DIFFICULT CHOLECYSTECTOMY

Asst. Prof. PONGSATORN TANGTAWEE

HPB DIVISION and MIS UNIT

RAMATHIBODI HOSPITAL

MAHIDOL UNIVERSITY

History

- The first planned cholecystectomy in the world was performed by Langenbuch in 1882

- The first iatrogenic bile duct injury was described by Sprengel in 1891. He also reported the first choledochoduodenostomy (ChD) for calculi (1891)

abłońska B, *World J Gastroenterol* 2009;15(33): 4097-4104

History

- Laparoscopic cholecystectomy (LC) was first performed by Mühe (under direct scope vision) in 1985.

- In guidelines published by the Society of American Gastrointestinal and Endoscopic Surgeons in 1993

- Acute Cholecystitis (AC) was described as a relative contraindication for LC

- Severity assessment criteria for AC were first set out in 2007

Go Wakabayashi et al. J Hepatobiliary Pancreat Sci (2018) 25:73–86

History

- Biliary injury is the most common severe complication of cholecystectomy.

- incidence of bile duct injuries has risen from 0.1%-0.2% to 0.4%-0.7% from the era OC to the era LC

- BDI continue to appear by experience surgeons

Steven M. Strasberg, HPB 2011, 13, 1–14

Wan-Yee Lau, *Hepatobiliary Pancreat Dis Int 2007; 6: 459-463*

Adamsen S,J AM Coll Surg, VOL184:571-578

Conditions associated with a Difficulty of cholecystectomy

- Patient-related or

- Disease-related or

- Both of them

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OR

Surgeons-related

</div>

Patient-related

- Older age
- Male gender
- Obesity
- Prior upper abdominal surgery

Stoikes N., Brunt L.M. (2020) The Difficult Cholecystectomy. In: Asbun H., Shah M., Ceppa E., Auyang E. (eds) The SAGES Manual of Biliary Surgery. Springer, Cham.

Disease-related

- Acute cholecystitis
  - Palpable gallbladder
  - WBC >18,000/mm^3
  - Thickened gallbladder on ultrasound
  - Gangrenous or emphysematous cholecystitis
  - Empyema of gallbladder

Conversion rates - 6% to 32%

Stoikes N., Brunt L.M. (2020) The Difficult Cholecystectomy. In: Asbun H., Shah M., Ceppa E., Auyang E. (eds) The SAGES Manual of Biliary Surgery. Springer, Cham.

Panni RZ, Strasberg SM, J Hepatobiliary Pancreas Sci. 2018;25:101–8.

Table 7 TG18/TG13 severity grading for acute cholecystitis

Grade III (severe) acute cholecystitis

"Grade III" acute cholecystitis is associated with dysfunction of any one of the following organs/systems:

1. Cardiovascular dysfunction: hypotension requiring treatment with dopamine ≥5 μg/kg per min, or any dose of norepinephrine
2. Neurological dysfunction: decreased level of consciousness
3. Respiratory dysfunction: PaO_2/FiO_2 ratio <300
4. Renal dysfunction: oliguria, creatinine >2.0 mg/dl
5. Hepatic dysfunction: PT-INR >1.5
6. Hematological dysfunction: platelet count <100,000/mm^3

Grade II (moderate) acute cholecystitis

"Grade II" acute cholecystitis is associated with any one of the following conditions:

1. Elevated WBC count (>18,000/mm^3)
2. Palpable tender mass in the right upper abdominal quadrant
3. Duration of complaints >72 h[a]
4. Marked local inflammation (gangrenous cholecystitis, pericholecystic abscess, hepatic abscess, biliary peritonitis, emphysematous cholecystitis)

Grade I (mild) acute cholecystitis

"Grade I" acute cholecystitis does not meet the criteria of "Grade III" or "Grade II" acute cholecystitis. It can also be defined as acute cholecystitis in a healthy patient with no organ dysfunction and mild inflammatory changes in the gallbladder, making cholecystectomy a safe and low-risk operative procedure

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Disease-related

- Severe chronic cholecystitis and multiple prior episodes of biliary colic
- Mirizzi syndrome
- Cirrhosis/portal hypertension

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Table 1 Risk factors associated with prolonged operative time and open conversion

Prolonged operative time [8, 9]	Conversion [15, 16]
Gallbladder wall thickening	Gallbladder wall > 4–5 mm on preoperative ultrasound
Incarcerated stones in the gallbladder neck	Age >60 or 65 years
Duration of elevated C-reactive protein	Male gender
Non-visualized gallbladder on preoperative cholangiography	Acute cholecystitis (TG13 grade II/III)
Body temperature	Contracted gallbladder on ultrasound
Abscess formation	Previous abdominal surgery
BMI	BMI
	ASA score

Go Wakabayashi et al. J Hepatobiliary Pancreat Sci (2018) 25:73–86
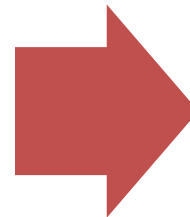
Difficult Cholecystectomy → Safe Chelecystectomy

SAGES six-step program

- In 2014, SAGES established the Safe Cholecystectomy program to *enhance a universal culture of safety for cholecystectomy*

- Developed from a Delphi consensus process that identified factors important for safe dissection in a survey of 160 SAGES committee members
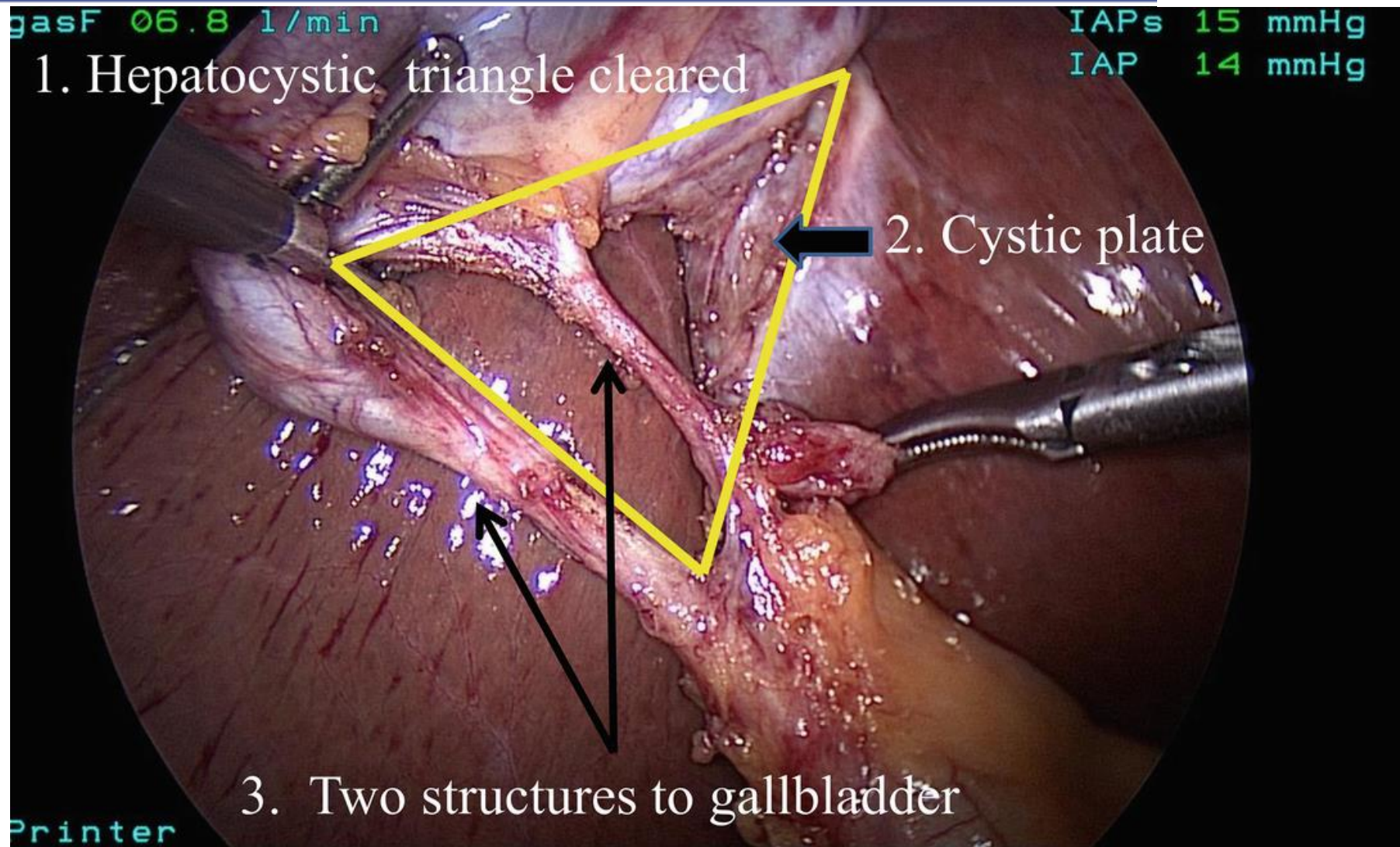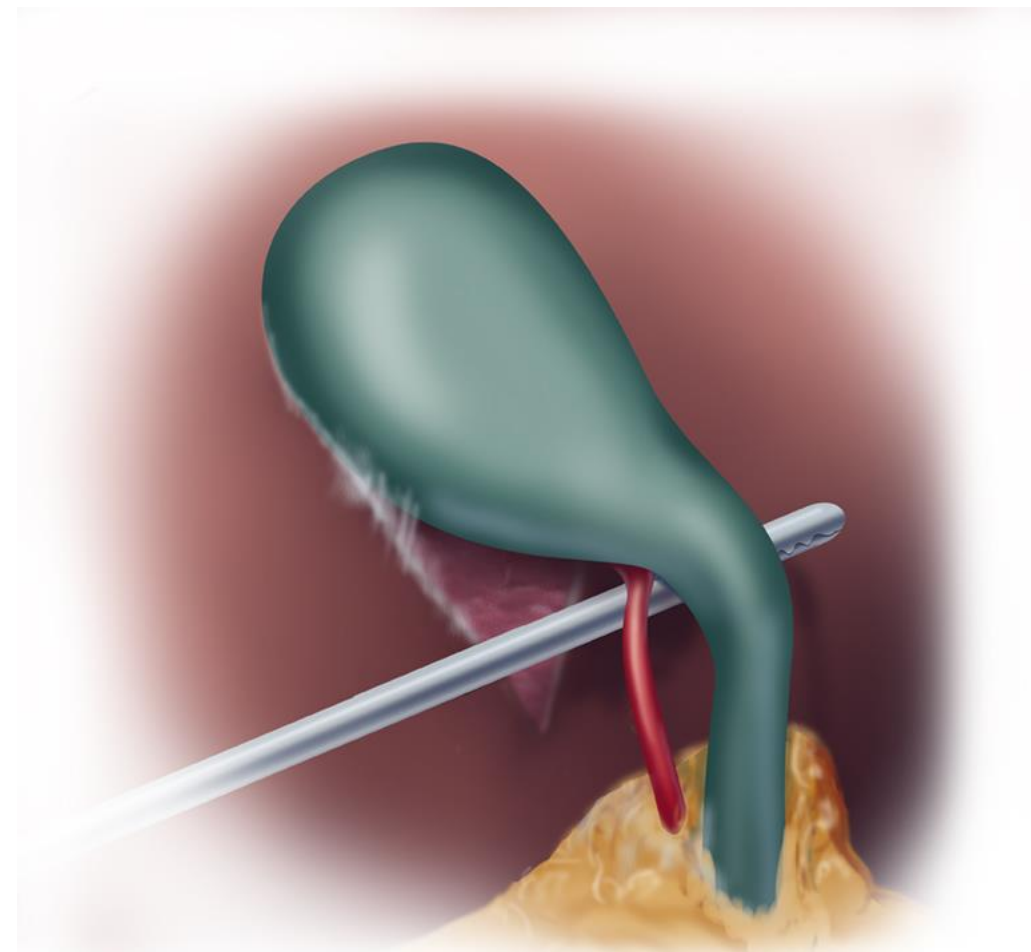
The SAGES Safe Cholecystectomy Program.
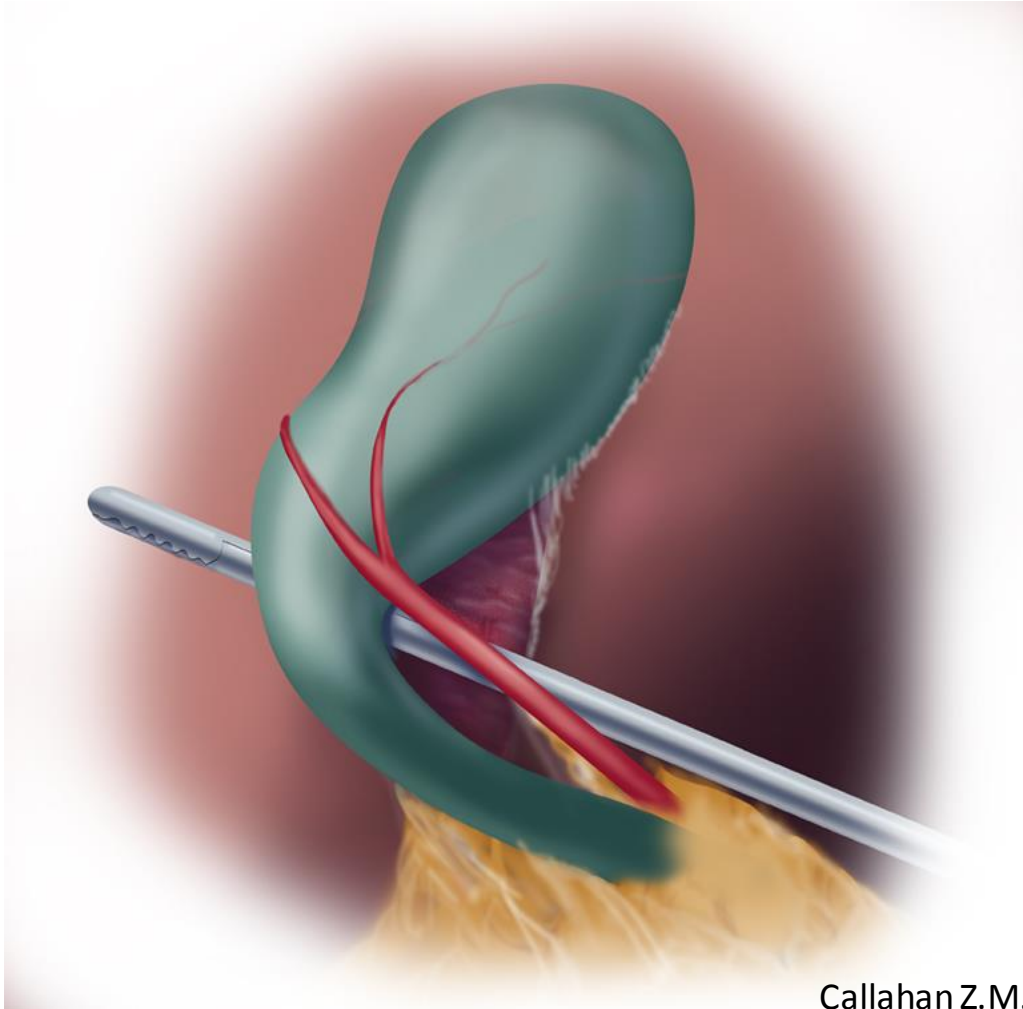https://www.sages.org/safe-cholecystectomy-program/. 2014.

SAGES six-step program

- Step 1: Understand the critical view of safety and use it on every case
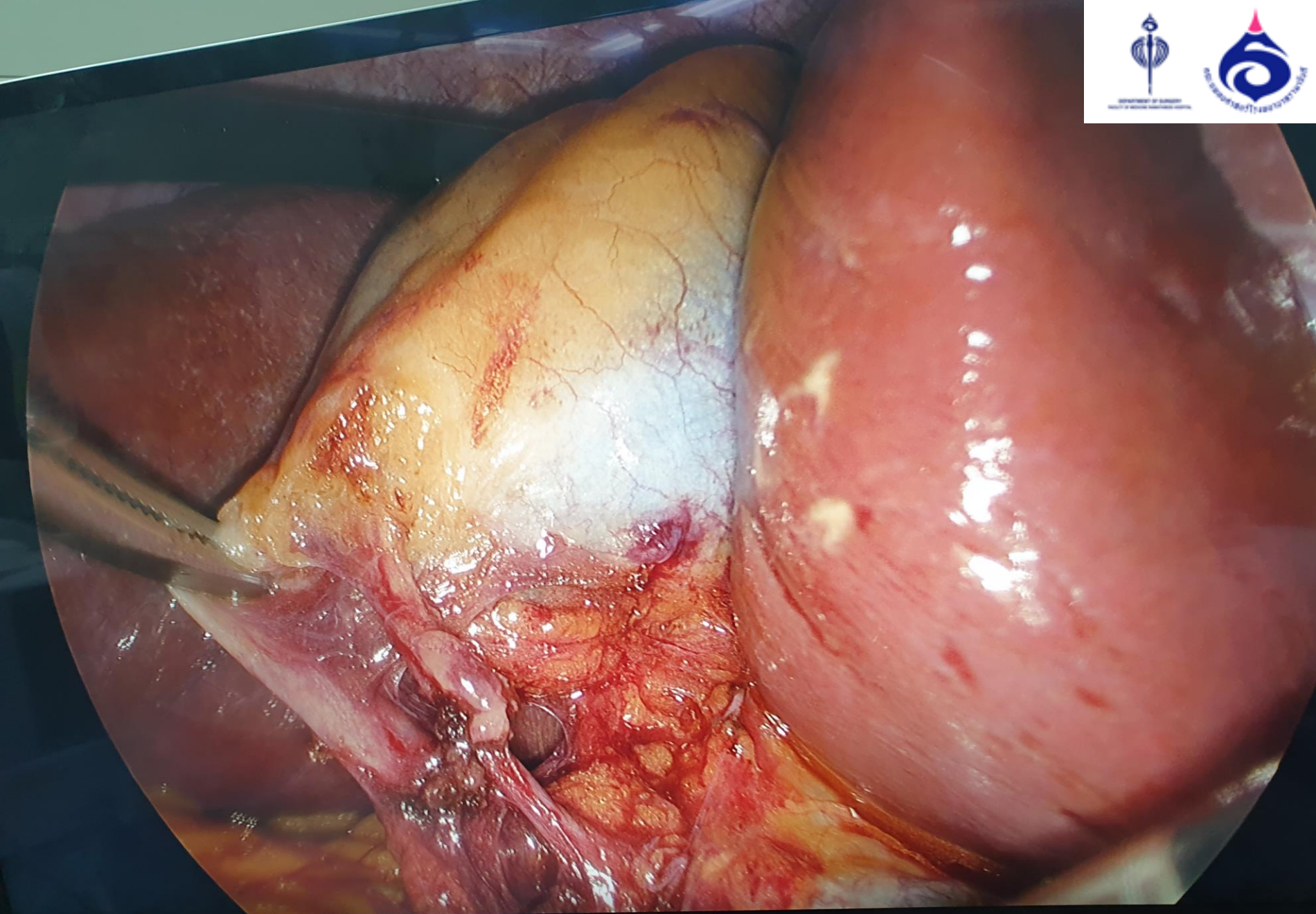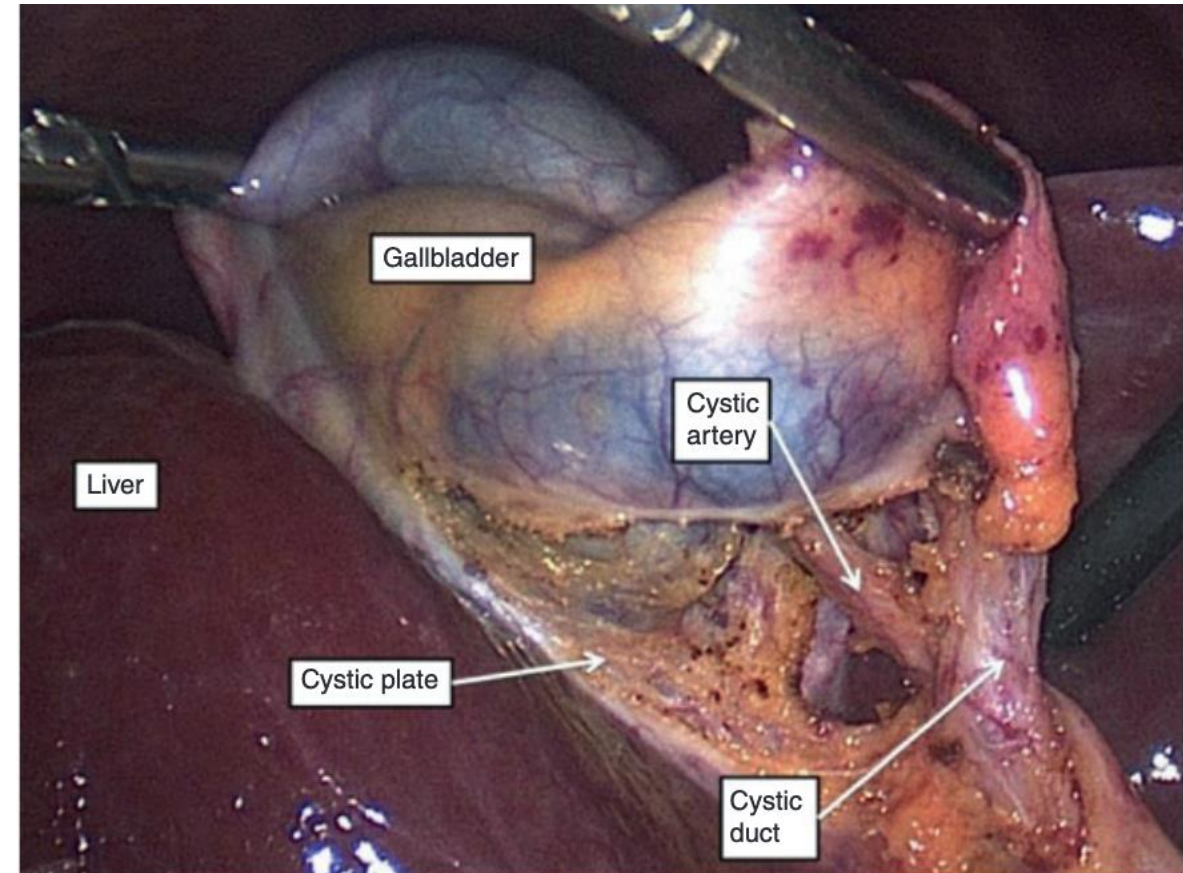
The SAGES Safe Cholecystectomy Program.
https://www.sages.org/safe-cholecystectomy-program/. 2014.

gasF 06.8 l/min   IAPs 15 mmHg
                       IAP 14 mmHg

1. Hepatocystic triangle cleared

2. Cystic plate

3. Two structures to gallbladder

Printer

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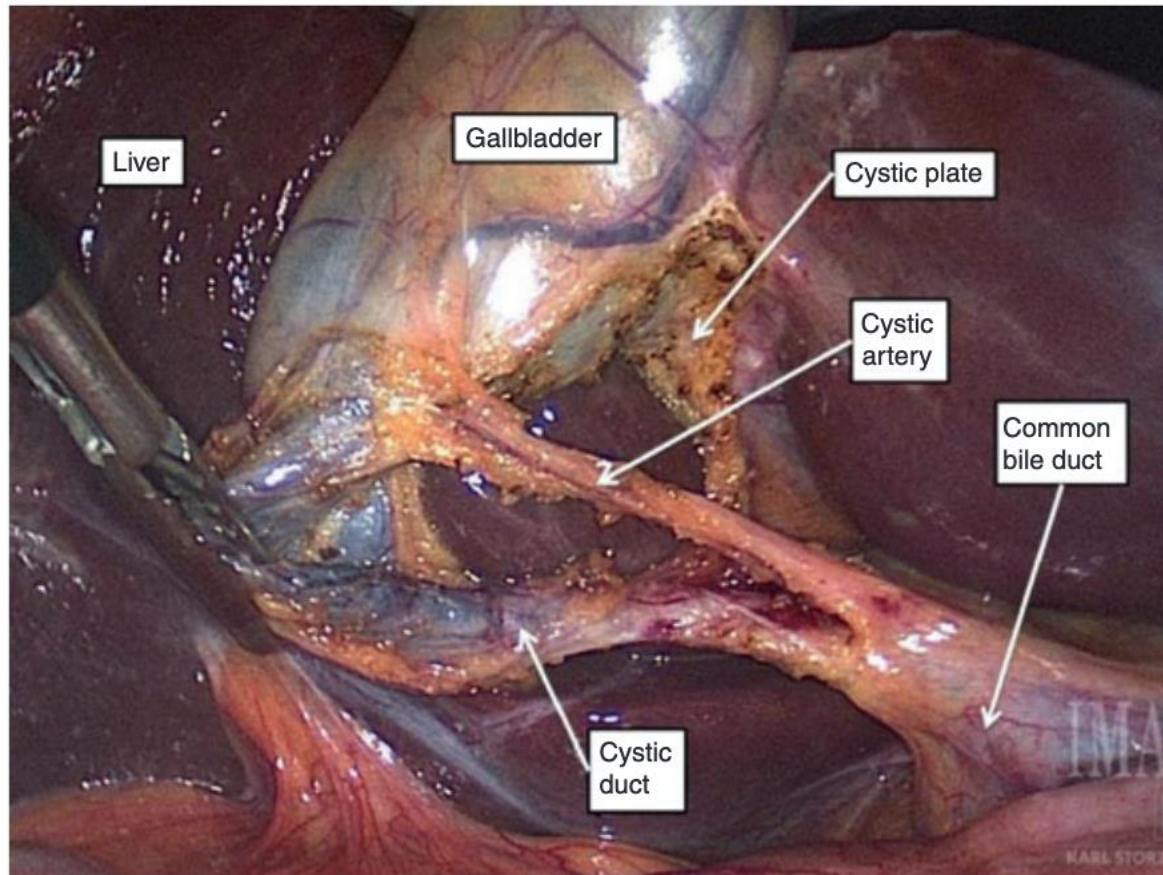Difficult cholecystectomy : Pongsatorn Tangtawee M.D.

"Critical View of Safety" (CVS)

Callahan Z.M., Deal S., Alseidi A., Pucci M.J. (2020), In: Asbun H., Shah M., Ceppa E., Auyang E. (eds)
The SAGES Manual of Biliary Surgery. Springer, Cham.

Callahan Z.M., Deal S., Alseidi A., Pucci M.J. (2020), In: Asbun H., Shah M., Ceppa E., Auyang E. (eds)
The SAGES Manual of Biliary Surgery. Springer, Cham.

SAGES six-step program

- Step 2: Understand normal and variations in biliary anatomy

The SAGES Safe Cholecystectomy Program.
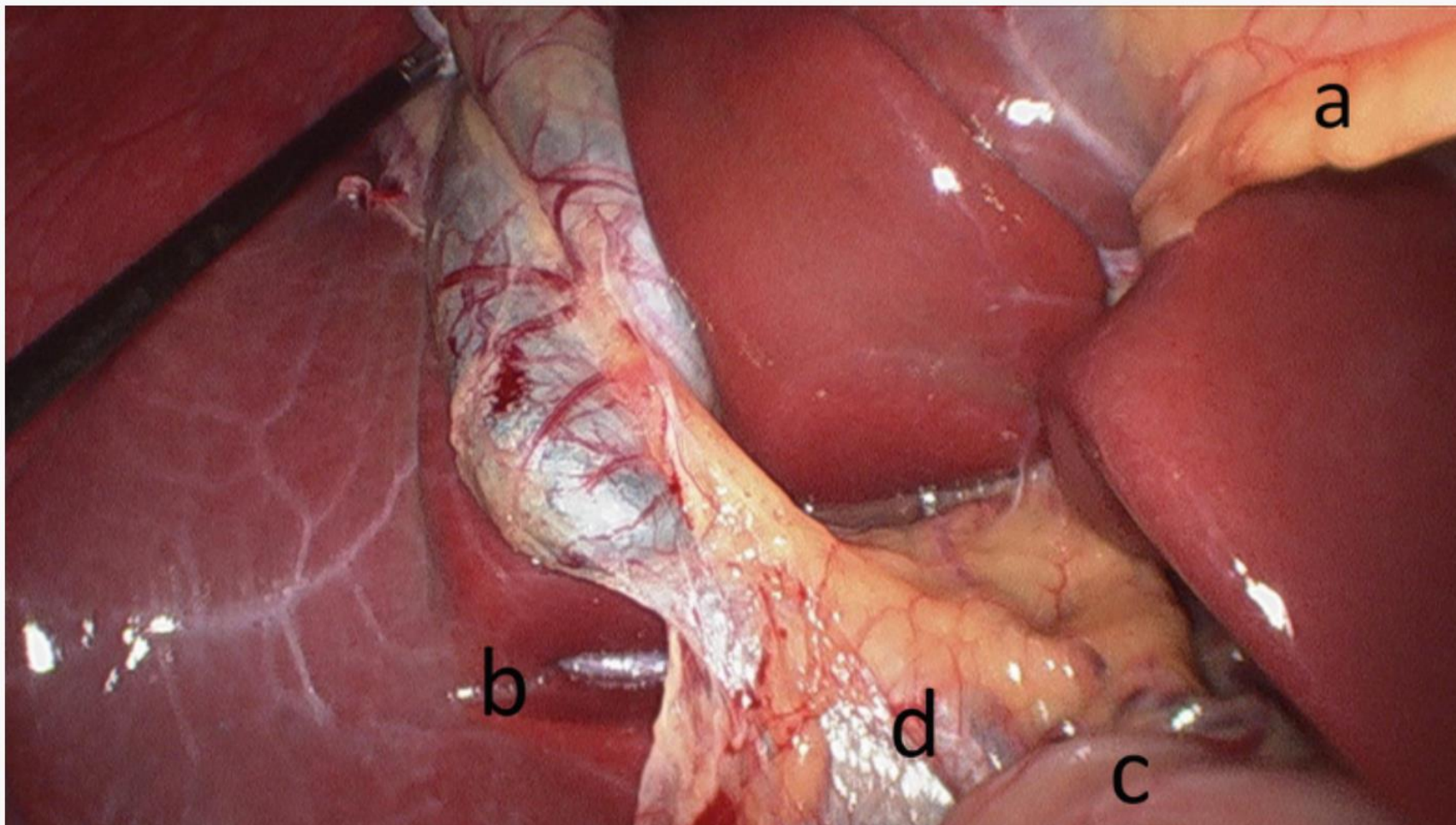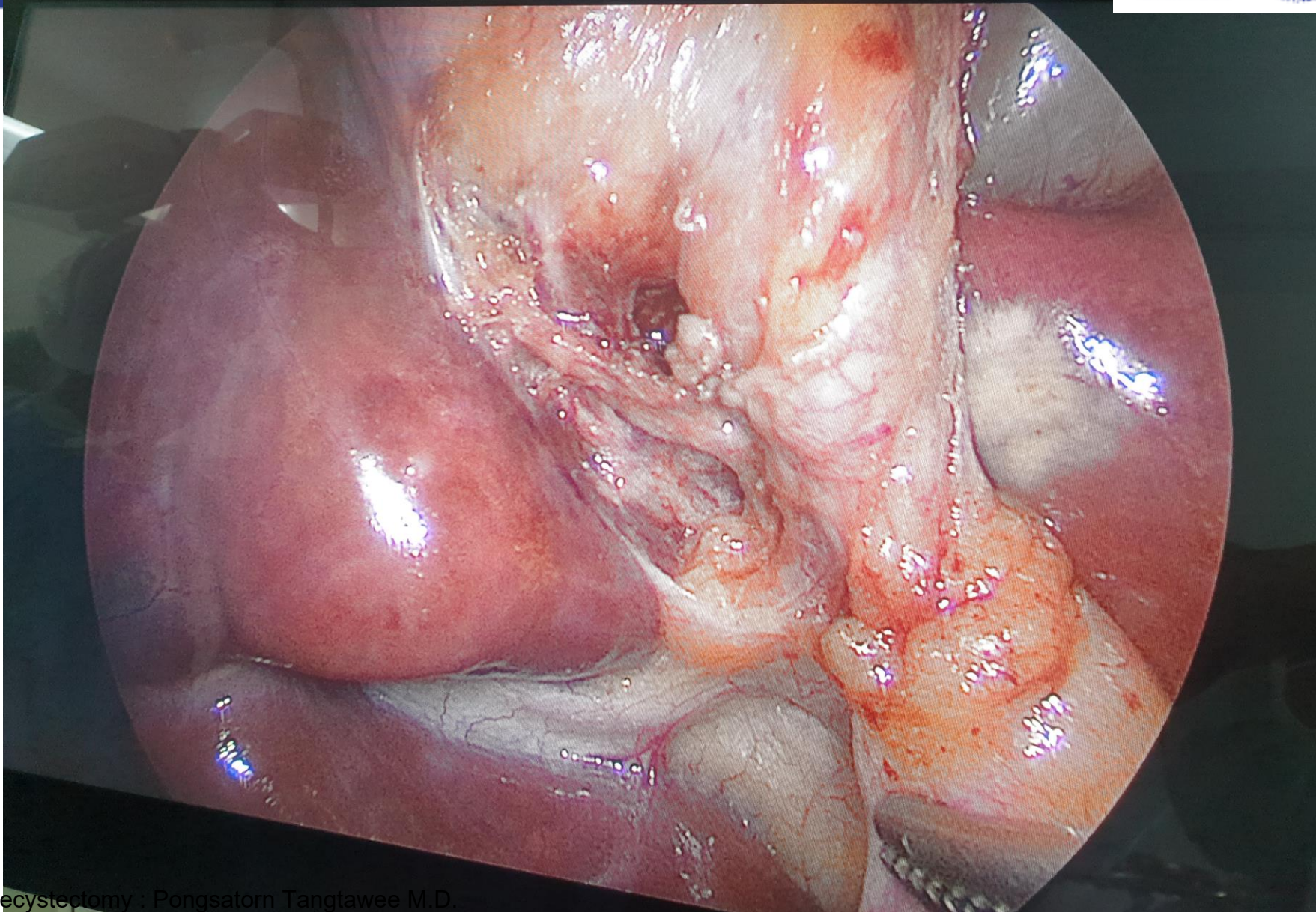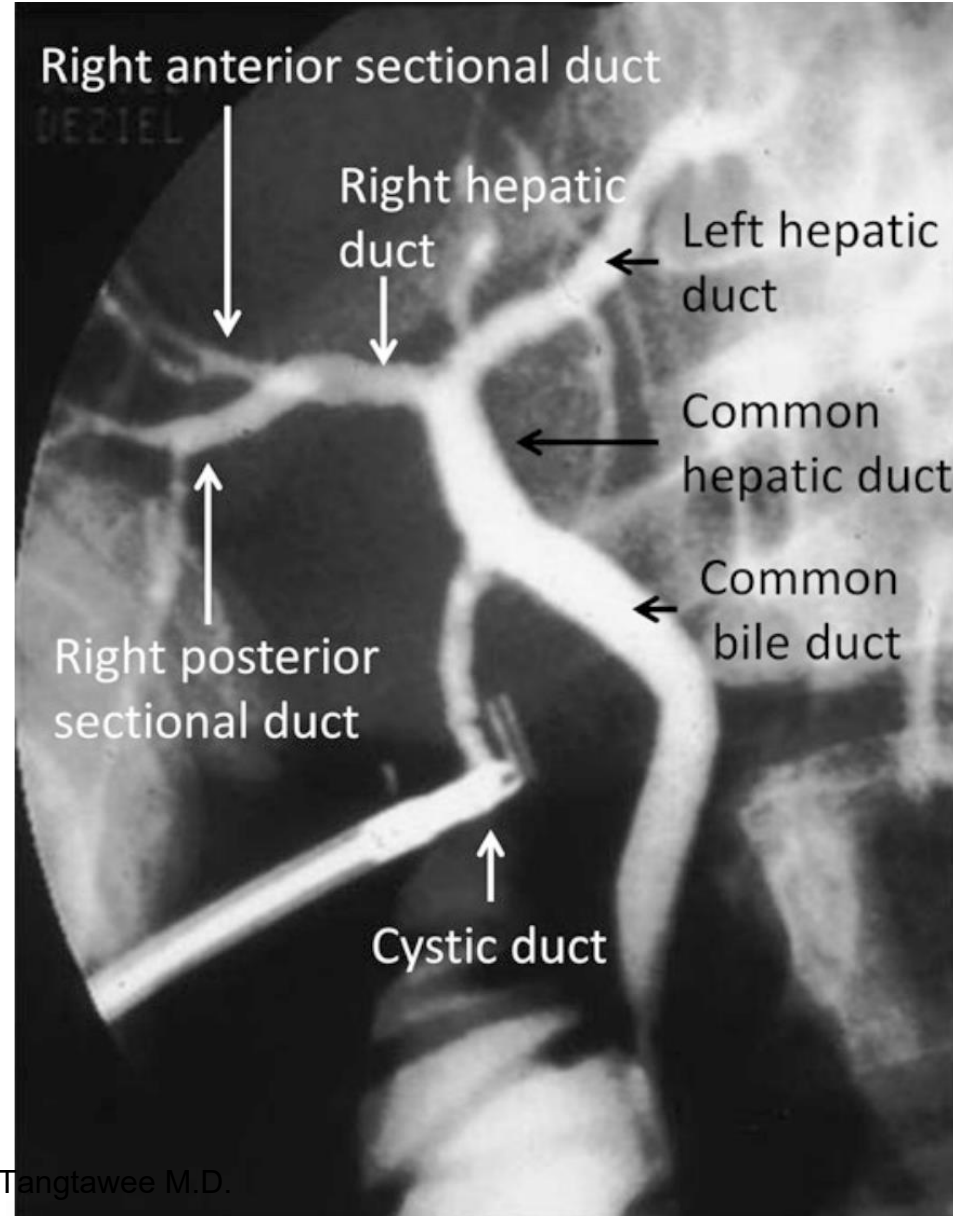https://www.sages.org/safe-cholecystectomy-program/. 2014.

Figure 2.2

Anatomic landmarks for orientation. Note the location of the falciform ligament (**a**), of Rouviere's sulcus (**b**), and of the duodenum (**c**) and the apperance of the epicholedochal plexes of vessels on the common bile duct (**d**)

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- The *falciform ligament*

- *Rouviere's sulcus*
  - It can be recognized in 75–80% of cases
  - Dissection must be ventral (anterior) to the sulcus to avoid injury to the bile duct or to vascular structures that are located within the sulcus.

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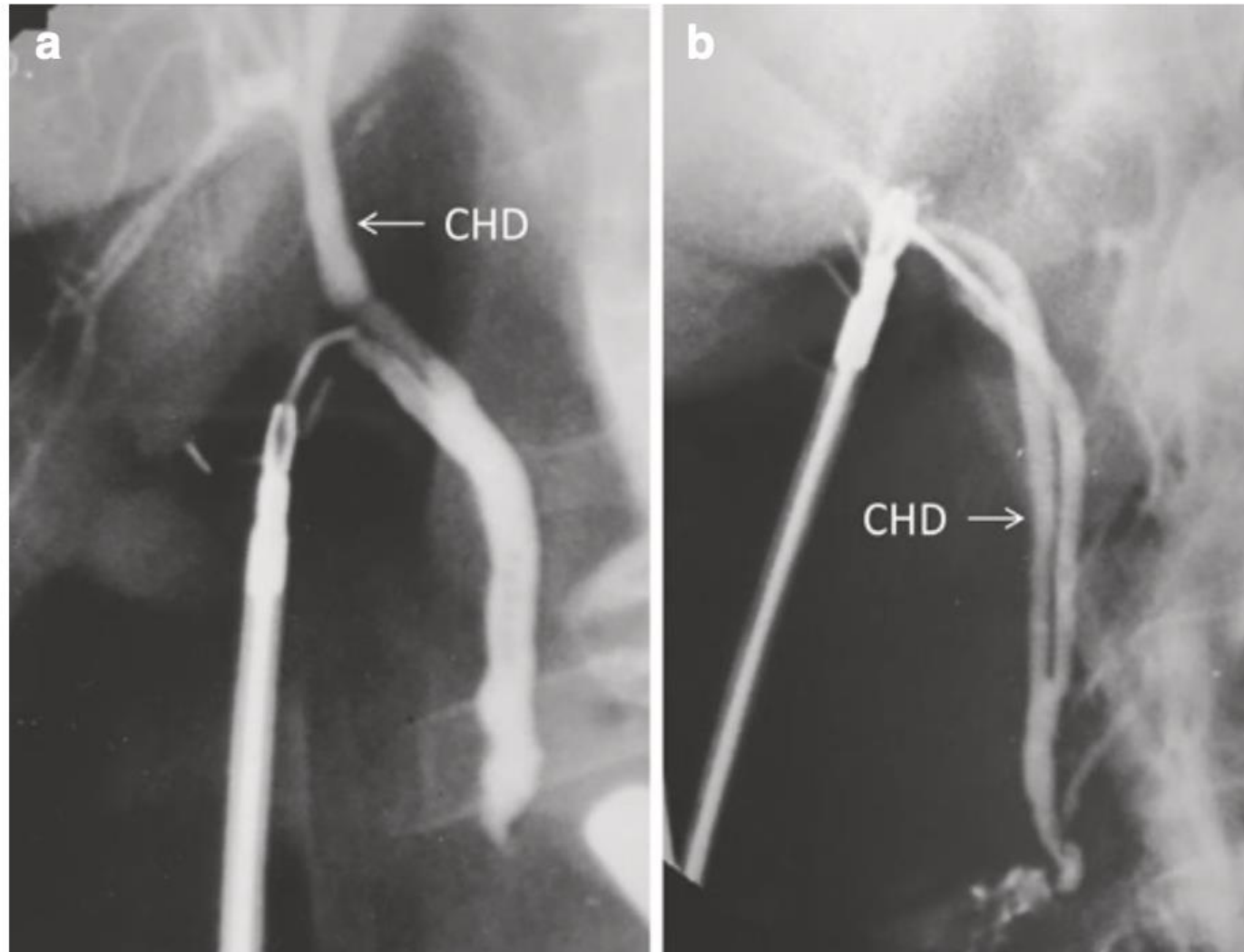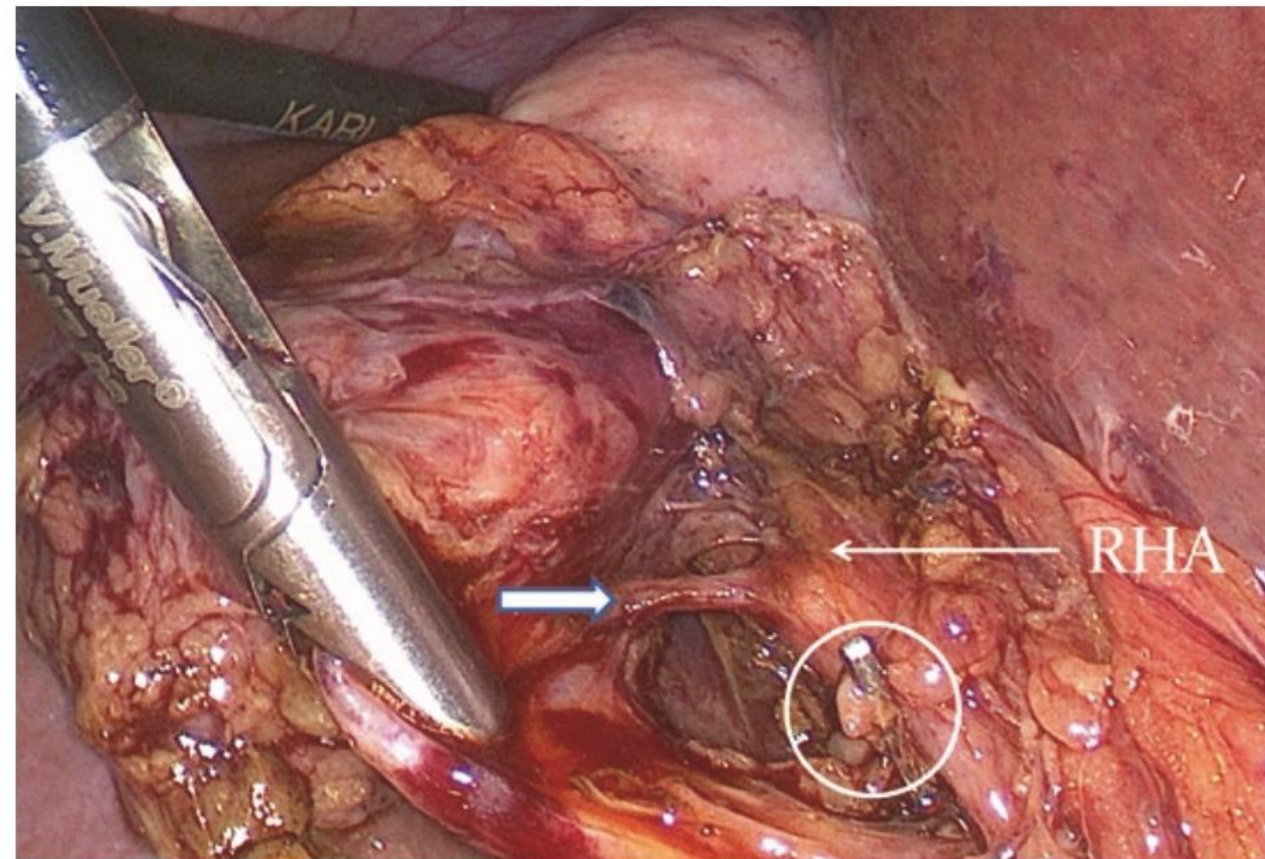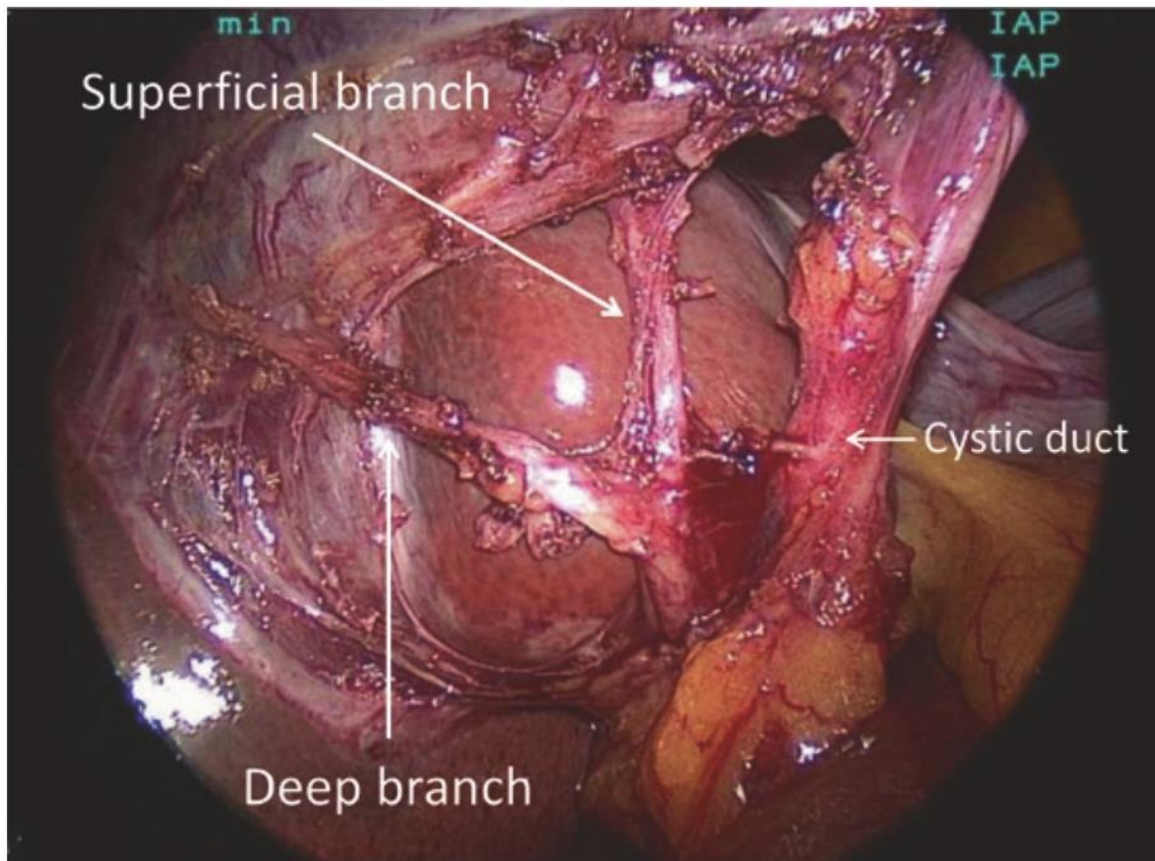
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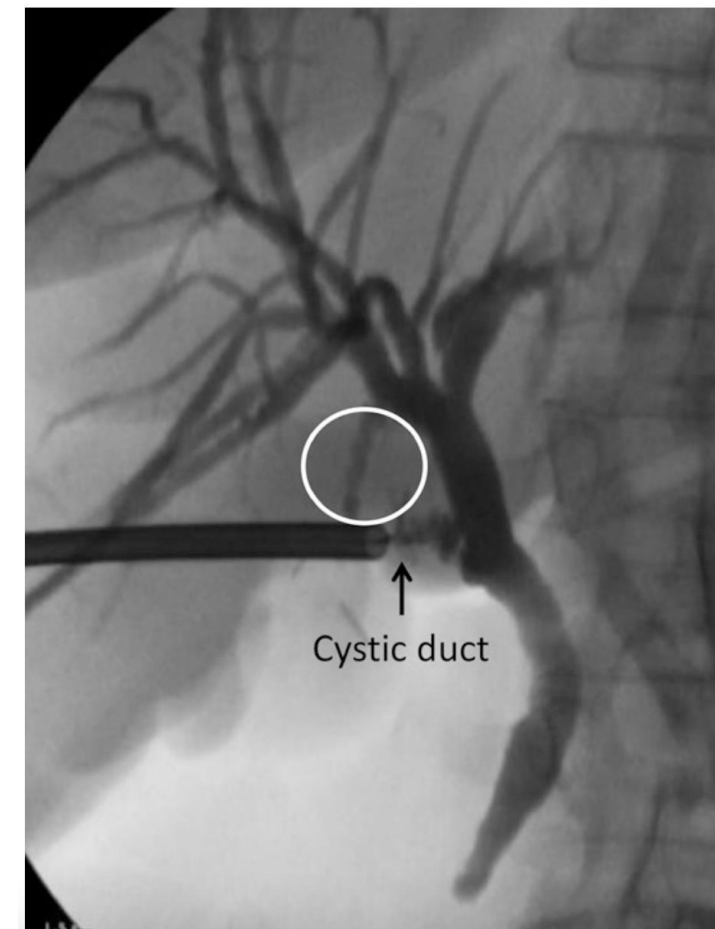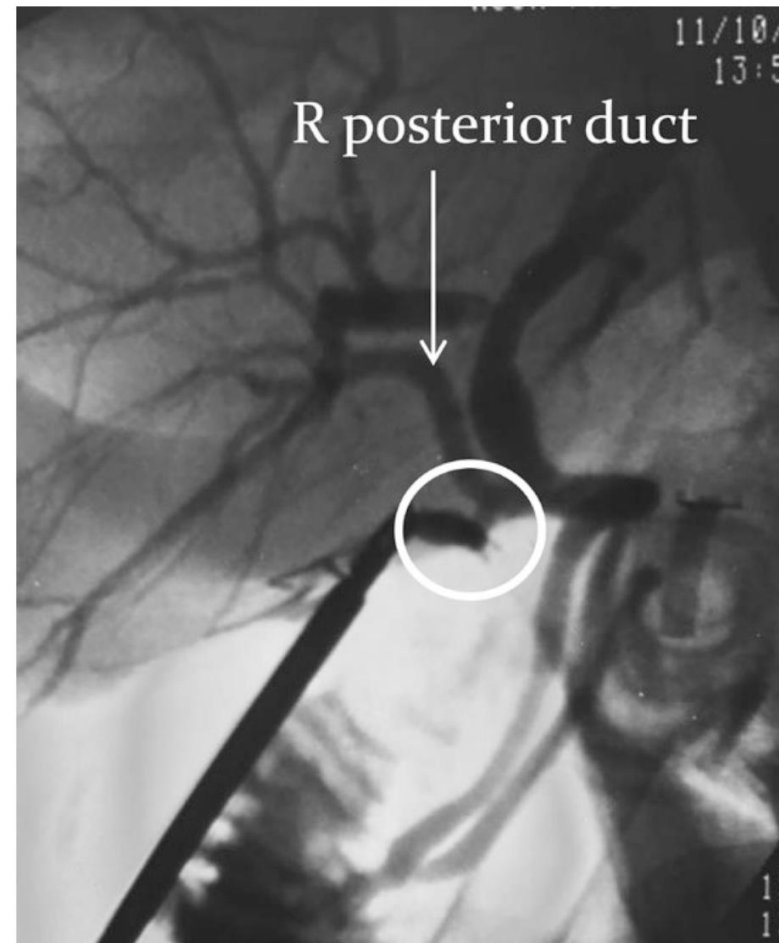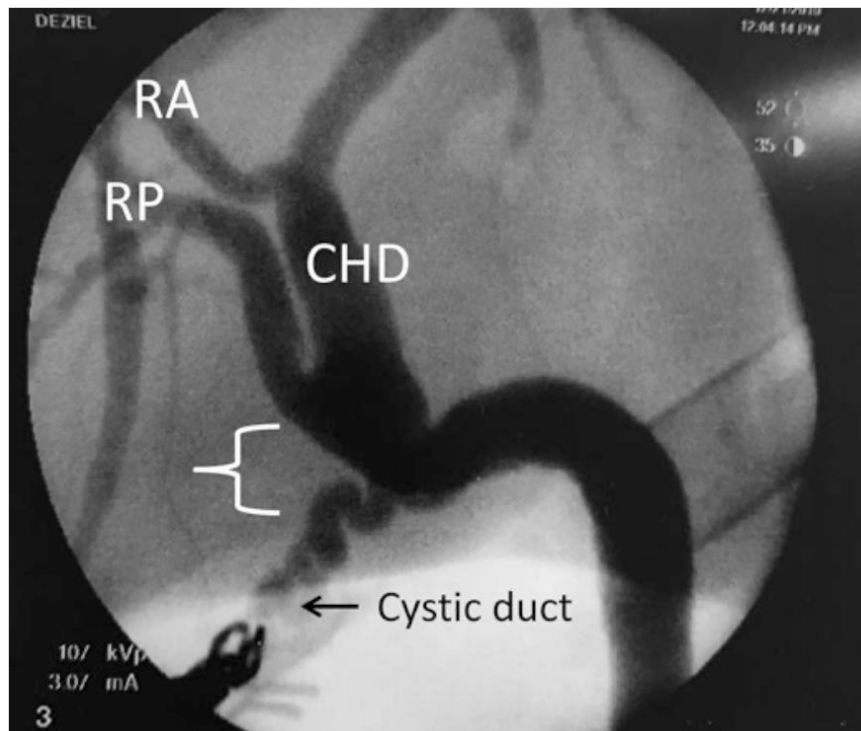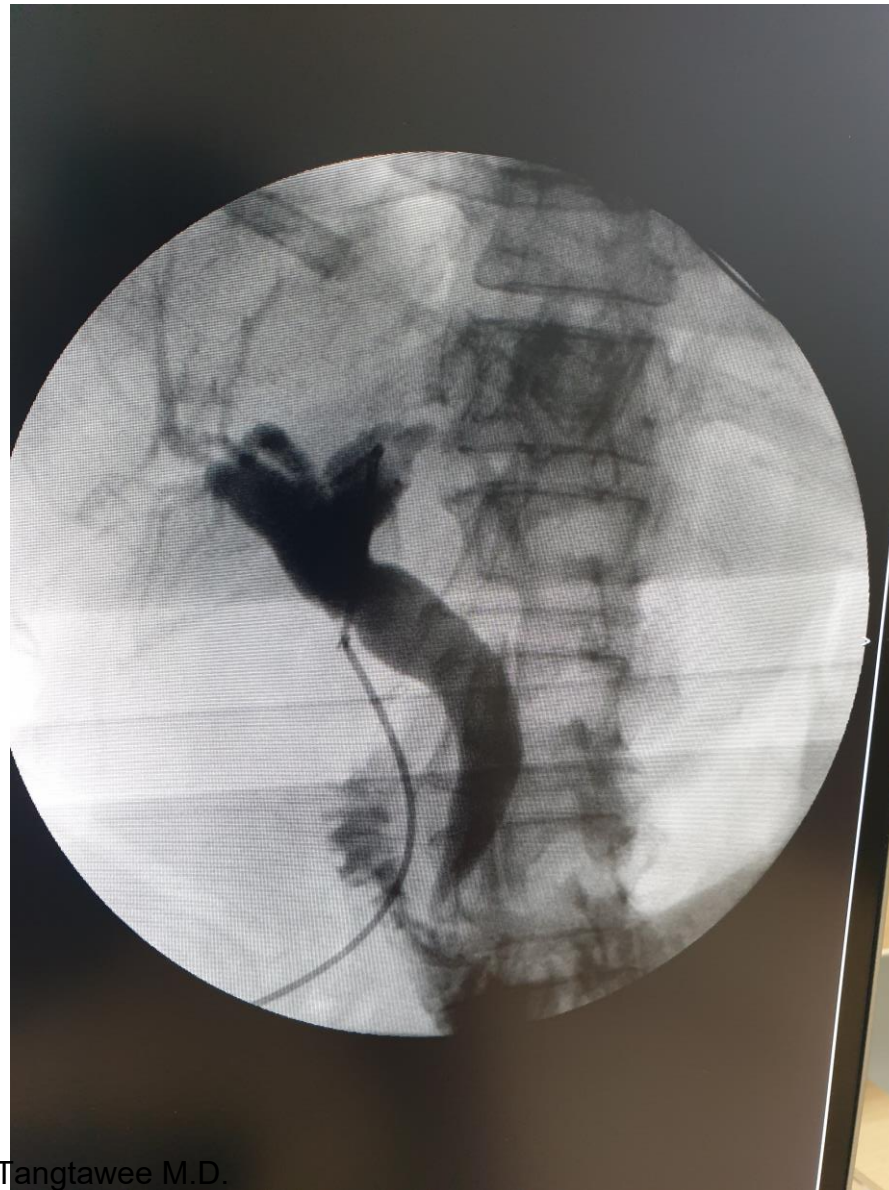
SAGES six-step program

- Step 3: Make liberal use of intraoperative imaging (e.g., cholangiography)

  "Cholangiography may be especially important in difficult cases"

The SAGES Safe Cholecystectomy Program.
https://www.sages.org/safe-cholecystectomy-program/. 2014.

SAGES six-step program

- Step 4: Perform an intraoperative timeout before clipping or cutting ductal structures

"The timeout is meant as a pause or stop point to verify anatomy before proceeding with dividing the ductal structures"

The SAGES Safe Cholecystectomy Program.
https://www.sages.org/safe-cholecystectomy-program/. 2014.

SAGES six-step program

- Step 5: Recognize when the dissection is approaching a zone of significant risk, and halt the dissection before entering the zone

"Finish the operation by a safe method other than total cholecystectomy if conditions around the gallbladder are too dangerous or the CVS cannot be obtained"

The SAGES Safe Cholecystectomy Program.
https://www.sages.org/safe-cholecystectomy-program/. 2014

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SAGES six-step program

- Step 6: Get help from another surgeon

"When the dissection is stalled or conditions are difficult and it is practical to obtain"

The SAGES Safe Cholecystectomy Program.
https://www.sages.org/safe-cholecystectomy-program/. 2014.

Prior abdominal surgery

- Difficulty access and exposure
  - prior periumbilical midline or upper abdominal surgery
- A quadrant of the abdomen should be selected that would be expected to be away from adhesions
- options may include
  - optical insufflating port
  - open access in the epigastric region

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Prior abdominal surgery

- if initial access can be safely obtained and a second port placed
- Careful adhesiolysis
- Extra ports may be needed
- Sharp dissection is preferred

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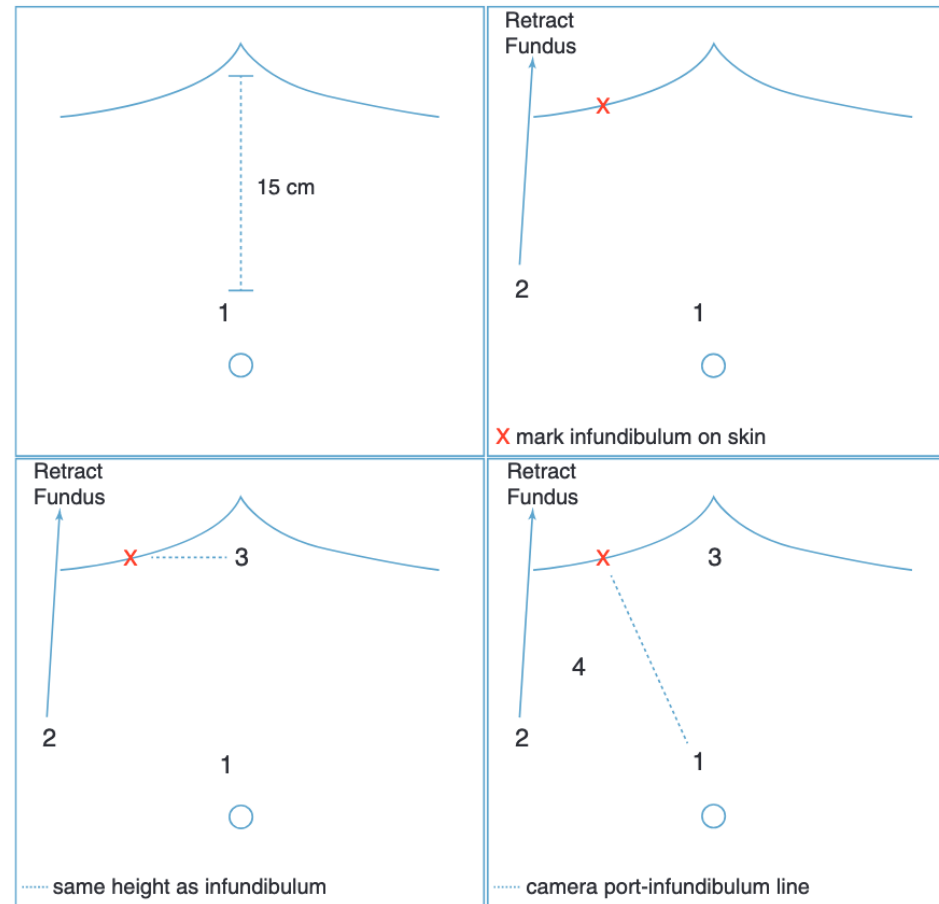
Obesity

FIGURE 3.1 Recommended port placement. Note this setup is used in the obese patient; otherwise, placement of the camera [1] port is performed through or around the patient's umbilicus

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Acute Cholecystitis

Table 2 Difficulty score for each intraoperative finding

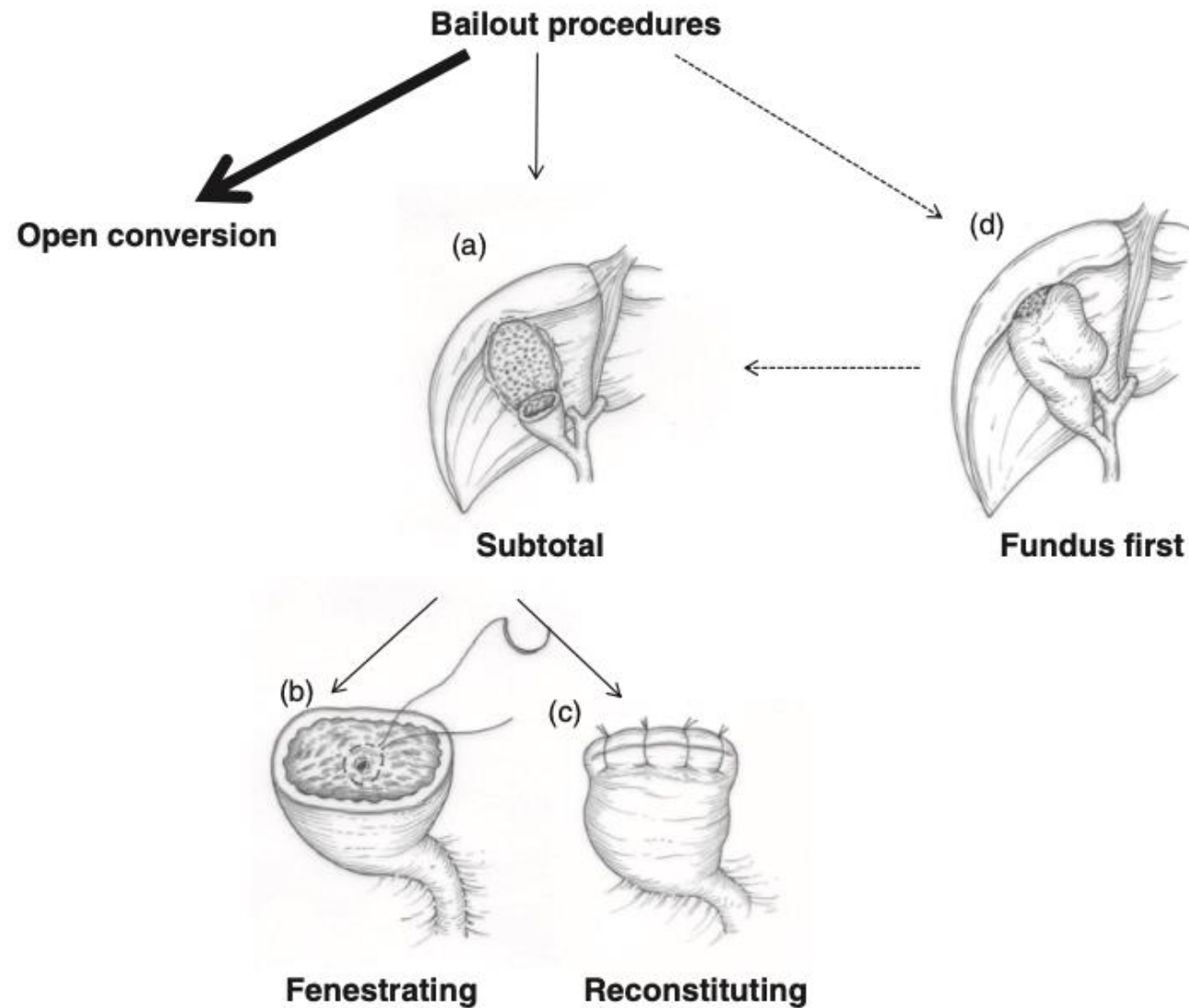| Intraoperative findings	Score
A. Factors related to inflammation of the gallbladder	
(a) Appearance around the gallbladder	
1. Fibrotic adhesions around the gallbladder due to inflammation	2
2. Partial scarring adhesions around the gallbladder	2
3. Diffuse scarring adhesions around the gallbladder	4
(b) Appearance of the Calot's triangle area	
4. Sparse fibrotic change in the Calot's triangle area	2
5. Dense fibrotic change but no scarring in the Calot's triangle area	3
6. Partial scarring in the Calot's triangle area	4
7. Diffuse scarring in the Calot's triangle area	5
(c) Appearance of the gallbladder bed	
8. Sparse fibrotic change in the gallbladder bed	1
9. Dense fibrotic change but no scarring in the gallbladder bed	2
10. Partial scarring in the gallbladder bed	3
11. Diffuse scarring in the gallbladder bed (includes atrophic gallbladder with no lumen due to severe contraction)	4
(d) Additional findings of the gallbladder and its surroundings	
12. Edematous change around the gallbladder/in the Calot's triangle area/in the gallbladder bed	1
13. Easy bleeding at dissection around the gallbladder/in the Calot's triangle area/in the gallbladder bed	3
14. Necrotic changes around the gallbladder/in the Calot's triangle area/in the gallbladder bed	4
15. Non-iatrogenic, perforated gallbladder wall and/or abscess formation towards the abdominal cavity noted during adhesiolysis around the gallbladder	3
16. Abscess formation towards the liver parenchyma	4
17. Cholecysto-enteric fistula	5
18. Cholecysto-choledochal fistula (included in the expanded classification of Mirizzi syndrome)	6
19. Impacted gallstone in the confluence of the cystic, common hepatic, and common bile duct (included in the expanded classification of Mirizzi syndrome)	5

B. Intra-abdominal factors unrelated to inflammation

20. Excessive visceral fat — 2
21. Inversion of the gallbladder in the gallbladder bed due to liver cirrhosis — 4
22. Collateral vein formation due to liver cirrhosis — 4
23. Non-inflammatory (physiological) adhesion around the gallbladder — 1
24. Anomalous bile duct — 4
25. Gallbladder neck mounting on the common bile duct — 3

Expert surgeons participated in a Delphi process and graded the 25 intraoperative findings using the seven-stage scale ranging from 0 to 6 (0: easiest, 6: most difficult). The median point for each item was set as the difficulty score.

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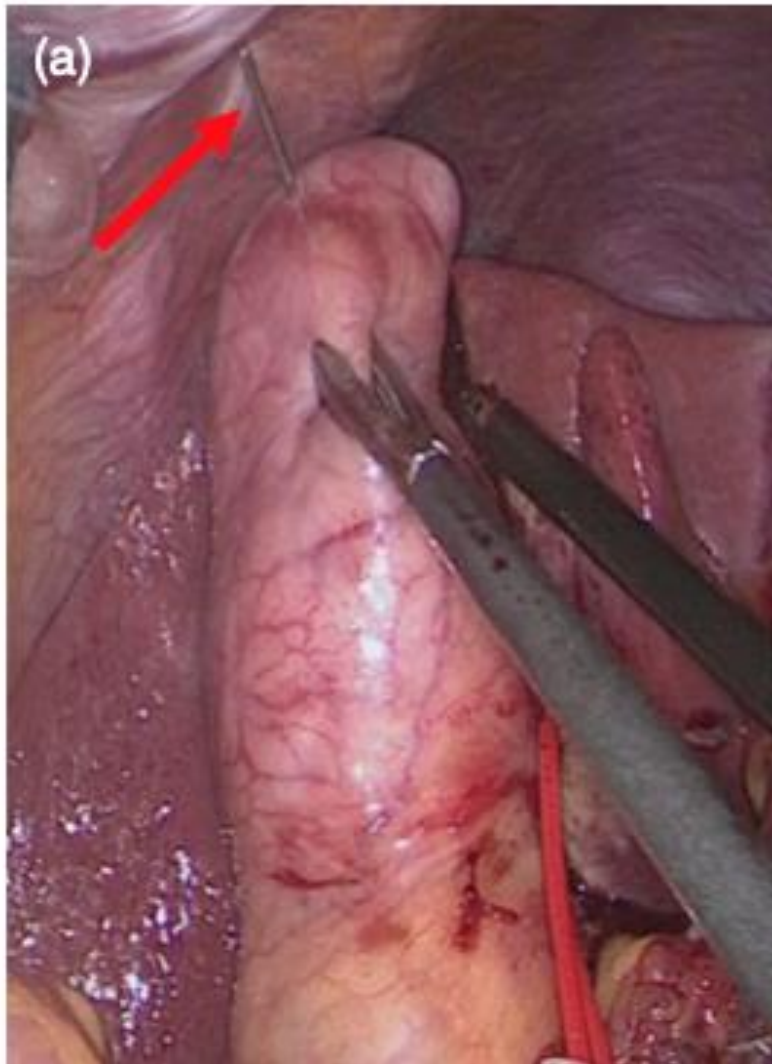
bailout procedures

- A bailout procedure should be chosen if a CVS cannot be achieved because of scarring or severe fibrosis, as long as the Calot's triangle is appropriately retracted and is recognized as a landmark

Bailout procedures

Open conversion

(a) Subtotal

(d) Fundus first

(b) Fenestrating

(c) Reconstituting

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Safe steps in LC for AC

- Step 1: If a distended GB interferes with the field of view, it should be decompressed by needle aspiration

- Step 2: Effective retraction of the GB to develop a plane in the Calot's triangle area and identify its boundaries

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Safe steps in LC for AC

- Step 3: Starting dissection from the posterior leaf of the peritoneum covering the neck of the GB and exposing the GB surface above Rouviere's sulcus

- Step 4: Maintaining the plane of dissection on the GB surface throughout LC
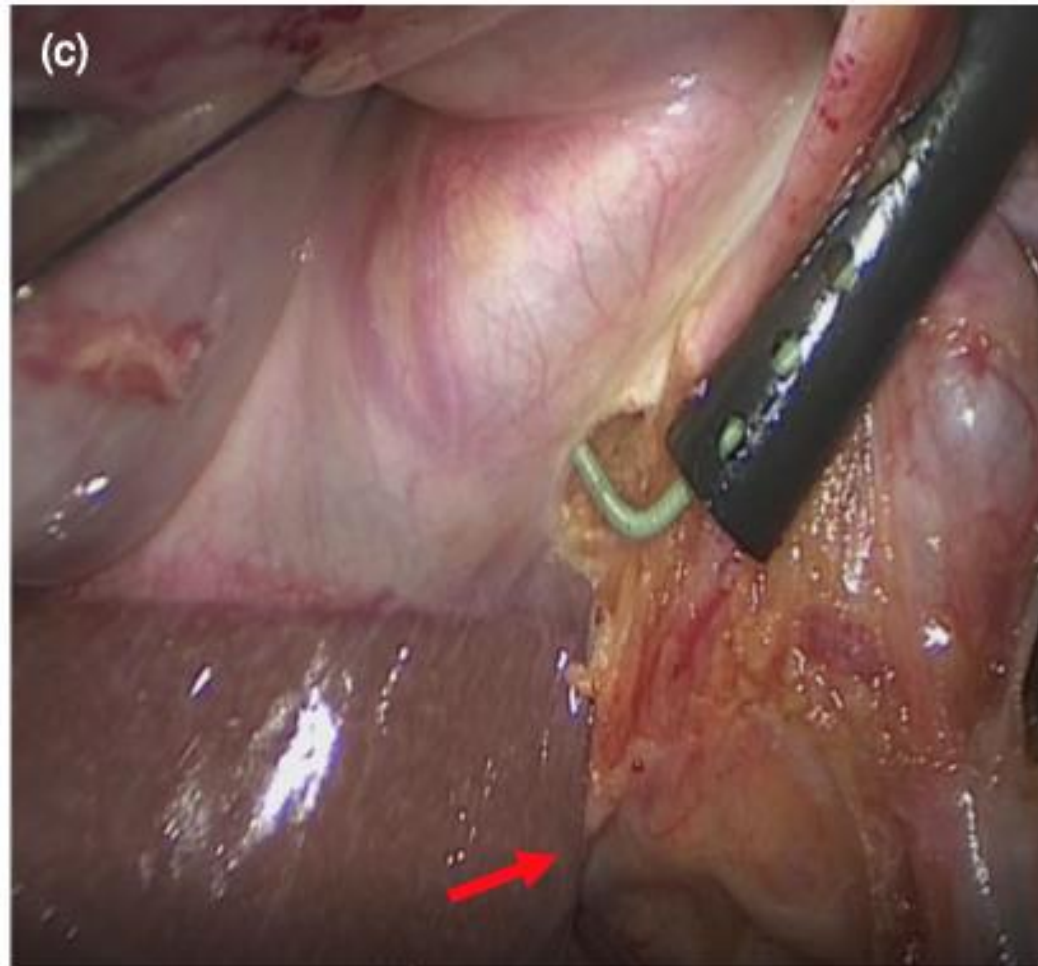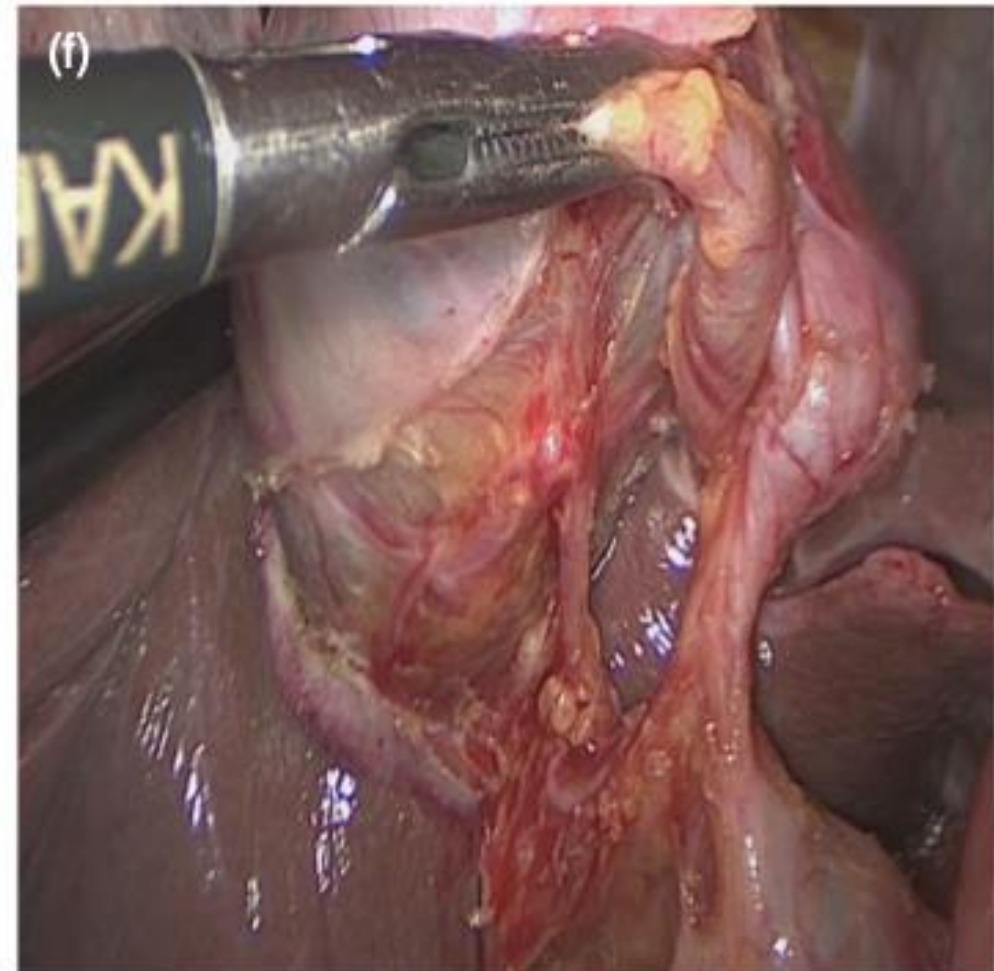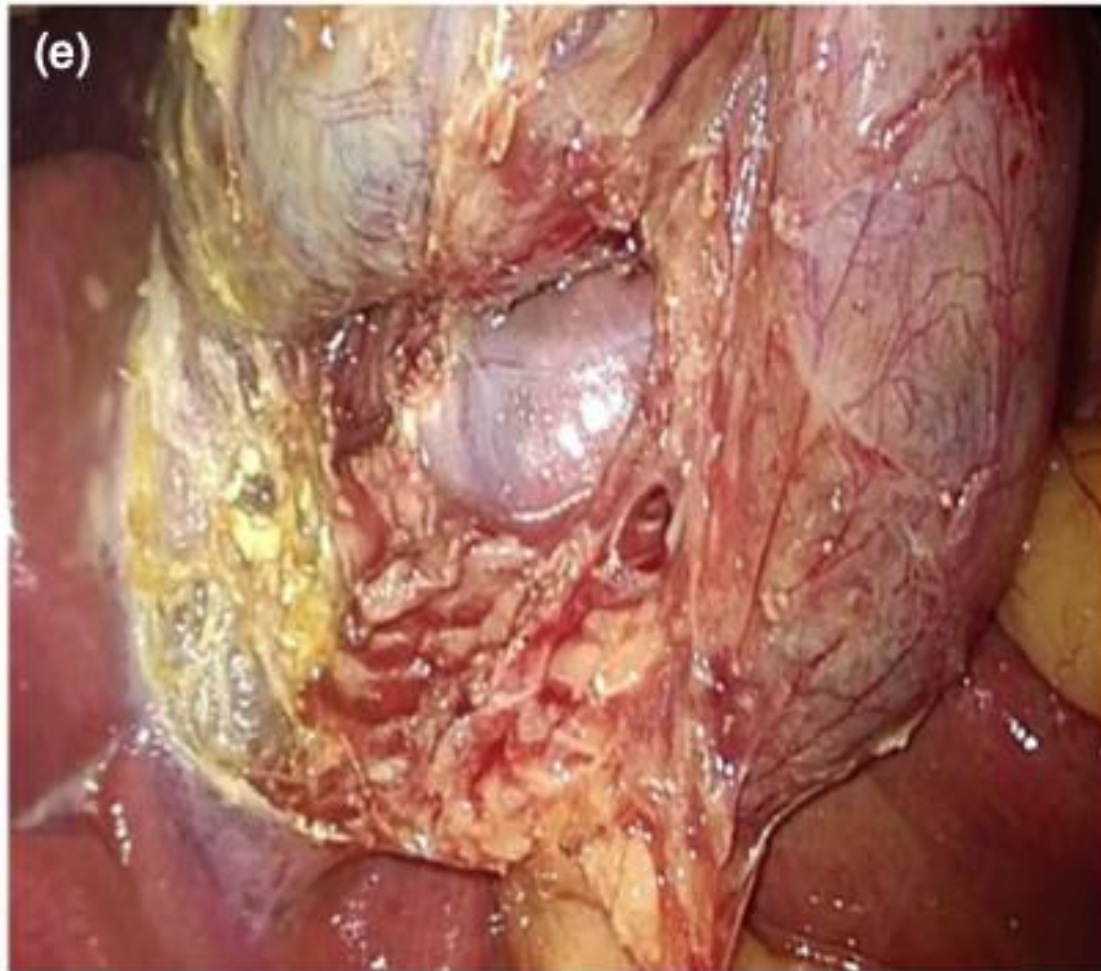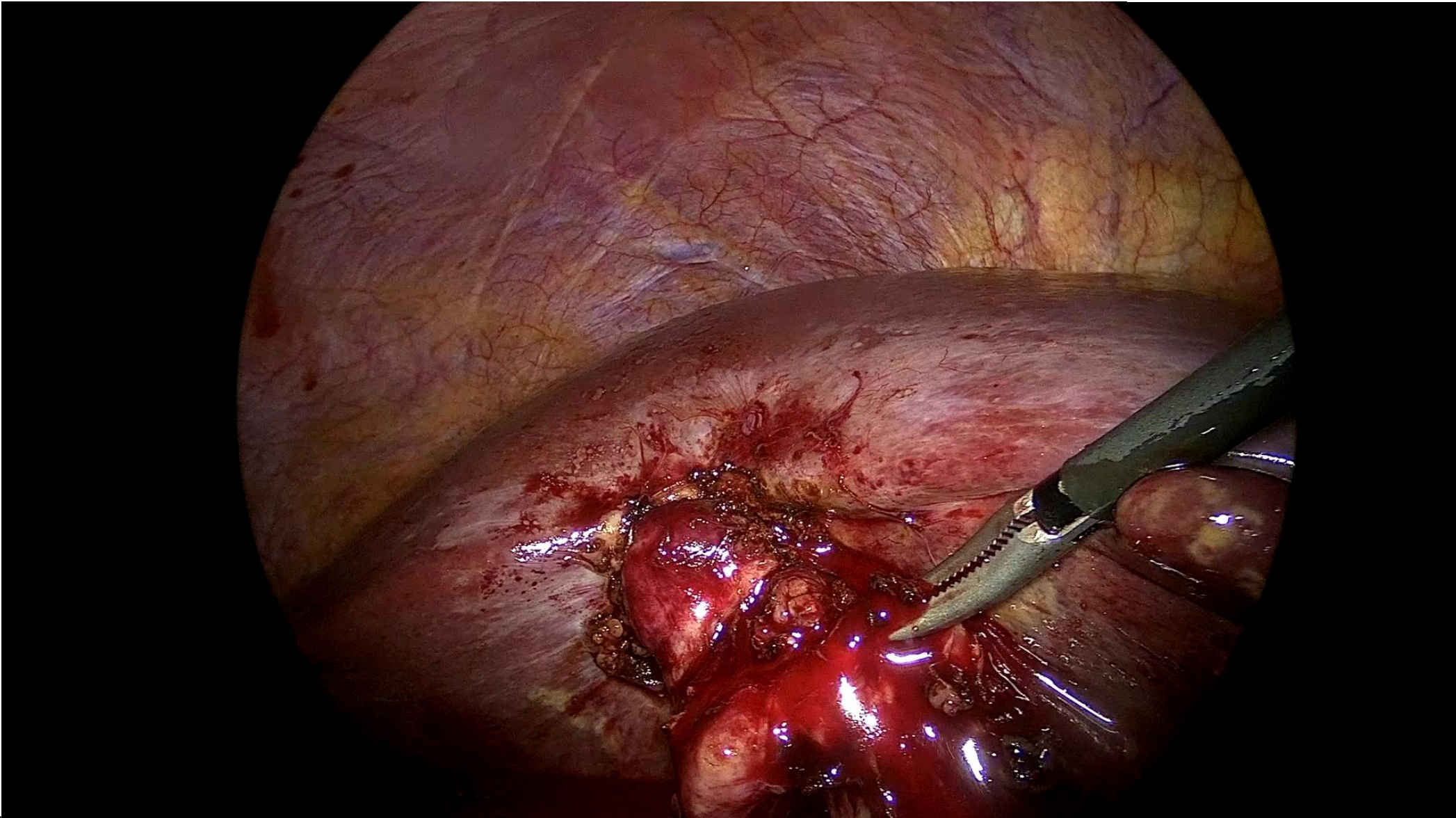
- Step 5: Dissecting the lower part of the GB bed (at least one-third) to obtain the critical view of safety (CVS)

- Step 6: Creating the critical view of safety

For persistent hemorrhage, achieving hemostasis primarily by compression and avoiding excessive use of electrocautery or clipping.

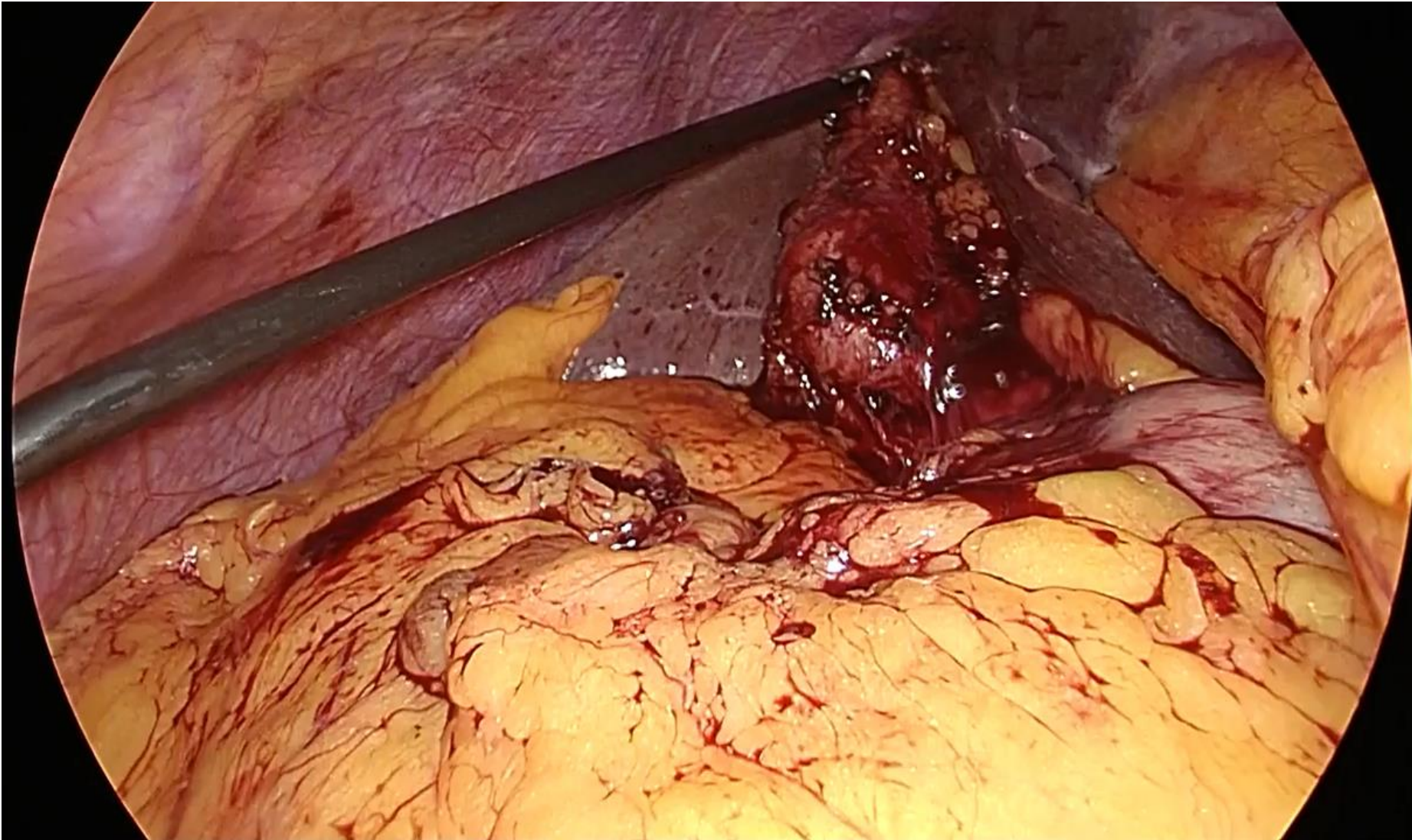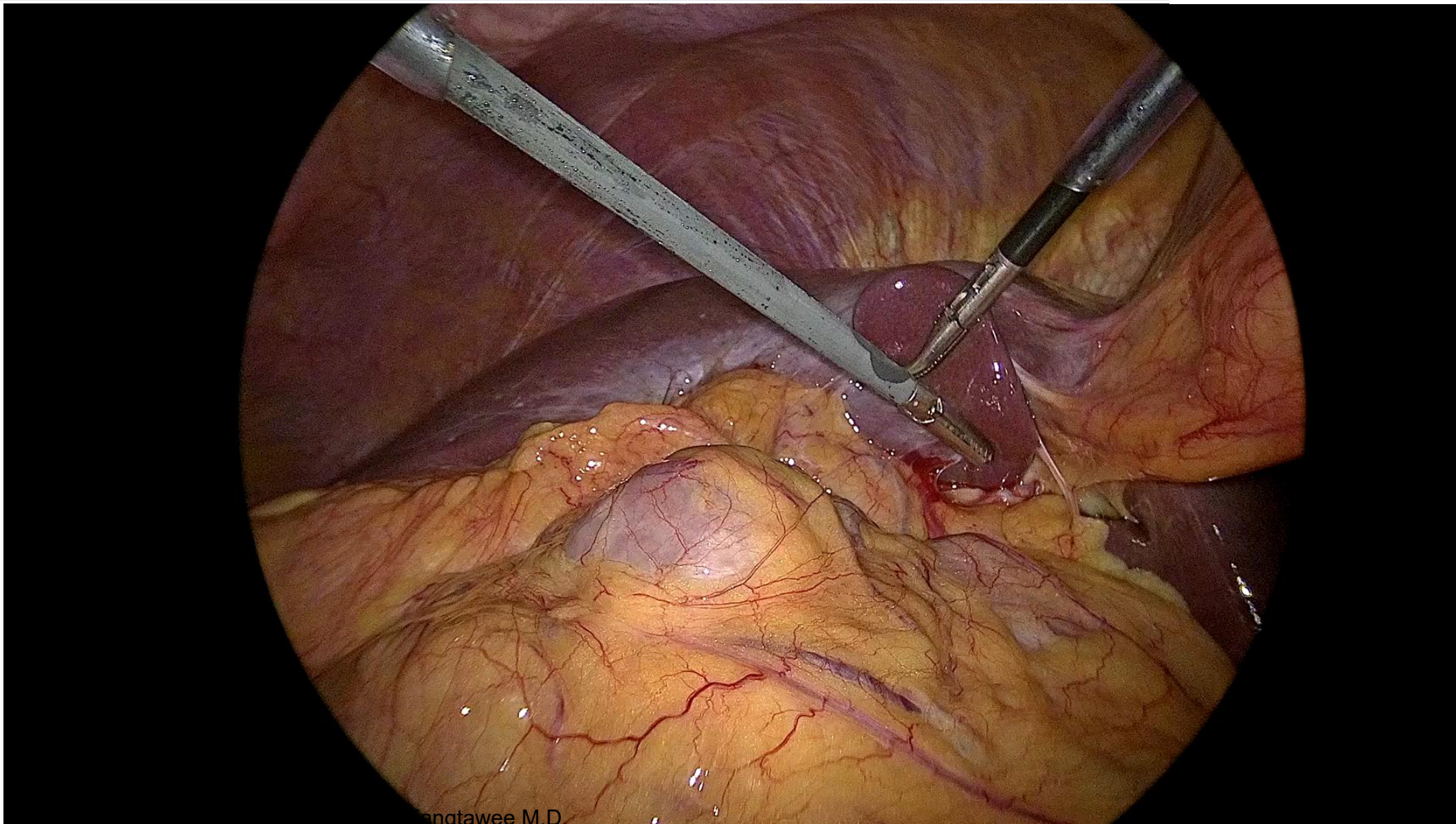Difficult cholecystectomy : Pongsatorn Tangtawee M.D.
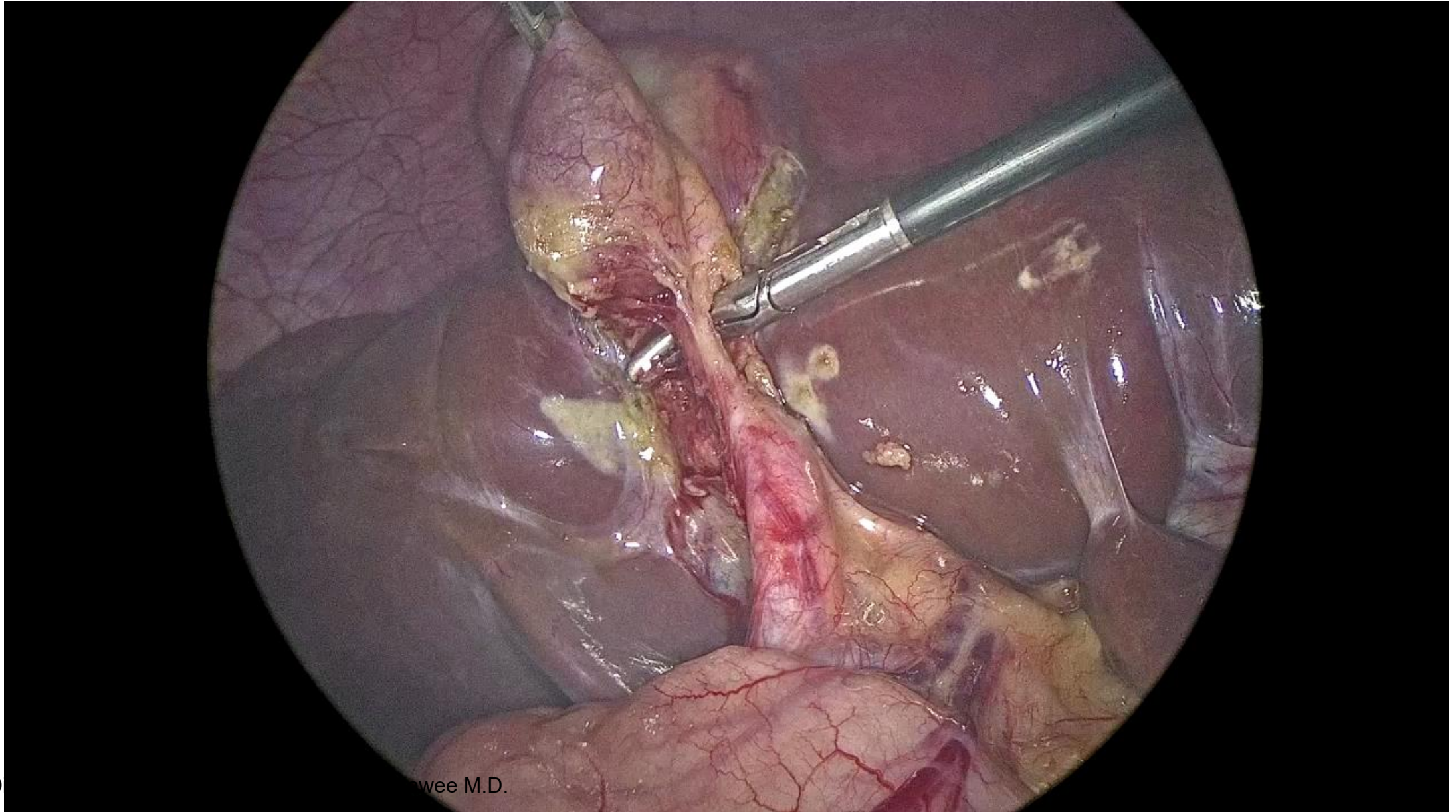
Chronic cholecystitis

- Dense fibrous or desmoplastic changes

- Contraction of the gallbladder with a chronically thickened gallbladder

- bailout techniques, conversion to open operation, and intraoperative imaging should be considered.

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Take Home Message

- The Culture of Safe Dissection = Critical view of safety

- Intraoperative timeout before clipping or cutting ductal structures

- If you feel too difficult, please Bailout or Call for help

- Record & Review then Repeat to Evolution

Thank You