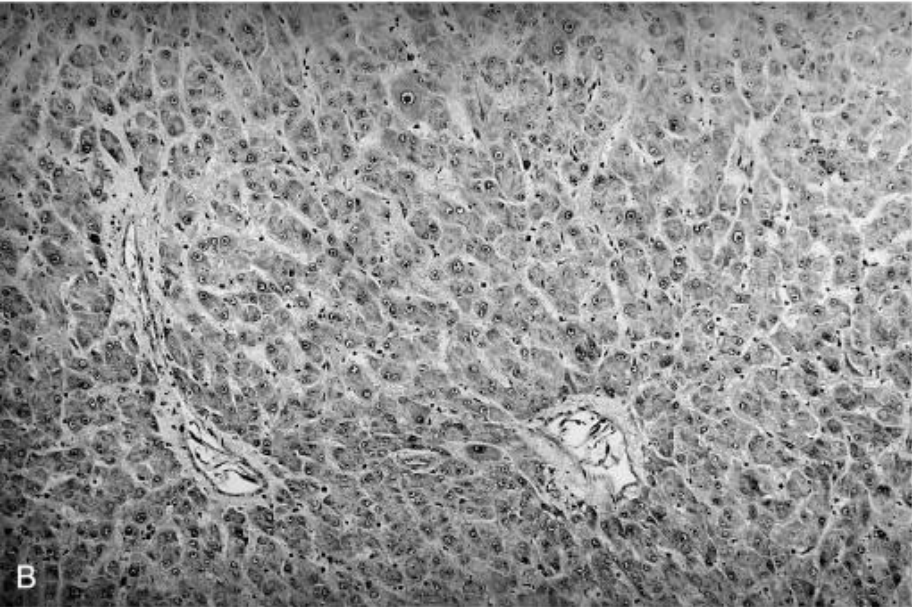
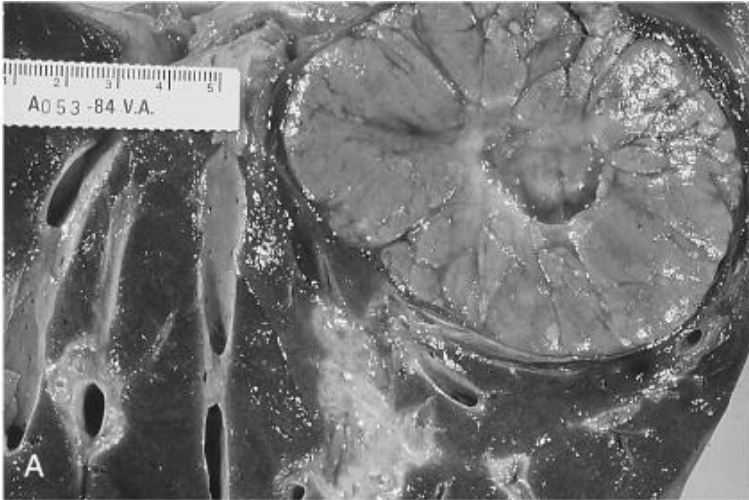
### Tx

Stop hormones

Observe every 6m for 2 y

If no regression then surgical excision

# ADENOMA



# LIVER CYSTS

May be single or multiple

May be part of polycystic kidney disease

Patients often asymptomatic

No specific management required

Hydated cyst




# **MALIGNANT LIVER LESIONS**

The background features abstract geometric shapes. A large light blue triangle points downwards from the top right. An orange triangle points downwards from the top left. A teal triangle points upwards from the bottom left. The text 'MALIGNANT LIVER LESIONS' is centered horizontally across the top of the image.



# MALIGNANT LIVER TUMORS

1. Hepatocellular carcinoma (HCC)
  2. Fibro-lamellar carcinoma of the liver
  3. Hepatoblastoma
  4. Intrahepatic cholangiocarcinoma
  5. Others
- 

# HCC: INCIDENCE

- The most common primary liver cancer
- The most common tumor in Saudi men
- Increasing in US and all the world

# HCC: RISK FACTORS

The most important risk factor is cirrhosis from any cause:

1. Hepatitis B (integrates in DNA)
2. Hepatitis C
3. Alcohol
4. Aflatoxin
5. Other

**Aflatoxins:** aflatoxin B<sub>1</sub>, a metabolite of the fungus *Aspergillus flavus*, is a potent carcinogen in some areas endemic for HCC; is activated by hepatocytes, products intercalate into DNA to form mutagenic adducts with guanosine; in sub-Saharan Africa and China, patients have mutation in hepatic enzymes that normally detoxify aflatoxin

**Cirrhosis:** major risk factor, caused by HCV, alcoholism, primary haemochromatosis, hereditary tyrosinaemia (40% develop HCC even with dietary control); due to stimulation of hepatocellular division in background of ongoing necrosis and inflammation.

# HCC: CLINICAL FEATURES

Weight loss and RUQ pain (most common)

Asymptomatic

Worsening of pre-existing chronic liver disease

Acute liver failure

O/E:

Signs of cirrhosis

Hard enlarged RUQ mass

Liver bruit (rare)

# HCC: METASTASES

Rest of the liver

Portal vein

Lymph nodes

Lung

Bone

Brain





# HCC: SYSTEMIC FEATURES

Hypercalcemia

Hypoglycemia

Hyperlipidemia

Hyperthyroidism



# HCC: LABS

Labs of liver cirrhosis

AFP (Alfa feto protein)

Is an HCC tumor marker

Values more than 100ng/ml are highly suggestive of HCC

Elevation seen in more than 70% of pt



# HCC: DIAGNOSIS

Clinical presentation

Elevated AFP

US

Triphasic CT scan: very early arterial perfusion

MRI

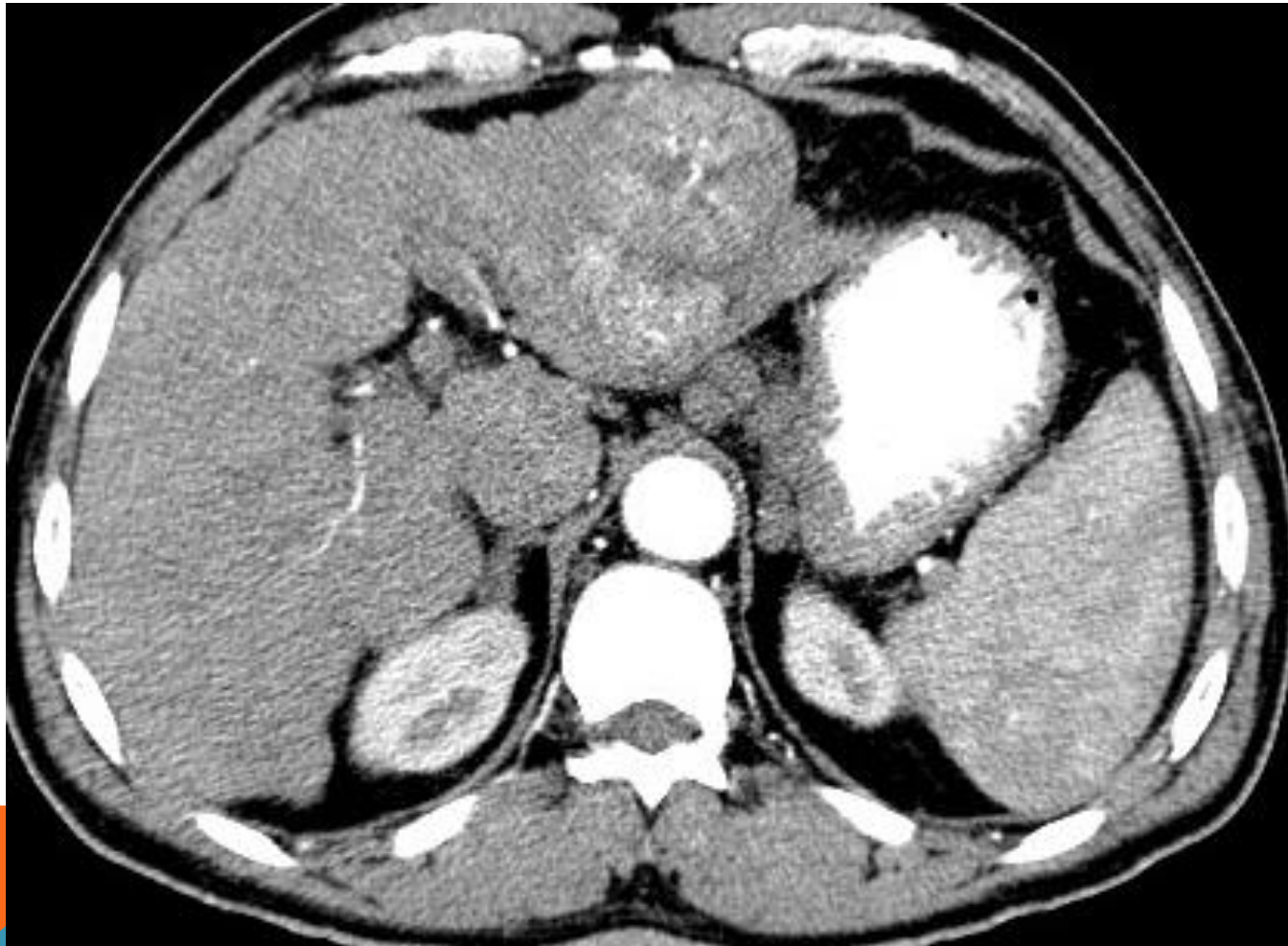
Biopsy



# US: HCC



# CT: ARTERIAL PHASE



# CT: VENOUS PHASE







a.

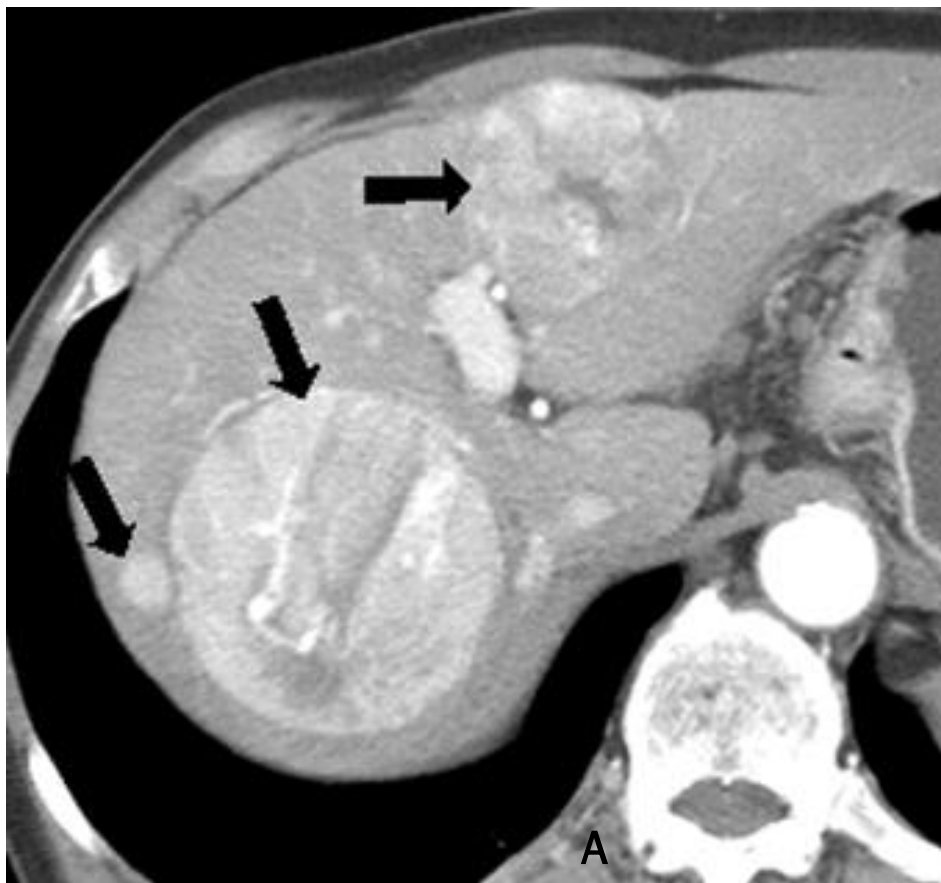


b.



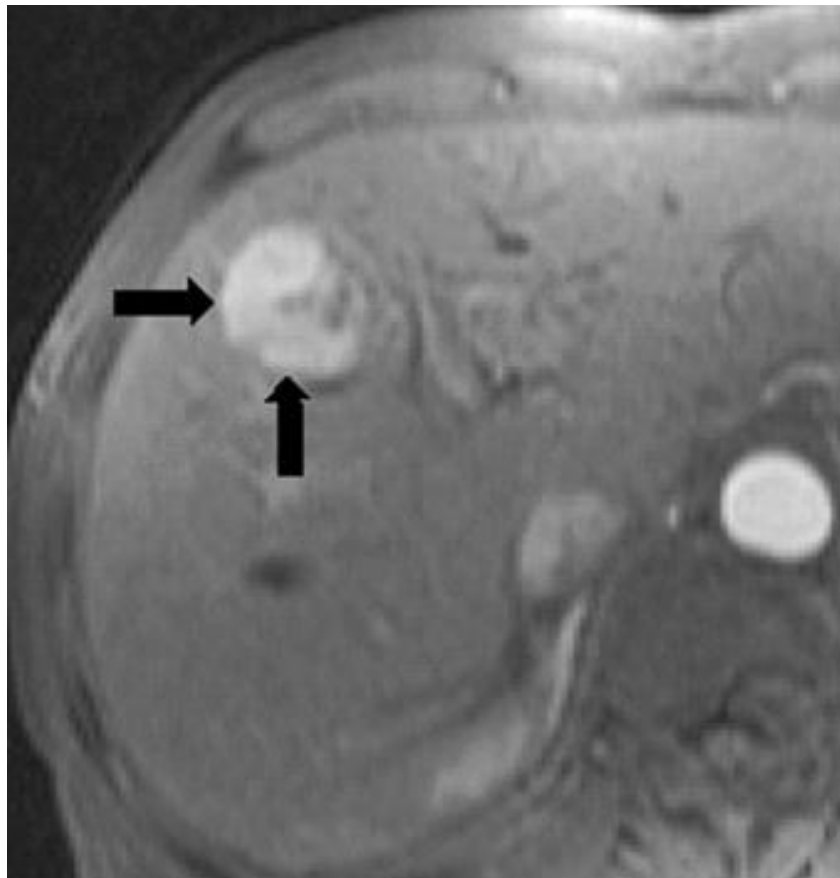
c.



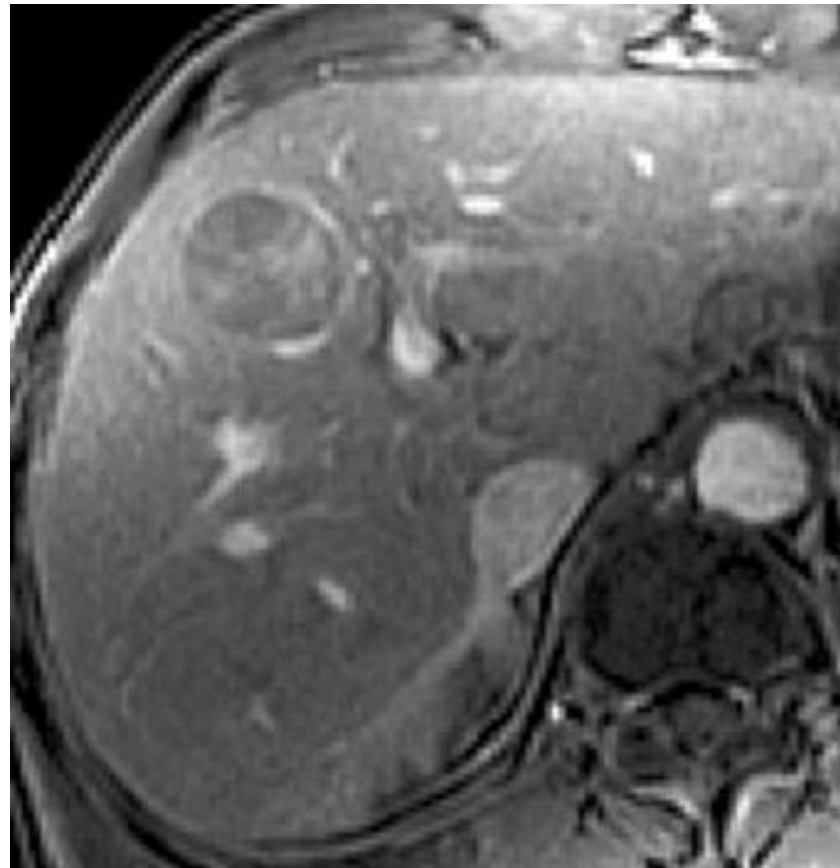


Multifocal hepatocellular carcinoma on dual-phase CT in 74-year-old man.  
**A**, Arterial phase CT scan shows heterogeneous enhancement of three hepatocellular carcinomas (*arrows*).  
**B**, On portal venous phase CT scan, lesions have capsular enhancement.





A

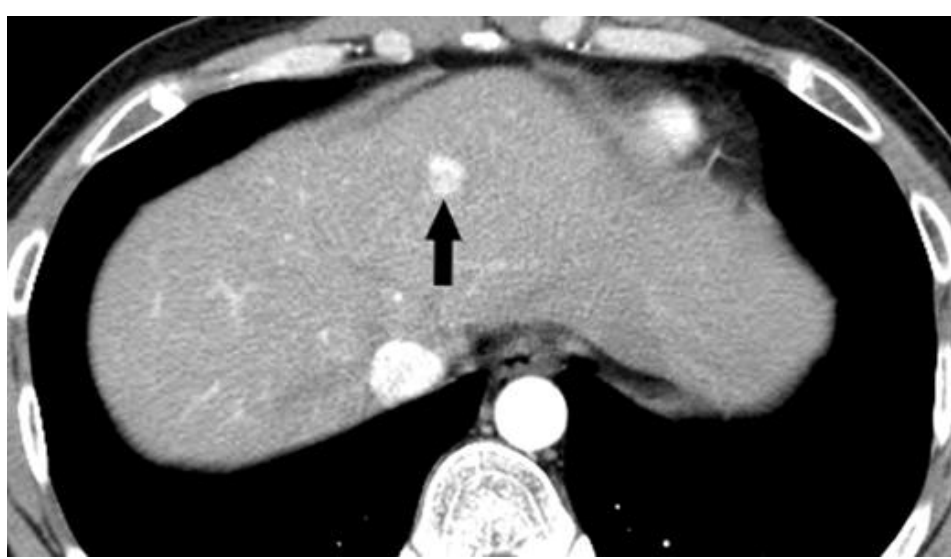


B

Hypervascular hepatocellular carcinoma on dynamic contrast-enhanced MRI in 62-year-old man.

A, Arterial phase T1-weighted gradient-echo MR image shows heterogeneous enhancing mass (*arrows*) in medial segment of left hepatic liver.

B, Delayed-phase T1-weighted gradient-echo MR image reveals hypointensity of mass with capsular enhancement. Hepatocellular carcinoma was found in surgical specimen.

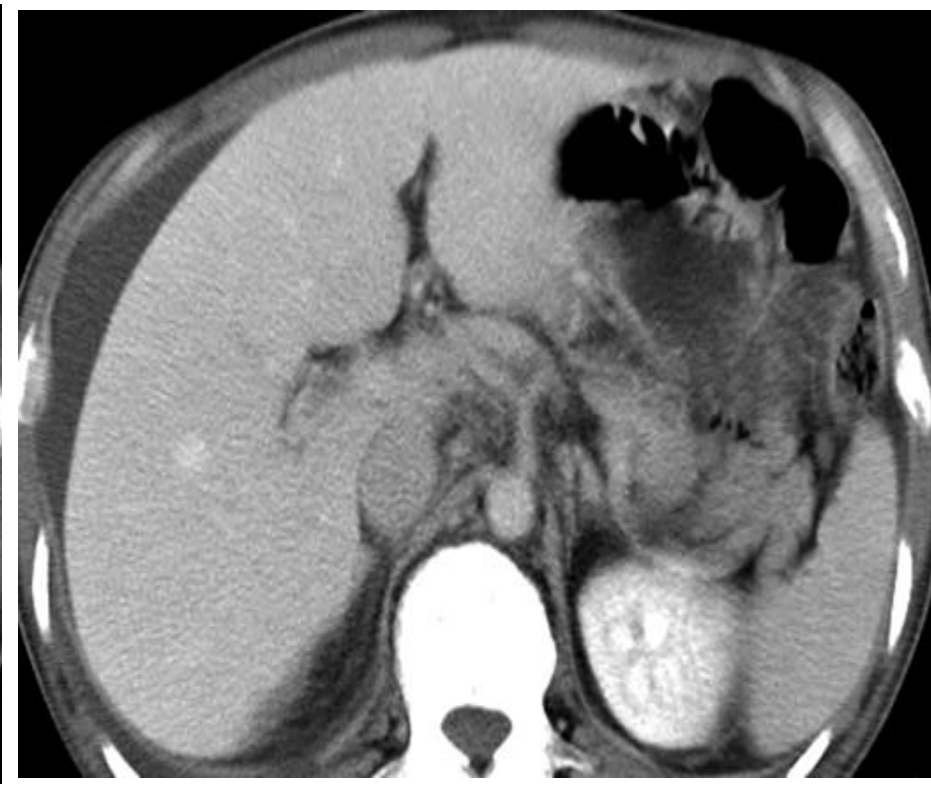


A



B

Small hepatocellular carcinoma on dynamic contrast-enhanced CT in 49-year-old man.  
A, Arterial phase CT scan shows small enhancing nodule (*arrow*) in lateral segment of left hepatic lobe.  
B, Portal venous phase CT scan shows lesion has capsular enhancement (*arrow*). Patient underwent surgical resection.



Aberrant vessel in 61-year-old man.

**A**, Arterial phase CT scan shows rectangular area of enhancement in dorsum of segment IV (arrows).

**B**, Delayed-phase CT scan shows no abnormalities. Perfusion disorder probably corresponds to third hepatic inflow tracts (aberrant right gastric veins or parabiliary venous system).



**Prior to ethanol ablation**

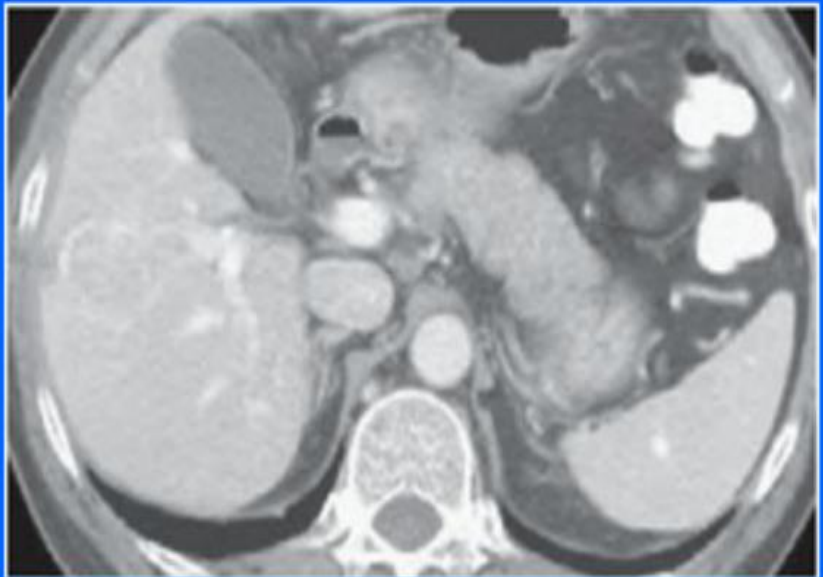


**After**

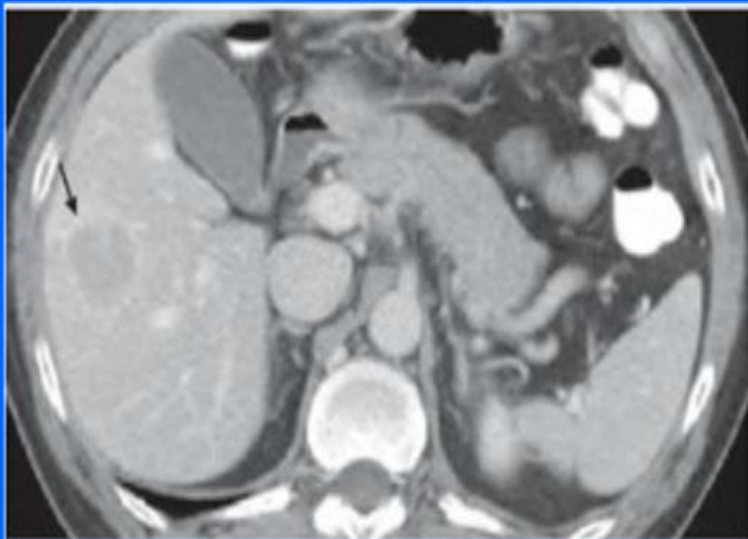




Arterial Phase

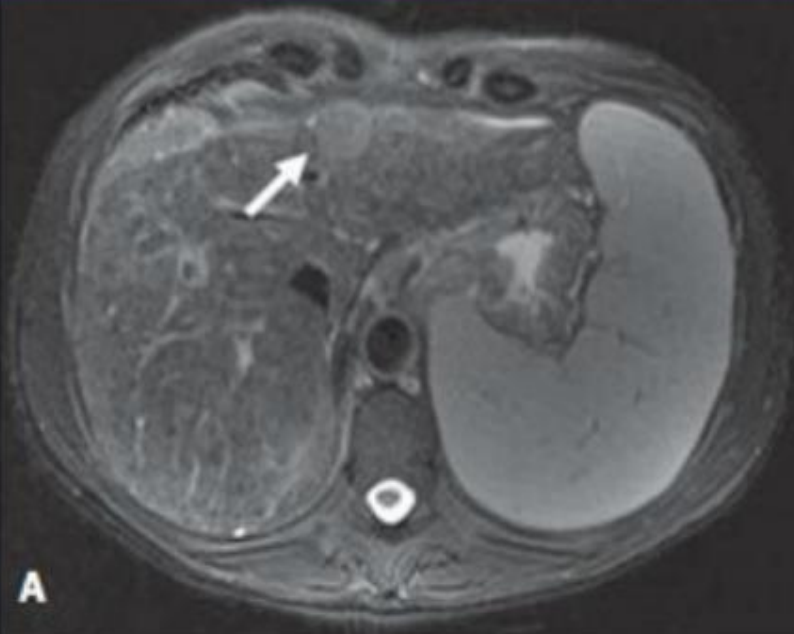


Portal Venous Phase



**Classic enhancement  
On Triphasic imaging**

Delayed Venous Phase



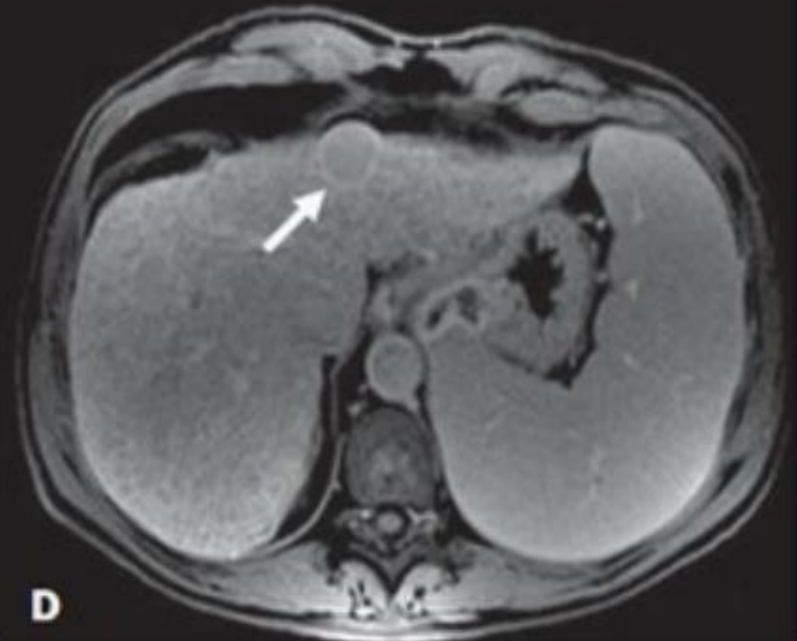
**A**



**B**



**C**



**D**



GE MEDICAL SYSTEMS  
LightSpeed16 CT16\_OCO  
Ex: 2298  
Se: 2  
Im: 9+C  
XY 152.8  
DFOV 36.8cm  
STANDARD/+

A 184

SP CSK Warszawa ul. Banacha 1a.

M68Y  
W 2371/IIID  
Aug 06 2003  
08:45:11 AM  
512 X 512

Mag = 1.00  
FL:  
ROT:

R  
1  
7  
7

L  
1  
9  
1

kV 120  
mA 175  
SFOV 50.0cm  
5.00mm 27.50mm/rot 1.375:1 /1i  
Tilt: 0.0  
0.8 s /HE + /01.17/1.02

1: distance 96.5mm, angle 57°

www.350WI.pl

P 184



GE MEDICAL SYSTEMS  
LightSpeed16 CT16\_OC0  
Ex: 2298  
Se: 2  
Im: 16+C  
XY 187.8  
DFOV 36.8cm  
STANDARD/+

A 184

SP CSK Warszawa ul. Banacha 1a.

M68Y  
W 2371/IID  
Aug 06 2003  
08:45:11 AM  
512 X 512

Mag = 1.00  
FL:  
ROT:

R  
1  
7  
7

L  
1  
9  
1



kV 120  
mA 175

SFOV 50.0cm  
5.00mm 27.50mm/rot 1.375:1 /1i  
Tilt: 0.0  
0.8 s /HE + /02.18/1.02

1: distance 140.0mm, angle 85°

P 184

NEW: 350WLE: 40



# HCC: PROGNOSIS

Tumor size

Extrahepatic spread

Underlying liver disease

Pt performance status



# HCC: LIVER TRANSPLANTATION

Best available treatment

Removes tumor and liver

Only if single tumor less than 5cm or less than 3 tumors less than 3 cm each

Recurrence rate is low

Not widely available



# HCC: RESECTION

Feasible for small tumors with preserved liver function (no jaundice or portal HTN)

Recurrence rate is high



# HCC: LOCAL ABLATION

For non resectable pt

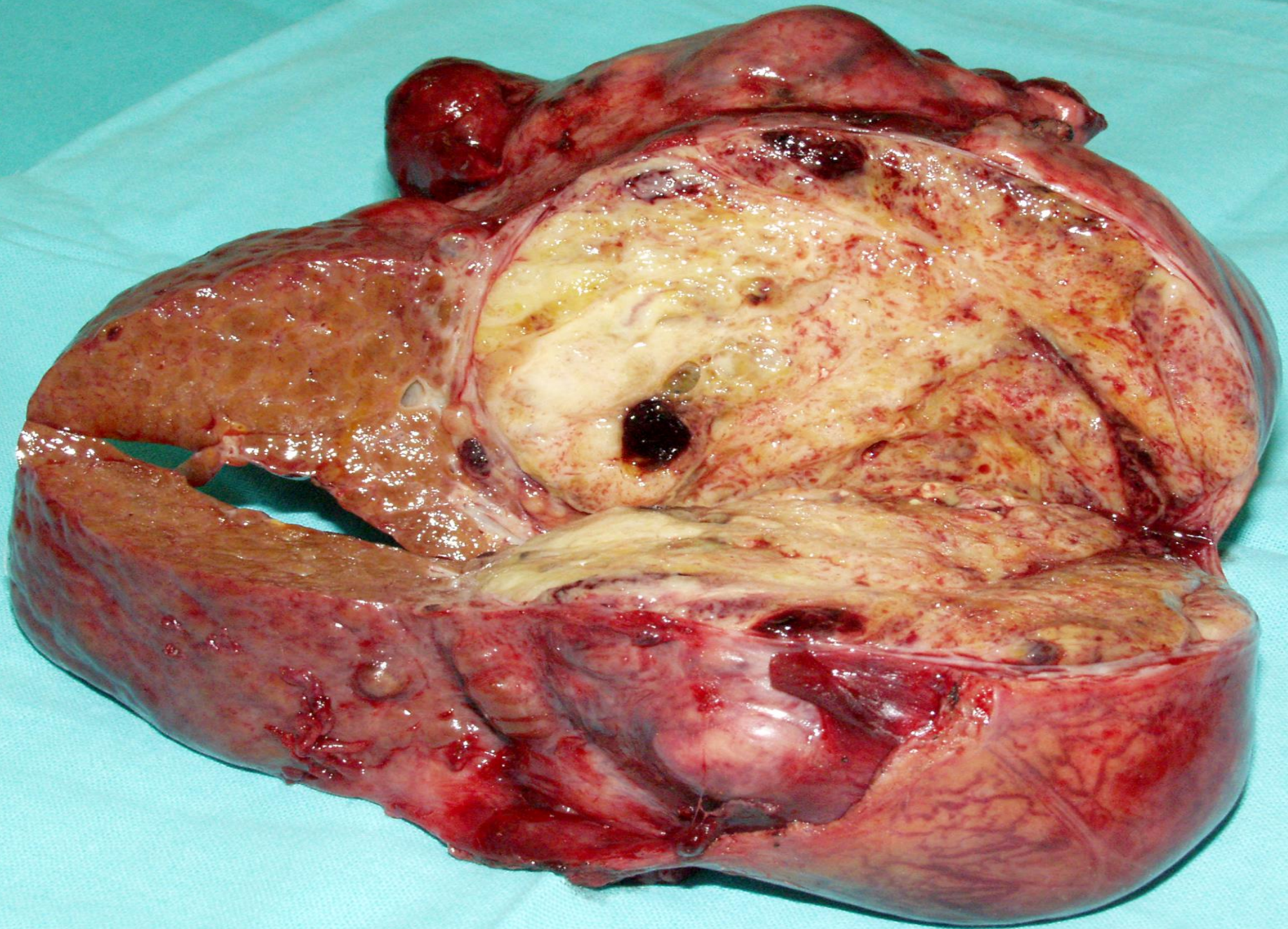
For pt with advanced liver cirrhosis

Alcohol injection

Radiofrequency ablation

Temporary measure only







A

Instytut Gruzlicy i Chorob Pluc

Sensation 16

VB10B

H-SP-CR

47621

\*19-Jul-1948, M, 57Y

02-Sep-2005

11:57:33.64

3 IMA 17

SPI 3

SP -329.0

R

kV 120  
eff.mAs 121  
ref.mAs 160  
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SL 5.0/0.75/9.0  
397 5/0  
B31f L3F0 A

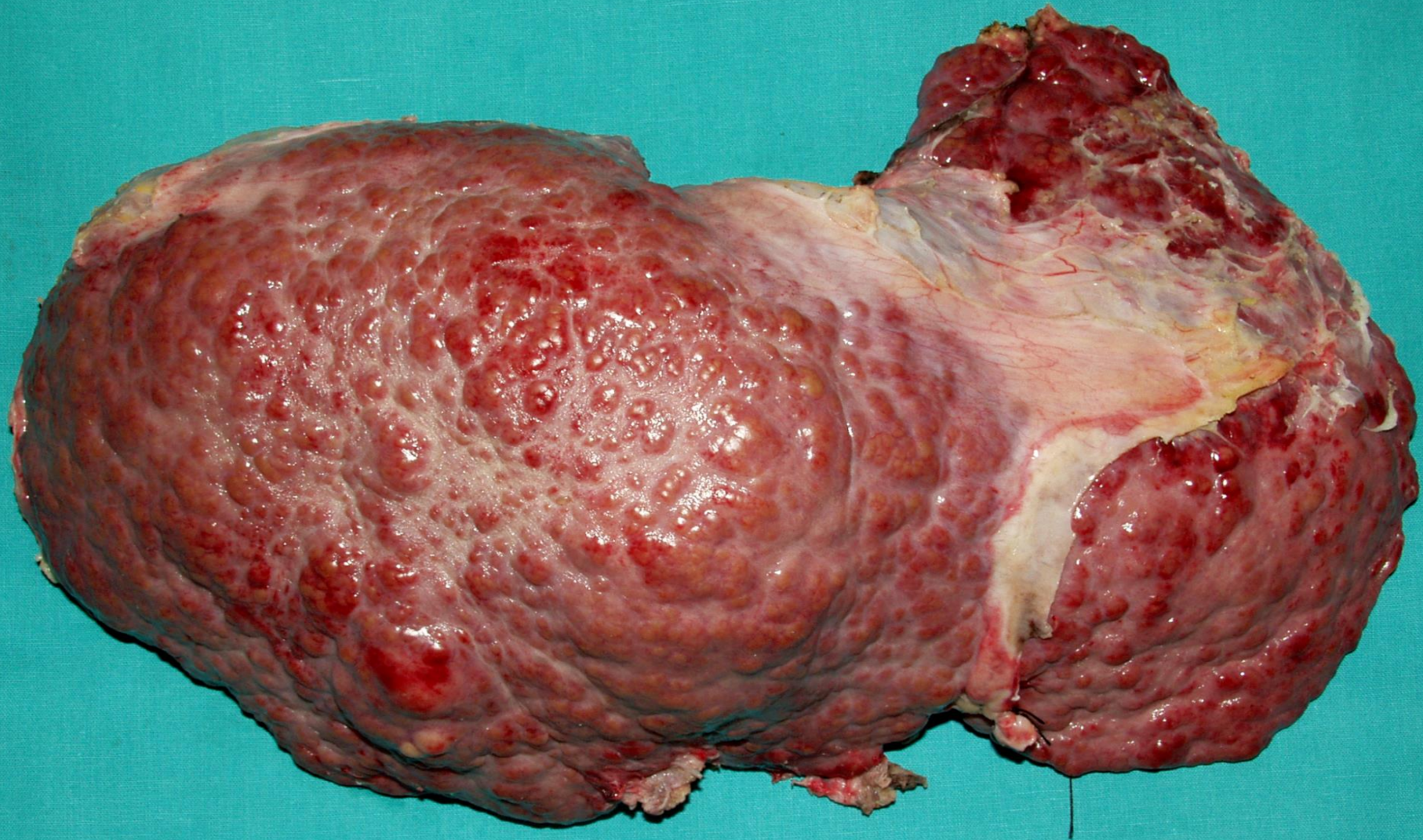
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FAZA TETNICZA

W 300  
C 40

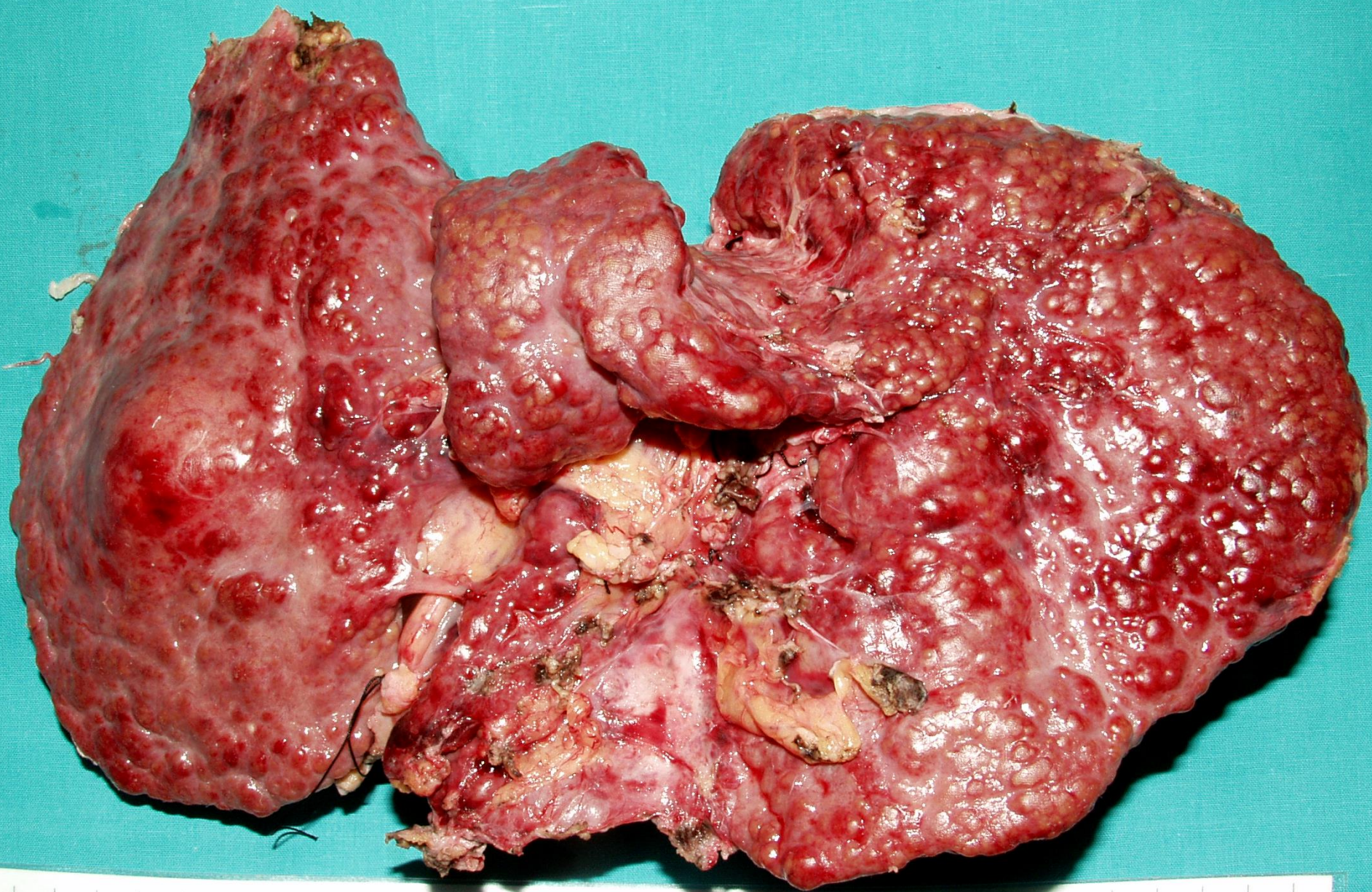
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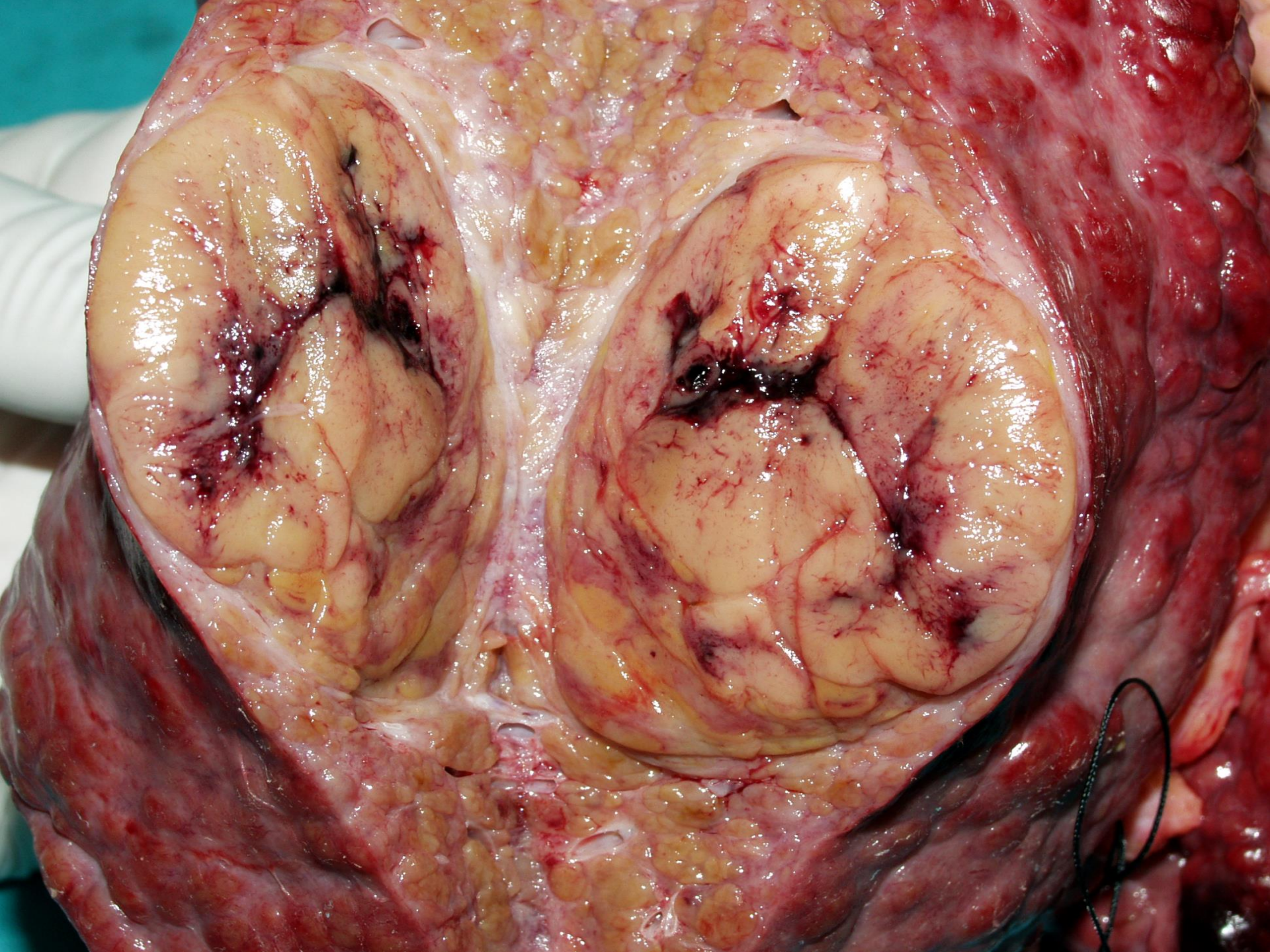














GE MEDICAL SYSTEMS  
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Im: 27+C  
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DFOV 36.0cm  
STANDARD/+

A 180

F56Y  
W 12278/POLIK  
May 15 2004  
08:41:53 AM  
512 X 512

Mag = 1.00  
FL:  
ROT:



V 120  
mA 351~  
Smart mA 0  
SFOV 50.0cm  
5.50mm 13.75mm/rot 1.375:1/1i  
Tilt: 0.0  
0.6 s /HE + /02.84/0.76

1: distance 119.6mm, angle 84°  
2: distance 96.8mm, angle 2°

WW: 400WL: 40

P 180

GE MEDICAL SYSTEMS  
LightSpeed16 CT16\_OC0  
Ex: 11742  
Se: 3  
Im: 89+C  
XY 117.9  
DFOV 36.0cm  
STANDARD/+

A 180

SP CSK Warszawa ul. Banacha 1a.

F56Y  
W 12278/POLIK  
May 15 2004  
08:45:34 AM  
512 X 512

Mag = 1.00  
FL:  
ROT:

R  
1  
7  
8

L  
1  
8  
2

kV 120  
mA 351~  
Smart mA 0  
SFOV 50.0cm  
5.00mm 13.75mm/rot 1.375:1 /1i  
Tilt: 0.0  
0.6 s /HE + /03.27/0.83

WW: 350WL: 40

P 180



Coronal  
Ex: 11742  
Se: 3 +c  
A: 62.9

S 96

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MALMUR MARIA  
F 56 W 12278/POLIK  
May 15 2004

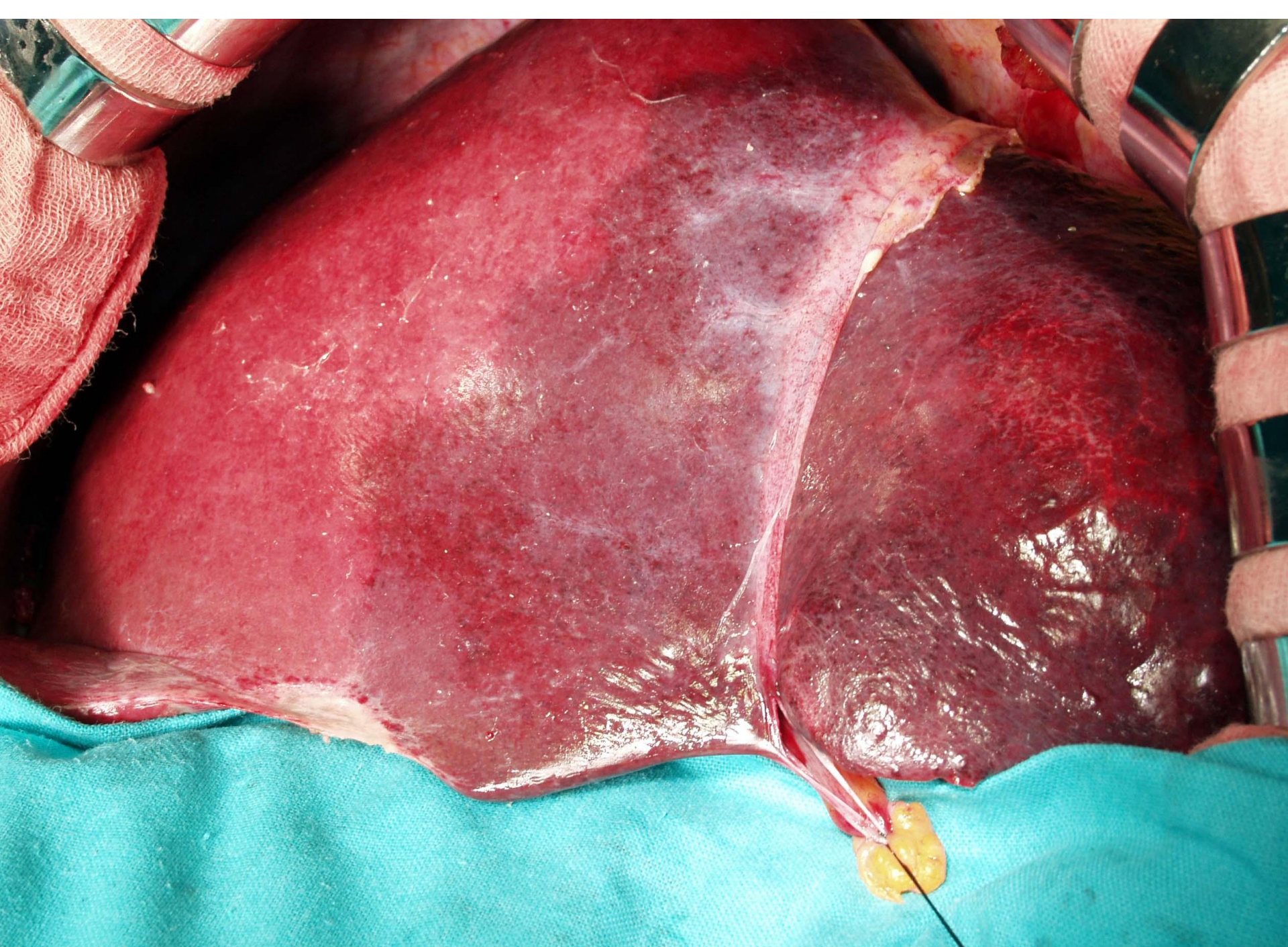
DFOV 25.0cm  
STANDARD



25.4/MIP  
kv 120  
mA N/A  
0.8  
2.5 mm 1.375:1/2.5sp  
Tilt: 0.0  
08:41:53 AM  
W = 437 L = 158

118.7 mm (2D)  
101.6 mm (2D)

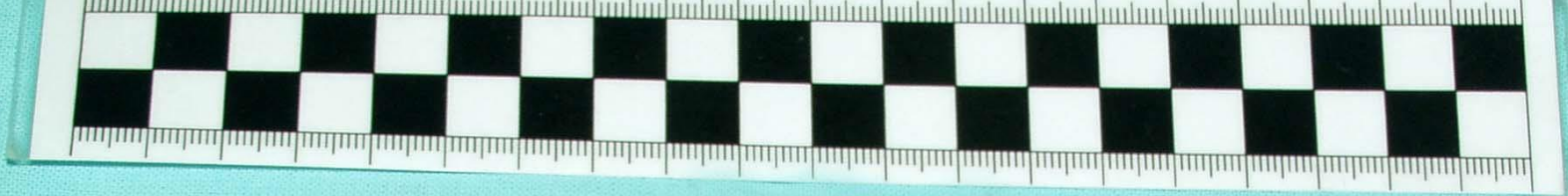














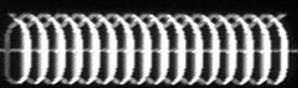




929/04

NZOZ "TOMMA" POZNAN  
C+B

0 17



17  
0

R

P



DEG 99  
LEN 90

DEG -162  
LEN 111

12826-34-B  
10.0 03-MAR-04 W242/L74

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929/04

NZOZ "TOMMA" POZNAN  
C

0 17

sqmm	27
MEAN	29.6
STD	8.36



17

R

0

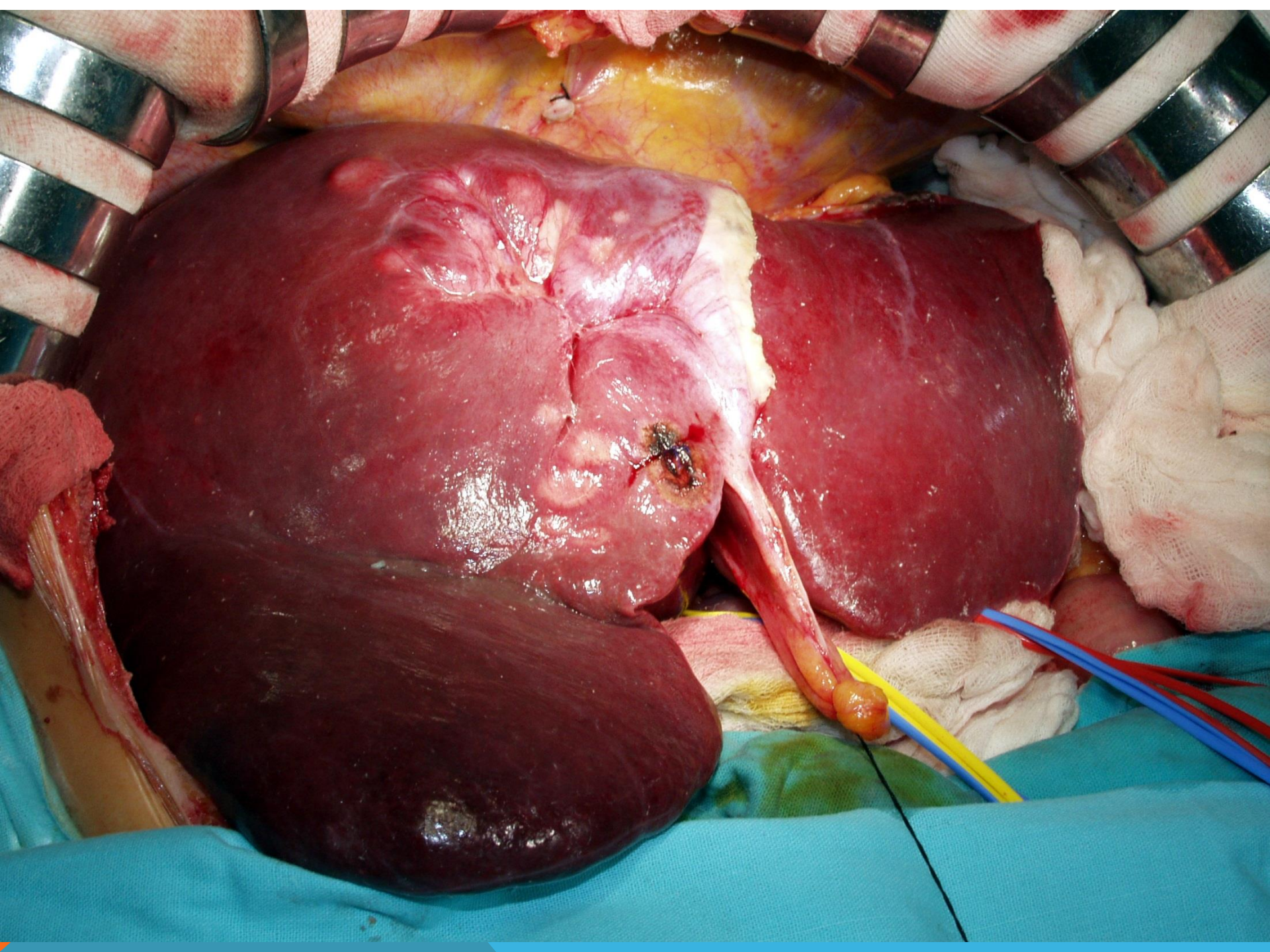


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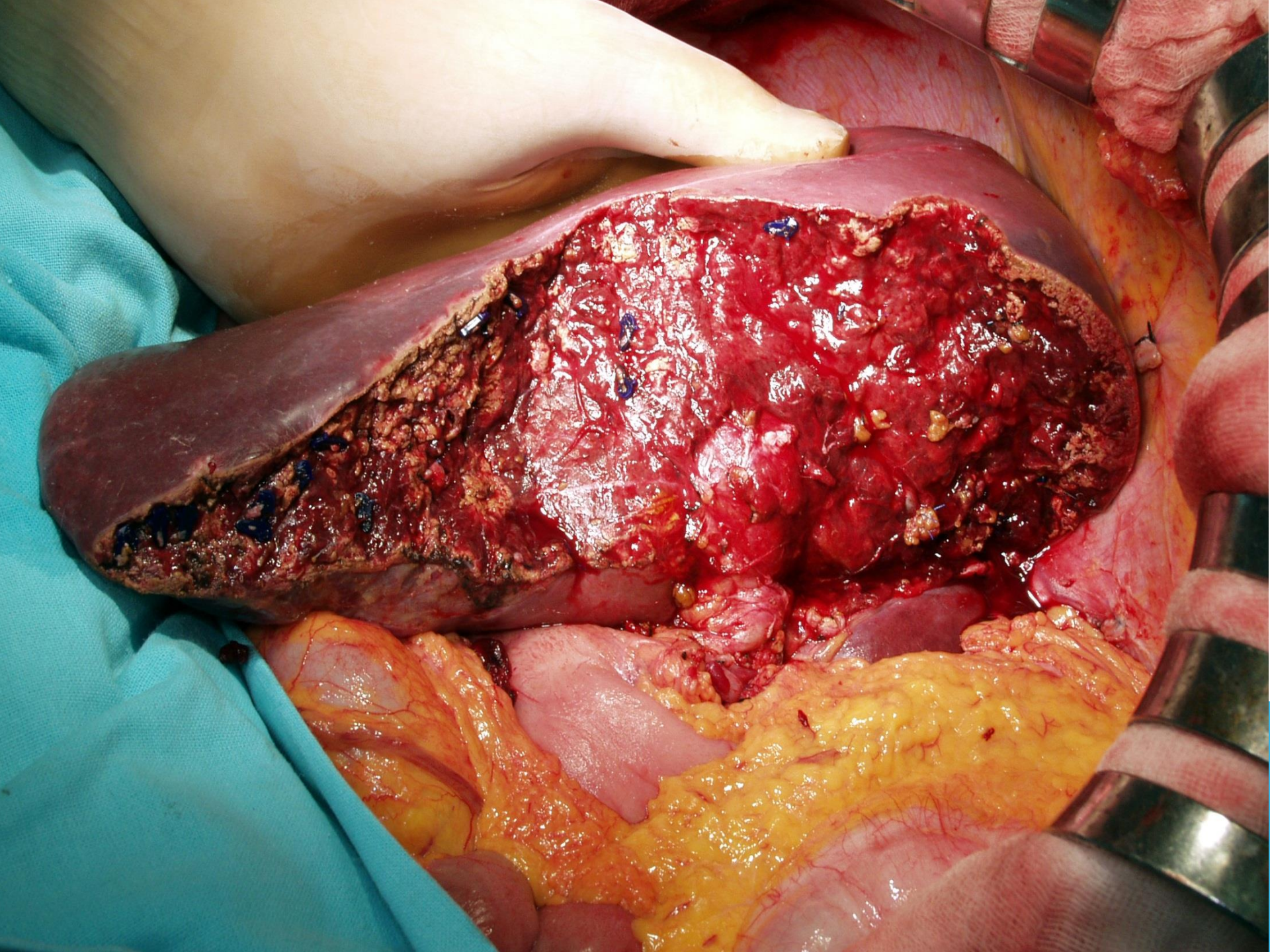




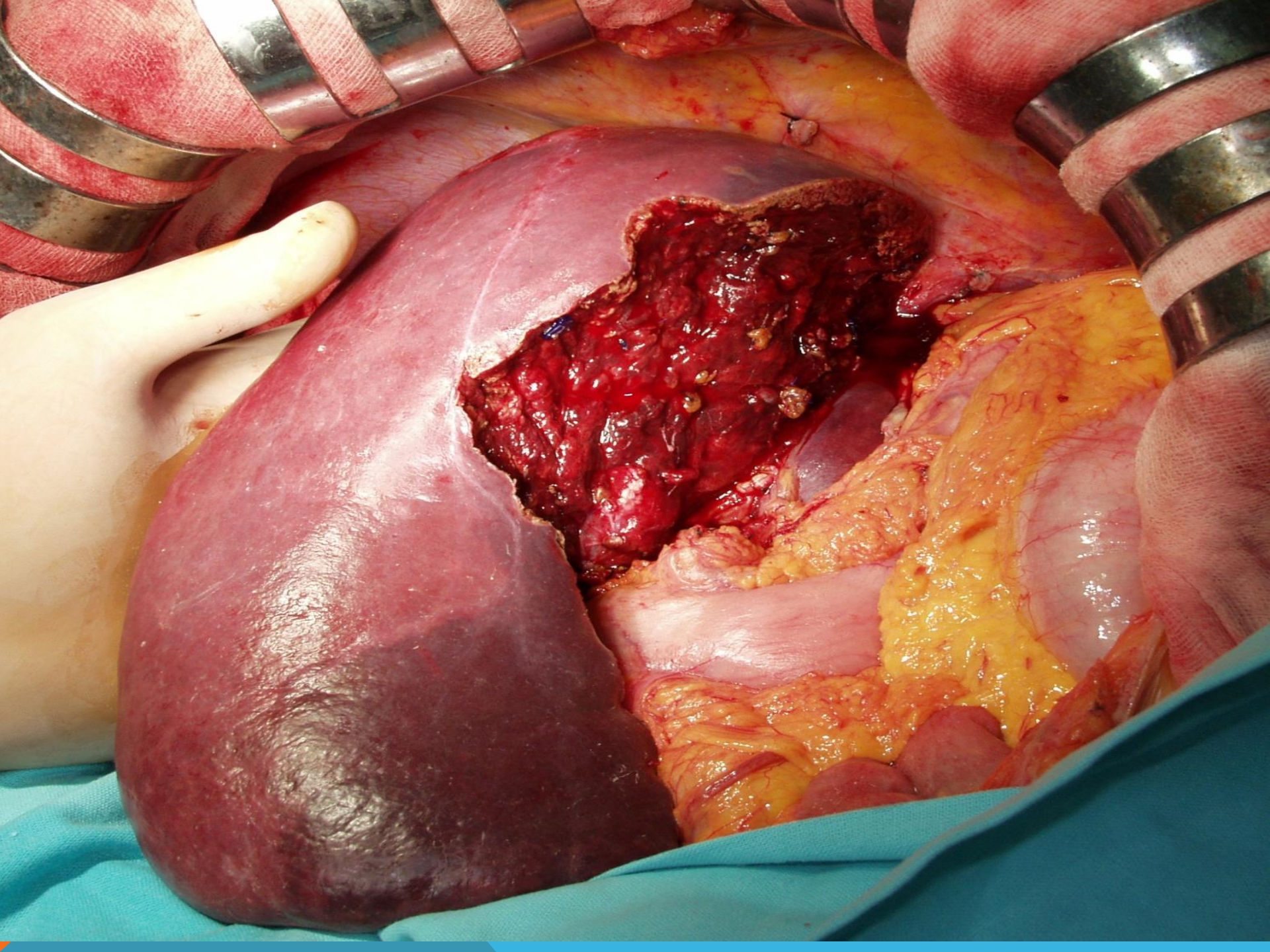




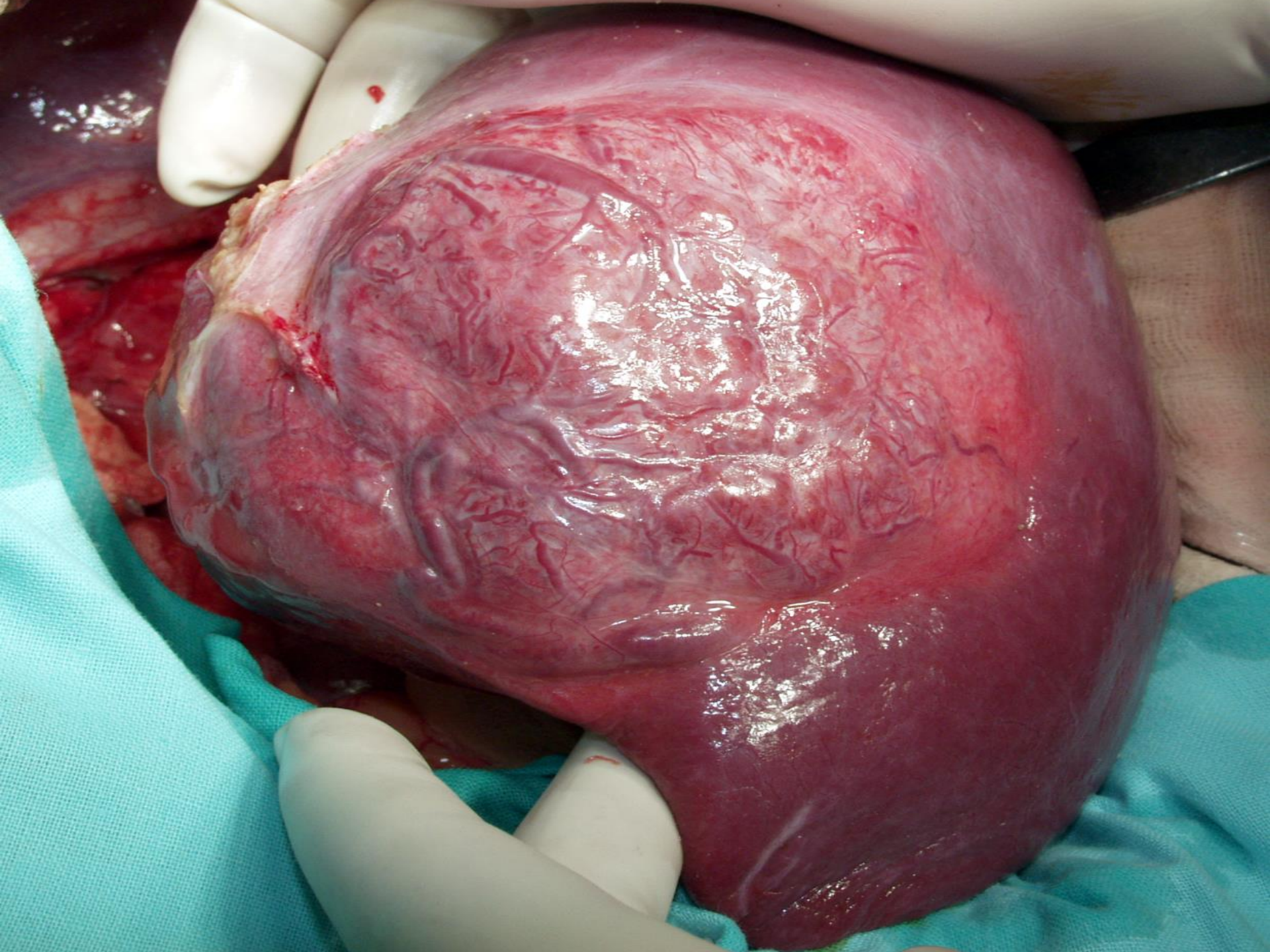




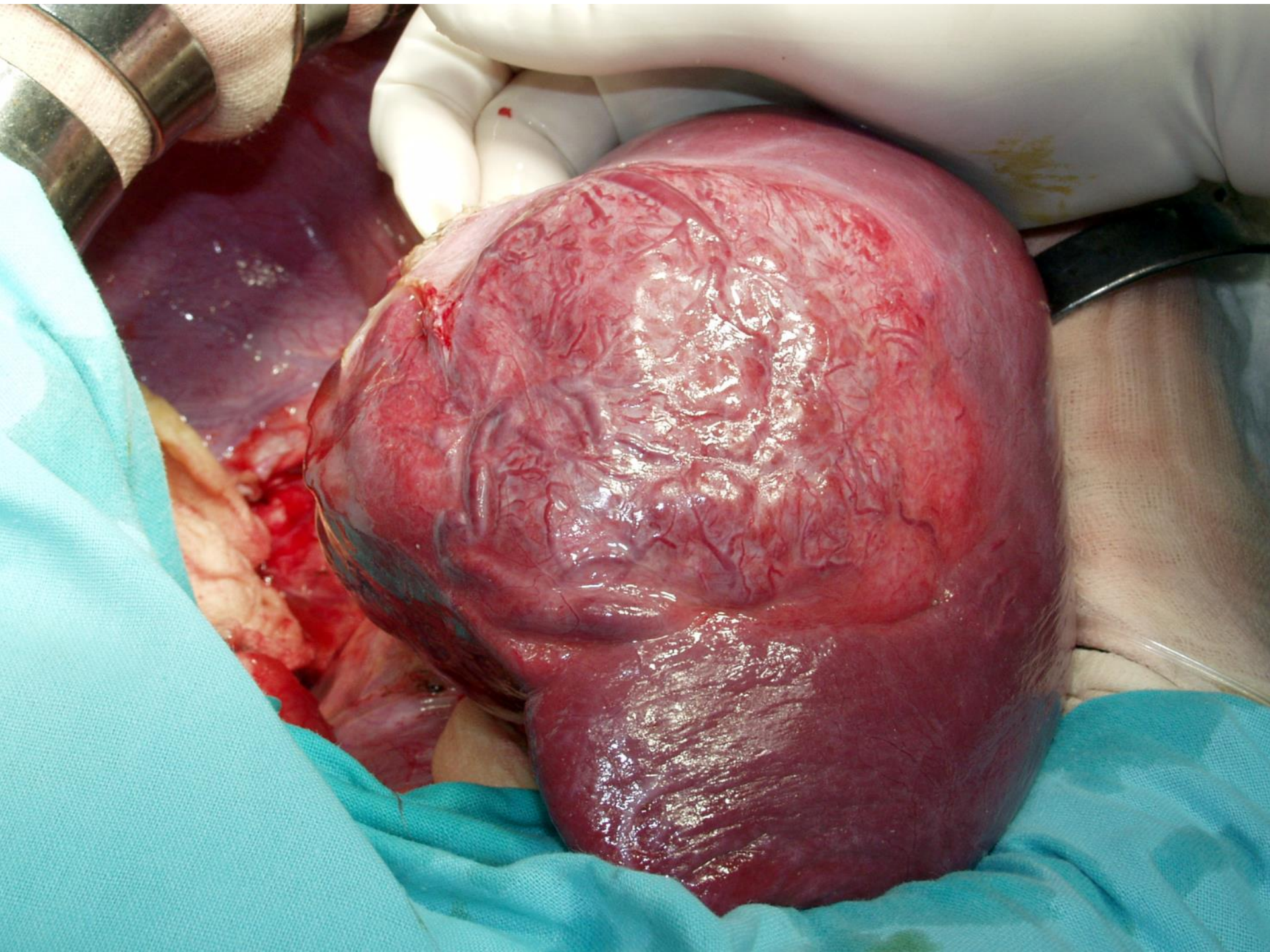




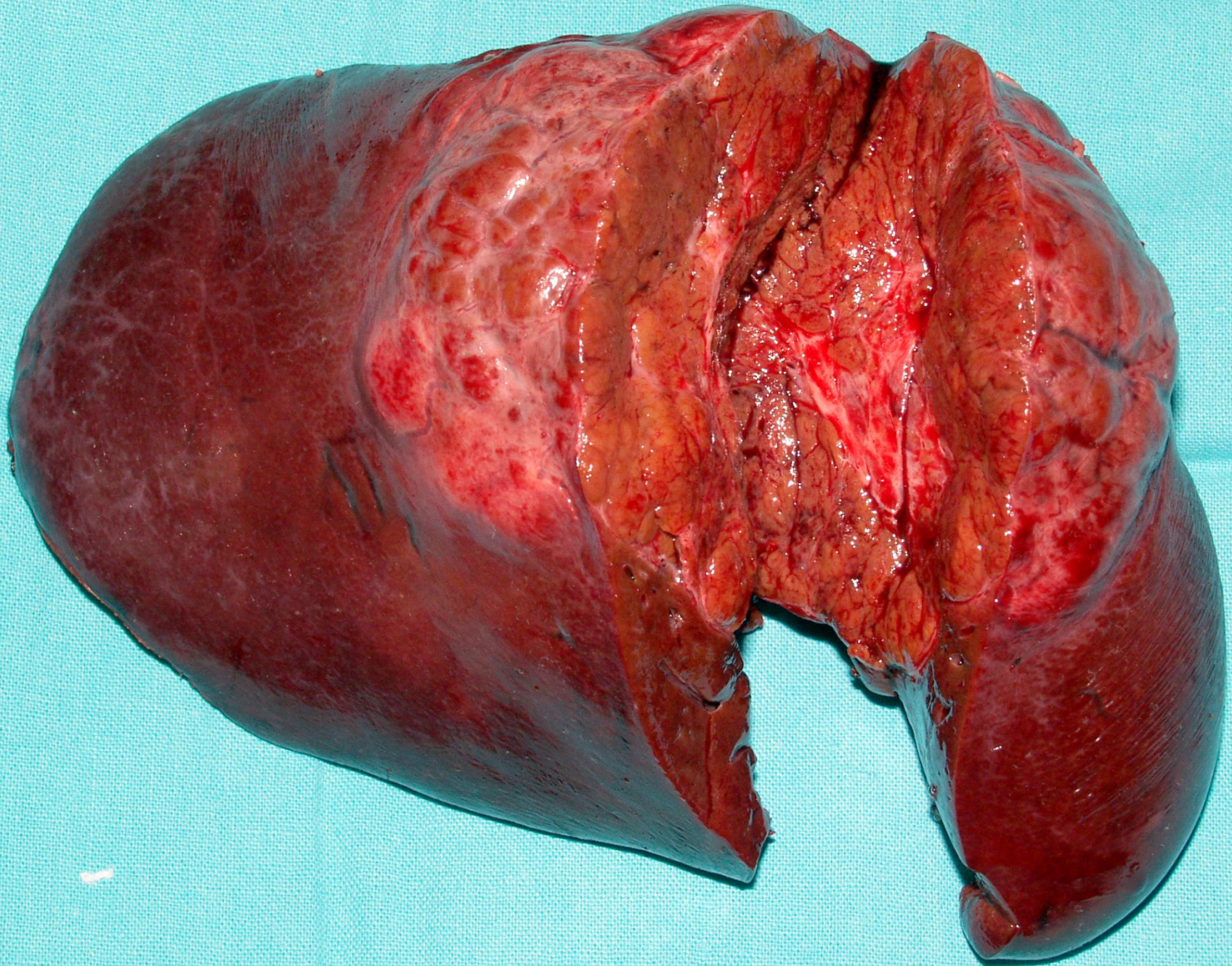




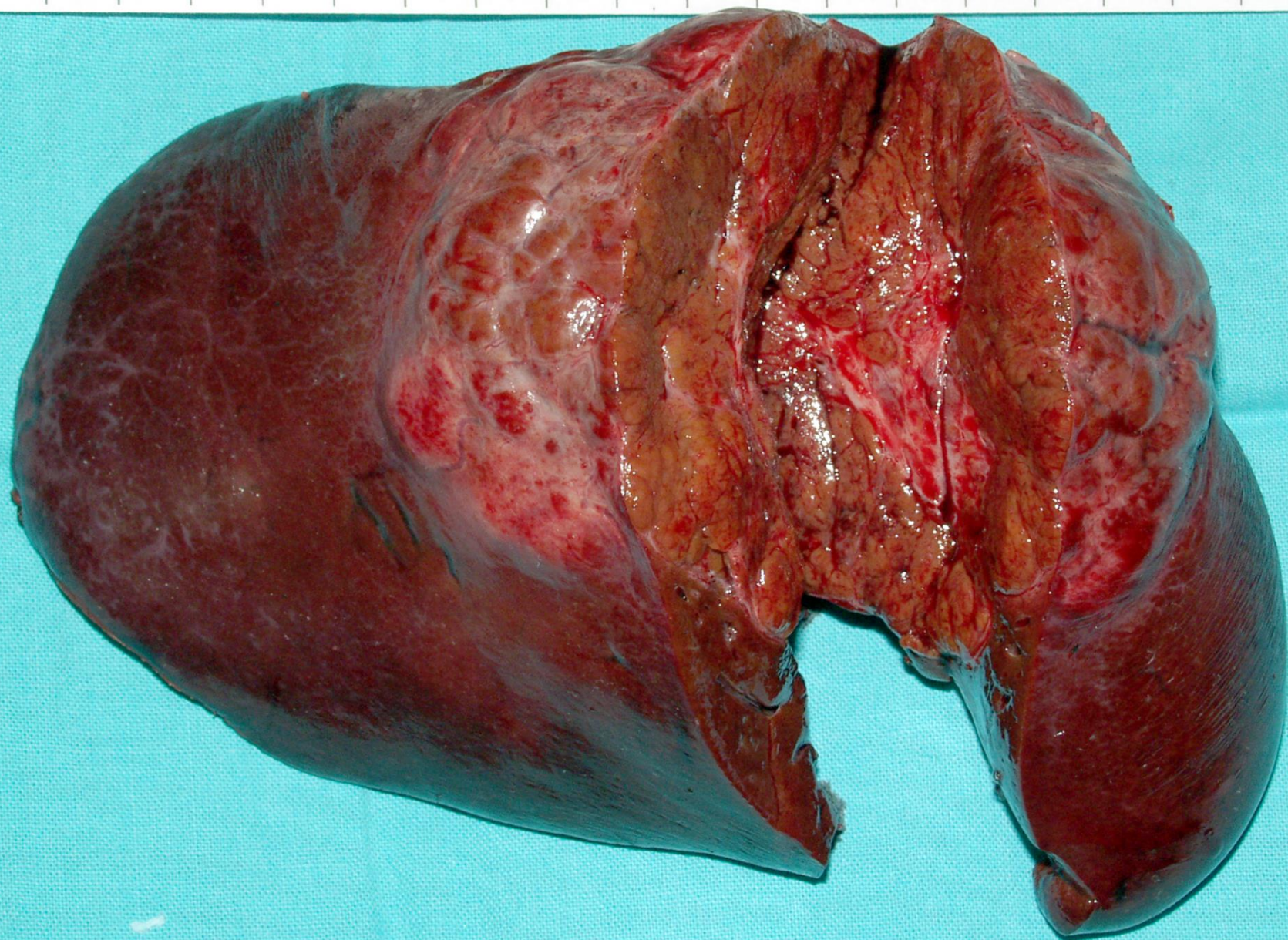
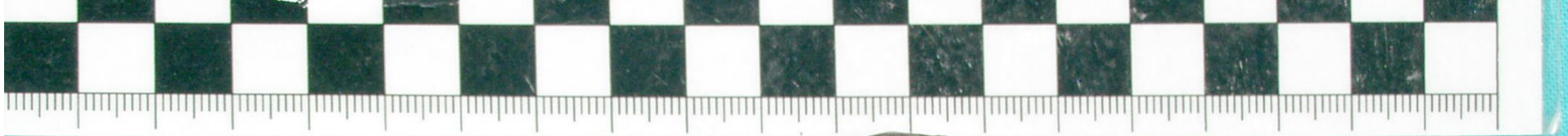








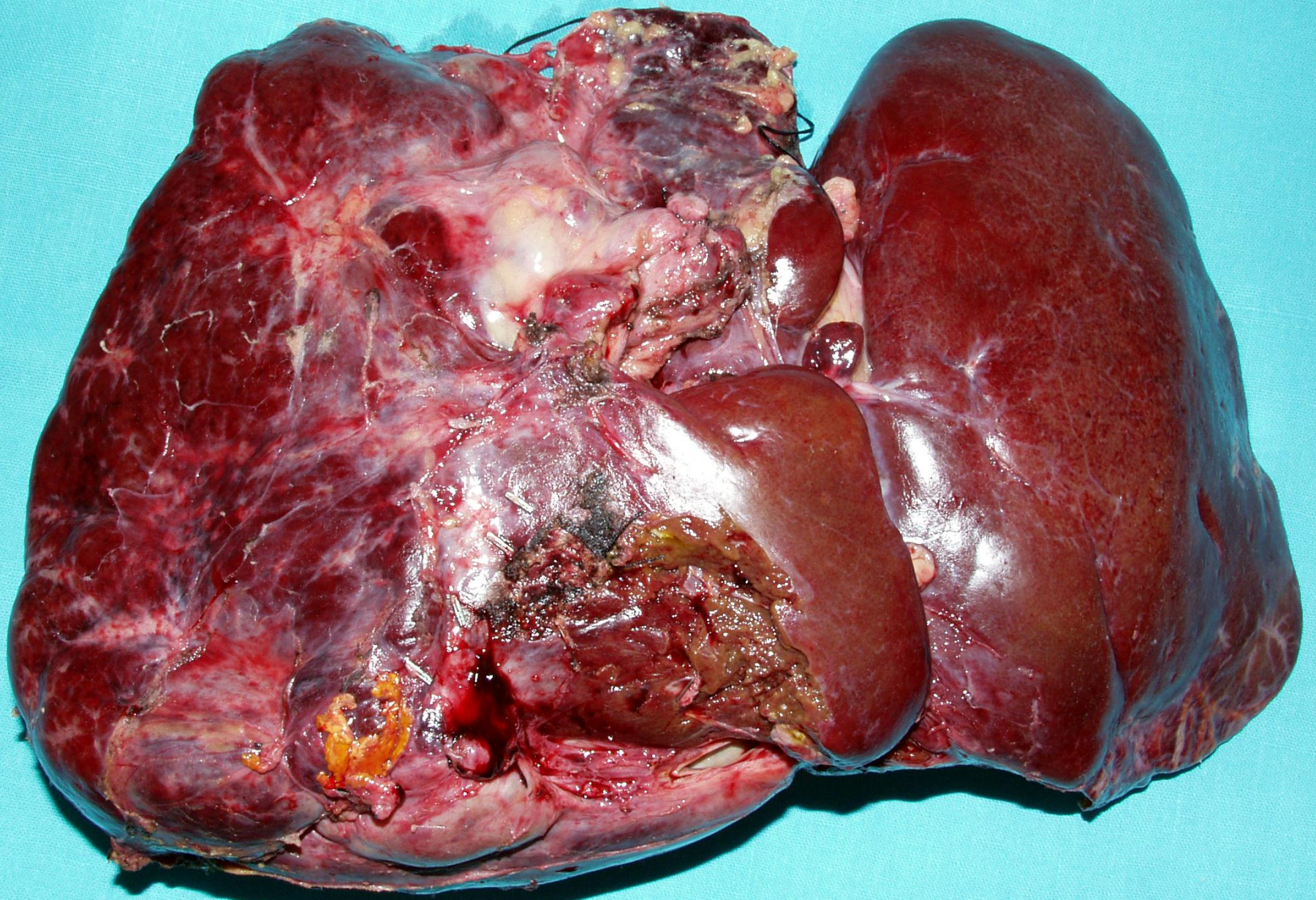




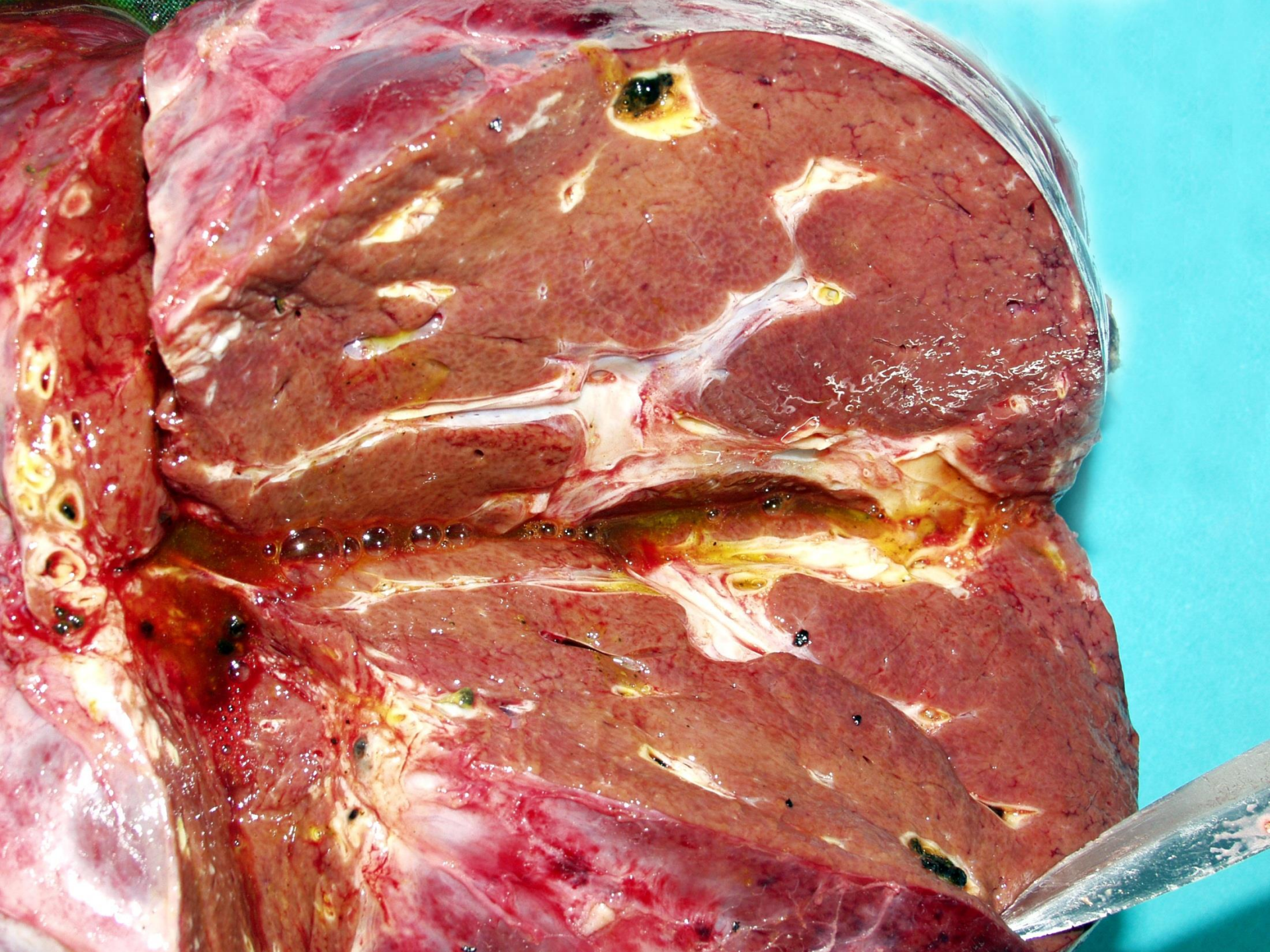




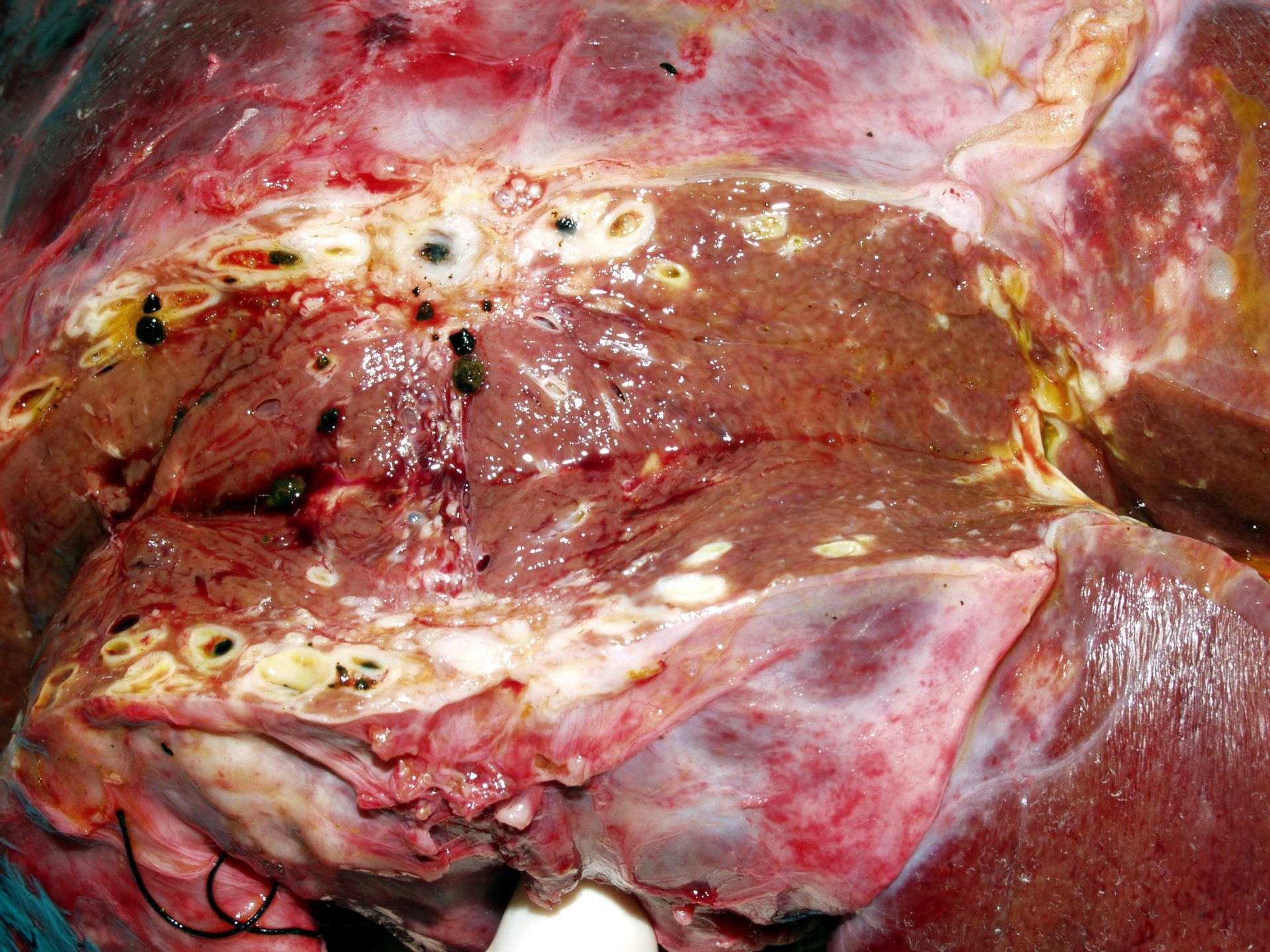




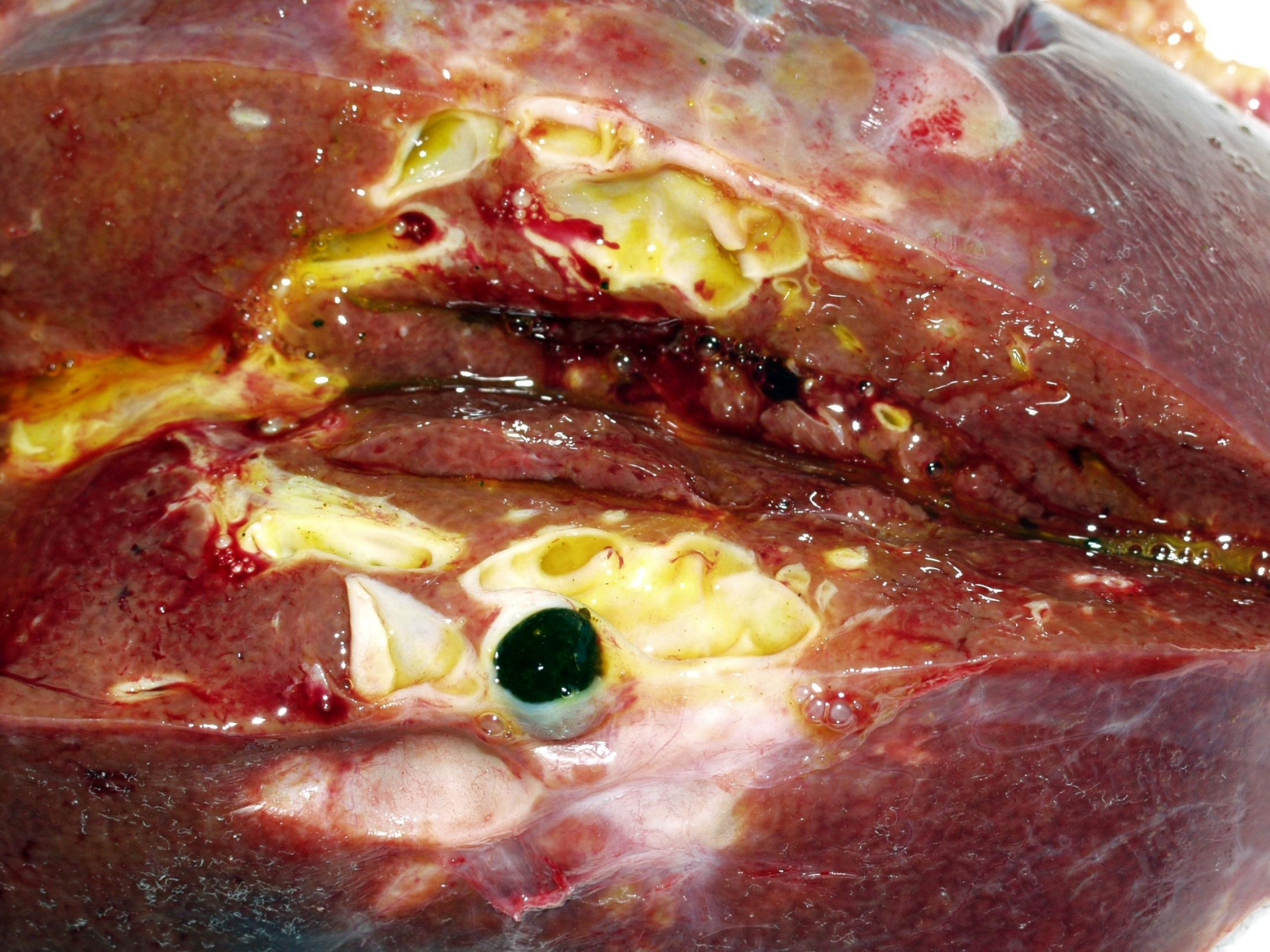










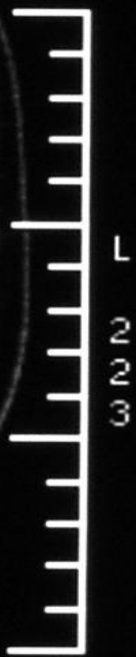
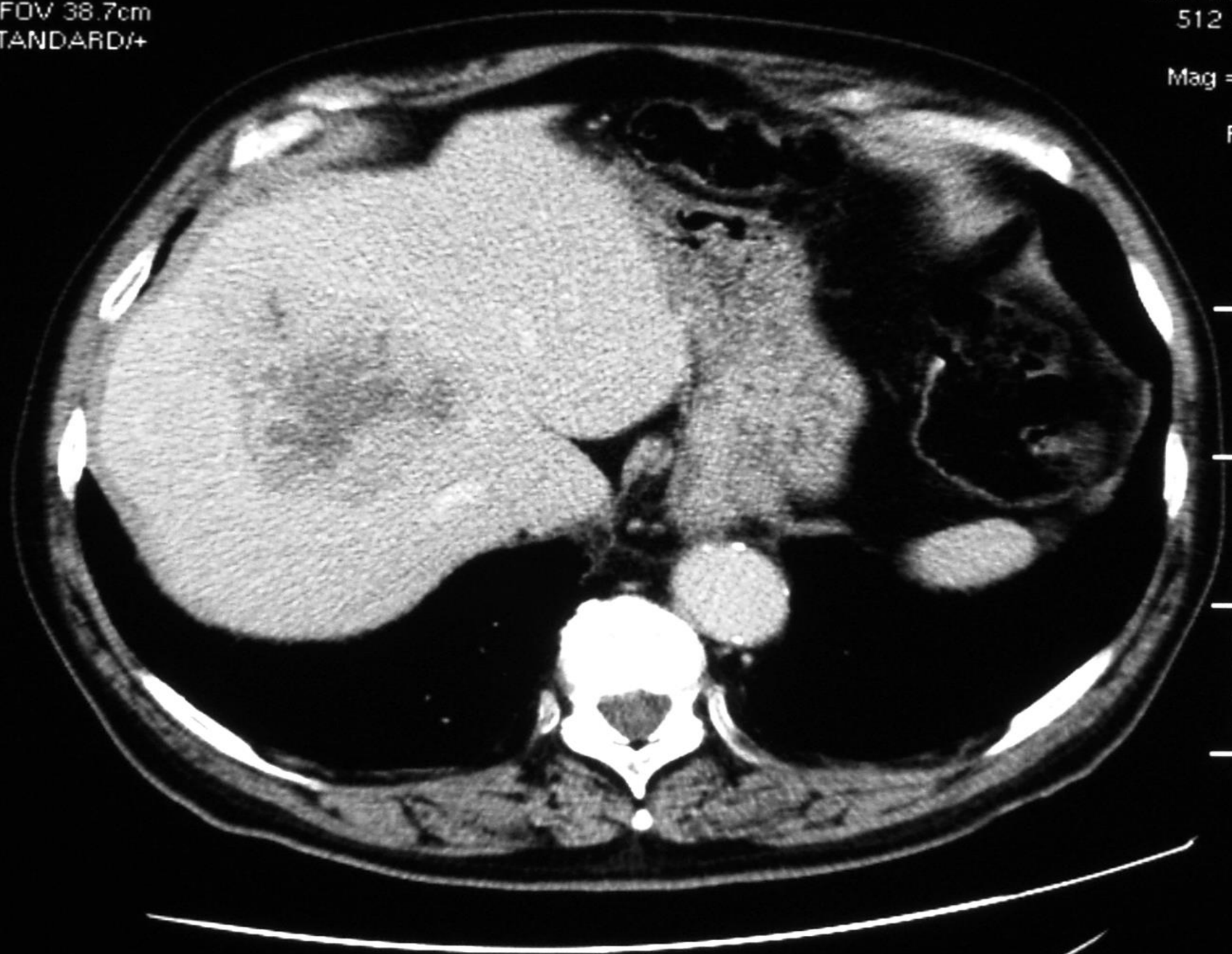




DFOV 38.7cm  
STANDARD/+

08.14.10 PM  
512 X 512

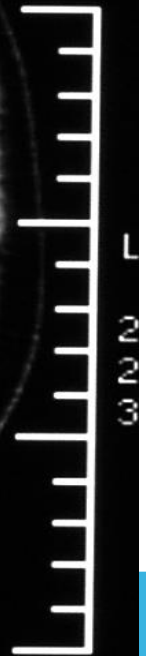
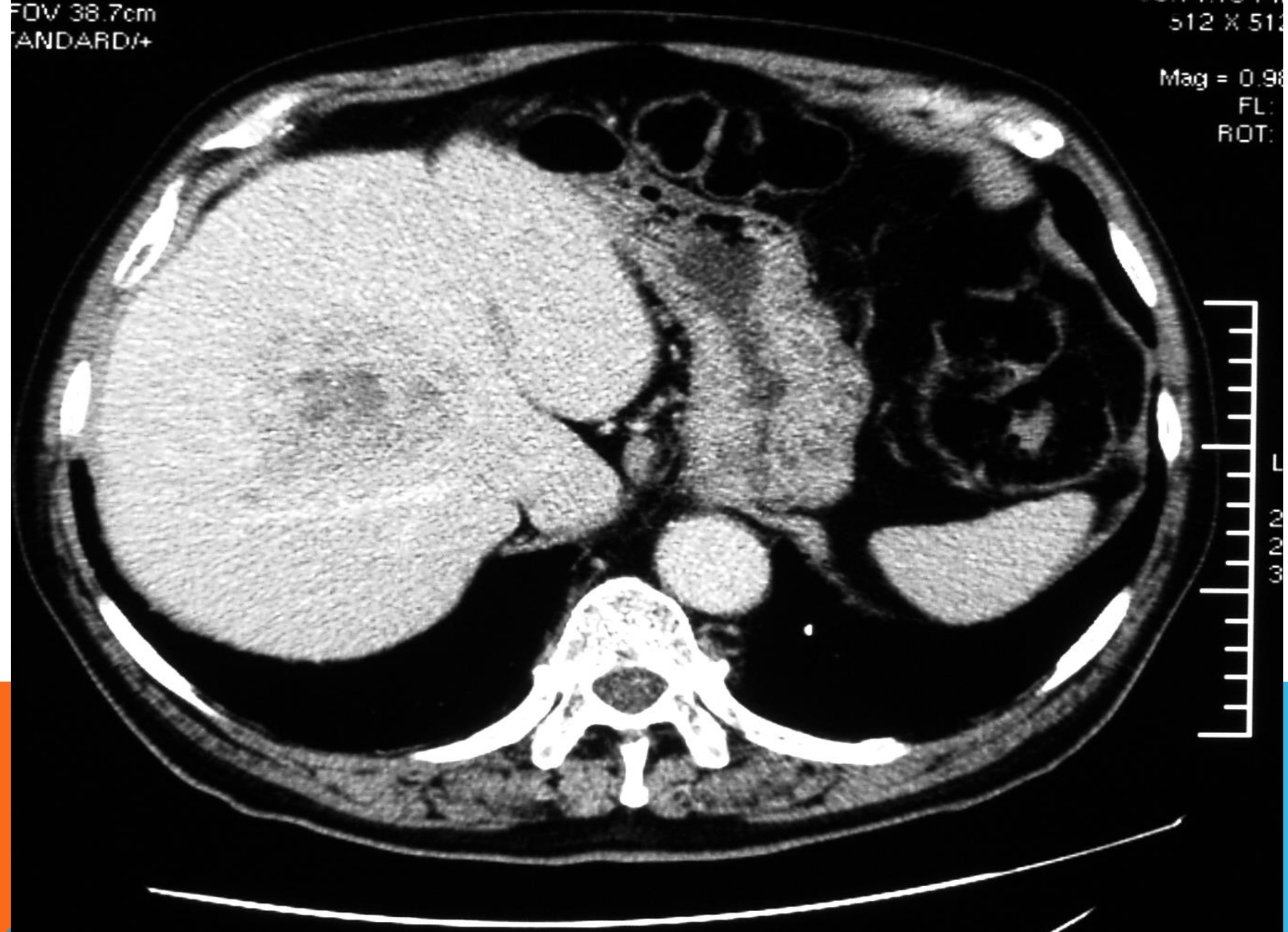
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ROT:



Z 519.7  
FOV 38.7cm  
STANDARD/+

06:14:10 PM  
512 X 512

Mag = 0.98  
FL:  
ROT:







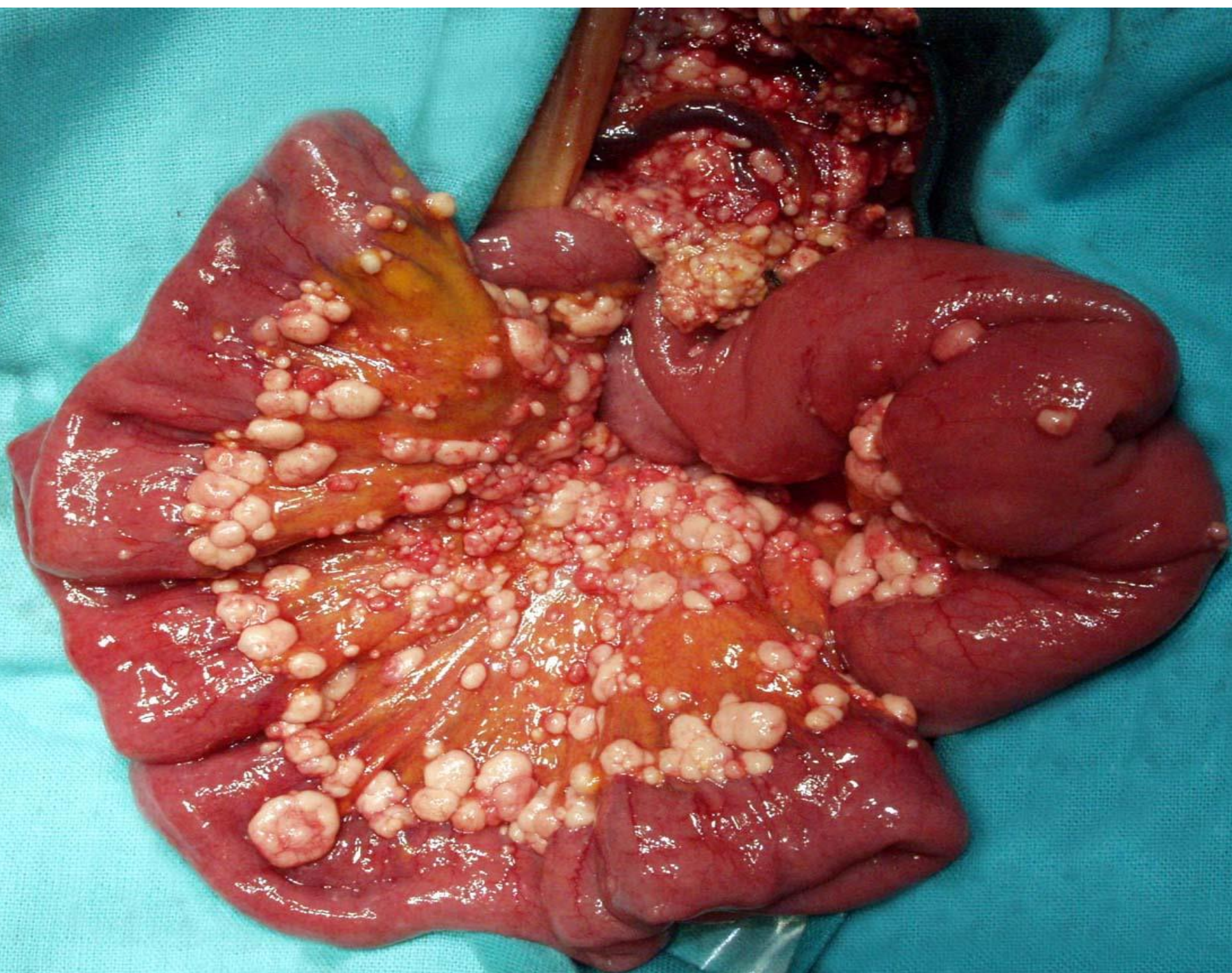




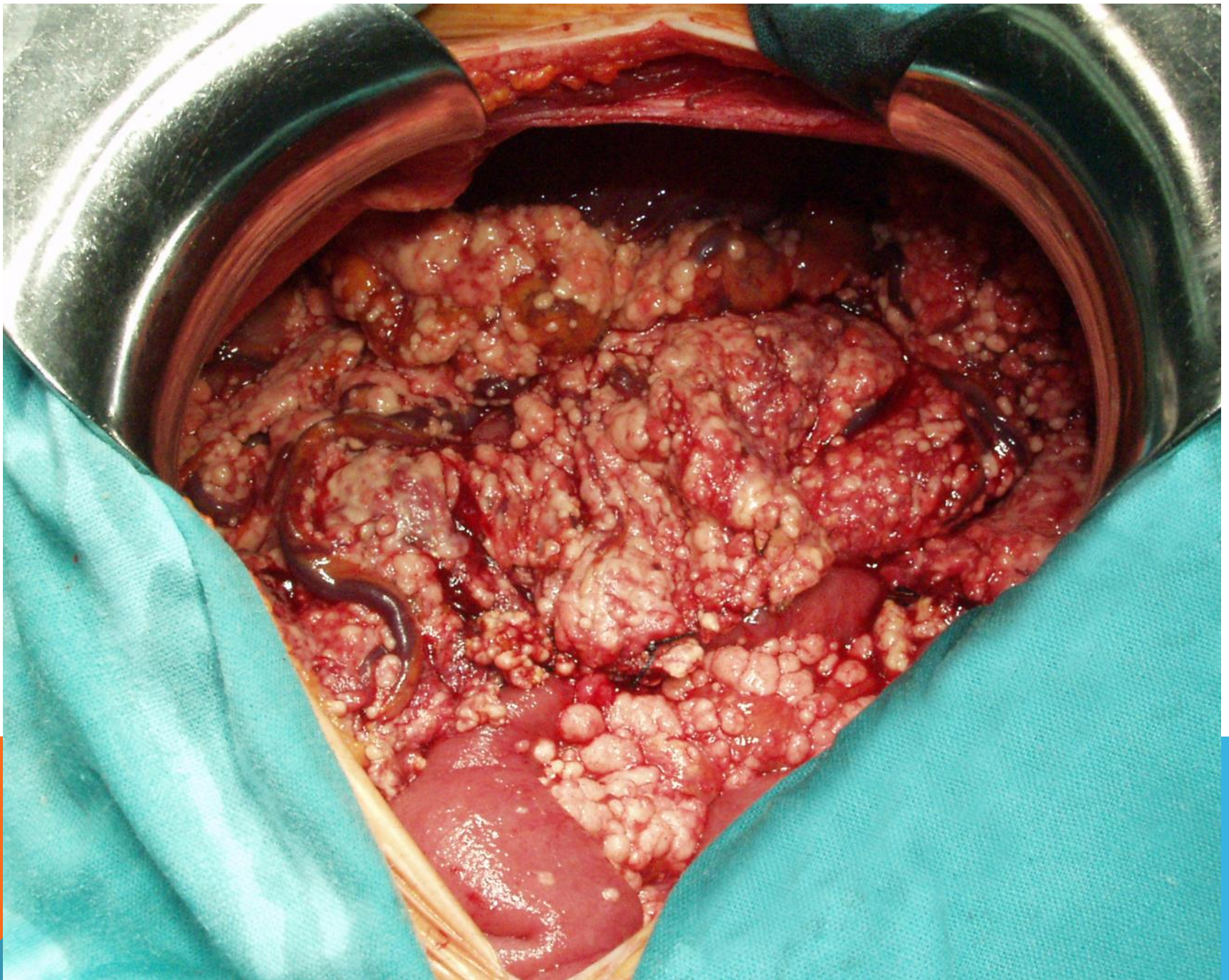




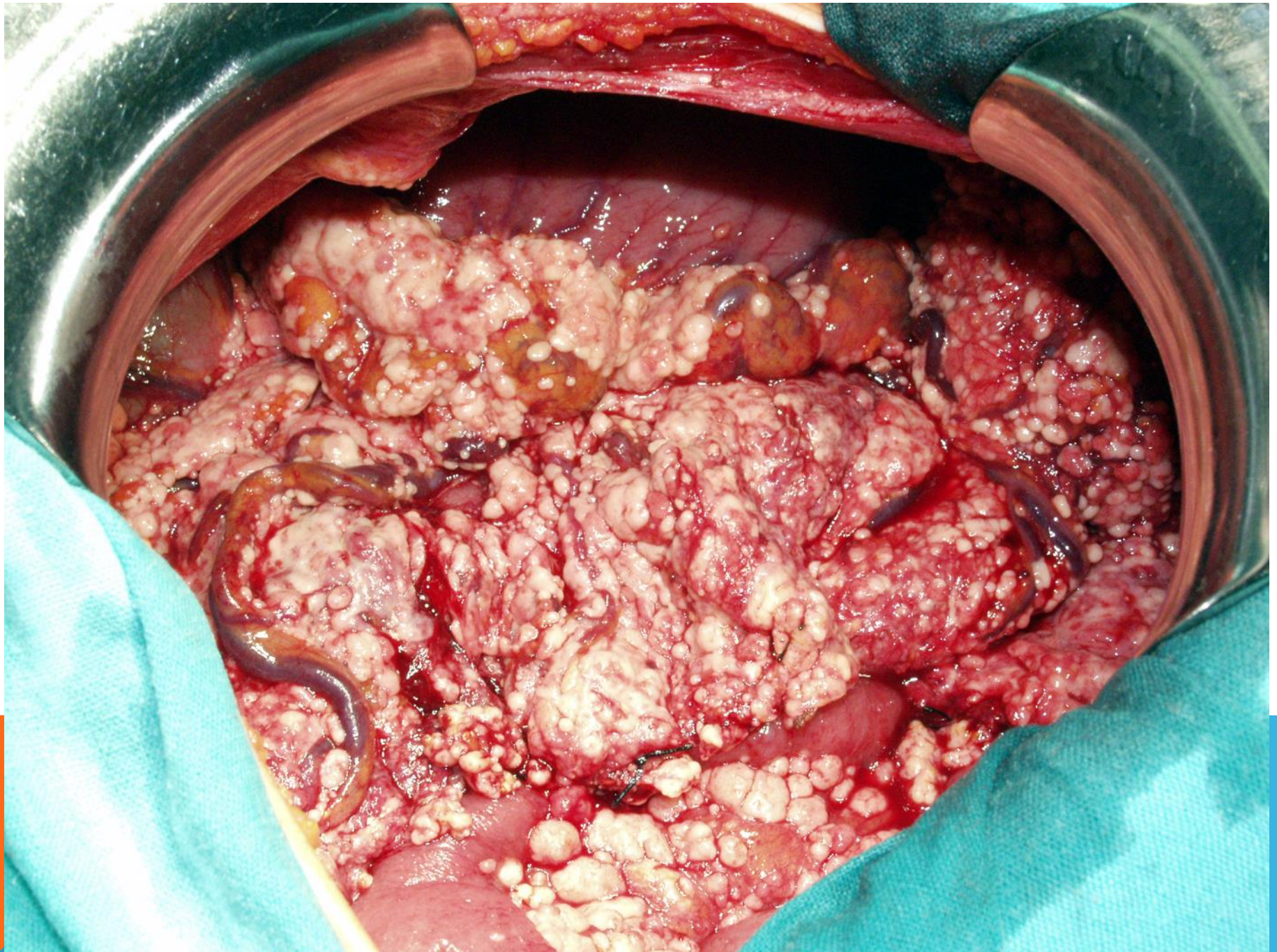














H

ASKLEPIOS Rzeszow  
Symphony  
MR 2002B  
HFS  
+LPH

3836  
\*10/01/76;29Y

STUDY 1  
23/12/05  
11:36:35  
7 IMA 11 / 16



10cm

R

MF 1.45

TI 850.0  
TR 2000.0  
TE 4.1  
TA 01.15\*2  
BW 130.0  
M/ND/NORM

A1/R  
BO1,2;SP3,4  
\*tf2d1 / 15

CONTRAST

SP P3.9  
SL 6.0  
FoV 400\*400  
256\*512 I  
Cor  
W 445  
C 190

E



H

ASKLEPIOS Rzeszow  
Symphony  
MR 2002B  
HFS  
+LPH

3836  
\*10/01/76;29Y  
STUDY 1  
23/12/05  
11:36:41  
7 IMA 14 / 16

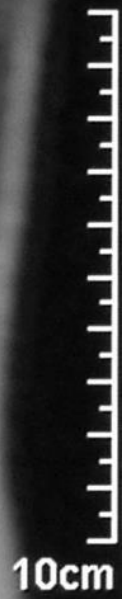


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MF 1.45

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TE 4.1  
TA 01.15\*2  
BW 130.0  
M/ND/NORM

A1/R  
BO1,2;SP3,4  
\*fl2d1 / 15



E

SP P27.3  
SL 6.0  
FoV 400\*400  
256\*512 I  
Cor  
W 431  
C 184

CONTRAST

A

Z.O.Z. S.P.Z. Mielec  
Emotion  
VA47C  
H-SP-CR

2696/05/WEWN  
\*10-Jan-1976

08-Dec-2005  
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5 IMA 17  
SPI 5  
SP 136.0

R

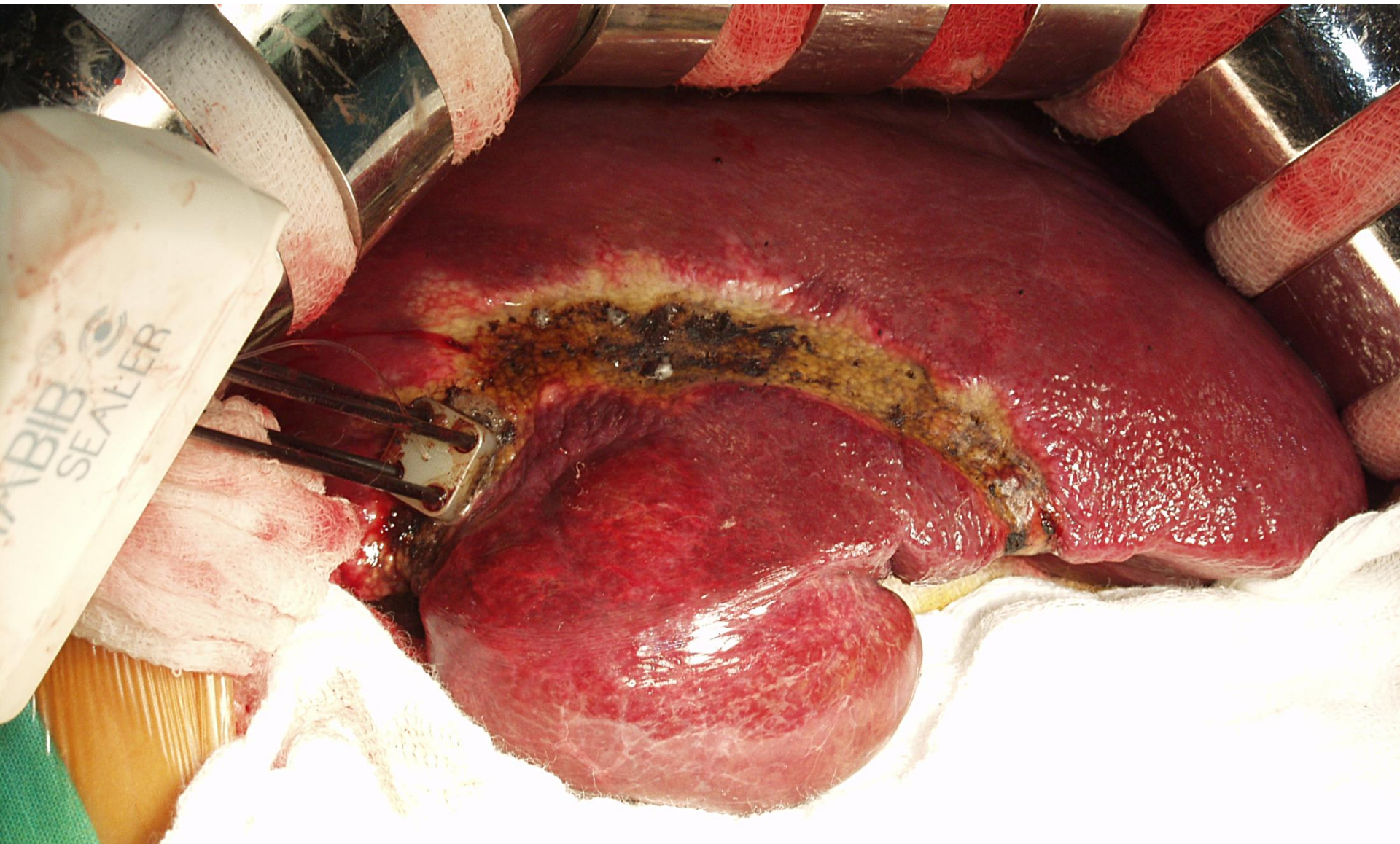


10cm

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W 200  
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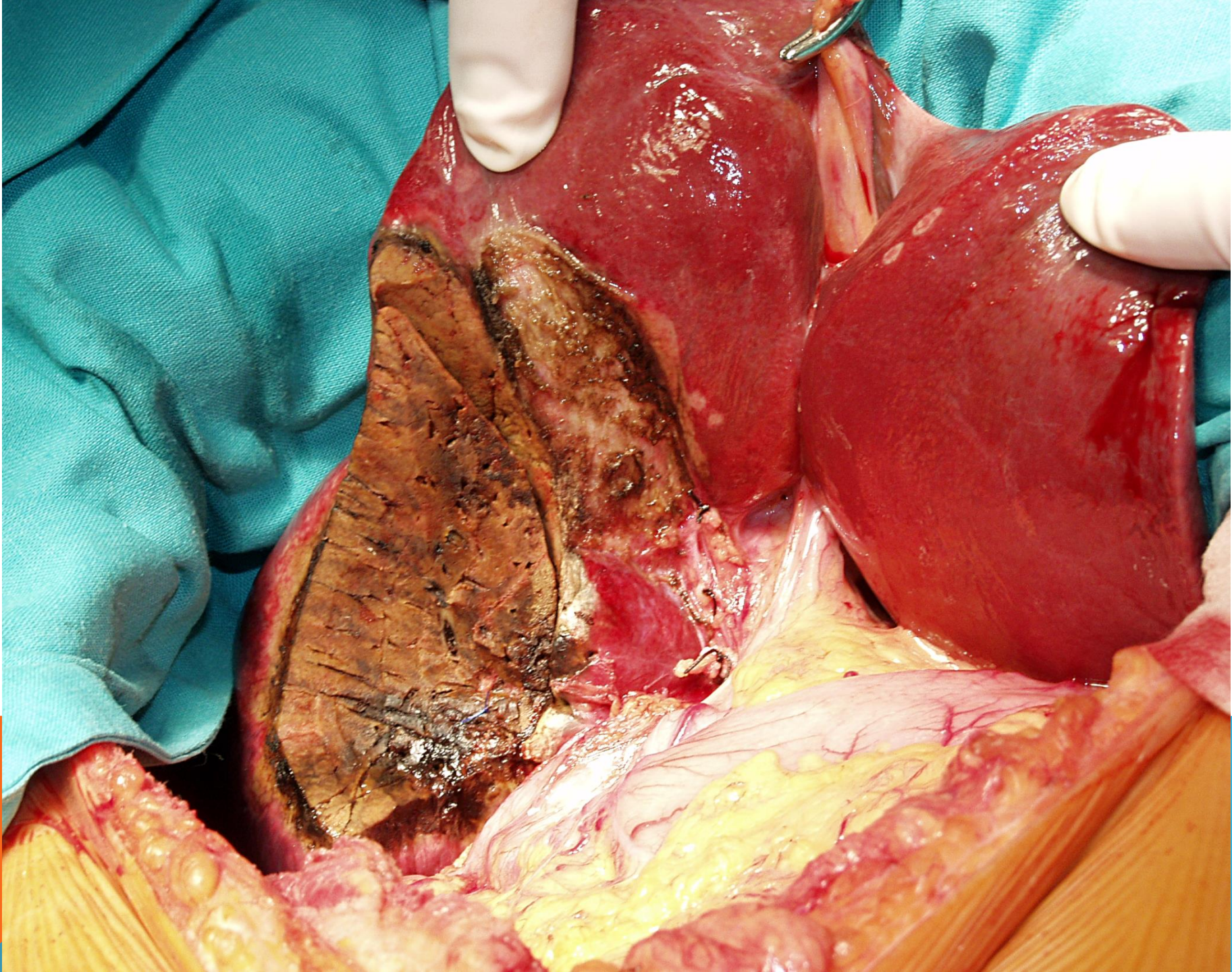














GE MEDICAL SYSTEMS  
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STANDARD

A 146

SP CSK Warszawa ul. Banacha 1a

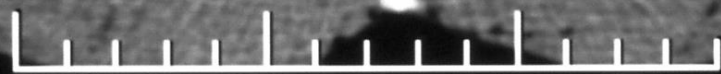
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Nov 19 2003  
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ROT:

R  
1  
4  
8

L  
1  
4  
8

kV 120  
mA 124~  
Smart mA 0  
SFOV 50.0cm  
2.50mm 11.25mm/rot 0.562:1 /11  
Tilt: 0.0  
1.0 s /HE /03.56/2.37



WW: 282WL: 93

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GE MEDICAL SYSTEMS  
LightSpeed16 CT16\_OC0  
Ex: 5272  
Se: 3  
Im: 213+C  
XY 156.0  
DFOV 29.1cm  
STANDARD

A 146

SP CSK Warszawa ul. Bonacha 1a

M56Y/Dec 27 1946  
W 5560VIC  
Nov 19 2003  
02:55:03 PM  
512 X 512

Mag = 1.24  
FL:  
ROT:

R  
1  
4  
8

L  
1  
4  
8

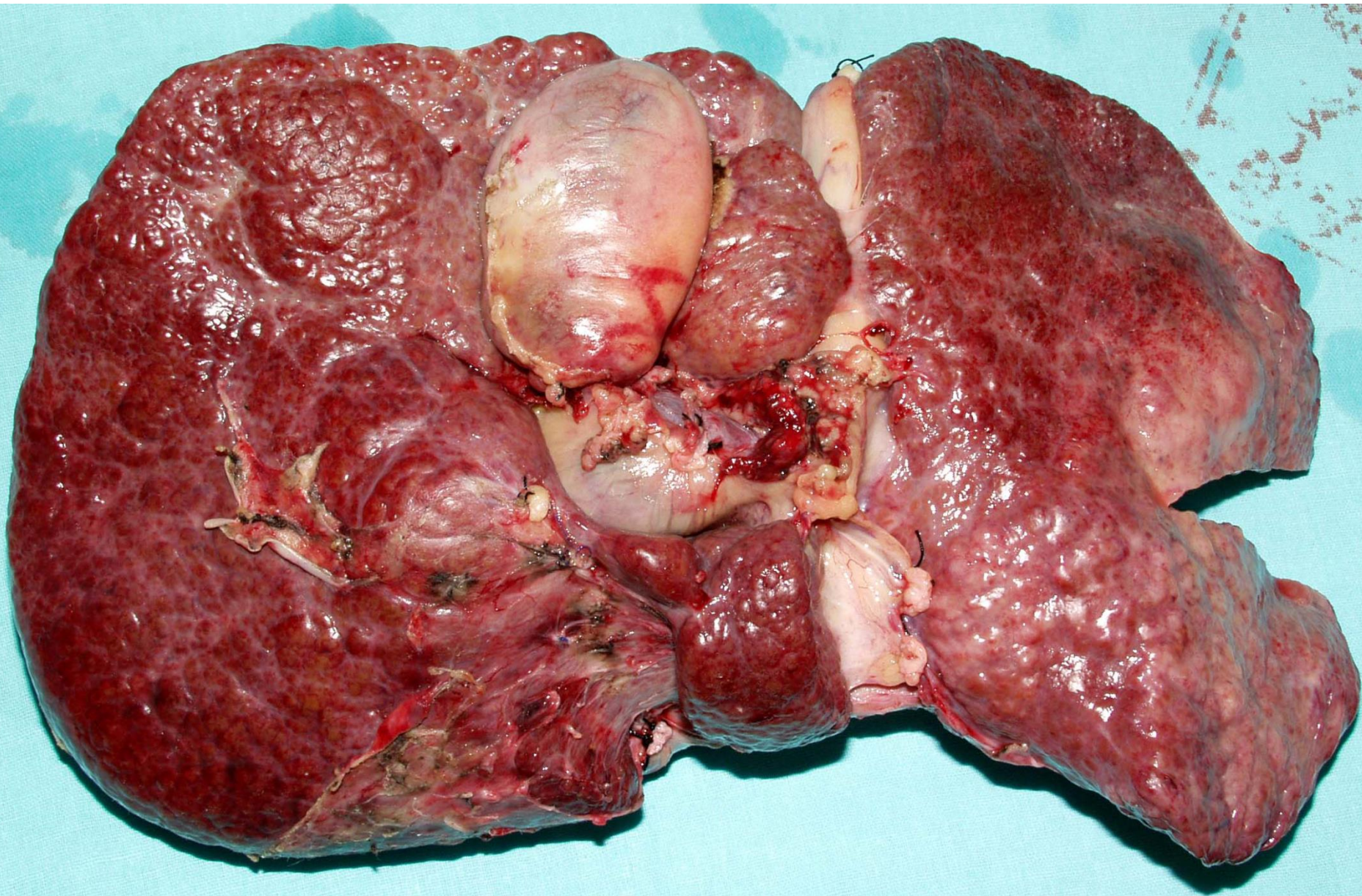
kV 120  
mA 102~  
Smart mA 0  
SFOV 50.0cm  
2.50mm 11.25mm/rot 0.562:1 //i  
Tilt: 0.0  
1.0 s /HE 102.67/12.37

1: distance 13.1mm, angle 63°  
2: distance 11.5mm, angle 20°

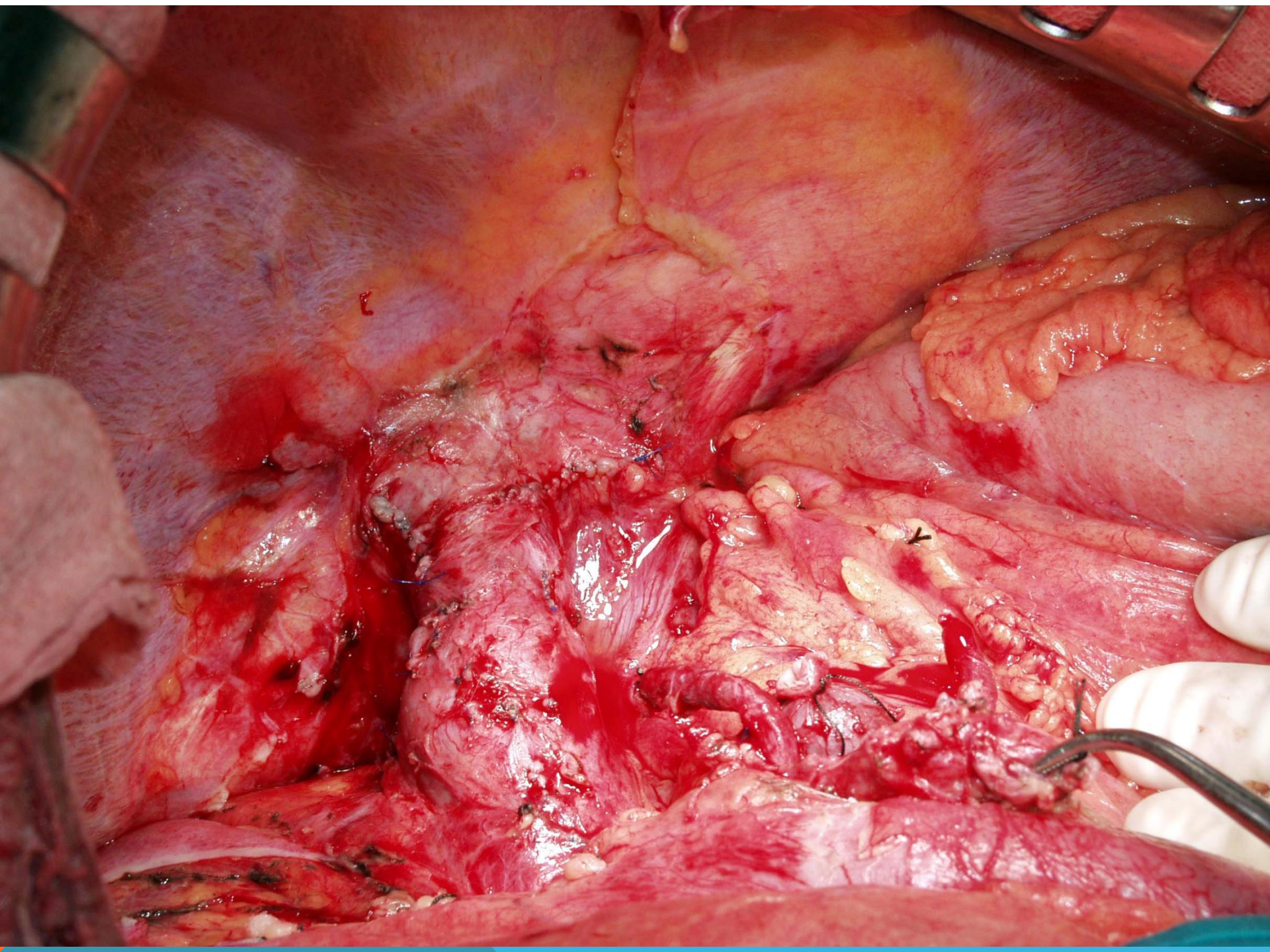
WW: 282WL: 92

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P. ONKOL.

W.S.Z.nr 1 Rzeszow

SOMATOM AR.STAR

VB41A

H-SP-CR

2418  
21-MAY-1937  
13-MAY-2004  
10:09:17.31  
TP -1082.0  
IMA 56  
SPI 4

A

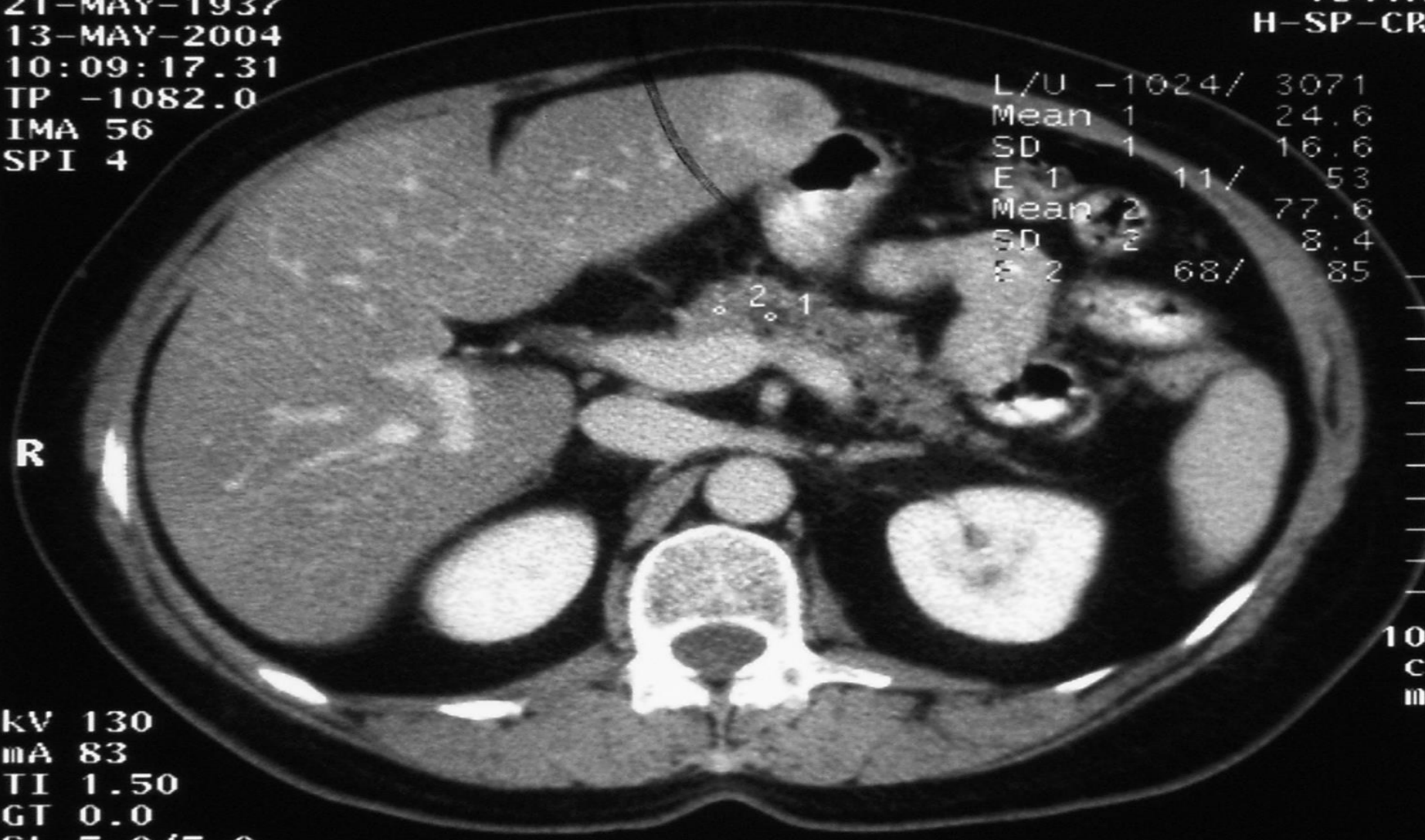
L/U	-1024/	3071
Mean	1	24.6
SD	1	16.6
E 1	11/	53
Mean	2	77.6
SD	2	8.4
E 2	68/	85

R

kV 130  
mA 83  
TI 1.50  
GT 0.0  
SL 5.0/5.0  
333 -3/0  
AB40 S0  
121S630 Contrast

W 300  
C 40

10  
C  
M





P.ONKOL.

W.S.Z.nr 1 Rzeszow

SOMATOM AR.STAR

VB41A

H-SP-CR

2418  
21-MAY-1937  
13-MAY-2004  
10:09:18.49  
TP -1086.0  
IMA 57  
SPI 4

A

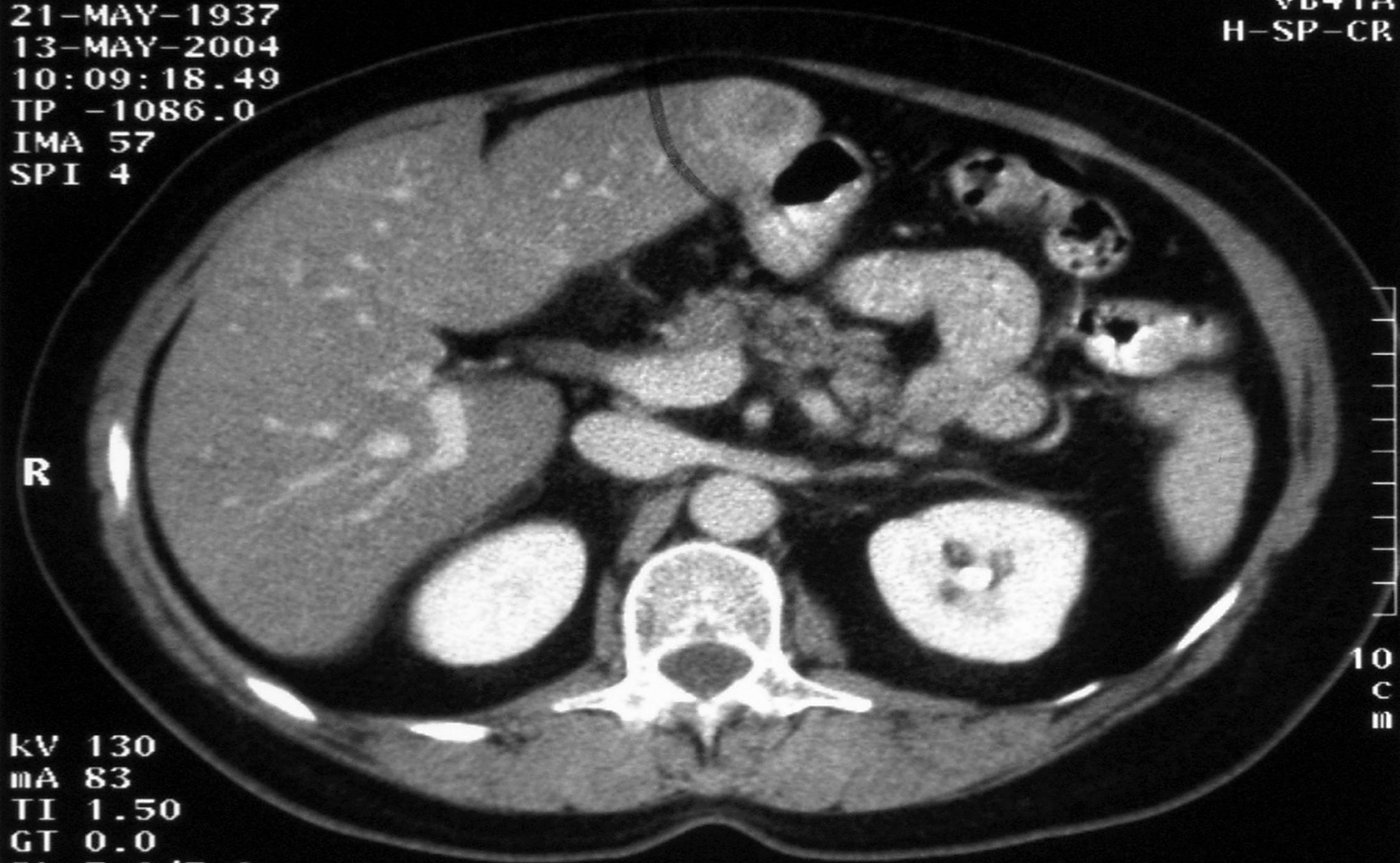
R

KV 130  
mA 83  
TI 1.50  
GT 0.0  
SL 5.0/5.0  
333 -3/0  
AB40 S0  
121S930

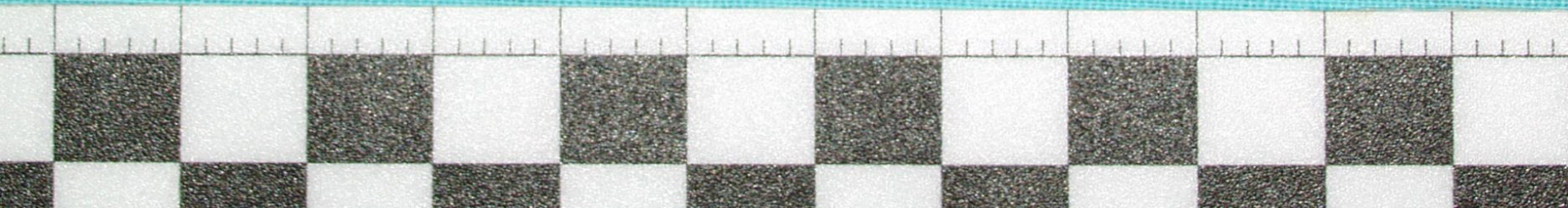
Contrast

W 300  
C 40

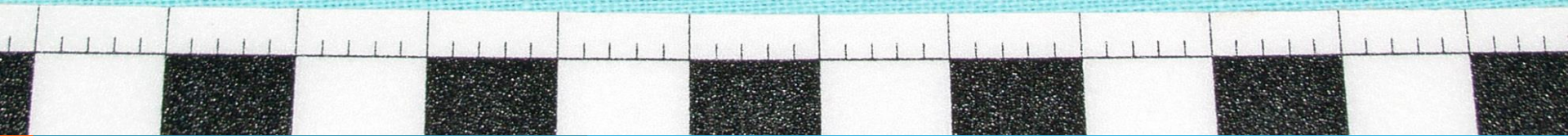
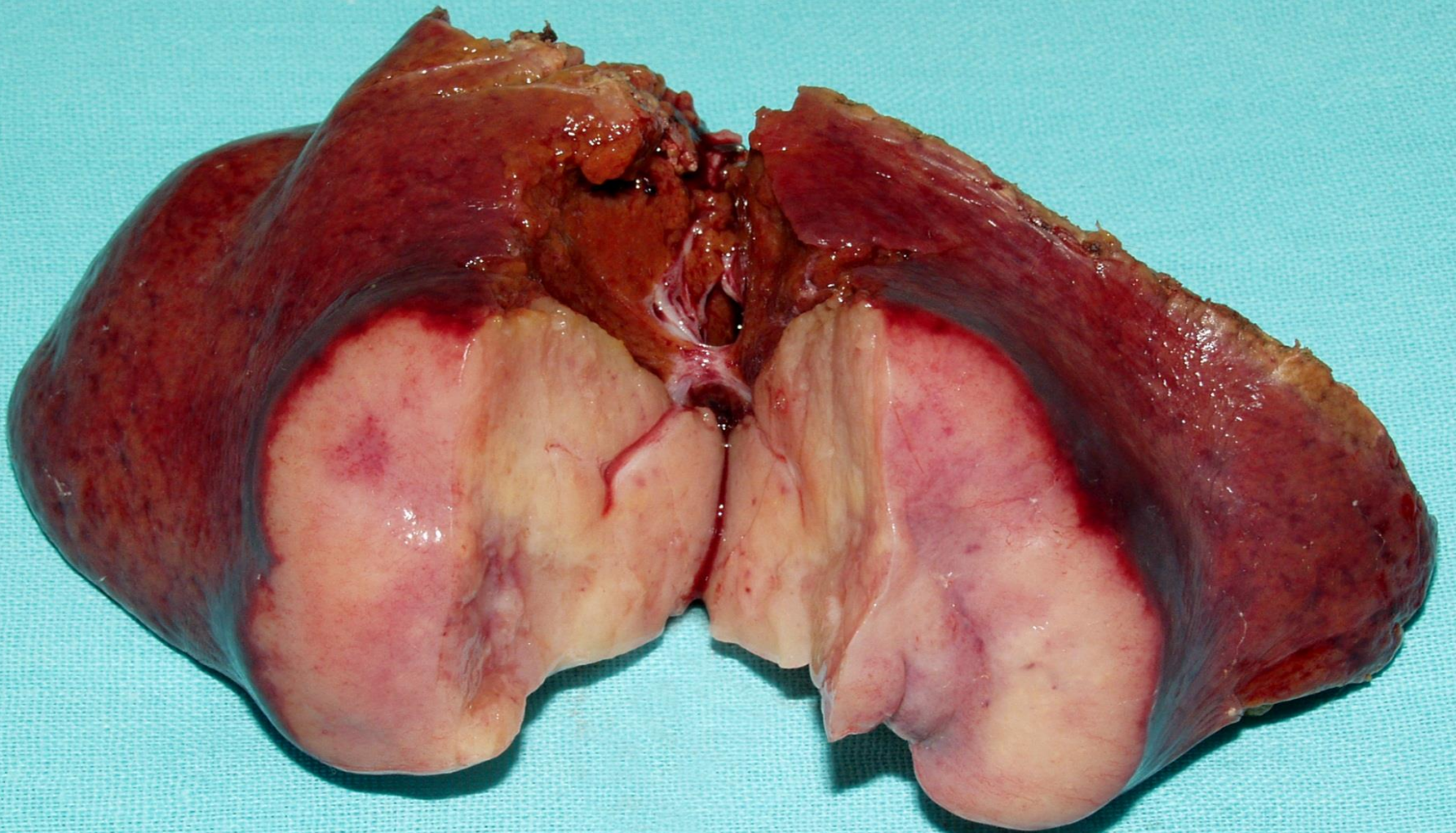
10  
C  
M



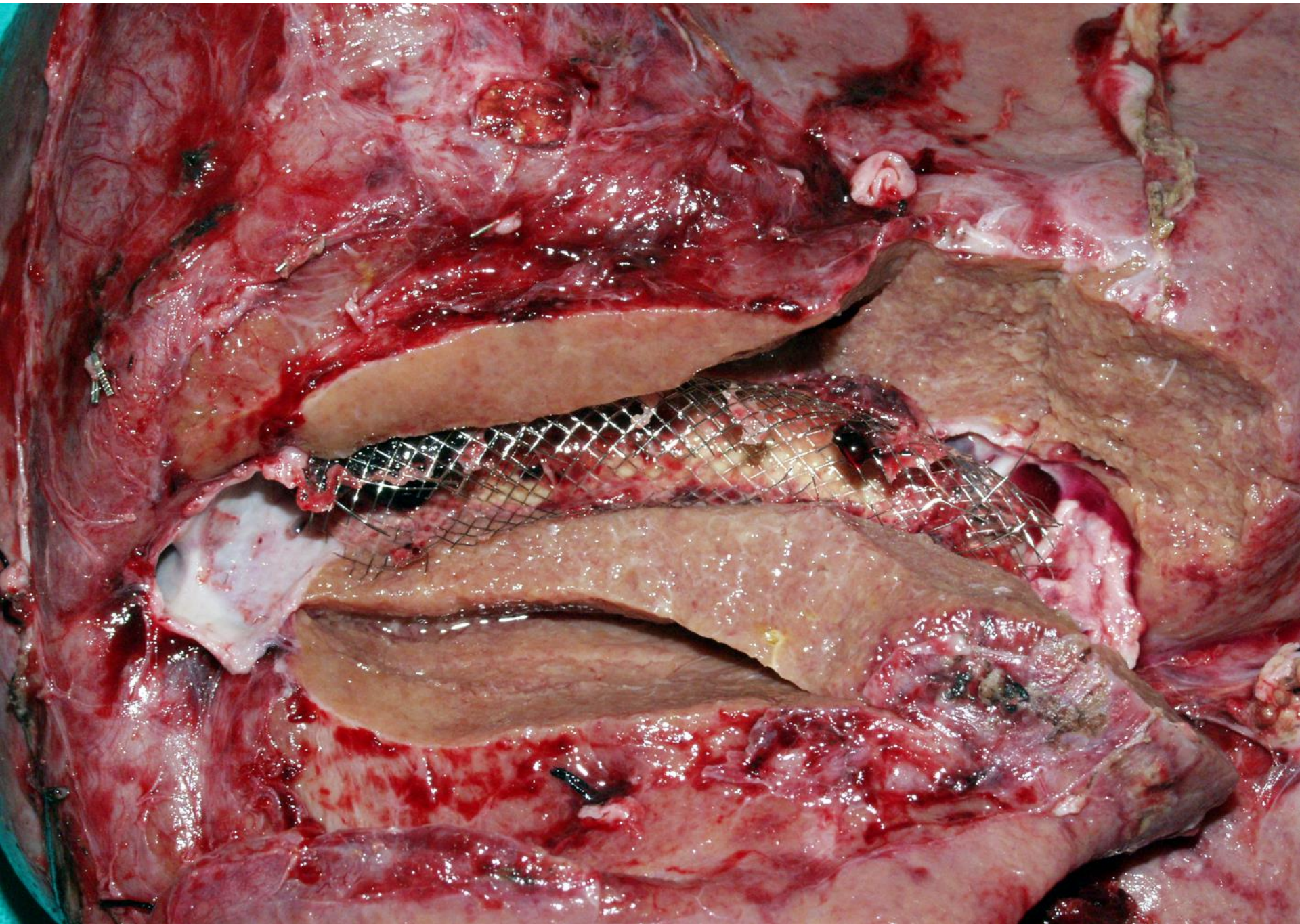




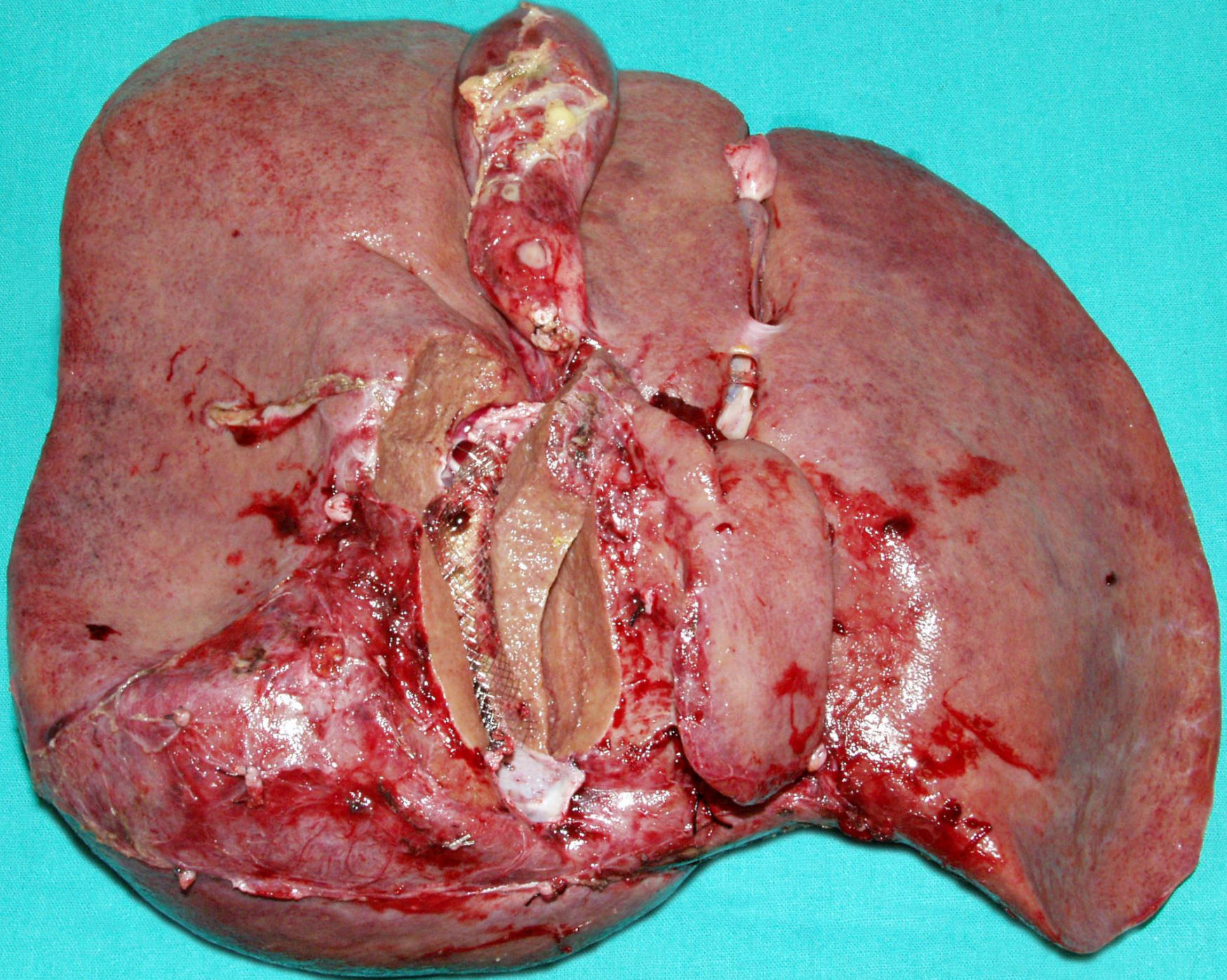




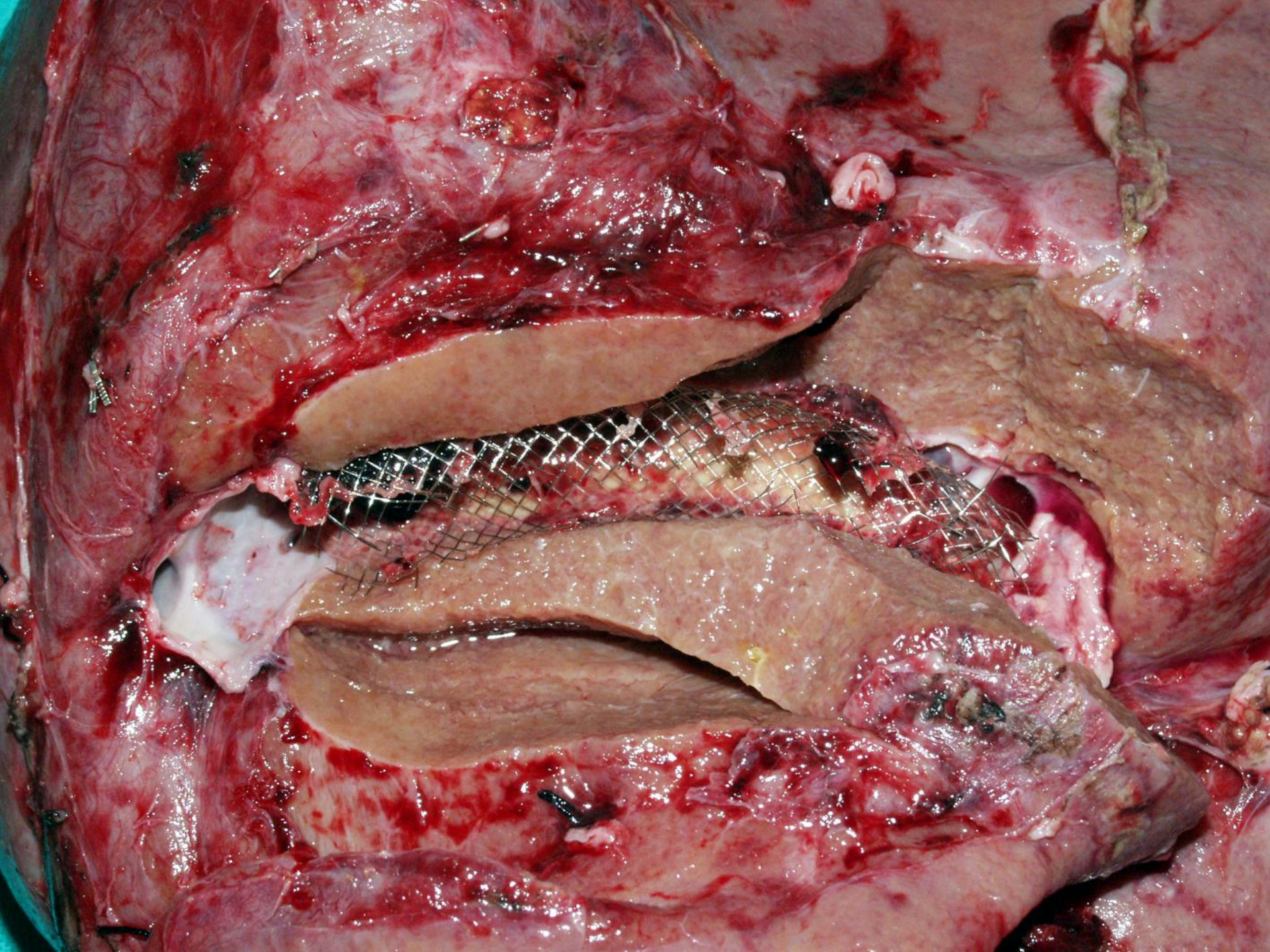












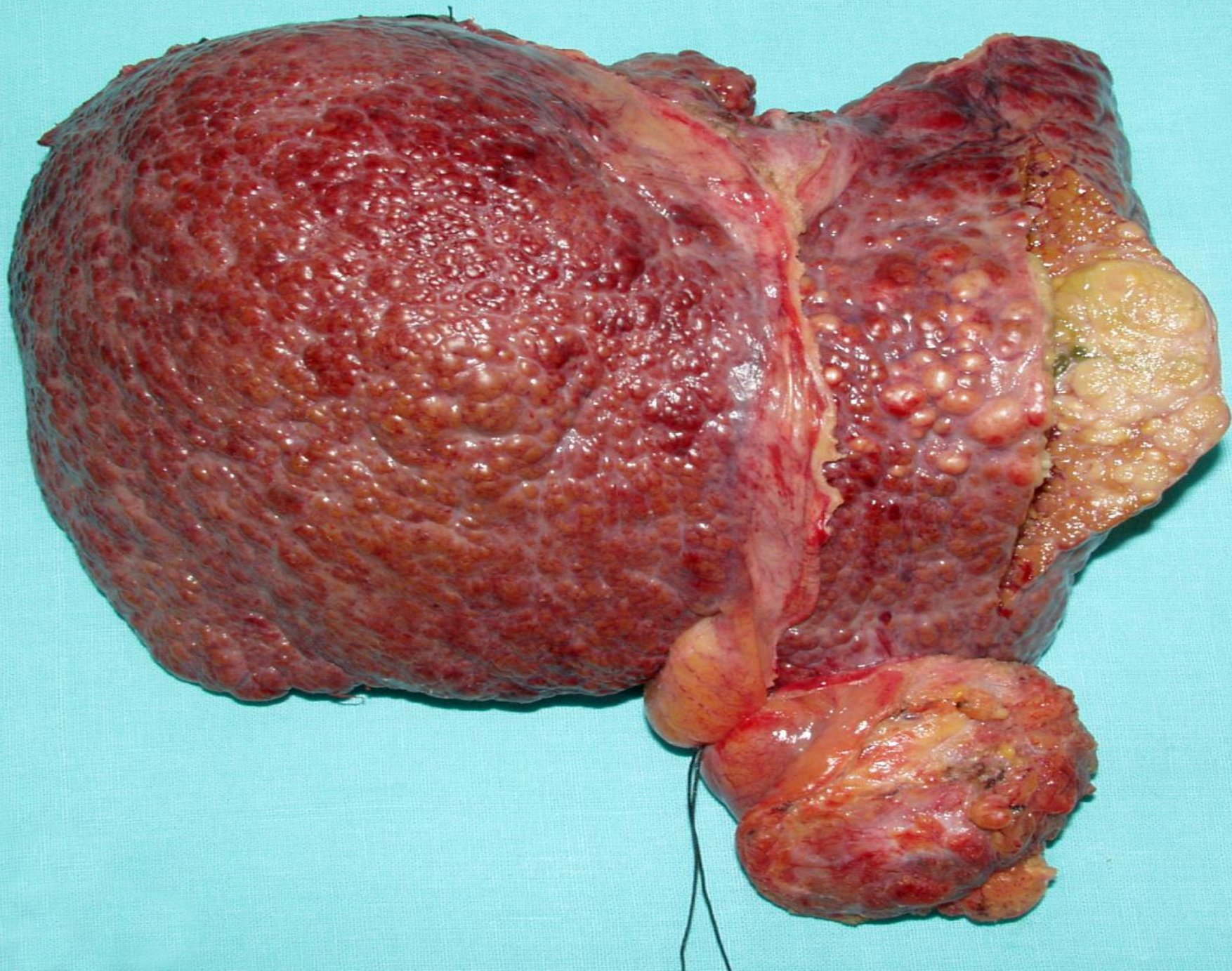




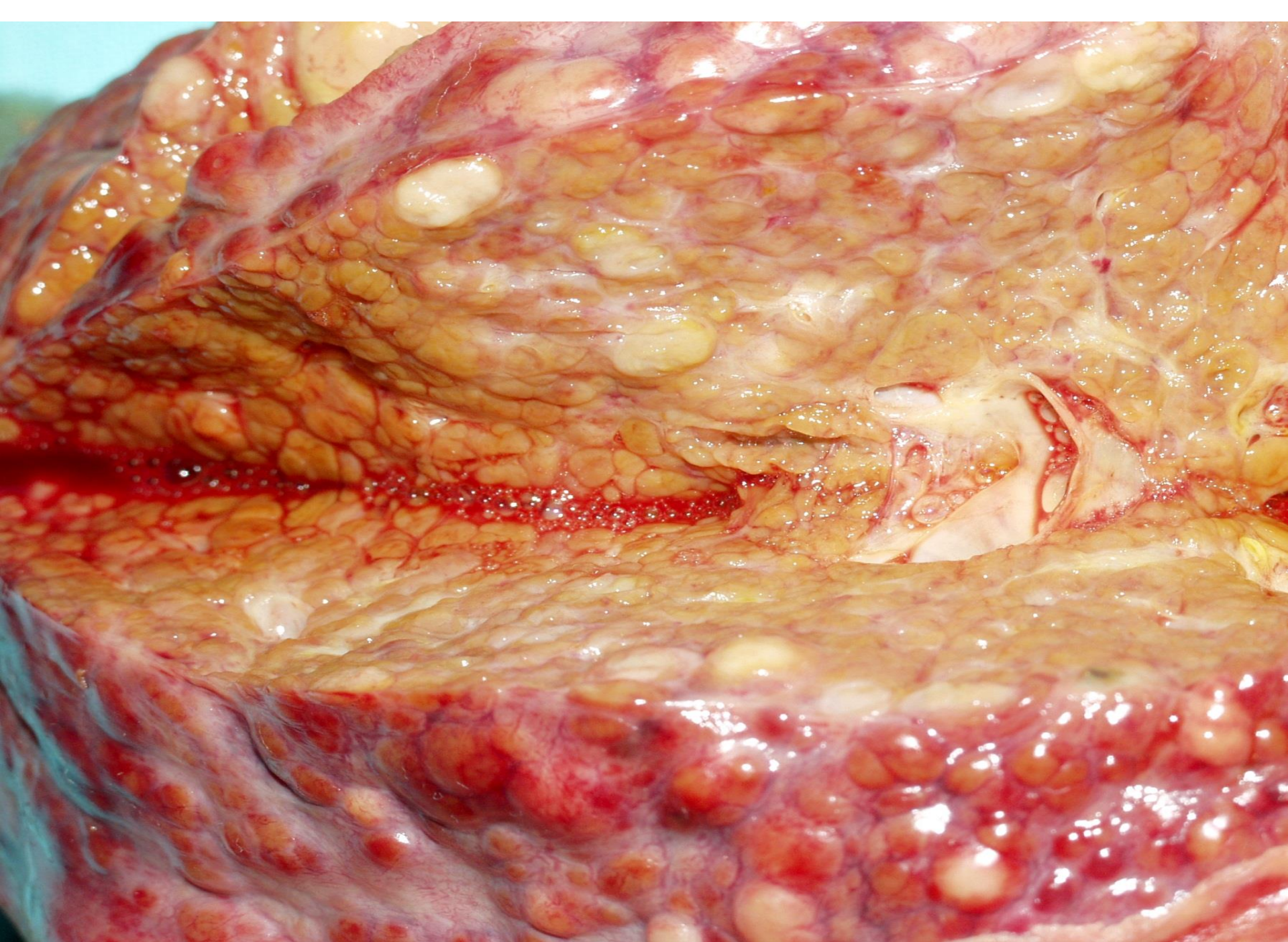
















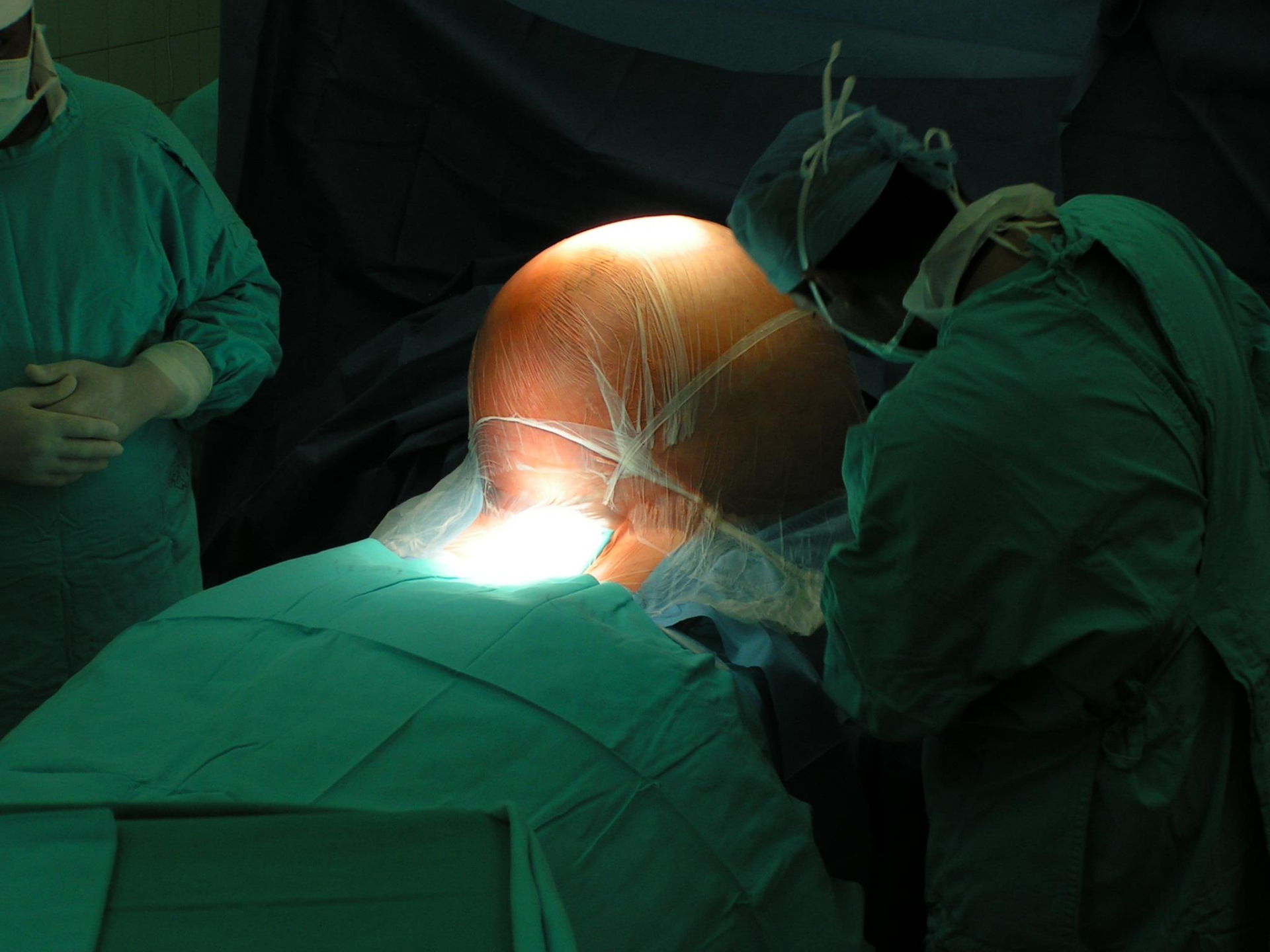








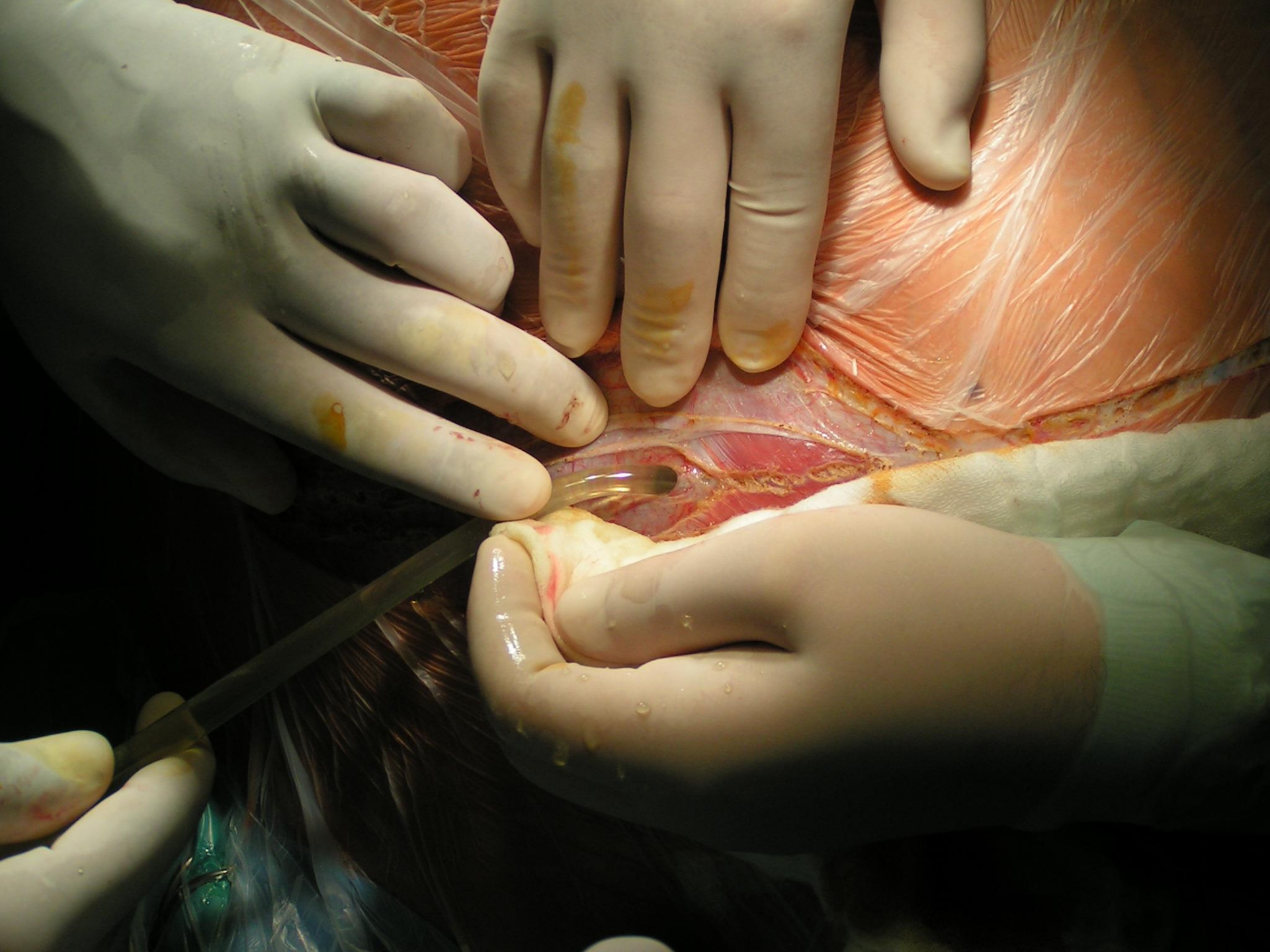












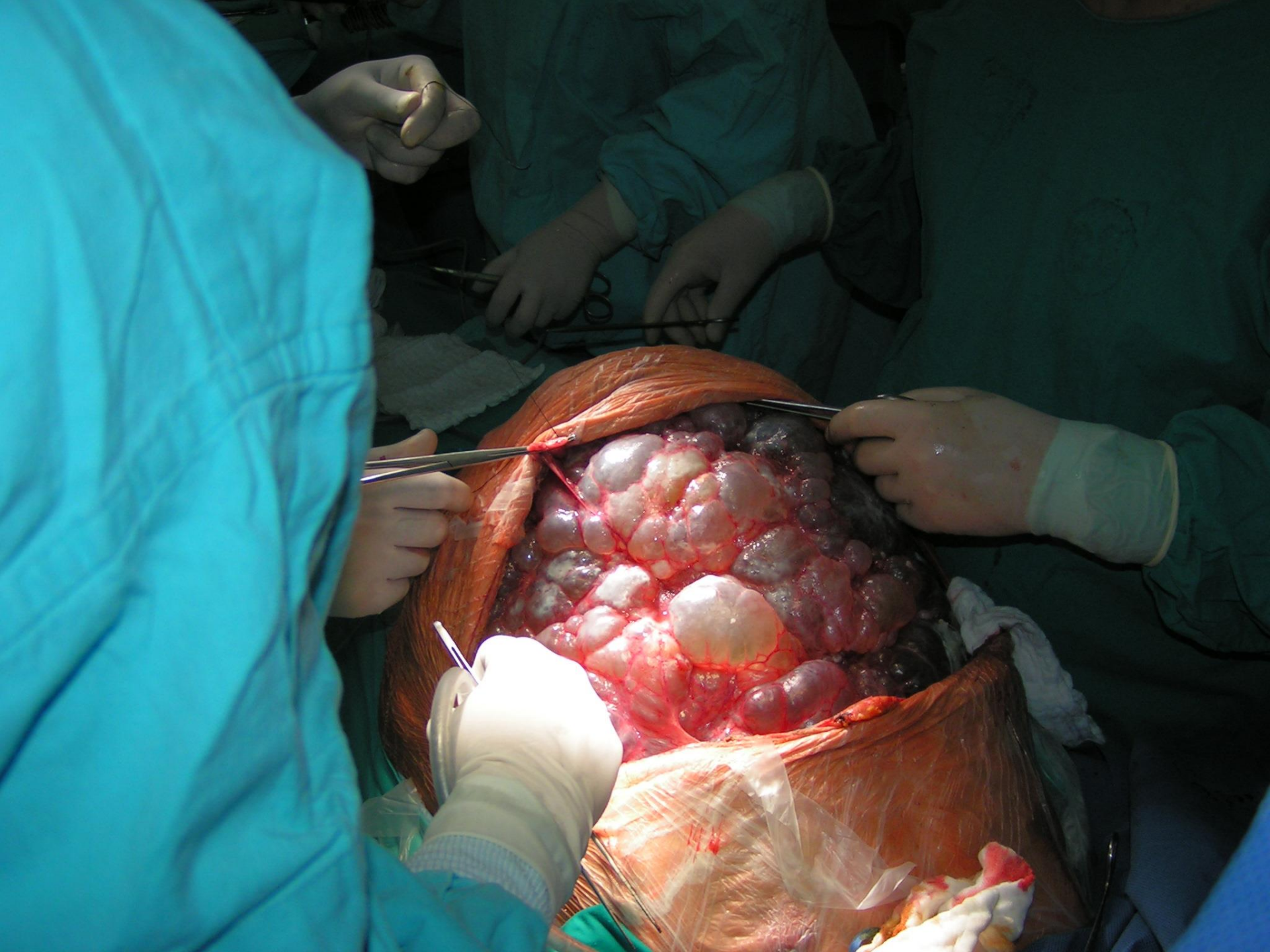












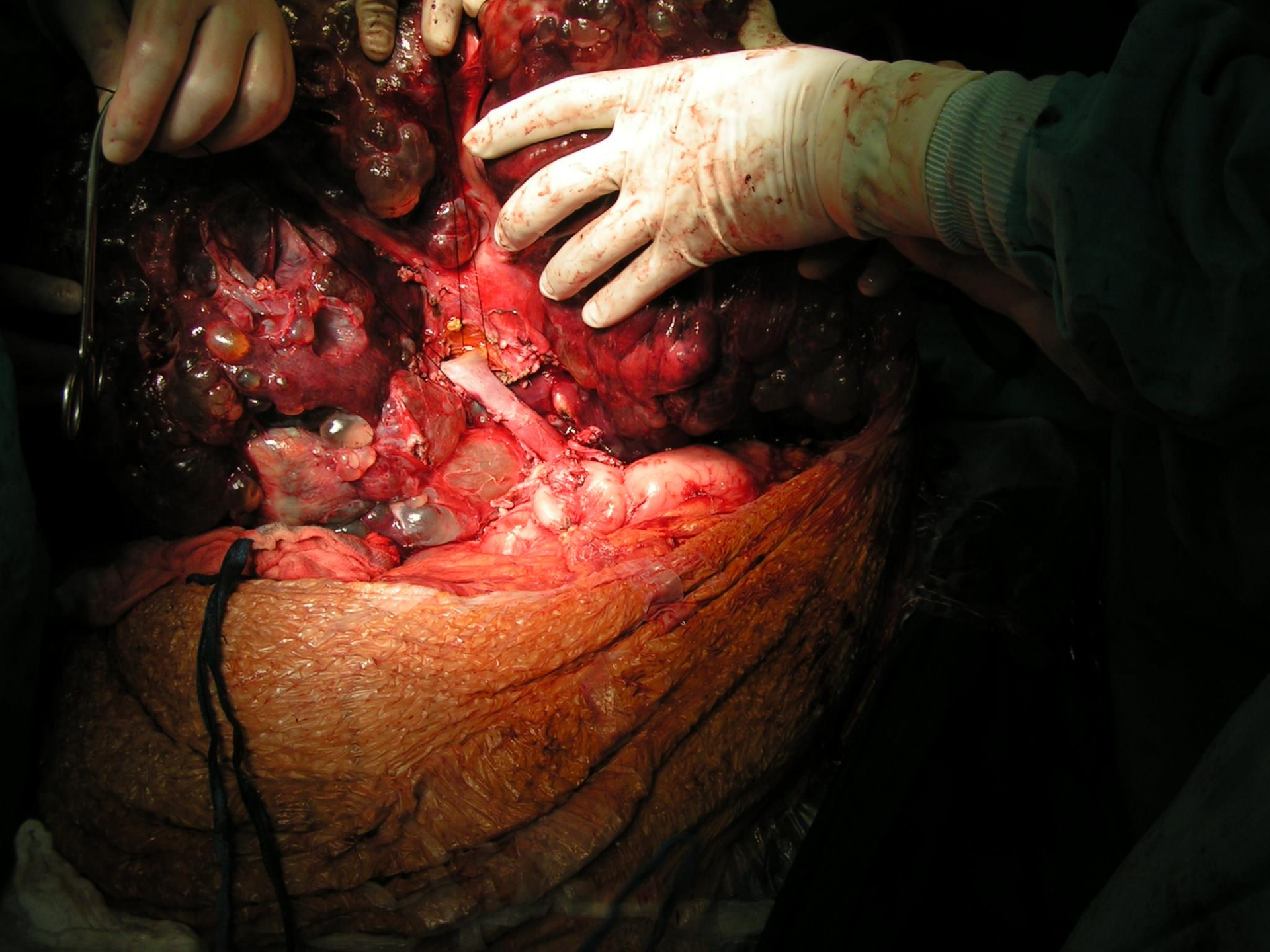




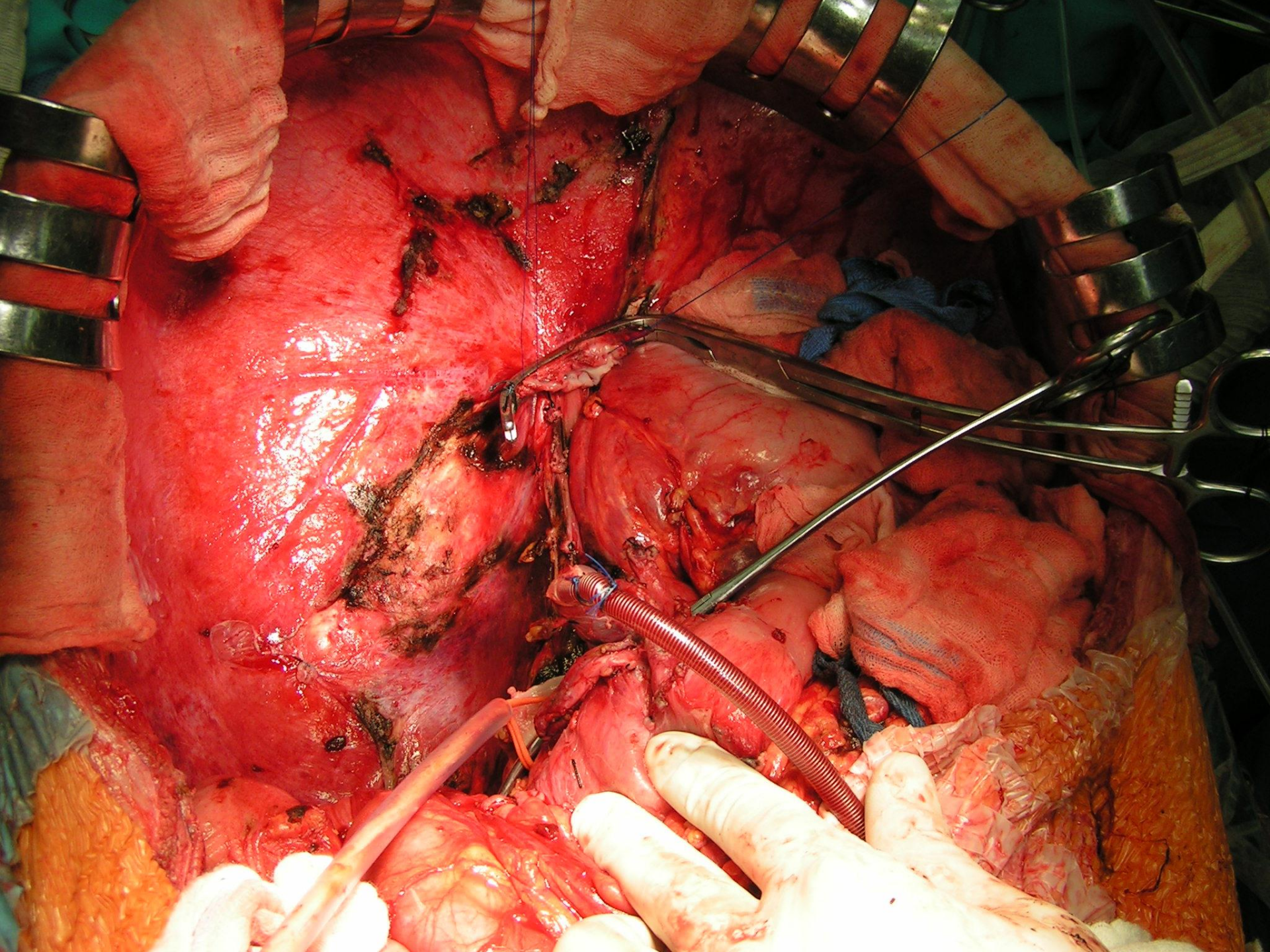








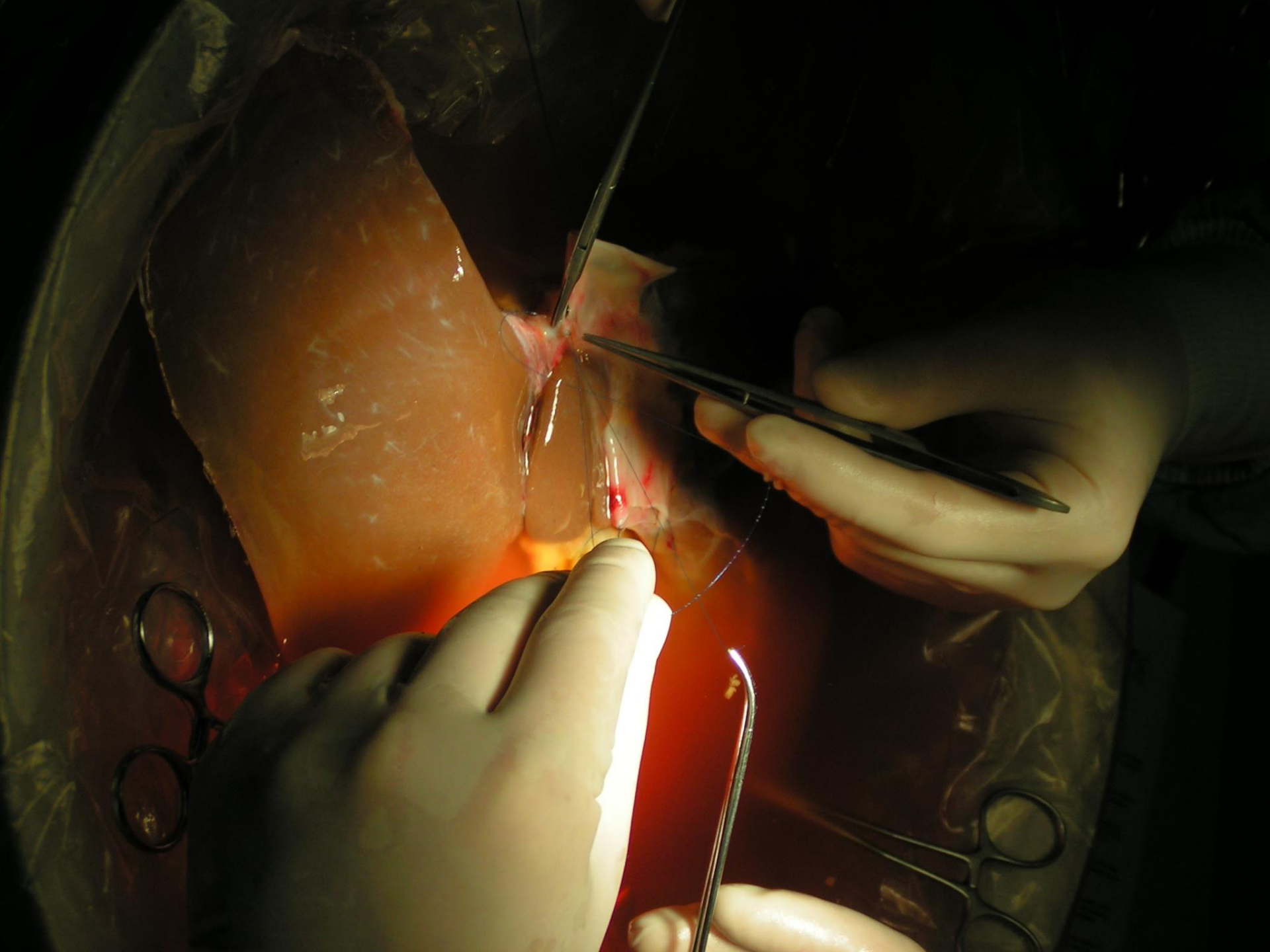




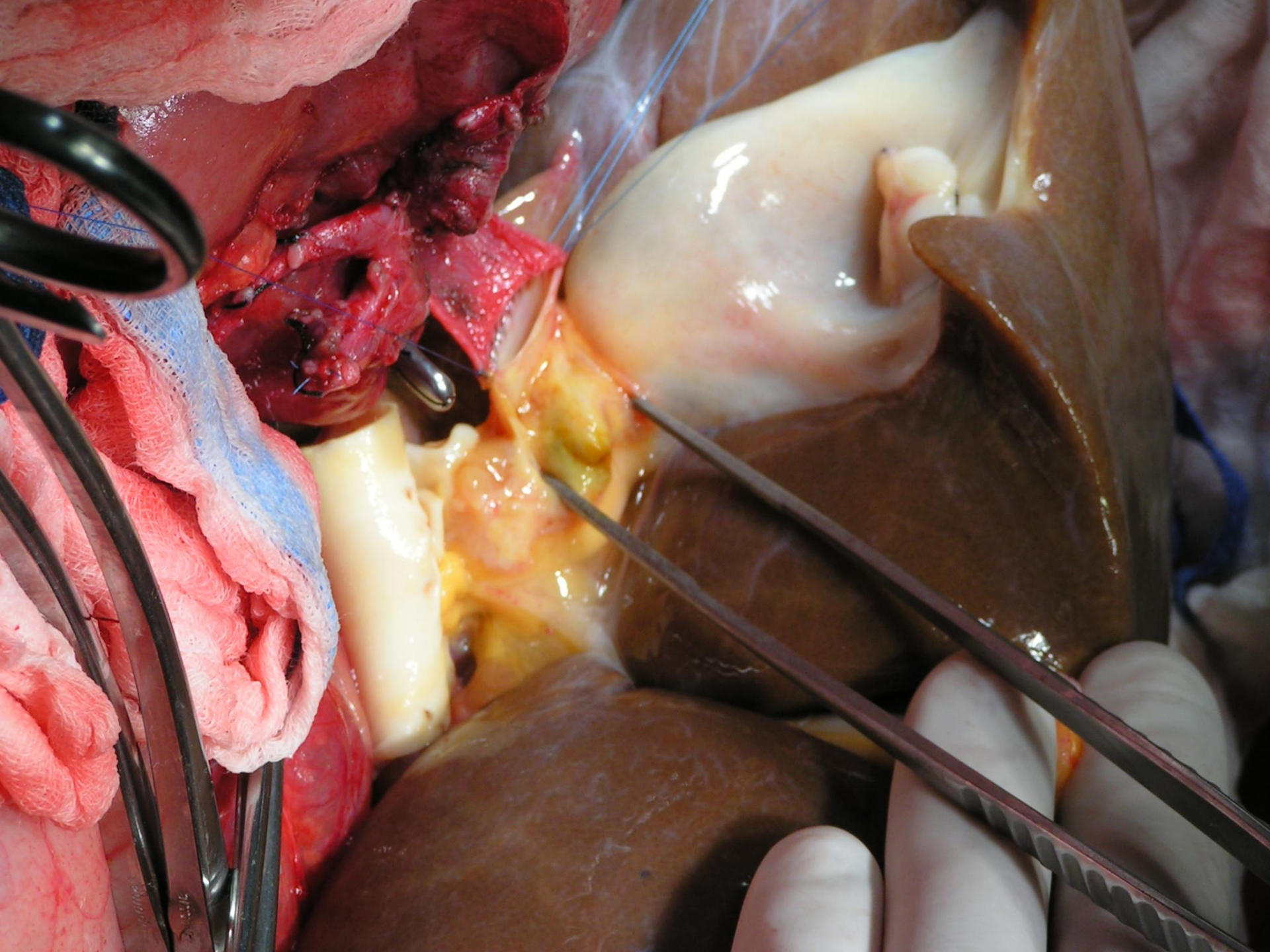




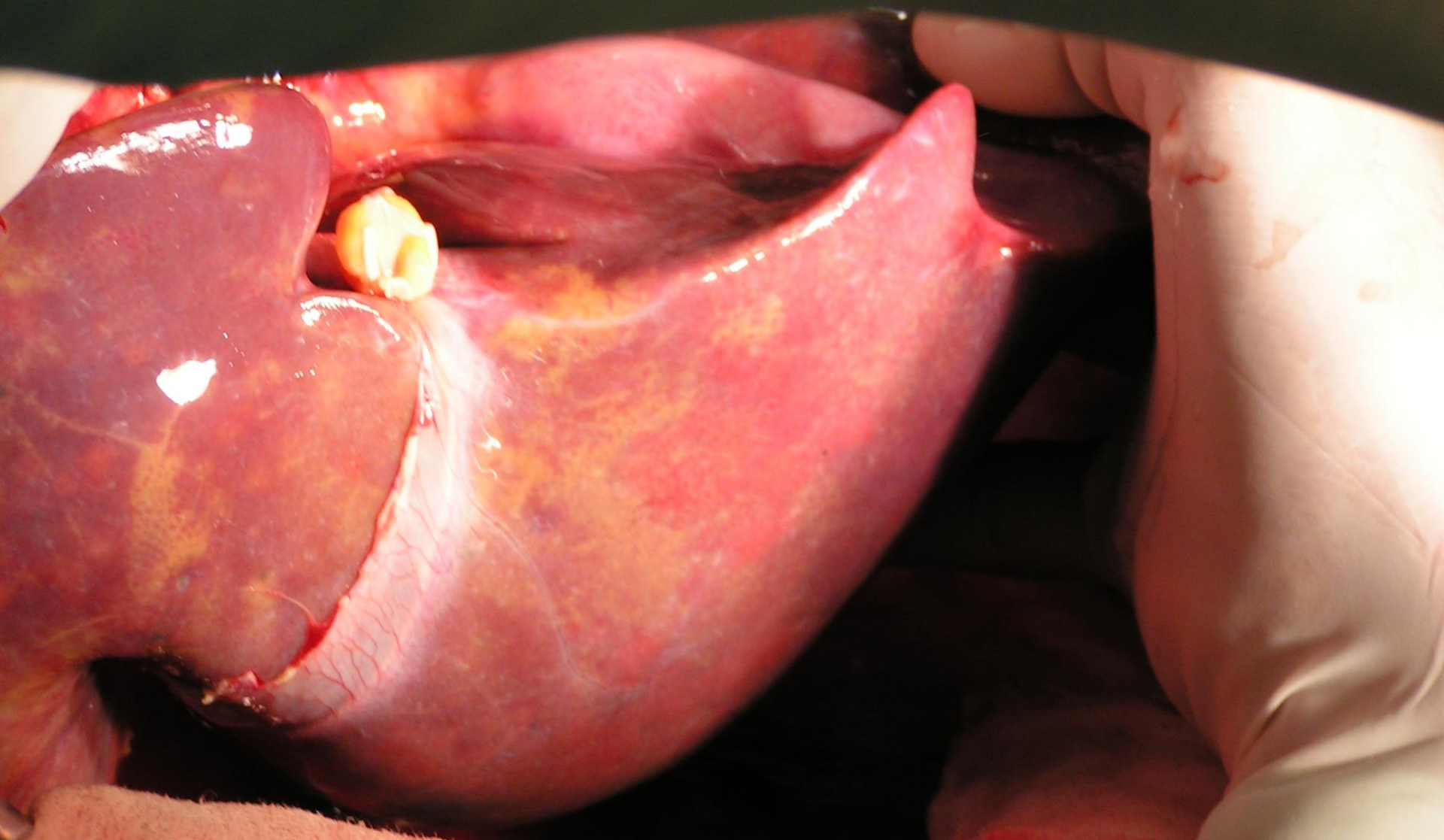




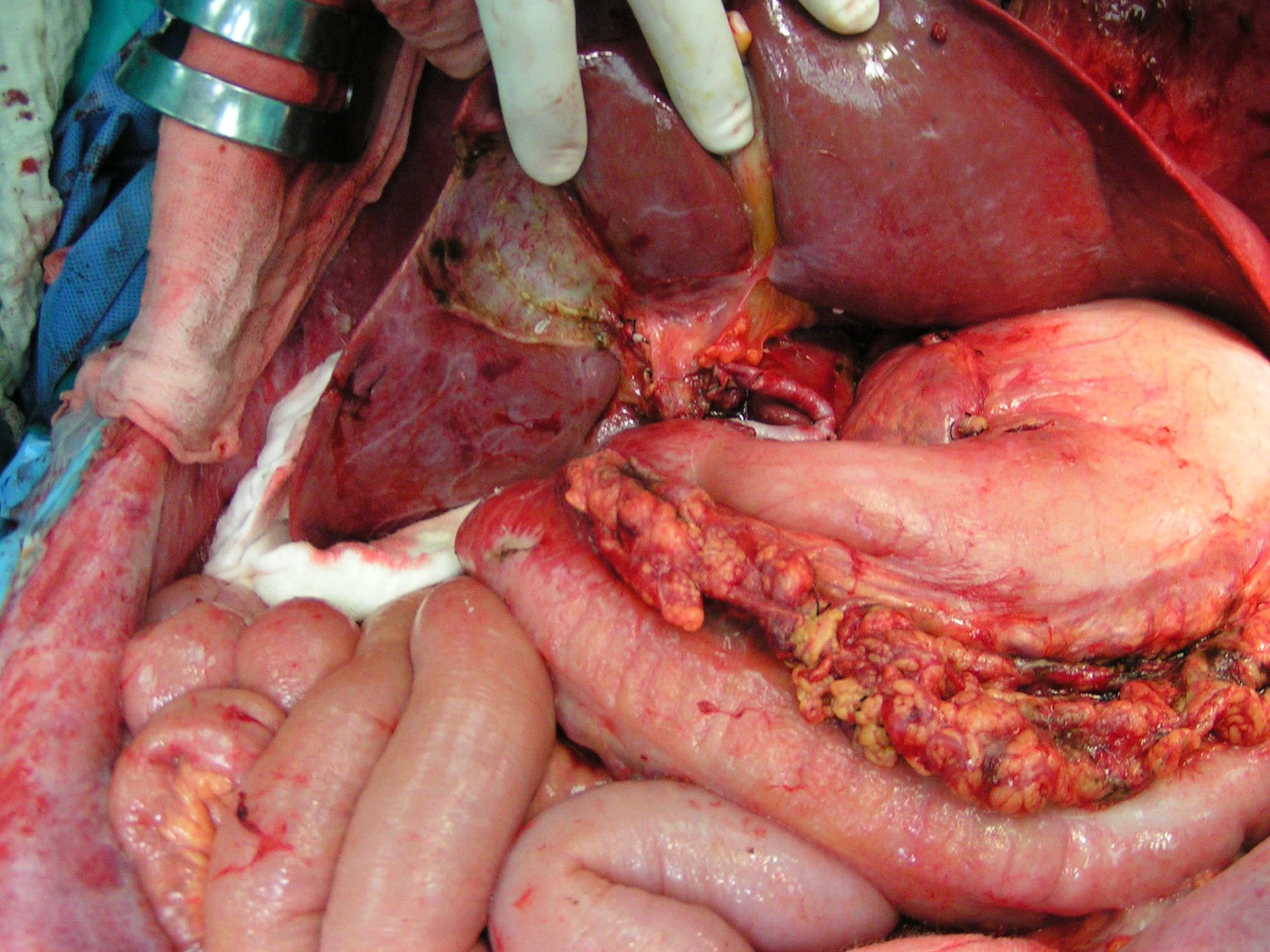




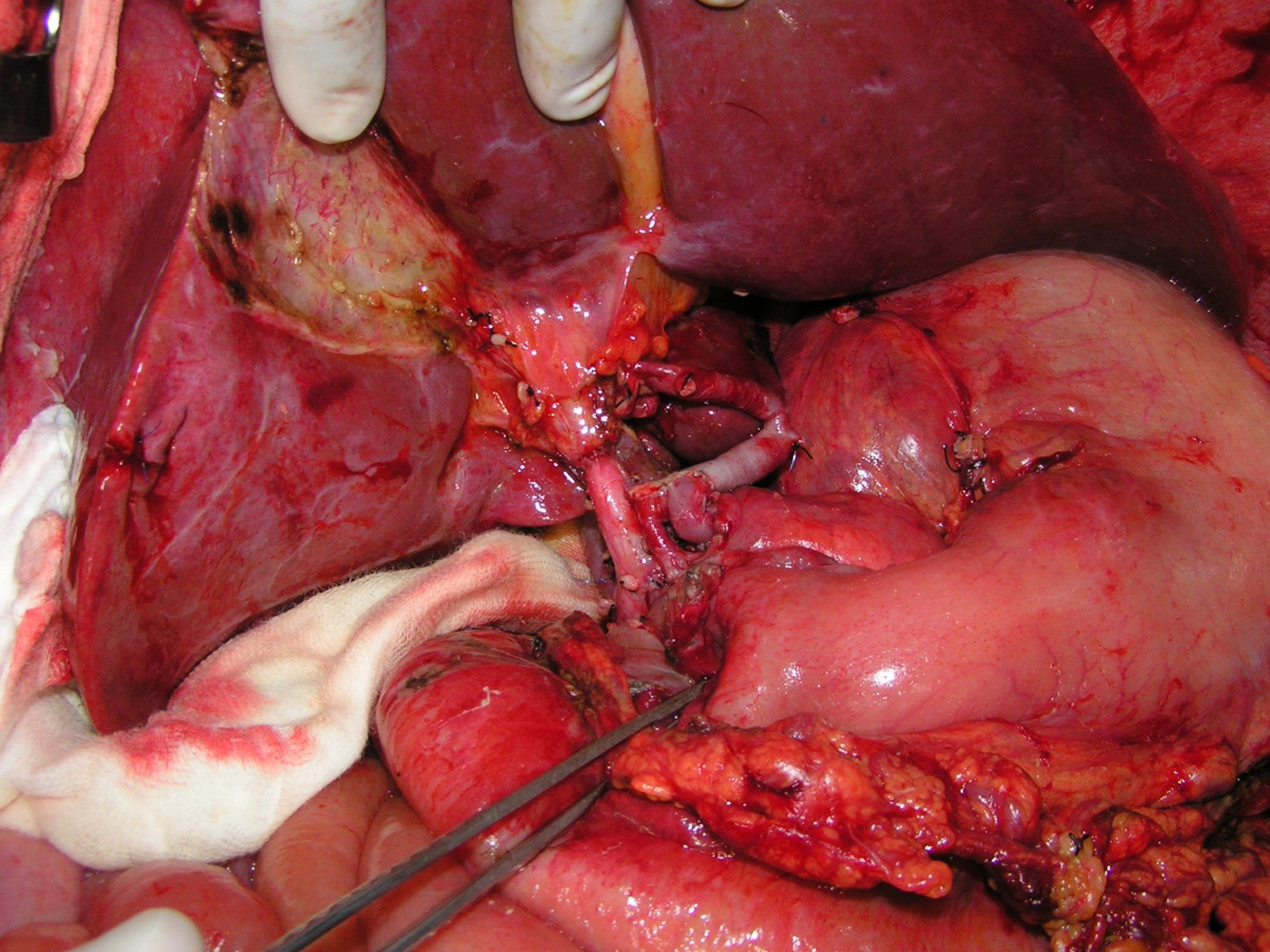




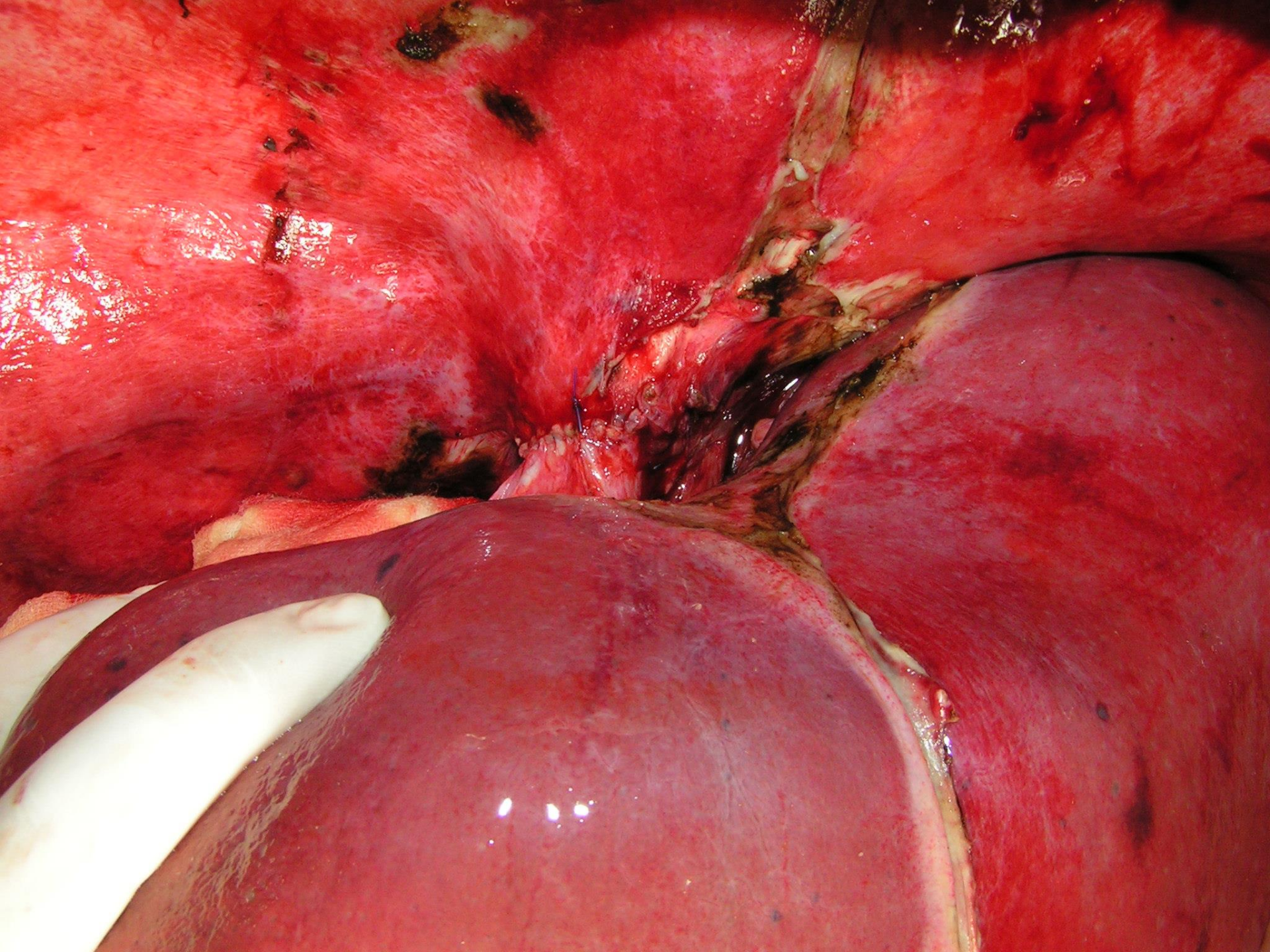




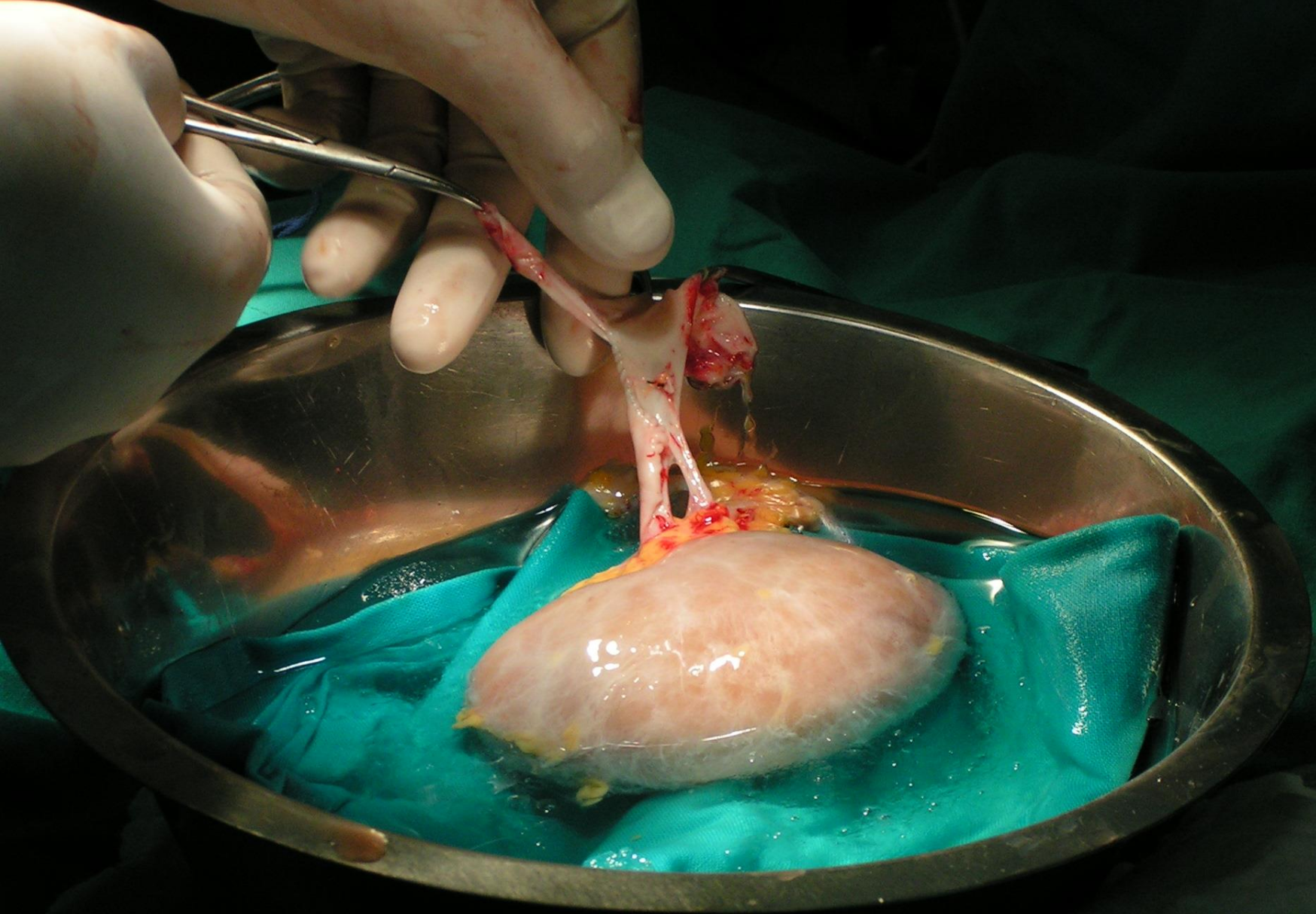




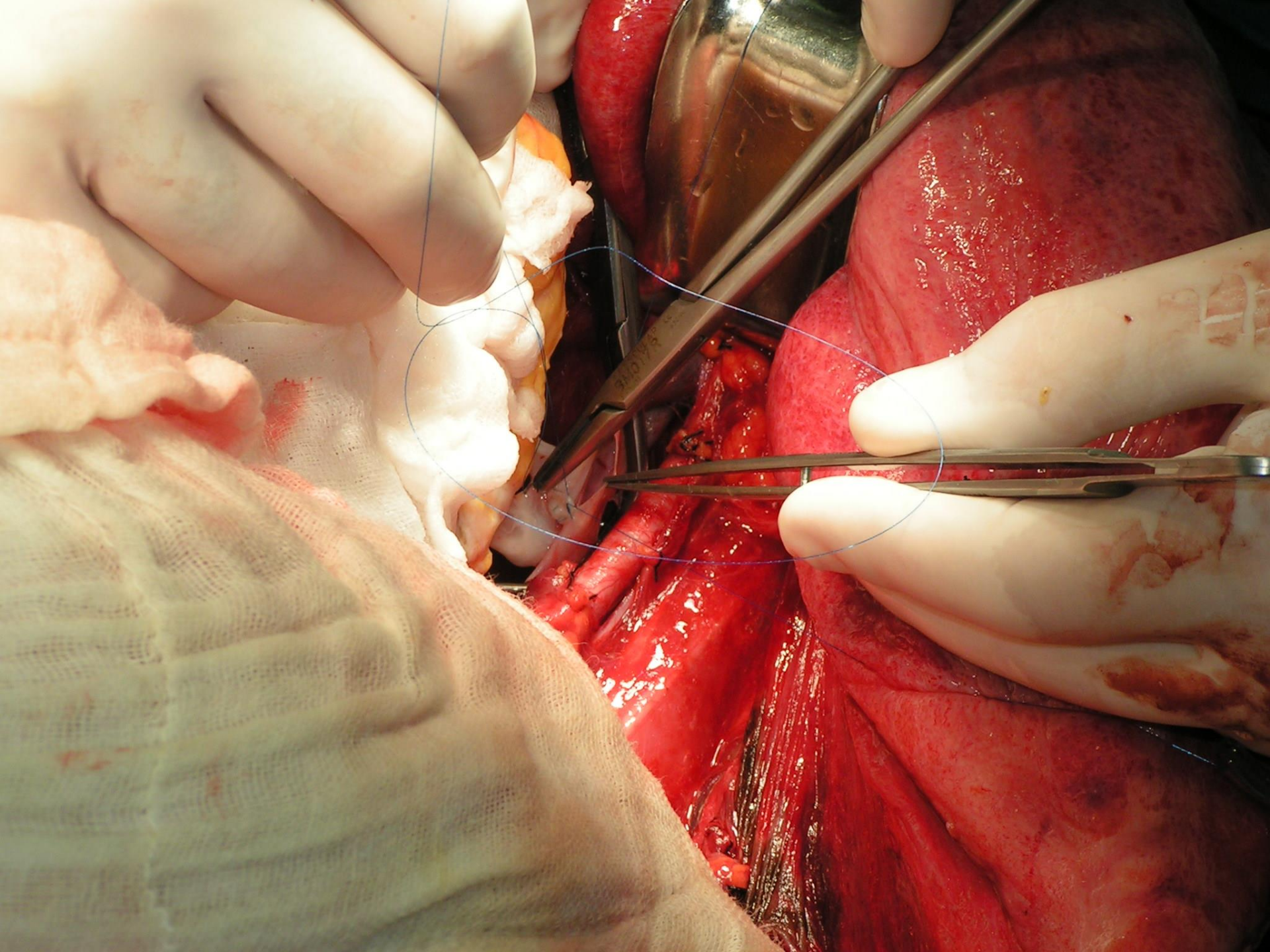




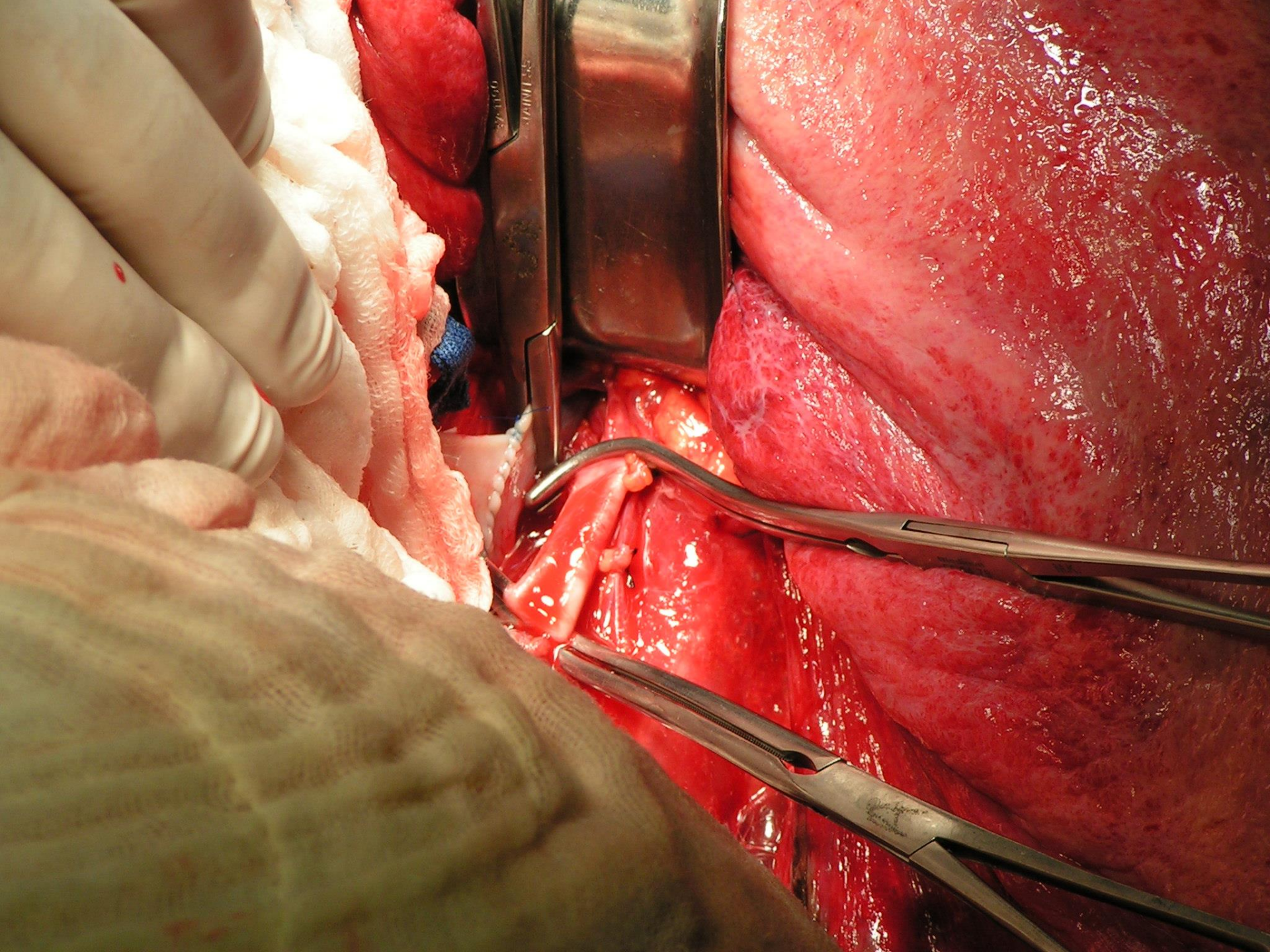




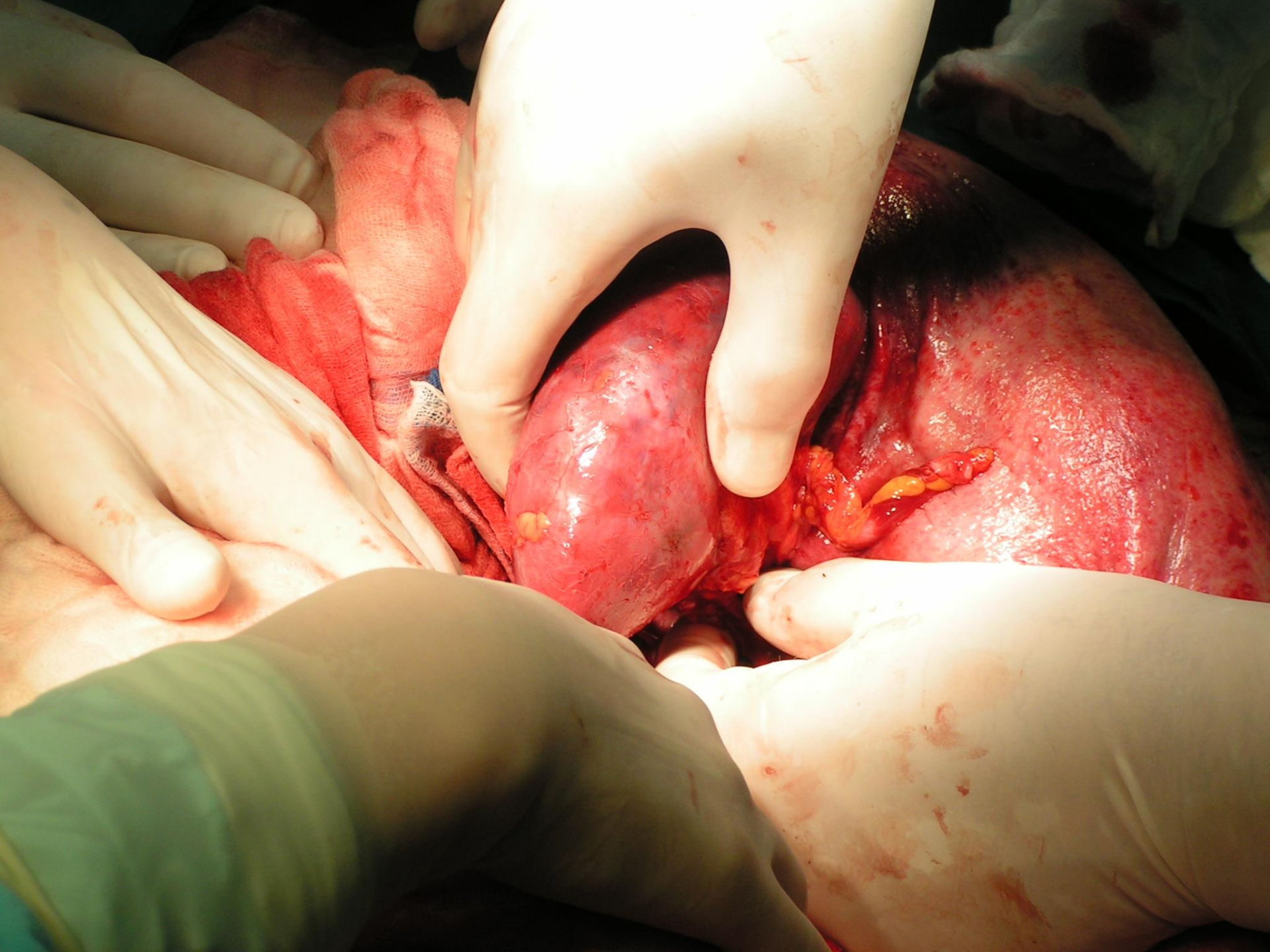




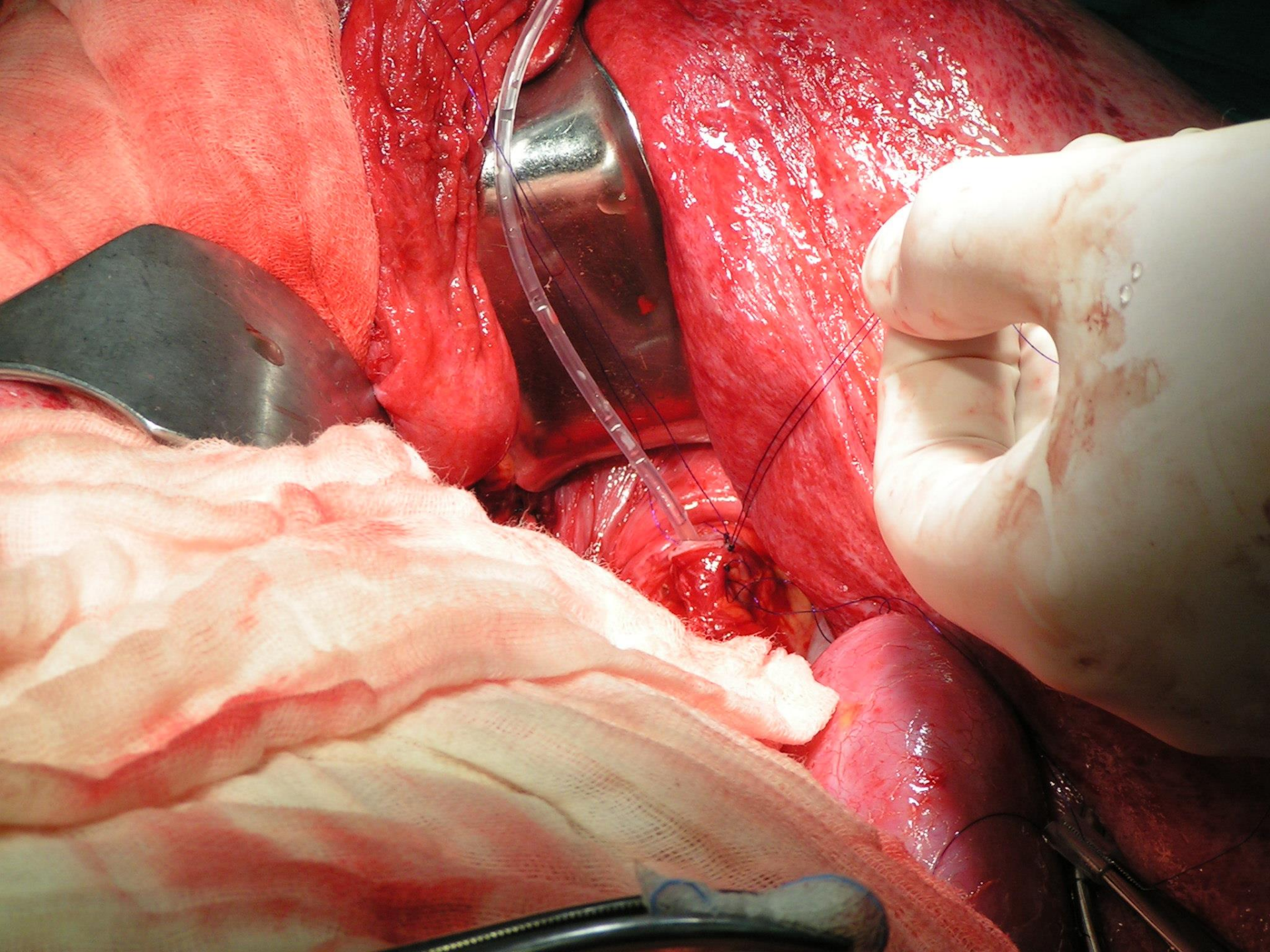




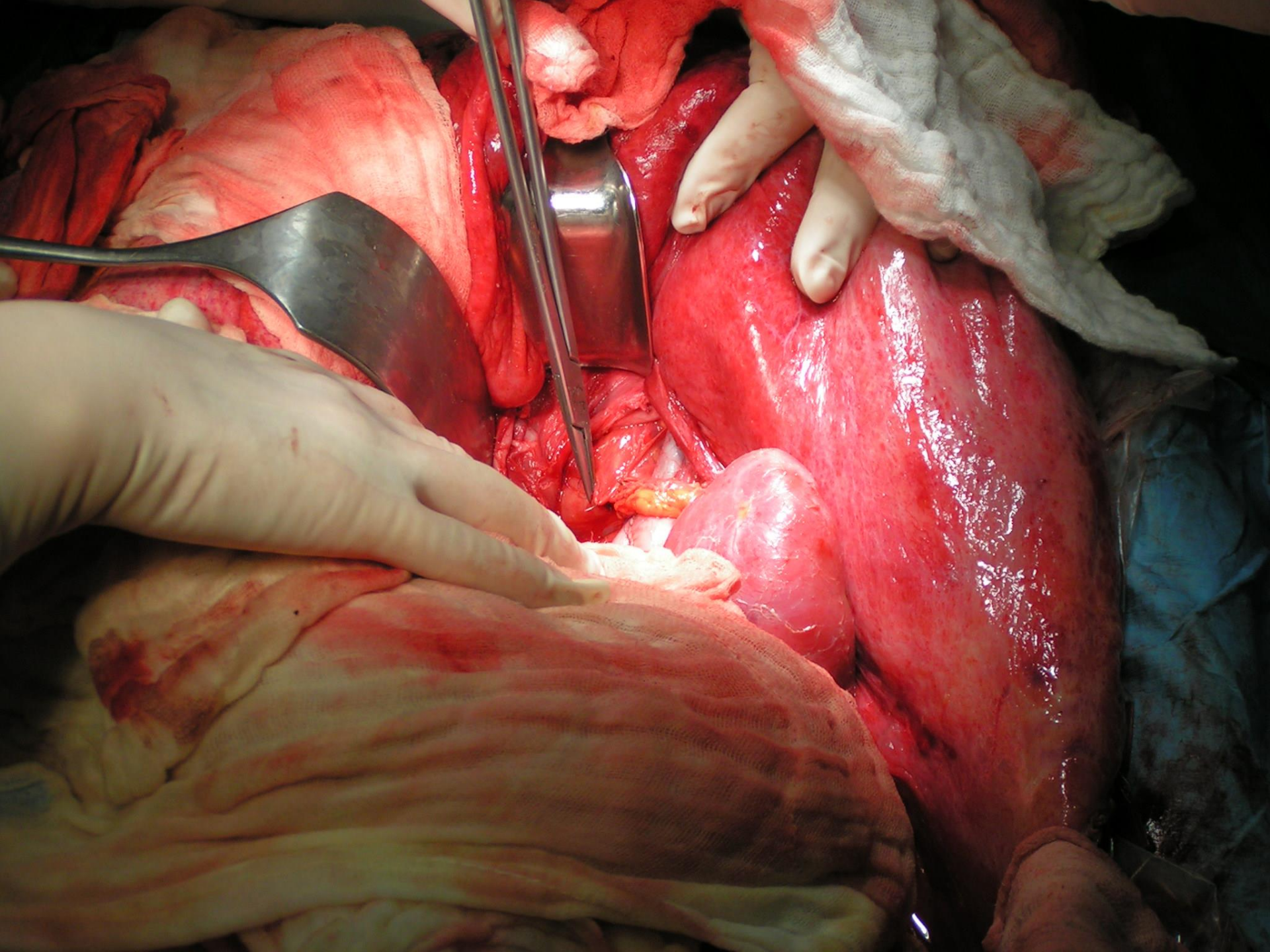




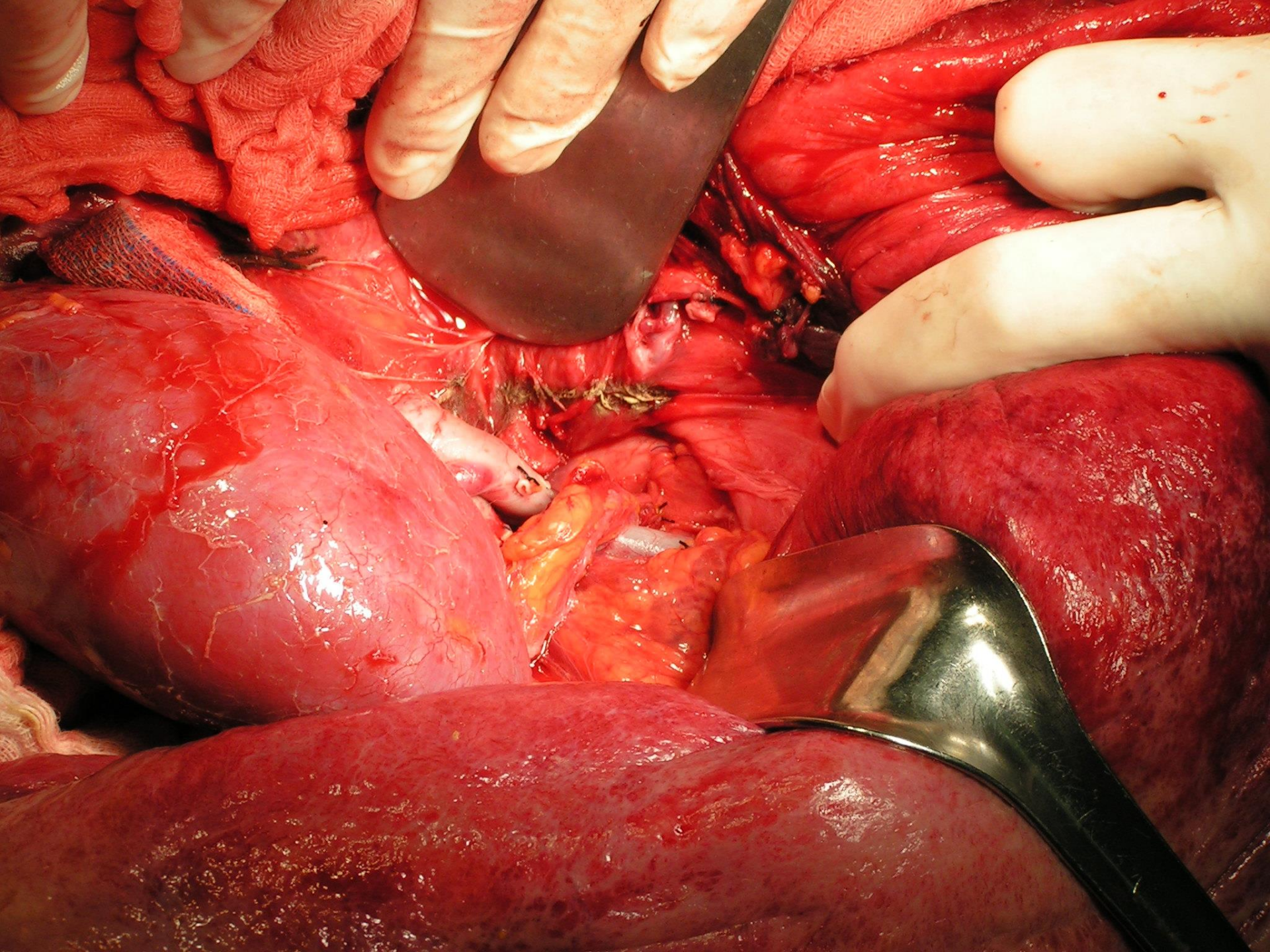








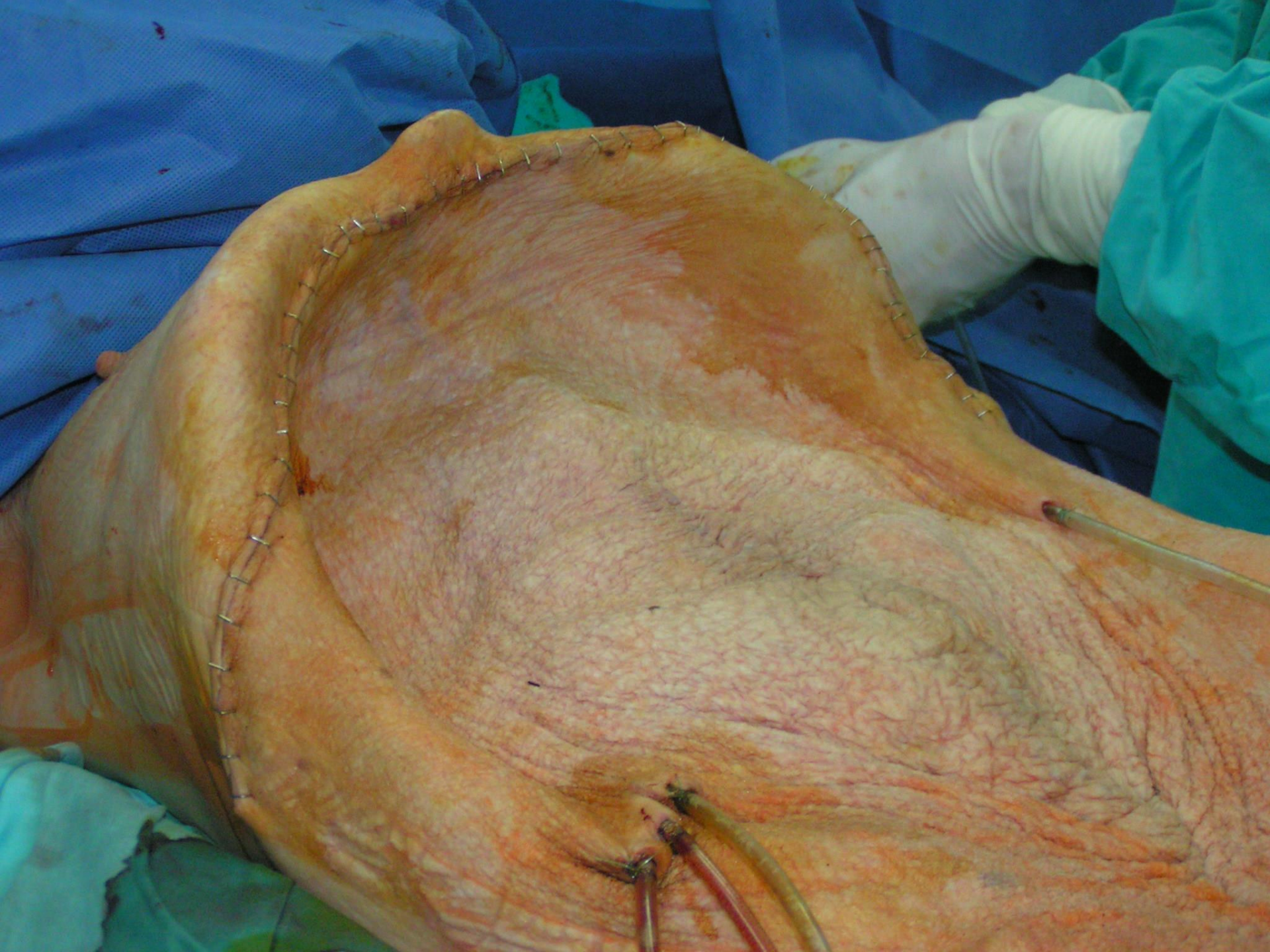




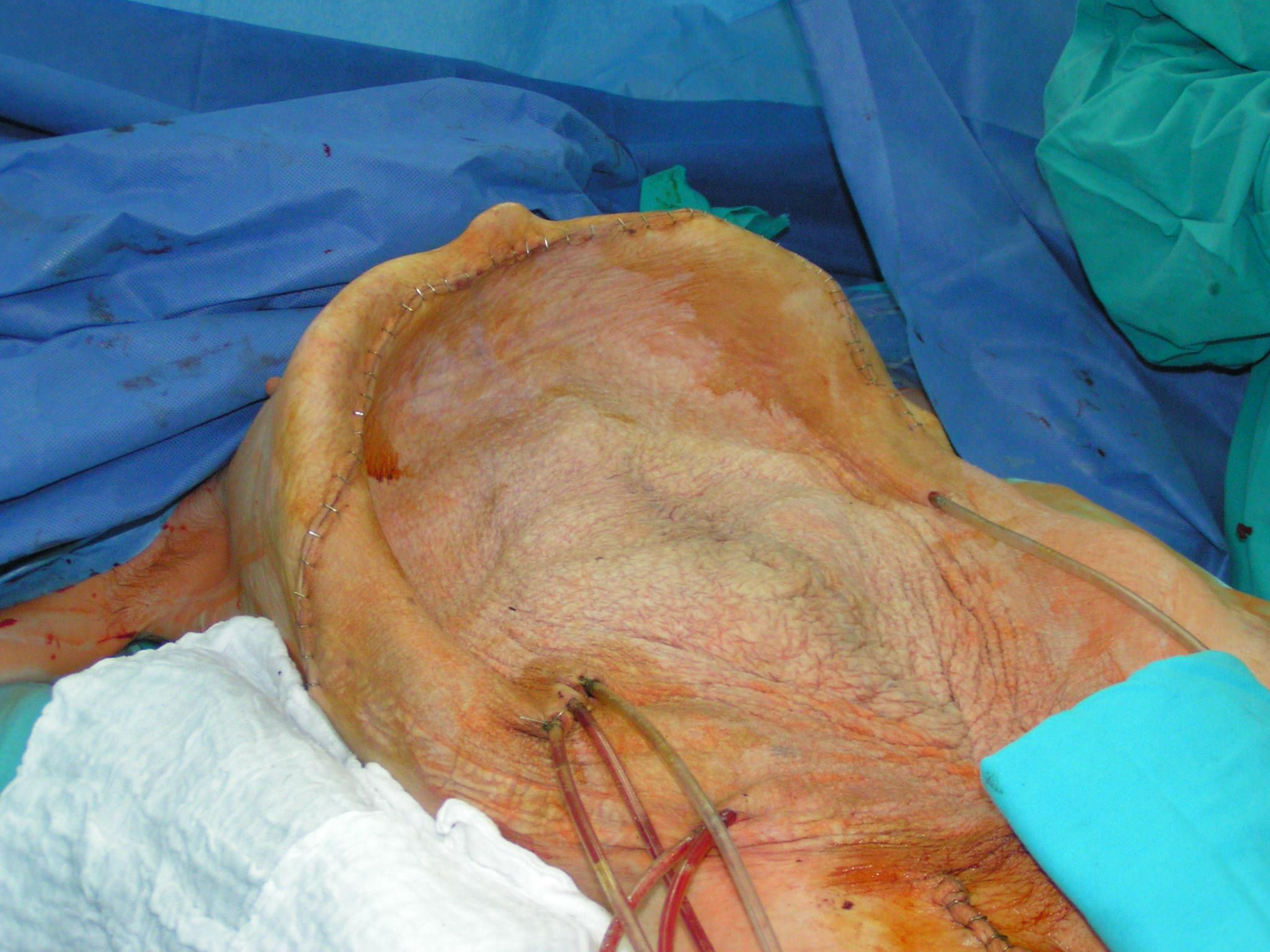


















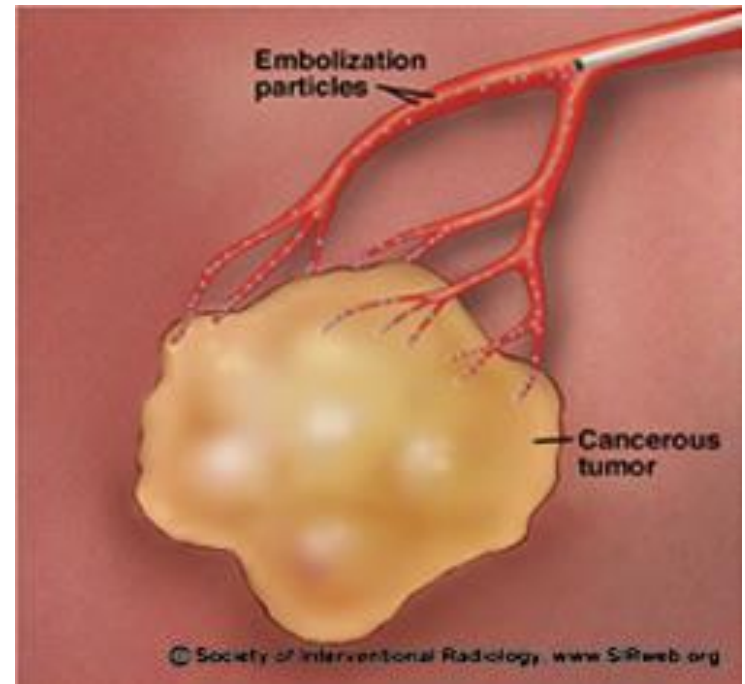
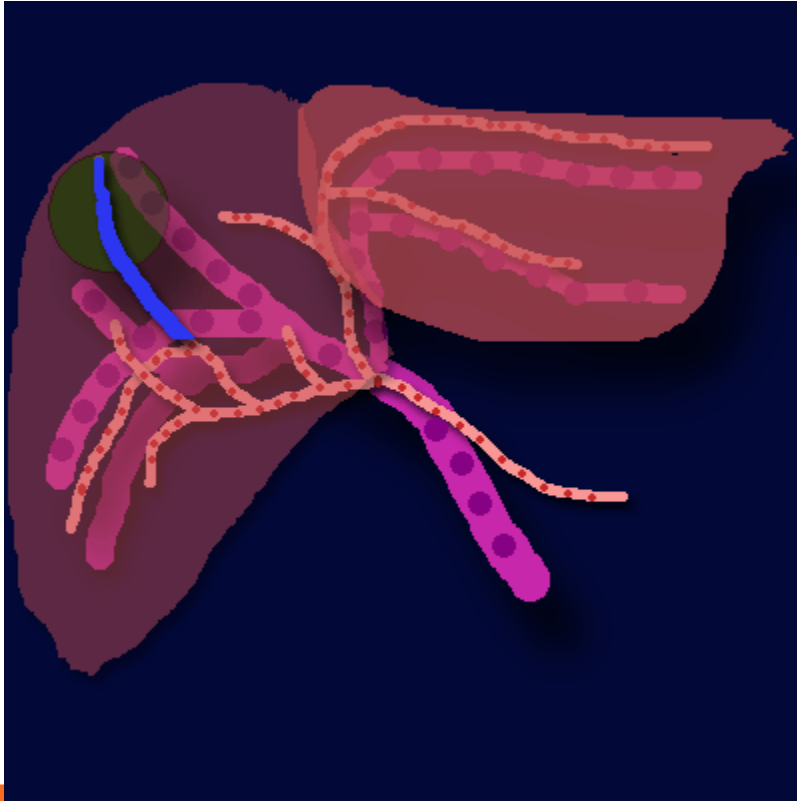
# CRYOSURGERY



**Iceball**



# TRANSCATHETER ARTERIAL CHEMOEMBOLIZATION



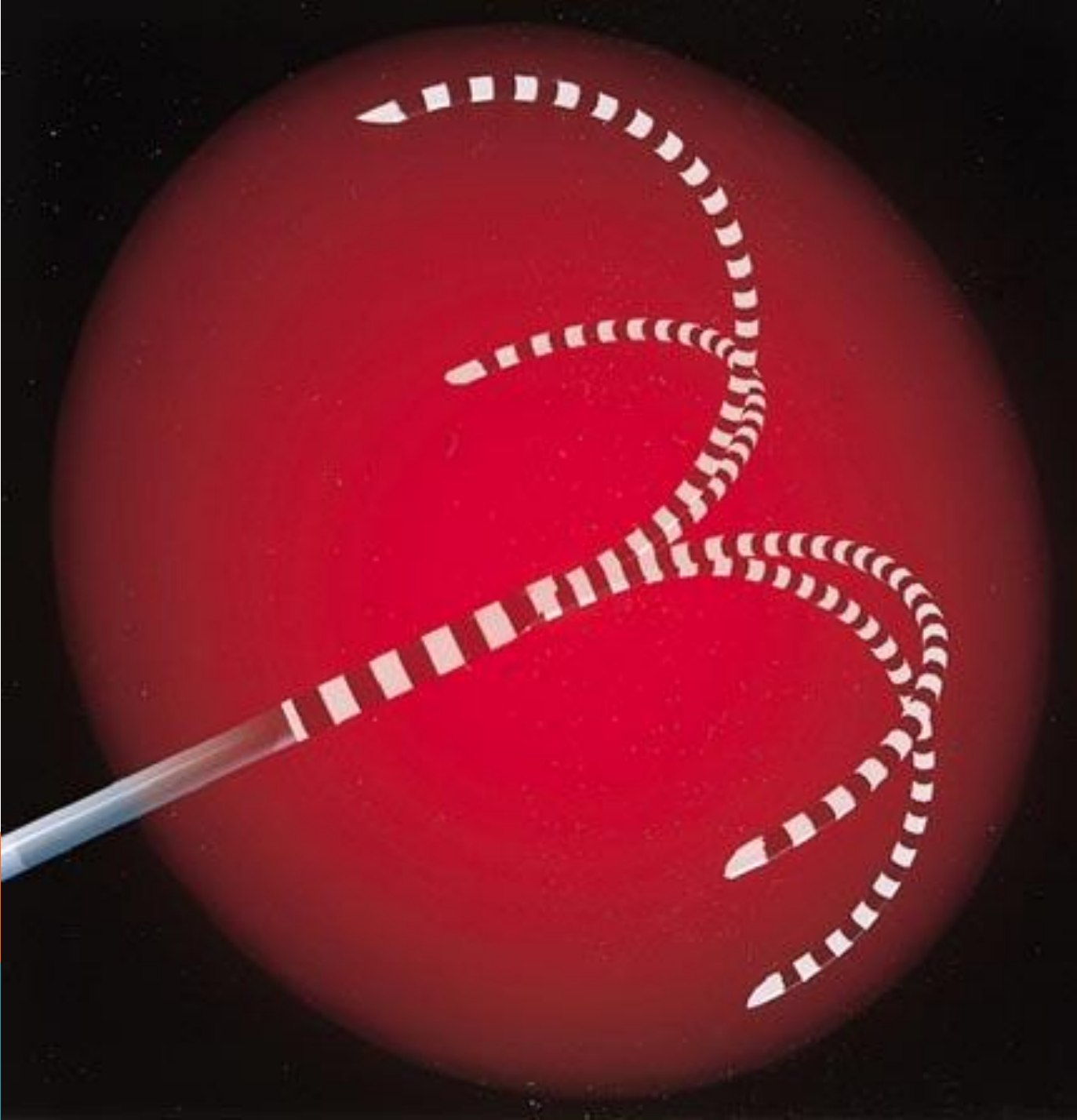




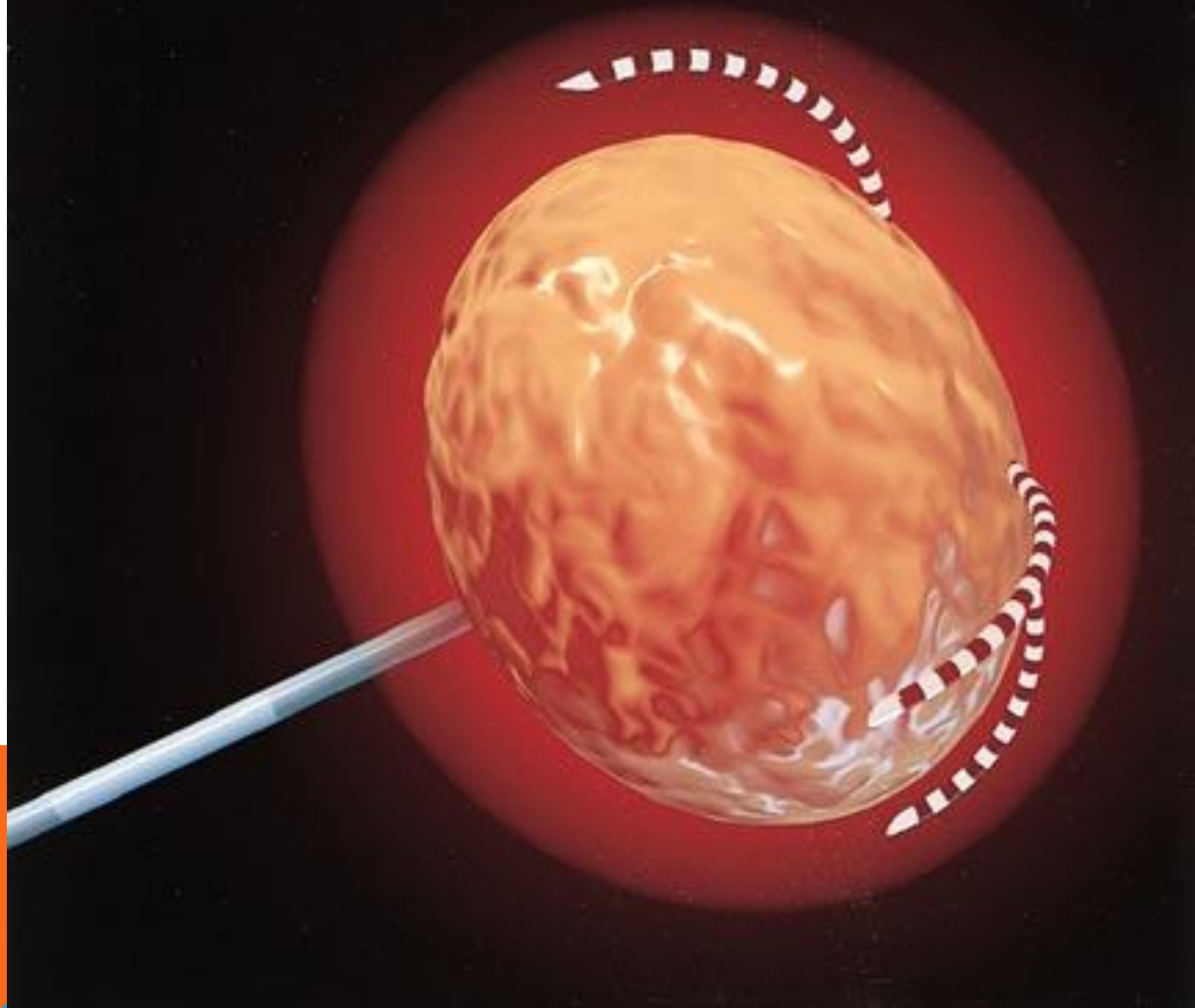




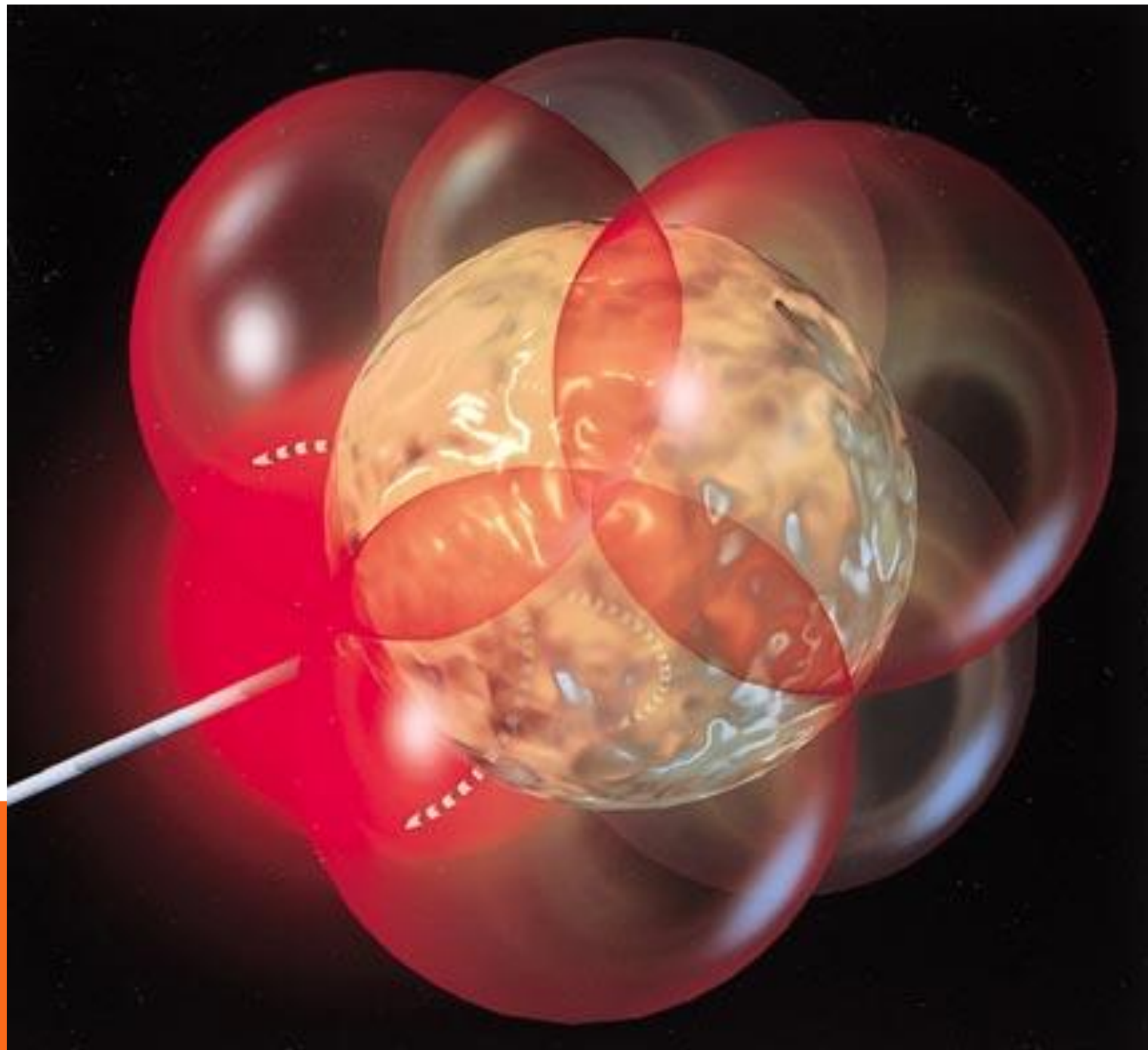






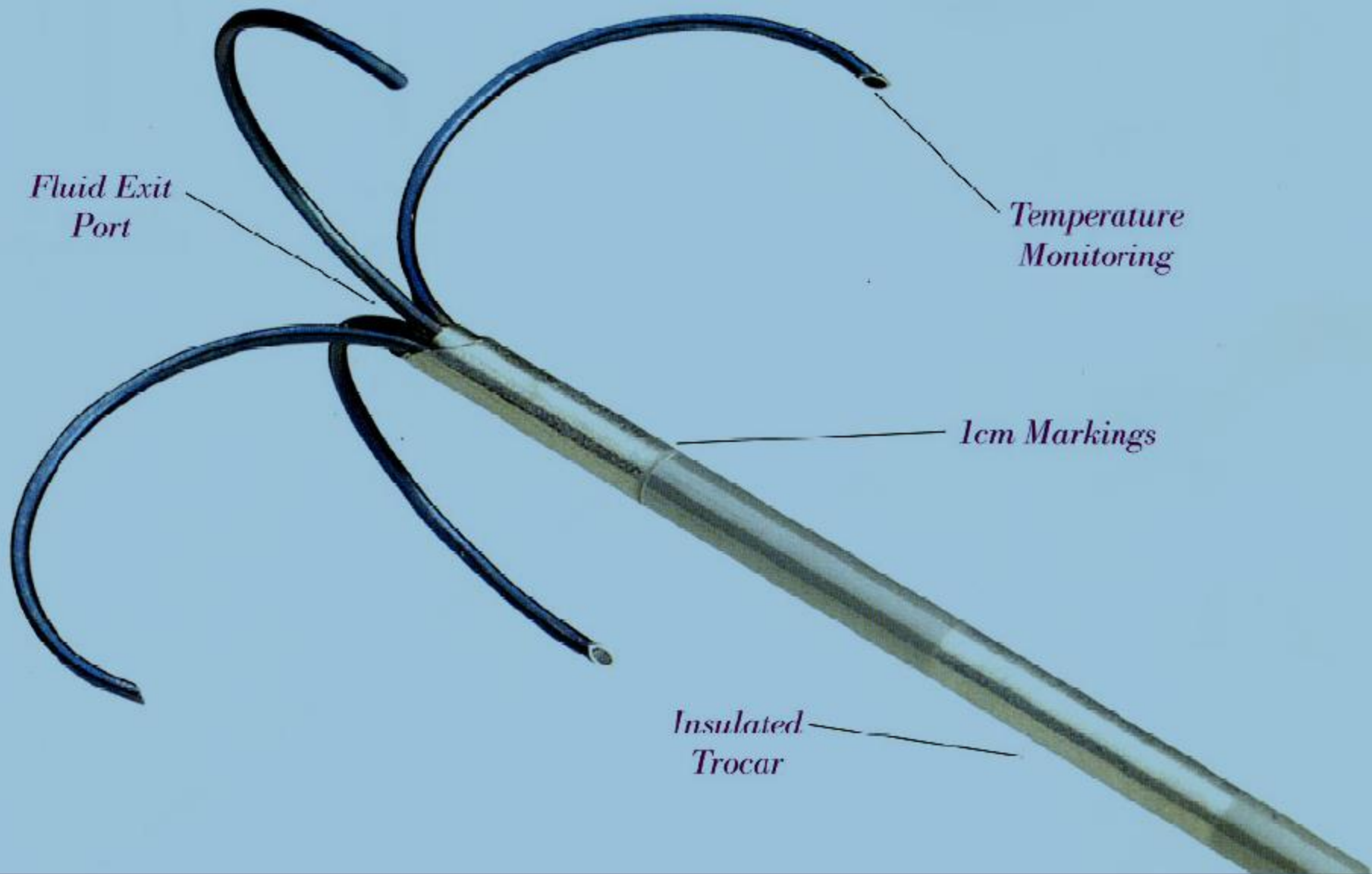








# Radiofrequency Ablation

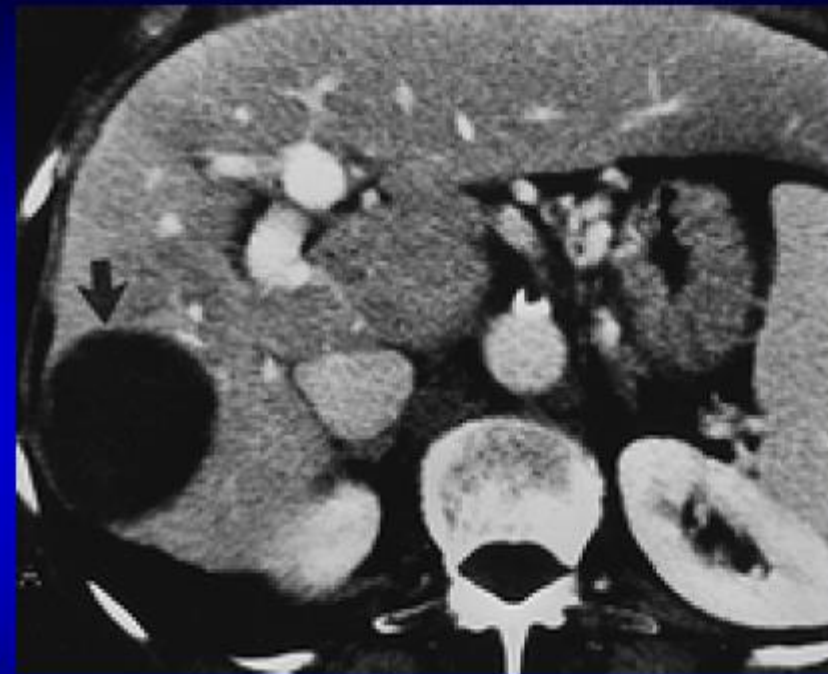




# Radio-Frequency Ablation



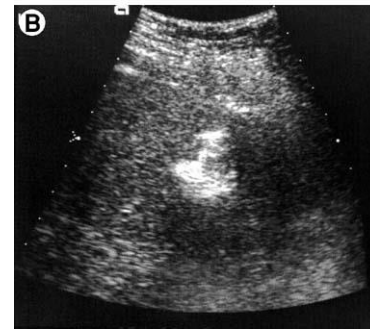
Pre-treatment



2 months post-treatment



# ETHANOL INJECTION





# HCC: CHEMOEMBOLIZATION

Inject chemotherapy selectively in hepatic artery

Then inject an embolic agent

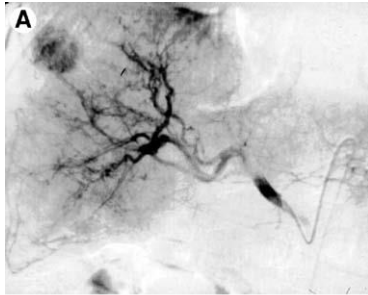
Only in pt with early cirrhosis

No role for systemic chemotherapy





# CHEMOEMBOLIZATION





# FIBRO-LAMELLAR

# CARCINOMA

Presents in young pt (5-35)

Not related to cirrhosis

AFP is normal

CT shows typical stellate scar with radial septa showing persistent enhancement





# **SECONDARY LIVER METASTASES**

**The most common site for blood born metastases**

**Common primaries : colon, breast, lung, stomach, pancreases, and melanoma**

**Mild cholestatic picture (ALP, LDH) with preserved liver function**

**Dx imaging or FNA**

**Treatment depends on the primary cancer**

**In some cases resection or chemoembolization is possible**



# SUMMARY

## Benign

Hemangioma  
Focal nodular  
hyperplasia  
Adenoma  
Liver cysts

## Malignant

1. Primary liver cancers
  - Hepatocellular carcinoma
  - Fibrolamellar carcinoma
  - Hepatoblastoma
2. Metastases